

**Meridian Wind Project
Hyde County, South Dakota**

**Application to the South Dakota Public Utilities Commission for a
Facility Permit**

April 23, 2020

MERIDIAN WIND PROJECT, LLC

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TABLE OF CONTENTS

1.0	INTRODUCTION	1-1
1.1	Project Overview	1-1
1.2	Names of Participants (Administrative Rules of South Dakota [ARSD] 20:10:22:06)	1-2
1.3	Name of Owner and Manager (ARSD 20:10:22:07)	1-2
1.4	Facility Permit Application Content and Organization	1-2
1.4.1	Completeness Check	1-3
2.0	PURPOSE OF, AND DEMAND FOR, THE WIND ENERGY FACILITY (ARSD 20:10:22:08, 20:10:22:10)	2-1
2.1	Renewable Power Demand	2-1
2.1.1	National Energy Demand	2-2
2.1.2	Regional and State Energy Demand.....	2-3
2.1.3	Local Benefits.....	2-4
2.1.4	Consequences of Delay	2-4
3.0	ESTIMATED COST OF THE WIND ENERGY FACILITY (ARSD 20:10:22:09).....	3-1
3.1	Capital and Operational Costs	3-1
4.0	GENERAL SITE AND PROJECT COMPONENT DESCRIPTION (ARSD 20:10:22:11, 20:10:22:33:02, 20:10:22:35)	4-1
4.1	Site Location and Overview.....	4-1
4.2	Wind Farm Facility	4-1
4.2.1	Wind Turbines	4-2
4.2.1.1	Wind Turbine Generators	4-2
4.2.1.2	Wind Turbine Towers	4-3
4.2.1.3	Wind Turbine Foundations	4-4
4.2.1.4	Generator Step-up Transformers.....	4-4
4.2.2	Meteorological Towers.....	4-4
4.2.3	Access Roads and Crane Paths.....	4-4
4.2.4	Temporary Laydown/Staging Area/Temporary Concrete Batch Plant.....	4-5
4.2.5	O&M Facility	4-5
4.2.6	ADLS.....	4-6
4.2.7	Electrical Collector System	4-6
4.2.8	Fiber Optic Communication System	4-6
4.2.9	Project Collection Substation	4-6
4.3	Transmission Facilities	4-7
4.3.1	Configuration of Poles and Conductors	4-7
4.3.2	Transmission Corridor.....	4-7
4.3.3	Temporary Laydown/Staging Area	4-7
4.3.4	Interconnection Facilities and Switching Station	4-8
4.4	Land Requirements	4-8
4.4.1	Right-of-way or Condemnation Requirements (ARSD 20:10:22:33.02 and 20:10:22:35)	4-9
4.5	Wind Farm Facility Construction, Restoration, Operation and Maintenance Procedures.....	4-9

4.5.1	Mobilization and Site Preparation	4-9
4.5.2	Roadwork	4-9
4.5.3	Installation of Turbine Foundations	4-10
4.5.4	Installation of Electrical Collector and Communication Systems..	4-10
4.5.5	Tower Deliveries and Erection.....	4-11
4.5.6	Construction of Project Collection Substation	4-11
4.5.7	Installation of Permanent Meteorological Tower.....	4-11
4.5.8	Restoration Procedures.....	4-11
4.5.9	Operation and Maintenance.....	4-12
4.5.10	Decommissioning.....	4-12
4.6	Transmission Facility Construction, Restoration, Operation and Maintenance Procedures.....	4-13
4.6.1	Mobilization and Site Preparation	4-13
4.6.2	Transmission Line Construction Procedures.....	4-13
4.6.3	Switchyard Construction Procedures	4-14
4.6.4	Restoration Procedures.....	4-14
4.6.5	Operations and Maintenance	4-15
4.6.6	Transmission Line Decommissioning	4-15
5.0	ALTERNATIVE SITES AND SITING CRITERIA (ARSD 20:10:22:12)	5-1
5.1	Site Evaluation Process and Project Area Refinement	5-1
5.1.1	Wind Resource	5-1
5.1.2	Ready Access to Transmission Interconnection.....	5-2
5.1.3	Land Use and Environmental Compatibility	5-2
5.2	Site Configuration Alternatives	5-2
5.3	Lack of Reliance on Eminent Domain Powers	5-4
6.0	ENVIRONMENTAL INFORMATION (ARSD 20:10:22:13)	6-1
7.0	EFFECT ON PHYSICAL ENVIRONMENT (ARSD 20:10:22:14).....	7-1
7.1	Geological Resources.....	7-1
7.1.1	Existing Geological Resources	7-1
7.1.1.1	Regional Landforms/Physiography	7-1
7.1.1.2	Surficial Geology	7-2
7.1.1.3	Bedrock Geology	7-2
7.1.1.4	Mineral Resources/Economic Deposits	7-2
7.1.1.5	Seismic Risks	7-3
7.1.1.6	Subsidence Potential	7-3
7.1.2	Impacts to Geological Resources	7-3
7.1.3	Mitigation Measures for Geological Resources	7-4
7.2	Soil Resources.....	7-4
7.2.1	Existing Soil Resources	7-4
7.2.1.1	Prime Farmland.....	7-5
7.2.1.2	Drainage Class	7-6
7.2.1.3	Erosion Potential	7-6
7.2.1.4	Steep Slopes	7-7
7.2.2	Impacts to Soil Resources	7-7
7.2.3	Mitigation Measures for Soil Resources	7-7

8.0	EFFECT ON HYDROLOGY (ARSD 20:10:22:15)	8-1
8.1	Groundwater Resources	8-1
8.1.1	Existing Groundwater Resources	8-1
8.1.2	Impacts to Groundwater Resources	8-2
8.1.3	Mitigation Measures for Groundwater Resources	8-3
8.2	Surface Water Resources	8-3
8.2.1	Existing Surface Water Resources	8-4
8.2.1.1	Waterbodies	8-4
8.2.1.2	Watercourses	8-4
8.2.1.3	Wetlands	8-4
8.2.1.4	Floodplains	8-5
8.2.1.5	National Park Service Nationwide Rivers Inventory	8-5
8.2.1.6	Impaired Waters	8-5
8.2.2	Impacts to Surface Water Resources	8-6
8.2.2.1	Wetlands and Waterbodies	8-6
8.2.2.2	Floodplains	8-7
8.2.2.3	NRI-Listed Rivers	8-7
8.2.2.4	Impaired Waters	8-7
8.2.3	Mitigation Measures for Surface Water Resources	8-7
8.3	Water Uses and Rights	8-8
8.3.1	Existing and Planned Water Uses and Rights	8-8
8.3.2	Impacts on Current or Planned Water Uses	8-9
8.3.3	Mitigation Measures for Existing and Planned Water Uses and Rights	8-10
9.0	EFFECT ON TERRESTRIAL ECOSYSTEMS (ARSD 20:10:22:16)	9-1
9.1	Vegetation	9-1
9.1.1	Existing Terrestrial Ecosystem	9-1
9.1.1.1	Grasslands	9-2
9.1.1.2	Noxious and Invasive Weeds	9-3
9.1.1.3	Forest and Woodlands	9-3
9.1.2	Impacts to Vegetation	9-3
9.1.2.1	Grasslands	9-4
9.1.2.2	Noxious and Invasive Weeds	9-4
9.1.2.3	Forest and Woodlands	9-5
9.1.3	Mitigation Measures for Vegetation	9-5
9.1.3.1	Grasslands	9-5
9.1.3.2	Noxious and Invasive Weeds	9-5
9.2	Wildlife	9-5
9.2.1	Existing Wildlife	9-5
9.2.1.1	Initial Site Assessment	9-5
9.2.1.2	Special Status Species	9-9
9.2.1.3	Studies Conducted to Date	9-14
9.2.2	Impacts to Wildlife	9-18
9.2.2.1	Federal and State-Status Terrestrial Species	9-18
9.2.2.2	Prairie Grouse	9-20
9.2.2.3	Eagles	9-21

	9.2.2.4	Bats	9-21
	9.2.3	Mitigation Measures for Wildlife.....	9-22
10.0		EFFECT ON AQUATIC ECOSYSTEMS (ARSD 20:10:22:17).....	10-1
10.1		Existing Aquatic Ecosystem	10-1
	10.1.1	Surface Water and Wetland Resources	10-1
	10.1.2	Federal and State Special Status Aquatic Species.....	10-1
10.2		Impacts to Aquatic Ecosystems	10-2
	10.2.1	Surface Water and Wetland Resources	10-2
	10.2.2	Federal and State Special Status Aquatic Species.....	10-2
10.3		Mitigation Measures for Aquatic Ecosystems	10-2
11.0		LAND USE (ARSD 20:10:22:18)	11-1
11.1		Land Use and Ownership.....	11-1
	11.1.1	Existing Land Use and Ownership.....	11-1
	11.1.2	Land Use Impacts.....	11-3
	11.1.3	Mitigation Measures for Land Use.....	11-3
11.2		Recreation, Public Facilities, and Conservation Easements	11-3
	11.2.1	Existing Recreation, Public Facilities, and Conservation Easements.....	11-3
	11.2.1.1	Recreational Resources	11-4
	11.2.1.2	Public Facilities.....	11-4
	11.2.1.3	South Dakota Office of School and Public Lands	11-4
	11.2.1.4	SDGFP Lands	11-4
	11.2.1.5	USFWS Lands	11-4
	11.2.2	Impacts to Recreation, Public Facilities and Conservation Easements.....	11-5
	11.2.2.1	Recreational Resources	11-5
	11.2.2.2	Public Facilities.....	11-6
	11.2.2.3	South Dakota Office of School and Public Land Areas	11-6
	11.2.2.4	SDGFP Lands	11-6
	11.2.2.5	USFWS Lands	11-6
	11.2.3	Mitigation Measures for Recreation, Public Facilities and Conservation Easements.....	11-6
	11.2.3.1	Recreational Resources	11-6
	11.2.3.2	Public Lands.....	11-6
	11.2.3.3	South Dakota Office of School and Public Land Areas	11-6
	11.2.3.4	SDGFP Lands	11-7
	11.2.3.5	USFWS Lands	11-7
11.3		Acoustics.....	11-7
	11.3.1	Existing Acoustic Levels and Regulatory Framework.....	11-7
	11.3.1.1	Acoustical Terminology.....	11-8
	11.3.1.2	Regulations	11-8
	11.3.2	Impacts from Acoustics	11-9
	11.3.2.1	Construction and Decommissioning.....	11-9
	11.3.2.2	Operation.....	11-9
	11.3.2.3	Acoustical Model Inputs.....	11-10
	11.3.2.4	Acoustical Modeling Results	11-11

	11.3.3	Mitigation Measures for Acoustics	11-11
11.4		Visual Resources.....	11-12
	11.4.1	Existing Visual Resources	11-12
	11.4.2	Impacts to Visual Resources	11-13
	11.4.3	Mitigation Measures for Visual Resources	11-14
11.5		Shadow Flicker	11-14
	11.5.1	Shadow Flicker Overview	11-14
	11.5.2	Shadow Flicker Impacts	11-15
	11.5.3	Mitigation Measures for Shadow Flicker.....	11-17
11.6		Telecommunications.....	11-17
	11.6.1	Existing Telecommunications	11-17
	11.6.2	Telecommunication Impacts	11-18
	11.6.3	Mitigation Measures for Telecommunications.....	11-18
11.7		Radar and Military Airspace Impacts	11-18
	11.7.1	Existing Radar and Military Airspace	11-18
	11.7.2	Impacts to Radar and Military Airspace.....	11-19
	11.7.3	Mitigation Measures for Radar and Military Airspace	11-19
12.0		LOCAL LAND USE CONTROLS (ARSD 20:10:22:19).....	12-1
13.0		WATER QUALITY (ARSD 20:10:22:20).....	13-1
14.0		AIR QUALITY (ARSD 20:10:22:21)	14-1
	14.1	Existing Air Quality	14-1
	14.2	Air Quality Impacts.....	14-1
	14.3	Mitigation Measures for Air Quality	14-2
15.0		TIME SCHEDULE (ARSD 20:10:22:22)	15-1
16.0		COMMUNITY IMPACT (ARSD 20:10:22:23 and ARSD 20:10:22:24).....	16-1
	16.1	Socioeconomic and Community Resources.....	16-1
	16.1.1	Existing Socioeconomic and Community Resources	16-1
	16.1.2	Socioeconomic and Community Resource Impacts	16-2
	16.1.2.1	Impacts to Economics	16-2
	16.1.2.2	Impacts to Property Values	16-3
	16.1.3	Mitigation Measures for Socioeconomic and Community Impacts.....	16-5
16.2		Commercial, Industrial and Agricultural Sectors	16-5
	16.2.1	Existing Commercial, Industrial and Agricultural Sectors.....	16-5
	16.2.2	Impacts to Commercial, Industrial and Agricultural Sectors	16-5
	16.2.3	Mitigation Measures for Commercial, Industrial and Agriculture Sectors	16-5
16.3		Community Facilities and Services	16-5
	16.3.1	Existing Community Facilities and Services.....	16-5
	16.3.2	Impacts to Community Facilities and Services	16-6
	16.3.3	Mitigation Measures for Community Facilities and Services	16-6
16.4		Transportation	16-6
	16.4.1	Existing Transportation	16-6
	16.4.1.1	Ground Transportation.....	16-6
	16.4.1.2	Aviation.....	16-6

16.4.2	Impacts to Transportation	16-7
16.4.2.1	Ground Transportation.....	16-7
16.4.2.2	Aviation.....	16-7
16.4.3	Mitigation Measures for Transportation.....	16-8
16.4.3.1	Ground Transportation.....	16-8
16.4.3.2	Aviation.....	16-8
16.5	Cultural Resources	16-9
16.5.1	Existing Cultural Resources	16-9
16.5.2	Impacts to Cultural Resources	16-9
16.5.3	Mitigation Measures for Cultural Resources.....	16-10
17.0	EMPLOYMENT ESTIMATES (ARSD 20:10:22:24)	17-1
18.0	FUTURE ADDITIONS AND MODIFICATIONS (ARSD 20:10:22:25)	18-1
19.0	DECOMMISSIONING OF ENERGY FACILITIES (ARSD 20:10:22:33)	19-1
20.0	RELIABILITY AND SAFETY (ARSD 20:10:22:33:02 (08)).....	20-1
20.1	Reliability.....	20-1
20.2	Safety	20-1
20.3	Electromagnetic Fields and Stray Voltage.....	20-2
21.0	INFORMATION CONCERNING WIND ENERGY FACILITIES AND TRANSMISSION FACILITIES (ARSD 20:10:22:33.02 and 20:10:22:35).....	21-1
22.0	ADDITIONAL INFORMATION IN APPLICATION (ARSD 10:22:36).....	22-1
22.1	Permits and Approvals	22-1
22.2	Agency Coordination	22-2
22.2.1	USFWS.....	22-3
22.2.2	SDSHS.....	22-3
22.2.3	DoD	22-3
22.2.4	Hyde County.....	22-3
22.3	Local Community Input.....	22-4
22.4	Applicant's Burden of Proof (49-41B-22).....	22-4
23.0	TESTIMONY AND EXHIBITS (ARSD 20:10:22:39)	23-1
24.0	REFERENCES	24-1

TABLES

Table 1-1. Completeness Checklist.....	1-4
Table 2-1. Unsubsidized Levelized Cost of Energy	2-2
Table 4-1. Project Location.....	4-1
Table 4-2. Wind Turbine Characteristics.....	4-2
Table 5-1. Meridian Wind Turbine Siting Requirements/Commitments	5-3
Table 6-1. Summary of Meridian Wind Ground Disturbance Impacts	6-2
Table 7-1. Soil Map Units within the Project Area	7-5
Table 7-2. Summary of Farmland Types Affected by the Project.....	7-6
Table 8-1. NHD-Mapped Waterbodies in the Project Area.....	8-4
Table 8-2. NWI-Mapped Wetlands in the Project Area	8-5
Table 8-3. Water Rights Permits Located within the Project Area.....	8-8
Table 8-4. Wells Located within and within 1,000 Feet of the Project Area	8-9
Table 9-1. WEST-Digitized Land Cover within the Project Area.....	9-2
Table 9-2. State and Local Noxious Weeds of South Dakota.....	9-3
Table 9-3. Summary of Impacts to WEST-Digitized Land Cover	9-4
Table 9-4. Raptors with Potential to Occur within Project Area	9-7
Table 9-5. Bat Species with the Potential to Occur in the Project Area Based on Range Maps.....	9-9
Table 9-6. Federally Threatened or Endangered Wildlife Species with the Potential to Occur in the Project Area.....	9-9
Table 9-7. Birds and Bats Listed As South Dakota SGCN With the Potential to Occur in the Project Area.....	9-14
Table 9-8. Summary of Studies Conducted to Date at the Project Area.....	9-15
Table 11-1. Estimated Maximum Sound Pressure Levels from Construction Equipment	11-9
Table 11-2. Anomalous Meteorological Acoustic Modeling Results for Non-Participating Landowners.....	11-12
Table 11-3. WindPro Top 10 Expected Shadow Flicker Impacts	11-15
Table 11-4. WindPro Predicted Expected Shadow Flicker for Non-Participating Landowners.....	11-16
Table 11-5. Statistical Summary of WindPro Expected Shadow Flicker Impacts— Number of Modeled Receptors	11-16
Table 11-6. Summary of Microwave Path that Intersects the Project Area.....	11-17
Table 12-1. Wind Turbine Setback Requirements for the Project.....	12-1
Table 15-1. Preliminary Permitting and Construction Schedule for the Project	15-1

Table 16-1. Populations of Communities in the Project Vicinity	16-1
Table 16-2. Additional Comparative Demographic Data for Counties with Wind Farms in Iowa, Minnesota and South Dakota	16-4
Table 16-3. Summary of Roadways within the Project Area	16-6
Table 16-4. Previously Recorded Cultural Resources	16-9
Table 17-1. Estimated Construction Jobs and Employment Expenditures for Wind Project....	17-1
Table 17-2. Estimated Construction Jobs and Employment Expenditures for Transmission Line	17-1
Table 17-3. Estimated Annual Operation and Employment Expenditures.....	17-2
Table 21-1. Information Concerning Wind Energy Facilities (ARSD 20:10:22:33.02).....	21-2
Table 21-2. Information Concerning Transmission Facilities (ARSD 20:10:22:35)	21-2
Table 22-1. Permits and Approvals	22-1
Table 23-1. List of Individuals Providing Testimony.....	23-1

FIGURES

Figure 1—Project Location
Figure 2a–2b—Project Layout
Figure 3a–3b—Environmental Constraints and Siting Setbacks
Figure 4a—Surficial Geology
Figure 4b-4c—South Dakota Geological Survey Stratigraphic Cross Sections
Figure 5a–5b—Soils
Figure 6—Hydrogeology
Figure 7—Surface Waters
Figure 8—Wetlands
Figure 9—Public Lands and Recreation
Figure 10—Incidental Whooping Crane Observations
Figure 11—Land Cover

APPENDICES

Appendix A—Figures

Appendix B—Usable Area Slideshow

Appendix C—Meridian Wind Project Field Studies Summary 2016—2018

Appendix D—Acoustic Assessment for the Meridian Wind Project

Appendix E—Shadow Flicker Impact Analysis for the Meridian Wind Project

Appendix F—Wind Power GeoPlanner™ Microwave Study for the Meridian Wind Project

Appendix G—Aviation Constraints Study

Appendix H—A Level I Cultural Resource Inventory of the Meridian Wind Turbines in Hyde
County, South Dakota (CONFIDENTIAL INFORMATION)

Appendix I—Meridian Wind Project Decommissioning Plan

Appendix J—Agency Letters

Appendix K—Agency Correspondence

Appendix L—Hyde County Voter Poll

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ACRONYMS AND ABBREVIATIONS

ADLS	Aircraft Detection Lighting System
Applicant	Meridian Wind Project, LLC
Application	Facility Permit Application
ARSD	Administrative Rules of South Dakota
BBCS	Bird and Bat Conservation Strategy
BBS	Breeding Bird Survey
BCC	Birds of Conservation Concern
BGEPA	Bald and Golden Eagle Protection Act
BMP	best management practice
CFR	Code of Federal Regulations
Ch.	Chapter
Commission	South Dakota Public Utilities Commission
CRP	Conservation Reserve Program
CUP	Conditional Use Permit
CWA	Clean Water Act
dB	decibel
dBA	A-weighted decibels
ECPG	Eagle Conservation Plan Guidance, Module 1—Land-based Wind Energy Guidelines, Version 2
ELF	extremely low frequency
ENGIE	ENGIE North America, Inc.
EMF	electromagnetic field
EPA	U.S. Environmental Protection Agency
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FSA	Farm Service Agency
GE	General Electric
GIS	geographic information system
GPA	Game Production Area
GW	gigawatts
HF	high-frequency
HUC	Hydrologic Unit Code
Hz	Hertz
IPAC	Information, Planning and Consultation

ISO	International Organization for Standardization
km	kilometer
kV	kilovolt
LBNL	Lawrence Berkeley National Laboratory
LF	low frequency
LNTE	Low-Noise Trailing Edges
LWES	large wind energy system
m	meter
m/s	meters per second
MBTA	Migratory Bird Treaty Act
MET	meteorological
Meridian Wind	Meridian Wind Project, LLC
mG	milligauss
MW	megawatt
MWh	megawatt hour
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHD	National Hydrography Dataset
NLEB	northern long-eared bat
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NRI	Nationwide Rivers Inventory
NSR	noise-sensitive receptor
NTIA	National Telecommunications and Information Administration
NWI	National Wetlands Inventory
O&M	Operations and Maintenance
PLSS	Public Land Survey System
PPA	power purchase agreement
Project	Meridian Wind Project
Project Area	the encompassing 15,043-acre area where the Project is located
PTC	Production Tax Credit
Quivira	Quivira National Wildlife Refuge
SCADA	supervisory control and data acquisition
SDCL	South Dakota Codified Law
SDDENR	South Dakota Department of Environment and Natural Resources

SDDOA	South Dakota Department of Agriculture
SDDOT	South Dakota Department of Transportation
SDGFP	South Dakota Department of Game, Fish and Parks
SDGS	South Dakota Geologic Survey
SDPUC	South Dakota Public Utilities Commission
SDSHS	South Dakota State Historical Society
SDSU	South Dakota State University
SGCN	Species of Greatest Conservation Need
SHPO	State Historic Preservation Office
SPCC	Spill Prevention, Control and Countermeasures
SSURGO	Soil Survey Geographic Database
SWPPP	Stormwater Pollution Prevention Plan
TWI	The Watershed Institute, Inc.
USACE	U.S. Army Corps of Engineers
USC	United States Code
USDA	U.S. Department of Agriculture
USDOE	U.S. Department of Energy
USEIA	U.S. Energy Information Administration
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WEG	Wind Energy Guidelines
WEST	Western Ecosystems Technology, Inc.
WIA	Walk-In Area
WIOM	Winter Ice Operation Mode
WMD	Wetland Management District
WNS	White Nose Syndrome
WoUS	Waters of the U.S.
WPA	Waterfowl Production Area
WRP	Wetland Reserve Program

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1.0 INTRODUCTION

1.1 Project Overview

Meridian Wind Project, LLC (Meridian Wind or Applicant) respectfully submits this Facility Permit Application (Application) to the South Dakota Public Utilities Commission (Commission or SDPUC) for an Energy Facility Permit to construct and operate the Meridian Wind Project (Project), a wind energy facility as defined under South Dakota Codified Law (SDCL) 49-41B-2 (13), and an associated approximately 8.9-mile 345-kilovolt (kV) transmission facility, as defined under SDCL 49-41B-2.1 (1). The total installed capacity of the wind energy facility will not exceed 175 megawatts (MW) and will include the construction of up to 64 wind turbine generators (turbines).

The Project will be located entirely within Hyde County in the Public Land Survey System (PLSS) townships of Van Order, Eagle, Chapelle, Highmore, and Holabird, approximately 3 miles southeast of Highmore (Figure 1 in Appendix A). The Project will be located on privately held land within an area that encompasses approximately 15,043 acres (Project Area).

Project components will include:

- Up to 64 turbines;
- Access roads to turbines and associated facilities;
- Underground 34.5-kV electrical collector lines connecting the turbines to the collection substation;
- Underground fiber-optic cable for turbine communications collocated with the collector lines;
- A 34.5- to 345-kV collection substation;
- An approximately 8.9-mile-long 345-kV transmission line;
- One permanent meteorological (MET) tower; and
- Additional temporary construction areas, including crane paths, public road improvements, laydown yard/staging area, and concrete batch plant(s), as needed.

The Project will interconnect to the high-voltage transmission grid via a 345-kV interconnection switch station (Chappelle Station) located at the western end of the Project's transmission line. Chappelle Station is owned and operated by Basin Electric Power Cooperative and is under construction in conjunction with the Triple H Wind Project. The Triple H Wind Project is located immediately west of State Highway 47 and is under construction and operated by Meridian Wind's parent company. Triple H is targeted for commercial operation by the end of 2020. The Triple H Wind Project was granted an Energy Facility Permit by the SDPUC on July 24, 2019, under EL19-007.

Meridian Wind anticipates sharing the operations and maintenance (O&M) facility and an Aircraft Detection Lighting System (ADLS) with the Triple H Wind Project, subject to the approval by the FAA. These facilities will be built as part of the Triple H Wind Project and modified to accommodate the Project's additional capacities, as needed.

Meridian Wind is a wholly owned subsidiary of ENGIE North America, Inc. (ENGIE). In North America, ENGIE manages a range of energy business in the United States and Canada, including retail energy sales and energy services to commercial, industrial, and residential customers; natural gas and liquefied natural

gas distribution and sales; and electrical generation. ENGIE's North America renewable portfolio consists of wind, solar, and biomass/biogas assets. In the United States and Canada, ENGIE's renewables portfolio has a capacity of close to 1,000 MW consisting of wind, solar, and biomass/biogas assets. In Canada, ENGIE is among the top five wind developers with assets in Ontario, the Maritimes, and British Columbia. ENGIE operates over 700 MW of wind generation and has over 2,000 MW of wind projects in various stages of development. ENGIE currently has two projects under construction in South Dakota—the 250-MW Triple H Wind Project located in South Dakota, and the 153-MW Dakota Range III Wind Project located in Grant and Roberts counties.

1.2 Names of Participants (Administrative Rules of South Dakota [ARSD] 20:10:22:06)

20:10:22:06. Names of participants required. The application shall contain the name, address, and telephone number of all persons participating in the proposed facility at the time of filing, as well as the names of any individuals authorized to receive communications relating to the application on behalf of those persons.

The Applicant is a South Dakota limited liability company. Individuals who are authorized to receive communications relating to the Application on behalf of the Applicant include:

Mr. Casey Willis, Senior Advisor, Project Development

ENGIE North America, Inc.

3760 State St., Ste. 200

Santa Barbara, CA 93105

805-569-6185

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Mr. Brett Koenecke

May, Adam, Gerdes and Thompson, LLP

503 S Pierre St.

Pierre, SD 57501

brett@mayadam.net

1.3 Name of Owner and Manager (ARSD 20:10:22:07)

ARSD 20:10:22:07. Name of owner and manager. The application shall contain a complete description of the current and proposed rights of ownership of the proposed facility. It shall also contain the name of the project manager of the proposed facility.

The Applicant will be the sole owner of the Project. Mr. Casey Willis, named above, is the Project Development Manager and primary contact.

1.4 Facility Permit Application Content and Organization

In accordance with SDCL Chapter (Ch.) 49-41B and ARSD Ch. 20:10:22 (Energy Facility Siting Rules), this Application provides information on the existing environment; potential Project impacts; and proposed avoidance, minimization, and/or mitigation measures for the following resources:

- Physical (geology, economic deposits, and soils);
- Hydrology (ground and surface water) and water quality;

- Terrestrial ecosystems (vegetation, wetlands, wildlife, threatened and endangered species);
- Aquatic ecosystems;
- Land use (agriculture, residential, recreation, noise, aesthetics, and telecommunications);
- Air quality; and
- Communities (socioeconomics, cultural resources, and transportation).

In this Application, Meridian Wind has addressed each matter set forth in SDCL Ch. 49-41B and in ARSD Ch. 20:10:22 related to wind energy and transmission facilities. Included with this Application is a Completeness Checklist (Table 1-1) that identifies where each rule requirement is addressed in this Application.

Pursuant to SDCL 49-41B-22, the information presented in this Application establishes that the Project:

- Complies with applicable laws and rules;
- Will not pose a threat of serious injury to the environment nor to the social and economic condition of inhabitants in the Project Area;
- Will not substantially impair the health, safety, or welfare of the inhabitants; and
- Will not unduly interfere with the orderly development of the region, having considered the views of the governing bodies of the local affected units of government.

A Conditional Use Permit (CUP) application was submitted to Hyde County on March 13, 2020. It is anticipated that the CUP will be issued by Hyde County in the second quarter of 2020.

1.4.1 Completeness Check

The contents required for an application with the SDPUC are described in SDCL 49-41B and further clarified in ARSD 20:10:22:01 (1) et seq. The SDPUC's submittal requirements are listed in Table 1-1 with cross-references identifying where each rule requirement is addressed in this Application.

Table 1-1. Completeness Checklist

SDCL	ARSD	Required Information	Location
49-41B-11 (1) thru (12); 49-41B-35 (2)	20:10:22:05	Application contents. The application for a permit for a facility shall contain a list of each permit that is known to be required from any other governmental entity at the time of the filing. The list of permits shall be updated, if needed, to include any permit the applicant becomes aware of after filing the application. The list shall state when each permit application will be filed. The application shall also list each notification that is required to be made to any other governmental entity.	Section 22.1
49-41B-11(1)	20:10:22:06	Names of participants required. The application shall contain the name, address, and telephone number of all persons participating in the proposed facility at the time of filing, as well as the names of any individuals authorized to receive communications relating to the application on behalf of those persons.	Section 1.2
49-41B-11(7)	20:10:22:07	Name of owner and manager. The application shall contain a complete description of the current and proposed rights of ownership of the proposed facility. It shall also contain the name of the project manager of the proposed facility.	Section 1.3
49-41B-11(8)	20:10:22:08	Purpose of facility. The applicant shall describe the purpose of the proposed facility.	Section 2.0
49-41B-11(12)	20:10:22:09	Estimated cost of facility. The applicant shall describe the estimated construction cost of the proposed facility.	Section 3.0
49-41B-11(9)	20:10:22:10	Demand for facility. The applicant shall provide a description of present and estimated consumer demand and estimated future energy needs of those customers to be directly served by the proposed facility. The applicant shall also provide data, data sources, assumptions, forecast methods or models, or other reasoning upon which the description is based. This statement shall also include information on the relative contribution to any power or energy distribution network or pool that the proposed facility is projected to supply and a statement on the consequences of delay or termination of the construction of the facility.	Section 2.0
49-41B-11(2)	20:10:22:11	General site description. The application shall contain a general site description of the proposed facility including a description of the specific site and its location with respect to State, county and other political subdivisions; a map showing prominent features such as cities, lakes and rivers; and maps showing cemeteries, places of historical significance, transportation facilities, or other public facilities adjacent to or abutting the plant or transmission site.	Figures 1 and 2, 2a-2e Section 4.0
49-41B-11(6); 49-41B-21; 34A-9-7(4)	20:10:22:12	Alternative sites. The applicant shall present information related to its selection of the proposed site for the facility, including the following: (1) The general criteria used to select alternative sites, how these criteria were measured and weighed, and reasons for selecting these criteria; (2) An evaluation of alternative sites considered by the applicant for the facility; (3) An evaluation of the proposed plant, wind energy, or transmission site and its advantages over the other alternative sites considered by the applicant, including a discussion of the extent to which reliance upon eminent domain powers could be reduced by use of an alternative site, alternative generation method, or alternative waste handling method.	Figure 3a-3b Section 5.0

Table 1-1. Completeness Checklist

SDCL	ARSD	Required Information	Location
49-41B-11(2,11); 49-41B-21; 49-41B-22	20:10:22:13	Environmental information. The applicant shall provide a description of the existing environment at the time of the submission of the application, estimates of changes in the existing environment which are anticipated to result from construction and operation of the proposed facility, and identification of irreversible changes which are anticipated to remain beyond the operating lifetime of the facility. The environmental effects shall be calculated to reveal and assess demonstrated or suspected hazards to the health and welfare of human, plant, and animal communities which may be cumulative or synergistic consequences of siting the proposed facility in combination with any operating energy conversion facilities, existing or under construction. The applicant shall provide a list of other major industrial facilities under regulation which may have an adverse effect on the environment as a result of their construction or operation in the transmission site, wind energy site, or siting area.	Section 6.0
49-41B-11(2,11); 49-41B-21; 49-41B-22	20:10:22:14	Effect on physical environment. The applicant shall provide information describing the effect of the proposed facility on the physical environment. The information shall include: (1) A written description of the regional land forms surrounding the proposed plant or wind energy site or through which the transmission facility will pass; (2) A topographic map of the plant, wind energy, or transmission site; (3) A written summary of the geological features of the plant, wind energy, or transmission site using the topographic map as a base showing the bedrock geology and surficial geology with sufficient cross-sections to depict the major subsurface variations in the siting area; (4) A description and location of economic deposits such as lignite, sand and gravel, scoria, and industrial and ceramic quality clay existent within the plant, wind energy, or transmission site; (5) A description of the soil type at the plant, wind energy, or transmission site; (6) An analysis of potential erosion or sedimentation which may result from site clearing, construction, or operating activities and measures which will be taken for their control; (7) Information on areas of seismic risks, subsidence potential and slope instability for the plant, wind energy, or transmission site; and (8) An analysis of any constraints that may be imposed by geological characteristics on the design, construction, or operation of the proposed facility and a description of plans to offset such constraints.	Section 7.0 (1) Section 7.1 (2) Section 7.1, Figure 1 and Figures 4a-4c (3) Sections 7.1 and 7.2, Figures 4a-4c (4) Section 7.1.1.4 (5) Section 7.2, Figures 5a-5b (6) Sections 7.2.1 and 7.2.2 (7) Sections 7.1.1.4, 7.1.1.5, and 7.2.1.4 (8) Sections 7.1.1, 7.1.2, and 7.1.3

Table 1-1. Completeness Checklist

SDCL	ARSD	Required Information	Location
49-41B-11(2,11); 49-41B-21; 49-41B-22	20:10:22:15	<p>Hydrology. The applicant shall provide information concerning the hydrology in the area of the proposed plant, wind energy, or transmission site, and the effect of the proposed site on surface and groundwater. The information shall include:</p> <ol style="list-style-type: none"> (1) A map drawn to scale of the plant, wind energy, or transmission site showing surface water drainage patterns before and anticipated patterns after construction of the facility; (2) Using plans filed with any local, State, or Federal agencies, indication on a map drawn to scale of the current planned water uses by communities, agriculture, recreation, fish, and wildlife which may be affected by the location of the proposed facility and a summary of those effects; (3) A map drawn to scale locating any known surface or groundwater supplies within the siting area to be used as a water source or a direct water discharge site for the proposed facility and all offsite pipelines or channels required for water transmission; (4) If aquifers are to be used as a source of potable water supply or process water, specifications of the aquifers to be used and definition of their characteristics, including the capacity of the aquifer to yield water, the estimated recharge rate, and the quality of groundwater; (5) A description of designs for storage, reprocessing, and cooling prior to discharge of heated water entering natural drainage systems; and (6) If deep well injection is to be used for effluent disposal, a description of the reservoir storage capacity, rate of injection, and confinement characteristics and potential negative effects on any aquifers and groundwater users which may be affected. 	<p>Section 8.0</p> <ol style="list-style-type: none"> (1) Figures 6, 7 and 8; Sections 8.1 and 8.2 (2) Figures 6, 7 and 8; Sections 8.1, 8.2 and 8.3 (3) Figures 6, 7 and 8; Section 8.1 (4) Sections 8.1.1 and 8.3.2. (5) N/A (6) N/A
49-41B-11(2,11); 49-41B-21; 49-41B-22	20:10:22:16	<p>Effect on terrestrial ecosystems. The applicant shall provide information on the effect of the proposed facility on the terrestrial ecosystems, including existing information resulting from biological surveys conducted to identify and quantify the terrestrial fauna and flora potentially affected within the transmission site, wind energy site, or siting area; an analysis of the impact of construction and operation of the proposed facility on the terrestrial biotic environment, including breeding times and places and pathways of migration; important species; and planned measures to ameliorate negative biological impacts as a result of construction and operation of the proposed facility.</p>	<p>Section 9.0 Figures 9 and 10</p>
49-41B-11(2,11); 49-41B-21; 49-41B-22	20:10:22:17	<p>Effect on aquatic ecosystems. The applicant shall provide information of the effect of the proposed facility on aquatic ecosystems, and including existing information resulting from biological surveys conducted to identify and quantify the aquatic fauna and flora, potentially affected within the transmission site, wind energy site, or siting area, an analysis of the impact of the construction and operation of the proposed facility on the total aquatic biotic environment and planned measures to ameliorate negative biological impacts as a result of construction and operation of the proposed facility.</p>	<p>Section 10.0</p>

Table 1-1. Completeness Checklist

SDCL	ARSD	Required Information	Location
49-41B-11(2,11); 49-41B-22	20:10:22:18	<p>Land use. The applicant shall provide the following information concerning present and anticipated use or condition of the land:</p> <ol style="list-style-type: none"> (1) A map or maps drawn to scale of the plant, wind energy, or transmission site identifying existing land use according to the following classification system: <ol style="list-style-type: none"> a. Land used primarily for row and nonrow crops in rotation; b. Irrigated lands; c. Pasturelands and rangelands; d. Haylands; e. Undisturbed native grasslands; f. Existing and potential extractive nonrenewable resources; g. Other major industries; h. Rural residences and farmsteads, family farms, and ranches; i. Residential; j. Public, commercial, and institutional use; k. Municipal water supply and water sources for organized rural water systems; and l. Noise sensitive land uses; (2) Identification of the number of persons and homes which will be displaced by the location of the proposed facility; (3) An analysis of the compatibility of the proposed facility with present land use of the surrounding area, with special attention paid to the effects on rural life and the business of farming; and (4) A general analysis of the effects of the proposed facility and associated facilities on land uses and the planned measures to ameliorate adverse impacts. 	<p>Section 11.0</p> <ol style="list-style-type: none"> (1) Figures 9 and 11; Section 11.1 (2) Section 11.1.2 (3) Sections 11.1–11.7 (4) Sections 11.1–11.7
49-41B-11(2,11); 49-41B-28	20:10:22:19	<p>Local land use controls. The applicant shall provide a general description of local land use controls and the manner in which the proposed facility will comply with the local land use zoning or building rules, regulations or ordinances. If the proposed facility violates local land use controls, the applicant shall provide the commission with a detailed explanation of the reasons why the proposed facility should preempt the local controls. The explanation shall include a detailed description of the restrictiveness of the local controls in view of existing technology, factors of cost, economics, needs of parties, or any additional information to aid the commission in determining whether a permit may supersede or preempt a local control pursuant to SDCL 49-41B-28.</p>	Section 12.0
49-41B-11(2,11); 49-41B-21; 49-41B-22	20:10:22:20	<p>Water quality. The applicant shall provide evidence that the proposed facility will comply with all water quality standards and regulations of any Federal or State agency having jurisdiction and any variances permitted.</p>	Section 13.0

Table 1-1. Completeness Checklist

SDCL	ARSD	Required Information	Location
49-41B-11(2,11); 49-41B-21; 49-41B-22	20:10:22:21	Air quality. The applicant shall provide evidence that the proposed facility will comply with all air quality standards and regulations of any Federal or State agency having jurisdiction and any variances permitted.	Section 14.0
49-41B-11(3)	20:10:22:22	Time schedule. The applicant shall provide estimated time schedules for accomplishment of major events in the commencement and duration of construction of the proposed facility.	Section 15.0
49-41B-11(11); 49-41B-22	20:10:22:23	<p>Community impact. The applicant shall include an identification and analysis of the effects the construction, operation, and maintenance of the proposed facility will have on the anticipated affected area including the following:</p> <ol style="list-style-type: none"> (1) A forecast of the impact on commercial and industrial sectors, housing, land values, labor market, health facilities, energy, sewage and water, solid waste management facilities, fire protection, law enforcement, recreational facilities, schools, transportation facilities, and other community and government facilities or services; (2) A forecast of the immediate and long-range impact of property and other taxes of the affected taxing jurisdictions; (3) A forecast of the impact on agricultural production and uses; (4) A forecast of the impact on population, income, occupational distribution, and integration and cohesion of communities; (5) A forecast of the impact on transportation facilities; (6) A forecast of the impact on landmarks and cultural resources of historic, religious, archaeological, scenic, natural, or other cultural significance. The information shall include the applicant's plans to coordinate with the local and State office of disaster services in the event of accidental release of contaminants from the proposed facility; and (7) An indication of means of ameliorating negative social impact of the facility development. 	<p>Section 16.0</p> <ol style="list-style-type: none"> (1) Sections 16.1–16.4 (2) Section 16.1.2 (3) Section 16.2.2 (4) Section 16.1.2 (5) Section 16.4 (6) Section 16.4.4 (7) Sections 16.1–16.4
49-41B-11(4)	20:10:22:24	Employment estimates. The application shall contain the estimated number of jobs and a description of job classifications, together with the estimated annual employment expenditures of the applicants, the contractors, and the subcontractors during the construction phase of the proposed facility. In a separate tabulation, the application shall contain the same data with respect to the operating life of the proposed facility, to be made for the first ten years of commercial operation in one-year intervals. The application shall include plans of the applicant for utilization and training of the available labor force in South Dakota by categories of special skills required. There shall also be an assessment of the adequacy of local manpower to meet temporary and permanent labor requirements during construction and operation of the proposed facility and the estimated percentage that will remain within the county and the township in which the facility is located after construction is completed.	Section 17.0
49-41B-11(5)	20:10:22:25	Future additions and modifications. The applicant shall describe any plans for future modification or expansion of the proposed facility or construction of additional facilities which the applicant may wish to be approved in the permit.	Section 18.0

