Appendix L6

Avian and Bat Protection Plan

Avian and Bat Protection Plan for the Ocotillo Wind Energy Facility

Ocotillo Express LLC
1600 Smith Street, Suite 4025
Houston, Texas 77002

February 2012

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

GRAPHS

APPENDICES

1.0 INTRODUCTION

1.1 Purpose

The primary purposes of this Avian and Bat Protection Plan (ABPP) are to summarize the baseline avian and bat studies conducted within the proposed Ocotillo Express Wind Energy Facility (OWEF), identify measures to avoid and minimize risks through site planning, best management practices (BMP's), advanced conservation practices (ACP's), and describe the adaptive management, monitoring, and reporting requirements for the proposed project. This plan describes the measures that would be implemented prior to, during, and following construction to protect migratory and resident birds and bats and allow for the proposed wind energy facility in an environmentally responsible and practicable manner. This ABPP was prepared in accordance with the Interim Guidelines for the Development of a Project Specific Avian and Bat Protection Plan for Wind Energy Facilities (US Fish and Wildlife Service [USFWS] 2010a) and with the California Guidelines for Reducing Impacts to Birds and Bats from Wind Energy Development (California Energy Commission [CEC] 2007).

1.2 Background

In order to address the growing interest in developing wind energy resources and National Energy Policy recommendations to increase renewable energy production capability, the Bureau of Land Management (BLM) began evaluating wind energy potential on public lands and developing a wind energy policy. In October 2003, the BLM started preparation of a *Wind Energy Development Programmatic Environmental Impact Statement* (PEIS) to analyze the potential impacts of wind energy development on public lands and to minimize those impacts to natural, cultural, and socioeconomic resources. The PEIS was published in June 2005, and in December 2005 the Record of Decision was signed to implement a comprehensive Wind Energy Development program on BLM-administered lands in the western United States (BLM 2005). The program has established policies and BMPs to address the administration of wind energy development actions on BLM lands and has identified mitigation measures. The programmatic policies and BMPs of the Wind Energy Development Program allow project-specific analysis to focus on the site-specific issues and concerns of individual projects. On August 24, 2006, the BLM Washington Office issued Instruction Memorandum (IM) 2006-216, Right-of-Way Management, Wind Energy Land Use Plan Amendments, Wind Energy that provided guidance on issuing rights-of-way (ROWs) for wind energy testing, monitoring, and development (BLM 2006). Until then, the BLM had an interim wind energy policy, issued in 2002 (BLM 2003).

In August 2009, Pattern Energy, through Ocotillo Express LLC (OE LLC), applied for a testing and monitoring ROW near Ocotillo, California. Since then, it has maintained anemometers to determine the suitability of the project for wind energy development. In October 2009, OE LLC applied for a wind energy development ROW grant from BLM. The ROW grant would be for the construction, operation, and maintenance of the 112-turbine, approximately 300-megawatt (MW)

OWEF and associated facilities. The OWEF would be located on approximately 12,565 acres in the project area and consist of up to112 turbines, including 6 potential alternate turbine locations and associated infrastructure.

In December 2008, a new IM, 2009-043, was issued to update policy and give further guidance on processing Wind Energy Facilities (WEFs) on BLM-administered lands (BLM 2009). OE LLC's Plan of Development (POD) complies with the 2008 guidance. The POD was tentatively finalized in February 2011 but may change in response to comments on the preliminary Environmental Impact Report/Environmental Impact Assessment (EIR/EIS).

On July 9, 2010, IM 2010-156 was issued to provide direction for complying with the Bald and Golden Eagle Protection Act (Eagle Act), including its implementing regulations (i.e., September 11, 2009, Eagle Rule [Rule] 50 CFR parts 13 and 22) for golden eagles, and to identify steps that may be necessary within the habitat of golden eagles to ensure environmentally responsible authorization and development of renewable energy resources. OE LLC has developed an Eagle Conservation Plan as a separate document, but in support of this Avian and Bat Protection Plan.

1.3 Facility Description

The principal components of the OWEF would consist of wind turbine generators (WTGs), an underground electrical collection system for collecting the power generated by each WTG, electrical substation and switchyard, access roads, Operation and Maintenance (O&M) building, temporary laydown and storage areas, concrete batch plant, sand and gravel source, fiber-optic communications, four permanent meteorological (MET) towers, and one radar unit. The maximum temporary and permanent disturbance areas are described in Table 1 below. The OWEF totals approximately 12,565 acres, all of which are on BLM land covered by the requested ROW except for 26 acres of private land. This is to allow for the necessary set back distances and spacing between individual WTGs and linear arrays. The total area estimated for use by the wind energy facility (including both short- and long-term disturbance) is approximately 491.6 acres, or approximately 4.0 % of the total ROW.

Table 1. Ocotillo Express Wind Facility Components; Maximum Disturbance Summary Table, Based on Construction of 112 Turbines.

Facility Component	Temporary Disturbance (Acres)	Permanent Disturbance (Acres)
Turbine Foundations	157.8	11.3
Access Roads Lines/Crane Walk/Crane Pads	96.9	75.7
Collector Lines	88.3	0
Substation / Switchyard	0.7	31.7
O&M Facility	0	3.3
Batching Plant & Laydown/Parking Area	29.4	0
Meteorological Towers	2.0	0.01
Total	**375.1**	**122.1**

Since wind turbine technology is continually improving and the cost and availability of specific types of WTGs vary from year to year, a representative range of turbine types that are most likely to be used for the project are listed in Table 2. One-hundred and twelve WTG sites have been identified that provide not only the highest wind speeds but also the most consistent wind resource, which provides the highest overall energy output and reliability.

Table 2. Wind Turbine Specifications.

Turbine	Hub Height (m)	Rotor Diameter (m)	Total Height (m)	Rated Capacity Wind Speed (rpm)	Rotor Speed (rpm)	Tower Base Diameter (m)
2.3/3.0 MW Siemens	80	101/108/113	136.5	13	6-16	4.5
1.6/2.75 MW GE	80	100/107	130	13.5	14.8	4.3

Notes: m = meters; rpm = rotations per minute.

Wind turbines consist of three main components: the turbine tower, the nacelle, and the rotor consisting of the hub and the blades. The nacelle is the portion of the wind turbine mounted at the top of the tower, which houses the gearbox and electrical generator. Turbine hub heights and rotor diameters (RD) for the potential turbines may have slight variations, but for purposes of analysis will not exceed 113 m max rotor diameter. The towers will be a tapered tubular steel structure manufactured in three or four sections depending on the tower height, and approximately 15 feet (4.5 meters) in diameter at the base. The towers will be painted white per Federal Aviation Administration (FAA) requirements. A service platform at the top of each section will allow for access to the tower's connecting bolts for routine inspection. A ladder inside the structure will ascend to the nacelle to provide access for turbine maintenance. The tower will be equipped with interior lighting and a safety glide cable alongside the ladder. The towers will be fabricated and erected in sections.

The nacelle houses the main mechanical components of the WTG, the drive train, gearbox, and generator. The nacelle will be equipped with an anemometer and a wind vane that signals wind speed and direction information to an electronic controller. A mechanism will use electric or hydraulic motors to rotate (yaw) the nacelle and rotor to keep the turbine pointed into the wind to maximize energy capture. An enclosed steel-reinforced fiberglass shell houses the nacelle to protect internal machinery from the elements.

Modern wind turbines have three-bladed rotors. The diameter of the circle swept by the blades will be no more than 371 feet (113 meters). Generally, larger wind turbine generators have slower rotating blades, but the specific rotations per minute (RPM) values depend on aerodynamic design and vary across machines. Based on the turbines considered, the blades will turn at no more than 16 RPM.

The proposed facility will connect to the new SDG&E Sunrise Powerlink 500-kilovolt (kV) transmission line scheduled for completion in June 2012 across the middle of the project site. The Point of Interconnection will be adjacent to the project substation. A new substation, electrical collection system, padmount transformer vaults (if used), and above ground junction boxes will be installed. Furthermore, a 500-kV above ground stub line will connect the new substation to the new SDG&E Sunrise Powerlink 500-kV line. In addition to the turbines, the project will include the construction of twenty-three 34.5-kV electrical collection system circuits connecting into a new high voltage (HV) main transformer located at the substation. The new substation will be located within the project area, near the new SDG&E 500kV line. The collection lines connecting one turbine to the next and to the project substation will be buried underground generally adjacent to the interior turbine access roads as noted above. Above ground components of the collection system will include pad mounted transformers alongside each turbine, junction boxes throughout the project site, the main substation/switchyard (which will be fenced), and the overhead 500-kV stub line connecting the switchyard to the new 500-kV transmission line. SDG&E intends to construct and operate the switchyard independently from OE LLC and as such the measures identified in the ABPP for the OWEF do not apply to the SDG&E facilities. SDG&E switchyard and facilities will meet APLIC standards for electrical equipment design.

1.4 Key Avian and Bat Laws, Regulations, Authorizations

The project is subject to all relevant federal, state, and local statutes, regulations, and plans as described in the EIS/EIR. The key federal, state, and local agency approvals, reviews, and permitting requirements for avian and bat species that are anticipated to be needed are presented in Table 3.

Table 3. Key Avian and Bat Laws, Regulations, and Authorizations.

Authorization	Agency Authority	Statutory Reference
Federal		
National Environmental Policy Act (NEPA) Compliance to Grant Right-of-Way	Bureau of Land Management (BLM)	NEPA (Public Law [PL] 91-190, 42 United States Code [USC] 4321−4347, January 1, 1970, as amended by PL 94-52, July 3, 1975, PL 94-83, August 9, 1975, and PL 97-258, §4[b], Sept. 13, 1982)
Endangered Species Act Compliance	U.S. Fish and Wildlife Service (USFWS)	Endangered Species Act (PL 93-205, as amended by PL 100-478 [16 USC 1531 *et seq*.]); 50 Code of Federal Regulations (CFR) 402
Migratory Bird Treaty Act	USFWS	16 USC 703–711; 50 CFR 21 Subchapter B
Bald and Golden Eagle Protection Act	USFWS	16 USC 668−668(d)
State		
Section 2081 Incidental Take Permit	California Department of Fish and Game (CDFG)	California Endangered Species Act (CESA) of 1984, Fish and Game Code §§ 2050-2098

The regulatory framework for protecting birds includes the Endangered Species Act of 1973, as amended (ESA 1973), the Migratory Bird Treaty Act (MBTA 1918), the Bald and Golden Eagle Protection Act (BGEPA) of 1940, and Executive Order (EO) 13186. The MBTA prohibits the take of migratory birds and does not include provisions for allowing unauthorized take. This project affords substantial design measures to avoid and minimize the likelihood of take, but if take occurs, it will be reported to the US Fish and Wildlife Service (USFWS) for further action. Additionally, this ABPP has been developed to meet BLM and USFWS requirements for addressing the ESA, MBTA, and BGEPA. Both the BGEPA and the MBTA prohibit take as defined as pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, disturb, or otherwise harm eagles, their nests, or their eggs. Under the BGEPA, “disturb” means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available: 1) injury to an eagle; 2) decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior; or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior. However, on September 11, 2009 (*Federal Register*, 50 Code of Federal Regulations [CFR] 13 and 22), the USFWS set in place rules establishing two new permit types: 1) take of bald and golden eagles that is associated with, but not the purpose of, the activity; and 2) purposeful take of eagle nests that pose a threat to human or eagle safety. The USFWS recommends that project proponents prepare an ABPP to avoid, minimize, and mitigate project-related impacts to birds and bats and specifically golden eagles to ensure no-net-loss to the golden eagle population. Pursuant to BLM IM 2010-156, the BLM will request “concurrence” from the USFWS that the ABPP meets specific requirements.

1.5 Policy and Commitment to Environmental Protection

Pattern is an independent, fully integrated energy company that develops, constructs, owns, and operates wind power projects across North America and parts of Latin America. Pattern commenced operations in June 2009 as one of the most experienced and best capitalized renewable energy companies in the United States. OE LLC, through Pattern, is dedicated to delivering the highest values for their partners and the communities where they work, while exhibiting a strong commitment to promoting environmental stewardship and corporate responsibility. The OE LLC team has a proven track record of using science and ground-breaking technology to build wind projects that successfully coexist with wildlife and protect the environment. OE LLC is committed to building environmentally responsible renewable energy projects and continues to work closely with environmental agencies to develop appropriate mitigation measures to reduce impacts to wildlife.

1.6 Public Outreach

OWEF will coordinate with key interest groups within the community to determine how capital contributions from the project can go towards worthwhile community projects. In addition, a project fact sheet describing the project and measures that have been put in place to address avian and bat issues will be prepared and made available at the local BLM El Centro District Office.

2.0 EXISTING CONDITIONS

2.1 Environmental Setting

The project site is located within four US Geological Survey (USFS) 7.5-minute quadrangle maps; Carrizo Mountain, Coyote Wells, In-Ko-Pah Gorge, and Painted Gorge. The northern portion of the site is generally situated north of Interstate 8 (I-8), from the Imperial/San Diego County border on its western edge to approximately 1.5 miles northeast of the town of Ocotillo on its eastern edge. The northern area includes several distinct features, including a portion of the

I-8 Island, which is undeveloped rocky and hilly terrain between the eastbound and westbound lanes of I-8, Sugarloaf Mountain, and a portion of the San Diego and Arizona Eastern railroad tracks. County Route (CR) S2 bisects the northern project area, and I-8 passes through the southern portion of the northern project area. The southern area is much smaller than the northern area and the majority is south of State Route (SR) 98.

Vegetation on site consists of a variety of desert scrub habitat types. Several dry desert washes cut through the site, generally from west to east: Palm Canyon Wash cuts through the center of the northern project area, Myer Creek Wash cuts through the southern portion of the northern project area, a portion of Coyote Wash cuts through the northwest portion of the southern project area, and several additional unnamed washes cut through the site.

Elevations on site range from approximately 300 feet above mean sea level (amsl) in the northeast portion of the site to approximately 1,490 feet amsl in the southwest portion of the site. The site generally slopes downward from the west to the east, with the Coyote Mountains to the north of the site, and the Jacumba Mountains to the west and south of the site.

2.1.1 Sensitive Species

California utilizes several levels of protection and/or designations for sensitive wildlife species, with the top tier being an official listing or proposed listing under the federal or California ESA, followed by state or federal candidate species for possible listing. The California Department of Fish and Game (CDFG) also maintain a list of sensitive species that includes several designations. A CDFG listed fully protected species is the most restrictive designation in terms of “take”; however, the CDFG code sections dealing with fully protective species were amended in 2003 to allow the department to authorize some take in specific circumstances (CDFG Code §3511). CDFG species of special concern are species that are vulnerable to extinction or extirpation due to declining population levels, limited ranges, and/or continuing threats. CDFG watch list species are those that are not on the current special species list, but were included in previous iterations or have been delisted from the federal ESA or CESA. Neither CDFG species of special concern nor watch list species are specifically protected under the CDFG code. In addition to the California hierarchy of sensitive species, the BLM maintains a list of sensitive species, and the USFWS maintains a list of Birds of Conservation Concern (BCC). A list of federally listed species, CA state-listed species, BLM sensitive species, and USFWS BCC species with at least some potential to occur within Imperial County, CA is provided in Appendix A.

No federally listed avian and bat species are known to occur within the OWEF. One California state threatened species (Swainson’s hawk; *Buteo swainsoni*) has been observed within the OWEF. One BLM sensitive avian species (burrowing owl; *Athene cunicularia*) as well as one BLM sensitive bat species (western mastiff*; Eumops perotis*) are known to occur within the

OWEF. In addition, four USFWS BCC species (Costa's hummingbird [*Calypte costae*], peregrine falcon [*Falco peregrines*], prairie falcon [*Falco mexicanus*], and yellow warbler [*Sonovana spp*.]) have been observed within the OWEF. The majority of federal or CESA listed species, BLM sensitive species, and UFSWS BCC species are unlikely to occur within the OWEF due to lack of suitable habitats.

2.2 Monitoring and Surveying to Date

In response to concerns about impacts to wildlife resulting from the development of the OWEF, a variety of field studies and literature reviews were initiated. Field studies consisted of avian and bat surveys, which are summarized below in Table 4. The field studies were conducted by HELIX Environmental Planning, Inc. (HELIX) biologists and subconsultants to HELIX.

Table 4. Monitoring and Surveying Efforts.

Study	Taxa	Survey Dates
Raptor Migration Count Surveys (Helix 2010a, Helix 2011)	Raptors, Vultures	September – November 2009,March – May 2010, August – November 2010, March – May 2011
Avian Point Count Surveys (Helix 2010b)	All Birds	September 2009-August 2010
Eagle Nest Surveys (WRI 2011)	Eagles	March – April 2010
Bat Surveys (Rahn 2011)	Bats	January – November 2010
AnaBat Acoustic Surveys (Rahn 2011)	Bats	April – November 2010
Burrowing Owl Surveys (Helix 2010c)	Owls	Jan 2010 ,March-April, 2010,June-July 2010, July-August 2010
Merlin Radar passive data collection (DeTect 2011)	Birds and Bats	July 2010 – present

2.2.1 Raptor Migration Count Surveys

2.2.1.1 Methods

The purpose of the raptor migration counts study was to document the diurnal raptor activity within the OWEF project area in order to provide a risk assessment for these species. HELIX conducted migration counts over an eight calendar-week period during the 2009 fall migration period (September 24 to November 10, 2009), over a 10-week calendar-week period during the 2010 spring migration period (March 22-May 28, 2010), over a 15 calendar-week period during the fall 2010 migration period (August 23 to November 12, 2010), and over a 10 calendar-week period during the spring 2011 migration period (March 21 to May 27, 2011). HELIX stationed four surveyors throughout the site to scan the sky and record bird migration data. The four migration count locations (Locations A through D; Figure 1) were spaced approximately two miles apart generally along a southwest-northeast axis across the site. Migration count locations were located to maximize the likelihood of detecting potential north-south and east-west migration through the site. Migration counts were conducted in accordance with the OWEF survey protocols approved by BLM and generally in accordance with the methods described in the CEC's Guidelines for Reducing Bird Impacts from Wind Development (CEC 2007).

Migration counts were focused on the time of day when raptors were observed to be most active over the site (late morning to late afternoon). The raptor counts were staggered to either begin shortly after sunrise or to conclude before sundown to cover the bimodal activity of diurnal bird migrants. During fall 2009 and spring 2010, migration counts were conducted approximately eight hours per day; during fall 2010 and spring 2011, migration counts were conducted approximately 5.5 hours per day (typically from mid morning to late afternoon). The total number of observation hours during each study included 763 observation hours in fall 2009, 952 observation hours in spring 2010, 577.5 observation hours in fall 2010, and 489.5 observation hours in spring 2011. Surveyors methodologically scanned the sky and recorded all bird species, number of individuals, direction of movement, estimated distance from the surveyor, and estimated height above the ground. Surveyors documented activity on standardized datasheets for each date. Weather conditions (e.g., temperature, wind speed, wind direction, cloud cover, etc.) at the start and end of each day were also recorded. Surveyor positions were rotated each day.

HELIX biologists Kimberly Davis, Erica Harris, Rob Hogenauer, Jason Kurnow, Erik LaCoste, Debbie Leonard, Eric Piehl, and Dale Ritenour, along with John Konecny (Konecny Biological Services), conducted the migration counts. Independent contractor Marie Bennett assisted on one date.

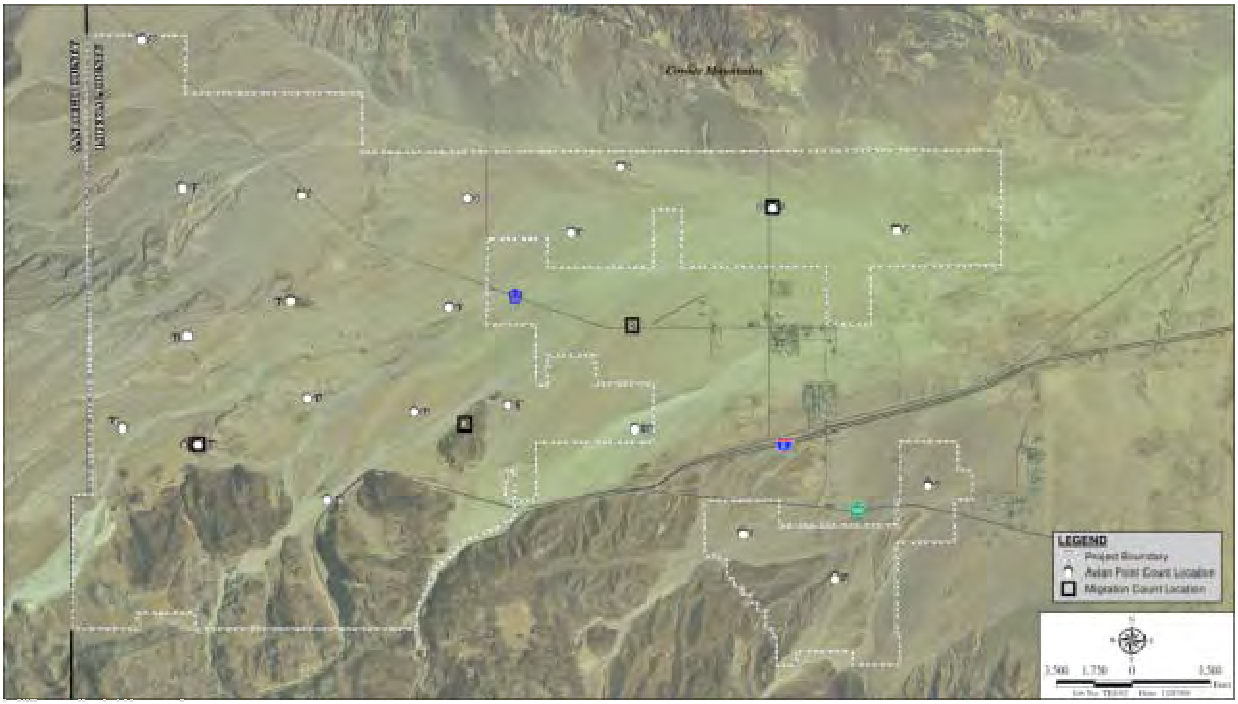


Figure 1. Raptor Migration Count and Avian Point Count Locations.

<u>2.2.1.2 Results</u>

A total of 2, 073 raptors/large birds were recorded on site or directly adjacent to the site during the four seasons of raptor migration surveys (165 raptors/large birds during the fall of 2009, 522 during spring 2010, 451 during fall 2010, and 935 during spring of 2011). The number of raptors and turkey vultures observed during the spring migration counts were greater compared to fall.

HELIX calculated raptor use estimates and relative abundance using the fall 2009, spring 2010, fall 2010, and spring 2011 migration count data (Table 5). Raptor use was calculated by dividing the number of raptor observations in each respective survey period by the number of observation hours in each of those survey periods. Relative abundance was calculated by dividing the number of observations of each raptor species by 2,073, which is the total number of raptor observations during the four seasons. Less than one raptor observation per hour of observation was recorded during the fall and spring migration periods at the proposed OWEF site (excluding turkey vultures). Raptor use (including turkey vultures) of the site in spring 2010 (0.548 observations/hour [hr]) was more than double the raptor use of the site during fall 2009 (0.216 observations/hr), but was less than the raptor use in the fall 2010 (0.781 observations/hr) and spring of 2010 (1.910 observations/hr; Table 5).

