

## **APPENDIX D**

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Biological Resources: *Administrative Draft Humboldt Wind Energy Project  
Biological Resources Work Plan, Humboldt County, California*

Administrative Draft



Humboldt Wind Energy Project  
Biological Resources Work Plan

August 10, 2018

Prepared for:

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**HUMBOLDT WIND ENERGY PROJECT  
BIOLOGICAL RESOURCES WORK PLAN**

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**HUMBOLDT WIND ENERGY PROJECT  
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## **Acronyms and Abbreviations**

ac	acre/s
BUC	bird use count/s
CDFG	California Department of Fish and Game
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CNDDB	California Natural Diversity Database
ECPG	eagle conservation plan guidance
EUC	eagle use count/s
ESA	Endangered Species Act
ft	foot/feet
Gen-Tie	generation tie-in line
GIS	geographic information system
GPS	global positioning system
HCP	Habitat Conservation Plan
HRC	Humboldt Redwood Company, LLC
kHz	kilohertz
km	kilometer
m	meter/s
met	meteorological tower
mi	mile
MMCA	Marbled Murrelet Conservation Area/s
MW	megawatt/s
NSO	northern spotted owl
SBUC	small bird use count/s
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
WEG	wind energy guidance

**Note:**

Often, agency suggestions and guidelines are provided in US units of measure (e.g., acres [ac], feet [ft], or miles [mi]), and in other instances, agency guidance is provided in metric units (aka SI, or System International; e.g., meters [m] or kilometers [km]). To convert an otherwise readily-recognized agency standard (e.g., 10 mi, or 1 km) to the other system may result in confusion. Accordingly, throughout this report measures are provided in either system, using the original agency suggestion unchanged, and provide conversion to the other standard only when it makes sense to do so.

**HUMBOLDT WIND ENERGY PROJECT  
BIOLOGICAL RESOURCES WORK PLAN**

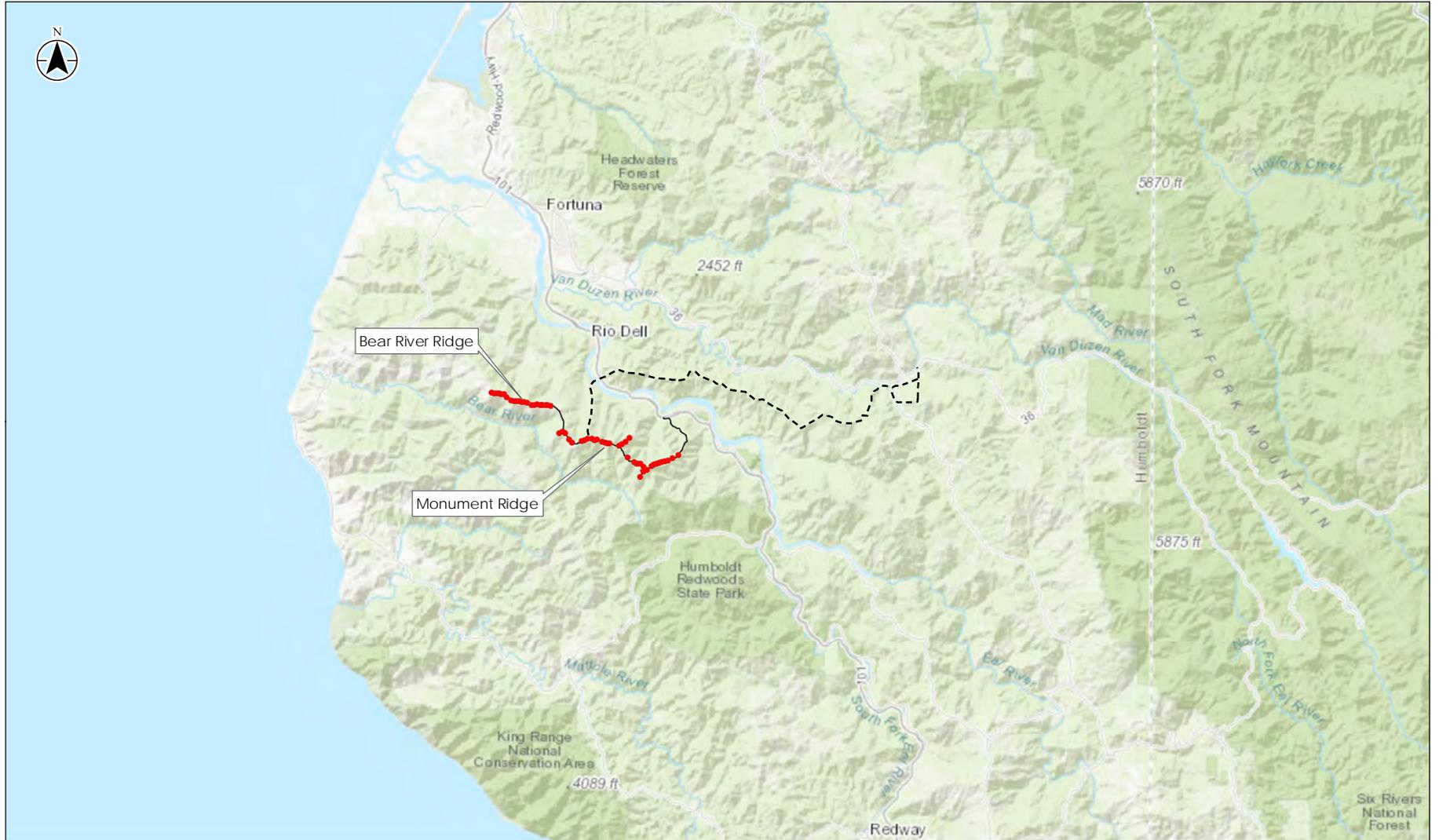
## 1.0 INTRODUCTION

Terra-Gen Development Company, LLC (Terra-Gen), is planning to construct and operate the Humboldt Wind Energy Project (project), a wind energy generation facility in Humboldt County, California (Figure 1-1). The project would consist of up to 60 wind turbine generators and associated infrastructure with a nameplate generating capacity (i.e., the theoretical maximum energy generation) of 135 megawatts (MW). In addition to the wind turbines and transformers, the project would include ancillary facilities such as temporary staging areas, access roads, 34.5-kilovolt collection lines (collection system), an operations and maintenance building, a substation, utility switchyard modification, meteorological towers (met), and a 115-kilovolt generation tie-in line (Gen-Tie).

Stantec Consulting Services Inc. (Stantec) prepared this Biological Resources Work Plan detailing biological resource surveys to support agency discussion and project permitting. The studies described in this work plan will provide information applicable to the following guidelines and permit application processes:

- Tiers 2 and 3 of the U.S. Fish and Wildlife Service's (USFWS) *Land-Based Wind Energy Guidelines* (WEG; USFWS 2012a)
- Eagle Incidental Take Permit
- USFWS Endangered Species Act (ESA) consultation process
- California Department of Fish and Wildlife (CDFW) 2081(b) Incidental Take Permit
- Section 404 and 401 Clean Water Act permits
- California Fish and Game Code Section 1600 Lake or Streambed Alteration Agreement
- Humboldt County-administered California Environmental Quality Act (CEQA) review

In addition, most of the project is located on lands owned by Humboldt Redwood Company, LLC (HRC). These HRC lands are managed as active timberlands under a functioning Habitat Conservation Plan (HCP), originally established in February 1999, inherited by HRC in July 2008, and revised on August 12, 2015 (HRC 2015). While the Humboldt Wind Energy project is not a Covered Activity under this HCP, and HRC lands will be leased to Terra-Gen but will remain under HRC-ownership/control, the project will be designed and permitted to remain consistent with the management objectives and conservation measures already in place in the HCP.



- Proposed Representative Wind Turbine Locations
- Proposed Generation Tie-In Line (Gen-IE)
- Proposed Access Roads



Notes  
1. Coordinate System: NAD 1983 UTM Zone 10N  
2. Base map: ESRI World Topographic Map web mapping service.

Project Location  
Humboldt County, California  
185703758  
Prepared by PG on 2018-08-06  
Reviewed by JD on 2018-08-07

Client/Project  
Humboldt Wind, LLC  
Humboldt Wind Energy Project

Figure No.  
1-1

Title  
General Location Map



**HUMBOLDT WIND ENERGY PROJECT  
BIOLOGICAL RESOURCES WORK PLAN**

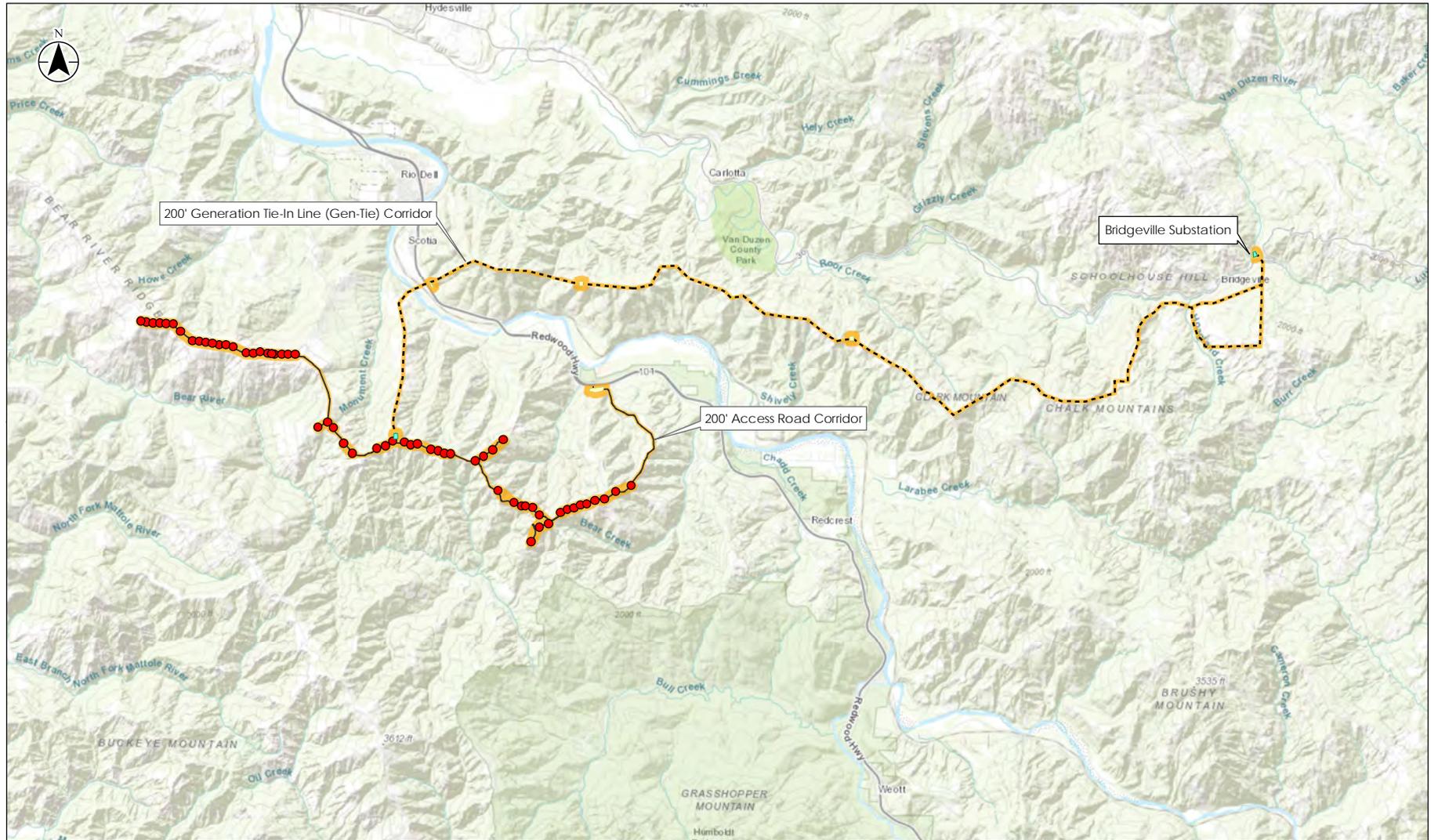
## 2.0 BIOLOGICAL RESOURCES SURVEY BACKGROUND

Stantec will conduct a suite of field surveys to characterize biological resources in the project area and to provide baseline information to support project permitting and the CEQA process. Stantec's biologists will conduct the surveys in all portions of the project area, including the proposed turbine locations, project roads, electrical collection lines, Gen-Tie, operations and maintenance facility, and temporary impact areas used for staging and stockpiling. Surveys will extend beyond boundaries of planned project features by a sufficient margin to enable analysis of indirect effects (i.e., those occurring away from direct impact areas, or later in time) and to obtain adequate coverage to allow for minor relocation of project features at construction, while remaining within surveyed areas. The size of the margin within which project features would be over-surveyed will depend on the type of project component. Stantec will survey a 152-meter (m) (500-ft) radius around proposed turbine locations and a 60-m (200-ft) wide corridor around project roads and electrical collection lines (30 m [100 ft] on either side of the centerline). Stantec will survey a 152-m (500 ft) wide buffer around proposed staging and temporary impact areas and project substations. Lastly, Stantec will survey a 60 m (200 ft) wide corridor around the Gen-Tie (30 m [100 ft] on either side of the center line). Collectively, these areas and corridors total 2,276 acre (ac) (Figure 2-1).

