Oregon

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To:	Energy Facility Siting Council
From:	Duane Kilsdonk
Date:	May 24, 2018
Re:	Klondike III Wind Project – Annual Monitoring for Wildlife Monitoring and Mitigation Plan (Condition 95)

Klondike III Wind Project is a wind energy generation facility consisting of 176 wind turbines, with a peak generating capacity of 300 megawatts (MW). The facility is located in Sherman County, approximately 4 miles east of the town of Wasco and 5 miles south of the Columbia River. The Council issued a site certificate for the facility in 2006.

Condition 95 of the site certificate states that, "The certificate shall conduct wildlife monitoring as described in the Wildlife Monitoring and Mitigation Plan (WMMP) that is incorporated in the Final Order on the Application as Attachment A and as amended from time to time."

The WMMP requires that the certificate holder implement the following components:

1) Fatality Monitoring Program
2) Raptor Nesting Surveys
3) Avian Use Surveys
4) Wildlife Reporting and Handling System

The monitoring activities during 2017 for this facility include Raptor Nesting Surveys and the ongoing wildlife reporting and handling system. The Fatality Monitoring Program and Avian Use Surveys were short-term monitoring activities and have been completed. Raptor nesting surveys are required to be completed for the life of the facility, on a 5-year cycle. The next raptor nesting survey will be completed in 2022.

Section 5 of the WMMP, Data Reporting, establishes an opportunity for the public to review and comment on monitoring results. Specifically the WMMP states, "The public will have an opportunity to receive information about monitoring results and to offer comment. Within 30 days after receiving the annual report of monitoring results, the Department will make the report available to the public on its website and will specify a time in which the public may submit comments to the Department."

The Department received the annual monitoring results for the facility on April 26, 2018. In accordance with the terms of the WMMP, the Department provides a copy of the 2017 monitoring results for the Klondike III Wind Project to the Council for review (attached) and posted a copy to the Department's project website at: http://www.oregon.gov/energy/facilities-safety/facilities/Pages/KWP.aspx and has established 30-day timeframe to accept public comments.

Comments are due within 30-days after the conclusion of the upcoming June 29th Energy Siting Council meeting. Comments are due July 29, 2018 at 5pm and may be summited to Duane Kilsdonk at duane.kilsdonk@oregon.gov

Attachments: Wildlife Monitoring and Mitigation Plan (August 24, 2012)
2016 Wildlife Monitoring Report

Klondike III Wind Project: Wildlife Monitoring and Mitigation Plan

[REVISED AUGUST 24, 2012]

This plan describes wildlife monitoring that the certificate holder shall conduct during operation of the Klondike III Wind Project (KWP).[1] The monitoring objectives are to determine whether the facility causes significant fatalities of birds and bats and to determine whether the facility results in a loss of habitat quality. The KWP facility consists of up to 208 wind turbines, three non-guyed meteorological towers and other related or supporting facilities as described in the site certificate. The certificate holder completed construction of 124 turbines authorized under the Second Amended Site Certificate in October 2007.

The certificate holder shall use experienced personnel to manage the monitoring required under this plan and properly trained personnel to conduct the monitoring, subject to approval by the Oregon Department of Energy (Department) as to professional qualifications. For all components of this plan except PPM Energy's Klondike III Wind Project Wildlife Reporting and Handling System, the certificate holder shall hire an independent third party (not employees of the certificate holder) to perform monitoring tasks.

The Wildlife Monitoring and Mitigation Plan for the Klondike III Wind Project has the following components:

1) Fatality monitoring program including:
    a) Removal trials
    b) Searcher efficiency trials
    c) Fatality search protocol
    d) Statistical analysis
2) Raptor nesting surveys
3) Avian use surveys
4) PPM Energy's Klondike III Wind Project Wildlife Reporting and Handling System

Following is a discussion of the components of the monitoring plan, statistical analysis methods for fatality data, data reporting and potential mitigation.

The selection of the mitigation actions that the certificate holder may be required to implement under this plan should allow for flexibility in creating appropriate responses to monitoring results that cannot be known in advance. If the Department determines that mitigation is needed, the certificate holder shall propose appropriate mitigation actions to the Department and shall carry out mitigation actions approved by the Department, subject to review by the Oregon Energy Facility Council (Council).

[1] This plan is incorporated by reference in the site certificate for the KWP and must be understood in that context. It is not a "stand-alone" document. This plan does not contain all mitigation required of the certificate holder.

1. Fatality Monitoring

(a) Definitions and Methods

Seasons

This plan uses the following dates for defining seasons:

Season	Dates
Spring Migration	March 16 to May 15
Summer/Breeding	May 16 to August 15
Fall Migration	August 16 to October 31
Winter	November 1 to March 15

Search Plots

The certificate holder shall conduct fatality monitoring within search plots. The certificate holder, in consultation with the Oregon Department of Fish and Wildlife (ODFW), shall select search plots based on a systematic sampling design that ensures that the selected search plots are representative of the habitat conditions in different parts of the site. Each search plot will contain one turbine. Search plots will be square or circular. Circular search plots will be centered on the turbine location and will have a radius equal to the maximum blade tip height of the turbine contained within the plot. "Maximum blade tip height" is the turbine hub-height plus one-half the rotor diameter. Square search plots will be of sufficient size to contain a circular search plot as described above. The certificate holder shall provide maps of the search plots to the Department before beginning fatality monitoring at the facility. The certificate holder shall use the same search plots for each search conducted during a monitoring year.

Scheduling

In each monitoring year, the certificate holder shall conduct fatality monitoring searches at the rates of frequency shown below. Over the course of one monitoring year, the certificate holder would conduct 16 searches, as follows:

Season	Frequency
Spring Migration	2 searches per month (4 searches)
Summer/Breeding	1 search per month (3 searches)
Fall Migration	2 searches per month (5 searches)
Winter	1 search per month (4 searches)

For the 124 turbines built as of October 2007, the certificate holder shall conduct fatality monitoring for two years (32 searches), beginning November 1, 2007. For turbines built after October 2007 (up to 84 turbines), the certificate holder shall conduct fatality monitoring for two years (32 searches) beginning one month after the start of commercial operation of those turbines.

Sample Size

The sample size for fatality monitoring is the number of turbines searched per monitoring year for each phase of construction. Phase 1 consists of turbines built as of October 2007; Phase 2 consists of turbines built after October 2007. During each monitoring year, the certificate

holder shall search a minimum of one-third of the total number of turbines that are built in the applicable phase.

As described in the site certificate, the certificate holder may choose to build the KWP using turbine types in two size classes:

- Small: turbines having a rotor diameter of 82 meters or less
- Large: turbines having a rotor diameter greater than 82 meters

If the final design of the KWP includes both small and large turbines, the certificate holder shall, at a minimum, sample one-third of the total number of turbines in each monitoring year for each phase of construction. Before beginning fatality monitoring, the certificate holder shall consult with an independent expert with experience in statistical analysis of avian fatality data to determine whether it would be possible to sample a sufficient number of the KWP turbines in each size class to allow a statistical comparison of fatality rates for all birds as a group. The certificate holder shall submit the expert's written conclusions to the Department. If sampling of one-third of the total number of all turbines per phase in each monitoring year would provide a sufficient number of turbines in each size class to allow the comparison, the certificate holder will sample the appropriate number of turbines from each class and conduct the analysis. The certificate holder may choose to sample more than one-third of the total number of all turbines in each monitoring year for each phase of construction to allow the comparison.

(b) Removal Trials

The objective of the removal trials is to estimate the length of time avian and bat carcasses remain in the search area. Carcass removal studies will be conducted during each season in the vicinity of the search plots. Estimates of carcass removal rates will be used to adjust carcass counts for removal bias. "Carcass removal" is the disappearance of a carcass from the search area due to predation, scavenging or other means such as farming activity. Removal rates will be estimated by habitat and season.

The certificate holder shall conduct carcass removal trials within each of the seasons defined above during the years in which fatality monitoring occurs. During the first year in which fatality monitoring occurs, the certificate holder shall conduct one removal trial per season (four removal trials per year). For each trial, at least 10 small bird carcasses and at least 10 large bird carcasses will be distributed throughout the project area (approximately 80 trial carcasses per year).

Before beginning removal trials for the second year of fatality monitoring, the certificate holder shall report the results of the first year removal trials to the Department and ODFW. In the report, the certificate holder shall analyze whether four removal trials per year, as described above, provides sufficient data to accurately estimate adjustment factors for carcass removal. The number of removal trials for the second year of fatality monitoring may be adjusted up or down, subject to the approval of the Department.

The "small bird" size class will use carcasses of house sparrows, starlings, commercially available game bird chicks or legally obtained native birds to simulate passerines. The "large bird" size class will use carcasses of raptors provided by agencies, commercially available adult game birds or cryptically colored chickens to simulate raptors, game birds and waterfowl. If fresh bat carcasses are available, they may also be used.

To avoid confusion with turbine-related fatalities, planted carcasses will not be placed in fatality monitoring search plots. Planted carcasses will be placed in the vicinity of search plots but not so near as to attract scavengers to the search plots. The planted carcasses will be located randomly within the carcass removal trial plots.

Carcasses will be placed in a variety of postures to simulate a range of conditions. For example, birds will be: 1) placed in an exposed posture (e.g., thrown over the shoulder), 2) hidden to simulate a crippled bird (e.g., placed beneath a shrub or tuft of grass) and, 3) partially hidden. Trial carcasses will be marked discreetly for recognition by searchers and other personnel. Trial carcasses will be left at the location until the end of the carcass removal trial.

It is expected that carcasses will be checked as follows, although actual intervals may vary. Carcasses will be checked for a period of 40 days to determine removal rates. They will be checked approximately every day for the first 4 days, and then on day 7, day 10, day 14, day 20, day 30 and day 40. This schedule may vary depending on weather and coordination with the other survey work. At the end of the 40-day period, the trial carcasses and scattered feathers will be removed.

(c) Searcher Efficiency Trials

The objective of searcher efficiency trials is to estimate the percentage of bird and bat fatalities that searchers are able to find. The certificate holder shall conduct searcher efficiency trials on the fatality monitoring search plots in both grassland/shrub-steppe and cultivated agriculture habitat types. Searcher efficiency will be estimated by size class, habitat type and season. A pooled estimate of searcher efficiency will be used to adjust carcass counts for detection bias.

The certificate holder shall conduct searcher efficiency trials within each of the seasons defined above during the years in which the fatality monitoring occurs. During each season of the years in which fatality monitoring occurs, the certificate holder shall use approximately 25 carcasses for searcher efficiency trials (approximately 100 carcasses per year). The certificate holder shall vary the number of trials per season and the number of carcasses per trial so that the searchers will not know the total number of trial carcasses being used in any trial. The certificate holder shall distribute trial carcasses in varied habitat in rough proportion to the habitat types within the facility site. During each season, both small bird and large bird carcasses will be used in approximately equal numbers. "Small bird" and "large bird" size classes and carcass selection are as described above for the removal trials.

Before beginning searcher efficiency trials for the second year of fatality monitoring, the certificate holder shall report the results of the first year efficiency trials to the Department and ODFW. In the report, the certificate holder shall analyze whether the efficiency trials as described above (using approximately 100 carcasses per year) provides sufficient data to accurately estimate adjustment factors for carcass removal. The number of removal trials for the second year of fatality monitoring may be adjusted up or down, subject to the approval of the Department.

Personnel conducting searches will not know in advance when trials are conducted; nor will they know the location of the trial carcasses. If suitable trial carcasses are available, trials during the fall season will include several small brown birds to simulate bat carcasses. Legally obtained bat carcasses will be used if available.

On the day of a standardized fatality monitoring search (described below) but before the beginning of the search, efficiency trial carcasses will be placed at random locations within areas to be searched. If scavengers appear attracted by placement of carcasses, the carcasses will be distributed before dawn.

Efficiency trials will be spread over the entire season to incorporate effects of varying weather and vegetation growth. Carcasses will be placed in a variety of postures to simulate a range of conditions. For example, birds will be: 1) placed in an exposed posture (thrown over the shoulder), 2) hidden to simulate a crippled bird and 3) partially hidden.

Each non-domestic carcass will be discreetly marked so that it can be identified as an efficiency trial carcass after it is found. The number and location of the efficiency trial carcasses found during the carcass search will be recorded. The number of efficiency trial carcasses available for detection during each trial will be determined immediately after the trial by the person responsible for distributing the carcasses.

If new searchers are brought into the search team, additional detection trials will be conducted to ensure that detection rates incorporate searcher differences.

(d) Coordination with the Biglow Canyon Wind Farm

The proposed Biglow Canyon Wind Farm lies to the north of the Klondike III Wind Power Project on similar terrain and habitat. If the Council approves site certificates for both facilities and requires similar wildlife monitoring, coordination of removal trials and searcher efficiency trials would be possible. Subject to the approval of both certificate holders and the Department, the number of trials at each site and the number of trial carcasses used at each site can be reduced by combining the removal data and efficiency data from both projects, if the certificate holder can demonstrate that the calculation of fatality rates would continue to have statistical validity for both facilities and that combining the data would not affect any other requirements of the monitoring plans for either facility.

