BURNS McDONNELL

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

Dakota Range I, LLC and Dakota Range II, LLC

Dakota Range Wind Energy Facility

January 2018

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Dakota Range Wind Energy Facility
Codington and Grant Counties, South Dakota

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prepared by

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LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
ADT	Average Daily Traffic
AMSL	above mean sea level
APE	area of potential effects
Apex	Apex Clean Energy Holdings, LLC
Applicant	Dakota Range I, LLC and Dakota Range II, LLC
ARSD	Administrative Rules of South Dakota
BBCS	Bird and Bat Conservation Strategy
BCC	Birds of Conservation Concern
BGEPA	Bald and Golden Eagle Protection Act
BMPs	Best Management Practices
CMWS	composite mean wind speeds
Commission	South Dakota Public Utilities Commission
CRMMP	Cultural Resources Monitoring and Management Plan
CWA	Clean Water Act
Dakota Range	Dakota Range I, LLC and Dakota Range II, LLC
dB	decibel
dBA	A-weighted decibels
ECPG	Eagle Conservation Plan Guidance
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration

Abbreviation	Term/Phrase/Name
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
GW	gigawatts
HAPET	Habitat and Population Evaluation Team
HPA	High Probability Area
Hz	Hertz
IPaC	Information for Planning and Conservation
Ksat	saturated hydraulic conductivity
kV	kilovolt
m/s	meters per second
MBTA	Migratory Bird Treaty Act
MERRA	Modern Era Retrospective-Analysis for Research and Application
met	meteorological
Mg/L	milligrams per liter
MISO	Midcontinent Independent System Operator, Inc.
MVA	megavolt-ampere
MW	megawatt
NAAQS	National Ambient Air Quality Standards
NCAR	National Center for Atmospheric Research
NCEP	National Centers for Environmental Prediction
NNRP	NCEP/NCAR Reanalysis Project
NPS	National Park Service

Abbreviation	Term/Phrase/Name
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NRI	Nationwide Rivers Inventory
NWI	National Wetland Inventory
NWP	Nationwide Permit
O&M	operations and maintenance
PEM	Palustrine Emergent Wetlands
PGA	peak ground acceleration
Project	Dakota Range Wind Project
PSA	Purchase and Sale Agreement
PSS	Palustrine Scrub/Shrub Wetlands
PTC	Production Tax Credit
PVRR	present value of revenue requirement
RD	rotor diameter
RPS	renewable portfolio standard
RUSLE	Revised Universal Soil Loss Equation
SCADA	supervisory control and data acquisition
SDARC	South Dakota Archaeological Research Center
SDCL	South Dakota Codified Laws
SDDENR	South Dakota Department of Environment and Natural Resources
SDDLR	South Dakota Department of Labor and Regulation
SDDOA	South Dakota Department of Agriculture

Abbreviation	Term/Phrase/Name
SDDOT	South Dakota Department of Transportation
SDGFP	South Dakota Game, Fish, and Parks
SDGS	South Dakota Geological Survey
SDPUC	South Dakota Public Utilities Commission
SGCN	South Dakota Species of Greatest Conservation Need
SHPO	State Historic Preservation Office
SLM	sound level meter
SWO	Sisseton-Wahpeton Oyate
SWPPP	Storm Water Pollution Prevention Plan
TMDL	total maximum daily load
TSS	total suspended solids
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USLE	Universal Soil Loss Equation
WEG	Wind Energy Guidelines
WES	Wind Energy Systems

1.0 INTRODUCTION

Dakota Range I, LLC and Dakota Range II, LLC (together Dakota Range or Applicant) are requesting an Energy Facility Permit from the South Dakota Public Utilities Commission (Commission or SDPUC) for an up to 302.4-megawatt (MW) wind energy conversion facility to be located in Grant County and Codington County, South Dakota, known as the Dakota Range Wind Project (Project).

The Project would be situated within an approximately 44,500-acre Project Area (Figure 1 in Appendix A), and the total installed capacity of the Project would not exceed 302.4 MW. Project components would include:

- Up to 72 wind turbine generators;
- Access roads to turbines and associated facilities;
- Underground 34.5-kilovolt (kV) electrical collector lines connecting the turbines to the collection substation;
- Underground fiber-optic cable for turbine communications co-located with the collector lines;
- A 34.5 to 345-kV collection substation;
- Up to 5 permanent meteorological (met) towers;
- An operations and maintenance (O&M) facility; and
- Additional temporary construction areas, including laydown and batch plant areas.

The Project would interconnect to the high-voltage transmission grid via the Big Stone South to Ellendale 345-kV transmission line, which crosses the Project site. A new 345-kV interconnection switching station connecting to the Big Stone South to Ellendale line will be constructed, owned, and operated by Otter Tail Power Company and Montana Dakota Utilities. Dakota Range would construct and own a 345-kV interconnection facility connecting a new collection substation and the interconnection switching station. Because the interconnection facility is less than 2,640-feet long, does not cross any public highways, and does not require the use of eminent domain, it falls outside the Commission's jurisdiction and has been permitted locally.

Both the Dakota Range I and Dakota Range II entities are Delaware limited liability companies and wholly owned indirect subsidiaries of Apex Clean Energy Holdings, LLC (Apex). Apex is an independent renewable energy company based in Charlottesville, Virginia. Apex has one of the nation's largest, most diversified portfolios of renewable energy resources, capable of producing more than 14,000 MW of clean electricity. Apex offers comprehensive in-house capabilities, including site origination, financing,

construction, and long-term asset management services, and works with corporations, utilities, and government entities, including Northern States Power Company d/b/a Xcel Energy, AEP, Southern Power, IKEA, the U.S. Army, and Steelcase. Apex has the experience, skills, personnel, and proven capability to successfully manage the development, financing, construction, and operation of wind projects. Apex has brought 2,200 MW online since 2012, and operating assets under management are nearly 1 gigawatts (GW) as of the first quarter of 2018.

2.0 PROJECT DEVELOPMENT SUMMARY

Apex acquired the Dakota Range Project from a small local developer, Wahpeton Wind, in March 2015. At the time of acquisition, the Project consisted of approximately 10,000 acres under lease. Since March 2015, the Applicant has undertaken extensive development activities, consisting of landowner outreach and easement acquisition, detailed studies of resources in the Project Area, coordination with resource agencies, county permitting, design and refinement of the Project layout, and entering into a purchase agreement for the Project. Following is a summary of these activities:

Community Outreach and Land Acquisition – The Applicant began meeting with landowners in March 2015. Community outreach meetings were held on January 19, 2016; August 2, 2016; February 1, 2017; February 15, 2017; and February 21, 2017. At the time of the March 2015 Project acquisition from Wahpeton Wind, approximately 20 percent of the current Project Area was under lease. Additional easement acquisitions for the remaining Project Area began in March 2015 and were completed in May 2017.

Agency Coordination – The Applicant conducted coordination with various agencies throughout Project planning and development. The Applicant conducted wildlife coordination meetings with the U.S. Fish and Wildlife Service (USFWS) and South Dakota Game, Fish and Parks (SDGFP) on August 12, 2015; March 28, 2017; and September 25, 2017, to agree on study plans and discuss impact avoidance and minimization measures. A Cultural Resources Monitoring and Management Plan (CRMMP) was developed for the Project in coordination with the South Dakota State Historic Preservation Office (SHPO). Coordination meetings with SHPO were held on June 13, 2017, and August 29, 2017. Furthermore, the Applicant has engaged in ongoing coordination with the Sisseton-Wahpeton Oyate (SWO) regarding impact avoidance for sensitive tribal resources. Agency coordination is discussed in Section 27.2.

Environmental Analysis – The environmental studies and field surveys conducted for the Project are summarized in Table 2-1.

Table 2-1: Environmental Studies and Surveys for the Dakota Range Project

Study	Dates	Status
Microwave beam path study	November 2015	Complete
Raptor nest surveys	April 2016; April 2017	Complete
Avian use surveys	December 2015 – May 2017 (winter and spring)	Complete

Study	Dates	Status
Grouse lek surveys	April-May 2016; April-May 2017	Complete
Dakota skipper/Poweshiek skipperling habitat survey	June 2016; June 2017	Complete
Level I cultural resources records search	June 2017	Complete
Level III intensive cultural resources survey of High Probability Areas within Project disturbance footprint (in accordance with CRMMP)	December 2017	Field survey complete; analysis results pending
Additional cultural resources survey for sensitive tribal resources in coordination with SWO	Initiated in December 2017	Ongoing
Historical/Architectural Survey	November 2017	Complete
Wetland and Stream Delineation	September 2017	Complete
Noise modeling	December 2017	Complete
Shadow flicker analysis	December 2017	Complete

County Permitting – The Applicant conducted pre-application meetings with Grant and Codington County in February and March 2017, submitted Conditional Use Permit applications for the Project in May 2017, and received unanimous board approvals in June 2017. County permitting is discussed in Chapter 17.0.

Purchase Agreement – In September 2017, Northern States Power Company, d/b/a Xcel Energy, entered into a Purchase and Sale Agreement (PSA) with Apex Clean Energy to acquire the Dakota Range I, LLC and Dakota Range II, LLC entities, which own the Project.

Project Design – The results of the various studies and coordination activities listed above have been used to inform the site layout and design of the Project. Final micrositing of Project facilities will occur in 2018, based on the results of the completed cultural resource investigations, geotechnical analysis, and final engineering design. The remaining study work is not anticipated to affect the environmental analysis set forth in this Application, nor will it prevent the Project from meeting all applicable local, State and Federal permitting requirements.