The surveys and subsequent analyses will focus on habitats potentially supporting special-status plant and wildlife species. For the purposes of this work plan, special-status species are defined as those that are:

- listed, formally proposed, or designated as candidates for listing as threatened or endangered under the ESA;
- listed or designated as candidates for listing as rare, threatened, or endangered under or the California Endangered Species Act;
- designated by CDFW as Species of Special Concern or Fully Protected Species (CDFW 2017b); and
- designated by CDFW and the California Native Plant Society a California Rare Plant Rank of 1A, 2A, 2B, 3, or 4 (CDFW 2017a).

Stantec will conduct the surveys and assessment using a combination of database searches, review of other reasonably obtainable information, and field surveys. Database searches will include the California Natural Diversity Database (CNDDDB) (CDFW 2017a), the California Native Plant Society Electronic Inventory (California Native Plant Society 2017), and the California Wildlife Habitat Relationships System (CDFW 2013). Other information will include USFWS lists of federally protected species and critical habitat occurring in Humboldt County, California; biological resource information available from HRC; and other relevant and reasonably obtainable documents and technical studies. Field surveys will include wildlife habitat and plant community field mapping using *A Guide to Wildlife Habitats of California* (Mayer and Laudenslayer 1988), *A Manual of California Vegetation, 2nd Edition* (Sawyer et al. 2009), and the *California Natural Communities List* (CDFW 2018). Data collected during the various studies described herein will be used to characterize the biological resources in the environment that may be affected by the project and recommend ways to avoid or minimize potentially adverse impacts. Stantec will prepare a Biological Resources Report summarizing the results of the survey, including habitat maps and descriptions, summaries of known or potentially occurring special-status species, and recommendations.



- Proposed Representative Wind Turbine Locations
- Proposed Generation Tie-In Line (Gen-Tie)
- Proposed Access Roads
- Project Area
- Substation
- Staging Area



Notes  
 1. Coordinate System: NAD 1983 UTM Zone 10N  
 2. Base map: ESRI World Topographic Map web mapping service.

Project Location  
 Humboldt County, California  
 Prepared by PG on 2018-08-07  
 Reviewed by JD on 2018-08-07

Client/Project  
 Humboldt Wind, LLC  
 Humboldt Wind Energy Project

Figure No.  
 2-1

Title  
 Project Area Map



## HUMBOLDT WIND ENERGY PROJECT BIOLOGICAL RESOURCES WORK PLAN

### 3.0 AVIAN USE SURVEYS

The goal of the bird surveys is to characterize bird species composition, abundance, and habitat use in the project area to provide Tier 3 pre-construction information, as outlined in the USFWS WEG (USFWS 2012a:19–33). Terra-Gen will complete a suite of studies representing a combination of approaches and methods recommended in the WEG (USFWS 2012a), the *California Guidelines for Reducing Impacts to Birds and Bats from Wind Energy Development* (California Energy Commission [CEC] and California Department of Fish and Game [CDFG] 2007), and the USFWS *Eagle Conservation Plan Guidance (ECPG), Module 1 – Land-based Wind Energy* (USFWS 2013).

Stantec will implement the surveys described in this section on the two ridgelines where turbines and other project elements will be located and in the air space above these ridgelines. Species-specific avian surveys presented in Section 7.0 (Northern Spotted Owl Surveys), and Section 8.0 (Marbled Murrelet Surveys), will include habitat assessments and species-specific protocols. The surveys described in this section include:

- Bird use counts (BUC) targeting large birds;
- Eagle use counts (EUC);
- Eagle and raptor aerial nest surveys; and
- Small bird use counts (SBUC).

#### 3.1 BIRD USE COUNT SURVEYS

Stantec will implement a BUC survey according to the methods suggested by the CEC and CDFG (2007). These surveys will:

- provide baseline data on species composition, occurrence and seasonality, frequency, and behavior;
- provide an estimate of spatial and temporal use of the site by diurnal birds, with a focus on large birds (raptors, vultures, corvids, and waterfowl; USFWS 2013:54);
- provide raptor migration activity data;
- inform micro-siting decisions; and
- provide an estimate of potential collision risk based on time spent in the rotor-swept area.

##### 3.1.1 BUC Survey Points

The CEC and CDFG (2007) Guidelines recommended that BUC survey points be located at least 1,600 m (5,200 ft) apart (CEC and CDFG 2007:45), and, to the extent possible, these locations should coincide with the proposed turbine locations. Sampling distribution should provide an average minimum density of one to 1.5 survey sites for each 2.6 square kilometers (km<sup>2</sup>) (1 mi<sup>2</sup>) of a project area (CEC and CDFG 2007:45). For the most effective surveys, the BUC survey points should provide unobstructed views of the surrounding terrain.

**HUMBOLDT WIND ENERGY PROJECT  
BIOLOGICAL RESOURCES WORK PLAN**

Stantec designed the BUC surveys based on these recommendations and the proposed project layout. Terra-Gen proposed 60 turbines for the project on Monument Ridge and Bear River Ridge (Figure 3-1a). Stantec applied a buffer of 1-km (0.62 mi) radius to each of the proposed turbines to establish the Project Footprint (USFWS 2013:57) (Figure 3-1b). To derive the area of the Project Footprint, Stantec then removed areas of overlap and calculated the area of the single remaining perimeter (Figure 3-1c). The resulting Project Footprint encompasses 43.4 km<sup>2</sup> (16.8 mi<sup>2</sup>) on Monument and Bear River Ridges. The USFWS recommended that BUC points cover at least 30% of the Project Footprint (USFWS 2013:57). Stantec then applied a radius of 800 m (2,625 ft) to each of the proposed BUC survey points to establish the fixed survey radius, to maintain the recommended separation among BUC points, and to sample in proportion to habitats represented in the Project Footprint. Based on the proposed turbine layout, project area terrain and habitats, visibility from candidate BUC points, and guidance provided from the CEC, CDFW, and USFWS (CEC and CDFG 2007; USFWS 2012a, 2013), Stantec designated 9 BUC points on Monument Ridge and 4 on Bear River Ridge (13 total BUC points) (Figure 3-1d).

The resulting BUC points were established in the field with the aid of a global positioning system (GPS) and rectified aerial photographs and adjusted as needed to obtain adequate visibility given terrain and vegetation. Stantec marked each BUC point inconspicuously in the field with surveyor’s ribbon and photographed the view from each point facing the cardinal directions. Stantec created an 8.5” X 11” field map for each BUC point based on a rectified aerial photo of appropriate scale to show the 800-m radius. Stantec overlaid these aerial photos with the BUC point identifier, topographic map, and concentric distance rings at 100-m intervals out to 800-m, to facilitate rapid distance estimation by enabling field surveyors to quickly associate distances with topography, vegetation, and other landmarks (Appendix A).

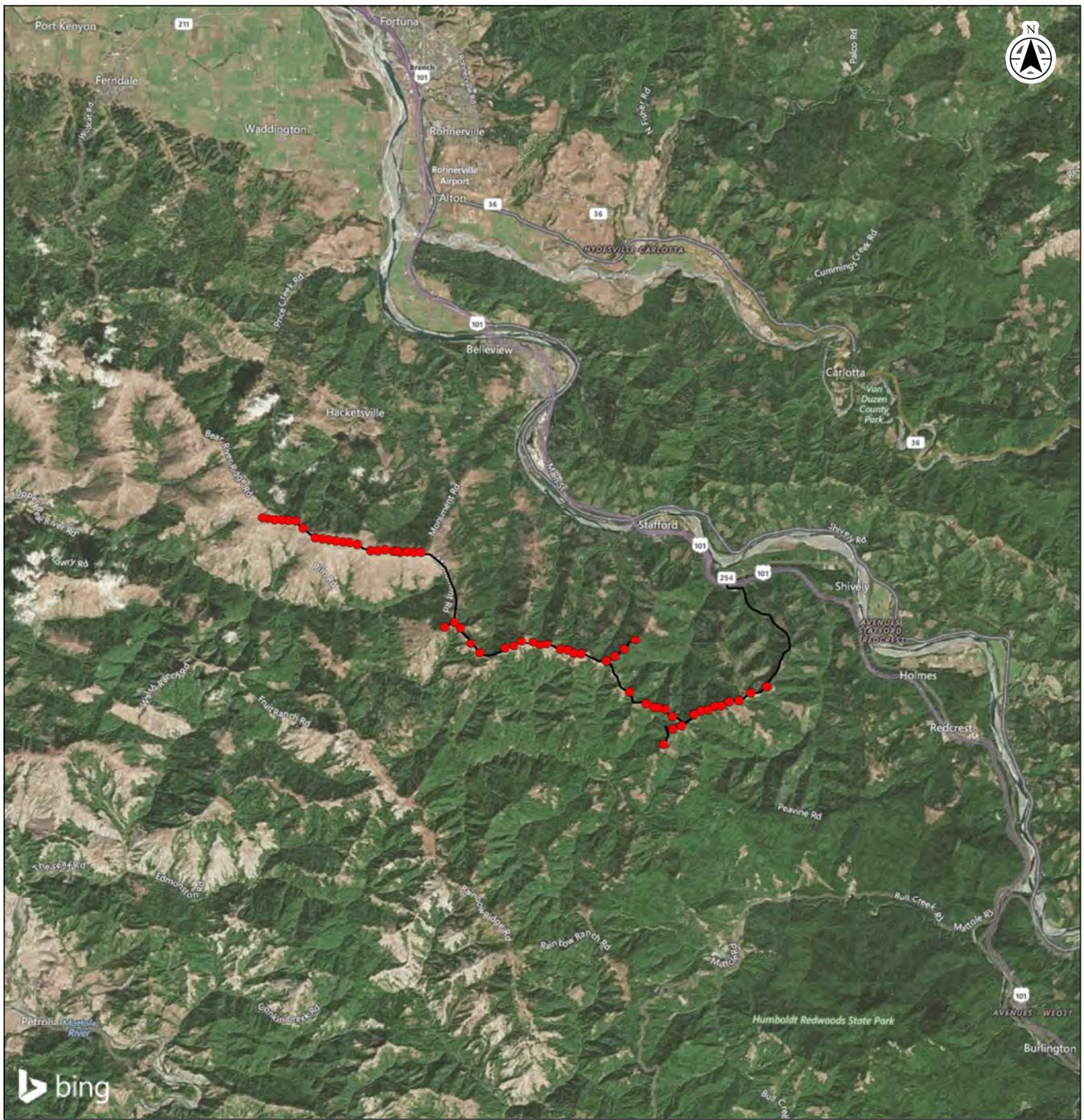
This arrangement assured the closest possible conformity to published guidance regarding survey coverage for eagles, other raptors, large birds, and small birds, based on BUC methods achievable given the project design (Table 3-1).

