Appendix D-29

Preliminary Draft #2 Avian Protection Plan March 2012

Preliminary Draft No. 2

Avian Protection Plan for the Avoidance and Minimization of Potential Impacts to Avian Species

Alta East Wind Project

Submitted to

U.S. Fish and Wildlife Service

Submitted by

Alta Windpower Development, LLC

March 2012

Prepared by

CH2MHILL

Contents

Section **Page**

Acronyms and Abbreviations ..... **v**

1 Introduction **1-1**
1.1 Project Description 1-1
1.2 Purpose of the Avian Protection Plan 1-1
1.3 Interagency Coordination and Communication History 1-2

2 Site Assessment and Surveys **2-1**
2.1 Initial Site Assessment 2-1
2.2 Site-specific Surveys and Assessment 2-1
2.2.1 Habitat Assessment 2-2
2.2.2 Avian Point Count Surveys 2-2
2.2.3 Nesting Territory Surveys 2-11
2.2.4 Burrowing Owl Surveys 2-12
2.2.5 Species Recorded 2-12

3 Risk Assessment **3-1**
3.1 Construction and Operations 3-1
3.2 Collision Risk 3-2
3.3 Electrocution Risk 3-3
3.4 Impacts on Nests or Nesting Territories 3-4
3.5 Nocturnal Migration 3-4
3.6 California Condor 3-5
3.7 Cumulative Impacts 3-6

4 Avoidance, Minimization, and Mitigation Measures **4-1**
4.1 Project Siting 4-1
4.2 Micrositing of Project Features 4-1
4.3 Construction Measures 4-2
4.3.1 Minimizing Potential Habitat Disturbance 4-2
4.3.2 Minimizing Potential Direct Disturbance 4-3
4.4 Operation Measures 4-4
4.5 Condor Mitigation Measures 4-4
4.6 Compensation for Habitat Loss 4-5

5 Post-construction Monitoring **5-1**
5.1 Fatality Studies 5-1
5.2 Nesting/Breeding Monitoring 5-2

6 Adaptive Management **6-1**
6.1 Accounting for Policy Changes 6-1
6.2 Agency Coordination 6-1
6.3 Implementing Adaptive Management 6-1

6.4 Mortality Reduction and Conservation Measures 6-2
6.5 Supplemental Measures 6-2
6.6 California Condor 6-2

7 References 7-1

Appendix

A California Condor Mitigation Strategy

Tables

1 Avian Species Recorded during all biological resource surveys completed for the Alta East Project from May 2009 to June 1, 2011
2 Summary of Historical Visibility Data

Figures

1 Project Area Map
2 Vegetation Communities
3 Alta East Project Boundary and Avian Use Survey Points from May 11, 2009 to May 6, 2010
4 Alta East Project Boundary and Avian Use Survey Points from July 10, 2010 to June 1, 2011.
5 Comparison of annual raptor use between the Alta East Project and Other Wind Energy Facilities, using data collected at the Alta East Project from July 10, 2010 to June 1, 2011.
6 Results of Raptor Nest Survey Results Completed for the Alta East Project Area in 2011.
7 Results of Burrowing Owl Surveys completed for the Alta East Project Area from May 30-July 15, 2010.

Acronyms and Abbreviations

APLIC	Avian Power Line Interaction Committee
AWD	Alta Windpower Development, LLC
BGEPA	Bald and Golden Eagle Protection Act
BLM	U.S. Bureau of Land Management
BMP	best management practice
CDFG	California Department of Fish and Game
CEC	California Energy Commission
dBA	A-weighted decibels
kV	kilovolt
MBTA	Migratory Bird Treaty Act
SR	State Route
USFWS	U.S. Fish and Wildlife Service
WEST	Western EcoSystems Technology, Inc.
WTG	wind turbine generator

SECTION 1.0

1 Introduction

1.1 Project Description

Alta Windpower Development, LLC (AWD) proposes to construct the Alta East Wind Project in the Tehachapi region of southern California. Portions of the project would be located on land managed by the U.S. Bureau of Land Management (BLM) and privately owned land under the jurisdiction of Kern County. The proposed development is a wind energy facility with a nameplate capacity rating of approximately 300 megawatts of wind turbine generation and includes ancillary facilities and supporting infrastructure. Up to 120 wind turbine generators (WTG) would be installed. The project includes repowering a historical wind power project site north of SR 58 on BLM lands.

The project is proposed to be located on approximately 3,195 acres on the northern and southern sides of State Route (SR) 58 in southeastern Kern County, California, within and adjacent to an area of existing wind development. The project area is approximately 3 miles northwest of the town of Mojave and approximately 11 miles east of the city of Tehachapi. Approximately 30 percent of the project's area (1,115 acres) and approximately 33 percent of the WTGs would be located on land under the jurisdiction of Kern County. The location of the project site is shown on Figure 1, Project Area Map.

BLM is the lead agency for review under the National Environmental Policy Act. The U.S. Fish and Wildlife Service (USFWS) is a cooperating agency involved in Section 7 consultation under the federal Endangered Species Act.

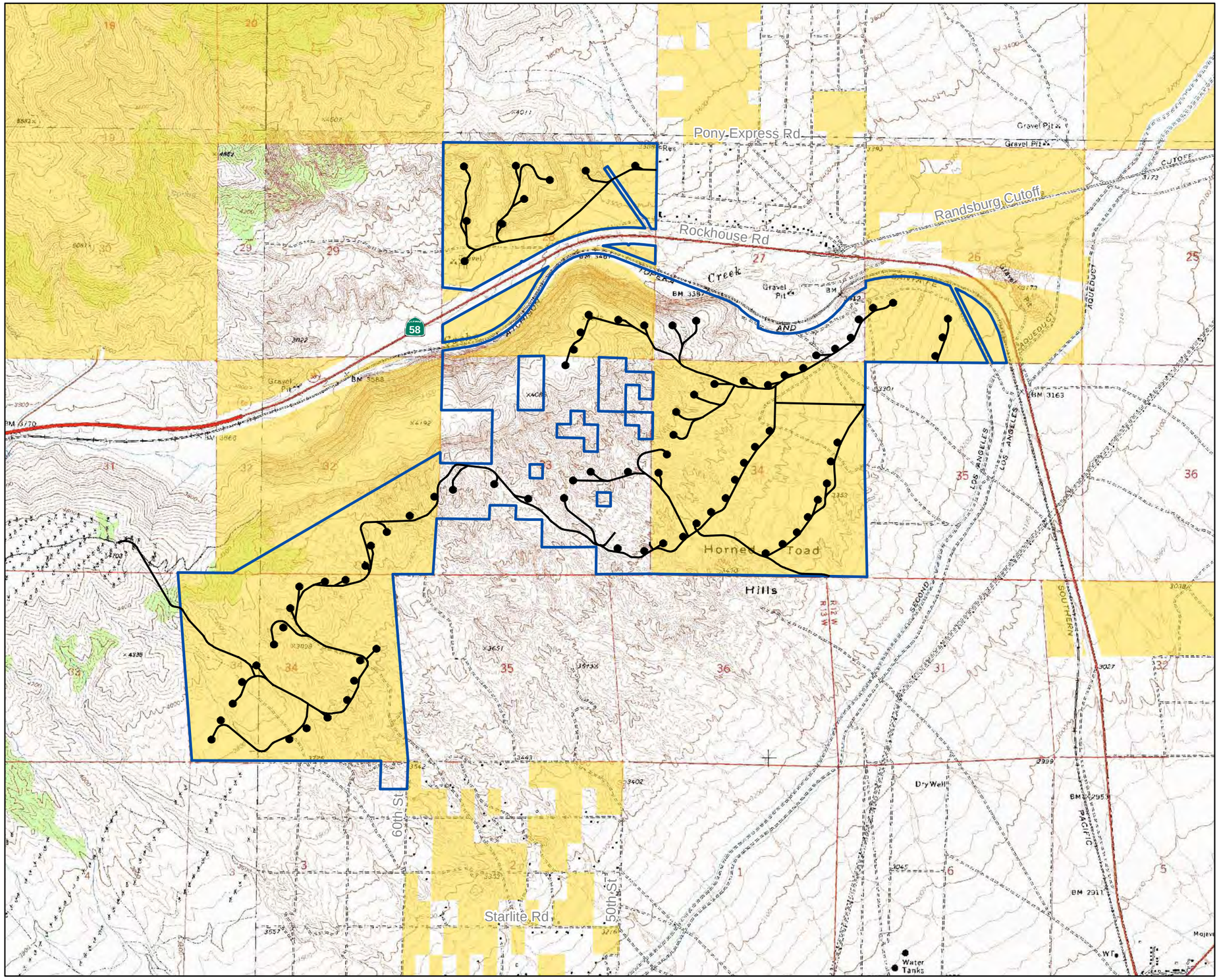
1.2 Purpose of the Avian Protection Plan

AWD has developed an Avian Protection Plan (APP) for the project to identify the reasonably foreseeable threats to avian species and to develop effective response measures to avoid or minimize these potential impacts. AWD is establishing this APP as a commitment to construct and operate the project in a manner that proactively addresses potential impacts on protected avian species. Under the Migratory Bird Treaty Act (MBTA) (16 United States Code [USC] §§ 703-712) (USFWS, 1998) it is "unlawful to pursue, hunt, take, capture or kill; attempt to take, capture or kill; possess, offer to or sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried or received any migratory bird, part, nest, egg or product…". The MBTA does not have provisions for authorizing "take" of migratory birds that may be killed or injured by otherwise lawful activities. Golden eagles, which are afforded protection under the MBTA and the Bald and Golden Eagle Protection Act (BGEPA) (16 United States Code §§ 668-668c), are addressed in the draft Eagle Conservation Plan provided to USFWS on March 22, 2011; however, many of the avoidance and conservation measures identified in this APP have the added benefit of minimizing risk and potential impacts on eagles. Bat detection rates in baseline studies for

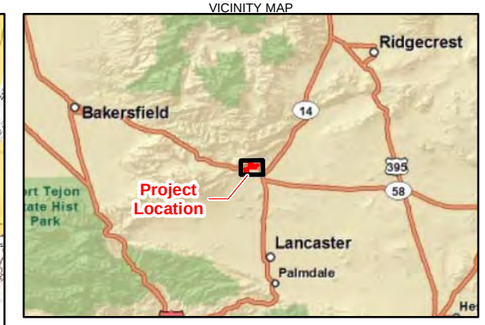
the project are low and bat fatality rates in the region are low, therefore, potential bat impacts and bat protection measures are not addressed in this plan.

1.3 Interagency Coordination and Communication History

April 29, 2010	AWD provided USFWS with the biological resources study plan for review and input.
November 29, 2010	Representatives from AWD met with Ashleigh Blackford and Danielle Dillard of USFWS and Justin Sloan of the California Department of Fish and Game (CDFG). Jacqui Kitchen of the Kern County Planning Department participated via telephone. The project was introduced and the results of baseline wildlife studies completed to date were presented.
November 30, 2010	AWD received correspondence from USFWS regarding the baseline study plan presented to USFWS in April 2010.
December 10, 2010	AWD responded to correspondence from USFWS regarding the baseline study plan
March 22, 2011	Draft Eagle Conservation Plan was submitted to USFWS.
April 29, 2011	Draft APP was submitted to USFWS
September 26, 2011	Comments on draft APP from USFWS provided to AWD
March 8, 2012	AWD responses and revised APP provided to USFWS.



VICINITY MAP



LEGEND

- Proposed Wind Turbine Layout
- Proposed Access Road
- BLM Lands
- Alta East Wind Project Area

N

0 1,100 2,200
Feet

FIGURE 1
Project Area Map
Alta East Wind Project
Alta Wind Energy Center Project

CH2MHILL

DEN \\COBRA\PROJ\TERRAGENPOWER\TERRAGEN_ALTA_EAST\GIS\MAPFILES\BIOLOGICAL_ASSESSMENT\ARCHIVE\20110802\GOLDENEAGLE_SITEMAP.MXD SCUTLER1 1/17/2012 10:05:09 AM
IS1115100939 37SAC

SECTION 2.0

2 Site Assessment and Surveys

2.1 Initial Site Assessment

In July 2009, AWD completed an initial site assessment to evaluate potential constraints or risks to successful project development. This area of the Tehachapis was specifically selected for evaluation because of the extensive existing wind energy development in the region, the expected low level of avian impacts associated with the operating projects, the lack of critical habitat for federally endangered species, and the manageable issues related to other special-status species potentially present on site. Based on pre-field review of publicly available resources (California Natural Diversity Database [CDFG, 2009], California Native Plant Society database [2009], BLM special-status species management manual [BLM, 2001], and the California Desert Conservation Area Plan [BLM, 1999]), as well as reconnaissance surveys conducted at the site between 2006 and 2009 and during a March 19, 2009, site visit specifically designed to evaluate potential resource issues, it was determined that the site presented low levels of risk to avian resources and that investment in site-specific resource studies was warranted.

AWD determined that avian species are present on the site, but that no wetlands or riparian areas exist on site that would attract avian species or provide unique habitat that would preclude potential development of a commercial-scale wind energy project. AWD determined that further study to understand and define the risk issues would yield sufficient information to construct and operate the project without significant adverse impacts to protected avian species and therefore completed detailed site surveys to identify potential risk issues warranting impact avoidance or minimization measures.

2.2 Site-specific Surveys and Assessment

AWD has implemented a comprehensive avian study program to consider avian species and their habitat. Survey protocols were presented to USFWS and CDFG for review in April 2010; comments were received and suggestions incorporated into the protocols where feasible. The avian study program consisted of vegetation mapping, avian use surveys, burrowing owl surveys, and raptor nesting surveys. Additionally, in 2009 AWD completed a general biological resource assessment for the project to determine the likelihood of special-status species occurring in the area proposed for development, as well as to identify important or unique avian habitats such as riparian corridors, wetlands, unique topography, or potential migratory stopover habitat that might warrant consideration in avian studies and APP development.

Baseline avian use studies for the project included 30-minute point counts conducted from May 2009 through March 2011 at approximately 1-week intervals throughout the area proposed for development. The avian point count surveys were completed in accordance with *The California Guidelines for Reducing Impacts to Birds and Bats from Wind Energy*

Development (California Energy Commission [CEC], 2007). These surveys were designed to document species using the proposed project site, identify seasonal and spatial patterns of use, and identify general and specific risk factors that could be eliminated or reduced through micrositing or modification of project features.

In addition, helicopter surveys were completed in April and May 2010, and February and April 2011, to identify nesting Swainson's hawks within 5 miles of the project area and other nesting raptor species within 2 miles. Additionally, to augment the helicopter surveys for Swainson's hawks, three ground-based surveys were completed between April 25 and April 30, 2011 within 5-miles of the project to detect nesting Swainson's hawks. The analysis area for Swainson's hawk nests was determined in accordance with *Swainson's Hawk Survey Protocols, Impact Avoidance, and Minimization Measures for Renewable Energy Projects in the Antelope Valley of Los Angeles and Kern Counties, California* (CEC and CDFG, 2010). A 2-mile analysis area was established for other nesting raptor species to enable detection of nests that could potentially be subject to construction period disturbance that were beyond the project boundary. Additionally, surveys to detect burrowing owls were completed in 2010 in accordance with the *Burrowing Owl Survey Protocol and Mitigation Guidelines* prepared by the California Burrowing Owl Consortium (1993).

Site-specific survey methods and results are summarized below, and complete avian reports that include detailed discussion of methods and results are presented in Chatfield et al. (2010a, b, and c) and Phoenix Ecological Consulting (2010).