3.0 FACILITY PERMIT APPLICATION

In accordance with South Dakota Codified Laws (SDCL) Chapter 49-41B and Administrative Rules of South Dakota (ARSD) Chapter 20:10:22, the 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, soils; see Chapter 12.0);
- Hydrology (surface water and groundwater; see Chapter 13.0);
- Terrestrial ecosystems (vegetation, wetlands, wildlife, threatened and endangered species; see Chapter 14.0);
- Aquatic ecosystems (see Chapter 15.0);
- Land use (agriculture, residential, displacement, sound, aesthetics, electromagnetic interference, safety and health, real estate values; see Chapter 16.0);
- Water quality (see Chapter 18.0);
- Air quality (see Chapter 19.0); and
- Communities (socioeconomics, transportation and emergency response, cultural resources; see Chapter 21.0)).

Based on the analysis completed by Dakota Range, the Project is not expected to have significant impacts on the environment. Approximately 65 acres of total disturbance is expected during the life of the Project. This represents less than 0.2 percent of the total acreage within the Project Area, and disturbances would be dispersed throughout the Project Area.

The Project has avoided locating facilities in wetland areas, to the extent possible. Wind turbines and access roads are generally located in upland areas, avoiding low-lying wetlands and drainage ways. As the design details for Project infrastructure are finalized, any wetland impacts would be identified to ensure compliance with Section 404 of the Clean Water Act (CWA).

The majority of land proposed to be directly affected by construction of the Project is cropland. Construction of Project facilities in cropland or grassland is not expected to negatively affect terrestrial ecosystems. Best Management Practices (BMPs) would be utilized to avoid or reduce impacts to the vegetation and water resources of the Project Area during construction. Because the Project avoids USFWS Grassland, Conservation, or Wetland Easements, there is no federal nexus for the Project that would require National Environmental Policy Act review.

Six species listed as threatened or endangered under the Federal Endangered Species Act (ESA) have the potential to occur in the Project Area and include: Dakota skipper (*Hesperia dacotae*), Poweshiek skipperling (*Oarisma poweshiek*), northern long-eared bat (*Myotis septentrionalis*), red knot (*Calidris canutus rufa*), whooping crane (*Grus americana*), and Topeka shiner (*Notropis topeka*). Wildlife studies and coordination with USFWS and SDGFP determined the Project to have a low risk of impacts to threatened or endangered species (see Section 14.3.2).

Existing land uses are not anticipated to be significantly changed or impacted by the Project. Sound from the Project construction activities would be temporary. Once the Project were operational, sound from the turbines and other facilities would be limited per applicable county requirements: (1) Grant County – 50 A-weighted decibels (dBA) at sound receptors (i.e., off-site residences, businesses, and buildings owned and/or maintained by a governmental entity); or (2) Codington County – 50 dBA at the property line of sound receptors (i.e., off-site residences, businesses, and buildings owned and/or maintained by a governmental entity). A sound level modeling study was completed for the Project to confirm compliance with these standards (see Section 16.3.2).

Construction activities for this Project would be short-term, and no negative impact to the socioeconomics of the area is expected. Project construction is anticipated to provide economic benefits to businesses in the region.

During Project construction, fugitive dust emissions would increase due to vehicle and equipment traffic in the area. The additional particulate matter emissions would not exceed the National Ambient Air Quality Standards (NAAQS). The wind turbines would not produce air emissions during operation.

Cultural resource Level I records review for the Project Area identified previously recorded archaeological and historic resources located within or near the Project Area. Level III intensive cultural resources surveys of High Probability Areas within the Project disturbance footprint were completed in December 2017. Additional surveys for sensitive tribal resources are being completed in coordination with the SWO. The Applicant would avoid direct impacts to identified cultural resources as defined in the CRMMP and in coordination with the SWO.

Additional avoidance and minimization measures proposed for the Project include:

- Wind turbines will be illuminated as required by Federal Aviation Administration (FAA) regulations and recommendations;
- Existing roads will be used for construction and maintenance where possible;

- Access roads created for the Project will be located to limit cuts and fills;
- Temporarily disturbed uncultivated areas will be reseeded with certified weed-free seed mixes to blend in with existing vegetation;
- BMPs will be used during construction to control erosion and prevent or reduce impacts to drainage ways and streams by sediment runoff from exposed soils in accordance with the Storm Water Pollution Prevention Plan (SWPPP);
- The Applicant will avoid impacts to land held for conservation purposes via USFWS Wetland and Grassland Easements;
- Construction activities will be limited in accordance with SDGFP recommendations to minimize impacts to grouse leks;
- The Applicant will avoid impacts to native grasslands to the extent practicable;
- The Applicant will meet or exceed setbacks, conditions, and siting standards required by State and local governing bodies where the wind turbines are located; and
- The Project will meet the Grant and Codington County noise requirements set forth above;
- The Project will meet the voluntary commitment of limiting shadow flicker to 30 hours per year or less at off-site residences, businesses, and buildings owned and/or maintained by a governmental entity.

In this Application, the Applicant has addressed each matter set forth in SDCL Chapter 49-41B and in ARSD Chapter 20:10:22 (Energy Facility Siting Rules) related to wind energy facilities. Included with this Application is a Completeness Checklist (Table 4-1) that sets forth where in the Application each rule requirement is addressed.

Pursuant to SDCL 49-41B-22, the information presented here establishes that:

- The proposed wind energy facility complies with applicable laws and rules;
- The facility will not pose a threat of serious injury to the environment or to the social and economic condition of inhabitants in, or near, the Project Area;
- The facility will not substantially impair the health, safety, or welfare of the inhabitants; and
- The facility will not unduly interfere with the orderly development of the region, having given consideration to the views of the governing bodies of the local affected units of government.

4.0 COMPLETENESS CHECKLIST

The contents required for an application with the Commission are described in SDCL 49-41B and further clarified in ARSD 20:10:22:01(1) et seq. The Commission submittal requirements are listed in Table 4-1 with cross-references indicating where the information can be found in this Application.

Table 4-1: Completeness Checklist

SDCL	ARSD	Required Information	Location
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; (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	Chapter 3.0
49-41B-11(1-12)	20.10.22.05	**Application contents.** The application for a permit for a facility shall contain the applicable information specified in §§ 20:10:22:06 to 20:10:22:25, inclusive, 20:10:22:36, and 20:10:22:39. If the application is for a permit for an energy conversion facility, it shall also contain the information specified in §§ 20:10:22:26 to 20:10:22:33, inclusive. If the application is for a permit for a transmission facility as defined in SDCL subdivision 49-41B-2.1(1), it shall also contain the information in §§ 20:10:22:34 and 20:10:22:35. If the application is for a permit for a transmission facility as defined in SDCL subdivision 49-41B-2.1(2), it shall also contain the information in §§ 20:10:22:37 and 20:10:22:38. If the application is for a permit for a wind energy facility, it shall also contain the information in §§ 20:10:22:33.01 and 20:10:22:33.02. 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.	Chapters 5.0-28.0
49-41B-11(1)	20:10:22:06	**Names of participants required.** The application shall contain the name, address, and telephone number of all	Chapter 5.0

SDCL	ARSD	Required Information	Location
		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.	
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.	Chapter 6.0
49-41B-11(8)	20:10:22:08	**Purpose of facility.** The applicant shall describe the purpose of the proposed facility.	Chapter 7.0
49-41B-11(12)	20:10:22:09	**Estimated cost of facility.** The applicant shall describe the estimated construction cost of the proposed facility	Chapter 8.0
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.	Chapter 7.0
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.	Chapter 9.0 Figures 1, 10, 12, and 13 Appendix M
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	Chapter 10.0

SDCL	ARSD	Required Information	Location
		site, alternative generation method, or alternative waste handling method.	
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.	Chapters 11.0, 12.0, 13.0, 14.0, 15.0, 16.0, 18.0, 19.0, and 21.0
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	Chapter 12.0 Figures 6, 7a, 7b, 8, and 9

SDCL	ARSD	Required Information	Location
		(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.	
49-41B-11(2,11); 49-41B-21; 49-41B-22	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 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.	Chapter 13.0 Figure 10
49-41B-11(2,11); 49-41B-21; 49-41B-22	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	Chapter 14.0

SDCL	ARSD	Required Information	Location
		ameliorate negative biological impacts as a result of construction and operation of the proposed facility.	
49-41B-11(2,11); 49-41B-21; 49-41B-22	20:10:22:17	**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.	Chapter 15.0
49-41B-11(2,11); 49-41B-22	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.	Chapters 16.0 and 21.0 Figure 12

SDCL	ARSD	Required Information	Location
49-41B-11(2,11); 49-41B-28	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.	Chapter 17.0
49-41B-11(2,11); 49-41B-21; 49-41B-22	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.	Chapter 18.0
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.	Chapter 19.0
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.	Chapter 20.0
49-41B-11(11); 49-41B-22	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;	Chapter 21.0

SDCL	ARSD	Required Information	Location
		(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.	
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.	Chapters 21.0 and 22.0
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.	Chapter 23.0
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.	Chapter 24.0
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:	Chapter 25.0 and 26.0

SDCL	ARSD	Required Information	Location
		(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.	
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.	Chapter 27.0
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.	Chapter 28.0 and Appendices

5.0 NAMES OF PARTICIPANTS (ARSD 20:10:22:06)

ARSD 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 Applicants' full names, business address, and business telephone number are:

- Dakota Range I, LLC and Dakota Range II, LLC
  c/o Apex Clean Energy Holdings, LLC
  310 4th Street NE, Suite 200
  Charlottesville, VA 22902
  (434) 220-7595

Individuals who are authorized to receive communications relating to the Application on behalf of the Applicant include:

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6.0 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.*

Dakota Range I, LLC and Dakota Range II, LLC (Dakota Range) are Delaware limited liability companies and wholly owned indirect subsidiaries of Apex Clean Energy Holdings, LLC. The two entities will jointly own, manage, and operate the Project and, between them, hold the land rights and interconnection requests necessary to facilitate development of the Project as proposed. Each entity has obtained a Certificate of Authority from the South Dakota Secretary of State to conduct business in South Dakota. As limited liability companies, sole-member managed by Apex Clean Energy Holdings, LLC, Dakota Range does not have officers and directors. Mark Mauersberger, Senior Development Manager, Apex Clean Energy Holdings, LLC, is managing development of the Project.