During the fall 2009 raptor migration counts, the species with the highest use of the site were the red-tailed hawk, American kestrel (*Falco sparverius*), prairie falcon (*Falco mexicanus*), and turkey vulture. During the fall of 2010, red-tailed hawk, turkey vulture, American kestrel, and

Swainson's hawk had the highest use of the site. During the spring 2010 migration counts, the species with the highest use of the site were the turkey vulture, red-tailed hawk, prairie falcon, and American kestrel. During the spring of 2011, turkey vulture, red-tailed hawk, Swainson's hawk, and prairie falcon had the highest use.

The turkey vulture accounted for 42% of the total observations during the study period and red-tailed hawk constituted 34% of the total observations. Prairie falcon and American kestrel each accounted for four percent of the observations, and Swainson's hawk accounted for three percent of total observations. There were 169 raptor sightings that could not be definitively identified, which accounted for approximately eight percent of observations (Table 5).

Table 5. Raptor use and relative abundance from Raptor Migration Count Surveys.

Species	Fall 2009		Spring 2010		Fall 2010		Spring 2011		Total		Relative Abundance
	No.	No./hr	No.	No./hr	No.	No./hr	No.	No./hr	No.	No./hr	
American kestrel	17	0.022	16	0.017	43	0.074	18	0.037	94	0.034	0.045
Cooper's hawk	2	0.003	1	0.001	3	0.005	3	0.006	9	0.003	0.004
ferruginous hawk	4	0.005	0	0	0	0	0	0	4	0.001	0.002
golden eagle	9	0.012	0	0	11	0.019	11	0.022	31	0.011	0.015
merlin	1	0.001	0	0	2	0.003	0	0	3	0.001	0.001
northern harrier	8	0.010	2	0.002	2	0.003	0	0	12	0.004	0.006
osprey	1	0.001	5	0.005	1	0.002	3	0.006	10	0.004	0.005
prairie falcon	15	0.020	22	0.023	9	0.016	37	0.076	83	0.030	0.040
red-tailed hawk	68	0.089	121	0.127	249	0.431	274	0.560	712	0.256	0.343
sharp-shinned hawk	1	0.001	0	0	3	0.005	1	0.002	5	0.002	0.002
Swainson's hawk	1	0.001	2	0.002	17	0.029	51	0.104	71	0.026	0.034
turkey vulture	15	0.020	316	0.332	83	0.144	456	0.932	870	0.313	0.420
unidentified raptor	23	0.030	37	0.039	28	0.048	81	0.165	169	0.061	0.082
Total Observations	**165**	**0.216**	**522**	**0.548**	**451**	**0.781**	**935**	**1.910**	**2,073**	**0.745**	
Total Identified Species	**12**		**8**		**11**		**9**		**12**		
Observation Hours	**763**		**952**		**577.5**		**489.5**		**2,782**		

HELIX noted raptor nests during the migration counts and during the other biological studies for the project. An active raven nest was observed on another lattice tower in the spring just south of Sugarloaf Mountain. A prairie falcon was observed on multiple occasions flying with nesting material to an area in the rocky hills south of Sugarloaf Mountain; however, a nest was not definitively located. Other large bird nests were documented on site during other biological surveys. A barn owl (*Tyto alba*) nest was documented in the western portion of the project site.

2.2.1.3 Conclusions

The majority of the project site supports desert scrub vegetation and dry desert washes. The site does not contain the appropriate topography to funnel migrating birds through the site. With the exception of Sugarloaf Mountain and the rocky terrain in the southwest portion of the site, the project is generally flat and is located east of the Jacumba Mountains and south of the Coyote Mountains. The site lacks a major ridgeline, water bodies, and large stands of mature trees. The closest major water body is the Salton Sea, which is 30 miles to the northeast of the site, and the irrigated agriculture fields near El Centro are approximately 15 miles to the east of Ocotillo. The results of HELIX's migration counts indicate that the OWEF site is not part of a major migratory pathway for diurnally migrating raptor species, although there was an increase in turkey vulture observations during spring seasons which may suggest increased turkey vulture migration during the spring season.

An average of approximately 0.745 raptor observations/hr (including turkey vultures) were made during the four seasons of migration counts, which is considered low raptor use when compared to similar studies conducted for other wind projects. Springtime raptor use estimates from other wind energy facilities in California range from approximately 0.25 birds/hr at Tehachapi Pass to approximately five birds/hr at Altamont Pass (WEST 2009); fall raptor use estimates from other wind energy facilities in California range from approximately 0.25 birds/hr at San Gorgonio to approximately 9.5 birds/hr at Diablo Winds (Erickson et al. 2009). The closest project site to the OWEF site where raptor use counts have been conducted is at the proposed Tule Wind Farm project site in McCain Valley where 1.16 birds/hour were counted from 2005-2006 and 1.96 birds/hour were counted from 2007-2008 (Tetra Tech EC, Inc. 2008, 2009 as cited in Dudek 2010).

Red-tailed hawk and turkey vulture accounted for approximately 76% of the observations made during the four seasons of raptor counts at the proposed OWEF site (see Table 5). Many of the red-tailed hawk observations made were likely repeat observations of the same individual or individuals. These two species were also commonly observed within the proposed rotor-swept area (RSA; see risk assessment section below) and are two of the most common raptor/vulture species in North America. Based solely on use, red-tailed hawk and turkey vulture would have the greatest risk of collision.

Resident raptor species (red-tailed hawk, prairie falcon, and American kestrel) use the site regularly for foraging and perching but do not occur in high densities. Migratory raptor species observed on site include turkey vulture, osprey (*Pandion haliaetus*), Cooper's hawk (*Accipiter cooperii*), sharp-shinned hawk (*A. striatus*), merlin (*Falco columbarius*), ferruginous hawk (*Buteo regalis*), and Swainson's hawk. With the exception of turkey vultures, migratory raptor species were uncommon during the fall and spring. The migratory raptor species listed above (excluding turkey vultures) were observed infrequently during the study period; 10 or fewer observations were made of each of the following species during the four seasons of raptor counts: osprey, Cooper's hawk, sharp shinned hawk, merlin, and ferruginous hawk. Based solely on behavioral use of the site, resident raptor species would be at greater risk to collision than migratory raptor species because they were more frequently observed foraging over the site, including in the proposed RSA.

2.2.2 Avian Point Count Surveys

2.2.2.1 Methods

The purpose of the avian point count surveys (Point Counts) was to determine what avian species are present on the project site and how the project site is used by those species. This was accomplished by recording bird species, abundance, behavior, and flight characteristics at selected sampling locations over 30-minute period.

HELIX conducted Point Counts approximately weekly over a one-year period (September 1, 2009, to August 31, 2010). A total of 50 weeks of Point Counts were conducted over the one-year period (Point Counts were not conducted the week of November 29-December 5, 2009 or the week of January 17-23, 2010). Each Point Count location was visited once per week (the one exception is that Location 13 was not surveyed the week of February 21-27, 2010). The Point Counts were conducted in accordance with the OWEF survey protocols approved by BLM and generally in accordance with the bird use count methods described in the CEC's Guidelines for Reducing Bird Impacts from Wind Development (CEC 2007). The yearlong Point Counts study was conducted in what was considered a typical year for the Colorado Desert. The 2009-2010 time period was considered an average rainfall year for the region, and the region did not experience abnormally long hot, cold, wet, or dry periods during this timeframe. As such, the results of the point counts would be considered typical for this area. In addition, the results of the raptor migration surveys (encompassing two years of fall and spring seasons) provide further support for the results identified during the yearlong Point Counts study. The timing of migration, resident and migratory species composition and abundance, and bird behavior is expected to vary during years when conditions are abnormally wet, dry, hot, or cold.

Twenty-one Point Count locations were established approximately one mile apart throughout the approximately 15,000-acre site (Locations 1-21; Figure 1). The Point Count locations cover a wide range of elevation, from approximately 340 feet AMSL (Location 4) to approximately

1,250 ft amsl (Location 18). The Point Count locations were strategically located to sample different microhabitats. Although each of the locations occurred in desert scrub habitat, several of the locations were within and adjacent to dry desert washes (e.g., Locations 6, 10, 13, 14, and 21), while others were located on or adjacent to hilly topography (e.g., Locations 2, 12, 18, and 19).

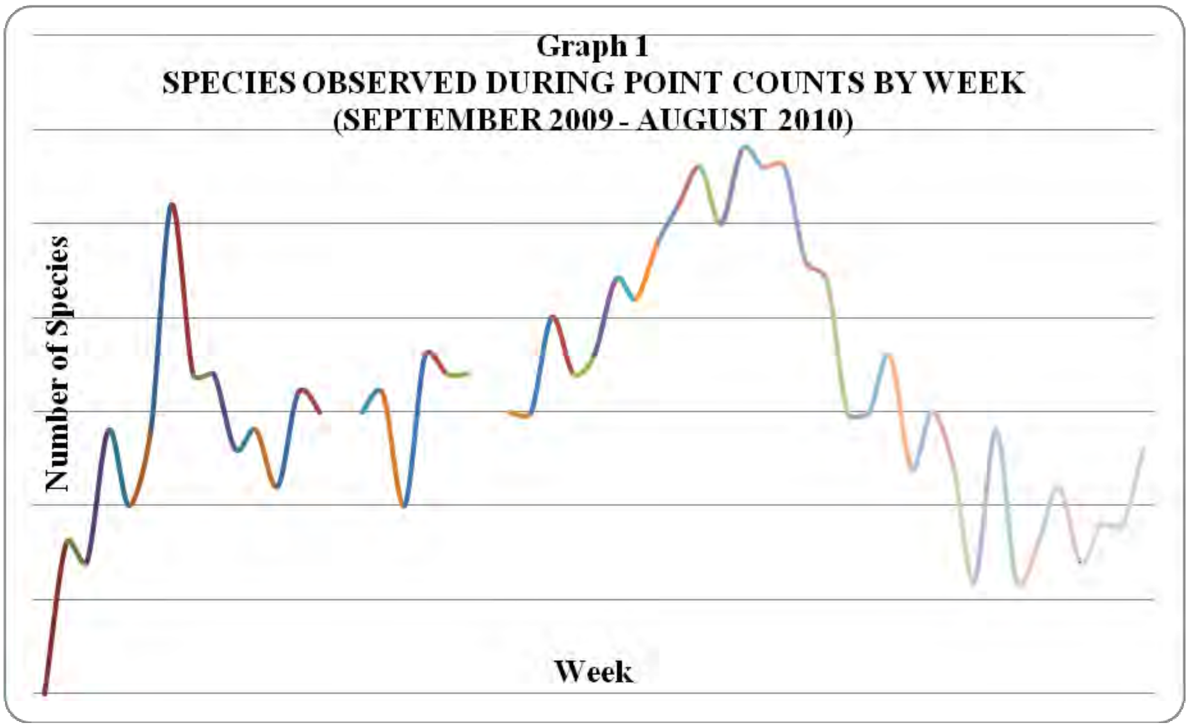
At each Point Count location, the species, number of individuals, flight height, flight direction, distance from observer, and behavior (e.g., directional flight, perched, flapping flight, soaring, etc.) was recorded over a 30-minute period. Weather conditions (e.g., temperature, wind speed and direction, and cloud cover) were recorded at the start and end of the 30-minute interval using a hand-held Kestrel anemometer. Species were detected visually with the aid of binoculars and by identifying songs and call notes. All observations were recorded on standardized data sheets. Efforts were made to sequence observation times so that locations were surveyed both in the morning and in the afternoon under varying weather conditions, in accordance with the CEC's Guidelines (2007).

2.2.2.2. Results

Resident species observed on site include black-throated sparrow (*Amphispiza bilineata*), rock wren (*Salpinctes obsoletus*), house finch (*Carpodacus mexicanus*), loggerhead shrike (*Lanius ludovicianus*), cactus wren (*Campylorhynchus brunneicapillus*), Costa's hummingbird (*Calypte costae*), verdin (*Auriparus flaviceps*), common raven (*Corvus corax*), and red-tailed hawk. Wintering species observed include white-crowned sparrow (*Zonotrichia leucophrys*), Brewer's sparrow (*Spizella breweri*), yellow-rumped warbler (*Dendroica coronata*), sage sparrow (*Amphispiza belli*), sage thrasher (*Oreoscoptes montanus*), and blue-gray gnatcatcher (*Polioptila caerulea*). Fall migratory species include various swallow species (of the genus *Tachycineta, Hirundo,* and *Petrochelidon*), black-throated gray warbler (*Dendroica nigrescens*), and chipping sparrow (*Spizella passerina*). Spring migratory species include various warblers (of the genus *Dendroica* and *Vermivora*), swallows, hooded oriole (*Icterus cucullatus*), western kingbird (*Tyrannus verticalis*), Swainson's hawk, and lazuli bunting (*Passerina amoena*).

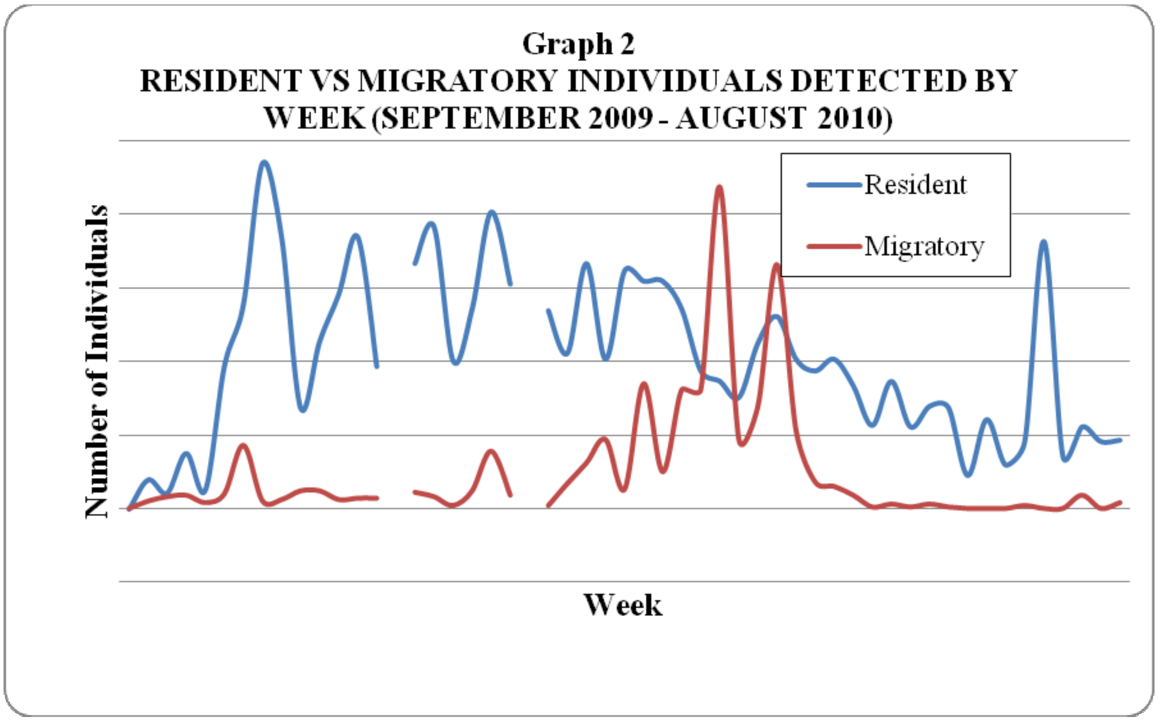
Forty-seven of the 77 species detected during Point Counts are considered migratory. Thirty-eight of the migratory species passed through the site, while nine of the species migrated to the site. Species that migrated to the site either arrived in the fall and wintered at the site, or arrived in the spring and summered at the site. Approximately one-third of the species that migrated through the site were warblers and swallows. The remaining two-thirds consisted of an assortment of species that included lazuli bunting, western tanager (*Piranga ludoviciana*), Pacific-slope flycatcher (*Empidonax difficilis*), black-headed grosbeak (*Pheucticus melanocephalus*), and warbling vireo (*Vireo gilvus*). Raptors accounted for nine of the 77 species observed.

Seventy-seven species were recorded over the 52-week survey period. The number of species detected during Point Counts varied weekly (Graph 1). Species richness substantially increased between March and May of 2010, corresponding to the peak in spring migration. Species richness was lowest (less than 10 species per week) during weeks 1, 2, 44, 46, 47, and 49-51, which corresponded with very hot daytime temperatures occurring during times of the year when migratory activity was either low or absent. Conversely, species richness was highest (25 or more species per week) during weeks 6 and 30-35, which were weeks when migratory species composed approximately 50% of the species recorded. The two peaks in species richness shown in Graph 1 (i.e., weeks 6-8 and weeks 30-35) correspond with the fall 2009 and spring 2010 migratory periods.



A total of 6,387 individual observations were recorded over the 52-week survey period. Of the 6,387 individual observations 5,169 were considered resident species and 1,218 were considered migratory species. House finches, black-throated sparrows, and horned larks were the most abundant species observed during the study. Combined, they make up 51% of total individual observations.

Migratory species occurred in low numbers throughout the survey period, with the exception of several weeks in April (Graph 2). During the first seven weeks, swallows were the most abundant species migrating through the site. During Week 6, there was a peak in species migrating through the site, a majority of which were Vaux's swifts (*Chaetura vauxi*). Beginning in March, spring migratory species were observed on site. The number of migratory individuals peaked during the first week in April (Week 31), which was the result of numerous observations of western kingbirds and Bullock's orioles (*Icterus bullockii*). In addition, low numbers of northern rough-winged swallows (*Stelgidopteryx serripennis*), warblers, and other migratory species were observed. A high number of migratory individuals were also detected during the end of April (Week 34). During this week, Brewer's sparrows, northern rough-winged swallows, and Vaux's swifts accounted for the majority of the species observations. Observations of migratory species were minimal after April.



Raptors were observed throughout the survey period. A total of 227 raptor observations (3.6% of the total species) were detected during the survey period. Raptor observations varied weekly from a low of zero in Weeks 46, 47, 49 and 51 to a high of 21 in Week 33. The most frequently observed raptors were red-tailed hawk and turkey vulture. The greatest number of raptor observations occurred in the spring (Weeks 28, 32-34, and 36-37). The American kestrel, Cooper's hawk, northern harrier (*Circus cyaneus*), prairie falcon, ferruginous hawk, Swainson's hawk, golden eagle (*Aquila chrysaetos*), and unidentified raptors made up the remaining 41 observations. HELIX conducted a Raptor Migration Study (HELIX 2010a), which is discussed in Section 2.2.1.

2.2.2.3 Conclusions

The OWEF site does not support a large population of resident species. Many of the resident species observations, including raptor observations, were likely repeat observations of the same individual. The site does not appear to be part of a major migration corridor for sensitive and non-sensitive species. Sensitive species observed were Swainson's hawk (ST), ferruginous hawk (CA watch list species), northern harrier (State Species of Special Concern; SSC), loggerhead shrike (SSC), yellow warbler (*Dendroica petechia*; SSC), Vaux's swift (SSC nesting), and Le Conte's thrasher (*Toxostoma lecontei*; SSC). All sensitive species were observed in low numbers during APC's, except Loggerhead Shrike which is a resident bird of the region.

A total of 77 species and 6,387 individual observations were documented during the yearlong Point Count study. All bird use across the yearlong Point Counts study was 6.1 birds per 30-minute survey. Species abundance was variable throughout the year, with the biggest fluctuation occurring between seasons. The weekly surveys began in fall, which had one of the lower seasonal abundance (5.4 individuals per 30-minute period). The lower abundance corresponded with very high daytime temperatures in September and early October. Species abundance was comparatively greater in the winter and spring compared to the fall. Migratory species were responsible for the increase in observations in spring. Hot temperatures and the absence of migratory species accounted for low abundance in summer.

Raptor observations account for 3.6% of birds recorded during the survey period. The highest number of raptor observations occurred in the spring, which likely correlated to an increase in prey availability. The majority of these sightings were common desert species, including red-tailed hawk, turkey vulture, American kestrel, and prairie falcon. Other raptor observations included a single individual of each of the three species (ferruginous hawk, Cooper's hawk, and northern Harrier), and three separate observations of a single Swainson's hawk flying over the site in spring.

Mean raptor use (number of raptors per hour) from avian Point Count study was determined to be 0.43/hr (including turkey vultures). Mean raptor use (number of raptors per hour) from raptor migration count surveys was determined to be 0.75/hr (including turkey vultures). Combining all surveys to date, mean raptor use (number of raptors per hour) was determined to be 0.70/hr (including turkey vultures).

Migratory species account for 19% of total observations over the yearlong study. Approximately 68% of individuals that were considered migrants occurred during the peak of spring migration (March-April). It is also notable that migratory species abundance surpassed that of resident species twice within this period. This is in contrast to fall migration, where resident species outnumbered migratory species 10:1. The amount of food resources available to migrants in spring is much greater than in winter, which is likely the primary factor responsible for the disproportionate numbers associated with migratory species richness and abundance.

2.2.3 Eagle Nest Surveys

HELIX contracted with the Wildlife Research Institute (WRI) to conduct surveys of golden eagle (*Aquila chrysaetos*) nest sites in eagle territories that occur within 10 miles of the project site, in accordance with the guidance provided in the USFWS Inventory and Monitoring Protocols (USFWS 2010b). WRI conducted helicopter surveys in 4 known territories (referred to as Coyote Mountains West, Coyote Mountains East, Table Mountain, and Carrizo Gorge) in spring 2010. A handheld Global Positioning System (GPS) was used to record the helicopter flight path and the location of each nest site. Nest-specific information was documented by two eagle biologists in the helicopter, and each nest site was photographed. In addition to helicopter surveys, WRI conducted ground surveys of an additional suspected golden eagle territory (referred to as Mountain Springs) in spring 2010. Helicopter surveys were not allowed by USFWS in the Mountain Springs area because of potential disturbance to Peninsular bighorn sheep (*Ovis canadensis nelsoni*). Results of the golden eagle nest surveys were provided in a survey report (WRI 2011). In addition to this ABPP, a separate Eagle Conservation Plan is being implemented for the OWEF project to address potential impacts to golden eagles.

2.2.4 Bat Surveys

<u>2.2.4.1 Methods</u>

The purpose of the bat surveys was to characterize what species are using the project area and the locations at which those species are observed. In addition, surveys aimed to characterize key areas of bat activity and determine which areas within the proposed wind turbine project area have a high impact risk for bats.

Initial surveys and site assessments were conducted in January 2010 to determine the best routes for active bat monitoring and to evaluate the availability of important bat resources (e.g., roost sites, standing water, and potential foraging areas). The surveys included assessments during the peak of all four seasons, which was dependant on prevailing weather conditions and expected periods of peak bat activity: winter (January/February), spring (May/June), summer (July/August), and fall (October/November).

