Bird and Bat Conservation Strategy
Prevailing Wind Park Project
Bon Homme, Charles Mix, and Hutchinson Counties, South Dakota

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EXECUTIVE SUMMARY

Prevailing Wind Park, LLC (Prevailing Wind) is developing the Prevailing Wind Park Project (Project) near Avon, South Dakota. As part of the wind energy development process, Prevailing Wind voluntarily implemented the tiered approach detailed in the final Land-Based Wind Energy Guidelines (WEG) and incorporated agency recommendations in Project survey efforts and development. The purpose of this Bird and Bat Conservation Strategy is to develop and implement a program to identify and minimize risks to avian and bat species that may result from construction and operation of the Project.

Information gathered during Tier 1, 2, and 3 studies was used during the development process to reduce potential impacts to birds and bats and their habitats. Tier 1 and 2 studies included a review of environmental characteristics and other aspects to help inform the Project in an overall sense. This analysis, as well as the Project's biological and environmental assessments, concluded that the Project area was suited for wind energy development and any significant impacts could be avoided, minimized, or mitigated with pre-construction design and siting.

Tier 3 studies included whooping crane habitat assessment, avian use surveys, raptor and eagle nest surveys, acoustic bat surveys, and northern long-eared bat presence/absence surveys, to help determine impacts to birds and bats and assist in avoiding and minimizing impacts. Results of these studies indicated that no direct or indirect impacts to whooping cranes were expected, but due to the location of the Project and the whooping crane migration corridor, whooping cranes could use the Project area. Direct impacts to migratory birds were anticipated to be similar to other wind projects in South Dakota and elsewhere in the Midwest. Direct impacts to bald and golden eagles were unlikely as a result of low eagle use within the Project area. No eagle nests were found in the Project; however, nests were observed in the surrounding areas. Impacts to bats were anticipated to be low and within the range of other wind energy projects in South Dakota and the Midwest region. Northern long-eared bats were detected within the Project area during bat acoustic surveys in 2015, but the Project was revised to be several miles away from the area of detection.

Tier 4 studies planned include post-construction studies to estimate the actual impacts the Project has on birds and bats. For this Project, the focus will be on the Tier 4a questions set forth in the WEG. Post-construction surveys will include fatality monitoring (i.e., standardized carcass searches and bias trials), operations personnel training, and adaptive management as deemed necessary. Given that the information collected during the pre-construction period indicated that the Project is not likely to cause significant adverse impacts, per the WEG, it is not anticipated that Tier 5 research will be necessary at this Project.

This document includes whooping crane migration use data from the Central Flyway stretching from Canada to Texas, collected, managed, and owned by the US Fish and Wildlife Service (USFWS). Data were provided to Western Ecosystems, Technology, Inc. (WEST), as a courtesy for their use. The USFWS has not directed, reviewed, or endorsed any aspect of the use of these data. Any and all data analysis, interpretation, and conclusions from these data are solely those of WEST.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION

The Prevailing Wind Park Project (Project) is located in Bon Homme, Charles Mix, and Hutchinson counties, South Dakota (Figure 1). The Project area was changed over the course of Tier 1, 2, and 3 studies, with different but overlapping Project areas surveyed in 2015 and 2016. The current Project boundary continues to be overlapping with those studies in 2015 and 2016, but extends somewhat outside of both areas to the northwest and northeast. Overall landscape characteristics are similar throughout the region contained within the boundaries. As part of the wind energy development process, Prevailing Wind Park, LLC (Prevailing Wind) has been implementing the US Fish and Wildlife Service's (USFWS) *Land-Based Wind Energy Guidelines* (WEG; USFWS 2012)). This Bird and Bat Conservation Strategy (BBCS) describes Prevailing Wind's process to identify and avoid and/or minimize potential impacts to birds and bats that may result from the construction and operation of the Project.

Specifically, this BBCS document was developed to:

1) Respond to the recommendations in the WEG for completion of a BBCS and post-construction monitoring actions;
2) Consolidate documentation of steps already taken to avoid and minimize potential effects on birds and bats during Project planning and development;
3) Identify and implement steps to further reduce the potential for avian and bat fatality or other potential adverse effects on birds and bats at the Project; and
4) Continue the coordination between Prevailing Wind and state and federal wildlife agencies.

1.1 Project Description

The Project mostly falls within the Southern Missouri Coteau Slope Level IV Ecoregion, with only a small portion falling within the Southern Missouri Coteau Level IV Ecoregion (US Environmental Protection Agency 2013). Historically, this area was dominated by mixed-grass prairie with numerous wetlands scattered throughout; today, the majority of the Project area has been converted to agricultural use, with crop production and livestock grazing as the main agricultural practices (Table 1, Figure 2; US Geological Survey (USGS) National Land Cover Database [NLCD] 2011, Homer et al. 2015). Trees and shrubs can be found around farmsteads, within planted shelter belts, and along drainages (Hamilton and Derby 2016; Appendix A). The landscape within the Project area is generally flat with elevation ranging from 455–574 meters (m; 1,491–1,882 feet [ft]; USGS 2016).

The 2015 Project area included land south of Avon, South Dakota, but in 2016, the Project area was reduced (Figure 2); the 2015 Project boundary was 8.2 miles (mi; 13.2 kilometers [km]) from the Missouri River, while the adjusted 2016 boundary was 12.1 mi (19.5 km) from the River. Additionally, the current Project boundary extends somewhat further to the northwest and northeast (Figure 2). Land use/cover types were assessed using the current boundary.

Cultivated cropland (49.92%) and grasslands (42.22%; including herbaceous/pasture/hay lands) dominated the overall landscape (Table 1, Figure 2).

Table 1. Land use/cover types acreage and percent (%) cover within the current Prevailing Wind Park Project in Bon Homme, Charles Mix, and Hutchinson counties, South Dakota, based on the US Geological Service's (USGS) National Land Cover Database (NLCD).

Land Use/Cover	Project Acres	% Cover
Cultivated Crops	25,128.83	49.92
Pasture/Hay	17,731.32	35.23
Grassland/Herbaceous	3,520.49	6.99
Developed	2,158.00	4.29
Wetlands/Open Water	1,336.99	2.66
Forest	375.96	0.75
Shrub/Scrub	69.65	0.14
Barren Land	14.67	0.03
Total	**50,335.91**	**100.00**

Data Source: USGS NLCD 2011

Based on the USFWS's National Wetland Inventory (NWI; USFWS NWI 2009), there are approximately 1,826 acres (ac; 739 hectares [ha]) of wetlands within the Project area, with freshwater emergent wetlands making up the majority (77.1%) of wetlands (Table 2).

Table 2. Wetlands present within the Prevailing Wind Park Project, Bon Homme, Charles Mix, and Hutchinson counties, South Dakota, based on the US Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI).

Wetland Type	Project Acres	Percent Total
Freshwater Emergent Wetland	1,407.89	77.10
Freshwater Pond	245.70	13.46
Lake	128.75	7.05
Freshwater Forested/Shrub Wetland	43.7	2.39
Total	**1,826.04**	**100.00**

Data Source: USFWS MWI 2009

Figure 1. Location of the Prevailing Wind Park Project in Bon Homme, Charles Mix, and Hutchinson counties, South Dakota.

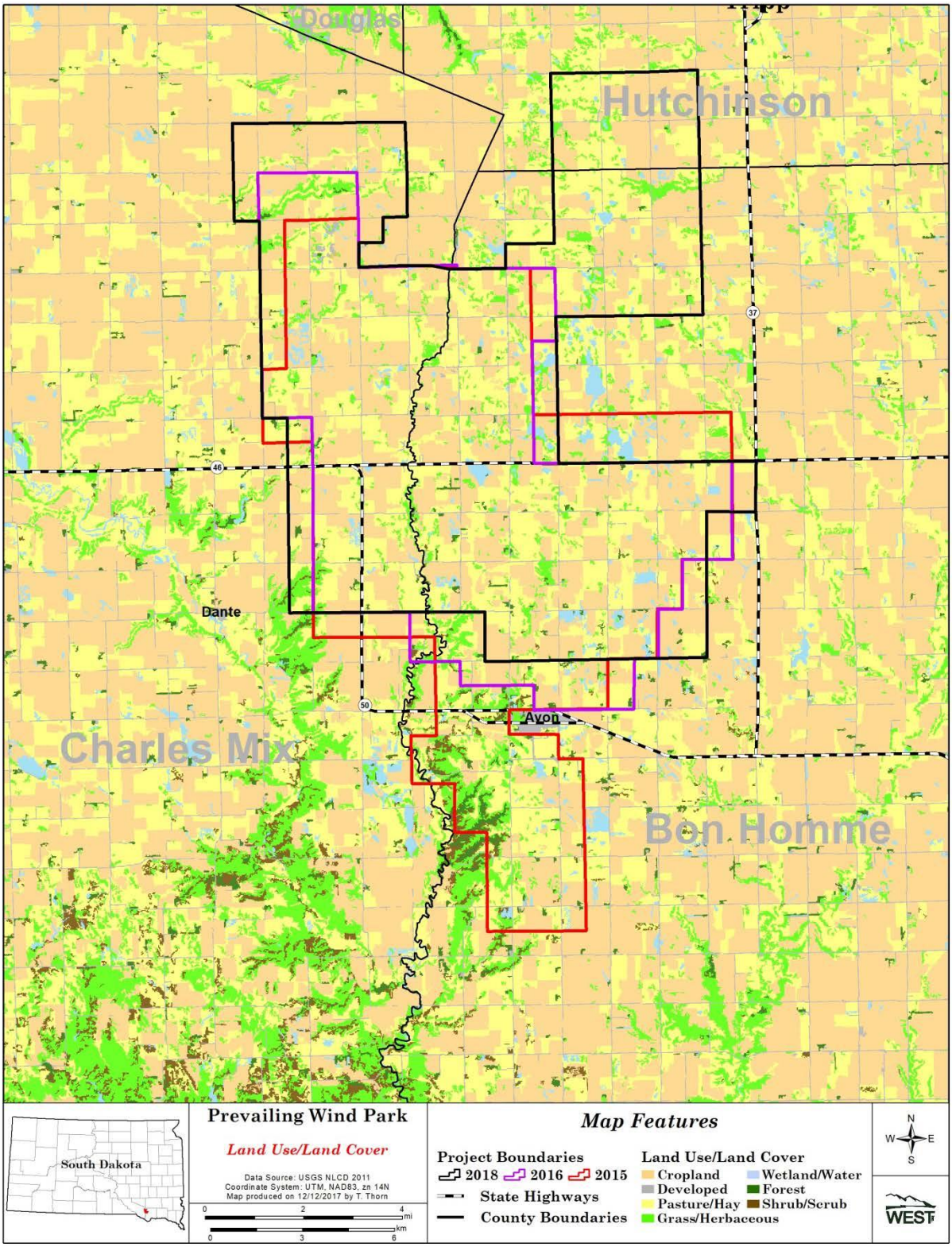

Figure 2. Land use/cover types within the 2015, 2016, and current Prevailing Wind Park Project boundaries in Bon Homme, Charles Mix, and Hutchinson counties, South Dakota (Sources: US Geological Survey (USGS) National Land Cover Data [NLCD] 2011, Homer et al. 2015).

The Project, planned for 200-megawatt (MW) output, will consist of either 57 3.6-MW turbines or 61 3.8 MW turbines. Turbines will have a hub height of 105 or 110 m (344.5 or 360.9 ft) with 136 or 137 m (446.2 or 449.5 ft) blades.

1.2 Project Siting, Construction, and Best Management Practices

The siting and development of the Project included a tiered-study review process that aligned closely with the tiered approach detailed in the final WEG (USFWS 2012). Information gathered during Tier 1–3 studies was used during the turbine and infrastructure siting process to minimize potential impacts to birds and bats and their habitats. Prior to designing the facility layout, Prevailing Wind incorporated setback and constraint information from expert sources, literature reviews, and siting standards suggested by the South Dakota Public Utilities Commission. This information was used to establish setbacks and inform site design.

1.2.1 Project Siting and Design Measures Used to Reduce Impacts

- The Project is attempting to avoid impacts to wildlife and habitat by siting turbines and roads mostly in cultivated fields.
- Standard, state-required, setbacks for non-participating landowners, residences, noise, airports, etc., will be implemented.
- Existing roads and field accesses will be used or improved for access roads when practicable.
- Electrical collection systems within the Project will be buried underground.
- Wind turbines designed with tubular towers and no external ladders or platforms on the towers or nacelles will be used so bird perching and nesting opportunities are minimized.
- The number of turbines with visibility lighting will be minimized, within Federal Aviation Administration (FAA) requirements.
- Implementation of FAA-approved lighting that uses the shortest allowable flash duration, the minimum allowed flashes per minute, and synchronized flashing, will reduce the potential for nocturnal migrating birds to be disoriented by lights.
- Lighting at the operations and maintenance facility, Project substation, and other installations will be minimized and designed such that light is directed downward (toward the access or work area), and is hooded to prevent light from shining into the sky and attracting or disorienting nocturnal migrants. Motion or heat-activated lighting will be used where practicable.
- Permanent meteorological towers without guy wires will be used, installing the minimum number needed within the Project area to minimize collision risk for birds.