7.0 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.*

Electricity generated by the Project would interconnect to the high-voltage transmission grid via a switching station connected to the Big Stone South to Ellendale 345-kV transmission line, which crosses the Project site. Apex Clean Energy Holdings, LLC currently owns the Dakota Range entities and is overseeing development of the Project. Northern States Power Company, d/b/a/ Xcel Energy, has entered into a Purchase and Sale Agreement with Apex Clean Energy Holdings, LLC to acquire the Dakota Range I, LLC and Dakota Range II, LLC entities, which own the Project. The PSA will be finalized after the completion of certain development milestones, including acquisition of an Energy Facility Permit from the Commission for the Project. Xcel Energy is a utility company operating in South Dakota, Minnesota, North Dakota, Colorado, Michigan, New Mexico, Texas, and Wisconsin. Xcel Energy's need for the Project is discussed further below.

Though Xcel will own the Project entities, and therefore the electricity produced, the specific electrons generated by the Project would be utilized as needed on the Midcontinent Independent System Operator, Inc. (MISO) regional grid and cannot be tracked to their exact delivery location or final use. The electricity generated by the Project would help MISO operators meet electricity demand in both the immediate and surrounding MISO control area. This Project would also provide zero-emission cost electricity to the grid, as well as firm price stability due to the availability of a renewable resource that would replace the need for ongoing fuel costs. Demand for this power and the benefits it provides are discussed in Section 7.2.

Additionally, Dakota Range would provide a variety of local benefits. During construction, a typical 300-MW wind project such as this Project typically generates an immediate need for up to 300 temporary construction jobs over 9 months. Construction and operation of a typical 300-MW wind project results in the injection of millions of dollars into the local economy throughout the life of the Project. These investments would 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 would employ approximately 10 full-time personnel as facility managers, site managers, and turbine technicians. Furthermore, the Project represents approximately a $400 million investment in Grant and Codington Counties. Dakota Range would pay taxes on the Project, which would significantly increase the revenue available for a variety of local needs.

7.1 Wind Resources Areas

The Applicant has retained the services of Vaisala, LLC to perform a Wind Energy Due Diligence report for Dakota Range. To obtain an accurate representation of the wind resource within the Project Area, Vaisala performed a comprehensive analysis using the following data:

- Onsite data collected at the Project's nine meteorological towers;
- Long-term correlation from NASA's Modern Era Retrospective-Analysis for Research and Application (MERRA), European Centre for Medium-Range Weather Forecasts Re-Analysis (ERA), and National Centers for Environmental Prediction/National Center for Atmospheric Research (NCEP/NCAR) Reanalysis Project (NNRP) upper-air data points;
- Project Area topographic and land cover data;
- Up to 72 potential turbine locations within the Project Area;
- Power curve from the Vestas V136-4.2 MW turbine at an 82-meter hub height; and
- State and County standards and setbacks.

Based on data collected, wind speeds are highest in November and December and lowest in July and August. Composite mean wind speeds (CMWS) are generally above 9 meters per second (m/s) during winter, spring and fall, but fall below 9 m/s during the months of July, August, and September. Wind speeds at hub height generally fall off in the morning as solar warming causes increased mixing of the winds at different levels aboveground. After sunset, less mixing occurs and the winds at hub height will tend to increase.

Vaisala compared the onsite data to long-term wind data near Dakota Range. The analysis showed that daily correlation coefficients of the towers average about 0.87 to all reference stations. This high correlation lends confidence to the assessment in that the site-specific data can accurately be placed in a long-term climatological context. The Project is classified as an IEC Classification Class II wind site. IEC Classifications are a set of design requirements that ensure wind turbines are engineered against damage from hazards within their planned lifetime. An IEC Class II wind site has an annual average wind speed at the hub height greater than 8.5 m/s and less than 10 m/s.

7.2 Renewable Power Demand

Regional demand for wind energy can be seen in utilities' Resource Plan filings. Xcel's most recent Minnesota Resource Plan shows a demand for 1,800 MW of new wind energy generation by 2026.[1] Otter Tail Power Company's ten-year plan listed 200 MW of new wind energy generation to be acquired by 2020.[2] Otter Tail Power Company's Integrated Resource Plan filed in Minnesota shows demand for an additional 200 MW of wind by 2023. Beyond demand from utilities, non-traditional power buyers, such as Google, IKEA, Apple, eBay, Facebook, General Motors, Johnson & Johnson, Kellogg's, Microsoft, Nike, and Wal-Mart, have shown demand for renewable energy such as wind energy to meet commitments to use 100 percent renewable energy.[3]

Beyond the market for wind energy, the public has also shown support for the use of renewable energy. According to a Gallup National poll in March 2017, 71 percent of Americans are in favor of "emphasiz[ing] the development of alternative energy such as wind and solar power" compared to 23 percent in favor of emphasizing production of oil, gas, and coal (Gallup, Inc., 2017).

This support can also be seen in legislation throughout the nation. Twenty-nine states, including South Dakota, have adopted renewable portfolio standards (RPSs). These standards require utilities to sell a specified percentage or amount of renewable electricity annually. In addition to these twenty-nine states with RPSs, eight states and two territories have set renewable energy goals. Dakota Range would provide a new source of low cost energy for South Dakota and the United States, helping the Nation move towards the goal of energy independence while reducing pollution and carbon emissions.

The cost of energy from wind has declined by over 66 percent in the past 7 years (Lazard, 2016), and new wind energy projects provide some of the lowest cost energy in the Nation. This low-cost energy is in demand not only from utilities, but also non-traditional power buyers such as major independent corporations. The demand for the Dakota Range Project has been shown by Xcel contracting with Apex Clean Energy to purchase the Dakota Range entities and Project.

Xcel has submitted an application to the North Dakota Public Service Commission for an Advance Determination of Prudence regarding its acquisition of the Dakota Range entities and, thereby, to build, own, and operate the Project. Xcel states in its application that "Dakota Range may be one of the last

[1] *Supplement to Xcel Energy's 2016-2030 Upper Midwest Resource Plan*, Attachment C, Northern States Power Company, Case No. E002/RP-15-21, at 2.
[2] *South Dakota Ten-Year Biennial Plan,* June 2016, Otter Tail Power Company.
[3] RE100, at http://there100.org/re100.

projects available to us that will have this level of transmission certainty for quite some time" and that "even when using conservative assumptions, Dakota Range will provide benefits to our customers by driving down the overall system cost of fuel" (Northern States Power Company, 2017).[4]

In support of its application, Xcel conducted a Strategist analysis for the addition of Dakota Range into its portfolio and found that at base projections the Project provides a $182 million-dollar system-wide present value of revenue requirement (PVRR) savings over the life of the Project, and that the savings could reach as high as $274 million under high gas price assumptions.[5] Furthermore, Xcel states that due to the addition of the Project to their portfolio, "there will be periods of time where the generation on our system exceeds our native load serving requirement. During these periods, we are likely to make energy sales into the MISO market. Revenues from those sales will be credited to customers through our Fuel Cost Rider."[6] Beyond savings for Xcel's customers, their sale of energy into the MISO market will displace the sale of more expensive energy into the MISO market, benefitting the whole region. Xcel goes on to state in this application that "the levelized costs of the proposed Project are more than offset by the value of avoided generation costs."[7] These analyses were all factors in Xcel's decision to enter into a PSA for the Project, and demonstrate that demand exists for this Project.

7.3 Consequences of Delay

If the Dakota Range project is delayed, the Project's benefits would be greatly reduced. Dakota Range must be constructed by the end of 2021 to receive a 1.92-cents per kilowatt hour Production Tax Credit (PTC). If the Project does not reach operation until 2022, the Project may not qualify for a PTC, or would qualify for only a 1.44-cents per kilowatt hour PTC. As scheduled, Dakota Range is expected to provide a $182 million-dollar system-wide present value of revenue requirement savings over the life of the Project. Xcel has scheduled Dakota Range to reach operation in 2021 to ensure the Project qualifies for the 1.92-cents per kilowatt hour PTC and to provide savings to its customers through the Project's low cost of energy. Delay could force Xcel to re-analyze its source of new generation, removing significant savings for Xcel's customers and guaranteeing a higher cost of energy.

[4] A*pplication for Advance Determination of Prudence*, Northern States Power Company, Case No. PU-17-372, at 1.
[5] A*pplication for Advance Determination of Prudence*, Resource Planning Testimony, Northern States Power Company, Case No. PU-17-372, at 19.
[6] *Id.*
[7] A*pplication for Advance Determination of Prudence*, Northern States Power Company, Case No. PU-17-372, at 16.