A minimum of nine nights of active AnaBat surveys were conducted during each season to determine the presence of resident and migratory bat species. Biologists followed established trails and access roads within the project area in three distinct areas, maximizing coverage of the entire study area. Survey routes were stratified across the various vegetation communities and habitat features (e.g., rocky outcrops, cliffs, and desert washes) in order to maximize the detection of bats. The active bat surveys utilized AnaBat™ SDI Bat Detectors that download all recorded echolocation signals into a Compact Flash memory card and can be linked to a GPS unit. The GPS provides the location of the echolocation calls as they are recorded during an evening. A thermal imaging camera was used to estimate the number of bats present along the survey route (relative abundance) and document the behavior of the bats (commuting, foraging, drinking, etc.). The thermal camera was also used to estimate the height that the bats were flying above ground level and their direction of travel. Ambient environmental conditions were recorded each night, ensuring that data are collected only during those conditions that are optimal for bat activity. Finally, surveys along the areas adjacent to the project area attempted to locate and identify potential roost sites, resources (e.g., water or potential foraging areas), and bat activity areas adjacent to the project area to determine if any bat species were actively using these adjacent areas, and identify any path of emergence.

Long-term echolocation monitoring stations were installed on two met towers to assess the temporal variability of bats in the project area. These stations collected data autonomously from April 18 through November 31. These stations collected data passively by storing bat calls for later analysis. Two stations were installed on the East and West tower at approximately 50 m and 2 m above ground level. Long-term acoustic monitoring collected data on bat presence and activity, as well as seasonal changes in species composition. The data were analyzed using software filters to remove those calls that were the result of wind or insect background noise. Analysis was conducted for all calls recorded during the project period, identifying bat species when possible.

Surveys were conducted by trained and expert bat biologists. Regular staff included Dr. Matt Rahn and Ms. Kelcey Stricker. Dr. Rahn has over 17 years of experience as a bat biologist, extensive experience with habitat assessments, and has been working with the AnaBat system since 1995. Ms. Stricker has been working on bat projects as both a researcher and consultant since 2005. Biologists from HELIX also regularly supported the bat surveys.

2.2.4.2 Results

Ultimately, only five bat species were identified in the project area in 2010: California myotis (*Myotis californicus*), big brown bat (*Eptesicus fuscus*), Mexican free-tailed bat (*Tadarida brasiliensis*), western pipistrelle (*Parastrellus hesperus*), and western mastiff bat. The majority of the bats (approximately 77%) were recorded during the spring (103 calls; May-June) and summer (56 calls; August-September). Bat activity was lower during the winter or fall survey periods (winter = 15 calls; fall = 31 calls). Bat activity was recorded at only seven distinct locations within the project area and from two tower locations within the project area (Figure 2). The remainder of the project area showed no bat activity, either through the echolocation recording or use of the thermal imaging camera.

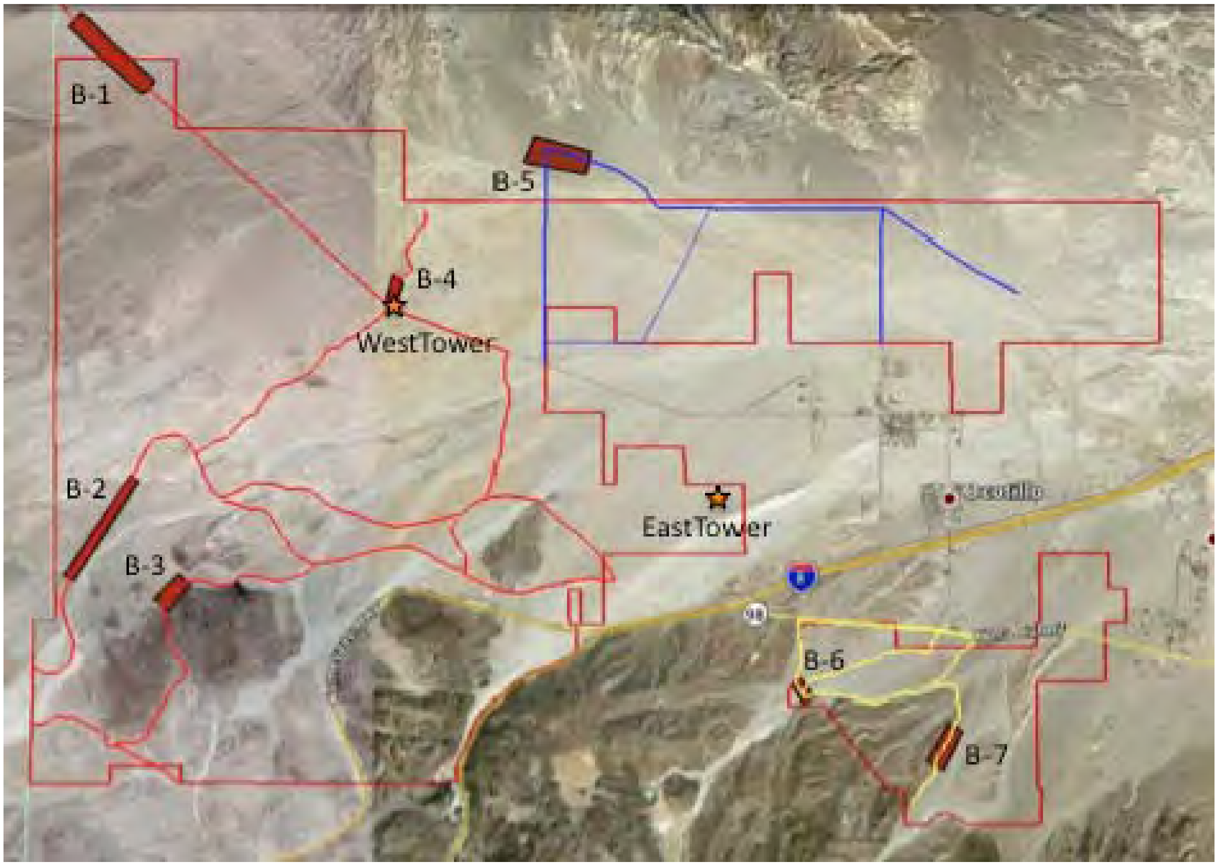


Figure 2. Bat Survey Routes. Long-term AnaBat stations were located on the two towers indicated on the map (designated East and West). Polygons represent areas where bat activity was observed or recorded during surveys (B-1 through B-7).

Most bat activity was located along the western edge of the project area. Other locations identified during the surveys recorded bats only along the perimeter of the area. The thermal imaging camera was used to identify the total number of bats flying when an echolocation signal was recorded. Over 95% of the time, the calls recorded represented only a single individual flying in the vicinity. Bats were infrequently observed in the interior of the site during the survey, and only from a distance using the thermal imaging camera.

The majority of the bats recorded during the driving/walking surveys were found at sites B-1 and B-2 (26% and 28%, respectively). Both B-4 and B-7 had roughly 12% of the bats recorded, with the remaining sites each having less than 10% of the remaining calls recorded (B-3 = 7%; B-5 = 5%; B-6 = 9%). The most abundant species recorded were the big brown bat (43%), the California myotis (26%), and the western pipistrelle (17%). The greater western mastiff bat and the Mexican free-tailed bat were rarely recorded within the project area (6% and 9%, respectively). Table 6 provides a summary of all bat data collected from both active and passive surveys in 2010.

Table 6. Bat species recorded at each survey location during each survey season in 2010.

Location	California Myotis	Big Brown Bat	Mexican Free-tailed Bat	Western Pipistrelle	Western Mastiff Bat	Unknown
Winter						
B-1	1	3				
B-2	1	4				1
B-3						
B-4						
B-5						
B-6						
B-7						
Spring						
B-1	1	1		1		2
B-2		1		1	1	2
B-3		1				
B-4						
B-5						
B-6						
B-7						
East Tower - 50m						
East Tower - 2m	6	11		7		
West Tower - 50m					3	
West Tower - 2m	23	16		19	7	
Summer						
B-1	1	2			1	
B-2	2					2
B-3	1					
B-4	1	2	1	1		2
B-5			1			
B-6	1	1		1		1
B-7			2		1	
East Tower - 50m		1		1		
East Tower - 2m		3		1		1
West Tower - 50m	2	1	2		2*	
West Tower - 2m	6	5	2	4	2*	3

Table 6. Bat species recorded at each survey location during each survey season in 2010.

Location	California Myotis	Big Brown Bat	Mexican Free-tailed Bat	Western Pipistrelle	Western Mastiff Bat	Unknown
Fall						
B-1		1		1		
B-2	1					
B-3		1		1		
B-4						
B-5	2					
B-6		1				
B-7		2		2		
East Tower - 50m**		1		1		1
East Tower - 2m		2		2		
West Tower - 50m	1	2		1	1	2
West Tower - 2m	1	2		1		1
Abundance/% (Transects)	**12/25.5%**	**20/42.5 %**	**4/8.5%**	**8/17.1%**	**3/6.4%**	**10/NA**
Calls Recorded (Tower)	**39**	**44**	**4**	**37**	**13**	**8**
TOTAL	**51**	**64**	**8**	**45**	**14**	**18**

*Calls were from the same individual at the same time in both upper and lower microphones;
**Strong winds broke the upper mounting bracket in late September.

2.2.4.3 Conclusions

Bat use of the project area was remarkably low. Over 70% of the surveys conducted failed to record a single bat during the night. Bat activity was generally restricted to the perimeter of the project boundary, with infrequent observations of bats. Bats observed during the surveys were commuting through the area (22%), actively foraging (60%), or were both foraging and commuting (18%). Surveys of adjacent land did not identify areas of suitable roosting habitat nor were there any significant opportunities for tree roosting nearby or within the town of Ocotillo. There was a general lack of cave formations, suitable cliff faces, and boulders.

The results of the long-term echolocation monitoring stations suggest that most of the bats in the project area were flying at lower heights. This is likely true for all species except the greater western mastiff bat, which typically flies at higher elevations than many species, particularly when commuting through an area. Observations with the thermal imaging camera showed similar results. Across all species observed, bats were typically seen at elevations between one and 25 m above ground level (below the RSA of the turbines proposed for the OWEF). Again, the only exception was the greater western mastiff bat, which was typically observed above 25 m.

No significant pattern in the distribution or flight behavior of the bats was observed. It is unlikely that significant numbers of bats occur throughout the project area. All observations and survey results suggest that the majority of the bat population in the local area occurs outside of the Ocotillo Valley area. No significant resources for foraging or water exist, severely limiting the bat abundance and diversity, particularly when compared with adjacent mountain ranges to the west and the Imperial Valley to the east.

2.2.5 Burrowing Owl Surveys

2.2.5.1 Methods

The CDFG requested HELIX to follow The California Burrowing Owl Consortium (CBOC) Guidelines (CBOC 1997) for burrowing owl habitat surveys within the OWEF study area. The CBOC Guidelines include three phases: (1) habitat assessment, (2) focused burrow search, and (3) surveys for owls during the breeding season. HELIX conducted a burrowing owl habitat assessment, a burrow survey, and focused owl surveys in accordance with the CBOC Guidelines and with OWEF's survey protocols that HELIX prepared and the BLM approved. The purpose of the surveys was to determine presence/absence of burrowing owls on site.

HELIX conducted a (Phase I) habitat assessment within the proposed project footprint in January 2010. HELIX biologists evaluated the project site to determine if it contained areas that met the basic requirements of owl habitat, which include open expanses of sparsely vegetated areas (less than 30% canopy cover for trees and shrubs), gently rolling or level terrain, small mammal burrows (especially those of antelope ground squirrel [*Ammospermophilus leucurus*]), and/or fence posts, rock, or other low perching locations. Suitable owl habitat was found to be present throughout the study area. As such, additional surveys were required.

HELIX conducted a winter resident burrowing owl survey from January 16 through 29. The CBOC and CDFG define the wintering survey period as December 1 to January 31 (CBOC 1997; CDFG 1995). The winter resident owl survey was conducted to gather data on burrowing owl use of the study area during the non-breeding season. The winter resident burrowing owl surveys were conducted in areas with the highest potential for burrowing owl use (i.e., low hilly regions, deep canyon washes with numerous rodent colony holes, and along both sides of the railroad tracks that cross through the study area). Biologists walked slowly and methodically through each of the survey areas to search for burrowing owls and to evaluate and map potential owl burrows, including those that showed signs of recent owl occupation.

HELIX conducted a (Phase II) focused burrow search in spring 2010 within the project footprint (i.e., proposed project features plus a 150-meter [500-foot] buffer from proposed project features). The focused burrow search was conducted concurrently with the spring rare plant survey in March and April 2010. Biologists walked transects within the survey area to allow for 100% coverage. All potential burrows, burrowing owl sign, or burrowing owls were recorded with a handheld GPS unit. Burrowing owl sign included pellets/casting (e.g., regurgitated fur, bones, and insect parts), white wash (excrement), and feathers.

HELIX conducted a (Phase III) focused burrowing owl survey between June 14 and July 8, 2010 for each of the potential burrow locations mapped during Phase II burrow search. The breeding season is defined by CDFG (1995) and CBOC (1997) as the period between April 15 and July 15. Surveys consisted of four site visits, each on a separate day, conducted approximately one week apart. Surveys took place from two hours before sunset to one hour after sunset or from one hour before sunrise to two hours after sunrise in accordance with the CBOC Guidelines. Biologists took care to not disturb potentially nesting burrowing owls and used a combination of techniques to determine occupancy and nesting status, including observing the locations from a distance using binoculars and spotting scopes and carefully walking through the habitat.

In addition, HELIX also conducted follow-up breeding season surveys between July 26 and August 3. The purpose of the follow-up breeding season surveys was to search for burrowing owls and owl burrows in areas of the project site that were not extensively surveyed during other surveys conducted by HELIX in spring and summer 2010 (i.e., rare plant surveys, flat tailed horned lizard (FTHL; *Phrynosoma mcallii*) survey, or Point Counts/migration surveys). Burrowing owls also were mapped opportunistically during other surveys, including during the fall 2010 special status plant surveys.

<u>2.2.5.2 Results</u>

The results of the Phase I, II, and III surveys were provided in a survey report (HELIX 2010c). Three burrowing owls and one active burrow were documented during the January 2010 winter resident burrowing owl survey. The three owls were in the north-central and western portions of Site 1 of the study area; the active burrow was in Site 2 of the study area. No burrowing owls were observed during the Phase II burrow search in March/April 2010. Two burrowing owl pairs with active burrows were documented during the Phase III focused survey in June/July 2010 in two of the same locations in Site 1 as in January. The active owl burrow observed in January in Site 2 was re-evaluated during the Phase III owl surveys and was determined to be inactive during the 2010 breeding season. Burrowing owls were repeatedly observed near the westernmost active burrow in Site 1 during the summer survey conducted at the end of July and early August. It is assumed that these repeat observations near the westernmost burrow were the owls associated with the active burrow. In addition, 20 burrowing owls were documented throughout the study area during the fall 2010 special status plant surveys.

2.2.5.3 Conclusions

The burrowing owl is a year-long resident of open, dry grassland and desert habitats. It is also found as a resident in grass, forb, and open shrub stages of pinyon-juniper and ponderosa pine habitats as well as agricultural lands. This small owl is found along the length of the State of California in appropriate habitats. The burrowing owl is migratory over much of its range, even in southern California (Unitt 2004). Burrowing owl observations on the proposed project site during the non‐breeding season is likely a combination of owls that use the Imperial Valley for breeding and owls that migrate through and/or overwinter in the project site from their breeding grounds in Canada and the northern United States.

Burrowing owls were not observed migrating through the site during the 2009 or 2010 migration counts. The increased number of burrowing owls observed on the proposed OWEF site in fall is likely due in part to migrating owls from the northern United States other areas of Imperial County.

2.2.6 Merlin Radar System

2.2.6.1 Methods

A MERLIN Avian Radar System was deployed at the OWEF site by DeTect on September 15, 2010 (DeTect 2011). The radar unit deployed contained both an X-band frequency vertical scanning radar (VSR) sensor and an S-band frequency horizontal surveillance radar (HSR) sensor. The initial radar system was upgraded to reduce ground clutter due to high water content in the dominant shrubs and cacti present within the site. For the study, the HSR settings were optimized for detecting bighorn sheep and the VSR was optimized for detecting birds. The VSR data is used to determine target altitudes, and was the primary dataset used to determine target passage rates through the rotor swept zones for mortality risk assessments. The HSR data is only used to determine directional movement of targets over or through the OWEF site, and does not provide data on target counts or passage rates.

The radar unit was located in open, desert habitat for which turbine locations are proposed. The data range settings for the radar were selected to allow optimal detection of bird-sized targets (for the VSR) as well as sheep sized targets (for the HSR). The MERLIN system collected radar data continuously (24 hours a day, 7 days a week), with the exception of limited periods of system maintenance and upgrade, service downtime, and periods of moderate to heavy precipitation.

The data was displayed in real-time (at the radar unit and remotely via the internet) and all data on targets, tracks, and system parameters were stored on internal databases. The databases were queried and used to develop statistical data from the target movements recorded within the OWEF site. DeTect biologists conducted the initial setups for both systems, after which each system was remotely monitored via the data uplink/internet connections for the remaining data collection periods. The data was run through the MERLIN Avian Radar processing software to identify and track bird targets within the OWEF site and to suppress noise. Although the criteria for identifying bird targets has been developed to only track targets that are most likely birds, occasional targets such as insects or clutter will be falsely identified and tracked as bird targets. Optimization of the operational settings in the software and application of custom database queries minimized the inclusion of non-bird targets. During review of the dataset, likely insect activity was noted in trackplot images, frequently occurring alongside bird activity. In order to preserve the bird activity in the dataset, some insect activity was not filtered out and is likely included in the data results. Time periods in which insect activity was noted by reviewers were identified and reported. Due to the inability to identify individual birds from radar echos, the radar data does not necessarily reflect a count of individuals, but rather an index of bird activity or exposure level for a given period of time.

The average altitude of each target AGL was generated and used to derive mean and median target heights, as well as to group targets into one of three categories: below rotor swept zone, in rotor swept zone, or above rotor swept zone to a maximum height of ~2,800 AGL. Some migrating birds fly even higher than this altitude, but these were not detected in this radar study. The turbine dimensions used for the altitude analyses included a rotor swept zone ranging from 29.9 to 133.8 m AGL.

The VSR data queries were standardized to a 1-km front per hour, generally the industry standard for most migratory and wind energy avian studies and risk analysis. For this report, target passage rates are further defined as the number of targets detected within 0.5 km to either side of the radar and up to ~ 2,8000 m AGL, for a total frontal width of 1 km, during a one hour period. Passage rates were standardized using the number of minutes with radar data within a given time period (minus any time with rain) and collated for each dawn (30 minutes before sunrise to 30 minutes after sunrise), day (30 minutes after sunrise to 30 minutes before sunset), dusk (30 minutes before sunset to 30 minutes after sunset), and night (30 minutes after sunset to 30 minutes before sunrise the next day) as well as the entire season. The average target passage rates (below, within, and above the rotor swept zone, as well as total), and mean and median target heights, were calculated for dawns, days, dusks, and nights as well as hourly during this survey (DeTect 2011).

<u>2.2.6.2 Results</u>

The MERLIN Avian Radar System operated continuously (24 hours a day) during the fall 2010 season, (September 15 – November 30, 2010), the winter season of 2010-2011 (December 1, 2010 – February 28, 2011), the spring season of 2011 (March 1 – May 31, 2011), and the summer season of 2011 (June 1 – July 9, 2011). A total of 7,151.2 hours were available during the study and 6,347.1 hours (88.8%) of VSR data were collected and 6,601.1 hours (92.3%) of HSR data were collected (DeTect 2011).

Weather can make some of this radar data unusable because precipitation can block the radar wavelength so few if any targets are discernable. This is more prevalent among X-band radars than S-band because the longer wavelength of the S-band radar allows almost all targets to be detected in rain with the help of digital processing.

Therefore, of the 6,347.1 hours of vertical radar data, 477.5 hours were removed because rain prevented the collection of radar data. This left 5,869.6 hours of useable vertical radar data (92.5% of radar time, 82.1% of the study period). A total of 168.8 hours of horizontal radar data were removed because of rain, leaving 6,432.3 hours of useable horizontal radar data (97.4% of radar time, 90.0% of the study period).

Vertical Radar Data (VSR)
Data collected from the vertical scanning radar (VSR) was used to quantify target movements through the project area. Data is presented as total number of targets / 1-km front / hr. This rate is also used when quantifying targets above (up to ~2,800 m AGL), below, and at the height of the rotor swept zone (DeTect 2011).

Target passage rates during the study period were variable throughout the study and among the four biological periods (days, nights, dawns, and dusks). During the fall of 2010, target passage rates averaged the greatest during days, followed by nights, dawns, and then dusks. During the winter season of 2010-2011, target passage rates averaged the greatest during days, followed by nights, dusks, and then dawns. Target passage rates during spring and summer seasons in 2011 season averaged the greatest during days and nights, and the least during dawns and dusks.

Average target passage rates differed hourly throughout the study with a consistent trend that passage rates were greatest during midday hours and another peak in the evening during all seasons except winter. During the fall of 2010, passage rates were greatest midday (hours 10-12, 10am-noon) with another peak around hour 18 (6pm). During the winter 2010-2011 season, passage rates were greatest midday (hours 11-13, 11am-1pm). Passage rates during the spring 2011 season were greatest midday (hours 10-12, 10am-noon) followed by a secondary peak during evening (hours 19-22). During the summer 2011 season passage rates were greatest midday (hours 9-12, 9am-noon) with a secondary peak in the evening (hours 19 and 20). Throughout the study period, target passage rates were greatest above the rotor swept zone compared to within and below the rotor swept zone (DeTect 2011).

Average hourly target heights varied throughout the study ranging from 232.5 m during hour 9 of the winter season to 474.4 during hour 5 of the summer season. Mean target heights detected during the study period were generally above the maximum RSA height of 133.8 m AGL.

Median target heights were consistently lower than means but were still generally above the RSA (DeTect 2011).

Targets were detected up to 2,800 m AGL by the vertical radar throughout the study period. The distribution of targets in 50-meter increments was greatest above the rotor swept zone throughout the study period although targets also occurred within the rotor swept zone during all seasons. When all targets detected within a season were combined together, the majority of targets were consistently recorded above the RSA and the least below the RSA throughout the study period.

Within the RSA, percents of targets recorded during the fall of 2010 were the greatest during days (16.3%) followed by dusks (12.9%), dawns (12.7%) and finally nights (9.4%). Within the RSA, percents of targets recorded during the winter 2010-2011 were the greatest during dawns (36.6%) followed by days (30.4%), nights (17.2%) and finally days (16.4%). Within the RSA, percents of targets recorded during the spring were the greatest during dusks (16.2%) followed by dawns (12.2%), days (10.5%) and finally nights (9.7%). Within the RSA, percents of targets recorded during the summer were the greatest during dusks (19.6%) followed by days (9.8%), nights (6.8%) and finally dawns (6.5%).

Average target passage rates above, within, and below the RSA were the greatest above the RSA during all time periods. When percent targets in the RSA were calculated for each date, dawns averaged the greatest, followed by dusks, days and nights had the lowest average percent of targets in the RSA during both the fall season of 2010 and the winter season of 2010-2011. During the spring and summer seasons of 2011, when percent targets in the RSA were calculated for each date, dusks averaged the greatest, followed by dawns, days and nights had the lowest average percent of targets in the RSA (DeTect 2011).