**Table 3-1. Project Footprint and Metrics of BUC Coverage, Humboldt Wind Project**

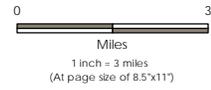
Project Footprint (km <sup>2</sup> )	30% of Area (km <sup>2</sup> )	Minimum Number of 2 km <sup>2</sup> BUC Points to Attain 30% of Project Footprint <sup>A</sup>	Minimum Number of BUC Points to Attain 1 to 1.5 BUC Points/2.6 km <sup>2</sup> Density <sup>B</sup>
43.4	13.02	7	16

<sup>A</sup> USFWS 2013:57

<sup>B</sup> CEC and CDFG 2007:45



- Proposed Representative Wind Turbine Locations
- Proposed Access Roads



Project Location: Humboldt County, California  
 Prepared by PG on 2018-08-07  
 Reviewed by JD on 2018-08-07

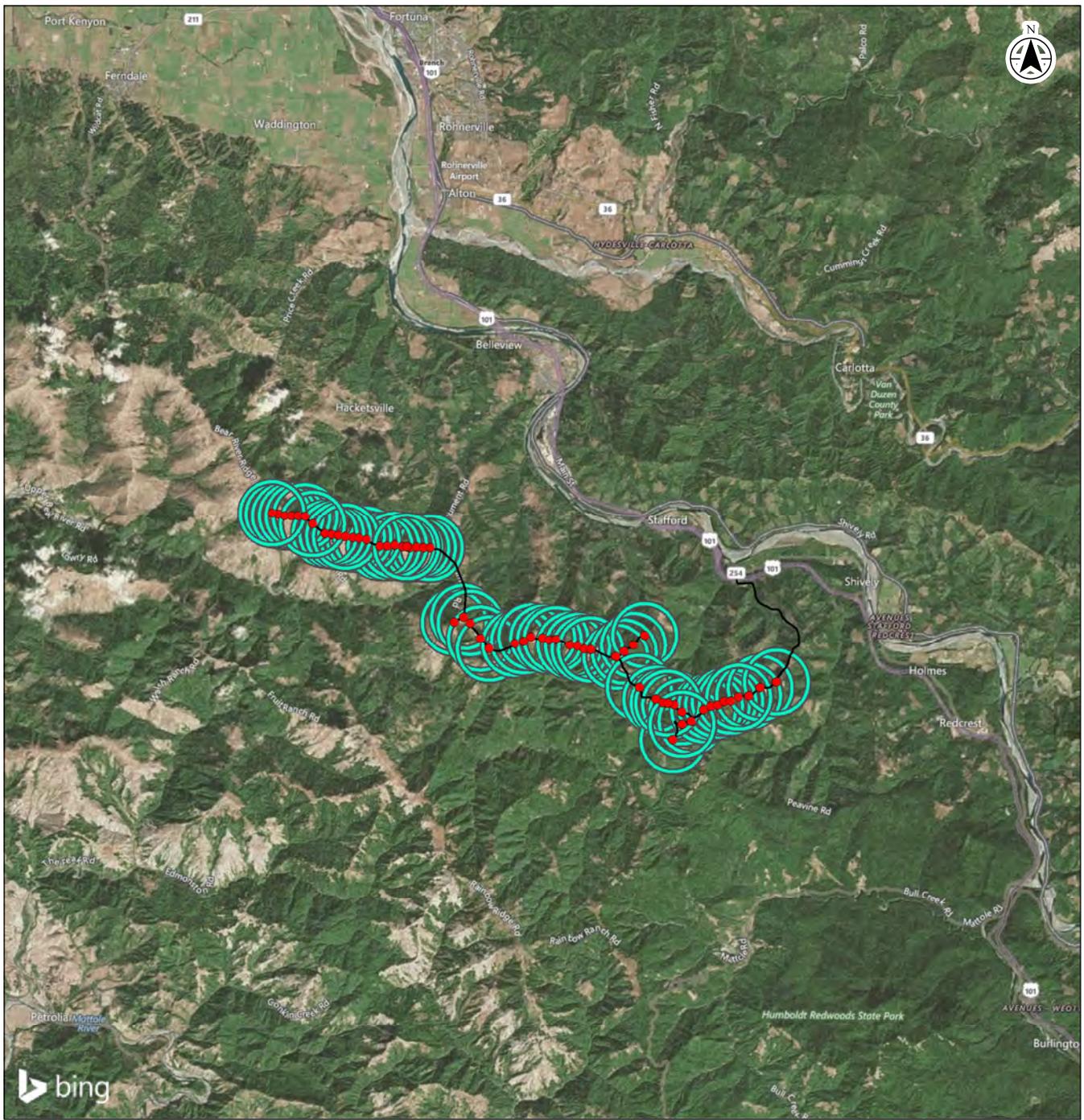
Client/Project: Humboldt Wind, LLC  
 Humboldt Wind Energy Project

Figure No.: 3-1a

Title: Proposed Turbine Locations

- Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
  2. Aerial imagery and base map: Bing Maps

Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.



- Proposed Representative Wind Turbine Locations
- Proposed Access Roads
- Proposed Turbine Buffer (1 kilometer)



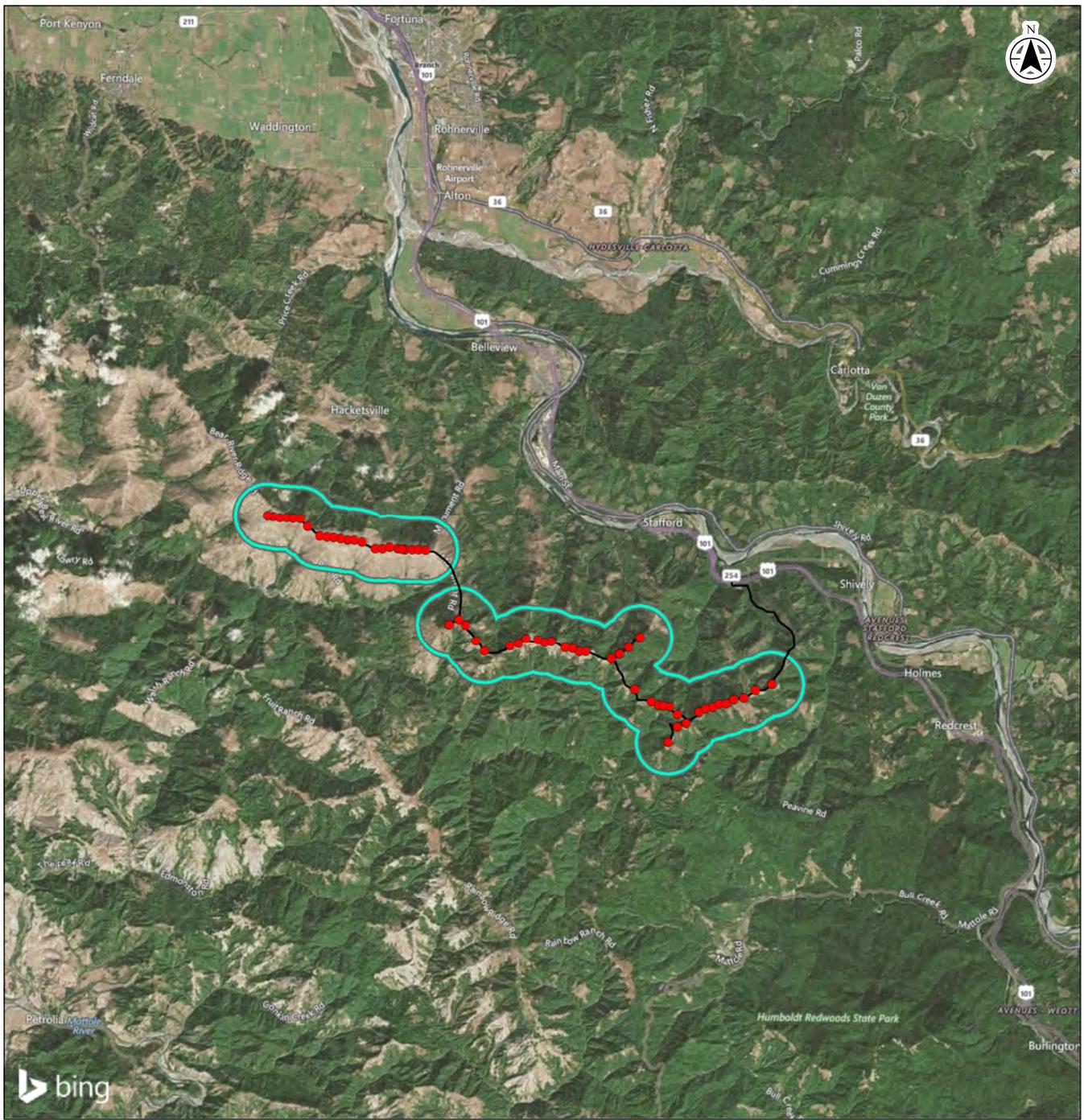
Project Location: Humboldt County, California  
 Client/Project: Humboldt Wind, LLC  
 Humboldt Wind Energy Project

Notes:  
 1. Coordinate System: NAD 1983 UTM Zone 10N  
 2. Aerial imagery and base map: Bing Maps

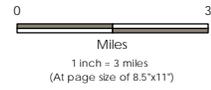
Figure No. 3-1b  
 Title

**Proposed Turbine Locations and 1-km Buffer**

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- Proposed Representative Wind Turbine Locations
- Proposed Access Roads
- ▭ Proposed Project Footprint



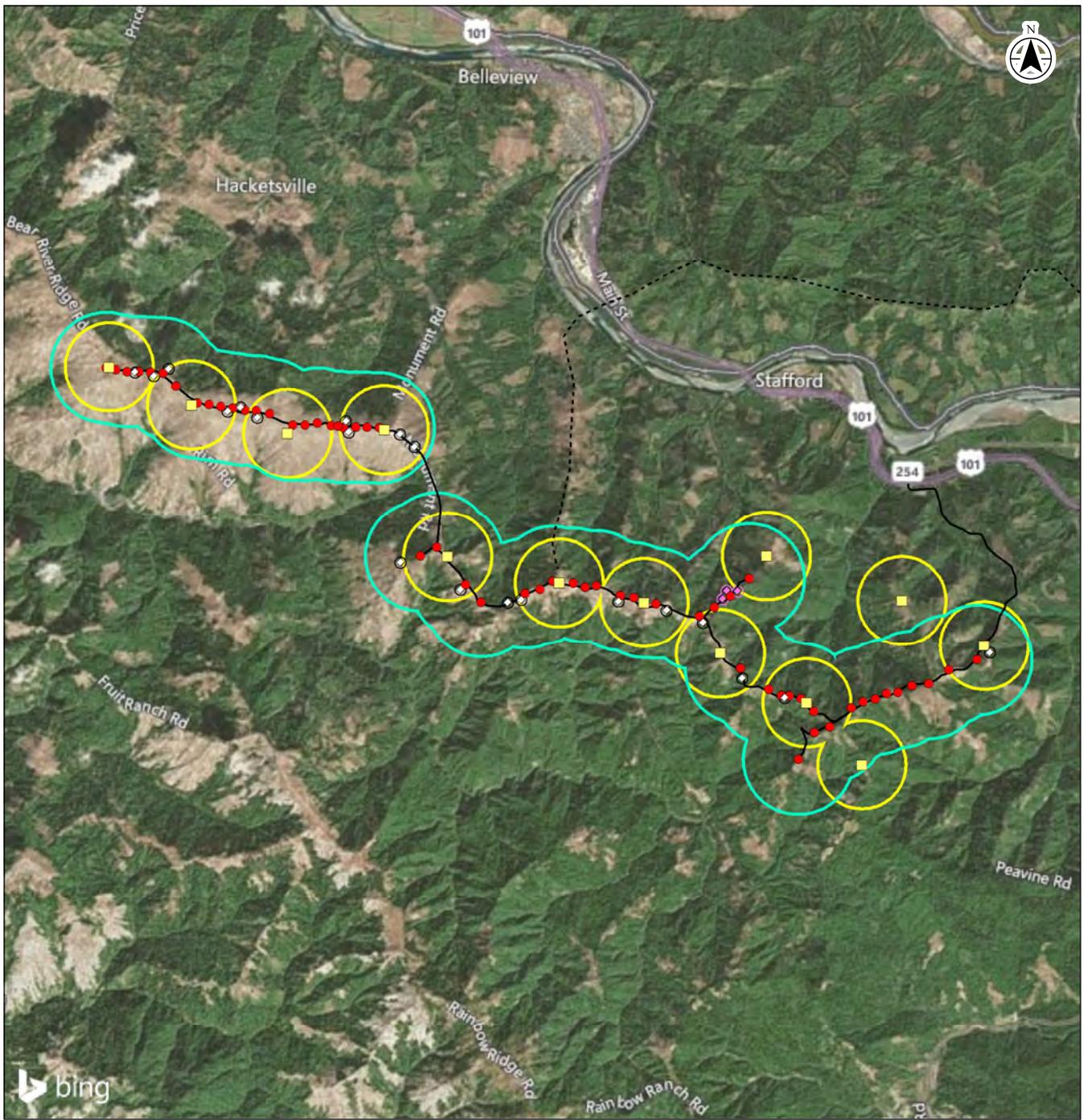
Project Location: Humboldt County, California  
 Prepared by PG on 2018-08-07  
 Reviewed by JD on 2018-08-07