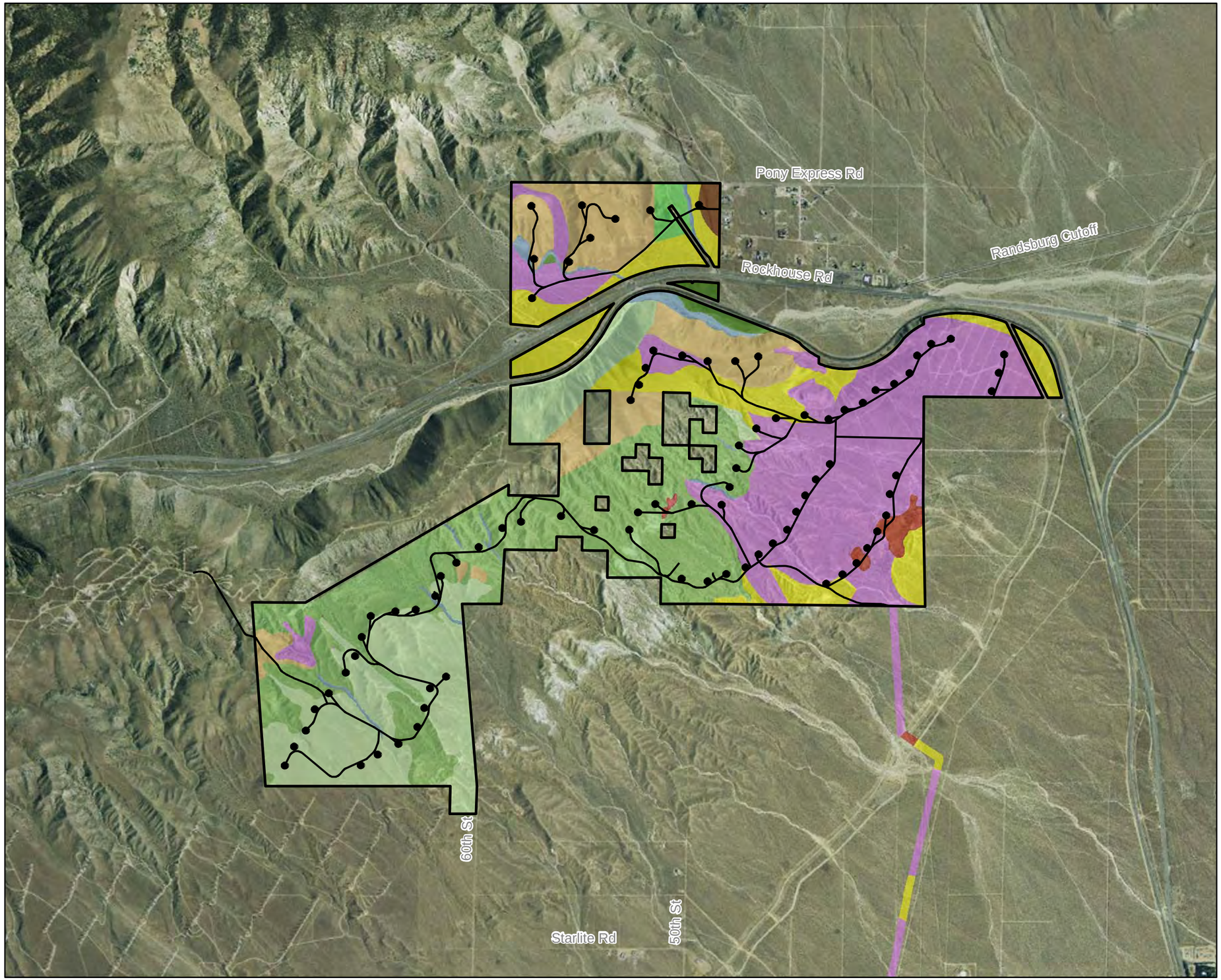
2.2.1 Habitat Assessment

CH2M HILL biologists identified eight general community types on the project site: creosote bush scrub, brittlebush scrub, rabbitbrush scrub, California buckwheat scrub, scalebroom scrub, desert almond scrub, California juniper woodland, and Joshua tree woodland. Substantial overlap in species composition occurs among the community types and the boundaries are generally diffused with gradual transitions between the mapped community types. Therefore, the vegetation boundaries shown on Figure 2 are intended to show the general distribution of the community types within the project area.

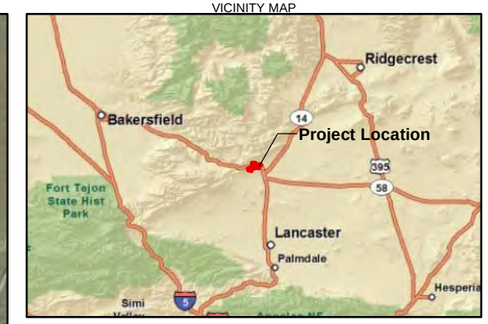
Each community type and edge habitat area likely presents suitable nesting and foraging habitat for a variety of avian communities. Avian survey locations were distributed across these habitat types to adequately document the species composition present at the project site, but surveys were not designed to specifically document habitat associations for each species.

2.2.2 Avian Point Count Surveys

The objective of the fixed-point bird use surveys was to estimate the seasonal and spatial use of the study area by birds, particularly diurnal raptors. Fixed-point surveys (variable circular plots) were conducted using methods described by Reynolds et al. (1980). All birds seen during each 30-minute fixed-point survey were recorded. These surveys are standard assessment techniques used to assess most wind energy projects in California and are completed in accordance with CEC guidelines (CEC, 2007). The point counts completed for this project are used to identify the species using the project and to determine seasonal mean use values by species that serve as an index to abundance. The index correlates well to



VICINITY MAP



LEGEND

- Proposed Wind Turbine Layout
- Proposed Access Road
- Project Area

Vegetation Type

- Brittlebush Scrub/Mormon Tea Scrub
- California Buckwheat Scrub
- California Buckwheat/Saltbush Scrub
- California Juniper Woodland
- Cheesebush Scrub
- Cheesebush/Bursage Scrub
- Creosote Bush Scrub
- Disturbed/Ruderal
- Joshua Tree Woodland
- Rabbitbrush Scrub
- Scalebroom Scrub

N

0 750 1,500 3,000
Feet

FIGURE 2
Vegetation Communities
Alta East Wind Project
Alta Wind Energy Center Project

CH2MHILL

I:\TERRAGENPOWER\TERRAGEN_ALTA_EAST\GIS\MAPFILES\VEGETATION\VEGETATIONCOMMUNITIES.MXD SCUTLER1 1/17/2012 10:34:47 AM
IS111510093937SAC

raptor fatality estimates for projects that have both baseline and postconstuction fatality data, and is thus an effective statistic for determining fatality risk for many species likely to use the project area. Similarly, risk can be evaluated as a function of mean use and behavior (flight height) to compare relative risk by species.

Six points were selected to survey representative habitats and topography, while providing relatively even coverage of the area that was proposed for development in May 2009 (Figure 3). The project boundary was modified to include additional area in June 2010, so the locations of three of the six avian use survey points were modified to ensure coverage of the revised project area (Figure 4). In June 2010, avian survey point 4 was moved approximately 0.5 miles south to allow the assessment viewshed to encompass the entire parcel located north of Highway 58. Points 5 and 6 were moved south of the highway, Point 5 approximately 0.5 mile south and Point 6 approximately 2 miles southeast, to enable full assessment of eagle use along the ridge located south of Highway 58 and of the southwestern portion of the new project area. These year 2 survey locations were evaluated for one full year during the second year of the study.

Relocating these avian survey points assists in the analysis of avian use of the area planned for WTG installation by focusing the study on the area planned for development.

A total of 311 30-minute fixed-point bird use surveys were conducted during 52 site visits, from May 2009 through May 2010. Sixty-one unique bird species were identified over the course of 311 30-minute surveys, representing 2,581 individuals within 1,044 groups. A total of 43 raptors were observed, representing six species. Among large birds, common raven had the highest use of any other species across all seasons (spring 1.56 birds/plot/ 30-minute survey; summer, 0.44; fall, 1.29; and winter, 0.89). Waterbird use was recorded only during spring (0.73 birds/plot/30-minute survey), while vultures use was recorded during spring (1.04) and fall (0.23). Raptor use was highest during the winter (0.20 birds/plot/30-minute survey) and lowest during the summer (0.10). A total of 43 individual raptors, representing six unique species, were observed during surveys, with red-tailed hawk and golden eagle being the most commonly observed raptor species. All golden eagle observations in Year 1 were recorded north and west of the area proposed for development at points 4, 5, and 6, and these are discussed in detail in the Eagle Conservation Plan (ECP) prepared for the project. Use by passerines was higher in winter (7.26 birds/plot/30-minute survey) and spring (7.07), compared to fall (5.23) and summer (2.28). Bird types most often observed flying within the turbine rotor-swept height were vultures (58.3%) and raptors (23.1%). Most of the passerines (94.4%) were observed below the rotor-swept heights, and the remaining 5.6 percent were observed flying within the rotor-swept height.

The annual mean raptor use estimate (number of raptors divided by the number of plots and the total number of surveys) for this period was compared to mean raptor use estimates from 39 other studies that implemented similar protocols and had data for three or four different seasons. Mean annual raptor use was 0.09 raptors/plot/20-minute survey from May 2009 to May 2010, ranking second lowest compared to raptor use at the other wind resource areas (Chatfield et al., 2010a). Raptor mean use at points 1, 2, and 3 was 0.03 raptors/plot/20-minute survey, which was substantially less than mean use at points 4-6 (0.22 raptors/plot/20-muinute survey), suggesting the area currently planned for development presents substantially less risk to raptors. Based on these seasonal use

estimates, it is expected that risk to raptors would be unequal across seasons, with higher risk during the winter and relatively low risk during other times of the year.

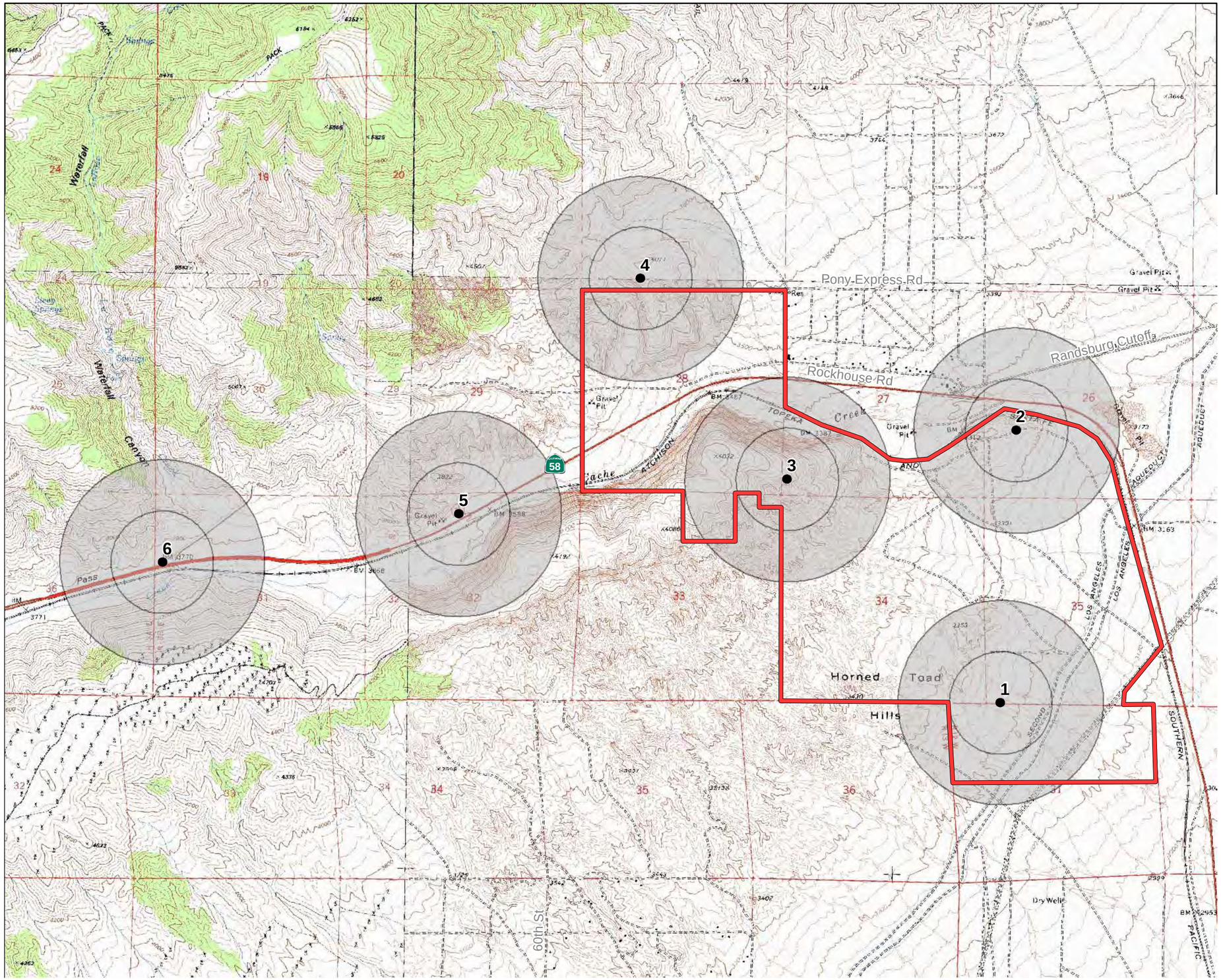
A total of 260 30-minute fixed-point bird use surveys were conducted during 47 site visits, from July 10, 2010 through June 1, 2011 at the six avian use points evaluated during year 2. During this survey period the avian use survey areas were focused more specifically on the project area as currently proposed for development (see Figure 3). Forty-eight unique species were observed during the fixed-point bird use surveys, with a mean of 0.67 large bird species/800-m plot/30-min survey and 1.37 small bird species/100-m plot/30-min survey. Bird diversity (number of unique species) was greater in the spring (38 species) than in the fall (26), winter (20), and summer (16; Table 1). Large bird species richness (mean number of species per survey) was highest in the winter (0.94 species/survey), followed by spring (0.69), fall (0.67), and summer (0.35).

Passerines (not including ravens) were the most frequently recorded bird type, accounting for 59.6 percent of observations, of which sage sparrow, house finch, western meadowlark, and cactus wren were the most frequently observed and accounted for 45.1 percent of the total bird observations. Common raven were the second most frequently observed bird type, comprising 19.4 percent of total bird observations. Raptors accounted for only 1.9 percent of all observations, with the red-tailed hawk and American kestrel being the most commonly observed raptor species during this period. The majority of passerines, large corvids, and raptors recorded during this period were observed in the fall (80.6, 95.1, and 85.7 percent, respectively) indicating extremely low use of the project area by all birds during summer months.

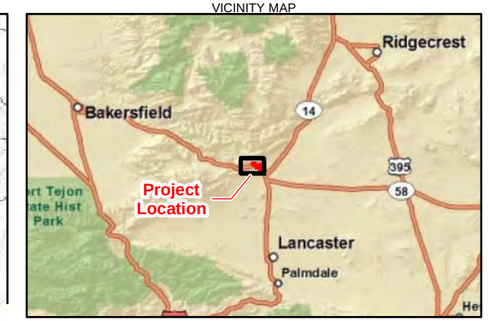
Six species (12.5% of all species) composed 74.6 percent of total observations: common raven (*Corvus corax*; 451 observations), sage sparrow (*Amphispiza belli*; 409), white-crowned sparrow (*Zonotrichia leucophrys*; 404), western meadowlark (*Sturnella neglecta*; 269), western bluebird (*Sialia Mexicana*; 214), and California quail (*Callipepla californica*; 112). All other species composed less than 4 percent of total observations, individually. A total of 48 individual raptors were recorded within the AEWRA, representing nine species: Cooper's hawk (*Accipiter cooperii*; one observations), red-tailed hawk (*Buteo jamaicensis*; 18), Swainson's hawk (*Buteo swainsoni*; one), northern harrier (*Circus cyaneus*; two), golden eagle (*Aquila chrysaetos*; eight), American kestrel (*Falco sparverius*; seven), peregrine falcon (*Falco peregrines*; one), prairie falcon (*Falco mexicanus*; two), and osprey (*Pandion haliaetus*; one. Unidentified accipiter (one observation) and unidentified hawk (six) were also observed during surveys.