Horizontal Radar Data (HSR)

The Horizontal Surveillance Radar (HSR) was used to determine directional movements of targets during dawns, days, dusks, and nights throughout all seasons during the study. The average flight direction varied by season as well as biological time period (day, dusks, nights, and dawns; DeTect 2011).

The average flight direction of all targets during the fall 2010 season was 111° (east), and averaged 75° (east) during dawns, 249° (west) during days, 257° (west) during dusks, and 112° (east) during nights. Prominent target movements varied by biological period; dawns had east and northeast movements, dusks had westerly movements, nights had east and southeast movements, and days were fairly dispersed. Target directions were only moderately concentrated, with dawns averaging the greatest angular concentration (average r = 0.51) and days the least (average r = 0.17: DeTect 2011).

The average flight direction of all targets during the winter 2010-11 season was 317° (northwest), and averaged 77° (east) during dawns, 313° (northwest) during days, 279° (west) during dusks, and 314° (northwest) during nights. Target movements were predominantly southwest and west during dawns, southwest and south during days and nights, and east during dusks. Target directions were moderately concentrated, with dusks averaging the greatest angular concentration (average r = 0.50) and day the least (average r = 0.18; DeTect 2011).

The average flight direction of all targets during the spring 2011 season was 201° (south), and averaged 201° (south) during dawns, 198° (south) during days, 188° (south) during dusks, and 205° (southwest) during nights. Target movements were predominantly south and southwest during all time periods. Target directions were moderately concentrated, with dawns averaging the greatest angular concentration (average r = 0.46) and day the least (average r = 0.11; DeTect 2011).

The average flight direction of all targets during the summer 2011 season was 58° (northeast), and averaged 46° (northeast) during dawns, 49° (northeast) during days, 58° (northeast) during dusks, and 136° (southeast) during nights. Target movements were quite varied during the summer 2011 season lacked any prominent directions or concentration of direction. Target directions were poorly concentrated, with dawns averaging the greatest angular concentration (average r = 0.21) and days the least (average r = 0.06: DeTect 2011).

2.2.6.3 Conclusions

Target passage rates varied considerably throughout each season, but also by biological period. Average target passage rates were greatest during the fall 2010 season and lowest during the summer 2011 season. Day time target passage rates averaged the greatest, and were much greater than the other three biological periods during the fall and winter seasons. During the spring and summer seasons, night time target passage rates were similar to day time target passage rates, but dawn and dusk rates stayed relatively low.

Hourly target passages rates support the greater target passage rates observed during days. Daytime target passage rates typically peaked between 10am and 1pm all season. The spring and summer seasons also had secondary target activity peaks during early night, between hours 19 and 22.

Before target passage rates can be compared with those from other proposed wind energy sites, it is important to recognize the variation in radar systems and methods among studies and the possible affects these differences may have on target counts and the related target passage rates. Although some radar study results such as average target directions and temporal magnitudes of nocturnal migration are fairly robust and resistant to differences in radar systems and methods, numerical target counts and related target passage rates are more influenced by these differences. Therefore, great care much be taken when comparing these types of numbers, and a full understanding of both the radar systems and methods used to derive these numbers are needed before making comparisons.

Due to the difficulty of comparing target passage rates from other radar systems, it is preferable to compare target passage rates at the proposed OWEF site to other studies using DeTect avian radar systems. Comparisons can be made between both the Gulf Wind I windfarm on the southeast coast of Texas, and from the proposed Ripley-Westfield Wind Farm in western New York. Although is it difficult to determine the degree that region and local topography or habitat may have influenced these target passage rates, they do provide target passage rates calculated the same way using data from the same DeTect vertical radars.

The nightly target passage rates observed at the proposed OWEF site during all seasons of year 1 were less than those observed at the other two sites. Daytime target passage rates at the proposed Ocotillo Wind Project site were similar to those from the proposed Ripley-Westfield Wind Farm site, but much lower than Gulf Wind I Wind Farm site, during similar seasons. Dawn and dusk target passage rates were not calculated at the proposed Ripley-Westfield Wind Farm, but the target passage rates calculated at Gulf Wind I during these time periods were greater than at the proposed OWEF site during each respective season.

When targets were combined by season at the proposed OWEF site, the majority passed above the RSA during year 1. At least 80% of targets passed above the RSA during all time periods of each season except for dawns and dusks of winter and dusks of summer, which averaged lower percentages. Mean and median target heights were typically above the RSA, although means, and especially median target heights which averaged lower, occurred more frequently below 133.8 m starting in November 2010 and tapering off during spring 2011.

Target movement patterns also varied by season and by biological period. The fall 2010 season showed most targets moving southeast and east, likely indicative of fall nocturnal migration. Days and dusks during fall were relatively dispersed, but dawns showed an east / northeast movement trend. The winter 2010-11 season had relatively lower targets than the other seasons, both in number and altitude, and had variable movement patterns (east / northeast during dawns, northwest during days, west during dusks, and northwest during nights). During the spring 2011 season, a northerly target movement was expected because of spring nocturnal migration (at least during nights) however, this was not the case as all time periods showed southerly movements. The summer 2011 season had target movements that were relatively dispersed, and lacked a prominent target movement pattern during any of the four time periods.

It is worth noting that the radar settings for the horizontal radar (from which target directional information is derived) were optimized for tracking bighorn sheep during year 1 of this study. Although still capable of also tracking bird targets well, the sheep-optimized settings on the horizontal radar likely captured somewhat different targets and target information than radar settings that are optimized specifically for small birds. It is also important to note that the sheep-optimized horizontal radar settings would have only affected target direction information, and not target counts or passage rates which are derived only from the vertical radar data. The vertical radar was NOT optimized for tracking sheep, but was rather fully configured for detecting and tracking bird activity. Thus, target counts and passage rates from the radar study were not affected by the study efforts to track bighorn sheep with the horizontal radar.

3.0 ASSESSMENT OF RISK TO BIRDS AND BATS

3.1 Direct Impacts to Birds and Bats

3.1.1 Raptors

3.1.1.1 All Raptors

Three approaches are used to describe and estimate risk to all raptors: 1) a comparison of annual use relative to other facilities in the US, 2) an estimate of fatality rates based on other publicly available studies for which both raptor use and raptor fatality rates are available, and 3) an estimate of risk based on fatality rates estimated for other California wind energy facilities.

Combined mean diurnal raptor use (number of raptor observations from both the Avian Point Count Surveys and Raptor Migration Counts divided by the total observation hours standardized to 20-minutes; excluding turkey vulture) at the OWEF was compared with 44 other wind energy facilities that implemented similar protocols and had data for three or four seasons. The annual mean raptor use at these wind energy facilities ranged from 0.06 to 2.34 raptors/plot/20-min survey (Figure 3). Mean diurnal raptor use at the OWEF excluding turkey vulture (adjusted for 20-min surveys; 0.14 raptors/plot/20-min survey) is considered to be low, ranking 41 compared to the 44 other wind energy facilities (Figure 3).

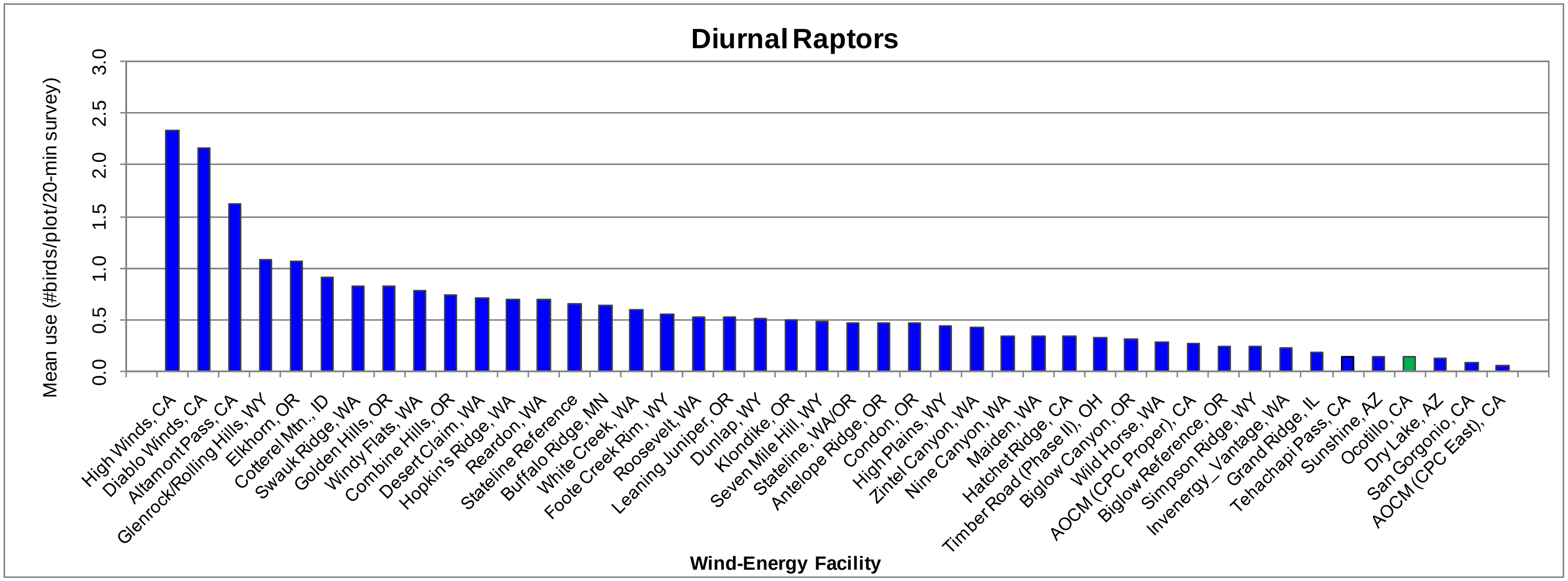


Figure 3. Comparison of annual raptor use between the Ocotillo Wind Energy Facility and other US wind energy facilities.

Data from the following sources:

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

The mean and range of mortality rates for sites considered to have low raptor use is 0.06 raptors/megawatt/year (0 – 0.11 raptors/MW/year; Table 7). Based on raptor use (excluding turkey vulture) at the project (approximately 0.14/20-min survey), the estimated raptor mortality rate might be expected to be within the range of fatality rates observed at existing facilities where low raptor use has been recorded. Based on the relative abundance of red-tailed hawks throughout the year and the flight height information recorded for red-tailed hawks, there is higher potential for red-tailed hawk fatalities compared to other species.

Table 7. Raptor use estimations and estimated raptor mortality for sites considered to have low use estimates (< 0.50 birds per plot per 20-minute survey).

Study and Location	Raptor Use (birds/plot /20-min survey)	Raptor Fatality Rate (fatalities/MW/yr)
Klondike II, OR	0.50	0.11
Stateline, WA/OR	0.48	0.09
Wild Horse, WA	0.29	0.09
Wessington Springs, SD	0.23	0.06
Zintel, WA	0.43	0.05
Klondike, OR	0.50	< 0.01
Grand Ridge, IL	0.20	0

Data From the following sources:

Study and Location	Use Estimate	Fatality Estimate
Klondike II, OR	Johnson 2004	NWC and WEST 2007
Stateline, WA/OR	Erickson et al. 2004	Erickson et al. 2002b
Wild Horse, WA	Erickson et al. 2003a	Erickson et al. 2008
Wessington Springs, SD	Derby et al. 2008	Derby et al. 2010a
Zintel, WA	Erickson et al. 2002a	Erickson et al. 2002b
Klondike, OR	Johnson et al. 2002	Johnson et al. 2003b
Grand Ridge, IL	Derby et al. 2009	Derby et al. 2010b

Estimated raptor fatality rates were available for six wind energy facilities in California. Raptor fatality estimates in California ranged from 0.87 raptor fatalities/MW/study period at the Diablo Winds facility to zero raptor fatalities/MW/study period at the Dillon wind energy facility (Table 8). Raptor use at the higher mortality sites was upwards of an order of magnitude higher than at Ocotillo.

Table 8. All bird, raptor, and bat fatality rates at other wind energy facilities in California.

Project	Bird fatality/ MW/study period	Raptor Use Estimate (raptors/plot/ 20-min survey)	Raptor fatality/ MW/study period	Bat fatality/ MW/study period	Habitat	Use Estimate Reference	Fatality Data Reference
Alite, CA	0.55	NA	0.12	0.24	desert scrub		Chatfield et al, 2010
Buena Vista, CA	NA	NA	0.44	NA	grassland		Insignia 2009
Diablo	4.29	2.16	0.87	NA	grassland	WEST 2006	WEST 2006, 2008
Dillon	4.71	NA	0	2.17	desert		Chatfield et al. 2009
High Winds 2004	1.62	2.34	NA	2.51	agriculture/grassland	Kerlinger et. al. 2005	Kerlinger 2006
High Winds 2005	1.1	2.34	NA	1.52	agriculture/grassland	Kerlinger et. al. 2005	Kerlinger 2006
Pine Tree, CA	8.33	NA	0.133	0	grassland/scrubland		BRC 2010
SMUD Solano	0.99	NA	0.53	0.07	agriculture/grassland		URS, Erickson et al. 2005

3.1.1.2. Specific Raptor Species

Collision risks to individual species were accessed as the likelihood that adverse impacts would occur to individuals or populations of species of concern as a result of wind energy development and operation, in accordance with Wind Turbine Guidelines Advisory Committee's (WTGAC's) recommendations to USFWS for wind projects in general (WTGAC 2010). A weight-of-evidence approach is often used to analyze risk because relatively few methods are available for direct estimation of risk (Anderson et al. 1999 as cited in WTGAC 2010). The WTGAC also indicates that "for most populations, risk cannot easily be reduced to a strict metric, especially in the absence of population viability models for most species. Consequently, estimating the quantitative risk to populations is usually beyond the scope of project studies due to the difficulties in evaluating these metrics, and therefore risk assessment will be qualitative" (WTGAC 2010). Use data for proposed wind sites is often compared to use data of other wind sites to evaluate collision risk. The collision risk analysis presented below incorporates the quantitative data collected during four seasons of raptor migration count studies and a full year of avian point count studies on the OWEF site. Avian use, observed flight heights, and species behaviors were incorporated into the qualitative collision risk assessment below. During analysis, the rotor swept area (i.e., the zone where the blades of the turbine would occur; RSA) was assumed to be between 100 feet to 450 feet above ground level.

Cooper's hawk does not commonly occur within the proposed OWEF site, and the 10 observations (nine during raptor migration counts and one during APC's) likely represent migratory birds passing through the proposed OWEF area. Cooper's hawk was recorded flying within the RSA 52% of the time observed flying during raptor migration observations (Table 9). Although foraging behavior was not observed, it is expected that the species could use the site for foraging during migration periods, which would put it at risk for collision. Wintering and resident Cooper's hawks are typically found in riparian habitats, which are lacking within the proposed OWEF site. Cooper's hawk use of the proposed OWEF site was low (0.003 observations/hour made over the four seasons of raptor migration counts); therefore, overall collision risk for this species is low.

Like the Cooper's hawk, sharp-shinned hawk does not commonly occur within the proposed OWEF site, and the five observations (all during raptor migration counts) likely represent migratory birds passing through the proposed OWEF site. Each observation was a single individual and sharp-shinned hawk was observed flying within the proposed RSA 63% of the time recorded flying based on raptor migration surveys (Table 9). Although foraging behavior was not observed, it is expected that the species could use the site for foraging during migration periods, which would put it at risk for collision. Both wintering and resident sharp-shinned hawk are typically associated with riparian habitats, which are lacking within the proposed OWEF site. Sharp-shinned hawk use of the proposed OWEF site was low (0.002 observations/hour made over the four seasons of raptor migration counts); therefore, overall collision risk for this species is low.

Ferruginous hawk is an infrequent migrant through the proposed OWEF site and is not a common winter resident. The five observations (four during raptor migration counts and one during APC's) likely represent migratory birds passing through the proposed OWEF site during fall/winter migration. Each observation was a single individual, and ferruginous hawks were observed flying within the proposed RSA 83% of the time recorded as flying during raptor migration surveys (based on four observations; Table 9). Although foraging behavior was not observed, it is expected that the species could use the site for foraging during migration periods, which would put it at risk for collision. Wintering ferruginous hawks are more commonly observed in the agricultural complexes east of the proposed OWEF site where rodent populations are typically higher. Ferruginous hawk use of the proposed OWEF site was low (0.002 observations/hour made over the four seasons of raptor counts); therefore, overall collision risk for this species is low.

A total of 74 Swainson's hawk observations were recorded (71 during raptor migration surveys and three during APC's. Of the 71 observations recorded during raptor migration surveys, Swainson's hawk was observed flying within the proposed RSA during 57% of the time (Table 9). Although foraging behavior was not observed, it is expected that the species could use the site for foraging during migration periods, which would put it at risk for collision. Collision risk for Swainson's hawk is considered low to moderate due to the species' use of the proposed OWEF site during the fall and spring (0.034 observations/hour made over the four seasons of raptor counts).

Northern harrier was not frequently observed on the OWEF site (a total of 13 observations were made over four seasons of raptor counts [12 observations] and during APC's [one observation]). During raptor migration surveys, northern harrier was recorded flying within the proposed RSA 11% of the time (Table 9). The species was observed foraging on site, which would put it at risk for collision. Northern harriers prey on a variety of species, specializing in small- to medium-sized mammals (Johnsgard 1990), which occur throughout the proposed OWEF site. Harriers typically hunt by flying at heights closer to the ground, although they will commonly fly at heights within the RSA. The species' use of the proposed OWEF site was low (0.004 observations/hour made over the four seasons of raptor counts); therefore, overall collision risk for this species is low.

Merlin does not commonly occur on the proposed OWEF site, and the three observations recorded during Raptor Migration Counts likely represent migratory birds passing through the proposed OWEF site. Each observation was a single individual, and merlins were recorded flying within the proposed RSA during 7% of the time (Table 9). Although foraging behavior was not observed, it is expected that the species could use the site for foraging during migration periods, which would put it at risk for collision. Wintering merlins are not common in southern California. Merlin use of the proposed OWEF site was low (0.001 observations/hour made over the four seasons of raptor counts); therefore, overall collision risk for this species is low.

Osprey was not frequently observed on the OWEF site (a total of nine observations were made over four seasons of raptor counts). Osprey were observed flying within the proposed RSA during 66% of the time (Table 9). This species does not commonly occur in the desert during migration and is not expected to use the proposed OWEF site for hunting due to the lack of water bodies within the proposed OWEF site. The species is commonly observed at the Salton Sea, which is located approximately 30 miles northeast of the proposed OWEF site. Osprey use of the proposed OWEF site is low (0.005 observations/hour made over the four seasons of raptor counts); therefore, the collision risk for this species is low.

The multiple observations (83 during raptor migration counts and nine during APC's) of prairie falcons on the proposed OWEF site suggest that this is a resident species of the Ocotillo area. Based on raptor migration surveys, prairie falcons were recorded as flying in the proposed RSA during 54% of the time (Table 9). The habitat in the southwest portion of the proposed OWEF site and adjacent areas to the north and west of the proposed OWEF site contain suitable nesting habitat for the species. A suspected prairie falcon nest location was noted in the I-8 Island (outside of the project ROW, just south of Site 1), but the location was never definitively documented. The prairie falcons that forage within the proposed OWEF site may be at greater risk of collision as compared to many of the other raptor species because their use of the site was greater (0.030 observations/hour made over the four seasons of raptor counts).

There were 94 observations of American kestrels during the four seasons of raptor counts and 10 observations were recorded during APC surveys suggesting American kestrels are resident species in the Ocotillo area. American kestrels are at a greater risk of collision compared to many raptors due to their use of the site and flight height information; although there were three raptor species (excluding turkey vulture) that had a higher number of exposure minutes within the RSA. They are commonly found as fatalities at existing wind energy facilities. Furthermore, their detection from visual observations is likely less than for larger raptor species, so their true use of the site may be higher than observed.

A single incidental observation of two peregrine falcons (*Falco peregrinus*) on the proposed OWEF site suggests that the species is a very rare visitor to the proposed OWEF site. No peregrine falcons were observed during raptor migration counts or APC surveys and the species is not expected to forage on site; therefore, the collision risk is low.

Excluding turkey vultures, red-tailed hawk was the most commonly observed raptor species and was also the raptor species with the highest number of exposure minutes within the RSA. The site specific baseline data suggest that red-tailed hawk would be the most likely collision risk at the OWEF.

In addition to the qualitative risk assessment provided above, a relative exposure index (minutes within the RSA) for each raptor species was calculated using the four seasons of raptor migration count data (fall 2009, spring 2010, fall 2010, and spring 2011). Table 9 also provides the percentage of time each species was observed flying in the proposed RSA out of the total time recorded as flying for each species. When evaluating relative species risk, it is important to assess relative abundance in addition to the duration within the RSA for a given species.

Table 9. Raptor flight height information and relative exposure based on Raptor Migration Counts at the Ocotillo Wind Energy Facility.

Species	# of Observations	Flight Height (ft above ground)	Cumulative duration of observations (minutes)	Relative Exposure Index (Duration within RSA[2] [minutes])	Percentage of Flight Time within RSA[3]
American kestrel	94	0 – 600	320	64	**0.20**
Cooper's hawk	9	0 - 1,000	21	11	**0.52**
ferruginous hawk	4	100 – 500	6	5	**0.83**
golden eagle	31*	0 – 4,000	384	165	**0.43**
merlin	3	10 – 100	14	1	**0.07**
northern harrier	12	0 – 1,000	53	6	**0.11**
osprey	10	5 – 1,500	32	21	**0.66**
prairie falcon	83	0 – 1,500	267	144	**0.54**
red-tailed hawk	712	0 – 7,500	3,764	1,729	**0.46**
sharp-shinned hawk	5	8 – 1,000	8	5	**0.63**
Swainson's hawk	71	0 – 2,500	512	293	**0.57**
turkey vulture	870	0 – 5,000	5,054	2,677	**0.53**
unidentified raptor	169	0 – 10,000	736	275	**0.37**

1Fall 2009, Spring 2010, Fall 2010 and Spring 2011 data
2Rotor Swept Area (100 ft to 450 ft above ground level)
3Percentage of flight time within RSA = (duration within RSA ÷ cumulative duration of observations)
*Does not include four additional golden eagles incidentally observed during other biological surveys

3.1.2 Non-raptor Bird Species

Estimated bird fatality rates were available for seven wind energy facilities in California. Bird fatality estimates in California ranged from 0.55 fatalities/MW/study period at the Alite facility to 4.71 fatalities/MW/study period at the Dillon wind energy facility. Fatality rates at the OWEF site might be expected to be within the range of fatality rates observed at other California wind energy facilities and based on habitat similarities, fatality rates could be similar to rates observed at the Dillon facility (Table 8).

Ninety-six% of observations of passerines occurred outside the RSA. However, some bias exists for lower flying birds. There is some potential for all recorded species to fly within the RSA. Given that the site is not part of a major migratory movement corridor and the bird abundance is relatively low, overall collision risk for diurnally active avian species is expected to not be unique. Based on data from other fatality studies, both likely nocturnal migrating passerines and resident passerines are the most common fatalities, and are the most common bird groups from surveys. It is possible that nocturnal species such as owls, nightjars, etc., and species that migrate at night (most passerines) may be at a greater risk of collision. Even with the abundance of individuals during spring migration, site use by migratory species should be considered low given the size of the site. Many of the migratory species were detected in relatively low numbers, which indicates this is not a major migratory corridor for passerines.