Client/Project: Humboldt Wind, LLC  
 Humboldt Wind Energy Project

Figure No.: 3-1C  
 Title: Proposed Project Footprint

Notes  
 1. Coordinate System: NAD 1983 UTM Zone 10N  
 2. Aerial imagery and base map: Bing Maps

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- Proposed Project Footprint
- Proposed Representative Wind Turbine Locations
- Proposed Access Roads
- Proposed Generation Tie-In Line (Gen-Tie)

- Bird Use Count/Eagle Use Count Survey Location
- Bird Use Count/Eagle Use Count Buffer (800 meters)
- ◇ Small Bird Use Count Survey Location
- Small Bird Use Count Buffer (100 meters)
- ◆ Small Bird Use Count Survey Location (Discontinued)
- Small Bird Use Count Buffer (100 meters; discontinued)



Project Location: Humboldt County, California  
 Prepared by PG on 2018-08-07  
 Reviewed by JD on 2018-08-07

Client/Project: Humboldt Wind, LLC  
 Humboldt Wind Energy Project

Figure No. 3-1d  
 Title

Avian Use Survey Locations

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BIOLOGICAL RESOURCES WORK PLAN**

**3.1.2 BUC Field Survey Methods**

Terra-Gen will conduct BUC surveys weekly from 2017 through 2019. To maintain regular data collection and to sample in all representative conditions, surveys will occur regardless of weather conditions, except events that limit accessibility, or which would violate established safe work practices in effect for the project. Each BUC survey will be 30 minutes. Because of the project layout, strict randomization is not logistically possible to achieve. However, Stantec will stratify sampling by establishing alternating northerly to southerly and southerly to northerly routes for conducting surveys. This will result in surveying each BUC point four times per month at various time of day (Tables 3-2, 3-3).

**Table 3-2. Example Eagle Use Count and Bird Use Count Sampling Strategy, Month #1, Humboldt Wind Project, Humboldt County, California.**

Avian Survey Point Number	Week 1		Week 2		Week 3		Week 4	
	Eagle Use Count	Bird Use Count						
<b>Monument Ridge</b>								
11	X ↓	X ↓		X ↑		X ↓		X ↑
12	X ↓	X ↓		X ↑		X ↓		X ↑
13	X ↓	X ↓		X ↑		X ↓		X ↑
14	X ↓	X ↓		X ↑		X ↓		X ↑
15	X ↓	X ↓		X ↑		X ↓		X ↑
16		X ↓		X ↑	X ↓	X ↓		X ↑
17		X ↓		X ↑	X ↓	X ↓		X ↑
18		X ↓		X ↑	X ↓	X ↓		X ↑
19		X ↓		X ↑	X ↓	X ↓		X ↑
<b>Bear River Ridge</b>								
28		X ↓	X ↑	X ↑		X ↓		X ↑
29		X ↓	X ↑	X ↑		X ↓		X ↑
30		X ↓	X ↑	X ↑		X ↓		X ↑
31		X ↓	X ↑	X ↑		X ↓		X ↑

X = BUC Completed

Route Direction:



North-South



South-North

**HUMBOLDT WIND ENERGY PROJECT  
BIOLOGICAL RESOURCES WORK PLAN**

**Table 3-3. Example Eagle Use Count and Bird Use Count Sampling Strategy, Month #2, Humboldt Wind Project, Humboldt County, California.**

Avian Survey Point Number	Week 1		Week 2		Week 3		Week 4	
	Eagle Use Count	Bird Use Count						
<b>Monument Ridge</b>								
11		X ↓	X ↑	X ↑		X ↓		X ↑
12		X ↓	X	X		X ↓		X
13		X ↓	X	X		X ↓		X
14		X ↓	X	X		X ↓		X
15		X ↓	X	X		X ↓		X
16		X ↓		X		X ↓	X ↑	X
17		X ↓		X		X ↓	X	X
18		X ↓		X		X ↓	X	X
19		X ↓		X		X ↓	X	X
<b>Bear River Ridge</b>								
28	X ↓	X ↓		X ↑		X ↓		X ↑
29	X ↓	X ↓		X		X ↓		X
30	X ↓	X ↓		X		X ↓		X
31	X ↓	X ↓		X		X ↓		X

X = BUC Completed

Route Direction:                      ↓ North-South                      ↑ South-North

At the start of each 30-minute survey, the observer will record the BUC point number, date, start time, temperature, wind speed and direction, visibility, cloud cover, and precipitation. For each observation, the following data will be recorded on a standardized BUC data sheet (Appendix B):

- Time of bird detection and detection type (i.e., auditory, visual, or both)
- Assign a unique reference number to each individual bird or group of birds detected
- Cardinal direction of detection
- Species
- Number of birds
- Estimated distance from the observer to each bird, including whether the bird is within or beyond the 800-m (2,600-ft) survey point radius
- Flight height above ground level estimated within 50-m intervals (0–50, 50–100, etc.)
- Behavior (e.g., perching, flying, migrating, singing, or calling)

## **HUMBOLDT WIND ENERGY PROJECT BIOLOGICAL RESOURCES WORK PLAN**

- Habitat type (e.g., grassland, coniferous forest) bird is occupying (non-flying birds) including type of perch used by perched birds

Stantec will use flight heights and distances to categorize the data according to whether the bird was below, within, or above the hypothetical rotor-swept area (CEC and CDFG 2007:44) to classify the bird's topographic location such as ridge top, ridge shoulder, passing over a ridge saddle. For each survey year, Stantec will produce a Bird Use Survey Report that provides the methods, data analyses, and summary results with conceptual project implications.

### **3.2 EAGLE USE COUNT SURVEY**

Stantec will conduct an EUC survey that is consistent with the ECPG (USFWS 2013) from 2017 through 2019. Once per month, Stantec will survey each of the 13 BUC points for 60 minutes. Use of the 13 BUC survey points results in a survey coverage of at least 30% of the Project Footprint (USFWS 2013:57). Like the BUC surveys, the EUC surveys will be stratified by establishing alternating northerly to southerly and southerly to northerly routes by which the surveys are conducted. This will result in a survey at each eagle point monthly and at various times of day (Table 3-1).

At the start of each 60-minute survey, the observer will record the EUC point number, date, start time, temperature, wind speed and direction, visibility, cloud cover, and precipitation. For each eagle observation, Stantec will record flight height category, distance, and behavior (i.e., flying or perched) during each 1-minute interval the eagle is within sight and within the 800-m (2,625-ft) radius and at or below 200 m (656 ft) above ground level. Eagles observed outside of the survey radius or above this altitude will be recorded but will not be included in the calculation of eagle use minutes (i.e., minutes eagles were observed within the 800-m [2,625-ft] plot and at or below 200 m [656 ft]). For those eagles observed for a fraction of a minute, the time will be rounded up to 1 whole minute (Appendix C).

Stantec will produce an Eagle Survey Report, which will summarize the seasonal and spatial variation in eagle use observed during the survey and will provide the overall number of eagle use minutes in the project area.

### **3.3 EAGLE AND RAPTOR AERIAL NEST SURVEYS**

Evaluating project impacts on the population of nesting eagles and other raptors requires an understanding of the population, nest locations, and overall nesting biology. In addition, these data can aid with micro-siting turbines to reduce potential impacts on nesting eagles and raptors, and with developing appropriate buffer zones around any breeding territories (CEC and CDFG 2007, USFWS 2013). Nest surveys for eagles and other raptors will supplement BUC surveys, EUC surveys, and other field survey data. The main objectives of these studies are to understand the species composition of the nesting cohort of raptors and their nest locations in the Project Footprint and affected surroundings, so that project impacts may be estimated. A secondary objective is to understand the nesting productivity (i.e., the number of nestlings that successfully fledged). This is because failure to nest (e.g., because a raptor failed to secure a mate, a mated pair failed to secure a nesting territory) and failure to nest successfully (i.e., a nest was initiated but failed to produce surviving fledglings) are the two variables that most limit raptor populations (Newton 1979). To the degree possible, Stantec will deploy a suite of studies that are collectively designed to detect early eagle courtship behavior and territoriality so that failure to nest and failure to nest successfully can be estimated and factored into estimates of nesting productivity (i.e., estimated number of chicks to survive to the age of fledging). This will minimize the overestimation bias that can result when evaluating population-level productivity based solely on successful nests.

## **HUMBOLDT WIND ENERGY PROJECT BIOLOGICAL RESOURCES WORK PLAN**

Stantec will use a combination of field methods to accomplish these objectives: (1) aerial nest surveys; (2) ground-based observations (i.e., EUCs); and (3) opportunistic detections that will trigger a specific data collection protocol which will supplement other survey data and may be used to affect timing of aerial surveys and areas of concentration for ground-based surveys. Aerial and ground-based surveys will be scheduled and sequenced based on USFWS guidance and CDFW instructions (USFWS 2013, CDFW 2017c) to detect important intervals: early incubation, early nesting, and late nesting (CDFW 2017c).