Table 1-1. Completeness Checklist

SDCL	ARSD	Required Information	Location
49-41B-35(3)	20:10:22:33	Decommissioning. The applicant shall provide a plan or policy statement on action to be taken at the end of the energy conversion facility's on-line life. Estimates of monetary costs, site condition after decommissioning, and the amount of land irretrievably committed shall be included in this statement.	Section 19.0 Sections 4.5.11 and 4.6.6
49-41B-35(3)	20:10:22:33.01	Decommissioning of wind energy facilities. Funding for removal of facilities. The applicant shall provide a plan regarding the action to be taken upon the decommissioning and removal of the wind energy facilities. Estimates of monetary costs and the site condition after decommissioning shall be included in the plan. The commission may require a bond, guarantee, insurance, or other requirement to provide funding for the decommissioning and removal of a wind energy facility. The commission shall consider the size of the facility, the location of the facility, and the financial condition of the applicant when determining whether to require some type of funding. The same criteria shall be used to determine the amount of any required funding.	Section 19.0
49-41B 11(2,11)	20:10:22:33.02	Information concerning wind energy facilities. If a wind energy facility is proposed, the applicant shall provide the following information: (1) Configuration of the wind turbines, including the distance measured from ground level to the blade extended at its highest point, distance between the wind turbines, type of material, and color; (2) The number of wind turbines, including the number of anticipated additions of wind turbines in each of the next five years; (3) Any warning lighting requirements for the wind turbines; (4) Setback distances from off-site buildings, rights-of-way of public roads, and property lines; (5) Anticipated noise levels during construction and operation; (6) Anticipated electromagnetic interference during operation of the facilities; (7) The proposed wind energy site and major alternatives as depicted on overhead photographs and land use culture maps; (8) Reliability and safety; (9) Right-of-way or condemnation requirements; (10) Necessary clearing activities; (11) Configuration of towers and poles for any electric interconnection facilities, including material, overall height, and width; (12) Conductor configuration and size, length of span between structures, and number of circuits per pole or tower for any electric interconnection facilities; and (13) If any electric interconnection facilities are placed underground, the depth of burial, distance between access points, conductor configuration and size, and number of circuits	Section 21.0 (1) Sections 4.1 and 4.2 (2) Section 4.2 (3) Section 9.2.3.1 and Section 12.0 (4) Section 5.2 and Section 12; Figures 3a and 3b (5) Section 4.12, Section 11.3 (6) Section 20.3 (7) Section 5; Figures 3a-3b and Figure 11; Appendix B (8) Section 20.1 (9) Section 4.4.1 (10) Sections 4.4, 6.0, 8.2.2.1 and 9.1.2.3 (11) Sections 4.2-4.10 (12) Section 4.10 (13) Section 4.12.4
49-41B-11 (1) thru (12); 49-41B-35 (2)	20:10:22:34	Transmission facility layout and construction. If a transmission facility is proposed, the applicant shall submit a policy statement concerning the route clearing, construction and landscaping operations, and a description of plans for continued right-of-way maintenance, including stabilization and weed control.	Sections 4.3 and 4.6

Table 1-1. Completeness Checklist

SDCL	ARSD	Required Information	Location
49-41B-11 (1) thru (12); 49-41B-35 (2)	20:10:22:35	Information concerning transmission facilities. If a transmission facility is proposed, the applicant shall provide the following information: (1) Configuration of the towers and poles, including material, overall height, and width; (2) Conductor configuration and size, length of span between structures, and number of circuits per pole or tower; (3) The proposed transmission site and major alternatives as depicted on overhead photographs and land use culture maps; (4) Reliability and safety; (5) Right-of-way or condemnation requirements; (6) Necessary clearing activities; and (7) If the transmission facility is placed underground, the depth of burial, distance between access points, conductor configuration and size, and number of circuits.	(1) Section 4.3.1 (2) Section 4.3.1 (3) Section 5, Figures 3a-3b and Figure 11; Appendix B (4) Section 20.1 (5) Section 4.4.1 (6) Sections 4.4, 6.0, 8.2.2.1 and 9.1.2.3 (7) N/A
49-41B-7; 49-41B-22	20:10:22:36	Additional information in application. The applicant shall also submit as part of the application any additional information necessary for the local review committees to assess the effects of the proposed facility pursuant to SDCL 49-41B-7. The applicant shall also submit as part of its application any additional information necessary to meet the burden of proof specified in SDCL 49-41B-22.	Section 22.0
49-41-B-35; 49-41B-11	20:10:22:39	Testimony and exhibits. Upon the filing of an application pursuant to SDCL 49-41B-11, an applicant shall also file all data, exhibits, and related testimony which the applicant intends to submit in support of its application. The application shall specifically show the witnesses supporting the information contained in the application.	Section 23.0
49-41B-22	N/A	Applicant's burden of proof. The applicant has the burden of proof to establish that: (1) The proposed facility will comply with all applicable laws and rules; (2) The facility will not pose a threat of serious injury to the environment nor to the social and economic condition of inhabitants or expected inhabitants in the siting area. An applicant for an electric transmission line, a solar energy facility, or a wind energy facility that holds a conditional use permit from the applicable local units of government is determined not to threaten the social and economic condition of inhabitants or expected inhabitants in the siting area; (3) The facility will not substantially impair the health, safety or welfare of the inhabitants; and (4) The facility will not unduly interfere with the orderly development of the region with due consideration having been given the views of governing bodies of affected local units of government. An applicant for an electric transmission line, a solar energy facility, or a wind energy facility that holds a conditional use permit from the applicable local units of government is in compliance with this subdivision.	Section 22.4

2.0 PURPOSE OF, AND DEMAND FOR, THE WIND ENERGY FACILITY (ARSD 20:10:22:08, 20:10:22:10)

ARSD 20:10:22:08. Purpose of facility. The applicant shall describe the purpose of the proposed facility.

ARSD 20:10:22:10. Demand for facility. The applicant shall provide a description of present and estimated consumer demand and estimated future energy needs of those customers to be directly served by the proposed facility. The applicant shall also provide data, data sources, assumptions, forecast methods or models, or other reasoning upon which the description is based. This statement shall also include information on the relative contribution to any power or energy distribution network or pool that the proposed facility is projected to supply and a statement on the consequences of delay or termination of the construction of the facility.

The total installed capacity of the Project will not exceed 175 MW. The purpose of the Project is to generate electricity to supply the needs to entities that have interest in procuring renewable energy. Meridian Wind is actively submitting bids for power purchase agreements (PPA) through various utility, commercial, and industrial opportunities.

The Project will provide numerous local and regional economic benefits. The area where the Project is proposed is largely dependent on an agricultural economy. Local agricultural economies are sensitive to commodity prices and weather, among other things. Wind energy facilities add significant revenue to existing farming operations and creates jobs in the local communities.

The Project will directly benefit local workers and local businesses. During construction, an approximately 175-MW wind project, such as Meridian Wind, typically generates a need for up to 400 temporary construction jobs over a peak construction period of approximately 8 months, with an average of 130 people working on-site at any one point in time. Construction and operation of such a wind project typically results in millions of dollars being added into the local economy. These investments could potentially benefit many businesses in the community including hotels, restaurants, gas stations, auto repair companies, tire companies, grocery stores, and other local businesses. During operation, there will be O&M responsibilities that will be shared with the Triple H Wind Project. As such, the Meridian Wind Project will add approximately six to eight full-time personnel, such as facility managers, site managers, and turbine technicians beyond those who will be hired to support the Triple H Wind Project. Over the estimated 25-year life of the Project, the Project is expected to directly and indirectly generate millions of dollars in annual local revenue, including taxes, lease payments, and local staff salaries.

2.1 Renewable Power Demand

The 2019 Lazard Levelized Cost of Energy Analysis (version 13.0) provides an in-depth study of the levelized cost of all types of energy production, including renewable energy resources and more traditional technologies.

Based on this analysis, wind energy is one of the most cost-effective electricity sources for customers, making it a desirable investment for utilities. New wind energy facilities are less expensive to construct than new conventional energy sources, even without the existing production tax credit program. Table 2-1 provides a comparison of the unsubsidized levelized cost of energy for both alternative and conventional energy sources. In general, alternative energy sources provide lower costs per megawatt hour (MWh) than conventional sources.

Table 2-1. Unsubsidized Levelized Cost of Energy

Energy Source	Energy Source	Levelized Cost (\$/MW hour)
Alternative Energy	Solar Photovoltaic—Rooftop Residential	\$151-242
	Solar Photovoltaic—Rooftop Commercial and Industrial	\$75-154
	Solar Photovoltaic—Thin Film Utility Scale	\$32-42
	Wind	\$28-54
Conventional Energy	Gas Peaking	\$150-199
	Nuclear	\$118-192
	Coal	\$66-152
	Gas Combined Cycle	\$44-68

Source: Lazard 2019

2.1.1 National Energy Demand

In 2019, United States electricity customers consumed 3.4 billion MWh of energy (USEIA 2020a). In its Annual Energy Outlook 2020, the U.S. Energy Information Administration (USEIA) estimated that electricity demand in the United States will grow slowly and will rise 1 percent annually from 2019 to 2050 (USEIA 2020a). A U.S. Department of Energy-Office of Energy Efficiency & Renewable Energy (USDOE) report assessed the technical feasibility of using wind energy to generate 20 percent of the nation's electricity demand by 2030 (USDOE 2008). To meet this demand, United States wind power capacity will have to reach more than 300 gigawatts (GW). As of December 2019, the total amount of wind energy capacity in the United States had grown to approximately 105.6 GW (AWEA 2019). Reaching a capacity of 300 GW will require an increase of more than 194 GW in 10 years or 19.4 GW per year.

In March 2015, the USDOE released its Wind Vision report, which builds on and updates the 2008 20 percent scenario based on wind power penetration of 10 percent by 2020, 20 percent by 2030, and 35 percent by 2050, utilizing plausible variations from central values of wind power and fossil fuel costs. The projected benefits associated with achieving the Wind Vision study scenario are:

- Avoidance of air pollution and reduction in greenhouse gas emissions (avoids 250,000 metric tons of air pollutants and 12.3 gigatons of greenhouse gases by 2050);
- Conservation of water resources (estimated at 260 billion gallons by 2050);
- Increased United States energy security by diversifying electricity portfolio;
- Reduced demand on fossil fuels and reduced energy costs to consumers (\$280 billion dollars in consumer savings by 2050);
- Creation of new income for rural landowners and tax revenues for local communities (\$3.2 billion annually in tax revenue by 2050); and
- Generation of well-paying jobs (600,000 jobs in manufacturing, installation, maintenance and supporting services by 2050 (USDOE 2015).

The demand for renewable energy from wind is high as project costs decline and capacity increases (USDOE 2018). In many situations, wind energy and natural gas generation are being combined to produce the lowest cost baseload power, thereby driving need and demand. Wind energy is also being used as a long-term financial hedge against the price of electricity generated from natural gas. Most, if not

all, of the region's power producers' resource plans call for increasing the use of fixed cost resources with zero fuel cost, zero pollution, and zero carbon emissions as a necessity to provide cost-effective electricity to their customers. Demand is coming from power producers signing long-term PPAs with wind energy projects or purchasing wind projects outright. Electric utilities signed approximately 60 percent (5,266 MW) of PPA capacity contracted for 2019 (8,726 MW; AWEA 2019). New demand for wind energy is also coming from non-utility buyers. Corporate and other non-utility customers, such as Baker Hughes, Estee Lauder, and McDonald's purchased wind energy for the first time during the fourth quarter of 2019 (AWEA 2019).

Wind and natural gas are replacing aging coal and nuclear facilities that are being retired for regulatory and financial reasons. Between 2012 and 2016, net coal capacity declined by about 60 GW partly because of compliance with the U.S. Environmental Protection Agency's (EPA's) Mercury and Air Toxic Standards (USEIA 2018). Coal-fired generating capacity may decrease by an additional 109 GW between 2019 and 2025 to comply with the Affordable Clean Energy rule before leveling off near 127 GW in 2050. Like coal, more nuclear capacity is being retired than built. Nearly 19 GW of nuclear capacity are expected to be retired from 2019 through 2050 (USEIA 2019). By contrast, the USEIA projects that utility scale wind capacity will grow by 20 GW from 2020 to 2050 (USEIA 2018).

Wind energy is an inexhaustible source of clean, renewable electric power that can help fill the identified capacity shortfall. Operation of wind turbines does not emit particulates, heavy metals or greenhouse gases, and does not consume significant water resources. Long-term, fixed-price PPAs for wind generation reduce electric utilities' exposure to fuel price volatility and stabilize energy prices for consumers.

Beyond the market for wind energy, the public has also shown support for the use of renewable energy. In a March 2019 poll, the majority of Americans wanted more emphasis placed on the production of solar power (80 percent) and wind (70 percent). Fewer Americans wanted increased emphasis on oil (28 percent) and coal (22 percent; Gallup, Inc. 2018).

2.1.2 Regional and State Energy Demand

South Dakota is one of the states with the greatest wind resources, and it ranks among the top five states in the nation in state electricity generation. In 2018, South Dakota had more than 600 wind turbines statewide at 16 active wind farms and more than 1,000 MW of installed generating capacity (USEIA 2019). The American Wind Energy Association's U.S. Wind Industry Fourth Quarter Market Report indicated that South Dakota installed and commissioned the fourth largest number of MWs in the United States at 506 MW in 2019. The Market Report also projects that South Dakota is on track to more than double their land-based wind capacity with an estimated 1,577 MW under construction or advanced development (AWEA 2019).

South Dakota, and the Project site in particular, has an abundance of wind that allows for energy to be produced with no fuel costs. This allows for the energy to be sold at lower prices compared to other forms of energy projects that rely on purchasing coal or natural gas to create energy. This translates to cheaper power for buyers of wind power and rate payers within the Southwest Power Pool grid, in this case.

The power produced by the Project will be injected at the Chappelle Creek Substation and into Basin Electric Power Cooperative's existing electrical infrastructure. The Project, at the time of filing this application, has not executed a PPA. That PPA will be a catalyst of the Project moving forward into construction and operation. ENGIE is actively submitting competitive bids into various commercial and

industrial RFPS to supply power from the Project. Given the market demand in South Dakota, it is highly likely that the Project will sign a PPA with a commercial or industrial partner (Corporate buyers) outside South Dakota.

2.1.3 Local Benefits

The Project will add meaningful revenue to the local economy. Rural landowners and farmers on whose land the Project is listed will receive annual lease payments for each turbine sited or operational payments for land that does not receive a turbine on their properties. Because only a small portion of the land under lease will be used for the Project, farming operations can continue largely undisturbed.

The Project will be located within Hyde County and the Highmore-Harrold School District. Meridian Wind anticipates that Hyde County will receive \$7,352,026 in taxes over the 25-year life of the Project. There are no organized townships in the Project, and the county will take the townships' share as required under the Wind Farm Production and Capacity tax found in SDCL Ch. 10-35 (19-1). Meridian Wind anticipates that the school district will receive \$7,352,026 over the life of the Project. That school district received almost no state aid for education in fiscal year 2019. It is anticipated that with the construction of the Triple H Wind Project, no more state aid for education will be given to the school district and the district will retain all taxes from this Project. Additional information is provided in Section 16.1.2.

Construction, operation, and maintenance of the facility are expected to create up to 400 temporary jobs during the peak construction phase with 130 at any one time, and approximately 6 to 8 long-term facility manager, site manager, and turbine technician positions beyond those already supporting the Triple H Wind Project, which will benefit local businesses. Statewide and nationally, the wind industry generates well-paying jobs in the entire supply chain, including engineering, manufacturing, and construction.

The construction and operation of a new renewable energy facility in a rural area will result in positive indirect economic impacts in addition to the direct landowner, tax, wage and donation benefits mentioned above at the local level. These local spillover benefits can include higher occupancy at hotels and more people eating at restaurants during project construction. A local hardware and machinery supplier might be utilized for the supply of tools during operations. Landowners receiving Project-related payments may spend more in local stores. A school receiving additional tax proceeds may be able to make an improvement to facilities or hire a new teacher.

2.1.4 Consequences of Delay

A delay in the Project would result in several consequences. First, there is a substantial demand for turbines in 2020 and 2021. A delay in the Project would result in the loss of the turbine delivery slot that has been locked in with the turbine vendors, resulting in significant uncertainty as to when additional turbine supply windows could be locked in. Second, similar to turbine availability, the availability of construction firms with significant wind turbine construction experience is limited in 2020 and 2021. Meridian Wind has not yet selected a construction contractor to construct the Project. A delay in the Project may result in the inability of the construction contractor to support the construction of the Project due to contractual obligations with other projects throughout the country.

In addition, a delay in the Project would not only defer, but also reduce, the Project's benefits to the local communities. The Production Tax Credit (PTC) will be reduced in value by 20 percent per year through 2024. The PTC value for projects that are operational by the end of 2021 will receive the PTC at 80 percent of the value compared to projects that are operational by the end of 2020. Thus, if Meridian Wind

were delayed where the Project could not be completed by the end of 2021, the Project would lose another 20 percent in the value of the PTC.

Delayed operation would also defer the local benefits of increased employment and spending in the community as well as tax revenue benefits to local school districts, the counties, and the state. Additionally, Project costs are subject to commodity flux and rise. If the Project were delayed, the construction costs might increase.

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3.0 ESTIMATED COST OF THE WIND ENERGY FACILITY (ARSD 20:10:22:09)

ARSD 20:10:22:09. Estimated cost of facility. The applicant shall describe the estimated construction cost of the proposed facility.

3.1 Capital and Operational Costs

The current estimated capital cost of the Project is approximately \$220 million based on indicative construction and turbine pricing cost estimates for the proposed turbine layout. This estimate includes lease acquisition and permitting, engineering, procurement and construction of turbines, access roads, underground electrical collector system, Project collection substation, interconnection facilities, leasing an O&M facility, a supervisory control and data acquisition (SCADA) system, one permanent MET tower, and Project financing.

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4.0 GENERAL SITE AND PROJECT COMPONENT DESCRIPTION (ARSD 20:10:22:11, 20:10:22:33:02, 20:10:22:35)

ARSD 20:10:22:11. General site description. *The application shall contain a general site description of the proposed facility including a description of the specific site and its location with respect to state, county, and other political subdivisions; a map showing prominent features such as cities, lakes and rivers; and maps showing cemeteries, places of historical significance, transportation facilities, or other public facilities adjacent to or abutting the plant or transmission site.*

4.1 Site Location and Overview

The Project is located entirely within Hyde County in the PLSS townships of Van Order, Eagle, Chapelle, Highmore, and Holabird, approximately 3 miles southeast of Highmore. The Project will be located on privately held land within the Project Area. Table 4-1 lists the counties, townships, sections, and ranges within the Project Area. Figure 1 (Appendix A) shows the Project's location; Figure 2 (Appendix A) shows the preliminary Project layout.

Table 4-1. Project Location

County Name	Township Name	Township	Range	Sections
Hyde	Van Order	111N	71W	1-13, 17-20
Hyde	Eagle	111N	72W	1-3, 7-13, 18, 24
Hyde	Chapelle	111N	73W	12, 13
Hyde	Highmore	112N	71W	27-29, 31-35
Hyde	Holabird	112N	72W	36

4.2 Wind Farm Facility

The Project will consist of up to 64 turbines with an aggregate nameplate capacity of up to 175 MW. The Project will generate utility scale electric power for residential, commercial, and industrial consumers. A detailed view of the Project configuration is shown in Figures 2a through 2e in Appendix A. As discussed further in Sections 11.3 and 12.0, proposed turbine locations meet all applicable state and county setback and noise requirements.

The long-term operational facilities for the Project will also include underground electric collector lines, a collection substation, a SCADA system, access roads to each turbine, and one permanent MET tower. The Project will interconnect to the high-voltage transmission grid via the Triple H Wind Project Chapelle Station located at the western end of the Project's transmission line. Meridian Wind also anticipates sharing the O&M facility and an ADLS with the Triple H Wind Project. Figure 2 (Appendix A) shows the proposed layout of the Project facilities. At this time, the location of the temporary construction laydown/staging area, approximately 3-acre temporary batch plant(s), if required, and the permanent MET tower have not been determined. Meridian Wind will grade a temporary laydown/staging area of up to approximately 10 acres within the Project Area on land under lease. It has not been determined at this time if on-site batch plants will be necessary for the Project. If they are utilized, each would temporarily impact approximately 3 acres of land, and it is anticipated that they would be located within the Project Area on land under lease. The final location of the proposed MET tower will be determined once the layout is final. The permanent MET tower is expected to be a free-standing 40-foot-by-40-foot area and will be located within the Project Area on land under lease.

The Project's layout is based on a detailed analysis of the Project Area and has been sited to avoid or minimize potential impacts. Meridian Wind requests that the permit allow turbines to be shifted within 250 feet of their currently proposed location, as long as specified noise and shadow flicker thresholds are not exceeded, County siting standards are complied with, and conditions specified in the Energy Facility Permit can be complied with. If turbine shifts are greater than 250 feet, exceed the noted thresholds, or do not meet the other limitations specified, Meridian Wind will either use an alternate turbine location or obtain SDPUC approval of the proposed turbine location change.

As a result of final engineering, shifts in the access roads and collector system, as well as the location of temporary facilities (e.g., laydown yard/staging area and any required concrete batch plant[s]), may also be necessary to accommodate turbine shifts and specifically to accommodate the needs of the landowners. Therefore, Meridian Wind requests that the permit allow those facilities to be shifted, as needed, so long as they are located on leased land, and the conditions specified in the Energy Facility Permit can be complied with.

4.2.1 Wind Turbines

4.2.1.1 Wind Turbine Generators

Figures 2 and 2a through 2e (Appendix A) show 74 turbine locations, of which up to 64 turbines will be built depending on the final turbine model. The Project is considering turbine model layout consisting of 64 General Electric (GE) turbines. The turbine proposed for the Project is the GE 2.72-116 turbine which has a rated power of 2.72 MW. The configuration illustrated in Figure 2 (Appendix A) complies with the SDPUC rules and Hyde County provisions with respect to setbacks and noise. Detailed schematics of turbine models are not typically available until contract negotiations with vendors is underway. Table 4-2 provides the turbine characteristics for the GE 2.72-116 turbine model being considered for the Project.

Table 4-2. Wind Turbine Characteristics

Characteristic	GE 2.72-116
Nameplate capacity (kW)	2,720
Hub height (m) ¹	90
Rotor Diameter (m)	116.5
Total height (m) ²	148.3
Cut-in wind speed (m/s) ³	3 m/s
Rated capacity wind speed (m/s) ⁴	12 m/s
Cut-out wind speed (m/s) ⁵	32 m/s average in a 600-second time interval. 37 m/s average in a 30-second time interval or 41 m/s average in a 3-second time interval
Wind Swept Area (m ²)	10,660
Rotor speed (rpm)	7.4-15.7

GE = General Electric

kW = kilowatts

m = meters

m/s = meters per second

rpm = rotations per minute

1 Hub height = the turbine height from the ground to the top of the nacelle

2 Total height = the total turbine height from the ground to the tip of the blade in an upright position

3 Cut-in wind speed = wind speed at which turbine begins operation

4 Rated capacity wind speed = wind speed at which turbine reaches its rated capacity

5 Cut-out wind speed = wind speed above which turbine shuts down operation

The GE 2.72-116 model contains emergency power supplies to allow operation of the control systems, braking systems, yaw systems, and blade pitch systems, and to shut the turbine down safely in the event grid power is lost. Turbine blades convert linear energy from wind into rotational energy, which the hub transfers to the gear box or directly to the generator located within the nacelle. The transferred mechanical force is converted to electrical energy by the generator. Mechanical and/or ultrasonic anemometers and weathervanes, located on the turbine nacelle, continuously collect real-time wind speed and direction data. Based on the data collected, the turbine yaw system constantly rotates the hub, blades, and nacelle into the wind, while the blade pitch system continuously adjusts the pitch of the blades to optimize the output of the generator. The pitch system also protects the turbine from over-speed events in high winds by pitching the blades perpendicular to the wind, and aero-brakes the turbine to a stop in normal shutdown conditions. The mechanical braking system, located within the nacelle, is used to stop the turbine's rotation in the event of a storm or other turbine fault. The mechanical brake and lock-out system is used to lock the blade rotor to prevent the blades from spinning during maintenance periods or other times when the turbine is out of service. The gear box adjusts shaft speeds to maintain generator speed in low and high wind speeds. Electrical energy produced by the generator is transmitted through insulated cables in the power rail to a safety switch and then to a transformer located internally in the tower or externally on the base of the tower.

The Project's design includes safety and control mechanisms. These mechanisms are generally monitored using a SCADA system. Each turbine is connected to the SCADA system via fiber-optic cable, which allows the turbines to be monitored in real time by the operation and maintenance staff. The SCADA system also allows the Project to be remotely monitored, thus increasing Project oversight, as well as the performance and reliability of the turbines. Not only will the local O&M office have full control of the turbines, but a 24/7 remote operations facility will also have control of the individual turbines. These two teams will coordinate to ensure that the wind turbines operate safely and efficiently.

Another mechanism for safety and control is the turbines themselves. Each turbine monitors the wind speed and direction to ensure that its current position is most efficient to produce electricity. This data is also used for feathering the blades; applying the brakes in high wind speeds or if there is ice build-up on the blades; and to tell the turbine when the wind is strong enough to begin turning the generator and producing electricity at the "cut-in" wind speed. The Project will utilize Winter Ice Operation Mode (WIOM), which provides stall mitigation during blade icing events. WIOM optimizes pitch controls, improves power output, and reduces the effects of icing on blade stall, which in turn reduces potential blade vibrations.

Operations, maintenance, and service arrangements between the turbine manufacturer and Meridian Wind will be structured to provide timely and efficient operation and maintenance. The computerized data network will provide detailed operating and performance information for each turbine. Meridian Wind will maintain a computer program and database for tracking each turbine's operational history.

4.2.1.2 Wind Turbine Towers

The towers will be conical tubular in shape; painted a non-glare white, off-white, or gray; and marked and lit to comply with Federal Aviation Administration (FAA) requirements. The turbine tower, where the nacelle is mounted, will consist of three to four sections manufactured from certified steel plates. Welds will be made with automatically controlled power welding machines and are ultrasonically inspected during manufacturing per American National Standards Institute specifications. All surfaces will be sandblasted and multi-layer coated for protection against corrosion. Access to the turbine will be through

a lockable steel door at the base of the tower. Within the tower, access to the nacelle will be provided by a ladder connecting four platforms and equipped with a fall arresting safety system.

4.2.1.3 Wind Turbine Foundations

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

The excavated area for the turbine foundations will typically be approximately 75 feet in diameter (37.5-foot radius). During construction, a larger area up to 150-foot radius may be used to lay down the rotors and maneuver cranes during turbine assembly. For purposes of calculating temporary impacts in this Application, Meridian Wind has assumed approximately 104 acres of total temporary disturbance from work/staging areas for 64 turbines. After construction, a 35-foot radius around each turbine will be maintained and graveled to prevent potential damage to the underground foundations and cabling that extends to each turbine. The resulting total long-term operational disturbance from the turbines will be reduced to approximately 5.6 acres, which will remain for the life of the Project.

4.2.1.4 Generator Step-up Transformers

The 64 GE 2.72-116 turbines used for the Meridian Wind Project turbines will possess a 34.5-kV generator step-up transformer. The transformer will be located at the base of each turbine. The step-up transformer will be installed to raise the voltage of the electricity generated by the turbine to the power collection line voltage of 34.5 kV at the base of each turbine. The external transformers will require small, concrete slab foundations within the gravel area at the turbine base for support. The exact dimensions of the transformers, concrete pad, and concrete slab will be dependent upon transformer manufacturer specifications and site-specific engineering requirements.

4.2.2 Meteorological Towers

Meridian Wind proposes to construct one permanent MET tower within the Project Area. Three preliminary locations for the permanent MET tower are shown on Figure 2 (Appendix A). The final location of the proposed MET tower will be determined once the layout is final. The permanent MET tower is expected to be free-standing and will be equal to the selected turbine hub height.

4.2.3 Access Roads and Crane Paths

Where practicable, existing public roads, private roads, and field paths will be utilized to access Project components. The existing roads may require improvements before, during, or following construction. Where necessary, new access roads will be constructed between existing roadways and Project components. The new and improved access roads will be all-weather, gravel surfaced, and generally up to 16 feet in width. During construction, some of the access roads will be widened to accommodate movement of the turbine erection crane, with temporary widths of up to 40 feet.

The final access road design will be dependent on geotechnical information obtained during the engineering phase and consultation with the landowners. It is anticipated that the access road network for the Project will include approximately 24.6 miles of new private access roads (Figure 2 in Appendix A).

For purposes of calculating access road impacts in this Application, Meridian Wind has assumed approximately 118 acres of temporary disturbance and 47 acres of disturbance during the life of the Project for new private access roads.

Separate access may be required for the cranes used to erect the turbines. Large construction cranes may spend as little as one day at each turbine site before moving on to the next. Cranes are sometimes moved cross-country rather than by using the developed access roads. In such cases, temporary crane paths will be constructed between turbine locations. There are a number of reasons for such cross-country movement. The first is time, since taking a more direct route saves time. The second is cost: breaking down the crane is time-consuming and can add costs to a project that cannot be otherwise avoided if the crane needs to pass under an overhead utility line or due to other obstacles. Cross-country walking of the crane enables it to be moved without complete de-rigging and disassembly. However, Meridian Wind generally tries to avoid walking cranes on county roads or state highways since that could impede traffic and potentially damage roads. The third reason for cross-country movement is topography: cranes cannot walk on inclines greater than 10 to 12 percent, and many crane walk routes are designed around topography. Finally, cranes cannot cross a property that is not under easement. Where cranes are required to travel cross-country, workers will lay down some form of cribbing, bedding, or mats to support the weight of the crane without impacting the underlying ground. The cribbing or mats will be removed immediately following passage of the crane, to be re-used elsewhere. Following completion of construction, the temporary crane paths will be removed and the area will be restored pursuant to the contractual easement obligations with landowners.

4.2.4 Temporary Laydown/Staging Area/Temporary Concrete Batch Plant

Meridian Wind will grade a temporary laydown/staging area of up to approximately 10 acres within the Project Area on land under lease. The potential location for the laydown/staging area will be identified prior to construction. The laydown/staging area will provide parking for construction personnel, staging area for large equipment deliveries, and potentially maintain an on-site temporary concrete batch plant during construction. If temporary batch plant(s) are required for the Project to prepare concrete for foundations onsite, they will be strategically placed to avoid sensitive resources and will temporarily impact up to 3 acres within the Project Area on land under lease.

The laydown/staging area will also be used to conduct maintenance on construction equipment and vehicles and to store fuel. On-site fuel storage will have secondary containment and will be inspected regularly, with containment being remediated promptly in accordance with the Project's Spill Prevention, Control and Countermeasures (SPCC) Plan. Fuel handling activities and spill remediation will also adhere to the procedures outlined in the Project's SPCC Plan.

4.2.5 O&M Facility

The O&M facility that would support Meridian is currently under construction in support of the Triple H Wind Project. Its location is provided on Figure 2 (Appendix A). The O&M building will be approximately 5,000 square feet and house the equipment to operate and maintain the Project. Ambient conditions within the O&M facility will need to be maintained to meet equipment operating requirements and/or to support the presence of maintenance personnel. Heating of all occupied structures will be provided by propane stored on site. Although the electric power demands of the O&M building and the operating equipment will be supplied from the grid, emergency power generation will also be available on-site via a diesel engine/generator set.

4.2.6 ADLS

An ADLS system maximizes the use of nighttime obstruction lighting at wind projects when there is aircraft activity in the vicinity. The ADLS utilizes a radar system that can detect the presence of aircraft within 30 miles of a wind facility. If an aircraft is detected within this range the lights operate as normal at night. If there are no aircraft within the detection area, the lighting remains off. Meridian Wind proposes to share the ADLS system installed at the Triple H Wind Project, as required by the conditions of the Energy Facility Permit approval in July 2019. Any footprint required for the ADLS system will be within the O&M facility parcel. Based on a preliminary analysis of radar coverage, it appears that the Meridian Wind Project can be covered by the radar facility that will be built for the Triple H Wind Project. The ADLS system will require final approval from the FAA.

The ADLS system consists of a tower up to 70 feet tall equipped with an 18-foot antenna mounted on the top of the tower. In addition, an outdoor cabinet will be located at the base of the tower that contains equipment associated with the system. This system is connected directly to each turbine to control the lighting system in the towers. The ADLS system will be connected by a collection cable run to the closest turbine (Figure 2 in Appendix A). If the system is shut down due to an event such as a power outage, the default operational mode involves having the lighting operate as it would normally, per the FAA requirements.

4.2.7 Electrical Collector System

The proposed collector system layout based on the proposed turbine configuration is shown on Figure 2 (Appendix A).

From the step-up transformers at each turbine, which raise the voltage to 34.5 kV, power will run through an underground system of collection cables, collector buses, and feeder breakers, referred to as a collector system, that connects to the Project collection substation. The Project collection substation will raise the voltage to 345 kV to tie into the grid. Up to 38.6 miles of underground circuits will be installed by trenching, plowing, or where required, directionally boring the cables underground to avoid sensitive environmental conditions or meet other requirements. Generally, the electrical collector lines will be buried to a minimum depth of 38 inches with marking tape and tracer wire to meet the appropriate national electrical code. Meridian Wind will register the appropriate underground facilities with the South Dakota One-Call system.

4.2.8 Fiber Optic Communication System

When installing the collector system, Meridian Wind will also install fiber optic communication systems connecting each of the Project's turbines to the Project collection substation to provide for communication among the turbines, collection substation, O&M facility and electrical grid as part of SCADA (see Section 4.2.1.1). If underground, the electrical and fiber optic cables will be placed in the same trench wherever possible and will include occasional aboveground junction boxes.

4.2.9 Project Collection Substation

The collection substation will be located generally in the center of the Project Area and will consist of two substation transformers, circuit breakers, switching devices, auxiliary equipment, a control enclosure containing equipment for proper control, protection, monitoring and communications, and associated equipment and facilities. The principal function of the collection substation is to increase the voltage from

34.5 kV at the collector system to the voltage of the 345-kV transmission line, which will transport the electricity of the entire Project to the grid via Chapelle Station.

Up to 5 acres of land will be purchased to facilitate construction and operation of the collection substation (Figure 2 in Appendix A). The collection substation will be located within a fenced area. The fence will be designed in accordance with industry standards to provide safety and security. As discussed in Section 4.2, Meridian Wind requests that the permit allow Project facilities, including the collection substation, to be modified as needed provided that the new locations are on land leased for the Project, cultural resource impacts are avoided, and conditions specified in the Energy Facility Permit are met.

4.3 Transmission Facilities

The Project's transmission line route is based on a detailed analysis of the Project Area and has been sited to avoid or minimize potential impacts. Meridian Wind is in the early stages of design for the transmission line and the location of its associated structures.

4.3.1 Configuration of Poles and Conductors

The Project's approximately 8.9-mile long single circuit 345 kV overhead transmission line will be constructed primarily on steel monopole structures. Meridian Wind is in early stages of design and has not identified the location or type of pole structures. Monopole structures are generally placed on foundations measuring between 6 to 11 feet in diameter and will typically be between 100 and 120 feet tall. Spacing intervals are generally between 400 and 1,000 feet. Meridian Wind also anticipates using Type 2-bundle 954 aluminum conductor steel reinforced conductors or conductors of comparable capacity.

As discussed in Section 4.3, Meridian Wind has not identified the individual locations of the transmission line structures. To allow for final micro-siting, Meridian Wind requests that the permit allow structures to be placed within the easement, avoiding any constraints that may be identified through final engineering and based on landowner consultation.

4.3.2 Transmission Corridor

The approximately 8.9-mile 345-kV overhead transmission line will run from the Project substation located at the intersection of 203rd Street and 339th Avenue to an interconnection switching stations located approximately 8.5 miles southwest of Highmore, South Dakota (Figure 2 in Appendix A).

The typical right-of-way easement area for the transmission line corridor will be 150-feet-wide. Temporary construction impacts along the transmission line corridor are anticipated to be approximately 100 feet wide. Permanent effects associated with construction will be limited to the footprint of the transmission structures. All temporary construction workspace will be restored once construction is complete. Vegetation within the right-of-way easement will be maintained to protect the lines, allow for ground-based inspections, and access to transmission structures when maintenance is required.

4.3.3 Temporary Laydown/Staging Area

Section 4.2.4 discusses a 10-acre temporary laydown/staging area that will be used by the Project for construction. The laydown/staging area will be temporary and will be restored once construction is complete. The location of the laydown area will be determined prior to construction based on the preferred location with the contractor and in consultation with the landowners.

4.3.4 Interconnection Facilities and Switching Station

The Project will interconnect to the high-voltage transmission grid via the 345-kV Chapelle Station owned and operated by Basin Electric Power Cooperative as part of the Triple H Wind Project. Chapelle Station is located adjacent to the Leland Olds to Fort Thompson 345-kV transmission line and will serve as the electrical interconnection between the Project and the Southwest Power Pool grid.

Chapelle Station consists of a fenced area including 345-kV circuit breakers, disconnect switches, bus conductors, auxiliary equipment and a control enclosure containing equipment for proper control, protection, monitoring and communications. The fence was designed in accordance with industry standards to provide safety and security. It was determined through the interconnection process that Meridian Wind would meet capacity limits at Chapelle Station.

4.4 Land Requirements

Temporary construction and long-term operational land requirements are identified below. Table 6-1 in Section 6.0 presents impact calculations.

- Temporary construction land requirements:
 - 150-foot radius at each wind turbine location, which includes a 60-foot-by-80-foot crane pad area at each turbine;
 - Access roads initially will be up to 40 feet wide to accommodate transportation of heavy construction equipment during construction;
 - 40-foot-wide crane paths (contingent upon turbine selection);
 - 40-foot-wide construction workspace to install collector and communication systems;
 - 10-acre temporary laydown/staging area;
 - 5-acre Project collection substation area;
 - An approximately 8.9 mile long 100-foot corridor to install the transmission line and its associated structures; and
 - 100-foot-by-100-foot MET tower workspace.
- Operational impacts during the life of the Project:
 - 35-foot-radius at each wind turbine location;
 - 16-foot-wide long-term operational access roads;
 - 2.5-acre Project collection substation footprint;
 - An approximately 8.9-mile long 150-foot rights-of-way for the transmission line; and
 - 40-foot-by-40-foot MET tower footprint.

4.4.1 *Right-of-way or Condemnation Requirements (ARSD 20:10:22:33.02 and 20:10:22:35)*

Meridian Wind did not use eminent domain powers to acquire easements for the Project. All land rights required for the wind energy facility and transmission line were obtained through voluntary easements with property owners. Private land and public road rights-of-way will be used for all facilities.

4.5 Wind Farm Facility Construction, Restoration, Operation and Maintenance Procedures

Meridian Wind plans to commence construction as early as within 30 days of receiving all required federal, state, and local permits and approvals. Construction is expected to require a period of approximately 12 months or less. Meridian Wind anticipates that the majority of civil construction will begin in early 2021. Turbine deliveries will occur through the spring and summer of 2021. Energization of the Project substation will occur by November 1, 2021, or earlier per contractual requirements, with a reduction in construction activities over the winter.

4.5.1 *Mobilization and Site Preparation*

The first step in construction will be to survey, stake, and prepare the workspace for clearing. Meridian Wind will then have the workspace cleared and graded, as necessary, to provide for construction access and the safe movement of equipment and personnel during construction. Silt fence and other erosion control measures will be installed in accordance with the Project's Stormwater Pollution Prevention Plan (SWPPP) and applicable permit conditions. Environmentally sensitive areas will be marked for avoidance. Meridian Wind will implement appropriate safety measures before excavation begins, including notification through the South Dakota One-Call system to ensure third-party utilities and adjacent pipelines are properly marked. Equipment and vehicles will be transported to the Project Area and staged at the temporary laydown/staging area. During construction activities, dust control measures will be applied to manage dust along access roads, the laydown/staging area, and other construction workspaces.

Potable water and sanitary facilities will be established to support the construction crews at the Project site. Potable water will be provided from off-site facilities, and sanitary facilities will be provided in the form of portable latrines by an outside vendor. Some construction areas and the laydown/staging area will be fenced to prevent access by wildlife or unauthorized personnel as needed.