Some fatalities of nocturnal migrating birds have been observed at wind energy projects within the U.S. (Kerlinger et al. 2010), although the rates of fatalities at individual wind farms appear to be relatively low compared to estimates of the numbers of migrants flying over the sites. Most nocturnal songbird mirgation is believed to occur above 500 feet above ground level (Longcore et al. 2005). There are several records of large mortality events at tall guyed communication towers (Kerlinger 2000, Kemper 1996) and these events are typically associated with bad weather conditions (low ceilings, fog). Unlike communication towers, however, there have been no reported large episodic mortality events (e.g., >50 birds during a single night) recorded within a single U.S. wind farm. Based on a review of collision fatalities at 30 wind energy facilities in North America, fatalities of nocturnal migrants have ranged from <1 fatality/turbine/year to ~7 fatalities/turbine/year with higher rates recorded in eastern North America and lower rates in the west (Kerlinger et al. 2010). Multi-bird mortality events (defined as >3 birds killed in one night at one turbine) were recorded at only four out of approximately 25,000 turbine searches. The largest mortality events reported at U.S. wind energy facilities to date include 14 migrant songbirds found at two turbines during spring migration at Buffalo Ridge, Minnesota (Johnson et al. 2002) and 27 migrants at the Mountaineer facility in West Virginia (Kerns and Kerlinger 2004). The West Virginia mortalities apparently occurred during inclement weather and the fatalities occurred at a turbine near a heavily lit substation. Most migrant songbird casualties recorded during systematic carcass searches at turbines have been a single fatality found during a single search (Erickson et al. 2001).

3.1.3 Bats

Estimated bat fatality rates were available for five wind energy facilities in California, and ranged from 0.07 fatalities/MW/study period at the SMUD Solano facility to 2.57 fatalities/MW/study period at the High Winds facility (2004). Based on estimated fatality rates observed at other California wind energy facilities, fatality rates at the OWEF site might be expected to be within the range of fatality rates observed at other California wind energy facilities (Table 8). However, more uncertainty exists for predicting bat mortality, based on high variation in rates across the country.

The species specific collision risk analysis for bats incorporates the quantitative data collected during four seasons of bat survey data on the OWEF site. Four of the five species observed in the project area are considered to be at low risk and not particularly sensitive species within the local area or the region (California myotis, western pipistrelle, Mexican free-tailed bat, and big brown bat). The greater western mastiff bat is the species considered a high-risk species. This species is severely limited to habitat areas based on its high demand for water (it is the largest bat in North America) and is unable to drink from water sources less than 30 m long (Chebes 2002). Therefore, because there are no water bodies within the project area that could likely support this species, and foraging potential is rather limited, this rare occurrence is probably only moving through the project area infrequently in search of suitable habitat.

3.2 Indirect Impacts to Birds and Bats

Construction and O&M of the OWEF may alter the landscape and habitat conditions so that wildlife use patterns are affected, displacing wildlife away from the project facilities and suitable habitat. Examples of potential indirect effects during construction and O&M include night lighting, construction noise, and degradation of foraging habitat. Construction will be conducted primarily during daylight hours; however, if it becomes necessary to conduct work at night, Best Management Practice’s (refer to avoidance and minimization of risk section below) will be implemented to avoid and minimize any potential impacts. Construction and O&M noise could impact breeding behavior or reproductive success.

The introduction or spread of invasive weed species that results in changes in prey abundance or species assemblages would also be considered an indirect impact to bird and bat species. Soil disturbance during construction can encourage invasive weeds to encroach into the habitat from areas outside the site, and weed seed can be introduced to the site if construction vehicles and equipment entering the site are not cleaned properly. Invasive weed species have the potential to out-compete native species and change the overall quality of the habitat.

3.2.1 Raptors

Raptors nesting closer to turbines have the potential to be impacted by disturbance due to construction or operation of the facility. Birds displaced from wind energy facilities might move to lower quality habitat with fewer disturbances, with an overall effect of reducing breeding success. Most studies on raptor displacement at wind energy facilities, however, indicate effects to be negligible (Howell and Noone 1992; Johnson et al. 2000a, 2003a; Madders and Whitfield 2006). Notable exceptions include a study in Scotland that described territorial golden eagles avoiding the entire wind energy facility area, except when intercepting non-territorial birds (Walker et al. 2005). A study at the Buffalo Ridge wind energy facility in Minnesota found evidence of northern harriers avoiding turbines on both a small scale (less than 100 m from turbines) and a larger scale in the year following construction (Johnson et al. 2000a). Two years following construction, however, no large-scale displacement of northern harriers was detected.

The only published report of avoidance of wind turbines by nesting raptors occurred at the Buffalo Ridge facility in Minnesota, where raptor nest density on 101 mi^2 (262 km^2) of land surrounding the wind energy facility was 5.94 nests/39 mi^2 (101 km^2), yet no nests were present in the 12 mi^2 (31 km^2) facility itself, even though habitat was similar (Usgaard et al. 1997). However, this analysis assumes that raptor nests are uniformly distributed across the landscape (an unlikely event), and only two nests would be expected for an area 12 mi^2 in size if the nests were distributed uniformly. Based on extensive monitoring using helicopter flights and ground observations, raptors continued to nest at a wind energy facility in eastern Washington at approximately the same levels after construction, and several nests were located within a half-mile of turbines (Erickson et al. 2004). At the Foote Creek Rim wind energy facility in southern Wyoming, one pair of red-tailed hawks nested within 0.3 miles (0.5 km) of the turbine strings, and seven red-tailed hawk nests, one great horned owl (*Bubo virginianus*) nest, and one golden eagle nest located within one mile of the wind energy facility successfully fledged young (Johnson et al. 2000b). The golden eagle pair successfully nested a half-mile from the facility for three different years after it became operational. In Oregon, a Swainson's hawk also nested within a quarter-mile (0.4 km) of a turbine string at the Klondike I wind energy facility after the facility was operational (Johnson et al. 2003b). These observations suggest that there will be limited nesting displacement of raptors at the OWEF, although the creation of a buffer surrounding known nests when siting turbines will further reduce any potential disturbance/displacement impact to nesting raptors by reducing human activities in close proximity to raptor nests.

3.2.2 Non-Raptor Bird Species

Wind energy facility construction appears to cause small-scale local displacement of grassland passerines. Construction also reduces habitat effectiveness because of the presence of access roads and large gravel pads surrounding turbines (Leddy 1996; Johnson et al. 2000a). Leddy et al. (1999) surveyed bird densities in Conservation Reserve Program (CRP) grasslands at the Buffalo Ridge wind energy facility in Minnesota, and found mean densities of 10 grassland bird species were four times higher at areas located 180 m (591 ft) from turbines than they were at grasslands nearer turbines. Johnson et al. (2000a) found reduced use of habitat by seven of 22 grassland-breeding birds following construction of the Buffalo Ridge wind energy facility.

Results from the Stateline wind energy facility in Oregon and Washington (Erickson et al. 2004) and the Combine Hills wind energy facility in Oregon (Young et al. 2005) suggest a relatively small impact of wind energy facilities on grassland-nesting passerines. Transect surveys conducted prior to and after construction of the wind energy facilities found that grassland passerine use was significantly reduced within approximately 50 m (164 ft) of turbine strings, but areas further away from turbine strings did not have reduced bird use. Assuming similar displacement impacts occur for passerine species that utilize desert-scrub habitats; there is the potential for small-scale displacement of passerines at the OWEF.

3.2.3 Bats

Due to the lack of any known maternity roosts for bats as well as the lack of wetland/water habitats for foraging, any potential displacement impacts to bats are unlikely at the proposed OWEF.

3.3 Sensitive Species

Burrowing owls, a BLM-listed sensitive species and CDFG designated species of special concern, have been regularly documented during surveys of the OWEF. Burrowing owls have been recorded as fatalities at existing wind energy projects. In a review of 21 monitoring studies, burrowing owls were among the most common raptor fatalities (n=13) based on cumulative fatality data from 21 monitoring studies (Johnson and Stephens 2010). However, all 13 fatalities were recorded at the Diablo Winds Facility and there was a high degree of uncertainty associated with cause of death determinations. In all 13 cases, strong evidence that the fatality was a wind turbine collision was lacking (WEST 2008). More research is needed to understand potential collision risks to burrowing owls however; given the low use of the RTWEP by burrowing owls (one observation during two years of baseline surveys) the risk of collision is considered low. Conservation measures for burrowing owls are included in Section 6.2 below.

Breeding Swainson’s hawk are listed as threatened in the CESA, and Swainson’s hawks were observed within the OWEF during APCs; however, the habitat at the OWEF suggests breeding Swainson’s hawks would be unlikely in the OWEF. Therefore, the proposed facility is unlikely to affect breeding and nesting populations of Swainson’s hawks. Collision risks to Swainson’s hawks are addressed in Section 3.1.1 above.

The western mastiff bat, a BLM sensitive species and CDFG designated species of special concern, was identified within the OWEF through acoustic bat monitoring. While collisions with turbines have the potential to occur, no western mastiff bat fatalities have been documented in publically available wind energy fatality monitoring studies (Chatfield et al. 2009, Piorkowski and O’Connell 2010).

4.0 AVOIDANCE AND MINIMIZATION OF RISK USING BMP's and ACP's

OE LLC plans to implement a variety of BMP's and ACP's to reduce the risk to avian and bat species from the project. The following BMP's and ACP's have been implemented or are planned for the OWEF during the pre-construction, construction, and operation phase of the project.

4.1 BMP's and ACP's Pre-Construction

OE LLC collected available site-specific information on avian and bat use to guide project siting to avoid and minimize impacts. Other BMP's and ACP's implemented during the pre-construction phase of the OWEF include:

- The area and intensity of disturbances was minimized during pre-construction monitoring and testing activities.
- Existing roads and transmission corridors have been used to the extent possible while developing site plans.
- The Avian Power Line Interaction Committee (APLIC) guidance on power line siting (APLIC 1994) was followed while planning.
- Site plans minimized the extent of the road network needed for the OWEF.
- No lattice or structures that are attractive to birds for perching are including in facility designs other than two SDG&E replacement structures to accommodate the switchyard.
- No guy wires will be included on permanent MET towers.
- The facility was not sited in any areas containing high concentrations of ponds, streams, or wetlands.
- The OWEF site plan includes a 50-foot tall Advanced Biological Observation Command and Control Center (ABOCCC) to allow for early detection of any significant raptor and passerine migration through the site. OE LLC will consult with USFWS on the appropriate perch deterrents for the ABOCCC.

4.2 BMP's during Construction

The following BMP's will be implemented at the OWEF during construction:

- The area and intensity of disturbance will be minimized to the extent possible during construction.
- Existing roads will be used for access during construction to the extent possible.
- Non-operational MET towers will be dismantled during construction.
- Powerlines will be buried to the extent possible to reduce avian collision and electrocution.
- APLIC guidance on power line construction (APLIC 2006) will be followed.

- A transportation plan will be implemented during construction that includes road design, locations and speed limits to minimize habitat fragmentation and wildlife collisions, and minimize noise effects.
- Lighting plans for the facility are the minimum according to requirements.
- All security lighting will be motion or heat activated, instead of being left on throughout the night.
- All security lighting will be down-shield and related to infrastructure lights.
- Night lighting will be minimized to the extent possible.
- Any construction lighting to be used at night will be down-shielded, will be directed toward the interior of the disturbance area, or at the specific location being constructed.
- Clearing of vegetation for construction will avoid the bird breeding season when feasible. Pre-construction bird surveys would be conducted if clearing of vegetation needs to be completed during the bird breeding season. Construction setbacks will be implemented if active nests are found during pre-construction surveys.
- A Designated Biologist/biological monitor will monitor compliance of measures to control the introduction/spread of invasive weed species during construction.
- A worker Education Awareness Program will be implemented to educate employees and contractors on controlling the spread of invasive weed species.
- An Integrated Weed Management Plan will be prepared and implemented.
- Any temporarily disturbed areas will be revegetated.
- A wildlife awareness program will be implemented by OE LLC for its employees and contractors.
- Compliance monitoring by a Designated Biologist will be conducted to ensure construction BMP's are being implemented.

In addition to the construction BMP's identified above, a Nesting Bird Management, Monitoring, and Reporting Plan (NBMMRP) will be implemented for the OWEF. If the project must occur during the avian breeding season (February 1st to August 31st, as early as January 1 for some raptors), OE LLC will work with the CDFG, BLM and the USFWS to prepare a Nesting Bird Management, Monitoring, and Reporting Plan (NBMMRP) to address avoidance of direct impacts to nesting birds.

4.3 BMP's during Operation

In addition to the intensive monitoring and research program, the following BMP's will be implemented during operation of the OWEF:

- Management activities such as seeding forbs or maintaining rock piles that attract potential prey will be avoided.
- Parts and equipment which may be used as cover by prey will not be stored in the vicinity of wind turbines.
- Any carcasses (with the exception carcasses being used for post-construction bias trials) found within the OWEF will be removed immediately assuming the appropriate permits/authorizations have been granted to OE LLC.
- Low level speed limits (< 25 mph) will be maintained on all roads within the OWEF.
- Personnel will be trained to be alert for wildlife at all times, especially during low visibility conditions.
- Personnel, contractors, and visitors will be instructed to avoid disturbing wildlife, especially during the breeding seasons and seasonal periods of stress.
- A wildlife incident reporting system and associated worker awareness training will be implemented for the life of the OWEF (see Section 5.1.6)
- Fire hazards will be reduced from vehicles and human activities (e.g., use spark arrestors on power equipment, avoid driving vehicles off roads, and allow smoking in designated areas only).
- Federal and state measures for handling toxic substances will be followed.
- Effects to wetlands and water resources will be minimized by following provisions of the Clean Water Act (1972).

5.0 MONITORING AND ADAPTIVE MANAGEMENT PROCESS

The process for addressing potential impacts to bird and bat species from implementation of the OWEF is divided into two sections: 1) Post-Construction Monitoring and 2) Adaptive Management based on monitoring results.

Post-construction monitoring is designed to evaluate the project during operation to determine actual impacts. Adaptive management has been designed to use monitoring data to evaluate whether impacts are determined to be significant or unique, and if so, to implement measures to reduce them to acceptable levels or consider some other type of minimization or mitigation.

To help ensure that impacts to avian and bat species can be monitored and mitigated as necessary due to routine operations of the OWEF, a Technical Advisory Committee (TAC) will monitor OWEF activities, including mortality data, to determine the need for project mitigation. The

TAC will consist of one representative from OE LLC, and a single resource specialist (two members may be appropriate if one person specializes in birds and the other in bats) from the BLM, USFWS, and CDFG. In addition, the TAC may invite an avian or bat expert to sit on the committee (e.g. Audubon, Bat Conservation International, etc.). The TAC will provide advice and recommendations to the BLM Authorized Officer on developing and implementing effective measures to monitor, avoid, minimize, and mitigate impacts to avian and bat species and their habitats related to operations. The BLM Authorized Officer will evaluate any recommendations of the TAC, including discussions with the proponent on new measures or measures that are not completely detailed in this ABPP, and make a decision on what measure(s) to require for implementation.

A TAC Lead will be designated for the group whose duties will include disseminating project data, including data on mortality events, setting up and moderating meetings, reviewing mortality data, and documenting mitigation recommendations for the OWEF. Because the OWEF occurs on BLM land and they are the federal decision-maker, BLM will provide a designated TAC Lead for the duration of the project. Because it is the TAC Lead's responsibility to coordinate meetings and involve all team members, the TAC Lead reserves the right to make recommendation decisions under extraordinary circumstances or when all TAC members are unable to meet.

A Memorandum of Agreement (MOA) will be signed by each party to ensure participation in the TAC. Unless there is a failure on the part of any of these representatives to respond or agree to participate, the TAC shall be formed prior to project operations.

The guiding principles, duties, and responsibilities of the TAC include the following.

- Approve TAC charter and sign MOA.
- Make recommendations based on best available science and to address specific issues resulting from this project.
- In the event decisions cannot be made by consensus, decisions of the TAC shall be made by simple majority vote.
- The TAC is only an advisory committee, and final management decisions will be made by the BLM Authorized Officer.
- Provide sufficient flexibility to adapt as more is learned about the project as well as strategies to reduce avian and bat impacts.
- Review initial and any subsequent revised monitoring protocols for mortality monitoring studies.
- Review results of mortality monitoring.
- Recommend appropriate mitigation measure(s) to the BLM Authorized Officer for implementation in the event that a significant or unique event occurs.
- Review annual report on status of compliance with mitigation measures and permit conditions and provide recommendations to the BLM Authorized Officer, as necessary.

- Develop and recommend additional mitigation measures or research to the BLM Authorized Officer if predetermined mitigation is outdated or deemed ineffective or "unexpected fatalities" occur.
- Evaluate effectiveness of implemented mitigation strategies and provide the BLM Authorized Officer with recommendations based on findings.
- If selected as part mitigation, recommend compensatory mitigation funding opportunities for implementation of off-site species or habitat enhancement or protection/conservation measures.
- The TAC will terminate when the BLM Authorized Officer determines that it is no longer a necessary pathway in reducing avian and bat impacts.

The TAC shall hold the first meeting prior to the commencement of operations to develop and approve the charter and requirements of this ABPP. The charter will include an MOA ensuring participation in the TAC and agreeing to how funds provided in this ABPP would be accessed. Thereafter, the TAC shall meet annually, unless data reveal that mortality triggers have been exceeded. Attendance at TAC meetings shall be by invitation of its members only.

5.1 Post-construction Monitoring

Post-construction monitoring for bats and birds is a critical component of this ABPP. The post construction monitoring described in the OWEF ABPP are for the OWEF only and do not apply to the SDG&E switchyard. SDG&E intends to construct and operate the switchyard independently from OE LLC. The observations made during post-construction monitoring will be reported to the TAC, which will respond with appropriate management decisions should mortalities exceed the triggers outlined in the adaptive management section of this ABPP. Post-construction monitoring will be completed for bats and birds concurrently, and detailed methods for these surveys are presented below. Since post-construction monitoring methods are constantly improving as researchers develop new and more accurate methods of survey, the TAC should consider recommendations to adopt new survey techniques and protocols as they become available.

Post-construction surveys will focus on mortality surveys for birds and bats. These surveys will be conducted in accordance with industry standards for post-construction fatality monitoring in the region and will be completed regularly to document the number and species of birds and bats killed as a result of the OWEF. As part of these mortality surveys, the searcher efficiency rate (i.e., the ability of a surveyor to locate a mortality) and carcass removal rate (i.e., the average time that a carcass persists before a scavenger removes it) will be determined for bats and small and large bird size classes. For each mortality located, the appropriate (i.e., bat, small bird, large bird) searcher efficiency and scavenger removal rate will be used to estimate the actual number of bird and bat mortalities. Methods for completing post-construction surveys are described below, and datasheets examples are shown in Appendix B.

OE LLC will also have a state of the art Merlin radar system onsite for the life of the OWEF specifically tiered to collect data to potentially curtail turbines in order to minimize direct impacts to golden eagles and indirect impacts to bighorn sheep. The Merlin radar system will be mounted on top of a 50-foot tall Advanced Biological Observation Command and Control Center (ABOCCC) that would be constructed in the central portion of the site. The Merlin system incorporates vertical and horizontal radar and the information detected on the radar is linked to a high-resolution camera, which will also be mounted on top of the ABOCCC. A depiction of the ABOCCC is provided as Figure 4. Due to the low level and avian migration and bat use at the site, this system will also be used for data collection purposes for general avian and bat species. The ABOCCC will be manned from sunup to sundown for the first ten years of operations to specifically monitor movements of eagles and other wildlife.

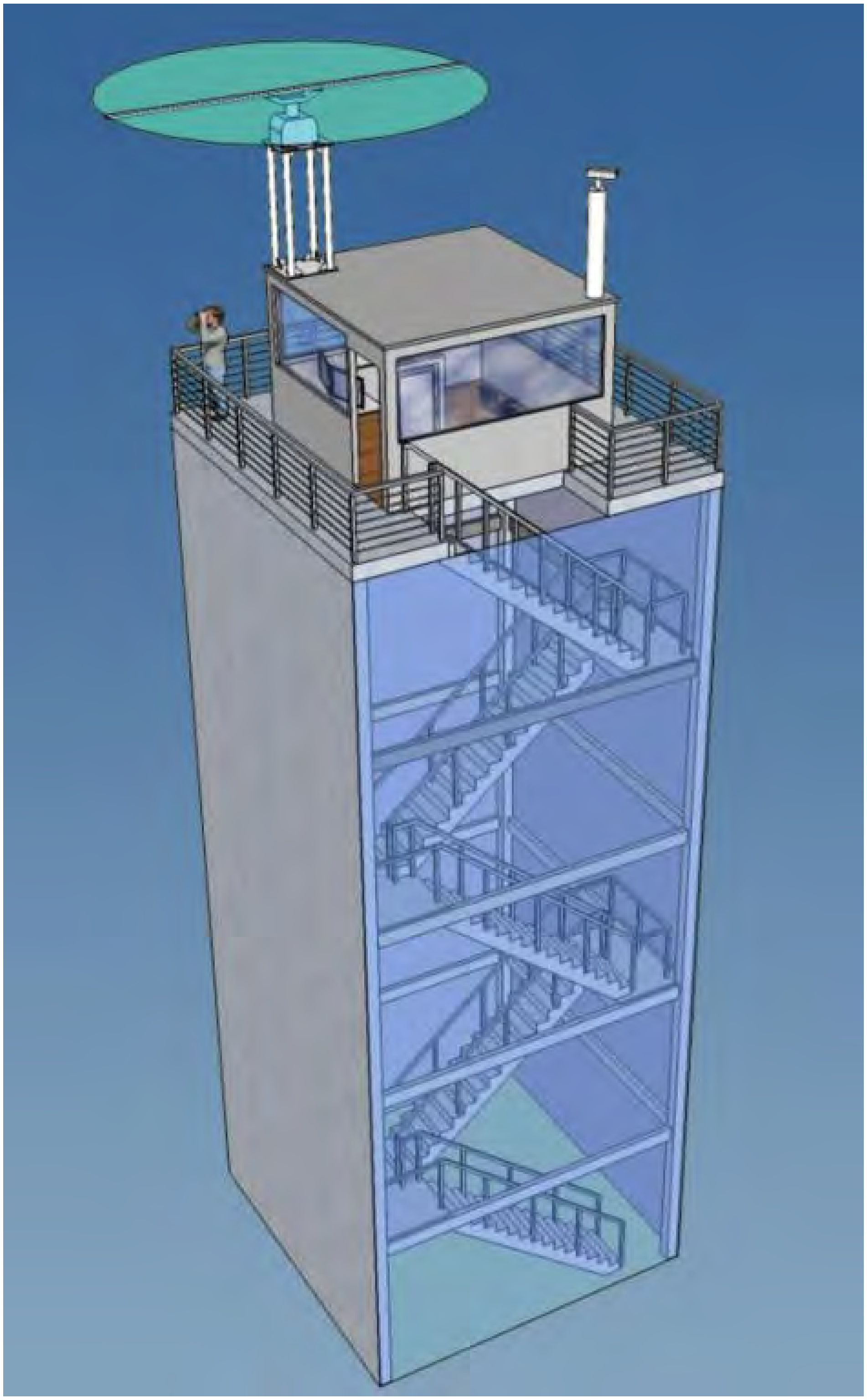


Figure 4. Advanced Biological Command and Control Center (ABOCCC). (Conceptual)

5.1.1 Raptor Nest Surveys

Nest surveys will be conducted prior to the nesting season (approximately March 15 to July 30) and once each month during the nesting season during the first three years of operations. Aerial or ground based raptor nest surveys will be conducted within the entire project area and a one-mile buffer for raptors (BLM 2007), except for golden eagles. The golden eagle nest surveys and associated mitigation are discussed in the OWEF's Eagle Conservation Plan (OE LLC 2012). The raptor nest survey effort will be focused on species that build large nest structures, such as red-tailed hawk (*Buteo jamaicensis*). Other species that nest on the ground or in cavities were recorded if observed, but will not be the focus of surveys. Where appropriate, construction activities will be limited within 500 feet of any active raptor nest site (except golden eagles). Nest locations found within the project area and within buffer will be documented by noting the species, dates of activity, Universal Transverse Mercator (UTM) North American Datum (NAD) 83 coordinates, nest contents (where possible), and behavior. The data will be presented to the TAC to determine whether mitigation should be recommended to reduce impacts to nesting activities. Active raptor nests will be monitored to track the breeding success of resident raptors and evaluate the effectiveness of mitigation measures, if any are applied.