1.2.2 Operational Procedures to Minimize Impacts

- Impacts to wetlands and water resources will be avoided or mitigated by following provisions of the Clean Water Act (1972).

- A Site Environmental Plan, specific to the operational activities of the Project, will be developed and implemented by the Site Supervisor or his/her designated Environmental Manager including, but not limited to:
  - Exhibits identifying sensitive resources and associated set-backs.
  - An employee orientation program to raise awareness of any wildlife issues on the site, as well as how to treat sensitive resource areas.
  - Instructions for employees and contractors to drive at an appropriate speed on all public and private roads within the Project area, in consideration of potential wildlife that may be present and to promote general site safety.
  - Instructions for employees to avoid harassing or disturbing wildlife, especially during the breeding seasons.
  - Federal and state measures for handling toxic substances to minimize contamination of water and wildlife resources.
  - Local policies for noxious weed control (e.g., cleaning vehicles and equipment arriving from areas with known invasive species issues, using locally sourced topsoil, identification and annual removal, etc.).
  - Parts and equipment that may be used as cover by prey will not be stored in the vicinity of wind turbines.
- During normal operational activities, if facility personnel discover carrion on or near Project facilities, reasonable measures will be taken to minimize attracting predators/scavengers such as raptors and vultures.
- A Wildlife Response and Reporting System or similar program will be implemented to establish protocols for identifying and communicating bird and bat fatalities.

1.3 Key Bird and Bat Regulations

1.3.1 Federal Endangered Species Act

Certain species at risk of extinction, including several birds and bats, are protected under the federal Endangered Species Act (ESA) of 1973, as amended (ESA 1973). The federal ESA provides a program for conservation and recovery of threatened and endangered species. Section 3 of the ESA defines and lists species as “endangered” and “threatened” and provides regulatory protection for the listed species (ESA Section [§] 3 1973). Section 9 of the federal ESA prohibits the “take” of species listed by USFWS as threatened or endangered (ESA Section [§] 9 1973). Take is defined in Section 3 as follows: “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in such conduct” (ESA § 3 1973). As of February 2017, there were 16 endangered and threatened animal species believed to or known to occur in South Dakota (USFWS 2017), five of which had the potential to occur within the Project area according to the Tier 1 and 2 studies (Hamilton and Derby 2016; Appendix A); Section 2.1 includes a description of these species.

1.3.2 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) makes it unlawful to pursue, capture, kill, or possess any migratory bird or part, nest, or egg of any such bird listed in wildlife protection treaties between the US, Great Britain, Mexico, Japan, and Russia (and other countries of the former Soviet Union; MBTA 1918). Most birds (except for introduced species and non-migratory game birds) within the US are protected under the MBTA. The birds, occupied nests, and the contents of the nests (eggs or chicks) within the Project area are afforded protection pursuant to the MBTA. Due to the potential for resident and migratory birds within the Project area, compliance with the MBTA has been considered in the development of this BBCS. Unlike the ESA and the Bald and Golden Eagle Protection Act (BGEPA), no permits are available to authorize incidental take of birds under the MBTA. However, on December 22, 2017, the U.S. Department of the Interior's Solicitor's Office issued a legal opinion in which it concluded that the MBTA ". . . is a law limited in relevant part to affirmative and purposeful actions . . ." and as such, any incidental takings would not constitute criminal violations (*See*, DOI Solicitor's Opinion, M-37050 [December 22, 2017]).

1.3.3 Bald and Golden Eagle Protection Act

The federal BGEPA (1940), administered by the USFWS, was enacted to protect bald (*Haliaeetus leucocephalus*) and golden (*Aquila chrysaetos*) eagles, their nests, eggs, and parts (e.g., feathers or talons). The BGEPA states that no person shall take, possess, sell, purchase, barter, offer for sale, transport, export, or import any bald or golden eagle alive or dead, or any body part, nest or egg without a valid permit to do so (BGEPA 1940). The BGEPA also prohibits the take of bald and golden eagles unless pursuant to regulations. Take is defined by the BGEPA as an action "to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb". Disturb is defined in the BGEPA as "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available: 1) injury to an eagle; 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior; or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior" (USFWS 2007b). In addition to immediate impacts, this definition also covers impacts that result from human-caused alterations initiated around a previously used nest site during a time when eagles were not present.

In 2009, the USFWS issued a final rule on new permit regulations that would allow some disturbance of eagles "in the course of conducting lawful activities" (50 Code of Federal Regulations [CFR] § 22.26 2009). The USFWS's description of its 2009 rule suggests that recurring, incidental take of eagles, will only be authorized if every avoidance measure has been exhausted. Removal of nests will still generally be permitted only in cases where the nest poses a threat to human health, or where the removal would protect eagles. Take permits may be issued when "necessary for the protection of other interests in any particular locality" (USFWS 2009). The discussion expands the definition of such public and private interests to include utility infrastructure development and maintenance. The document states that due to concerns about population declines, permits for take of golden eagles are likely to be restricted throughout the eagle's range (USFWS 2009). Considerations for issuing take permits include the health of the local and regional eagle populations, availability of suitable nesting and

foraging habitat for any displaced eagles, and whether the take and associated mitigation provides a net benefit to eagles (50 CFR § 22.26 2009). In April 2013, the USFWS issued the *Eagle Conservation Plan Guidance Module 1 – Land-based Wind Energy Version 2* to address these new regulatory matters (ECPG; USFWS 2013). In December 2016, the USFWS published notice of a final rule revising its eagle permitting regulations and extended the maximum permit duration to 30 years. The development of an Eagle Conservation Plan for this Project is underway following the 2016 eagle rule to meet USFWS's requirements for addressing take under the BGEPA.

1.3.4 Birds of Conservation Concern

The USFWS's list of Birds of Conservation Concern (BCC) includes migratory and non-migratory bird species of conservation priority across North America; concern for these BCC species results from naturally or human-caused small ranges or population sizes, threats to habitat and other factors (USFWS 2015b). The Project area falls within Bird Conservation Region 11, which lists 27 bird species (USFWS 2008).

1.3.5 South Dakota State Issues

The South Dakota Game, Fish, and Parks (SDGFP) manages a state-specific list of endangered and threatened species. As of April 2016, South Dakota listed 16 endangered and threatened species that did not appear on the federal list for a total of 22 state-listed species; the SDGFP is responsible for managing and conserving the state's endangered species. Seven of the 22 state-listed species are birds; no state-listed bat species were included in this list (SDGFP 2014a). Seventy-seven species listed by the South Dakota Wildlife Action Plan as species of greatest conservation need have records of occurrence in at least one of the counties in which the Project is located (SDGFP 2014a, SDGFP 2014b; USGS 2015; NatureServe 2017). Some of these species are only associated with the Missouri River and would not be expected to occur in the Project. Section 2.1 includes a description of the state-listed species potentially occurring in the Project area.

2.0 PRE-CONSTRUCTION: TIER 1-3 SUMMARIES

The WEG outlines a tiered approach to assessing suitability and risks to wildlife at a potential wind resource area. The tiered approach ensures that sufficient data are collected to enable project proponents to make informed decisions about continued development of a proposed project (USFWS 2012). At each tier, potential issues associated with the development or operations of the opposed project are identified and questions are formulated to guide the decision process. This process starts with a broad scope and provides more site-specific detail at each tier as more data are gathered and the potential for avian and bat issues are better understood. The sections below briefly describe the efforts completed as part of Tiers 1–3 studies (Appendices A–F).

2.1 Tiers 1 and 2: Desktop Evaluation Review

As recommended in the WEG, Tier 1 and 2 studies for the Project evaluated potential issues that needed to be addressed before further actions could be taken with the development or operations of the proposed Project. The objective of the Tiers 1 and 2 studies was to assist the developer in further identifying a potential Project site through a preliminary evaluation or screening of public data from federal, state, and tribal entities, and to offer early guidance about the sensitivity of the Project in regards to flora and fauna. Tier 1 and 2 studies provided a preliminary evaluation or screening of public data from federal, state, and tribal entities and offered early guidance about the sensitivity of the site, in regards to flora and fauna; these studies also included a more substantive review of existing information, including publicly available data on land use land cover, topography, wetland data, wildlife, habitat, and sensitive plant distribution, and a reconnaissance level site visit (Hamilton and Derby 2016; Appendix A)

The Tier 1 and 2 Report identified federally and state-listed wildlife species present in the Project area (Hamilton and Derby 2016; Appendix A). Five of the 16 animal species listed as federally listed species in South Dakota had the potential to occur within the Project area, including the federally endangered interior least tern (*Sterna antillarum athalassos*) and whooping crane (*Grus americana*), and the federally threatened piping plover (*Charadrius melodus*), red knot (*Calidris canutus rufa*), and northern long-eared bat (*Myotis septentrionalis*). The interior least tern, whooping crane, and piping plover are also listed as threatened or endangered in the state of South Dakota (SDGFP 2016); additionally, the state-threatened osprey (*Pandion haliaetus*) has the potential to occur within the Project area (Hamilton and Derby 2016; Appendix A).

According to the Tier 1 and 2 studies, no suitable nesting habitat for interior least tern was identified within the Project, but the interior least tern could potentially nest along the Missouri River or pass through the Project area during spring and fall migration (Hamilton and Derby 2016; Appendix A). No suitable habitat for piping plover was observed in the Project during the site visit conducted in 2016, and this species is unlikely to breed within the Project, but individuals could potentially migrate through the Project area; piping plover Critical Habitat has been designated along the Missouri River in both counties 19.5 km (12.1 mi) south of the Project area (Appendix A). No suitable habitat for rufa red knot was observed in the Project during the site visit conducted in 2016 and this species is unlikely to breed within the Project, but could potentially migrate through the Project area (Appendix A). The 2016 Project boundary occurred 3.5 km (2.2 mi) east of 95% of the confirmed whooping crane sightings within the 354-km (220-mi) whooping crane national migration corridor (Figure 3), but is within the South Dakota specific migration corridor; therefore, whooping cranes may occasionally migrate through the Project area (Appendix A).

The Tier 1 and 2 studies recommended coordinating with the USFWS and South Dakota Game, Fish, and Parks in regards to Project development. This coordination occurred during an in person site visit and was used for both the formal scoping process in the Tier 3 studies as well as to inform ongoing Project siting. In conclusion, the Tier 1 and 2 studies did not find any items

that suggested abandonment of the Project area, and as such, the pre-construction efforts progressed to Tier 3 studies to further investigate issues in more detail.

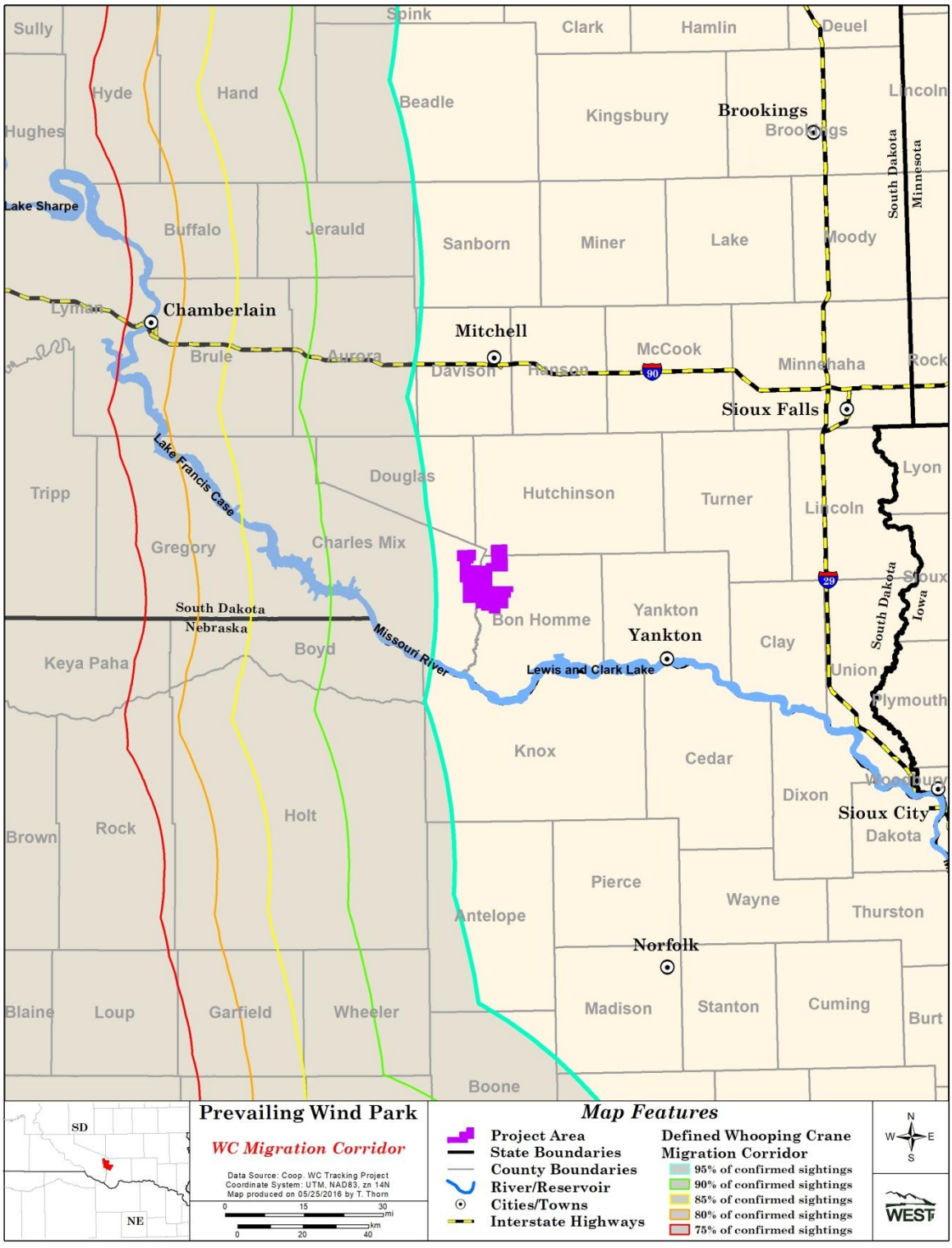

Figure 3. Location of the national whooping crane migration corridor in relation to the 2016 Prevailing Wind Park Project in Bon Homme, Charles Mix and Hutchinson counties, South Dakota.