8.0 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.*

The current estimated capital cost of the Project is approximately $380 million based on indicative construction and wind turbine pricing cost estimates for the proposed Vestas V136-4.2 MW turbine layout. This estimate includes lease acquisition; permitting, engineering, procurement, and construction of turbines, access roads, underground electrical collector system, Project collection substation, interconnection facilities, O&M facility, supervisory control and data acquisition (SCADA) system, and meteorological towers; and project financing. Capital costs could fluctuate as much as 20 percent for the Project, dependent on final micrositing and MISO interconnection costs.

9.0 GENERAL SITE AND PROJECT COMPONENT DESCRIPTION (ARSD 20:10:22:11)

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.*

The Project would be located on approximately 44,500 acres of land in Codington and Grant Counties north of Watertown, South Dakota. Table 9-1 shows the sections that intersect the Project Area.

Table 9-1: Sections that Intersect the Project Area Boundary

County	Township	Range	Sections
Codington	118N	52W	1-4, 10-12
	119N	51W	5-6, 19
	119N	52W	1-4, 8-17, 21-24, 26-28, 31-36
	119N (A)	51W (A)	6
	120N (A)	51W (A)	30-31
	120N (A)	52W (A)	25, 36
Grant	120N	51W	6-8, 17-22, 27-29, 33
	120N	52W	1-2, 10-15, 22-24, 26-28, 33-35
	120N (A)	51W (A)	4-9, 3, 18-19, 10
	120N (A)	52W (A)	1-4, 9-15, 22-24
	121N (A)	51W (A)	27-28, 31-33
	121N	52W	34-36

(A) = Township duplicate

Figure 1 shows the locations of the State, county, and town boundaries; lakes and rivers; railroads; and major highways and roads with respect to the Project Area. Figure 12 shows the locations of cemeteries, places of historical significance, and other community facilities (i.e., schools, religious facilities) within or near the Project Area. There are no active transportation facilities (i.e., airports) other than roads and railroads within or adjacent to the Project Area.

9.1 Wind Farm Facility

The Project would consist of up to 72 wind turbines with an aggregate nameplate capacity of up to 302.4 MW. The Project would also include underground electric collector lines, a central collection substation, an interconnection switching station, an O&M facility, access roads connecting to turbines and associated facilities, up to five permanent meteorological towers, and a SCADA system (installed with the collector

lines and interconnection facility). A 345-kV interconnection facility will also be constructed between the collection substation and the interconnection switching station. Figure 2 shows the proposed layout of the Project facilities. Table 9-2 lists the sections within the Project Area containing proposed wind farm facilities.

Table 9-2: Sections Containing Wind Farm Facilities

County	Township	Range	Sections
Codington	119N	51W	5-6
	119N	52W	1-3, 11-14, 23-24
Grant	120N	51W	6-7, 17-21, 27-28
	120N	52W	1-2, 10-15, 22-24, 26-27, 34-35
	120N (A)	51W (A)	4-9
	120N (A)	52W (A)	12
	121N (A)	51W (A)	31-33
	121N	52W	34-36

(A) = Township duplicate

Figure 2 shows the 72 proposed primary wind turbine locations, as well as the 25 proposed alternate turbine locations. No more than 72 turbines will be built. As a result of final micrositing, minor shifts in the turbine locations may be necessary to avoid newly identified cultural resources (cultural resource studies in coordination with the SWO are ongoing), or due to geotechnical evaluations of the wind turbine locations, landowner input, or other factors. Therefore, the Applicant requests that the permit allow turbines to be shifted within 500 feet of their current proposed location, so long as specified noise and shadow flicker thresholds are not exceeded, cultural resource impacts are avoided or minimized per the CRMMP, environmental setbacks are adhered to as agreed upon with USFWS and SDGFP, and wetland impacts are avoided to the extent practicable. If turbine shifts are greater than 500 feet, exceed the noted thresholds, or do not meet the other limitations specified, the Applicant would either use an alternate turbine location or obtain Commission approval of the proposed turbine location change. Twenty-five alternate turbine locations are proposed to hedge against additional turbine locations becoming necessary during final micrositing. Furthermore, these additional locations provide layout flexibility to hedge against potential capacity factor reductions in cases where a necessary turbine shift within 500 feet of its original location lowers the capacity factor greater than activating an alternate location. This number of alternate turbine locations prevents unforeseen findings from reducing the size of the project or from significantly injuring the productivity of the project. In all cases, the final turbine locations constructed will adhere to all applicable local, State, and Federal regulations and requirements.

Figure 2 also shows the proposed access road and underground collection system locations. As a result of final micrositing and the utility coordination needed to facilitate Project interconnection, shifts in the access roads and collector system, as well as changes in the locations of the O&M facility, Project substation, concrete batch plant, and laydown/staging areas, may be necessary. Therefore, the Applicant requests that the permit allow those facilities to be modified, as needed, so long as the new locations are on land leased for the Project, cultural resources and environmental setbacks are retained, wetland impacts are avoided to the extent practicable, and all other applicable regulations and requirements are met.

9.2 Turbines

Each wind turbine consists of three major components: the tower, the nacelle, and the rotor. These components are mounted on a concrete foundation, also known as a turbine pad, to provide structural support to the assembled turbine. The nacelle sits atop the tower, and the rotor hub is mounted on a drive shaft that is connected to the gearbox and generator contained within the nacelle.

Turbine Type: The proposed turbine that would be utilized for the Project is the Vestas V136-4.2 MW turbine at an 82-meter hub height and 136-meter rotor diameter (RD). Figure 3 is a diagram depicting hub height and RD. Table 9-3 identifies the wind turbine characteristics for this turbine model.

Table 9-3: Wind Turbine Characteristics

Manufacturer	Model	Rotor Diameter	Hub Height	Generator Nameplate Capacity
Vestas	V136-4.2MW	136 meters	82 meters	4.2 MW

Tower: The tubular towers proposed for the Project would be conical steel structures. Each tower has a lockable access door, internal lighting, and an internal ladder and lift to access the nacelle. In accordance with FAA regulations, the towers would be painted off-white to minimize visual impact.

Nacelle: The main mechanical and electrical components of the wind turbine are housed in the nacelle. The nacelle is mounted on a sliding ring that allows it to rotate, or "yaw," into the wind to maximize energy capture. The nacelle components include the drive train, gearbox, generator, and generator step-up transformer. The nacelle is housed in a steel-reinforced fiberglass shell that protects internal machinery from the environment. The housing is designed to allow for adequate ventilation to cool internal machinery. It is externally equipped with an anemometer and a wind vane to measure wind speed and direction. The generated electricity is conducted through cables within the tower to a switch enclosure

mounted at the base of the turbine tower. Attached to the top of select nacelles, per FAA specifications, would be a single, medium-intensity aviation warning light. These would be red flashing lights that would be operated in accordance with FAA requirements. The FAA determines lighting specifications and determines which turbines must be equipped with lights.

Rotor: A rotor assembly is mounted on the drive shaft and operates upwind of the tower. Electric motors within the rotor hub vary the pitch of each blade according to wind conditions to maximize turbine efficiency at varying wind speeds.

9.3 Access Roads

Existing public roads, private roads, and field paths are being utilized to access the Project. The existing roads may require improvements before, during, or following construction. Where necessary, new access roads would be constructed between existing roadways and Project components. The new and improved access roads would be all-weather, gravel surfaced, and generally 16 feet in width. During construction, some of the access roads would be widened to accommodate movement of the turbine erection crane, with temporary widths generally not exceeding 50 feet.

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

The final access road design would be dependent on geotechnical information obtained during the engineering phase. It is anticipated that the access road network for the Project would include approximately 19 to 23 miles of new private roads. For purposes of calculating access road impacts in this Application, the Applicant has conservatively assumed approximately 140 acres of temporary disturbance and 45 acres of disturbance during the life of the Project for access roads. Final turbine placement would determine the amount of roadway and disturbance for the Project.

9.4 Underground Electrical Collector Lines

The electrical collector lines would consist of an underground cable system between the collection substation and the individual turbine locations. The collector system would be designed for operation at 34.5 kV. The collector lines would be installed in a trench at least 30 inches below the ground to avoid potential impact from the existing land uses. A fiber-optic cable and an additional separate ground wire would also be installed with the collector system. The fiber-optic cable would be used for telemetry, control, and communication purposes. Above-ground junction boxes would be installed as required for connections or splices. For purposes of calculating temporary impacts in this application, the Applicant

has conservatively assumed approximately 160 acres of total temporary disturbance from underground collector system construction. The Applicant assumes that some of the construction disturbance for the underground collector system would be shared with construction disturbance for access roads where these facilities overlap. Ground disturbance impacts during the operational life of the Project are assumed to be approximately 0.03 acre for the above-ground junction boxes.

9.5 Collection Substation

The collection substation would be located generally in the center of the Project footprint and would 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 substation is to increase the voltage from the collector system (34.5 kV) to the voltage of the transmission line (345 kV), which would transport the electricity of the entire Project to the MISO grid via the interconnection switching station. The collection substation would be located within a fenced area. The fence would be designed in accordance with industry standards to provide safety and security.