5.1.2 Avian Monitoring

To provide a comparison between pre-construction use and post-construction use at the site, avian point-count surveys will be conducted twice each month during the first two years of operation. Point-count surveys will be completed using the same methods as pre-construction studies. Basic methods will include general use point-counts in the first few hours of the morning, followed by raptor counts during the middle of the day, and several hours of general use point-counts in the late-afternoon/evening. General use point-count data will be collected to provide an accurate comparison between pre- and post-construction use to inform our understanding of avian exposure and probability of mortality as well as behavioral responses to the facility. Raptor count data would be collected to help determine how post-construction use compares to recorded mortality.

5.1.3 Mortality Surveys

Fatality surveys for baseline monitoring will begin with the next survey season (within 4 months) after commercial operation delivery (COD) of the project. Monitoring will consist of a minimum of 3 years of post-construction bird and bat mortality monitoring, in accordance with the California Guidelines for Reducing Impacts to Birds and Bats from Wind Energy Development (CEC 2007) or improved protocols as recommended by the TAC. If the first two years of fatality monitoring do not coincide with a good rain year (i.e. a good rain year is defined as greater than annual rainfall of 10.6 inches in Campo, CA; WRCC-DRI 2009), then OE LLC will conduct the third year of monitoring following a good rain year.

OWEF will implement monitoring of turbines for fatalities pursuant to an enforceable monitoring program established in consultation with the TAC. OWEF shall monitor a subset (30%) of the turbines at least twice per month for the duration of the post-construction monitoring period for fatalities, bird and bat utilization and or behavior, in consultation with the TAC, as appropriate. Data collected for each carcass will include estimated time since death, condition, type of injury, cover type, distance to nearest WTG location, distance to nearest road, and distance to nearest structure. All observed carcasses will be photo-documented and identified. All mortalities that cannot be identified will be recorded as an unidentified bat or bird. Contingent upon approval and permit by CDFG and the USFWS, it is recommended that carcasses be collected for use in searcher efficiency and scavenger removal trials. Post-construction monitoring shall be conducted by a consultant with applicable experience ("Monitor") approved by the TAC.

5.1.3.1 Searcher Efficiency Trials

Searcher efficiency and scavenger rate studies will be used to develop correction factors that will be applied to mortality findings for each surveyed turbine. The corrected data for surveyed turbines will be used to evaluate the mortality per turbine and per MW. Additionally, survey intervals may need to be adjusted based on the findings for these studies in order to ensure precise correction factors, as described by Huso (2009).

Searcher efficiency trials will be conducted throughout the year to correct observed bat and bird mortalities for bias created by the ability of the surveyor to detect bat and bird carcasses. These will be conducted for each searcher to address differences between searchers. Searcher efficiency trials will be completed during each season to account for different field conditions and weather (i.e., springtime when annual vegetation may be dense, summertime when vegetation is dry and temperatures are hot, etc.) that may affect the ability of the surveyor to locate carcasses. Seasons will be defined as described by Erickson et al. (2003): spring migration (March 16–May 15), breeding season (May 16–August 15), fall migration (August 16–October 31), and winter (November 1–March 15). Although seasonal trials will not address fluke events, they will address the overall time period.

Separate searcher efficiency rates will be determined for bats, small birds (passerines), and large birds (raptors). In order to have an adequate sample size (> 50, Huso [2009]), 20 carcasses will be used for each rate. Bat carcasses collected from the OWEF will be used for bat searcher efficiency trials, as available. If an insufficient number of bat carcasses are available, small, drab passerines or brown mice carcasses will be used as substitutes. A minimum of two distinct sizes of bird carcasses will be used to determine searcher efficiency rates for passerines and larger birds. As available, bird carcasses collected from the OWEF will be used in the searcher efficiency trials; however, substitute carcasses may be used as necessary. Substitute small bird carcasses may include species such house sparrows (*Passer domesticus*) and/or brown-headed cowbirds (*Molothrus ater*). Substitute large bird carcasses may include road-killed birds (fresh carcasses only) and/or carcasses from veterinary colleges or wildlife rehabilitation centers; actual large species will be determined in coordination with the TAC. In all cases, carcasses used will either be non-native, non-protected species provided by an authorized agency, or species collected through permitted take, and carcasses will be free of disease and poison.

Prior to initiating the searcher efficiency trial, carcass locations will be randomly generated, but constrained so that no more than three carcasses will be located at any one turbine at a time. An additional biologist who is not participating in the searcher efficiency trials will plant carcasses in pre-determined locations. Carcasses will be dropped from waist level, so that they land in a random position and location. The position and location will be recorded for later comparison with actual mortalities.

Bat carcasses will be marked by pulling an upper canine tooth as described by Arnett et al. (2009). Similarly, the beaks of trial birds will be notched to avoid using chemically based marking methods, which may influence scavenger removal rates. When surveyors located a marked carcass, they will note the finding and notify the biologist who planted the carcass. The percentage of planted bats and birds located by surveyors will be used to generate a correction factor to estimate the actual number of bats killed, based on the number of actual mortalities observed.

5.1.3.2 Carcass Removal Trials

Carcass removal trials will be completed during each of the four seasons over the three-year post-construction monitoring period. Different seasonal rates for carcass removal are necessary to address the effects of varying weather conditions, scavenger densities, and scavenger assemblages throughout the season, as well as over time, as scavengers adapt to a novel food source. Separate carcass removal rates will be determined for bats, small birds (passerines), and large birds (raptors). All animals used in the carcass removal trials will be handled with disposable nitrile gloves or an inverted plastic bag to avoid leaving a scent on the carcasses and interfering with the scavenger removal trial (Arnett et al. 2009). Carcasses to be used for the carcass removal trials will be obtained from the same sources as described for the Searcher Efficiency Trials, as described in Section 4.4.

5.1.4 Reporting

The Monitor will prepare an interim monitoring/progress report within 3 months of the half way point for each year of monitoring, annual monitoring reports within three months of completing each year of post-construction monitoring, and will prepare a final three-year Monitoring Report within three months of completing three years of post-construction monitoring.

All monitoring reports, including all raw monitoring data upon which the reports are based, will be made available to members of the TAC. All monitoring reports will report adjusted and unadjusted annual fatalities for bats and all other bird species on a per-turbine and per megawatt basis. The fatality numbers will be adjusted to account for searcher efficiency and scavenger rates. The monitoring reports shall also summarize the results of the bird and bat behavior and use studies, the results of the searcher efficiency trials, and the results of the carcass removal trials, for the preceding one or three years, as applicable. The Monitor shall supplement the final three-year Monitoring Report with subsequent monitoring data collected.

5.1.5 Fatality Measures

The TAC, as applicable, shall review the final three-year Monitoring Report for the project to evaluate whether any turbines are causing significantly bird and/or bat fatalities relative to other turbines included within that particular portion of the project. If one or more turbines are causing significantly disproportionate bird or bat fatalities, then the TAC, as applicable, in consultation with the Parties, may recommend to the Planning Director of the BLM additional focused monitoring and/or management measures designed to reduce the fatalities attributable to those turbines; provided, however, that such measures shall not include relocation or permanent shutdown of any turbine. Notwithstanding the foregoing, the Parties acknowledge that fatality reduction or other measures may be required pursuant to applicable law inc1uding but not limited to the federal Endangered Species Act (16 U.S.C §§ 1530 *et seq.)*, Bald and Golden Eagle Protection. Act (16 U.S.C. §§ 668-668d), Migratory Bird Treaty Act (16 U.S.C. §§ 703712) or the California Endangered Species Act {California Fish and Game Code, §§ 2050, *et seqJ.*

5.1.6 Wildlife Incident Reporting System

In addition to the three-year post-construction fatality monitoring study described above, OE LLC will implement a Wildlife Incident Reporting System (WIRS) at the start of operations and it will remain active for the life of the OWEF. The purpose of the WIRS is to standardize the actions taken by site personnel in response to wildlife incidents encountered in the OWEF and to fulfill the obligations for reporting wildlife incidents. The WIRS will be utilized by site operations and maintenance personnel who encounter dead or injured birds or bats incidentally while conducting general wind facility or transmission line maintenance activities. The WIRS is designed to provide a means of recording and collecting fatalities in the OWEF to increase the understanding of wind turbine and wildlife interactions. Additionally, any native bird or bat found injured within the OWEF will be taken to the nearest appropriate wildlife rehabilitation facility as directed in the WIRS. Any incident involving a State or Federally listed threatened or endangered species or a bald or golden eagle must be reported to the USFWS and CDFG within 24 hours of identification. OE LLC maintains an ongoing commitment to investigate wildlife incidents involving company facilities and to work cooperatively with federal and state agencies in an effort to prevent and mitigate future bird and wildlife fatalities. It is the responsibility of

OE LLC employees and subcontractors to report all avian incidents to their immediate supervisor.

5.2 Adaptive Management

The adaptive management techniques described in this section have been developed to ensure that potentially significant levels of mortality from operation of the OWEF are effectively mitigated.

This section describes the adaptive management process that will be applied for avian and bat species. Changes in federal, state, and/or BLM status for wildlife species occurring within the project area may result in the addition of, or changes to, adaptive management strategies, as determined by the BLM through TAC recommendations.

5.2.1 Adaptive Management Process

The TAC will meet to discuss mitigation needs if the TAC Lead determines a unique or significant event has occurred. The TAC will evaluate the results of the post-construction monitoring efforts including evaluation of any potential local population impacts. Cumulative impacts due to other developments in the region will be considered. At a minimum, the TAC will meet annually to review data and determine whether mitigation is necessary. If the TAC determines mitigation is necessary, the TAC will be responsible for identifying and recommending suitable mitigation(s). One or more ACP's may be applied for birds or bats if a unique or significant event occurs.

5.2.2 TAC Consultation Triggers

For this ABPP, species for which TAC consultation triggers have been designated are provided protection by federal and/or state ESA regulations (CESA 1984) which protect against unlawful take, BLM sensitive species and USFWS Birds of Conservation Concern (BCC) in Bird Conservation Region (BCR) 33, and all raptors. Changes in federal listing status or state status for avian and bat species occurring within the project area may result in the addition to, removal or reclassification of species for TAC consultation triggers. These triggers do not permit take under any legal protections but have been developed to ensure any potential population impacts to identified species are addressed. If TAC consultation triggers are exceeded, voluntary mitigation will be considered as described in Section 5.2.3 below. TAC consultation triggers for federal or state ESA listed species as well as BLM sensitive bats will not have searcher efficiency or scavenger rate correction factors applied.

The first step taken to identify TAC consultation triggers for BLM sensitive or BCC species and raptors was to estimate the 75^{th} percentile of observed fatality rates at existing in the western US (Figures 4 and 5). References for fatality data from wind energy facilities in the western US is included in Table 10. Using the observed fatality rates in the western US, a probability density function for regional bird (small and large birds), raptors, and bat fatality rates was generated using kernel density estimation (Parzen 1962). Kernel density estimation is a non-parametric data smoothing process used to interpolate population distributions from finite samples. Regional fatality data were log transformed to provide support across the all real numbers and then fit to a probability density function using R-statistical software (2011). The 75th percentile of the resulting density function was calculated and provides a population level estimate for fatality rates exceeding the upper quartile of observed data. The 75th percentile for small birds was estimated at 3.19 birds/MW/study period, 0.42 birds/MW/study period for large birds, 0.12 birds/MW/study period for raptors, and 2.41 bats/MW/study period for bats.

To calculate TAC consultation triggers for BLM sensitive and BCC species, the proportions of BLM sensitive and BCC species (birds [small and large] and bats) observed as fatalities out of all known fatalities at existing wind energy facilities in the western US were multiplied by the estimated 75th percentile for small birds (3.19 birds/MW/study period), large birds (0.42) or all bat (2.41) fatality rates (Tables 11 and 12). In the event that no BLM sensitive or BCC species were found in the fatality database for a given class (i.e., small birds, large birds, or bats), one observed fatality was assumed.

Table 10. References for fatality data from wind energy facilities in the western U.S.

Project, Location	Reference	Project, Location	Reference
Alite (10), CA	Chatfield et al. 2010	Hopkins Ridge, WA (08)	Young et al. 2009
Big Horn, WA	Kronner et al. 2008	Klondike, OR	Johnson et al. 2003
Biglow Canyon, OR (Phase I; 08)	Jeffrey et al. 2009a	Klondike II, OR	NWC and WEST 2007
Biglow Canyon, OR (Phase I; 09)	Enk et al. 2010	Klondike III, OR	Gritski et al. 2009a
Biglow Canyon, OR (Phase II; 09/10)	Enk et al. 2011	Klondike IIIa (Phase II), OR	Gritski et al. 2009b
Combine Hills, OR	Young et al. 2006	Leaning Juniper, OR	Kronner et al. 2007
Dillon, CA	Chatfield et al. 2009	Marengo I, WA (2009)	URS Corporation 2010b
Dry Lake, AZ	Thompson et al. 2011	Marengo II, WA (2009)	URS Corporation 2010c
Elkhorn, OR (2008)	Jeffrey et al. 2009b	Nine Canyon, WA	Erickson et al. 2003
Foote Creek Rim, WY (Phase I; 99)	Young et al. 2003	Pebble Springs, OR	Gritski and Kronner 2010b
Foote Creek Rim, WY (Phase I; 00)	Young et al. 2003	Pine Tree, CA	BioResource Consultants 2010
Foote Creek Rim, WY (Phase I; 01-02)	Young et al. 2003	Shiloh I, CA	Kerlinger et al. 2010
Goodnoe, WA	URS Corporation 2010a	Stateline, OR/WA (02)	Erickson et al. 2004
Hay Canyon, OR	Gritski and Kronner 2010a	Stateline, OR/WA (03)	Erickson et al. 2004
High Winds, CA (2004)	Kerlinger et al. 2006	Tuolumne (Windy Point I), WA	Enz and Bay 2010
High Winds, CA (2005)	Kerlinger et al. 2006	Vansycle, OR	Erickson et al. 2000
Hopkins Ridge, WA (2006)	Young et al. 2007	Wild Horse, WA	Erickson et al. 2008

Table 11. Three year Average TAC Consultation Triggers for Mortality among Avian Species.

TAC Consultation Trigger Categories	Trigger Value[1,2] Large Birds[3]	Small Birds[4]
Federal or State ESA listed species (refer to Appendix A) Golden eagle has a separate mitigation plan outlined in the Ocotillo ECP.	1	1
BLM sensitive or BCC bird species (e.g. refer to Appendix A).	Exceeds adjusted average of 0.03 per MW per year over 3 year period	Exceeds adjusted average of 0.02 per MW per year over 3 year period
Raptors	Exceeds adjusted average of 0.12 raptors per MW per year over a 3 year period	

[1] The triggers for federal or state ESA listed species are unadjusted.
[2] For BLM sensitive and BCC species triggers (excluding ESA listed species), fatality estimates will be determined by estimating the proportion of observed BLM sensitive or BCC species fatalities out of all observed fatalities and multiplying that proportion by the overall adjusted fatality estimate for the large or small category.
[3] For the purpose of this ABPP, large birds include any ESA listed (federal or state) and BLM sensitive or BCC species in the following bird types: waterbirds, waterfowl, rails and coots, gulls and terns, shorebirds, diurnal raptors, owls, vultures, upland game birds, doves/pigeons, large corvids (e.g., ravens, magpies, and crows), goatsuckers, kingfisher, and large woodpeckers (e.g., flickers).
[4] For the purpose of this ABPP, small birds include any ESA listed (federal or state) and BLM sensitive or BCC species in the following bird types: passerines (excluding large corvids, cuckoo, and woodpeckers), swifts/hummingbirds, some woodpeckers, and most cuckoos are considered small birds.

Table 12. Three year Average TAC Consultation Triggers for Mortality among Bat Species.

TAC Consultation Trigger Species	Trigger Value[1,2]
Species categorized as state or federally listed as threatened or endangered (none currently known to occur; refer to Appendix A)	1
BLM sensitive species (refer to Appendix A)	Greater than 1[1,3]

[1] The TAC consultation trigger for state or federally listed species and BLM sensitive bats are unadjusted.
[2] For the BLM sensitive species triggers, fatality estimates will be determined by estimating the proportion of observed sensitive species fatalities out of all observed fatalities and multiplying that proportion by the overall fatality estimate.
[3] No BLM sensitive bat species with potential for occurrence in Imperial county have been observed as fatalities in the western US and as such the approach used would result in less than one fatality at the OWEF over three years of monitoring. Due to the level of sensitivity associated with BLM sensitive species, the trigger level was modified to be greater than 1 individual during the three years of post construction monitoring.

5.2.3 Voluntary Conservation Measures

The determination of how to implement voluntary conservation measures will be determined in consultation with the TAC. A voluntary conservation measure may be applied each time a TAC consultation trigger (shown in Table 11 or 12) is exceeded for either a bird or bat species, depending on recommendations from the TAC. Each time a TAC consultation trigger for that group (i.e., birds or bats) is exceeded an additional voluntary conservation measure may be implemented up to a fourth and final measure (e.g., if three voluntary conservation measures have been applied and TAC consultation triggers continue to be exceeded, at the decision of OE LLC, either a final voluntary habitat compensation payout may be made or OE LLC will work with the TAC to determine additional reasonable phases of voluntary conservation). The final voluntary conservation measure would be triggered the fourth time a bird TAC consultation trigger is met, the fourth time a bat TAC consultation trigger is met or a combination of four bird and bat TAC consultation triggers are exceeded. The final voluntary measure will be capped based on models that have been completed to ensure a commercially viable project. Examples of voluntary conservation measures that could be funded through this program include:

- Placement of visual and/or auditory bird flight diverters in critical locations determined based on evaluation of all post-construction monitoring data.
- If fossorial mammals are found burrowing near turbines, burrows may be filled and the turbine pad may be surrounded within gravel at least two inches deep.
- Installing perch guards on overhead electric lines in the vicinity of the OWEF if raptors are shown to regularly use the lines.
- Possibly cut-in speed adjustments during peak migration periods to reduce impacts to bats.
- Other direct, non-operational mitigation as recommended by the TAC.

6.0 CONCLUSION

This document was written to provide guidance for avoiding, minimizing, and monitoring potential impacts to avian and bat species prior to, during, and after construction of the OWEF. The measures described in this document are intended to help protect and reduce impacts to wildlife, as well as to monitor potential impacts to wildlife following implementation of the OWEF. It is anticipated that this ABPP will adaptively manage the OWEF based on findings following construction.

7.0 LITERATURE CITED

74 Federal Register (FR) 46836. 2009. United States Fish and Wildlife Service, Department of the Interior. Part II. 50 CFR Parts 13 and 22: Eagle Permits; Take Necessary to Protect Interests in Particular Localities; Final Rules. 74 FR 175, 46836. September 11, 2009. Available online at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/BaldEagle/Final%20Disturbance%20Rule%209%20Sept%202009.pdf

All About Birds website. Species Profiles. Cornell Lab of Ornithology. Accessed May and June, 2010. Homepage: http://www.allaboutbirds.org

Anderson, R., M. Morrison, K. Sinclair, and D. Strickland. 1999. Studying Wind Energy/Bird Interactions: A Guidance Document. Metrics and Methods for Determining or Monitoring Potential Impacts on Birds at Existing and Proposed Wind Energy Sites. Prepared for the Avian Subcommittee and National Wind Coordinating Collaborative (NWCC). December 1999. National Wind Coordinating Committee/RESOLVE. Washington, D.C. 87 pp.

Arnett, E.B., M. Schirmacher, M.M.P. Huso, and J.P. Hayes. 2009. Effectiveness of Changing Wind Turbine Cut-in Speed to Reduce Bat Fatalities at Wind Facilities: 2008 Annual Report. Prepared for the Bats and Wind Energy Cooperative (BWEC) and the Pennsylvania Game Commission. Bat Conservation International (BCI), Austin, Texas. April 2009. http://www.batsandwind.org/pdf/Curtailment_2008_Final_Report.pdf

Avian Power Line Interaction Committee (APLIC). 1994. Mitigating Bird Collisions with Power Lines: The State of the Art in 1994. Edison Electric Institute. Washington, D.C.

Avian Power Line Interaction Committee (APLIC). 2006. Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006. Public Interest Energy Research Program (PIER) Final Project Report CEC-500-2006-022. Edison Electric Institute, APLIC, and the California Energy Commission. Washington D.C. and Sacramento, California.

Bald and Golden Eagle Protection Act (BGEPA). 1940. 16 United States Code § 668-668d. June 8, 1940.

BioResource Consultants, Inc. (BRC). 2010. 2009/2010 Annual Report: Bird and Bat Mortality Monitoring, Pine Tree Wind Farm, Kern County, California. To the Los Angeles Department of Water and Power, from AECOM, Irvine, California. Report prepared by Bioresource Consultants, Inc., Ojai, California. October 14, 2010.

Bureau of Land Management (BLM). 2005. Final Programmatic Environmental Impact Statement on Wind Energy Development on Blm Administered Land in the Western United States. US Department of the Interior (USDOI), BLM, Washington, D.C. http://windeis.anl.gov/

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.