4.5.2 *Roadwork*

Meridian Wind will construct one gravel access road to each turbine location. Access roads will initially be up to 40 feet wide to accommodate transportation of heavy construction equipment during construction. Before gravel is placed on the access roads, topsoil will be removed and stockpiled in the temporary construction workspace, subsoil will be compacted, and a geotextile matting will be installed. Meridian Wind will install temporary culverts and field approaches where needed to maintain adequate access and drainage throughout construction.

After construction has been completed, temporary access roads will be converted to narrower, long-term operational access roads up to 16 feet wide. These long-term operational access roads will be maintained to facilitate access to the turbine for ongoing operation and maintenance. The temporary portion of the

access roads will be restored after use by removing the gravel and geotextile fabric, decompacting the subsoil, and replacing the stored topsoil.

A similar process will be used to develop crane paths. Meridian Wind will clear, grade, and segregate the topsoil along the crane paths and compact the subsoil. Once construction is complete, crane paths will be restored by decompacting the subsoil, replacing the topsoil, and seeding in accordance with landowner or local agency requests.

Public roads may also need improvements to allow for the safe and efficient access of flatbed trailers carrying the turbine tower components to the Project Area. Meridian Wind is in the process of identifying the best haul route to the Project Area and where existing road improvements may be required. Final haul routes will be selected in consultation with the Hyde County Road Department during the development of a Project specific road use agreement. Meridian Wind will work with the appropriate federal, state, and/or local agencies to obtain the permits required for these improvements. See Section 16.4 for more information.

4.5.3 Installation of Turbine Foundations

Meridian Wind will next initiate the construction of the turbine foundations by clearing, removing, and stockpiling the topsoil and subsoil from each turbine site. Topsoil and subsoil will be stored separately in a semicircle around the foundation. Foundations will be constructed by excavating an approximately 75-foot-diameter hole, placing reinforcing steel and pouring concrete into the excavation. Next, the subsoil and topsoil will be replaced over most of the concrete foundation, leaving only the center of the foundation above the surface grade.

Meridian Wind will clear, grade, and develop a 150-foot radius around each turbine location, including a 60-by-80-foot crane pad area extending from the access road to the turbine foundation, that will be used to erect the turbine tower. After construction, a 35-foot radius around each turbine will be maintained and graveled to prevent potential damage to the underground foundation and cabling that extends to each turbine. The remaining temporary construction area around each wind turbine will be restored and returned to its pre-construction use pursuant to the contractual easement obligations.

4.5.4 Installation of Electrical Collector and Communication Systems

To install the underground collection lines and fiber optic cables, Meridian Wind will trench, plow, or where needed, directionally bore the cables underground to avoid sensitive environmental areas or to address other needs. Trenching and plowing are anticipated to be the primary methods of installation. Typical collector lines will be installed at least 42 inches below grade. Generally, the electrical collection lines will be buried with marking tape and tracer wire per appropriate national electrical code and the Project will register the appropriate underground facilities with the South Dakota One-Call system. Lines are typically plowed in using bulldozers and associated plowing equipment. Where trenching is appropriate, topsoil will be segregated according to applicable permit conditions. The cables will be placed into the trench and backfilled. During backfilling, subsoil will be replaced first and then the topsoil will be replaced.

4.5.5 Tower Deliveries and Erection

The first sections of the turbine to be delivered and erected are the base and mid-sections of the tower. These will be transported to the Project Area by semi-truck and then assembled by crane in the crane pad area. The typical process includes the following steps.

1. The two tower sections are assembled, and the base is bolted to the foundation.
2. The top tower section is erected and then the nacelle is raised and bolted to the top.
3. The blades are connected to the hub, collectively called the rotor assembly, which is then connected to a shaft that passes into the nacelle.

Each turbine requires 4 to 5 days to erect, from offload to pre-assembly and staging of components. Once installed, Meridian Wind will mark and light the turbines to comply with FAA requirements and the requirements of other permits.

4.5.6 Construction of Project Collection Substation

The Project collection substation area will require initial civil and grading work to prepare for construction and to create positive drainage for the facilities. The collection substation will be constructed, and all associated safety, electrical, and controls equipment will be installed using applicable utility standards. Power and control cables will be routed, and additional pre-operational testing could begin once the system(s) are energized. Once the Project is fully operational, all systems will then be re-checked. Final site civil work will be completed. Once all final checks have been completed, the facility will be turned over to operations for in-service operation.

4.5.7 Installation of Permanent Meteorological Tower

Similar to turbines, one permanent MET tower will be erected using a crane. The base will be erected and bolted to the foundation. A 100-by-100-foot square temporary workspace will be required for foundation installation and stacking the MET tower. The foundation will be a 10-by-10-foot square within a 40-foot by 40-foot footprint, and long-term operational access roads will be required. Meridian Wind will paint the MET tower to meet applicable regulations and best practices to improve visibility. Meridian Wind will also notify local airports about the Project and new towers in the area to reduce the risk to crop dusters. The permanent MET tower will be free-standing with no guy wires and equipped with FAA approved lighting and markings.

4.5.8 Restoration Procedures

Once construction is complete, the construction workspace will be cleaned up and restored. All temporary construction workspaces, such as the crane paths, temporary access roads, the temporary laydown/staging area, and extra workspace areas (e.g., crane pad) will be restored by removing gravel (where applicable), decompacting the subsoil, and replacing stored topsoil to pre-construction conditions pursuant to the contractual easement obligations. Temporary and long-term operational stabilization measures, such as slope breakers and mulching and seeding with the appropriate seed mix will then be implemented. Meridian Wind will compensate landowners for damages from Project construction to crops, tile, fences, or other property.

Meridian Wind will develop and implement a Noxious and Invasive Weed Management Plan that will identify and establish the procedures to prevent the introduction and spread of noxious and invasive

weeds during construction and ongoing operations. Additional information regarding noxious weeds is available in Section 9.1.

4.5.9 Operation and Maintenance

The expected life span of the Project is approximately 25 years. As described in Section 4.2.1, all proposed turbine models have SCADA communication technology to control and monitor the Project. The SCADA communications system permits automatic, independent operation and remote supervision, allowing the simultaneous control of the wind turbines at all times. An operation and maintenance crew will be on-site during normal working hours to monitor turbine operation from the O&M facility and to conduct maintenance activities.

All major components of turbines will undergo routine maintenance according to the schedules established by the component manufacturer. Examples of such activities include lubrication filter replacements, gear oil changeouts, adding coolant, greasing, and applying paints or coatings for corrosion control. Over the life of the turbine, some mechanical components may also need repair or replacement.

Other activities include the regrading and gravel replacement on access roads, routine electrical inspections, and the application of herbicides to control noxious and invasive weeds. Meridian Wind will also conduct routine preventative maintenance testing of on-site emergency power generators and maintain fuel levels of on-site propane and fuel tanks.

Access doors to individual turbine towers will be secured against unauthorized entry at all times. Doors to the O&M facility and equipment enclosures will also be locked, and physical barriers such as fences will be maintained around the Project collection substation, interconnection switching station, and external tower transformers to prevent unauthorized entry.

4.5.10 Decommissioning

The anticipated Project life is approximately 25 years beyond the date of initiating commercial operation. At the end of commercial operation, Meridian Wind will be responsible for removing wind facilities and the turbine foundations to a depth of 4 feet below grade. In this case, a decision may be made on whether to continue operation with existing equipment or to retrofit the turbines and power system with upgrades based on newer technologies.

Meridian Wind will be responsible for all costs to decommission the Project and associated facilities. Meridian Wind has outlined its decommissioning plan similar to the Triple H Wind Project and anticipates similar SDPUC conditions. The cost to decommission will depend on the prevailing rates for salvage value of the equipment and labor costs. Because of the uncertainties surrounding future decommissioning costs and salvage values, Meridian Wind will review and update the cost estimate of decommissioning and restoration for the Project every 5 years after Project commissioning. See Section 19.0 of this Application for more detail on decommissioning.

4.6 Transmission Facility Construction, Restoration, Operation and Maintenance Procedures

4.6.1 Mobilization and Site Preparation

Construction of a transmission line generally follows a sequence of surveying the centerline, determining construction access, installing foundations, assembling and erecting the structures, installing shield wires and conductors, installing ground rods, and cleanup and site reclamation. Construction will begin after applicable permits and approvals have been obtained, property and rights-of-way are acquired, soil conditions are established, and final design is completed. The precise timing of construction will consider various requirements that may be in place due to permit conditions, system loading issues, weather and available workforce and materials.

Surveyors will stake the construction corridor within the approved construction workspace and the pole locations of the approved alignment in preparation for the construction crew arriving on site. Meridian Wind will then have the workspace cleared and graded, as necessary, to provide for construction access and the safe movement of equipment and personnel during construction. Typical construction equipment that would be used on the Project consists of tree removal equipment, mowers, cranes, backhoes, digger-derrick line trucks, track-mounted drill rigs, dump trucks, front-end loaders, bucket trucks, bulldozers, flatbed tractor-trailers, flatbed trucks, pickup trucks, concrete trucks, and various trailers.

Silt fence and other erosion control measures will be installed in accordance with the Project's SWPPP and applicable permit conditions. Environmentally sensitive areas will be marked for avoidance. Meridian Wind will implement appropriate safety measures before excavation begins, including notification through the South Dakota One-Call system to ensure third-party utilities and adjacent pipelines are properly marked. Equipment and vehicles will be transported to the Project Area and staged at the temporary laydown/staging area. During construction activities, dust control measures will be applied to manage dust along access roads, the laydown/staging area and other construction workspaces.

Potable water and sanitary facilities will be established to support the construction crews at the Project site. Potable water will be provided from off-site facilities and sanitary facilities will be provided in the form of portable latrines by an outside vendor. Some construction areas and the laydown/staging area will be fenced to prevent access by wildlife or unauthorized personnel as needed.

4.6.2 Transmission Line Construction Procedures

Transmission line structures are generally designed for installation at existing grades. Typically, structure sites with ten percent or less slope will not be graded or leveled. Sites with more than ten percent slope will have working areas graded level or fill brought in for working pads. If the landowner permits, it is preferred to leave the leveled areas and working pads in place for use in future maintenance activities. If permission is not obtained, the site will be graded back to its original condition as much as possible, and all imported fill, including temporary culverts and road approaches, will be removed from the site and disturbed areas will be returned to pre-disturbance conditions. Meridian Wind anticipates that only minimal grading will be needed because the route has very little elevation change. Where grading is required, the topsoil will be removed and stored for replacement after construction is complete.

The staging area required for construction of the transmission line will be shared with construction activities at the wind farm. Structures are delivered to staging areas, sorted and loaded onto structure trailers for delivery to the staked location and are stored until they are needed for the Project. When it is

time to install the poles, structures are moved from the staging areas, delivered to the staked location and placed within the transmission line corridor until the structure is set. Insulators and other hardware would be attached while the pole is on the ground. The monopole structures for the Project will be secured using concrete foundations. Topsoil and subsoil will be excavated for the pole foundation, concrete poured, and pile driven to establish the foundation. The pole will then be lifted, placed, and secured using a crane. Construction mats may be placed in wet or soft soil locations and in narrow ditches to minimize disturbance. These mats also can provide access to sensitive areas during times when the ground is not frozen to minimize impacts at the site.

Access to the transmission line corridor is made directly from existing roads that run parallel or perpendicular to the transmission line. In all cases where construction traffic and activities are within close proximity to local, county or State roadways, the contractor will coordinate with the governing body on traffic control and safety measures. In some situations, private field roads are used. Where necessary to accommodate the heavy equipment used in construction (including cranes, concrete cement trucks, and hole-drilling equipment), existing access roads may be upgraded, or new roads may be constructed. Once construction is complete the construction workspace will be allowed to regenerate naturally so long as it does not encroach on typical utility best practice prescribed clearances. The spoils from the excavated foundation will be removed from site unless other arrangements are made with the landowner.

4.6.3 Switchyard Construction Procedures

As discussed in Section 4.3.4, Chapelle Station is owned and operated by Basin Electric Power Cooperative. The Meridian Wind Project will connect into an open bay that is being constructed within this substation.

4.6.4 Restoration Procedures

During transmission line construction, crews will limit ground disturbance wherever possible. However, areas will be disturbed during the normal course of work, which can last several weeks in any one location. Meridian Wind will take the steps necessary to lessen the impact of the transmission line on the surrounding environment by restoring areas disturbed by construction in accordance with best management practices (BMPs) and the Project's permit conditions. As construction on each parcel is completed, disturbed areas will be restored to their original condition to the maximum extent practicable. Meridian Wind will compensate landowners for damages from Project construction to crops, tile, fences, or other property.

Areas where vegetation is disturbed or removed during construction will be allowed to naturally reestablish to pre-disturbance conditions. Areas with significant soil compaction and disturbance from construction activities may require assistance to reestablish vegetation and control soil erosion. Commonly used methods to accomplish this include, but are not limited to, prompt reseeding of disturbed areas, erosion control blankets, silt fences, and weekly inspection of construction sites for compliance. In addition, Meridian Wind will develop and implement a Noxious and Invasive Weed Management Plan that will identify and establish the procedures to prevent the introduction and spread of noxious and invasive weeds during construction and ongoing operations. Additional information regarding noxious weeds is available in Section 9.1.

4.6.5 *Operations and Maintenance*

Transmission lines are designed to operate for decades and require only moderate maintenance, particularly in the first few years of operation. The estimated service life of a transmission line is estimated for accounting purposes at approximately 40 years; however, high-voltage transmission lines are seldom completely retired. Transmission lines are automatically taken out of service by the operation of protective relaying equipment when a fault is sensed on the system. Such interruptions are usually only momentary. Scheduled maintenance outages also are infrequent.

The principal operating and maintenance cost for transmission facilities is the cost of inspections, which will be performed semi-annually by either truck, utility terrain vehicle, on foot, or by air. Inspections will be conducted to ensure that the transmission line is fully functional and in compliance with utility best practice prescribed clearances. Meridian Wind will prune or remove vegetation as required to prevent physical contact between the transmission lines and nearby vegetation. Actual line-specific maintenance costs depend on the amount of vegetation management necessary, storm damage occurrences, structure types, materials used, and the age of the line.

4.6.6 *Transmission Line Decommissioning*

The anticipated Project life is approximately 25 years beyond the date of initiating commercial operation. At the end of commercial operation, the transmission line will remain in place. The line is assumed to be integrated into the grid and will be used for other purposes besides the Project; therefore, it is not included for removal as a part of the decommissioning effort. See Section 19.0 of this Application for more detail on decommissioning.

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5.0 ALTERNATIVE SITES AND SITING CRITERIA (ARSD 20:10:22:12)

ARSD 20:10:22:12. Alternative sites. The applicant shall present information related to its selection of the proposed site for the facility, including the following:

- (1) The general criteria used to select alternative sites, how these criteria were measured and weighed, and reasons for selecting these criteria;*
- (2) An evaluation of alternative sites considered by the applicant for the facility;*
- (3) An evaluation of the proposed plant, wind energy, or transmission site and its advantages over the other alternative sites considered by the applicant, including a discussion of the extent to which reliance upon eminent domain powers could be reduced by use of an alternative site, alternative generation method, or alternative waste handling method.*

In addition to access to electric transmission facilities and sufficient wind, a wind energy project must be located in an area where landowners are willing to grant various easements and leases on commercially reasonable terms and conditions and where land use provides sufficient space for optimum turbine spacing. Access to electric transmission must be available so that the power generated by the wind project can be relatively easily delivered into the grid. The following sections further describe the criteria used in the selection of the Project Area to develop the turbine configuration layout.

The following sections describe the criteria that were considered in determining the development potential of the site, identifying the appropriate Project Area to develop, and designing the Project's proposed configuration within the Project Area. Included is a summary of how Meridian Wind has voluntarily followed the U.S. Fish and Wildlife (USFWS) Land-Based Wind Energy Guidelines (WEG; USFWS 2012) and the USFWS Region 6 Wildlife Buffer Recommendations for Wind Energy Projects (USFWS 2020a) to minimize risks to species of concerns.

5.1 Site Evaluation Process and Project Area Refinement

Development of a wind energy project is an iterative process that involves: (1) site identification; (2) project area refinement; and (3) micro-siting of project infrastructure. The identification of the Project Area was primarily driven by:

- Available wind energy resource;
- Ready access to transmission interconnection;
- Land use and environmental compatibility with wind development; and
- Landowner support for wind energy development.

Each of these factors is discussed further below.

5.1.1 Wind Resource

Strong wind speeds—key for development of a competitive, economically viable wind project—occur in the region and in the immediate area of the Project. Wind resources in the Project Area are significantly better than an average site in the upper Great Plains, making the Project very competitive on a regional basis. Areas with an annual average wind speed around 6.5 meters per second (m/s) and over 80 meters in height are generally considered to have a wind resource suitable for development. According to the

USDOE (2017), wind resources within the Project's region range from 7.0 to 9.0 m/s at a 100-meter hub height, making it a highly suitable wind resource for economical, sustainable, and reliable production of power. Meridian Wind's proposed hub height is 90 meters.

5.1.2 Ready Access to Transmission Interconnection

The existing Leland Olds to Fort Thompson 345-kV transmission line provided an economically feasible location for the Chappelle Station switching station to be constructed as part of the adjacent Triple H Wind Project, which would allow for the Project to interconnect into the Southwest Power Pool electrical grid. The Chappelle Station will be owned and operated by Basin Electric Power Cooperative. The Triple H Wind Project is located immediately west of State Highway 47 and is currently under construction by Meridian Wind's parent company. The Triple H Wind Project is targeted for commercial operation by the end of 2020. The Chappelle Station will provide ready access to transmission and has the capacity for the Project to interconnect to the electrical grid. The Project is situated to allow economic delivery of power to the electrical grid.

5.1.3 Land Use and Environmental Compatibility

The Project Area was selected following a review of the surrounding land use and regional constraints. The Project is compatible with the existing primarily agricultural land uses consisting of cropland, grassland pasture, and grass hay land. Wind development is particularly compatible with agricultural land because the existing uses can continue around the wind energy facility and transmission line. As a result, wind development allows landowners to diversify their operations with minimal disruption to existing agricultural uses.

Once the initial site location had been selected, the Project Area was modified over time based on landowner interest and to avoid environmental concerns based on consultations with federal, state, and local agencies.

Meridian Wind conducted an evaluation of a 14,586-acre easement area available to propose turbines for the Project after applicable setbacks and constraints were applied (Appendix B). After all setbacks were applied, 2,773 acres of the original easement area was available to place turbines, representing a decrease of more than 80 percent in area. This area was further evaluated for the current Project layout configuration.

5.2 Site Configuration Alternatives

Figure 2 (Appendix A) shows 74 turbine locations, of which up to 64 turbines will be built. The proposed layout reflects an optimal turbine model to best capture wind energy within the Project Area, while avoiding negative impacts to residences, known cultural resources, wetlands, grasslands, and sensitive species and their habitats.

As discussed in Section 4.2, final engineering could result in minor turbine location adjustments. However, the final Project layout will comply with all applicable federal, state, and local requirements, including the state and local requirements and/or commitments listed in Table 5-1 below. The buildable area for turbines, after considering the setbacks in Table 5-1 as well as additional environmental setbacks, is visually depicted on the siting constraints maps provided as Figures 3a and 3b (Appendix A) and discussed further in Appendix B.

Table 5-1. Meridian Wind Turbine Siting Requirements/Commitments

Category	Requirement/Commitment
State Requirements	
Setbacks	Turbines shall be set back at least 500 feet or 1.1 times the height of the tower, whichever is greater, from any surrounding property line. However, if the owner of the wind turbine tower has a written agreement with an adjacent land owner allowing the placement of the tower closer to the property line, the tower may be placed closer to the property line shared with that adjacent land owner (SDCL 43-13-24).
Hyde County	
Setbacks	<ol style="list-style-type: none"> 1. The setback from any established dwelling shall be 2,640 feet or 4.9 times tower height, whichever is greater; an exception may be granted in the event that all adjoining property owners sign an opt out from the setback requirement. The opt out may result in a setback of no less than 1,400 feet minimum from an established dwelling or one point one (1.1) the system height; whichever is greater. 2. The setback from any county gravel roads, section line roads, highways and minimum maintenance roads shall be not less than 750 feet or 1.4 times the tower height, whichever is greater. 3. Distance from the exterior boundary of the proposed wind project shall be not less than 500 feet or 1.1 times the system height, whichever is greater, unless appropriate opt out has been obtained from all adjoining property owners.
Noise	Noise level produced by the large wind energy system (LWES) shall not exceed 45 decibels of sound at the perimeter of occupied residences existing at the time the permit application is filed, unless a signed waiver or easement is obtained from the owner of the residence. The level, however, may be exceeded during short-term events such as utility outages or wind storms.
Turbine Spacing	The turbines shall be spaced no closer than is allowed by the turbine manufacturer in its approval of the turbine array for warranty purposes. Minimum spacing is actually rotor diameter, which is greater than manufacturer requirements.
Flicker	Flicker at any receptor shall not exceed 30 hours per year within an established dwelling and 40 hours per year from any occupied structure.
Height from Ground Surface	The minimum height of blade tips at their lowest possible point shall be 25 feet above grade.

5.3 Lack of Reliance on Eminent Domain Powers

Meridian Wind does not have eminent domain powers to acquire easements for the Project. As a result, selection of an alternative site will not reduce reliance on eminent domain powers. Private land rights and public road rights-of-way will be used for all facilities. All private land rights required for the wind energy facility and transmission line were obtained through voluntary leases with property owners. Meridian Wind will obtain necessary road permits from road authorities prior to construction. Further, Meridian Wind will coordinate with federal, state, and local agencies to obtain appropriate permits for the Project.

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6.0 ENVIRONMENTAL INFORMATION (ARSD 20:10:22:13)

ARSD 20:10:22:13. Environmental information. The applicant shall provide a description of the existing environment at the time of the submission of the application, estimates of changes in the existing environment which are anticipated to result from construction and operation of the proposed facility, and identification of irreversible changes which are anticipated to remain beyond the operating lifetime of the facility. The environmental effects shall be calculated to reveal and assess demonstrated or suspected hazards to the health and welfare of human, plant and animal communities which may be cumulative or synergistic consequences of siting the proposed facility in combination with any operating energy conversion facilities, existing or under construction. The applicant shall provide a list of other major industrial facilities under regulation which may have an adverse effect on the environment as a result of their construction or operation in the transmission site, wind energy site, or siting area.

Sections 7.0 through 11.0 and Sections 13.0, 14.0, and 16.0 provide descriptions of the existing environment at the time of Application submittal, the potential changes to the existing environment that are anticipated as a result of Project construction and operation, and the irreversible changes that are anticipated to remain beyond the operational lifetime of the facility. These sections also identify the avoidance, minimization, and mitigation measures that will be implemented for the Project.

Impacts are quantified where possible based on either publicly available information or field survey data. For purposes of analyzing environmental resource impacts, both temporary construction and long-term operational impacts were evaluated, including the permanent MET tower location and the transmission line structures. For this reason, impacts to environmental resources are based on a worst-case scenario.

Two operating energy conversion facilities, and one currently under construction energy conversion facility are located in proximity to the Project Area (Figure 1 in Appendix A):

- Triple H Wind Project will consist of 92 turbines and will be an approximately 250-MW facility located immediately adjacent to the Project to the west of State Highway 47. Triple H Wind Project's SDPUC application was approved in July 2019 and is currently under construction (Docket # EL 19-007).
- The South Dakota Wind Energy Center is a 40.5-MW facility located approximately 0.6 miles southwest of the Project Area. This NextEra Energy Resources wind farm consists of 27 turbines and has been in operation since 2003.
- The Titan Wind Project, consisting of 10 turbines generating 25 MW, is located approximately 7.4 miles east of the Project Area. This project has been in operation since December 2009.

Although the SDPUC has siting authority for wind farms with a capacity of 100 MW or more, and two of these facilities fall below that threshold, Meridian Wind has reviewed the cumulative effects associated with the operation of all three of the wind projects listed above and the currently proposed Project.

Because of the distance of the Titan Wind Project from the Project Area, construction and operation of the Project will not result in cumulative effects on resources in the area from siting the Project.

The Project, in combination with the 40.5-MW South Dakota Wind Energy Center and Triple H Wind, will result in the construction and operation of up to 181 wind turbines and associated access roads, transmission line, collector lines, and other facilities in Hyde County. The South Dakota Wind Energy

Center turbines are in short east-west oriented strings, with the strings approximately 2 miles long (Figure 1 in Appendix A). Triple H wind turbines are west-east oriented strings with the strings approximately 2 to 4 miles long.

Table 6-1 presents both the temporary construction impacts and long-term operational impacts by Project component and is limited to the final Project layout not including Project interconnection switching station, transmission line structures, temporary batch plant locations, and the laydown area location. See section 4.0 for additional information on Project components.

Table 6-1. Summary of Meridian Wind Ground Disturbance Impacts

Project Component ¹	Construction Impacts (Temporary)		Operational Impacts (Long-Term)	
	Dimensions	Total Acreage	Dimensions	Total Acreage
Turbine Foundations ² (includes crane pad area adjacent to turbine foundation)	150-foot radius x 64 turbines	103.6	35-foot radius x 64 turbines	5.6
Access Roads ^{3,4}	40-foot-wide x 24.6 miles	118.0	16-foot-wide x 24.6 miles	47.3
Electrical Collector and Communication Systems	40-foot-wide x 38.6 miles	180.4	N/A	0
Temporary Laydown/Staging Area	10 acres	10	N/A	0
Batch Plant(s), if Required	3 acres x 2 locations	6	N/A	0
Project Collection Substation ⁴	5 acres	5	2.5 acres	2.5
One Permanent MET Tower	100-foot by 100-foot	0.2	40-foot by 40-foot	0.04
	TOTAL	423.2	TOTAL	55.4

1 The O&M facility, ADLS system, and interconnection switching stations acreages are not included as these components will be built as part of the Triple H Wind Project. The transmission line will be located within a 100-foot-wide by 8.9-mile-long corridor. Meridian Wind is in early stages of design and has not identified the location or type of pole structures. Meridian Wind requests the permit allow structures to be placed within the easement, avoiding any constraints.

2 Ground disturbance impacts are based on installing 64 GE turbines.

3 Separate crane paths up to 40 feet wide may be required. Following completion of construction, any temporary crane paths will be removed, and the area restored pursuant to the contractual easement obligations.

3 Access road calculations are based on routes to up to 64 turbines.

4 Total impact may be overestimated due to overlap of components.

5 Transmission line structures will be located within an 8.9-mile-long, 150-foot right-of-way. Meridian Wind will maintain vegetation to keep with good utility best practice prescribed clearances.

As discussed in Sections 7.0 through 16.0 of this Application, impacts to the physical environment, hydrologic resources, terrestrial and aquatic ecosystems, and socioeconomic and community resources have been avoided or minimized during the siting and design of the Project. Furthermore, implementation of the mitigation measures identified in this Application will minimize potential impacts of the Project on all resources. Because of the measures that Meridian Wind will implement to minimize the potential impacts of the Project on all resources, the construction and operation of the Project will not cause any irreversible change that would exist beyond the operating lifetime of the facility.

7.0 EFFECT ON PHYSICAL ENVIRONMENT (ARSD 20:10:22:14)

ARSD 20:10:22:14. Effect on physical environment. The applicant shall provide information describing the effect of the proposed facility on the physical environment. The information shall include:

- (1) A written description of the regional land forms surrounding the proposed plant or wind energy site or through which the transmission facility will pass;*
- (2) A topographic map of the plant, wind energy, or transmission site;*
- (3) A written summary of the geological features of the plant, wind energy, or transmission site using the topographic map as a base showing the bedrock geology and surficial geology with sufficient cross-sections to depict the major subsurface variations in the siting area;*
- (4) A description and location of economic deposits such as lignite, sand and gravel, scoria, and industrial and ceramic quality clay existent within the plant, wind energy, or transmission site;*
- (5) A description of the soil type at the plant, wind energy, or transmission site;*
- (6) An analysis of potential erosion or sedimentation which may result from site clearing, construction, or operating activities and measures which will be taken for their control;*
- (7) Information on areas of seismic risks, subsidence potential and slope instability for the plant, wind energy, or transmission site; and*
- (8) An analysis of any constraints that may be imposed by geological characteristics on the design, construction, or operation of the proposed facility and a description of plans to offset such constraints.*

7.1 Geological Resources

7.1.1 Existing Geological Resources

7.1.1.1 Regional Landforms/Physiography

The Meridian Wind Project Area lies entirely within the Great Plains Province, the second largest physiographic province in the United States. The Great Plains span 450,000 square miles of flat high plains, bordered to the west by the Rocky Mountains and the east by the Central Lowlands (NPS 2020a).

The Project Area lies within the Coteau du Missouri division of the Great Plains Province. The Coteau du Missouri is a north-south trending 25- to 80-mile-wide highland extending through South Dakota. The James Basin division, located east and northeast of the Project Area, is approximately 500 feet lower in elevation than the Coteau du Missouri. Transition from the Coteau du Missouri to the James Basin is gradual. In Hyde County, this broad low area, called the Great Ree Valley, is bounded by the Orient Hills to the north and the Ree Hills to the south. The Project Area is in south-central Hyde County in the Ree Hills. The Ree Hills have the highest elevation in the county with an elevation of 2,190 feet above mean sea level located south of the Project Area. The Project Area is located on a stagnation moraine consisting of glacial till of Wisconsin age with numerous closed small depressions (Helgerson and Duchossois 1987). The Missouri River Trench and Lake Sharpe impoundment of the Missouri River is located in extreme southwestern Hyde County with a full pool level of 1,420 feet above mean sea level (Helgerson and Duchossois 1987; Lakes Online 2020). This represents a topographic variation in Hyde County of approximately 770 feet. Figure 4a (Appendix A) shows that the topographic relief within the Project Area ranges from approximately 1,860 to 2,111 feet above mean sea level, which represents a variation of

approximately 251 feet (U.S. Geological Survey [USGS] 7.5-minute topographic quadrangles Chapelle Lake NW, Chapelle Lake and Macs Corner; USGS 2020a).

7.1.1.2 Surficial Geology

The surficial geology of Hyde County consists of late Wisconsin age glacial deposits, which form a mantle up to 500 feet thick over the Pierre shale bedrock and consist primarily of till and outwash. In Hyde and Hughes counties, these surficial deposits average 200 feet in thickness. Recent deposits include alluvial sediments in stream valleys and colluvium along the Coteau du Missouri escarpment (Helgerson and Duchossois 1987). Figures 4a through 4c (Appendix A) illustrate the surficial geology present within the Project Area, which consists of:

- Upper Wisconsin Outwash valley train (Qlov): Consists of varying amounts of sand and gravel with some silt and clay of glacial origin that can reach up to 150 feet in thickness. A geomorphic feature that is characterized by relatively flat terraces. Outwash valley train is only present in the very northern portions of the Project Area associated with the South Fork Medicine Knoll Creek corridor.
- Upper Wisconsin Ground moraine till (Qltg): Consists of a compact, silty, clay-rich matrix with sand- to boulder- sized clasts of glacial origin. A geomorphic feature that is characterized by smooth, rolling terrain. Composite thickness of upper Wisconsin till may be up to 300 feet. Ground moraine till is only present in the very northern portion of the Project Area.
- Upper Wisconsin End moraine till (Qlte): Consists of compact, silty, clay-rich matrix with sand- to boulder-sized clasts of glacial origin. A geomorphic feature that is characterized by a ridge-like accumulation of glacial drift typified by lineations and pot holes. End moraine till is only present in the very northern portion of the Project Area.
- Upper Wisconsin Stagnation moraine till (Qlts): Consists of a compact, silty, clay-rich matrix with sand- to boulder-sized clasts of glacial origin. A geomorphic feature that is characterized by hummocky terrain with abundant sloughs resulting from stagnation of ice sheets. Composite thickness of upper Wisconsin till may be up to 300 feet (Stoeser et al. 2005). Stagnation moraine till is the predominant surficial geology that covers most of the Project Area including the transmission line corridor.

7.1.1.3 Bedrock Geology

Upper Cretaceous age Pierre shale is the shallowest bedrock encountered and ranges from 220 to 710 feet in thickness. The shale outcrops in the extreme southwest portion of Hyde County near the Missouri River. In the rest of Hyde County and in the Project Area, the shale lies beneath thick glacial deposits (Helgerson and Duchossois 1987). Pierre shale is a blue-gray to dark-gray, fissile to blocky shale with persistent beds of bentonite, black organic shale, and light-brown chalky shale. It contains minor sandstone, conglomerate, and abundant carbonate and ferruginous concretions (Tomhave and Schulz 2004).

7.1.1.4 Mineral Resources/Economic Deposits

Commercial mineral deposits within the Project Area are limited to sand, gravel, and construction aggregate enterprises. Information from the South Dakota Department of Environment and Natural

Resources (SDDENR) Minerals and Mining Program mapping does not show any active sand and gravel sites within the Project Area (SDDENR 2020a). The nearest sand and gravel operations are located approximately 2 miles east (Figure 4a in Appendix A).

A review of the online information from the SDDENR Oil and Gas Initiative Program Geographic Information System (GIS) website shows that the Project Area does not lie within an oil and gas field (SDDENR 2020b). The nearest identified oil and gas fields are the Lantry field in Dewey County, located approximately 100 miles northwest of the Project Area and the Faith field located in Meade County, approximately 130 miles northwest of the Project (SDDENR 2020b). The nearest oil and gas wells are dry holes located in Hughes and Buffalo counties. No other active or historical economic mineral deposits have been identified within the vicinity of the Project.

7.1.1.5 Seismic Risks

The risk of seismic activity in the Project Area is extremely low to negligible. According to USGS's 2014 Seismic Hazard Map for the United States (Petersen et al. 2015), a 2 percent chance exists for an earthquake to occur within the Project Area in the next 50 years (i.e., a recurrence interval of 2,500 years) that could result in a peak ground acceleration of between 6 percent of gravity (0.06 g) and 8 percent gravity (0.80 g)¹. The USGS estimates a 10 percent chance exists for an earthquake to occur within the Project Area in the next 50 years (i.e., a recurrence interval of 475 years) that could result in a peak ground acceleration of between 1 and 2 percent gravity. For reference purposes, 1 to 2.5 percent gravity earthquakes can be felt outdoors, sleepers are awakened, liquids are disturbed and possibly spilled, small unstable objects can be displaced or upset, doors swing open and closed, and shutters and pictures move. Five to 10 percent gravity earthquakes can make it difficult to stand, is noted by car drivers, hanging objects quiver, some cracks occur in non-reinforced masonry, waves occur on ponds, small slides and caving in can occur along sand or gravel banks, large bells ring, and concrete culverts can be damaged (Seismic Research Centre 2020).

According to the South Dakota Geologic Survey (SDGS), one earthquake has been recorded in Hyde County from 1872 to 2013. This 4.4 Richter scale magnitude earthquake occurred on March 1983 (SDGS 2013). A review of the geologic mapping and information provided by the USGS Earthquake Hazards Program indicate that there are no active or inactive faults in the vicinity of the Project (USGS 2020b).

7.1.1.6 Subsidence Potential

The potential for subsidence within the Project Area is negligible. The Pierre Shale bedrock is buried beneath an approximate 80- to 300-foot-thick layer of glacial deposits across the Project vicinity (Helgerson and Duchossois 1987; Figures 4b and 4c). Additionally, the bedrock does not exhibit karst topography or contain subsurface geologic layers or members that are identified as susceptible to dissolution by water (Schultz, Tourtelot, Gill and Boerngen 1980). Meridian Wind is not aware of any documented historic underground mining operations within the Project vicinity, which could indicate a potential subsidence risk.

7.1.2 Impacts to Geological Resources

The geologic conditions within the Project Area are appropriate for the construction of the Project and will result in negligible impacts on geologic resources. Excavation, bearing, and groundwater conditions

¹ "g" refers to gravity

are anticipated to be conducive to construction and operation of the Project facilities. Excavation and trenching will be required to install the wind turbines and associated collection and communications systems. Trenching will also be required for the installation of the transmission line structures as described in Section 4.6. Meridian Wind will clear vegetation and grade construction workspaces, access roads, and crane paths.

The depth to bedrock averages 200 feet in Hyde and Hughes counties (Helgerson and Duchossois 1987). Project construction activities are primarily limited to the upper 30 to 40 feet; therefore, excavation required for the installation of the turbines, collection and communication systems, and transmission structures are unlikely to encounter or impact the underlying bedrock.

Operational impacts to bedrock or surface geology are limited to temporary impacts associated with maintenance activities that may require excavation. Given the limited potential for large, seismically induced ground movements, there is minimal risk of earthquake-related impacts on the Project.

Construction and operation of the Project will not interfere with the ongoing operation of sand and gravel pit operations located near the Project. The closest sand and gravel operation are located approximately 2 miles east of the Project Area (Figure 4a in Appendix A).

7.1.3 Mitigation Measures for Geological Resources

As discussed in Section 7.1.1.2, the Project is not anticipated to impact bedrock because the depths of excavation are shallower than the estimated depth of bedrock in the Project Area. Therefore, blasting is not anticipated.

Geologic hazards, such as seismicity, are considered to be extremely low to negligible in the Project Area. Given the limited potential for large, seismically induced ground movements, there is minimal risk of earthquake-related impacts on the Project. No additional mitigation beyond designing the Project to currently accepted industry specifications will be required.

7.2 Soil Resources

7.2.1 Existing Soil Resources

Soil characteristics within the Project Area were assessed using the Soil Survey Geographic Database (SSURGO; NRCS 2020b). The SSURGO database is a digital version of the original county soil surveys developed by the Natural Resources Conservation Service (NRCS) for use with GIS. It provides the most detailed level of soils information for natural resource planning and management. The majority of the details were gathered at a scale of 1:12,000. Soil maps are linked in the SSURGO database to information about the component soils and their properties (NRCS 2020b).

Table 7-1 lists the soil types located within the Project Area, which are also displayed on Figure 5a (Appendix A).

Table 7-1. Soil Map Units within the Project Area

Map Unit Symbol	Map Unit Name	Slope Gradient	Acres in Project Area	Percent of Project Area
ReB	Eakin-Raber complex, 2 to 6 percent slopes	4	2.40	0.0
ZmD	Peno-Raber loams, hilly	12	2.40	0.0
ZyD	Java-Glenham loams, hilly	12	0.80	0.0
BkF	Betts-Java loams, 20 to 40 percent slopes	30	56.60	0.4
CrA	Cavo-Jerauld loams, 0 to 4 percent slopes	2	771.80	5.1
Cs	Cavo-Stickney loams	1	788.00	5.2
Df	DeGrey-Walke silt loams, 0 to 2 percent slopes	1	1,503.70	10.0
Du	Durrstein-Egas complex	1	53.50	0.4
EpC	Eakin-Peno complex, 6 to 9 percent slopes	8	782.50	5.2
ErA	Eakin-Raber complex, 0 to 2 percent slopes	1	123.10	0.8
ErB	Eakin-Raber complex, 2 to 6 percent slopes	4	2,200.30	14.6
GmB	Glenham-Java-Prosper loams, 1 to 6 percent slopes	4	216.30	1.4
GrA	Glenham-Prosper loams, 0 to 2 percent slopes	1	1.80	0.0
HdA	Highmore-DeGrey silt loams, 0 to 2 percent slopes	1	1,655.80	11.0
HdB	Highmore-DeGrey silt loams, 2 to 6 percent slopes	4	1,449.30	9.6
HeA	Highmore silt loam, 0 to 2 percent slopes	1	73.10	0.5
HeB	Highmore silt loam, 2 to 6 percent slopes	4	222.90	1.5
Ho	Hoven silt loam, 0 to 1 percent slopes	1	120.90	0.8
JaC	Java, stony-Glenham-Prosper loams, 1 to 9 percent slopes	6	6.50	0.0
JbD	Java-Betts loams, 6 to 15 percent slopes	11	26.30	0.2
JgC	Java-Glenham loams, 6 to 9 percent slopes	8	11.30	0.1
Ma	Macken silty clay loam, 0 to 1 percent slopes	1	109.10	0.7
Mb	Macken silty clay loam, ponded	1	215.30	1.4
OnA	Mobridge silt loam, 0 to 2 percent slopes	1	93.10	0.6
Os	Onita-Hoven silt loams	1	13.40	0.1
PgD	Peno-Gettys clay loams, 9 to 15 percent slopes	12	193.90	1.3
Pk	Plankinton silt loam	1	134.80	0.9
RcA	Raber-Cavo loams, 0 to 2 percent slopes	1	952.90	6.3
RcB	Raber-Cavo loams, 2 to 6 percent slopes	4	1,434.00	9.5
RpB	Raber-Peno loams, 2 to 6 percent slopes	4	595.30	4.0
RpC	Raber-Peno loams, 6 to 9 percent slopes	7	896.00	6.0
StA	Stickney-Java loams, 0 to 4 percent slopes	1	16.50	0.1
Te	Tetanka silt loam, 0 to 1 percent slopes	1	280.40	1.9
W	Water	N/A	38.80	0.3
Totals			15,042.8	100

7.2.1.1 Prime Farmland

Prime farmland is defined by the U.S Department of Agriculture (USDA) as land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, and oilseed crops and is also available for these uses (the land could be cropland, pasture, woodland, or other lands). Urbanized land and open water cannot be designated as prime farmland. Prime farmland typically contains few or no rocks, is permeable to water and air, is not excessively erodible or saturated with water

for long periods, and is not subject to frequent or prolonged flooding during the growing season. Soils that do not meet the above criteria may be considered prime farmland if the limiting factor is mitigated (e.g., by draining or irrigating).