Mean bird use, percent composition, and frequency of occurrence were calculated by season for each bird type and species. Large bird use (within 800-m plot) was highest in the winter (4.41 birds/plot/30-min survey), followed by fall (2.75), summer (2.39), and spring (1.64). For small birds (i.e., passerines, swifts/hummingbirds, and woodpeckers), use (within 100-m plots) was highest in the spring and winter (7.70 and 7.41 birds/plot/30-min survey, respectively), and lower in fall (5.35) and summer (1.65). Because different viewsheds were used in the analyses for large and small birds, use estimates calculated for the two groups are not directly comparable.

Diurnal Raptor use was highest during the winter (0.27 birds/800-m plot/30-min survey), with spring and fall having moderate use (0.19 and 0.18, respectively) and summer having



VICINITY MAP



LEGEND

- Alta East Original Project Area
- Year 1 Observation Point
- Year 1 400/800-m Buffers

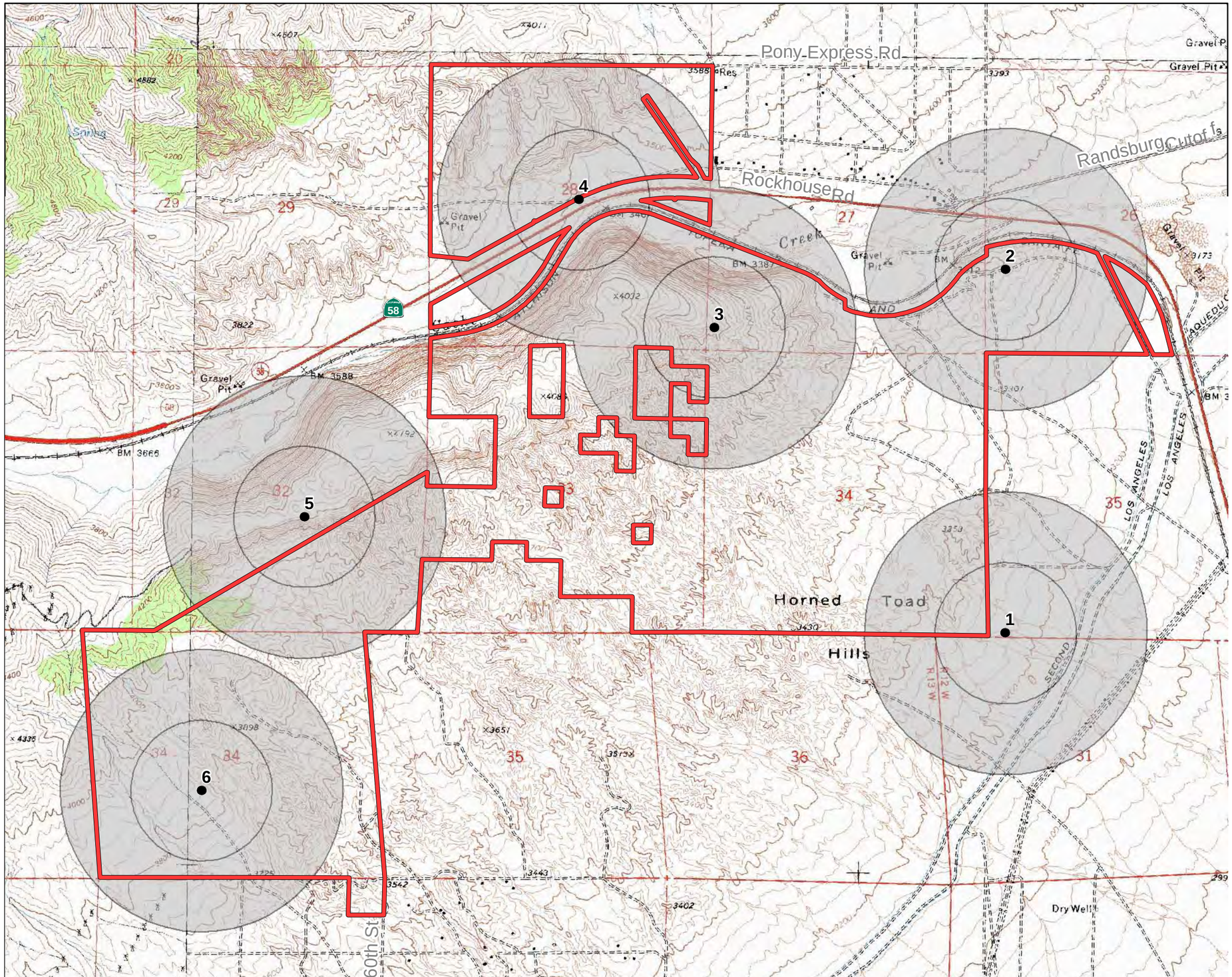
N

0 1,100 2,200
Feet

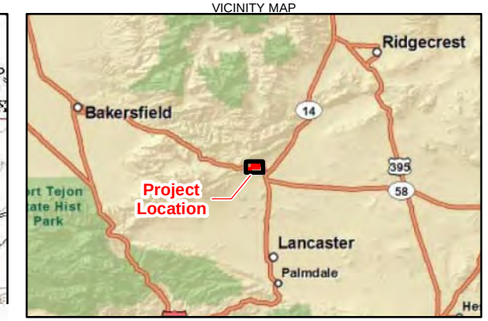
FIGURE 3
Alta East Project Boundary and Avian Use Survey Points from May 11, 2009 to May 6, 2010
Alta East Wind Project
Alta Wind Energy Center Project

CH2MHILL

I:\TERRAGENPOWER\TERRAGEN_ALTA_EAST\GIS\MAPFILES\BIOLOGICAL_ASSESSMENT\ARCHIVE\20110802\AU_FIG3_PROJECT_AREA.MXD S CUTLER1 1/17/2012 4:18:05 PM
IS1115100939 37SAC



VICINITY MAP



LEGEND

- Alta East Project Area
- Year 2 Observation Point
- Year 2 400/800-m Buffers

N

0 1,100 2,200
Feet

FIGURE 4
Alta East Project Boundary and Avian Use Survey Points from July 10, 2010 to June 1, 2011
Alta East Wind Project
Alta Wind Energy Center Project

CH2MHILL

T:\TERRAGENPOWER\TERRAGEN_ALTA_EAST\GIS\MAPFILES\BIOLOGICAL_ASSESSMENT\ARCHIVE\20110802\AU_FIG4_PROJECT_AREA.MXD SCUTLER1 1/18/2012 10:31:37 AM
IS111510093937SAC

considerably lower use (0.04). Higher use in the winter was primarily due to higher use of the area by red-tailed hawk (0.09 birds/plot/30-min survey) and golden eagle (0.08). Red tailed hawk and American kestrel comprised the majority of raptor use during both spring (0.08 and 0.04 birds/plot/3-min survey; respectively) and fall (0.08 and 0.07; respectively). Diurnal raptor use in summer was attributed entirely to a single red-tailed hawk and a single unidentified accipiter. Diurnal raptors comprised 11.7 percent of overall large bird use in spring, 6.7 percent in fall, 6.0 percent in winter, and 1.6 percent in summer. Diurnal raptors were observed during 13.8 percent of spring surveys, 3.7 percent of summer surveys, 13.3 percent of fall surveys, and 22.7 percent of winter surveys.

Among large bird types, four species (common raven, red-tailed hawk, golden eagle, and mourning dove) had at least five groups observed flying. Of these, golden eagle had the greatest percentage of observations within the RSH (87.5%), followed by common raven (75.0%), and red-tailed hawk (73.4%). Four other species (osprey, Copper's hawk, Swainson's hawk, and rock pigeon) were recorded flying within the RSH during 100 percent of the observations; however these were each based on only a single observation. Among small bird types, nine species had at least five groups observed flying. Of these, the only species observed flying within the RSH were white-crowned sparrow (21.6% of observations) and sage sparrow (3.1%). Additional details are provided in Chatifeld et.al 2011.

Annual mean raptor use (number of raptors divided by the number of 800-m plots and the total number of surveys) at the project was compared with raptor use at 43 other sites proposed for wind-energy development in the western and Midwestern US that implemented similar protocols and had data for three or four seasons. The annual mean raptor use at these wind-energy facilities ranged from 0.06 to 2.34 raptors/plot/20-min survey (Figure 5. Based on the results from these wind-energy facilities, a ranking of seasonal mean raptor use was developed as low (0 – 0.5 raptors/plot/20-min survey), low to moderate (0.5 – 1.0), moderate (1.0 – 2.0), high (2.0 – 3.0), and very high (more than 3.0). Under this ranking, mean raptor use at the project site for year 2 studies (0.12 raptors/plot/20-min survey) is considered to be low, ranking third lowest compared to the other wind-energy facilities. On a seasonal basis, mean raptor use estimates at the project were consistently low across all seasons when compared with other projects with the highest ranking occurring during the winter, when the project site presents the 13th lowest mean use value out of 41 sites (Chatfield et al. 2011)..

2.2.3 Nesting Territory Surveys

Aerial nest surveys were conducted via helicopter on April 13 and May 24, 2010, within 5 miles of the project area to identify Swainson's hawk nests and within 2 miles of the project to identify other raptor nests. No Swainson's hawk nests were recorded and nine inactive raptor nests and one active raven nest were located within 2 miles of the project. No active raptor nests were located within the boundary of the project, or within 2 miles of the project during the 2010 surveys.

One aerial nest survey was conducted in late February 2011 and a second was completed during the week of April 11, 2011 and three ground surveys for Swainson's hawk nests were completed in late April. In additional to evaluating potential nesting habitat for new or previously undocumented nests, all nests detected in 2010 were specifically evaluated.

Findings were consistent with 2010 surveys – no Swainson's hawk nests were observed within 5 miles of the project, and no active raptor nests were detected within 2 miles of the project. One inactive raptor nest and two active common raven nests were identified within two miles of the project. All nests reported in 2011 survey are presented in Figure 6.

2.2.4 Burrowing Owl Surveys

Protocol-level surveys for burrowing owl were completed for 992 acres of the project area from May 30 to July 15, 2010. The survey results were positive for burrowing owl sign, but negative for breeding burrowing owls during the 2010 survey efforts. Burrowing owl whitewash was detected at two burrows located near avian use survey point 2 in the northeastern portion of the project, near an incidental observation reported by WEST in their Year 1 avian use surveys on March 19, 2010; however, no burrowing owls were recorded during the protocol-level survey efforts. Details of the burrowing owl survey are provided in Phoenix Ecological Consulting (2010) and Figure 7.

2.2.5 Species Recorded

During the course of all surveys completed for the project, a total of 73 avian species were recorded (Table 1). Sixty one species were recorded during year 1 avian use surveys and 48 species were recorded in year 2, of which 10 were not recorded during year 1 surveys. Two additional species were reported during the burrowing owl survey (Lesser nighthawk and lesser yellowlegs). USFWS designated Birds of Conservation Concern (BCC) for Bird Conservation Region 32 are noted per the USFWS 2008 BCC list (USFWS 2008). Those BCC designated species that are likely to breed/nest in the project area based on likely habitat associations are also noted.

Table 1
Avian Species Recorded during all Biological Resource Surveys Completed for the Alta East Project from May 2009 to June 1, 2011

Common Name	Scientific Name	Status
Raptors		
American kestrel	*Falco sparverius*	
burrowing owl	*Athene cunicularia*	BLMS, BLMSSC, CASSC, BCC, b
Cooper's hawk	*Accipiter cooperii*	
golden eagle	*Aquila chrysaetos*	BLMS, BGEPA, CAFP
northern harrier	*Circus cyaneus*	CASSC
osprey	*Pandion haliaetus*	
peregrine falcon	*Falco peregrines*	CAFP, BCC, b
prairie falcon	*Falco mexicanus*	
red-tailed hawk	*Buteo jamaicensis*	
sharp-shinned hawk	*Accipiter striatus*	
Swainson's hawk	*Buteo swainsoni*	CAT

Table 1
Avian Species Recorded during all Biological Resource Surveys Completed for the Alta East Project from May 2009 to June 1, 2011

Common Name	Scientific Name	Status
Others		
Anna's hummingbird	*Calypte anna*	
ash-throated flycatcher	*Myiarchus cinerascens*	
barn swallow	*Hirundo rustica*	
Bewick's wren	*Thryomanes bewickii*	
black-throated sparrow	*Amphispiza bilineata*	
blue-gray gnatcatcher	*Polioptila caerulea*	
Brewer's blackbird	*Euphagus cyanocephalus*	
Brewer's sparrow	*Spizella breweri*	
cactus wren	*Campylorhynchus brunneicapillus*	BCC, b
California gull	*Larus californicus*	
California quail	*Callipepla californica*	
California towhee	*Pipilo crissalis*	
Cassin's vireo	*Vireo cassinii*	
chipping sparrow	*Spizella passerina*	
chukar	*Alectoris chukar*	
cliff swallow	*Hirundo pyrrhondota*	
common grackle	*Quiscalus qiscula*	
common raven	*Corvus corax*	
Costa's hummingbird	*Calypte costae*	BCC, b
dark-eyed junco	*Junco hyemalis*	
dusky flycatcher	*Empidonax oberholseri*	
European starling	*Sturnus vulgaris*	
fox sparrow	*Passerella iliaca*	
great egret	*Ardea alba*	
greater roadrunner	*Geococcyx californianus*	
horned lark	*Eremophila alpestris*	
house finch	*Carpodacus mexicanus*	
house wren	*Troglodytes aedon*	
unidentified hummingbird		
ladder-backed woodpecker	*Picoides scalaris*	

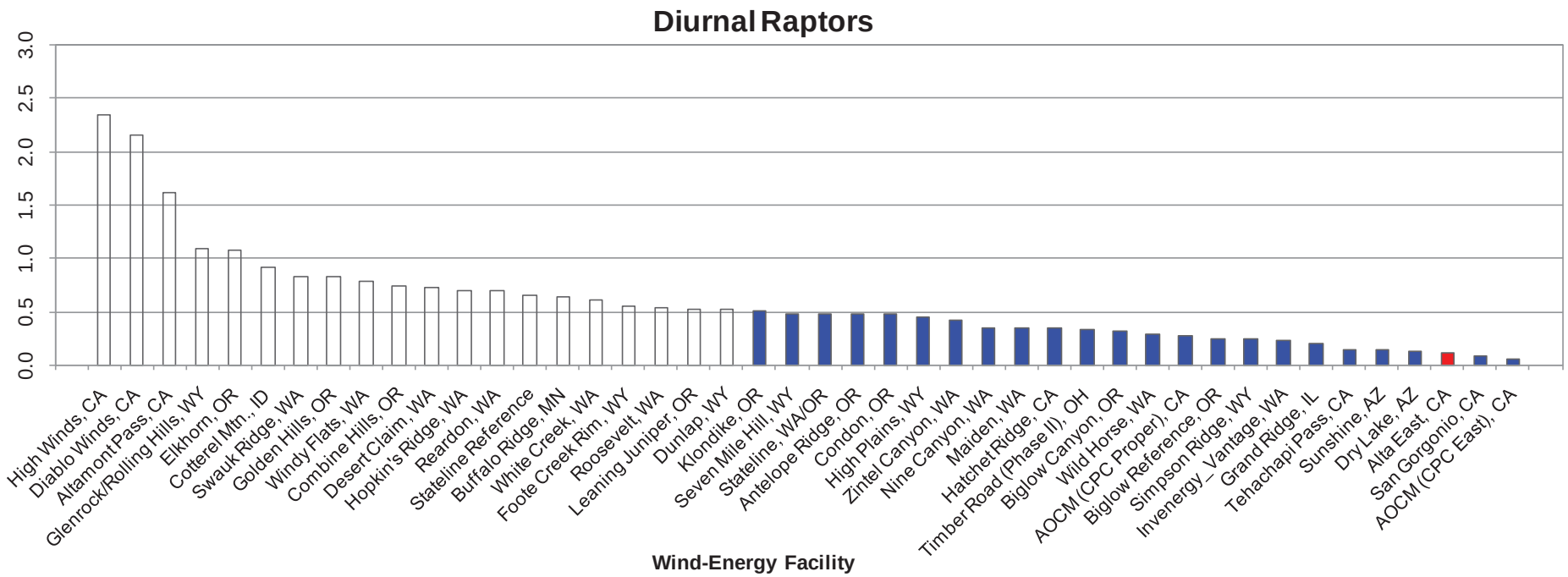
Table 1
Avian Species Recorded during all Biological Resource Surveys Completed for the Alta East Project from May 2009 to June 1, 2011