(e) Fatality Monitoring Search Protocol

The objective fatality monitoring is to estimate the number of bird and bat fatalities that are attributable to facility operation. The goal of bird and bat fatality monitoring is to obtain a precise estimate of the fatality rate and associated variances. The certificate holder shall conduct fatality monitoring using standardized carcass searches.

The certificate holder shall use a worst-case analysis to resolve any uncertainty in the results and to determine whether the data indicate that additional mitigation should be considered. The Department may require additional, targeted monitoring if the data indicate the potential for significant impacts that cannot be addressed by worst-case analysis and appropriate mitigation. On an annual basis, the certificate holder shall report an estimate of fatalities in seven categories: 1) all birds, 2) small birds, 3) large birds, 4) raptors, 5) grassland birds, 6) nocturnal migrants, 7) State Sensitive Species listed under OAR 635-100-0040 and 8) bats. If there is sufficient sampling of large and small turbines, the certificate holder shall compare the fatality rates in the "all birds" category for each of the turbine size classes. The certificate holder shall calculate fatality rates using the statistical methods described in Sections (a) and (f).

The certificate holder shall estimate the number of avian and bat fatalities attributable to operation of the facility based on the number of avian and bat fatalities found at the facility site. All carcasses located within areas surveyed, regardless of species, will be recorded and, if

possible, a cause of death determined based on blind necropsy results. If a different cause of death is not apparent, the fatality will be attributed to facility operation. The total number of avian and bat carcasses will be estimated by adjusting for removal and searcher efficiency bias.

Personnel trained in proper search techniques ("the searchers") will conduct the carcass searches by walking parallel transects within the search plots.[2] Transects will be initially set at 6 meters apart in the area to be searched. A searcher will walk at a rate of approximately 45 to 60 meters per minute along each transect searching both sides out to three meters for casualties. Search area and speed may be adjusted by habitat type after evaluation of the first searcher efficiency trial. The searchers will record the condition of each carcass found, using the following condition categories:

- Intact – a carcass that is completely intact, is not badly decomposed and shows no sign of being fed upon by a predator or scavenger
- Scavenged – an entire carcass that shows signs of being fed upon by a predator or scavenger, or portions of a carcass in one location (e.g., wings, skeletal remains, legs, pieces of skin, etc.)
- Feather Spot – 10 or more feathers at one location indicating predation or scavenging or 2 or more primary feathers

All carcasses (avian and bat) found during the standardized carcass searches will be photographed, recorded and labeled with a unique number. Each carcass will be bagged and frozen for future reference and possible necropsy. A copy of the data sheet for each carcass will be kept with the carcass at all times. For each carcass found, searchers will record species, sex and age when possible, date and time collected, location, condition (e.g., intact, scavenged, feather spot) and any comments that may indicate cause of death. Searchers will photograph each carcass as found and will map the find on a detailed map of the search area showing the location of the wind turbines and associated facilities. The certificate holder shall coordinate collection of state endangered, threatened or protected species with ODFW. The certificate holder shall coordinate collection of federal endangered, threatened or protected species with the U.S. Fish and Wildlife Service (USFWS). The certificate holder shall obtain appropriate collection permits from ODFW and USFWS.

The searchers might discover carcasses incidental to formal carcass searches (e.g., while driving within the project area). For each incidentally discovered carcass, the searcher shall identify, photograph, record data and collect the carcass as would be done for carcasses within the formal search sample during scheduled searches. If the incidentally discovered carcass is found within a formal search plot, the fatality data will be included in the calculation of fatality rates. If the incidentally discovered carcass is found outside a formal search plot, the data will be reported separately. The certificate holder shall coordinate collection of incidentally discovered state endangered, threatened or protected species with ODFW. The certificate holder shall coordinate collection of incidentally discovered federal endangered, threatened or protected species with the USFWS.

Any injured native birds found on the facility site will be carefully captured by a trained project biologist or technician and transported to Jean Cypher (wildlife rehabilitator) in The

[2] Where search plots are adjacent, the search area may be rectangular.

Dalles, the Blue Mountain Wildlife Rehabilitation Center in Pendleton or the Audubon Bird Care Center in Portland in a timely fashion. The certificate holder shall pay costs, if any, charged for time and expenses related to care and rehabilitation of injured native birds found on the site, unless the cause of injury is clearly demonstrated to be unrelated to the facility operations.

(f) Statistical Methods for Fatality Estimates

The certificate holder shall estimate the total number of wind facility-related fatalities for each phase of construction based on:

(1) The observed number of carcasses found during standardized searches during the two monitoring years (for the applicable phase) for which the cause of death is attributed to the facility.[3]
(2) Searcher efficiency expressed as the proportion of planted carcasses found by searchers.
(3) Removal rates expressed as the estimated average probability a carcass is expected to remain in the study area and be available for detection by the searchers during the entire survey period.

Definition of Variables

The following variables are used in the equations below:

c_i	the number of carcasses detected at plot *i* for the study period of interest (e.g., one year) for which the cause of death is either unknown or is attributed to the facility
n	the number of search plots
k	the number of turbines searched (includes the turbines centered within each search plot and a proportion of the number of turbines adjacent to search plots to account for the effect of adjacent turbines on the 90-meter search plot buffer area)
$\bar{c}$	the average number of carcasses observed per turbine per year
s	the number of carcasses used in removal trials
s_c	the number of carcasses in removal trials that remain in the study area after 40 days
se	standard error (square of the sample variance of the mean)
t_i	the time (days) a carcass remains in the study area before it is removed
$\bar{t}$	the average time (days) a carcass remains in the study area before it is removed
d	the total number of carcasses placed in searcher efficiency trials
p	the estimated proportion of detectable carcasses found by searchers
I	the average interval between searches in days
$\hat{\pi}$	the estimated probability that a carcass is both available to be found during a search and is found

[3] If a different cause of death is not apparent, the fatality will be attributed to facility operation.

m_t the estimated annual average number of fatalities per turbine per year, adjusted for removal and observer detection bias

C nameplate energy output of turbine in megawatts (MW)

Observed Number of Carcasses

The estimated average number of carcasses ($\bar{c}$) observed per turbine per year is:

$$\bar{c} = \frac{\sum_{i=1}^{n} c_i}{k}. \quad (1)$$

Estimation of Carcass Removal

Estimates of carcass removal are used to adjust carcass counts for removal bias. Mean carcass removal time ($\bar{t}$) is the average length of time a carcass remains at the site before it is removed:

$$\bar{t} = \frac{\sum_{i=1}^{s} t_i}{s - s_c}. \quad (2)$$

This estimator is the maximum likelihood estimator assuming the removal times follow an exponential distribution and there is right-censoring of data. Any trial carcasses still remaining at 40 days are collected, yielding censored observations at 40 days. If all trial carcasses are removed before the end of the trial, then s_c is 0, and $\bar{t}$ is just the arithmetic average of the removal times. Removal rates will be estimated by carcass size (small and large) and season.

Estimation of Observer Detection Rates

Observer detection rates (i.e., searcher efficiency rates) are expressed as *p*, the proportion of trial carcasses that are detected by searchers. Observer detection rates will be estimated by carcass size and season.

Estimation of Facility-Related Fatality Rates

The estimated per turbine annual fatality rate (m_t) is calculated by:

$$m_t = \frac{\bar{c}}{\hat{\pi}}, \quad (3)$$

where $\hat{\pi}$ includes adjustments for both carcass removal (from scavenging and other means) and observer detection bias assuming that the carcass removal times t_i follow an exponential distribution. Under these assumptions, this detection probability is estimated by:

$$\hat{\pi} = \frac{t \cdot p}{I} \cdot \left[\frac{\exp\left(I/\bar{t}\right) - 1}{\exp\left(I/\bar{t}\right) - 1 + p} \right]. \quad (4)$$

The estimated per MW annual fatality rate (m) is calculated by:

$$m = \frac{m_t}{C}. \quad (5)$$

For each phase of construction, the certificate holder shall calculate fatality estimates for: (1) all birds, (2) small birds, (3) large birds, (4) raptors, (5) grassland birds, (6) nocturnal migrants 7) State Sensitive Species listed under OAR 635-100-0040 and 8) bats. If there is sufficient sampling of large and small turbines, the certificate holder shall compare the fatality rates in the "all birds" category for each of the turbine size classes. The final reported estimates of *m*, associated standard errors and 90% confidence intervals will be calculated using bootstrapping (Manly 1997). Bootstrapping is a computer simulation technique that is useful for calculating point estimates, variances and confidence intervals for complicated test statistics. For each iteration of the bootstrap, the plots will be sampled with replacement, trial carcasses will be sampled with replacement and $\bar{c}$, $\bar{t}$, p, $\hat{\pi}$ and m will be calculated. A total of 5,000 bootstrap iterations will be used. The reported estimates will be the means of the 5,000 bootstrap estimates. The standard deviation of the bootstrap estimates is the estimated standard error. The lower 5th and upper 95th percentiles of the 5000 bootstrap estimates are estimates of the lower limit and upper limit of 90% confidence intervals.

Nocturnal Migrant and Bat Fatalities

Differences in observed nocturnal migrant and bat fatality rates for lit turbines, unlit turbines that are adjacent to lit turbines and unlit turbines that are not adjacent to lit turbines will be compared graphically and statistically.

(g) Mitigation

Mitigation may be appropriate if fatality rates exceed a "threshold of concern." For the purpose of determining whether a threshold has been exceeded, the certificate holder shall calculate the average annual fatality rates for species groups for each phase of construction after two years of monitoring. Based on current knowledge of the species that are likely to use the habitat in the area of the facility, the following thresholds apply to the Klondike III facility:

Species Group	**Threshold of Concern** (fatalities per MW)
Raptors (All eagles, hawks, falcons and owls, including burrowing owls.)	0.09
Raptor species of special concern (Swainson's hawk, ferruginous hawk, peregrine falcon, golden eagle, bald eagle, burrowing owl and any federal threatened or endangered raptor species.)	0.06
Grassland species (All native bird species that rely on grassland habitat and are either resident species, occurring year round, or species that nest in the area, excluding horned lark, burrowing owl and northern harrier.)	0.59
State sensitive avian species listed under OAR 635-100-0040 (Excluding raptors listed above.)	0.2

If the data show that a threshold of concern for a species group has been exceeded, the certificate holder shall implement additional mitigation if the Department determines that mitigation is appropriate based on analysis of the data, consultation with ODFW and

consideration of any other significant information available at the time. In addition, mitigation may be appropriate if the Department determines that fatality rates for individual avian or bat species (especially State Sensitive Species) are higher than expected and at a level of biological concern. If mitigation is appropriate, the certificate holder, in consultation with the Department and ODFW, shall propose mitigation measures designed to benefit the affected species. The certificate holder shall implement mitigation as approved by the Council. The Department may recommend additional, targeted data collection if the need for mitigation is unclear based on the information available at the time. The certificate holder shall implement such data collection as approved by the Council.

Mitigation should be designed to benefit the affected species group. Mitigation may include, but is not limited to, protection of nesting habitat for the affected group of native species through a conservation easement or similar agreement. Tracts of land that are intact and functional for wildlife are preferable to degraded habitat areas. Preference should be given to protection of land that would otherwise be subject to development or use that would diminish the wildlife value of the land. In addition, mitigation measures might include: enhancement of the protected tract by weed removal and control; increasing the diversity of native grasses and forbs; planting sagebrush or other shrubs; constructing and maintaining artificial nest structures for raptors; improving wildfire response; and local research that will aid in understanding more about the species and conservation needs. In considering whether additional mitigation is appropriate for bat fatalities, the Department will take into account the mitigation that the certificate holder has already implemented under Condition 96 of the site certificate (a contribution of $10,000 per year for three years, beginning in the first year of operation, to fund research toward better understanding wind facility impacts to bats and to develop mitigation solutions).

2. Raptor Nest Surveys

The objectives of raptor nest surveys are to estimate the size of the local breeding populations of tree or other above-ground-nesting raptor species in the vicinity of the facility and to determine whether operation of the facility results in a reduction of nesting activity or nesting success in the local populations of the following raptor species: Swainson's hawk, golden eagle and ferruginous hawk.

(a) Survey Protocol

For the species listed above, aerial and ground surveys will be used to gather ~~nest success~~ data on active nests, nests with young and young fledged. The certificate holder will share the data with state and federal biologists. The certificate holder will conduct two years of post-construction raptor nest surveys. One year of surveys will be done in 2008. The second year of surveys will be done in 2012.

During each monitoring year, the certificate holder will conduct a minimum of one helicopter survey in late May or early June and additional surveys as described in this section. All nests discovered during pre-construction surveys and any nests discovered during post-construction surveys, whether active or inactive, will be given identification numbers. Nest locations will be recorded on U.S. Geological Survey 7.5-minute quadrangle maps. Global positioning system coordinates will be recorded for each nest. Locations of inactive nests will be recorded as they may become occupied during future years.