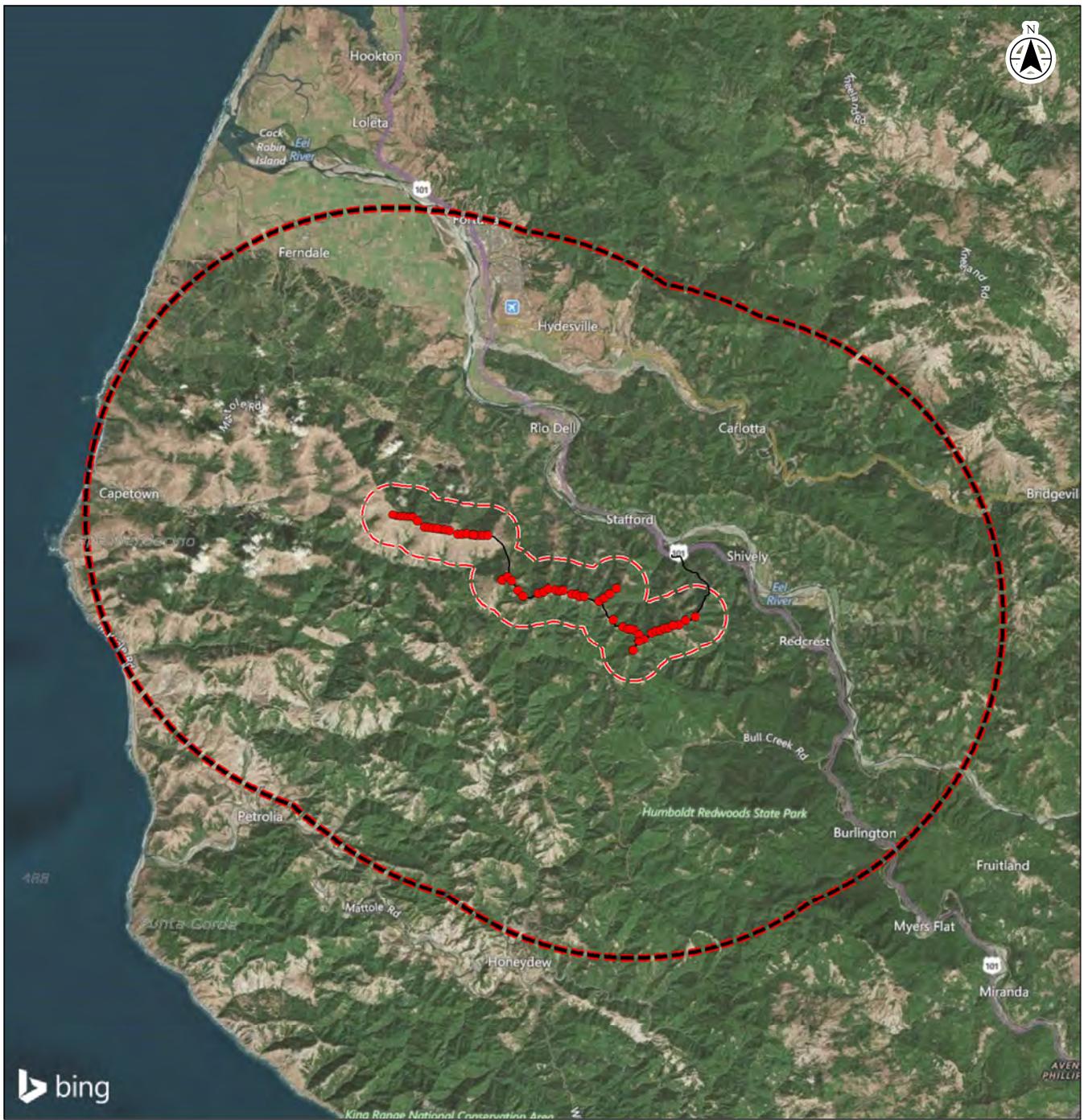
### **3.3.1 Eagle and Raptor Aerial Nest Surveys**

The aerial survey is designed to maximize detection probability and to locate nests sites accurately. Field survey methods will generally follow the ECPG (USFWS 2013) and CDFW *Bald Eagle Breeding Survey Instructions* (CDFW 2017c), other published agency guidance, and relevant published literature. Additionally, survey methods will include concepts and concerns expressed by USFWS in a work plan review meeting (January 8, 2018; Heather Beeler, Tracy Borneman, and Thomas Leeman, personal communication).

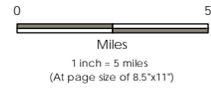
Both the CEC and CDFG Guidelines and the WEG suggested surveying for raptor and eagle nests within at least a 1-mile (mi) area around proposed turbines (CEC and CDFG 2007:46, and USFWS 2012a:29, respectively). However, Stantec is aware from multiple agency consultations and emerging standard practice that a larger survey radius surrounding turbines of at least 10-mi radius is normally suggested.

Stantec established a 16 km (10 mi) radius around the proposed turbine locations within which surveys for nests of eagles and other large raptors will be conducted (Figure 3-2). A 1.6 km (1 mi) radius around the proposed turbine locations will be used to search for nests of raptors other than eagles, particularly those species that build medium to large stick nests in tree canopies that may be less visible from the air. Additionally, the proposed Gen-Tie corridor, and a .5-mi buffer on either side, will be surveyed for nests of eagles and other raptors. Surveys will be used to inspect suitable nesting substrates (e.g., trees, cliffs, and natural features, as well as transmission line towers or other anthropogenic structures, and any known historic nesting locations for both bald eagles [*Haliaeetus leucocephalus*] and golden eagles [*Aquila chrysaetos*]).

Results of the Aerial Nest Surveys will be incorporated in the Eagle Survey Report, which will summarize known data for the region, survey methods, and results and include a map depicting relevant results and observations.



- Proposed Representative Wind Turbine Locations
- Proposed Access Roads
- 1 Mile from Proposed Turbines (Raptor Survey Area)
- 10 Miles from Proposed Turbines (Eagle Survey Area)



Project Location: Humboldt County, California  
 Client/Project: Humboldt Wind, LLC  
 Humboldt Wind Energy Project

Notes  
 1. Coordinate System: NAD 1983 UTM Zone 10N  
 2. Aerial imagery and base map: Bing Maps

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Figure No. 3-2  
 Title: Eagle and Raptor Aerial Nest Survey Area

## **HUMBOLDT WIND ENERGY PROJECT BIOLOGICAL RESOURCES WORK PLAN**

Prior to the survey, a geographic information system (GIS)-based map will be composed, showing all proposed turbine locations and other proposed project elements that require surveys. The 10-mi buffer around proposed turbines will be mapped, as will all known locations of active or historic and inactive nest locations or potential habitats. These maps will be uploaded to GPS-enabled tablets that will be used during aerial surveys to identify historic nests and the survey boundary, track survey progress, and map new nest observations. Waypoints may be plotted, and flight tracks will be retained, so that planned survey flights provide for 100% visual coverage.

Three biologists familiar with nesting biology and experienced in aerial nest searches will conduct surveys (excluding the pilot) from a Bell Long Ranger L-4 helicopter, following applicable safe work practices, and upon receiving any required additional training to comply with company or project-specific safety protocols. Stantec biologists will conduct a minimum of two aerial nest surveys; a third may be added pending results of the initial two surveys. Biologists will use image-stabilized binoculars, and at least two GPS-enabled tablets will be onboard the helicopter to map any nests located and to log flight tracks for reporting.

Surveys will be separated by at least 30 days. The first survey will ideally be timed during the early incubation period for eagles (early to mid-March; CDFW 2017c), with the second survey occurring during the early nesting period (late April–early May; CDFW 2017c). It is anticipated that the first survey will target only eagles, due to their earlier nesting phenology compared to other diurnal raptors. The second survey would include those other species within the 1-mi turbine buffer survey area and along the transmission line corridor as well as any eagle nests documented during the first survey.

During aerial surveys, the location of any eagle identified flying, perching, nesting, or conducting territorial and/or reproductive displays will be mapped using GPS and GIS. Additionally, the species, age class, and behavior of eagles will be noted on an Aerial Eagle and Raptor Nest Survey Data Sheet as well as active nest locations of any non-eagle raptor species. Aerial nesting surveys will be conducted in 2018 and 2019.

### **3.3.2 Opportunistic Eagle and Raptor Nest Surveys**

Field work will result in biologists being present throughout the Project Footprint for various purposes. Collectively, these tasks will result in considerable cumulative time spent on the project site, during which it will be possible to document roost locations (USFWS 2013:62) or to incidentally observe indications of raptor and eagle nesting behavior. These opportunistic observations could include foraging, roosting, courtship flights and pair-bonding, nest-building, or displays of territorial defense. These behaviors are not readily detected during aerial surveys but can be used to indicate the possibility of nests that could be detected during aerial surveys.

Any incidental eagle observation that could be used to locate individual or communal roost sites, or that may indicate nesting, will trigger a focused effort to collect additional data. When not otherwise committed, or if engaged in an activity that is not time-sensitive, biologists observing eagles in these behaviors will complete a data collection protocol that consists of the following: (1) date and time of initial observation and location using hand-held GPS or map approximation; (2) species and number of raptors; (3) all observed behaviors (apparent roosting or moving to or from a possible roost; paired perching, flying, courtship display, undulating flight display, or territory defense against conspecifics or other birds; carrying nesting material or actively nest building; carrying prey) in brief narrative format; and, (4) ending time and location (if different from initial observation). If otherwise committed, biologists will collect sufficient data to revisit the location and follow the same protocol as soon as possible after making the initial

## **HUMBOLDT WIND ENERGY PROJECT BIOLOGICAL RESOURCES WORK PLAN**

detection. These data will be used to compile a map prior to aerial and ground-based nesting eagle and raptor surveys and may be used to influence the timing or areas of concentration of ground-based surveys.

This opportunistic protocol is not intended to serve as a core data collection method; rather, it is intended only to provide additional data that may add to or improve other data collected. Any incidental observations recorded will be included in the Eagle Survey Report.

### **3.4 SMALL BIRD USE SURVEY**

SBUC surveys incorporating methods in the CDFG/CEC Guidelines will be conducted during spring, summer, and fall 2018. Methods largely follow Reynolds et al. (1980) and will be recorded during BUC surveys. Small birds will be recorded when observed within 100 m (328 ft) whereas larger birds will be recorded within the full 800-m (2,625-ft) radius.

In addition to documenting small birds during BUC surveys, 20 additional small bird use specific survey points will be distributed on the ridgelines within the proposed project area. The SBUC surveys will be generally located proportional to the abundance of each habitat type within the project area.

Surveys at each SBUC point will be completed every week from approximately March 15 through October 31, 2018. Each SBUC will be surveyed for 10 minutes between sunrise and 10:00 am. The count data will be segregated into observations during the first 3 minutes of the survey, from minutes 3–5, and from minutes 5–10 to allow for comparisons with other survey efforts, if warranted. The order in which the points are surveyed will be alternated in a similar manner as the BUC surveys.

The following information will be recorded at the start of each point count: SBUC point number, date, visibility, and weather information (i.e., temperature, wind speed, wind direction, precipitation, and cloud cover). The start and end time of each SBUC survey will be recorded and the following data will be recorded for each observation (Appendix D):

- A unique reference number for each individual bird or group of birds detected
- Species (or best possible identification)
- Number of individuals
- Time when first observed
- Distance and cardinal direction from plot center
- Flight height based on height codes (e.g., 0–1 m, 2–10m)
- Flight direction (as much as practical)
- Behavior (flying or perched)
- Habitat type (e.g., grassland, coniferous forest) bird is occupying (non-flying birds)
- Any other notable observations or comments (e.g., nesting, territorial behavior)

Other species observed during the SBUC surveys will be recorded and reported as incidental observations. The data will be analyzed and summarized in the Bird Use Survey Report described in Section 3.1.2, above.

**HUMBOLDT WIND ENERGY PROJECT  
BIOLOGICAL RESOURCES WORK PLAN**

## 4.0 ACOUSTIC BAT MONITORING

Stantec will conduct acoustic monitoring incorporating methods in the CEC and CDFG Guidelines (CEC and CDFG 2007) starting in spring 2018, to sample and characterize the level and timing of bat activity in the project area. Patterns of observed bat activities will be compared with results of similar surveys conducted within the region.

Stantec will deploy ground-level bat detectors along the ridgelines where turbines are proposed and at a reference location at a lower elevation (Figure 4-1) for a total of up to 8 detectors deployed across Monument Ridge. Sites selected for detectors will be in locations and habitats that are representative of the habitats occurring along the full ridgetop portion of the project area. Detectors will also be deployed on a subset of project mts.

At each ground-level detector location, Stantec will install the following equipment:

- An approximately 3-m portable microphone pole
- A Wildlife Acoustics SM4BAT detector with a cable-mounted microphone located atop the microphone pole

At each met, Stantec will install the following equipment:

- A Wildlife Acoustics SM4BAT detector with a cable-mounted microphone located in the met tower approximately 40–45 m above the ground
- A Wildlife Acoustics SM4BAT detector with a cable-mounted microphone located approximately 3 m above the ground

Stantec will calibrate and program the equipment prior to deployment. The detectors will be programmed to record from 30 minutes prior to sunset to 30 minutes after sunrise each night of the survey. The survey period will encompass the spring migration, summer residency, fall migration, and winter residency seasons for bats.