The NRCS also recognizes farmlands of statewide importance, which are defined as lands other than prime farmland that are used for production of specific high-value food and fiber crops (e.g., citrus, tree nuts, olives, fruits, and vegetables). Farmlands of statewide importance have the special combination of soil quality, location, growing season and moisture supply needed to economically produce sustained high quality or high yields of specific crops when treated and managed according to acceptable farming methods. Farmland of statewide importance is similar to prime farmland but with minor shortcomings such as greater slopes or less ability to store soil moisture. The methods for defining and listing farmland of statewide importance are determined by the appropriate state agencies, typically in association with local soil conservation districts or other local agencies.

Approximately 65 percent of the Project Area is classified as not prime farmland, and approximately 1 percent of the Project Area is classified as prime farmland (Table 7-2; Figure 5b in Appendix A). Approximately 17 percent of the Project Area is classified as farmland of statewide importance. The remaining land within the Project Area is considered prime farmland if irrigated (17 percent).

Table 7-2. Summary of Farmland Types Affected by the Project

Farmland Categorization	Acres in Project Area	Percent of Project Area	Construction Impacts ¹ (Temporary, Acres)	Operational Impacts ¹ (Long-Term, Acres)
Prime Farmland	93.1	0.6	1.0	0.0
Farmland of Statewide Importance	2,520.30	16.8	71.8	8.8
Not Prime Farmland	9,808.20	65.1	296.6	31.0
Prime Farmland if Irrigated	2,621.20	17.4	104.8	13.2

¹ Does not include laydown/staging areas, batch plants, MET tower footprint, transmission structures (locations not yet determined).

7.2.1.2 Drainage Class

The drainage class identifies the natural drainage condition of the soil. It refers to the frequency and duration of wet periods and provides a guide to the limitations and potentials of the soil for field crops, forestry, range, wildlife, and recreational uses. The class roughly indicates the degree, frequency, and duration of wetness, which are factors in rating soils for various uses (NRCS 2020b). Approximately 72 percent of the Project Area is classified as well drained.

7.2.1.3 Erosion Potential

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation and the Revised Universal Soil Loss Equation to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter, and on soil structure and saturated hydraulic conductivity (Ksat). Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water. The soils in the Project Area are moderately susceptible to erosion and have K factors ranging from 0.170 to 0.49, with the majority between 0.24 and 0.37.

A wind erodibility group consists of soils that have similar properties affecting their susceptibility to wind erosion. Soils assigned to group 1 are the most susceptible to wind erosion and those assigned to group 8

are the least susceptible. The soils in the Project Area have limited susceptibility to wind erosion, i.e., groups ranging from 4 to 6, with the majority being in group 6.

7.2.1.4 Steep Slopes

The slope gradient of a soil influences several characteristics such as the ability of a soil to retain water and the potential for accelerated erosion or subsidence (NRCS 2020b). The slope gradient of a soil is used to assess soils with high water erosion potential and is a factor used to identify soils that may have revegetation concerns. Slopes in the Project Area range from zero to 40 percent, with the majority of slopes from zero to 4 percent.

7.2.2 Impacts to Soil Resources

Construction activities such as clearing, grading, trench excavation and backfilling, as well as the movement of construction equipment within the construction workspace, may result in impacts to soil resources. Potential impacts on soil resources include soil erosion, soil compaction, reduction of soil fertility and changes to other soil characteristics. Clearing removes protective cover and exposes soil to the effects of wind and precipitation, which may increase the potential for soil erosion and movement of sediments into sensitive environmental areas. Grading and equipment traffic may compact soil, reducing porosity and percolation rates, which could result in increased runoff potential. Contamination from release of fuels, lubricants and coolants from construction equipment could also impact soils. The majority of these impacts are temporary and related to construction activities; however, there will be long-term operational impacts associated with aboveground facilities.

Table 7-2 provides a summary of farmland types identified within the temporary and long-term operational footprints associated with aboveground facilities, such as the wind turbines, Project collection substation, and long-term operational access roads. Land impacted by the installation of these facilities will be converted to impervious surfaces, thereby altering the soil composition at these locations.

7.2.3 Mitigation Measures for Soil Resources

Wind facilities are predominantly designed with turbines situated at higher elevations to minimize obstructions to wind. The current layout sites access roads away from steep slopes to the degree possible. The underground collector lines also avoid crossing steep ravines. Geotechnical soil borings will be conducted at wind turbine foundation and transmission line structure locations prior to construction to determine the soil suitability to support turbine and transmission line structure foundations. This information will help dictate final design parameters of the turbine and structure foundations.

Construction of the Project will require coverage under the SDDENR General Permit for Storm Water Discharges Associated with Construction Activities. To maintain compliance with provisions of this General Permit, Meridian Wind will prepare a SWPPP to identify potential sources of stormwater pollution from the Project Area and specify BMPs to control erosion and sedimentation and minimize negative impacts caused by stormwater discharges from the Project. The SWPPP will be prepared prior to construction of the Project. The SWPPP will be implemented from the initiation of construction and used through site restoration efforts. Once construction has been completed, Meridian Wind will backfill graded and excavated areas with the stored native material and return surface conditions to pre-construction conditions. During Project operation, stormwater volume, stormwater flow and erosion, and sediment impact to surface water and groundwater resources are not anticipated to change from pre-construction conditions.

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8.0 EFFECT ON HYDROLOGY (ARSD 20:10:22:15)

ARSD 20:10:22:15. Hydrology. *The applicant shall provide information concerning the hydrology in the area of the proposed plant, wind energy, or transmission site and the effect of the proposed site on surface and groundwater. The information shall include:*

- (1) A map drawn to scale of the plant, wind energy, or transmission site showing surface water drainage patterns before and anticipated patterns after construction of the facility;*
- (2) Using plans filed with any local, state, or federal agencies, indication on a map drawn to scale of the current planned water uses by communities, agriculture, recreation, fish, and wildlife which may be affected by the location of the proposed facility and a summary of those effects;*
- (3) A map drawn to scale locating any known surface or groundwater supplies within the siting area to be used as a water source or a direct water discharge site for the proposed facility and all offsite pipelines or channels required for water transmission;*
- (4) If aquifers are to be used as a source of potable water supply or process water, specifications of the aquifers to be used and definition of their characteristics, including the capacity of the aquifer to yield water, the estimated recharge rate, and the quality of ground water;*
- (5) A description of designs for storage, reprocessing, and cooling prior to discharge of heated water entering natural drainage systems; and*
- (6) If deep well injection is to be used for effluent disposal, a description of the reservoir storage capacity, rate of injection, and confinement characteristics and potential negative effects on any aquifers and groundwater users which may be affected.*

8.1 Groundwater Resources

8.1.1 Existing Groundwater Resources

Depths to groundwater vary considerably in South Dakota. The Project is located in an area covered by glacial deposits that range up to 500 feet thick with an average thickness of 200 feet. These glacial deposits contain almost all of the shallow groundwater in areas east of Missouri River. Other sources of groundwater in this region are recent alluvial deposits along major rivers and their tributaries, ancient river channels buried beneath glacial deposits and bedrock (Agnew et al. 1959).

The Project Area is located within the Northern Great Plains aquifer system and underlies most of North Dakota and South Dakota, about one-half of Montana, and about one-third of Wyoming. The major aquifers of the Northern Great Plains aquifer system are sandstones of Tertiary and Cretaceous age and carbonate rocks of Paleozoic age. These aquifers and the regional confining units that separate some of them form one of the largest confined aquifer systems in the United States (USGS 1996). The Project is located within an area underlain by several confining units of the aquifer system.

The regional direction of flow in the deep confined aquifers follows long flow paths and is from southwest to northeast. Most of the recharge to the aquifer system is either from precipitation that falls on outcrop areas where the aquifers have been folded or faulted upward and subsequently exposed by erosion or from snowmelt that runs into streams that cross aquifer outcrops and seep downward through the stream beds into the aquifers. Some local recharge is by seepage of excess irrigation water. Much of the discharge from the aquifer system is through upward leakage of water into shallower aquifers where the hydraulic head in the shallower aquifer is less than that of a deeper aquifer (USGS 1996).

The SDDENR developed a detailed map that identifies the shallowest occurrence of aquifer material in Hyde County (Figure 6 in Appendix A; Rich 2012). This map indicates that the majority of the Project

Area is underlain by the Dakota Sandstone aquifer at depths below land surface ranging from 900 feet along the Missouri River to 1,750 feet in the south-central part of Hyde County (Rich 2012). The Dakota Sandstone consists of interbedded sandstone, siltstone, and shale with a maximum thickness of approximately 300 feet. This aquifer is overlain by thick confining units consisting largely of shales, which due to their low permeability, limit the downward movement of water from the ground surface to the Dakota Sandstone aquifer. The area along South Fork Medicine Knoll Creek in the northern portion of the Project area is mapped as containing outwash sand and gravel; and a small area in the southeastern portion of the Project area is mapped as alluvial aquifer material which consists of clay and silt with minor amounts of sand and gravel in drainages and creeks in portions of the Project Area (Rich 2012). These areas are identified as alluvium deposits on the map and occur near the surface (Rich 2012).

A USGS study of aquifers in Hyde and Hand counties identified four glacial aquifers within Hyde County (USGS 1976). The only glacial aquifer to occur in the Project Area is the Highmore Aquifer. As mapped, the southernmost extent of this aquifer just reaches the northernmost edge the Project Area (Township 112N, Range 73W). The Highmore Aquifer underlies an area of approximately 100 square miles and may yield as much as 1,000 gallons of water per minute to wells ranging from 20 to 200 feet in depth. Water mostly occurs under artesian conditions except where it underlies the South Fork Medicine Knoll Creek. The depth to water in the wells is generally less than 100 feet below land surface (USGS 1976). The water is predominantly of calcium bicarbonate or sodium sulfate type with dissolved solids ranging from 500 to 2,000 milligrams per liter. It is suitable for domestic, stock, municipal and irrigation use (USGS 1976). In 2018, groundwater accounted for 549.5 percent of the total freshwater supply for the state, of which over 58 percent was used as irrigation (NGWA 2020).

8.1.2 Impacts to Groundwater Resources

Construction of the Project is not anticipated to have long-term impacts on groundwater resources. As discussed in Section 1.0, disturbances associated with Project construction activities are primarily limited to the upper 30 to 40 feet with excavations for turbine foundations and transmission line structure foundations, which are above the water table of most of the aquifers in the Project Area (Section 8.1.1). Construction activities such as trenching and backfilling and dewatering that encounter shallow surficial aquifers may result in negligible to minor short-term and very localized fluctuations in groundwater levels depending on the proximity and connectivity of groundwater and extent of the excavated area. Once the construction activity has been completed, the groundwater levels typically recover quickly.

Water usage at the existing O&M facility will be similar to a household volume and any impacts to local groundwater supplies would be negligible.

Because turbine structures, their associated facilities, and the transmission line structures are typically located at higher elevations where water tables tend to be deeper, minimal trench dewatering is anticipated. As discussed in Section 8.1.1, the Highmore aquifer is mapped as reaching the northmost edge of the Project Area. The introduction of contaminants into groundwater due to accidental release of construction related chemicals, fuels or hydraulic fluid during construction would have the potential to have an adverse effect on groundwater quality, most notably near shallow water wells (Section 8.1.2). Spill-related effects are primarily associated with fuel storage, equipment refueling, and equipment maintenance.

Routine operation and maintenance are not expected to affect groundwater resources. During operations, potential negligible to minor short-term groundwater quality degradation is possible from maintenance

equipment, vehicle spills, and maintenance activities that may require excavation. Although there is potential for dewatering of shallow groundwater aquifers and potential changes in groundwater quality (such as increases in total suspended solids concentrations) during trenching, excavation, and backfilling maintenance activities, these changes are expected to be temporary and short term. Shallow groundwater aquifers generally recharge quickly because they are receptive to recharge from precipitation and surface water flow.

8.1.3 Mitigation Measures for Groundwater Resources

Given the depths of construction activities of up to 30 to 40 feet for turbine foundations and transmission line structure foundations, excavations are not likely to intercept the water table. If construction dewatering were to be required, it will be conducted in accordance with the General Permit for Temporary Discharge Activities (Permit No.: SDG070000) and Temporary Permit to Use Public Waters from the SDDENR and through the implementation of industry-accepted BMPs to minimize sediment withdrawal during dewatering activities and erosion and sediment release at the discharge point. Regarding potential impacts to wells, in the case that water supply wells are located near potential construction dewatering locations, provisions will be made to ensure that an adequate supply of water is provided until construction dewatering activities have ceased, if required (Section 8.2).

Project construction will require coverage under the General Permit Authorizing Stormwater Discharges Associated with Construction Activities (Permit No.: SDR10000), administered by the SDDENR. One condition of the permit is the development and implementation of SWPPP that identifies potential sources of stormwater pollution at the construction site and specifies the structural and non-structural controls that must be in place to minimize the negative impacts to receiving waters caused by stormwater discharges associated with the construction activities.

On-site fuel storage will have secondary containment and will be inspected regularly, with containment being remediated promptly in accordance with the Project's SPCC Plan. Fuel handling activities and spill remediation will also adhere to the procedures outlined in the Project's SPCC Plan.

8.2 Surface Water Resources

The Project Area is situated south of South Fork Medicine Knoll Figure 7 (Appendix A). The Project Area is located within the Medicine Knoll, Crow, and Fort Randall Reservoir Hydrologic Unit Code (HUC) 8 watersheds of the Fort Randall Reservoir HUC-6 watershed (USGS 2013). As noted in Sections 7.1 and 8.2, the Project Area is in south-central Hyde County in the Ree Hills, located on a stagnation moraine of Wisconsin age with numerous closed small depressions (Helgerson et al. 1987). The Ree Hills have the highest elevation in the county and are drained by South Fork Medicine Knoll, South Chapelle, Chapelle, Elm, Campbell, and West Fork Elm creeks (NRCS 1998).

The USACE has the authority to regulate the discharge of dredged and fill material into jurisdictional waters of the U.S (WoUS). Impacts to WoUS are reviewed, permitted, and mitigated through the Clean Water Act (CWA) Section 404 permitting process. The information provided in this section was compiled through desktop studies. A field investigation to delineate wetlands, watercourses and other waterbodies will be conducted in the spring of 2020 to confirm and characterize wetlands and other water resources where Project infrastructure (temporary and long-term operational) is proposed.

8.2.1 Existing Surface Water Resources

8.2.1.1 Waterbodies

The National Hydrography Dataset (NHD) represents United States drainage networks and related features, such as rivers, streams, canals, lakes, ponds, glaciers, coastlines, dams, and stream gauges (USGS 2018). NHD waterbodies, a subset of these data, are mapped in Figure 7 (Appendix A). Some 112 NHD waterbodies, covering a total of 376 acres are located within the Project Area. Chapelle Lake, the largest named NHD waterbody feature within the Project Area, covers approximately 40 acres and is located approximately 1.8 miles southwest of the Project Area.

8.2.1.2 Watercourses

Watercourses can typically be categorized as perennial, intermittent, or ephemeral based primarily on the periods of time in which they hold flowing water. Perennial streams, while under normal conditions, have flowing water year-round. Conversely, an ephemeral stream's flow is typically limited to brief periods of time in response to rain events. Intermittent streams, therefore, can be described as somewhere in between the two other categories and normally possess flowing water during the wet season(s). All 32.1 miles of NHD watercourses within the Project Area are mapped as intermittent streams as shown on Table 8-1 and Figure 7 (Appendix A). Streams in the Project Area include South Fork Medicine Knoll Creek and its unnamed tributaries.

Table 8-1. NHD-Mapped Waterbodies in the Project Area

Stream Classification	Length in Project Area (Miles)
Intermittent	32.1
All Stream Types	32.1

8.2.1.3 Wetlands

Wetlands are defined in the USACE Wetland Delineation Manual, as “those areas that are inundated or saturated by surface or groundwater at a frequency and duration to support and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.” Wetlands have the following general diagnostic characteristics: hydrophytic vegetation, hydric soil, and wetland hydrology (Environmental Laboratory 1987).

The Project Area lies within the 276,000-square-mile Prairie Pothole Region, which extends from Alberta, Saskatchewan and Manitoba, Canada, south into eastern North Dakota and South Dakota and extends east and south into Minnesota and Iowa. This region is defined by the abundance of shallow wetlands known as potholes, glacial potholes, kettles, or kettle lakes, which can be temporarily or semi-permanently inundated (Prairie Pothole Joint Venture 2005).

Meridian Wind conducted desktop land cover analysis to identify potential wetlands in the Project Area (Appendix C). Wetlands and other WoUS within the Project Area were identified by reviewing digital National Wetlands Inventory (NWI) data as well as aerial imagery. According to NWI data (USFWS 2017), approximately 4.6 percent of the Project Area is mapped as wetland (Figure 8 Appendix A). Wetlands within eight vegetation classes, including those from the Palustrine (inland wetlands), Riverine (rivers) and Lacustrine (lake) Systems are located in the Project Area. The wetland classification and total area of wetland by type occurring within the Project Area are shown in Table 8-2.

Table 8-2. NWI-Mapped Wetlands in the Project Area

Wetland Type (Cowardin Class)	Area (acres)	Percentage
Lacustrine, Littoral, Aquatic Bed, Semipermanently Flooded (L2ABF)	90.95	0.6
Palustrine, Aquatic Bed, Emergent, Persistent, Semipermanently Flooded (PAB/EM1F)	66.17	0.4
Palustrine Aquatic Bed, Semipermanently Flooded, Diked/Impounded (PABFh)	30.77	0.2
Palustrine, Emergent, Persistent, Temporary Flooded (PEM1A)	121.41	0.8
Palustrine, Emergent, Persistent, Temporary Flooded, Partially Drained/Ditched (PEM1Ad)	16.45	0.1
Palustrine, Emergent, Persistent, Seasonally Flooded (PEM1C)	348.07	2.3
Palustrine, Emergent, Persistent, Seasonally Flooded, Partially Drained/Ditched (PEM1Cd)	5.50	0.0
Riverine, Intermittent, Streambed, Seasonally Flooded (R4SBC)	12.42	0.1
All Wetland Types	697.07	4.6

8.2.1.4 Floodplains

Floodplains perform many natural functions, including the storage of excess water and reduction of flow velocity during times of flood, groundwater recharge, provision of habitat and removal of excess sediment, nutrients, and other pollutants. The placement of fill into floodplains reduces the effectiveness of these functions. The Federal Emergency Management Agency (FEMA) maintains materials developed to support flood hazard mapping for the National Flood Insurance Program. Flood hazard mapping provides states, local communities and Tribes with flood risk information and tools that they can use to increase their resilience to flooding and better protect people and property through collaboration with state and local entities.

FEMA has not completed a study to determine flood hazard in Hyde County (FEMA 2020); therefore, a flood map for the Project Area has not been published at this time.

8.2.1.5 National Park Service Nationwide Rivers Inventory

Pursuant to Section 5(d) of the National Wild and Scenic Rivers Act, the NPS maintains the Nationwide Rivers Inventory (NRI), a listing of more than 3,400 free-flowing river segments in the United States that are believed to possess one or more “outstandingly remarkable” natural or cultural values judged to be of more than local or regional significance. The NRI includes river segments that potentially qualify as national wild, scenic, or recreational river areas (NPS 2020b). Under a 1979 Presidential Directive and related Council on Environmental Quality procedures, all federal agencies must seek to avoid or mitigate actions that will adversely affect one or more NRI segments. There are no NRI-listed rivers within the Project Area; the closest NRI segment listed is the White River in Lyman County, approximately 46 miles south of the Project Area (NPS 2020c).

8.2.1.6 Impaired Waters

CWA Section 303(d) requires that each state review, establish and revise water quality standards for all surface waters within the state. Waters that do not meet their designated beneficial uses because of water quality standard violations are listed as impaired. The list, known as the 303(d) list, is based on violations of water quality standards. States establish priority rankings for waters on the 303(d) list and develop the total maximum daily load of a pollutant that the water can receive and still safely meet water quality standards. There are no 303(d)-listed waterbodies within the Project Area (SDDENR 2018).

8.2.2 Impacts to Surface Water Resources

8.2.2.1 Wetlands and Waterbodies

The turbines and the MET tower will be constructed on higher elevation portions of the Project Area to maximize the wind resource and as such, generally avoid direct impacts to wetlands and waterbodies, which tend to be in lower topographic positions. Prior to construction, Meridian Wind will conduct wetland and waterbody delineations within the Project Area according to the USACE Wetlands Delineation Manual, Great Plains Regional Supplement (Environmental Laboratory 1987). Access roads, collector systems, collection substation, and transmission line structures will be designed to avoid or minimize impacts to wetland and waterway features whenever feasible. Temporary impacts associated with crane paths will also be minimized. Installation of underground utilities is expected to avoid impacts by boring under water features as necessary and will minimize impacts to wetlands and waterbodies or where possible make them coincident with other impacts (e.g., crane paths). Where crossings of streams and drainageways cannot be avoided by access roads, appropriately designed crossings (i.e., culverts, low-water crossings) will be constructed to maintain existing drainage. Temporary impacts may also result from construction matting to access certain locations.

Meridian Wind anticipates that there will be no long-term impacts on emergent wetlands. Any temporarily impacted wetlands will be restored to pre-construction conditions and the herbaceous vegetation will be allowed to vegetate naturally in these areas. The impacts on scrub-shrub wetlands and forested wetlands will be of a longer duration than emergent wetlands because the woody vegetation will require a longer time to reestablish in the construction workspace after restoration.

Construction of the Project will result in new impervious surfaces (turbine foundations, long-term operational access roads, collection substation, transmission line structures) in the Project Area. The creation of impervious surfaces reduces the ability of soils to infiltrate precipitation to groundwater, potentially increasing the volume and rates of stormwater runoff. Infiltration will be inhibited within these newly created impervious surfaces and incremental increases in stormwater runoff may be exhibited immediately adjacent to these surfaces. Implementation of stormwater BMPs is anticipated to adequately mitigate any increases in runoff resulting from construction. In addition, the dispersed nature of the Project facilities will not provide enough of a concentration of increased impervious surfaces in any specific location to change drainage patterns. As such, the Project is not anticipated to cause significant changes in drainage and runoff patterns or volume.

Clearing and grading of stream banks, topsoil disturbance, in-stream trenching, trench dewatering, backfilling and development of access roads and crane paths could result in increased sedimentation and erosion, modification to hydrological flow, releases of chemical and nutrient pollutant from sediments and introduction of chemical contaminants such as fuel and lubricants. Coverage under the General Permit for Storm Water Discharges Associated with Construction Activities, administered by the SDDENR, will be required for the Project. Section 13.0 discusses the development and implementation of a SWPPP and BMPs in accordance with the General Permit. Erosion and sediment controls that will be implemented during Project construction and operation are expected to avoid negative impacts to water quality.

8.2.2.2 Floodplains

As discussed in Section 8.2.1.3, floodplains have not been mapped by FEMA in Hyde County. Although the federal government has not officially mapped floodplains in the county, it is unlikely the Project will impact floodplains. Wind turbines, the MET tower, transmission line structures, access roads, and the collection substation will be located at higher elevations. If impacts to floodplains are unavoidable, they will be temporary in nature and existing contours and elevations will be restored upon Project completion.

8.2.2.3 NRI-Listed Rivers

There are no NRI-listed rivers within the Project Area. Construction and operation of the proposed facility anticipates no impacts to these resources; therefore, no mitigation is required for impacts to NRI-listed rivers.

8.2.2.4 Impaired Waters

As of the 2018 South Dakota Integrated Report for Surface Water Quality Assessment, there are no 303(d)-listed waterbodies within the Project Area. Construction and operation of the proposed facility anticipates no impacts to these resources; therefore, no mitigation is required for impacts to 303(d)-listed waterbodies.

Sections 8.0 and 13.0 discusses the development and implementation of a SWPPP and BMPs in accordance with General Permit for Storm Water Discharges Associated with Construction Activities issued by the SDDENR.

8.2.3 Mitigation Measures for Surface Water Resources

Wetlands and waterbodies will be avoided to the extent possible during the construction phase of the Project. If wetland or waterbody impacts cannot be avoided, Meridian Wind will submit a permit application to the USACE for dredge and fill within WoUS under Section 404 of the CWA.

Project construction will require coverage under the General Permit Authorizing Stormwater Discharges Associated with Construction Activities (Permit No.: SDR10000), administered by the SDDENR. One condition of the permit is the development and implementation of SWPPP that identifies potential sources of stormwater pollution at the construction site and specifies the structural and non-structural controls that will be in place to minimize the negative impacts to receiving waters caused by stormwater discharges associated with the construction activities. The Project is not expected to cause significant changes to existing hydrology or stormwater runoff. Increased sedimentation and impacts to drainage patterns due to stormwater runoff from the Project during construction and operation will be minimized by the use of BMPs. The use of BMPs during construction will minimize the delivery of sediment due to erosional processes and also control erosion and minimize sedimentation during precipitation events. To further protect wetlands and streams, BMPs for sediment and erosion control will be implemented. To limit the risk of contamination of wetlands and streams due to accidental spilling of fuels or other hazardous substances, construction equipment will be refueled in areas away from wetlands or drainage areas and a spill kit will be available at the construction site.

Construction dewatering will be conducted in accordance with the General Permit for Temporary Discharge Activities (Permit No.: SDG070000) and Temporary Permit to Use Public Waters from the SDDENR and through the implementation of industry-accepted BMPs to minimize sediment withdrawal

during dewatering activities and erosion and sediment release at the discharge point. Regarding potential impacts to wells, in the case that water supply wells are located near potential construction dewatering locations, provisions will be made to ensure that an adequate supply of water is provided until construction dewatering activities have ceased.

8.3 Water Uses and Rights

8.3.1 Existing and Planned Water Uses and Rights

The Project Area is located within the general area of the Mid Dakota Rural Water System service area (SDARWS 2020). Meridian Wind reviewed the SDDENR Water Rights and Well Completion Report databases to identify where there are existing water uses within the Project Area (SDDENR 2020c,d). Private wells that supply water for domestic and irrigation purposes are located throughout the Project Area. Water Right Permits are required for water use exceeding 25,920 gallons per day or a peak pump rate of 25 gallons per minute or for non-domestic uses regardless if it is appropriated from surface or groundwater resources. If appropriating from surface waters, a Water Rights Permit is required for dams that impound more than 25 acre-feet of water at the primary spillway elevation.

Water Rights Permits within the Project Area are listed in Table 8-3 (SDDENR 2020c). In South Dakota, all water (surface and ground water) is the property of the people of the state and whether a Water Rights Permit is required depends on the type of water use. The only type of water use which does not require a water right permit is domestic use that does not exceed a peak pump rate of 25 gallons per minute.

Table 8-3. Water Rights Permits Located within the Project Area

Permit	Section	Township	Range	Status ^{1,2,3}
717-3	18	109	71	License
6769-3	20	109	71	License
6078-3	16	110	71	License
6854-3	17	111	72	License
6855-3	19	111	72	License
716-3	22	111	73	License
6852-3	24	112	72	License
6949-3	24	112	72	License
6950A-3	24	112	72	Permit
744-3	24	112	72	License
6851-3	25	112	72	License
7197-3	21	113	71	License
1310-3	7	114	71	License
1309-3	17	114	71	License
1309A-3	18	114	71	Incorporated
1934-3	18	114	71	Incorporated
5164-3	18	114	71	License
5735-3	11	115	72	License
3334-3	11	115	72	Incorporated
FC24-3	4	115	73	Permit

1 Permit = A water permit has been issued for the project which allows the holder to construct the project and put the water to beneficial use within a time frame specified on the water permit.

2 License = An inspection of the permitted water use system was conducted and a water license issued for the portion of the project that was developed.

3 Incorporated = If two or more permits cover one water use system, they are incorporated together into one water license. Any development under the individual permits is combined into a single water license.

Based on a review of the SDDENR Well Completion Report databases (SDDENR 2020d), there are 10 wells located within and within 1,000 feet of the Project Area (Table 8-4).

Table 8-4. Wells Located within and within 1,000 Feet of the Project Area

Feature ID (FID)	T/R/S ¹	Well Depth (feet)	Use Type
39732	T11N / 71W / 1	100	Test Hole
27715	T111N R71W S12	2,140	Domestic
13034	T111N R71W S5	2,231	Domestic
8905	T112N R72W S36	2,100	Domestic
32801	T111N R72W S1	2,160	Domestic
34422	T111N R72W S11	200	Ground Heat Pump
5255	T111N R72W S12	1,738.9	Domestic
30295	T111N R72W S12	2,155	Domestic
6425	T111N R71W S18	160	Domestic
43748	T111N R71W S20	32	Stock

1 T/R/S = Township / Range / Section; Source: SDDENR 2020d

Based on a review of SDDENR's Pending Applications to Appropriate Water and Future Use Reviews, there are no pending water right applications in Hyde County (SDDENR 2020e).

8.3.2 Impacts on Current or Planned Water Uses

The Project will not appropriate from surface water in the Project Area and will not conduct permanent dewatering, deep well injection, water storage, reprocessing or cooling for either construction or operation of the facilities. Water required for dust control, and potentially for a concrete batch plant, is typically obtained from an existing or new well. Meridian Wind will seek and comply with the conditions of the applicable permits for water appropriation.

A water supply well and a private septic system located at the O&M facility that will be shared with Triple H Wind Project will be used for facility operations. Water usage at the O&M facility will be similar to a household volume. Water use associated with Project operations will be negligible and will not create undue burden, so no mitigation is proposed.

Potential construction-related impacts on wells could include localized decreases in groundwater recharge rates through changes to overland water flow, contamination, decreased well yields, decreased water quality (such as increased turbidity or odor in the water), interference with well mechanics or complete disruption of the well. These impacts could result from trenching, equipment traffic or hazardous materials spills. However, Meridian Wind does not anticipate impacting residential domestic wells because wind turbines will be set back a minimum of 2,640 feet from non-participating residences and 1,540 feet from participating residences. Furthermore, excavation will only occur up to 40 feet and most domestic wells in the Project Area are generally drilled deeper than 1,700 feet (Table 8-4).

If required, construction dewatering will be conducted in compliance with South Dakota law. As stated above, residential domestic wells will not be impacted by construction dewatering due to the minimum setback of 2,640 feet from non-participating residences and 1,540 feet from participating residences.

The Project will not impact surface water availability or use for communities, agriculture, recreation, fish, or wildlife. As discussed in Section 8.2.2.1, the Project anticipates minimal impacts to wetlands and waterbodies. Following construction, temporary impacts to wetlands and waterbodies will be restored to pre-construction conditions.

8.3.3 Mitigation Measures for Existing and Planned Water Uses and Rights

In the case that water supply wells are located near potential construction dewatering locations, provisions will be made to ensure that an adequate supply of water is provided until construction dewatering activities have ceased. These impacts are expected to be minor and temporary. Surface water availability for communities, schools, agriculture, recreation, fish, or wildlife will not be impacted.

9.0 EFFECT ON TERRESTRIAL ECOSYSTEMS (ARSD 20:10:22:16)

ARSD 20:10:22:16. Effect on terrestrial ecosystems. *The applicant shall provide information on the effect of the proposed facility on the terrestrial ecosystems, including existing information resulting from biological surveys conducted to identify and quantify the terrestrial fauna and flora potentially affected within the transmission site, wind energy site, or siting area; an analysis of the impact of construction and operation of the proposed facility on the terrestrial biotic environment, including breeding times and places and pathways of migration; important species; and planned measures to ameliorate negative biological impacts as a result of construction and operation of the proposed facility.*

This section discusses the existing terrestrial ecosystem, the Project's potential impacts to it and potential avoidance, minimization, and mitigation techniques to minimize impacts. Terrestrial ecosystem wildlife and vegetation data was identified and gathered through literature searches, federal and state agency reports and consultations, natural resource databases and field studies. Biologists from Western Ecosystems Technology, Inc (WEST) conducted field surveys on behalf of Meridian Wind within and surrounding the Project Area to provide site-specific information on terrestrial resources. The results of these surveys are summarized in the vegetation and wildlife sections below.

9.1 Vegetation

9.1.1 Existing Terrestrial Ecosystem

The Project Area is located within the Northwestern Glaciated Plains Level III Ecoregion, an area characterized by significant surface irregularity and dense concentrations of wetlands. Historically dominated by grasslands composed of grama, needlegrass, and wheatgrass, land use in the Northwestern Glaciated Plains ecoregion is now dominated by rangeland, haycrop, and row crop agriculture used for growing corn (*Zea mays*), soybeans (*Glycine max*), sunflowers (*Helianthus annuus*), and sorghum (*Sorghum bicolor*). In addition to direct conversion of the native ecosystem, human activity has also altered or interrupted the natural disturbance processes of this ecosystem. Through the suppression of fire and alteration of historical grazing practices (relative to historical bison (*Bison latifrons*) herd grazing), invasive plants and woody plants not part of the grassland ecosystem have been able to take root and out-compete the grassland-obligate vegetation (SDGFP 2018).

Based on desktop review completed by WEST, land cover types were digitized using GIS within the Project Area. Using U.S. Department of Agriculture (USDA) National Agriculture Imagery Program (USDA 2019) aerial imagery in combination with 2011 South Dakota Land Cover Patterns (NLCD; Yang et al. 2018, Multi-Resolution Land Characteristics 2019), and U.S. Department of Agriculture National Agricultural Statistics Service National Cropland Layer (USDA NASS 2018) cropland classification, and field inspections, all lands within the Project Area were digitized and assigned one of nine cover types (excluding NWI wetlands). NWI data was used to represent water within the Project Area. Those water features visible on the aerial imagery but not in the NWI data were digitized as "water".

Based on this desktop review (Appendix C), approximately 52.1 percent of the Project Area is mapped as grassland/herbaceous and approximately 41.6 percent is mapped as cultivated crops. Croplands included fields where corn, soybeans, sunflowers, sorghum, alfalfa (*Medicago sativa*), winter wheat (*Triticum*

aestivum), millet (*Panicum miliaceum*), spring wheat or other row crops were grown. Herbaceous grassland vegetation was divided into grassland pastures or grass hay.

Grassland pastures typically were characterized by a mixture of native cool and warm season grasses including western wheatgrass (*Pascopyrum smithii*), green needle grass (*Nassella viridula*), needle-and-thread (*Hesperostipa comata*), blue grama (*Bouteloua gracilis*), sideoats grama (*Bouteloua curtipendula*), and little blue stem (*Schizachyrium scoparium*) (Western 2018). Grass hay fields typically contained fewer species such as smooth brome grass (*Bromus inermis*) and intermediate wheatgrass (*Thinopyrum intermedium*) and could possibly have been older Conservation Reserve Program (CRP) fields that were hayed in 2017. Trees typically included shelterbelts with a mixture of evergreen and deciduous species, near residences or along field borders. Developed lands included roads, ranches and residential areas, feed lots, and stock yards (WEST 2020).

This particular classification activity does not differentiate between potential native grasslands and areas where soils have been manipulated and/or introduced grasses have been planted. Other digitized land cover within the Project Area includes NWI wetlands, grass hay, developed, trees and water (Table 9-1).

Table 9-1. WEST-Digitized Land Cover within the Project Area

Land Cover Type	Acres	Percent of Project Area
Barren Land	29.58	0.20
Cropland	6262.79	41.63
Grassland Pasture	97.62	0.65
Grass Hay	14.59	0.10
Grassland/Herbaceous	7847.34	52.17
NWI Wetlands	451.54	3.00
Developed	300.42	2.00
Trees	5.10	0.03
Water	33.80	0.22
Total	15,042.8	100.0

Cropland and Developed land uses are discussed further in Section 11.0. See Section 8.2.1.3 for a detailed discussion of NWI wetlands mapped within the Project Area.

9.1.1.1 Grasslands

Grasslands are important and valuable communities, providing habitat to a diverse range of taxa, including highly specialized, habitat-specific birds, rare and economically-important pollinators, and a wide range of mammals. Once covering millions of acres across North America, it is estimated by some that mixed grass prairies have declined by 68 percent (Banchard 2001). Aside from direct impacts, the primary concern associated with turbine development in grasslands is habitat fragmentation created by the development of access roads. Fragmented habitat not only supports edge-generalist species such as white-tailed deer (*Odocoileus virginianus*) and American robins (*Turdus migratorius*), but simultaneously deters many species that require large areas of undisturbed land to breed (NDGF 2020).

Based on WEST data, less than one percent (97.62 acres) of the Project Area is mapped as grassland pasture. However, these data do not distinguish between untilled, native grassland and other pastureland, fallow fields, or similarly vegetated areas. Instead, a GIS layer created by South Dakota State University (SDSU) to quantify undisturbed grasslands of eastern South Dakota was utilized (Bauman, Carson, and

Butler 2016). Based on the data, approximately 6,068 acres of potentially undisturbed grassland are present within the Project Area. Because this GIS layer was created based on a tiered, desktop analysis, it remains likely that some areas mapped as “potential native grassland” have, in fact, been tilled.

Within the Project Area, 3,131 acres of the land is under easement with USFWS to protect the grasslands and native prairie (Figure 9 in Appendix A).

9.1.1.2 Noxious and Invasive Weeds

Noxious and invasive weeds are regulated by state (SDCL 38-22) and federally (7 Code of Federal Regulations [CFR] 360) rules and regulations designed to stop the spread of plants that are detrimental to the environment, crops, livestock, and/or public health. According to the South Dakota Department of Agriculture (SDDOA), 11 listed species of noxious weeds have the potential to occur and are regulated within Hyde County (SDDOA 2019, 2020). Three of these species are listed statewide and the remaining eight species are locally listed for Hyde County (Table 9-2).

Table 9-2. State and Local Noxious Weeds of South Dakota

Common Name	Scientific Name	State Weed Status
Absinth Wormwood	<i>Artemisia absinthium</i>	Local noxious weed
Bull Thistle	<i>Cirsium vulgare</i>	Local noxious weed
Common Mullein	<i>Verbascum thapsus</i>	Local noxious weed
Houndstongue	<i>Cynoglossum officinale</i>	Local noxious weed
Musk Thistle	<i>Carduus nutans</i>	Local noxious weed
Plumeless Thistle	<i>Carduus acanthoides</i>	Local noxious weed
Yellow Toadflax	<i>Linaria vulgaris</i>	Local noxious weed
Field Bindweed Distribution	<i>Convolvulus arvensis</i>	Local noxious weed
Canada Thistle	<i>Cirsium arvense</i>	State noxious weed
Leafy Spurge	<i>Euphorbia esula</i>	State noxious weed
Perennial Sow Thistle	<i>Sonchus arvensis</i>	State noxious weed

Source: SDDOA 2019, 2020

9.1.1.3 Forest and Woodlands

Based on WEST data, the land cover Trees classification comprises less than one percent, or 5.10 acres, of the Project Area. Typical trees include shelterbelts with a mixture of evergreen and deciduous species located along field borders and near residences. As part of the Northern Long-eared Bat (NLEB) Habitat Assessment (Appendix C), WEST conducted a desktop assessment of potential suitable habitat, which included deciduous forest, evergreen forest, mixed forest, and woody wetlands. The NLEB Habitat Assessment resulted in one connected habitat patch outside of the Project Area, but within a 2.5-mile buffer. A discussion regarding the NLEB Habitat Assessment can be found in Section 9.2.1.3.

9.1.2 Impacts to Vegetation

The Project will result in long-term operational impacts to approximately 55.4 acres and temporarily impact approximately 423 acres. Table 9-3 identifies the acreages of WEST-digitized land cover classes that will be directly affected by construction and operation of the Project. Long-term operational impact acreages will be limited to locations where vegetation will be removed and replaced by wind turbine foundations, the MET tower, collector substation, transmission line structures, and the long-term operational access roads. Overall, 61 percent of the Project’s construction and 48 percent of the Project’s

operations related impacts will occur in vegetation types that have experienced prior disturbance or alteration, including Cropland and Developed land cover types.

Table 9-3. Summary of Impacts to WEST-Digitized Land Cover

Landcover Type	Long-Term Operational Impacts (acres) ¹	Temporary Construction Impacts (acres) ²
Cropland	25.7	249.2
Grassland Pasture	--	21.6
Grassland/Herbaceous	26.5	188.6
NWI Wetlands	--	6.5
Developed	0.7	8.0
Trees	--	0.3
Project Total	52.9	474.2

1 Estimated value; impact value does not include features not yet sited including the MET tower or transmission line structures.

2 Estimated value; impact value does not include features not yet sited including the batch plants, the laydown/staging area, or MET tower construction workspace.

9.1.2.1 Grasslands

Based on the WEST-digitized land cover classification, Project construction activities have the potential to impact vegetation categorized as grassland/herbaceous and grassland pasture (Table 9-3). A subset of this category, areas of potentially undisturbed grassland, as mapped by SDSU described in 9.1.1.1 of this Application could be impacted.