The certificate holder shall conduct the aerial surveys within the Klondike III site and a 2-mile buffer around the turbines to determine nest occupancy. Determining nest *occupancy* will likely require two helicopter visits to each nest. For occupied nests, the certificate holder shall determine nesting outcomes by a minimum of one ground visit to determine species, number of young and nesting status. For Swainson's hawks and ferruginous hawks, "nesting success" means that at least one young has successfully fledged (left the nest at the appropriate age). For golden eagles, "nesting success" means that at least one young (whether in the nest or out) has attained an age of 51 or more days. "Nesting failure" is presumed in any case in which a breeding attempt does not proceed to the point of "nesting success" as defined above.[4] Nests that cannot be monitored due to the landowner denying access will be checked from a distance where feasible.

(b) Mitigation

The certificate holder shall analyze the raptor nesting data collected after two monitoring years to determine whether a reduction in either nesting success or nest use has occurred in the vicinity of the Klondike III facility. If the analysis indicates a reduction in nesting success by Swainson's hawk, golden eagle or ferruginous hawk within 2 miles of the facility, then the certificate holder shall propose appropriate mitigation and shall implement mitigation as approved by the Council. At a minimum, if the analysis shows that any of these species has abandoned a nest territory within ½ mile of the facility or has not fledged any young over the two-year period within a ½ mile of the facility, the certificate holder shall assume the abandonment or unsuccessful fledging is the result of the facility unless another cause can be demonstrated convincingly.

Given the very low buteo nesting densities in the area, statistical power to detect a relationship between distance from a wind turbine and nesting parameters (e.g., number of fledglings per reproductive pair) will be very low. Therefore, impacts may have to be judged based on trends in the data, results from other wind energy facility monitoring studies and literature on what is known regarding the populations in the region.

If the analysis shows that mitigation is appropriate, the certificate holder shall propose mitigation for the affected species in consultation with the Department and ODFW. Mitigation should be designed to benefit the affected species or contribute to overall scientific knowledge and understanding what stimulates nest abandonment. Mitigation may be designed to proceed in phases over several years. It may include, but is not limited to, additional raptor nest monitoring, protection of natural nest sites from human disturbance or cattle activity (preferably within two miles of the facility) or participation in research projects designed to improve scientific understanding of the needs of the affected species.

(c) Long-term Raptor Nest Monitoring and Mitigation Plan

In addition to the two years of post-construction raptor nest surveys described in paragraph (a), the certificate holder shall conduct long-term raptor nest surveys at five-year intervals for the life of the facility. The certificate holder shall conduct the first long-term raptor nest survey in 2017. In conducting long-term surveys, the certificate holder shall follow the same

[4] Qualified observers shall determine nesting outcomes using survey methods generally consistent with U.S. Fish and Wildlife Service guidance (Pagel, J.E., D.M. Whittington, and G.T. Allen. 2010. *Interim golden eagle technical guidance: inventory and monitoring protocols; and other recommendations in support of eagle management and permit issuance*).

survey protocol that is described above in paragraph (a) unless the certificate holder proposes an alternative protocol that is approved by the Department. In developing an alternative protocol, the certificate holder shall consult with ODFW and may collaborate with the certificate holder for any other wind energy facility.

The certificate holder shall analyze the long-term survey data as described above in paragraph (b). If the analysis shows that mitigation is appropriate, the certificate holder shall propose mitigation for the affected species in consultation with the Department and ODFW as described in paragraph (b) and shall implement mitigation as approved by the Council. Any reduction in nesting success could be due to operation of the KWP, operation of another wind facility in the vicinity or some other cause. The reduction shall be attributed to the KWP if the wind turbine closest to the affected nest site is a KWP turbine unless the certificate holder demonstrates, and the Department agrees, that the reduction was due to a different cause.

3. Avian Use Surveys

During each fatality monitoring search, observers will record birds detected in a ten-minute period at approximately one-third of the turbines within the fatality monitoring sample using standard variable circular plot point count survey methods. The purpose of observing and recording avian use while conducting the fatality monitoring is to identify additional species that may not have been listed in the original baseline survey report. In addition, avian use surveys provide a basis to evaluate, in general terms, whether the species with the highest fatality numbers are also the most common species at the site.

4. PPM Energy's Klondike III Wind Project Wildlife Reporting and Handling System

PPM Energy's Klondike III Wind Project Wildlife Reporting and Handling System (WRHS) is a monitoring program to search for and handle avian and bat casualties found by maintenance personnel during construction and operation of the facility. A similar system is in place for Klondike I and II. Construction and maintenance personnel will be trained in the methods. This monitoring program includes the initial response, the handling and the reporting of bird and bat carcasses discovered incidental to construction and maintenance operations ("incidental finds").

All carcasses discovered by maintenance personnel will be photographed and recorded. If maintenance personnel discover incidental finds at turbines that are not within search plots for the fatality monitoring searches, the data will be reported separately from fatality monitoring data. For such incidental finds, the maintenance personnel will notify a project biologist. The project biologist must be a qualified independent professional biologist who is not an employee of the certificate holder. The project biologist (or the project biologist's experienced wildlife technician) will collect the carcass or will instruct maintenance personnel to have an on-site carcass handling permittee collect the carcass. The certificate holder's on-site carcass handling permitee must be a person who is listed on state and federal scientific or salvage collection permits and who is available to process (collect) the find on the day it is discovered. The find must be processed on the same day as it is discovered.

If maintenance personnel discover carcasses within search plots, the data will be included in the calculation of fatality rates. The maintenance personnel will notify a project biologist. The project biologist will collect the carcass or will instruct maintenance personnel to have an on-site carcass handling permittee collect the carcass. As stated above, the on-site permittee must be

available to process the find on the day it is discovered. The certificate holder shall coordinate collection of state endangered, threatened or protected species with ODFW. The certificate holder shall coordinate collection of federal endangered, threatened or protected species with the USFWS.

5. Data Reporting

The certificate holder will report the monitoring data and analysis to the Department. Monitoring data include fatality data, raptor nest survey data, avian use point counts and data on incidental finds by fatality searchers and KWP personnel. The report may be included in the annual report required under OAR 345-026-0080 or may be submitted as a separate document at the same time the annual report is submitted. In addition, the certificate holder shall provide to the Department any data or record generated in carrying out this monitoring plan upon request by the Department.

The certificate holder shall notify USFWS and ODFW immediately in the event that any federal or state endangered or threatened species are killed or injured on the facility site.

The public will have an opportunity to receive information about monitoring results and to offer comment. Within 30 days after receiving the annual report of monitoring results, the Department will make the report available to the public on its website and will specify a time in which the public may submit comments to the Department.[5]

6. Amendment of the Plan

This Wildlife Monitoring and Mitigation Plan may be amended from time to time by agreement of the certificate holder and the Council. Such amendments may be made without amendment of the site certificate. The Council authorizes the Department to agree to amendments to this plan and to mitigation actions that may be required under this plan. The Department shall notify the Council of all amendments and mitigation actions, and the Council retains the authority to approve, reject or modify any amendment of this plan or mitigation action agreed to by the Department.

[5] The certificate holder may establish a Technical Advisor Committee (TAC) but is not required to do so. If the certificate holder establishes a TAC, the TAC may offer comments to the Council about the results of the monitoring required under this plan.

Klondike III Wind Power Project
2017 Raptor Nest Survey

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EXECUTIVE SUMMARY

Raptor nest survey and monitoring was performed in 2017 as mandated by the 2007 Klondike III Wind Project Wildlife Monitoring and Mitigation Plan (revised August 24, 2012). Ground-based and aerial surveys were conducted by Northwest Wildlife Consultants, Inc. and covered the same 98.04-square-mile (253.02-square-kilometer) Raptor Nest Survey Area (a two-mile buffer around Project turbines, "survey area") as was surveyed in 2008 and 2012. The objectives of raptor nest surveys are to estimate the size of the local breeding populations of tree or other above-ground-nesting raptor species in the vicinity of the facility and to determine whether operation of the facility results in a reduction of nesting activity or nesting success in the local populations of the following raptor species: golden eagle, ferruginous hawk, and Swainson's hawk.

Active nests of target raptor species (golden eagle, ferruginous hawk, and Swainson's hawk) were monitored in each year to determine outcome. The 2017 survey and monitoring year was the first year of the five-year interval "long-term raptor nest monitoring" specified in the 2012 Wildlife Monitoring and Mitigation Plan.

Fourteen active raptor nests were documented within the survey area in 2017. Density of active raptor nests in 2017 (0.14/square mile; 0.06/square kilometer) was slightly less than that recorded in 2008 (0.15/square mile; 0.06/square kilometer) and 2012 (0.23/square mile; 0.09/square kilometer); the difference in 2012 was due mainly to a greater number of nesting red-tailed hawks (17) that year (vs. seven in 2017 and five in 2008).

In 2017, one successful golden eagle breeding attempt was documented at a nest 1.0 mile from Project turbines in the Grass Valley territory resulted in one fledged young. In 2008, a successful golden eagle breeding attempt was documented at this same nest, resulting in two fledged young, whereas in 2012 two successful breeding attempts resulted in five fledgings from two separate territories, Grass Valley and John Day River. All documented golden eagle nests were located outside of the Project site boundary (three in the southeast in the Grass Valley Canyon and two in the northeast in John Day River Canyon).

No ferruginous hawk nesting was documented in 2017. In 2008, one successful nest was documented, resulting in one fledged young. No active nests were documented in 2012. The tree supporting the 2008 active nest was still suitable in 2017. Active Swainson's hawk nests were fewer in 2017 (three) than in 2008 (six), but more than in 2012 (one). None of the three 2017 active Swainson's hawks resulted in successful nesting, whereas in 2008 five of the six active nests were successful. In 2012, the single active nest was not successful. Common raven breeding continued to increase—from two in 2008 to four in 2012 to eight in 2017—which likely has a depressing effect on Swainson's hawk breeding and success.

In 2008, three Swainson's hawks fledged from three separate nests within 0.5 mile of Project turbines. This same area contained one active nest in 2012 (no young fledged, no known cause) and one in 2017 (no young fledged, no known cause). Survey results of raptor nesting occurrence and success from 2008-2017 are within natural variations. A number of factors contribute to these variations; these include the predominance of non-native habitat, an increase in the amount of human activity during nesting seasons, the increase in nesting by common ravens, and harsh weather, low prey densities, ongoing senescence and loss of suitable nest trees, and land use changes (i.e., wind energy development, some landowner conversions of dryland wheat cropland to orchards or vineyards, etc.).

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1.0 INTRODUCTION

Klondike III Wind Project, located in Sherman County, Oregon is a wind-powered electric generating plant with an average electric generating capacity of approximately 125 megawatts (MW) and a peak generating capacity of not more than 375 MW (OEFSC, 2007). It was developed and is operated by Klondike Wind Power III LLC (Avangrid Renewables LLC, originally PPM Energy) of Portland, Oregon. There are two phases, referred to simply as Klondike III (Phase 1) and Klondike IIIa (Phase 2), both permitted by the Oregon Department of Energy through the Energy Facility Siting Council (EFSC) process. Klondike Wind Power III LLC received a Site Certificate from the EFSC on June 30, 2006 and a Site Certificate for Klondike IIIa (KIIIa) on November 16, 2007. Klondike III Phase 1 (KIII) was commissioned and fully operational in October 2007 and consists of 125 turbines. Of these 125 turbines, 80 are 1.5 MW GE turbines and 44 are Siemens 2.3 MW turbines and there is one Mitsubishi 2.4 MW turbine. Phase 2 (KIIIa) consists of 51 1.5-MW turbines and was commissioned and fully operational June 21, 2008. Collectively the two phases are referred to as the 'Project' in this report.

The Klondike III Wind Project Wildlife Monitoring and Mitigation Plan (WMMP), filed under the EFSC Site Certificate (OEFSC, 2007 and OEFSC, 2012), mandates KIII and KIIIa raptor nest survey and monitoring in 2017. The 2017 survey and monitoring year was the first year beginning a five-year interval of "long-term nest monitoring" specified in the 2012 WMMP (pgs. A-11−12). The objectives of raptor nest surveys are to estimate the size of the local breeding populations of tree or other above-ground-nesting raptor species in the vicinity of the facility and to determine, if possible, whether operation of the facility results in a reduction of nesting activity or nesting success in the local populations of the following raptor species: golden eagle (*Aquila chrysaetos*), ferruginous hawk (*Buteo regalis*), and Swainson's hawk (*Buteo swainsoni*). This report presents methods and results of the 2017 survey and monitoring, conducted by Northwest Wildlife Consultants, Inc. (NWC).

2.0 METHODS

Wildlife monitoring study protocol methods are available in detail in the Klondike III Wind Project WMMP (Attachment A of the Final Order on Amendment #3 of the Site Certificate for the Klondike III Wind Project, dated November 16, 2007, OEFSC, 2007), which was revised August 24, 2012 (OEFSC, 2012). The methods for the raptor nest monitoring portion are summarized in this section. In addition to the standard surveys for raptor nesting, the methods include specific monitoring of active nests, which focuses on the following 'target raptor species': golden eagle, ferruginous hawk, and Swainson's hawk, per the WMMP. The Raptor Nest Survey Area encompasses 98.04 square miles (253.02 square kilometers) and consists of all areas within the Project site boundary and within a 2-mile buffer around Project turbines.