The bat detectors digitally record in full-spectrum the echolocation pulses of bats that pass near the microphones. These acoustic data files are stored on data cards that are periodically downloaded. The data files are then filtered using Kaleidoscope Pro 4.3.2 (Wildlife Acoustics, Inc.) to eliminate noise (e.g., insects, rain, wind). A bat biologist trained in this analysis will visually review the files in AnalookW (version 4.2n) to confirm they contain a bat “pass” (i.e., call with two or more echolocation pulses) and not noise. Files that do not contain a bat pass will be manually removed and not analyzed further.

Biologists experienced in qualitative analysis of acoustic bat data will conduct the analysis, and a second experienced biologist will conduct a quality review of analyzed calls. Bat call sequences will be identified to the lowest possible taxon; guild (i.e., classification based on foraging and echolocation behaviors), genus, or species when possible. Bat species can be identified by the differences in the frequencies of their echolocation calls. The minimum frequency of a bat pass (measured in kilohertz [kHz]) is a characteristic used to differentiate species or groups of species from one another. Bats with minimum echolocation pulse frequencies typically less than or equal to 30 kHz will be placed into the low frequency species group. Bats with minimum echolocation pulse frequencies typically higher than 30 kHz will be sorted into the high frequency species group. Once all call files are identified and categorized into appropriate guilds, nightly tallies of detected calls will be compiled to provide an index of bat activity. To describe bat activity

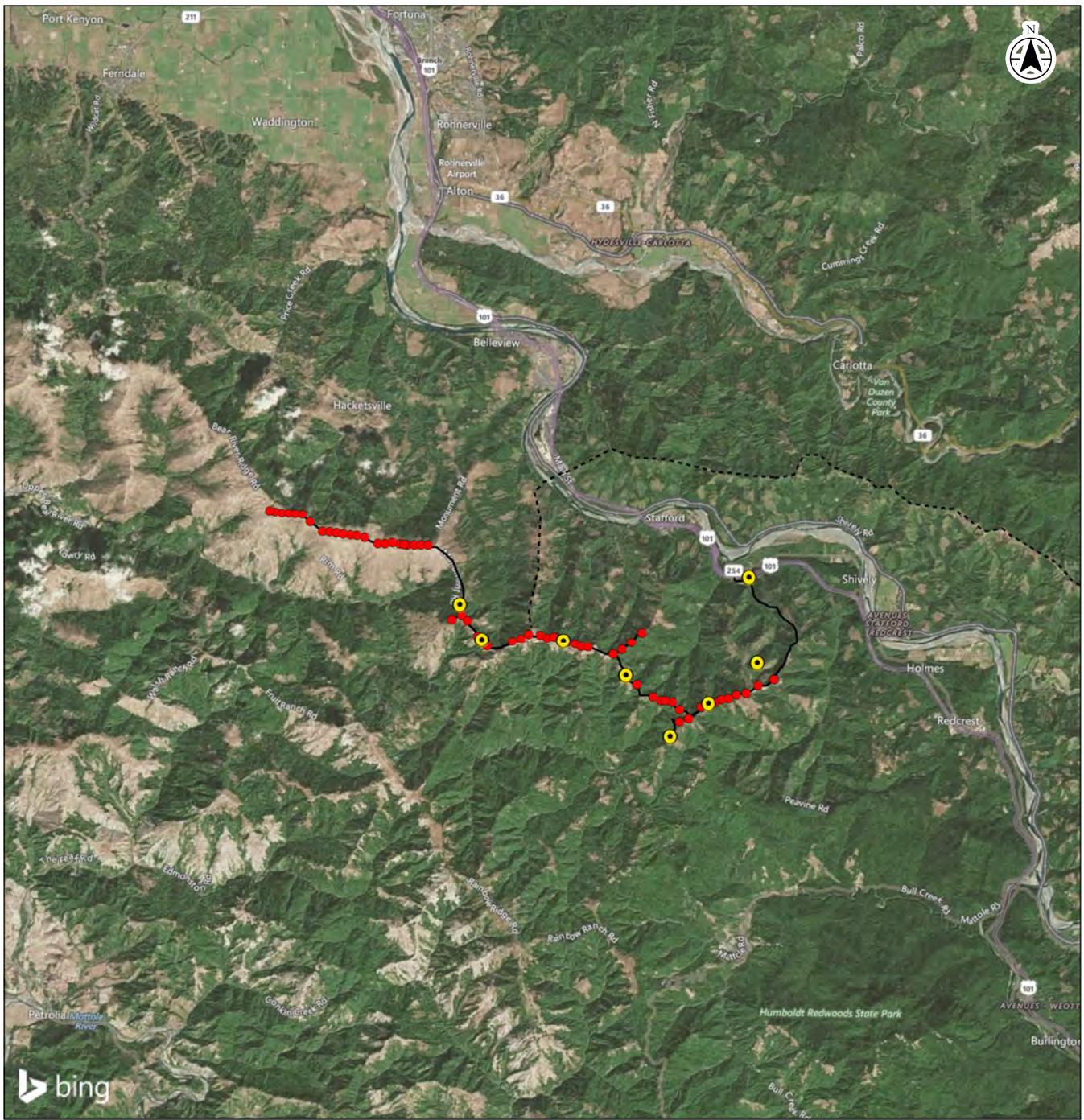
**HUMBOLDT WIND ENERGY PROJECT  
BIOLOGICAL RESOURCES WORK PLAN**

levels in relation to weather variables, weather data collected at the onsite met tower will be acquired and summarized for the survey period<sup>1</sup>.

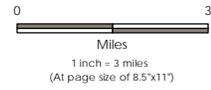
Stantec will prepare a Bat Acoustic Monitoring Report summarizing the bat activity recorded at the project. The report will include an introduction, methods, results, discussion, and references used to complete the survey. The results will include graphs of total bat activity recorded each night at each recording location and the bat species composition recorded at each location. Additionally, Stantec will analyze bat activity as it relates to weather variables (e.g., wind speed, temperature) and will provide a discussion of any pertinent results in the report.

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<sup>1</sup> If meteorological data are not available for the full deployment period, data from onsite SODARs will be used.



- Proposed Representative Wind Turbine Locations
- Acoustic Survey Location
- Proposed Generation Tie-Line (Gen-Tie)
- Proposed Access Roads



Project Location: Humboldt County, California  
 Client/Project: Humboldt Wind, LLC  
 Humboldt Wind Energy Project

Figure No. 4-1  
 Title: Acoustic Bat Detector Locations

Notes  
 1. Coordinate System: NAD 1983 UTM Zone 10N  
 2. Aerial imagery and base map: Bing Maps

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## **5.0 RARE PLANT SURVEYS**

Stantec will conduct a botanical survey of the project area for special-status plants. The survey area includes a 30-m (100-ft) corridor on either side of the transmission interconnection center line and access roads and a 152-m (500-ft) corridor along the two ridgelines where turbines are proposed (Figure 2-1).

The botanical survey will be conducted by a botanist(s) in accordance with *Protocols for Surveying and Evaluating Impacts to Special-Status Native Plant Populations and Natural Communities* (California Department of Fish and Game 2009). Survey timing will correspond to the blooming period(s) (or other periods during which species may be otherwise identifiable) for special-status plants known or potentially occurring in the project area. Stantec anticipates the botanical surveys will consist of three survey rounds occurring between March and August 2018, with surveys of some project areas occurring in appropriate bloom periods during 2019.

Stantec will delineate special-status plant occurrences found during the surveys using GPS or aerial photos, as appropriate, and will complete a CDFW California Native Species Field Survey Form (Appendix E) to document associated occurrence information. Stantec will also photograph and collect herbarium vouchers for each special-status plant occurrence, as appropriate.

Stantec will prepare a Botanical Resources Report summarizing the botanical survey methods and results, including all appropriate graphics, GIS data, and special-status plant occurrence documentation.

**HUMBOLDT WIND ENERGY PROJECT  
BIOLOGICAL RESOURCES WORK PLAN**

## 6.0 AQUATIC RESOURCE DELINEATION

Stantec wetland scientists will conduct a delineation of wetlands and “other waters” of the United States and/or State in the project area and prepare an Aquatic Resources Report. The report will contain the information necessary for submittal to: 1) the U.S. Army Corps of Engineers (USACE) San Francisco District for verification to support Section 404 Clean Water Act permitting, 2) the North Coast Regional Water Quality Control Board to support Section 401 Clean Water Act Permitting, and 3) CDFW to support Fish and Game Code Section 1600 Lake and Streambed Alteration permitting. The delineation of waters of the United States report will be prepared to support a Preliminary Jurisdictional Determination by the USACE. The delineation study area includes a 30-m (100-ft) corridor on either side of the transmission interconnection center line and access roads and a 152-m (500-ft) corridor along the two ridgelines where turbines are proposed (Figure 2-1).

Stantec will prepare base maps using publicly available aerial photography and topographic contours and evaluate existing baseline data (e.g., aerial imagery, topographic maps, soil survey, the USFWS National Wetland Inventory). Following baseline data review, Stantec will conduct an on-site routine delineation of wetlands and “other waters” potentially under the jurisdiction of the USACE and RWQCB using methods described in the *1987 USACE of Engineers Wetlands Delineation Manual* and the *2010 Regional Supplement to the USACE of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (USACE 2010) (jurisdictional determination will be subject to USACE verification). In addition, top-of-bank measurements will be noted for each drainage to assess the areas that may be CDFW-jurisdictional. Potentially CDFW-jurisdictional riparian canopy will also be mapped.

Stantec will delineate the wetland features and the associated data points using a Trimble Mapping Grade GPS capable of sub-meter accuracy. Where GPS use is impracticable or adequate satellite coverage unavailable, the wetland features will be delineated by hand onto ortho-rectified color aerial photographs. The GPS and hand-drawn location data will be overlaid onto aerial photographs of the project area to develop the delineation map(s).

Following the field delineation, Stantec will prepare an Aquatic Resources Report with the required information to support the previously listed permit applications.