Common Name	Scientific Name	Status
lark sparrow	*Chondestes grammacus*	
Le Conte's thrasher	*Toxostoma lecontei*	BLMS, BLMSSC, CASSC, BCC, b
lesser goldfinch	*Carduelis psaltria*	
lesser nighthawk	*Chordeiles acutipennis*	
lesser yellowlegs	*Tringa flavipes*	
Lincoln's sparrow	*Melospiza lincolnii*	
loggerhead shrike	*Lanius ludovicianus*	CASSC, BCC, b
mourning dove	*Zenaida macroura*	
northern flicker	*Colaptes auratus*	
northern mockingbird	*Mimus polyglottos*	
rock pigeon	*Columba livia*	
rock wren	*Salpinctes obsoletus*	
ruby-crowned kinglet	*Regulus calendula*	
sage sparrow	*Amphispiza belli*	
savannah sparrow	*Passerculus sandwichensis*	
Say's phoebe	*Sayornis saya*	
Scott's oriole	*Icterus parisorum*	
Townsend's warbler	*Dendroica townsendi*	
tree swallow	*Tachycineta bicolor*	
turkey vulture	*Cathartes aura*	
Vaux's swift	*Chaetura vauxi*	CASSC
verdin	*Auriparus flaviceps*	
violet-green swallow	*Tachycineta thalassina*	
western bluebird	*Sialia Mexicana*	
western kingbird	*Tyrannus verticalis*	
western meadowlark	*Sturnella neglecta*	
western scrub-jay	*Aphelocoma californica*	
western tanager	*Piranga ludoviciana*	
white-crowned sparrow	*Zonotrichia leucophrys*	
white throated swift	*Aeronautes saxatalis*	
Wilson's warbler	*Wilsonia pusilla*	

Table 1
Avian Species Recorded during all Biological Resource Surveys Completed for the Alta East Project from May 2009 to June 1, 2011

Common Name	Scientific Name	Status
yellow-rumped warbler	*Dendroica coronate*	

*California: species of special concern (CASSC), Threatened (CAT), Fully protected (CAFP)
BLM: Sensitive Species (BLMS), species of special concern (BLMSSC)
USFWS: Bald and Golden Eagle Protection Act (BGEPA), Bird of Conservation Concern (BCC), Breeding (b)



Data from the following sources:

Wind Energy Facility	Reference	Wind Energy Facility	Reference
Alta East, CA	This study.		
High Winds, CA	Kerlinger et al. 2005	Stateline, WA/OR	Erickson et al. 2002b
Diablo Winds, CA	WEST 2006	Antelope Ridge, OR	WEST 2009
Altamont Pass, CA	Erickson et al. 2002b	Condon, OR	Erickson et al. 2002b
Glenrock/Rolling Hills, WY	Johnson et al. 2008a	High Plains, WY	Johnson et al. 2009b
Elkhorn, OR	WEST 2005a	Zintel Canyon, WA	Erickson et al. 2002a
Cotterel Mtn., ID	BLM 2006	Nine Canyon, WA	Erickson et al. 2001
Swauk Ridge, WA	Erickson et al. 2003a	Maiden, WA	Erickson et al. 2002b
Golden Hills, OR	Jeffrey et al. 2008	Hatchet Ridge, CA	Young et al. 2007a
Windy Flats, WA	Johnson et al. 2007	Timber Road (Phase II), OH	Good et al. 2010
Combine Hills, OR	Young et al. 2003c	Biglow Canyon, OR	WEST 2005d
Desert Claim, WA	Young et al. 2003b	Wild Horse, WA	Erickson et al. 2003c
Hopkin's Ridge, WA	Young et al. 2003a	AOCM (CPC Proper), CA	Chatfield et al. 2010c
Reardon, WA	WEST 2005b	Biglow Reference, OR	WEST 2005d
Stateline Reference	URS et al. 2001	Simpson Ridge, WY	Johnson et al. 2000
Buffalo Ridge, MN	Erickson et al. 2002b	Invenergy_Vantage, WA	WEST 2007
White Creek, WA	NWC and WEST 2005	Grand Ridge, IL	Derby et al. 2009
Foote Creek Rim, WY	Erickson et al. 2002b	Tehachapi Pass, CA	Erickson et al. 2002b
Roosevelt, WA	NWC and WEST 2004	Sunshine, AZ	WEST and the CPRS 2006
Leaning Juniper, OR	Kronner et al. 2005	Dry Lake, AZ	Young et al. 2007b
Dunlap, WY	Johnson et al. 2009a	San Gorgonio, CA	Erickson et al. 2002b
Klondike, OR	Johnson et al. 2002	AOCM (CPC East), CA	Chatfield et al. 2010a
Seven Mile Hill, WY	Johnson et al. 2008		

FIGURE 5
Comparison of annual raptor use between the Alta East Project and Other Wind Energy Facilities, using data collected at the Alta East Project from July 10, 2010 to June 1, 2011

Alta East Wind Project
Alta Wind Energy Center Project

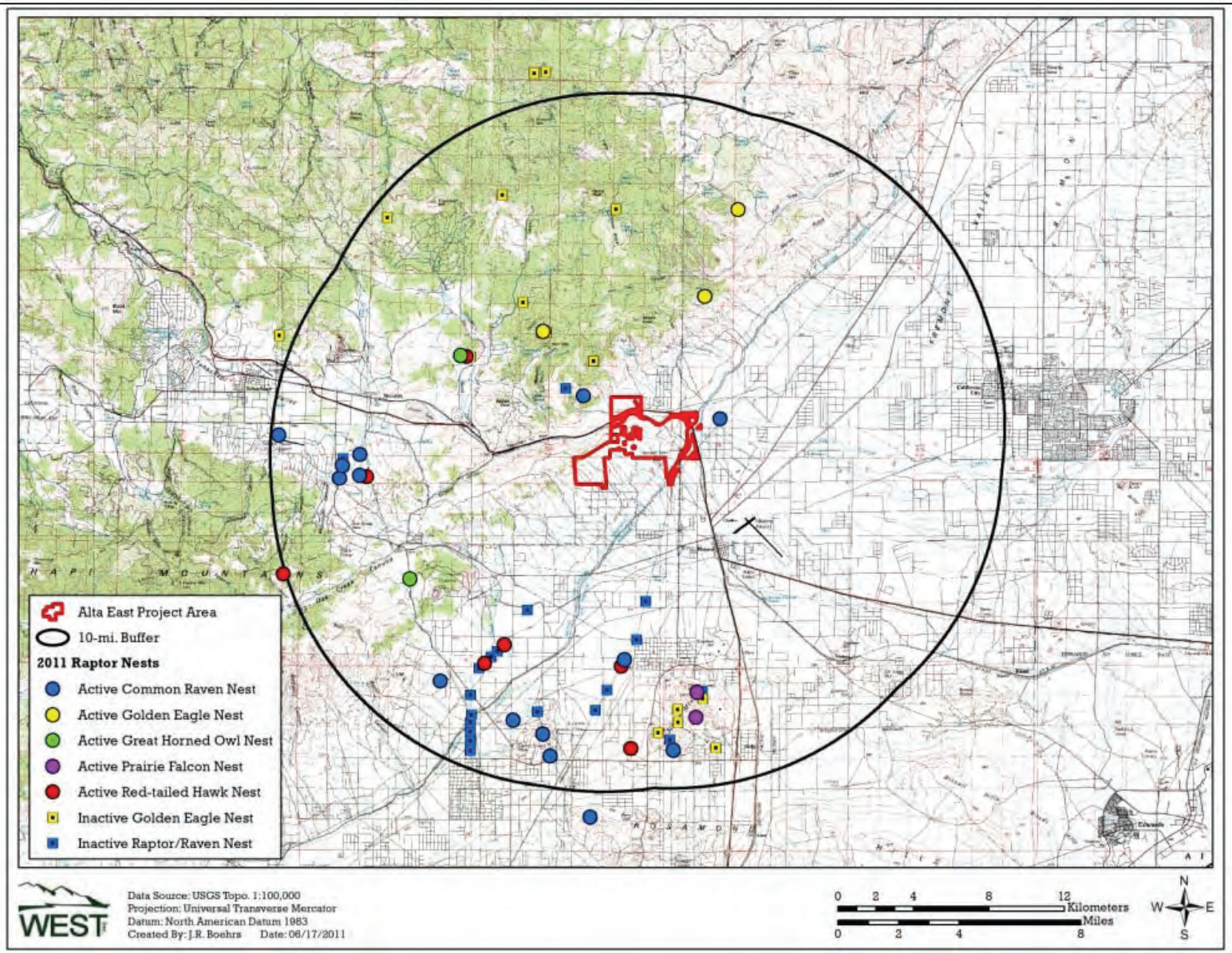


FIGURE 6
Results of Raptor Nest Survey Results Completed for the Alta East Project Area in 2011

Alta East Wind Project
Alta Wind Energy Center Project

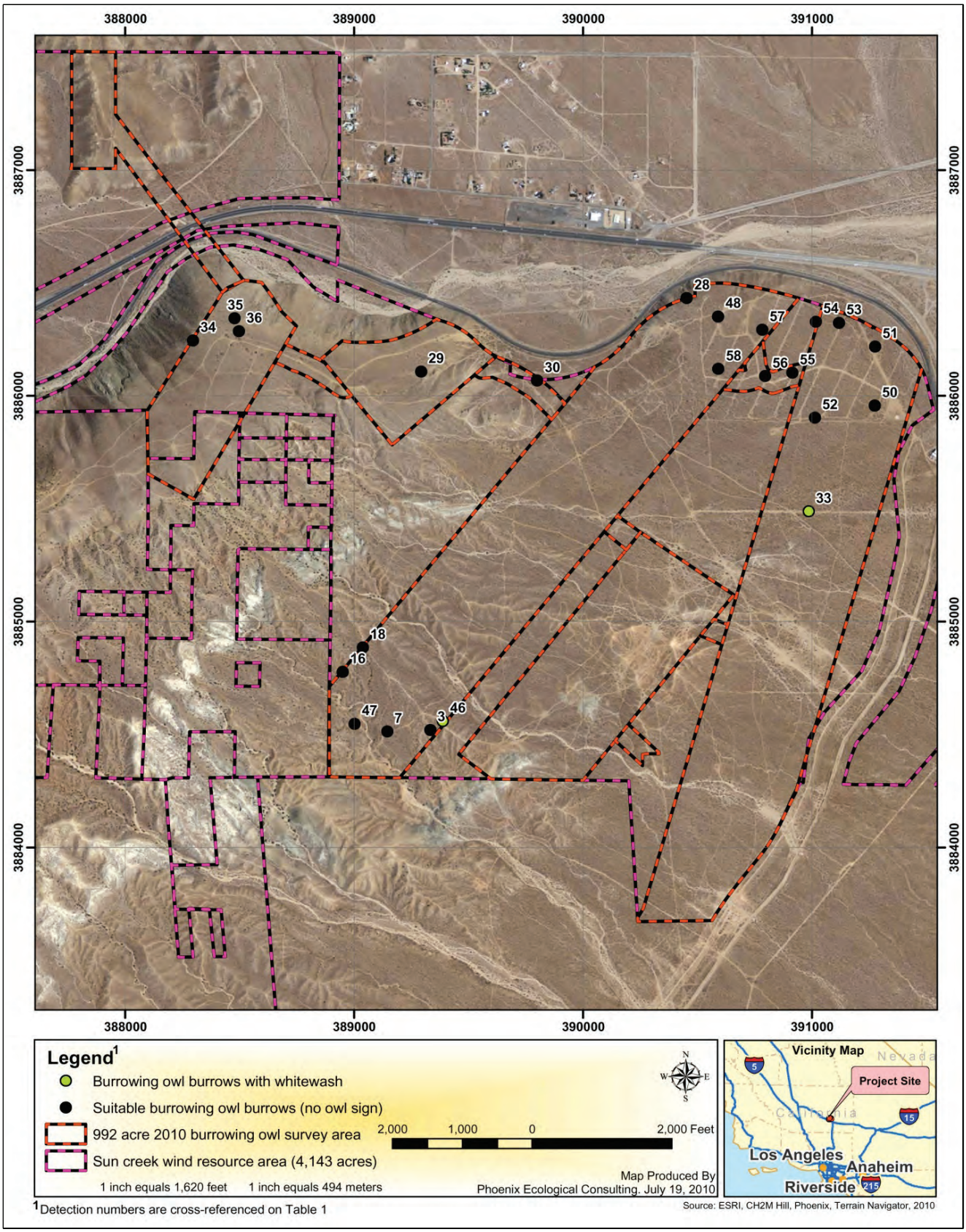


FIGURE 7
Results of Burrowing Owl Surveys completed for the Alta East Project Area from May 30-July 15, 2010

Alta East Wind Project
Alta Wind Energy Center Project

SECTION 3.0

3 Risk Assessment

3.1 Construction and Operations

Construction of the project will include installation of the WTGs, roads, underground electrical collector lines, a collector substation, an aboveground transmission line, a temporary construction laydown area, and an operations and maintenance building. Noise from the equipment would vary throughout the day with equipment use and location of construction, but would be reasonably expected to be as high as 95 A-weighted decibels (dBA) at the point of origin, attenuating to 63 dBA at 800 feet.

Operation of the project will comprise up to 120 operating WTGs, approximately 15 miles of aboveground 230-kilovolt (kV) transmission line, and 15 full-time-equivalent personnel, all of which present potential hazards to avian species potentially using the project area. Maintenance activities will occur regularly and will generally require only pick-up trucks travelling on project roads. When repairs are required, other vehicles, such as cranes and excavation equipment may be used.

The project area has no natural substrates for diurnal raptor nesting. Although no raptor nests are documented in the project area, nests in power poles are sometimes at risk of disturbance and nest abandonment if human activity levels increase following nest initiation. Potential diurnal raptor nesting habitat exists outside the project vicinity in the rugged topography located north of the project where rocky terrain could support cliff-nesting species, and potentially in Joshua tree or other treed habitats in the project vicinity. However, the proximity of these potential nests to project area activities indicates that they are highly unlikely to be disturbed if they exist. The project area currently provides suitable foraging and hunting habitat for raptors, but use is documented as low based on the avian use surveys completed to date. Although habitat functionality may be altered during and after construction, raptors might continue to forage or hunt in this area. Burrowing owl could currently use the project area for nesting, although no nesting territories have been documented in the project area. During year 2 studies, no burrowing owls were observed onsite; however, one burrowing owl was recorded near avian survey point 2 on March 19, 2010, coincidentally near the burrowing owl sign located during the burrowing owl survey as described in Section 2.2.4.