Prior to the initiation of surveys, NWC personnel reviewed available raptor nesting information from previous years within the survey area. NWC obtained and reviewed golden eagle nesting data from 2011 through 2016 from the Oregon Eagle Foundation (OEF; Isaacs, pers. comm., 2017). NWC personnel also obtained early-season information from biologists at Portland General Electric (Marheine, pers. comm., 2017), who were conducting 2017 raptor nest surveys at the adjacent Biglow Canyon Wind Farm.

Aerial surveys were conducted in March, May, and June. Nesting eagles and ferruginous hawks (one historic site) were the primary focus for the March survey. The May survey was timed to coincide with the nesting of most raptor species, and the June aerial survey was for monitoring the outcome of active breeding attempts by golden eagles and Swainson's

hawks. Within the leased land of the Project site boundary, an initial ground-based survey was conducted on April 14, 2017. The purpose of this was to identify breeding attempts of early-nesting species—great horned owl (*Bubo virginianus*), ferruginous hawk, and red-tailed hawk (*Buteo jamaicensis*)—some of which might otherwise have gone undocumented had they failed before the aerial survey. This information is of particular importance for ferruginous hawk, a species of special interest (currently a Federal Species of Concern and Oregon State-Sensitive Critical status, ODFW, 2016) and one of three target raptor species for the Project long-term raptor nest monitoring. Subsequent monitoring of target species was conducted from the ground.

On May 5, an aerial survey was conducted within the Raptor Nest Survey Area, to determine presence and occupancy of all raptor nests (Figure 1), as per the WMMP, page A-10−11. The survey was conducted by a NWC raptor biologist and a helicopter pilot experienced at this type of survey. All appropriate nesting areas were investigated from the air; these included trees, rock formations, old water-pumping windmills, and power lines.

All potential and confirmed raptor nests were recorded, regardless of activity status. Common raven (*Corvus corax*) and American crow (*Corvus brachyrhynchos*) nests were also recorded due to their natural competition for nest sites. Determination of nest status (active, inactive, unknown) was made using a combination of visual clues such as adult behavior, presence of eggs or young, and presence or absence of whitewash (excrement). A nest was determined to be active if behaviors consistent with a breeding attempt were noted; these included nest building/repair, egg laying, incubation, or presence of young. A nest was considered to be inactive if none of these behaviors was noted; presence of adult birds was not sufficient to deem a nest active. Inactive nests (without sign of current year's use) were assessed as to the type of bird that may have used the nest previously. Large stick nests, potentially built by golden eagles or ferruginous hawks, were distinguished from other inactive nests. All nest locations were recorded using a hand-held Global Positioning System (GPS) receiver. All new nest locations were corrected using aerial imagery in a Global Information System (GIS) environment.

Nests at two previously identified golden eagle breeding territories that overlap with the Raptor Nest Survey Area—Grass Valley (OEF #C0063) and John Day River (OEF #C1080)—were monitored during helicopter flights on March 28 and June 6. Searches for new golden eagle nesting (in suitable habitat) also occurred during the first flight. Survey and monitoring were conducted by a NWC eagle specialist and a helicopter pilot experienced at this type of survey; methods followed protocols recommended by the United States Fish and Wildlife Service (Pagel et al., 2010; USFWS, 2013). Those protocols include a minimum of two surveys, one in late March and one near the expected time of fledging of eaglets.

Following the May 5 aerial nest survey, ground monitoring was conducted periodically (on May 19, May 30, June 23, and July 7) to ascertain nest success of target raptor species. Active nests of these species were observed from the ground at intervals of between one and two weeks until fledging had occurred or the nest failed. According to the WMMP, nesting success for target raptor species was defined as follows:

- Golden eagles - one or more young at least 51 days old was observed, whether in or out of the nest,
- Swainson's hawks and ferruginous hawks – at least one young has successfully fledged.

A nest was considered to have failed if a breeding attempt occurred, but was not ultimately successful (as previously defined).

As specified on pages A-10−11 of the WMMP (OEFSC, 2012) for long-term raptor nest monitoring, results of 2017 raptor nest monitoring were compared with those of 2008 and

2012 (Table 1) to assess trends in nest use or nesting success in the Raptor Nest Survey Area.

3.0 RESULTS

Nest Occupancy

Fourteen active raptor nests were documented within the survey area in 2017 (Figure 1). In addition, eight active common raven nests and 23 inactive stick nests (four of which were inactive golden eagle nests) were found (Figure 1). In 2017, the survey area had a density of 0.14 active raptor nests per square mile (0.06 per square kilometer). Documented nests were as follows:

Active Nests for Target Raptor Species

- 1 Golden eagle
- 3 Swainson's hawk

Active Nests of Other Raptor Species and Common Ravens

- 7 Red-tailed hawk
- 3 Great horned owl
- 8 Common raven

Inactive Nests

- 19 Inactive stick nests
- 1 Ferruginous hawk (historical nest)
- 4 Inactive golden eagle nests (in two known territories)

Target Species Monitoring

Golden Eagle

The nest in Grass Valley Territory where the successful golden eagle breeding attempt occurred was outside the Project site boundary and farther than 0.5 mile from the nearest Project turbine (Table 1, Figure 1, Nest #3277). (Specifically, this nest was 1.0 mile from Klondike IIIa turbine X7.) This breeding attempt was successful; on June 6 it contained a single young more than 56 days old.

Swainson's Hawk

Two of the three active Swainson's hawk (current status is Oregon State-Sensitive; ODFW, 2016) nests were within the Project site boundary. All three of these breeding attempts failed (cause undetermined), one early on and two early in the breeding stage. One of the three was located within 0.5 mile of Project turbines.

4.0 DISCUSSION

In 2017, there were 14 active raptor nests, compared to 15 in 2008 and 25 in 2012, within the Raptor Nest Survey Area (excluding four American kestrel nests in 2008, for which this survey method is unreliable; Table 1; Figure 2). Thus the 14 active nests in 2017 were slightly less than in 2008. Raptors nested more densely in the survey area in 2012 (0.23 nests per square mile; Gerhardt and Anderson, 2012). In addition, eight active common raven nests were found in 2017, whereas two were documented in 2008 and four in 2012. The most striking difference among the three survey years was the variation in breeding attempts by red-tailed hawks: five in 2008, 17 in 2012, and seven in 2017. Analysis was conducted for the three target raptor species; this utilized information for golden eagles from OEF (Isaacs, 2017) and, where applicable, general comments are included for ferruginous and Swainson's hawk nesting trends in the Columbia Plateau (Watson, 2014; NWC, unpublished data).

Golden Eagle

There were two golden eagle territories within the survey area in 2008, 2012 and 2017. Between the two territories, nesting success resulted in two young fledged in 2008, five young fledged in 2012, and one young fledged in 2017.

The Grass Valley territory had an active nest in 2008, and two young fledged from this nest. In 2012, nest success resulted in three fledged young. Nest success in 2017 resulted in a single young fledged. Information from OEF indicates breeding success in 2013 with two fledged young and a breeding attempt in 2015 with a single fledged young. (OEF did not document occupancy in 2011 or 2014, and monitoring by OEF was not conducted in 2009 or 2010.) The nest cliff is 1.0 mile from the nearest turbine, Klondike IIIa turbine X7.

The John Day River territory, four miles to the north of the Grass Valley territory, did not have a documented breeding attempt in 2008; it had an active breeding attempt during the 2012 monitoring season, which resulted in two fledged young. Golden eagles do not attempt breeding every year, even when both adults are present during a breeding season; this was the case at this territory in 2017. Though no breeding attempt was documented here in 2017, this territory was occupied by a pair of adult golden eagles (as determined during the aerial survey of May 5). Information from OEF indicates that this territory was occupied by at least one adult eagle (but without a documented breeding attempt) in 2011 and 2013; breeding attempts in 2015 and 2016 each resulted in a single fledged young. (OEF did not document occupancy in 2014, and monitoring by OEF was not conducted in 2009 or 2010.) The nest cliffs are approximately 1.2 miles from the nearest turbine, Klondike III turbine V1.

In summary, the Raptor Nest Survey Area contains two golden eagle territories, both of which have been occupied during survey years. Based on available habitat and golden eagle home range sizes, it is unlikely that a third territory would ever be established within this area. That being the case, natural variation will result in as few as zero or as many as two breeding attempts or successful breeding attempts in a survey year. The results from each of the three survey years fall within this range.

Ferruginous Hawk

The survey area contained a single active ferruginous hawk nest in 2008, whereas no active nests of this species were found in 2012 or 2017. The locust tree in which the 2008 nest was located was still present in 2017. The survey area is near the western edge of this species' breeding range, and if (as seems likely), the species is declining within the Columbia Plateau Ecosystem (Watson, 2014), such a decline would be noticeable as a loss of breeding territories at the edge of the range. Within the survey area, the high ratio of developed wheat to native habitats makes the potential for successful breeding by ferruginous hawks low. Today, neither the 2008 nest site nor the general habitat within the Raptor Nest Survey Area is likely to attract ferruginous hawks searching for a new breeding territory.

Swainson's Hawk

Swainson's hawks nested in greater numbers (six nests) in 2008 than in 2017 (three nests) or 2012 (one nest), and produced more fledged young (five from four successful nests) in 2008 than in 2017 (no successful fledgings) or 2012 (no successful fledgings). Further east within the Columbia Plateau, Swainson's hawks are the most abundant breeding raptor, with populations remaining stable or increasing over the same time period (NWC, unpublished data).

A number of factors are likely contributing to low breeding success by this species on the survey area. In general, the amount of wheat monoculture on the survey area—and the corresponding dearth of native habitat—limits the abundance and diversity of breeding season prey. The area also experiences various levels of human activity (associated with agriculture, residences, and wind energy production) that may disturb courtship, nest-building, incubation, brooding, and prey provisioning behaviors and result in fewer breeding attempts and/or failure of initiated breeding attempts. Nest sites available to Swainson's hawks within the survey area increasingly consist of smaller, senescent locust trees, which likely offer less protection from predators than larger, vigorous trees. The increase in common raven breeding attempts (see below) serves to further reduce the nesting opportunities for Swainson's hawks, which arrive from their wintering grounds after ravens and all of the area's other raptor species have already begun nesting. In 2017, due to a cold winter and a cold, wet spring, arthropods that constitute much of the Swainson's hawk diet seemed fewer in number and later in attaining full size than in most years (based on the biologist's experience in the Columbia Plateau since 2008), and this may have contributed to fewer breeding attempts and to nesting failure in this particular year. Unusually high numbers of an arthropod (the katydid, Mormon cricket) in 2017 further east in Gilliam County may have resulted in attracting Swainson's hawks to nest further east where prey was more abundant.

The other trend within the Raptor Nest Survey Area (which mirrors the situation throughout much of the Oregon Columbia Plateau Ecoregion) is an increase in the number of nesting common ravens. Common raven breeding attempts numbered two in 2008, four in 2012, and eight in 2017. Nesting earlier than Swainson's hawk, common ravens can negatively affect Swainson's hawk breeding by decreasing the number of nest sites available, by harassing hawks as they try to court, build nests, and attempt breeding nearby, and even by depredating unattended eggs and young.

For within 0.50 mi. of turbines, there is inadequate information and thus lack of statistical power to determine definitive reasons for changes in Swainson's hawk nesting between 2008 and 2017. In this time span of almost a decade, there have been three surveys conducted in the Raptor Nest Survey Area; annual fluctuations are not known. The decrease between 2008 and 2017 of active Swainson's hawk nests within 0.5 mile of turbines is likely due to a combination of the same factors discussed above for the decrease within the entire Raptor Nest Survey Area. In 2008, there were three nests of this species (three young fledged) within this distance; this same area contained one nest in 2012 (no young fledged) and one in 2017 (no young fledged). Two of the three trees that in 2008 contained active Swainson's hawk nests, contained no nests in 2017. The third tree contained an active red-tailed hawk nest in 2017 (Figure 1; nest #2023). The tree containing the 2017 active Swainson's hawk nest (Figure 1; nest #2007) that was within 0.5 mile of a turbine contained an active red-tailed hawk nest in 2012 and was in the same small grove of locust trees as the single 2012 active Swainson's hawk nest.

In summary, golden eagle territory occupancy and number of successful breeding attempts was the same in 2017 as in 2008. For tree-nesting raptors, the number of active and successful nests was similar in 2017 to 2008, but was fewer than those documented in 2012. A number of factors are likely to contribute to low nest occupancy and breeding success by tree-nesting raptors within and near the Project area; these include the predominance of non-native habitat, an increase in the amount of human activity during nesting seasons, the increase in nesting by common ravens, harsh weather, low prey densities, ongoing senescence and loss of suitable nest trees, and land use changes (i.e., wind energy development, some landowner conversions of dryland wheat cropland to orchards or vineyards, etc.).

Table 1. Comparison of results of Klondike III and IIIa 2017, 2012, and 2008 raptor nest surveys with number of young fledged for target raptor species.