2.2 Tier 3: Baseline Survey Results Review

A number of site-specific baseline avian and bat studies have been conducted within the Project area since 2015. A brief summary of each of these baseline studies is provided below and final reports are provided in Appendices B–F. The data collected and methods used to conduct the Tier 3 studies were consistent with other regional studies and followed the recommendations in the WEG. The results of Tier 3 studies indicated that significant adverse impacts are not anticipated from the Project.

2.2.1 Whooping Crane Habitat Review

Whooping crane habitat was assessed within the Project and surrounding area to determine if the Project area contained unique features to attract whooping cranes (Derby 2016b; Appendix B). This issue was investigated by comparing the potential whooping crane stopover habitat (using wetlands as this indicator) in the Project area to adjacent areas of the same dimensions in the four cardinal directions, located adjacent to the Project boundary, based on the Project's boundary extent (Figure 4). GIS was used to calculate the amount of the various habitats and in the case of wetlands, number of individual basins, their type, and suitability (score of 12 or higher according to the Watershed Institute 2012), in each of the adjacent areas compared to the proposed Project (Tables 3 and 4). This analysis showed that both roosting (i.e., wetlands) and foraging (i.e., croplands) habitats were available in the Project and alternate areas.

Potential whooping crane habitat within the Project appeared to be most similar to that in the north, east, and west reference areas and more suitable than that found in the south alternate area (Derby 2016), indicating that the potential whooping crane habitat found within the Project was not unique compared to adjacent areas. Based on the USGS's recent determination of whooping crane stopover use sites and their intensity of use within the Great Plains Region from radio telemetry information (Pearse et al. 2015), whooping crane use occurs adjacent to the proposed Project area, and it is possible that this species could fly over or through the Project area during the migration period (Appendix B).

Table 3. Comparison of land use/cover acreage and percent (%) cover for whooping crane habitat assessment within the 2016 Prevailing Wind Park Project in Bon Homme, Charles Mix and Hutchinson counties, South Dakota, and adjacent areas.

Habitat Type	Project Area		North		East		South		West	
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Cultivated Crops	17,588.3	47.5	20,033.3	54.1	24,592.7	66.4	14,716.9	39.8	20,507.8	55.4
Grassland/ Herbaceous	2,481.9	6.7	2,922.5	7.9	995.0	2.7	7,270.3	19.6	1,398.2	3.8
Pasture/Hay	13,897.5	37.5	11,676.7	31.5	8,853.2	23.9	9,985.0	27.0	1,1482.6	31.0
Developed	1,578.0	4.3	1,894.3	5.1	1,668.2	4.5	1,142.3	3.1	1,998.4	5.4
Water/ Wetlands	1,016.5	2.8	327.6	0.9	562.2	1.5	682.0	1.8	1,086.7	2.9
Forests	372.1	1.0	152.5	0.4	307.5	0.8	958.8	2.6	441.8	1.2
Shrub/Scrub	67.5	0.2	9.7	<0.1	22.7	<0.1	2,251.6	6.1	93.3	0.3
Barren	14.7	<0.1	NA	NA	15.1	<0.1	9.7	<0.1	7.8	<0.1

National Land Cover Database 2011

Table 4. Comparison of suitable whooping crane habitat within the 2016 Prevailing Wind Park Project in Bon Homme, Charles Mix and Hutchinson counties, South Dakota, and adjacent t areas.

Area	Number of Basins	Total Acres	Mean Score[1]	Score Range
Project Area	262	490.1	9.4	6–16
North	270	517.2	9.8	6–18
South	157	285.9	8.4	5–14
East	244	395.6	9.7	6–16
West	284	1,239.8	9.8	6–17

[1.] A score of 12 or higher represents potentially suitable whooping crane habitat. Data Derived From: Potentially Suitable Habitat Assessment, Watershed Institute 2012.

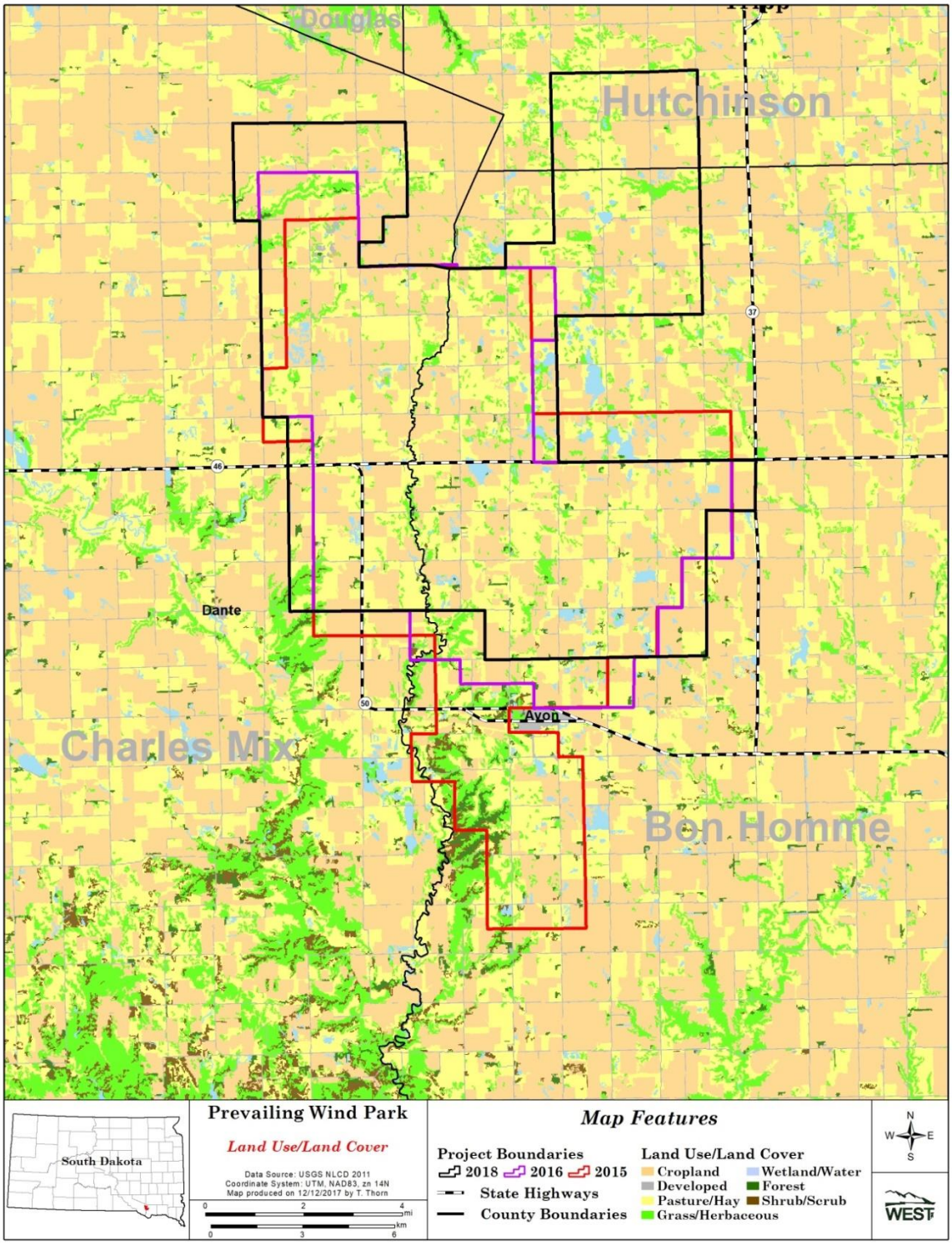

Figure 4. Land use/cover type comparisons for whooping crane habitat assessment within the 2016 Prevailing Wind Park Project in Bon Homme, Charles Mix, and Hutchinson counties, South Dakota, and adjacent areas.

2.2.2 Avian Use Surveys

Year-round avian-use surveys were conducted by WEST during 2015 – 2016 (Year 1) and 2016 – 2017 (Year 2) to address issues posed under Tier 3, following guidance in the WEG (USFWS 2012) and ECPG (USFWS 2013), within the Project area. The primary objectives of the avian use studies were to: 1) assess the relative abundance and spatial distribution of species in the Project area during an entire year, with emphasis on eagles, other raptors, and federally and state-listed species; and 2) identify and assess the potential risk of adverse impacts from the Project to sensitive species or groups (Derby et al. 2018a, 2018b; Appendices C1 and C2).

During Years 1 and 2, sixteen points were surveyed for 60 minutes (min; Figures 5 and 6) with all bird species observed in the first 20 min being recorded and only eagles and federally and state-listed species being recorded during the remaining 40 min (Appendices C1 and C2). The metric used for mean bird use was number of birds per plot (100-m [328-ft]) radius plot for small birds and 800-m [2,625-ft] radius plot for large birds) per 20-min survey. Surveys were conducted twice per month in the spring (March 4 – May 20) and fall (September 9 – November 28), and monthly during winter (November 29 – March 3) and summer (May 21 – September 8). Surveys were carried out during daylight hours and survey periods varied to approximately cover all daylight hours during a season. To the extent practical, each point was surveyed roughly the same number of times.

A total of 271 fixed-point avian use surveys were conducted during 18 visits during Year 1, while 205 surveys were conducted during 13 visits in Year 2 (Appendices C1 and C2). Bird diversity (the number of unique species observed for the entire 60-min survey) was lower in Year 1 (72) than Year 2 (90). No federally or state-listed species were observed during Year 1 surveys, and one state-listed species (peregrine falcon [*Falco peregrinus*]) was observed during Year 2 surveys. Additionally, seven and thirteen state sensitive species were observed during fixed-point surveys and incidentally during Years 1 and 2, respectively.

