# Prevailing Wind Park Energy Facility

*Draft Environmental Assessment*

Western Area Power Administration

DOE/EA-2061

January 2019

# Prevailing Wind Park Energy Facility Draft Environmental Assessment

Bon Homme, Charles Mix, Hutchinson, and Yankton Counties, South Dakota

U.S. Department of Energy

Western Area Power Administration

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# TABLE OF CONTENTS

**Page No.**

# LIST OF TABLES

**Page No.**

# LIST OF FIGURES

**Page No.**

# LIST OF ABBREVIATIONS

| **Abbreviation** | **Term/Phrase/Name** |
|---|---|
| ADT | average daily traffic |
| APE | Area of Potential Effects |
| APLIC | Avian Power Line Interaction Committee |
| BCI | Bat Conservation International, Inc. |
| BCR | Bird Conservation Region |
| BMPs | best management practices |
| CEQ | Council on Environmental Quality |
| CFR | Code of Federal Regulations |
| COE | U.S. Army Corps of Engineers |
| dBA | A-weighted decibels |
| EA | Environmental Assessment |
| ECP | Eagle Conservation Plan |
| EMFs | electric and magnetic fields |
| EPA | U.S. Environmental Protection Agency |
| FAA | Federal Aviation Administration |
| FEMA | Federal Emergency Management Agency |
| gen-tie | generation-tie |
| GHGs | greenhouse gases |
| GPAs | Game Production Areas |
| HAPs | hazardous air pollutants |
| IBAs | Important Bird Areas |

| **Abbreviation** | **Term/Phrase/Name** |
|---|---|
| ICNIRP | International Commission on Non-ionizing Radiation Protection |
| IEEE | Institute of Electrical and Electronics Engineers |
| IPaC | Information for Planning and Consultation |
| kV | kilovolt |
| $L_{90}$ | sound level exceeded for 90 percent of the time period |
| $L_{eq}$ | equivalent sound level |
| $L_x$ | exceedance sound level |
| mG | milliGauss |
| MRLC | Multi-Resolution Land Characteristics Consortium |
| MW | megawatt |
| NAAQS | National Ambient Air Quality Standards |
| NABCI | North American Bird Conservation Initiative |
| NEPA | National Environmental Policy Act of 1969 |
| NHPA | National Historic Preservation Act |
| NIEHS | National Institute of Environmental Health Sciences |
| NPS | National Park Service |
| NRCS | Natural Resources Conservation Service |
| NRHP | National Register of Historic Places |
| NWCC | National Wind Coordinating Collaborative |
| NWI | National Wetland Inventory |
| NWR | National Wildlife Refuge |
| O&M | operations and maintenance |

| **Abbreviation** | **Term/Phrase/Name** |
|---|---|
| PEIS | Programmatic Environmental Impact Statement |
| PFYC | Potential Fossil Yield Classification |
| Prevailing Wind Park | Prevailing Wind Park, LLC |
| Project | Prevailing Wind Park Energy Facility |
| ROW | right-of-way |
| SDDENR | South Dakota Department of Environment and Natural Resources |
| SDDOR | South Dakota Department of Revenue |
| SDDOT | South Dakota Department of Transportation |
| SDGFP | South Dakota Game, Fish and Parks |
| SDGS | South Dakota Geological Survey |
| SDNHP | South Dakota Natural Heritage Program |
| SHPO | State Historic Preservation Office |
| SPP | Southwest Power Pool |
| SWPPP | Storm Water Pollution Prevention Plan |
| TCPs | Traditional Cultural Properties |
| THPO | Tribal Historic Preservation Office |
| U.S.C. | United States Code |
| USDA | U.S. Department of Agriculture |
| UGP | Upper Great Plains |
| USFWS | U.S. Fish and Wildlife Service |
| USGS | U.S. Geological Survey |
| VOCs | volatile organic compounds |

| **Abbreviation** | **Term/Phrase/Name** |
|---|---|
| WAPA | Western Area Power Administration |
| WPAs | waterfowl production areas |

# 1.0 INTRODUCTION

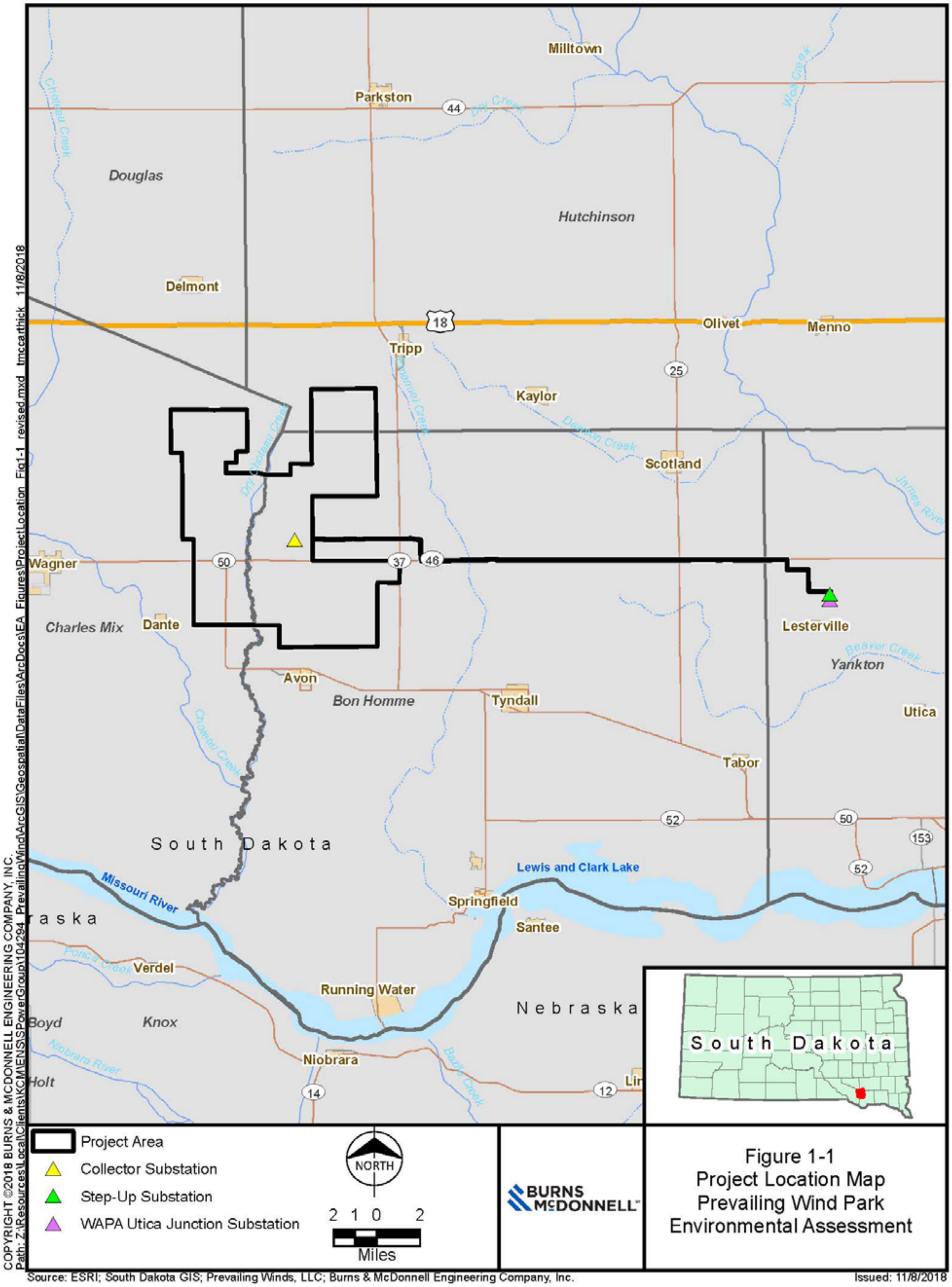
Prevailing Wind Park, LLC (Prevailing Wind Park) proposes to construct the Prevailing Wind Park Energy Facility (Project), a 216.6-megawatt (MW) nameplate capacity wind energy facility in Bon Homme, Charles Mix, and Hutchinson counties, South Dakota. The Project would consist of up to 61 wind turbines, associated access roads, underground electrical power collector and communications systems, a new Project collector substation, up to four permanent meteorological towers, an operations and maintenance (O&M) facility and an electric transmission line.

To interconnect with the existing Utica Junction Substation, which is operated by the Western Area Power Administration (WAPA) and located approximately 27 miles east of the Project, Prevailing Wind Park is proposing to construct a new 27.6-mile-long 115-kilovolt (kV) generation-tie (gen-tie) transmission line in Bon Homme and Yankton counties from the collector substation to the Utica Junction Substation (Figure 1-1). A second 115/230-kV substation (step-up substation) would be constructed near the point of interconnection to step up the voltage to match that of WAPA's interconnection facilities. WAPA would install the necessary equipment at the existing Utica Junction Substation to accept the generated power.

The Project Area encompasses 50,858 acres of private land between the towns of Avon, Tripp, and Wagner (Figure 1-1). The right-of-way (ROW) width varies from approximately 40 feet to approximately 2,200 feet along most of its length, with a wider ROW (approximately 380 feet) in the vicinity of the step-up substation.

The interconnection of the proposed Project to WAPA's transmission system is a Federal action under the National Environmental Policy Act of 1969 (NEPA). This Environmental Assessment (EA) tiers off the analysis conducted in the Upper Great Plains (UGP) Wind Energy Final Programmatic Environmental Impact Statement (PEIS), a document prepared jointly by WAPA and the U.S. Fish and Wildlife Service (USFWS) (WAPA and USFWS, 2015a). The UGP Region encompasses all or parts of the States of Iowa, Minnesota, Montana, Nebraska, North Dakota, and South Dakota, including Bon Homme, Charles Mix, Hutchinson, and Yankton counties, South Dakota. The PEIS assesses environmental impacts associated with wind energy development and identifies best management practices (BMPs) to avoid and minimize those impacts. As stated in the Executive Summary of the PEIS, if wind energy project developers are willing to implement the applicable evaluation process, BMPs, and conservation measures identified in the PEIS, the NEPA evaluation for that wind energy project may tier off the analyses in the PEIS.

**Figure 1-1: Project Location Map**



Applicable material from the UGP PEIS is incorporated by reference in this EA in accordance with 40 Code of Federal Regulations (CFR) §§ 1502.20 and 1508.28. The analysis in this EA is Project-specific and focuses on site-specific issues not addressed in sufficient detail in the PEIS. This EA is intended to be read together with the PEIS, and the EA and PEIS together form the NEPA documentation for this Federal action. Prevailing Wind Park has committed to implementing the applicable BMPs and conservation measures from the PEIS to allow for tiering.

## 1.1 WAPA's Purpose and Need

WAPA's purpose and need is to consider and respond to Prevailing Wind Park's interconnection request in accordance with the Southwest Power Pool (SPP) Tariff and the Federal Power Act, as described in Section 1.1.1 of the PEIS. WAPA's UGP Region is currently operating under the SPP Tariff.

## 1.2 Prevailing Wind Park's Goals and Objectives

Prevailing Wind Park's goals and objectives for the proposed Project are to provide an economically viable, reliable, and cost-effective source of renewable energy to users in the Dakotas and throughout WAPA's service area. To accomplish this purpose, the Project must be technically, environmentally, and economically feasible. To that end, Prevailing Wind Park needs for the following factors to be present:

- A reliable wind resource capable of producing enough power for the Project to be economically viable,
- Landowners willing to participate in the Project,
- Environmental conditions that allow the Project to follow applicable environmental regulations at a reasonable cost,
- An interconnection agreement with WAPA to transmit power to a power purchaser, and
- A power purchase agreement for a duration and at a price that allows the Project to be economically viable.

# 2.0 DESCRIPTION OF PROPOSED ACTION AND NO ACTION ALTERNATIVES

This EA analyzes two alternatives, the Proposed Action and the No Action Alternative.

## 2.1 Proposed Action

The Proposed Action evaluated in this EA is for Prevailing Wind Park to construct and operate the Project and enter into an Interconnection Agreement with WAPA and SPP to connect the Project to WAPA's Utica Junction Substation. As part of the Proposed Action, WAPA would install necessary equipment, as specified in the Interconnection Agreement, at its existing substation to accept the generated power.

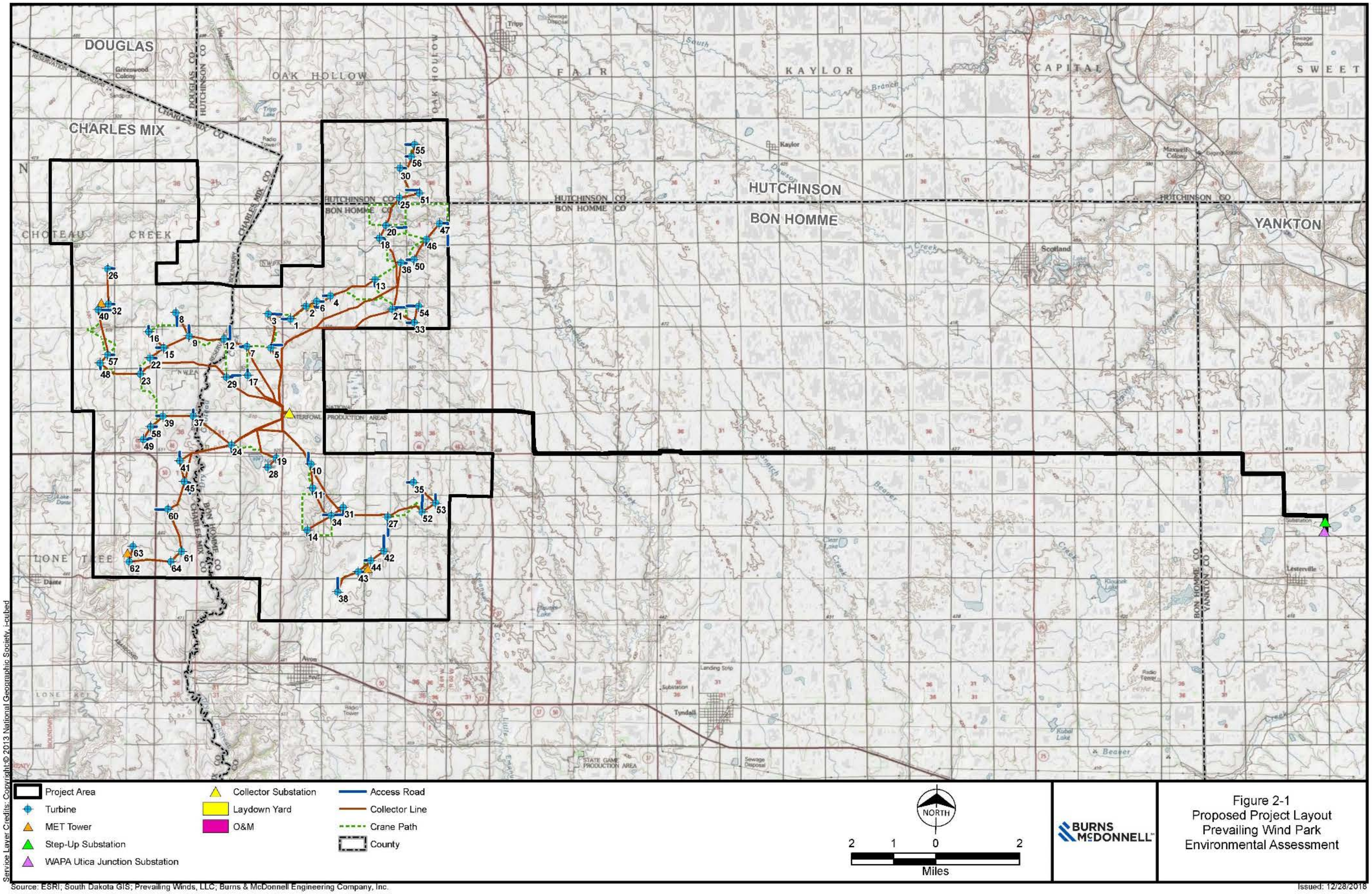
### 2.1.1 Prevailing Wind Park Project

The Project would include:

- Up to 61 wind turbines
- Access roads to each wind turbine
- An O&M facility
- Up to four permanent meteorological towers
- Underground electrical power collector system and communications system
- A collector substation
- A 27.6-mile-long, 115-kV gen-tie transmission line
- A 115/230-kV step-up substation
- Additional temporary construction areas, including crane paths, public road improvements, a laydown yard, and
- Concrete batch plant(s) (as needed), which would be located within the footprint of the laydown yard.

Figure 2-1 shows the proposed layout of the Project facilities. The expected life of the Project is approximately 30 years.

**Figure 2-1: Proposed Wind Farm and Transmission Line Layout**



#### 2.1.1.1 Wind Turbines

Prevailing Wind Park plans to install up to 61 wind turbines for the Project; three alternate turbine locations were also analyzed. The turbine model selected for the Project is the GE 3.8-137 turbine. Each turbine would have a hub height of up to 366 feet and a turbine rotor diameter of up to 449 feet. The total height of each turbine would be up to 590.6 feet with a blade in the vertical position. Additional specifications for the proposed turbine model are provided for reference in Appendix A of this EA. Ongoing evaluation of factors such as project engineering and economics may result in other turbine models being considered for the Project. Any change in turbine technology would require a re-evaluation to determine whether environmental impacts remain similar to or less than those described in this document.

The proposed wind turbines consist of a nacelle, hub, blades, tower, and foundation. The proposed turbine model has three blades composed of carbon fibers, fiberglass, and internal supports to be both lightweight and strong. The tip of each blade has a lightning receptor. Towers are tubular steel (not latticed) and are painted a non-glare white per Federal Aviation Administration (FAA) requirements.

Foundations for the towers would be approximately 2,700 square feet, with a depth of up to 10 feet. Except for approximately 12 inches that would remain aboveground to allow the tower to be bolted to the foundation, the tower foundation would be underground. A specific foundation design would be chosen based on soil borings conducted at each turbine location.

The excavated area for the turbine foundations would typically be approximately 65 feet in diameter (approximately 0.07 acre). During construction, a larger area (approximately 160-foot radius) may be used to lay down the rotors and maneuver cranes during turbine assembly (see Figure 3.3-3 in the UGP PEIS).

#### 2.1.1.2 Access Roads

Where practicable, existing public roads, private roads, and field paths would be used to access Project components. The existing roads may need modifications before, during, or following construction. Where necessary, new access roads would be constructed between existing roadways and Project components. The new access roads would be all-weather, gravel surfaced, and generally 16 feet in width. During construction, some of the access roads would be widened to accommodate movement of the turbine erection crane, with temporary widths of approximately 60 feet.

Separate access may be needed for the cranes used to erect the wind turbines. In such cases, temporary crane paths would be constructed between turbine locations. Following completion of construction, the temporary crane paths would be removed, and the area would be restored, to the extent practicable.

The final access road design would be dependent on geotechnical information obtained during the engineering phase. The access road network for the Project would include approximately 17 miles of new private roads and 40 miles of upgraded public roads.

#### 2.1.1.3 O&M Facility

The O&M facility would be located within the Project Area, in a location with proper transportation, communications facilities, and access to Project facilities. One potential O&M facility location, as shown on Figure 2-1, has been identified. The proposed O&M facility would house the equipment to operate and maintain the wind farm. A gravel parking pad would provide the building with a parking area and secured outside storage. Running water in the O&M facility would be provided by B-Y Water District's rural water supply; no well would be required.

#### 2.1.1.4 Meteorological Towers

Six temporary 197-foot meteorological towers have been deployed within the Project Area. These are expected to be removed during or following Project construction. Prevailing Wind Park anticipates that the Project would include permanent wind measurement equipment, which could consist of up to four permanent 361-foot meteorological towers. Four potential permanent meteorological tower locations, as shown on Figure 2-1, have been identified. The permanent meteorological towers would be self-supporting, without guy wires. The towers would be lighted and painted as necessary to comply with FAA guidelines and would be connected to the Project collection system for communications and power needs.

#### 2.1.1.5 Temporary Laydown/Stockpile Areas/Batch Plant/Crane Walks

A temporary laydown area for the office trailer and storage of materials has been identified within the Project Area (Figure 2-1). Construction materials, including turbine components, would be temporarily stored in this laydown area before being installed or moved to the final turbine sites. In addition, one or more temporary concrete batch plants may be necessary during construction to prepare concrete for foundations onsite. It has not been determined at this time if onsite batch plants will be necessary for the Project. If they are utilized, each would temporarily impact approximately 3 to 5 acres of land, and it is anticipated that they would be located within the temporary 12-acre laydown area.

Temporary crane path disturbances would also be necessary for the Project as shown on Figure 2-1. Crane paths are estimated to be 60 feet wide and would generally be located along the same route as the collector system and access roads, except where topography or soils conditions prevent safe crane travel.

#### 2.1.1.6 Project Electrical System

Each of the wind turbines would have a transformer either pad-mounted outside the tower at the base of the turbine, mounted in the nacelle, or mounted within the tower. The proposed turbines would be connected to the collector substation by an underground 34.5-kV electrical collection system, including an occasional aboveground junction box. At the collector substation, the power would be converted from 34.5 to 115 kV and then transmitted via an aboveground 115-kV transmission line to WAPA's existing 230-kV Utica Junction Substation, located approximately 27 miles east of the Project. A second 115/230-kV substation (step-up substation) would be constructed near the point of interconnection to step up the voltage to match that of WAPA's interconnection facilities. The step-up substation would terminate at the WAPA facilities via a 1,165-foot, 230-kV line. Inside the Utica Junction Substation, WAPA would perform any necessary upgrades to the substation equipment.

##### 2.1.1.6.1 34.5-kV Collector System

The Project would include underground feeder lines (collector lines) that would collect wind-generated power from each wind turbine and deliver it to the Prevailing Wind Park-owned collector substation.

The system would be used to route the power from each turbine to the collector substation, where the electrical voltage would be stepped up from 34.5 to 115 kV. The underground collector system bundle (containing three conductors, ground wire, and fiber optic conduit) would be placed in one trench and connect each of the turbines to the collector substation. The estimated total length of trench is approximately 65 miles. The underground collector circuits would be buried at a minimum depth of 4 feet and would not interfere with farming operations.

The underground electrical collector and communication system cable bundle generally would be installed by open trenching. Using this method, the disturbed soils are typically replaced over the buried cable within 1 day, and the drainage patterns and surface topography are restored to pre-construction conditions. In grassland/rangeland areas, Prevailing Wind Park would re-vegetate the disturbed soils with a weed-free native plant seed mix.

The fiber optic communication conduits and cables for the Project would be installed in the same trench as the underground electrical collector cables and would connect the communication channels from each turbine to control facilities in the collector substation, O&M facility, and offsite locations.

#### 2.1.1.6.2 Collector Substation

A new collector substation would be constructed in the center of the Project Area (Figure 2-1), on private land, where the 34.5-kV electric collection grid and fiber optic communication network would terminate. The collector substation would include a main transformer to step up the voltage of the collection grid from 34.5 to 115 kV, aboveground bus structures to interconnect the substation components, breakers, a control building, relays, switchgear, cable storage, communications and controls, and other related facilities required for delivery of electric power to the 115-kV gen-tie transmission line.

The design of the collector substation is not finalized, but Prevailing Wind Park expects it would be enclosed by a chain-link fence with dimensions of roughly 350 feet by 450 feet (4 acres). The substation components would be placed on concrete and steel foundations. The collector substation would be designed in compliance with Federal, State, and local regulations; National Electrical Safety Code standards; and other applicable industry standards.

#### 2.1.1.6.3 115-kV Gen-Tie Transmission Line

Prevailing Wind Park would construct a new 27.6-mile-long, 115-kV gen-tie transmission line in Bon Homme and Yankton counties from the collector substation to the step-up substation. The proposed 115-kV, single-circuit transmission line would be constructed using self-supporting, single-pole tangent structures within an approximately 50- to 200-foot-wide ROW. Double-pole structures, guyed angle poles, and dead-end structures would be constructed at specific locations along the route at changes in direction, long spans, or crossings of other transmission lines. Structures would be made of wood or tubular steel with a height of approximately 50 to 65 feet for wood poles and 85 to 115 feet for steel structures.