Species	2017		2012		2008	
	Active Nests Within 0.5 Mi. of Turbines (young fledged)	**Active Nests 0.5 to 2 Mi. from Turbines** (young fledged)	**Active Nests Within 0.5 Mi. of Turbines** (young fledged)	**Active Nests 0.5 to 2 Mi. from Turbines** (young fledged)	**Active Nests Within 0.5 Mi. of Turbines** (young fledged)	**Active Nests 0.5 to 2 Mi. from Turbines** (young fledged)
Golden Eagle	0	1 (1)	0	2 (5)	0	1 (2)
Swainson's Hawk	1 (0)	2 (0)	1 (0)	0	3 (3)	3 (2)
Ferruginous Hawk	0	0	0	0	0	1 (1)
Red-tailed Hawk	2	5	10	7	2	3
Unidentified *Buteo*	0	0	0	0	0	1
Total Falconiformes	**3**	**8**	**11**	**9**	**5**	**9**
Great Horned Owl	0	3	1	2	0	0
Barn Owl	0	0	0	2	0	0
Long-eared Owl	0	0	0	0	0	1
Total Raptors	**3**	**11**	**12**	**13**	**5**	**10**

5.0 ACKNOWLEDGEMENTS

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7.0 FIGURES

Figure 1. Klondike III and IIIa 2017 Raptor and Other Large Bird Nest Monitoring. *(Confidential - submitted under separate cover)*

Figure 2. Klondike III and IIIa 2008 Raptor and Other Large Bird Nest Monitoring. *(Confidential - submitted under separate cover)*

Klondike III Wind Project: Wildlife Monitoring and Mitigation Plan

[REVISED AUGUST 24, 2012]

This plan describes wildlife monitoring that the certificate holder shall conduct during operation of the Klondike III Wind Project (KWP).[1] The monitoring objectives are to determine whether the facility causes significant fatalities of birds and bats and to determine whether the facility results in a loss of habitat quality. The KWP facility consists of up to 208 wind turbines, three non-guyed meteorological towers and other related or supporting facilities as described in the site certificate. The certificate holder completed construction of 124 turbines authorized under the Second Amended Site Certificate in October 2007.

The certificate holder shall use experienced personnel to manage the monitoring required under this plan and properly trained personnel to conduct the monitoring, subject to approval by the Oregon Department of Energy (Department) as to professional qualifications. For all components of this plan except PPM Energy's Klondike III Wind Project Wildlife Reporting and Handling System, the certificate holder shall hire an independent third party (not employees of the certificate holder) to perform monitoring tasks.

The Wildlife Monitoring and Mitigation Plan for the Klondike III Wind Project has the following components:

1) Fatality monitoring program including:
    a) Removal trials
    b) Searcher efficiency trials
    c) Fatality search protocol
    d) Statistical analysis
2) Raptor nesting surveys
3) Avian use surveys
4) PPM Energy's Klondike III Wind Project Wildlife Reporting and Handling System

Following is a discussion of the components of the monitoring plan, statistical analysis methods for fatality data, data reporting and potential mitigation.

The selection of the mitigation actions that the certificate holder may be required to implement under this plan should allow for flexibility in creating appropriate responses to monitoring results that cannot be known in advance. If the Department determines that mitigation is needed, the certificate holder shall propose appropriate mitigation actions to the Department and shall carry out mitigation actions approved by the Department, subject to review by the Oregon Energy Facility Council (Council).

[1] This plan is incorporated by reference in the site certificate for the KWP and must be understood in that context. It is not a "stand-alone" document. This plan does not contain all mitigation required of the certificate holder.

1. Fatality Monitoring

(a) Definitions and Methods

Seasons

This plan uses the following dates for defining seasons:

Season	Dates
Spring Migration	March 16 to May 15
Summer/Breeding	May 16 to August 15
Fall Migration	August 16 to October 31
Winter	November 1 to March 15

Search Plots

The certificate holder shall conduct fatality monitoring within search plots. The certificate holder, in consultation with the Oregon Department of Fish and Wildlife (ODFW), shall select search plots based on a systematic sampling design that ensures that the selected search plots are representative of the habitat conditions in different parts of the site. Each search plot will contain one turbine. Search plots will be square or circular. Circular search plots will be centered on the turbine location and will have a radius equal to the maximum blade tip height of the turbine contained within the plot. "Maximum blade tip height" is the turbine hub-height plus one-half the rotor diameter. Square search plots will be of sufficient size to contain a circular search plot as described above. The certificate holder shall provide maps of the search plots to the Department before beginning fatality monitoring at the facility. The certificate holder shall use the same search plots for each search conducted during a monitoring year.

Scheduling

In each monitoring year, the certificate holder shall conduct fatality monitoring searches at the rates of frequency shown below. Over the course of one monitoring year, the certificate holder would conduct 16 searches, as follows:

Season	Frequency
Spring Migration	2 searches per month (4 searches)
Summer/Breeding	1 search per month (3 searches)
Fall Migration	2 searches per month (5 searches)
Winter	1 search per month (4 searches)

For the 124 turbines built as of October 2007, the certificate holder shall conduct fatality monitoring for two years (32 searches), beginning November 1, 2007. For turbines built after October 2007 (up to 84 turbines), the certificate holder shall conduct fatality monitoring for two years (32 searches) beginning one month after the start of commercial operation of those turbines.

Sample Size

The sample size for fatality monitoring is the number of turbines searched per monitoring year for each phase of construction. Phase 1 consists of turbines built as of October 2007; Phase 2 consists of turbines built after October 2007. During each monitoring year, the certificate

holder shall search a minimum of one-third of the total number of turbines that are built in the applicable phase.

As described in the site certificate, the certificate holder may choose to build the KWP using turbine types in two size classes:

- Small: turbines having a rotor diameter of 82 meters or less
- Large: turbines having a rotor diameter greater than 82 meters

If the final design of the KWP includes both small and large turbines, the certificate holder shall, at a minimum, sample one-third of the total number of turbines in each monitoring year for each phase of construction. Before beginning fatality monitoring, the certificate holder shall consult with an independent expert with experience in statistical analysis of avian fatality data to determine whether it would be possible to sample a sufficient number of the KWP turbines in each size class to allow a statistical comparison of fatality rates for all birds as a group. The certificate holder shall submit the expert's written conclusions to the Department. If sampling of one-third of the total number of all turbines per phase in each monitoring year would provide a sufficient number of turbines in each size class to allow the comparison, the certificate holder will sample the appropriate number of turbines from each class and conduct the analysis. The certificate holder may choose to sample more than one-third of the total number of all turbines in each monitoring year for each phase of construction to allow the comparison.

(b) Removal Trials

The objective of the removal trials is to estimate the length of time avian and bat carcasses remain in the search area. Carcass removal studies will be conducted during each season in the vicinity of the search plots. Estimates of carcass removal rates will be used to adjust carcass counts for removal bias. "Carcass removal" is the disappearance of a carcass from the search area due to predation, scavenging or other means such as farming activity. Removal rates will be estimated by habitat and season.

The certificate holder shall conduct carcass removal trials within each of the seasons defined above during the years in which fatality monitoring occurs. During the first year in which fatality monitoring occurs, the certificate holder shall conduct one removal trial per season (four removal trials per year). For each trial, at least 10 small bird carcasses and at least 10 large bird carcasses will be distributed throughout the project area (approximately 80 trial carcasses per year).

Before beginning removal trials for the second year of fatality monitoring, the certificate holder shall report the results of the first year removal trials to the Department and ODFW. In the report, the certificate holder shall analyze whether four removal trials per year, as described above, provides sufficient data to accurately estimate adjustment factors for carcass removal. The number of removal trials for the second year of fatality monitoring may be adjusted up or down, subject to the approval of the Department.

The "small bird" size class will use carcasses of house sparrows, starlings, commercially available game bird chicks or legally obtained native birds to simulate passerines. The "large bird" size class will use carcasses of raptors provided by agencies, commercially available adult game birds or cryptically colored chickens to simulate raptors, game birds and waterfowl. If fresh bat carcasses are available, they may also be used.

To avoid confusion with turbine-related fatalities, planted carcasses will not be placed in fatality monitoring search plots. Planted carcasses will be placed in the vicinity of search plots but not so near as to attract scavengers to the search plots. The planted carcasses will be located randomly within the carcass removal trial plots.

Carcasses will be placed in a variety of postures to simulate a range of conditions. For example, birds will be: 1) placed in an exposed posture (e.g., thrown over the shoulder), 2) hidden to simulate a crippled bird (e.g., placed beneath a shrub or tuft of grass) and, 3) partially hidden. Trial carcasses will be marked discreetly for recognition by searchers and other personnel. Trial carcasses will be left at the location until the end of the carcass removal trial.

It is expected that carcasses will be checked as follows, although actual intervals may vary. Carcasses will be checked for a period of 40 days to determine removal rates. They will be checked approximately every day for the first 4 days, and then on day 7, day 10, day 14, day 20, day 30 and day 40. This schedule may vary depending on weather and coordination with the other survey work. At the end of the 40-day period, the trial carcasses and scattered feathers will be removed.

(c) Searcher Efficiency Trials

The objective of searcher efficiency trials is to estimate the percentage of bird and bat fatalities that searchers are able to find. The certificate holder shall conduct searcher efficiency trials on the fatality monitoring search plots in both grassland/shrub-steppe and cultivated agriculture habitat types. Searcher efficiency will be estimated by size class, habitat type and season. A pooled estimate of searcher efficiency will be used to adjust carcass counts for detection bias.

The certificate holder shall conduct searcher efficiency trials within each of the seasons defined above during the years in which the fatality monitoring occurs. During each season of the years in which fatality monitoring occurs, the certificate holder shall use approximately 25 carcasses for searcher efficiency trials (approximately 100 carcasses per year). The certificate holder shall vary the number of trials per season and the number of carcasses per trial so that the searchers will not know the total number of trial carcasses being used in any trial. The certificate holder shall distribute trial carcasses in varied habitat in rough proportion to the habitat types within the facility site. During each season, both small bird and large bird carcasses will be used in approximately equal numbers. “Small bird” and “large bird” size classes and carcass selection are as described above for the removal trials.

Before beginning searcher efficiency trials for the second year of fatality monitoring, the certificate holder shall report the results of the first year efficiency trials to the Department and ODFW. In the report, the certificate holder shall analyze whether the efficiency trials as described above (using approximately 100 carcasses per year) provides sufficient data to accurately estimate adjustment factors for carcass removal. The number of removal trials for the second year of fatality monitoring may be adjusted up or down, subject to the approval of the Department.

Personnel conducting searches will not know in advance when trials are conducted; nor will they know the location of the trial carcasses. If suitable trial carcasses are available, trials during the fall season will include several small brown birds to simulate bat carcasses. Legally obtained bat carcasses will be used if available.

On the day of a standardized fatality monitoring search (described below) but before the beginning of the search, efficiency trial carcasses will be placed at random locations within areas to be searched. If scavengers appear attracted by placement of carcasses, the carcasses will be distributed before dawn.

Efficiency trials will be spread over the entire season to incorporate effects of varying weather and vegetation growth. Carcasses will be placed in a variety of postures to simulate a range of conditions. For example, birds will be: 1) placed in an exposed posture (thrown over the shoulder), 2) hidden to simulate a crippled bird and 3) partially hidden.

Each non-domestic carcass will be discreetly marked so that it can be identified as an efficiency trial carcass after it is found. The number and location of the efficiency trial carcasses found during the carcass search will be recorded. The number of efficiency trial carcasses available for detection during each trial will be determined immediately after the trial by the person responsible for distributing the carcasses.

If new searchers are brought into the search team, additional detection trials will be conducted to ensure that detection rates incorporate searcher differences.

(d) Coordination with the Biglow Canyon Wind Farm

The proposed Biglow Canyon Wind Farm lies to the north of the Klondike III Wind Power Project on similar terrain and habitat. If the Council approves site certificates for both facilities and requires similar wildlife monitoring, coordination of removal trials and searcher efficiency trials would be possible. Subject to the approval of both certificate holders and the Department, the number of trials at each site and the number of trial carcasses used at each site can be reduced by combining the removal data and efficiency data from both projects, if the certificate holder can demonstrate that the calculation of fatality rates would continue to have statistical validity for both facilities and that combining the data would not affect any other requirements of the monitoring plans for either facility.

(e) Fatality Monitoring Search Protocol

The objective fatality monitoring is to estimate the number of bird and bat fatalities that are attributable to facility operation. The goal of bird and bat fatality monitoring is to obtain a precise estimate of the fatality rate and associated variances. The certificate holder shall conduct fatality monitoring using standardized carcass searches.

The certificate holder shall use a worst-case analysis to resolve any uncertainty in the results and to determine whether the data indicate that additional mitigation should be considered. The Department may require additional, targeted monitoring if the data indicate the potential for significant impacts that cannot be addressed by worst-case analysis and appropriate mitigation. On an annual basis, the certificate holder shall report an estimate of fatalities in seven categories: 1) all birds, 2) small birds, 3) large birds, 4) raptors, 5) grassland birds, 6) nocturnal migrants, 7) State Sensitive Species listed under OAR 635-100-0040 and 8) bats. If there is sufficient sampling of large and small turbines, the certificate holder shall compare the fatality rates in the "all birds" category for each of the turbine size classes. The certificate holder shall calculate fatality rates using the statistical methods described in Sections (a) and (f).