**HUMBOLDT WIND ENERGY PROJECT  
BIOLOGICAL RESOURCES WORK PLAN**

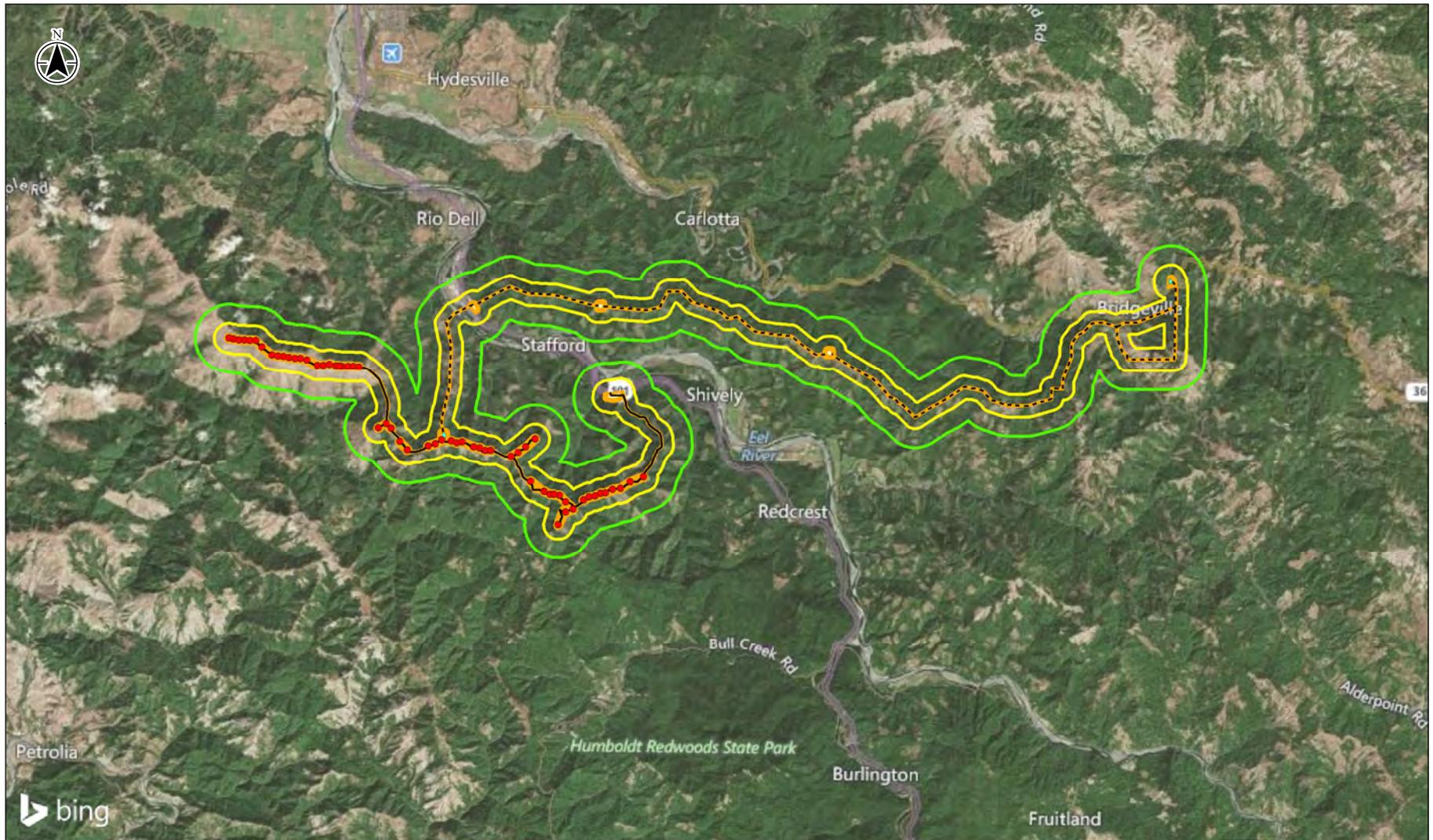
## **7.0 NORTHERN SPOTTED OWL SURVEYS**

Habitat assessments and surveys for northern spotted owls (*Strix occidentalis caurina*) (NSO) will be conducted to determine occupancy of the project area by NSO. This information will be used to inform siting of project turbines and to support the project permitting process. The protocol described below defines the survey area and describes activity center searches, nighttime call surveys, and measures taken in the event surveys detect barred owls (*Strix varia*). This approach will be implemented after a thorough review of existing HRC survey data and coordination with their on-going NSO survey efforts. The survey protocol is based on The *Protocol for Surveying Proposed Management Activities That May Impact Northern Spotted Owl* (USFWS 2012b) (NSO protocol); however, some modifications are anticipated. The need for protocol-level surveys will be assessed based on the results of the habitat assessment, existing information, and coordination with HRC and coordination with the USFWS and CDFW.

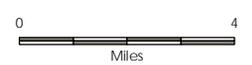
### **7.1 HABITAT ASSESSMENT**

The NSO habitat assessment and survey area includes the project area footprint, including the proposed turbine locations, project roads, electrical collection lines, Gen-Tie, and staging areas, and a 1.8 km (0.7-mi) provincial median annual home range radius per the survey radius recommended for the California Coast Range (redwood zone) in the NSO protocol (Figure 7-1), where access is granted. Surveys will include habitats in the survey area that provide potential NSO nesting, roosting, or foraging habitat, per current USFWS and CDFW guidelines.

Stantec will summarize the methods and results of the NSO habitat assessment in the Biological Resources Report.



- Proposed Representative Wind Turbine Locations
- Proposed Generation Tie-In Line (Gen-Tie)
- Proposed Access Roads
- Project Area
- Substation
- Staging Area
- Northern Spotted Owl Survey Area (0.7 mile)
- Marbled Murrelet Survey Area (0.25 mile)



Notes  
 1. Coordinate System: NAD 1983 UTM Zone 10N  
 2. Aerial imagery and base map: Bing Maps



Project Location  
 Humboldt County, California  
 185703758  
 Prepared by PG on 2018-08-07  
 Reviewed by JD on 2018-08-07

Client/Project  
 Humboldt Wind, LLC  
 Humboldt Wind Energy Project

Figure No.  
 7-1

Title  
 Northern Spotted Owl and Marbled Murrelet Survey Area

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C:\Users\jgiles\Documents\Projects\YearGen\_Humboldt\YearGen\_Humboldt\Map\Map\_070318\_11\_AECO\_MARBLMURRLET.mxd Revised: 2018.08.08 B. p.g./cslabing

**HUMBOLDT WIND ENERGY PROJECT  
BIOLOGICAL RESOURCES WORK PLAN**

## **7.2 NORTHERN SPOTTED OWL OCCUPANCY SURVEYS**

Based on the results of the habitat assessment, Stantec will conduct protocol-level NSO occupancy surveys. The NSO surveys will include coordination with HRC, who has established NSO survey locations in the project area. HRC currently conducts annual NSO surveys as part of the HCP for their Pacific Lumber Company, Scotia Pacific Holding Company, and Salmon Creek Corporation properties (HRC 2015). Approximately one-fifth of HRC's established NSO survey locations are surveyed annually, providing some level of historical survey data available for the project area. The HCP identifies forest stand types typically associated with NSO foraging, roosting, and nesting activities, and described nesting can occur in montane hardwood, montane hardwood-conifer, Douglas-fir, or redwood forest types; however, high probability of nesting typically requires stands where trees are more than 24 inches diameter-at-breast-height with moderate (40 to 59%) to dense (60 to 100%) canopy closure (HRC 2015). The NSO survey effort will incorporate HRC stand information and known NSO locations to focus efforts on those stands where nesting activity has been previously documented or would be most likely to occur. Project surveys will be coordinated with HRC to avoid duplication of survey efforts and avoid unnecessary disturbance to resident owls.

Following coordination with HRC, the NSO surveys will be conducted using Activity Center Searches and Nighttime Call Surveys as described below.

### **7.2.1 Activity Center Searches**

Activity center searches will be conducted to search habitat and locate NSO within previously identified core areas occurring in the survey area. A minimum of one daytime activity center search will be completed for each activity center identified within the survey area. These surveys will be conducted during late March or early April prior to the start of nighttime call surveys.

### **7.2.2 Nighttime Call Surveys**

Potential NSO habitat within the NSO survey area not included in activity center searches will be surveyed using nighttime call surveys. Six NSO survey visits will be completed during each survey season (March 1–August 31). At least three survey visits will be conducted before June 30 and each survey visit will be spaced a minimum of seven days apart. The nighttime call surveys will follow the spot calling method as described in the NSO protocol using a series of fixed calling points established within the surveys area. The call points will be spaced approximately 0.25 to 0.5 mi apart located on prominent points such as ridgelines or openings above topographic drainages if possible. Each NSO call point will be monumented in the field and established using GPS so the same points are used throughout the surveys.

Nighttime call surveys will occur between official apparent sunset and sunrise, and attempts will be made to vary the order in which individual calling points are surveyed so that points are surveyed at different times throughout the survey period. All surveys will be conducted during appropriate weather conditions, per the NSO protocol.

Survey personnel will use high quality digital callers with well recorded northern spotted owl calls to perform the surveys following the calling procedures described in the NSO protocol for the required the 10-minute survey period at each calling point or until a NSO responds. If barred owls are detected during the NSO surveys, the surveyor will continue to call for NSO for the entire 10-minute period. If a NSO responds, and the barred owl is nearby, calling will

**HUMBOLDT WIND ENERGY PROJECT  
BIOLOGICAL RESOURCES WORK PLAN**

be discontinued, but the surveyor will continue to listen for additional responses and collect associated data for the full 10-minute survey period.

All NSO survey results will be documented using standard data forms (Appendix F), including:

- survey date;
- calling point location/identifier;
- survey start and stop time at stations (total amount of time spent calling) and total time of survey if calling between stations;
- weather conditions (including estimated wind speed and precipitation). Stop and restart times will be noted if weather during the survey momentarily exceeds recommended conditions;
- observations or responses by barred owls, spotted-barred owl hybrids, great horned owls (*Bubo virginianus*), northern goshawks (*Accipiter gentilis*), or any other large raptor species;
- compass bearing and approximate distance to northern spotted owl or other detected raptor;
- sex and age, if known;
- time of first response; and
- type of detection (i.e., audio, visual, both).

Follow-up outings as described in the NSO protocol will be conducted for all NSO detections occurring during the nighttime call surveys.

If protocol-level surveys are conducted, Stantec will also prepare a NSO Survey Report summarizing all survey coordination, methods, and results, including appropriate supporting survey data, graphics, and GIS data.

**HUMBOLDT WIND ENERGY PROJECT  
BIOLOGICAL RESOURCES WORK PLAN**

## **8.0 MARBLED MURRELET SURVEYS**

A habitat assessment for marbled murrelet (*Brachyramphus marmoratus*) (MAMU) will be conducted to determine the presence of suitable habitat in the project vicinity. In addition, radar surveys will be conducted to determine if MAMU are using the airspace over the project area. This information will be used to inform siting of project turbines and to support the project permitting process, including project risk assessment. The protocol described below defines the study area for the habitat assessment and describes the radar surveys and is based upon *The Methods for Surveying Marbled Murrelets in Forests: A Revised Protocol for Land Management and Research* (Evans Mack et al. 2003), *Transmittal of Guidance: Estimating the Effects of Auditory and Visual Disturbance to Northern Spotted Owls and Marbled Murrelets in Northwestern California* (USFWS 2006), and MAMU surveys conducted for wind energy development or other related research (Cooper and Sanzenbacher 2006, Cooper and Mabee 2010, Sanzenbacher et al. 2014). A risk assessment model will be developed through consultation with USFWS and CDFW. Dr. Rick Golightly will be involved in radar survey design, data analysis, and risk assessment model design.

An initial assessment was completed in February 2018 to identify potential radar locations and to identify potential MAMU nesting habitat within the project area. This assessment involved a review of available information from HRC as it relates to established Marbled Murrelet Conservation Areas (MMCA), mapped redwood forest stands, survey locations, applicable survey reports, and on-the-ground field reconnaissance.

Because radar surveys are not limited by available nesting habitat within the project area and are also intended to identify use of air space over the project area, these surveys will be conducted regardless of whether potential nesting habitat is identified and are described in Section 8.2, below.

### **8.1 HABITAT ASSESSMENT**

The MAMU habitat assessment survey area includes the project area including the proposed turbine locations, project roads, electrical collection lines, Gen-Tie, and staging areas; and a 0.40-km (0.25-mi) provincial median annual home range radius per the 2006 USFWS guidance (Table 1; USFWS 2006) (Figure 7-1), where access is granted. Surveys will include habitats suitable for MAMU in the survey area as determined based on the protocols and guidelines previously mentioned and coordination with the USFWS and CDFW. The habitat assessment will include both a desktop-analysis and a “walk-through” of the survey area, during which surveyors will look for the presence of specific characteristics required by MAMU. Desktop analysis will incorporate existing mapped data provided by HRC as relevant.

Stantec will summarize the methods and results of the MAMU habitat assessment in the Biological Resources Report.

### **8.2 MARBLED MURRELET RADAR SURVEYS**

The goal of these surveys is to determine if MAMU are using the airspace over the project area to move between offshore habitats and inland nesting sites. Radar surveys are not capable of determining site occupancy by MAMU, but they can be used to identify use of the airspace above the project area and the probable presence of birds at or near the turbines.

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As part of their HCP, HRC has identified MMCAs on their properties located north of the Eel River with the nearest identified MMCA located approximately 6 mi north of Shively Ridge and approximately 10.5 mi north of Monument Ridge (HRC 2014). HRC has been conducting annual radar surveys for MAMU as part of the HCP since 2002 (HRC 2016). Their radar survey locations are associated with the identified MMCA and with the Headwater Forest Reserve and the Humboldt Redwood State Park. To monitor movement of MAMU from the coast to the Humboldt Redwood State Park, two of their radar sites are located along the Eel River, north of the project area, and two other sites are located along the Eel River to the east of the project area.