Temporary construction impacts along the transmission line corridor are anticipated to be approximately 100 feet wide along the route. Permanent impacts would be limited to the area required for the transmission line structures. Additional temporary construction workspace may be required to allow for access to the easement area, cable-pulling, or stringing the transmission line on the conductors. All temporary construction workspace would be restored once construction is complete. Vegetation in the easement area would be maintained to protect the lines, allow for ground-based inspections, and access to transmission structures when maintenance is required.

#### 2.1.1.6.4 115/230-kV Step-Up Substation

A 115/230-kV step-up substation would be constructed near the point of interconnection to step up the voltage to match that of WAPA's interconnection facilities. The step-up substation would include a main transformer to step up the voltage from 115 to 230 kV, aboveground bus structures to interconnect the substation components, breakers, a control building, relays, switchgear, cable storage, communications and controls, and other related facilities required for delivery of electric power to WAPA’s 230-kV Utica Junction Substation via the Project’s 1,165-foot, 230-kV line. The step-up substation would be constructed within an approximately 300-foot by 200-foot fenced-in area, adjacent to the Utica Junction Substation.

### 2.1.2 Project Life Cycle

Section 3 of the UGP PEIS describes the activities likely to occur during each of the major phases of a typical wind energy project’s life cycle – site testing and monitoring, construction, operation, maintenance, and decommissioning. The same project phases, with similar types of activities for each phase, would occur for this proposed Project. Prevailing Wind Park anticipates that the life of the Project would be approximately 30 years, with the option to extend the life of the Project as well as explore alternatives regarding Project decommissioning. One way to extend the life of the Project may be to retrofit the turbines and power system with upgrades based on new technology. These steps, if taken, may allow the wind farm to produce energy efficiently and successfully for many more years.

## 2.2 No Action Alternative

Under the No Action Alternative, WAPA would not approve an interconnection agreement to its transmission system. For the purpose of impact analysis and comparison, it is assumed that the proposed Project would not be built, and the environmental impacts, both positive and negative, associated with construction and operation of this Project would not occur. However, these counties would continue to have wind energy resources, and other wind power projects could be proposed in the same area.

# 3.0 AFFECTED ENVIRONMENT

This section briefly describes the existing physical, social, and regulatory environment that would be affected by the Proposed Action or the No Action Alternative.

## 3.1 Land Cover and Land Use

Land cover refers to the physical material at the surface of the earth, while land use addresses how people use the land.

### 3.1.1 Land Cover

The dominant land cover types in the Project Area are cultivated crops, pasture/hay, grassland/herbaceous, and developed. Less than 1 percent of the Project Area is forestland and shrubland. Land cover types within the Project Area are summarized in Table 3-1 and shown on Figure 3-1.

**Table 3-1: Land Cover Types Within the Project Area**

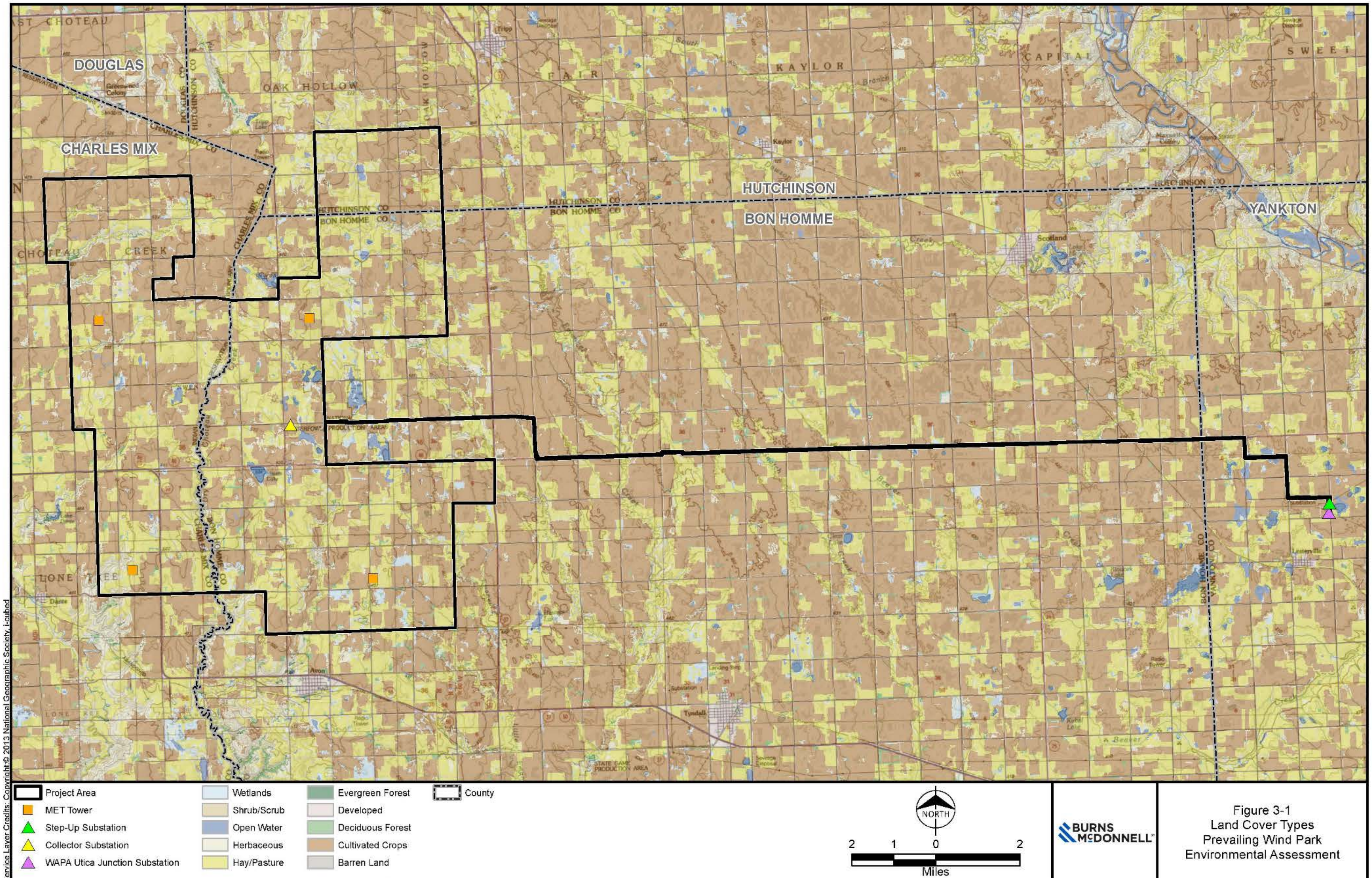
| Land Cover Type[a] | Area (acres) | Percentage of Project Area |
|---|---|---|
| Cultivated crops | 25,210 | 49.6 |
| Pasture/Hay | 17,724 | 34.8 |
| Grassland/Herbaceous | 3,645 | 7.2 |
| Developed | 2,426 | 4.8 |
| Wetlands | 865 | 1.7 |
| Open water | 538 | 1.1 |
| Deciduous forest | 375 | 0.7 |
| Shrub/Scrub | 70 | 0.1 |
| Barren land | 4 | <0.01 |
| Evergreen forest | 1 | <0.01 |
| Total | 50,858 | 100 |

(a) National Land Cover Database 2011 classification system (Multi-Resolution Land Characteristics Consortium [MRLC], 2011)

### 3.1.2 Land Use

Land use within the Project Area is predominantly agricultural, consisting of a mix of cropland, hayland, pastureland, and rangeland. Occupied farm sites and rural residences are scattered throughout the Project Area. Most of the transmission line extends along State and township roads. The transmission line ROW overlaps with the maintained public road ROWs, as well as adjacent agricultural lands.

**Figure 3-1: Land Cover Types**




Source: ESRI; South Dakota GIS; Prevailing Winds, LLC; Burns & McDonnell Engineering Company, Inc. Issued: 11/7/2018

### 3.1.3 Public Lands and Facilities

Figure 3-2 is a map showing public lands and facilities within the Project Area.

Based on correspondence with the USFWS Lake Andes National Wildlife Refuge (NWR), three wetland and two grassland conservation easements managed by the USFWS are within the Project Area. The actual area of protected land is limited to the boundaries of the resource (e.g., wetland) within the mapped area (Bryant, pers. comm., 2018). USFWS wetland and grassland easements are part of the NWR System and are managed for the protection of wildlife and waterfowl habitat.

Three Waterfowl Production Areas (WPAs), managed by the USFWS Lake Andes Wetland Management District, are located within the Project Area. The Cosby and Bucholz WPAs are in Bon Homme County, and the Juran WPA is in Charles Mix County (see Figure 3-2). WPAs are satellite areas of the NWR System and are managed for the preservation of wetlands and grasslands critical to waterfowl and other wildlife.

Two Game Production Areas (GPAs) managed by South Dakota Game, Fish and Parks (SDGFP) for the production and maintenance of wildlife, are located within the Project Area – Mach GPA in Bon Homme County and Rolling Hills GPA in Hutchinson County (see Figure 3-2).

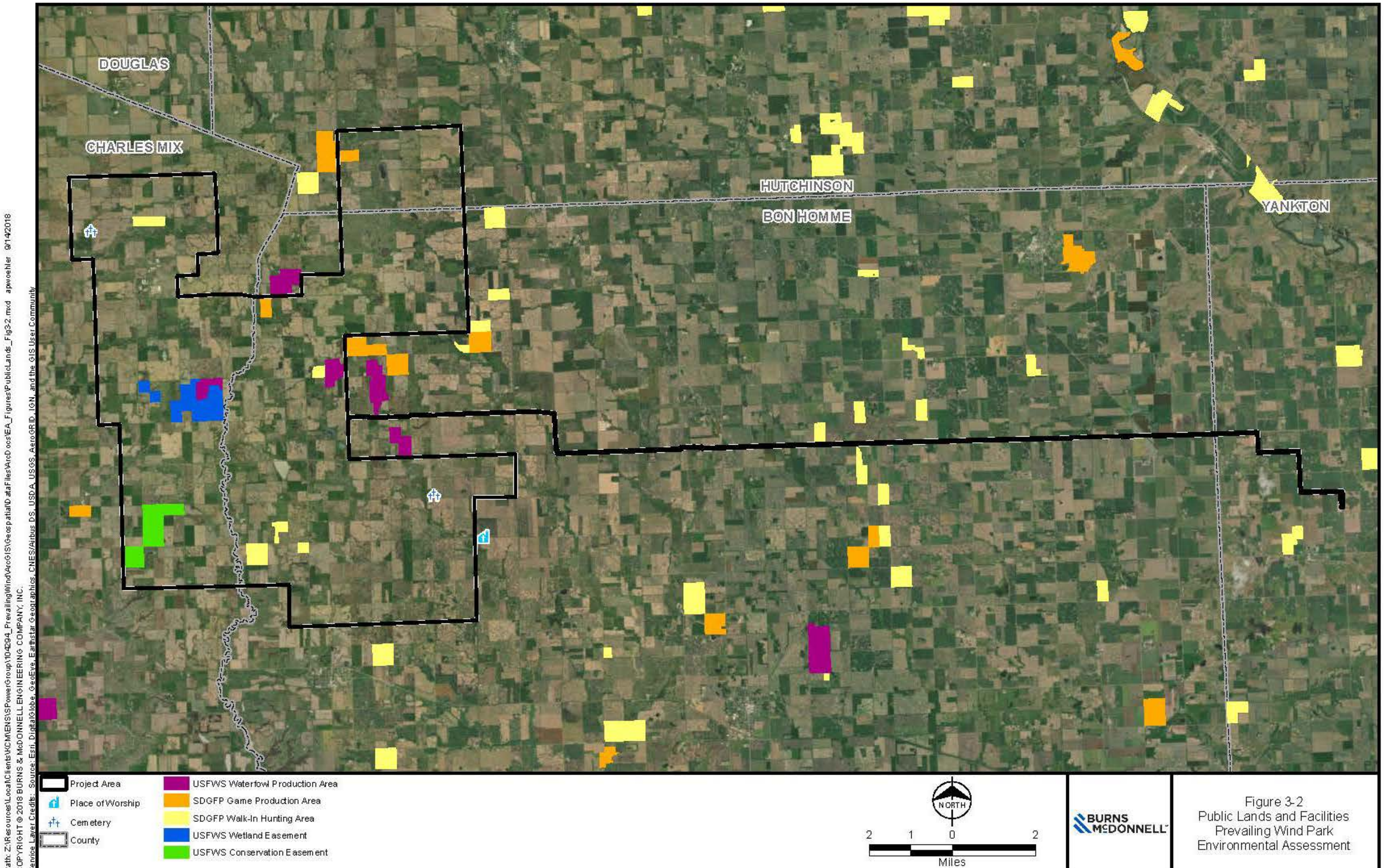
Five parcels of privately-owned lands within the Project Area are leased for public walk-in hunting access by South Dakota Game, Fish and Parks (SDGFP) (referred to as Walk-In Areas).

Two cemeteries are in the Project Area. One church is located outside the Project Area, approximately 0.25 mile east.

### 3.1.4 Transportation

Table 3-2 lists the roads that intersect the Project Area. The primary access to the Project Area is from State Highway 46, which parallels a large portion of the transmission line ROW and cuts through the middle of the southern half of the wind farm boundary. The transmission line ROW portion of the Project Area also overlaps with road ROW along County Highway 213 and secondary township roads; it crosses State Highway 37, State Highway 25, and secondary county and township roads.

**Figure 3-2: Public Lands and Facilities**




Source: ESRI; South Dakota GIS; Prevailing Winds, LLC; Burns & McDonnell Engineering Company, Inc.

Issued: 9/14/2018

**Table 3-2: Project Area Roads**

| Road | Surface Type | Surface Width | Total Lanes |
|---|---|---|---|
| State Highway 50 | Paved asphalt | 24 feet | 2 |
| State Highway 46 | Paved asphalt | 24 feet | 2 |
| State Highway 37 | Paved asphalt | 24 feet | 2 |
| State Highway 25 | Bituminous | 24 feet | 2 |
| Secondary County roads | Gravel or crushed rock/Bituminous | 20 to 22 feet | 2 |
| Secondary Township roads | Gravel or crushed rock | 16 to 20 feet | 2 |

Source: South Dakota Department of Transportation (SDDOT), 2016

In 2016, average daily traffic (ADT) volume was 1,246 trips along State Highway 50 through the Project Area and 780 trips along State Highway 46. ADT along 292nd Street through the Project Area was 113 trips (collected in 2015), and ADT along 401st Avenue was not available (SDDOT, 2016). In 2016, ADT volume was 600 trips between State Highways 37 and 25 on State Highway 46 along the transmission line ROW (SDDOT, 2016).

No airports are located within the Project Area. The closest airport is Wagner Municipal Airport, which is a public airport located in Wagner, South Dakota, approximately 7 miles west of the Project Area. The closest private airport to the Project Area is the Plihalr Farms airstrip, located north of Tyndall, South Dakota, approximately 4.5 miles south of the Project Area. The nearest U.S. air military installation is Offutt Air Force Base, located approximately 160 miles southeast of the Project Area. The nearest South Dakota Air National Guard installation is the 114th Fighter Wing, located approximately 55 miles northeast of the Project Area at Joe Foss Field Base in Sioux Falls, South Dakota. The Project would overlap with the boundaries of the Lake Andes Military Operations Area, but below the operating floor of 6,000 feet above mean sea level.

## 3.2 Geology and Soil Resources

The majority of the Project Area is located within the Central Lowland province of the Interior Plains physiographic region. The Central Lowland province is characterized by flat lands and geomorphic remnants of glaciation. The western edge of the Project Area is located within the Great Plains province of the Interior Plains physiographic region. The Great Plains province is characterized by plateau-like flat plains with little relief throughout the area (National Park Service [NPS], 2017).

Commercially viable mineral deposits within Charles Mix, Bon Homme, Hutchinson, and Yankton counties include sand, gravel, and construction aggregates. The nearest active gravel quarries are approximately 1.5 miles north and approximately 2 miles south of the Project Area ([SDDENR], 2017).

The risk of seismic activity in the vicinity of the Project Area is low. According to the South Dakota Geological Survey (SDGS), no earthquakes have been recorded in the Project Area from 1872 to 2013 (SDGS, 2013). However, a magnitude 4.3 earthquake was recorded in 1982 approximately 4.5 miles south of the nearest point of the Project Area. Available geologic mapping and information from the U.S. Geological Survey (USGS) Earthquake Hazards Program do not indicate any active or inactive faults within the Project Area (USGS, 2017).

No historic underground mining operations, which could lead to subsidence or collapse, exist within the Project Area.

The soils within the Project Area are primarily loams, silty loams, and silty clay loams derived mostly from glacial till, alluvium, and the underlying Pierre Shale bedrock. The soils in the Project Area are not highly susceptible to erosion and are generally good for crop production (Natural Resources Conservation Service [NRCS], 2018). Most soils in the Project Area are well drained. Approximately 7 percent of the soils have a significant hydric component (30 to 100 percent of the soil is hydric). Approximately 11 percent of the soils in the Project Area have a high potential for frost action (NRCS, 2018).

Prime farmlands are subject to protection under the Farmland Protection Policy Act (Public Law 97-98, 7 United States Code [U.S.C.] 4201 et seq.). Most soils in the Project Area are classified as either “prime farmland” (32 percent) or “farmland of statewide importance” (36 percent). Approximately 15 percent is categorized as “not prime farmland.” The remaining 17 percent is divided among “prime farmland” categories with stipulations. Farmland types within the Project Area are shown in Table 3-3.

**Table 3-3: Farmland Types Within the Project Area**

| Farmland Type | Area (acres) | Percentage of Project Area[a] |
|---|---|---|
| Prime farmland | 16,201 | 32 |
| Farmland of statewide importance | 18,183 | 36 |
| Not prime farmland | 7,431 | 15 |
| Prime farmland if drained | 5,009 | 10 |
| Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season | 845 | 1 |
| Prime farmland if irrigated | 3,190 | 6 |
| Total | 50,858 | 100 |

Source: NRCS, 2018
(a) Due to rounding, percentages do not add up to 100 percent.

## 3.3 Water Resources

The Project Area is located within the Missouri River Basin surface water drainage system. Streams within the Project Area consist of intermittent streams and drainages. Named streams include Dry Choteau Creek, Little Emanuel Creek, Emanuel Creek, Snatch Creek, and Beaver Creek (Figure 3-3).

Based on a review of National Wetland Inventory (NWI) data (USFWS, 2015a) and a wetland delineation (HDR Engineering, 2018), approximately 1,856 acres of mapped wetlands occur within the Project Area (Figure 3-3). The types of wetlands found in the Project Area are typical of the region. Table 3-4 summarizes the types and proportions of wetlands found within the Project Area, based on the NWI data.

**Table 3-4: Wetland Types Mapped Within the Project Area**

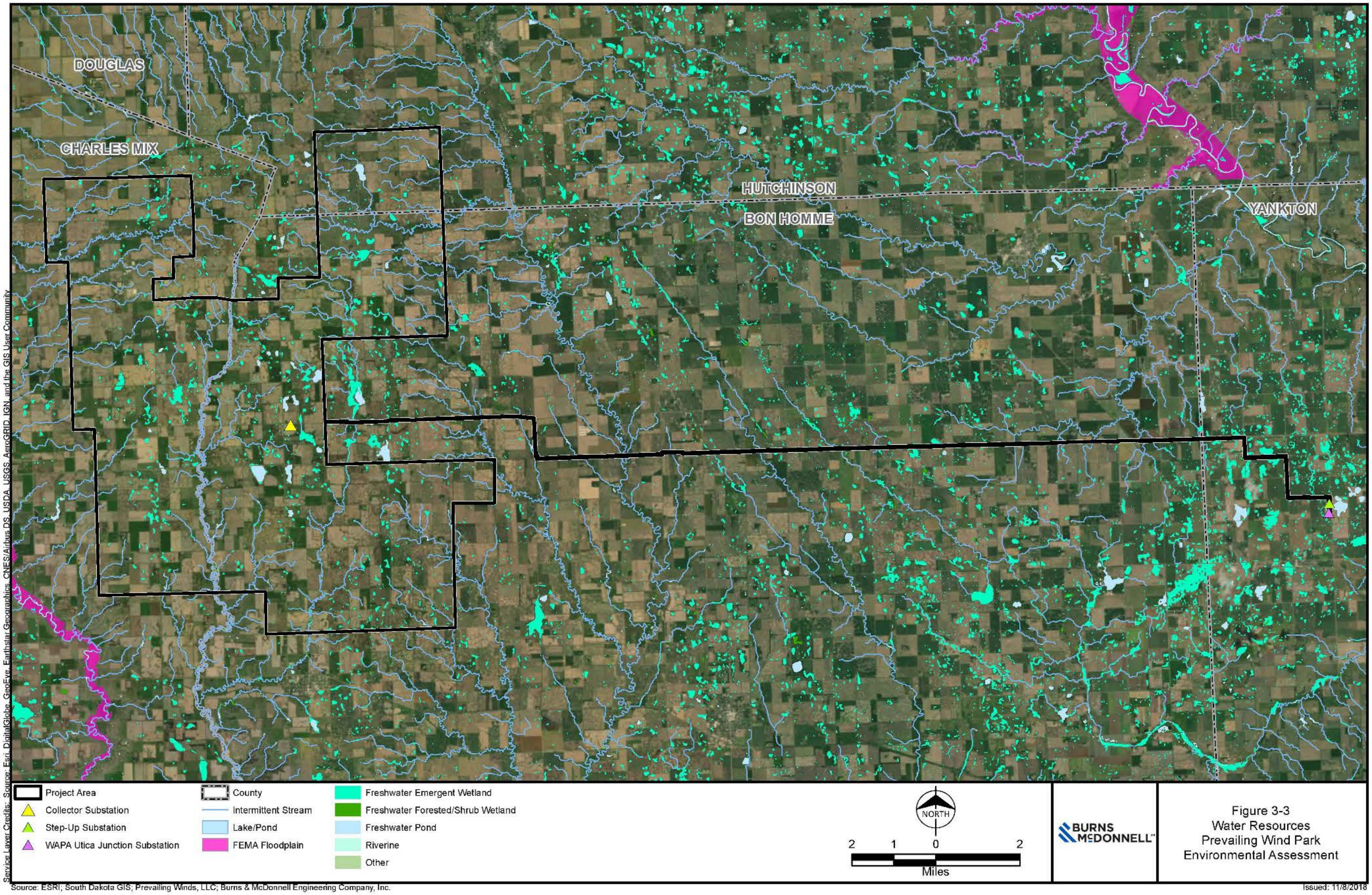
| Wetland | Acres | Proportion of Project Area |
|---|---|---|
| Freshwater Emergent Wetland | 1,435 | 2.8% |
| Freshwater Forested/Shrub Wetland | 44 | 0.1% |
| Freshwater Pond | 248 | 0.5% |
| Lake | 129 | 0.3% |
| Total | 1,856 | 3.6% |

Source: USFWS, 2015a.

Based on available Federal Emergency Management Agency (FEMA) flood maps, there are no FEMA-mapped floodplains within the Project Area. The nearest mapped floodplains are along Choteau Creek, over 1 mile southwest of the Project Area. A small floodplain in Yankton County associated with Prairie Creek is located adjacent to the transmission line ROW (Figure 3-3). FEMA flood maps are available for Charles Mix, Hutchinson, and Yankton counties, but have not been produced for Bon Homme County.

The groundwater system is nearly exclusively based on glacial outwash aquifers. According to the SDGS, of the 444 public water supply systems east of the Missouri River, 392 of them utilize glacial outwash aquifers (Iles, 2008). This is consistent with the types of the soils in the area, many of which were formed from glacial till or glacial drift. Glacial drift and alluvium aquifers in South Dakota vary in depth from 0 to 400 feet, with a range in yield from 3 to 50 gallons per minute (Chadima, 1994).

**Figure 3-3: Water Resources**



## 3.4 Air Quality and Climate

South Dakota has a typical continental climate with extreme summer heat and winter cold. Temperatures have ranged from –58 °F to 120 °F. Annual precipitation patterns tend to decrease northwestward across the State and range from about 25 inches in the southeast to fewer than 13 inches in the northwest. Occasional heavy snowfall with considerable depth can occur in winter. South Dakota is within the path of many cyclones and anticyclones (WAPA and USFWS, 2015a).