The Project has been designed to avoid impacts to USFWS grassland easements and the delineated features associated with the USFWS wetland easement program. Meridian Wind will continue to coordinate with USFWS to confirm that impacts to the delineated features within USFWS wetland easement programs are avoided. Two turbines and associated access roads and collector lines are located on easements that were “top leased” with USFWS grassland easements (Figure 9 in Appendix A). The phrase “top leased” refers to the circumstance in which a lease is executed covering land upon which a current lease already exists. In this instance, Meridian Wind easements were in place prior to the USFWS grassland easements. The South Dakota state law principle of “first in time - first in rights” applies here. As a result, the Project easements are superior to the USFWS grassland easements in the identified “top leased” areas. Based on discussions with USFWS (Appendix K), the agency understands and agrees that the Meridian Wind easements will take precedent because they were in-place before the USFWS grassland easements. As a result, National Environmental Policy Act (NEPA) will not be triggered due to Meridian Wind placing the two turbines and associated roads and collector lines on the “top-leased” lands. The USFWS grassland easement program is further discussed in Section 11.2.1.5.

Other areas, such as tilled, degraded grasslands dominated by non-native vegetation are anticipated to be impacted during construction. Impacts will likely be both short-term (i.e., collector lines or temporary road construction) and long term (i.e., turbine foundations, turbine access roads) in nature.

9.1.2.2 Noxious and Invasive Weeds

Noxious weeds have the potential to spread through a variety of mechanisms. They are often carried on vehicles’ undercarriage and tires and thrive in highly disturbed areas, rapidly out-competing native vegetation, particularly when exposed soil conditions are present (Sheley 2011). Areas of disturbance due to construction will occur in the Project Area and it is anticipated that concentrated pockets of noxious

and invasive weed populations are present. With construction activities potentially taking place nearby, the threat of these species spreading via work crews, vehicles or other vessels exists.

9.1.2.3 Forest and Woodlands

Areas mapped as trees in the Project Area include shelterbelts with a mixture of evergreen and deciduous species, typically located along field borders and near residences. Meridian Wind sited the Project to avoid impacts to forested areas, especially those greater than 15 acres in size that are related to NLEB habitat (Appendix C). No major tree clearing activities are anticipated.

9.1.3 Mitigation Measures for Vegetation

9.1.3.1 Grasslands

Meridian Wind has worked with the South Dakota Department of Game, Fish and Parks (SDGFP) to adjust the site layout to minimize impacts to native grassland areas, as identified by the SDSU data layer. Best efforts were made to utilize cropland for turbine placement and existing disturbed corridors (e.g., roads, transmission lines, fence rows) to reduce habitat fragmentation and direct impacts to the vegetation. Infrastructure placed within areas mapped by SDSU as potentially undisturbed land will be inspected for signs indicative of past disturbance or tillage by a qualified biologist in order to determine if these areas are undisturbed grasslands. In areas where impacts to undisturbed grasslands cannot be avoided, Meridian Wind will employ BMPs such as revegetation and erosion control measures and will restore areas of disturbed soils as soon as possible after construction activities have been completed.

9.1.3.2 Noxious and Invasive Weeds

Meridian Wind will develop and implement a Noxious and Invasive Weed Management Plan that will identify and establish the procedures to prevent the introduction and spread of noxious and invasive weeds during construction and ongoing operations. This plan will be based on the construction schedule and the potential for weeds to be spread during that timeframe. During restoration, Meridian Wind will utilize seed mixes free of noxious and invasive weeds. Meridian Wind will coordinate with SDGFP, USFWS, USDA NRCS, and landowners on seed mixes to be used during restoration. Therefore, the Project may have a beneficial impact in the Project Area by reducing and controlling the spread of noxious and invasive species that are already present.

9.2 Wildlife

The USFWS has developed a series of guidance documents, the USFWS Land-Based-WEG (USFWS 2012) and the Eagle Conservation Plan Guidance (ECPG; USFWS 2013a), to provide a structured, scientific process for addressing wildlife conservation concerns related to wind facilities.

9.2.1 Existing Wildlife

9.2.1.1 Initial Site Assessment

In accordance with WEG Tiers 1 and 2, a landscape-level site analysis was conducted utilizing desktop resources to identify potential sensitive species or habitats that could be located near the Project. Resources reviewed included South Dakota Natural Heritage Program, SDGFP Wildlife Action Plan,

USFWS Information, Planning and Consultation (IPaC), NLCD mapping, aerial imagery, eBird, USGS Breeding Bird Survey (BBS), NatureServe and USGS Gap data, among other sources.

In 2016, baseline wildlife studies at the Project were completed to address the questions posed under Tier 3 of the USFWS Land-Based WEG (USFWS 2012) and Stage 2 of the USFWS ECPG (USFWS 2013a). Studies conducted at the Project from 2016 to 2019 include avian use surveys, raptor and eagle nest surveys, prairie grouse lek surveys, acoustic monitoring for bats and NLEB summer habitat analysis, whooping crane (*Grus americana*) stop-over habitat analysis, and land cover characterization study (Appendix C). Wildlife species associated with grasslands and tilled agricultural landscapes are expected to be the most common species within the Project Area.

Migratory Birds

The Migratory Bird Treaty Act (MBTA) is the cornerstone of migratory bird conservation and protection in the United States. The MBTA implements four treaties that provide for international protection of migratory birds. Under the MBTA, it is illegal “to pursue, hunt, take, capture, kill ... possess, offer for sale, sell ... purchase ... ship, export, import ... transport or cause to be transported... any migratory bird, any part, nest or eggs of any such bird ...” (16 United States Code [USC] 703). The word “take” is defined by regulation as “to pursue, hunt, shoot, wound, kill, trap, capture or collect or attempt to pursue, hunt, shoot, wound, kill, trap, capture or collect” (50 CFR 10.12). The USFWS maintains a list of all species protected by the MBTA at 50 CFR. This list includes over one thousand species of migratory birds, including eagles and other raptors, waterfowl, shorebirds, seabirds, wading birds and passerines (USFWS 2015a). A December 22, 2017 memorandum from the U.S. Department of the Interior’s Office of the Solicitor opined that the prohibitions of take under the MBTA apply only to “affirmative actions that have as their purpose the taking or killing of migratory birds, their nests, or their eggs”. An April 11, 2018 memorandum from the USFWS reinforced this interpretation stating that the “take of birds, eggs or nests” was not prohibited when the purpose of the activity was not to conduct take.

In an effort to characterize potential use of the Project Area by breeding birds, the two nearest USGS BBS routes, the Crow Creek BBS and Fort Thompson BBS, were analyzed. Each route is approximately 24.5 miles (39.4 kilometer [km]) long, with survey points located every half-mile. Standard survey protocol dictates that all birds seen or heard are tallied for a 3-minute period at each point along the route.

In 2011, 2,242 individual birds of 80 species were observed along the two routes surveyed (1,146 individuals of 64 species in Crow Creek and 1,096 birds of 53 species in Fort Thompson; Pardieck, et al. 2019). The most abundant species observed were the brown-headed cowbird (*Molothrus ater*; 290 individuals), western meadowlark (*Sturnella neglecta*; 244 individuals), common grackle (*Quiscalus quiscula*; 196 individuals), dickcissel (*Spiza americana*; 174 individuals), red-winged blackbird (*Agelaius phoeniceus*; 156 individuals), mourning dove (*Zenaida macroura*; 134 individuals), and cliff swallow (*Hirundo rustica*; 108 individuals). In 2018, 783 individuals of 40 species were observed along Crow Creek BBS (Pardieck, et al. 2019). The most abundant species observed were the western meadowlark (105 individuals), brown-headed cowbird (145 individuals), western meadowlark (139 individuals), red-winged blackbird (68 individuals), mourning dove (70 individuals), and the common grackle (45 individuals). Fort Thompson did not have 2018 data available for review.

Raptors

Following a desktop assessment of potential raptor roosting habitat, prey base and species distributions, a total of 16 diurnal raptors, 1 vulture, and 6 owls were determined to have the potential to occur within the

Project Area (WEST 2016). Of these species, one vulture (*Cathartiformes*), seven species of diurnal raptors and five species of owls (*Strigiformes*) have the potential to nest near or within the Project Area (Table 9-4). Within the Project Area, trees and woodland areas occur around wetlands, streams, and houses, providing potential nesting opportunities for many of these species. Raptors may also nest on man-made structures, such as power poles associated with power lines and structures associated with transmission lines, both of which are present in the Project Area. Ground-nesting raptors may nest in the grassland areas located throughout the Project Area.

Table 9-4. Raptors with Potential to Occur within Project Area

Species	Scientific Name	Nesting Potential
Diurnal Raptors (<i>Accipitriformes</i> and <i>Falconiformes</i>)		
American Kestrel	(<i>Falco sparverius</i>)	X
Bald Eagle	(<i>Haliaeetus leucocephalus</i>)	X
Broad-Winged Hawk	(<i>Buteo platypterus</i>)	
Cooper's Hawk	(<i>Accipiter cooperii</i>)	
Ferruginous Hawk	(<i>Buteo regalis</i>)	X
Golden Eagle	(<i>Aquila chrysaetos</i>)	X
Merlin	(<i>Falco columbarius</i>)	
Northern Goshawk	(<i>Accipiter gentilis</i>)	
Northern Harrier	(<i>Circus hudsonius</i>)	X
Osprey	(<i>Pandion haliaetus</i>)	
Peregrine Falcon	(<i>Falco peregrinus</i>)	
Prairie Falcon	(<i>Falco mexicanus</i>)	
Red-Tailed Hawk	(<i>Buteo jamaicensis</i>)	X
Rough-Legged Hawk	(<i>Buteo lagopus</i>)	
Sharp-Shinned Hawk	(<i>Accipiter striatus</i>)	
Swainson's Hawk	(<i>Buteo swainsoni</i>)	X
Owls (<i>Strigiformes</i>)		
Burrowing Owl	(<i>Athene cunicularia</i>)	X
Eastern Screech-Owl	(<i>Megascops asio</i>)	X
Great Horned Owl	(<i>Bubo virginianus</i>)	X
Long-Eared Owl	(<i>Asio otus</i>)	X
Northern Saw-Whet Owl	(<i>Aegolius acadicus</i>)	
Short-Eared Owl	(<i>Asio flammeus</i>)	X
Vultures (<i>Cathartiformes</i>)		
Turkey Vulture	(<i>Cathartes aura</i>)	X

The remaining 10 species are all potential visitors during migration, winter, or post-breeding dispersal (Jennings, Cable and Burrows 2005). Several factors influence the migratory pathways of raptors, the most significant of which is geography. Two geographical features used by raptors during migration are ridgelines and shorelines of large bodies of water (Liguori 2005). The up-drafts formed as the wind hits the ridges and thermals created over land (but not water) make for energy -efficient travel for raptors over long distances (Liguori 2005). It is for this reason that raptors often follow corridors or pathways (e.g., along prominent ridges with defined edges) during migration. Topography in the Project Area is relatively flat to gently rolling hills and none of the features of the Project Area are likely to concentrate raptors. However, the Project Area is located within the Central Flyway avian migratory corridor used by raptors and wetland and water impoundments may provide some stopover and/or foraging habitat for raptors that migrate through the area.

Specific foraging habitat that could attract both migrating and breeding raptors include grassland areas that are utilized by the likes of prairie dogs and other small colonial mammals. Black-tailed prairie dog (*Cynomys ludovicianus*) towns, which were documented within the Project Area during aerial raptor nest surveys, provide hunting opportunities for eagles and several raptor species likely to occur within the Project Area, including the ferruginous hawk (*Buteo regalis*), red-tailed hawk (*Buteo jamaicensis*), northern harrier (*Circus hudsonius*), and Swainson's hawk (*Buteo swainsoni*).

Prairie Grouse

The Project Area occurs within the occupied range of the greater prairie-chicken (*Tympanuchus cupido*) and sharp-tailed grouse (*T. phasianellus*) hereafter referred to as prairie grouse for both species combined (Sibley 2014). These two species of gamebirds are native to the Great Plains of North America and thus prefer large expanses of grasslands with tall residual grass or shrubs that can provide cover while nesting and short or sparse grass on slightly elevated ground for leks (area where prairie grouse congregate during spring for mating), which provides maximum visibility for female grouse while simultaneously enabling a clear view of avian and mammalian predators. Areas with tall structures such as trees are generally avoided due to perceived vulnerabilities associated with perching raptors (Johnson, Schroeder, and Robb 2011; Connelly, Gratson, and Reese 1998).

Prairie grouse are found throughout much of South Dakota with the highest concentrations extending from the south-central through the northwestern portions of the state. Neither prairie grouse species have regulatory protection in South Dakota and are legal game species that are routinely hunted. Prairie grouse hunting typically occurs on large expanses of grassland between September and January, but can occur in cropland or field edges in grassland-dominated landscapes. Hunters are limited to three grouse per day and require a small game or any combination license to hunt. Hunting limitations and regulations are defined by statute and enforced by the SDGFP. According to the SDGFP 2018 harvest season report, an estimated 23,860 prairie grouse were harvested within the state in 2018 of which approximately 217 were from Hyde County.

Surveys conducted in 2016, 2018, and 2019 by WEST verified the presence of prairie grouse leks during the breeding season within and surrounding the Project Area (Section 9.2.1.3). Grasslands within and adjacent to the Project Area have the potential to support prairie grouse. The Project Area is outside of the range for the greater sage-grouse (*Centrocercus urophasianus*).

Bats

Based on range maps (BCI 2020), seven bat species are possible residents and/or migrants in the Project Area (Table 9-5). One of the seven species are included due to range (BCI 2020) but is unlikely to occur in the Project Area based on habitat restrictions: the Townsend's big-eared bat (*Corynorhinus townsendii*). The six remaining species that have potential to occur in the Project Area based on range maps (Table 9-5) have been documented as fatalities at wind energy facilities. These species include big brown bat (*Eptesicus fuscus*), eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), little brown bat (*Myotis lucifugus*), NLEB and silver-haired bat (*Lasionycteris noctivagans*).

Table 9-5. Bat Species with the Potential to Occur in the Project Area Based on Range Maps

Species	Scientific Name	Habitat	Likelihood of Occurrence
Big Brown Bat	<i>Eptesicus fuscus</i>	Common in most habitats; abundant in deciduous forests and suburban areas with agriculture; maternity colonies beneath bark or in tree cavities, buildings, barns, or bridges.	Probable
Eastern Red Bat	<i>Lasiurus borealis</i>	Abundant tree bat; roosts in trees; solitary, prefers forested environments.	Probable
Hoary Bat	<i>Lasiurus cinereus</i>	Usually not found in human-made structures; roosts in trees along forest borders; very wide-spread. Found in a wide variety of habitats.	Probable
Little Brown Bat	<i>Myotis lucifugus</i>	Especially associated with humans, often uses man-made structures for nursery colonies. Roosts in tree cavities and crevices and forages over meadows, farmland and cliff faces.	Probable
Northern Long-Eared Bat	<i>Myotis septentrionalis</i>	Found roosting beneath exfoliating bark and in tree cavities. Hibernates in caves and underground mines.	Possible
Silver-Haired Bat	<i>Lasionycteris noctivagans</i>	Common bat in forested areas, particularly old growth forest; maternity colonies in tree cavities or hollows; hibernates beneath exfoliating bark, in wood piles and in cliff faces.	Probable
Townsend's Big-Eared Bat	<i>Corynorhinus townsendii</i>	Commonly found in arid desert scrub and pine forests; maternity colonies in mines, caves, and buildings.	Unlikely

9.2.1.2 Special Status Species

Federally-Listed Species

Six wildlife species listed as federally threatened or endangered under the Endangered Species Act (ESA 1973) have been verified to occur or have the potential to occur in Hyde County (USFWS 2020b). This includes four federally listed avian species, one federally listed bat species and one federally listed fish species (Table 9-6; USFWS 2020b). These six species are described Table 9-6.

Table 9-6. Federally Threatened or Endangered Wildlife Species with the Potential to Occur in the Project Area

Species	Scientific Name	Federal Status ¹	Likelihood of Occurrence
Mammals			
Northern Long-eared Bat	<i>Myotis septentrionalis</i>	T ³	Possible
Birds			
Whooping Crane	<i>Grus americana</i>	E	Possible
Red Knot	<i>Calidris canutus rufa</i>	T	Unlikely
Interior Least Tern	<i>Sternula antillarum athalassos</i>	E ⁴	Possible
Piping Plover	<i>Charadrius melodus</i>	T	Possible
Fish²			
Pallid Sturgeon	<i>Scaphirhynchus albus</i>	E	No occurrence

¹ E = endangered, T = threatened

² See Aquatic Resources Section 10.1.2 for discussion

³ The status of NLEB is currently under court-ordered review (Barclay Damon 2020)

⁴ Least tern status currently under review for delisting (USFWS 2020c)

Sources: Jennings et al. 2005; USFWS 2020b

Northern Long-eared Bat

The NLEB is found in the United States, from Maine to North Carolina on the Atlantic Coast, westward to eastern Oklahoma and north through parts of South and North Dakota (USFWS 2020d). This species hibernates in caves and abandoned mines during winter. During the summer, individuals may roost alone or in small colonies beneath exfoliating bark or in cavities or crevices of both live and dead trees (USFWS 2020d; BCI 2020).

South Dakota contains 21 known NLEB hibernacula, all within the Black Hills, in western South Dakota, nine of which are abandoned mines (USFWS 2015b). NLEBs, including some pregnant females, have been captured during the summer along the Missouri River in South Dakota (Swier 2006; Kiesow and Kiesow 2010). Acoustic data recorded by bat monitoring stations operated by the SDDGFP also detected the NLEB sporadically throughout the state (across 16 counties) in 2011 and 2012 (USFWS 2015b).

Under the final Section 4(d) rule, incidental take of NLEB is prohibited within a hibernaculum, as a result of tree removal activities within 0.25 mile of a known hibernaculum, or results from tree removal activities where the activity cuts or destroys a known, occupied roost tree or other trees within a 150-foot radius from the roost tree during the pup season from June 1 through July 31 within the USFWS White Nose Syndrome (WNS) zone. The WNS zone now covers the entire U.S. portion of the NLEB range (USFWS 2020e), which includes the Project Area. Lethal take by operating wind turbines is specifically excluded from the incidental take prohibition. As evidenced during site visits, suitable NLEB habitat features in the form of tall trees, abandoned buildings, and riparian areas are present throughout and near the Project Area. Although WNS (caused by the fungus *Pseudogymnoascus destructans*) is the primary threat to NLEB populations (USFWS 2016a), there is additional concern about the impacts of wind facilities on bat species.

Whooping Crane

The whooping crane (*Grus americana*) is a federally and state endangered migratory species that prefers stopovers in croplands interspersed with palustrine wetlands. The only self-sustaining wild population, with an estimated 504 whooping cranes (including 13 juveniles and 198 adult pairs) as of the winter of 2018-2019, over-winters in the Texas Gulf Coast at the Aransas National Wildlife Refuge (USFWS 2019a). The cranes then migrate north through Oklahoma, Kansas, Nebraska, South Dakota and North Dakota to breed in the Northwest Territories of Canada (University of Wisconsin-Madison 2020). Between the years 2010 and 2016, 95 percent of whooping crane sightings occurred within a 182-mile wide migration corridor along this route (Pearse et al. 2018). The Project Area is within the distance bands where 75 to 80 percent of observations have occurred, based on confirmed sightings (CWCTP 2017).

Whooping cranes occasionally migrate with sandhill cranes (*Grus canadensis*), so stop-over sites used by sandhill cranes may be used to identify potential whooping crane stop-over areas (CWS and USFWS 2007). The Project Area provides potentially suitable habitat for both sandhill and whooping cranes as it is primarily composed of herbaceous cover and cropland with interspersed streams and areas of open water. Through fall 2016, no whooping crane sightings had been documented within the Project Area; however, there have been three confirmed sightings within 10 miles of the Project Area (CWCTP 2017; Figure 10 in Appendix A). In the spring of 2010, during crane monitoring at the Titan Wind Project located approximately 7.4 miles east of the Project Area in Hand County, a group of five whooping cranes spent 3 days approximately 2 miles from the Titan I Wind Facility. The closest they ever were on the ground from a turbine was 1.2 miles (Stehn 2011).

Whooping cranes generally migrate at altitudes between 1,000 to 6,000 feet, well above turbine height (Stehn and Wassenich 2007); thus, for the most part, whooping cranes are unlikely to collide with turbines. However, whooping cranes ascend and descend for roosting and feeding, or in inclement weather, and may fly at lower altitudes, sometimes within rotor swept areas.

Red Knot

The rufa red knot (*Calidris canutus rufa*) is a federally listed threatened shorebird species that breeds in the tundra of the central Canadian Arctic and winters in Tierra del Fuego at the southern tip of South America (USFWS 2019b). Outside of its breeding grounds, it uses marine habitats such as estuaries and bays (USFWS 2019b). The red knot is a potential but infrequent migrant through the Project Area during spring and fall; however, potential of occurrence within the Project Area is considered unlikely given the lack of confirmed observations in the region (eBird 2020) and lack of suitable stopover habitat within the Project Area.

Interior Least Tern

The interior least tern (*Sternula antillarum athalassos*) is federally endangered although currently proposed for delisting (USFWS 2020c), and also listed as state endangered. This species breeds along barren areas near water such as riverine inter-channel sandbars, salt marshes or salt flats (NatureServe 2019a). These birds prefer open habitat and tend to avoid thick vegetation and narrow beaches. Favorable nesting habitat includes sand and gravel bars within a wide unobstructed river channel or open flats along shorelines of lakes and reservoirs, away from disturbed areas and near plentiful sources of small fish, although they will forage up to 7.5 miles from their nests (USFWS 2020d, NatureServe 2019a). Ideal foraging areas include shallow water regions of lakes, ponds, and rivers (USFWS 2013b, NatureServe 2019a).

Least terns may occur anywhere in Hyde County during migration and breed along the Missouri River (WEST 2016). Although no suitable nesting habitat was identified within the Project Area during a site visit conducted in February 2016, there is evidence of breeding activity of interior least terns within 20 miles of the Project Area (USFWS 2013b, 2020c).

Piping Plover

The piping plover (*Charadrius melodus*) is a federally and state threatened migratory shorebird that nests and forages along shorelines of small lakes, large beaches, river islands or industrial pond shorelines. Wide beaches with sparse vegetation are preferred nesting habitat, while wintering habitat includes ocean beaches (NatureServe 2019b). The piping plover Northern Great Plains Distinct Population Segment occupies sand and gravel bars and beaches along major rivers and around lakes, reservoirs, ponds, and alkali wetlands (USFWS 2015c).

Critical Habitat is designated along the Missouri River/Oahe Reservoir in Hughes County (USFWS 2002); this is the closest critical habitat to the Project (within about 44 miles to the west of the Project Area). Very little information is available about historical levels of breeding piping plovers prior to the 1980s. The 1988 Recovery Plan (USFWS 1988) documents historical breeding, which primarily occurs along the sandbars of the Missouri River. According to Aron (2005) the Oahe Reservoir supported approximately 19 percent of all Missouri River piping plovers from 1994 through 2004, although surveys of off-river sites have found few birds nesting in alkali lakes in central South Dakota (USFWS 2009). While this suggests that the state's alkali lake system could support additional breeding piping plovers, the Project Area is located outside of the major alkaline lakes nesting areas of plovers (USFWS 2009).

Inland nesting piping plovers are infrequently seen at suitable migration stopover points, indicating that they may fly non-stop to their Gulf of Mexico wintering areas (Johnson, Adolph, and Higgins 1997). Within South Dakota, reports of migratory piping plovers are not common, but the species does occur east and west of the Project Area (eBird 2020). Piping plovers are not known to breed within the Project Area, but they do breed in the vicinity of the Project Area along the Missouri River (Aron 2005).

State-Listed Species

Four species ranked by South Dakota as threatened or endangered are listed as occurring in Hyde County (SDGFP 2016), including three federally listed avian species (whooping crane, piping plover, and interior least tern), discussed in the federally listed species section above and one federally listed fish species (pallid sturgeon), discussed in Section 9.2.1.2.

The swift fox (*Vulpes velox*), is a state-threatened species that relies on open, rolling mixed-grass and short grass prairies with little or no shrubs. It also inhabits areas of mixed agricultural use, but population densities are lower in these areas. Prairie dog towns are a preferred habitat of swift fox, as they use burrows made by other mammals or dig their own burrows in sandy soils on high ground (NatureServe 2019c). Major threats to this species include loss of suitable native short and mixed-grass prairie due to conversion to agricultural and development. Herbaceous and agricultural areas within the Project Area might provide suitable habitat for the swift fox; however, they are not known to occur in Hyde County.

Bald and Golden Eagle Protection Act

Under authority of the Bald and Golden Eagle Protection Act (BGEPA; 16 USC 668-668d), bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) are afforded additional legal protection. The BGEPA prohibits the take, sale, purchase, barter, offer of sale, purchase or barter, transport, export, or import, at any time or in any manner of any bald or golden eagle, alive or dead or any part, nest, or egg thereof (16 USC 668). The BGEPA also defines take to include “pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb” (16 USC 668c) and includes criminal and civil penalties for violating the statute. The term “disturb” is defined as agitating or bothering an eagle to a degree that causes or is likely to cause, injury to an eagle or either a decrease in productivity or nest abandonment by substantially interfering with normal breeding, feeding, or sheltering behavior (50 CFR 22.3).

The bald eagle occurs in South Dakota as a resident (BirdLife International and NatureServe 2014) utilizing suitable areas year-round, with verified and potential occurrences reported for Hyde County (eBird 2020, NatureServe 2019d). Preferred nesting, foraging, and roosting bald eagle habitats include large, mature trees near water with abundant fish and waterfowl prey, especially in areas with little disturbance. Preferred perch sites include tall trees and snags located near nesting and foraging areas that provide good vantage points, while nests and foraging activities are usually associated with permanent water bodies (Buehler 2019). There are multiple lakes and rivers within and/or adjacent to the Project that provide suitable nesting and wintering habitat for bald eagles. Furthermore, the Project is approximately 15 miles northeast of the Missouri River, which serves as a migration corridor and provides suitable nesting and wintering habitat for bald eagles.

Observations of golden eagles have been reported in South Dakota year round (eBird 2020), with the majority of sightings in the vicinity of the Project reported during the winter season (National Audubon Society 2019). The golden eagle usually hunts on the rimrock terrain of open grassland areas and nests on cliffs near open foraging areas such as grassland or shrubland (Kochert et al. 2002). During a site visit

conducted by WEST on March 26 and April 16-17, 2019, suitable foraging and roosting habitat was found within the Project Area and one golden eagle was observed occupying a nest within the Project Area (West 2020).

Birds of Conservation Concern

The USFWS lists 27 Birds of Conservation Concern (BCC) within the Prairie Potholes Bird Conservation Region 11 (USFWS 2008) which includes the Project Area. These species are protected under the MBTA, but they do not receive any additional protection as BCC but have been identified as vulnerable to population declines in the Bird Conservation Region by the USFWS (2008).

Species of Greatest Conservation Need

In addition to the federally and state-listed species noted above, there are several species identified as Species of Greatest Conservation Need (SGCN) by the SDGFP's Wildlife Action Plan (SDGFP 2018) that have the potential to occur in the Project Area. Species were placed on this list by meeting one or more of the criteria including:

- State or federally listed species for which the state has a mandate for recovery.
- Species that are regionally or globally imperiled and South Dakota represents an important portion of their remaining range or, the species is regionally or globally secure and for which South Dakota represent an important portion of their remaining range.
- Species with characteristics that make them vulnerable, including species that are indicative of or depend on a unique or declining habitat in South Dakota, require large home ranges/use multiple habitats, depend on large habitat patch sizes, depend on an ecological process that no longer operates within the natural range of variation, are limited in their ability to recover on their own due to low dispersal ability or low reproductive rates, have a highly localized or restricted distribution (endemics) or concentrate their populations during some time of the year.

Only bird and bat SGCN are presented in Table 9-7, since these are the two groups most likely to be impacted by a wind facility and transmission line. Two SGCN bats have the potential to occur in the Project Area (Table 9-7), while 20 bird SGCN have the potential to occur in the Project Area (SDGFP 2020a; WEST 2016). A SGCN designation does not afford these species any regulatory protections, although most of the avian species are protected under other state or federal regulation (MBTA, BGEPA, ESA).

Table 9-7. Birds and Bats Listed As South Dakota SGCN With the Potential to Occur in the Project Area

Common Name	Scientific Name	Spring	Summer	Fall	Winter
Mammals					
Northern long-Eared Bat	<i>Myotis septentrionalis</i>		X		
Silver-haired Bat	<i>Lasionycteris noctivagans</i>		X		
Birds					
American White Pelican	<i>Pelecanus erythrorhynchos</i>		X		
Baird's Sparrow	<i>Ammodramus bairdii</i>	X		X	
Bald Eagle	<i>Haliaeetus leucocephalus</i>	X	X	X	X
Black Tern	<i>Chlidonias niger</i>		X		
Burrowing Owl	<i>Athene cunicularia</i>		X		
Chestnut-Collared Longspur	<i>Calcarius ornatus</i>		X		
Ferruginous Hawk	<i>Buteo regalis</i>	X	X	X	X
Golden Eagle	<i>Aquila chrysaetos</i>	X	X	X	X
Greater Prairie Chicken	<i>Tympanuchus cupido</i>	X	X	X	X
Interior Least Tern	<i>Sternula antillarum athalassos</i>		X		
Lark Bunting	<i>Calamospiza melanocorys</i>		X		
LeConte's Sparrow	<i>Ammodramus leconteii</i>	X		X	
Marbled Godwit	<i>Limosa fedoa</i>	X		X	
Northern Goshawk	<i>Accipiter gentilis</i>				X
Osprey	<i>Pandion haliaetus</i>	X		X	
Piping Plover	<i>Charadrius melodus</i>		X		
Sprague's Pipit	<i>Anthus spragueii</i>	X	X	X	
Whooping Crane	<i>Grus americana</i>	X		X	
Willet	<i>Catoptrophorus semipalmatus</i>		X		
Wilson's Phalarope	<i>Phalaropus tricolor</i>		X		

Sources : SDGFP 2018, SDGFP 2020a, WEST 2016

South Dakota Natural Heritage Program

The South Dakota Natural Heritage Program maintains documentation of reported rare species. These include species that have a federal/state protection status (i.e., endangered, threatened, candidate, or proposed listing status) or state conservation status, which is a rarity ranking of breeding and non-breeding species (South Dakota Natural Heritage Program 2018).

9.2.1.3 Studies Conducted to Date

Project-specific wildlife surveys began in April 2016 and are ongoing (Table 9-8). These wildlife surveys were conducted to satisfy the Tier 3 studies as recommended by the USFWS Land-Based WEG, Stage 2 of the ECPG and the USFWS and SDGFP guidance. Throughout this time, the Project Area evolved through both expansions and contractions. In 2016, baseline wildlife studies were completed within a previous defined wind resource area encompassing 39,099.3 acres based on a 200-MW project. In 2017, this wind resource area was expanded to encompass 110,142.3 acres based on up to three separate 250 MW phases. Meridian Wind refined the wind resource area for the Project which is primarily located along the eastern portion of previously surveyed areas. In order to incorporate areas previously outside of the Project Area, some surveys required multiple years to gather the required data over the specified area. Appendix C includes a summary of all studies conducted to date.

Table 9-8. Summary of Studies Conducted to Date at the Project Area

Survey Type	Dates	Survey Area Covered
Bird Surveys		
2016 Eagle Nest Surveys	March 28–April 1	2016 Project Area and 10-mile buffer
2016 Raptor Nest Surveys	March 28–April 1	2016 Project Area and 1-mile buffer
2016 Sharp-tailed Grouse and Greater Prairie Chicken Lek Surveys	March 29–April 30	2016 Project Area and 0.5-mile buffer
2018 Eagle Nest Surveys	March 9-14	2017 Project Area and 10-mile buffer
2018 Raptor Nest Surveys	March 9-14	2017 Project Area and 1-mile buffer
2018 Sharp-tailed Grouse and Greater Prairie Chicken Lek Surveys	March 27–May 6	2017 Project Area and 1-mile buffer (excluding 2016 Project Area)
2019 Avian Use Studies	2019-Ongoing	Current Project Area
2019 Raptor Nest Surveys	March 26 and April 16-17	Current Project Area and 1-mile buffer and 10-mile buffer
2019 Sharp-tailed Grouse and Greater Prairie Chicken Lek Surveys	April 21-May 21	Current Project Area
Bat Surveys		
2016 General Bat Acoustic Survey	May 26–October 21	2016 Project Area (4 locations)
2018 General Bat Acoustic Survey	April 26–October 25	2017 Project Area (6 locations)
Threatened and Endangered Species Habitat Surveys		
Whooping Crane Stopover Habitat	Desktop	Current Project Area and 10-mile buffer
Northern Long-eared Bat Habitat Assessment	Desktop	Current Project Area and 2.5-mile buffer

Raptor and Eagle Nest Surveys

During the 2016 aerial survey, 10 raptor nests were documented within the Project and 1.0-mile buffer (Figure 3 in Appendix C). One nest was occupied by a red-tailed hawk, while all the remaining nests were inactive. No eagle nests were located during the survey within the Project Area or the 10.0-mile survey area. During aerial and ground surveys in 2018, 17 raptor nests were identified; two great-horned owl, two Swainson's hawk and one red-tailed hawk (Figure 4 in Appendix C). No potential eagle nests were identified within 10 miles of the Project Area. Of the 10 nests previously documented in 2016, six were confirmed present and four could not be relocated.

In 2019, two surveys were conducted on March 26 and April 16 – 17, 2019 and included the Project Area, 1.0-mile, and 10.0-mile buffers (Figure 5 in Appendix C). Eighteen nests were documented and eight previously identified nests were either not present or excluded from surveys due to safety considerations. Six nests were determined to be occupied with adults in the nest, perched in the same tree, or eggs in the nest. One nest was recorded twice as it was occupied by a great horned owl during the first survey on March 26 and a ferruginous hawk on April 16. Eleven nests were considered unoccupied as no activity was recorded during either survey in accordance with the ECPG. Of the occupied nests, three were occupied by great horned owl, two by ferruginous hawk, one by a red-tailed hawk, one by a golden eagle, and one unidentified raptor (eggs were present in the nest). The nest occupied by the golden eagle was previously occupied by a red-tailed hawk in surveys conducted in 2016 and 2018.

Prairie Grouse Lek Surveys

WEST conducted surveys to document prairie grouse leks during the 2016, 2018, and 2019 breeding seasons within the Project Area. The objective of the prairie grouse lek survey was to collect pre-construction data that can be used to help site the wind turbines to minimize impacts on prairie grouse. A combination of aerial and ground-based surveys was used to search for breeding prairie grouse locations.

In 2019, WEST conducted ground-based lek status surveys at eight previously identified (2016 and 2018) potential lek locations to document current lek usage and determine whether or not these locations meet the SDGFP criteria for a lek (i.e., active lek for at least two of the last 5 years). Surveys were conducted at each lek three times from April 21 to May 21, 2019.

The 2019 surveys were conducted at 17 previously identified locations. The 2016 surveys were conducted three times between March 29 and April 30. In 2018, surveys for new leks were conducted three times between March 27 and May 6 within the entire 2017 Project Area excluding areas that were previously surveyed within the 2016 Project Area. The surveys extended to a 1-mile buffer of the 2017 Project Area. The 2019 surveys were conducted at each lek three times from April 21 to May 21, 2019.

WEST identified a total of eight prairie grouse leks during aerial and ground lek surveys within the Project Area and its 1-mile survey area during the 2016, 2018, and 2019 breeding season (Figure 6 in Appendix C). Four lek locations were active in 2016, seven in 2018, and three in 2019 surveys; of these identified and potential leks, one was a sharp-tailed grouse lek and seven were greater prairie chicken leks. Only the sharp-tailed grouse lek and three greater prairie chicken leks meet the SDGFP criteria for an active prairie grouse leks and are within the Project Area or one mile boundary (Figure 6 in Appendix C).

Northern Long-eared Bat Habitat Assessment

A desktop assessment of the presence of potentially suitable habitat for the NLEB was conducted within the Project Area. During the summer, suitable habitat for this species consists of forested areas where bats might roost, forage and commute between roosting and foraging sites. NLEB primarily forage or travel in forest habitat and are typically constrained to forest features (Boyles and Willis 2009). Therefore, habitat suitability was evaluated based primarily on the presence of forested areas that NLEB might use for roosting and foraging.

Forested patches were sorted by size into the following groups: fewer than 15 acres: small forest patches; 15 to 50 acres: potential NLEB roost/foraging habitat; and more than 50 acres: large potential roost/foraging habitat. All polygons representing forested habitats were buffered by 500 feet and dissolved to group any habitat patches within 1,000 feet of each other. This buffer, representing all forested habitats within 1,000 feet of each other, was then purged of small isolated patches by selecting only those connected habitats containing forested patches at least 15 acres in size. This selection of habitat patches was then buffered by 1,000 feet to represent the potential foraging area for NLEB.

No NLEB habitat was identified within the Project Area. One connected habitat patch was located within 2.5 miles from the Project Area (Figure 8 in Appendix C).

Whooping Crane Stopover Habitat Assessment

Potential stop-over habitat for whooping cranes was evaluated using a model developed by The Watershed Institute, Inc. (TWI 2012). The TWI habitat assessment model evaluates the quantity, quality, and locations of potential whooping crane stopover habitat in a given area. It is based on available data on water regime, water depth, visibility obstructions, wetland size, disturbance, and proximity to feeding areas, which are all factors that have been shown to affect how whooping cranes choose stopover habitat. The desktop evaluation of potential whooping crane stopover habitat using the TWI model included the Project Area plus a 10-mile buffer.

Results of wetland feature scores within the Project Area and 10-mile buffer were compared to Quivira National Wildlife Refuge (Quivira), which is a traditional stop-over site for whooping cranes in Kansas. Based on the average score for Quivira wetlands, scores of 12 or higher were considered by TWI to be potentially suitable habitat. High-scoring (12+) features were present within the Project Area and a 10-mile buffer area, with the largest high-scoring features in terms of acreage and the areas with the most densely occurring high-scoring features outside of the Project Area. However, one area of densely occurring high-scoring features was present within the southwest portion of the Project Area (Figure 9 in Appendix C). The widespread availability of suitable stopover habitat indicates that if cranes are displaced from suitable habitat by development of the Project, they are likely to find similar habitat nearby.

No whooping crane observations were confirmed through the fall of 2016 within the Project Area, and three observations were confirmed within 10 miles of the Project Area (Figure 10 in Appendix A; CWCTP 2017). The Cooperative Whooping Crane Tracking Project emphasizes that the whooping crane observation data are incidental sightings and not accurate documentations of absence in areas where no observations are recorded, nor are observation locations representative of all sites used by tracked cranes since only the location of the first observation is logged in the database.

The USGS evaluated spatial intensity of use by 58 whooping cranes fitted with platform transmitting terminals (Pearse et al. 2015). Based on stopover site use density and duration, 20-square-km grid cells were categorized as unoccupied, low use, core intensity or extended-use core intensity. Overlaying the USGS site use intensity data with the Project Area indicates that the Project is located in an area with unoccupied and lower use intensity. However, more recently Pearse et al. (2020) reported low stopover site fidelity based on 58 marked whooping cranes tracked from 2010 to 2016. The authors suggested that past use of stopover habitat was a poor indicator of future use and that use of potential stopover habitat was likely related to other factor including length of migration bout and informed landscape and habitat features.

Acoustic Bat Survey

WEST conducted acoustic monitoring surveys to estimate levels of bat activity throughout the 2016 and 2017 Project Areas from May 26 to October 21, 2016 and April 25 to October 25, 2018 (Appendix C). Studies of bat activity followed the recommendations of the USFWS Land-based WEG (USFWS 2012) and Kunz et al. (2007).

In 2016 surveys, the AnaBat units recorded approximately 58 percent of bat passes as high frequency (e.g., eastern red bats, and little brown bats [*Myotis lucifugus*]) and 42 percent of bat passes as low frequency (e.g., big brown bats, hoary bats, and silver-haired bats). Bat activity varied between seasons, with lower activity in the summer and higher activity in fall. At this station, bat pass rates peaked during the first part September. Higher activity during the late summer and early fall may be due to the presence of migrating bats passing through the area.

During 2018 surveys approximately 19.3 percent and 49.7 percent of bat passes recorded at the representative habitat and bat feature, respectively, in the Project Area were classified as low frequency bats. Bat activity recorded at the Project Area at ground representative stations during the fall migration period (0.31 bat passes per detector-night) was lower than activity at facilities in the Midwest.

Avian Use Surveys

There are ongoing avian use point count surveys at 12 survey points in the Project Area. Each of these points are surveyed once per month beginning on April 7, 2019 and will continue through March 2020. The following provides a preliminary summary of the avian use surveys conducted or being conducted within the Project Area through December 2019. No analyses of these data have been completed nor has the data been thoroughly vetted and curated. An avian use report will be drafted late May 2020 and will include historical data if available.

A total of 108 fixed-point surveys were completed for each small and large bird survey representing 18 and 108 hours of survey, respectively for each size class. No bald or golden eagles were recorded during any fixed-point survey. For small bird surveys, 25 unique bird species were identified. The most common small bird species recorded were red-winged blackbird (278 observations, 36 groups), western meadowlark (234 observations, 83 groups), and horned lark (*Eremophila alpestris*; 189 observations, 25 groups). For large birds the most common species recorded included sandhill crane (1,343 observations, 13 groups), Franklin's gull (*Leucophaeus pipixcan*; 173 observations, 5 groups), and northern shoveler (*Anas clypeata*; 89 observations, 22 groups). The most common raptor identified within the Project Area was red-tailed hawk (21 observations, 20 groups) followed by northern harrier (7 observations, 7 groups).