Up to 10 acres of land would be purchased to facilitate construction and operation of the collection substation. The final location of the collection substation depends on the location of the interconnection switching station, which, as discussed below in Section 9.6, will be determined by Otter Tail Power Company in Q1 2018. Four potential substation locations, as shown on Figure 2, are currently being evaluated. The collection substation, whether ultimately located at one of the four locations under evaluation or elsewhere within the Project Area, would be sited so that the transmission facility between the collection substation and the interconnection switching station is less than a 0.5-mile in length and so that it does not cross any public roads. As discussed in Section 9.1, the Applicant requests that the permit allow Project facilities, including the collection substation, to be modified, as needed, so long as the new locations are on land leased for the Project, cultural resource impacts are avoided or minimized per the CRMMP, environmental setbacks are adhered to as agreed upon with USFWS and SDGFP, wetland impacts are avoided to the extent practicable, and all other applicable regulations and requirements are met.

9.6 Interconnection Facilities and Switching Station

Associated with the Project would be an interconnection switching station. This switching station would occupy a fenced area and would be situated within the Project footprint, adjacent to the under-construction Big Stone South to Ellendale 345-kV transmission line. The switching station would serve as the electrical interconnection between the Project and the MISO grid. The switching station would consist

of 345-kV circuit breakers, disconnect switches, bus conductors, auxiliary equipment, and a control enclosure containing equipment for proper control, protection, monitoring, and communications. The switching station would be located within a fenced area. The fence would be designed in accordance with industry standards to provide safety and security.

Potential locations for the interconnection switching station have been determined through coordination between Dakota Range and Otter Tail Power Company, the owner and operator of the Big Stone South to Ellendale 345-kV transmission line. Otter Tail Power Company will identify the interconnection switching station location in Q1 2018 after the necessary interconnection agreement documentation has been signed. Otter Tail Power Company will be responsible for the construction and operation of the switching station. The interconnection switching station will utilize approximately 10 acres, but the parcel will consist of up to 40 acres for future expansion or upgrades that the MISO system may need.

Dakota Range would construct a 345-kV interconnection facility connecting the collection substation and the interconnection switching station. Because the interconnection facility is less than 2,640-feet long, does not cross any public highways, and does not require the use of eminent domain, it falls outside the Commission's jurisdiction and has been permitted locally.

9.7 Meteorological Towers

Up to five permanent met towers would be installed as part of the Project. These met towers are used to obtain wind data for performance management once the Project is operational. The met towers would be self-supporting with heights not to exceed the hub height of the wind turbines. The permanent met towers would be marked and lighted as specified by the FAA. Each meteorological tower would result in a permanent impact of approximately 42 feet by 42 feet (0.3 acre).

9.8 O&M Facility

An O&M facility would be constructed within the Project Area at a location well-suited for access to the turbines, as well as the substation and switching station. One potential O&M facility location, as shown on Figure 2, is currently being evaluated. As discussed in Section 9.1, the Applicant requests that the permit allow the O&M facility location to be modified, as needed, so long as the final location is on land leased for the Project, cultural resource impacts are avoided or minimized per the CRMMP, environmental setbacks are adhered to as agreed upon with USFWS and SDGFP, wetland impacts are avoided to the extent practicable, and all other applicable regulations and requirements are met. The facility would comprise a single- or two-story, 7,000 to 10,000 square-foot building, which would house operating personnel, offices, operations and communication equipment, parts storage and maintenance

activities, and a vehicle parking area. An area for outdoor storage of larger equipment and materials would also be included within a fenced area for safety and security.

For purposes of calculating temporary impacts in this Application, the Applicant has assumed approximately 5 acres of total temporary disturbance from O&M facility construction. After construction, total permanent disturbance from the O&M facility, including parking, would be approximately 5 acres. Dakota Range would purchase up to 5 acres to facilitate construction and use of the O&M facility.

Station power for Dakota Range facilities would be provided through the Project interconnection. Back-up power for the Dakota Range substation would be provided by the local electrical cooperative(s), providing power to operate communications, relaying, and control systems, indefinitely.

9.9 SCADA System

The Project's design includes safety and control mechanisms. These mechanisms are generally monitored using a Supervisory Control and Data Acquisition ("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 O&M 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 would the local O&M office have full control of the wind turbines, but a 24/7 remote operations facility would also have control of the individual turbines. These two teams coordinate to ensure that the wind turbines operate safely and efficiently.

A third mechanism for safety and control is the turbines themselves. Each turbine monitors the wind speed and direction to ensure 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.

9.10 Construction

Once the Facility Permit is approved and other county, state, and Federal approvals are obtained, the Applicant would complete engineering-scale design of the access roads, construction areas, turbine foundations, and the electrical components. Construction of the on-site roads, tower foundations, and substation would take approximately 8 to 10 months. The actual installation of the turbines would take approximately 2 to 3 months. Figure 4 shows a typical site layout during construction. Collector lines would be installed by trenching or, if necessary based on site conditions, by other non-trenching means (e.g., directional boring). For collection system trenching during construction, Dakota Range personnel

and its contractors would remove topsoil prior to trenching and restore topsoil after trenching is complete. The contractor would typically decompact up to 10 inches below grade for crane paths post construction. Per agreement with the SWO, tribal resources will be marked in advance of construction to avoid unintentional impacts. For road construction, topsoil will be removed and stockpiled in the temporary construction area. If necessary for drainage and access, temporary culverts and field approaches will be installed. For turbine foundation installation, topsoil and subsoil will be removed, separated, and stockpiled at each turbine site. After construction, the subsoil and topsoil will be restored over the spread footer concrete foundation. All temporary construction areas will be restored after construction, including removing gravel, decompacting subsoil, and replacing removed topsoil. Where necessary, temporary and permanent stabilization measures will be implemented, including mulching, seed with appropriate seed mix, and installing slope breakers.

Dakota Range personnel and its contractors would confer and coordinate closely with the South Dakota Department of Transportation (SDDOT) and Codington and Grant Counties to manage construction traffic and safely deliver the various turbine components. Highway Access and Utility Permits would be obtained from the SDDOT prior to construction, and contractors would be required to obtain any necessary overheight or overweight haul permits. County road permits required for right-of-way occupancy, utility crossings, road approaches, and overweight loads would be obtained from Codington and Grant Counties prior to construction.

9.11 Operation

The Project would be operated and maintained by a team of approximately 10 personnel, including facility managers, a site manager, and a certified crew of technicians. This team would be at the Project site or O&M facility during normal business hours and would perform routine checks, respond to issues, and optimize the performance of the wind farm. The team would also have specified personnel on-call 24 hours per day, seven days per week, should an issue arise outside of normal business hours. The on-site team will work in coordination with off-site operations staff at a Remote Operation Control Center in accordance with FERC guidelines. This off-site team will assist in identifying turbines operating at non-peak efficiency, helping on-site staff quickly locate turbines with potential operating issues so they can be quickly resolved to ensure safety and optimal performance of the wind farm. The on-site team will also conduct frequent visual assessments of the wind turbines to check for issues that are not impacting performance of the wind farm. A plan for addressing emergency incidents will be in place, and is discussed in Section 21.3.3.

During operations, the O&M staff would perform scheduled, preventive maintenance on the turbines. This is typically done in conjunction with representatives from the turbine manufacturer for the first 1 to 3 years. Turbine inspections are conducted and recorded twice a year. Once a year, maintenance is conducted on the turbine for 10 hours with a crew of 3 technicians. The other annual maintenance is a 36-hour inspection with a crew of 3 technicians. During these inspections, the entire turbine is inspected, including bolt torque checks, lubrication and filter changes, electrical inspections, pitch calibrations, amongst other tasks. The on-site operations team also drives throughout the Project on a daily basis conducting unrecorded visual inspections on the Project.

10.0 ALTERNATE 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.

Following is a description of the general Project location site selection process, a discussion of the turbine and site configuration alternatives considered for the Project, and a summary of the siting criteria applied to the Project.

10.1 General Project Location Selection

Apex acquired approximately 10,000 acres under lease from a different developer, Wahpeton Wind, in March 2015. Apex pursued this sale due to MISO transmission availability, which was scarce throughout South Dakota. Because the Dakota Range Project was acquired after initial site selection, and a specific area was offered for sale, Apex was not involved in considering broader alternative locations. However, after Apex acquired Dakota Range, Apex and Dakota Range analyzed potential alternatives for expansion of the initial site. A number of constraints limited the area within which the initial site could be expanded. Specifically, Apex and Dakota Range identified constraints to the south, east and north due to competing wind farm leases. Additionally, Apex and Dakota Range identified USFWS Grassland Easements to the north and east that they wanted to avoid. Constraints further west existed due to diminishing wind speeds west of the initial site. Given the constraints noted, Dakota Range ultimately sought to acquire leases from landowners in the immediate vicinity of the initial site, with new leases signed primarily within 5-7 miles of existing leases with the goal of connectivity to the initial site acquired.

In addition to existing constraints, Apex considered a number of factors in selecting the final Project site, including:

- The site has strong wind speeds for both the region as a whole and the immediate area, which is key for development of a competitive, economically viable wind project.
- The site is in close proximity to the Big Stone South to Ellendale 345-kV transmission line that is currently under construction and would run through the Project boundary. Having direct access to available transmission minimizes the interconnection infrastructure needed, and helps reduce overall Project costs.

- The Project is compatible with the existing land uses, which are primarily agricultural (i.e., crop production, pasture land, hay production). Wind development is particularly compatible with agricultural land because the existing uses can continue around the wind energy facility. As a result, wind development allows landowners to diversify their operations with minimal disruption to existing agricultural uses.
- The proposed Project has received strong support from landowners in the Project Area, as well as the surrounding community. Dakota Range gained its support by establishing long-term relationships within the community. In return, landowners voluntarily signed wind leases in order to make the Project a reality.
- Through preliminary desktop analysis, site-specific field studies, and ongoing coordination with agencies, such as the USFWS and SDGFP, the Project was able to avoid or minimize potential adverse impacts to cultural resources, wetlands, grasslands, and wildlife species of concern. Given the need to acquire an Energy Facility Permit for the Project, and to comply with applicable federal and state permitting requirements, minimal impacts to existing resources is key to enabling Project development.