The U.S. Environmental Protection Agency (EPA) has set National Ambient Air Quality Standards (NAAQS) for six criteria pollutants: sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, particulate matter, and lead. Volatile organic carbons (VOCs) can participate in photochemical reactions that form ozone, so VOC levels are also monitored. An area where the concentration of these pollutants does not exceed the NAAQS levels is called an attainment area. The entire state of South Dakota is in attainment for all NAAQS criteria pollutants (EPA, 2018).

The EPA also tracks emissions of greenhouse gases (GHGs). GHGs are emitted into the atmosphere through natural processes and human activities, which include production, transport, and burning of fossil fuels; burning solid wastes and trees and wood products; chemical reactions; emissions from livestock and agricultural practices; and emissions from various industrial activities (EPA, 2017b).

The nearest ambient air quality monitoring site to the Project Area is located near Santee, Knox County, Nebraska, which is southeast of the Project Area (EPA, 2017a). The primary emission sources within the Project Area include agricultural-related equipment and vehicles traveling along State Highways 50, 46, and 37.

## 3.5 Noise

Sound can be measured in decibels. A human's perception of sound also can be measured in A-weighted decibels, or dBA, which are representative of the human ear's response to sound. Unwanted or offensive sound is often called noise. The sound pressure levels (in dBA) of some common sound sources are provided in Table 3-5.

**Table 3-5: Typical Sound Pressure Levels Associated with Common Noise Sources**

| Sound Pressure Level (dBA) | Subjective Evaluation | Environment | |
|---|---|---|---|
| | | Outdoor | Indoor |
| 140 | Deafening | Jet aircraft at 75 feet | -- |
| 130 | Threshold of pain | Jet aircraft during takeoff at a distance of 300 feet | -- |
| 120 | Threshold of feeling | Elevated train | Hard rock band |
| 110 | -- | Jet flyover at 1,000 feet | Inside propeller plane |
| 100 | Very loud | Power mower, motorcycle at 25 feet, auto horn at 10 feet, crowd noise at football game | -- |
| 90 | -- | Propeller plane flyover at 1,000 feet, noisy urban street | Full symphony or band, food blender, noisy factory |
| 80 | Moderately loud | Diesel truck (40 miles per hour) at 50 feet | Inside automobile at high speed, garbage disposal |
| 70 | Loud | B-757 cabin during flight | Close conversation, vacuum cleaner |
| 60 | Moderate | Air-conditioner condenser at 15 feet, near highway traffic | General office |
| 50 | Quiet | -- | Private office |
| 40 | -- | Farm field with light breeze, birdcalls | Soft stereo music in residence |
| 30 | Very quiet | Quiet residential neighborhood | Bedroom, average residence (without TV and stereo) |
| 20 | -- | Rustling leaves | Quiet theater, whisper |
| 10 | Just audible | -- | Human breathing |
| 0 | Threshold of hearing | -- | -- |

Sources:
(1) Adapted from *Architectural Acoustics*, D.M. Egan, 1988
(2) *Architectural Graphic Standards*, Ramsey et al., 1994

Sound in the environment is constantly changing, for example, when a car drives by, a dog barks, or a plane passes overhead. Although an instantaneous sound level measured in dBA may indicate the level of sound experienced by an observer at that point in time, environmental sound levels vary continuously. Most ambient environmental sound levels include a mixture of sound from identifiable sources plus a relatively steady background sound where no particular sources are identifiable.

To quantify sound levels occurring during a measurement period, a sound metric called the equivalent sound level ($L_{eq}$) was developed. The $L_{eq}$ is used to describe the average sound level for a specific time period. Additional sound metrics have been developed to quantify fluctuating environmental sound levels. These metrics include the exceedance sound level. The exceedance sound level, $L_x$, is the sound level exceeded during "x" percent of the sampling period. The $L_{90}$ is a common $L_x$ value and represents the sound level exceeded for 90 percent of the time period during which sound levels are measured. The $L_{90}$ metric is a tool that is commonly used for measuring relatively constant background sounds and for minimizing the influence of isolated spikes in sound levels (e.g., barking dog, door slamming).

An ambient noise survey within the Project Area was conducted in March 2018 and measured the background sound levels in the community. Community sound levels were measured at 5:00 PM, midnight, and 10:00 AM at 16 locations distributed across the Project Area. These locations were selected because they were accessible, close to noise-sensitive places such as residences, and representative of larger areas. Sound levels measured ranged from 21.5 to 45.0 dBA $L_{90}$. Extraneous sounds during the measurement periods included high-speed traffic, birds, wind noise, and farm equipment. The loudest sound level was measured at 5:00 PM at measurement point 11, which adjoins State Highway 46 in Bon Homme County. The quietest sound level was measured at midnight at measurement point 12, located near 406th Avenue and south of 295th Street in Bonne Homme County. However, all measured sound levels were quiet to very quiet background sound levels, as shown in Table 3-5. Additional details regarding the sound survey are presented in the Sound Study (Appendix B).

The EPA has delegated authority to the states to regulate environmental sound levels. There are no Federal regulations establishing numerical noise limits; however, many counties in South Dakota have established quantitative sound-level regulations. In the Project Area, Bon Homme County has adopted a zoning ordinance that limits sound levels of wind energy systems to 45 dBA at occupied receptors unless the landowner provides a written waiver. None of the other three counties has an ordinance relating to turbine noise.

## 3.6 Ecological Resources

The following sections describe the site-specific ecological resources (i.e., plant communities, wildlife, aquatic biota, and threatened, endangered, and special status species) within the Project Area.

### 3.6.1 Vegetation

The Project Area is located within the Northern and Northwestern Glaciated Level III ecoregion. On a smaller scale, the Project Area is located within two Level IV Ecoregions: Southern Missouri Coteau and Southern Missouri Coteau Slope (Bryce and Omernik, 1996). Within these ecoregions, the major crops include soybeans, corn, sunflowers, wheat millet, and barley.

Natural vegetation in the Southern Missouri Coteau and Southern Missouri Coteau Slope Ecoregions includes willows, green ash, and elm in riparian areas; western wheatgrass, green needlegrass, big bluestem, porcupine grass, and needle and thread are scattered throughout the region. Prairie cordgrass and northern reedgrass are present in poorly drained areas. Stream drainages tend to be grazed.

Approximately 84 percent of the Project Area has been converted to agricultural use, with crop production and livestock grazing as the main agricultural practices (see Table 3-6). Trees and woodlands occur mainly in planted shelterbelts, within draws, and on hillslopes. Wetlands are scattered throughout the Project Area. Approximately 7 percent of the Project Area consists of grasslands, including 4 percent non-native grasslands. Nearly 6 percent of the Project Area is unvegetated. Less than 2 percent of the Project Area has been mapped as wetlands. Predominant wetland types in the Project Area include wet meadow type communities and shallow marsh communities comprised of reed canary grass, prairie cordgrass, cattail, smartweed, and/or foxtail barley; wetlands are discussed further in Section 3.3. Less than 0.1 percent of the Project Area is mapped as palustrine or forested wetlands; these areas typically support willow, boxelder, and other deciduous trees.

**Table 3-6: Vegetation Communities in the Project Area**

| Vegetation Community | Acres[a] | Proportion[a] |
|---|---|---|
| Row crops | 25,210 | 49.6% |
| Hay fields and pastures | 17,724 | 34.8% |
| Native grassland | 1,609 | 3.2% |
| Non-native grassland | 2,036 | 4.0% |
| Forested wetlands | 1 | <0.1% |
| Emergent herbaceous wetlands | 863 | 1.7% |
| Deciduous forest | 375 | 0.7% |
| Evergreen forest | 1 | <0.1% |
| Shrub/Scrub | 70 | 0.1% |
| Unvegetated | 2,968 | 5.8% |
| Total | 50,858 | 100% |

(a) Slight difference from totals is due to rounding.

The USFWS South Dakota Field Office and SDGFP consider untilled grasslands, which include pastures and fallow fields, as native grasslands[1] that may provide important wildlife habitat (Natalie Gates and Leslie Murphy, pers comm., 2017). A total of 4,882 acres of untilled grasslands within the Project Area

[1] The USFWS and SDGFP "native grasslands" are in addition to areas of native grassland mapped by the National Land Cover Database (MRLC, 2011)

were identified (U.S. Department of Agriculture [USDA], 2016a and 2016b; Bauman et al., 2013). Untilled grassland areas identified during the desktop analysis are displayed on a figure attached to this document as Appendix C.

### 3.6.2 Wildlife

Wildlife species associated with croplands, grasslands, and shrublands are the most common types of species observed or expected to occur within the Project Area, including white-tailed deer, white-tailed jackrabbit, raccoon, woodchuck, Virginia opossum, Plains pocket mouse, Canada goose, snow goose, mallard, wild turkey, ring-necked pheasant, bobwhite quail, mourning dove, rock pigeon, red-tailed hawk, turkey vulture, sandhill crane, killdeer, Franklin’s gull, great-horned owl, barn owl, loggerhead shrike, black-capped chickadee, European starling, horned lark, red-winged blackbird, western meadowlark, northern flicker, northern leopard frog, Great Plains toad, Woodhouse’s toad, Boreal chorus frog, gophersnake, western foxsnake, North American racer, and common gartersnake.

Various wildlife studies were completed for the Project between 2015 and 2018. Surveys were conducted to assess abundance, distribution, and habitat affinities of wildlife within the Project Area (and associated study area buffers; see descriptions of study areas for individual studies below), with specific assessments conducted for birds; bats; and threatened, endangered, and special-status species. Detailed discussions of the methodology and results of the wildlife surveys conducted for the Project are reported in Appendices D through K and summarized below.

#### 3.6.2.1 Birds

A total of 426 bird species have been reported in South Dakota (Table 4.6-4 in WAPA and USFWS, 2015b). County records for Charles Mix and Yankton counties have documented as many as 307 and 237 species, respectively (South Dakota Ornithological Union, 2018). No information is available for Bon Homme or Hutchinson counties.

Many of the bird species reported from the Project Area exhibit seasonal migrations. These birds include waterfowl, shorebirds, raptors, and neotropical songbirds. Two of the three major North American migration flyways pass through the Project Area: the Mississippi Flyway (crosses mainly through Minnesota and Iowa, although birds associated with this flyway can occur in all UGP Region States except for Montana), and the Central Flyway (crosses through all the States except Iowa and Minnesota) (Lincoln et al., 1998).

The Project Area is in the Prairie Potholes Bird Conservation Region (BCR), which covers northern Montana, much of North Dakota, eastern South Dakota, northeastern Nebraska, western Minnesota, and north-central Iowa. This BCR is the most important waterfowl production area of North America (U.S. North American Bird Conservation Initiative [NABCI] Committee, 2000). Within this BCR, bird species of conservation concern, which represent species of the highest conservation concern (other than those already listed as federally threatened or endangered), include the yellow rail, marbled godwit, and Sprague's pipit (USFWS, 2008). BCRs are ecologically distinct regions in North America with similar bird communities, habitats, and resource management issues. Wetland degradation and fragmentation of grassland habitats threaten the suitability of the region for these and other bird species (U.S. NABCI Committee, 2016).

The Project Area does not overlap with any Important Bird Areas (IBAs). The nearest IBA is the Lower Missouri River, located approximately 13 miles south of the Project Area (National Audubon Society, 2018). IBAs are areas identified using an internationally agreed set of criteria as being globally important for the conservation of bird populations.

USFWS conservation easements in the Project Area include WPAs, as described in Section 3.1.3. WPAs primarily provide breeding habitat for migratory waterfowl. Some of these areas are federally owned, but most are managed by private landowners under leases, easements, or agreements with the USFWS.

#### 3.6.2.1.1 Nest Surveys

An aerial raptor nest survey was conducted in April 2016. Due to modifications to the Project Area following the survey, some areas of the current Project Area were not surveyed. The 2016 survey area for eagles included the current wind farm area and a 10-mile buffer, which covered the current Project Area, except for the easternmost 12 miles of the gen-tie transmission line. The 2016 survey area for other (non-eagle) raptors covered the current wind farm area, but did not include the northeastern corner of the Project Area or approximately 21.5 miles of the gen-tie transmission line. To supplement the 2016 surveys, a search of the South Dakota Natural Heritage Program (SDNHP) was conducted (SDNHP, 2018).

Aerial raptor nest surveys (Appendix E) detected 44 non-eagle raptor nests (15 occupied and 29 unoccupied) within the wind farm portion of the Project Area and 1-mile buffer. The occupied nests were primarily common species; none of the unoccupied nests exhibited characteristics of eagle nests.

Six bald eagle nests (three occupied: PW-01 through PW-03; three unoccupied: PW-04 through PW-06) were documented in the vicinity of the Project Area (Figure 3-4), with the closest (PW-02) located approximately 0.5 mile from the current Project Area boundary. Nest PW-02 is approximately 2 miles away from the nearest proposed turbine and 0.7 mile from the transmission line. Nest PW-02 was confirmed active in March 2018 (Clayton Derby, pers. comm., 2018a).

The SDNHP documented a single active eagle nest (PW-02) within the Project Area (SDNHP, 2018).

**Figure 3-4: Bald Eagle Nest Locations**

Available upon request.

### 3.6.2.1.2 Avian Use Surveys

Avian use point count surveys were conducted for 2 years beginning in March 2015 and ending in April 2017. The surveys were conducted from 16 fixed points with a radius of 2,625 feet for large birds and 328 feet for small birds (passerines). Sixty-minute surveys were conducted monthly at each point. All birds were recorded for the first 20 minutes; only eagles and State- and federally listed species were recorded during the final 40 minutes. The survey area for the Year 1 and Year 2 surveys varied due to changes in the Project Area boundary over time (see Figure 3-5); however, during both years, avian surveys were conducted across most of the current Project Area boundary, with the exception of the northeastern portion in Hutchinson County. Because point count surveys did not cover 100 percent of the current Project area boundary, the adjacent Beethoven Wind Project is used for comparison. The Beethoven Wind Project is located adjacent to the Project's northern boundary, comprises the three counties where the wind turbines would be installed, and contains similar habitat types to those present in the Project area boundary.

Over 2 years of avian use surveys (Appendices F and G), 90 unique bird species including 17,470 observations were recorded. Raptor use was highest in fall during both years (0.52 birds/20 minutes and 0.55 birds/20 minutes, respectively). The next highest raptor use was recorded in winter of Year 1 (0.45 birds/20 minutes) and spring of Year 2 (0.51 birds/20 minutes). The lowest raptor mean use was recorded in spring of Year 1 (0.10 birds/20 minutes) and winter of Year 2 (0.12 birds/20 minutes). Red-tailed hawk and northern harrier were the most recorded daytime raptor species during both years. By comparison, at the adjacent Beethoven Wind Project, raptor mean use recorded during avian use surveys in 2013 and 2014 ranged from 0.1 birds/20 minutes during summer and winter to 0.12 birds/20 minutes during fall (Derby and Thorn, 2014). Similar to the results from avian surveys at the Project, red-tailed hawk and northern harrier were the most commonly observed raptors at Beethoven. Daytime raptor use at the Project was low during both years (0.31 and 0.33 birds/20 minutes during Year 1 and Year 2, respectively). For comparison, daytime raptor use at other U.S. wind facilities ranged from 0.1 to 2.3 birds/20 minutes (see Figure 4, in Appendices F and G). For a comparison, daytime raptor use at the few other wind energy facilities in the Midwest with publicly available data, ranged from 0.103 to 0.23 birds/20 minutes; see Table 10 in Appendices F and G.

During the 2 years of surveys, 32 eagle observations were recorded. Because individual eagles could not be tracked during surveys, detections may represent multiple observations of the same bird. Of the bald eagles observed, most were perched on or near the active nest. During Year 2, bald eagles were observed in all seasons except summer. During Year 1, bald eagles were observed only in the winter. Eagle use ranged from 0.01 birds/60 minutes in Year 1 to 0.09 birds/60 minutes in Year 2. Minutes of eagle use ranged from 15 minutes in Year 1 to 143 minutes in Year 2, for a total of 158 eagle minutes (89 minutes observed flying) during both years. It is not known why use in Year 2 was considerably higher than in Year 1; however, 72 of the total 143 eagle minutes recorded in Year 2 were from a single day (March 5, 2017) at a survey plot located on the eastern boundary of the current Project Area. Excluding this single event, average eagle use of the Project represents a low risk per the Eagle Conservation Plan (ECP) Guidance (USFWS, 2013). When the data from this single high use event is factored in, eagle risk appears to be moderate (USFWS, 2013).

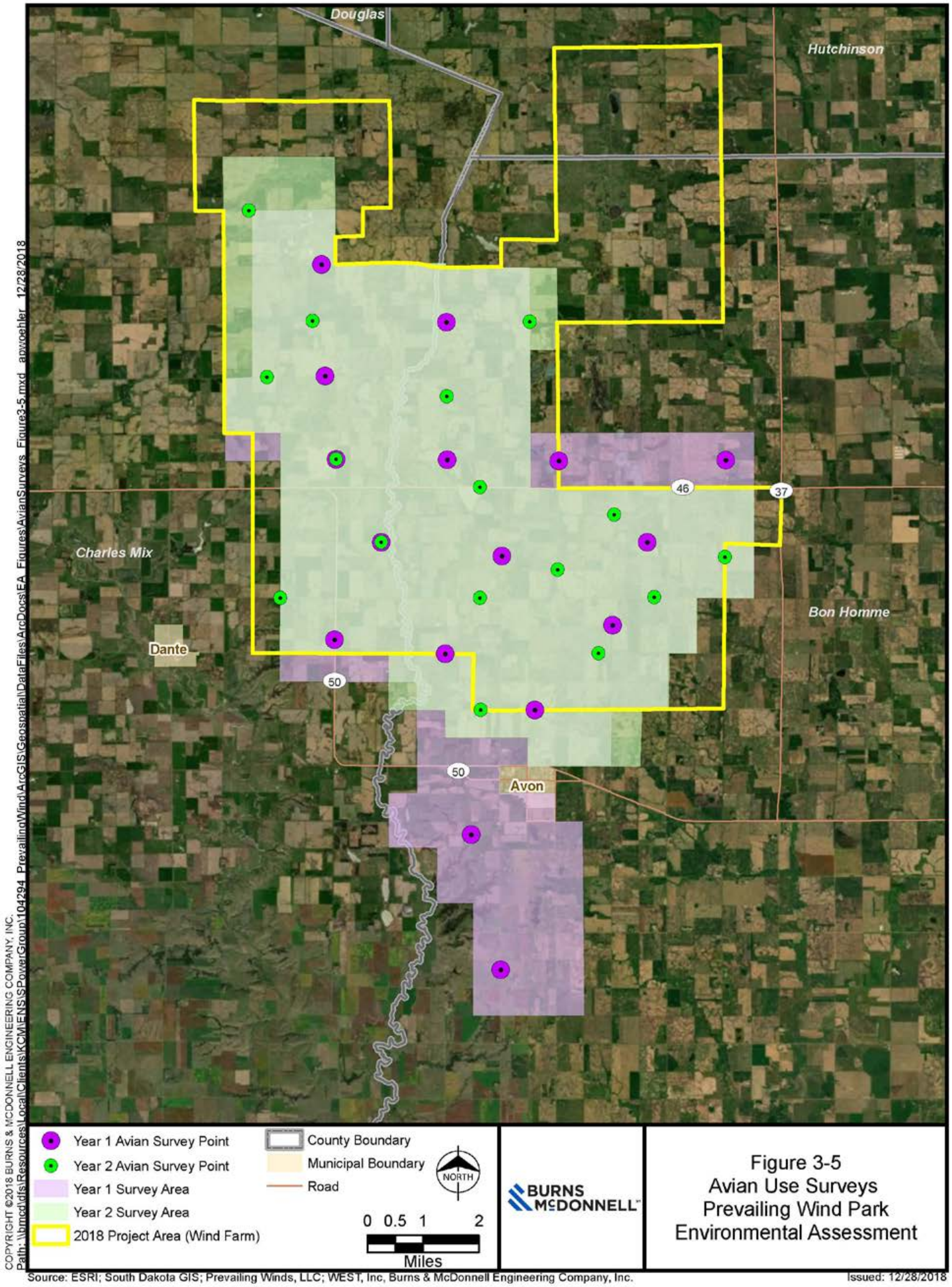
Mean use by passerines (i.e., songbirds), the most frequently observed group during the surveys conducted for the Project, was highest during the fall season in both years (15.59 birds and 35.31 birds, respectively, per 20 minutes); however, use varied considerably during other seasons (see Table 3 of Appendices F and G). Passerine mean use data were not available for the adjacent Beethoven Wind Project. At the Project, the most commonly observed passerines in Year 1 were European starling, unidentified blackbird, and red-winged blackbird; in Year 2, the most commonly observed passerines were common grackle, red-winged blackbird, and unidentified blackbird. At the Beethoven Wind Project, the most commonly documented passerines were red-winged blackbird, horned lark, and common grackle (Derby and Thorn, 2014).

Mean use of waterfowl at the Project was highest during spring of Year 2 (29.2 birds/20 minutes) and winter of Year 1 (11.66 birds/20 minutes). Use was significantly lower in summer during both Year 1 (0.18 birds/20 minutes) and Year 2 (0.48 birds/20 minutes). Meanwhile, at the Beethoven Wind Project, waterfowl mean use ranged from 0.36 birds/20 minutes in summer to 9.81 birds/20 minutes in summer (Derby and Thorn, 2014). The most commonly observed waterfowl observed at the Project were Canada goose and snow goose in Year 1 and snow goose and greater white-fronted goose in Year 2. By comparison, at the Beethoven Wind Project, the most commonly observed waterfowl were mallard, pintail, and Canada goose (Derby and Thorn, 2014).

Waterbird mean use at the Project ranged from 10.17 birds/20 minutes during spring of Year 1 to 0 birds/20 minutes in winter of Year 2. At the Project, the most commonly reported waterbird species was sandhill crane during both years. Sandhill crane was also the most commonly observed waterbird species reported during the Beethoven Wind Project surveys (Derby and Thorn, 2014). Whooping cranes sometimes occur in small numbers among larger flocks of sandhill cranes; however, no whooping cranes were observed at either Prevailing Wind Park or at the Beethoven Wind Project.

No federally listed species were observed during fixed-point bird use surveys conducted at the Project. One State-listed species, peregrine falcon, was observed during the Year 2 eagle use surveys. Similarly, at the adjacent Beethoven Wind Project, no federally or State-listed species were documented (Derby and Thorn, 2014).

**Figure 3-5: Avian Surveys**



#### 3.6.2.2 Bat Surveys

Seven bat species are potential residents and/or migrants in the Project Area and include big brown bat, eastern red bat, hoary bat, silver-haired bat, northern long-eared bat, little brown bat, and western small-footed bat. Acoustic surveys conducted for the Project focused on the northern long-eared bat, a federally threatened species, and are detailed in Section 3.6.3.1 of this EA.

### 3.6.3 Threatened and Endangered Species

Federally listed species that could potentially occur in the Project Area were identified from a search of the USFWS' Information for Planning and Consultation (IPaC) database and South Dakota Natural Heritage Center and are described in Table 3-6.