Bureau of Land Management (BLM). 2003. Instruction Memorandum 2003-020. Interim Wind Energy Development Policy. Issued October 16, 2002. Expires September 30, 2004. Available online at: http://windeis.anl.gov/documents/docs/IM2003-020,InterimWindEnergyDevelopmentPolicy.htm

Bureau of Land Management (BLM). 2006. Instruction Memorandum 2006-216. Right-of-Way Management, Wind Energy Land Use Plan Amendments, Wind Energy. August 24, 2006. Expires September 30, 2007. Available online at : http://www.blm.gov/wo/st/en/info/regulations/Instruction_Memos_and_Bulletins/national_instruction/2006/2006-216__.html

Bureau of Land Management (BLM). 2009. Instruction Memorandum 2009-043. Wind Energy Development Policy. Issued December 19, 2008. Expires September 30, 2010. Available online at: http://www.blm.gov/wo/st/en/info/regulations/Instruction_Memos_and_Bulletins/national_instruction/2009/IM_2009-043.html

Bureau of Land Management (BLM). 2011. Instruction Memorandum 2011-060. Solar and Wind Energy Applications – Due Diligence. Issued February 7, 2011. Expires September 30, 2012. Available online at: http://www.blm.gov/wo/st/en/info/regulations/Instruction_Memos_and_Bulletins/national_instruction/2011/IM_2011-060.html

Bureau of Land Management (BLM). 2010. Special Status Animals in California, Including BLM Designated Sensitive Species. Available online at: http://www.blm.gov/ca/dir/pdfs/2010/im/CAIM2010-008ATT1.pdf

California Burrowing Owl Consortium (CBOC). 1997. Burrowing Owl Survey Protocol and Mitigation Guidelines.

California Department of Fish and Game (CDFG). 1995. Staff Report on Burrowing Owl Mitigation.

California Department of Fish and Game (CDFG). 2011. State and Federally Listed Endangered and Threatened Animals of California. State of California, Natural Resources Agency, Department of Fish and Game Biogeographic Data Branch, California Natural Diversity Database (CNDDB). January 2011. Available online at: http://www.dfg.ca.gov/biogeodata/cnddb/pdfs/TEAnimals.pdf

California Endangered Species Act (CESA) of 1984, Fish and Game Code §§ 2050-2098

California Energy Commission (CEC) and California Department of Fish and Game (CDFG). 2007. California Guidelines for Reducing Impacts to Birds and Bats from Wind Energy Development. . Commission Final Report. California Energy Commission, Renewables Committee, and Energy Facilities Siting Division, and California Department of Fish and Game, Resources Management and Policy Division. CEC-700-2007-008-CMF.

Chatfield, A., W. Erickson, and K. Bay. 2009. Avian and Bat Fatality Study, Dillon Wind-Energy Facility, Riverside County, California. Final Report: March 26, 2008 - March 26, 2009. Prepared for Iberdrola Renewables, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. June 3, 2009.

Chatfield, A., W.P. Erickson, and K. Bay. 2010. Baseline Avian Studies at 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., Cheyenne, Wyoming.

Chebes, L. 2002. *Eumops perotis*. Available online at: http://animaldiversity.ummz.umich.edu/accounts/eumops/e._perotis$narrative.html

Clean Water Act (CWA). 1972. Clean Water Act. October 18, 1972. 33 United States Code § 1251-1387, 1251 et seq., 2000.

Derby, C., A. Dahl, K. Taylor, K. Bay, and K. Seginak. 2008. Wildlife Baseline Studies for the Wessington Springs Wind Resource Area, Jearald County, South Dakota, March 2007-November 2007. Technical report prepapred for Power Engineers, Inc. and Babcock and Brown Renewable Holdings, Inc. by Western EcoSystems Technology, Inc. (WEST).

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.

Derby, C., K. Chodachek, and K. Bay. 2010a. Post-Construction Bat and Bird Fatality Study Crystal Lake II Wind Energy Center, Hancock and Winnebago Counties, Iowa. Final Report: April 2009- October 2009. Prepared for NextEra Energy Resources, Juno Beach, Florida. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. June 2, 2010.

DeTect 2011. MERLIN Avian Radar Survey for the proposed Ocotillo Wind Project. Year 1 Data Report, September 15, 2010 to July 9, 2011. September 8, 2011. Prepared for Pattern Energy Group LP, Houston, Texas, USA. Prepared by DeTect, Inc., Panama City, Florida, USA.

Dudek. 2010. Draft Environmental Impact Report/Environmental Impact Statement for East County Substation, Tule Wind, and Energia Sierra Juarez Gen-Tie Projects. December.

Endangered Species Act (ESA). 1973. 16 United States Code § 1531-1544. December 28, 1973.

Enk, T., K. Bay, M. Sonnenberg, J. Baker, M. Kesterke, J. Boehrs, and A. Palochak. 2010. Biglow Canyon Wind Farm Phase I Post-Construction Avian and Bat Monitoring Second Annual Report, Sherman County, Oregon. January 26, 2009 - December 11, 2009. Prepared for Portland General Electric Company, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc.(WEST) Cheyenne, Wyoming, and Walla Walla, Washington. April 2010.

Enk, T., K. Bay, M. Sonnenberg, J. Flaig, J.R. Boehrs, and A. Palochak. 2011. Biglow Canyon Wind Farm Phase II, Sherman County, Oregon. Year 1 Post-Construction Avian and Bat Monitoring Report: September 10, 2009 - September 12, 2010. Prepared for Portland General Electric Company, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Walla Walla, Washington. January 7, 2011.

Enz, T. and K. Bay. 2010. Post-Construction Avian and Bat Fatality Monitoring Study, Tuolumne Wind Project, Klickitat County, Washington. Final Report: April 20, 2009 to April 7, 2010. Prepared for Turlock Irrigation District, Turlock, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. July 6, 2010.

Erickson, W., A. Chatfield, and K. Bay. 2009. Review of Avian Studies in the Tehachapi Wind Resource Area, Kern County, California. June 10.

Erickson, W.P., J. Jeffrey, K. Kronner, and K. Bay. 2004. Stateline Wind Project Wildlife Monitoring Annual Report. July 2001 - December 2003. Technical report peer-reviewed by and submitted to FPL Energy, the Oregon Energy Facility Siting Council, and the Stateline Technical Advisory Committee. Western EcoSystems Technology, Inc.(WEST), Cheyenne, Wyoming. December 2004.

Erickson, W.P., J. Jeffrey, and V.K. Poulton. 2008. Avian and Bat Monitoring: Year 1 Report. Puget Sound Energy Wild Horse Wind Project, Kittitas County, Washington. Prepared for Puget Sound Energy, Ellensburg, Washington, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. January 2008.

Erickson, W.P., G.D. Johnson, M.D. Strickland, and K. Kronner. 2000. Avian and Bat Mortality Associated with the Vansycle Wind Project, Umatilla County, Oregon: 1999 Study Year. Technical report prepared by WEST, Inc. for Umatilla County Department of Resource Services and Development, Pendleton, Oregon. 21pp. http://www.west-inc.com/reports/vansyclereportnet.pdf

Erickson, W.P., K. Kronner, and K.J. Bay. 2007. Stateline II Wind Project Wildlife Monitoring Report, January - December 2006. Technical report submitted to FPL Energy, the Oregon Energy Facility Siting Council, and the Stateline Technical Advisory Committee.

Erickson, W.P. and L. Sharp. 2005. Phase 1 and Phase 1a Avian Mortality Monitoring Report for 2004-2005 for the SMUD Solano Wind Project. Prepared for Sacramento Municipal Utility District (SMUD), Sacramento, California. Prepared by URS Sacramento, California and Western EcoSystems Technology, Inc. (WEST). August 2005.

Erickson, W.P., K. Kronner, and R. Gritski. 2003c. Nine Canyon Wind Power Project Avian and Bat Monitoring Report. September 2002 – August 2003. Prepared for the Nine Canyon Technical Advisory Committee and Energy Northwest by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Northwest Wildlife Consultants (NWC), Pendleton, Oregon. October 2003. http://www.west-inc.com/reports/nine_canyon_monitoring_final.pdf

Erickson, W., D. Young, G. Johnson, J. Jeffrey, K. Bay, R. Good, and H. Sawyer. 2003a. 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., 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. and L. Sharp. 2005. Phase 1 and Phase 1a Avian Mortality Monitoring Report for 2004-2005 for the Smud Solano Wind Project. Prepared for Sacramento Municipal Utility District (SMUD), Sacramento, California. Prepared by URS Sacramento, California and Western EcoSystems Technology, Inc. (WEST). August 2005.

Erickson, W.P., G.D. Johnson, D.P. Young, 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., 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, M.D. Strickland, D.P. Young, Jr., K.J. Sernka, and R.E. Good. 2001a. Avian Collisions with Wind Turbines: A Summary of Existing Studies and Comparisons to Other Sources of Bird Collision Mortality in the United States. National Wind Coordinating Collaborative (NWCC) Publication and Resource Document. Prepared for the NWCC by WEST, Inc., Cheyenne, Wyoming. August 2001. Available online at: http://www.nationalwind.org /assets/archive/Avian_Collisions_with_Wind_Turbines_-_A_Summary_of_Existing_Studies_and_ Comparisons_to_Other_Sources_of_Avian_Collision_Mortality_in_the_United_States__2001_.pdf

Executive Order 13186. 2001. Responsibilities of Federal Agencies to Protect Migratory Birds. 66 FR 3853. January 10, 2001.

Federal Register. 1974. 50 Code of Federal Regulations (Cfr) Part 22. Title 50 - Wildlife and Fisheries, Chapter I -United States Fish and Wildlife Service, Department of the Interior, Subchapter B - Taking, Possession, Transportation, Sale, Purchase, Barter, Exportation, and Importation of Wildlife and Plants, Part 22 - Eagle Permits. January 4, 1974, as amended.

Gritski, R., S. Downes, and K. Kronner. 2009. Klondike III (Phase 1) Wind Power Project Wildlife Monitoring Year One Summary, October 2007-October 2008. Prepared for Iberdrola Renewables, Portland, Oregon. Prepared by Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. April 3, 2009. Available online at: http://www.oregon.gov/ENERGY/SITING/docs/KWPWildlifeReport040309.pdf

Gritski, R. and K. Kronner. 2010a. Hay Canyon Wind Power Project Wildlife Monitoring Study: May 2009 - May 2010. Prepared for Iberdrola Renewables, Inc. (IRI) for the Hay Canyon Wind Power Project LLC. Prepared by Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. September 20, 2010.

Gritski, R. and K. Kronner. 2010b. Pebble Springs Wind Power Project Wildlife Monitoring Study: January 2009 - January 2010. Prepared for Iberdrola Renewables, Inc. (IRI), for the Pebble Springs Wind Power Project LLC and the Pebble Springs Technical Advisory Committee (TAC). Prepared by Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. April 20, 2010.

Gritski, R., K. Kronner, and S. Downes. 2008. Leaning Juniper Wind Power Project, 2006 − 2008. Wildlife Monitoring Final Report. Prepared for PacifiCorp Energy, Portland, Oregon. Prepared by Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. December 30, 2008.

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.

HELIX Environmental Planning, Inc (HELIX). 2010a. Ocotillo Wind Energy Project Raptor Migration Report. December 7.

HELIX Environmental Planning, Inc (HELIX). 2010b. Ocotillo Wind Energy Project, Avian Point Count Report. December 7.

HELIX Environmental Planning, Inc (HELIX). 2010c. Results of 2010 Burrowing Owl Surveys for the Ocotillo Wind Energy Project. December 9.

HELIX Environmental Planning, Inc. (HELIX). 2011. Ocotillo Wind Energy Project Raptor Migration Report. September 7.

Howell, J.A. and J. Noone. 1992. Examination of Avian Use and Mortality at a U.S. Windpower Wind Energy Development Site, Montezuma Hills, Solano County, California. Final Report to Solano County Department of Environmental Management, Fairfield, California. 41pp.

Huso, M. 2009. A Comparison of Estimators of Bat (and Bird) Fatality at Wind Power Generation Facilities. Presented at the National Wind Coordinating Collaborative (NWCC) Wildlife and Wind Research Meeting VII, October 28-29, 2008, Milwaukee, Wisconsin. Pre-Conference Session, October 27, 2008. Prepared for the NWCC by S.S. Schwartz. Published June 2009.

Insignia Environmental. 2009. 2008/2009 Annual Report for the Buena Vista Avian and Bat Monitoring Project. Prepared for Contra Costa County, Martinez, California. Prepared by Insignia Environmental, Palo Alto, California. September 4, 2009.

Jeffrey, J.D., K. Bay, W.P. Erickson, M. Sonneberg, J. Baker, M. Kesterke, J. Boehrs, and A. Palochak. 2009a. Portland General Electric Biglow Canyon Wind Farm Phase I Post-Construction Avian and Bat Monitoring First Annual Report, Sherman County, Oregon. January 2008 - December 2008. Technical report prepared for Portland General Electric Company, Portland, Oregon. Prepared by Western EcoSystems Technology (WEST) Inc., Cheyenne, Wyoming, and Walla Walla, Washington. April 29, 2009.

Jeffrey, J.D., W.P. Erickson, K. Bay, M. Sonneberg, J. Baker, J. Boehrs, and A. Palochak. 2009b. Horizon Wind Energy, Elkhorn Valley Wind Project, Post-Construction Avian and Bat Monitoring, First Annual Report, January-December 2008. Technical report prepared for Horizon Wind Energy, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc., Cheyenne, Wyoming, and Walla Walla, Washington.

Johnsgard, P.A. 1990. Hawks, Eagles, and Falcons of North America. Smithsonian Institute, Washington, D.C.

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 CH2MHILL, 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 CH2MHILL. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming.

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 CH2MHILL. 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 CH2MHILL, Englewood, Colorado. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming.

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., M.K. Perlik, W.P. Erickson, and M.D. Strickland. 2004. Bat Activity, Composition and Collision Mortality at a Large Wind Plant in Minnesota. Wildlife Society Bulletin 32(4): 1278-1288.

Johnson, G.D., W.P. Erickson, and J. White. 2003. Avian and Bat Mortality During the First Year of Operation at the Klondike Phase I Wind Project, Sherman County, Oregon. Technical report prepared for Northwestern Wind Power, Goldendale, Washington, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. March 2003. http://www.west-inc.com

Johnson, G.D., W.P. Erickson, M.D. Strickland, M.F. Shepherd, D.A. Shepherd, and S.A. Sarappo. 2002b. Collision Mortality of Local and Migrant Birds at a Large-Scale Wind-Power Development on Buffalo Ridge, Minnesota. Wildlife Society Bulletin 30(3): 879-887.

Johnson, G.D., W.P. Erickson, M.D. Strickland, M.F. Shepherd, and D.A. Shepherd. 2000a. Avian Monitoring Studies at the Buffalo Ridge Wind Resource Area, Minnesota: Results of a 4-Year Study. Final report prepared for Northern States Power Company, Minneapolis, Minnesota, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. September 22, 2000. 212 pp. http://www.west-inc.com

Johnson, G.D., D.P. Young, W.P. Erickson, C.E. Derby, M.D. Strickland, and R.E. Good. 2000b. 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/reports/fcr_final_baseline.pdf

Kemper, C. 1996. A Study of Bird Mortality at a West Central Wisconsin TV Tower from 1957-1995. The Passenger Pigeon 58: 219-235.

Kerlinger, P., R. Curry, L. Culp, A. Hasch, and A. Jain. 2010. Post-Construction Avian Monitoring Study for the Shiloh I Wind Power Project, Solano County, California. Final Report: October 2009. Third Year Report (Revised). Prepared for Iberdrola Renewables, Inc. (IRI). Prepared by Curry and Kilinger, LLC., McLean, Virginia.

Kerlinger, P., R. Curry, L. Culp, A. Jain, C. Wilkerson, B. Fischer, and A. Hasch. 2006. Post-Construction Avian and Bat Fatality Monitoring for the High Winds Wind Power Project, Solano County, California: Two Year Report. Prepared for High Winds LLC, FPL Energy by Curry and Kerlinger, LLC. April 2006.

Kerlinger, P. 2000. Avian Mortality at Communication Towers: A Review of the Recent Literature, Research, and Methodology. US Fish and Wildlife Service, Office of Migratory Bird Management. March 2000. Available online at: http://library.fws.gov/Pubs9/avian_mortality00.pdf

Kerns, J. and P. Kerlinger. 2004. A Study of Bird and Bat Collision Fatalities at the Mountaineer Wind Energy Center, Tucker County, West Virginia: Annual Report for 2003. Technical Report prepared for FPL Energy and Mountaineer Wind Energy Center Technical Review Committee. Curry and Kerlinger, LLC. 39 pp.

Kronner, K., R. Gritski, Z. Ruhlen, and T. Ruhlen. 2007. Leaning Juniper Phase I Wind Power Project, 2006-2007: Wildlife Monitoring Annual Report. Unpublished report prepared by Northwest Wildlife Consultants, Inc. for PacifiCorp Energy, Portland, Oregon.

Kronner, K., R. Gritski, and S. Downes. 2008. Big Horn Wind Power Project Wildlife Fatality Monitoring Study: 2006−2007. Final report prepared for PPM Energy and the Big Horn Wind Project Technical Advisory Committee by Northwest Wildlife Consultants, Inc. (NWC), Mid-Columbia Field Office, Goldendale, Washington. June 1, 2008.

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 CH2MHILL, Portland, Oregon by NWC, Pendleton, Oregon, and WEST, Inc., Cheyenne, Wyoming. November 3, 2005.

Leddy, K.L. 1996. Effects of Wind Turbines on Nongame Birds in Conservation Reserve Program Grasslands in Southwestern Minnesota. M.S. Thesis. South Dakota State University, Brookings. 61 pp.

Leddy, K.L., K.F. Higgins, and D.E. Naugle. 1999. Effects of Wind Turbines on Upland Nesting Birds in Conservation Reserve Program Grasslands. Wilson Bulletin 111(1): 100-104.

Longcore, T., C. Rich, and J. Sidney A. Gauthreaux. 2005. Scientific Basis to Establish Policy Regulating Communications Towers to Protect Migratory Birds: Response to Avatar Environmental, LLC, Report Regarding Migratory Bird Collisions with Communications Towers, WT Docket No. 03-187, Federal Communications Commission Notice of Inquiry. Prepared for American Bird Conservancy, Defenders of Wildlife, Forest Conservation Council, The Humane Society of the United States. February 14, 2005.

Madders, M. and D.P. Whitfield. 2006. Upland Raptors and the Assessment of Wind Farm Impacts. Ibis 148: 43-56.

Migratory Bird Treaty Act (MBTA). 1918. 16 United States Code § 703-712. July 13, 1918.

National Environmental Policy Act (NEPA). 1969. 42 United States Code § 4321-4347. January 1, 1970.

Northwest Wildlife Consultants, Inc. (NWC) and Western EcoSystems Technology, Inc. (WEST). 2007. Avian and Bat Monitoring Report for the Klondike II Wind Power Project. Sherman County, Oregon. Prepared for PPM Energy, Portland, Oregon. Managed and conducted by NWC, Pendleton, Oregon. Analysis conducted by WEST, Cheyenne, Wyoming. July 17, 2007.

Ocotillo Express LLC. 2012 (In Press). Golden Eagle Conservation Plan for the Ocotillo Wind Energy Facility. February 2012..

Parzen, E. (1962). "On estimation of a probability density function and mode". Annals of Mathematical Statistics 33: 1065–1076.

Piorkowski, M.D. and T.J. O'Connell. 2010. Spatial Pattern of Summer Bat Mortality from Collisions with Wind Turbines in Mixed-Grass Prairie. American Midland Naturalist 164: 260-269.

R Development Core Team (2011). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. ISBN 3-900051-07-0, URL http://www.R-project.org/.

Rahn Conservation Consulting. 2011. Bat Surveys for Ocotillo Wind Energy Project. January.

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

Thompson, J., D. Solick, and K. Bay. 2011. Post-Construction Fatality Surveys for the Dry Lake Phase I Wind Project. Iberdrola Renewables: September 2009 - November 2010. Prepared for Iberdrola Renewables, Portland, Oregon. Prepared by Western Ecosystems Technology, Inc. (WEST), Cheyenne, Wyoming. February 10, 2011.

TRC Environmental Corporation. 2008. Post-Construction Avian and Bat Fatality Monitoring and Grassland Bird Displacement Surveys at the Judith Gap Wind Energy Project, Wheatland County, Montana. Prepared for Judith Gap Energy, LLC, Chicago, Illinois. TRC Environmental Corporation, Laramie, Wyoming. TRC Project 51883-01 (112416). January 2008. http://www.newwest.net/pdfs/AvianBatFatalityMonitoring.pdf

Unitt, P.A. 2004. *San Diego County Bird Atlas*. Proceedings of the San Diego Society of Natural History, No. 39.

URS Corporation. 2010a. Final Marengo I Wind Project Year One Avian Mortality Monitoring Report. Prepared for PacifiCorp, Salt Lake City, Utah. Prepared by URS Corporation, Seattle, Washington. March 22, 2010.

URS Corporation. 2010b. Final Marengo II Wind Project Year One Avian Mortality Monitoring Report. Prepared for PacifiCorp, Salt Lake City, Utah. Prepared by URS Corporation, Seattle, Washington. March 22, 2010.

URS Corporation. 2010c. Final Marengo II Wind Project Year One Avian Mortality Monitoring Report. Prepared for PacifiCorp, Salt Lake City, Utah. Prepared by URS Corporation, Seattle, Washington. March 22, 2010.

US Fish and Wildlife Service (USFWS), Online. 2008. Usfws Threatened and Endangered Species System: Species Lists by State. Acessed June, 2008. USFWS Endangered Species Progam Homepage: http://www.fws.gov/endangered/ Species list by state: http://ecos.fws.gov/tess_public/StateListing.do?state=all

U.S. Fish and Wildlife Service. 2008. Birds of Conservation Concern 2008. United States Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, Virginia. 85 pp. [Online version available at <http://www.fws.gov/migratorybirds/>]

US Fish and Wildlife Service (USFWS). 2010a. Interim Guidelines for the Development of a Project Specific Avian and Bat Protection Plan for Wind Energy Facilities.

Usgaard, R.E., D.E. Naugle, R.G. Osborn, and K.F. Higgins. 1997. Effects of Wind Turbines on Nesting Raptors at Buffalo Ridge in Southwestern Minnesota. Proceedings of the South Dakota Academy of Science 76: 113-117.

Walker, D., M. McGrady, A. McCluskie, M. Madders, and D.R.A. McLeod. 2005. Resident Golden Eagle Ranging Behaviour before and after Construction of a Windfarm in Argyll. Scottish Birds 25: 24-40. http://www.natural-research.org/projects/documents/SB25-EAGLESDOC.pdf

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). 2008. Diablo Winds Wildlife Monitoring Progress Report: March 2005 – February 2007. Prepared by WEST, Cheyenne, Wyoming. August 2008.

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). 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). 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) 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.

Wildlife Research Institute, Inc. (WRI). 2011. Golden Eagle Surveys Surrounding the Ocotillo Express Wind Farm Project area in Imperial County, California. January.

Wind Turbine Guidelines Advisory Committee (WTGAC). 2010. Consensus Recommendations on Developing Effective Measures to Mitigate Impacts to Wildlife and Their Habitats Related to Land-Based Wind Energy Facilities. Prepared by Kearns and West for the US Department of the Interior (USDOI), Washington, D.C. WTGAC homepage available online at: http://www.fws.gov/habitatconservation/windpower/wind_turbine_advisory_committee.html; Recommendations to the Secretary of the Interior available online at: http://www.fws.gov/habitatconservation/windpower/Wind_Turbine_Guidelines_Advisory_Committee_Recommendations_Secretary.pdf

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, R.E. Good, M.D. Strickland, and G.D. Johnson. 2003c. Avian and Bat Mortality Associated with the Initial Phase of the Foote Creek Rim Windpower Project, Carbon County, Wyoming, Final Report, November 1998 - June 2002. Prepared for Pacificorp, Inc. Portland, Oregon, SeaWest Windpower Inc. San Diego, California, and Bureau of Land Management, Rawlins District Office, Rawlins, Wyoming.