10.2 Site Configuration Alternatives

The proposed layout of 72 turbines reflects an optimal configuration to best capture wind energy within the Project Area, while avoiding impacts to residences, known cultural resources, wetlands, grasslands, and sensitive species and their habitats. A previous site configuration, which included 158 turbine locations, was submitted and permitted at the County level in May 2017 (see Chapter 17.0 for a discussion of County permitting). However, for market and wind resource suitability reasons, it was determined that Dakota Range would utilize a 4.2-MW turbine rather than a 2.0-MW turbine, as previously contemplated. This reduced the number of primary turbine positions in the layout from 150 to 72 and reduced the total footprint of turbines. Rather than spanning the whole Project Area boundary, the turbines are now primarily located in the northeast portion of the Project Area to maximize the available wind resource. As discussed in Section 9.1, final micrositing could result in minor turbine adjustments. However, the final Project layout will comply with all applicable local, State, and Federal requirements, including the state and local requirements and/or commitments set forth in Table 10-1 below. The buildable area for turbines, after taking into account the setbacks in Table 10-1 as well as further environmental setbacks (see Figure 11), is visually depicted on the siting constraints map provided as Figure 5.

Table 10-1: Dakota Range Siting Requirements/Commitments

Category	Requirements/Commitments
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 (SDCL 43-13-24).
Codington County	
Setbacks	- 1,000 feet from existing off-site residences, businesses, churches, and buildings owned and/or maintained by a government entity. - 500 feet from on-site or lessor's residence. - 110% the height of the wind turbines from the centerline of public roads. - 110% the height of the wind turbines from any property line unless a wind easement has been obtained from adjoining property owner.
Noise	Noise level shall not exceed 50 dBA average A-weighted sound pressure including constructive interference effects at the property line of existing off-site residences, businesses, and buildings owned and/or maintained by a governmental entity.
Turbine Spacing	The turbines shall be spaced no closer than three rotor diameters (RD) within a string. If required during final micro siting of the turbines to account for topographic conditions, up to 10 percent of the towers may be sited closer than the above spacing, but the permittees shall minimize the need to site the turbines closer.
Grant County	
Setbacks	- 1,000 feet from existing off-site residences, businesses, churches, and buildings owned and/or maintained by a government entity. - 500 feet from on-site or lessor's residence. - 110% the height of the wind turbines from the centerline of public roads. - 110% the height of the wind turbines from any property line unless a wind easement has been obtained from adjoining property owner.
Noise	Noise level shall not exceed 50 dBA average A-weighted sound pressure including constructive interference effects at the perimeter of the principal and accessory structures of existing off-site residences, businesses, and buildings owned and/or maintained by a governmental entity.
Turbine Spacing	The turbines shall be spaced no closer than three RD within a string. If required during final micro siting of the turbines to account for topographic conditions, up to 10 percent of the towers may be sited closer than the above spacing but the permittees shall minimize the need to site the turbines closer.
Voluntary	
Shadow Flicker	Facility will not exceed a maximum of 30 hours of shadow flicker per year at any existing non-participating residence, business, or building owned and/or maintained by a governmental entity, unless otherwise agreed to by the landowner.
Punished Woman's Lake	The turbines will be set back 2 miles from the shoreline of Punished Woman's Lake.

10.3 Lack of Reliance on Eminent Domain Powers

Dakota Range will not use eminent domain powers to acquire easements for the wind energy facility. All land rights required for the wind energy facility were obtained through voluntary leases with property owners. Private land and public road rights-of-way would be used for all facilities. Further, the Applicant will coordinate with Federal, State, and local agencies to obtain appropriate permits for the Project. Thus, selection of an alternative site would not reduce reliance on eminent domain powers.

11.0 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.*

Chapters 12.0 through 16.0 and Chapters 18.0, 19.0, and 21.0 provide a description of the existing environment at the time of the 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 chapters also identify the avoidance, minimization, and mitigation measures that will be implemented for the Project. Table 11-1 identifies the ground disturbance impacts (both temporary impacts during construction and operational impacts during the life of the Project) assumed for the Project.

Table 11-1: Summary of Dakota Range Ground Disturbance Impacts

Project Component	Construction Impacts (Temporary)		Operational Impacts (Long-Term)	
	Dimensions	*Total Acreage*	*Dimensions*	*Total Acreage*
Turbines	150-foot radius	117 acres	25-foot radius	4 acres
Access roads	50-foot wide	140 acres	16-foot wide	45 acres
Crane paths	50-foot wide	210 acres	N/A	N/A
Collector lines	30-foot wide	160 acres	10-foot by 5-foot junction box	0.03 acre
Collection substation	10 acres	10 acres	10 acres	10 acres
Met towers	50-foot by 50-foot area	0.3 acres	42-foot by 42-foot area	0.3 acres
O&M facility	5 acres	5 acres	5 acres	5 acres
Laydown/staging/ batch plant areas	10 acres	10 acres	N/A	N/A
	Total:	**647 acres**	**Total:**	**65 acres**

There are no other operating energy conversion facilities, existing or under construction, or other major industrial facilities under regulation within or adjacent to the Project Area. As such, construction and

operation of the Dakota Range Project would not result in cumulative effects on resources in the area from siting the Project in combination with other energy conversion or major industrial facilities.

12.0 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.

The following sections describe the existing physical environment within the Project Area, the potential effects of the proposed Project on the physical environment, and measures that will be utilized to avoid, minimize, and/or mitigate potential impacts.

12.1 Geological Resources

The existing geological resources within the Project Area are described below, followed by a discussion of the potential effects of the proposed Project and mitigation and minimization measures.

12.1.1 Existing Geological Resources

This section describes the regional landforms, surficial geology, bedrock geology, economic deposits, seismic risk, and subsidence potential within the Project Area.

12.1.1.1 Regional Landforms/Surficial Geology

The topography within the Project Area is generally characterized by gently rolling hills. Relief within the Project Area is low with site elevations ranging from approximately 1,800 to 2,050 feet above mean sea level (AMSL). Within the Project Area, perennial streams and drainages bisect the terrain. The majority of the Project Area drains southwest into the Big Sioux River via the Indian River, Soo Creek, Mahoney Creek, and Mud Creek. Drainage of the northeastern portion of the Project Area is east into the Minnesota River via the South Fork Whetstone River. Figure 6 is a topographic map of the Project Area.

The Project Area is located within the Central Lowland province of the Interior Plains physiographic region. The Central Lowland province is characterized by flat lands and geomorphic remnants of glaciation (National Park Service [NPS], 2015a). The Central Lowlands were subject to repeated Pleistocene glaciations. Underlying glacial deposits are largely horizontal Paleozoic sandstones, shales, limestones, conglomerates, and coals.

The following surficial geologic units are mapped within the Project Area (South Dakota Geological Survey [SDGS], 2004a):

- Qal - Alluvium (Quaternary) – Clay- to boulder-sized clasts with locally abundant organic material. Thickness up to 75 feet (23 meters).
- Qlo - Outwash, undifferentiated (Upper Wisconsin) – Heterogeneous sand and gravel with minor clay and silt, of glaciofluvial origin, including outwash plains, kames, kame terraces, and other undifferentiated deposits. Thickness up to 30 feet (9 meters).
- Qlot - Outwash, terrace (Upper Wisconsin) – Heterogeneous clay to gravel of glaciofluvial origin. Thickness up to 60 feet (18 meters).
- Qlov - Outwash, valley train (Upper Wisconsin) – Heterogeneous silt to gravel. Confined to valleys of glaciofluvial origin. Thickness up to 60 feet (18 meters).
- Qlt - Till, moraine (Upper Wisconsin) – Compact, silty, clay-rich matrix with sand- to boulder-sized clasts of glacial origin. Exhibits a distinctive weathered, dissected surface. Typically overlain by up to 10 feet (3 meters) of loess. Thickness up to 150 feet (46 meters).
- Qlte - Till, end moraine (Upper Wisconsin) – Compact, silty, clay-rich matrix with sand- to boulder-sized clasts of glacial origin. A geomorphic feature characterized by elevated linear ridges with hummocky terrain locally at former ice sheet margins. Composite thickness of all Upper Wisconsin till may be up to 300 feet (91 meters).
- Qltg - Till, ground moraine (Upper Wisconsin) – Compact, silty, clay-rich matrix with sand- to boulder-sized clasts of glacial origin. A geomorphic feature characterized by smooth, rolling terrain. Composite thickness of all Upper Wisconsin till may be up to 300 feet (91 meters).

Figure 7a illustrates the surficial geology within the Project Area, and Figure 7b is a geologic cross section of the Project Area.

12.1.1.2 Bedrock Geology

The uppermost bedrock unit underlying the entire Project Area is the Pierre Shale (Figure 8). The Pierre Shale, is an Upper Cretaceous-aged blue-gray to dark-gray, fissile to blocky shale with persistent beds of

bentonite, black organic shale, and light-brown chalky shale (SDGS, 2004b). The Pierre Shale contains minor sandstone, conglomerate, and abundant carbonate and ferruginous concretions, with thickness up to 1,000 feet (205 meters).