**Table 3-6: Federally Listed Species**

| Species | Federal Status | Potential to Occur |
|---|---|---|
| Northern long-eared bat | Threatened | Low. Limited suitable habitat in Project Area; trees that could provide roosting or foraging habitat in the Project Area are limited to shelterbelts or small woodlots. Nearest occupied habitat located approximately 4 miles to the south. Not detected in the current Project Area during 2016 surveys. Detected in 2015 during surveys located closer to the Missouri River. |
| Interior least tern | Endangered | Low. No suitable habitat; nearest suitable habitat associated with the Missouri River, 13 miles to the south. None observed during avian surveys. Possible migrant. |
| Whooping crane | Endangered | Low. The Project Area is located 5.4 miles east of the national whooping crane migration corridor in which 95 percent of whooping crane observations occur. Nearest designated critical habitat is 150 miles away. None observed during avian surveys. |
| Piping plover | Threatened | Low. No suitable habitat; nearest suitable habitat associated with the Missouri River, 13 miles to the south. Nearest designated critical habitat is 13 miles away. None observed during avian surveys. Possible migrant. |
| Rufa red knot | Threatened | Low. No suitable habitat; nearest suitable habitat associated with the Missouri River, 13 miles to the south. None observed during avian surveys. Possible migrant. |
| Pallid sturgeon | Endangered | None. Limited to large, silty river bottoms with braided channels, sandbars, sand flats, and gravel bars; nearest suitable habitat is the Missouri River, 13 miles to the south. |
| Western prairie-fringed orchid | Threatened | Low. Believed to be extirpated from South Dakota (USFWS, 1996) and has not been recorded in the Project Area (SDNHP, 2018; USFWS, 2009). |
| Higgins eye (pearlymussel) | Endangered | None. Found in larger rivers with deeper water; nearest suitable habitat associated with the Missouri River, 13 miles to the south. |

| Species | Federal Status | Potential to Occur |
|---|---|---|
| Scaleshell mussel | Endangered | None. Found in sand and gravel beds of medium-sized and large rivers; nearest suitable habitat associated with the Missouri River, 13 miles to the south. |

Sources: USFWS (2018b and 2018c); SDNHP (2018)

Six of these species have some potential to occur in the Project Area during some portion of the year: northern long-eared bat, interior least tern, whooping crane, red knot, piping plover, and western fringed prairie orchid. The interior least tern, red knot, whooping crane, and piping plover could migrate through the Project Area during the spring and fall but are otherwise not expected to occur in the Project Area.

At the time the UGP PEIS was prepared, the northern long-eared bat was proposed for listing. The northern long-eared bat has since been listed as threatened.

No critical habitat has been designated for these species within the Project Area.

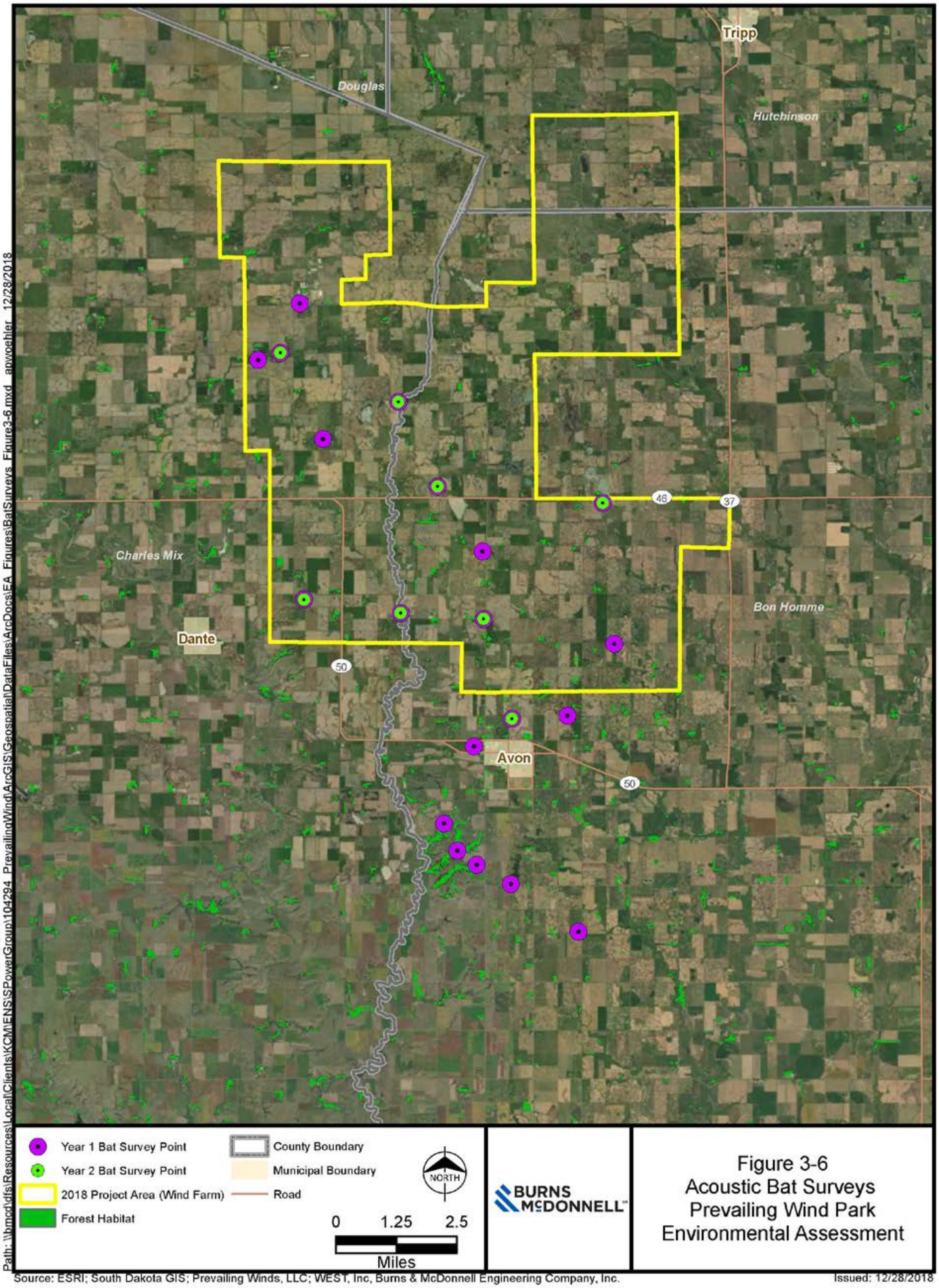
#### 3.6.3.1 Northern Long-eared Bat

The Project Area is within the defined range of the northern long-eared bat, and the species could be present during the summer breeding period (Bat Conservation International, Inc. [BCI], 2018). The primary threat to the species is the spread of white-nose syndrome (USFWS, 2016), which has recently spread to southwestern South Dakota, as well as the neighboring states of Nebraska, Iowa, and Minnesota (White-Nose Syndrome Response Team, 2018). The SDNHP database contains two records in the Project Area and vicinity dating from 2015: one location, with one call recorded, was within 0.5 mile of Turbine 24 in the interior of the Project; a second location with several calls detection was 0.5 mile south of the Project Area (SDNHP, 2018). A single detection, such as that recorded near Turbine 24, suggests that this site is not important habitat for the species and may represent a transiting bat.

In 2015 (Year 1) and 2016 (Year 2), acoustic surveys were conducted in suitable habitat (forested acres) in earlier Project Area boundaries (see Figure 3-6). Surveys were conducted at 20 survey stations in approximately 1,180 forested acres in 2015 and 8 survey stations in approximately 440 forested acres in 2016 (see Figure 1 in Appendix J). In Year 1, surveys were conducted from July 21 to August 10, 2015, and in Year 2, surveys took place from July 12 to August 4, 2016. During the Year 1 acoustic surveys, northern long-eared bat calls were detected at a location (Station 13) 1.5 miles south of Avon; a second location on the western edge of the current Project Area (Station 9a) also recorded a single northern long-eared bat (see Figure 1 in Appendix I) call. During the acoustic surveys, the nearest call detected near a turbine was approximately 0.3 mile from Turbine 63. Following the Year 1 surveys, the Project Area was moved 4.6 miles to the north and away from the Missouri River. In Year 2, no northern long-eared bat calls were recorded at any of the 8 stations surveyed that year, which included the location of the Year 1 call on the western edge of the Project Area. The lack of call detections in 2016 may coincide with the move away from the riparian habitat along the Missouri River and/or the westward spread of white-nose syndrome. Although white-nose syndrome was not reported in South Dakota until May 2018, the disease was detected in 2015 approximately 225 miles southeast of the Project area, and along the Missouri River corridor, in Cass County, Nebraska and in 2016 approximately 220 miles east of the Project Area in Webster County, Iowa (White-Nose Syndrome Response Team, 2018).

Changes to the Project Area in 2018 included the addition of some lands in the northwest and northeast corners of the Project Area in Charles Mix and Hutchinson counties, respectively, and shifting the Project 0.5 mile further away from the riparian forest habitat along the Missouri River. Based on the limited amount of interior forested or riparian roosting habitat and no known caves or mines in these additional areas, no supplementary bat surveys were completed. The Year 2 bat acoustic survey results, which indicate probable absence of this species, are expected to be representative of conditions throughout the current Project Area.

**Figure 3-6: Acoustic Bat Surveys**



#### 3.6.3.2 Interior Least Tern

The Project Area does not contain suitable riverine sandbar or island nesting habitat for the interior least tern. The nearest suitable habitat for the species is associated with the Missouri River, 13 miles to the south. The interior least tern was not observed during avian surveys conducted for the Project; however, it may pass through the Project Area during migration. The SDNHP had no record of the species within 2 miles of the Project Area (SDNHP, 2018).

#### 3.6.3.3 Whooping Crane

The Project Area is located 5.4 miles east of the national whooping crane migration corridor in which 95 percent of whooping crane observations occur (WAPA and USFWS, 2015b); however, based on South Dakota-specific data, the Project is within the State-based migration corridor (Gates and Murphy, pers. comm. 2017). Regardless, whooping cranes have been observed within the Project counties and are likely to occur within these counties in the future (Hamilton and Derby, 2016); thus, the species may fly over or through the Project Area. There have been no confirmed whooping crane sightings within 2 miles of the Project Area as of spring 2018 (SDNHP, 2018). The nearest observation dates from 2011 from an area 8 miles northeast of the Project (USFWS, 2018a). Sandhill cranes, which may flock with whooping cranes, have been observed in the Project Area.

There is potential whooping crane stopover habitat within the Project Area (Pearse et al., 2015). The quality and quantity of stopover habitat in the Project Area is similar to habitat in adjacent areas outside of the Project Area (Appendix K), and use of the Project Area by whooping cranes is not expected to differ significantly. Stopover habitat in the Project Area falls into cells classified as either “unoccupied” (areas where wind turbines installed and western part of the t-line) or “low intensity” (areas of the t-line); USGS describes an “unoccupied” cell as “lacking evidence of use” and “low intensity” cell shows “evidence of use and low stopover site use intensity” (Pearse et al., 2015). A 2016 study indicated that whooping cranes are less likely to use stopover habitat within 160 feet of disturbance features such as roads and dwellings (Pearse et al., 2017); therefore, the Project Area with its numerous farmsteads and roads may be less attractive than outlying areas with lower levels of disturbance. The nearest designated critical habitat for the whooping crane is located approximately 150 miles from the Project Area (USFWS, 2018a).

#### 3.6.3.4 Rufa Red Knot

The Project Area contains no suitable breeding or foraging habitat for the rufa red knot, which is a rare transient in inland parts of its range. In North America, red knots are commonly found along sandy, gravel, or cobble beaches, tidal mudflats, salt marshes, shallow coastal impoundments and lagoons, and peat banks (USFWS, 2015b). The nearest suitable stopover habitat for the species is the Missouri River and associated wetlands located 13 miles to the south. No rufa red knots were observed during avian surveys conducted for the Project. The SDNHP had no record of the species within 2 miles of the Project Area (SDNHP, 2018). This species may pass through the Project Area during migration.

#### 3.6.3.5 Piping Plover

The Project Area lacks suitable breeding or foraging habitat for piping plover, which typically nests on sparsely vegetated riverine sandbars. The nearest suitable habitat is associated with the Missouri River, 13 miles to the south, which coincides with the nearest designated critical habitat for the species. Due to lack of suitable habitat, no pre-construction surveys were conducted for the piping plover. This species was not observed during avian surveys, and the SDNHP had no record of the species within 2 miles of the Project Area (SDNHP, 2018). However, the piping plover may pass through the Project Area during migration.

#### 3.6.3.6 Pallid Sturgeon

The Project Area does not contain suitable habitat for pallid sturgeon. This fish inhabits large river systems with high turbidity and flow conditions. The nearest suitable habitat is 13 miles away in the Missouri River. Due to the lack of habitat in the Project Area, no pre-construction surveys were conducted for pallid sturgeon. The SDNHP had no record of this species within 2 miles of the Project Area (SDNHP, 2018).

#### 3.6.3.7 Higgins Eye and Scaleshell Mussel

There is no suitable habitat in the Project Area for either Higgins eye or scaleshell mussel. Both species require large or medium-sized (scaleshell mussel, only) rivers. The nearest suitable habitat is 13 miles away. Therefore, no pre-construction surveys were conducted for the species. The SDNHP had no record of either species within 2 miles of the Project Area (SDNHP, 2018).

#### 3.6.3.8 Western Prairie Fringed Orchid

The USFWS IPaC online tool indicates that the federally threatened western prairie fringed orchid has the potential to occur in the Project Area (USFWS, 2018e). The USFWS Species Profiles (USFWS, 2018e) indicates the species is known only from Yankton County. However, other sources USFWS (2018d, 2009, 1996) indicate the species' current range excludes South Dakota. This orchid reportedly grows in moist tallgrass prairies and sedge meadows and was historically found throughout the tallgrass regions of North America, including South Dakota. The SDNHP had no record of the species within 2 miles of the

Project Area (SDNHP, 2018); however, it is not known when surveys were last conducted in the area. Approximately 890 acres of potentially suitable habitat was identified in the Project Area.

## 3.7 Visual Resources

Visual resources refer to all objects (man-made and natural, moving and stationary) and features (e.g., landforms and water bodies) that are visible on a landscape. Cropland, grassland, large open vistas, and gently rolling topography visually dominate the Project Area landscape.

Two WAPA transmission lines bisect the Project Area from east to west, and one East River Electric transmission line traverses the Project Area, also from east to west. State Highways 50, 46, and 37 extend through the Project Area, and State Highway 46 runs parallel to the transmission line. The existing Beethoven Wind Farm, comprised of 43 wind turbines, is located adjacent to the northern portion of the Project Area.

There are 147 occupied residences and scattered farm buildings within the Project Area and other scattered rural residences and towns that are near, but outside of, the Project Area. Travelers through the Project Area would include local or regional traffic along State Highways 50, 46, and 37. USFWS and SDGFP public hunting areas (discussed in Section 3.1.3) are present within the Project Area.

The nearest scenic resources to the Project Area are the Lake Andes NWR, located approximately 12 miles west of the Project Area, and the Missouri River, designated as a National Recreation River by the NPS, located approximately 13 miles south of the Project Area.

## 3.8 Paleontological Resources

The UGP Region is composed of sedimentary rocks that have the potential to contain significant fossils; however, occurrence of significant fossils is rare in the area. The surface geology of the Project Area has been classified and scored by the Potential Fossil Yield Classification (PFYC) system. The PFYC assigns a numeric score between 1 and 5, with 5 representing the highest potential for fossil materials to be present. Paleontological localities are common in formations with a PFYC rating of 5.

The majority of the Project Area is underlain by Pierre Shale bedrock, with a PFYC rating of 4. Minor areas of alluvial deposits found within the Sulphur Creek drainages of the northern extents of the Project Area also have a PFYC rating of 4. Significant rock outcroppings are not present within the Project Area.

## 3.9 Cultural Resources

Cultural resources include archaeological, historic, and architectural sites or structures, or places that are significant in understanding the history of the United States or North America and may include definite locations (sites or places) of traditional cultural or religious importance to specified social or cultural groups, such as Native American tribes ("traditional cultural properties"). Cultural resources that meet the eligibility criteria for listing on the National Register of Historic Places (NRHP) are termed "historic properties" under the National Historic Preservation Act (NHPA). Because the Project requires a Federal interconnection agreement, it qualifies as an undertaking subject to review under Section 106 of the NHPA and its implementing regulations (36 CFR § 800).

To identify new or previously recorded cultural resources eligible for listing on the NRHP, cultural resources surveys were undertaken within a specified Area of Potential Effects (APE). The APE is defined as the geographic area within which the Project may directly or indirectly cause changes to the character or use of cultural resources (36 CFR Part 800.16(d)). Surveys were conducted for archaeological resources and for architectural/historical resources; each resource had a separate APE.

### 3.9.1 Archaeological Survey

Archaeological surveys locate and identify cultural resources that may be present. The following subsections describe the background research and onsite field surveys undertaken to identify cultural resources that could be affected in the APE. For archaeological resources, the APE was defined as the footprint of the wind farm with associated turbines, access roads, feeder cables, crane paths, turn-radius areas, as well as the collector substation, laydown yard, O&M building, transmission line, and the step-up substation plus a 100-foot buffer (50-foot radius) around all features; the archaeological resources APE covers 2,106 acres (Eigenberger et al., 2018).

#### 3.9.1.1 Records Search

A records search of the archaeological APE, plus a 1-mile buffer, was conducted at the South Dakota State Archaeological Research Center in March and April 2018. The records search identified 24 previous cultural resources surveys. The records search revealed 11 previously identified archaeological sites. One site, a railroad segment (39BO2007), is considered eligible for the NRHP. Of the remaining 10 sites, three have been determined not eligible, and seven have not been evaluated (Eigenberger et al., 2018).

The records search also revealed 27 previously inventoried architectural structures. One structure, the Wagner House (CH00000024) is eligible for the NRHP because it is an excellent example of the Craftsman style and is eligible under Criterion C ("That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction"). Of the remaining 26 structures, 2 are determined not eligible, and 24 are unevaluated (Eigenberger et al., 2018).

Seven previously inventoried cemeteries were identified. One of the seven previously inventoried cemeteries is determined not eligible for the NRHP, and the remaining cemeteries have not been evaluated (Eigenberger et al., 2018).

The records search revealed the presence of 20 previously inventoried bridges. Two of the bridges (BO00000248 and CH00000261) had been determined eligible for the NRHP in 2004; however, one of the bridges (BO00000248) has since been removed (Plimpton et al., 2018). The remaining 18 bridges are not eligible for the NRHP (Eigenberger et al., 2018).

#### 3.9.1.2 Field Surveys Results

In June, July, and October 2018, archaeologists conducted an intensive (Level III) archaeological survey consisting of a pedestrian survey and selective shovel testing of the archaeological APE.

A new segment of the previously identified historic period railroad segment (39BO2007) and a new historic period archaeological site (39CH0317) were identified within the archaeological APE.

The newly recorded railroad segment of site 39BO2007 is part of the historic Chicago, Milwaukee, St. Paul and Pacific railroad, which is considered eligible for the NRHP. This newly recorded segment is adjacent to a segment of the railroad previously recorded in 2004. The site consists of a railroad berm, rail bed, and ditched ROW and is currently still in use by the Burlington Northern Santa Fe railroad.

The new historic period site (39CH0317) is an approximately 1.4-acre former farmstead that includes foundations and a historic material scatter. Background research revealed that the occupants of the farmstead did not play an important role in local, State, or national history. The archaeological investigation revealed agricultural and domestic debris common to mid-20th century farmsteads in South Dakota. The farmstead does not retain enough information potential to qualify for listing in the NRHP, and it is recommended not eligible for listing on the NRHP under any criteria (Eigenberger et al., 2018).

### 3.9.2 Architectural History Survey

Architectural history surveys locate and identify historically significant aboveground resources. The following subsections describe the background research and onsite field surveys undertaken to identify historic architectural resources that could be affected in the APE. For architectural resources, the APE was defined as a 2-mile buffer around the turbines and a 0.5-mile buffer on both sides of the transmission line. The architectural resources APE covered approximately 47,000 acres (Plimpton et al., 2018).

#### 3.9.2.1 Records Search

A records search was conducted at the South Dakota State Historical Society in June 2018 to identify any previously recorded architectural historic resources (45 years of age or older) located within the architectural history APE. The records search of the architectural history APE identified 46 previously recorded architectural historic resources: 23 buildings, 3 cemeteries, and 20 bridges. Of the 23 buildings, 21 were unevaluated, and 2 were previously evaluated. One of the buildings, an abandoned schoolhouse (CH00000021), was determined in 2014 not to be eligible for listing. The other building was the previously mentioned Wagner House (CH00000024), which was determined eligible. Also, as discussed previously, two of the bridges had been determined eligible in 2004; however, one of the bridges has since been removed. The remaining 18 bridges were determined not eligible. The three cemeteries were unevaluated. In addition to these 46 resources was the railroad segment (39BO2007) previously discussed.

#### 3.9.2.2 Field Survey Results

In June and August 2018, architectural historians conducted a reconnaissance-level field study of the architectural APE. Due to the rural nature of the Project Area, a large number of properties were not visible from the public ROW. Landowner permission to access the properties was requested, and 69 property owners granted permission. The remaining 100 properties were surveyed from the ROW and from available online imagery. However, in cases where properties were too distant from the ROW or otherwise too visually obscured to be fully recorded, the property was not evaluated.

In total, 301 historic architectural resources were identified. Of these, 244 were evaluated for NRHP eligibility (including the previously evaluated bridge). The remaining 57 properties include the previously NRHP-listed Wagner House property (CH00000024), the abandoned schoolhouse previously determined not eligible (2014), and 55 properties unable to be evaluated due to their inaccessibility during the survey. Two properties were newly recommended eligible: 28912 410th Avenue (site 57893) and 415 N. Birch Street (site 58279).

## 3.10 Socioeconomics

The UGP PEIS describes 10 key measures of economic development: employment, unemployment, personal income, State sales and income tax revenues, population, vacant rental housing, State and local government expenditures and employment, and recreation. Table 3-7 lists the key measures of economic development applicable to the Project Area. Data are reported for Bon Homme, Charles Mix, Hutchinson, and Yankton counties and South Dakota for the most recent year available. South Dakota does not currently have a State income tax, and, therefore, this measure is not reported in the table. As can be seen in this table, the unemployment rate in three of the four affected counties is lower than the statewide average. The unemployment rates of all four affected counties are within half a percentage point of the statewide average which is 3.3 percent. Anecdotally, an unemployment rate of between 4 percent and 6 percent is considered "healthy." The median household income of all four affected counties is lower than the statewide value.

**Table 3-7: Key Measures of Economic Development**

| Economic Development Measures (Year) | Bon Homme County | Charles Mix County | Hutchinson County | Yankton County | South Dakota |
|---|---|---|---|---|---|
| Employment (2017)[a] | 2,829 | 3,724 | 3,489 | 11,541 | 440,028 |
| Unemployment rate (2017)[a] | 3.1% | 3.7% | 3.1% | 3.0% | 3.3% |
| Median household income (2016)[b] | $48,023 | $43,376 | $47,358 | $48,723 | $52,078 |
| State sales tax revenue (2017)[c] | N/A | N/A | N/A | N/A | $2.0 billion |
| Population (2017)[d] | 6,984 | 9,428 | 7,358 | 22,662 | 869,666 |
| Rental vacancy rate (2016)[b] | 4.9% | 8.4% | 5.1% | 5.8% | 5.2% |
| State and local government expenditures (2012)[e] | N/A | N/A | N/A | N/A | $6.9 million |
| State and local government employment (2016)[b] | N/A | N/A | N/A | N/A | 62,565 |
| State recreation sector income (2006)[f] | N/A | N/A | N/A | N/A | $763 million |

(a) South Dakota Department of Labor and Regulation, 2016
(b) U.S. Census Bureau, 2016
(c) South Dakota Department of Revenue (SDDOR), 2017
(d) U.S. Census Bureau, 2017
(e) U.S. Census Bureau, 2012
(f) WAPA and USFWS, 2015b

## 3.11 Environmental Justice

Executive Order 12898 requires Federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of their actions, programs, or policies on minority and low-income populations.

For this Project, minority populations were identified by determining the percentage of minority residents for the census tracts in which the Project Area is located. Low-income populations were identified based on poverty rates for the population of these census tracts. Charles Mix, Bon Homme, Hutchinson, and Yankton counties and the State of South Dakota were selected as comparison areas. If the minority or low-income populations of the census tract exceeds 50 percent or exceeds the county or State levels by greater than 20 percentage points (i.e., "meaningfully greater than the general population"), the census tract would be defined as a minority or low-income population (Council on Environmental Quality [CEQ], 1997).

Table 3-8 displays the percentage of minority and low-income residents for the census tract, counties, and State in which the Project Area is located. As indicated in this table, the percentages of minority and low-income residents in the census tracts do not exceed 50 percent nor do they exceed Charles Mix, Bon Homme, Hutchinson, and Yankton counties or State levels by greater than 20 percentage points. Therefore, according to CEQ guidance (1997), no minority or low-income populations are in the Project Area.