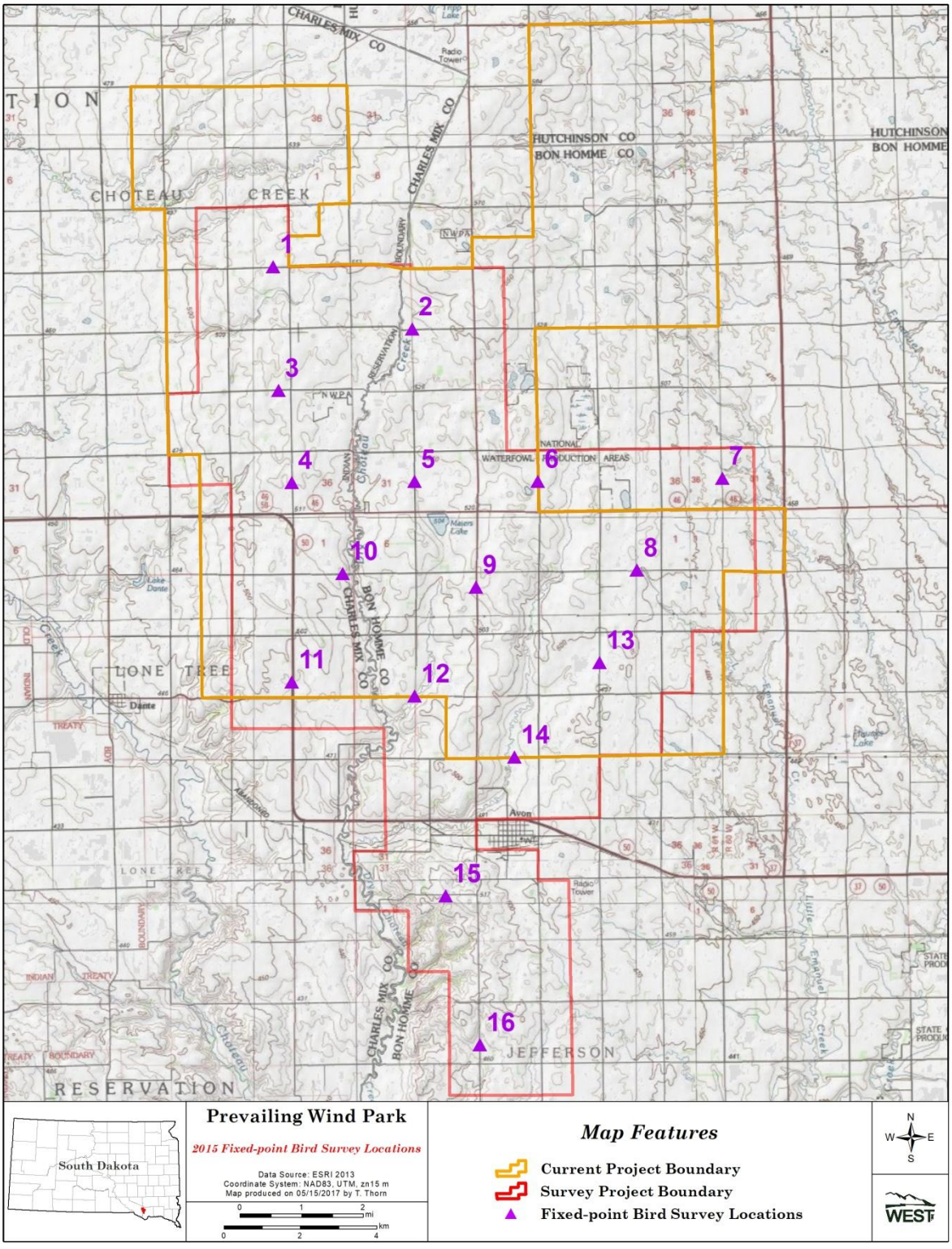

Figure 5. Location of the fixed-points selected for the Year 1 fixed-point avian use surveys conducted from 2015 – 2016 at the Prevailing Wind Park Project in Bon Homme, Hutchinson, and Charles Mix counties, South Dakota.

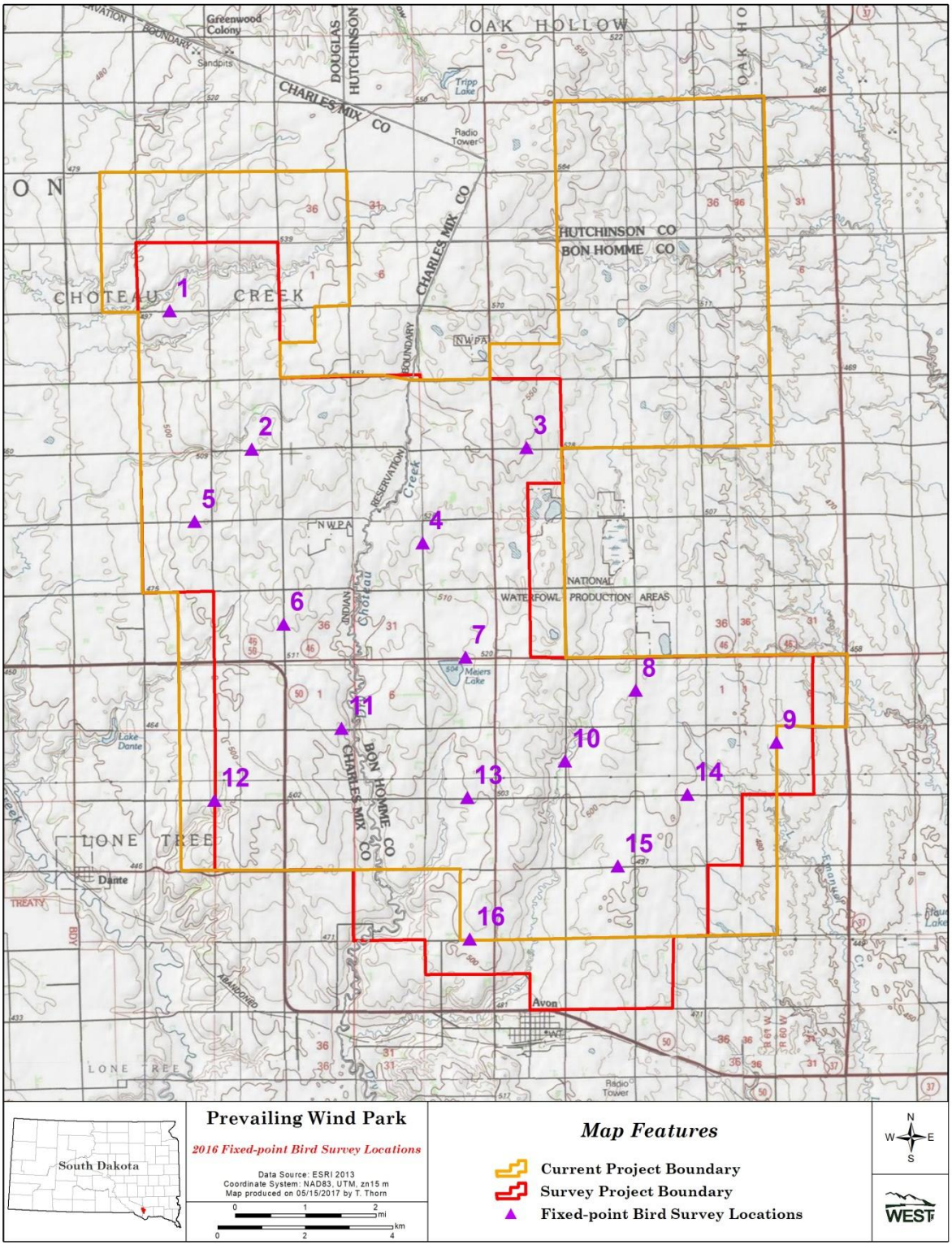

Figure 6. Location of the fixed-points selected for the Year 2 fixed-point avian use surveys conducted from 2016 – 2017 at the Prevailing Wind Park Project in Bon Homme, Hutchinson, and Charles Mix counties, South Dakota.

During Year 1, large bird use was highest during spring (30.43 birds800-m plot/20-min survey), whereas small bird use was highest during fall (15.71 birds/100-m plot/20-min survey; Appendix C1). Annual mean diurnal raptor use during Year 1 was 0.31 raptors/800-m plot/20-min survey with the highest mean use during the fall (0.52; Appendix C1). Four bald eagles were observed during the Year 1 fixed-point avian use surveys (Appendix C1). Eagles were observed for 15 min of which 11 min were risk minutes (eagles flew below 200 m above ground level and within 800 m of the observer; Appendix C1). Three other bald eagles were observed incidentally.

Year 2 avian use was similar to Year 1 for large and small birds; however, more eagles were observed during Year 2. Large bird use was highest during spring (36.38 birds/800-m plot/20-min survey), whereas small bird use was highest during fall (35.73 birds/100-m plot/20-min survey; Appendix C2). Annual mean diurnal raptor use was 0.33 raptors/800-m plot/20-min survey during Year 2 with the highest mean diurnal raptor use during fall (0.55; Appendix C2). Twenty bald eagles and one unidentified eagle were observed during Year 2 fixed-point avian use surveys. Bald eagles were observed for 135 min of which 70 min were risk minutes; the unidentified eagle was observed for eight minutes, all of which were risk minutes (Appendix C2). Most of the observations (nine) and minutes (72 total and 43 risk minutes) came from survey point nine during the spring migration on March 9, 2017. One golden eagle was observed incidentally during Year 2. Further detailed information pertaining specifically to eagles is discussed in the Eagle Conservation Plan developed for the Project.

Mean raptor use during Year 1 was compared with other wind energy facilities that implemented similar protocols and had data covering similar seasons, ranking 34th from the highest use compared to 47 other wind energy facilities in North America (Appendix C1). Mean raptor use during Year 2 ranked 33rd from the highest use compared to the other 47 wind energy facilities in North America (Appendix C2). Publicly available data containing both mean raptor use and raptor fatality information in the Midwest are scarce, while data having this information for four seasons is even rarer. Annual raptor use at the adjacent Beethoven Wind Energy Project (Beethoven; an operating wind energy facility immediately north of the Project area) was 0.10 raptors/plot/20-min survey (WEST 2015). Raptor fatality rates reported at other South Dakota wind energy facilities have ranged from 0–0.20 fatalities/MW/year. At the Grand Ridge I Project in Illinois, mean raptor use was 0.20 raptors/800-m plot/20-min survey, and no raptor fatalities were recorded (Derby et al. 2010a). Raptor fatality rates throughout the Midwest have ranged from zero at numerous facilities to 0.47 fatalities/MW/year at Buffalo Ridge, Phase I (Johnson et al. 2000a).

2.2.3 Raptor Nest Surveys

The objective of the raptor nest surveys was to locate and record raptor nests that may be subject to disturbance and displacement effects by wind energy facility construction and operation. As part of agency-approved baseline survey efforts, aerial surveys for raptor nests were completed in 2015 and 2016 by a qualified biologist before leaf out when raptors would be actively tending to a nest or incubating eggs (Derby 2015, 2016a); Appendices D1 and D2). Aerial surveys were conducted in accordance with the guidance provided in the USFWS Inventory and Monitoring Protocols (Pagel et al. 2010) and focused on locating large, stick nest structures in suitable raptor nesting substrate (trees, transmission lines, cliff faces, etc.) within the proposed Project and a 1.6-km (1-mi) buffer. Additionally, a second buffer was surveyed out to 16.1 km (10 mi) beyond the Project boundary to document any eagle nests.

Nests were classified as “occupied” if any of the following were observed at the nest structure: 1) an adult in an incubating position; 2) eggs; 3) nestlings or fledglings; 4) occurrence of a pair of adults (or, sometimes sub-adults); 5) a newly constructed or refurbished stick nest in the area where territorial behavior of a raptor was observed or had been observed early in the breeding season; or 6) a recently repaired nest with fresh sticks (clean breaks) or fresh boughs on top, and/or droppings and/or molted feathers on its rim or underneath. A nest that did not meet the above criteria for “occupied” was classified as “unoccupied”.

During April 11, 12, and 15, 2015, 71 raptor nests representing three species were documented within the Project area and 16.1 km (10.0 mi) buffer (Figure 7; Derby 2015; Appendix D1). No bald eagle nests were located within the Project area, but eight bald eagle nests (seven occupied and one unoccupied) were documented during the survey (Figure 7). The closest bald eagle nest was observed approximately 0.8 km (0.5 mi) north of the 2015 Project boundary. Three of the seven active bald eagle nests observed in 2015 corresponded to known historic nest locations (PW-EN2, PW-EN3, PW-EN6; Figure 7). Additionally, three occupied great horned owl (*Bubo virginianus*) and five red-tailed hawk (*Buteo jamaicensis*) nests were recorded during raptor nest surveys conducted in 2015.

During the April 21, 2016, aerial raptor nest survey, 50 occupied and/or unoccupied raptor nests representing three species were documented within the Project area and associated 16.1- km (10-mi) buffer (Figure 7 and 8; Appendix D2). No eagle nests were documented within the Project area, but six eagle nests (three unoccupied and three occupied) were located during the 2016 survey (Figure 8); three of these were known historic bald eagle nests (PW-EN1, PW-EN2, PW-EN6). The closest active bald eagle nest was observed approximately 0.8 km (0.5 mi) from the 2016 Project boundary (Figure 8). Other raptor species identified during aerial raptor nest surveys conducted in 2016 included three occupied great horned owl nests and ten occupied red-tailed hawk nests (Figure 8); additionally, 31 unknown raptor nests (two occupied; 29 unoccupied) were documented during the 2016 survey (Derby 2016a; Appendix D2).