9.2.2 Impacts to Wildlife

The primary wildlife-related concerns associated with the construction and operation of wind energy facilities and transmission lines are generally associated with birds and bats. These impacts may be direct, such as those resulting from collision into MET towers, transmission line structures, or wind turbines during operations or habitat loss. Indirect impacts include displacement, habitat degradation, or fragmentation. Permanent habitat loss due to construction of wind turbines and transmission line structures will be minimal across the Project Area and localized. The sections below further describe potential impacts on birds, bats, and other wildlife that have the potential to occur in the Project Area based on recent published research and project-specific survey results.

9.2.2.1 Federal and State-Status Terrestrial Species

This section discusses potential impacts to federally and state-listed species that have the potential to occur within the Project Area.

Northern Long-eared Bat

The Project Area is located on the western fringe of the NLEB range and within the WNS zone and therefore must comply with the section of the NLEB 4(d) rule applying to areas impacted by WNS (USFWS 2016b). Meridian Wind has completed an NLEB habitat assessment and avoided suitable habitat by 1,000 feet pursuant to USFWS guidance (Figure 8 in Appendix C). Given the Project's location, the presence of limited suitable habitat, and recorded occurrences of NLEB in the general vicinity of the Project, it is possible that this species occurs in the Project Area during migration and/or summer. However, incidental take of NLEB by wind turbines is exempted by the 4(d) rule.

Whooping Crane

Generally, risk regarding whooping cranes is considered low due to low population numbers and the little amount of time they spend flying during migration within the rotor swept and transmission line heights. However, the Project Area provides potentially suitable habitat for whooping cranes since it is primarily

composed of herbaceous cover and cropland with interspersed streams and areas of open water. Additionally, the Project Area is located within the 50 percent migration corridor. When comparing the TWI model results between an expanded version of the Project Area and the 10-mile buffer, the areas were found to be similar in that features scoring 11 or 12 were most common (Appendix C). The lack of a concentration of high-scoring features within the Project Area relative to the surrounding landscape infers whooping cranes may not be more attracted to the Project Area and risky areas near wind turbine blades and transmission lines.

Red Knot

The rufa red knot is a potential but infrequent migrant through the Project Area during spring and fall. However, the potential of occurrence within the Project Area is considered unlikely given the lack of confirmed observations in the region (eBird 2020) and lack of suitable stopover habitat within the Project Area.

Interior Least Tern

Although no suitable nesting habitat was identified within the Project Area during the site visit conducted in February 2016, there is evidence of breeding activity of interior least terns within 13 miles of the Project Area (USFWS 2013b, 2020c). Furthermore, least terns are documented migrants throughout Hyde County during the spring and fall and therefore have potential to occur in the Project Area.

Piping Plover

Although unlikely, the potential for occurrence of breeding piping plovers exists based on limited suitable habitat present during low water years on lands within and around the Project Area. Outside of the breeding period, this species may migrate over the Project Area.

Swift Fox

Based on a compilation of recent records and areas with established populations (Stratman 2015) and because the Project Area falls slightly (approximately 13 miles) outside of the species distribution (SDGFP 2020a), it is unlikely that this species will occur in the Project Area. However, if swift foxes were to be present in prairie dog colonies within or immediately adjacent to areas disturbed by Project development, direct and indirect impacts will be limited by the avoidance measures identified for burrowing owls that also use prairie dog towns.

Birds

Mortality or injury due to collisions with turbines, transmission line structures, or other infrastructure is the most probable direct impact to birds from wind energy facilities and associated transmission facilities. It should be noted that the Project's transmission line will travel through the Triple H Wind Project and will be surrounded by turbines to the north and the south (Figure 1 in Appendix A). Collisions may occur with resident birds foraging and flying within the Project Area or with migrant birds seasonally moving through the area. Project construction could affect birds through loss of habitat, construction disturbance, or fatalities from construction equipment. Impacts from decommissioning of the facility are anticipated to be similar to construction in terms of noise, disturbance, and equipment used. Potential mortality from construction equipment is expected to be relatively low, as equipment used in wind energy facility and transmission line construction generally moves at slow rates or is stationary for long periods (e.g., cranes). The highest risk of direct mortality to birds during construction is most likely the potential destruction of nests of ground- and shrub-nesting species during initial site clearing.

Post-construction fatality monitoring reports from the Midwest region of North America show a wide variation in levels of bird mortality, ranging from 0.27 to 8.25 birds/MW/year (WEST 2017a). This same wide variation in mortality was noted for studies specific to South Dakota wind farms, as bird mortality at the Wessington Springs facility ranged between 8.25 and 0.89 bird fatalities/MW/year in 2009 (Derby et al. 2010) and 2010 (Derby et al. 2011), respectively.

The majority of bird species commonly observed during the WEST avian surveys completed to date are not of conservation concern. The majority of sandhill cranes were recorded flying above the rotor swept area, indicating these individuals were migrating over the Project Area rather than using habitats within the Project. Despite their abundance, potential impacts to sandhill cranes are estimated to be low based on all available data regarding crane and wind energy facility interactions in North America; however, the risk of collision cannot be entirely ruled out.

While overall risk to raptors is expected to be low, based on species composition of the most common raptor fatalities at other western wind energy facilities and species composition of raptors observed in the area between 2016 and 2019, the majority of the fatalities of diurnal raptors will likely consist of red-tailed hawks. It is expected that risk to raptors will be unequal across seasons, with the lowest risk in the winter and highest risk during the spring. Raptor fatality rates are expected to be comparable to other wind energy facilities in South Dakota and the Midwest region.

9.2.2.2 *Prairie Grouse*

Human-induced influences that fragment grouse habitat could affect population growth rates, persistence or occupancy through negative behavioral responses affectively leading to habitat loss (Doherty et al. 2011). Currently, the state of the science related to wind power project effects on prairie grouse is developing; thus, management recommendations for future wind power projects are limited. The effects of wind energy development have been studied on three species of grouse within the United States including the greater prairie-chicken, Columbian sharp-tailed grouse [*T. phasianellus columbianus*] and greater sage-grouse. Although the Project Area is outside of the range of the greater sage-grouse, due to the lack of peer-reviewed studies that investigate the effects of turbines on plains sharp-tailed grouse, the subspecies found within the Project Area, grouse studies in general were used to provide a framework for impact analysis.

Generally, these studies indicate grouse nest site selection, nest survival, and female survival are not negatively affected by the presence of turbines (Winder et al. 2014a,b; McNew et al. 2014; Proett 2017; LeBeau et al. 2017a; Harrison et al. 2017). However, studies have indicated greater prairie-chicken space use during the breeding season in Kansas was negatively affected by proximity to turbines (Winder et al. 2014a) and lek abandonment was high for smaller leks within cropland habitats within 8 km of turbines (Winder et al. 2015). LeBeau documented female greater sage-grouse habitat use during the breeding period decreased as proximity to turbines increased (LeBeau et al. 2017b) and Columbian sharp-tailed grouse had lower chick survival in habitats with increasing number of turbines (Proett 2017).

Given the location of leks within the Project Area and the likely presence of suitable nesting and brooding habitat in proximity to turbines, transmission line infrastructure, or associated structures, the potential for either direct or indirect impacts exist. Siting turbines within agricultural fields and avoiding disturbance or fragmentation to large blocks of grassland habitats help reduce potential impacts to prairie grouse and their breeding habitat within the Project Area.

9.2.2.3 *Eagles*

Exact numbers of bald and golden eagle mortalities at wind energy facilities are difficult to determine for a variety of reasons including, until recently, the lack of a centralized database, and legal proceedings that prevent the release of information. Eagle mortalities at wind facilities in the contiguous United States (excluding the Altamont Pass Wind Resource Area in California) were summarized through June 2012 from public domain data by Pagel et al. (2013). They found that 32 wind energy facilities had experienced eagle fatalities (85 total fatalities—6 bald eagles and 79 golden eagles). More recently, Kritz et al. (2018) updated the findings of Pagel et al. and found 49 verifiable records of bald eagle mortality in the United States between 2013 and 2018. None of these fatalities occurred in South Dakota, although 25 occurred in the neighboring states of Wyoming, Montana, North Dakota, Minnesota, and Iowa.

To date, no bald eagles have been recorded within the Project Area during fixed-point surveys, nor were any bald eagle nests located during 3 years of nest surveys, suggesting very little to no use of the Project Area by bald eagles. Similarly, no golden eagles have been recorded during any fixed-point surveys; however, three have been observed incidentally when on site. Further, one golden eagle nest was found within the Project Area in 2019. The nest occupied by the golden eagle had been previously occupied by a red-tailed hawk in surveys conducted in 2016 and 2018. Surveys conducted in March 2020 indicated that this nest was no longer viable because the limb that contained the nest broke, evidenced by tree limb and nest debris on the ground. The presence of a golden eagle nest within a project may indicate an elevated level of risk for golden eagle collision with turbines and nesting disturbance during construction and operation of the Project; however, at the time of this application there are no identified eagle nests within the Project Area.

9.2.2.4 *Bats*

Bat fatalities have been discovered at most wind energy facilities monitored in North America, ranging from zero (Chatfield and Bay 2014) to 40.2 bat fatalities per MW per year (Hein et al. 2013). In 2012, an estimated 600,000 bats died as a result of interactions with wind turbines in the United States (Hayes 2013). Proximate causes of bat fatalities are primarily due to collisions with moving turbine blades (Grodsky and Drake 2011; Rollins et al. 2012), but to a limited extent may also be caused by barotrauma (Baerwald 2008). The underlying reasons for why bats enter the proximity of turbines are still largely unknown (Cryan and Barclay 2009). To date, post-construction monitoring studies of wind energy facilities show that (1) migratory tree-roosting species (e.g., eastern red bat, hoary and silver-haired bat) compose approximately 78 percent of reported bat fatalities; (2) the majority of fatalities occur during the fall migration season (August and September); and (3) most fatalities occur on nights with relatively low wind speeds (e.g., less than 6.0 m/s [19.7 feet per second]; Arnett et al. 2008, 2013; Arnett and Baerwald 2013).

Approximately 19.3 percent and 49.7 percent of bat passes recorded at the representative habitat and bat feature, respectively, in the Project Area were classified as low-frequency bats. These low frequency species may become casualties because they typically fly at higher altitudes (Aldridge and Rautenbach 1987; Norberg and Rayner 1987; Fenton and Bogdanowicz 2002). Given that hoary bats, eastern red bats, and silver-haired bats are among the most commonly found bat fatalities at many facilities (Arnett et al. 2008, Arnett and Baerwald 2013), it is expected that these three species will likely be the most common fatalities at the Project.

Mean bat activity during the fall migration period at the fixed ground detectors was lower than average for the majority of studies available from the Midwest (Appendix C). Overall activity by low-frequency (e.g., big brown bats, hoary bats, and silver-haired bats) and high-frequency (e.g., eastern red bats and *Myotis* species) bats peaked during the end of July and first week of August. Bat activity at bat features had similar temporal patterns with bat activity being lowest in the summer (0.25 bat passes/night) and highest in the fall (0.67). Bat feature stations had peak activity in late August and early September. This timing is consistent with peak fatality periods for most wind energy facilities in the United States.

Given that over two-thirds of bat fatality studies in the Midwest report fewer than five bat fatalities/MW/year (WEST 2017b), it is possible that similar fatality rates might be recorded at the Project. However, some studies indicate that facilities in agricultural settings in the Midwest can produce higher levels of bat fatalities (Jain 2005; Baerwald 2008; Gruver et al. 2009).

9.2.3 Mitigation Measures for Wildlife

Meridian Wind has sited the layout to avoid or minimize impacts to federally and state-protected species, avoid impacts to high quality prairie habitat, and to realign linear corridors, such as the access roads, collector system, crane pathways, and transmission lines to follow existing disturbed corridors (e.g., roads, transmission lines, fence rows) in an effort to reduce fragmentation.. Pending completion of pre-construction avian and bat studies, Meridian Wind will prepare a Bird and Bat Conservation Strategy (BBCS) that will be implemented during construction and operation of the Project. The BBCS will consist of Meridian Wind's corporate standards for minimizing impacts to avian and bat species during construction and operation of wind energy projects and will be developed in a manner that is consistent with the USFWS Land-Based WEG (USFWS 2012). It will include Meridian Wind's commitments to wind project siting, construction practices and design standards, operational practices, permit compliance, and construction and operation worker training.

In addition, Meridian Wind has implemented or will implement the following mitigation measures to avoid or minimize potential impacts to wildlife in the Project Area during Project design, construction, operation, and decommissioning.

Design

- Maximize infrastructure siting in previously-disturbed habitat to avoid habitats associated with protected wildlife and plant species, localized areas of concentrated bird and bat use and breeding/brood-rearing areas.
- Minimize siting turbines in native prairie and native plant communities. Previously disturbed lands, including existing roads, will be used, where practical, to minimize wildlife habitat fragmentation.
- All turbines will be sited away from SDGFP South Dakota Game Production Areas and USFWS Waterfowl Production Areas (WPA); to reduce risk to waterfowl and waterbirds and grassland-associated birds.
- Prairie dog town will be avoided to the extent possible to minimize disturbance to potential swift fox, burrowing owl, and other species (i.e. raptors).
- Avoid or minimize disturbance of wetlands during Project construction. A wetland delineation will be conducted prior to construction to identify the limits of wetland boundaries in the vicinity of Project activities.

- Turbine towers will be designed and constructed to discourage bird nesting and wildlife attraction; no perching structures will be placed on the nacelles of the turbines.
- Guy wires will not be used on permanent MET towers.
- Wind turbines will be illuminated as required by FAA regulations.
- Lighting guidelines will be followed where applicable, from the USFWS Land-Based WEG (USFWS 2012). This includes using lights with timed shutoff, downward-directed lighting to minimize horizontal or skyward illumination and avoidance of steady-burning, high-intensity lights. Hoods/shields will be installed on exterior lights at the O&M facility, collector switchyard and interconnection substation to minimize skyward light. All unnecessary lighting will be turned off at night to limit attraction of migratory birds.
- Turbines will be sited more than 1,000 feet (305 meters) from the edge of connected patches of forested habitat to avoid potential impacts to bats, including NLEBs, during the summer.
- Construct wind turbines using tubular monopole towers.
- Turbine doors will not have exterior lights installed at the entrance.
- Consult with the appropriate natural resource agencies to avoid scheduling construction activities during important periods for wildlife courtship, breeding and nesting that are applicable to sensitive species within the Project Area.
- Minimize the size of areas in which soil will be disturbed or vegetation will be removed.

Construction

- Reduce habitat disturbance by keeping vehicles on access roads and minimizing foot and vehicle traffic through undisturbed areas; traffic will be restricted to Project-specific roads and use of unimproved roads will be restricted to emergency situations.
- Speed limits will be set to ensure safe and efficient traffic flow; signs will be placed along roads, as necessary, to identify speed limits, travel restrictions and other standard traffic control information.
- Educate and instruct employees, contractors and site visitors to avoid harassment and disturbance of wildlife, especially during reproductive (e.g., courtship and nesting) seasons.
- Prior to construction, all supervisory construction personnel will be instructed on the BBBS and wildlife resource protection measures, including: (1) applicable federal and state laws (e.g., those that prohibit animal collection or removal) and (2) the importance of these resources and the purpose and necessity of protecting them and ensure this information is disseminated to applicable contractor personnel, including the correct reporting procedures.
- Sound water and soil conservation practices will be maintained during construction and operation of the Project to protect topsoil and adjacent resources and to minimize soil erosion. This includes the preparation and implementation of a SWPPP. The SWPPP will include standard sediment and erosion control devices and practices (e.g., silt fences, straw bales, netting, mulching, temporary seeding, soil stabilizers, check dams, grassed waterways) to minimize soil erosion during and after construction.

- Stormwater management practices will be implemented to minimize open water resources that may attract birds and bats.
- Meridian Wind will 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 landowners, land managers and appropriate agencies.
- Noxious weeds will be controlled in all surficially disturbed areas using mowing and/or herbicides.
- If site evaluations show that proposed construction activities will pose a significant risk to avian or bat species of concern, establish buffer zones around known raptor nests, bat roosts and biota and habitats of concern.

Operation

- Conduct post-construction mortality monitoring for a minimum of 1 year. The monitoring will include searcher efficiency and carcass removal trials and the overall mortality rate will be adjusted based on the trial results. This protocol is based on guidelines from the USFWS Land-Based WEG (USFWS 2012) and the National Wind Coordinating Collaborative Comprehensive Guide to Studying Wind Energy/Wildlife Interactions (Strickland et al. 2011). Estimates of mortality will use the most appropriate and up-to date statistical analysis modeling available.
- Turn off unnecessary lighting at night to limit attraction of migratory birds. Follow lighting guidelines, where applicable, from the USFWS Land-Based WEG (USFWS 2012). This includes using lights with timed shutoff, downward-directed lighting to minimize horizontal or skyward illumination and avoidance of steady-burning, high- intensity lights.
- Instruct employees, contractors and site visitors to avoid harassment and disturbance of wildlife, especially during reproductive (e.g., courtship and nesting) seasons.
- With the exception of bird and bat carcasses, all carrion discovered on site during regular maintenance activities will be disposed of in an appropriate manner to prevent the attraction of eagles and other raptors. All discoveries of bird and bat carcasses will follow protocol as described in the BBCS.
- Meridian Wind will encourage landowners to appropriately and regularly dispose of livestock carcasses to prevent the attraction of eagles and other raptors to the Project Area.

Decommissioning

- Meridian Wind will remove all turbines and ancillary structures from the Project Area.
- Meridian Wind will salvage and reapply topsoil excavated during decommissioning activities to disturbed areas during final restoration activities.
- Meridian Wind will 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.

10.0 EFFECT ON AQUATIC ECOSYSTEMS (ARSD 20:10:22:17)

ARSD 20:10:22:17. Effect of aquatic ecosystems. The applicant shall provide information of the effect of the proposed facility on aquatic ecosystems, and including existing information resulting from biological surveys conducted to identify and quantify the aquatic fauna and flora, potentially affected within the transmission site, wind energy site, or siting area, an analysis of the impact of the construction and operation of the proposed facility on the total aquatic biotic environment and planned measures to ameliorate negative biological impacts as a result of construction and operation of the proposed facility.

10.1 Existing Aquatic Ecosystem

10.1.1 Surface Water and Wetland Resources

The Project Area is located within the Medicine Knoll, Crow, and Fort Randall Reservoir HUC 8 watersheds of the Fort Randall Reservoir HUC-6 watershed. No significant, open water communities are present within the Project Area. Chapelle Lake is the closest open water community located approximately 1.8 miles southwest of the Project Area. Instead, aquatic resources are dominated by wetlands, which cover approximately 697 acres (4.6 percent) of the Project according to NWI data. Based on the data, wetlands found in the Project Area consist of eight vegetation classes, including those from the palustrine (inland wetlands), riverine (rivers) and lacustrine (lake) systems. Streams within the Project Area are primarily intermittent watercourses; some of which have been bermed to create ponds. Given the pervasiveness of wetlands within the Prairie Pothole region, aquatic biota with the Project Area is likely representative of the region.

Chapelle Lake, located southwest of the Project Area, is approximately 40 acres in size. According to the SDGFP (2020b), Chapelle Lake is a managed fishery for northern pike (*Esox lucius*) and yellow perch (*Perca flavescens*), while black bullhead (*Ameiurus melas*) and white sucker (*Catostomus commersonii*) are also commonly present. Given the lake's small size, deepwater habitat is likely limited.

10.1.2 Federal and State Special Status Aquatic Species

Pallid Sturgeon

The pallid sturgeon (*Scaphirhynchus albus*) is a federally and state endangered fish species adapted to sandy areas with fine substrates, floodplains, backwaters, chutes, sloughs, islands, sandbars, and main channel waters within large river ecosystems (USFWS 2014). Major threats to this species are habitat alteration caused by channelization and dam construction, leading to the replacement of estuarine and flooded areas by permanent lakes and alteration of water flow and temperature. Although potential/verified occurrence of the pallid sturgeon has been reported for all counties that are contiguous with the Missouri River, its geographic range falls outside the Project Area (USFWS 2013c). The pallid sturgeon can be found in the Missouri River, approximately 15 miles southwest of the Project.

10.2 Impacts to Aquatic Ecosystems

10.2.1 Surface Water and Wetland Resources

Temporary and long-term operational impacts to surface waters and wetlands are discussed in Sections 8.2.1.1 and 8.2.1.2. Construction activities in the vicinity of these waterbodies and wetlands may temporarily increase sedimentation due to erosion and from changes in runoff patterns and water volumes due to increased impervious surfaces. This could temporarily degrade the water quality of aquatic habitat supporting these species. Meridian Wind will not impact Chapelle Lake during construction or operation of the Project.

10.2.2 Federal and State Special Status Aquatic Species

Pallid Sturgeon

The pallid sturgeon can be found in the Missouri River, approximately 15 miles southwest of the Project. No suitable habitat is present within the Project Area, and therefore, the pallid sturgeon will not be affected by the development and operation of the Project.

10.3 Mitigation Measures for Aquatic Ecosystems

As described in Section 8.2.3, for surface water and wetlands, BMPs will be designed and utilized to control sedimentation and erosion during the construction phase of the Project. The pallid sturgeon is not present within the Project Area. Therefore, no mitigation measures are proposed.

11.0 LAND USE (ARSD 20:10:22:18)

ARSD 20:10:22:18. Land use. *The applicant shall provide the following information concerning present and anticipated use or condition of the land:*

- (1) A map or maps drawn to scale of the plant, wind energy, or transmission site identifying existing land use according to the following classification system:*
 - a. Land used primarily for row and nonrow crops in rotation;*
 - b. Irrigated lands;*
 - c. Pasturelands and rangelands;*
 - d. Haylands;*
 - e. Undisturbed native grasslands;*
 - f. Existing and potential extractive nonrenewable resources;*
 - g. Other major industries;*
 - h. Rural residences and farmsteads, family farms, and ranches;*
 - i. Residential;*
 - j. Public, commercial, and institutional use;*
 - k. Municipal water supply and water sources for organized rural water systems; and*
 - l. Noise sensitive land uses;*
- (2) Identification of the number of persons and homes which will be displaced by the location of the proposed facility;*
- (3) An analysis of the compatibility of the proposed facility with present land use of the surrounding area, with special attention paid to the effects on rural life and the business of farming; and*
- (4) A general analysis of the effects of the proposed facility and associated facilities on land uses and the planned measures to ameliorate adverse impacts.*

11.1 Land Use and Ownership

11.1.1 Existing Land Use and Ownership

The Project Area is predominantly located on private land (Figure 11 in Appendix A). Occupied farm sites and rural residences occur within the Project Area and other scattered rural residences are adjacent to the Project Area. Occupied farmsteads and rural residence locations were originally identified using satellite imagery and verified with field surveys. There are 12 occupied dwellings in the Project Area which, as defined in Section 11.3.2, are noise-sensitive receptors. None of these occupied dwellings are located within the transmission line easement.

As discussed in Section 9.1.1 and Table 9-1, land use within the Project Area is predominantly agricultural, consisting of a mix of cropland and grassland/herbaceous land. Other digitized land cover within the Project Area include barren land, grassland pasture, grass hay, NWI wetlands, developed areas, trees, and water (Table 9-1). NWI wetlands are included in Table 8-2. Developed lands included roads, ranches and residential areas. Trees typically included shelterbelts with a mixture of evergreen and deciduous species, near residences or along field borders. Figure 11 in Appendix A provides Project land use based on the classification system specified in ARSD 20:10:22:18(1).

The USDA NRCS and Farm Service Agency (FSA) administer a number of conservation-based programs for private landowners. The CRP conserves soil and water resources and provides wildlife habitat by removing enrolled tracts from agricultural production, generally for a period of 10 years. An offspring of the CRP program is the Conservation Reserve Enhancement Program with similar management constraints and goals. These tracts cannot be hayed, tilled, seeded, or otherwise disturbed (including

disturbance associated with power line or other project construction) without authorization from the USDA. The FSA does not distribute the location of CRP lands without written authorization from landowners; however, as of the time of this report, 4,913 acres of land in Hyde County are enrolled in the program (FSA 2017).

Another NRCS conservation program is the Wetland Reserve Program (WRP), a voluntary program to restore and protect wetlands on private property. The NRCS provides technical and financial support to help landowners with wetland restoration efforts. The program allows landowners to choose permanent conservation easements, 30-year easements, or 10-year restoration cost-share agreements (NRCS 2020a). No construction is permitted on WRP land. There are no WRP wetlands identified in the Project Area.

Other NRCS programs include the following:

- The Farm and Ranch Land Protection helps purchase development rights to keep productive farm and ranchland in agricultural use.
- The Grasslands Reserve protects, restores and enhances grassland including rangeland, pastureland, shrublands and certain other lands.
- The Healthy Forests Reserve Program assists landowners in restoring, enhancing and protecting forestland resources or private lands.

Desktop analysis confirmed that there was no land enrolled in these NRCS programs within the Project Area (NCED 2020).

Croplands included fields where corn (*Zea mays*), soybeans (*Glycine max*), sunflowers (*Helianthus annuus*), sorghum (*Sorghum bicolor*), alfalfa (*Medicago sativa*), winter wheat (*Triticum aestivum*), millet (*Panicum miliaceum*), spring wheat, or other row crops were grown. Herbaceous grassland vegetation was divided into grassland pastures or grass hay.

Grassland pastures in the area are typically characterized by a mixture of native cool and warm season grasses including western wheatgrass (*Pascopyrum smithii*), green needle grass (*Nassella viridula*), needle-and-thread (*Hesperostipa comata*), blue grama (*Bouteloua gracilis*), sideoats grama (*Bouteloua curtipendula*) and little blue stem (*Schizachyrium scoparium*). Grass hay fields typically contain fewer species such as smooth brome grass (*Bromus inermis*) and intermediate wheatgrass (*Thinopyrum intermedium*) and could possibly be older CRP fields that were hayed in 2017. The SDSU 2013 study quantifying undisturbed grasslands of eastern South Dakota identified approximately 6,068 acres of potentially undisturbed grassland present within the Project Area (approximately 40 percent of the Project Area). Comparing potentially undisturbed grassland present within the Project Area with the WEST land cover map, the Potentially Undisturbed Lands were primarily digitized as grassland pastures. Based on the 2017 Census of Agriculture in South Dakota, both the number and land in farms in Hyde County decreased by 16 percent and 2 percent, respectively, from 2012 to 2017 (USDA 2017). Forage (hay/haylage), corn for grain, sunflower seed, soybeans for beans, and wheat for grain are the top crops grown in Hyde County by acreage. Pastureland in Hyde County supports cattle and other livestock operations; cattle and calves are the top livestock raised in the county by number (USDA 2017). There are no irrigated lands (center-pivot) or major industries in the Project Area.

11.1.2 Land Use Impacts

The Project will result in conversion of a small portion of the land within the Project Area from existing agricultural land uses into a renewable energy resource during the life of the Project. It is estimated that approximately 423 acres of land will be temporarily impacted by Project construction. Approximately 55 acres of land will have long-term operational impacts (0.4 percent of the total land within the Project Area; Table 9-3). Temporary impacts associated with construction staging and laydown areas and underground collector lines will also occur. Following construction, the areas will be returned to pre-construction land uses, which primarily consist of croplands and grassland pasture.

There are 12 occupied dwellings within the Project Area. As designed, the Project layout of turbines, transmission line structures, access roads, collector lines, and associated facilities will not cause displacement of residences or businesses due to construction or operation of the Project. As currently designed, the closest participating residence to a turbine is approximately 1,625 feet; the closest non-participating residence to a turbine is approximately 2,753 feet. As discussed in Section 19.0, the Project will be decommissioned at the end of its operating life. Disturbed surfaces will be graded, reseeded, and restored to their pre-construction conditions, unless otherwise agreed to by the landowner.

11.1.3 Mitigation Measures for Land Use

During construction, the construction workspace located on cropland and grasslands will be removed from productivity; however, following construction, these areas will be restored and returned to its prior use. Fencing or grazing deferment in pasturelands within or adjacent to the construction workspace may also be necessary to prevent livestock from injury by entering the construction area. Meridian Wind will work with landowners on the following issues: installation of gates and cattle guards where access roads cross existing fence lines, access control, signing of open range areas, traffic management (e.g., vehicle speed management) and location of livestock water sources. Additionally, the following BMPs will be used:

- Excess concrete will not be buried or left in active agricultural areas.
- Vehicles will be washed outside of active agricultural areas to minimize the possibility of the spread of noxious weeds.
- Topsoil will be stripped from any agricultural area used for traffic or vehicle parking, segregated, and replaced during restoration activities.
- Drainage problems caused by construction will be corrected to prevent damage to agricultural fields.
- Following completion of construction and during decommissioning, subsoil will be decompacted.

11.2 Recreation, Public Facilities, and Conservation Easements

11.2.1 Existing Recreation, Public Facilities, and Conservation Easements

The Project Area is entirely located on private land. While there are several USFWS conservation easements in the Project Area, these are private lands (see Section 11.2.1.4).

11.2.1.1 Recreational Resources

Recreational opportunities in Hyde County include hunting, biking, hiking, boating, fishing, camping, swimming, horseback riding, cross country skiing, snowmobiling, and nature viewing. The Woodruff Lake State Game Area is approximately 11.5 miles northwest of the Project Area in Hughes County. The Lake Louise State Recreation Area and West Bend Recreation Area are approximately 13.75 miles northeast and 19.75 miles southwest of the Project Area, respectively (SDGFP 2020c). Chapelle Lake and the Peno Managed Fish Areas are public fisheries located within 5 miles of the Project Area (Figure 9 in Appendix A; SDGFP 2020b).

11.2.1.2 Public Facilities

No schools, churches or cemeteries occur within the Project Area, although several schools, churches, and cemeteries are located just outside the Project Area in the city of Highmore.

11.2.1.3 South Dakota Office of School and Public Lands

The South Dakota Office of School and Public Lands manages over 750,000 acres of land in the state (SDGFP 2020d). These lands are available to the public for hunting and fishing. There are no school and public lands areas located within the Project Area (South Dakota School & Public Lands 2020).

11.2.1.4 SDGFP Lands

Game Production Areas (GPAs) are managed to provide wildlife habitat, improve wildlife production, and provide public hunting and trapping opportunities. The SDGFP owns and manages the Highmore GPA located approximately 1 mile north of the Project Area, and the Chapelle GPA located approximately 1.8 miles southwest of the Project Area. (Figure 9 in Appendix A; SDGFP 2020e).

SDGFP contracts with private landowners to provide general hunting access through the Walk in Area (WIA) program. The WIA program leases private land with valuable hunting areas for unlimited public hunting access (foot-traffic only) in exchange for an annual payment and immunity from non-negligent liability (SDGFP 2020e). There are no WIAs within or adjacent to the Project Area (SDGFP 2020e).

Figure 9 (Appendix A) shows the locations of GPAs and School and Public Lands in the Project vicinity, which are all public lands open for hunting.

11.2.1.5 USFWS Lands

The Project is located within the USFWS Huron Wetland Management District (WMD). The Huron WMD consists of 59 WPAs, totaling 17,683 fee-owned acres in Beadle, Sanborn, Jerauld, Hand, Hyde, Hughes, Sully, and Buffalo counties (USFWS 2019c). These areas are part of the National Wildlife Refuge System and are managed for the production of waterfowl, but other game and nongame wildlife thrive on them as well. USFWS WPAs are managed to protect breeding, forage, shelter and migratory habitat for waterfowl or wading birds, such as ducks, geese, herons, and egrets. WPAs provide opportunities for viewing wildlife and intact ecosystems and also provide hunting opportunities. There are no WPAs located within the Project Area (Figure 9 in Appendix A); however, the Hyde County WPA is immediately south of the transmission line corridor.

The Huron WMD also works with private landowners to administer the wetland easement and grassland easement programs. A grassland easement is a legal agreement that pays landowners to keep their land in

grass. Land covered by a USFWS grassland easement may not be cultivated and mowing, haying and grass seed harvesting must be delayed until after July 15 each year. This restriction is to help grassland nesting species, such as ducks and pheasants, complete their nesting before the grass is disturbed. Grazing is not restricted. Similarly, the wetland easement program pays landowners to permanently protect wetland basins. Protected basins covered by a wetland easement cannot be drained, filled, leveled, or burned. When these protected basins dry up naturally, they can be farmed, grazed, or hayed. A USFWS wetland easement protects the protected basin within a parcel; however, the upland area outside the protected basin is not covered by the easement. The wetland easements help provide crucial habitat for many types of wildlife including ducks, pheasants, and deer. Hunting and trapping are allowed on both grassland and wetland easements, and the easements do not affect landowners' mineral rights (USFWS 2010a,b).

As shown in Figure 9 (Appendix A), the Project Area encompasses:

- 584.7 acres of grassland easements;
- 472.5 acres of top lease grassland easements; and
- 2073.8 acres of wetland easements.

Section 22.2.1 summarizes ongoing coordination between Meridian Wind and the USFWS regarding conservation easements and Project facilities. Meridian Wind is avoiding all non-top lease grassland conservation easements and will avoid the protected basins associated on the wetland easements. In a series of emails and telephone conversations, Meridian Wind and the USFWS discussed the grassland easement that was “top leased” by the USFWS after Meridian Wind had existing wind easements in place that had been executed with landowners and recorded in the appropriate land records prior to the USFWS implementation of a grassland easement for all or a portion of the property. The phrase “top leased” is refers to the circumstance in which a lease is executed covering land upon which a current lease already exists. In this instance, Meridian Wind easements were in place prior to the USFWS grassland easements. The South Dakota state law principle of “first in time - first in rights” applies here. As a result, the Project easements are superior to the USFWS grassland easements in the identified “top leased” areas. The USFWS reviewed the grassland easement and concurred that the existing wind easements and their associated lease agreements supersede any USFWS easements that were established after the fact and determined that no authorization from the USFWS will be required as it relates to the wind easement. Based on discussions with USFWS (Appendix K), the agency understands and agrees that the Meridian Wind easements will take precedent because they were in-place before the USFWS grassland easements. As a result, NEPA will not be triggered due to Meridian Wind placing the four turbines and associated roads and collector lines on the “top-leased” lands.

11.2.2 Impacts to Recreation, Public Facilities and Conservation Easements

11.2.2.1 Recreational Resources

Lake access to nearby State Game Areas, Recreation Areas, and Managed Fish Areas will not be restricted as a result of Project construction or operation. Chapelle Lake Managed Fish Area is approximately 1.8 miles southwest of Chapelle Station and the Project's transmission line corridor. The closest turbine and its associated construction workspaces are approximately 4.6 miles from the Peno Managed Fish Area.

11.2.2.2 Public Facilities

The Project will not impact public facilities in the area.

11.2.2.3 South Dakota Office of School and Public Land Areas

The Project will not impact any School and Public Lands parcels as none are located within the Project Area. The closest turbine and its associated construction workspace are approximately 0.45 mile northwest of the closest School and Public Lands parcel.

11.2.2.4 SDGFP Lands

The Project avoids direct impacts to all GPAs and WIAs.

Operation of the wind farm and transmission facilities could disrupt movements of terrestrial wildlife, particularly during migration. However, based on the abundance of suitable habitat in the Project Area, impacts to white-tailed deer are anticipated to be negligible. Therefore, impacts to the availability or distribution of deer for hunting in the Project Area is anticipated to be negligible. See Section 9.2 for a discussion on the potential impacts of the Project on waterfowl and other bird species that are hunted in the Project Area.

11.2.2.5 USFWS Lands

The Project has been designed to avoid impacts to USFWS grassland easements and the delineated features associated with the USFWS wetland easement program. Four turbines and associated access roads and collector lines are located on easements that were “top leased” with USFWS grassland easements (Figure 9 in Appendix A). The Project will result in long-term operational impacts to a maximum of approximately 1.7 acres and temporarily impacts to a maximum of approximately 9.8 acres on “top leased” grassland easements described in Section 11.2.1.5. The Project will result in long-term operational impacts to approximately 0.4 percent of the top leased grassland easements where Meridian Wind had procured wind easements prior to the USFWS securing the grassland easement. The Project will not impact the Hyde County WPA which is located immediately south of the transmission line corridor.

11.2.3 Mitigation Measures for Recreation, Public Facilities and Conservation Easements

11.2.3.1 Recreational Resources

The Project will not impact recreational resources in the area; therefore, no mitigation is required.

11.2.3.2 Public Lands

The Project will not impact public facilities in the area; therefore, no mitigation is required.

11.2.3.3 South Dakota Office of School and Public Land Areas

Meridian Wind will ensure that adequate safety measures are established for recreational visitors to School and Public Lands during construction and operation. These may include access control and traffic

management. Meridian Wind will work with SDGFP to address safety issues associated with the School and Public Lands.

11.2.3.4 SDGFP Lands

The Project avoids GPAs and WIAs, so no mitigation is required.

11.2.3.5 USFWS Lands

The Project avoids WPAs, so no mitigation is required.

Meridian Wind coordinated with the USFWS regarding the exact boundaries of the USFWS wetland, grassland, and conservation easements (Figure 9 in Appendix A). Meridian Wind's layout reflected in this Application balances setbacks, constructability, noise, shadow flicker, cultural resources, sensitive habitat, and other factors.

Following construction, disturbed areas will be returned to pre-construction land uses. In addition, impacts on USFWS easements will be reduced using BMPs to minimize the delivery of sediment due to erosional processes. BMPs for sediment and erosion control will be implemented within wetland conservation easements to minimize impacts to protected basins on wetland easements.

11.3 Acoustics

A pre-construction wind turbine Acoustic Assessment was conducted for the Project in March 2020 and is included in Appendix D. The acoustic modeling analyses demonstrates that received sound levels will be greater than 45 dBA at 11 noise-sensitive receptors (NSRs; 1 non-participating) for the GE 2.72-116 scenario and 5 NSRs (all participating) for the GE 2.72-116 Low Noise Trailing Edge (LNTE) scenario under worst-case anomalous conditions. It is expected that received sound levels at NSRs will be consistent with sound generated at similar wind energy projects successfully sited throughout the state of South Dakota employing the same or similar criteria.

The following sections provide information on the existing sound levels within the Project Area; the potential effects of the Project's construction and operation; and potential avoidance, minimization, and mitigation measures.

11.3.1 Existing Acoustic Levels and Regulatory Framework

County and township (section line) roads characterize the existing roadway system and the Project Area is accessible via State Highway 47, and other local two-lane paved and gravel county roads. The land within the Project Area is primarily agricultural with scattered farmstead residences. Current land use within the Project Area is primarily agricultural, supporting both crops and livestock grazing. Potential NSR locations within the Project Area and in the vicinity of proposed turbine locations were included in the acoustic analysis (Figure 11 in Appendix A).

Ambient acoustic environment refers to the all-encompassing sound in a given environment or community. Hyde County would generally be considered a rural agricultural area. Existing ambient sound levels are expected to be relatively low, although sound levels will be higher near roadways such as State Highway 47. Other human activity such as agricultural operations will seasonally contribute to sound levels in the area associated with crop harvests. Background sound levels are expected to vary both spatially and temporally, depending on natural sounds and proximity to area sound sources such as

roadways. Typically, background sound levels are quieter during the night than during the daytime, except during periods when evening and nighttime insect noise may contribute to the soundscape, predominantly in the warmer seasons.

11.3.1.1 Acoustical Terminology

Airborne sound is described as the rapid fluctuation or oscillation of air pressure above and below atmospheric pressure, creating a sound wave. Sound is characterized by properties of the sound waves, which are frequency, wavelength, period, amplitude, and velocity. Noise is defined as unwanted sound. A sound source is defined by a sound power level, which is independent of any external factors. The acoustic sound power is the rate at which acoustical energy is radiated outward and is expressed in units of watts. Sound energy travels in the form of a wave, a rapid fluctuation or oscillation of air pressure above and below atmospheric pressure. A sound pressure level is a measure of this fluctuation and can be directly determined with a microphone or calculated from information about the source sound power level and the surrounding environment through predictive acoustic modeling. While the sound power of a source is strictly a function of the total amount of acoustic energy being radiated by the source, the sound pressure levels produced by a source are a function of the distance from the source and the effective radiating area or physical size of the source. In general, the magnitude of a source's sound power level is always considerably higher than the observed sound pressure level near a source since the acoustic energy is being radiated in various directions.

Sound levels are presented on a logarithmic scale to account for the large pressure response range of the human ear and are expressed in units of decibels (dB). A dB is defined as the ratio between a measured value and a reference value usually corresponding to the lower threshold of human hearing defined as 20 micropascals. Conversely, sound power is commonly referenced to 1 picowatt, which is one trillionth of a watt. Broadband sound includes sound energy summed across the frequency spectrum. In addition to broadband sound pressure levels, analysis of the various frequency components of the sound spectrum is often completed to determine tonal characteristics. The unit of frequency is Hertz (Hz), which corresponds to the rate in cycles per second that sound pressure waves are generated. Typically, a sound frequency analysis examines 11 octave bands (or 33 1/3 octave) ranging from 20 Hz (low) to 20,000 Hz (high). This range encompasses the entire human audible frequency range. Since the human ear does not perceive every frequency with equal loudness, spectrally varying sounds are often adjusted with a weighting filter. The A-weighted filter is applied to compensate for the frequency response of the human auditory system. Sound exposure in acoustic assessments is commonly measured and calculated as A-weighted decibels (dBA). Unweighted sound levels are referred to as linear. Linear dB (dBL) are used to determine a sound's tonality and to engineer solutions to reduce or control noise as techniques are different for low and high frequency noise.