The certificate holder shall estimate the number of avian and bat fatalities attributable to operation of the facility based on the number of avian and bat fatalities found at the facility site. All carcasses located within areas surveyed, regardless of species, will be recorded and, if

possible, a cause of death determined based on blind necropsy results. If a different cause of death is not apparent, the fatality will be attributed to facility operation. The total number of avian and bat carcasses will be estimated by adjusting for removal and searcher efficiency bias.

Personnel trained in proper search techniques ("the searchers") will conduct the carcass searches by walking parallel transects within the search plots.[2] Transects will be initially set at 6 meters apart in the area to be searched. A searcher will walk at a rate of approximately 45 to 60 meters per minute along each transect searching both sides out to three meters for casualties. Search area and speed may be adjusted by habitat type after evaluation of the first searcher efficiency trial. The searchers will record the condition of each carcass found, using the following condition categories:

- Intact – a carcass that is completely intact, is not badly decomposed and shows no sign of being fed upon by a predator or scavenger
- Scavenged – an entire carcass that shows signs of being fed upon by a predator or scavenger, or portions of a carcass in one location (e.g., wings, skeletal remains, legs, pieces of skin, etc.)
- Feather Spot – 10 or more feathers at one location indicating predation or scavenging or 2 or more primary feathers

All carcasses (avian and bat) found during the standardized carcass searches will be photographed, recorded and labeled with a unique number. Each carcass will be bagged and frozen for future reference and possible necropsy. A copy of the data sheet for each carcass will be kept with the carcass at all times. For each carcass found, searchers will record species, sex and age when possible, date and time collected, location, condition (e.g., intact, scavenged, feather spot) and any comments that may indicate cause of death. Searchers will photograph each carcass as found and will map the find on a detailed map of the search area showing the location of the wind turbines and associated facilities. The certificate holder shall coordinate collection of state endangered, threatened or protected species with ODFW. The certificate holder shall coordinate collection of federal endangered, threatened or protected species with the U.S. Fish and Wildlife Service (USFWS). The certificate holder shall obtain appropriate collection permits from ODFW and USFWS.

The searchers might discover carcasses incidental to formal carcass searches (e.g., while driving within the project area). For each incidentally discovered carcass, the searcher shall identify, photograph, record data and collect the carcass as would be done for carcasses within the formal search sample during scheduled searches. If the incidentally discovered carcass is found within a formal search plot, the fatality data will be included in the calculation of fatality rates. If the incidentally discovered carcass is found outside a formal search plot, the data will be reported separately. The certificate holder shall coordinate collection of incidentally discovered state endangered, threatened or protected species with ODFW. The certificate holder shall coordinate collection of incidentally discovered federal endangered, threatened or protected species with the USFWS.

Any injured native birds found on the facility site will be carefully captured by a trained project biologist or technician and transported to Jean Cypher (wildlife rehabilitator) in The

[2] Where search plots are adjacent, the search area may be rectangular.

Dalles, the Blue Mountain Wildlife Rehabilitation Center in Pendleton or the Audubon Bird Care Center in Portland in a timely fashion. The certificate holder shall pay costs, if any, charged for time and expenses related to care and rehabilitation of injured native birds found on the site, unless the cause of injury is clearly demonstrated to be unrelated to the facility operations.

(f) Statistical Methods for Fatality Estimates

The certificate holder shall estimate the total number of wind facility-related fatalities for each phase of construction based on:

(1) The observed number of carcasses found during standardized searches during the two monitoring years (for the applicable phase) for which the cause of death is attributed to the facility.[3]
(2) Searcher efficiency expressed as the proportion of planted carcasses found by searchers.
(3) Removal rates expressed as the estimated average probability a carcass is expected to remain in the study area and be available for detection by the searchers during the entire survey period.

Definition of Variables

The following variables are used in the equations below:

c_i	the number of carcasses detected at plot *i* for the study period of interest (e.g., one year) for which the cause of death is either unknown or is attributed to the facility
n	the number of search plots
k	the number of turbines searched (includes the turbines centered within each search plot and a proportion of the number of turbines adjacent to search plots to account for the effect of adjacent turbines on the 90-meter search plot buffer area)
$\bar{c}$	the average number of carcasses observed per turbine per year
s	the number of carcasses used in removal trials
s_c	the number of carcasses in removal trials that remain in the study area after 40 days
se	standard error (square of the sample variance of the mean)
t_i	the time (days) a carcass remains in the study area before it is removed
$\bar{t}$	the average time (days) a carcass remains in the study area before it is removed
d	the total number of carcasses placed in searcher efficiency trials
p	the estimated proportion of detectable carcasses found by searchers
I	the average interval between searches in days
$\hat{\pi}$	the estimated probability that a carcass is both available to be found during a search and is found

[3] If a different cause of death is not apparent, the fatality will be attributed to facility operation.

m_t the estimated annual average number of fatalities per turbine per year, adjusted for removal and observer detection bias

C nameplate energy output of turbine in megawatts (MW)

Observed Number of Carcasses

The estimated average number of carcasses ($\bar{c}$) observed per turbine per year is:

$$\bar{c} = \frac{\sum_{i=1}^{n} c_i}{k}. \quad (1)$$

Estimation of Carcass Removal

Estimates of carcass removal are used to adjust carcass counts for removal bias. Mean carcass removal time ($\bar{t}$) is the average length of time a carcass remains at the site before it is removed:

$$\bar{t} = \frac{\sum_{i=1}^{s} t_i}{s - s_c}. \quad (2)$$

This estimator is the maximum likelihood estimator assuming the removal times follow an exponential distribution and there is right-censoring of data. Any trial carcasses still remaining at 40 days are collected, yielding censored observations at 40 days. If all trial carcasses are removed before the end of the trial, then s_c is 0, and $\bar{t}$ is just the arithmetic average of the removal times. Removal rates will be estimated by carcass size (small and large) and season.

Estimation of Observer Detection Rates

Observer detection rates (i.e., searcher efficiency rates) are expressed as *p,* the proportion of trial carcasses that are detected by searchers. Observer detection rates will be estimated by carcass size and season.

Estimation of Facility-Related Fatality Rates

The estimated per turbine annual fatality rate (m_t) is calculated by:

$$m_t = \frac{\bar{c}}{\hat{\pi}}, \quad (3)$$

where $\hat{\pi}$ includes adjustments for both carcass removal (from scavenging and other means) and observer detection bias assuming that the carcass removal times t_i follow an exponential distribution. Under these assumptions, this detection probability is estimated by:

$$\hat{\pi} = \frac{\bar{t} \cdot p}{I} \cdot \left[\frac{\exp\left(I/\bar{t}\right) - 1}{\exp\left(I/\bar{t}\right) - 1 + p} \right]. \quad (4)$$

The estimated per MW annual fatality rate (m) is calculated by:

$$m = \frac{m_t}{C}. \quad (5)$$

For each phase of construction, the certificate holder shall calculate fatality estimates for: (1) all birds, (2) small birds, (3) large birds, (4) raptors, (5) grassland birds, (6) nocturnal migrants 7) State Sensitive Species listed under OAR 635-100-0040 and 8) bats. If there is sufficient sampling of large and small turbines, the certificate holder shall compare the fatality rates in the "all birds" category for each of the turbine size classes. The final reported estimates of *m*, associated standard errors and 90% confidence intervals will be calculated using bootstrapping (Manly 1997). Bootstrapping is a computer simulation technique that is useful for calculating point estimates, variances and confidence intervals for complicated test statistics. For each iteration of the bootstrap, the plots will be sampled with replacement, trial carcasses will be sampled with replacement and $\bar{c}$, $\bar{t}$, p, $\hat{\pi}$ and m will be calculated. A total of 5,000 bootstrap iterations will be used. The reported estimates will be the means of the 5,000 bootstrap estimates. The standard deviation of the bootstrap estimates is the estimated standard error. The lower 5th and upper 95th percentiles of the 5000 bootstrap estimates are estimates of the lower limit and upper limit of 90% confidence intervals.

Nocturnal Migrant and Bat Fatalities

Differences in observed nocturnal migrant and bat fatality rates for lit turbines, unlit turbines that are adjacent to lit turbines and unlit turbines that are not adjacent to lit turbines will be compared graphically and statistically.

(g) Mitigation

Mitigation may be appropriate if fatality rates exceed a "threshold of concern." For the purpose of determining whether a threshold has been exceeded, the certificate holder shall calculate the average annual fatality rates for species groups for each phase of construction after two years of monitoring. Based on current knowledge of the species that are likely to use the habitat in the area of the facility, the following thresholds apply to the Klondike III facility:

Species Group	**Threshold of Concern** (fatalities per MW)
Raptors (All eagles, hawks, falcons and owls, including burrowing owls.)	0.09
Raptor species of special concern (Swainson's hawk, ferruginous hawk, peregrine falcon, golden eagle, bald eagle, burrowing owl and any federal threatened or endangered raptor species.)	0.06
Grassland species (All native bird species that rely on grassland habitat and are either resident species, occurring year round, or species that nest in the area, excluding horned lark, burrowing owl and northern harrier.)	0.59
State sensitive avian species listed under OAR 635-100-0040 (Excluding raptors listed above.)	0.2

If the data show that a threshold of concern for a species group has been exceeded, the certificate holder shall implement additional mitigation if the Department determines that mitigation is appropriate based on analysis of the data, consultation with ODFW and

consideration of any other significant information available at the time. In addition, mitigation may be appropriate if the Department determines that fatality rates for individual avian or bat species (especially State Sensitive Species) are higher than expected and at a level of biological concern. If mitigation is appropriate, the certificate holder, in consultation with the Department and ODFW, shall propose mitigation measures designed to benefit the affected species. The certificate holder shall implement mitigation as approved by the Council. The Department may recommend additional, targeted data collection if the need for mitigation is unclear based on the information available at the time. The certificate holder shall implement such data collection as approved by the Council.

Mitigation should be designed to benefit the affected species group. Mitigation may include, but is not limited to, protection of nesting habitat for the affected group of native species through a conservation easement or similar agreement. Tracts of land that are intact and functional for wildlife are preferable to degraded habitat areas. Preference should be given to protection of land that would otherwise be subject to development or use that would diminish the wildlife value of the land. In addition, mitigation measures might include: enhancement of the protected tract by weed removal and control; increasing the diversity of native grasses and forbs; planting sagebrush or other shrubs; constructing and maintaining artificial nest structures for raptors; improving wildfire response; and local research that will aid in understanding more about the species and conservation needs. In considering whether additional mitigation is appropriate for bat fatalities, the Department will take into account the mitigation that the certificate holder has already implemented under Condition 96 of the site certificate (a contribution of $10,000 per year for three years, beginning in the first year of operation, to fund research toward better understanding wind facility impacts to bats and to develop mitigation solutions).

2. Raptor Nest Surveys

The objectives of raptor nest surveys are to estimate the size of the local breeding populations of tree or other above-ground-nesting raptor species in the vicinity of the facility and to determine whether operation of the facility results in a reduction of nesting activity or nesting success in the local populations of the following raptor species: Swainson's hawk, golden eagle and ferruginous hawk.

(a) Survey Protocol

For the species listed above, aerial and ground surveys will be used to gather ~~nest success~~ data on active nests, nests with young and young fledged. The certificate holder will share the data with state and federal biologists. The certificate holder will conduct two years of post-construction raptor nest surveys. One year of surveys will be done in 2008. The second year of surveys will be done in 2012.

During each monitoring year, the certificate holder will conduct a minimum of one helicopter survey in late May or early June and additional surveys as described in this section. All nests discovered during pre-construction surveys and any nests discovered during post-construction surveys, whether active or inactive, will be given identification numbers. Nest locations will be recorded on U.S. Geological Survey 7.5-minute quadrangle maps. Global positioning system coordinates will be recorded for each nest. Locations of inactive nests will be recorded as they may become occupied during future years.

The certificate holder shall conduct the aerial surveys within the Klondike III site and a 2-mile buffer around the turbines to determine nest occupancy. Determining nest *occupancy* will likely require two helicopter visits to each nest. For occupied nests, the certificate holder shall determine nesting outcomes by a minimum of one ground visit to determine species, number of young and nesting status. For Swainson's hawks and ferruginous hawks, "nesting success" means that at least one young has successfully fledged (left the nest at the appropriate age). For golden eagles, "nesting success" means that at least one young (whether in the nest or out) has attained an age of 51 or more days. "Nesting failure" is presumed in any case in which a breeding attempt does not proceed to the point of "nesting success" as defined above.[4] Nests that cannot be monitored due to the landowner denying access will be checked from a distance where feasible.

(b) Mitigation

The certificate holder shall analyze the raptor nesting data collected after two monitoring years to determine whether a reduction in either nesting success or nest use has occurred in the vicinity of the Klondike III facility. If the analysis indicates a reduction in nesting success by Swainson's hawk, golden eagle or ferruginous hawk within 2 miles of the facility, then the certificate holder shall propose appropriate mitigation and shall implement mitigation as approved by the Council. At a minimum, if the analysis shows that any of these species has abandoned a nest territory within ½ mile of the facility or has not fledged any young over the two-year period within a ½ mile of the facility, the certificate holder shall assume the abandonment or unsuccessful fledging is the result of the facility unless another cause can be demonstrated convincingly.