12.1.1.3 Economic Deposits

Commercially viable mineral deposits within Codington and Grant Counties are limited to sand, gravel, and construction aggregates. Information from the South Dakota Department of Environment and Natural Resources (SDDENR) Minerals and Mining Program and a review of the U.S. Geological Survey (USGS) 7.5-minute quadrangle mapping indicates that a sand and gravel quarry was developed in the southern part of the Project Area, but it has been inactive since 1995. The nearest active gravel quarries are approximately 10 miles north and 11 miles southwest of the Project Area (SDDENR, 2017a).

A review of information from the SDDENR Oil and Gas Initiative Program reveals that the majority of current and historic oil and gas development in South Dakota occurs in the western half of the State. The Project Area does not lie within an identified oil and gas field, and there are no active or historical oil and gas developments within or near the vicinity of the Project Area (SDDENR, 2017b).

12.1.1.4 Seismic Risks

The risk of seismic activity in the vicinity of the Project Area is low. The USGS Earthquake Hazards Program estimates less than 1 percent chance of damage from earthquakes in 2017 (USGS, 2017a). Further, the 2014 USGS National Seismic Hazard Map indicates the peak ground acceleration (PGA) with a 2 percent chance of exceedance in 50 years is 0.02 to 0.04 g (USGS, 2017a). According to the SDGS, no earthquakes have been recorded in Codington or Grant County from 1872 to 2013 (SDGS, 2013). However, a magnitude 3.7 earthquake was recorded approximately 40 miles northeast of the Project Area in 1995. Available geologic mapping and information from the USGS Earthquake Hazards Program do not indicate any active or inactive faults within the Project Area (USGS, 2017b).

12.1.1.5 Subsidence Potential

The risk for subsidence within the Project Area is considered negligible. The Pierre Shale bedrock is not known to exhibit karst topography or contain layers or members susceptible to dissolution by water. No historic underground mining operations, which could lead to subsidence potential, exist within the Project Area.

12.1.2 Geological Resources Impacts/Mitigation

The geological conditions, including geologic formations, seismic risk, and subsidence potential, within the Project Area are favorable and are not anticipated to control or impact construction or operation of the Project. Excavation would be required to install the turbine tower foundations, and trenching would be required to install collector lines. Prior to construction, geotechnical borings would be performed at all wind turbine locations to develop the specific design and construction parameters. Laboratory testing of soil samples obtained from the site and geophysical surveys would be performed to determine the engineering characteristics of the site subgrade soils. If necessary, modifications to roadway and foundation subgrade design would be made to account for specific site conditions. As discussed in Chapter 24.0, the facility would be decommissioned after the end of the Project's operating life. Facilities would be removed in accordance with applicable State and County regulations, unless otherwise agreed to by the landowner. After decommissioning of the Project is complete, the portions of underground facilities that have been abandoned in place would remain beyond the operational lifetime of the facility. However, these remaining facilities would not result in irreversible changes to the underlying geological conditions of the Project Area.

Due to the lack of developed or potential economic mineral resources within the Project Area, construction and operation of the proposed facility poses no impact to economic mineral resources. Therefore, no mitigation is required for impacts to mineral resources.

12.2 Soil Resources

The existing soil resources within the Project Area are described below, followed by a discussion of the potential effects of the proposed Project and mitigation and minimization measures.

12.2.1 Existing Soil Resources

This section describes the existing soil types, erosion potential and slopes, and prime farmland soils within the Project Area.

12.2.1.1 Soil Types

The soils within the Project Area primarily consist of loams, silty loams, and silty clay loams derived mostly from glacial till, alluvium, and the underlying Pierre Shale bedrock. The soils in the Project Area are not highly susceptible to erosion and are generally conducive to crop production (Natural Resources Conservation Service [NRCS], 2017). Nearly all the soils within the Project Area have the potential to be highly corrosive to buried steel, while less than half of the soils within the Project Area have the potential to be moderately corrosive to concrete. The majority of soils in the Project Area are well drained, and

only approximately 6 percent of the soils have a significant hydric component (30 to 100 percent of the soil is hydric). Approximately 11 percent of the soils are considered to have a high potential for frost action (NRCS, 2017). Table 12-1 lists the soil types comprising more than 1 percent of the Project Area and the characteristics of these soils, and Figure 9 illustrates the soil types and distributions within the Project Area.

Table 12-1: Soil Types Within the Project Area

Soil Type	Soil Taxonomy	Soil Texture	Parent Material	Natural Drainage Class	Depth to Restrictive Feature (inches)	Acres in Project Area	Percent of Project Area
Z192B (Vienna-Brookings complex, coteau, 1 to 6 percent slopes)	Fine-loamy, mixed, superactive, frigid Calcic Hapludolls	Silt loam	Loess over loamy till	Well drained	Greater than 201	8,781	19.73%
Z192A (Vienna-Brookings complex, coteau, 0 to 2 percent slopes)	Fine-loamy, mixed, superactive, frigid Calcic Hapludolls	Silt loam	Loess over loamy till	Well drained	Greater than 201	7,193	16.16%
Z171A (Renshaw-Fordville loams, coteau, 0 to 2 percent slopes)	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, frigid Calcic Hapludolls	Loam	Alluvium over outwash	Somewhat excessively drained	Greater than 201	4,518	10.15%
Z199B (Vienna-Barnes-Forestville loams, 1 to 6 percent slopes)	Fine-loamy, mixed, superactive, frigid Calcic Hapludolls	Loam	Loess over loamy till	Well drained	Greater than 201	3,062	6.88%
Z194B (Barnes clay loam, coteau, 2 to 6 percent slopes)	Fine-loamy, mixed, superactive, frigid Calcic Hapludolls	Clay loam	Loamy till	Well drained	Greater than 201	2,419	5.43%
Z141B (Barnes-Svea loams, coteau, 1 to 6 percent slopes)	Fine-loamy, mixed, superactive, frigid Calcic Hapludolls	Loam	Loamy till	Well drained	Greater than 201	1,564	3.51%

Soil Type	Soil Taxonomy	Soil Texture	Parent Material	Natural Drainage Class	Depth to Restrictive Feature (inches)	Acres in Project Area	Percent of Project Area
Z153A (Lamoure-Rauville silty clay loams, channeled, 0 to 2 percent slopes, frequently flooded)*	Fine-silty, mixed, superactive, calcareous, frigid Cumulic Endoaquolls	Silty clay loam	Silty alluvium	Poorly drained	Greater than 201	1,523	3.42%
Z173B (Renshaw-Sioux complex, 2 to 6 percent slopes)	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, frigid Calcic Hapludolls	Loam	Loamy alluvium over outwash	Somewhat excessively drained	Greater than 201	1,499	3.37%
Z142C (Barnes-Buse-Svea loams, coteau, 2 to 9 percent slopes)*	Fine-loamy, mixed, superactive, frigid Calcic Hapludolls	Loam	Loamy till	Well drained	Greater than 201	1,276	2.87%
Z145D (Buse-Barnes loams, coteau, 2 to 15 percent slopes, very stony)	Fine-loamy, mixed, superactive, frigid Typic Calciudolls	Loam	Loamy till	Well drained	Greater than 201	951	2.14%
Z143C (Barnes-Buse loams, coteau, 6 to 9 percent slopes)	Fine-loamy, mixed, superactive, frigid Calcic Hapludolls	Loam	Loamy till	Well drained	Greater than 201	950	2.13%
Z117A (McKranz-Badger silty clay loams, 0 to 2 percent slopes)	Fine-silty, mixed, superactive, frigid Aeric Calciaquolls	Silty clay loam	Loess over loamy till	Somewhat poorly drained	Greater than 201	932	2.09%

Soil Type	Soil Taxonomy	Soil Texture	Parent Material	Natural Drainage Class	Depth to Restrictive Feature (inches)	Acres in Project Area	Percent of Project Area
Z159A (Divide loam, 0 to 2 percent slopes, occasionally flooded)	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, frigid Aeric Calciaquolls	Loam	Loamy alluvium over outwash	Somewhat poorly drained	Greater than 201	840	1.89%
Z190A (Brookings silty clay loam, 0 to 2 percent slopes)	Fine-silty, mixed, superactive, frigid Pachic Hapludolls	Silt clay loam	Loess over fine-loamy till	Moderately well drained	Greater than 201	672	1.51%
Z171B (Renshaw-Fordville loams, coteau, 2 to 6 percent slopes)	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, frigid Calcic Hapludolls	Loam	Alluvium over outwash	Somewhat excessively drained	Greater than 201	544	1.22%

Source: NRCS, 2017 *designates hydric soil

12.2.1.2 Erosion Potential and Slopes

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 (USLE) and the Revised Universal Soil Loss Equation (RUSLE) 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 0.10 to 0.32, with the majority between 0.24 and 0.32. Slopes in the Project Area range from 0 to 40 percent, with the majority of slope at 1 to 6 percent.

12.2.1.3 Prime Farmland Soils

NRCS farmland classifications include “prime farmland” (land that has the best combination of physical and chemical characteristics for the production of crops), “farmland of statewide importance” (land other than prime farmland that has a good combination of physical and chemical characteristics for the production of crops), and “not prime farmland” (land that does not meet qualifications for prime farmland), among other classifications. Much of the farmland in the Project Area is classified as either “prime farmland” (59 percent) or “farmland of statewide importance” (10 percent). Approximately 16 percent is categorized as “not prime farmland.” The remaining 15 percent is divided among “prime farmland” categories with stipulations. Farmland types within the Project Area are shown in Table 12-2.