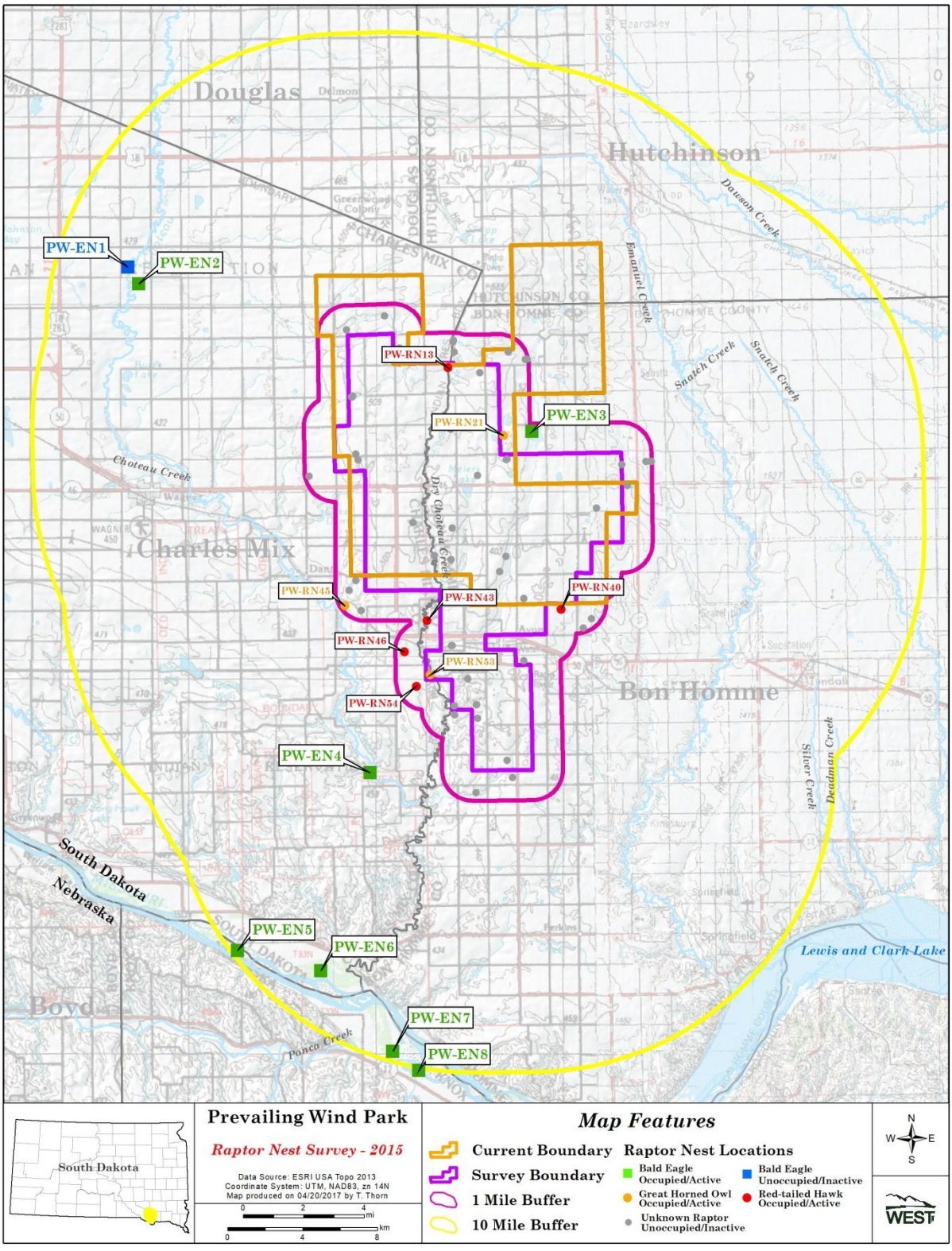

Figure 7. Raptor and eagle nest locations documented during the aerial survey conducted in April 2015 at the Prevailing Wind Park Project in Bon Homme, Hutchinson, and Charles Mix counties, South Dakota.

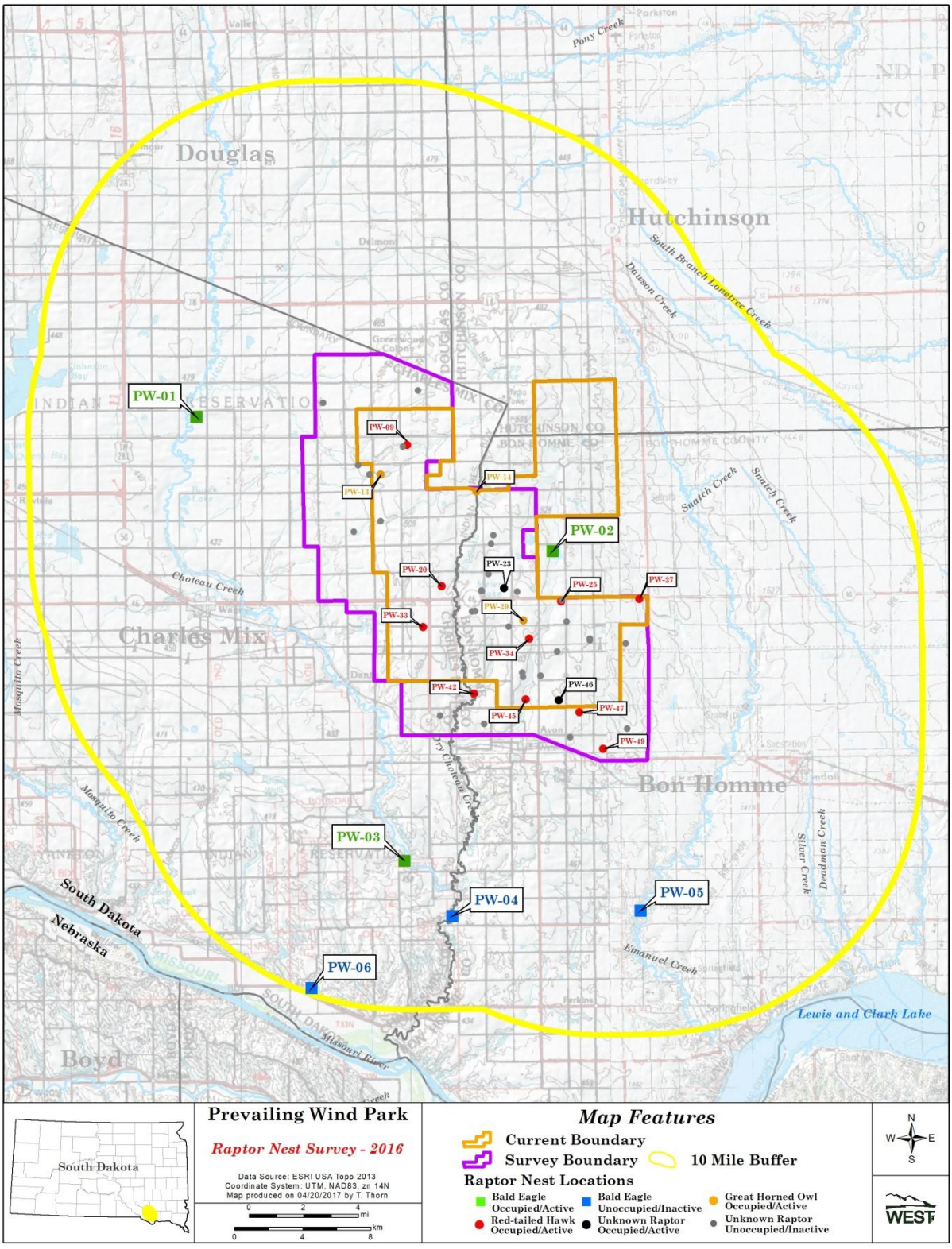

Figure 8. Raptor and eagle nest locations documented during the aerial survey conducted in April 2016 at the Prevailing Wind Park Project in Bon Homme, Hutchinson, and Charles Mix counties, South Dakota.

2.2.4 Acoustic Bat Surveys

No general bat survey was conducted within the Project area during Tier 3 surveys; however, an acoustic bat survey was completed by WEST at Beethoven, located north and adjacent to the Project area, in 2014. Bat surveys at Beethoven recorded an average of 11.49±5.36 bat passes per detector-night (WEST 2015). For all detector locations, 85.4% of bat passes were classified as low-frequency (e.g., big brown bats [*Eptesicus fuscus*], hoary bats [*Lasiurus cinereus*], and silver-haired bats [*Lasionycteris noctivagans*]), while only 14.6% were classified as high frequency (e.g., eastern red bats [*Lasiurus borealis*] and *Myotis* species); summer bat activity at Beethoven was higher than fall bat activity with peak activity the week of July 7 – July 14, 2014 (WEST 2015).

As a means to compare bat activity rates across projects with different sampling periods as well as to compare rates during what historically has been the period of higher fatality rates, WEST uses a standardized "fall migration period" in reviewing bat activity rates. The pre-construction bat activity rate recorded by ground detectors at Beethoven during the fall migration period (2.04±0.99 bat passes per detector-night; WEST 2015) was very low compared to activity rates at other facilities in the Midwest (Table 5), and throughout North America, from studies conducted with similarly-collected data. Bat activity rates are not available for other wind energy projects in North and South Dakota (Table 5). Reported bat fatality rates at Beethoven (2.69 bats/MW/year; WEST 2016) were within the range of other regional projects in the Midwest region of North America, where reported bat fatalities have ranged from 0.16–2.81 bat fatalities/MW/year (Table 5). Based on the location of the Project, habitats present, activity rates recorded during studies at nearby Beethoven, and bat fatality rates at Beethoven and other Midwest wind energy facilities, estimated direct impacts to bats at the Project is expected to be similar to Beethoven and low compared to bat fatality rates at other projects across the country.

Table 5. Wind energy facilities in the Midwest with comparable activity and fatality data for bats.

Wind Energy Facility	Bat Activity Estimate[A]	Bat Activity Dates	Fatality Estimate[B]	Number of Turbines	Total Megawatts
Cedar Ridge, WI (2009)	9.97[C,D,E,F]	7/16/07-9/30/07	30.61	41	67.60
Blue Sky Green Field, WI (2008; 2009)	7.70[d]	7/24/07-10/29/07	24.57	88	145.00
Cedar Ridge, WI (2010)	9.97[C,D,E,F]	7/16/07-9/30/07	24.12	41	68.00
Fowler I, II, III, IN (2011)			20.19	355	600.00
Fowler I, II, III, IN (2010)			18.96	355	600.00
Forward Energy Center, WI (2008-2010)	6.97	8/5/08-11/08/08	18.17	86	129.00
Harrow, Ont (2010)			11.13	24 (four 6-turb facilities)	39.60
Top of Iowa, IA (2004)	35.70	5/26/04-9/24/04	10.27	89	80.00
Pioneer Prairie I, IA (Phase II; 2011-2012)			10.06	62	102.30
Fowler I, IN (2009)			8.09	162	301.00
Crystal Lake II, IA (2009)			7.42	80	200.00
Top of Iowa, IA (2003)			7.16	89	80.00
Kewaunee County, WI (1999-2001)			6.45	31	20.46
Ripley, Ont (2008)			4.67	38	76.00
Winnebago, IA (2009-2010)			4.54	10	20.00
Buffalo Ridge, MN (Phase II; 2001/Lake Benton I)	2.20[c]	6/15/01-9/15/01	4.35	143	107.25
Buffalo Ridge, MN (Phase III; 2001/Lake Benton II)	2.20[c]	6/15/01-9/15/01	3.71	138	103.50
Crescent Ridge, IL (2005-2006)			3.27	33	49.50
Fowler I, II, III, IN (2012)			2.96	355	600.00
Elm Creek II, MN (2011-2012)			2.81	62	148.80
Buffalo Ridge II, SD (2011-2012)			2.81	105	210.00
Buffalo Ridge, MN (Phase III; 1999)			2.72	138	103.50
Buffalo Ridge, MN (Phase II; 1999)			2.59	143	107.25
Moraine II, MN (2009)			2.42	33	49.50
Buffalo Ridge, MN (Phase II; 1998)			2.16	143	107.25
PrairieWinds ND1 (Minot), ND (2010)			2.13	80	115.50
Grand Ridge I, IL (2009-2010)			2.1	66	99.00
Barton I & II, IA (2010-2011)			1.85	80	160.00
Fowler III, IN (2009)			1.84	60	99.00
Buffalo Ridge, MN (Phase III; 2002/Lake Benton II)	1.90[C]	6/15/02-9/15/02	1.81	138	103.50
Buffalo Ridge, MN (Phase II; 2002/Lake Benton I)	1.90[C]	6/15/02-9/15/02	1.64	143	107.25
Rugby, ND (2010-2011)			1.60	71	149.00
Elm Creek, MN (2009-2010)			1.49	67	100.00
Wessington Springs, SD (2009)			1.48	34	51.00
PrairieWinds ND1 (Minot), ND (2011)			1.39	80	115.50

Table 5. Wind energy facilities in the Midwest with comparable activity and fatality data for bats.