**Table 3-8: Minority and Low-Income Populations**

| Location | Total Population | Percent Minority[a] | Percent Below Poverty |
|---|---|---|---|
| Census Tract 940300 (in Charles Mix County) | 3,497 | 6.5% | 22.7% |
| Census Tract 968800 (in Hutchinson County) | 1,748 | 0.1% | 9.7% |
| Census Tract 967700 (in Bon Homme County) | 3,744 | 3.6% | 8.7% |
| Census Tract 967600 (in Bon Homme County) | 3,257 | 2.6% | 12.5% |
| Census Tract 966400 (in Yankton County) | 4,080 | 1.1% | 8.8% |
| Bon Homme County | 7,001 | 12.4% | 10.8% |
| Charles Mix County | 9,277 | 36.8% | 21.5% |
| Hutchinson County | 7,264 | 4.6% | 13.4% |
| Yankton County | 22,649 | 10.2% | 14.5% |
| South Dakota | 851,058 | 17.1% | 14.0% |

Source: U.S. Census Bureau, 2016
(a) Minority is calculated by adding the populations for all non-white races and the population for white-Hispanic.

## 3.12 Health and Safety

The Project Area is a predominantly agricultural area, with occupied farm sites, rural residences, and several roadways. The following sections describe electric and magnetic fields, noise and infrasound, shadow flicker, and other hazards in the Project Area.

### 3.12.1 Electric and Magnetic Fields

Natural and man-made sources of electric and magnetic fields (EMFs) are commonplace in the United States. Man-made sources include wind farms, substations, and power lines as well as ordinary household appliances such as hairdryers, electric shavers, computers, wireless networks, cell phones, microwaves, and remote controls.

Electric fields exist wherever an electric charge exists. A magnetic field exists when that charge is in motion (i.e., the flow of electrons to produce an electric current). EMFs are vector quantities, which means they have a strength and a specific direction. The strength of an EMF decreases substantially with increasing distance from the source (National Institute of Environmental Health Sciences [NIEHS], 2018).

Potential health effects from EMF have been extensively studied (NIEHS, 1999; World Health Organization, 2007). The studies found a weak link between EMF exposure and a slightly increased risk of childhood leukemia. Studies that have been conducted on adults show no evidence of a link between EMF exposure and adult cancers, such as leukemia, brain cancer, and breast cancer (NIEHS, 2018).

There are currently no Federal or State regulations on maximum EMF intensity. However, the International Commission on Non-ionizing Radiation Protection (ICNIRP) and the Institute of Electrical and Electronics Engineers (IEEE) have issued guidelines for exposure to EMF (ICNIRP, 1998; IEEE, 2002).

### 3.12.2 Noise and Infrasound

The affected environment for noise is discussed in Section 3.5.

In addition to generally audible noise (typically, frequencies of 20 to 20,000 Hertz) in the environment, infrasound (sound with frequencies in the range of 1 to less than 20 Hertz) is commonplace in the United States. Infrasound is created from natural sources, such as wind and any other natural motions that result in the slow oscillations of air, as well as man-made sources, such as cars, industrial machinery, slow-moving fans, and other household appliances (Leventhall, 2003 and 2006). Infrasound is generally not audible. However, infrasound can be audible at very high levels (110+ dBA), and these sounds may occur from man-made but also natural sources, such as meteors or volcanic eruptions.

Because infrasound has many sources and because it can travel efficiently over long distances, its effects on human health have been extensively studied. The studies have differing conclusions. However, expert testimony filed before the South Dakota Public Utilities Commission found that peer-reviewed, published scientific research has not demonstrated a link between infrasound from wind turbines and adverse health effects, including sleep disturbance or vertigo (Roberts, 2018).

The State of South Dakota has not independently studied or taken a formal position on the issue of wind turbines and human health effects. However, for the proposed Crocker Wind Farm in Clark County (not associated with Prevailing Wind Park or sPower), the South Dakota Secretary of Health submitted a letter to the South Dakota Public Utilities Commission stating:

> *A number of state public health agencies have studied the issue, including the Massachusetts Department of Public Health and the Minnesota Department of Health. These studies generally conclude that there is insufficient evidence to establish a significant risk to human health. Annoyance and quality of life are the most common complaints associated with wind turbines, and the studies indicate that those issues may be minimized by incorporating best practices into the planning guidelines* (Kim Malsam-Rysdon, 2017).

There currently are no regulations limiting infrasound exposure levels.

### 3.12.3 Shadow Flicker

Shadow flicker occurs when wind turbine blades pass in front of the sun to create recurring shadows on an object. Such shadows occur only under very specific conditions, including sun position, wind direction, time of day, and other similar factors. Shadow flicker becomes less noticeable with increasing distance from a wind turbine. Shadow flicker at distances greater than 10 rotor diameters (i.e., about 4,490 feet or 0.85 mile) is generally low intensity and considered imperceptible. At such distances, shadow flicker is typically only caused at sunrise or sunset, when cast shadows are sufficiently long.

Shadow flicker impacts are not currently regulated in applicable State or Federal law, nor are there requirements in the current Charles Mix County or Hutchinson County ordinances. The Bon Homme County zoning ordinance states the following:

> *When determined appropriate by the County, a Shadow Flicker Control System shall be installed upon all turbines which will cause a perceived shadow effect upon a habitable residential dwelling. Such system shall limit blade rotation at those times when shadow flicker exceeds thirty (30) minutes per day or thirty (30) hours per year at perceivable shadow flicker intensity as confirmed by the Zoning Administrator are probable.*

### 3.12.4 Physical Hazards

The Project Area is subject to physical safety hazards typical of a rural agricultural area, such as storms and vehicle accidents. In addition, wind turbines can present physical safety hazards from a rotor blade breaking and parts being thrown off or from ice buildup on a blade and the ice being thrown off. Both blade throw and ice throw historically have rarely occurred.

# 4.0 ENVIRONMENTAL CONSEQUENCES

This section describes the environmental consequences of the Proposed Action and the No Action Alternative and lists applicable BMPs and avoidance and minimization measures that would be incorporated.

## 4.1 Land Cover and Land Use

The following subsections list BMPs and avoidance and minimization measures incorporated into Project plans and discuss the potential impacts of the Proposed Action and the No Action Alternative on land cover and land use.

### 4.1.1 BMPs

The following BMPs and avoidance and minimization measures would be implemented:

- Develop restoration plans to verify all temporary use areas are restored.
- Construction activities shall be coordinated with landowners to minimize interference with farming or livestock operations. Issues that would need to be addressed could include installation of gates and cattle guards where access roads cross existing fencelines, access control, signing of open range areas, traffic management (e.g., vehicle speed management), and location of livestock water sources.
- Construction debris shall be removed from the site.
- Excess concrete (excluding belowground portions of decommissioned turbine foundations intentionally left in place) shall not be buried or left in active agricultural areas.
- Vehicles shall be washed outside of active agricultural areas to limit the possibility of the spread of noxious weeds.
- Topsoil shall be stripped from any agricultural area used for traffic or vehicle parking—segregating topsoil from excavated rock and subsoil—and replaced during restoration activities.
- Drainage problems caused by construction shall be corrected to avoid damage to agricultural fields.
- Following completion of construction and during decommissioning, subsoil shall be decompacted.
- Adequate safety measures (e.g., access control and traffic management) shall be established for recreational visitors to adjacent properties.

- Access roads shall be designed and constructed to the appropriate standard necessary to accommodate their intended function (e.g., traffic volume and weight of vehicles) and minimize erosion. Access roads that are no longer needed should be recontoured and revegetated.
- A transportation plan shall be prepared that identifies measures the developer will implement to comply with State or Federal requirements and to obtain the necessary permits. This will address the transport of turbine components, main assembly crane, and other large pieces of equipment. The plan shall consider specific object size, weight, origin, destination, and unique handling requirements and shall evaluate alternative means of transportation (e.g., rail or barge).
- A traffic management plan shall be prepared for the site access roads to verify that no hazards would result from increased truck traffic and that traffic flow would not be adversely impacted. This plan shall identify measures that will be implemented to comply with any State or Federal Department of Transportation requirements, such as informational signs, flaggers when equipment may result in blocked throughways, and traffic cones to identify any necessary changes in temporary lane configurations. Signs shall be placed along roads to identify speed limits, travel restrictions, and other standard traffic control information. To minimize impacts on local communities, consideration shall be given to limiting construction vehicles on public roadways during the morning and late afternoon commute times.
- Project personnel and contractors shall be instructed and required to adhere to speed limits commensurate with road types, traffic volumes, vehicle types, and site-specific conditions to ensure safe and efficient traffic flow.
- During construction, O&M, and decommissioning phases, traffic shall be restricted to designated Project roads. Use of other unimproved roads shall be restricted to emergency situations.

### 4.1.2 Proposed Action

It is estimated that up to 761 acres of land (662 acres agricultural land, 99 acres non-agricultural) would be temporarily impacted by construction of the Project, and up to 47 acres of land (42 acres agricultural land, 5 acres non-agricultural) would be permanently impacted (less than 0.1 percent of the total land within the Project Area).

Project facilities would be re-vegetated with vegetation types matching the surrounding agricultural landscape. Agricultural activities could occur up to the edge of access roads and turbine pads. Access roads and turbine pads would not be fenced off except for gates/cattle guards installed in landowner fences. Livestock and the landowners would be able to cross access roads and move about unimpeded. The buried underground collection system would not alter agricultural activities in the long-term.

While the transmission line ROW does not encroach on either of the two cemeteries in the vicinity of the Project, there would be visual impacts to the viewshed from these cemeteries (see further discussion in Section 4.7)

Prevailing Wind Park coordinated with the USFWS regarding the exact boundaries of the USFWS wetland conservation easements within the larger easement parcels shown on Figure 3-2. The Project has been designed such that no Project facilities (e.g., turbines, collector lines, access roads) would be placed on these USFWS wetland or grassland easements, and thus, no impacts to these easement areas would occur. In addition, no Project facilities would be placed on the USFWS WPAs, SDGFP GPAs, or SDGFP Walk-In Areas identified in Section 3.1.3.

The Project would not result in any permanent impacts to the area's ground transportation resources. There would be some improvements to gravel roads and temporary impacts to local roads during the construction phase of the Project. Prevailing Wind Park would work with the SDDOT and Charles Mix, Bon Homme, Hutchinson, and Yankton counties to obtain the appropriate access and use permits, and to minimize and mitigate the impacts to area transportation.

The air traffic generated by the airports listed in Section 3.1 would not be impacted by the proposed Project. Prevailing Wind Park would follow FAA regulations for marking towers and would implement the necessary safety lighting. An Aircraft Detection Lighting System would be installed on towers, pending approval by FAA. Notification of construction and operation of the wind energy facility would be sent to the FAA, and FAA-required avoidance and minimization measures would be implemented.

### 4.1.3 No Action Alternative

Under the No Action Alternative, the Project would not be developed. Therefore, no specific Project-related changes to land cover or land use would occur within the Project Area. However, effects from existing disturbances, such as farming, would likely continue, and the trend toward conversion of native habitat to agriculture would likely continue. Furthermore, under the No Action Alternative, other land development could occur because private landowners may choose to develop their agricultural or undeveloped properties for more intensive land uses.

## 4.2 Geologic Setting and Soil Resources

The following subsections discuss the potential impacts of the Proposed Action and the No Action Alternative on the geologic setting and soil resources.

### 4.2.1 BMPs

The following BMPs and avoidance and minimization measures would be implemented:

- Minimize ground-disturbing activities, especially during the rainy season.
- Surface new roads with aggregate materials, wherever appropriate.
- Restrict heavy vehicles and equipment to improved roads to the extent practicable.
- Control vehicle and equipment speed on unpaved surfaces.
- Conduct construction and maintenance activities when the ground is frozen or when soils are dry and native vegetation is dormant.
- Stabilize disturbed areas that are not actively under construction using methods such as erosion matting or soil aggregation, as site conditions warrant.
- Salvage topsoil from all excavation and construction activities to reapply to disturbed areas once construction is completed.
- Dispose of excess excavation materials in approved areas to control erosion.
- Isolate excavation areas (and soil piles) from surface water bodies using silt fencing, bales, or other accepted appropriate methods to limit sediment transport by surface runoff.
- Use earth dikes, swales, and lined ditches to divert local runoff around the work site.
- Reestablish the original grade and drainage pattern to the extent practicable.
- Reseed disturbed areas with a native seed mix, and revegetate disturbed areas immediately following construction.

### 4.2.2 Proposed Action

Construction of the wind turbine foundations, access roads, collector lines, substation, and O&M facility would result in up to 761 acres of temporary disturbance and up 47 acres of permanent impacts to soils within the Project Area. During construction, existing vegetation would be removed in the areas associated with the proposed Project components, potentially increasing the risk of erosion. Prevailing Wind Park has designed the Project to minimize construction cut and fill work and avoid construction in steep slope areas. Placement of wind energy facilities and access roads in areas with excessive slopes would be avoided.

Construction of the Project would require coverage under the General Permit for Storm Water Discharges Associated with Construction Activities issued by the SDDENR. A condition of this permit is the development and implementation of a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP would be developed during civil engineering design of the Project and would incorporate BMPs to control erosion and sedimentation.

Prior to construction, soil borings would be performed at all wind turbine locations to develop the specific design and construction parameters. Laboratory testing of soil samples obtained from the site and geophysical surveys would be performed to determine the engineering characteristics of the site subgrade soils. If necessary, corrections to roadway and foundation subgrade would be prescribed depending on soil conditions.

The soils in the Project Area are not highly susceptible to erosion, and Prevailing Wind Park has designed the Project to avoid steep slope areas. Implementation of BMPs would protect drainageways, streams, and associated aquatic ecosystems from impacts by sediment runoff from exposed soils during precipitation events.

Following construction, the Project Area would be stabilized either with new surfaces or vegetation. Salvaged topsoil removed during construction activities would be replaced once construction is completed. Project operation would not be expected to affect geologic resources and soils, except for occasional disturbances from maintenance activities.

During decommissioning, soil resources would be managed in a similar manner as during construction activities. As part of decommissioning, soil resources would be restored. Subsoil would be decompacted. Topsoil excavated during decommissioning activities would be reapplied to disturbed areas during final restoration activities.

### 4.2.3 No Action Alternative

Under the No Action Alternative, the Project would not be developed. Therefore, no specific Project-related changes to geological or soil resources would occur within the Project Area. However, effects from existing disturbances, such as farming, would likely continue, and the trend toward conversion of undeveloped land to agriculture would likely continue. Furthermore, under the No Action Alternative, other geological or soil resource impacts could occur because private landowners may choose to develop their agricultural or undeveloped properties for more intensive land uses.

## 4.3 Water Resources

As discussed in Section 3.3, water resources in the Project Area consist of intermittent streams and drainages, freshwater emergent and forested wetlands, freshwater ponds, and a small freshwater lake. The following subsections discuss the potential impacts of the Proposed Action and the No Action Alternative on water resources.

### 4.3.1 BMPs

The following BMPs and avoidance and minimization measures would be implemented:

- Apply standard erosion control BMPs to all construction activities and disturbed areas (e.g., sediment traps, water barriers, erosion control matting) as applicable to minimize erosion and protect water quality.
- Apply erosion controls relative to possible soil erosion from vehicular traffic.
- Construct drainage ditches only where necessary; use appropriate structures at culvert outlets to prevent erosion.
- Avoid altering existing drainage systems, especially in sensitive areas such as erodible soils or steep slopes.
- Clean and maintain catch basins, drainage ditches, and culverts regularly.
- Limit herbicide and pesticide use to nonpersistent, immobile compounds and apply them using a properly licensed applicator in accordance with label requirements.
- Dispose of excess excavation materials in approved areas to control erosion and minimize leaching of hazardous materials.
- Reestablish the original grade and drainage pattern to the extent practicable.
- Reseed (non-cropland) disturbed areas with a native seed mix, and revegetate disturbed areas immediately following construction.
- When decommissioning sites, verify that any wells are properly filled and capped.

### 4.3.2 Proposed Action

The Proposed Action would temporarily cross 11 intermittent stream segments (1,235 linear feet of stream segments) and temporarily impact up to 149 wetlands totaling up to 34.9 acres. Less than 0.01 acre (6 square feet) of wetlands would be permanently impacted. Culverts would be installed as needed at stream crossings to allow continued water flow and would be removed after construction.

Up to 761 acres, including wetlands, would be temporarily disturbed as a result of construction of turbines, substations, the transmission line, access roads, underground collector lines, O&M facility, meteorological equipment, and temporary laydown areas. Up to 47 acres would be permanently impacted by the Project footprint.

Following construction, temporarily disturbed areas in wetlands and streams would be restored to pre-construction conditions. Prevailing Wind Park would obtain necessary Section 404 permits from the U.S. Army Corps of Engineers (COE) to authorize these impacts. Based on the field wetland delineation, it is anticipated that Project impacts to wetlands and streams would be authorized under COE Nationwide Permit 51 and Nationwide Permit 12. Nationwide Permit 51 allows for permanent impacts to jurisdictional wetlands and waters of up to 0.5 acre for activities associated with development of land-based renewable energy generation facilities; Nationwide Permit 12 allows for permanent impacts of up to 0.5 acre for activities associated with development of utility lines. The Project has coordinated with the COE, including submittal of a pre-construction notification package on December 19, 2018.

Once construction is completed, the original grade and drainage pattern would be reestablished to the extent practicable. Disturbed areas would be revegetated to avoid erosion to surface water resources during Project operation. Water during the O&M phase would be used mainly for periodic cleaning of wind turbine rotor blades to eliminate dust and insect buildup. Accidental spills or leaks from transformers and other liquid-filled devices at substations could impact the quality of nearby surface water bodies and shallow aquifers during the O&M phase. Herbicides, if used to control noxious weeds and vegetation growth around towers and access roads, could also degrade water quality in nearby surface water bodies and shallow aquifers.

Decommissioning would involve ground-disturbing activities that could increase the potential for soil compaction, soil erosion, surface runoff, and sedimentation of surface water bodies. Standard erosion controls would be implemented to address sedimentation to offsite water bodies.

### 4.3.3 No Action Alternative

Under the No Action Alternative, the Project would not be developed. Therefore, no specific Project-related changes to water resources would occur within the Project Area. However, effects from existing disturbances, such as farming, would likely continue, and the trend toward conversion of undeveloped land to agriculture would likely continue. Furthermore, under the No Action Alternative, other water resources impacts could occur because private landowners may choose to develop their agricultural or undeveloped properties for more intensive land uses.

## 4.4 Air Quality and Climate

The following subsections discuss the potential impacts of the Proposed Action and the No Action Alternative on air quality and climate.

### 4.4.1 BMPs

The following BMPs and avoidance and minimization measures would be implemented:

- Use surface access roads, onsite roads, and parking lots with aggregates or that maintain compacted soil conditions to reduce dust generation.
- Post and enforce lower speed limits on dirt and gravel access roads to minimize airborne fugitive dust.
- Minimize potential environmental impacts from the use of dust palliatives by taking the necessary measures to keep the chemicals out of sensitive terrestrial habitats and streams. The application of dust palliatives must comply with Federal, State, and local laws and regulations.
- Verify that all pieces of heavy equipment meet emission standards specified in the State Code of Regulations, and conduct routine preventive maintenance, including tune-ups to manufacturer specification for efficient combustion and minimum emissions. If possible, equipment with more stringent emission controls should be leased or purchased.
- Employ fuel diesel engines in facility construction and maintenance that use ultra-low sulfur diesel, with a maximum 15 ppm sulfur content.
- Limit idling of diesel equipment to no more than 10 minutes unless necessary for proper operation.
- Stage construction activities to limit the area of disturbed soils exposed at any particular time.
- Water unpaved roads, disturbed areas (e.g., scraping, excavation, backfilling, grading, and compacting), and loose materials generated during Project activities as necessary to minimize fugitive dust generation.
- Install wind fences around disturbed areas if windborne dust is likely to impact sensitive areas beyond the site boundaries (e.g., nearby residences).
- Spray stockpiles of soils with water, cover with tarpaulins, and/or treat with appropriate dust suppressants, especially when high wind or storm conditions are likely. Vegetative plantings may also be used to limit dust generation for stockpiles that will be inactive for relatively long periods.
- Train workers to comply with speed limits; use good engineering practices; minimize the drop height of excavated materials; and minimize disturbed areas.
- Cover vehicles transporting loose materials when traveling on public roads, and keep loads sufficiently wet and below the freeboard of the truck to minimize wind dispersal.
- Inspect and clean tires of construction-related vehicles, as necessary, so they are free of dirt prior to entering paved public roadways.

- Clean (e.g., street vacuum sweeping) visible trackout or runoff dirt from the construction site off public roadways.

### 4.4.2 Proposed Action

Construction activities could release air emissions of criteria pollutants, VOCs, GHGs (including carbon dioxide), and small amounts of hazardous air pollutants (HAPs). During construction of the Project, fugitive dust emissions would temporarily increase due to truck and equipment traffic in the Project Area. Additionally, there would be short-term emissions from diesel trucks and construction equipment. Air quality effects caused by dust would be short-term, limited to the time of construction or decommissioning, and would not result in NAAQS exceedances or significantly contribute to GHG emissions.

There would be no direct air emissions from operating wind turbines because no fossil fuels are combusted. Negligible amounts of dust, vehicle exhaust emissions, and combustion-related emissions from diesel emergency generators would occur during maintenance activities. These emissions would not cause exceedances of air quality standards or have any negative impacts on climate change. Operation of the collector and step-up substations could produce minute amounts of ozone and nitrogen oxide emissions as a result of atmospheric interactions with the energized conductors. Impacts on ambient air quality from these minor emissions during operation would be negligible. The proposed substations would employ sulfur hexafluoride-filled circuit breakers. Sulfur hexafluoride is a GHG, and, therefore, equipment leaks could contribute to air quality impacts. Equipment would undergo routine inspection and preventative maintenance to minimize such leaks, and if leaks did occur, the sulfur hexafluoride would be captured to avoid entering the atmosphere.

The Project would avoid considerable amounts of criteria pollutants, GHG, and HAP emissions that would otherwise have been generated from power plants burning fossil fuels. Operation of the Project would avoid from 4 percent up to 24 percent of air emissions from electric power systems in South Dakota (WAPA and USFWS, 2015b), assuming the Project would displace fossil-fueled generation.

Activities for decommissioning would be similar to those used for construction, but on a more limited scale and for a shorter duration. Potential effects on ambient air quality would be similar, but correspondingly less than those for construction activities.

### 4.4.3 No Action Alternative

Under the No Action Alternative, the Project would not be developed. Therefore, no specific Project-related changes to air quality would occur within the Project Area. However, effects from existing disturbances, such as farming, would likely continue, and the trend toward conversion of undeveloped land to agriculture would likely continue. Furthermore, under the No Action Alternative, other air quality impacts could occur because private landowners may choose to develop their agricultural or undeveloped properties for more intensive land uses.

## 4.5 Noise Impacts

The following subsections discuss the potential impacts of the Proposed Action and the No Action Alternative to noise levels.

### 4.5.1 BMPs

The following BMPs and avoidance and minimization measures would be implemented:

- Maintain equipment in good working order in accordance with manufacturer specifications. Suitable mufflers and/or air-inlet silencers should be installed on internal combustion engines and certain compressor components.
- Vehicles traveling within and around the Project Area should operate in accordance with posted speed limits.
- Establish a process for documenting, investigating, evaluating, and resolving Project-related noise complaints.
- When possible, limit noisy construction activities to times when nearby sensitive receptors are least likely to be disturbed.
- Schedule noisy activities to occur at the same time whenever feasible, since additional sources of sound generally do not greatly increase sound levels at the site boundary.
- Locate stationary construction equipment (e.g., compressors or generators) as far as practicable from nearby sensitive receptors.
- In the unlikely event that blasting or pile driving would be needed during the construction period, notify nearby residents in advance.

### 4.5.2 Proposed Action

The Project would develop up to 61 wind turbines as well as associated facilities, and construction and operation of the Project would introduce a new source of sound into the Project Area. There are approximately 147 residences within the Project Area that could potentially be affected by Project-related sound. All of the wind turbines would be located greater than 1,000 feet from any residence.

Construction of the Project would typically occur in several stages, and each stage would have a specific equipment mix. Most construction equipment would have sound levels ranging from 75 to 90 dBA at a distance of 50 feet (Quagliata et al., 2018). Most construction activities would occur during the day, when higher background sounds better mask construction-related noise. Also, construction sound at any one location would only be expected to occur for a few days because as turbine construction in one area is completed, construction activities would move elsewhere within the overall Project Area. Construction-related equipment sound would be temporary and short-term.