Given the very low buteo nesting densities in the area, statistical power to detect a relationship between distance from a wind turbine and nesting parameters (e.g., number of fledglings per reproductive pair) will be very low. Therefore, impacts may have to be judged based on trends in the data, results from other wind energy facility monitoring studies and literature on what is known regarding the populations in the region.

If the analysis shows that mitigation is appropriate, the certificate holder shall propose mitigation for the affected species in consultation with the Department and ODFW. Mitigation should be designed to benefit the affected species or contribute to overall scientific knowledge and understanding what stimulates nest abandonment. Mitigation may be designed to proceed in phases over several years. It may include, but is not limited to, additional raptor nest monitoring, protection of natural nest sites from human disturbance or cattle activity (preferably within two miles of the facility) or participation in research projects designed to improve scientific understanding of the needs of the affected species.

(c) Long-term Raptor Nest Monitoring and Mitigation Plan

In addition to the two years of post-construction raptor nest surveys described in paragraph (a), the certificate holder shall conduct long-term raptor nest surveys at five-year intervals for the life of the facility. The certificate holder shall conduct the first long-term raptor nest survey in 2017. In conducting long-term surveys, the certificate holder shall follow the same

[4] Qualified observers shall determine nesting outcomes using survey methods generally consistent with U.S. Fish and Wildlife Service guidance (Pagel, J.E., D.M. Whittington, and G.T. Allen. 2010. *Interim golden eagle technical guidance: inventory and monitoring protocols; and other recommendations in support of eagle management and permit issuance*).

survey protocol that is described above in paragraph (a) unless the certificate holder proposes an alternative protocol that is approved by the Department. In developing an alternative protocol, the certificate holder shall consult with ODFW and may collaborate with the certificate holder for any other wind energy facility.

The certificate holder shall analyze the long-term survey data as described above in paragraph (b). If the analysis shows that mitigation is appropriate, the certificate holder shall propose mitigation for the affected species in consultation with the Department and ODFW as described in paragraph (b) and shall implement mitigation as approved by the Council. Any reduction in nesting success could be due to operation of the KWP, operation of another wind facility in the vicinity or some other cause. The reduction shall be attributed to the KWP if the wind turbine closest to the affected nest site is a KWP turbine unless the certificate holder demonstrates, and the Department agrees, that the reduction was due to a different cause.

3. Avian Use Surveys

During each fatality monitoring search, observers will record birds detected in a ten-minute period at approximately one-third of the turbines within the fatality monitoring sample using standard variable circular plot point count survey methods. The purpose of observing and recording avian use while conducting the fatality monitoring is to identify additional species that may not have been listed in the original baseline survey report. In addition, avian use surveys provide a basis to evaluate, in general terms, whether the species with the highest fatality numbers are also the most common species at the site.

4. PPM Energy's Klondike III Wind Project Wildlife Reporting and Handling System

PPM Energy's Klondike III Wind Project Wildlife Reporting and Handling System (WRHS) is a monitoring program to search for and handle avian and bat casualties found by maintenance personnel during construction and operation of the facility. A similar system is in place for Klondike I and II. Construction and maintenance personnel will be trained in the methods. This monitoring program includes the initial response, the handling and the reporting of bird and bat carcasses discovered incidental to construction and maintenance operations ("incidental finds").

All carcasses discovered by maintenance personnel will be photographed and recorded. If maintenance personnel discover incidental finds at turbines that are not within search plots for the fatality monitoring searches, the data will be reported separately from fatality monitoring data. For such incidental finds, the maintenance personnel will notify a project biologist. The project biologist must be a qualified independent professional biologist who is not an employee of the certificate holder. The project biologist (or the project biologist's experienced wildlife technician) will collect the carcass or will instruct maintenance personnel to have an on-site carcass handling permittee collect the carcass. The certificate holder's on-site carcass handling permitee must be a person who is listed on state and federal scientific or salvage collection permits and who is available to process (collect) the find on the day it is discovered. The find must be processed on the same day as it is discovered.

If maintenance personnel discover carcasses within search plots, the data will be included in the calculation of fatality rates. The maintenance personnel will notify a project biologist. The project biologist will collect the carcass or will instruct maintenance personnel to have an on-site carcass handling permittee collect the carcass. As stated above, the on-site permittee must be

available to process the find on the day it is discovered. The certificate holder shall coordinate collection of state endangered, threatened or protected species with ODFW. The certificate holder shall coordinate collection of federal endangered, threatened or protected species with the USFWS.

5. Data Reporting

The certificate holder will report the monitoring data and analysis to the Department. Monitoring data include fatality data, raptor nest survey data, avian use point counts and data on incidental finds by fatality searchers and KWP personnel. The report may be included in the annual report required under OAR 345-026-0080 or may be submitted as a separate document at the same time the annual report is submitted. In addition, the certificate holder shall provide to the Department any data or record generated in carrying out this monitoring plan upon request by the Department.

The certificate holder shall notify USFWS and ODFW immediately in the event that any federal or state endangered or threatened species are killed or injured on the facility site.

The public will have an opportunity to receive information about monitoring results and to offer comment. Within 30 days after receiving the annual report of monitoring results, the Department will make the report available to the public on its website and will specify a time in which the public may submit comments to the Department.[5]

6. Amendment of the Plan

This Wildlife Monitoring and Mitigation Plan may be amended from time to time by agreement of the certificate holder and the Council. Such amendments may be made without amendment of the site certificate. The Council authorizes the Department to agree to amendments to this plan and to mitigation actions that may be required under this plan. The Department shall notify the Council of all amendments and mitigation actions, and the Council retains the authority to approve, reject or modify any amendment of this plan or mitigation action agreed to by the Department.

[5] The certificate holder may establish a Technical Advisor Committee (TAC) but is not required to do so. If the certificate holder establishes a TAC, the TAC may offer comments to the Council about the results of the monitoring required under this plan.

Klondike III Wind Power Project
2017 Raptor Nest Survey

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EXECUTIVE SUMMARY

Raptor nest survey and monitoring was performed in 2017 as mandated by the 2007 Klondike III Wind Project Wildlife Monitoring and Mitigation Plan (revised August 24, 2012). Ground-based and aerial surveys were conducted by Northwest Wildlife Consultants, Inc. and covered the same 98.04-square-mile (253.02-square-kilometer) Raptor Nest Survey Area (a two-mile buffer around Project turbines, "survey area") as was surveyed in 2008 and 2012. The objectives of raptor nest surveys are to estimate the size of the local breeding populations of tree or other above-ground-nesting raptor species in the vicinity of the facility and to determine whether operation of the facility results in a reduction of nesting activity or nesting success in the local populations of the following raptor species: golden eagle, ferruginous hawk, and Swainson's hawk.

Active nests of target raptor species (golden eagle, ferruginous hawk, and Swainson's hawk) were monitored in each year to determine outcome. The 2017 survey and monitoring year was the first year of the five-year interval "long-term raptor nest monitoring" specified in the 2012 Wildlife Monitoring and Mitigation Plan.

Fourteen active raptor nests were documented within the survey area in 2017. Density of active raptor nests in 2017 (0.14/square mile; 0.06/square kilometer) was slightly less than that recorded in 2008 (0.15/square mile; 0.06/square kilometer) and 2012 (0.23/square mile; 0.09/square kilometer); the difference in 2012 was due mainly to a greater number of nesting red-tailed hawks (17) that year (vs. seven in 2017 and five in 2008).

In 2017, one successful golden eagle breeding attempt was documented at a nest 1.0 mile from Project turbines in the Grass Valley territory resulted in one fledged young. In 2008, a successful golden eagle breeding attempt was documented at this same nest, resulting in two fledged young, whereas in 2012 two successful breeding attempts resulted in five fledgings from two separate territories, Grass Valley and John Day River. All documented golden eagle nests were located outside of the Project site boundary (three in the southeast in the Grass Valley Canyon and two in the northeast in John Day River Canyon).

No ferruginous hawk nesting was documented in 2017. In 2008, one successful nest was documented, resulting in one fledged young. No active nests were documented in 2012. The tree supporting the 2008 active nest was still suitable in 2017. Active Swainson's hawk nests were fewer in 2017 (three) than in 2008 (six), but more than in 2012 (one). None of the three 2017 active Swainson's hawks resulted in successful nesting, whereas in 2008 five of the six active nests were successful. In 2012, the single active nest was not successful. Common raven breeding continued to increase—from two in 2008 to four in 2012 to eight in 2017—which likely has a depressing effect on Swainson's hawk breeding and success.

In 2008, three Swainson's hawks fledged from three separate nests within 0.5 mile of Project turbines. This same area contained one active nest in 2012 (no young fledged, no known cause) and one in 2017 (no young fledged, no known cause). Survey results of raptor nesting occurrence and success from 2008-2017 are within natural variations. A number of factors contribute to these variations; these include the predominance of non-native habitat, an increase in the amount of human activity during nesting seasons, the increase in nesting by common ravens, and harsh weather, low prey densities, ongoing senescence and loss of suitable nest trees, and land use changes (i.e., wind energy development, some landowner conversions of dryland wheat cropland to orchards or vineyards, etc.).

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1.0 INTRODUCTION

Klondike III Wind Project, located in Sherman County, Oregon is a wind-powered electric generating plant with an average electric generating capacity of approximately 125 megawatts (MW) and a peak generating capacity of not more than 375 MW (OEFSC, 2007). It was developed and is operated by Klondike Wind Power III LLC (Avangrid Renewables LLC, originally PPM Energy) of Portland, Oregon. There are two phases, referred to simply as Klondike III (Phase 1) and Klondike IIIa (Phase 2), both permitted by the Oregon Department of Energy through the Energy Facility Siting Council (EFSC) process. Klondike Wind Power III LLC received a Site Certificate from the EFSC on June 30, 2006 and a Site Certificate for Klondike IIIa (KIIIa) on November 16, 2007. Klondike III Phase 1 (KIII) was commissioned and fully operational in October 2007 and consists of 125 turbines. Of these 125 turbines, 80 are 1.5 MW GE turbines and 44 are Siemens 2.3 MW turbines and there is one Mitsubishi 2.4 MW turbine. Phase 2 (KIIIa) consists of 51 1.5-MW turbines and was commissioned and fully operational June 21, 2008. Collectively the two phases are referred to as the 'Project' in this report.

The Klondike III Wind Project Wildlife Monitoring and Mitigation Plan (WMMP), filed under the EFSC Site Certificate (OEFSC, 2007 and OEFSC, 2012), mandates KIII and KIIIa raptor nest survey and monitoring in 2017. The 2017 survey and monitoring year was the first year beginning a five-year interval of "long-term nest monitoring" specified in the 2012 WMMP (pgs. A-11−12). The objectives of raptor nest surveys are to estimate the size of the local breeding populations of tree or other above-ground-nesting raptor species in the vicinity of the facility and to determine, if possible, whether operation of the facility results in a reduction of nesting activity or nesting success in the local populations of the following raptor species: golden eagle (*Aquila chrysaetos*), ferruginous hawk (*Buteo regalis*), and Swainson's hawk (*Buteo swainsoni*). This report presents methods and results of the 2017 survey and monitoring, conducted by Northwest Wildlife Consultants, Inc. (NWC).

2.0 METHODS

Wildlife monitoring study protocol methods are available in detail in the Klondike III Wind Project WMMP (Attachment A of the Final Order on Amendment #3 of the Site Certificate for the Klondike III Wind Project, dated November 16, 2007, OEFSC, 2007), which was revised August 24, 2012 (OEFSC, 2012). The methods for the raptor nest monitoring portion are summarized in this section. In addition to the standard surveys for raptor nesting, the methods include specific monitoring of active nests, which focuses on the following 'target raptor species': golden eagle, ferruginous hawk, and Swainson's hawk, per the WMMP. The Raptor Nest Survey Area encompasses 98.04 square miles (253.02 square kilometers) and consists of all areas within the Project site boundary and within a 2-mile buffer around Project turbines.

Prior to the initiation of surveys, NWC personnel reviewed available raptor nesting information from previous years within the survey area. NWC obtained and reviewed golden eagle nesting data from 2011 through 2016 from the Oregon Eagle Foundation (OEF; Isaacs, pers. comm., 2017). NWC personnel also obtained early-season information from biologists at Portland General Electric (Marheine, pers. comm., 2017), who were conducting 2017 raptor nest surveys at the adjacent Biglow Canyon Wind Farm.

Aerial surveys were conducted in March, May, and June. Nesting eagles and ferruginous hawks (one historic site) were the primary focus for the March survey. The May survey was timed to coincide with the nesting of most raptor species, and the June aerial survey was for monitoring the outcome of active breeding attempts by golden eagles and Swainson's

hawks. Within the leased land of the Project site boundary, an initial ground-based survey was conducted on April 14, 2017. The purpose of this was to identify breeding attempts of early-nesting species—great horned owl (*Bubo virginianus*), ferruginous hawk, and red-tailed hawk (*Buteo jamaicensis*)—some of which might otherwise have gone undocumented had they failed before the aerial survey. This information is of particular importance for ferruginous hawk, a species of special interest (currently a Federal Species of Concern and Oregon State-Sensitive Critical status, ODFW, 2016) and one of three target raptor species for the Project long-term raptor nest monitoring. Subsequent monitoring of target species was conducted from the ground.