Radar survey locations for the project will be located along Monument Ridge, west of the HRC survey locations, to track potential movement of MAMU over the project area and those areas with proposed turbine locations. Additionally, a lower elevation site along the Eel River will be sampled. Radar surveys will use X-band marine surveillance radar, like that described by Cooper et al. (1991), to detect and track MAMU when they are in flight. Seven radar locations will occur along Monument Ridge (5 sites) and Bear River Ridge (2 sites), where turbines are proposed (Figure 8-1). Locations were selected in areas with safe access, relatively flat topography, and with clearings or openings in the forest canopy that can be used to reduce ground clutter interference and maximize the radar view of the surrounding airspace.

Each location will be sampled using two radars; one in horizontal (surveillance) mode and one in vertical mode. The flight path and flight speed of targets will be recorded with the horizontal radar the flight height of targets will be recorded with the vertical radar, when possible<sup>2</sup>. Both radars will be operating concurrently. Each X-band marine surveillance radar will be operated at a range of 1.5 km (0.75 nautical mile, 0.9 mi) with the pulse length at 0.07 µsec (Cooper and Sanzenbacher 2006, Cooper and Mabee 2010).

Surveys will be conducted using distinct sampling “events” during which all eight radar locations are sampled in both the evening and morning. Evening surveys will occur from 60 minutes before to 60 minutes after sunset, and morning surveys will occur from 90 minutes before to 75 minutes after sunrise. Sampling events will begin in mid-April 2018 and will be timed to occur every 2 to 3 weeks through the end of September and then once in the months of October and December, and then again in February 2019. Evening sampling will be discontinued after August, as fledged young should have left nesting territories by then and evening flights by adults virtually cease. Additionally, a single round of mid-day sampling at the three ridgeline sites will be conducted in summer 2018 to evaluate if murrelets transit back and forth between the coast and nesting areas during the day.

To identify MAMU targets, a combination of flight speed (greater than 64 km/hr [40 mi/hr]), flight behavior (usually direct flight unless circling over a forest stand), timing of flight, radar target signature, and flight path (e.g., from sea to land) will be used (Evans Mack et al. 2003; Cooper and Sanzenbacher 2006; Cooper and Mabee 2010). These flight characteristics will be used to separate other targets such as band-tailed pigeons (*Patagioenas fasciata*) from MAMU targets (Cooper and Sanzenbacher 2006). One or more birds flying close together on the same flight path can appear as one echo on the radar screen. Individual targets will be observed closely for several scans to determine the minimum number of birds per target, or a single echo trail will be counted as one detection. The approach to assessing potential multiple birds per target will be determined prior to the start of surveys. During all radar surveys the radar biologist will attempt to obtain visual verification of murrelet and non-murrelet targets during periods when

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<sup>2</sup> The vertical radar samples a smaller volume of airspace due to its alignment. Consequently, not all radar targets observed on the horizontal radar will pass through the vertical radar beam.

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ambient light and visibility allow. The radar screen will also be recorded during each survey period using video capturing software.

Recorded radar tracks of MAMU will be post-processed to record a series of data (Cooper and Mabee 2010; Sanzenbacher et al. 2014):

- Date
- Time
- Flight direction
- Flight altitude, when available
- Nearest distance to radar location
- Ground speed
- Flight behavior
- If detected by radar, observer (seen or heard), or both

Stantec will prepare a MAMU Radar Survey Report summarizing survey methods and results. This will include examples of radar views, accumulated radar target tracks, tallies of audio-visual detections, summaries of potential occupancy determinations, and figures showing radar survey locations. The data collected during these surveys will be used to assess fatality risk. A risk assessment model will be developed through consultation with USFWS and CDFW.



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# **APPENDICES**

**HUMBOLDT WIND ENERGY PROJECT  
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**Appendix A      EXAMPLE BIRD USE COUNT POINT FIELD  
MAP**



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**Appendix B      BIRD USE COUNT DATA SHEET**





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**Appendix C EAGLE USE COUNT DATA SHEET**

Point Count Number:	<b>Stantec Eagle Point Count Datasheet (60 min)</b>					Pg ___ of ___
Date:	Project Name:	County: Humboldt			Weather Conditions during Point Count	
Observer:	Survey notes: <i>(Change in weather conditions, migration flights, etc.)</i>				Temp (°F)	Wind Speed Code
Survey start and end time:					Wind Direct	Sky Code

					Eagle observations per 1-minute interval																																		
Obs #	Species (BAEA, GOEA, UNEA)	Sex (M, F, UNK)	Age (A, SA, J, UNK)	*Obs info	Behavior Codes																																		
					SO: soaring					KH: kiting or hovering					UT: undulating, territorial flight																								
					PE: perched					MB: being mobbed					SB: stooping or diving in response to another bird																								
					FG: flap or glide					AD: auditory detection only					SP: stooping or diving on prey																								
					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30					
				No. Eagles																																			
				Flight height (m)**																																			
				Flight direction																																			
				Distance from plot center (m)																																			
				Behavior Code																																			
<b>Notes:</b>					<u>31</u>	<u>32</u>	<u>33</u>	<u>34</u>	<u>35</u>	<u>36</u>	<u>37</u>	<u>38</u>	<u>39</u>	<u>40</u>	<u>41</u>	<u>42</u>	<u>43</u>	<u>44</u>	<u>45</u>	<u>46</u>	<u>47</u>	<u>48</u>	<u>49</u>	<u>50</u>	<u>51</u>	<u>52</u>	<u>53</u>	<u>54</u>	<u>55</u>	<u>56</u>	<u>57</u>	<u>58</u>	<u>59</u>	<u>60</u>					
				No. Eagles																																			
				Flight height (m)**																																			
				Flight direction																																			
				Distance from plot center (m)																																			
				Behavior Code																																			
<b>Notes:</b>					<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>17</u>	<u>18</u>	<u>19</u>	<u>20</u>	<u>21</u>	<u>22</u>	<u>23</u>	<u>24</u>	<u>25</u>	<u>26</u>	<u>27</u>	<u>28</u>	<u>29</u>	<u>30</u>					
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				Distance from plot center (m)																																			
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				Flight direction																																			
				Distance from plot center (m)																																			
				Behavior Code																																			
<b>Notes:</b>					<u>31</u>	<u>32</u>	<u>33</u>	<u>34</u>	<u>35</u>	<u>36</u>	<u>37</u>	<u>38</u>	<u>39</u>	<u>40</u>	<u>41</u>	<u>42</u>	<u>43</u>	<u>44</u>	<u>45</u>	<u>46</u>	<u>47</u>	<u>48</u>	<u>49</u>	<u>50</u>	<u>51</u>	<u>52</u>	<u>53</u>	<u>54</u>	<u>55</u>	<u>56</u>	<u>57</u>	<u>58</u>	<u>59</u>	<u>60</u>					

\*Observation # corresponds to the # on map; use new # if a pair of eagles split, or a new individual is observed.  
 \*\*Record flight heights to the nearest 50-m interval.  
 Additional Notes:



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**Appendix D      SMALL BIRD USE COUNT DATA SHEET**





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**Appendix E      CNDDDB NATIVE SPECIES FIELD FORM**

Mail to:  
California Natural Diversity Database  
California Dept. of Fish & Wildlife  
1416 9th Street, Suite 1266  
Sacramento, CA 95814  
Fax: (916) 324-0475 email: CNDDDB@wildlife.ca.gov

*For Office Use Only*

Source Code: \_\_\_\_\_ Quad Code: \_\_\_\_\_  
Elm Code: \_\_\_\_\_ Occ No.: \_\_\_\_\_  
EO Index: \_\_\_\_\_ Map Index: \_\_\_\_\_

Date of Field Work (mm/dd/yyyy): \_\_\_\_\_

Clear Form

### California Native Species Field Survey Form

Print Form

Scientific Name: \_\_\_\_\_

Common Name: \_\_\_\_\_

Species Found?  Yes  No \_\_\_\_\_  
If not found, why? \_\_\_\_\_

Total No. Individuals: \_\_\_\_\_ Subsequent Visit?  Yes  No

Is this an existing NDDDB occurrence? \_\_\_\_\_  
Yes, Occ. #  No  Unk.

Collection? If yes: \_\_\_\_\_  
Number \_\_\_\_\_ Museum / Herbarium \_\_\_\_\_

Reporter: \_\_\_\_\_

Address: \_\_\_\_\_

E-mail Address: \_\_\_\_\_

Phone: \_\_\_\_\_

#### Plant Information

Phenology: \_\_\_\_\_  
% vegetative \_\_\_\_\_ % flowering \_\_\_\_\_ % fruiting \_\_\_\_\_

#### Animal Information

# adults \_\_\_\_\_ # juveniles \_\_\_\_\_ # larvae \_\_\_\_\_ # egg masses \_\_\_\_\_ # unknown \_\_\_\_\_  
 wintering  breeding  nesting  rookery  burrow site  lek  other

#### Location Description (please attach map AND/OR fill out your choice of coordinates, below)

County: \_\_\_\_\_ Landowner / Mgr: \_\_\_\_\_

Quad Name: \_\_\_\_\_ Elevation: \_\_\_\_\_

T \_\_\_\_\_ R \_\_\_\_\_ Sec \_\_\_\_\_, \_\_\_\_\_ 1/4 of \_\_\_\_\_ 1/4, Meridian: H  M  S  Source of Coordinates (GPS, topo. map & type): \_\_\_\_\_

T \_\_\_\_\_ R \_\_\_\_\_ Sec \_\_\_\_\_, \_\_\_\_\_ 1/4 of \_\_\_\_\_ 1/4, Meridian: H  M  S  GPS Make & Model: \_\_\_\_\_

DATUM: NAD27  NAD83  WGS84  Horizontal Accuracy: \_\_\_\_\_ meters/feet

Coordinate System: UTM Zone 10  UTM Zone 11  OR Geographic (Latitude & Longitude)

Coordinates: \_\_\_\_\_

Habitat Description (plants & animals) plant communities, dominants, associates, substrates/soils, aspects/slope:

Animal Behavior (Describe observed behavior, such as territoriality, foraging, singing, calling, copulating, perching, roosting, etc., especially for avifauna):

Please fill out separate form for other rare taxa seen at this site.

Site Information Overall site/occurrence quality/viability (site + population):  Excellent  Good  Fair  Poor

Immediate AND surrounding land use: \_\_\_\_\_

Visible disturbances: \_\_\_\_\_

Threats: \_\_\_\_\_

Comments: \_\_\_\_\_

#### Determination: (check one or more, and fill in blanks)

- Keyed (cite reference): \_\_\_\_\_
- Compared with specimen housed at: \_\_\_\_\_
- Compared with photo / drawing in: \_\_\_\_\_
- By another person (name): \_\_\_\_\_
- Other: \_\_\_\_\_

#### Photographs: (check one or more)

	Slide	Print	Digital
Plant / animal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Habitat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Diagnostic feature	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

May we obtain duplicates at our expense?  yes  no

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**Appendix F      EXAMPLE NORTHERN SPOTTED OWL  
SURVEY DATA FORM**



**Field Data Form - Data Dictionary**

**Age** – Age is verifiable only upon visual detections.

**AD**=Adult

**IMM** = Immature (adult plumage but white tipped tail feathers observed)

**F1**=young; all downy **F2** = young, partial adult/partial down feathers **F3** = Young of the year with almost all adult feathers; may see a few downy feathers sticking through

**UNK**=Age unknown

**Detection Time** – Record in military time

**Location Name** – Enter name of survey area (i.e., Jackson Timber Sale)

**Master Site Number** - Enter state-identified activity center number

**Physiographic Province** – e.g., CA or OR Klamath, OR Coast, WA Cascades, etc.

**SEX** – **M**= Male **F**=Female **Unk** = Unknown. Contact whistles can be made by male or female.

**SPP** – **NSO** = Northern spotted owl **BAOW** – Barred Owl