During operation, the Project would be a permanent source of sound from the wind turbines and substations. The proposed 115-kV transmission line would be a minor source of noise typical of background sound levels in a rural environment; based on a prior study of a 230-kV transmission line, transmission line noise would be below 39 dBA at the edge of the ROW, even during wet weather (Lee et al., 1996). The collector lines would be underground and would not be a source of audible noise. Another sound source would be infrequent (about 2 hours once per month) operation of a diesel generator for testing at the O&M facility; however, this would be intermittent, short-term noise similar to construction activities. Thus, the operational sound study focuses on potential wind turbine and substation noise.

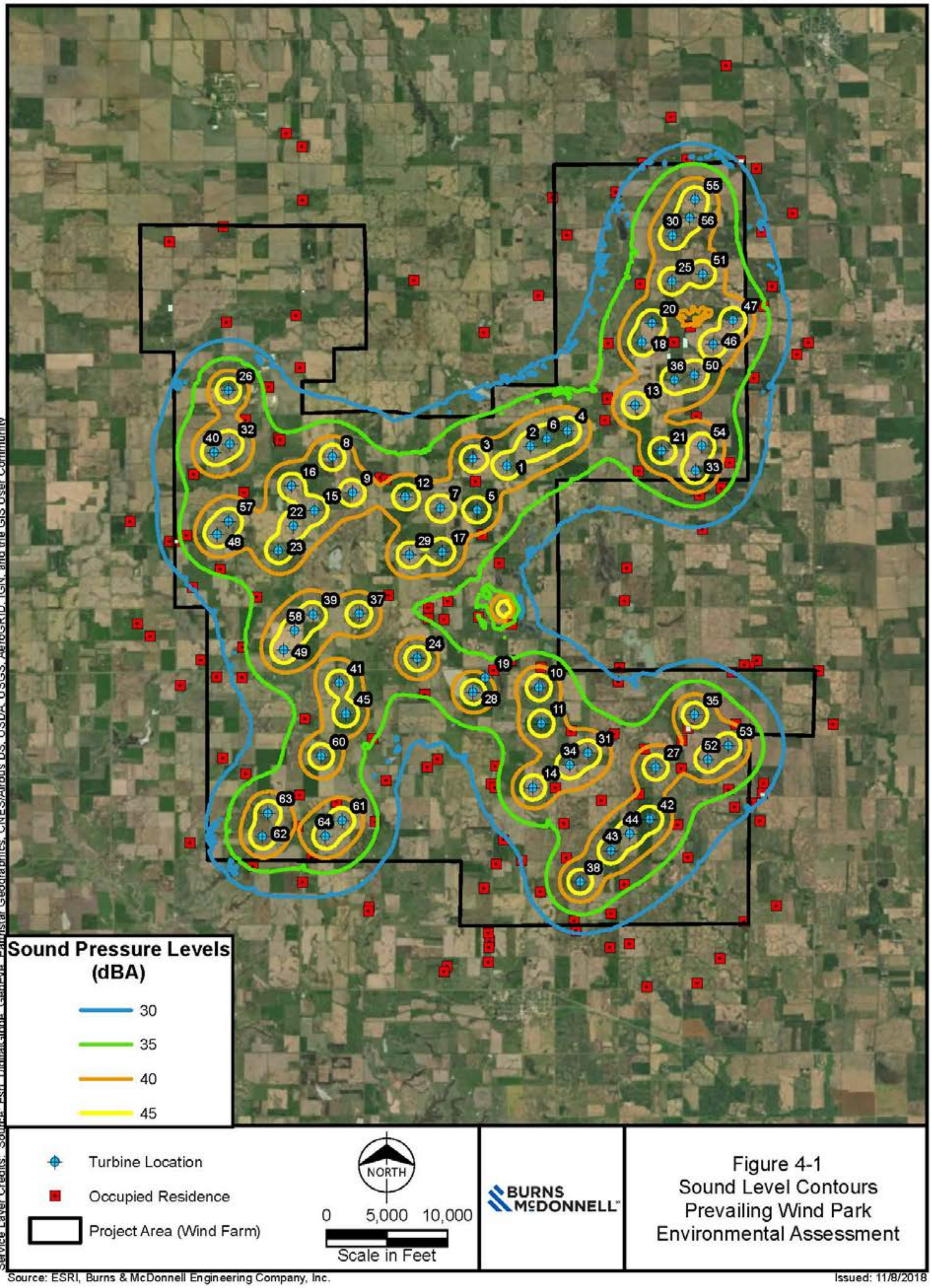
Sound modeling software was used to conservatively estimate Project-generated sound at 149 different locations in the Project Area, 147 residences and 2 cemeteries (see the Sound Study in Appendix B). The Bon Homme County ordinance sound level limit was used as a design goal for all areas of the Project. The modeling results showed that operation of the wind turbines and transformers would result in a maximum predicted sound level of 41.9 dBA (see Figure 4-1). As shown in Table 3-5, a sound level of 41.9 dBA is generally perceived as quiet.

The ambient noise survey within the Project Area (see Section 3.5) found community sound levels varied highly, ranging from 21.5 to 45.0 dBA $L_{90}$. A total sound level can be calculated by combining the expected background community sound levels with the modeled Project-generated sound. Using the maximum predicted Project-generated sound level of 41.9 dBA and combining it with the measured range of community sound levels (21.5 to 45.0 dBA) would result in a worst-case cumulative sound level range of 41.9 to 46.7 dBA. Note that the community sound levels and the Project sound levels were not directly added together; this is because decibels are measured using a logarithmic scale, not a linear scale. These cumulative sound levels are generally perceived as quiet (Table 3-5).

The regulatory criteria applicable to the Project Area are from the Bon Homme zoning ordinance, which limits a source’s sound level at a residence to a maximum of 45 dBA. Operation of the wind turbines and transformers would not exceed the Bon Homme County zoning ordinance 45-dBA noise limit at occupied residences or at cemeteries. There are no expected exceedances of the identified regulations due to operation of any of the Project's proposed wind turbine locations and transformers.

During decommissioning, sound levels would be similar to those used for construction, but on a more limited scale and for a shorter duration. Potential noise levels would be similar, but correspondingly less than those for construction activities.

**Figure 4-1: Sound Level Contours**




Source: ESRI, Burns & McDonnell Engineering Company, Inc. Issued: 11/8/2018

### 4.5.3 No Action Alternative

Under the No Action Alternative, the Project would not be developed. Therefore, no specific Project-related changes to sound would occur within the Project Area. However, effects from existing disturbances, such as farming, would likely continue, and the trend toward conversion of undeveloped land to agriculture would likely continue. Furthermore, under the No Action Alternative, other noise impacts could occur because private landowners may choose to develop their agricultural or undeveloped properties for more intensive land uses.

## 4.6 Ecological Resources

The following subsections discuss the potential impacts of the Proposed Action and the No Action Alternative on ecological resources, as well as BMPs that would be used to avoid and minimize impacts during all Project phases.

### 4.6.1 BMPs

The following BMPs would be implemented to avoid and minimize impacts to ecological resources during Project construction, operation & maintenance, and decommissioning:

- The transmission lines shall be designed and constructed with regard to the recommendations in *Avian Protection Plan Guidelines* (Avian Power Line Interaction Committee [APLIC] and USFWS, 2005), in conjunction with *Suggested Practices for Avian Protection on Power Lines* (APLIC, 2006) and *Reducing Avian Collisions with Power Lines* (APLIC, 2012), to reduce the risks that result from avian interactions with electric utility facilities.
- Minimize the area disturbed during the installation of meteorological towers (i.e., the footprint needed for meteorological towers and associated laydown areas).
- Schedule the installation of meteorological towers and other characterization activities to avoid disruption of wildlife reproductive activities or other important behaviors (e.g., do not install towers during periods of sage-grouse nesting).
- Reduce habitat disturbance by keeping vehicles on access roads and minimizing foot and vehicle traffic through undisturbed areas.
- Instruct employees, contractors, and site visitors to avoid harassment and disturbance of wildlife, especially during reproductive (e.g., courtship and nesting) seasons. Pets shall not be allowed in the Project Area.
- Establish buffer zones around known raptor nests, bat roosts, and biota and habitats of concern if site evaluations show that proposed construction activities would pose a significant risk to avian or bat species of concern.

- If needed during construction, only use explosives within specified times and at specified distances from sensitive wildlife or surface waters as established by the appropriate Federal and State agencies.
- Use designs for meteorological towers that do not require guy wires.
- Initiate habitat restoration of disturbed soils and vegetation as soon as possible after construction activities are completed. Restore areas of disturbed soil using weed-free native grasses, forbs, and shrubs, in consultation with land managers and appropriate agencies such as State or County extension offices or weed boards.
- Develop a plan for control of noxious weeds and invasive plants that could occur as a result of new surface disturbance activities at the site. The plan shall address monitoring, weed identification, the manner in which weeds spread, and methods for treating infestations. Require the use of certified weed-free mulching.
- Establish a controlled inspection and cleaning area for trucks and construction equipment arriving from locations with known invasive vegetation problems. Visually inspect construction equipment arriving to the Project Area and remove and contain seeds that may be adhering to tires and other equipment surfaces.
- Regularly monitor access roads and newly established utility and transmission line corridors for the establishment of invasive species. Initiate weed control measures immediately upon evidence of the introduction or establishment of invasive species.
- Place marking devices on any newly constructed or upgraded transmission lines, where appropriate, within suitable habitats for sensitive bird species.
- Promptly dispose of all garbage or human waste generated onsite in order to avoid attracting nuisance wildlife.
- Do not use fill materials that originate from areas with known invasive vegetation problems.
- Access roads, utility and transmission line corridors, and tower site areas shall be monitored regularly for the establishment of invasive species, and weed control measures should be initiated immediately upon evidence of the introduction of invasive species.
- Regularly inspect access roads, utility and transmission line corridors, and tower site areas for damage from erosion, washouts, and rutting. Initiate corrective measures immediately upon evidence of damage.
- Turn off unnecessary lighting at night to limit attraction of migratory birds. Follow lighting guidelines, where applicable, from the Wind Energy Guidelines Handbook. This includes using

lights with timed shutoff, downward-directed lighting to minimize horizontal or skyward illumination, and avoidance of steady-burning, high-intensity lights.

- Increasing turbine cut-in speeds (i.e., prevent turbine rotation at lower wind velocity) in areas of bat conservation concern during times when active bats may be at particular risk from turbines.
- Monitor regularly for potential wildlife problems including wildlife mortality. Report observations of potential wildlife problems, including wildlife mortality, to the appropriate State or Federal agency in a timely manner, and work with the agencies to utilize this information to avoid/minimize/offset impacts. The Ecological Services Division of the USFWS shall be contacted. Development of additional avoidance and minimization measures may be necessary.
- All turbines and ancillary structures shall be removed from the site during decommissioning.
- Salvage and reapply topsoil excavated during decommissioning activities to disturbed areas during final restoration activities.
- Reclaim areas of disturbed soil using weed-free native shrubs, grasses, and forbs. Restore the vegetation cover, composition, and diversity to values commensurate with the ecological setting.

### 4.6.2 Proposed Action

Potential impacts from the Proposed Action on vegetation, wildlife, aquatic biota, and threatened and endangered species are discussed in the following subsections.

#### 4.6.2.1 Vegetation

Impacts to non-agricultural vegetation types were limited during Project planning by placing turbines outside of sensitive vegetation communities (e.g., wetlands and grasslands), moving the Project away from the forested vegetation along the Missouri River, burying collector lines, and following existing ROWs where feasible.

Construction of the wind turbine foundations, access roads, transmission line, collector lines, substations, and O&M facilities would result in up to 761 acres of temporary disturbance and up to 47 acres of permanent disturbance to vegetation (predominantly cropland and hayfields/pasture) in the Project Area. These impacts would result in a temporary loss of production of crops and pasture grasses; less than 0.2 acre of native grassland would be permanently affected. Fugitive dust generated by construction equipment could be deposited on leaves resulting in decreased photosynthesis; however, this effect is expected to be limited to plants growing close to active construction areas and controlled with BMPs. In addition, seeds of invasive plants could be introduced during construction resulting in the spread of invasive vegetation, which could be either a short-term or long-term effect depending on effectiveness of BMPs.

The Project would involve minor tree clearing. Tree removal would be limited to individual trees in small woodlots or shelterbelts, estimated to total less than 0.9 acre. Trees growing in impact areas are typically a mix of ornamental and native species chosen for rapid growth, size, and hardiness and are expected to be replanted to achieve maturity within 5-10 years. Turbines were sited in open upland areas. When feasible, access roads, collector lines, crane paths, and the transmission line ROW were sited to avoid crossing tree rows. Some minor clearing of shrubs may be required during construction of collector lines, access roads, and the transmission line ROW. Native shrubs are typically fast-growing and are expected to provide habitat functions within 2-5 years.

Impacts from operation and maintenance of the Project would include routine vegetation maintenance to control invasive vegetation, manage woody vegetation that could interfere with the transmission line, and prevent wildfires. These impacts would be short-term during the life of the Project. In addition, invasive vegetation species could be spread during Project operation and maintenance, unless BMPs are effectively implemented. No new permanent impacts would occur during operation and maintenance.

Decommissioning impacts to vegetation would be similar, but likely less significant than, temporary impacts described for construction and would be limited to an approximately 6-month period. No new permanent impacts would be expected during decommissioning.

Implementation of BMPs (Section 4.6.1) during all phases of the Project would reduce and minimize potential impacts on vegetation by training site workers, using only designated roads, limiting the area of disturbance, establishing buffers around sensitive habitat, controlling erosion and sedimentation, and implementing a noxious weed control plan, salvaging topsoil, and restoring habitat.

#### 4.6.2.2 Wildlife

Site-specific species and updated information for this Project are provided in the various wildlife reports (Appendices D-K) and Bird and Bat Conservation Strategy (Appendix L). Wildlife species could be impacted locally at various temporal scales during the construction phase of the Project. Habitat fragmentation and degradation may occur from grading and clearing or introduction of invasive vegetation. Temporary loss of non-agricultural wildlife habitats would total up to 24 acres. Permanent loss of non-agricultural wildlife habitats due to construction of the Project would total up to 1.5 acres dispersed across the Project Area.

Individuals of some common wildlife species may temporarily avoid the construction zone due to increased noise and physical disturbance. These impacts would be limited at any one time to the areas of the site where construction activities are occurring on any particular day during the period of construction, which would extend from spring through fall of 2019.

Direct mortality or injury may occur if wildlife collides with vehicles, occupied breeding habitat is removed or altered, or increased noise or physical disturbance occurs in proximity to vulnerable breeding wildlife. Wildlife expected to be present are predominantly common species adapted to agricultural and edge habitats; thus, impacts are expected to be limited to local populations.

Following construction, common wildlife species are expected to habituate to routine facility operation and maintenance activities in a manner similar to relationships with existing farming operations. Occasional direct mortality may occur due to collisions with maintenance vehicles; this effect is expected to be lower than during construction but could occur over the life of the Project. Other potential long-term effects of operation and maintenance may include electrocutions or collisions with turbines, meteorological towers, or the transmission line; increased predation due to increased perch sites for avian predators; injury or mortality of less mobile species from mowing; habitat avoidance by some species; decreased quality of forage due to fugitive dust buildup; establishment of invasive vegetation; increased noise and physical disturbance; and increased risk of wildfire. For the most part, these impacts would be localized; however, some species may permanently avoid the Project Area, putting pressure on adjacent areas, which could lead to potential population-level effects. Similarly, collisions with the facilities could lead to population-level effects for some species.

Decommissioning impacts would be similar to those temporary impacts described for the construction phase; however, the length of the impact would be limited to approximately 6 months.

Implementation of BMPs (Section 4.6.1) during all phases of the Project would reduce and minimize potential impacts on wildlife by training site workers, properly disposing of waste, limiting the area of disturbance, using only designated roads, restoring habitat, implementing a noxious weed control plan, controlling Project lighting, and reporting wildlife mortalities to the appropriate State or Federal agency. In addition, Species-Specific Avoidance and Minimization Measures (Section 4.6.2.3) will further limit impacts to wildlife.

#### 4.6.2.2.1 Birds

The Project completed Tiers 1, 2, and 3 of the U.S. Fish and Wildlife Service *Land-Based Wind Energy Guidelines* (USFWS, 2012) to assess the potential effects of the Project on migratory birds including eagles. Results are provided in Appendices D through L.

Potential impacts to avian species from Project construction are the same as those described above for wildlife. Most of the bird species expected to be present are species that are locally common; thus, impacts would be mostly limited to the local population. As with all wildlife, direct impacts could occur to birds if they are present within the construction zone during the critical breeding period or if occupied breeding habitat is removed. Because birds are highly mobile, they are less likely to be struck by vehicles or construction equipment than many other wildlife species. Indirect impacts are expected to be low based on the predominantly disturbed agricultural landscape where the Project facilities have been sited, combined with efforts to avoid impacts to untilled grassland, wetlands, and forested habitats to the extent practicable. Less than 0.2 acre of native grassland would be permanently affected. Because the birds using the Project Area are generally common species already adapted to habitual disturbance associated with farming, grazing, and other human-caused changes to the landscape, they are expected to return to the Project Area shortly after construction is completed.

Potential impacts to avian species from Project operation and maintenance include the impacts described above for wildlife generally, as well as potential collision with Project components. The majority of bird species observed during the surveys are widespread and abundant (e.g., European starling, horned lark, blackbirds, western meadowlark), and most are at low risk of collision or other Project impacts. Grassland-nesting birds are the most likely to be affected by indirect impacts, such as avoidance, whereas, large birds (including raptors) are more likely to be directly affected by turbine operations such as blade strikes. Large birds would also be at higher risk of electrocution from transmission lines.

Avian use surveys conducted for the Project (see Avian Use Survey Reports [Appendices F and G]) revealed no indicators of elevated risk; therefore, collision risk to birds in the Project Area is likely to be consistent with other wind sites in the Midwestern U.S. Based on national estimates of 2.6 to 2.8 bird fatalities per installed megawatt per year (Loss et al. 2013, Erickson et al. 2012), the Project could be expected to result in a total of 571 to 615 bird deaths per year. The fatalities would be distributed across many species, and the individuals affected represent a fraction of a percent of the populations that migrate through the area.

Raptor use documented for the Project Area was low compared to other wind project sites located in similar habitat, and species documented consisted primarily of common raptor species, suggesting risk of impacts are not likely to be significant at the local or regional population level (see data on bird use and fatality estimates in the avian use survey reports [Appendices F and G]). To prevent potential bird strikes with electric lines, collector lines would be buried, and the Project would incorporate other avian safe practices consistent with recommendations from the APLIC (APLIC, 2012). These recommendations include such actions as siting the transmission line outside of sensitive habitats (e.g., open water, migration corridors) and marking the transmission line in sensitive areas.

Seven Birds of Conservation Concern species and three Species of Greatest Conservation Need[2] species were documented at relatively low numbers, indicating low risk of significant impacts to these species. The most frequently observed species during the avian use surveys represent common, widespread species. Passerines, or small birds, were the most frequently observed group; migrating passerines typically migrate at elevations that are higher than most modern turbines (Lincoln et al., 1998) and are most at risk when ascending or descending from stopover habitat or during weather conditions (e.g., fog) that cause them to fly at lower elevations.

Bird deaths at wind farms have been minor when compared to other human-caused sources of avian mortality. In order of severity, predation by domestic cats, collisions with building windows, collision with vehicles, use of agricultural pesticides, collisions with power lines, collisions with communication towers, and poisoning in oil pits cause exponentially more bird deaths than wind turbines (Erickson et al. 2005, 2012; Loss et al. 2013; Longcore et al. 2012). In addition, a review by Sovacool estimated that in the U.S., avian deaths related to operations of fossil-fueled plants were responsible for 17 times more bird mortality than wind turbines (Sovacool, 2013).

Impacts from Project decommissioning would be the same as those described for wildlife during construction; however, the length of the impact would be limited to approximately 6 months.

Implementation of BMPs (Section 4.6.1) during all phases of the Project would reduce and minimize potential impacts on birds by training site workers, properly disposing of waste, using only designated roads, limiting the area of disturbance, establishing buffers around nesting habitat for non-listed birds in coordination with SDGFP, implementing a noxious weed control plan, restoring habitat, limiting the use of guy wires on meteorological towers, constructing new transmission lines to APLIC recommendations, controlling Project lighting, and reporting wildlife mortalities to the appropriate State or Federal agency. Incorporation of Species-Specific Avoidance and Minimization Measures (see Appendix P and Sections 4.6.2.3) for threatened and endangered avian and bat species will benefit non-listed bird species as well.

#### 4.6.2.2.2 Bats

Tree removal during construction of the Project is not expected to impact roosting or foraging bats, as tree clearing would be limited to individual trees located in small woodlots or shelterbelts, estimated to total

[2] Bald eagle is both a Bird of Conservation Concern species and Species of Greatest Conservation Need.

less than 0.9 acre, and no roost sites are known within the Project Area. The Project Area contains little or no suitable foraging habitat. The nearest known occupied foraging habitat is approximately 4 miles south and associated with a Missouri River tributary.

Operation of the Project is likely to result in the mortality of some bats. The majority of the bat casualties at wind energy facilities to date are migratory species that undertake long migrations between summer roosts and wintering areas. The species most commonly found as fatalities at wind energy facilities include hoary bats, silver-haired bats, and eastern red bats (Johnson, 2005). The highest numbers of bat fatalities found at wind energy facilities to date have occurred in eastern North America on ridge tops dominated by deciduous forest (National Wind Coordinating Collaborative [NWCC], 2004), as well as relatively high fatality rates from facilities in Wisconsin, Iowa, and Alberta, Canada, that were located in grassland and agricultural habitats (Grodsky et al., 2012). In the Project Area, hoary bat, silver-haired bat, and eastern red bat may be present during migration (see Appendix D); use of the Project Area by these species is expected to be low to moderate.

Reported estimates of bat mortality at wind energy facilities have averaged 3.4 bats per turbine or 4.6 bats per MW (NWCC, 2004). Based on these estimates, Project fatalities may total approximately 189 bats annually.

Impacts from Project decommissioning would be the same as those described for wildlife during construction; the length of the impact would be limited to approximately 6 months.

Implementation of BMPs (Section 4.6.1) during all phases of the Project would reduce and minimize potential impacts on bats by training site workers, properly disposing of waste, using only designated roads, limiting the area of disturbance, establishing buffers around roosting habitat, implementing a noxious weed control plan, restoring habitat, limiting the use of guy wires on meteorological towers, and reporting wildlife mortalities to the appropriate State or Federal agency. Incorporation of Species-Specific Avoidance and Minimization Measures (see Appendix P and Section 4.6.2.3.1) for the northern long-eared bat will also benefit non-listed bat species.

### 4.6.2.3 Threatened and Endangered Species

The following subsections discuss potential effects to threatened and endangered species.

#### 4.6.2.3.1 Northern Long-eared Bat

The Project Area is on the western fringe of the estimated range for the northern long-eared bat (BCI, 2018). Some habitat features for the species are located in the Project Area. Potential loss of up to 0.75

acre of forested roosting, foraging, or commuting habitat may occur during construction-related vegetation clearing; however, the likelihood of this impact is low as tree clearing would be on the scale of individual trees removed from small woodlots and/or shelterbelts, and there are no known roost sites in the Project Area.

Impacts from operation and maintenance of the Project could include collisions with turbines, meteorological towers, and the transmission line.

Decommissioning of the Project would result in similar impacts to those associated with construction; however, the magnitude of effects would be less, as no trees would be removed, and the effects would be limited to approximately 6 months.

With the implementation of the general Project BMPs (see Section 4.6.1) and the following Species-Specific Avoidance and Minimization Measures, the Proposed Action may affect, but is not likely to adversely affect the northern long-eared bat.

Pre-construction evaluations and surveys identified approximately 376 acres of potentially suitable foraging, roosting, and commuting habitat for the northern long-eared bat within the Project boundaries. The Project boundary is approximately 250 miles from the nearest known/presumed hibernaculum for the species. Disturbance of hibernacula is prohibited throughout the year.