Wind Energy Facility	Bat Activity Estimate[A]	Bat Activity Dates	Fatality Estimate[B]	Number of Turbines	Total Megawatts
PrairieWinds SD1, SD (2011-2012)			1.23	108	162.00
NPPD Ainsworth, NE (2006)			1.16	36	20.50
PrairieWinds SD1, SD (2012-2013)			1.05	108	162.00
Buffalo Ridge, MN (Phase I; 1999)			0.74	73	25.00
Wessington Springs, SD (2010)			0.41	34	51.00
Buffalo Ridge I, SD (2009-2010)			0.16	24	50.40

[A]. = Bat passes per detector-night.

[B]. = Number of fatalities per megawatt per year.

[C]. = Activity rate was averaged across phases and/or years.

[D]. = Activity rate based on pre-construction monitoring; data for all other activity and fatality rates were collected concurrently.

[E]. = Activity rate calculated by WEST from data presented in referenced report.

[F]. = Activity rate based on data collected at various heights all other activity rates are from ground-based units only.

Data from the following sources:

Wind Energy Facility	Activity Reference	Fatality Reference	Wind Energy Facility	Activity Reference	Fatality Reference
Barton I & II, IA (10-11)		Derby et al. 2011b	Fowler I, II, III, IN (10)		Good et al. 2011
Blue Sky Green Field, WI (08; 09)	Gruver 2008	Gruver et al. 2009	Fowler I, II, III, IN (11)		Good et al. 2012
Buffalo Ridge, MN (Phase I; 99)		Johnson et al. 2000b	Fowler I, II, III, IN (12)		Good et al. 2013
Buffalo Ridge, MN (Phase II; 98)		Johnson et al. 2000b	Grand Ridge I, IL (09-10)		Derby et al. 2010a
Buffalo Ridge, MN (Phase II; 99)		Johnson et al. 2000b	Harrow, Ont (10)		NRSI 2011
Buffalo Ridge, MN (Phase II; 01/Lake Benton I)	Johnson et al. 2004	Johnson et al. 2004	Kewaunee County, WI (99-01)		Howe et al. 2002
Buffalo Ridge, MN (Phase II; 02/Lake Benton I)	Johnson et al. 2004	Johnson et al. 2004	Moraine II, MN (09)		Derby et al. 2010e
Buffalo Ridge, MN (Phase III; 99)		Johnson et al. 2000b	NPPD Ainsworth, NE (06)		Derby et al. 2007
Buffalo Ridge, MN (Phase III; 01/Lake Benton II)	Johnson et al. 2004	Johnson et al. 2004	Pioneer Prairie I, IA (Phase II; 11-12)		Chodachek et al. 2012
Buffalo Ridge, MN (Phase III; 02/Lake Benton II)	Johnson et al. 2004	Johnson et al. 2004	PrairieWinds ND1 (Minot), ND (10)		Derby et al. 2011d
Buffalo Ridge I, SD (09-10)		Derby et al. 2010c	PrairieWinds ND1 (Minot), ND (11)		Derby et al. 2012e
Buffalo Ridge II, SD (11-12)		Derby et al. 2012a	PrairieWinds SD1 (Crow Lake), SD (11-12)		Derby et al. 2012c
Cedar Ridge, WI (09)	BHE Environmental 2008	BHE Environmental 2010	PrairieWinds SD1 (Crow Lake), SD (12-13)		Derby et al. 2013
Cedar Ridge, WI (10)	BHE Environmental 2008	BHE Environmental 2011	Ripley, Ont (08)		Jacques Whitford 2009
Crescent Ridge, IL (05-06)		Kerlinger et al. 2007	Rugby, ND (10-11)		Derby et al. 2011c
Elm Creek, MN (09-10)		Derby et al. 2010d	Top of Iowa, IA (03)		Jain 2005
Elm Creek II, MN (11-12)		Derby et al. 2012b	Top of Iowa, IA (04)	Jain 2005	Jain 2005
Forward Energy Center, WI (08-10)	Watt and Drake 2011	Grodsky and Drake 2011	Wessington Springs, SD (09)		Derby et al. 2010b
Fowler I, IN (09)		Johnson et al. 2010a	Wessington Springs, SD (10)		Derby et al. 2011a
Fowler III, IN (09)		Johnson et al. 2010b	Winnebago, IA (09-10)		Derby et al. 2010g

2.2.5 Northern Long-Eared Bat Presence/Absence Surveys

In 2015, the northern long-eared bat was listed as federally threatened. During the summers of 2015 and 2016, acoustic surveys were implemented at the Project to determine the probable presence/absence of the species within the Project area (Derby et al. 2016, Derby 2017; Appendices E1 and E2). Surveys were conducted following the survey recommendations found in the USFWS's *Northern Long-eared Bat Interim Conference and Planning Guidance* and *2015 Range-Wide Indiana Bat Summer Survey Guidelines* (USFWS (USFWS 2014, 2015a, 2016). Consistent with survey guidelines and based on total wooded acres within the Project area as defined in 2015 (total of 477.5 ha [1,180 ac] of woodland), acoustic surveys were completed at 20 locations (two detector stations per site) for a total of 104 detector nights (Derby et al. 2016; Appendix E1) from July 21 – August 10, 2015 (Figure 10). Presence/absence surveys conducted in the summer of 2016 were based on the Project boundary as provided by Prevailing Winds, LLC in 2016. Based on this redefined boundary, there were approximately 178 ha (440 ac) of wooded habitat within the Project boundary (Table 1); therefore, eight locations were surveyed for two nights each, for a total of 16 detector-nights, from July 12 – August 4 (Figure 10; Derby 2017).

Based on the Bat Call Identification (Allen 2012) analysis, in 2015, nine locations recorded potential northern long-eared bat calls with a p-value less than 0.05 for the maximum-likelihood estimation; therefore, data from these nine stations were included in qualitative analysis (USFWS 2014, Derby et al. 2016). Qualitative identification verified the presence of northern long-eared bats at one station on six nights and at another station on one night; however, qualitative analysis did not verify the presence of this bat species at the remaining seven stations with probable northern long-eared bat calls (Appendix E1). Based on echolocation call analysis, using Kaleidoscope version 4.0.0 (Wildlife Acoustics 2017) and qualitative identification, following the acoustic survey guidelines issued by the USFWS (2016), no northern long-eared bat calls were recorded during the 2016 survey (Derby 2017; Appendix E2).

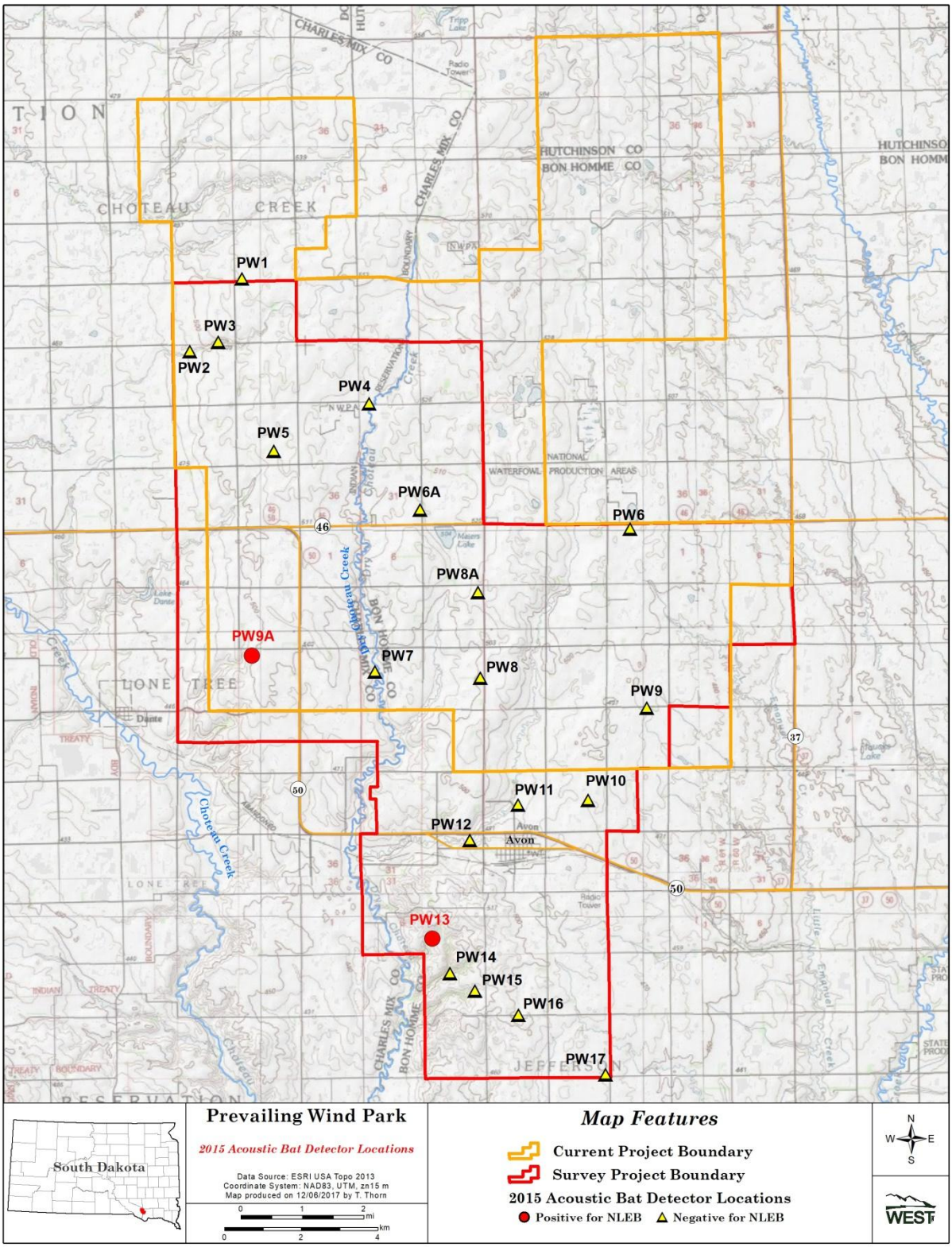

Figure 9. Locations of acoustic bat detectors and those confirmed positive for northern long-eared bats during acoustic surveys conducted in 2015 at the Prevailing Wind Park Project in Bon Homme, Hutchinson, and Charles Mix counties, South Dakota.

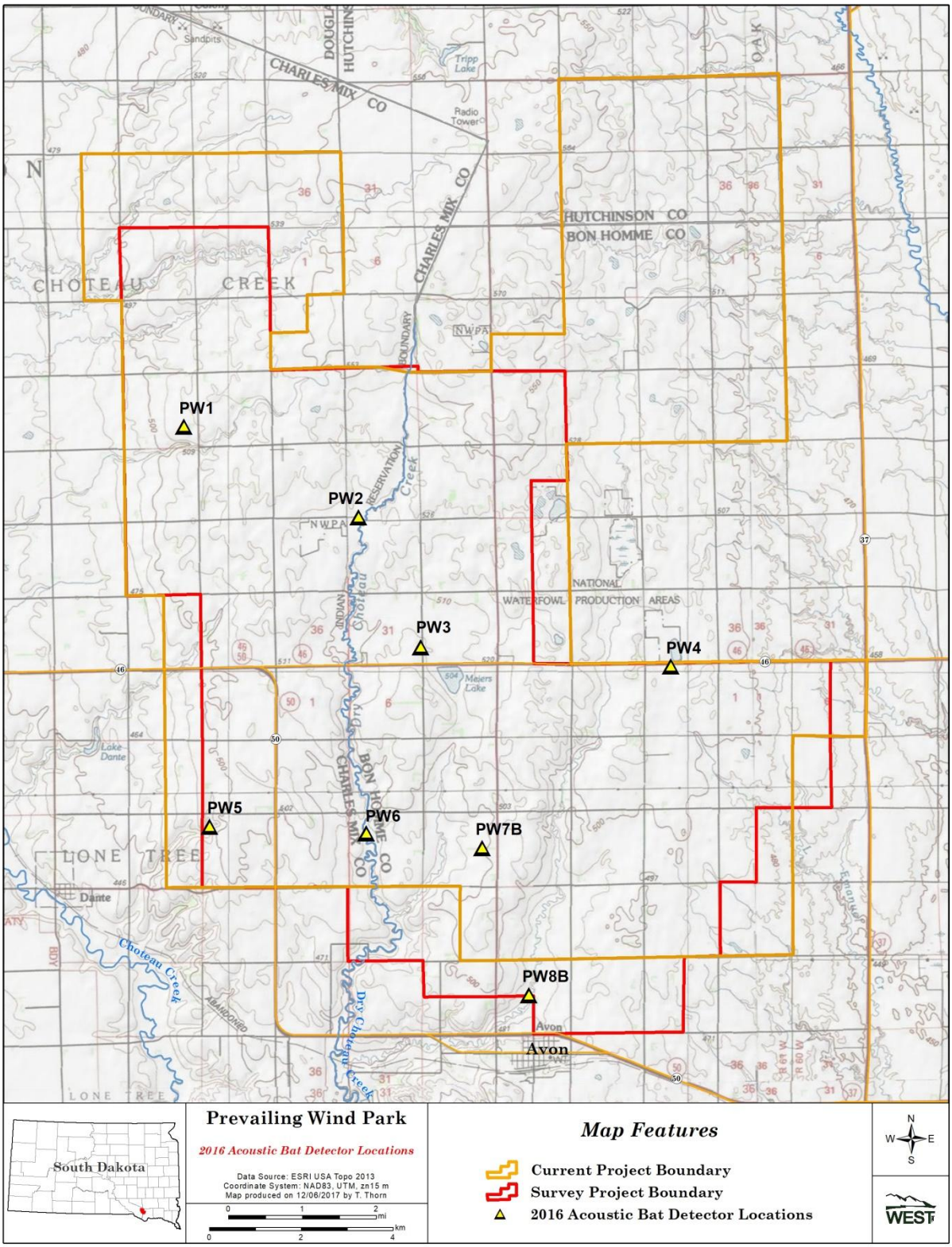

Figure 10. Locations of acoustic bat detectors during acoustic surveys conducted in 2016 at the Prevailing Wind Park Project in Bon Homme, Hutchinson, and Charles Mix counties, South Dakota.