Habitats used by the avian species documented on the project site, as well as other species that may potentially occur but have gone undetected, would be disturbed by construction of the project. Habitat fragmentation could influence habitat functionality for some species, but more likely will simply reduce the density of affected birds proportional to the amount of habitat lost. Habitat fragmentation may exacerbate the problem of habitat loss for birds by decreasing patch area and increasing edge habitat, potentially reducing avian productivity through increased nest predation and brood parasitism, and reducing pairing success of males in some species. However, the construction of Alta East is not likely to significantly increase the degree of habitat fragmentation of the area because the majority of the wind

farm is located on habitat that is already fragmented due to the roads, trails and multiple uses within the area. Potential habitat fragmentation resulting from minimized through avoidance and minimization measures taken during the design, construction, and operational phases of the Project, the most significant of which include minimization of habitat disturbance, burial of collector lines, and using existing roadways where possible.

Shrub and ground-nesting species, as well as their nests and young, could be at risk during vegetation removal and ground-disturbing activities during construction (to the extent it occurred during the nesting season), and disturbance during construction would displace birds from the project site and surrounding area. In addition to being at risk of collision with vehicular travel during project construction and operation, raptors and other bird species could be susceptible to injury or mortality from collision with rotating WTG blades and transmission lines, electrocution from contact with the electrical conductors, and displacement from nests or nesting habitat.

During and following construction, only a small portion of the project area will be converted to developed lands that will be unsuitable for avian use. The human activity within and around the project structures may deter some birds from nesting in the project area; however, human activity and vehicle traffic are typically so minor that most avian species would be unaffected by such activity during project operation. Additionally, placement of project features, such as transmission lines and WTGs, can influence risk of impact on avian species. These risk factors are present and are therefore considered in AWD's assessment of risk from the avian use and raptor nest survey data.

3.2 Collision Risk

Bird density, age, residency status and season, flight style, interaction with other birds, and presence of foraging opportunities all may influence the likelihood of birds colliding with a WTG or other project feature. The majority of birds detected at the Alta East project site were passerines, and over 94 percent of the passerines were documented below the rotor swept area during the May 2009 to May 2010 studies. Although migrant passerines have been found more frequently in fatality studies than other bird groups (Arnett et al., 2007), they also occur at substantially higher numbers than other bird groups. And, although nocturnal migrants may be at greater risk than resident birds, Erickson (2007) used radar data and mortality monitoring to estimate that less than 0.01 percent of migrant songbirds that pass over wind projects are killed.

Western EcoSystems Technology, Inc. (WEST) analyzed exposure risk in detail using the first year of data collected for the site and concluded that with exception of turkey vultures and ravens, most non-raptors had relatively low exposure indices due to low use estimates and/or the majority of individuals flying below the rotor-swept height (Chatfield et al., 2010a). The only sensitive bird species with an exposure index greater than zero was Vaux's swift, in year 1. Due to the fact that very few nonraptor species were observed in the rotor swept area (RSA), and no nonraptor USFWS designated Birds of Conservation Concern species were observed in the RSA, it is extremely unlikely that non-raptor populations will be adversely affected by direct mortality from the operation of the wind energy facility. Similarly, WEST analyzed raptor use for this period and, based on comparisons with other projects in California, fatality rates of raptors are expected to be lower than the fatality rates

observed at other facilities. These results and conclusions are consistent with the year 2 data collected to date, in which year round mean raptor use was 0.12 raptor/20 minute point count, yielding a predicted fatality rate of less than 0.01 fatalities/MW/year, or less than 3 raptors/year for a 300 MW project.

Field data analyzed to date indicate that topographic features within the project area are not conducive to slope soaring or creation of potential flight corridors for any bird species. Turbines have been moved from the area of rugged topography located to the north and northwest where orographic uplift would be probable, and where higher incidence of golden eagle observations were recorded in year 1. The low levels of documented use by all bird species suggest that bird density is very low and migration corridors or stopover habitat are not present onsite. No foraging sites, roost sites, or perch structures have been identified for raptors and, although minor raptor use is documented within the project area during baseline studies, the actual risk of collision with proposed WTGs appears to be very low for raptors. Six WTGs planned in the northernmost parcel of the project north of Highway 58 are associated with ridgelines and may pose greater risk to species that rely on orographic lift for soaring; however, the majority of the WTGs are planned for installation in lower elevation, less rugged areas.. Based on low avian use of the project site the two years of diurnal avian use studies completed to date, it is appropriate to conclude that potential collision risk to birds is very low and would be unlikely to be significant at the population level, with the possible exception of some BCC listed species.

Avian species are known to be at risk because of collisions with power lines (i.e. Drewitt and Langston, 2006; Janss, 2000) and other project-related features. Fatal collisions can occur when birds collide with transmission and distribution wires, transmissions tower guy wires, and other structures associated primarily with electrical power transmission (CEC, 2002). The number of collisions that occur is not related to flight frequency (Rusz et al., 1986) but instead is due to a bird's flight performance (Savereno et al., 1996). Density, age, residency status, season, flight style, interaction with other birds, and hunting or presence of foraging opportunities all may influence the likelihood of a bird colliding with a power line or other project features.

The project area is within the Pacific Coast Migratory Route; migratory birds moving northwest from Mexico into California and the Pacific northwestern United States utilize this route (USGS, 2006). There are no prominent agricultural fields in the project area, nor are there wetlands or riparian features that would attract avian species and potentially increase collision risk. Based on the habitat characteristics and the avian data collected to date, it would be unlikely that large numbers of any species would utilize or be supported by the habitats present in and near the project site.

3.3 Electrocution Risk

Power lines are present in many wildlife habitats and can result in the electrocution of raptor and other bird species (Lehman et al., 2010; and references therein). Electrocutions are caused by the arrangement and spacing of energized and grounded components of poles and towers that are use for perching and other activities (Avian Power Line Interaction Committee [APLIC], 2006). However, nearly all electrocutions occur on residential and commercial electrical distribution lines that are less than 69 kV (APLIC, 2006). The 230-kV

transmission line planned for this project will have clearances between electrical components that are greater than 60 inches, as recommended by APLIC (2006), which is greater than the physical dimensions of all large birds that would potentially use the transmission structures for perching with the possible exception of California condor.

To protect avian species from electrocution, the APLIC has established guidelines to reduce this risk. Incorporating appropriate design standards into the project, such as 60 inches of horizontal separation and a vertical separation of 40 inches between phase conductors and/or grounded hardware, will reduce electrocution risk. In the event that adequate separation is not feasible, insulation or covering of phases and grounds will be used to ensure avian protection from electrocution. Examples of insulation or covering are phase covers, bushing covers, jumper wire hoses, and covered conductors. Thus, electrocution of raptors on this project's transmission line would be highly unlikely. Additionally, design measures will be incorporated to prevent perching by raptors, which will further reduce the attractiveness of the transmission line for species that use transmission line structures for perching or nesting.

3.4 Impacts on Nests or Nesting Territories

Areas proposed for installation of project components may potentially support suitable nesting habitat for burrowing owl and other avian species associated with the vegetation types present on the project, and these species potentially could be affected during construction and operation activities. Bird nesting could also occur in vegetation (particularly shrubby plants) and in ground burrows on or near the project site. In the project vicinity, the avian nesting season for most bird species is from late February to early July.

No raptor nests were located within 1 mile of any proposed project feature; therefore, direct disturbance of raptor nests will not occur and indirect disturbance associated with human activity in proximity to these nests is extremely unlikely. Ground- or shrub-nesting non-raptor bird species would, however, be vulnerable to construction activities during the nesting season. Active burrowing owl nests were not observed within the project area, although potential habitat is present in the project area and along the transmission line corridor. The project area could also provide foraging habitat for other raptor species.

3.5 Nocturnal Migration

Nighttime visibility data available for the area suggest that risk of nocturnal avian fatality during migration is low because of infrequent low visibility events that are associated with bird strike risk. Historical visibility information within the region of the project site was accessed through airport Automated Surface Observing System (ASOS) and Automated Weather Observation System databases to assess the frequency of occurrence of low visibility conditions that could increase risk to birds from the project. Data from all 24 hours of the day were collected from the nearest reporting station near Edwards AFB, CA from January 1, 2006 through December 31, 2009 (Table 2). Current reportable ASOS values of visibility in statute miles are: <1/4, 1/4, 1/2, 3/4, 1, 11/4, 11/2, 13/4, 2, 21/2, 3, 4, 5, 6, 7, 8, 9, 10+. For avian risk assessment, low visibility resulting in bird strike risk would

reasonably be defined as visibility of less than 1/3 mile; however, AWD uses 1/2 mile as the threshold value for low visibility to be more conservative than what would seem biologically appropriate. Using 1/2 mile as the threshold for low visibility, this area reported only 590 hours (1.8%) of visibility conditions less than ½ mile.

TABLE 2
Summary of Historical Visibility Data

Weather Station	Date Range	Number of Observation Hours	Number of Hours With Visibility Less Than ½ mile	Percentage
HRL (Valley International	1/1/2006 - 1231/2009	33,540	590	1.76

AWD is not aware of any significant fatality events involving nocturnal migrants in the region. Nocturnal migrants typically fly at altitudes well above the rotor-swept area unless ascending or descending in response to available stopover habitats. The largely uninterrupted expanse of land mass with relatively uniform vegetative cover present in and near the project area does not contain topographical scenarios that would concentrate migrations into narrow and obvious pathways.

3.6 California Condor

The California condor was federally listed as an endangered species by USFWS in 1967 (32 Federal Register 4001) and is designated fully protected under California law. A Biological Assessment has been drafted to evaluate the potential effect of the project on the species. The recommended conclusion is that the project may affect, and is not likely to adversely affect the species. Current threats to the California condor include low population numbers in the wild, mortality from ingesting lead from shotgun- and rifle-killed game, predation of newly released condors, and collisions with manmade structures, such as power lines (Southwest Condor Working Group, 2007). Condor fatalities have been documented as a result of ingestion of microtrash and hazardous materials such as ethylene glycol. No condor collision fatalities with meteorological towers, or wind turbines, have been reported. During the first 2 years of reintroduction, four condors were reported killed by transmission line collision/electrocution (Snyder and Snyder, 2000). Since 1995, condors have been receiving negative conditioning to discourage perching on transmission towers; however, occasional collisions/electrocutions are still reported.

There is a strong association of rugged topography with the presence of condor Global Positioning System (GPS) locations. Generally, the project area is away from these condor observations and is at a lower elevation, with flatter, less rugged topography. Thus, topography and wind characteristics of the project area may provide features that have less probability to be used by condors. Site-specific avian use data, collected for almost 2 years, indicates that currently condors are not using the project site. This conclusion is supported by current GPS data provided by USFWS, in which the nearest documented condor was located in the Tehachapi Mountains approximately 3.8 miles northeast of the project and a historical location approximately 2.3 miles west of the project site. Condors may use

adjacent areas north and west of the project site. Whether the geographic range of the condor will expand over the life of the project, or whether the landscape-level patterns of use will change to include the project area over the life of the project, is unknown at this time, but there is no habitat or other features on the site identified by AWD that are known attractions for condors.

3.7 Cumulative Impacts

Typical activities that may be disruptive or detrimental to avian species occurring throughout the project region, although very limited within the project area, include illegal shooting, loss of habitat to development through wind and non-wind industry-related development, and general encroachment into avian habitats, each of which could potentially contribute to negative impacts on the regional avian populations. However, implementation of best management practices (BMPs) designed specifically to avoid and minimize potential impacts on avian species will reduce the likelihood of any cumulative impacts associated with the project.

SECTION 4.0

4 Avoidance, Minimization, and Mitigation Measures

The analyses and documentation provided in this APP show the project is well sited; however, it does present some risk to avian species using the project area. This risk is low; however, adequate baseline studies have been completed to avoid and minimize site-specific threats through siting, and construction and operation measures. Additionally, mortality monitoring during operation will allow ongoing assessment of loss, enabling documentation of species composition and fatality rates. Avoidance and minimization measures are presented in the following sections.

4.1 Project Siting

Avian use and raptor nesting was evaluated during baselines studies for the project area in 2009 and 2010. The project site was modified in June 2010 to include additional areas, extending development southward from the rugged topographical areas that seemed to provide conditions more suitable for raptor nesting and use of thermals than the flat, nonrugged topography comprising the current area proposed for development. The project includes repowering a historical wind power project site north of SR 58 on BLM lands and infilling existing wind facilities south of SR 58 in the area of Cameron Ridge.

The project location allows AWD the opportunity to avoid impacts on federal or state-listed avian species, as well as other important resource areas such as BLM Areas of Critical Environmental Concern or USFWS Designated Critical Habitat. No known areas of breeding, concentrated winter use, or migratory concentrations are documented in or near the project site. Raptor use was highest during winter, and passerine use is highest during spring (followed by winter), but these use values are very low. The data collected shows no evidence of concentrated winter or migratory use. Additonally, lower visibility conditions caused by fog, mist, and low clouds that would present high risk to avian species are infrequent in the area. Overall, the project area presents a very low risk of direct impacts and the potential for very minor indirect impacts on birds. The project is appropriately sited on the landscape as it relates to the risk of impact on avian species.

4.2 Micrositing of Project Features

Baseline surveys for the project resulted in no areas of unique or high use by avian species. Although some avian use of the project area will occur during construction and operation, no unique habitat features such as prominent raptor perch sites (rock outcrops, cliffs, trees) or unique concentrations of prey were detected during any biological resource studies performed on the project area that would attract predatory avian species are evident. Additionally, the areas where raptor nests are documented are at sufficient distance from the project site to avoid direct disturbance or displacement impacts on nesting raptors.

Additionally, Cameron Ridge, in the western portion of the project site and south of SR 58, has operating WTGs along the ridge. The ridge may have provided historical perch locations for raptors prior to development, but now this ridge presents existing wind development.

All other project features are located away from the higher elevation and rugged topography that would be potentially associated with higher raptor use and/or provide potential to concentrate movements of migratory species. Habitats are generally expansive and regionally common, with 87 percent of the area composed of four types: California buckwheat scrub (27 percent), Joshua tree woodland (23 percent), California juniper woodland (22 percent), and brittlebush scrub (15 percent); therefore, use by smaller birds will be affected but direct impacts to individuals and nests will be minimized and avoided through the following construction-related measures. Therefore, micrositing in response to avian use or habitat is not necessary for the remainder of the project features.

The following design features will be built into the project as a means to reduce risk:

- WTGs will generally be grouped in parallel linear arrangements.
- Electrical collector lines will be located underground wherever feasible.
- The following APLIC (2006) design guidelines will be applied for overhead transmission lines by incorporating recommended or other methods that enhance the visibility of the lines to avian species:
  - Provide 60-inch minimum horizontal separation between energized conductors and/or energized conductors and grounded hardware.

4.3 Construction Measures

Appropriate site-specific avoidance and minimization measures have been identified by AWD and include, but may not be limited to, measures specified in the following BMPs. These measures are consistent with those identified in BLM right-of-way grants received by AWD on nearby wind development projects, and applicable measures from the adjacent Alta-Oak Creek Mojave project. All potentially applicable measures from the above references are listed below. The BLM *Wind Energy Programmatic Environmental Impact Statement* also includes BMPs and mitigation measures for a plan of development and project design.

Because raptor nesting areas are not located in the project vicinity, construction activities would not need to be scheduled to avoid important periods of courtship or nesting. If new nests are detected during project construction, timing and avoidance measures would be implemented as appropriate in coordination with USFWS.

4.3.1 Minimizing Potential Habitat Disturbance

To mitigate habitat reduction or alteration during construction, the following measures may be implemented:

- Where applicable, the extent of habitat disturbance would be reduced by keeping vehicles on access roads and minimizing foot and vehicle traffic through undisturbed areas.
- Habitat restoration activities would be initiated as soon as possible after construction activities are completed.
- Appropriate control measures will be implemented to control the introduction and spread of non-native plants, as specified by the project's Noxious Weed Management and Habitat Rehabilitation plans, which will reduce impacts on the quality of avian habitats.
- Existing roads and utility corridors will be used to the maximum extent feasible.
- Potential for creating temporary or permanent habitats suitable for rodents, such as rock piles, eroded slopes with openings or overhangs, or stockpiling of construction debris will be avoided.
- The potential for wildfire will be minimized by implementing safety measures in accordance with the requirements of the California Fire Code (California Code of Regulations, Title 24, Chapter 4, Emergency Planning and Preparedness).