- Habitat evaluations were coordinated with the local USFWS Ecological Services Office prior to turbine site planning. The Project avoided suitable habitat by siting turbines outside of a 5-mile buffer surrounding hibernacula used by northern long-eared bat. The nearest known hibernaculum is 249 miles from the nearest turbine.
- There are 23 turbine sites within 0.5 mile of suitable foraging, roosting, and commuting habitat, but based upon a lack of call detections, the habitat is presumed unoccupied. The Project avoided siting turbines within 0.5 mile of known or presumed occupied foraging, roosting, and commuting habitat.

#### 4.6.2.3.2 Interior Least Tern

There is no suitable nesting habitat in the Project Area for the interior least tern; however, individuals could pass through the Project Area during spring and fall migration. Potential construction impacts to interior least tern would be limited to loss of migration habitat.

During Project operation, there would be a low likelihood of collision with wind turbines, meteorological towers, or the transmission line given the distance to suitable habitat. Interior least tern fatalities have not been recorded during post-construction monitoring of operating wind farms (Clayton Derby, pers. Comm., 2018c).

Decommissioning impacts would be similar to those described above for construction but would be of a lesser magnitude (no new impacts would occur to migration habitat) and limited to approximately 6 months.

With the implementation of the Project BMPs (Section 4.6.1) and the following Species-Specific Avoidance and Minimization Measures, the Proposed Action may affect, but is not likely to adversely affect the interior least tern.

The Project sited turbines, access roads, transmission lines, and other Project facilities outside of the Missouri River floodplain. Project facilities are over 1.5 miles from the nearest known or suitable sandbar habitat or reservoir shoreline. The Project sited turbines, access roads, transmission lines, and other Project facilities over 1.5 miles from the nearest known or suitable riverine habitat.

#### 4.6.2.3.3 Whooping Crane

Suitable whooping crane stopover habitat is present within and surrounding the Project Area, and documented occurrence of sandhill cranes during avian use surveys suggests whooping cranes may be present in small numbers. However, the attractiveness of potential stopover habitat within the Project Area is likely reduced somewhat by the presence of disturbance features (e.g., roads, dwellings) (Pearse et al., 2015). Potential impacts during construction would be limited to loss or degradation of stopover habitat. This impact would be low, given that the distance to the nearest suitable stopover habitat is approximately 0.5 mile from the Project, and habitat in the vicinity of the Project disturbance areas is already degraded by the presence of roads, buildings, and other manmade features.

Impacts to whooping cranes during operation and maintenance would be limited to direct mortality or injury from collision with turbines, meteorological towers, or the transmission lines. No whooping crane fatalities have been reported during post-construction monitoring at operating wind farms (Clayton Derby, pers. Comm., 2018b).

Decommissioning impacts would be similar to the impacts described above for construction; however, the impacts would be of lesser magnitude and limited to approximately 6 months.

Although the Project is located outside of the portion of the whooping crane migration corridor that encompasses 95 percent of historic sightings, the implementation of the general Project BMPs (Section 4.6.1) and the following Species-Specific Avoidance and Minimization Measures would be implemented; therefore, the Proposed Action may affect, but is not likely to adversely affect the whooping crane.

- Establish a procedure for avoiding whooping crane collisions with turbines during operations by establishing and implementing formal plans for monitoring the Project site and surrounding area for whooping cranes during spring and fall migration periods throughout the operational life of the Project (or as determined by the local USFWS field office) and shutting down turbines and/or construction activities within 2 miles of whooping crane sightings. Monitoring can be done by existing onsite personnel trained in whooping crane identification. Specific requirements of the monitoring and shutdown plan will be determined during pre-construction evaluations. Sightings of whooping cranes in the vicinity of the Project will be reported to the appropriate USFWS field office immediately.
- Instruct workers in the identification and reporting of sandhill and whooping cranes, and to avoid disturbance of cranes present near the Project Area.

#### 4.6.2.3.4 Rufa Red Knot

There is no suitable breeding or foraging habitat for the Rufa red knot in the Project Area. Red knots are unlikely to breed within the Project Area, but the species could potentially migrate through the Project Area. Potential impacts from Project construction may include loss of migration habitat; however, given the rare occurrence of this species in the counties where the Project would be developed, impacts would be low to very low.

Impacts from Project operation and maintenance may include direct mortality from collision with turbines, meteorological towers, or the transmission line. However, due to the rarity of the species in the Project Area and surrounding areas, this impact would be very low. Rufa red knot fatalities have not been recorded during post-construction monitoring of operating wind farms (Clayton Derby, pers. comm., 2018c).

Decommissioning impacts would be similar to the impacts described above for construction; however, the impacts would be of lesser magnitude and limited to approximately 6 months.

Species-Specific Avoidance and Minimization Measures have not been developed for the Rufa red knot; however, general Project BMPs would be implemented. Therefore, the Proposed Action may affect, but is not likely to adversely affect the red knot.

#### 4.6.2.3.5 Piping Plover

There is no suitable breeding or foraging habitat for piping plover in the Project Area. Piping plovers are unlikely to breed within the Project Area; however, the species could potentially migrate through the Project Area. Therefore, impacts from construction would be limited to potential loss of migration habitat.

Potential impacts from Project operation and maintenance would be limited to collision with wind turbines, meteorological towers, or the transmission line; this impact would be very low given the distance to suitable habitat. Piping plover fatalities have not been recorded during post-construction monitoring of operating wind farms (Clayton Derby, pers. comm., 2018c).

Decommissioning impacts would be similar to the impacts described above for construction; however, the impacts would be of lesser magnitude and limited to approximately 6 months.

With the implementation of the general Project BMPs, the Proposed Action may affect, but is not likely to adversely affect the piping plover. The Project sited turbines, access roads, transmission lines, and other Project facilities outside of the Missouri River floodplain, over 1.5 miles from the nearest known or suitable riverine habitat, and over 3 miles from designated critical habitat and alkali lakes were piping plover nesting has been documented. Project facilities are also over 1.5 miles from the nearest known or suitable sandbar habitat or reservoir shoreline.

#### 4.6.2.3.6 Pallid Sturgeon

There is no suitable pallid sturgeon habitat within or adjacent to the Project Area. The Project Area is 13 miles from potential habitat, and no impacts would occur to the Missouri River. BMPs would be implemented to protect stream flow and reduce sedimentation. Therefore, the Proposed Action would have no effect on pallid sturgeon.

#### 4.6.2.3.7 Higgins Eye and Scaleshell Mussel

The Project would not be located in areas adjacent to potential Higgins eye or scaleshell mussel habitat. The Project Area is 13 miles from potential habitat, and no impacts would occur to the Missouri River. BMPs would be implemented; therefore, no potential indirect impacts would occur because stream flow would not be altered, and sediments would not enter the water. Therefore, the Proposed Action would have no effect on either of these aquatic species.

#### 4.6.2.3.8 Western Prairie Fringed Orchid

The western prairie fringed orchid has not been documented in the Project Area (SDNHP, 2018) and is believed to be extirpated from South Dakota. It is likely there are no existing remnant plants to be affected, but Prevailing Wind Park has adopted avoidance and minimization measures because 890 acres of potentially suitable habitat is present in the Project area. If the species was present, Project impacts would be limited to potential habitat loss. With the implementation of general Project BMPs and Prevailing Wind Park's adopted avoidance and minimization measures, the Proposed Action may affect, but is not likely to adversely affect the species.

- Prior to construction, Prevailing Wind Park would conduct focused botanical surveys in areas of suitable habitat.
- If western prairie fringed orchid is recorded during pre-construction surveys, the USFWS would be contacted for guidance.

### 4.6.3 No Action Alternative

With the No Action Alternative, there would be no expected Project-related ecological resources changes in the Project Area. Effects to vegetation from existing disturbances, such as farming, would likely continue, and the trend toward conversion of native habitat to agriculture would likely continue. Effects to wildlife, such as habitat fragmentation, resulting from habitat conversion would likely continue at the same level. Effects to threatened and endangered species would likely continue at the current rate, with the possible of exception of northern long-eared bats, which may decline at an increasing rate due to the continued spread of white-nose syndrome.

## 4.7 Visual Resources

The following subsections discuss the potential impacts of the Proposed Action and the No Action Alternative on visual resources.

### 4.7.1 BMPs

The following BMPs and avoidance and minimization measures would be implemented:

- For ancillary buildings and other structures, low-profile structures shall be chosen whenever possible to reduce their visibility.
- Color selections for turbines shall be made to reduce visual impact and shall be applied uniformly to tower, nacelle, and rotor, unless gradient or other patterned color schemes are used.
- Grouped structures shall all be painted the same color to reduce visual complexity and color contrast.
- For ancillary structures, materials and surface treatments shall repeat and/or blend with the existing form, line, color, and texture of the landscape. If the Project will be viewed against an

earthen or other non-sky background, appropriately colored materials shall be selected for structures, or appropriate stains/coatings shall be applied to blend with the Project's backdrop.

- The operator shall use non-reflective paints and coatings on wind turbines, visible ancillary structures, and other equipment to reduce reflection and glare.
- Turbines, visible ancillary structures, and other equipment shall be painted before or immediately after installation.
- Lighting for facilities shall not exceed the minimum required for safety and security, and full-cutoff designs that minimize upward light scattering (light pollution) shall be selected. If possible, site design shall be accomplished to make security lights nonessential. Where they are necessary, security lights shall be extinguished except when activated by motion detectors (e.g., only around the substation).
- Commercial messages and symbols (such as logos, trademarks) on wind turbines shall be avoided and shall not appear on sites or ancillary structures of wind energy projects. Similarly, billboards and advertising messages shall also be discouraged.
- A site restoration plan shall be in place prior to construction. Restoration of the construction areas shall begin immediately after construction to reduce the likelihood of visual contrasts associated with erosion and invasive weed infestation and to reduce the visibility of affected areas as quickly as possible.
- Disturbed surfaces shall be restored to their original contours as closely as possible and revegetated immediately after, or contemporaneously with, construction. Prompt action shall be taken to limit erosion and to accelerate restoring the pre-construction color and texture of the landscape.
- Visual impact avoidance and minimization objectives and activities shall be discussed with equipment operators before construction activities begin.
- Existing rocks, vegetation, and drainage patterns shall be preserved to the extent practicable.
- Slash from vegetation removal shall be mulched and spread to cover fresh soil disturbances (preferred) or shall be buried. Slash piles shall not be left in sensitive viewing areas.
- Installation of gravel and pavement shall be avoided where possible to reduce color and texture contrasts with the existing landscape.
- For road construction, excess fill shall be used to fill uphill-side swales to reduce slope interruption that would appear unnatural and to reduce fill piles.
- The geometry of road ditch design shall consider visual objectives; rounded slopes are preferred to V-shaped and U-shaped ditches.

- Road-cut slopes shall be rounded, and the cut/fill pitch shall be varied to reduce contrasts in form and line; the slope shall be varied to preserve specimen trees and nonhazardous rock outcroppings.
- Planting pockets shall be left on slopes, where feasible.
- Benches shall be provided in rock cuts to accent natural strata.
- Topsoil from cut/fill activities shall be segregated and spread on freshly disturbed areas to reduce color contrast and aid rapid revegetation. Topsoil piles shall not be left in sensitive viewing areas.
- Excess fill material shall not be disposed of downslope in order to avoid creating color contrast with existing vegetation/soils.
- Excess cut/fill materials shall be hauled in or out to minimize ground disturbance and impacts from fill piles.
- Soil disturbance shall be minimized in areas with highly contrasting subsoil color.
- Natural or previously excavated bedrock landforms shall be sculpted and shaped when excavation of these landforms is required. A percentage of backslope, benches, and vertical variations shall be integrated into a final landform that repeats the natural shapes, forms, textures, and lines of the surrounding landscape. The earthen landform shall be integrated and transitioned into the excavated bedrock landform. Sculpted rock face angles, bench formations, and backslope need to adhere to the natural bedding planes of the natural bedrock geology. Half-case drill traces from pre-split blasting shall not remain evident in the final rock face. Where feasible, the color contrast shall be removed from the excavated rock faces by color-treating with a rock stain.
- Where feasible, construction on wet soils shall be avoided to reduce erosion.
- Communication and other local utility cables shall be buried, where feasible.
- Culvert ends shall be painted or coated to reduce color contrasts with existing landscape.
- Signage shall be minimized; reverse sides of signs and mounts shall be painted or coated to reduce color contrasts with the existing landscape.
- The burning of trash shall be prohibited during construction; trash shall be stored in containers and/or hauled offsite.
- Litter must be controlled and removed regularly during construction.
- Dust abatement measures shall be implemented in arid environments to minimize the impacts of vehicular and pedestrian traffic, construction, and wind on exposed surface soils.
- Wind facilities and sites shall be actively and carefully maintained during operation. Wind energy projects shall evidence environmental care, which would also reinforce the expectation and impression of good management for benign or clean power.

- Inoperative turbines shall be repaired, replaced, or removed quickly. Nacelle covers and rotor nose cones shall always be in place and undamaged.
- Nacelles and towers shall be cleaned regularly (yearly, at minimum) to remove spilled or leaking fluids and the dirt and dust that accumulates, especially in seeping lubricants.
- Facilities and offsite surrounding areas shall be kept clean of debris, “fugitive” trash or waste, and graffiti. Scrap heaps and materials dumps shall be prohibited and prevented. Materials storage yards, even if thought to be orderly, shall be kept to an absolute minimum. Surplus, broken, and disused materials and equipment of any size shall not be allowed to accumulate.
- Maintenance activities shall include dust abatement (in arid environments), litter cleanup, and noxious weed control.
- Road maintenance activities shall avoid blading of existing forbs and grasses in ditches and adjacent to roads; however, any invasive or noxious weeds shall be controlled as needed.
- Interim restoration shall be undertaken during the operating life of the Project as soon as possible after disturbances.
- All aboveground and near-ground structures shall be removed.
- Soil borrow areas, cut-and-fill slopes, berms, waterbars, and other disturbed areas shall be contoured to approximate naturally occurring slopes, thereby avoiding form and line contrasts with the existing landscapes. Contouring to rough texture would trap seed and discourage off-road travel, thereby reducing associated visual impacts.
- Cut slopes shall be randomly scarified and roughened to reduce texture contrasts with existing landscapes and to aid in revegetation.
- Combining seeding, planting of nursery stock, transplanting of local vegetation within the proposed disturbance areas, and staging of construction shall be considered, enabling direct transplanting. Generally, native vegetation shall be used for revegetation, establishing a composition consistent with the form, line, color, and texture of the surrounding undisturbed landscape. Seed mixes shall be coordinated with local authorities, such as country extension services, weed boards, or land management agencies.
- Gravel and other surface treatments shall be removed or buried.
- Rocks, brush, and forest debris shall be restored, whenever possible, to approximate pre-construction visual conditions.

### 4.7.2 Proposed Action

Viewers of the Project would include occupied residences within and adjacent to the Project Area, travelers along State Highways 50, 46, and 37, and hunters utilizing public hunting areas. The Project would potentially result in visual impacts from construction and operation of the Project. The magnitude of the visual impacts associated with the proposed Project would depend on many factors, including distance of the proposed wind energy facility from viewers, weather and lighting conditions, the presence and arrangements of lights on the turbines and other structures, and viewer attitudes. Viewer attitudes are very subjective, and their reactions to visual changes may be influenced by several non-visual factors, such as perceptions of renewable energy and wind power and on financial considerations.

Construction activities could potentially result in visual impacts from vegetation clearing and grading; road building/upgrading; construction and use of staging and laydown areas; construction of facilities; vehicular, equipment, and worker presence and activity; dust; and emissions. In particular, because of the large size of wind turbine towers, blades, and other components, the transport and installation of wind turbines are visually conspicuous activities. Large, and in some cases unusual, vehicles are required to transport some components, and the sight of these components on local roads would be memorable. In general, construction visual impacts would vary in frequency and duration throughout the course of construction. There would be periods of intense activity followed by periods with less activity, and associated visual impacts would vary in accordance with construction activity levels. Site monitoring, adherence to standard construction practices, and restoration activities would reduce many of these potential construction impacts.

The primary direct visual impacts associated with operation of the Project would result from the introduction of the numerous vertical lines of the up to 61 wind turbines into the generally strongly horizontal landscape found in the Project Area. The proposed 27-mile-long transmission line would also be a new visual feature in the visual landscape of the transmission line ROW. Shadow flicker and blade glinting as well as turbine marker lights and other lighting on other Project facilities would also potentially result in visual impacts.

To minimize visual impacts of the Project, Prevailing Wind Park has incorporated setback requirements and commitments into the design of the Project. Turbines would be set back at least 1,000 feet from currently occupied offsite residences, businesses, and public buildings and at least 500 feet or 1.1 times the turbine height, whichever is greater, from residences with turbines, per Bon Homme County requirements. Turbines would also be set back at least 500 feet or 1.1 times the height of the turbines from ROWs of public roads and from any surrounding property line. In accordance with FAA regulations, the towers would be painted off-white to reduce potential glare and minimize visual impact.

As discussed in Section 3.7, the nearest scenic resources to the Project Area are the Lake Andes NWR, located approximately 12 miles west, and the Missouri River, located approximately 13 miles south. Depending on topography and atmospheric conditions, the Project turbines could be visible from the NWR or the river.

Additional potential visual impacts from Project operation could result from shadow flicker. Shadow flicker software was used to conservatively estimate Project-generated shadow flicker at the 147 residences and 2 cemeteries in the Project Area. The results were compared to the Bon Homme County zoning ordinance related to shadow flicker. The modeling results indicate that shadow flicker impacts are within the zoning ordinance levels, which limits shadow flicker to 30 minutes per day. With the proposed Project layout, the modeling results indicate that 3 of the 149 known receptors would exceed 30 hours per year of shadow flicker. Additionally, 25 of the 149 known receptors would exceed 30 minutes per day of shadow flicker; although approximately one quarter (7 of 25) would exceed this daily threshold by 5 or fewer minutes and more than half (13 of 25) would exceed this daily threshold by 10 or fewer minutes. Additional details on the shadow flicker analysis are provided in Appendix M.

Decommissioning impacts would be similar to the impacts described above for construction; however, the impacts would be of lesser magnitude and limited to approximately 6 months.

### 4.7.3 No Action Alternative

Under the No Action Alternative, the Project would not be developed. Therefore, no specific Project-related changes to visual resources would occur within the Project Area. However, effects from existing disturbances, such as farming, would likely continue, and the trend toward conversion of undeveloped land to agriculture would likely continue. Furthermore, under the No Action Alternative, other visual resource impacts could occur because private landowners may choose to develop their agricultural or undeveloped properties for more intensive land uses.

## 4.8 Paleontological Resources

The following subsections discuss the potential impacts of the Proposed Action and the No Action Alternative on paleontological resources.

### 4.8.1 BMPs

As a BMP and avoidance and minimization measure, the Project would avoid the placement of wind energy structures in fossil-rich areas, such as outcrops.

### 4.8.2 Proposed Action

Ground-disturbing activities, the majority of which take place during construction, represent the greatest impacting factor to paleontological resources. Based on the paleontological resource sensitivity (PFYC 4) of the geologic formations within the Project Area, the risk for impacts to paleontological resources from the Proposed Action is moderate. The construction of the turbine foundations would have the greatest potential to affect fossil-bearing formations. Foundations for substation equipment, while not nearly as deep, could also affect fossil-bearing formations at the substation site.

Project operation would not be expected to affect paleontological resources because ground disturbance for the Project would be largely limited to the construction phase. Similarly, decommissioning activities would not affect paleontological resources because these activities would take place in areas that had already been disturbed by Project construction.

### 4.8.3 No Action Alternative

Under the No Action Alternative, the Project would not be developed. Therefore, no specific Project-related changes to paleontological resources would occur within the Project Area. However, effects from existing disturbances, such as farming, would likely continue, and the trend toward conversion of undeveloped land to agriculture would likely continue. Furthermore, under the No Action Alternative, other paleontological resources impacts could occur because private landowners may choose to develop their agricultural or undeveloped properties for more intensive land uses.

## 4.9 Cultural Resources

The following subsections discuss the potential impacts of the Proposed Action and the No Action Alternative on cultural resources.

### 4.9.1 BMPs

The following BMPs and avoidance and minimization measures would be implemented:

- The Project re-sited features away from sensitive cultural resources, including features identified during Traditional Cultural Properties (TCPs) surveys.
- The Project will employ tribal monitors during ground-disturbing activities in proximity to documented or suspected TCPs.
- The Project will develop and implement an Inadvertent Discovery Plan, in coordination with the Yankton Sioux Tribe Tribal Historic Preservation Office (THPO) and the South Dakota State Historic Preservation Office (SHPO).

- Cultural resources discovered during construction shall immediately be brought to the attention of the responsible Federal agency. Work shall be immediately halted in the vicinity of the find to avoid further disturbance to the resources while they are being evaluated and appropriate mitigation plans are being developed.
- If human remains are found on a development site, work shall cease immediately in the vicinity of the find. The appropriate law enforcement officials and the appropriate Federal agency shall be contacted. No material shall be removed from the find location. Once it is determined that the remains belong to an archaeological site, the appropriate South Dakota SHPO shall be contacted to determine how the remains shall be addressed.

### 4.9.2 Proposed Action

Potential Project effects to cultural resources were studied in archaeological and architectural resources surveys and TCP surveys completed by the Yankton Sioux Tribe. Cultural resources survey reports documenting those surveys (Eigenberger et al., 2018; Plimpton, 2018) are attached in Appendix N and summarized in the following paragraphs.

Representatives from the Yankton Sioux Tribe conducted a TCPs survey of the Project area during September, October, and November of 2018. Results of the survey were shared with the WAPA archaeologist. The Tribal TCP survey identified 133 features or cultural elements of importance to the Tribe. The Yankton Sioux THPO has recommended that, so long as the features are avoided by ground-disturbing activities and appropriate buffer distances can be implemented, the Project will have no adverse effect on the TCPs. Prevailing Wind Park has re-sited Project features to avoid impacts to TCPs.

The archaeological APE includes 27 previously inventoried and two newly identified archaeological resources. Project components will avoid the 27 previously inventoried archaeological structures. A new segment of a previously surveyed railroad segment (39CH0317) and a new historic period archaeological site (39BO2007) are within the Project archaeological APE.

Site 39BO2007 is a segment of the historic Chicago, Milwaukee, St. Paul, and Pacific Railroad. Although this railway corridor is considered eligible for the NRHP, the Project is not anticipated to physically alter the site, have an adverse effect on the site, and as such will not affect the qualities that make the railroad corridor eligible. It is recommended that the Project would have no adverse effect on 39BO2007.

Site 39CH0317 is a former farmstead. Background research found that the occupants of the farmstead did not play an important role in local, State or national history. The archaeological investigation revealed agricultural and domestic debris common to mid-twentieth century farmsteads in South Dakota. Site

39CH0317 is recommended as not eligible for listing on the NRHP under any criteria. It is recommended that the Project would have no adverse effect on 39CH0317.

A total of four NRHP-eligible or -listed architectural historic properties are located in the architectural APE: the NRHP-listed Wagner House (CH00000024), the previously determined Eligible Bridge 12-570-324 (CH00000261), and two newly-recommended eligible properties (site numbers 57893 and 58279).

The Wagner House (CH00000024) was listed in the NRHP in 2014. The building is significant as a local example of the Craftsman style of architecture popular during the early 20th century. The closest turbine is located approximately 2 miles east of this historic farmstead. The topography of the property's setting is gently undulating, marked by agricultural fields, grassy pastures, and wooded groves of trees along creeks and bodies of water. A shelterbelt of mature deciduous and evergreen trees surrounds the collection of historic buildings at CH00000024, obscuring its long-range viewsheds in all directions. Due to a combination of topography, mature vegetation, and the considerable distance of the historic property from the proposed turbines, the visual impact of the Project would be minimal and would not alter the overall historic viewshed or rural setting of the property. The proposed turbines would not impact the materials, workmanship, or design of the farmhouse or its associated outbuildings. It is recommended that the Project would have no adverse effect on CH00000024.