2.2.6 Summary of Tier 3 Questions

1. *Do field studies indicate that species of concern are present on or likely to use the proposed site?*

While there is whooping crane habitat available within the Project area, the Project area does not have unique features compared to the surrounding landscape. Due to the close proximity of the Project to the whooping crane corridor, whooping cranes could potentially migrate through the Project area. Bald eagles nests were observed during spring surveys and individuals were observed during fixed-point counts in spring, fall, and winter, indicating eagles may utilize the Project area year-round; additionally, one golden eagle was observed incidentally during Year 2 surveys. One state-listed bird species (peregrine falcon) was observed during avian use surveys conducted at the Project and several special status bird species, including ferruginous hawk (*Buteo regalis*) and Swainson's hawk (*Buteo swainsoni*) were observed during these surveys. The federally threatened northern long-eared bat was recorded in two locations during the 2015 acoustic survey, but none were found during surveys in 2016, including at one point where one call was classified as a NLEB in 2015.

2. *Do field studies indicate potential for significant adverse impacts on the affected populations of species of habitat fragmentation concern?*

Approximately 42% of the Project area is composed of grassland/pasture land that may contain native grasses. If construction takes place in grassland areas, it is possible that some grassland and/or shrub-dependent species could be displaced. Grassland dependent species observed during fixed-point avian use surveys and incidentally included ferruginous hawk, golden eagle, and bobolink (*Dolichonys oryzivorous*). Project development is being planned to minimize impacts and disturbances to grasslands by siting in cropland to the greatest extent practicable.

3. *What is the distribution, relative abundance, behavior, and site use of species of concern identified in Tiers 1 or 2, and to what extent do these factors expose these species to risk from the proposed Project?*

No whooping cranes have been observed in the Project area. Site-specific data indicate whooping cranes may migrate over the Project, but site characteristics are similar to the surrounding area. Although large groups of sandhill cranes (*Antigone canadensis*) were observed incidentally during both years of fixed-point avian use surveys at the Project; no whooping cranes were observed during baseline studies. No sandhill or whooping cranes have been reported as fatalities from wind energy centers within the migration corridor; therefore impacts to whooping cranes are expected to be low (Derby et al. 2012d). One juvenile peregrine falcon, a state-listed species, was observed using grassland habitats within the Project area. Peregrine falcons have been reported in the general region where the Project is located and negative impacts from Project development are not expected due to the lack of suitable nesting habitat for this species.

The Canada goose (*Branta canadensis*), European starling (*Sturnus vulgaris*), sandhill crane, Franklin's gull (*Leucophaeus pipixcan*), snow goose (*Chen caerulescens*), common grackle (*Quiscalus quiscula*), and red-winged blackbird (*Agelaius phoeniceus*) were observed most often during Years 1 and 2 fixed-point avian use surveys. None of the above species are listed as federal or state-threatened or endangered. However, bald and golden eagles, both protected by the BGEPA, were observed during surveys and incidentally. Impacts are expected to be low for migratory bird species and population-level impacts are not expected.

While eagles are known to nest in the immediate area, no eagle nests were observed within the Project area. One eagle nest is within 1.6 km (1 mile) of the current Project boundary and approximately 3.2 km (2 mile) from the nearest turbine. Due to the proximity of the eagle nest, eagle use of the Project area is possible. Other eagle nests have been documented south of the Project along the Missouri River, and those individuals may utilize resources in the Project. Bald eagles were observed in spring, fall, and winter; however, eagle use of the Project was low.

As described in previous sections, northern long-eared bats were detected in two locations during acoustic surveys conducted in 2015, but were not detected during 2016 surveys.

4. *What are the potential risks of adverse impacts of the proposed Project to individuals and local populations of species of concern and their habitats?*

Where practicable, Project siting has avoided grasslands to limit impacts to wildlife species. Non-cropland vegetation may need to be cleared for construction of facilities, but habitat impacts are not expected to be significant. Most turbines will be located in cropland, which is of low habitat value for most wildlife species. The most likely impacts would be to individual birds and bats that may collide with wind turbines or other Project facilities; however, significant adverse impacts are not anticipated.

5. *How can developers mitigate identified significant adverse impacts?*

No significant impacts to species of concern are expected. Placement of turbines in cultivated crop fields and away from forested and native grassland areas will minimize impacts to sensitive bird and bat species. Project design alterations and best management practices have been developed based on the results from Tier 3 studies, information available in the WEG, and other studies at wind energy facilities. These steps to avoid and reduce impacts are described in Section 3 below.

6. *Are there studies that should be initiated at this stage that would be continued in either Tier 4 or Tier 5?*

Prevailing Wind plans to conduct Tier 4 post-construction monitoring studies for the Project as detailed in Section 4.

2.2.7 Summary of Potential Adverse Impacts

Overall impacts to bird species are expected to be low. The Project is located within a mix of grass/pasture land and cropland. Placement of turbines in grasslands or pasture lands could displace grassland-dependent species and other bird species that can occur in large blocks of grassland. Placement of turbines within mostly cultivated crop fields will limit impacts on birds and displacement of nesting birds.

Whooping cranes may utilize the Project area; however, no whooping or sandhill crane fatalities have been recorded at wind energy facilities in the migratory corridor and no impacts to whooping cranes are expected (Derby et al. 2012d). Overall diurnal raptor use was relatively low throughout the Project area during Years 1 and 2 (0.31 and 0.33 raptors/800-m plot/20-min survey, respectively) and pre-construction raptor use data is shown to generally correlate with post-construction raptor fatality rates at other wind energy projects. Post-construction monitoring at existing wind energy facilities in South Dakota has indicated that impacts to raptors in the region are low; therefore, impacts to raptors are likely to be low at the Project. Bald eagles were observed within the Project area during both years; however more eagles were observed during Year 2. One active bald eagle nest was located 1.6 km (1 mi) east of the Project boundary or 3.2 km (2 mi) from nearest turbine and other bald eagle nests were located within 16.1 km (10 mi) of the Project. Observed eagle use was low within the Project area which suggests minimal potential impacts to eagles.

Based on the Project's location in an agricultural setting, any impacts to bat species will likely be low and fall within the range of other wind energy projects in North and South Dakota and the Midwest region. However, it is difficult to predict what the actual level of bat mortality may be. Based on the location of the Project, limited bat roosting habitat, low bat activity recorded during acoustic surveys, and fatality data from other facilities close to the Project area, low levels of bat mortality could occur from the Project, and significant adverse impacts are not anticipated. The post-construction fatality monitoring surveys planned for the Project (see Section 4) are designed to provide empirical data on actual bat fatalities that can be compared to the pre-construction survey data.

3.0 POST-CONSTRUCTION: TIER 4

According to the WEG, "during post-construction tiers (including Tier 4), developers are assessing whether actions taken in earlier tiers to avoid and minimize impacts are successfully achieving the goals and, when necessary, taking additional steps to compensate for impacts" (USFWS 2012). The specific questions to be investigated in Tier 4 are:

- What are the bird and bat fatality rates within the Project area?
- What are the fatality rates of species of concern?
- How do the estimated fatality rates compare to the predicted fatality rates?
- Do bird and bat fatalities vary within the Project area in relation to site characteristics?

- How do the bird and bat fatality rates compare to the fatality rates from existing projects in similar landscapes with similar species composition and use?
- What is the composition of fatalities in relation to migrating and resident birds and bats at the Project?
- Do fatality data suggest the need for measures to reduce Project impacts?

After the field surveys and analysis are completed in accordance with the protocol described below, Prevailing Wind will review the efforts and make a determination pursuant to the WEG "Decision Framework for Tier 4a Fatality Monitoring" (USFWS 2012) to determine the need for further monitoring or if any measures are needed to reduce impacts.

3.1 Formal Avian and Bat Fatality Monitoring

Prevailing Wind has developed a post-construction monitoring plan with the intent to focus on the WEG Tier 4a questions for the Project. Fatality monitoring will provide information on the impact of the Project on birds and bats and give an indication of whether any specific turbines or Project facilities are responsible for a significant proportion of fatalities. As pre-construction surveys did not indicate significant potential impacts for birds or bats, current plans for the post-construction fatality monitoring are to conduct one year of general bird and bat fatality monitoring.

Fatality monitoring will begin after all the turbines have been commissioned and are fully operational, and will be conducted by a third party biologist. The duration and intensity of carcass searches, the number of selected turbines, and the levels of searcher efficiency and carcass removal trials will be consistent with general wind industry standard practices as described in the WEG. Impacts to avian and bat species are anticipated to be within the overall range of other Midwestern facilities, particularly those within North and South Dakota. The objective of the monitoring will be to determine if the avian or bat fatality rates are lower, similar to, or higher than other regional and national studies.

Fatality monitoring procedures will consist of the following components: 1) standardized carcass searches of selected turbines and/or turbine pads and roads, 2) searcher efficiency trials to estimate the percentage of carcasses found by searchers, and 3) carcass removal trials to estimate the length of time that a carcass remains in the field for possible detection. Fatality estimates for the monitoring period will be provided for a minimum of three categories: 1) bats, 2) all birds, and 3) raptors. The primary purpose of the proposed fatality monitoring is to document bat fatalities and large bird (e.g., raptor) fatalities.

Estimates of facility-related fatalities will be based on:

- Observed number of carcasses found during standardized searches during the monitoring year, for which the cause of death is either unknown or is probably facility-related.

- Non-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 removal trials.
- Searcher efficiency, expressed as the proportion of planted carcasses found by searchers during searcher efficiency trials.
- Percent of area searched at each turbine (i.e., takes into consideration road and pad sampling) and percentage of carcasses found at varying distances from turbine.

3.2 Incidental Monitoring

3.2.1 On-Site Staff Training

All operations personnel will be trained to identify potential wildlife interactions and the proper response. An incidental reporting process will be developed for operations personnel ensuring they can document bird or bat casualties within the Project area during routine maintenance work and at other times. In addition to incidental fatality reporting, operations personnel will be trained to identify bald and golden eagles, to be sensitive to relative use rates of eagles, and to look for eagle casualties while driving between turbines and conducting turbine maintenance.

3.2.2 Injured Wildlife Handling and Reporting Protocol

Any injured wildlife observed during operations of the Project will be left in place until Prevailing Wind's primary biological/ecological representative has been contacted. Prevailing Wind will then decide the most appropriate course of action depending on the condition and species of injured animal discovered. All injured native birds, including federally or state-listed species, will be promptly delivered to the appropriate rehabilitation center or other approved facility as specified in state and federal permits; or as directed by necessary law enforcement personnel.

3.3 Post-Construction Results and Recommendations Reporting Protocol

Prevailing Wind will prepare a report summarizing the results of the monitoring and assessment completed, as described in Sections 3.1 and 3.2.

Specific to the formal avian and bat fatality monitoring, this report will include turbine-specific information on found carcasses, along with estimated fatality rates for birds and bats. Fatality estimates will be calculated for bats, all birds, and raptors, at a minimum. Seasonal estimates for both birds and bats will also be reported. Estimated fatality rates will be calculated using the total number of carcasses found, along with data from searcher efficiency and carcass removal trials. The report will include an analysis that provides a comparison of fatality estimates, searcher efficiency, and scavenger removal rates between the cleared plots and road and pad searches. All species found as fatalities will be reported and if any federally listed or state-listed species are found they will be reported immediately to the proper agency personnel.

4.0 RESEARCH: TIER 5

In addition to the Tiers 1–4 described above, the WEG contain a Tier 5 *"Other Post-Construction Studies*" section. In general, the studies identified in Tier 5 are research-related and "will not be necessary for most wind energy projects" (USFWS 2012). Given that the Project's pre-construction studies indicate that the Project is not likely to cause significant adverse impacts, no Tier 5 studies are planned.