Sound can be measured, modeled, and presented in various formats, with the most common metric being the equivalent sound level (abbreviated as L_{eq}). The equivalent sound level has been shown to provide both an effective and uniform method for comparing time-varying sound levels and is widely used in acoustic assessments in South Dakota. Estimates of noise sources and outdoor acoustic environments and the comparison of relative loudness are presented in Table 1 in Appendix D.

11.3.1.2 Regulations

A review was conducted of noise regulations applicable to the Project at the federal, state, county, and local levels. There are no federal or state environmental noise requirements specific to this Project. Hyde

County proposed regulations for wind energy facilities under Zoning Ordinance Section 9-104-A-18 limiting sounds levels to 45 dBA at the perimeter of occupied residences existing at the time the permit application unless a signed waiver is obtained from the landowner or the land is leased. The noise level may be exceeded during short-term events such as utility outages or windstorms.

Sound levels resulting from the Project at all identified NSRs located in the vicinity of the Project were assessed against the 45 dBA limit to determine whether compliance was achieved. The Hyde County Zoning Ordinance noise limit is absolute and independent of the existing acoustic environment; therefore, a baseline sound survey was not required to assess conformity.

11.3.2 Impacts from Acoustics

11.3.2.1 Construction and Decommissioning

Potential noise associated with the construction and decommissioning of the Project includes site clearing, grading, foundation work, wind turbine generator installation, and transmission line structure installation. All reasonable efforts will be made to minimize the impact of noise resulting from construction activities. Sounds generated by construction activities are typically exempt from state and local noise oversight if they occur within weekday, daytime periods. While most heavy construction work is anticipated to occur during daylight hours, some construction operations may be conducted outside of normal working hours. In these cases, the necessary construction efforts generally require activities that must be completed in their entirety once initiated (i.e., pouring concrete). All construction and decommissioning related noise producing activities will be undertaken as to comply with applicable state and county regulatory obligations and ordinances. The list of construction equipment that may be used on the Project and estimates of near and far sound source levels are presented in Table 11-1.

Table 11-1. Estimated Maximum Sound Pressure Levels from Construction Equipment

Equipment	Estimated Sound Pressure Level at 50 feet (dBA)	Estimated Sound Pressure Level at 2,000 feet (dBA)
Crane	85	53
Forklift	80	48
Backhoe	80	48
Grader	85	53
Man basket	85	53
Dozer	83–88	51–56
Loader	83–88	51–56
Scissor Lift	85	53
Truck	84	52
Welder	73	41
Compressor	80	48
Concrete Pump	77	45
Concrete Batch Plant	83	51

Source: FHWA 2006; Bolt et al. 1977

11.3.2.2 Operation

When in motion, the turbines generate sound primarily from aerodynamic flow across and around the blades. Secondary contributors to turbine sound are associated with the mechanical and electrical equipment within the nacelle including gearboxes, motors, cooling systems, and pumps. Sound level is strongly dependent on the speed of the tip of the blade, the design of the blade, and on atmospheric

conditions such as the degree of turbulence. Blade sound increases with wind speed until full-rated electrical power is achieved due to the interaction between the incident turbulence eddies and the blade surface. The prevalence of this inflow turbulence sound varies depending on site-specific and variable atmospheric conditions. The second mechanism is the shedding of vortices that form at the tip of each blade. This depends on the strength of the vortex and the design of the blade tip. Finally, sound may be generated by turbulent flow over the trailing edge of the blade. As air flows over the face of the blade, a turbulent boundary layer develops, but remains attached to the trailing edge. Eddies extending past the trailing edge causes sound emission scattering, resulting in the characteristic wind turbine broadband swooshing sound. This turbulent boundary layer sound (trailing edge noise) usually defines the upper limit of wind turbine sound levels and is considered the greatest contributor to aerodynamic sound.

One of the primary blade design features affecting sound emissions is the shape of the trailing edge of the blades. Sound reduction elements are being accessed for the chosen turbine model (GE 2.72-116) to incorporate into the Project design, including the use of LNTE blades. The addition of blade serrations has been demonstrated to reduce sound levels by 2 to 3 dBA below standard blades.

Transmission lines produce sound under certain conditions. The level of sound depends on conductor geometry, voltage level, and weather conditions. Corona is the electrical breakdown of the air near high voltage conductors into charged particles. Corona consists of audible sound and radio and television interference from electromagnetic interference. Corona from transmission lines can create buzzing, humming, or crackling because a small amount of electricity ionizes the moist air near the conductors. Measures such as carefully handling the conductor during construction to avoid nicking or scraping or otherwise damaging the surface and using hardware with no sharp edges or points are typically adequate to control corona. Corona effects are expected to be low enough that no objectionable audible sound would result outside the Project Area. Corona-related ozone and nitrogen oxide emissions are the primary air quality concerns related to transmission line operation. The concentration of ozone caused by corona is a few parts per million near the conductor and is not measurable at any distance from the conductor.

11.3.2.3 Acoustical Model Inputs

Sound propagation modeling was conducted using the Computer-Aided Noise Abatement (CadnaA) program (version 2019), a comprehensive three-dimensional acoustic modeling computer simulation software, with calculations made in accordance with the International Organization for Standardization (ISO) standard 9613-2 “Attenuation of Sound during Propagation Outdoors.” The engineering methods specified in this standard consist of full (1/1) octave band algorithms that incorporate geometric spreading due to wave divergence, reflection from surfaces, atmospheric absorption, screening by topography and obstacles, ground effects, source directivity, heights of both sources and receptors, seasonal foliage effects, and meteorological conditions. For compliance assessment purposes, operational broadband sound pressure levels were calculated assuming that all wind turbines are operating continuously and concurrently at the maximum manufacturer-rated sound level. The acoustic assessment was performed using the March 4, 2020 site layout with 74 potential turbine locations (sound sources) to calculate the sound levels at the 34 NSRs. The following wind turbine models were evaluated in the acoustic analysis:

- GE 2.72-116 – Wind turbine with a rotor diameter of 381 feet and a hub height of 295 feet
- GE 2.72-116 with LNTE – Wind turbine equipped with LNTE blade technology, a rotor diameter of 381 feet, and a hub height of 295 feet

11.3.2.4 Acoustical Modeling Results

Acoustic modeling was completed for turbine operation for the following conditions thereby describing the full range of expected receive sound levels at receiver locations: (1) initial cut-in wind speeds, (2) maximum rotation, and (3) maximum rotation during anomalous meteorological conditions.

The maximum calculated sound level, based on assumptions incorporated into the CadnaA model and the turbine layout, is 50 dBA at one participating NSR in the GE 2.72-116 standard scenario (Table 5 in Appendix D). When turbines are at maximum rotational power during anomalous meteorological conditions, the acoustic model suggests sound levels will be greater than 45 dBA at:

- 11 NSRs (1 non-participating) for the GE 2.72-116 standard scenario; and
- 5 NSRs (all participating) for the GE 2.72-116 LNTE scenario.

Meridian Wind has committed to using the GE 2.72-116 LNTE scenario for the Project. There are 10 non-participating NSRs located within 1 mile from the closest turbine. Anomalous meteorological sound level results for these NSRs are shown in Table 11-2. Figure A-1 in Appendix D provides the NSR locations reviewed as part of this analysis.

11.3.3 Mitigation Measures for Acoustics

Meridian Wind considered acoustics when siting turbines to minimize impacts to area residents. Project operational sound has been calculated and compared to the 45 dBA Hyde County Zoning Ordinance noise requirements. Modeling shows that any landowners experiencing sound levels above the limits will experience them only in very limited circumstances. Even then, some of those landowners are Project participants and have agreed to these terms after having the circumstances discussed with them. Meridian Wind does not anticipate that sound mitigation will be necessary; however, Meridian Wind will establish a process for documenting, investigating, and resolving Project-related sound complaints.

With respect to the short-term construction-related sound, mitigation measures will include maintaining all equipment in good working order in accordance with manufacturer specifications (e.g., suitable mufflers and/or air-inlet silencers should be installed on all internal combustion engines and certain compressor components); and enforcing speed limits for all vehicles and construction equipment traveling within and around the Project Area.

Meridian Wind has committed to using the GE 2.72-116 LNTE scenario to further reduce the noise levels generated by the Project.

Table 11-2. Anomalous Meteorological Acoustic Modeling Results for Non-Participating Landowners

NSR ID	UTM Coordinates (meters)		Distance from Nearest Turbine (meters)	Received Sound Levels (dBA)	
	Easting	Northing		GE 2.72-116	GE 2.72-116 with LNTE
1	464696	4924005	1,475	40	38
4	464884	4919863	1,047	44	42
5	464748	4919035	1,336	43	41
6	464857	4925441	2,647	37	35
7	464803	4927722	4,809	28	27
8	464851	4927459	4,551	29	28
9	465002	4927396	4,429	29	28
10	468316	4927007	2,501	37	36
11	471332	4926983	1,736	39	37
12	471209	4924768	990	45	43
13	471206	4924735	996	45	43
14	464660	4916997	1,544	41	39
15	464996	4914979	1,733	38	36
16	466480	4914752	1,619	40	38
17	466495	4914819	1,623	40	38
20	468070	4914826	1,882	39	37
21	470985	4912972	5,021	14	18
22	472613	4917854	1,729	41	39
23	472969	4917714	1,844	41	39
26	473795	4925678	1,591	41	39
27	475241	4920717	843	44	42
29	477592	4926817	4,474	27	26
30	471201	4924811	995	45	43
32	473177	4921096	839	46	45

Note: Predicted sound levels greater than the 45 dBA threshold criteria are identified in red.
Non-participating NSRs identified within 1 mile of Project turbines are identified in blue.

11.4 Visual Resources

11.4.1 Existing Visual Resources

The term “visual resources” refers to the composite of basic terrain features, geologic features, hydrologic features, vegetation patterns and anthropogenic features that influence the visual appeal of an area.

Private lands crossed by the Project are not subject to known federal, state, or county visual management standards. Sensitive viewsheds are generally associated with scenic resources and can include state or national parks, monuments, and recreation areas or historic sites and landmarks. Recreational users in the Project Area and vicinity may include hunters accessing private land, GPAs, WPAs, WIAs, School and Public Lands, and recreationists accessing Chapelle and Peno lakes. There are 12 occupied residences within the Project Area and other scattered rural residences adjacent to, but outside, the Project Area. Travelers through the Project vicinity include local or regional traffic along U.S. Highway 14, State Highway 47, or other local roads. There are no designated scenic byways in the Project Area (Federal Highway Administration 2020).

The South Dakota Wind Energy Center is located approximately 0.6 mile south of the Project Area while the Triple H Wind Project, currently under construction is located immediately adjacent to the Project, west of State Highway 47 (Figure 1 in Appendix A). The South Dakota Wind Energy Center wind farm consists of 27 turbines and became operational in 2003. The Triple H Wind Project consists of 92 turbines and will be operational by the end of 2020. Additionally, the Titan Wind Project, consisting of 10 turbines, is located approximately 7.4 miles east of the Project Area (Figure 1 in Appendix A) and became operational in December 2009.

11.4.2 Impacts to Visual Resources

Visual impacts can be defined as the human response to visual contrasts resulting from introduction of elements into a viewshed. Such visual contrasts interact with viewer perceptions of the landscape and may cause a negative, positive, or neutral response to the changes in the viewed landscape.

The Project will add additional vertical lines of wind turbines into the generally strongly horizontal landscape found in the Project Area. Based on the turbine model selected, the total hub height of the turbines will be up to 295 feet, and the total turbine height from the ground to the tip of the blade in an upright position up to 487 feet. These structures could produce visual contrast by virtue of the design attributes of form, color, and line. Marker lighting could also cause visual impacts at night.

Nearby viewers include the rural residences dispersed throughout the Project Area; recreational and public land users; and drivers, primarily those using U.S. Highway 14, State Highway 47, and other local roads. For these nearby viewers, the large size, and strong geometric lines of both the individual turbines themselves and the array of turbines could dominate views. The presence of the wind farms within the viewsheds of GPAs, WPAs, WIAs, and School and Public Lands, Chapelle Lake, and Peno Lake may diminish the natural quality of those areas and the experience of the persons utilizing those areas and may be perceived as a negative impact. However, the operation of the Project will not generate a significant increase in traffic or noticeable increase in day-to-day human activity; therefore, the Project Area will retain the rural sense and remote characteristic of the vicinity. Furthermore, the proposed land use will not involve any ongoing industrial use of non-renewable resources or emissions into the environment.

The large sweep of the moving rotors may command visual attention. Structural details, such as surface textures, could become apparent, and associated structures such as the O&M facility, Project collection substation, Chapelle Station, transmission line, and other structures could also be visible. Shadow flicker, a subset of visual impacts is discussed in Section 11.5 of this Application.

As previously discussed, Meridian Wind has collocated linear Project features such as access roads and collector and communication systems with existing disturbances where possible. This is consistent with the South Dakota Bat Working Group's and SDGFP's (Undated) Siting Guidelines for Wind Power Projects in South Dakota for reducing impacts to visual resources. Similarly, operation of the Project will not introduce new visual components into the Project vicinity. The Project vicinity includes wind turbines from the South Dakota Wind Energy Center, Triple H Wind Project, and the Titan Wind Project, as well as existing electrical transmission lines.

The magnitude of visual impacts associated with the Project will depend on several factors, including:

- Distance of the proposed Project facilities from viewers;
- Duration of views (highway travelers vs. permanent residents);

- Weather and lighting conditions;
- The presence and arrangements of lights on the turbines and other structures; and
- Viewer attitudes toward renewable energy and wind power.

At the end of the Project's operating life, the facility will be decommissioned (see Section 19.0) and all wind turbines, electrical cabling, electrical components, access roads, transmission line structures, and any other associated facilities will be removed in accordance with applicable state and county regulations, unless otherwise agreed to by the landowner. As such, no visual impacts will remain beyond the operating life of the Project.

11.4.3 Mitigation Measures for Visual Resources

In general, opportunities to mitigate visual effects for wind projects are limited, given the size and physical characteristics of the wind turbines and the open expanse of the agricultural landscape environment in which they are located. Therefore, screening, such as implementing berms, fences, or vegetation, will not be a viable option. However, all turbines will be uniform in shape, color, size of rotor blades, nacelle and towers. Since the turbines will be viewed against a sky background, a light color, such as white or light gray, will be used for the structures in accordance with FAA requirements (as noted in Section 11.4.2). The use of the light-colored turbines will help to minimize contrast with the sky under most conditions. The Project will also incorporate the use of an ADLS system to maximize the use of nighttime obstruction lighting when there is aircraft activity in the surrounding vicinity (Section 4.2.5). No other mitigation measures over those already described are proposed.

11.5 Shadow Flicker

A shadow flicker analysis for the Project was finalized in March 2020 and is included in Appendix E. The analysis of potential shadow flicker impacts from the Project on nearby receptors shows that shadow flicker impacts within the area of study are expected to be minor and well within acceptable ranges for avoiding nuisance and/or health hazards. All of the receptor locations had modeled shadow flicker impacts below the Hyde County ordinance threshold of 30 hours per year. The following sections provide information from the report on the potential shadow flicker effects of the Project and potential avoidance, minimization, and mitigation measures.

11.5.1 Shadow Flicker Overview

A turbine's moving blades can cast a moving shadow on locations within a certain distance of a turbine. These moving shadows are called shadow flicker and can be a temporary phenomenon experienced at nearby residences or public gathering places. The impact area depends on the time of year and day (which determine the sun's azimuth and altitude angles) and the wind turbine's physical characteristics (height, rotor diameter, blade width and orientation of the rotor blades). Shadow flicker impact to surrounding properties generally occurs during low angle sunlight conditions, typically during sunrise and sunset times of the day. However, when the sun angle gets very low (less than three degrees), sunlight passes through more atmosphere and becomes too diffused to form a coherent shadow. Shadow flicker will not occur when the sun is obscured by clouds or fog, at night or when the source turbine(s) are not operating. In addition, shadow flicker only occurs when at least 20 percent of the sun's disc is covered by the turbine blades.

Shadow flicker intensity is defined as the difference in brightness at a given location in the presence and absence of a shadow. Shadow flicker intensity diminishes with greater receptor-to-turbine separation distance. Shadow flicker intensity for receptor-to-turbine distances beyond 2,000 meters (6,562 feet) is very low and generally considered imperceptible. In general, increasing proximity to turbines may make shadow flicker more noticeable, with the largest number of shadow flicker hours, along with greatest shadow flicker intensity, occurring nearest the wind turbines.

Shadow flicker impacts are not regulated in applicable state or federal law. However, the Hyde County Zoning Ordinance Section 9-104-A-20 establishes that flicker at any receptor shall not exceed 30 hours per year within an established dwelling and 40 hours per year from any occupied structure.

11.5.2 Shadow Flicker Impacts

An analysis of potential shadow flicker impacts from the Project was conducted using the WindPro software package. The WindPro analysis was conducted to determine shadow flicker impacts under realistic impact conditions (actual expected shadow). This analysis calculated the total amount of time (hours and minutes per year) that shadow flicker could occur at receptors surrounding the Project turbines.

A total of 34 residential structures were identified within and near the Project Area as occupied or potentially occupied residences and are considered potential shadow-flicker receptors. A receptor in the model is defined as a 1-meter-square area (approximate size of a typical window), 1 meter (3.28 feet) above ground level. Approximate eye level is set at 1.5 meters (4.94 feet). Figure 11 in Appendix A show the locations of all 34 identified residential structures, along with the potential turbine locations considered.

Table 11-3 summarizes the predicted shadow flicker impacts for the top 10 worst case impact receptors from each turbine model layout scenario. Unlike the various scenarios required for the acoustic analysis described in Section 11.3, shadow flicker analysis for noise reducing blades and standard blades are the same. The maximum predicted shadow flicker impact at any occupied residence receptor is 25 hours and 17 minutes per year (Receptor 28). This is approximately 0.6 percent of the potential available daylight hours. All of the receptor locations had modeled shadow flicker impacts below the Hyde County Ordinance threshold of 30 hours per year. There are 10 non-participating receptors located within 1 mile from the closest turbine. Expected shadow flicker results for these receptors are shown in Table 11-4.

Table 11-3. WindPro Top 10 Expected Shadow Flicker Impacts

Receptor ID	Receptor Type	Receptor Project Participation Status	Expected Shadow Flicker Hours per Year (Hours/Year)
GE Layout			
28	Residential	Participant	25:17
34	Residential	Participant	25:02
19	Residential	Participant	22:34
3	Residential	Participant	21:24
32	Residential	Non-Participant	17:26
2	Residential	Participant	15:34
18	Residential	Participant	12:17
24	Residential	Participant	9:54
31	Residential	Participant	9:13
33	Residential	Participant	8:18

Table 11-4. WindPro Predicted Expected Shadow Flicker for Non-Participating Landowners

Receptor ID	UTM Coordinates (meters)		Distance from Nearest Turbine (Meters)	WindPro Predicted Expected Shadow Flicker (Hours per Year)
	Easting	Northing		GE Layout
1	464696	4924005	1,475	0:00
4	464884	4919863	1,047	3:51
5	464748	4919035	1,336	4:54
6	464857	4925441	2,647	0:00
7	464803	4927722	4,809	0:00
8	464851	4927459	4,551	0:00
9	465002	4927396	4,429	0:00
10	468316	4927007	2,501	0:00
11	471332	4926983	1,736	0:00
12	471209	4924768	990	7:19
13	471206	4924735	996	7:25
14	464660	4916997	1,544	1:41
15	464996	4914979	1,733	0:00
16	466480	4914752	1,619	0:00
17	466495	4914819	1,623	0:00
20	468070	4914826	1,882	0:00
21	470985	4912972	5,021	0:00
22	472613	4917854	1,729	0:00
23	472969	4917714	1,844	0:00
26	473795	4925678	1,591	0:53
27	475241	4920717	843	0:00
29	477592	4926817	4,474	0:00
30	471201	4924811	995	7:10
32	473177	4921096	839	17:26

Note: Non-participating NSRs identified within 1 mile of Project turbines are identified in blue.

Table 11-5 summarizes the shadow flicker impact prediction statistics. The predicted shadow flicker impact for all 34 receptors is included in Appendix E.

Table 11-5. Statistical Summary of WindPro Expected Shadow Flicker Impacts—Number of Modeled Receptors

Cumulative Shadow Flicker Time (Expected)	Number of Modeled Receptors
	GE Layout
Total	34
= 0 Hours	16
> 0 Hours < 10 Hours	11
≥ 10 Hours < 20 Hours	3
≥ 20 Hours < 30 Hours	4
≥ 30 Hours	0

At a distance of 2,640 feet or greater for non-participants and 1,540 feet or greater for participants (the Project setbacks for residences), receptors will typically experience shadow flicker only when the sun is

low in the sky and only when the factors described above are present. If a receptor does experience shadow flicker, it most likely will be only during a few days per year from a given turbine and for a total of only a fraction (typically less than 1 percent) of annual daylight hours.

11.5.3 Mitigation Measures for Shadow Flicker

Meridian Wind considered shadow flicker when siting wind turbines to minimize impacts to area residents. Flicker mitigation will be addressed as situations arise wherein a residence is experiencing inordinately more flicker than anticipated in the modeling, although it is highly unlikely more flicker than modeled will occur. If shadow flicker concerns are reported to Meridian Wind, Project representatives will implement the following procedures:

- Log the contact in Meridian Wind's complaint database to track resolution efforts;
- Prepare site-specific assessment of shadow flicker impacts, noting the time of day, season and expected duration of future flicker impacts;
- Meet with the landowner to discuss site-specific assessment, educate landowners on landowner driven mitigation strategies (e.g., modification of interior lighting) and discuss concerns;
- Assess the residence to determine if on-site mitigation measures, including but not limited to, installation of exterior or interior screening, are appropriate for the level of impact and effectively address the concern;
- Work with the landowner to develop a mitigation plan; and
- Implement the mitigation plan.

11.6 Telecommunications

11.6.1 Existing Telecommunications

Meridian Wind has conducted a microwave beam path analysis (Appendix F) which identified one path intersecting the wind farm facility within the Project Area and one intersecting the transmission line corridor (Figure 3b in Appendix A; Comsearch 2016 and 2020). The analyses were performed using Comsearch's proprietary microwave database, which contains all non-government licensed, proposed, and applied paths from 0.9 to 23 GHz². Table 11-6 lists all microwave paths that intersect the Project Area.

Table 11-6. Summary of Microwave Path that Intersects the Project Area

Status	Callsign 1	Callsign 2	Band	Path Length (km)	Licensee
Licensed	WBD225	WQRB909	6.1 GHz	59.49	Basin Electric Power Cooperative
Licensed	WBD224	WBD225	6.7 GHz	77.00	Basin Electric Power Cooperative

Source: Comsearch 2016, 2020

² Note that this analysis does not include unlicensed microwave paths or federal government paths that are not registered with the FCC.

Comsearch provided the Fresnel Zones within the area of interest. These zones show the narrow area of signal swath and should be avoided, if possible. A description of Fresnel Zones are provided in Appendix F.

Meridian Wind submitted a Project notification letter to the National Telecommunications and Information Administration (NTIA) in February 2020, for the agency to review potential impacts to federal telecommunication. A copy of the letter is available in Appendix J and discussed further in Section 22.2.

11.6.2 Telecommunication Impacts

Because of their height, modern turbines have the potential to interfere with existing communications systems licensed to operate in the United States. Based on Comsearch's analysis, turbines have been sited in a manner that avoids all identified microwave beam paths and communication systems (Figure 3b in Appendix A and Appendix F). Corona associated with the Project's transmission line is expected to be low enough so that no radio or television interference is anticipated outside of the Project Area. The construction and operation of the Project will not result in interference to microwave, radio, or navigation signals.

11.6.3 Mitigation Measures for Telecommunications

Meridian Wind is committed to taking all reasonable steps to assure that the Project will not interfere with radio or television reception in the area. In the event the Project wind turbines or its operation causes interference to communication systems, Meridian Wind will take the steps necessary to correct the problem. If interference is identified during or after construction of the Project, Meridian Wind will address the interference on a case-by-case basis. In cases where there is a demonstrable effect from the transmission line on reception, very often simple corrective steps, such as checking line hardware for loose or defective hardware and repairing or replacing defective items is sufficient to solve the problems. In a very limited number of cases, it has been necessary to take more extensive corrective steps such as relocating individual television or radio antenna systems or installing systems where none previously existed. In most cases, however, it is possible to entirely avoid radio and television interference by appropriate routing steps and by post-construction adjustments of line hardware.

The Project has been sited to avoid impacts microwave beam paths, and therefore, no mitigation is proposed at this time.

11.7 Radar and Military Airspace Impacts

11.7.1 Existing Radar and Military Airspace

Meridian Wind conducted an initial aviation constraints study in 2016 to evaluate the feasibility of the Project against federally aviation and airspace criteria (Appendix G). The FAA uses this criterion in evaluating the aeronautical compatibility and regulatory compliance of projects when submitted to their office for regulatory review under FAR Part 77 as specified in Title 49 UCS 44718. The study determined the feasibility of the wind turbines up to 499 feet above ground level.

The nearest public-use airport subject to federal regulatory criteria is the Highmore Municipal Airport located approximately 4.7 miles north of the Project Area (Figure 1 in Appendix A). One other airport, Miller Municipal, is located approximately 18 miles east of the Project Area near the city of Miller.

11.7.2 Impacts to Radar and Military Airspace

In addition to providing vertical above mean sea level limits within the Project Area, the aviation constraints analysis included the following findings:

- The Project will not impact Minimum Vectoring Altitudes or Enroute Low Altitude Airways;
- Impact is likely to Joint Use Long Range Radar. Further study may be advised. For additional follow-up with DoD see Section 22.2.6;
- No impact is expected to NEXRAD weather radar. Further weather radar study is not necessary; and
- The Project is outside any Military Operations Areas or Restricted Areas.

11.7.3 Mitigation Measures for Radar and Military Airspace

Previous Determinations of No Hazard were determined at the Project Area for a prior array at 599 feet. Meridian Wind currently has pending Form 7460 filings with the FAA for the current array at a height of 487 feet. If taller turbines are used, or if the Project layout changes from what has been provided to the FAA, Meridian Wind will re-file with the FAA.

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12.0 LOCAL LAND USE CONTROLS (ARSD 20:10:22:19)

ARSD 20:10:22:19. Local land use controls. *The applicant shall provide a general description of local land use controls and the manner in which the proposed facility will comply with the local land use zoning or building rules, regulations or ordinances. If the proposed facility violates local land use controls, the applicant shall provide the commission with a detailed explanation of the reasons why the proposed facility should preempt the local controls. The explanation shall include a detailed description of the restrictiveness of the local controls in view of existing technology, factors of cost, economics, needs of parties, or any additional information to aid the commission in determining whether a permit may supersede or preempt a local control pursuant to SDCL 49-41B-28.*

The Project will be constructed in Hyde County on agricultural land. Per the Hyde County Zoning Ordinance, a wind energy facility and its associated transmission system located in the Agricultural Zoning District must obtain a CUP. Meridian Wind submitted a CUP application on March 13, 2020, for the wind turbines under Section 9-104 of the ordinance and will comply with all terms and conditions of the permit. Meridian Wind's current configuration has been designed to comply with County setbacks and other applicable requirements, as outlined in Table 12-1 below and displayed on Figure 3b in Appendix A.

Section 9-104 of the Hyde County Zoning Ordinance, the Requirements for Siting LWES, outlines a number of general provisions including but not limited to: mitigation measures, setbacks, electromagnetic interference, lighting, turbine spacing, feeder lines, towers, sound, etc. Meridian Wind will comply with all provisions and setback requirements. Table 12-1 outlines the local, state, and voluntary Project setbacks.

Table 12-1. Wind Turbine Setback Requirements for the Project

Turbine Setback Requirement	Requirements
Hyde County	
9-104.A.9 (a) Any established dwellings and/or maintained by governmental entity	2,640 feet or 4.9 times tower height, whichever is greater.
9-104.A.9 (b) County gravel roads, section line roads, highways and minimum maintenance roads	750 feet or 1.4 times the tower height, whichever is greater.
9-104.A.9 (c) Exterior boundary of the proposed wind project	500 feet or 1.1 times the system height, whichever is greater.
Noise requirement at the perimeter of occupied residences	Distance from receptors must meet the noise standard of 45 dBA.
South Dakota	
SDCL 43-13-24 Property lines	500 feet or 1.1 times the height of the tower, whichever is greater.
Local	
9-104.A.20 Shadow Flicker	Flicker at any receptor shall not exceed 30 hours per year within an established dwelling and 40 hours per year from any occupied structure.

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13.0 WATER QUALITY (ARSD 20:10:22:20)

ARSD 20:10:22:20. Water quality. The applicant shall provide evidence that the proposed facility will comply with all water quality standards and regulations of any federal or state agency having jurisdiction and any variances permitted.

Groundwater and surface water resources are discussed in Section 8.0. As discussed in Section 8.2.2, the excavation and exposure of soils during the construction and decommissioning of wind turbines, access roads, underground collector lines, transmission line structures, and other Project facilities may temporarily cause sediment runoff during rain events. This sediment may temporarily increase the total suspended solids loading in receiving waters. However, erosion control BMPs will keep sediments on site that might otherwise increase sediment loading in receiving waters.

As discussed in Sections 8.1.3 and 8.2.3, construction of the Project will 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 SWPPP. The SWPPP will be developed during civil engineering design of the Project and will prescribe BMPs to control erosion and sedimentation. The BMPs may include silt fence, wattles, erosion control blankets, temporary stormwater sedimentation ponds, revegetation, and/or other features and methods designed to control stormwater runoff and mitigate erosion and sedimentation. The BMPs will be implemented to reduce the potential for impacts to drainage ways and streams by sediment runoff. Because erosion and sediment control will be in place for construction, operation and decommissioning of the Project, impacts to water quality are not expected to be significant.

Section 9-104.A.8 of the Hyde County Zoning Ordinance requires LWES to develop a Soil Erosion and Sediment Control Plan prior to construction and submit the plan to the County Zoning Office. The Ordinance outlines several components required in the plan including but not limited to: plans for revegetation, grading, minimizing area of disturbance, maintaining downstream quality, etc. Meridian Wind will submit a copy of the SWPPP to the County Zoning Office.

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14.0 AIR QUALITY (ARSD 20:10:22:21)

ARSD 20:10:22:21. Air quality. The applicant shall provide evidence that the proposed facility will comply with all air quality standards and regulations of any federal or state agency having jurisdiction and any variances permitted.

14.1 Existing Air Quality

The entire State of South Dakota is in attainment for all National Ambient Air Quality Standards (NAAQS) criteria pollutants (EPA 2020). In accordance with EPA requirements, the SDDENR operates an ambient air monitoring network of samplers. The nearest air monitoring location to the Project is located approximately 39 miles to the southwest in Pierre, Hughes County (SDDENR 2020f). The primary emission sources that exist within the Project Area include agriculture-related equipment and vehicles traveling along State Highway 47.

14.2 Air Quality Impacts

Temporary construction impacts include fugitive dust emissions and short-term emissions from diesel trucks and construction equipment. Temporary impacts will result if a batch plant is required. Any air quality effects resulting from construction will be short term and limited to the time of construction activities and will not result in NAAQS exceedances for particulate matter or significantly contribute to greenhouse gas emissions.

There will be no direct air emissions from operating wind turbines or the transmission line, because no fossil fuels will be combusted. Wind power is a low-carbon energy source, when a wind turbine generates electricity it produces zero carbon emissions. The development of clean wind energy avoids significant carbon dioxide (CO₂) pollution. In 2018, the electricity generated from wind turbines avoided an estimated 200 million tons of carbon pollution (AWEA 2020). This reduction is equal to roughly 43 million cars' worth of CO₂ emissions. Wind power also helps cut significant amounts of sulfur dioxide (SO₂) and nitrogen oxides (NO_x), air pollutants known for creating smog and triggering asthma attacks (AWEA 2020).

Operation of the transmission line is expected to have negligible impacts on air quality. Most calculations for the production and concentration of ozone assume high humidity or rain, with no reduction in the amount of ozone due to oxidation or air movement. These calculations would therefore overestimate the amount of ozone that is produced and concentrated at ground level. Studies designed to monitor the production of ozone under transmission lines have generally been unable to detect any significant increase due to a transmission line facility (Sebo et al. 1976; Valuntaite et al. 2009).

Negligible amounts of dust, vehicle exhaust emissions and combustion-related emissions from diesel emergency generators will occur during maintenance activities. These emissions will not cause exceedances of air quality standards or have any negative impacts on climate change. Operation of the Project and transmission line could produce minute amounts of ozone and nitrogen oxides emissions as a result of atmospheric interactions with the energized conductors. Impacts on ambient air quality from these minor emissions during operation will be negligible. The Project collector substation will employ sulfur hexafluoride-filled circuit breakers. Sulfur hexafluoride is a greenhouse gas, and therefore, equipment leaks could contribute to air quality impacts. Air quality impacts from transmission line maintenance and inspection activities would be negligible.

14.3 Mitigation Measures for Air Quality

A general air quality permit may be required if the Project elects to install a concrete batch plant. Approval of that application typically takes up to 30 days. If a batch plant is required, it will be permitted by Meridian Wind's balance-of-plant contractor or concrete batch plant operator through the SDDENR.

Additionally, BMPs will be implemented during construction to suppress fugitive dust emissions and equipment will undergo routine inspection and preventative maintenance to minimize leaks.

General mitigation measures applicable to multiple phases of Project development include the following:

- Using surface access roads, on-site roads, and parking lots with aggregates or that maintain compacted soil conditions to reduce dust generation;
- Staging construction activities to limit the area of disturbed soils exposed at any particular time; and
- Watering 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.

15.0 TIME SCHEDULE (ARSD 20:10:22:22)

ARSD 20:10:22:22. Time schedule. The applicant shall provide estimated time schedules for accomplishment of major events in the commencement and duration of construction of the proposed facility.

The Project is scheduled to be operational by late fall of 2021. To remain on track, Hyde County CUP and SDPUC facility permits are anticipated to be received in 2020, while pre-construction engineering, layout finalization, and construction are anticipated to begin in early 2021 (Table 15-1). However, the possibility for delays as result of conditions beyond the Applicant's control exist. Land-leasing and environmental permitting are ongoing.

Table 15-1. Preliminary Permitting and Construction Schedule for the Project

Milestone	Date
Land Leasing	2015 – present
Environmental Studies	2016 – present
County CUP	2020
SDPUC Facility Permit	2020
Pre-construction Engineering	Summer 2020
Construction	Early 2021
Commercial Operation Date	Late fall 2021

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16.0 COMMUNITY IMPACT (ARSD 20:10:22:23 and ARSD 20:10:22:24)

ARSD 20:10:22:23. Community impact. *The applicant shall include an identification and analysis of the effects the construction, operation, and maintenance of the proposed facility will have on the anticipated affected area including the following:*

- (1) *A forecast of the impact on commercial and industrial sectors, housing, land values, labor market, health facilities, energy, sewage and water, solid waste management facilities, fire protection, law enforcement, recreational facilities, schools, transportation facilities, and other community and government facilities or services;*
- (2) *A forecast of the immediate and long-range impact of property and other taxes of the affected taxing jurisdictions;*
- (3) *A forecast of the impact on agricultural production and uses;*
- (4) *A forecast of the impact on population, income, occupational distribution, and integration and cohesion of communities;*
- (5) *A forecast of the impact on transportation facilities;*
- (6) *A forecast of the impact on landmarks and cultural resources of historic, religious, archaeological, scenic, natural, or other cultural significance. The information shall include the applicant's plans to coordinate with the local and state office of disaster services in the event of accidental release of contaminants from the proposed facility; and*
- (7) *An indication of means of ameliorating negative social impact of the facility development.*

16.1 Socioeconomic and Community Resources

16.1.1 Existing Socioeconomic and Community Resources

The Project Area is located in northeastern South Dakota in Hyde County. Hyde County had an estimated population of 1,282 in 2018 (U.S. Census Bureau 2018). The largest city in Hyde County is the city of Highmore which, in 2018, had an estimated population of 798 (62.2 percent of Hyde County; U.S. Census Bureau 2018). Highmore is located approximately 6 miles north of the Project Area. There are two additional communities located within 15 miles of the Project Area; the populations of communities in the Project vicinity are listed in Table 16-1 and shown on Figure 1 (Appendix A).

Table 16-1. Populations of Communities in the Project Vicinity

Community, County	2010 Population	Distance and Direction from Project Area
Highmore, Hyde County	798	6 miles north
Ree Heights, Hand County	76	6 miles northeast
Harrold, Hyde County	81	10 miles northwest

Source: U.S. Census Bureau 2018

The median household income in Hyde County reported in the 2017 census data was \$53,696 (U.S. Census Bureau 2017). In comparison to the state as a whole, the median household income for the state was slightly higher at \$54,126 (U.S. Census Bureau 2017). The unemployment rate in Hyde County in December 2019 was 3.9 percent, which was higher than the unemployment rate in South Dakota for the same month (3.2 percent) (South Dakota Department of Labor and Regulation 2020). The most common job groups are management, administration, education and library occupations. The most common employment sectors are agriculture, forestry, fishing and hunting, educational services and healthcare and social assistance (Data-USA 2020).

16.1.2 Socioeconomic and Community Resource Impacts

16.1.2.1 Impacts to Economics

The Project is anticipated to provide positive short-term and long-term impacts to the local economy. Impacts to social and economic resources from construction activities will be short-term. Increased patronage of local commercial businesses, such as restaurants, grocery stores, hotels and gas stations, will result in increased business from construction related workers. Local contractors and suppliers will also likely benefit from construction of the Project. Total wages and salaries paid to contractors and workers in Hyde County will contribute to the total personal income of the region. Additional personal income will be generated for residents in the county and state by circulation and recirculation of dollars paid out by Meridian Wind for business expenditures and for state and local taxes. Expenditures made for equipment, fuel, operating supplies, and other products and services benefit businesses in the county and the state.

During construction, a typical 175-MW wind project such as Meridian Wind typically generates an immediate need for up to 400 temporary construction jobs over the peak 8-month construction period, with as many as 130 at any given time. Construction and operation of a typical 175-MW wind project results in the injection of millions of dollars into the local economy both immediately and throughout the life of the project. These investments will be seen throughout the community, including at hotels, restaurants, gas stations, auto repair companies, tire companies, grocery stores, and countless other local businesses. During operation, the Project will employ approximately 6 to 8 full-time personnel as facility managers, site managers and turbine technicians. These numbers are subject to change depending on type of turbine used for the Project and would be in addition to that related to the Triple H Wind Project currently under construction. A breakdown of the typical construction and operation jobs for a 175-MW wind energy project are shown below in Section 17, Table 17-1.

Long-term beneficial impacts to the state and local tax base as a result of the operation of the Project will contribute to improving the local economy in this area of South Dakota. In addition to the creation of jobs and personal income, the Project will pay capacity and production taxes which will benefit the state, Hyde County, school districts and the communities in the Project Area with wind turbines. Direct Project economic impacts over 25 years of operation (based on a 175-MW project) are projected as follows:

- Landowners Payments: Approximately \$1 million per year
- Production Tax Payments: Approximately \$842,730 per year (tax allocation details provided below)
- Full-Time Jobs: Approximately six to eight full-time jobs totaling approximately \$500,000 to \$650,000 per year

The yearly tax projection is based on the Wind Farm Production and Capacity tax defined in SDCL Ch. 10-35-16 through 21. The estimates are based on Meridian Wind operating 175 MW of nameplate capacity and an operations profile designed by Meridian Wind's experienced development team. The actual amount paid will be based on current law and real operations of the year in question. Allocations to taxing jurisdictions are projected below with conservative production measures.

The total projected annual capacity and generation tax is projected to be around \$842,730 per year totaling approximately \$21,068,256 over 25 years distributed as follows:

- State of South Dakota: Approximately \$254,568 per year totaling \$6,364,205 over 25 years

- Hyde County (no townships, county benefit): Approximately \$294,081 per year totaling \$7,352,026 over 25 years
- Highmore-Harrold School District: Approximately \$294,081 per year totaling \$7,352,026 over 25 years

The above direct payment information does not include any multiplying factor of additional income earned in Hyde County or the local area, which is expected to multiply total economic impact of the Project.

16.1.2.2 *Impacts to Property Values*

No negative impacts to property values are anticipated from the Project. A review of academic literature pertaining to wind project development and its impact on property values was completed for a similar project in Clark County, South Dakota (Crocker Wind Farm, LLC; Docket No. EL17-055). The report summarized the results of two Hedonic Price Model studies (Hoen et al. 2009, 2013) conducted by the Environmental Energy Technologies Division of the Lawrence Berkeley National Laboratory (LBNL) and included a review of additional studies providing supportive and critical views (Thayer 2017). The 2009 LBNL study determined that there was no significant impact to sale values of properties over time due to proximity of wind-energy project development. The 2013 follow-up study examined changes in property values of 51,276 home sales from 27 counties in nine states within 10 miles of 67 individual wind energy projects. This study found no statistical evidence for differences in home values from pre- to post-construction.