4.3.2 Minimizing Potential Direct Disturbance

- Permanent meteorological towers, transmission towers, and other facility structures would be designed to discourage birds from perching or nesting on them (for example, non-lattice towers, APLIC [2006] standards).
- Guy wires installed on project structures, such as temporary meteorological towers, will be marked with bird flight diverters. Meteorological towers placed on BLM lands would adhere to BLM Guidelines
- Permanent meteorological towers will be free-standing without the use of guy wires.
- Power lines would be configured to minimize the potential for electrocution of birds, by following established guidelines (for example, APLIC, 2006).
- Explosives would be used only within specified times and at specified distances from sensitive wildlife or surface waters as established by BLM.
- If any federally listed species is injured or killed during construction, AWD will immediately notify USFWS
- Vegetation removal and initial ground disturbance will be timed to occur outside the nesting season (August 1 through March 1) to reduce potential for direct disturbance of ground- or shrub-nesting species.
- If vegetation must be cleared during the nesting season (March 1 through August 1), a qualified biologist will conduct a pre-construction sweep of the area proposed for disturbance. The biologist will inspect the area for nests, or signs of nesting or courtship behavior. If a nest or sign of nesting is discovered, measures such as altering the timing

of construction or distance of construction activity from the nest will be taken to ensure that no impacts on these nests or individuals occur during construction.

- A Raven Management Plan will be prepared to provide instructions on how to avoid and minimize providing subsidies to common ravens in the project area.
- AWD will provide environmental training to all personnel working on the site during project construction. The training will include a review of federally protected species identification and promote awareness and facilitate implementation of appropriate measures to minimize risk of impacts on avian species.

4.4 Operation Measures

As part of AWD's mortality monitoring and reporting program, AWD will provide environmental training to all personnel working onsite during project operation. The training will include a review of federally protected species identification and to teach appropriate avoidance and minimization measures, as well as response measures if dead or injured avian species are found. The importance of onsite staff is significant in that they are onsite daily, can become familiar with how all wildlife move through and use the project site and vicinity, are the eyes and ears of environmental staff for identifying project risk or impact issues, and can help identify ways to reduce unexpected impacts if they are detected.

- Onsite management efforts will reduce attractants to predatory and scavenging species, such as avoiding creation of attractive features for prey and removing carrion (livestock carcasses).
- Outdoor lighting will be limited to that necessary for facility safety and security, using motion and infrared sensors when appropriate and practical, and lights will be focused downward whenever possible to reduce skyward illumination.
- Informal operational monitoring will be performed during the life of the project as a course of business by all AWD operations staff. Staff will be required to report all avian fatalities and observations of nesting behavior. While this monitoring will not be statistically based, it will allow detection of issues that may potentially occur onsite.
- Formal operational monitoring and reporting measures will also be implemented and are described in detail in Section 5.0, Post-construction Monitoring.

4.5 Condor Mitigation Measures

AWD has proposed a comprehensive California Condor Mitigation Strategy for its projects located in the Tehachapi area. In order to effectively protect and manage the California condor within the area, AWD proposes to create a Condor Preservation Foundation (hereafter, the Foundation). Companies proposing wind energy facilities in the Tehachapi area would be required by Kern County to contribute to the Foundation. The advantages of establishing a foundation are that it can more effectively protect the California condor and implement the mitigation strategies outlined below than could be accomplished on a project-by-project basis. The Foundation, for example, can reach a wider audience for public outreach and education, focus its efforts on research and funding, employ condor biologists,

operate a carcass management plan over an area that encompasses all future and potentially existing projects, and develop an effective and widespread condor supplemental feeding program. Eventually, the Foundation could purchase and manage condor conservation lands.

A draft Condor Mitigation Strategy Plan is included as Appendix A, and presents the details proposed by AWD. The suggested mitigation strategies presented in the plan are grouped into six major categories, listed roughly in descending order of importance. For details on each strategy, please refer to the draft plan (Appendix A). The California condor will be addressed in detail through the ESA Section 7 process and measures resulting from that consultation process will be incorporated into avian protection planning. However, strategies 1 through 4 below directly address the causes of decline for the species.

1. Elimination of lead bullet fragments and lead shot from the current and future range of the California condor in California
2. Implementation of a carcass management and supplemental feeding program
3. Support for the California condor recovery plan
4. Funding for California condor research and education programs
5. Hiring of a full-time biologist

4.6 Compensation for Habitat Loss

AWD will address direct impacts to and loss of avian habitat through the conservation measures to be determined as part of incidental take permitting for state protected species and as a result of Section 7 consultation under the ESA.

SECTION 5.0

5 Post-construction Monitoring

Post-construction monitoring will enable AWD to document avian fatalities if they occur and identify factors associated with fatalities that might warrant additional or improved measures, or might warrant elimination of BMPs found to be ineffective. As part of AWD's mortality monitoring and reporting program, AWD will complete post-construction monitoring and reporting to determine whether baseline predictions of low levels of avian fatality are consistent with operational outcomes. The monitoring program is explained below.

5.1 Fatality Studies

AWD or its representatives will perform post-construction avian mortality monitoring in the first, third, and fifth years following the initial operation of the project. Post-construction mortality monitoring will include a mortality analysis, which will be conducted as follows:

- AWD will provide USFWS with the results of the mortality study annually. A qualified biologist will conduct mortality monitoring using a statistically significant sample size of operational turbines within the project area, not to exceed 33 percent of the WTGs.
- All eagle and federally listed species fatalities will be reported to USFWS within 24 hours of detection.
- The mortality analysis will note species number, location, distance from the turbine, and apparent cause of mortality for each recovered species.
- The mortality monitoring will follow standardized guidelines outlined by the CEC (2007) and will include carcass scavenging and searcher efficiency trials.If improved field or data analyses methods become generally accepted practice by the wind and wildlife scientific community, and are deemed acceptable by AWD's avian biologist's, such most methods will be implemented for the project.
- The results of the mortality analysis will be provided to USFWS. At a minimum, the mortality analysis will:
  - Estimate number of annual avian mortalities per turbine
  - Consider a comparison to existing data on wind-energy-project-related avian mortality in the region, if available
- If after the post-construction mortality monitoring is completed during first, third, or fifth year of operation, data indicate that the project is resulting in inappropriate levels of impacts on avian species, AWD will consult with USFWS as described in Section 6.0, Adaptive Management.

5.2 Nesting/Breeding Monitoring

- AWD or its representative will conduct post-construction breeding monitoring of raptor nests within 2 miles of the project site in the first and third years following the project's initial operation. Post-construction breeding monitoring will include aerial surveys or ground surveys where access is available. Survey results will be provided annually to USFWS.
- If the project results in a level of incidental injury and mortality to nesting raptors that constitutes levels of take that might influence productivity of a species, AWD will undertake supplemental compensatory measures that are commensurate with the impacts identified, to support regional conservation of that species in accordance with measures presented in Section 6.0, Adaptive Management.

SECTION 6.0

6 Adaptive Management

6.1 Accounting for Policy Changes

With the possibility of future implementation of new policies it is understood that commitments made in this Plan may require adaptation relative to potential forthcoming guidance. AWD will work collaboratively with USFWS to apply necessary policy changes to the project ABPP.

6.2 Agency Coordination

To ensure that impacts on avian species do not reach levels of significance during project operation or result in a net loss of avian species in the regional population, study results will be provided to USFWS on an annual basis.

6.3 Implementing Adaptive Management

Results and work products produced throughout the permitting process will be used to guide management decisions that are made in the development process but extend beyond development and into all phases of construction, operations, repowering, and decommissioning. The foundation for guiding management decisions made during the development process should be well-founded and science-based risk assessments. This work will establish a baseline for identifying the need for future actions that may be required to avoid, minimize or mitigate impacts to avian and bat species. Well founded risk assessment and forecasted avian and/or bat mortalities will be evaluated by TGP Environmental Managers periodically to determine if assumptions and forecasts used to predict mortality were correct. If unexpected levels of mortality are determined to exist at the project site, corrective actions will be evaluated to avoid, minimize or mitigate for the impacts. Implementing a system by which mortality risk assessments established during the development of a project are monitored during the operation of a project allows TGP to potentially modify operations for long-term reductions in avian and bat mortality.

Uncertainty in mortality predictions from work performed within the permitting process should establish the first step necessary to establish a feed-back loop that may identify the need for, and actions taken to, address unexpected mortality. Modifications made in response to monitoring operational mortalities and comparing them to predictive morality is the foundation of adaptive management. Adaptive management should be considered at the project site where observed avian or bat mortality is significantly inconsistent with predicted mortality.

6.4 Mortality Reduction and Conservation Measures

Mortality predictions and avian and bat risk assessments performed in the permitting process will be used in conjunction with any agency requirements among other factors including but not limited to economic considerations to determine if adaptive management is necessary. Observed mortality will be monitored and by operations staff in accordance with TGP's operational monitoring and reporting protocols.

TGP acknowledges the importance of understanding potential impacts to avian and bat species during the operation of wind energy projects. Adaptive management will be implemented to avoid, minimize, and mitigate for unexpected impacts in accordance with state, federal, and local laws pertaining to the protection of avian and bat species.

Adaptive management assessment techniques will be incorporated to assess the level of unexpected avian or bat mortalities. Observed mortalities will be evaluated for the likely causes of mortality and possible mortality reduction coordinated with the appropriate state, and federal agencies. Conservation measures will be implemented to address the cause of the mortality. Details of conservation measures will be determined from site specific assessment and will focus on reducing mortality relative to what has been observed.

6.5 Supplemental Measures

If the avoidance, minimization, and mitigation measures proposed in Section 4.0 have not been sufficient in reducing project impacts to an acceptable level, the supplemental measures listed below may be considered for implementation. Mitigation measures would be incorporated to this APP in response to specific issues identified during post-construction monitoring and may include such actions as:

- Upgrade existing power lines following APLIC guidelines to reduce the risk of electrocution.
- Provide assistance with a conservation project.
- Provide opportunities to enhance avian populations through enhancement techniques, such as creating nesting platforms, such as poles or nesting boxes, or habitat improvements for migratory birds on conservation lands or nearby BLM-administered land.

6.6 California Condor

Although wandering California condors may occur in the project area, the frequency of this occurring is expected to be extremely low based on the results of the avian studies and evaluation of existing data for the project. Based on the baseline data collected for the project, the likelihood of occurrence of California condors is low to nonexistent in or near the project area at this time, making the current probability of collision fatality close to zero.

If California condors are detected in or near the project area during the life of the project using radar or observational techniques, and are determined to be at risk of collision, or if condors are injured or killed by the project, AWD will immediately coordinate with USFWS

to effectively address the issue. Advanced conservation practices and/or mitigation to address the loss would be incorporated into this APP and may include the following actions:

- Further evaluation and management of forage resources to identify areas posting greatest risk.
- Operational modifications to reduce likelihood of loss of condor.
- Implementation of collision deterrents and/or features to increasing detectability of WTGs by condors, such as colored or marked blades, pylons at the end of WTG arrays, acoustic deterrents (hazing) or other means considered feasible for preventing condor impacts.

SECTION 7.0

7 References

Arnett, E. B., D. B. Inkley, D. H. Johnson, R. P. Larkin, S. Manes, A. M. Manville, J. R. Mason, M. L. Morrison, M. D. Strickland, and R. Thresher. 2007. Impacts of Wind Energy Facilities on Wildlife and Wildlife Habitat. Wildlife Society Technical Review 07-2. The Wildlife Society, Bethesda, Maryland, USA

Avian Power Line Interaction Committee (APLIC). 2006. Suggested practices for avian protection on power lines: the state of the art in 2006. Edison Electric Institute, APLIC, and the California Energy Commission. Washington D.C. and Sacramento, CA, USA. http://www.aplic.org/SuggestedPractices2006(LR-2watermark).pdf.

Bureau of Land Management (BLM). 2006. Final Environmental Impact Statement for the Proposed Cotterel Wind Power Project and Proposed Resource Management Plan Amendment. FES 06-07. Serial No. IDI-33676. Prepared for the US Department of the Interior (USDOI), BLM, Twin Falls District, Burley Field Office, Cassia County, Idaho, on behalf of Windland, Inc., Boise, Idaho, and Shell WindEnergy Inc., Houston, Texas. March 2006.

California Burrowing Owl Consortium (CBOC). 1993. *Burrowing Owl Survey Protocol and Mitigation Guidelines.* April.

California Department of Fish and Game (CDFG). 2009. California Natural Diversity Database. Web site: http://www.dfg.ca.gov/biogeodata/cnddb/

California Energy Commission (CEC). 2002. *A Roadmap for PIER Research on Avian Collisions with Power Lines in California.* California Energy Commission Staff Report. December.

California Energy Commission (CEC). 2007. *California Guidelines for Reducing Impacts to Birds and Bats from Wind Energy Development*. CEC-700-2007-008-CMF. October.

CEC and CDFG. 2010. *Swainson's Hawk Survey Protocols, Impact Avoidance, and Minimization Measures for Renewable Energy Projects in the Antelope Valley of Los Angeles and Kern Counties, California*. June 2.

California Native Plant Society (CNPS). 2009. Inventory of Rare and Endangered Plants. Web site: http://cnps.web.aplus.net/cgi-bin/inv/inventory.cgi.ca/pdf/pdfs/cdd_pdfs/wemo_pdfs.Par.4dfb777.file: wemo_rod_3-06.pdf

Chatfield, A., W. P. Erickson, and K. Bay. 2010a. *Wildlife Baseline Studies for the Sun Creek Wind Resource Area, Kern County, California. Final Report: May 2009 – May 2010*. Prepared for CH2M HILL, Oakland, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming.

Chatfield, A., W. P. Erickson, and K. Bay. 2010b. *Baseline Avian Studies for the Alta East Wind Resource Area, Kern County, California. Interim Report, July 10 – August 31, 2010*.

Chatfield, A., W. P. Erickson, and K. Bay. 2010c. *Baseline Avian Studies for the Alta East Wind Resource Area, Kern County, California, Summer- Fall Interim Report, July 10 – November 12, 2010*.

Derby, C., K. Bay, and J. Ritzert. 2009. Bird Use Monitoring, Grand Ridge Wind Resource Area, La Salle County, Illinois. Year One Final Report, March 2008 - February 2009. Prepared for Grand Ridge Energy LLC, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. July 29, 2009.

Drewitt, A.L., and R.H.W. Langston. 2006. Assessing the Impacts of Wind Farms on Birds. *Ibis* 148:29-42.

Erickson, W.P., E. Lack, M. Bourassa, K. Sernka, and K. Kronner. 2001. Wildlife Baseline Study for the Nine Canyon Wind Project, Final Report May 2000-October 2001 Technical report prepared for Energy Northwest, Richland, Washington.

Erickson, W.P., G.D. Johnson, K. Bay, and K. Kronner. 2002a. Ecological Baseline Study for the Zintel Canyon Wind Project. Final Report April 2001 – June 2002. Technical report prepared for Energy Northwest. Prepared for Energy Northwest by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. June 2002.

Erickson, W.P., G.D. Johnson, D.P. Young, Jr., D. Strickland, R. Good, M. Bourassa, K. Bay, and K. Sernka. 2002b. Synthesis and Comparison of Baseline Avian and Bat Use, Raptor Nesting and Mortality Information from Proposed and Existing Wind Developments. Technical report prepared for Bonneville Power Administration, Portland, Oregon by WEST, Inc., Cheyenne, Wyoming. December 2002. http://www.bpa.gov/Power/pgc/wind/Avian_and_Bat_Study_12-2002.pdf

Erickson, W.P., J. Jeffrey, D.P. Young, Jr., K. Bay, R. Good, K. Sernka, and K. Kronner. 2003a. Wildlife Baseline Study for the Kittitas Valley Wind Project: Summary of Results from 2002 Wildlife Surveys. Final Report February 2002– November 2002. Prepared for Zilkha Renewable Energy, Portland, Oregon, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. January 2003.