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., W.P. Erickson, J. Jeffrey, and V.K. Poulton. 2007a. Puget Sound Energy Hopkins Ridge Wind Project Phase 1 Post-Construction Avian and Bat Monitoring First Annual Report, January - December 2006. Technical report for Puget Sound Energy, Dayton, Washington and Hopkins Ridge Wind Project Technical Advisory Committee, Columbia County, Washington. Western EcoSystems Technology, Inc. (WEST) Cheyenne, Wyoming, and Walla Walla, Washington. 25 pp.

Young, D.P. Jr., J. Jeffrey, W.P. Erickson, K. Bay, and V.K. Poulton. 2006. Eurus Combine Hills Turbine Ranch. Phase 1 Post Construction Wildlife Monitoring First Annual Report. Technical report prepared for Eurus Energy America Corporation, San Diego, California, and the Combine Hills Technical Advisory Committee, Umatilla County, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon.

Young, D.P., Jr., J.D. Jeffrey, K. Bay, and W.P. Erickson. 2009. Puget Sound Energy Hopkins Ridge Wind Project, Phase 1, Columbia County, Washington. Post-Construction Avian and Bat Monitoring, Second Annual Report: January - December, 2008. Prepared for Puget Sound Energy, Dayton, Washington, and the Hopkins Ridge Wind Project Technical Advisory Committee, Columbia County, Washington. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Walla Walla, Washington. May 20, 2009.

Appendix A: Sensitive Species with the Potential to Occur in Imperial County, California.

Appendix A. Sensitive species protected under the Federal or California Endangered Species Act, species listed as sensitive by the Bureau of Land Management, and USFWS Birds of Conservation Concern that have potential to occur within Imperial County, California.

Common Name	Scientific Name	Status*	Habitat	Likelihood in Project Area
Birds				
Arizona bell's vireo	*Vireo bellii arizonae*	SE; BLM:S; BCC	Inhabits low, dense riparian growth along water or along dry parts of intermittent streams. Typically associated with willow, cottonwood, baccharis, wild blackberry, or mesquite in desert localities.	Unlikely due to the lack of riparian areas and wetlands
bald eagle	*Haliaeetus leucocephalus*	SE; BLM:S; BCC	Requires large bodies or free flowing rivers with adjacent perches. Roosts in dense, sheltered conifer stands.	Unlikely due to the lack of suitable habitat.
Bendire's thrasher	*Toxostoma bendirei*	BLM:S; BCC	Flat areas of desert shrub and Joshua tree habitats. Primarily occurs in San Bernardino and Kern Counties.	Unlikely to occur in the project area based on range maps.
black-chinned sparrow	*Spizella atrogularis*	BCC	Breeds and forages in open to moderately dense chaparral and similar brushy habitats; often on arid, south-facing slopes with ceanothus, manzanita, sagebrush, chamise.	Possible
black skimmer	*Rynchops niger*	BCC	Requires shallow, calm water for foraging, and sand bars, beaches, or dikes for roosting and nesting.	Unlikely due to the lack of suitable habitat
brown pelican	*Pelecanus occidentalis*	BLM:S	Rare to uncommon on the Salton Sea. Generally found in estuarine, marine subtidal, and marine pelagic waters.	Unlikely due to lack of suitable habitat.
burrowing owl	*Athene cunicularia*	BLM:S; SSC; BCC	Open, dry grassland and desert habitats, and in grass, forb, and open shrub stages of pinyon-juniper and ponderosa pine habitats; uses rodent or other burrow for roosting and nesting cover.	Known to occur in the OWEF.
California black rail	*Laterallus jamaicensis coturniculus*	ST; BLM:S; BCC	Dependent upon upper zones of saline emergent wetlands and brackish fresh emergent wetlands.	Unlikely due to the lack of riparian areas and wetlands
Costa's hummingbird	*Calypte costae*	BCC	Occurs primarily in arid scrub and chaparral habitats and in riparian edge.	Known to occur in the OWEF
elf owl	*Micrathene whitneyi*	SE; BLM:S; BCC	Occupies desert riparian habitat of moderate to open canopy, often with a moderate to sparse shrub understory, and typically bordering desert wash, desert scrub, or grassland habitats. Taller trees with a shrub understory seem to be required	Unlikely due to the lack of riparian areas and wetlands
Gila woodpecker	*Melanerpes uropygialis*	SE; BLM:S; BCC	Groves of riparian trees, planted shade trees, and date palm orchards; Formerly found in farm and ranchyards throughout the Imperial Valley, but most regularly now near Brawley.	Unlikely due to the lack of riparian areas and wetlands

Appendix A. Sensitive species protected under the Federal or California Endangered Species Act, species listed as sensitive by the Bureau of Land Management, and USFWS Birds of Conservation Concern that have potential to occur within Imperial County, California.

Common Name	Scientific Name	Status*	Habitat	Likelihood in Project Area
gilded flicker	*Colaptes chrysoides*	SE; BLM:S; BCC	Desert riparian woodlands and giant cactus forests with snags for nest cavities; trees, shrubs, nest, and roost cavities provide cover. Frequents riparian, desert wash, and other habitats with Joshua trees or saguaro cactus.	Occurs in the Colorado River Valley in southeastern California in desert riparian, desert wash, and Joshua tree habitats.
golden eagle**	*Aquila chrysaetos*	BLM:S	Typically utilizes rolling foothills, mountainous areas, sage-juniper flats, and desert habitat. Cliffs with overhanging ledges and large trees used for cover.	Known to occur in the project area
gray vireo	*Vireo vicinior*	BLM:S; BCC	Arid chaparral habitats in the mountains of southern California.	Unlikely to occur in the project area, but occurs in adjacent counties.
greater sandhill crane	*Grus canadensis tabida*	ST; BLM:S	Occurs near wet meadow, shallow lacustrine, and fresh emergent wetlands	Unlikely to occur due to the lack of suitable habitat.
gull-billed tern	*Gelochelidon nilotica*	BCC	Prefers sandy beaches for nesting, and forages over shallow waters, mudflats, grasslands, and croplands	Unlikely to occur due to lack of suitable habitat
Inyo California towhee	*Pipilo crissalis eremophilus*	FT; SE	Foothills and lowlands, as well as open chaparral and coastal scrub, brushland patches in open riparian habitat, hardwood, cropland, and urban. Edge species of densely vegetated habitats.	Unlikely to occur in the OWEF. Occurs only in the Argus Mountains of Inyo County.
Laurence's goldfinch	*Carduelis lawrencei*	BCC	Typical habitats include valley foothill hardwood, valley foothill hardwood-conifer, and, in southern California, desert riparian, palm oasis, pinyon-juniper, and lower montane habitats. Nearby herbaceous habitats often used for feeding.	Unlikely to occur due to lack of suitable habitat
least Bell's vireo	*Vireo bellii pusillus*	FE;SE; BCC	Early successional riparian areas, brushy fields, young forest or woodland, coastal chaparral and mesquite brushlands; often near water in arid regions.	Unlikely due to the lack of riparian areas and wetlands
least bittern	*Ixobrychus exilis*	BCC	Southern California common summer resident at Salton Sea and Colorado River, in dense emergent wetlands near sources of freshwater, and in desert riparian	Unlikely to occur due to lack of suitable habitat
long-billed curlew	*Numenius americanus*	BCC	Upland shortgrass prairies and wet meadows are used for nesting; coastal	Unlikely to occur due

Appendix A. Sensitive species protected under the Federal or California Endangered Species Act, species listed as sensitive by the Bureau of Land Management, and USFWS Birds of Conservation Concern that have potential to occur within Imperial County, California.

Common Name	Scientific Name	Status*	Habitat	Likelihood in Project Area
			estuaries, open grasslands, and croplands are used in winter.	to lack of suitable habitat
Lucy's warbler	*Oreothlypis luciae*	BLM:S; SSC; BCC	Frequents open to dense thickets of mesquite and other trees and shrubs in desert wash and desert riparian habitats.	An uncommon to common, summer resident and breeder along the Colorado River, fairly common locally in a few other desert areas, and rare near Salton Sea.
marbled godwit	*Limosa fedoa*	BCC	Estuaries, Common along CA coast, uncommon in interior, except at Salton Sea	Unlikely to occur due to lack of suitable habitat
mountain plover	*Charadrius montanus*	BLM:S; SSC; BCC	Winter resident found in foothill valleys west of San Joaquin Valley and Imperial Valley; frequents open plains with low, herbaceous or scattered shrub vegetation.	Some potential to occur in the project area.
peregrine falcon	*Falco peregrines*	BCC	Frequents bodies of water in open areas with cliffs and canyons nearby for cover and nesting.	Recorded incidentally within the OWEF. Although the OWEF generally lacks suitable habitat
prairie falcon	*Falco mexicanus*	BCC	Uses open terrain for foraging; nests in open terrain with canyons, cliffs, escarpments, and rock outcrops. Distributed from annual grasslands to alpine meadows, but associated primarily with perennial grasslands, savannahs, rangeland, some agricultural fields, and desert scrub areas.	Known to occur within the OWEF.
red knot	*Calidris canutus*	BCC	Coastal Estuaries	Unlikely due to lack of habitat
rufous-winged sparrow	*Peucaea carpalis*	BCC	South-central Arizona	Unlikely due to species range.
San Joaquin Le Conte's thrasher	*Toxostoma lecontei macmillanorum*	BLM:S; SSC; BCC	Frequents desert washes and flats with scattered shrubs and large areas of open, sandy, or alkaline terrain in desert wash, desert scrub, alkali desert scrub, and desert succulent shrub habitats.	Le Conte's thrasher identified within the OWEF
snowy plover	*Charadrius nivosus*	BCC	Nests, feeds, and takes cover on sandy or gravelly beaches along the coast, on estuarine salt ponds, alkali lakes, and at the Salton Sea.	Unlikely due to the lack of suitable habitat
southwestern	*Empidonax traillii*	FE;SE	Requires dense riparian habitats for	Unlikely due to the

Appendix A. Sensitive species protected under the Federal or California Endangered Species Act, species listed as sensitive by the Bureau of Land Management, and USFWS Birds of Conservation Concern that have potential to occur within Imperial County, California.

Common Name	Scientific Name	Status*	Habitat	Likelihood in Project Area
willow flycatcher	*extimus*		nesting. Saturated soils, standing water, streams, pools required for breeding. Summer breeding in US only.	lack of wetlands in the OWEF
Swainson's hawk	*Buteo Swainsoni*	ST(B); BLM:S	Breeds in stands with few trees in juniper-sage flats, riparian areas, and in oak savannah and forages in adjacent grasslands or suitable grain or alfalfa fields, or livestock pastures. Mostly limited to spring and fall transient in southern California.	Breeding pairs unlikely to occur in the OWEF.
tricolored blackbird	*Agelaius tricolor*	BLMS; SCC	Breeds near fresh water, preferably in emergent wetlands with tall, dense cattail or tules. Feeds in grassland and cropland habitats.	Some potential to occur in the OWEF.
western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	FC;SE; BCC	Inhabits extensive deciduous riparian thickets or forests with dense, low-level or understory foliage, which abut on slow-moving watercourses, backwaters, or seeps. Willow almost always a dominant component of the vegetation.	Unlikely due to the lack of riparian areas and wetlands
whimbrel	*Numenius phaeopus*	BCC	On the coast, forages on rocky intertidal and sandy beach marine habitats, on the intertidal mudflats of estuarine habitats, and on wet meadow and pasture habitats adjacent to the immediate coast. Occasionally forages on lawns or golf courses. Inland, prefers flooded fields, wet meadows, croplands and the margins of riverine and lacustrine habitats	Unlikely due to lack of suitable habitat
white-tailed kite	*Elanus leucurus*	BLM:S; FP	Uses herbaceous lowlands with variable tree growth and dense population of voles; Substantial groves of dense, broad-leafed deciduous trees used for nesting and roosting	Unlikely due to the lack of suitable habitat
yellow warbler	*Sonorana spp*	BCC	Winters in Imperial and Colorado river valleys. Frequents open to medium-density woodlands and forests with a heavy brush understory in breeding season. In migration, found in a variety of sparse to dense woodland and forest habitats.	Known to occur within the OWEF
Yuma clapper rail	*Rallus longirostris yumanensis*	FE;ST	Freshwater marshes dominated by cattail or bulrush that provide both vegetated and shallow open water areas	Unlikely due to the lack of wetland habitat
Bats				
California leaf-nosed bat	*Macrotus californicus*	SSC; BLM:S	Roosts in rocky, rugged terrain with mines and caves. Forages over nearby	Some potential to occur in the project

Appendix A. Sensitive species protected under the Federal or California Endangered Species Act, species listed as sensitive by the Bureau of Land Management, and USFWS Birds of Conservation Concern that have potential to occur within Imperial County, California.

Common Name	Scientific Name	Status*	Habitat	Likelihood in Project Area
			flats and washes; Habitats occupied include desert riparian, desert wash, desert scrub, desert succulent shrub, alkali desert scrub, and palm oasis. Can go extended periods of time (~6wks) without water.	area.
cave myotis	*Myotis velifer*	SSC; BLM:S	Feeds along riparian vegetation, over water, between patches of riparian vegetation, and to a lesser extent over open areas. Habitats occupied in California include desert scrub, desert succulent shrub, desert wash, and desert riparian. Water probably required; A colonial cave-dweller but temporary night roosts used.	Some potential to occur in the project area. However, less likely due to water requirements.
fringed myotis	*Myotis thysanodes*	BLM:S	Wide variety of habitats, with optimally habitat being pinyon-juniper, valley foothill hardwood and hardwood conifer. Roosts in caves, mines, buildings and crevices. Feeds over water, open habitats, and gleans foliage.	Unlikely to occur in the project area based on range maps.
long-eared myotis	*Myotis evotis*	BLM:S	Found in brush, woodland, and forest habitats, but prefers coniferous woodlands and forests. Avoids hot arid regions. Roosts in buildings, crevices, under bard, and in snags. Forages among trees, over water, and over shrubs.	Unlikely to occur in the project area based on range maps.
pallid bat	*Antrozous pallidus*	SSC; BLM:S	A wide variety of habitats, including grasslands, shrublands, woodlands, and forests from sea level up through mixed conifer forests. The species is most common in open, dry habitats with rocky areas for roosting.	Potential to occur in the project area.
spotted bat	*Euderma maculatum*	BLM:S; SSC	Habitats include arid deserts, grasslands and mixed conifer forests; prefers sites with roosting habitat. Feeds over water and along washes. May move from forests to lowlands in autumn.	Some potential to occur in the project area.
Townsend's big-eared bat	*Corynorhinus townsendii*	SSC; BLM:S	Prefers mesic habitats. Gleans from brush or trees or feeds along habitat edges.	Some potential to occur in the project area.

Appendix A. Sensitive species protected under the Federal or California Endangered Species Act, species listed as sensitive by the Bureau of Land Management, and USFWS Birds of Conservation Concern that have potential to occur within Imperial County, California.

Common Name	Scientific Name	Status*	Habitat	Likelihood in Project Area
western mastiff bat	*Eumops perotis californicus*	SSC; BLM:S	Most frequently encountered in broad open areas. Generally, this bat is found in a variety of habitats, from dry desert washes, flood plains, chaparral, oak woodland, open ponderosa pine forest, grassland, montane meadows, and agricultural areas.	Known to occur in the project area.
western small-footed myotis	*Myotis ciliolabrum*	BLM:S	Arid, upland habitats. It prefers open stands in forests and woodlands as well as brushy habitats. Streams, ponds, springs, and stock tanks are used for drinking and feeding. This species requires water	Unlikely due to the lack of wetland habitat
Yuma myotis	*Myotis yumanensis*	BLM:S	Distribution is closely tied to bodies of water, which it uses as foraging sites and sources of drinking water. Open forests and woodlands are optimal habitat.	Unlikely due to the lack of wetland habitat

*FE=federally endangered (USFWS 2008);
BLM:S=Bureau of Land Management sensitive species (BLM 2006);
SE=Endangered under the California Endangered Species Act (CDFG 2011);
ST=Threatened under the California Endangered Species Act (CDFG 2011);
ST(B)=Breeding population listed as threatened under the California Endangered Species Act (CDFG 2011);
SSC=California Species of Special Concern species by the California Department of Fish and Game (CDFG 2011).
BCC=USFWS Birds of Conservation Concern in Bird Conservation Region 33 (USFWS 2008)
Source of habitat information: All About Birds website
** discussed in detail in the Eagle Conservation Plan

Appendix B: Mortality Tracking Spreadsheets.

Bird Mortality

Location: ___________________
Turbine number
should add types of towers (e.g., lattice or tubular)

Date: ________________
in a form appropriate for sorting in the database software (i.e., 021496)

Start time: ___________
24-hour clock

Weather
Temperature: _________°C

Precipitation: ________________
Record as N (none), L (light), M (moderate), H (heavy), F (fog)

Snow cover: __________% ground covered

Observer: ___________________
initials

Primary data

Species: ___________________________
4-letter code

Sex: M or F; unknown

Age: ____
Adult, immature (be as specific as possible)

Dead: Y or N

Estimated time since death: ___________________
in days

Description of bird (e.g., broken or missing body parts): ____

Disposition of bird: ____

Distance of carcass from turbine: _______m

Notes on bird: ____
(e.g., condition and location)

MORTALITY/INJURY STUDY 1996
Field Data Sheet with Variables

(CEC 1/10/96)

Check1___ Comp____
Check2___ Map____
Spp. List___

CODE

_____ **Rec.#**: Record Number: sequential number starting with 001.(Will be assigned outside of field.)

_____ **Date**: Date bird discovered: month/day

_____ **Comp.**:Company/Area:
100 = Zond
110 = near Zond/Zond side of Cameron Rd.
120 = between TWS Rd.& Zond - West of Zond
200 = Cannon
210 = near Cannon/Cannon side of Cameron Rd
220 = area between Cannon & Sea West
300 = Sea West
310 = near Sea West
400 = FloWind

_____ **Trans#**: Transect Number or "0" for not applicable.

_____ **Subloc.**: Sublocation Number or "0" for not applicable.

_____ **Obs.**: Observer:
1 = Dick Anderson
2 = Natasha Neumann
3 = Jennifer Noone
4 = Judy Tom
5= Michele Disney
6= John Cleckler

_____ **Spp.**: Species: the 4-letter acronym for the species of bird found dead.

_____ **Age**:
1 = unknown 2 = immature 3 = adult

_____ **Sex**:
1 = unknown 2 = female 3 = male

_____ **Time**: Estimated time since death:
1 = undetermined
2 = fresh kill - < 2 days old
3 = few days - maggots starting to appear
4 = 1 week - maggots over entire body
5 = 2 week - flesh at least half gone
6 = 1 month - no flesh left, just bones and feathers
7 = over 6 months - bones and feathers disassembled
8 = bird alive - not applicable
9 = status unknown - not applicable

_____ **Cause**: Cause of Death or Injury
1 = unknown
2 = collission with turbine
3 = collission with wire
4 = electrocution
5 = other - explain in comments
6 = not applicable (ie.one feather)

* If bird/feather(s) found in association with a predator/scavenger den (ie. coyote, kit fox) or raptor nest, exclude from study. But be sure to include in an incidental observation report. Make sure to document in mort. rec. only if feather is of resident nester.

CODE

_____ **Certain.**: Degree of certainty for cause of death/injury.

1	2	3	4	5
low				high

6 = not applicable

_____ **Cond.**: Condition (also describe in detail in comments)
1 = dead
2 = alive
3 = unknown - not applicable

_____ **Injur.**: Injuries (For both dead and alive birds)(Can include more than one code)
1 = no obvious signs
2 = wing sheared off
3 = head sheared off
4 = feet sheared off
5 = body sheared in half
6 = multiple dimemberment
7 = broken wing bone
8 = broken neck bone
9 = broken leg bone
10 = injury to wing
11 = injury to legs
12 = injury to eyes
13 = injury to body
14 = injury to head
15 = feather damage
16 = body and feathers intact
17 = feathers and body disassembled
18 = just feathers
19 = just bones
20 = just feathers and bones
23 = wing only
24 = electric burns on feet
25 = electric burns on wings
26 = internal injuries
27 = impact, then continued on
28 = stunned
29 = entangled in wires
30 = other - describe in comments
100 = unknown status - no indication of injury/mortality (ie.single feather; feather(s)of same species found within 1 sublocation.)
200 = unknown status of bird found outside of sublocation (ie. feather found only)
200 + code = injury of bird found outside of sublocation.

_____ **Collected**: Was the bird collected?
1 = collected
2 = not collected
3 = partially collected (ie.few feathers)

_____ **Mx.Dt.**: Maximum Distance(m)at which bird/bird part/feather could be observed: Refer to feather closest to turbine
1 = <0.5m
2 = 0.5m - 1m
3 = 1.1m - 5m
4 = 5.1m - 10m
5 = >10m

(MORE ON BACK)

RECORD OF DEAD BIRDS - SCAVENGING STUDY # ___ ___ ___ 1996

Date: ________ Obs: _______ [chicken spp. not included in this list] *(CEC 12/12/95)*

Size: 1 = small (ie. sparrow); 2 = medium (ie. dove, kestral); 3 = large (ie.raven, hawk,) Cond(ition): 1 = fresh; 2 = old

Band#	Spp.	Size	Cond.	Band#	Spp.	Size	Cond.	Band#	Spp.	Size	Cond.

___ ___ ___ scavenging study #

SCAVENGING STUDY 1996

Company/Area ________ (c)___ OBS ____________ (c)___

pg — of —

heck 1 ☐
mp ☐
heck 2 ☐

Date														
Time	am	pm	am	pm	am	pm	am	pm	am	pm	am	pm	am	pm
Temp.														
Wind														
Cloud														
Precip.														
Fog														
Moon														

SITE#:	Time														
Spp: ____	Cond.														
Size: ____	Comments:														
Bd#: ____															

SITE#:	Time														
Spp: ____	Cond.														
Size: ____	Comments:														
Bd#: ____															

SITE#:	Time														
Spp: ____	Cond.														
Size: ____	Comments:														
Bd#: ____															

SITE#:	Time														
Spp: ____	Cond.														
Size: ____	Comments:														
Bd#: ____															

SITE#:	Time														
Spp: ____	Cond.														
Size: ____	Comments:														
Bd#: ____															

OBSERVER BIAS STUDY
1996

DATE:____ / ____ OSERVER:_________ (c) ___

NCom. Type:_____ (c) _____ SITE #:_____

ORDER: 1st 2nd 3rd

COMPANY:_________ (c) _____ TIME: Start ______ End ______

Bird Mortality Sign Description (small = ≤ 8 in.; large = > 8 in.)
Distance at which sign was first observed

	sm	lg	dist.
1.			
2.			
3.			
4.			
5.			
6.			

	sm	lg	dist.
7.			
8.			
9.			

	sm	lg	dist.
10			
11			
12