The 2009 and 2013 LBNL studies evaluated wind farms in a variety of landscapes, including agricultural areas. The studies examined 36 unique counties in the United States. It noted that 21 of the 36 unique counties are considered more than 50 percent rural, whereas only four counties (Benton, Washington; Walla Walla, Washington; DeKalb, Illinois; Atlantic, New Jersey) are less than 22 percent rural. Sixteen unique counties have a percentage rural greater than or equal to 59 percent, the raw average of the South Dakota counties. According to the U.S. Census Bureau's 2010 Census, Hyde County is 100 percent rural (U.S. Census Bureau 2010). Additionally, Hyde County's land cover is 25.8 percent pasture grassland and several counties that were examined have land cover dominated by pastureland (over 50 percent) including Grady, Oklahoma; Custer, Oklahoma; Kittitas, Washington; and Howard, Texas (USDA 2014).

Because none of the previous academic research or literature on the impact of large-scale wind farms on nearby property values has included South Dakota wind projects, to predict what might occur near South Dakota wind facilities requires the transfer of existing research from similar areas. The LBNL studies were constructed with transferability specifically in mind as they used a wide range of community types so that the results will be applicable to the maximum number of alternative sites.

The range of counties studied in the LBNL studies include counties like those in South Dakota. Hyde County is similar to some of the LBNL counties, which implies that the LBNL studies are a reasonable transfer source. In general, the South Dakota counties have lower average population per square mile, median income and median home values than the average county in either the 2009 or 2013 LBNL studies. The South Dakota counties are very similar to their Minnesota and Iowa counterparts, especially Cottonwood and Jackson counties, Minnesota and Franklin and Sac counties, Iowa.

Table 16-2 provides a more detailed examination among the three South Dakota counties and Cottonwood and Jackson counties, Minnesota and Franklin and Sac counties, Iowa. Two additional measures of

similarity are presented—mean size of farms and the percent of the workforce employed in agriculture, broadly defined. In addition, the calculated averages are weighted by population. As is evident, the percent employed in agriculture is very close between the comparison group and the South Dakota counties. Mean farm size is larger in the South Dakota counties but the percent rural is larger in the comparison group. This group-wise comparison suggests that the LBNL studies do include information from counties similar to those evaluated in South Dakota.

Given the information about the types of facilities planned and the previous research on like counties, the LBNL studies are a reasonable source for a benefit transfer (or damage transfer) effort to South Dakota. This leads to the overall conclusion that this Project in Hyde County will not significantly reduce the sales prices of properties in the vicinity of the Project Area.

Table 16-2. Additional Comparative Demographic Data for Counties with Wind Farms in Iowa, Minnesota and South Dakota

County	State	Population	Percent Rural	Mean Size of Farms ¹	Percent Agriculture Employment ²
Sac	IA	9,719	60	429	9.1
Franklin	IA	10,124	100	409	12.5
Cottonwood	MN	11,437	62	450	3.7
Jackson	MN	9,911	69	402	11.0
Weighted Average³			72.2	423.3	8.9
Clark	SD	3,739	100	894	25.4
Codington	SD	28,015	22	557	4.9
Grant	SD	7,147	55	639	16.7
Weighted Average³			36.3	606.7	9.3

1 Acres

2 Agriculture, Fishing, Forestry and Hunting

3 Weighted by population

Similarly, the SDPUC has previously concluded that there is “no record evidence that property values will be adversely affected. *In the Matter of the Application of Dakota Range I, LLC and Dakota Range II, LLC for a Permit of a Wind Energy Facility in Grant County and Codington County, South Dakota for the Dakota Range Wind Project*, Docket No. EL18-003, Final Decision and Order Granting Permit to Construct Wind Energy Facility, Notice of Entry Para. 55 (July 23, 2018). The SDPUC found similarly in the Crocker Wind Farm docket: “There was no credible showing that there will be quantifiable or qualitative effect on property value.” *In the Matter of the Application by Crocker Wind Farm, LLC for a Permit of a Wind Energy Facility and a 345 kV Transmission Line in Clark County, South Dakota, for Crocker Wind Farm*, Docket No. EL17-055, Final Decision and Order Granting Permit to Construct Facilities and Notice of Entry, ¶ 60 (June 12, 2018).

MaRous & Company recently completed a market impact study for the Dakota Range Wind Project III (MaRous & Company 2019). This study concluded that there is no market data indicating the Dakota Range Wind Project III project would have a negative impact on either rural residential or agricultural property values in the surrounding area. Further, the study found that market data from South Dakota supports the conclusion that the project would not have a negative impact on rural residential or agricultural property values in the surrounding area. Finally, for agricultural properties that host turbines, the additional income from the wind lease may increase the value and marketability of those properties.

16.1.3 Mitigation Measures for Socioeconomic and Community Impacts

As noted above, the Project will positively impact the local community. As such, no mitigation measures are proposed.

16.2 Commercial, Industrial and Agricultural Sectors

16.2.1 Existing Commercial, Industrial and Agricultural Sectors

The Project Area is primarily private-owned agricultural (predominantly cropland and grassland/pasture). No commercial, industrial, mining or institutional land uses are located within the Project Area. Therefore, no mitigation measures are proposed.

In 2012, Hyde County's 207 farms encompassed a total of 514,618 acres (average farm size of 2,486 acres) and produced \$94.3 million in agricultural products (USDA 2012). Sixty-seven percent of sales were from crop sales and 33 percent was livestock sales. The majority of crop acreage was corn and wheat. Cattle and calves were the largest livestock component in the county. Hyde County ranked 48th of the 66 South Dakota counties in total value of agricultural products sold.

16.2.2 Impacts to Commercial, Industrial and Agricultural Sectors

Less than 1 percent of the existing agricultural land within the Project Area will be removed from long-term crop and forage production by the Project, primarily the area around wind turbine foundations, access roads and interconnection facilities. Landowners will be compensated by Meridian Wind for losses to crop production during construction. Agricultural activities can occur up to the edge of access roads and turbine pads. The buried underground collection system will not alter agricultural activities.

Approximately 271 acres of agricultural land (including cropland and pastureland identified in Table 9-3) will be temporarily impacted by Project construction for collection lines, the transmission line, and workspace around each turbine foundation. It is estimated that approximately 26 acres of agricultural land will be impacted long-term, which constitutes 0.2 percent of the total land within the Project Area. Approximately 13 acres of prime farmland, if irrigated, will be impacted long-term, which constitutes approximately 0.1 percent of the total land within the Project Area. Areas disturbed due to construction that will not host long-term operational Project facilities will be restored and will returned to its prior agricultural use.

16.2.3 Mitigation Measures for Commercial, Industrial and Agriculture Sectors

The mitigation measures for impacts to agricultural lands are described in Section 11.1.3.

16.3 Community Facilities and Services

16.3.1 Existing Community Facilities and Services

Table 16-1 identifies communities within the vicinity of the Project Area which will have facilities and services such as hospitals, police, fire and ambulance services, schools, churches and parks, and recreational facilities. Electrical service in the Project Area is provided by Dakota Electric Cooperative, Inc. The Project is not located within a rural water system.

16.3.2 Impacts to Community Facilities and Services

Given the short-term duration of the construction activities, the Project is not likely to increase the need for public services, including police and fire protection. No significant increase in the permanent population of local communities will be expected from construction and operation of the facility. Existing community facilities and services should be adequate to support the workforce during construction. In addition, the construction workforce will not create any measurable negative impact to the local government, utilities, or community services.

It is expected that the Project will have no significant impact on the security and safety of the local communities and the surrounding area during Project construction and operation periods. Additional risk for worker or public injury may exist during the construction phase, as it will for any large construction project. In response, work plans and specifications will be prepared to address worker and community safety during Project construction. The Project's general contractor will identify and secure all active construction areas to prevent public access to potentially hazardous areas.

16.3.3 Mitigation Measures for Community Facilities and Services

During Project construction and operation, Meridian Wind will work with local and Hyde County emergency management to develop procedures for response to emergencies, natural hazards, hazardous materials incidents, and potential incidents. The Project will register each turbine location and transmission line structure with the rural identification / addressing (fire number) system and 911 systems.

16.4 Transportation

16.4.1 Existing Transportation

16.4.1.1 Ground Transportation

In general, the existing roadway infrastructure in and around the Project Area is characterized by state, county, and township roads that generally follow section lines. Various local roads provide access to the Project and include both two-lane and gravel roads. In the agricultural areas, many landowners use private, single-lane farm roads and driveways on their property. The length of roads within the Project Area by jurisdiction are summarized in Table 16-3.

Table 16-3. Summary of Roadways within the Project Area

Road Type	Miles within Project Area
Federal Highways	0
State Highways	2.2
Local Roads	26.4
Total	28.6

16.4.1.2 Aviation

As discussed in Section 11.7.1, Highmore Municipal Airport is located approximately 4.7 miles north of the Project Area (Figure 1 in Appendix A). One other airport, Miller Municipal, is located approximately 18 miles east of the Project Area near the City of Miller. There are no other public airports in proximity to the Project Area. Meridian Wind has not identified any private airstrips within the Project Area.

Air traffic may be present near the Project Area for crop dusting of agricultural fields. Crop dusting is typically carried out during the day by highly maneuverable airplanes or helicopters. The installation of wind turbines will create a potential for collisions with crop-dusting aircraft. The turbines will be visible from a distance and lighted according to FAA guidelines. Meridian Wind received Determinations of No Hazard for a preliminary array and has since submitted the current array to the FAA, which is currently under review. See Section 16.4.2.2 for more details.

16.4.2 Impacts to Transportation

16.4.2.1 Ground Transportation

During the construction phase, temporary impacts are anticipated on some public roads in the vicinity of the Project Area; however, local traffic will continue to have safe access through the area. Roads will be affected by the transportation of equipment to and from the Project. Construction traffic will use the existing county and state roadway system to access the Project and deliver construction materials and personnel. During the construction phase, several types of light, medium, and heavy-duty construction vehicles, as well as private vehicles used by construction personnel, will travel to and from the Project Area. Meridian Wind estimates that there will be up to approximately 45 large truck trips per day per foundation and up to 100 small-vehicle (pickups and automobiles) trips per day in the area during peak construction periods. Some roads may also be temporarily expanded along specific routes as necessary to facilitate the movement of equipment. Meridian Wind expects to enter into road use agreements with Hyde County. Construction activities will increase the amount of traffic using local roadways, but such use is not anticipated to result in adverse traffic impacts. Operation and maintenance activities will not noticeably increase traffic in the Project vicinity.

After construction is complete, traffic impacts during the operation phase of the Project will be minimal. A small maintenance crew driving through the area in pickup trucks on a regular basis will monitor and maintain the wind turbines, collector lines, and the transmission line as needed. There will be a slight increase in traffic for occasional turbine, collector substation repair, transmission line structure, and/or collector line repair, but traffic function will not be impacted as a result.

16.4.2.2 Aviation

Meridian Wind will coordinate with the Highmore Municipal Airport, the FAA and South Dakota Department of Transportation (SDDOT) prior to construction to understand potential impacts.

Meridian Wind currently has Form 7460 filings under review by the FAA for the current array at a height of 599 feet. If taller turbines are used or if the Project layout changes from what has been previously provided to the FAA, Meridian Wind will re-file with the FAA.

The installation of wind turbine towers in active croplands will create a potential collision risk with crop dusting aircraft. Meridian Wind will notify local airports about the Project including locations of MET towers in the area to minimize impacts and reduce potential risks to crop dusters.

16.4.3 Mitigation Measures for Transportation

16.4.3.1 Ground Transportation

Given the increased road use in the Project Area during construction, Meridian Wind will coordinate with local road authorities to establish road use agreements that will be in place prior to construction to ensure the safe and efficient use of roads and to minimize and mitigate the overall impact. Existing roads will be used when possible, but only in safe and environmentally sound locations. In locations where new access roads are necessary, they will 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 not needed during operations will be decompacted, recontoured, and revegetated.

When the Project is in the process of making road improvements, local traffic will either be directed safely through the work area or around on alternate routes, if needed. If practical, roads will be designed to allow two-way traffic so construction and local traffic will be able to use the roads during construction of the Project. Some delays or detours are expected during this phase to enable the installation of road improvements, but the Project will have plans in place to enable the traffic to move safely. Delays and detours will be similar in nature to what can occur during peak farming operations or other road improvements. Additional coordination will occur during peak harvest time to ensure farmers are able to utilize the public roads as well. Local Project management and support staff will be available on-site to address concerns or challenges that occur during construction. The Project will implement the following to minimize any adverse traffic impacts: improved roads to handle two-way traffic during construction, proper signage, project-based speed limits, follow state/local road requirements, dust control, safety personnel on site, and road agreements.

Project personnel and contractors will 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 will be restricted to designated project roads. Use of other unimproved roads will be restricted to emergency situations.

The cost estimate to repair roads back to pre-construction conditions will be completed as part of final engineering and will depend on the plans for road upgrades as well as the turbine delivery plan. Meridian Wind will enter road agreements with Hyde County and the impacted townships prior to construction and are expected to provide detailed engineering and financial security. Pursuant to SDCL 49-41B-38, Meridian Wind will furnish an indemnity bond to secure the restoration and repair of roads after construction.

16.4.3.2 Aviation

Meridian Wind will mark and light the turbines and the permanent MET tower to comply with FAA requirements and Hyde County Zoning Regulations under Section 9-104. Meridian Wind will notify local airports about the Project and new towers in the area to reduce the risk to crop dusters. Meridian Wind will work with landowners on coordinating crop dusting activities. The permanent MET tower will be free-standing with no guy wires. Temporary MET towers that are already installed in the Project Area have supporting guy wires that are marked with safety shields (colored balls) and painted red and white for increased visibility.

16.5 Cultural Resources

16.5.1 Existing Cultural Resources

Cultural resources are the material remains of human activity and can include sites, buildings, districts, and landscapes. Cultural resources are finite and non-renewable; once destroyed, they and the information they provide are lost. Federal laws and regulations provide the standards for cultural resources identification, evaluation, and mitigation of impacts. If a cultural resource site meets the criteria for listing on the National Register of Historic Places (NRHP), it is considered significant and termed a “historic property.” The Project layout was designed, in part, to consider impacts to cultural sites that may meet the criteria for historic properties.

Beaver Creek Archaeology, on behalf of Meridian Wind, performed a Level I Record Search for the Project Area and 1-mile buffer (the Research Area) using data provided by the South Dakota State Archaeological Research Center. Due to the sensitivity of this data, the Level I Cultural Resource Inventory of the Meridian Wind Turbines in Hyde County, South Dakota Report is provided as a confidential appendix to the SDPUC (Appendix H).

The record search indicated that three previous archaeological surveys have been conducted within the sections where the proposed Project is located; however, none of these previous surveys overlap the Project Area. In addition, one archaeological site and three historic architectural structures are within the Research Area (Table 16-4). These resources, 39HE0039, HE00000018, HE00000031, and HE00000035, are located outside of the Project Area and thus will not be affected by Project construction as currently planned.

Table 16-4. Previously Recorded Cultural Resources

SHPO ID	Affiliation	Description	NRHP Status
39HE0039	Period Unknown	Native American Artifact Scatter	Unevaluated
HE00000018	Architectural	Bridge #35-130-282	Not Eligible
HE00000031	Architectural	Harry Bawdon Barn	Not Eligible
HE00000033	Architectural	Bridge #35-150-285	Not Eligible

SHPO = State Historic Preservation Office; ID = Identification

Source: Beaver Creek Archeology, Inc, 2020

Because the Project Area has no previous archaeological survey coverage, BCA concludes that undocumented cultural resources may exist within the Project Area. These resources might be prehistoric or historic, and are most likely to occur on terraces, ridges, hills, knolls, or bluffs, plains, and bottomlands. BCA recommends that a Level III pedestrian survey of the area be conducted along all potential surface disturbance locations within the Project Area.

Meridian Wind anticipates completing archaeological pedestrian survey of the Project Area of Potential Effect in the spring of 2020. The survey will follow procedures outlined by the South Dakota State Historical Society (SDSHS) and State Historic Preservation Office (SHPO; SDSHS 2012). A cultural resources inventory report will be drafted after this survey is completed and submitted to SDPUC and South Dakota SHPO for review.

16.5.2 Impacts to Cultural Resources

Meridian Wind is committed to avoidance of all potentially significant cultural resources (those that are listed, eligible or potentially eligible for listing, or unevaluated for listing in the NRHP). This includes

previously documented resources and any resources that are identified in further surveys. As outlined in Section 4.2, potentially significant resources may require minor shifts in turbine locations or elimination of turbines from consideration. Access roads and collector line locations will be modified to avoid any potentially significant cultural resources identified in the forthcoming surveys.

16.5.3 Mitigation Measures for Cultural Resources

If there are minor modifications to the Project layout based on final engineering design, Meridian Wind will conduct supplemental archaeology survey and commit to avoiding any NHRP-eligible sites that are identified. The Project will avoid impacts to potentially significant cultural resources. Avoidance buffers (50 to 100 feet) will be placed around cultural resources that fall within this category (NRHP-listed, -eligible, -potentially eligible, or unevaluated) to ensure that the Project has no adverse impacts on these resources. All sites will be fenced along the avoidance buffer perimeter to reduce the likelihood that they will be inadvertently disturbed during construction. Therefore, no significant impacts on cultural resources are anticipated from the Project.

An Unanticipated Discovery Plan will be prepared for the Project outlining procedures to follow in order to prepare for and address any unanticipated discoveries of cultural resources, including previously undiscovered archaeological sites and possible human remains. This Unanticipated Discovery Plan will provide direction to on-site personnel and their contractors as to proper procedures to follow if unanticipated discoveries occur during construction of the Project.

If human remains are identified during construction of the Project, work will immediately halt within a minimum of 100 feet of the site and the site will be protected until SDSHS and the South Dakota Archaeological Research Center are consulted, in addition to any involved Tribes that express interest in the Project and identify a potential impact.

If confirmed or potential human skeletal remains are discovered, the Hyde County Sheriff's office will also be contacted. If the remains are determined not to be part of an active crime scene or investigation, the South Dakota Chief Archaeologist will be contacted.

17.0 EMPLOYMENT ESTIMATES (ARSD 20:10:22:24)

ARSD 20:10:22:24. Employment estimates. *The application shall contain the estimated number of jobs and a description of job classifications, together with the estimated annual employment expenditures of the applicants, the contractors, and the subcontractors during the construction phase of the proposed facility. In a separate tabulation, the application shall contain the same data with respect to the operating life of the proposed facility, to be made for the first ten years of commercial operation in one-year intervals. The application shall include plans of the applicant for utilization and training of the available labor force in South Dakota by categories of special skills required. There shall also be an assessment of the adequacy of local manpower to meet temporary and permanent labor requirements during construction and operation of the proposed facility and the estimated percentage that will remain within the county and the township in which the facility is located after construction is completed.*

As discussed in Section 16.1.2, the Project is expected to employ approximately 400 temporary construction workers during an estimated 8-month peak construction period to support Project construction, of which up to 130 would be onsite at any one point. It is likely that general skilled labor is available in the surrounding counties or the state to serve the basic infrastructure and site development needs of the Project. Specialized labor will be required for certain components of Project construction. It is likely that this labor will be imported from other areas of the state or from other states, as the relatively short duration of construction makes special training of local or regional labor impracticable.

The estimated number of construction jobs by classification and annual employment expenditures during construction are included in Tables 17-1 and 17-2; however, the number of jobs during the peak of construction may be higher.

Table 17-1. Estimated Construction Jobs and Employment Expenditures for Wind Project

Job Classification	Number	Estimated Annual Salary
Crane Operators	15	\$90,000 – \$150,000
Civil Workers	70	\$75,000 – \$100,000
Construction Workers	80	\$40,000 – \$70,000
Collection Workers	20	\$70,000 – \$85,000
Tower Erectors	100	\$65,000 – \$85,000
Substation Workers	30	\$70,000 – \$95,000
Foundation Workers	58	\$60,000 – \$85,000
Testing and Inspections	12	\$60,000 – \$85,000
Design Engineers	15	\$60,000 – \$85,000

Table 17-2. Estimated Construction Jobs and Employment Expenditures for Transmission Line

Job Classification	Number	Estimated Annual Salary
Crane Operators	2	\$90,000 – \$150,000
Supervision	3	\$100,000 – \$150,000
Lineman	8	\$80,000 – \$95,000
Operators	4	\$75,000 – \$85,000
Groundman/labor	8	\$70,000 – \$80,000
Design Engineers	2	\$145,000 – \$160,000

The estimated number of jobs by classification and annual employment expenditures during operation are dependent on the final turbine model used for the Project. A summary is included in Table 17-3. Annual

estimated employment expenditures are anticipated to be the same for each of the first 10 years of commercial operation.

Table 17-3. Estimated Annual Operation and Employment Expenditures

Job Classification	Number ¹	Estimated Annual Salary
Facility Managers	1	\$90,000 – \$135,000
Site Engineer	1	\$75,000 – \$90,000
Wind Turbine Technicians	4 – 6	\$50,000 – \$65,000
Administrative	0	\$40,000 – \$55,000

1 The Project anticipates position synergies with those already held at the Triple H Wind Project.

18.0 FUTURE ADDITIONS AND MODIFICATIONS (ARSD 20:10:22:25)

ARSD 20:10:22:25. Future additions and modifications. The applicant shall describe any plans for future modification or expansion of the proposed facility or construction of additional facilities which the applicant may wish to be approved in the permit.

The Meridian Wind Project as proposed is a standalone project that will be built as described in this Application.

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19.0 DECOMMISSIONING OF ENERGY FACILITIES (ARSD 20:10:22:33)

ARSD 20:10:22:33.01. Decommissioning of wind energy facilities -- Funding for removal of facilities. The applicant shall provide a plan regarding the action to be taken upon the decommissioning and removal of the wind energy facilities. Estimates of monetary costs and the site condition after decommissioning shall be included in the plan. The commission may require a bond, guarantee, insurance, or other requirement to provide funding for the decommissioning and removal of a wind energy facility. The commission shall consider the size of the facility, the location of the facility, and the financial condition of the applicant when determining whether to require some type of funding. The same criteria shall be used to determine the amount of any required funding.

A Decommissioning Plan and estimated cost analysis was prepared for the Project and is included in Appendix I. The detailed reclamation cost estimate is provided in Appendix B of the Decommissioning Plan. Overall, the net decommissioning cost (in 2020 U.S. dollars) is based on two scenarios:

- GE 2.72-MW turbine model assuming salvage and no resale; and
- GE 2.72-MW turbine model assuming no salvage and no resale.

The current cost of decommissioning this Project is estimated to be approximately \$86,650 per turbine. If salvage value is not taken into account, the current cost of decommissioning this Project is estimated to be \$157,769 per turbine.

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20.0 RELIABILITY AND SAFETY (ARSD 20:10:22:33:02 (08))

ARSD 20:10:22:33.02. Information concerning wind energy facilities. If a wind energy facility is proposed, the applicant shall provide the following information:

(8) Reliability and safety;

20.1 Reliability

Reliability (availability) as related to wind energy is defined as the percentage of time that a turbine will be functioning at full capacity during appropriate wind conditions at a site with specified wind resource characterization for a specified period of time, such as the life of the facility (Hill et al. 2008). The Project is located in one of the windier areas of South Dakota and has been determined to be economically viable as based on the PPAs that have been executed by the Project.

20.2 Safety

The Project is located in a rural setting. Construction and operation of the Project will have minimal impacts on the security and safety of the local populace. Meridian Wind and its construction team will coordinate with first responders, including but not limited to air ambulance, local sheriff's office(s), and local fire services to develop an emergency management plan during construction and operation of the Project. Meridian Wind will also be in contact with local first responders to offer information about the Project and to answer any questions response teams may have regarding Project plans and details. The following security measures will be taken to reduce the chance of physical and property damage, as well as personal injury, at the site:

- The turbines will be set back from occupied homes as described in this Application and the applicable regulations identified herein. Distances from participating homes are considered to be safe based on developer experience and are consistent with prior Facility Permits. Setbacks from non-participating residences exceed industry standards and any impacts from turbines is negligible.
- Security measures will be taken during the construction and operation of the Project including temporary (safety) and long-term operational fencing, warning signs and locks on equipment and wind power facilities.
- Regular maintenance and inspections will be implemented to minimize the potential for blade failures.
- Turbines will sit on steel enclosed tubular towers within which all electrical equipment will be located, except for the pad-mounted transformer where applicable.
- Access to the interior of the tower is only through a solid steel door that will be locked when not in use.
- The permanent MET tower will be free-standing.
- Where necessary or requested by landowners, Meridian Wind will construct gates or fences.

- The foundation and tower design of the wind turbine will be certified by a professional engineer to be within accepted professional standards.
- Safety training will be conducted, and standardized practices will be implemented for construction crews and on-site personnel.
- The Project will register each turbine location and the O&M facility with a rural address identifier as outlined in the South Dakota Rural Addressing Procedural Handbook.
- Meridian Wind will coordinate with South Dakota One-Call and pipeline companies prior to commencement of construction activities and will register Project underground facilities with the One-Call program following construction.
- Icing conditions of the wind turbines will be monitored; if severe icing conditions are identified, control systems will either automatically or manually shut down until icing is no longer a concern.

The Project will have minimal waste as a result of operation, and all required permits for handling contaminants will be obtained. Meridian Wind has and will be in contact with local first responders to offer information about the Project and to answer any questions response teams may have regarding Project plans and details.

20.3 Electromagnetic Fields and Stray Voltage

The frequency of transmission line electromagnetic fields (EMF) in the United States is 60 Hz and falls in the extremely low frequency (ELF) range of the electromagnetic spectrum (any frequency below 300 Hz). For the lower frequencies associated with power lines, the electric and magnetic fields are typically evaluated separately. The intensity of the electric field is related to the voltage of the line, while the intensity of the magnetic field is related to the current flow along the conductors.

Concerns about health effects of EMF from power lines were first raised in the late 1970s. Since then, considerable research has been conducted to determine if exposure to magnetic fields, such as those from high-voltage power lines, causes biological responses and health effects. Initial epidemiological studies completed in the late 1970s showed a weak correlation between surrogate indicators of magnetic field exposure (such as wiring codes or distance from roads) and increased rates of childhood leukemia (Wertheimer and Leeper 1979). Toxicological and laboratory studies have not shown a biological mechanism between EMF and cancer or other adverse health effects. In 2007, the World Health Organization (WHO) concluded a review of health implications from magnetic fields and concluded, "...virtually all of the laboratory evidence and the mechanistic evidence fail to support a relationship between low-level ELF magnetic fields and changes in biological function or disease status" (WHO 2007).

Natural and human-made electromagnetic fields are present everywhere in our environment. Natural electric fields in the atmosphere range from background static levels of 10 to 120 volts per meter to well over several kilovolts per meter produced by the build-up of electric charges in thunderstorms. The earth itself has a magnetic field that ranges from approximately 300 to 700 milligauss (mG). In addition to the presence of the earth's steady state electric field, an average home experiences additional magnetic fields of 0.5 mG to 4 mG which arise from the general wiring and appliances located in a typical home.

Impacts from stray voltage are typically related to improper grounding of electrical service to the farm (distribution lines) or on-farm electrical wiring. Transmission lines do not, by themselves, create stray voltage because they do not connect to businesses or residences and they are typically grounded properly. Transmission lines can induce stray voltage on a distribution circuit that is parallel to and immediately under the transmission line. Appropriate measures, such as proper grounding, will be taken to prevent stray voltage problems.

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21.0 INFORMATION CONCERNING WIND ENERGY FACILITIES AND TRANSMISSION FACILITIES (ARSD 20:10:22:33.02 and 20:10:22:35)

ARSD 20:10:22:33.02. Information concerning wind energy facilities. *If a wind energy facility is proposed, the applicant shall provide the following information:*

- (1) Configuration of the wind turbines, including the distance measured from ground level to the blade extended at its highest point, distance between the wind turbines, type of material, and color;*
- (2) The number of wind turbines, including the number of anticipated additions of wind turbines in each of the next five years;*
- (3) Any warning lighting requirements for the wind turbines;*
- (4) Setback distances from off-site buildings, right-of-ways of public roads, and property lines;*
- (5) Anticipated noise levels during construction and operation;*
- (6) Anticipated electromagnetic interference during operation of the facilities;*
- (7) The proposed wind energy site and major alternatives as depicted on overhead photographs and land use culture maps;*
- (8) Reliability and safety;*
- (9) Right-of-way or condemnation requirements;*
- (10) Necessary clearing activities;*
- (11) Configuration of towers and poles for any electric interconnection facilities, including material, overall height, and width;*
- (12) Conductor configuration and size, length of span between structures, and number of circuits per pole or tower for any electric interconnection facilities; and*
- (13) If any electric interconnection facilities are placed underground, the depth of burial, distance between access points, conductor configuration and size, and number of circuits.*

ARSD 20:10:22:35. Information concerning transmission facilities. *If a transmission facility is proposed, the applicant shall provide the following information:*

- (1) Configuration of the towers and poles, including material, overall height, and width;*
- (2) Conductor configuration and size, length of span between structures, and number of circuits per pole or tower;*
- (3) The proposed transmission site and major alternatives as depicted on overhead photographs and land use culture maps;*
- (4) Reliability and safety;*
- (5) Right-of-way or condemnation requirements;*
- (6) Necessary clearing activities; and*
- (7) If the transmission facility is placed underground, the depth of burial, distance between access points, conductor configuration and size, and number of circuits.*

Refer to the Completeness Checklist in Section 1.4.1 of this Application for ARSD requirement details. Requirements specific to ARSD 20:10:22:33.02 (1-13) and ARSD 20:10:22:35 (1-7) are addressed in various sections of this Application, as indicated in Tables 21-1 and 21-2 below.

Table 21-1. Information Concerning Wind Energy Facilities (ARSD 20:10:22:33.02)

Information Request	Section
(1) Configuration of wind turbine	Section 4.1 and Section 4.2
(2) Number of wind turbines	Section 4.2
(3) Warning light requirements for wind turbines	Section 9.2.3.1 and Section 12.0
(4) Setback distances	Section 5.2 and Section 12.0; Figures 3a-3b
(5) Sound levels during construction and operation	Section 4.12 and Section 11.3
(6) Electromagnetic interference	Section 20.3
(7) Site and major alternatives	Section 5; Figures 3a-3b and Figure 11; Appendix B
(8) Reliability and safety	Section 20.1
(9) Right-of-way or condemnation requirements	Section 4.4.1
(10) Clearing activities	Sections 4.4, 6.0, 8.2.2.1 and 9.1.2.3
(11) Configuration of interconnection towers and poles	Sections 4.2–4.10
(12) Conductor and structure configurations	Section 4.10
(13) Underground electric interconnection facilities	Section 4.12.4

Table 21-2. Information Concerning Transmission Facilities (ARSD 20:10:22:35)

Information Request	Section
(1) Configuration of the towers and poles, including material, overall height, and width;	Section 4.3.1
(2) Conductor configuration and size, length of span between structures, and number of circuits per pole or tower;	Section 4.3.1
(3) The proposed transmission site and major alternatives as depicted on overhead photographs and land use culture maps;	Section 5, Figures 3a-3b and Figure 11; Appendix B
(4) Reliability and safety;	Section 20.1
(5) Right-of-way or condemnation requirements;	Section 4.4.1
(6) Necessary clearing activities; and	Sections 4.4, 6.0, 8.2.2.1 and 9.1.2.3
(7) If the transmission facility is placed underground, the depth of burial, distance between access points, conductor configuration and size, and number of circuits.	N/A

22.0 ADDITIONAL INFORMATION IN APPLICATION (ARSD 10:22:36)

ARSD 20:10:22:36. Additional information in application. The applicant shall also submit as part of the application any additional information necessary for the local review committees to assess the effects of the proposed facility pursuant to SDCL 49-41B-7. The applicant shall also submit as part of its application any additional information necessary to meet the burden of proof specified in SDCL 49-41B-22.

22.1 Permits and Approvals

The Applicant is responsible for undertaking all required environmental review and will obtain all permits and licenses that are required following issuance of the Energy Facility Permit. The potential permits or approvals that have been identified as being required for the construction and operation of the Project are shown in Table 22-1.

Table 22-1. Permits and Approvals

Regulatory Authority	Permit/Approval	Status
Federal Approvals		
USFWS–Huron WMD	Special Use Permit for temporary impacts on wetland and grassland easements	Avoided impacting all USFWS grassland easements except for four turbine locations. Two existing easements supersede USFWS easements. No authorization required.
USACE	CWA Section 404 and Section 10 Permit(s)	Not anticipated—To be determined once layout is finalized.
EPA (Region 8) in coordination with the South Dakota Department of Health	SPCC Plan	To be completed in conjunction with final engineering and design.
FAA	Form 7460-1 Notice of Proposed Construction or Alteration (Determination of No Hazard)	Issued Q1 2020—future revisions may be required depending on layout and/or determination expiration.
	Notice of Actual Construction or Alteration (Form 7460-2)	To be submitted as required during construction.
State of South Dakota Approvals		
South Dakota Aeronautics Commission	Aeronautical Hazard Permit	Will be completed after final design is complete.
SDPUC	Application for Energy Facility Permit	Will be submitted spring 2020.
SDSHS	Cultural and Historic Resources Review and Review of State and NRHP and Archeological Survey	Spring/summer 2020.
SDDENR	Section 401 Water Quality Certification	Not anticipated unless Individual Section 404 Permit is needed from USACE.
	National Pollutant Discharge Elimination System General Stormwater Permit for Construction Activity	SWPPP would be prepared and Notice of Intent will be submitted after final design is complete.
	Temporary Water Use Permit for Construction Activities	If necessary, will be obtained prior to construction.

Table 22-1. Permits and Approvals

Regulatory Authority	Permit/Approval	Status
SDDENR (continued)	Water Rights Permit for Non-irrigation Use	If necessary, will be obtained prior to construction.
	Temporary Discharge Permit	If necessary, will be obtained prior to construction.
SDDOT	Utility Permit	If necessary, will be obtained prior to construction.
	Oversize/Overweight Permit for State Highways	Will be obtained prior to construction.
	Highway Access Permit	If necessary, will be obtained prior to construction.
Local Approvals		
Hyde County Zoning Administrator	Conditional Use Permit	Submitted March 13, 2020.
Hyde County Planning and Zoning Department	Building Permit and Soil Erosion and Sediment Control Plan	Will be obtained prior to construction.
Hyde County Planning and Zoning Department	Oversize/Overweight and Approach Permit	Will be obtained prior to construction.

22.2 Agency Coordination

Throughout Project planning, Meridian Wind has coordinated with various federal, state and local agencies to identify agency concerns regarding the Project. A summary of agency comments and coordination is provided below.

In February 2020 Meridian Wind also sent consultation letters to the following agencies:

- USFWS Huron Wetland Management District;
- USFWS South Dakota Ecological Services Field Office;
- USACE, Pierre Regulatory Office;
- U.S. Department of Commerce NTIA;
- SDSHS SHPO;
- USDA-NRCS;
- SDGFP;
- SDDENR, Division of Environmental Services;
- SDDOT, South Dakota Aeronautics Commission; and
- SDDOT, Office of Aeronautics Services.

No responses have been received at the time of the submittal of this Application submittal. Agency consultation letters are provided in Appendix J.

22.2.1 USFWS

As part of the coordination for the Triple H Wind Project that is currently under construction by Meridian Wind's parent company, the company coordinated closely with USFWS Ecological Services and the Huron WMD through meetings, conference calls and electronic communications. The area covered by this earlier coordination extended well outside of the Triple H Wind Project area and, as such, some of the key items are also pertinent to this Project. Such information where it is applicable to this Project has been included in Appendix K for reference. In addition, a meeting was held on February 11, 2020, with the USFWS and SDGFP to discuss the Project.

- USFWS easements: The Project is within the USFWS' Huron WMD. As discussed in Section 11.2.1, there are two wetland conservation easements and two grassland conservation easements in the Project Area. As shown in Figure 9 (Appendix A) the Project Area encompasses 584.7 acres of grassland easements, 472.5 acres of top lease grasslands, and 2073.8 acres of wetland easements. The USFWS noted that conservation easements are held in perpetuity and that it would be advisable to avoid dredge/fill in wetlands within the wetland easements and any development that would result in grassland conversion. Wetland easements are depicted on the entire parcel although they are limited to wetlands and streams within that parcel. If facilities were to be placed within the easement areas, NEPA would be triggered. The USFWS Huron Office provided shapefiles of the conservation easements.
 - Over a series of emails and telephone calls, the USFWS discussed the “top lease” of an existing wind easements that had been executed with the landowner and recorded in the appropriate land records before the USFWS implemented a grassland easement for all or a portion of the property. The USFWS concurred that the existing wind easements and their associated lease agreements supersede any USFWS easements that were established after the fact and determined that no authorization from the USFWS will be required as it relates to the wind easement. Meridian Wind is avoiding installing structures within grassland conservation easements and will avoid the delineated features associated with the wetland program.

22.2.2 SDSHS

Meridian Wind completed a file search (see Section 16.5.1). BCA, on behalf of Meridian Wind will consult with the SDSHS regarding the results of the spring 2020 field surveys, as weather permits.

22.2.3 DoD

Form 7460 filings have been submitted for the current array at a height of 599 feet and are under review. Given that the current filing is in the same general area of the prior filing, it is anticipated that Determinations of No Hazard will be issued by the FAA. If taller turbines are used or if the Project layout changes from what has been previously provided to the FAA, Meridian Wind will re-file with the FAA.

22.2.4 Hyde County

Meridian Wind has consulted with Hyde County representatives through meetings, telephone calls and electronic communications. The primary topics of these coordination efforts are summarized below.

- Project introduction summary and status update presentations to County Commissioners and Board of Adjustment;
- Coordination with Hyde County regarding the Meridian Wind CUP application. The application will be submitted in spring 2020.

22.3 Local Community Input

Meridian Wind held an open house meeting regarding the Meridian Wind Project on February 12, 2020. As stated in Table 5-1 and Section 12.0, Meridian Wind will comply with all adopted Hyde County setbacks in addition to voluntary environmental setbacks on other infrastructure and natural resources.

A poll was conducted by Mason-Dixon Polling & Strategy of Jacksonville, Florida from August 22 through September 9, 2018 (Appendix L). A total of 173 registered voters in Hyde County were interviewed by telephone. Those interviewed were selected randomly from a telephone-matched voter registration list that included both land line and cell phone numbers. The poll found that 74 percent of the interviewed voters support the building of new wind turbines in Hyde County, 22 percent opposed, and 4 percent were undecided.

22.4 Applicant's Burden of Proof (49-41B-22)

As described in Section 1.4, Meridian Wind has addressed the matters set forth in SDCL Ch. 49-41B and in ARSD Ch. 20:10:22 (Energy Facility Siting Rules), related to wind energy facilities.

Meridian Wind's burden of proof is set forth in SDCL 49-41B-22. Meridian Wind has established that:

- The Project will comply with all applicable laws and rules;
- The Project will not pose a threat of serious injury to the environment nor to the social and economic condition of inhabitants or expected inhabitants in the Project Area. An applicant for an electric transmission line, a solar energy facility, or a wind energy facility that holds a conditional use permit from the applicable local units of government is determined not to threaten the social and economic condition of inhabitants or expected inhabitants in Project Area;
- The Project will not substantially impair the health, safety or welfare of the inhabitants; and
- The Project will not unduly interfere with the orderly development of the region with due consideration having been given the views of governing bodies of affected local units of government. An applicant for an electric transmission line, a solar energy facility, or a wind energy facility that holds a CUP from the applicable local units of government is in compliance with this subdivision.

23.0 TESTIMONY AND EXHIBITS (ARSD 20:10:22:39)

ARSD 20:10:22:39. Testimony and Exhibits. Upon the filing of an application pursuant to SDCL 49-41B-11, an applicant shall also file all data, exhibits, and related testimony which the applicant intends to submit in support of its application. The application shall specifically show the witnesses supporting the information contained in the application.

Meridian Wind is submitting testimony and exhibits in support of this Application. The individuals identified in Table 23-1 are providing testimony in support of the Application. Meridian Wind reserves the right to provide supplemental and/or rebuttal testimony, as needed to further support this Application.

Table 23-1. List of Individuals Providing Testimony

Individual	Company	Subject Matter
Casey Willis, Senior Advisor, Project Development	ENGIE North America, Inc.	Overall development of the Meridian Wind Project; permitting/environmental
Dave Mebane, Land Agent	ENGIE North America, Inc.	Landowner relationships
Tricia Pellerin	Tetra Tech, Inc.	Sound and noise impact analysis
Ted Guertin	Tetra Tech, Inc.	Shadow flicker analysis
Clayton Derby	WEST, Inc.	Biology/Wildlife
Manuela Elizondo	Tetra Tech, Inc.	Physical environment, hydrology, aquatic ecosystems, visual, water quality, and air quality
Blake Crosby	ENGIE North America, Inc.	Project Construction
Wade Burns	Beaver Creek Archaeology	Archaeological surveys

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