Erickson, W.P., J. Jeffrey, K. Kronner, and K. Bay. 2003b. Stateline Wind Project Wildlife Monitoring Annual Report, Results for the Period July 2001 - December 2002. Technical report submitted to FPL Energy, the Oregon Office of Energy, and the Stateline Technical Advisory Committee. Western EcoSystems Technology, Inc., Cheyenne, Wyoming. May 2003.

Erickson, W.P., D.P. Young, G. Johnson, J. Jeffrey, K. Bay, R. Good, and H. Sawyer. 2003c. Wildlife Baseline Study for the Wild Horse Wind Project. Summary of Results from 2002-2003 Wildlife Surveys May 10, 2002- May 22, 2003. Draft report prepared for Zilkha Renewable Energy, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. November 2003.

Erickson, W. P. 2007. Summary of Methods and Results for Prediction and Estimation of Impacts and Risk. Presented at NWCC Probability of Impact Workshop, 13 November 2007, Golden, CO.

Good, R.E., M. Ritzert, and K. Bay. 2010. Wildlife Baseline Studies for the Timber Road Phase II Wind Resource Area, Paulding County, Ohio. Final Report: September 2, 2008 - August 19, 2009. Prepared for Horizon Wind Energy, Houston, Texas. Prepared by Western EcoSystems Technology, Inc. (WEST), Bloomington, Indiana. April 28, 2010.

Janss, G. F. E. 2000. "Avian Mortality from Power Lines: A Morphologic Approach of a Species-Specific Mortality." *Biological Conservation.* 95 (2000): 353-359.

Jeffrey, J.D., W.P. Erickson, K.J. Bay, V.K. Poulton, W.L. Tidhar, and J.E. Baker. 2008. Wildlife Baseline Studies for the Golden Hills Wind Resource Area, Sherman County, Oregon. Final Report May 2006 – October 2007. Prepared for BP Alternative Energy North America Inc., Houston, Texas, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming.

Johnson, G.D., D.P. Young, W.P. Erickson, C.E. Derby, M.D. Strickland, and R.E. Good. 2000. Wildlife Monitoring Studies, Seawest Windpower Plant, Carbon County, Wyoming, 1995-1999. Final report prepared for SeaWest Energy Corporation, San Diego, California, and the Bureau of Land Management, Rawlins, Wyoming, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. August 9, 2000. http://www.west-inc.com and http://www.west-inc.com/reports/fcr_final_baseline.pdf

Johnson, G.D., W.P. Erickson, K. Bay, and K. Kronner. 2002. Baseline Ecological Studies for the Klondike Wind Project, Sherman County, Oregon. Final report prepared for Northwestern Wind Power, Goldendale, Washington, by Western EcoSystems Technology, Inc. (WEST) Cheyenne, Wyoming, and Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. May 29, 2002.

Johnson, G.D., J. Jeffrey, J. Baker, and K. Bay. 2007. Baseline Avian Studies for the Windy Flats Wind Energy Project, Klickitat County, Washington. Prepared for Windy Point Partners, LLC., by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. May 29, 2007.

Johnson, G.D., K. Bay, J. Eddy, and T. Rintz. 2008a. Wildlife Baseline Studies for the Glenrock Wind Resource Area, Converse County, Wyoming. Prepared for CH2M HILL. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming.

Johnson, G.D., J. Eddy, K. Bay, and A. Chatfield. 2008b. Wildlife Baseline Studies for the Seven Mile Hill Wind Resource Area, Carbon County, Wyoming: April 30 - November 15, 2007. Prepared for CH2M HILL, Englewood, Colorado. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming.

Johnson, G.D., K. Bay, and J. Eddy. 2009a. Wildlife Baseline Studies for the Dunlap Ranch Wind Resource Area, Carbon and Albany Counties, Wyoming. June 4, 2008 - May 27, 2009. Prepared for CH2M HILL, Englewood, Colorado. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming.

Johnson, G.D., K. Bay, and J. Eddy. 2009b. Wildlife Baseline Studies for the High Plains Wind Resource Area, Carbon and Albany Counties, Wyoming. Prepared for CH2M HILL. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming.

Kerlinger, P., L. Culp, and R. Curry. 2005. Post-Construction Avian Monitoring Study for the High Winds Wind Power Project, Solano County, California. Year One Report. Prepared for High Winds, LLC and FPL Energy.

Kronner, K., B. Gritski, J. Baker, V. Marr, G.D. Johnson, and K.Bay. 2005. Wildlife Baseline Study for the Leaning Juniper Wind Power Project, Gilliam County, Oregon. Prepared for PPM Energy, Portland, Oregon and CH2M HILL, Portland, Oregon by NWC, Pendleton, Oregon, and WEST, Inc., Cheyenne, Wyoming. November 3, 2005.

Lehman, R. N., J. A. Savidge, P. L. Kennedy, and R.E. Harness. 2010. Raptor electrocution rates for a Utility in the Intermountain Western United States. Journal of Wildlife Management 74(3): 459-470.

Northwest Wildlife Consultants, Inc. (NWC) and Western Ecosystems Technology, Inc. (WEST). 2004. Ecological Baseline Studies for the Roosevelt Wind Project, Klickitat County, Washington. Final Report. Prepared by NWC, Pendleton, Oregon, and WEST, Inc., Cheyenne, Wyoming. September 2004

Northwest Wildlife Consultants, Inc. (NWC) and Western Ecosystems Technology, Inc. (WEST). 2005. Ecological Baseline Studies and Wildlife Impact Assessment for the White Creek Wind Power Project, Klickitat County, Washington. Prepared for Last Mile Electric Cooperative, Goldendale, Washington, by Northwest Wildlife Consultants, Inc., Goldendale, Washington, and Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. January 12, 2005.

Phoenix Ecological Consulting. 2010. Burrowing Owl (*Athene cunicularia*) Protocol Presence/Absence Survey for Sun Creek Wind Resource Area, Kern County, California. July 19.

Reynolds, R. T., J. M. Scott, and R. A. Nussbaum. 1980. "A Variable Circular-Plot Method for Estimating Bird Numbers." *Condor* 82(3): 309-313.

Rusz, P. J., H. H. Prince, R. D. Rusz, and G. A. Dawson. 1986. Bird collisions with transmission lines near power plant cooling pond. *Wildlife Society Bulletin* 14, 441-444.

Savereno, A. J., L. A. Savereno, R. Boettcher, and S. M. Haig. 1996. "Avian Behavior and Mortality at Power Lines in Coastal South Carolina." *Wildlife Society Bulletin* 24, 636-648.

Snyder, N. F. R. and H. Snyder. 2000. *The California Condor: a saga of natural history and conservation*. Academic Press, San Diego, California.

Southwest Condor Working Group. 2007. Review of the Second Five Years of the California Condor Reintroduction Program in the Southwest. April. 87pp.

U.S. Bureau of Land Management (BLM). 1999. California Desert Conservation Area Plan of 1980. Amended 1999.

U.S. Bureau of Land Management (BLM). 2001. Special Status Species Management Manual 6840. Available online at: http://www.blm.gov/pgdata/etc/medialib//blm/ca/pdf/pdfs/pa_pdfs/biology_pdfs.Par.9d22a8ee.File.pdf/6840_ManualFinal.pdf

United States Geological Survey (USGS). 2006. *Migration of Birds: Routes of Migration*. Available at: http://www.npwrc.usgs.gov/resource/birds/migratio/routes.htm.

United States Fish and Wildlife Service (USFWS). 2008. Birds of Conservation Concern, 2008. USFWS Division of Migratory Bird Management. Arlington, Virginia. December. http://www.fws.gov/migratorybirds/NewReportsPublications/SpecialTopics/BCC2008/BCC2008.pdf

URS Corporation, Western EcoSystems Technology, Inc. (WEST), and Northwest Wildlife Consultants, Inc. (NWC). 2001. Avian Baseline Study for the Stateline Project. Prepared for FPL Energy Vansycle, LLC, Juno Beach, Florida.

Western Ecosystems Technology, Inc. (WEST). 2005a. Ecological Baseline Study at the Elkhorn Wind Power Project. Exhibit A. Final report prepared for Zilkha Renewable Energy, LLC., Portland, Oregon, by WEST, Cheyenne, Wyoming. June 2005.

Western EcoSystems Technology, Inc. (WEST). 2005b. Ecological Baseline Study for the Proposed Reardan Wind Project, Lincoln County, Washington. Draft Final Report. Prepared for Energy Northwest, Richland, Washington, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. June 2005.

Western EcoSystems Technology, Inc. (WEST). 2005c. Exhibit A: Ecological Baseline Study at the Elkhorn Wind Power Project. Draft final report prepared for Zilkha Renewable Energy, LLC, Portland, Oregon, by WEST, Cheyenne, Wyoming. June 2005.

Western EcoSystems Technology, Inc. (WEST). 2005d. Wildlife and Habitat Baseline Study for the Proposed Biglow Canyon Wind Power Project, Sherman County, Oregon. March 2004 - August 2005. Prepared for Orion Energy LLC., Oakland, California. WEST, Cheyenne, Wyoming. October, 2005.

Western EcoSystems Technology, Inc. (WEST). 2006. Diablo Winds Wildlife Monitoring Progress Report, March 2005 - February 2006. Technical report submitted to FPL Energy and Alameda County California. WEST. Cheyenne, Wyoming.

Western EcoSystems Technology, Inc. (WEST). 2007. Wildlife and Habitat Baseline Study for the Vantage Wind Power Project, Kittitas County, Washington. Draft report prepared for Invenergy by Western EcoSystems Technology, Inc. (WEST), Cheyenne Wyoming and Walla Walla, Washington. June 2007

Western EcoSystems Technology, Inc. (WEST). 2009. Wildlife Baseline Studies for the Antelope Ridge Wind Resource Area, Union County, Oregon. August 28, 2008 - August 12, 2009. Draft final report prepared for Horizon Wind Energy, Houston, Texas. Prepared by WEST, Cheyenne, Wyoming.

Western EcoSystems Technology, Inc. (WEST) and Colorado Plateau Research Station (CPRS). 2006. Avian Studies for the Proposed Sunshine Wind Park, Coconino County, Arizona. Prepared for Sunshine Arizona Wind Energy, LLC., Flagstaff, Arizona, by WEST, Cheyenne, Wyoming, and the CPRS, Northern Arizona University, Flagstaff, Arizona. May 2006.

Young, D.P. Jr., W.P. Erickson, K. Bay, J. Jeffrey, E.G. Lack, R.E. Good, and H.H. Sawyer. 2003a. Baseline Avian Studies for the Proposed Hopkins Ridge Wind Project, Columbia County, Washington. Final Report, March 2002 - March 2003. Prepared for RES North America, LLC., Portland, Oregon, by Western EcoSystems Technology, Inc.(WEST), Cheyenne, Wyoming. April 30, 2003.

Young, D.P. Jr., W.P. Erickson, K. Bay, J. Jeffrey, E.G. Lack, and H.H. Sawyer. 2003b. Baseline Avian Studies for the Proposed Desert Claim Wind Power Project, Kittitas County, Washington. Final Report. Prepared for Desert Claim Wind Power, LLC, Ellensburg, Washington, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. July 2003.

Young, D.P. Jr., W.P. Erickson, J. Jeffrey, K. Bay, R.E. Good, and E.G. Lack. 2003d. Avian and Sensitive Species Baseline Study Plan and Final Report. Eurus Combine Hills Turbine Ranch, Umatilla County, Oregon. Technical report prepared for Eurus Energy America Corporation, San Diego, California and Aeropower Services, Inc., Portland, Oregon, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. March 10, 2003.

Young, D.P. Jr., G.D. Johnson, V.K. Poulton, and K. Bay. 2007b. Ecological Baseline Studies for the

Young, D.P. Jr., V.K. Poulton, and K. Bay. 2007c. Ecological Baseline Studies Report. Proposed Dry Lake Wind Project, Navajo County, Arizona. Prepared for PPM Energy, Portland, Oregon, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. July 1, 2007.

Appendix A
California Condor Mitigation Strategy

CALIFORNIA CONDOR MITIGATION STRATEGY
CALIFORNIA HIGH WIND PROJECTS
TEHACHAPI WIND RESOURCE AREA

Bloom Biological, Inc.

Research | Consulting | Conservation

Prepared for:
Terra-Gen Power, LLC
8731 Red Oak Blvd., Suite 200
Charlotte, NC 28217

Prepared by:
Bloom Biological, Inc
13611 Hewes Avenue
Santa Ana, CA 92705

October 2010

CONDOR MITIGATION STRATEGY
CALIFORNIA HIGH WIND PROJECTS
TEHACHAPI WIND RESOURCE AREA

Terra-Gen Power, LLC has proposed a comprehensive California Condor Mitigation Strategy for California High Wind Projects (CHWP) in the Tehachapi Wind Resource Area (TWRA). In order to effectively protect and manage the California condor within the TWRA, Terra-Gen proposes to create a Condor Preservation Foundation (hereafter, the Foundation). Companies proposing wind energy facilities in the TWRA would be required by Kern County to contribute to the Foundation. The advantages of establishing a foundation are that it can more effectively protect the California condor and implement the mitigation strategies outlined below than could be accomplished on a project-by-project basis. The Foundation, for example, can reach a wider audience for public outreach and education, focus its efforts on research and funding, employ condor biologists, operate a carcass management plan over an area that encompasses all future and potentially existing projects, and develop an effective and widespread condor supplemental feeding program. Eventually, the Foundation could purchase and manage condor conservation lands.

Below are brief discussions of some of the key components of an effective mitigation strategy for minimizing harm to California condors and aiding in the condor's recovery in the wild. The suggested mitigation strategies outlined below are grouped into six major categories, listed roughly in descending order of importance:

1. Elimination of lead bullet fragments and lead shot from the current and future range of the California condor in California;
2. Implementation of a carcass management and supplemental feeding program;
3. Support for the California condor recovery plan;
4. Funding for California condor research and education programs;
5. Hiring of a full-time biologist;
6. Implementation of a Common Raven Management Plan.

1. Elimination of Lead Bullet Fragments and Lead Shot From the Current and Future Range of the California Condor in California

Lead poisoning remains the number one killer of California condors, and the source of this lead has been traced to bullet fragments in carcasses and gut piles left by hunters. Lead poisoning is now thought to have been one of the major causes of mortality that resulted in the decline of the California condor in the latter half of the 20th Century, particularly since the development of lead ammunition that fragments upon impact in living tissue. All-copper bullets, on the other hand, are far less toxic to condors. They also do not fragment upon impact like lead bullets, and condors are less likely to ingest an intact bullet than many small bullet fragments scattered throughout a carcass or gut pile.

Many recently reintroduced condors have been exposed to high levels of lead. Since their release back into the wild beginning in the mid-1990s, at least two deaths in California and eight deaths in Arizona have been attributed directly to lead poisoning, while another three condors in California with high lead levels in their blood died during emergency chelation treatment. Several other birds would likely have died due to lead toxicity if it were not for chelation treatment. Other birds have disappeared with no known cause of death, with lead poisoning a plausible explanation. Lead poisoning is, thus, considered to be the most significant current cause of condor mortality.

Research on golden eagles within the range of the California condor has documented high lead levels in that species as well (Bloom 1989, Pattee et al. 1990). Golden eagles also feed on carrion and typically compete with condors for available carrion where their ranges overlap. Approximately 35.8% of the 162 golden eagles sampled had elevated lead levels, comparable to levels reported on free-ranging California condors. The blood lead levels were highest during the months of October, November, and December, which correlates with peak hunting season (Pattee et al 1990).