CH00000261 is eligible for NRHP listing for its significance as an example of post-World War II concrete slab bridge construction. The bridge is located approximately 1.6 miles from the two nearest proposed turbines. In the distance between the bridge and the proposed turbines, the landscape is rolling in topography, carved by multiple creeks and water features. Flanking each water feature are dense, mature trees. Cultivated agricultural fields and farmsteads also are present in the area. Due to the considerable distance, uneven topography, and mature vegetation, the presence of the proposed turbines would have a negligible impact on the historically rural, agricultural setting of the bridge. The Project would not affect or alter the bridge's design, materials, workmanship, or any other aspect of integrity. Therefore, it is recommended that the Project would have no adverse effect on CH00000261.

Site 57893 is eligible for NRHP listing for its local significance for architecture. Site 57893 is approximately 1 mile northeast of the closest turbine. The topography of the property's setting is rolling, marked by agricultural fields, grassy pastures, and wooded groves of trees along creeks and bodies of water. Due to the rolling topography and considerable distance of the historic property from the proposed turbines, the visual impact of the Project would be small and would not alter the overall historic viewshed or rural setting of the site. The proposed turbines would not impact the materials, workmanship, or design of the farmhouse or its associated outbuildings. The Project would not diminish the overall integrity of site 57893, and, therefore, it is recommended that the Project would have no adverse effect on site 57893.

Site 58279 is eligible for NRHP listing for its local significance for architecture. The closest turbine is located approximately 2 miles northeast of 58279. The property is located within the town of Avon and is immediately buffered on its north, east, and west sides by residential properties. The setting of the property is marked by mature trees and residences. Due to the setting and considerable distance of the historic property from the proposed turbines, the visual impact of the Project would be small and would not alter the overall historic viewshed or residential setting of site 58279. The proposed turbines would not impact the materials, workmanship, or design of the home. Therefore, it is recommended the Project would have no adverse effect on site 58279.

Based on the results of the cultural resources surveys for the Project, it is recommended that no archaeological or architectural properties would be adversely affected by the Project. However, if new cultural resources or human remains were to be found during construction activities, all work would cease at that location and notification and protection protocols would be implemented, as described above.

### 4.9.3 No Action Alternative

Under the No Action Alternative, the Project would not be developed. Therefore, no specific Project-related changes to cultural resources would occur within the Project Area. However, effects from existing disturbances, such as farming, would likely continue, and the trend toward conversion of undeveloped land to agriculture would likely continue. Furthermore, under the No Action Alternative, other cultural resources impacts could occur because private landowners may choose to develop their agricultural or undeveloped properties for more intensive land uses.

## 4.10 Socioeconomics

The following subsections discuss the potential impacts of the Proposed Action and the No Action Alternative on local socioeconomics.

### 4.10.1 BMPs

BMPs and avoidance and minimization measures for air quality, noise, visual resources, and health and safety would apply to the Project Area. Separate socioeconomics BMPs and avoidance and minimization measures are not identified.

### 4.10.2 Proposed Action

The Project is expected to create both short-term and long-term positive impacts to the local economy. Impacts to social and economic resources from construction activities, and eventually from decommissioning activities at the end of the Project lifecycle, would be short-term. Local businesses, such as restaurants, grocery stores, hotels, and gas stations, would see increased business during this phase from construction-related workers. Local industrial businesses, including aggregate and cement suppliers, welding and industrial suppliers, hardware stores, automotive and heavy equipment repair, electrical contractors, and maintenance providers, would also likely benefit from construction of the Project.

The Project would generate approximately $60 million in direct economic benefits for local landowners, local communities, and the State of South Dakota based on calculations of South Dakota’s Nameplate Capacity Tax and Electric Production Tax for wind projects greater than 5 MW (South Dakota Department of Revenue [SDDOR], 2012).

In addition to the direct payments, construction of the Project would create an estimated $14.9 million boost to the local economy. Prevailing Wind Park estimates that $220,000 of food, supplies, and fuel would be purchased locally by the Project and Project staff annually (or $20.4 million over the life of the Project).

The construction crews would include skilled labor, such as foremen, carpenters, iron workers, electricians, millwrights, and heavy equipment operators, as well as unskilled laborers. This diverse workforce would be needed to install the Project components, including wind turbines, access roads, underground collector system, O&M building, collector substation, etc. Table 4-1 lists the anticipated construction jobs for the Project. Job estimates are based on the recent construction of the Beethoven Wind Project and a wind energy contractor’s construction estimate.

**Table 4-1: Anticipated Construction Jobs**

| Construction Jobs Metric | Estimate |
|---|---|
| Total construction days | 195 |
| Total man-hours | 510,000 |
| Peak construction jobs | 245[a] |

(a) Estimated peak construction jobs; average may be lower.

Prevailing Wind Park anticipates that there would not be sufficient trained local labor to fill the number of jobs available. Based on what was observed during the construction of the Beethoven Wind Project, it is anticipated that the majority of the non-local construction workforce would travel within a 65-mile radius, and within that radius, the largest city that would provide workers would be Sioux Falls, South Dakota. Workers within the 65-mile radius would likely not need additional temporary or permanent housing at the Project Area but would commute to the jobs. During construction, the vacancy rate of rental properties in the commuting radius of the Project could be reduced. However, anecdotal evidence would lead to the conclusion that construction workers would likely provide their own housing in recreational vehicle trailers. Therefore, this Project is not expected to have a negative effect on the economics of rental properties and could potentially have a positive effect.

The annual salary of construction workers is expected to be above the median household incomes of the four counties within which the Project would be constructed (see Table 3-7). However, since the number of construction jobs is less than 10 percent of the respective county populations and since the construction jobs are temporary, the Project is not expected to result in a material impact on median household income for any of the four counties.

The number of permanent employees needed to operate and maintain the Project is expected to be less than 10. While the salary of these workers is likely to be greater than the median household incomes of the four counties within which the Project lies, the small number of workers would not have a material effect on overall county median household income. Similarly, this small number of workers would not affect rental vacancy levels.

Section 5.10 of the UGP PEIS discusses potential impacts to property values from wind farm projects, indicating no evidence that wind turbines decreased property values. Hoen et al. (2013) concluded that there was no statistical evidence that home values near turbines were affected either after construction or after the site selection/project announcement.

Electricity transmission lines associated with wind developments can also potentially affect property values through the visibility of electrical transmission structures, with other factors such as health and safety and noise associated with each of the three transmission systems likely being less important. In a review of the evidence from sales data and interviews with real estate professionals (Kroll and Priestley, 1992; Grover, Elliot, and Company, 2005), it was found that price differentials for residential properties based on sales data in appraisal studies tended to be small, usually 5 percent or less, with slightly larger price impacts for agricultural, commercial, and industrial land. It is anticipated that the proposed Project would have similar implications on property values in the Project Area to those described in the PEIS.

While the Project is expected to produce a net positive socioeconomic effect, there could be minor negative effects such as increased maintenance on roads due to construction traffic. The period of construction is relatively short in duration, and this effect is, therefore, expected to be minimal. Prevailing Wind Park has entered into road use agreements with the counties and townships in the Project Area so that repairs are addressed quickly. Additionally, there could be negative socioeconomic effects due to reduced recreational opportunities. No data is known to exist to quantify these effects, but since the land on which the Project is to be built is privately owned, the amount of recreation on them is limited and not economically substantial.

### 4.10.3 No Action Alternative

Under the No Action Alternative, the Project would not be developed. Therefore, no specific Project-related changes to socioeconomics would occur within the Project Area. However, the existing trend toward conversion of undeveloped land to agriculture would likely continue. Furthermore, under the No Action Alternative, other socioeconomics impacts could occur because private landowners may choose to develop their agricultural or undeveloped properties for more intensive land uses.

## 4.11 Environmental Justice

The following subsections discuss the potential impacts of the Proposed Action and the No Action Alternative on environmental justice.

### 4.11.1 BMPs

BMPs and avoidance and minimization measures for air quality, noise, visual resources, and health and safety would apply to the complete residential population in the Project Area, including any minority or low-income residents. Separate environmental justice BMPs and avoidance and minimization measures are not identified.

### 4.11.2 Proposed Action

As determined in Section 3.11, no minority or low-income populations have been identified, and, thus, no disproportionately high and adverse human health or environmental effects are expected from construction, operation, or decommissioning of the proposed Project.

### 4.11.3 No Action Alternative

Under the No Action Alternative, the Project would not be developed. Therefore, no specific Project-related environmental justice effects would occur within the Project Area. However, the existing trend toward conversion of undeveloped land to agriculture would likely continue.

## 4.12 Health and Safety

The following sections identify potential safety and health issues for the general public.

### 4.12.1 BMPs

The following BMPs and avoidance and minimization measures would be implemented:

- If Project operation could cause potential adverse impacts on nearby residences and occupied buildings as a result of EMFs, incorporate recommendations for addressing these concerns into the Project design (e.g., establishing a sufficient setback from transmission lines).
- Establish a process for documenting, investigating, evaluating, and resolving Project-related noise complaints.
- If Project operation could cause potential adverse impacts on nearby residences and occupied buildings as a result of noise, incorporate recommendations for addressing these concerns into the Project design (e.g., establishing a sufficient setback from transmission lines).
- Develop a Project health and safety program that addresses protection of public health and safety during site characterization, construction, operation, maintenance, and decommissioning activities for a wind energy project. The program shall establish a safety zone or setback for wind energy facilities and associated transmission lines from residences and occupied buildings, roads, ROWs, and other public access areas that is sufficient to limit accidents resulting from various hazards during all phases of development. It shall identify requirements for temporary fencing around staging areas, storage yards, and excavations during construction or decommissioning activities. It shall also identify measures to be taken during the operations phase to limit public access to facilities (e.g., equipment with access doors shall be locked to limit public access, and permanent fencing with slats shall be installed around electrical substations).
- Project developers shall work with appropriate agencies (e.g., DOE and Transportation Security Administration) to address critical infrastructure and key resource vulnerabilities at wind energy facilities, and to minimize and plan for potential risks from natural events, sabotage, and terrorism.

### 4.12.2 Proposed Action

The Project could potentially result in impacts associated with EMFs, noise and infrasound, shadow flicker, and physical hazards.

#### 4.12.2.1 Electric and Magnetic Fields

EMFs may exist within substations and switchyards of the wind farm and along the transmission line that connects the facility to the grid. The substation and switchyard locations are located on private property and are not accessible to the general public; however, the public would have greater accessibility to transmission-related locations because some locations will be located on public ROWs, and others will be accessible for agricultural uses. The Environmental Protection Agency recommends limiting exposure to 0.5 milliGaus (mG) to 2.5 mG (EPA, 1992).

Table 4-2 shows how EMF levels decrease sharply with increasing distance. For example, as shown in the table, the electric field of a 115-kV transmission line decreases by 97 percent (from 1.0 kV to 0.07 kV) at 100 feet away from the transmission line.

**Table 4-2: Example EMF Levels with Increasing Distance from a Power Transmission Line**

| Transmission Line Voltage (kV) | Electric Field (kV)[a] | | | | Average Magnetic Field (mG)[a] | | | |
|---|---|---|---|---|---|---|---|---|
| | At the Source | 100 Feet Away | 200 Feet Away | 300 Feet Away | At the Source | 100 Feet Away | 200 Feet Away | 300 Feet Away |
| 115 | 1.0 | 0.07 | 0.01 | 0.003 | 29.7 | 1.7 | 0.4 | 0.2 |
| 230 | 2.0 | 0.3 | 0.05 | 0.01 | 57.5 | 7.1 | 1.8 | 0.8 |

Source: Bonneville Power Administration, 1994
(a) kV = kilovolt, mG = milligauss

For comparison, Table 4-3 provides EMF levels for common home appliances at distances up to 4 feet away.

**Table 4-3: EMF Levels of Common Household Appliances**

| Appliance | Average Magnetic Field (mG)[a] | |
|---|---|---|
| | Within 6 inches | 4 Feet Away |
| Blender | 30-100 | 0 |
| Dishwasher | 10-100 | 0-1 |
| Microwave Oven | 100-300 | 0-20 |
| Electric Range | 20-200 | 0-6 |
| Refrigerator | 0-40 | 0-10 |
| Vacuum Cleaner | 100-700 | 0-10 |

Source: Environmental Protection Agency, 1992
(a) mG = milligauss

Project construction and decommissioning activities would not generate EMFs because the wind farm, substation, switchyard, and transmission line components would not be activated.

Project operation would create EMFs. However, at present, there is no scientific consensus regarding a cause-effect relationship between continued exposure to EMFs and adverse health consequences. Furthermore, Prevailing Wind Park has incorporated draft setback requirements and commitments into the design of the Project. Turbines would be set back at least 1,000 feet from currently occupied offsite residences, businesses, and public buildings and at least 500 feet or 1.1 times the turbine height, whichever is greater, from residences with turbines, per Bon Homme County requirements. Turbines would also be set back at least 500 feet or 1.1 times the height of the turbines from ROW of public roads and from any surrounding property line. The proposed 115-kV, single-circuit transmission line would be constructed within an approximately 50- to 200-foot-wide ROW. A collector substation would be enclosed by a chain link fence with dimensions of roughly 350 feet by 450 feet (4 acres) and be located on private land within the Project Area. The step-up substation would be constructed within an approximately 300-foot by 200-foot fenced-in area, adjacent to the Utica Junction Substation. The nearest occupied residences/buildings to an EMF source is 68 feet away, and thus, the EMF exposure is expected to be less than 1.7 mG and less than that generated by many common household appliances (see Table 4-3) and below the midpoint of the Environmental Protection Agency recommendations.

#### 4.12.2.2 Noise and Infrasound

Potential impacts associated with noise are discussed in Section 4.5.2.

In addition to audible noise, wind turbines can generate infrasound from the rotation of the turbine blades. The infrasound levels from contemporary wind turbines are lower than those that have been shown to cause harm, such as the high-intensity infrasound aircraft maintenance workers encounter (Roberts, 2018).

Project construction and decommissioning activities would not generate infrasound because the turbine blades would not be moving. Project operation would create infrasound, however.

Human health effects sometimes attributed to wind farm noise and infrasound include sleep disturbance, vertigo, and stress. However, reliable evidence has not provided a link between infrasound and these adverse health effects. An independent expert panel for Massachusetts (Ellenbogen et al., 2012) found insufficient evidence that the noise from wind turbines is directly causing human health effects. Instead, studies have linked the experience of adverse human health effects to individual perceptions and attitudes about wind farms. Thus, while studies have not reliably shown that wind farms cause direct health effects, negative attitudes about wind farms have been correlated with health effects such as sleep disturbance (Ellenbogen et al., 2012).

#### 4.12.2.3 Shadow Flicker

Potential impacts associated with shadow flicker are discussed in Section 4.7.2.

#### 4.12.2.4 Physical Hazards

As with any wind farm, the Project would present potential risks from natural disasters (earthquakes, storms, etc.), mechanical failure, human error, sabotage, cyber-attack, or deliberate destructive acts. The Project would not present unusual intrinsic system vulnerabilities or especially high potential for an event/threat. Thus, the proposed Project is not anticipated to be at an unusual risk for natural disasters, mechanical accidents, or acts of sabotage or terrorism during Project construction, operation, or decommissioning.

Project wind turbines could potentially have a rotor blade break and be thrown from the turbine. Historically, blade breakage is a rare event, and the probability of a fragment hitting a person is even lower (Manwell et al., 2002; Hau, 2000). A blade or turbine part has rarely traveled farther than 1,640 feet from a tower; most pieces typically land within 328 to 656 feet (Manwell et al., 2002). Current quality control standards for utility-scale wind turbine manufacture suggest that blade throw will continue to be a rare occurrence.

Project wind turbines also could potentially throw ice from a rotating blade. Historically, ice throw is a rare event because either ice pieces simply fall down off a blade or turbine control software triggers a turbine to stop rotating if ice buildup occurs. Contemporary turbine design limits the extent to which ice buildup can occur because as ice begins to form, blade balance would be altered, and monitoring devices would stop the blade rotation. Thus, ice throw also will likely continue to be a rare occurrence. To further lessen the potential for ice throw, wind farms establish a safety zone or setback from residences, roads, and other public access areas; such safety zones are often required by permitting agencies (Manwell et al., 2002). The suggested setback for the turbine model proposed for the Project, which will include turbine control software to control for ice throw, is 1.1 times the sum of the hub height and rotor diameter (GE Renewable Energy, 2018).

Project construction and decommissioning activities would not generate risk from rotor blade break or ice throw because the turbine blades would not be moving.

### 4.12.3 No Action Alternative

Under the No Action Alternative, the Project would not be developed. Therefore, no specific Project-related health or safety concerns would occur within the Project Area. However, effects from existing disturbances, such as farming, would likely continue, and the trend toward conversion of undeveloped land to agriculture would likely continue. Furthermore, under the No Action Alternative, other health or safety impacts could occur because private landowners may choose to develop their agricultural or undeveloped properties for more intensive land uses.

# 5.0 CUMULATIVE IMPACTS

The cumulative impacts of past, present, and future actions on resources within the UGP Region are analyzed in Section 6 of the UGP Wind Energy Final PEIS. The contribution of cumulative impacts associated with the proposed Project falls within the scope of the cumulative impacts analysis in the PEIS. The PEIS (Section 2.4) projected wind energy development through the year 2030 for the UGP Region, and the proposed Project is part of that projected development.

One existing wind energy facility, the 80-MW Beethoven Wind Project, is located adjacent to the northern boundary of the Project Area. There are no other operating wind projects in the four-county area that overlap the Project Area. In addition, no other wind projects within the four counties have been announced or are reasonably foreseeable.

The construction and operation of the proposed Project, in combination with operation of the existing Beethoven Wind Project, as well as other private and public development occurring in the Project Area, could contribute to cumulative impacts on resources within the UGP Region. Such impacts would be similar to those described in the UGP PEIS. A summary of cumulative impacts analyzed for each resource area under the PEIS's preferred alternative (of which this Project is a part) is provided in Table 6.3-2 of the PEIS.

Several past and present activities could result in cumulative effects with the proposed Project. These include the construction of roads, residences and other buildings, and transmission lines as well as farming, grazing, and hunting. Table 5-1 summarizes potential cumulative effects associated with the Project.

**Table 5-1: Discussion of Cumulative Effects**

| Resources that Could Experience Cumulative Effects | Related Past, Present, and Reasonably Foreseeable Activities | Discussion of Potential Cumulative Effects |
|---|---|---|
| Noise | • Roads and highways<br>• Beethoven Wind Project | The cumulative effects analysis area for noise is the four counties within which the Project is located. The only other substantial impacts to noise in this area are vehicular traffic on roads and the Beethoven Wind Project. Given the large area encompassed by the four counties and the comparatively small area impacted by noise from vehicles and these two wind projects, no cumulative effects are anticipated to result from this Project. |

| Resources that Could Experience Cumulative Effects | Related Past, Present, and Reasonably Foreseeable Activities | Discussion of Potential Cumulative Effects |
|---|---|---|
| Ecological Resources, Land Use, Land Cover | • Roads and highways<br>• Electric transmission and distribution lines<br>• Beethoven Wind Project<br>• Cultivated land<br>• Developed land<br>• Residences and other buildings<br>• Grazing<br>• Hunting | The cumulative effects analysis area for ecological resources, land use, and land cover is the Project Area itself. In this area, the related activities have cumulatively impacted ecological resources, land use, and land cover for more than two centuries. The addition of the proposed Project (47 acres of permanent disturbance) is not expected to add substantially to the cumulative alteration and impact of the landscape and the ecological resources. |
| Visual Resources | • Beethoven Wind Project<br>• Electric transmission and distribution lines<br>• Residences and other buildings<br>• Roads and highways | The cumulative effects analysis area for visual resources is the four counties within which the Project is located. Related activities have cumulatively impacted visual resources through construction and alteration of the natural viewshed for more than two centuries. The natural viewshed is one of a “working” landscape with man-made alterations as prominent features. The addition of the proposed Project is not expected to add substantially to the cumulative alteration and impacts to the natural viewshed that have occurred to date. |

With the implementation of BMPs and Species-Specific Avoidance and Minimization Measures, the Project would avoid or minimize impacts to the resources described above and, therefore, would not measurably contribute to cumulative effects on resources from other past, present, and reasonably foreseeable future actions.

# 6.0 COORDINATION

A public scoping meeting was held on December 13, 2017, in Tripp, South Dakota. Federal, State, and local agencies were invited to the meeting to provide comments regarding the proposed Project. The general public was invited through newspaper and radio announcements, and residents near the Project were invited to comment. The public scoping meeting documentation is included in Appendix Q. Comments received regarding the proposed Project from agencies and the public are included in Appendix R.

## 6.1 Federal Agencies

The Federal agencies that were contacted for the purpose of the EA scoping process are:

- Advisory Council on Historic Preservation
- Bureau of Indian Affairs
- Bureau of Land Management
- Farm Service Agency
- Federal Aviation Administration
- Federal Emergency Management Agency
- Federal Energy Regulatory Commission
- Federal Highway Administration
- Natural Resources Conservation Service
- Rural Utilities Service
- U.S. Army Corps of Engineers
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service
- U.S. Geological Survey
- U.S. House of Representatives
- U.S. Senate

## 6.2 State and Local Agencies

The State and local agencies that were contacted for the purpose of the EA scoping process are:

- Office of the Governor
- Governor's Office of Economic Development
- Bon Homme County Conservation District
- Charles Mix County Conservation District
- Hutchinson County Conservation District
- Yankton County Conservation District
- South Dakota Department of Agriculture
- South Dakota Department of Environment and Natural Resources
- South Dakota Department of Transportation
- South Dakota Game, Fish and Parks Department

- South Dakota House of Representatives
- South Dakota Senate
- South Dakota Public Utilities Commission
- South Dakota School and Public Lands
- South Dakota State Historic Preservation Office
- South Dakota Department of Tribal Relations
- Bon Homme County
- Charles Mix County
- Hutchinson County
- Yankton County
- Avon School District
- Bon Homme School District
- Tripp-Delmont School District
- Wagner Community School District

## 6.3 Native American Tribes and Associated Bodies

Pursuant to Section 106 of the NHPA, WAPA initiated Section 2016 tribal consultation, by letter, regarding the proposed Project with the following eight tribes on July 10, 2017.

- Yankton Sioux Tribe
- Santee Sioux Nation
- Rosebud Sioux Tribe
- Ponca Tribe of Nebraska
- Omaha Tribe of Nebraska
- Fort Belknap Indian Community
- Cheyenne and Arapaho Tribes
- Apache Tribe of Oklahoma

A second Project notification was sent, by email, on February 16, 2018. Cheyenne and Arapaho Tribes indicated they knew of no historic properties in the Project Area. The Yankton Sioux Tribe indicated their desire to consult with WAPA on the Project. The Omaha Tribe of Nebraska indicated they would like to be informed of any general Project meetings that might be held. The other five tribes did not respond to WAPA's letter announcing the Project. WAPA attended a meeting with the Yankton Sioux Tribe – Business and Claims Committee on April 30, 2018, at the Tribal Council Headquarters in Wagner, South Dakota, as part of the Yankton Sioux's "*Ihanktonwan* Consultation *Wo'ope*" (Protocols for Consultation). WAPA also attended a meeting with the Yankton Sioux Tribal Council on November 15, 2018, in Wagner, South Dakota. Following the November meeting, the Yankton Sioux Tribe submitted a series of written questions to WAPA, indicating that upon receipt of satisfactory responses, Project consultation would be completed. WAPA responded to the Yankton Sioux Tribe on January 22, 2019.

## 6.4 Non-Governmental Organizations

The non-governmental organizations that were contacted for the purpose of the EA scoping process are:

- American Bird Conservancy

- Ducks Unlimited, Great Plains Regional Office
- Isaak Walton League of America, South Dakota Division
- Pheasants Forever
- Missouri Breaks Audubon Society
- Sierra Club, South Dakota Chapter
- The Nature Conservancy, South Dakota Field Office

# 7.0 LIST OF PREPARERS

Table 7-1 identifies the personnel responsible for the preparation of this EA.

**Table 7-1: List of EA Preparers**

| Name | Agency/Firm | Title |
|---|---|---|
| Christina Gomer | Western Area Power Administration | NEPA Coordinator (Natural Resources Specialist) |
| Alyssa Fellow | Western Area Power Administration | Environmental Protection Specialist (Biologist) |
| David Kluth | Western Area Power Administration | Archeologist |
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| Angelina Woehler | Burns & McDonnell Engineering Company, Inc. | Assistant Environmental Specialist |

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