5.0 ADAPTIVE MANAGEMENT AND OPERATIONS MEASURES

Within the WEG, the Department of the Interior defines adaptive management as "an iterative decision process that promotes flexible decision-making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. Comprehensively applying the tiered approach embodies the adaptive management process" (USFWS 2012). The WEG further note that adaptive management at most wind energy facilities is unlikely to be needed if they are sited in accordance with the tiered approach. Nevertheless, Prevailing Wind recognizes the value of applying this approach to its Project activities that include some uncertainty. As such, Prevailing Wind has incorporated an adaptive approach for the conservation of wildlife potentially impacted by the Project.

Section 2.0 of this BBCS describes the tiered approach used to study wildlife conditions and predict Project impacts. Based on Project siting, response to pre-construction monitoring actions (turbines sited mostly in cultivated areas), and results to date of overall biological monitoring, the anticipated bat and bird mortality is expected to be within the overall range for other projects in the region and no significant adverse impacts on birds and bats are anticipated from the Project. Estimated avian and bat fatality rates reported at the nearby Beethoven were 2.69 bat fatalities/MW/study period, 1.43 bird fatalities, and 0.07 raptor fatalities. Additional available studies from Midwestern projects have reported estimated fatality rates ranging from 0.16–2.81 bats/MW/year (Table 5), 0.27–8.25 birds/MW/year (Table 6), and 0–0.47 raptors/MW/year (Table 7). To confirm the anticipated impacts, post-construction fatality surveys will be conducted after the facility is fully functioning, using a third party biologist according to the methods set forth in Section 3.

Table 6. Wind energy facilities in the Midwest with fatality data for all bird species.

Wind Energy Facility	Fatality Estimate[A]	Number of Turbines	Total Megawatts
Wessington Springs, SD (2009)	8.25	34	51.00
Blue Sky Green Field, WI (2008; 2009)	7.17	88	145.00
Cedar Ridge, WI (2009)	6.55	41	67.60
Buffalo Ridge, MN (Phase III; 1999)	5.93	138	103.50
Moraine II, MN (2009)	5.59	33	49.50
Barton I & II, IA (2010-2011)	5.5	80	160.00
Buffalo Ridge I, SD (2009-2010)	5.06	24	50.40
Buffalo Ridge, MN (Phase I; 1996)	4.14	73	25.00

Table 6. Wind energy facilities in the Midwest with fatality data for all bird species.

Wind Energy Facility	Fatality Estimate[A]	Number of Turbines	Total Megawatts
Winnebago, IA (2009-2010)	3.88	10	20.00
Rugby, ND (2010-2011)	3.82	71	149.00
Cedar Ridge, WI (2010)	3.72	41	68.00
Elm Creek II, MN (2011-2012)	3.64	62	148.80
Buffalo Ridge, MN (Phase II; 1999)	3.57	143	107.25
Buffalo Ridge, MN (Phase I; 1998)	3.14	73	25.00
Ripley, Ont (2008)	3.09	38	76.00
Fowler I, IN (2009)	2.83	162	301.00
Buffalo Ridge, MN (Phase I; 1997)	2.51	73	25.00
Buffalo Ridge, MN (Phase II; 1998)	2.47	143	107.25
PrairieWinds SD1, SD (2012-2013)	2.01	108	162.00
Buffalo Ridge II, SD (2011-2012)	1.99	105	210.00
Kewaunee County, WI (1999-2001)	1.95	31	20.46
NPPD Ainsworth, NE (2006)	1.63	36	20.50
PrairieWinds ND1 (Minot), ND (2011)	1.56	80	115.50
Elm Creek, MN (2009-2010)	1.55	67	100.00
PrairieWinds ND1 (Minot), ND (2010)	1.48	80	115.50
Buffalo Ridge, MN (Phase I; 1999)	1.43	73	25.00
PrairieWinds SD1, SD (2011-2012)	1.41	108	162.00
Wessington Springs, SD (2010)	0.89	34	51.00
Top of Iowa, IA (2004)	0.81	89	80.00
Grand Ridge I, IL (2009-2010)	0.48	66	99.00
Top of Iowa, IA (2003)	0.42	89	80.00
Pioneer Prairie I, IA (Phase II; 2011-2012)	0.27	62	102.30

[A]. = Number of bird fatalities per megawatt per year.

Data from the following sources:

Wind Energy Facility	Fatality Reference	Wind Energy Facility	Fatality Reference
Barton I & II, IA (10-11)	Derby et al. 2011b	Grand Ridge, IL (09-10)	Derby et al. 2010a
Blue Sky Green Field, WI (08; 09)	Gruver et al. 2009	Kewaunee County, WI (99-01)	Howe et al. 2002
Buffalo Ridge, MN (Phase I; 96)	Johnson et al. 2000b	Moraine II, MN (09)	Derby et al. 2010e
Buffalo Ridge, MN (Phase I; 97)	Johnson et al. 2000b	NPPD Ainsworth, NE (06)	Derby et al. 2007
Buffalo Ridge, MN (Phase I; 98)	Johnson et al. 2000b	Pioneer Prairie I, IA (Phase II; 11-12)	Chodachek et al. 2012
Buffalo Ridge, MN (Phase I; 99)	Johnson et al. 2000b	PrairieWinds ND1 (Minot), ND (10)	Derby et al. 2011d
Buffalo Ridge, MN (Phase II; 98)	Johnson et al. 2000b	PrairieWinds ND1 (Minot), ND (11)	Derby et al. 2012e
Buffalo Ridge, MN (Phase II; 99)	Johnson et al. 2000b	PrairieWinds SD1 (Crow Lake), SD (11-12)	Derby et al. 2012c
Buffalo Ridge, MN (Phase III; 99)	Johnson et al. 2000b	PrairieWinds SD1 (Crow Lake), SD (12-13)	Derby et al. 2013
Buffalo Ridge I, SD (09-10)	Derby et al. 2010c	Ripley, Ont (08)	Jacques Whitford 2009
Buffalo Ridge II, SD (11-12)	Derby et al. 2012a	Rugby, ND (10-11)	Derby et al. 2011c
Cedar Ridge, WI (09)	BHE Environmental 2010	Top of Iowa, IA (03)	Jain 2005
Cedar Ridge, WI (10)	BHE Environmental 2011	Top of Iowa, IA (04)	Jain 2005
Elm Creek, MN (09-10)	Derby et al. 2010d	Wessington Springs, SD (09)	Derby et al. 2010b
Elm Creek II, MN (11-12)	Derby et al. 2012b	Wessington Springs, SD (10)	Derby et al. 2011a
Fowler I, IN (09)	Johnson et al. 2010a	Winnebago, IA (09-10)	Derby et al. 2010f

Table 7. Wind energy facilities in the Midwest with fatality data for raptors.

Wind Energy Facility	Raptor Fatality Estimate[A]	Number of Turbines	Total Megawatts
Buffalo Ridge, MN (Phase I; 1999)	0.47	73	25.00
Moraine II, MN (2009)	0.37	33	49.50
Winnebago, IA (2009-2010)	0.27	10	20.00
Buffalo Ridge I, SD (2009-2010)	0.2	24	50.40
Cedar Ridge, WI (2009)	0.18	41	67.60
Top of Iowa, IA (2004)	0.17	89	80.00
Cedar Ridge, WI (2010)	0.13	41	68.00
Ripley, Ont (2008)	0.10	38	76.00
Wessington Springs, SD (2010)	0.07	34	51.00
NPPD Ainsworth, NE (2006)	0.06	36	20.50
Wessington Springs, SD (2009)	0.06	34	51.00
Rugby, ND (2010-2011)	0.06	71	149.00
PrairieWinds ND1 (Minot), ND (2011)	0.05	80	115.50
PrairieWinds ND1 (Minot), ND (2010)	0.05	80	115.50
PrairieWinds SD1, SD (2012-2013)	0.03	108	162.00
Kewaunee County, WI (1999-2001)	0	31	20.46
Buffalo Ridge, MN (Phase I; 1996)	0	73	25.00
Buffalo Ridge, MN (Phase I; 1997)	0	73	25.00
Buffalo Ridge, MN (Phase I; 1998)	0	73	25.00
Top of Iowa, IA (2003)	0	89	80.00
Grand Ridge I, IL (2009-2010)	0	66	99.00
Elm Creek, MN (2009-2010)	0	67	100.00
Pioneer Prairie I, IA (Phase II; 2011-2012)	0	62	102.30
Buffalo Ridge, MN (Phase III; 1999)	0	138	103.50
Buffalo Ridge, MN (Phase II; 1998)	0	143	107.25
Buffalo Ridge, MN (Phase II; 1999)	0	143	107.25
Blue Sky Green Field, WI (2008; 2009)	0	88	145.00
Elm Creek II, MN (2011-2012)	0	62	148.80
Barton I & II, IA (2010-2011)	0	80	160.00
PrairieWinds SD1, SD (2011-2012)	0	108	162.00
Buffalo Ridge II, SD (2011-2012)	0	105	210.00
Fowler I, IN (2009)	0	162	301.00

[A] = Number of raptor fatalities per megawatt per year

Data from the following sources:

Wind Energy Facility	Fatality Reference	Wind Energy Facility	Fatality Reference
Barton I & II, IA (10-11)	Derby et al. 2011b	Grand Ridge, IL (09-10)	Derby et al. 2010a
Blue Sky Green Field, WI (08; 09)	Gruver et al. 2009	Kewaunee County, WI (99-01)	Howe et al. 2002
Buffalo Ridge, MN (Phase I; 96)	Johnson et al. 2000b	Moraine II, MN (09)	Derby et al. 2010e
Buffalo Ridge, MN (Phase I; 97)	Johnson et al. 2000b	NPPD Ainsworth, NE (06)	Derby et al. 2007
Buffalo Ridge, MN (Phase I; 98)	Johnson et al. 2000b	Pioneer Prairie I, IA (Phase II; 11-12)	Chodachek et al. 2012
Buffalo Ridge, MN (Phase I; 99)	Johnson et al. 2000b	PrairieWinds ND1 (Minot), ND (10)	Derby et al. 2011d
Buffalo Ridge, MN (Phase II; 98)	Johnson et al. 2000b	PrairieWinds ND1 (Minot), ND (11)	Derby et al. 2012e
Buffalo Ridge, MN (Phase II; 99)	Johnson et al. 2000b	PrairieWinds SD1 (Crow Lake), SD (11-12)	Derby et al. 2012c
Buffalo Ridge, MN (Phase III; 99)	Johnson et al. 2000b	PrairieWinds SD1 (Crow Lake), SD (12-13)	Derby et al. 2013
Buffalo Ridge I, SD (09-10)	Derby et al. 2010c	Ripley, Ont (08)	Jacques Whitford 2009
Buffalo Ridge II, SD (11-12)	Derby et al. 2012a	Rugby, ND (10-11)	Derby et al. 2011c
Cedar Ridge, WI (09)	BHE Environmental 2010	Top of Iowa, IA (03)	Jain 2005
Cedar Ridge, WI (10)	BHE Environmental 2011	Top of Iowa, IA (04)	Jain 2005
Elm Creek, MN (09-10)	Derby et al. 2010d	Wessington Springs, SD (09)	Derby et al. 2010b
Elm Creek II, MN (11-12)	Derby et al. 2012b	Wessington Springs, SD (10)	Derby et al. 2011a
Fowler I, IN (09)	Johnson et al. 2010a	Winnebago, IA (09-10)	Derby et al. 2010f

5.1 Unexpected Avian, Bat, and/or Habitat Impacts

Based on the results of the Tier 4 monitoring program described in the sections above, adaptive management measures could be considered to further avoid, minimize, or compensate for unanticipated and significant Project impacts to wildlife. Examples for considering an adaptive response may include:

- Mortality of a bald or golden eagle (to be addressed via the Eagle Conservation Plan), northern long-eared bat, whooping crane or species listed as endangered/threatened under the federal ESA;
- Significant levels of mortality of non-listed species of birds or bats above those outlined in the tables above; or
- New occurrence of an eagle nest or listed species occupancy during operations.

Prevailing Wind would also consider adaptive management responses if additional species become listed under federal or state-protected species regulations.

6.0 IMPLEMENTATION OF THE BBCS

6.1 Document Availability

This BBCS will be maintained by Prevailing Wind's appropriate management staff member and a copy of the BBCS will be kept on-site throughout operations of the Project.

6.2 Reporting

In accordance with the BBCS, annual reports for post-construction Tier 4 efforts will be developed and submitted to appropriate agency representatives for review. Reporting of finding any listed species fatality will be done immediately to the USFWS for the life of the Project. Prevailing Wind will also coordinate any adaptive management changes needed with agency personnel.

7.0 REFERENCES

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