In spring 2007, the Tejon Ranch Company announced a total ban on the use of lead shot and bullets for hunting purposes on the Tejon Ranch. The State of California subsequently enacted the Ridley-Tree Condor Preservation Act (AB 821), which banned lead ammunition in the range of the California condor effective July 1, 2008. As a result of these initiatives, condor mortality rates resulting from lead poisoning are expected to decline in the future. But enforcement of the ban will be challenging, especially since lead shot and lead bullets can be purchased elsewhere in the state and is not illegal outside the condor's range.

- In furtherance of the ban on use of lead shot and lead bullets for hunting, the Foundation should support efforts to ban the sales and use of lead ammunition throughout Kern County in the short-term and elimination of lead shot and lead bullets used for hunting statewide in the long term.

Because lead toxicity has been identified as the leading cause of death in condors in the Arizona reintroduction program, the Arizona Game and Fish Department began encouraging sportsmen to take lead reduction actions when hunting in condor range (see www.azgfd.gov/w_c/california_condor_lead.shtml). In Fall 2005, as part of an effort to reduce lead exposure in condors, the Department offered non-lead rifle ammunition to big game hunters in the areas condors frequent most. Hunters responded, and 65% participated voluntarily in this program paid for by state lottery revenue. As a result, condor lead exposure rates declined by 40% from the previous year. Additionally, 93% of successful hunters who used the non-lead ammunition said it performed as well or better than lead bullets.

- In addition to supporting a ban on the use of lead ammunition, the Foundation should consider encouraging and funding a countywide effort to subsidize sales of non-lead bullets to sportsmen until such time that lead ammunition is banned statewide.

2. Implementation of a Carcass Management and Supplemental Feeding Plan

California condors are obligate scavengers, feeding only on the carcasses of dead animals, primarily medium- to large-sized mammals. Typical foraging behavior includes long-distance reconnaissance flights, lengthy circling flights over a carcass, and hours of waiting at a roost or on the ground near a carcass. Prior to the arrival of European man, California condor food items within interior California probably included mule deer (*Odocoileus hemionus*), tule elk (*Cervus elaphus nannodes*), pronghorn antelope (*Antilocapra americana*), and smaller mammals. Along the Pacific shore, their diet included whales, sea lions, and other marine species. With the introduction of livestock into California, the deliberate killing and control of large mammalian predators, and the demise of pronghorn and tule elk, the condor diet shifted dramatically. By the 20th Century, 95% of the California condor diet consisted of cattle, domestic sheep, ground squirrels (*Spermophilus beecheyi*), mule deer, and horses, with over half of the condors feeding on cattle carcasses, mostly calves. California condors appear to feed only 1 to 3 days per week, but the frequency of adult feeding is variable and may show seasonal differences. Condors feed on decaying as well as fresh carcasses and are not known to feed on roadkill.

Seasonal shifts seem to be based generally on food availability. For example, California condors tend to move to the Tehachapi Mountains area during the hunting season where deer gut-piles and abandoned deer carcasses are consumed; whereas, during the calving season in the San Joaquin Valley foraging region, wild California condors frequently feed on calf carcasses. Year-round pig hunting, however, on Tejon Ranch and perhaps areas within the TWRA provides the potential for abundant large carcasses in any season.

One of the primary objectives of the CHWP is to keep condors away from wind turbines. This can be accomplished in part by reducing the amount of food sources available to condors near wind turbine facilities.

- The Foundation should routinely inspect the TWRA and adjacent areas for any animal carcasses, and particularly those killed by hunters, that are potentially lead-contaminated and remove those found. These inspections can be greatly facilitated by the use of aircraft during routine patrol efforts supplemented by ground observations.

- Other steps the Foundation may want to consider to reduce the number of potentially lead-contaminated carcasses is:
  - the elimination or close management of hunting within the TWRA, and
  - reduction of livestock grazing within the TWRA.

- Another approach in discouraging condors from foraging on lead-contaminated carcasses would be an aggressive raven management plan along with monetary support of the USFWS and CDFG regional raven management efforts. The idea behind this program is the knowledge that condors traditionally follow ravens to carcasses, as well as the fact that ravens are occasional predators of condor eggs. The mitigation measures required by Kern

County for new projects within the TWRA require such an aggressive raven management program.

- Kern County also requires an aggressive micro-trash program that includes training of employees in the dangers and prevention of micro-trash and micro-trash cleaning programs.

A recent analysis of condors outfitted with GPS-transmitters supports the notion that movement patterns tend to be highly influenced by food availability. Data from these birds, as well as VHF equipped birds from the 1980s at feeding and trap sites also clearly show that condors concentrate at supplemental feeding sites such as the current one at the Bitter Creek National Wildlife Refuge. Based on the best available science and consultations with USFWS and other biological experts on the California condor, construction and operation of one or more feeding stations in collaboration with the USFWS as part of a supplemental feeding program will contribute to the conservation and recovery of the California condor. A supplemental feeding program should continue to reduce (but not eliminate) the likelihood of injury or mortality of California condors from lead or other poisoning by offering the birds a safe alternative to feeding on contaminated carcasses. In addition, feeding sites can be strategically located in order to influence movements of the birds away from wind turbine areas. Finally, supplemental feeding can permit the reintroduction and maintenance of California condor populations in areas where the supply of natural food resources is too variable to support the birds over the entire annual cycle. The supplemental feeding program will predictably become even more important in two more decades when the number of wild southern California condors should more than double. Such sites may also provide the opportunity for public viewing of condors, from an appropriate distance.

- In collaboration with the USFWS, the Foundation should implement an off-site supplemental feeding program to provide an ongoing source of clean, lead-free and contaminant-free food for California condors to keep them from using the TWRA as a foraging habitat..

- With approval from USFWS, clean carcasses should be supplied at designated spots well removed from wind turbine locations to encourage condors away from both the wind turbine rows and potentially contaminated carcasses elsewhere within the TWRA.

- Food carcasses should generally be stillborn calves supplied by a local dairy or ranch, or dead cattle or other large animals (e.g., deer, pigs) that have been determined to be free of lead and other contaminants. The feeding site(s) will be supplied at least twice per week or as needed.

- The program will be implemented by a qualified biologist retained by the Foundation (see below). The biologist will be trained by USFWS personnel in feeding station protocols prior to the biologist being able to supply the designated feeding site with carcasses.

- An MOU issued by the USFWS will serve as the official endorsement and certification by the USFWS of the Foundation as a qualified operator in the supplemental feeding of

California condors. The supplemental feeding program will be initiated upon approval of the MOU by the USFWS.

3. Support for the California Condor Recovery Plan

While discouraging condor use of the TWRA, the Foundation should encourage the expansion of the overall numbers of condors in the wild by supporting the California condor recovery efforts. To this end, the Foundation should commit to certain measures that are collaborative in nature and intended to contribute to the conservation and recovery of the California condor in the wild. These measures are discussed below.

- The Foundation should be fully supportive of recovery efforts and efforts to increase the scientific database that supports the recovery effort.

- The Foundation can assist in funding the production of condors in captivity and the release sites where they are re-introduced into the wild.

- The Foundation should consider creating pit trap and cannon net sites at supplemental feeding locations that provide the USFWS the flexibility to trap condors that are sick or injured and treat them in a controlled situation such that they can be eventually released back into the wild, or to monitor blood lead and other chemical levels.

4. Funding for California Condor Research and Education Programs

Southern California zoos and university-level research programs have already greatly aided efforts to successfully rear condors in captivity and reintroduce them into the wild and to gain a better understanding of the causal factors that resulted in the necessity for a captive breeding program in the first place. Without such work, the captive breeding and recovery programs would have been much less likely to succeed. Ongoing research is critical to the continuing success of these programs. A number of vital research programs are in need of funding and/or manpower in order to continue uninterrupted and others are in need of funding to be initiated. The Foundation can assist with these programs in several ways.

- The Foundation may choose to provide funding to the USFWS to institute a GPS satellite-tracking transmitter or similarly effective system to allow for the continuous, real-time monitoring of the location of California condors. In furtherance of this effort, the Foundation should consider providing an initial fee of approximately $150,000 prior to the issuance of any development permits affecting suitable condor foraging or roosting habitat and an additional $20,000 every year afterwards for the life of the project. This system will enable the immediate location of birds that are not moving relative to the ground, which usually indicates than an injury, illness or death has occurred. The prompt retrieval of injured or sick birds will allow for the rapid implementation of appropriate medical care or rehabilitation, actions that have saved the lives of several condors in the past.

- The Foundation can initiate, support, and fund university level research efforts that address important issues such as the following:

- Golden eagles and red-tailed hawks are impacted by wind farms. In sublethal amounts, lead may be a contributing factor in causing collisions by interfering with their cognitive recognition of wind turbines or accurately judging their trajectory.
- Study the potential attractants of condor into the TWRA, and conceive additional mitigation efforts to keep them from expanding their range into the wind resource areas of the TWRA.
- Hire or support a biostatistician to work with condors on the TWRA and beyond.

5. Hiring of a Full-Time Biologist

It is recommended that the Foundation retain the services of a full-time biologist to be responsible for implementing the supplemental feeding program and generally managing condor use of the TWRA as described in this and previous sections. The hiring should occur no later than 30 days prior to initiation of the start of wind resource facility construction. The biologist's primary function will be to assist the Foundation in minimizing and mitigating any unfavorable interactions between humans and California condors and in administering the avoidance, minimization, and mitigations pertaining to condors outlined in this document. Other duties and responsibilities of the biologist include but are not limited to the following:

- To facilitate the recovery and long-term survival of individual California condors on TWRA, the biologist will monitor for condors currently wearing only VHF transmitters and will analyze near real-time downloads of GPS locations of California condors using the TWRA and notify the USFWS of any atypical behavior so that the agency can respond quickly.

- Because California condors and other scavengers are so vulnerable to contaminants of all kinds, lead, micro-trash and other contaminant studies will likely be needed for the foreseeable future. The biologist will be an active collaborator in any effort that promotes condor conservation on the TWRA. This may include collecting tissue samples from dead animals, or the collection of whole carcasses, blood samples from live eagles, ravens and vultures, or the use of a radiograph.

- Working in collaboration with USFWS condor biologists, the biologist will assist when needed with the placement of lead-free dairy calf carcasses or similar dead animals at supplemental feeding stations.

- The biologist shall actively search for small collections of micro-trash, and larger collections at historic or recent garbage sites, and either remove them immediately if the sources are small or develop plans for their later removal, perhaps with local community effort.

- If requested or desired by the USFWS, the biologist may also participate in condor capture events that occur on the TWRA, if any.

- The biologist will coordinate with retained environmental education specialists, as described above, to prepare guidelines and educational programs regarding micro-trash and proper behavior by persons who recreate or hunt in the TWRA.

- The biologist will monitor use of the TWRA by condors and facilitate communication and coordination among the USFWS and the Foundation to ensure that allowed uses of the TWRA do not compromise the value of the area as a California condor safe zone.

- The biologist will prepare annual monitoring and compliance reports regarding compliance and enforcement of measures associated with avoiding and/or mitigating potential impacts on condors as described herein.

As more projects come on-line, additional biologists can be hired as needed.

6. Implementation of a Raven Management Plan

A Common Raven Management Plan will be developed for the project site in consultation with the USFWS and the CDFG. This plan will contain measures such as annual nest removal, removal of carrion at the base of turbines, storage of garbage in raven-proof containers, and the installation of anti-nesting devices on structures where raven nests could be built.

The CHWP has contributed to and will continue to contribute to the USFWS regional raven management program to fund the following raven management measures:

- reduction of food, water, sheltering, and nesting sites;
- common raven nest removal;
- common raven removal;
- evaluation of effectiveness and adaptive management; and
- education and outreach
- banding, blood sampling for lead, and/or radio-telemetry research.

References

American Wind Energy Association. 1995. *Avian Interactions With Wind Energy Facilities: A Summary*. Prepared by Colson and Associates for AWEA, Washington. DC.

Anderson, R. L., Tom, J., Neumann, N., Cleckler, J., and Brownell, J. A. 1995. *Avian monitoring and risk assessment at Tehachapi Pass Wind Resource Area, California, 1995*. Progress report to the California Energy Commission, CEC-700-95-001.

Barrios, L., and Rodríguez, A. 2004. Behavioural and environmental correlates of soaring-bird mortality at on-shore wind turbines. J. Applied Ecology 41: 72-81.

Bloom, P.H., J.N. Scott, O.H. Pattee, and M.R. Smith. 1989. Lead contamination of Golden Eagles within the range of the California Condor. In Raptors in the Modern World – Proceeding of the International Conference of Birds of Prey. Eilat, Israel, 1987.

Estep, J. 1989. Avian mortality at large wind energy facilities in California: identification of a problem. Staff report no. P700-89-001. California Energy Commission, Sacramento, CA. Haussler, R. 1988. Avian mortality at wind turbine facilities in California. Paper presented at 1988 American Wind Energy Association National Conference, Honolulu, HI.

de Lucas, M., Janss, G. F. E., Whitfield, D. P., and Ferrer, M. 2008. Collision fatality of raptors in wind farms does not depend on raptor abundance. *J. Applied Ecology* 45: 1695-1703.

Leukonia, J. M. 2001. Uso del espacio por la avifauna y control de a mortalidad de aves en los parques eólicos de Navarra. Govierno de Navarro, Pamplona.

Lekuona, J. M., and Ursua, C. 2007. Avian mortality in wind power plants of Navarra (northern Spain). In: de Lucas, M, Janns, G. F. E., and Ferrer, M. (eds.), *Birds and Wind Farms: Risk Assessment and Mitigation*, Quercus.

Orloff, S., and Flannery, A. 1992. Wind turbine effects on avian activity, habitat, and mortality in Altamont Pass and Solano County Wind Resource Areas, 1989-1991. Final Report to Alameda, Contra Costa, and Solano Counties and California Energy Commission by Biosystems Analysis, Inc., Tiburon, CA.

Orloff, S., and Flannery, A. 1996. A continued examination of avian mortality in the Altamont Pass Wind Resource Area. Prepared by BioSystems Analysis Inc., Tiburon, CA, for the California Energy Commission, Sacramento, CA.

Pattee, O.H., P.H. Bloom, J.M. Scott, and M.R. Smith. 1990. Lead Hazards Within the Range of the California Condor. Condor 92:931-937.

Smallwood, K. S., and Thelander, C. G. 2004. Developing Methods to Reduce Bird Mortality in the Altamont Pass Wind Resource Area. Final Report by BioResource Consultants to the California Energy Commission, Public Interest Energy Research-Environmental Area, Contract No. 500-01-019:L Spiegel, Program Manager.
appendices.

Sterner, D., Orloff, S., and Spiegel, L. 2007. Wind Turbine Collision Research in the United States. In: de Lucas, M, Janns, G. F. E., and Ferrer, M. (eds.), *Birds and Wind Farms: Risk Assessment and Mitigation*, Qurecus.

Thelander, C. G., and Rugge, L. 2001. Examining relationships between bird risk behaviors and fatalities at the Altamont Wind Resource Area: a second year's progress report. In: Schwartz, S. S. (ed.), *Proceedings of the National Avian-Wind Power Planning Meeting IV, Carmel, CA. May 16-17, 2000*, pp. 5-14. Prepared for the Avian Subcommittee of the National Wind Coordinating Committee by RESOLVE, Inc., Washington DC.

Thelander, C. G., Smallwood, S., and Rugge, L. 2001. Bird risk behaviors and fatalities at the Altamont Wind Resource Area – a progress report. Proceedings of the American Wind Energy Association, Washington, DC.

Thelander, C. G., and Smallwood, K. S. 2007. The Altamont Pass Wind Resource Area'seffects on birds: a case history. In: de Lucas, M, Janns, G. F. E., and Ferrer, M. (eds.), *Birds and Wind Farms: Risk Assessment and Mitigation*, Qurecus.