On May 5, an aerial survey was conducted within the Raptor Nest Survey Area, to determine presence and occupancy of all raptor nests (Figure 1), as per the WMMP, page A-10−11. The survey was conducted by a NWC raptor biologist and a helicopter pilot experienced at this type of survey. All appropriate nesting areas were investigated from the air; these included trees, rock formations, old water-pumping windmills, and power lines.

All potential and confirmed raptor nests were recorded, regardless of activity status. Common raven (*Corvus corax*) and American crow (*Corvus brachyrhynchos*) nests were also recorded due to their natural competition for nest sites. Determination of nest status (active, inactive, unknown) was made using a combination of visual clues such as adult behavior, presence of eggs or young, and presence or absence of whitewash (excrement). A nest was determined to be active if behaviors consistent with a breeding attempt were noted; these included nest building/repair, egg laying, incubation, or presence of young. A nest was considered to be inactive if none of these behaviors was noted; presence of adult birds was not sufficient to deem a nest active. Inactive nests (without sign of current year's use) were assessed as to the type of bird that may have used the nest previously. Large stick nests, potentially built by golden eagles or ferruginous hawks, were distinguished from other inactive nests. All nest locations were recorded using a hand-held Global Positioning System (GPS) receiver. All new nest locations were corrected using aerial imagery in a Global Information System (GIS) environment.

Nests at two previously identified golden eagle breeding territories that overlap with the Raptor Nest Survey Area—Grass Valley (OEF #C0063) and John Day River (OEF #C1080)—were monitored during helicopter flights on March 28 and June 6. Searches for new golden eagle nesting (in suitable habitat) also occurred during the first flight. Survey and monitoring were conducted by a NWC eagle specialist and a helicopter pilot experienced at this type of survey; methods followed protocols recommended by the United States Fish and Wildlife Service (Pagel et al., 2010; USFWS, 2013). Those protocols include a minimum of two surveys, one in late March and one near the expected time of fledging of eaglets.

Following the May 5 aerial nest survey, ground monitoring was conducted periodically (on May 19, May 30, June 23, and July 7) to ascertain nest success of target raptor species. Active nests of these species were observed from the ground at intervals of between one and two weeks until fledging had occurred or the nest failed. According to the WMMP, nesting success for target raptor species was defined as follows:

- Golden eagles - one or more young at least 51 days old was observed, whether in or out of the nest,
- Swainson's hawks and ferruginous hawks – at least one young has successfully fledged.

A nest was considered to have failed if a breeding attempt occurred, but was not ultimately successful (as previously defined).

As specified on pages A-10−11 of the WMMP (OEFSC, 2012) for long-term raptor nest monitoring, results of 2017 raptor nest monitoring were compared with those of 2008 and

2012 (Table 1) to assess trends in nest use or nesting success in the Raptor Nest Survey Area.

3.0 RESULTS

Nest Occupancy

Fourteen active raptor nests were documented within the survey area in 2017 (Figure 1). In addition, eight active common raven nests and 23 inactive stick nests (four of which were inactive golden eagle nests) were found (Figure 1). In 2017, the survey area had a density of 0.14 active raptor nests per square mile (0.06 per square kilometer). Documented nests were as follows:

Active Nests for Target Raptor Species

- 1 Golden eagle
- 3 Swainson's hawk

Active Nests of Other Raptor Species and Common Ravens

- 7 Red-tailed hawk
- 3 Great horned owl
- 8 Common raven

Inactive Nests

- 19 Inactive stick nests
- 1 Ferruginous hawk (historical nest)
- 4 Inactive golden eagle nests (in two known territories)

Target Species Monitoring

Golden Eagle

The nest in Grass Valley Territory where the successful golden eagle breeding attempt occurred was outside the Project site boundary and farther than 0.5 mile from the nearest Project turbine (Table 1, Figure 1, Nest #3277). (Specifically, this nest was 1.0 mile from Klondike IIIa turbine X7.) This breeding attempt was successful; on June 6 it contained a single young more than 56 days old.

Swainson's Hawk

Two of the three active Swainson's hawk (current status is Oregon State-Sensitive; ODFW, 2016) nests were within the Project site boundary. All three of these breeding attempts failed (cause undetermined), one early on and two early in the breeding stage. One of the three was located within 0.5 mile of Project turbines.

4.0 DISCUSSION

In 2017, there were 14 active raptor nests, compared to 15 in 2008 and 25 in 2012, within the Raptor Nest Survey Area (excluding four American kestrel nests in 2008, for which this survey method is unreliable; Table 1; Figure 2). Thus the 14 active nests in 2017 were slightly less than in 2008. Raptors nested more densely in the survey area in 2012 (0.23 nests per square mile; Gerhardt and Anderson, 2012). In addition, eight active common raven nests were found in 2017, whereas two were documented in 2008 and four in 2012. The most striking difference among the three survey years was the variation in breeding attempts by red-tailed hawks: five in 2008, 17 in 2012, and seven in 2017. Analysis was conducted for the three target raptor species; this utilized information for golden eagles from OEF (Isaacs, 2017) and, where applicable, general comments are included for ferruginous and Swainson's hawk nesting trends in the Columbia Plateau (Watson, 2014; NWC, unpublished data).

Golden Eagle

There were two golden eagle territories within the survey area in 2008, 2012 and 2017. Between the two territories, nesting success resulted in two young fledged in 2008, five young fledged in 2012, and one young fledged in 2017.

The Grass Valley territory had an active nest in 2008, and two young fledged from this nest. In 2012, nest success resulted in three fledged young. Nest success in 2017 resulted in a single young fledged. Information from OEF indicates breeding success in 2013 with two fledged young and a breeding attempt in 2015 with a single fledged young. (OEF did not document occupancy in 2011 or 2014, and monitoring by OEF was not conducted in 2009 or 2010.) The nest cliff is 1.0 mile from the nearest turbine, Klondike IIIa turbine X7.

The John Day River territory, four miles to the north of the Grass Valley territory, did not have a documented breeding attempt in 2008; it had an active breeding attempt during the 2012 monitoring season, which resulted in two fledged young. Golden eagles do not attempt breeding every year, even when both adults are present during a breeding season; this was the case at this territory in 2017. Though no breeding attempt was documented here in 2017, this territory was occupied by a pair of adult golden eagles (as determined during the aerial survey of May 5). Information from OEF indicates that this territory was occupied by at least one adult eagle (but without a documented breeding attempt) in 2011 and 2013; breeding attempts in 2015 and 2016 each resulted in a single fledged young. (OEF did not document occupancy in 2014, and monitoring by OEF was not conducted in 2009 or 2010.) The nest cliffs are approximately 1.2 miles from the nearest turbine, Klondike III turbine V1.

In summary, the Raptor Nest Survey Area contains two golden eagle territories, both of which have been occupied during survey years. Based on available habitat and golden eagle home range sizes, it is unlikely that a third territory would ever be established within this area. That being the case, natural variation will result in as few as zero or as many as two breeding attempts or successful breeding attempts in a survey year. The results from each of the three survey years fall within this range.

Ferruginous Hawk

The survey area contained a single active ferruginous hawk nest in 2008, whereas no active nests of this species were found in 2012 or 2017. The locust tree in which the 2008 nest was located was still present in 2017. The survey area is near the western edge of this species' breeding range, and if (as seems likely), the species is declining within the Columbia Plateau Ecosystem (Watson, 2014), such a decline would be noticeable as a loss of breeding territories at the edge of the range. Within the survey area, the high ratio of developed wheat to native habitats makes the potential for successful breeding by ferruginous hawks low. Today, neither the 2008 nest site nor the general habitat within the Raptor Nest Survey Area is likely to attract ferruginous hawks searching for a new breeding territory.

Swainson's Hawk

Swainson's hawks nested in greater numbers (six nests) in 2008 than in 2017 (three nests) or 2012 (one nest), and produced more fledged young (five from four successful nests) in 2008 than in 2017 (no successful fledgings) or 2012 (no successful fledgings). Further east within the Columbia Plateau, Swainson's hawks are the most abundant breeding raptor, with populations remaining stable or increasing over the same time period (NWC, unpublished data).

A number of factors are likely contributing to low breeding success by this species on the survey area. In general, the amount of wheat monoculture on the survey area—and the corresponding dearth of native habitat—limits the abundance and diversity of breeding season prey. The area also experiences various levels of human activity (associated with agriculture, residences, and wind energy production) that may disturb courtship, nest-building, incubation, brooding, and prey provisioning behaviors and result in fewer breeding attempts and/or failure of initiated breeding attempts. Nest sites available to Swainson's hawks within the survey area increasingly consist of smaller, senescent locust trees, which likely offer less protection from predators than larger, vigorous trees. The increase in common raven breeding attempts (see below) serves to further reduce the nesting opportunities for Swainson's hawks, which arrive from their wintering grounds after ravens and all of the area's other raptor species have already begun nesting. In 2017, due to a cold winter and a cold, wet spring, arthropods that constitute much of the Swainson's hawk diet seemed fewer in number and later in attaining full size than in most years (based on the biologist's experience in the Columbia Plateau since 2008), and this may have contributed to fewer breeding attempts and to nesting failure in this particular year. Unusually high numbers of an arthropod (the katydid, Mormon cricket) in 2017 further east in Gilliam County may have resulted in attracting Swainson's hawks to nest further east where prey was more abundant.

The other trend within the Raptor Nest Survey Area (which mirrors the situation throughout much of the Oregon Columbia Plateau Ecoregion) is an increase in the number of nesting common ravens. Common raven breeding attempts numbered two in 2008, four in 2012, and eight in 2017. Nesting earlier than Swainson's hawk, common ravens can negatively affect Swainson's hawk breeding by decreasing the number of nest sites available, by harassing hawks as they try to court, build nests, and attempt breeding nearby, and even by depredating unattended eggs and young.

For within 0.50 mi. of turbines, there is inadequate information and thus lack of statistical power to determine definitive reasons for changes in Swainson's hawk nesting between 2008 and 2017. In this time span of almost a decade, there have been three surveys conducted in the Raptor Nest Survey Area; annual fluctuations are not known. The decrease between 2008 and 2017 of active Swainson's hawk nests within 0.5 mile of turbines is likely due to a combination of the same factors discussed above for the decrease within the entire Raptor Nest Survey Area. In 2008, there were three nests of this species (three young fledged) within this distance; this same area contained one nest in 2012 (no young fledged) and one in 2017 (no young fledged). Two of the three trees that in 2008 contained active Swainson's hawk nests, contained no nests in 2017. The third tree contained an active red-tailed hawk nest in 2017 (Figure 1; nest #2023). The tree containing the 2017 active Swainson's hawk nest (Figure 1; nest #2007) that was within 0.5 mile of a turbine contained an active red-tailed hawk nest in 2012 and was in the same small grove of locust trees as the single 2012 active Swainson's hawk nest.

In summary, golden eagle territory occupancy and number of successful breeding attempts was the same in 2017 as in 2008. For tree-nesting raptors, the number of active and successful nests was similar in 2017 to 2008, but was fewer than those documented in 2012. A number of factors are likely to contribute to low nest occupancy and breeding success by tree-nesting raptors within and near the Project area; these include the predominance of non-native habitat, an increase in the amount of human activity during nesting seasons, the increase in nesting by common ravens, harsh weather, low prey densities, ongoing senescence and loss of suitable nest trees, and land use changes (i.e., wind energy development, some landowner conversions of dryland wheat cropland to orchards or vineyards, etc.).

Table 1. Comparison of results of Klondike III and IIIa 2017, 2012, and 2008 raptor nest surveys with number of young fledged for target raptor species.

Species	2017		2012		2008	
	Active Nests Within 0.5 Mi. of Turbines (young fledged)	**Active Nests 0.5 to 2 Mi. from Turbines** (young fledged)	**Active Nests Within 0.5 Mi. of Turbines** (young fledged)	**Active Nests 0.5 to 2 Mi. from Turbines** (young fledged)	**Active Nests Within 0.5 Mi. of Turbines** (young fledged)	**Active Nests 0.5 to 2 Mi. from Turbines** (young fledged)
Golden Eagle	0	1 (1)	0	2 (5)	0	1 (2)
Swainson's Hawk	1 (0)	2 (0)	1 (0)	0	3 (3)	3 (2)
Ferruginous Hawk	0	0	0	0	0	1 (1)
Red-tailed Hawk	2	5	10	7	2	3
Unidentified *Buteo*	0	0	0	0	0	1
Total Falconiformes	**3**	**8**	**11**	**9**	**5**	**9**
Great Horned Owl	0	3	1	2	0	0
Barn Owl	0	0	0	2	0	0
Long-eared Owl	0	0	0	0	0	1
Total Raptors	**3**	**11**	**12**	**13**	**5**	**10**

5.0 ACKNOWLEDGEMENTS

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7.0 FIGURES

Figure 1. Klondike III and IIIa 2017 Raptor and Other Large Bird Nest Monitoring. *(Confidential - submitted under separate cover)*

Figure 2. Klondike III and IIIa 2008 Raptor and Other Large Bird Nest Monitoring. *(Confidential - submitted under separate cover)*