Table 12-2: Farmland Types Within the Project Area

Farmland Type	Area (acres)	Percentage of Project Area
Prime farmland	26,464	59%
Farmland of statewide importance	4,222	10%
Not prime farmland	6,974	16%
Prime farmland if drained	1,517	3%
Prime farmland if irrigated	5,336	12%
Total	44,513	100%

12.2.2 Soil Resources Impacts/Mitigation

The following sections describe the potential effects of the proposed Project on soil resources. Where applicable, planned measures to avoid, minimize, or mitigate impacts are noted.

12.2.2.1 Potential for Impacts to Soil Resources

Construction of up to 72 wind turbine foundations, access roads, collector lines, substation, and O&M facilities would result in approximately 647 acres of temporary disturbance and approximately 65 acres of permanent impacts (see Table 11-1) to surface soils within the Project Area. During construction, existing vegetation would be removed in the areas associated with the proposed Project components, potentially increasing the risk of erosion, which is discussed in more detail below. Potential impacts to agricultural soils from the Project, and associated mitigation measures, are discussed in Section 21.2.2. As discussed in Chapter 24.0, the facility would be decommissioned after the end of the Project's operating life. Facilities would be removed in accordance with applicable State and County regulations, unless otherwise agreed to by the landowner. Disturbed surfaces would be graded, reseeded, and restored as nearly as possible to their preconstruction conditions. After decommissioning of the Project is complete, no irreversible changes to soil resources would remain beyond the operating life of the Project.

12.2.2.2 Erosion, Slope Stability, and Sedimentation

The Applicant will design the Project layout to limit construction cut and fill work and limit construction in steep slope areas. Wind turbines are generally located at higher elevations to maximize exposure to wind and to avoid steep slope areas for foundation installation. The current layout has sited access roads to avoid steep slopes as much as possible, and the underground collector lines similarly avoid crossing steep ravines whenever feasible.

Surface disturbance caused by construction of the wind turbines and infrastructure improvements would result in the soil surface becoming more prone to erosion. Another potential issue is soil compaction, which can occur by use of heavy equipment. Silt and clay soils are especially susceptible to this. Measures to reduce impacts to soils would be implemented during construction. These may include the use of erosion and sediment control during and after construction, noxious weed control, segregating topsoil from subsurface materials, reseeding of disturbed areas, the use of construction equipment appropriately sized to the scope and scale of the Project, ensuring access road grades fit closely with the natural terrain, proper on-site disposal of soil cuttings from turbine foundation construction and maintaining proper drainage.

Construction of the Project would require coverage under the General Permit for Storm Water Discharges Associated with Construction Activities issued by the SDDENR. A condition of this permit is the development and implementation of a SWPPP. The SWPPP would be developed during civil engineering design of the Project and would prescribe BMPs to control erosion and sedimentation. The BMPs may include use of silt fences, straw wattles, erosion control blankets, temporary storm water sedimentation

ponds, re-vegetation, or other features and methods designed to control storm water runoff and mitigate erosion and sedimentation. The BMPs would be implemented to reduce the potential for impacts to drainage ways and streams by sediment-laden runoff. During the facility design life, storm water volume and flow erosion rates are not anticipated to increase from those of pre-development conditions.

13.0 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 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.

The following sections describe the existing hydrology within the Project Area, the potential effects of the proposed Project on hydrology, and measures that will be utilized to avoid, minimize, and/or mitigate potential impacts.

13.1 Groundwater Resources

The existing groundwater resources within the Project Area are described below, followed by a discussion of the potential effects of the proposed Project, and avoidance, minimization, and/or mitigation measures.

13.1.1 Existing Groundwater Resources

The groundwater system underlying the parts of South Dakota that are east of the Missouri River, including the Project Area, is nearly exclusively based on glacial outwash aquifers. According to the SDGS, there are approximately 444 public water supply systems east of the Missouri River, and 392 of them utilize glacial outwash aquifers (Iles, 2008). This is consistent with the types of the soils in the area, many of which were formed from glacial till or glacial drift. Glacial drift and alluvium aquifers in South Dakota vary in depth from 0 to 400 feet, with a range of yield from 3 to 50 gallons per minute (Chadima, 1994). Unlike bedrock-type aquifers, glacial outwash aquifers are extremely difficult to predict at the subsurface; however, the quality of water from glacial outwash aquifers tends to exceed that of water derived from bedrock-type aquifers.

13.1.2 Groundwater Resources Impacts/Mitigation

The construction of wind farm facilities can require dewatering of excavated areas as a result of shallow groundwater, particularly for wind turbine foundations or collector line trenches. Construction dewatering may temporarily lower the water table in the immediate area and may temporarily lower nearby surface water elevations depending on the proximity and connectivity of groundwater and surface water and extent of the excavated area.

Groundwater dewatering is not anticipated to be a major concern within the Project Area, because wind turbines are most likely to be placed at higher elevation where the water table tends to be deeper. Should groundwater be encountered that must be dewatered, the necessary permits would be obtained and associated requirements implemented. In addition, the duration of dewatering would be limited to the extent possible. Dewatered groundwater would be properly handled to allow sediments to settle out and be removed before the water is discharged, to reduce soil erosion and sedimentation of surface waters.

13.2 Surface Water Resources

The existing surface water resources within the Project Area are described below, followed by a discussion of the potential effects of the proposed Project, and avoidance, minimization, and/or mitigation measures.

13.2.1 Existing Surface Water Resources

This section describes the existing hydrology, floodplains, NPS Nationwide Rivers Inventory (NRI) resources, and impaired waters within the Project Area.

13.2.1.1 Hydrology

The majority of the Project Area is located within the Big Sioux watershed, part of the Missouri River Basin surface water drainage system. Drainage from the Project Area is to the southwest into the Big Sioux River via the Indian River, Soo Creek, Mahoney Creek, Mud Creek, and their tributaries (Figure 10). The northeastern portion of the Project Area is located within the Minnesota River watershed, and drainage is to the east into the Minnesota River via the South Fork Whetstone River and its tributaries.

Prairie potholes, depressions formed by previous glacier activity, are common in the Upper Midwest region. These potholes fill with rain and snowmelt and become depression wetlands (primarily freshwater marshes). Many prairie potholes are temporary and are not connected to surface waters, but permanently filled prairie potholes also exist (U.S. Environmental Protection Agency [EPA], 2016).

To more accurately characterize surface water resources, including wetlands, streams, and other surface waters, within the facility footprint, a wetland delineation was completed for the Project in September 2017. The results of the delineation and a discussion of Project impacts to wetlands and other waters of the U.S. is discussed in Section 14.2.

13.2.1.2 National Park Service Nationwide Rivers Inventory

The NRI is a "listing of more than 3,400 free-flowing river segments in the U.S. that are believed to possess one or more 'outstandingly remarkable' natural or cultural values judged to be of more than local or regional significance. Under a 1979 Presidential Directive, and related Council on Environmental Quality procedures, all Federal agencies must seek to avoid or mitigate actions that would adversely affect one or more NRI segments" (NPS, 2015b). There are no NRI-listed rivers within the Project Area. The nearest NRI-listed rivers are the South Fork of the Yellow Bank River, located approximately 12 miles southeast of the Project Area, and the North Fork of the Whetstone River, located approximately 12 miles north of the Project Area.

13.2.1.3 Impaired Waters

The CWA requires states to publish biannually a list of streams and lakes that are not meeting their designated uses because of excess pollutants. These streams and lakes are considered impaired waters (EPA, 2015). 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 (TMDL) of a pollutant that the water can receive and still safely meet water quality standards. The section of the Big Sioux River that extends through the Project Area is listed as impaired on South Dakota's 2016 303(d) list requiring TMDLs for exceedance of *Escherichia coli* (*E. coli*) and dissolved oxygen standards (SDDENR, 2016). This section of the Big Sioux is classified for the following beneficial uses: warmwater semipermanent fish life propagation; limited contact recreation; fish and wildlife propagation, recreation, and stock watering; and irrigation (Minerich, 2017). An unnamed tributary in Grant County that extends through the Project Area is also on the 303(d) list and classified for the following beneficial uses: warmwater marginal fish life propagation; limited contact recreation; fish and wildlife propagation, recreation, and stock watering; and irrigation (Minerich, 2017).

13.2.1.4 Floodplains

Within the Project Area, narrow floodplains exist along major streams, including Indian River, Soo Creek, and Mud Creek, as well as along several unnamed tributaries to these streams (Figure 10). According to the Federal Emergency Management Agency (FEMA)-mapped floodplain zones, all

floodplains within the Project Area are mapped as Zone A, indicating no base flood elevations have been determined.

13.2.2 Surface Water Resources Impacts/Mitigation

Potential impacts to water resources from the construction and operation of wind projects include deterioration of surface water quality through sedimentation, impacts to drainage patterns, and increased runoff due to the creation of impervious surfaces. Project facilities have been designed to avoid impacts on surface water resources to the extent practicable. Therefore, the Project is not expected to cause significant changes in runoff patterns or volume of runoff, nor is it expected to have adverse impacts on existing hydrology.

In general, because wind turbines would be located at higher elevations within the Project Area to maximize wind exposure, impacts to streams and drainage ways are not anticipated from turbine sites. The underground collection system may temporarily impact surface drainage patterns during construction if the collection system is trenched through drainage ways; however, these impacts would be short-term, and existing contours and drainage patterns are expected to be restored within 24 hours of trenching. Where stream/drainage crossings cannot be avoided for construction of access roads, appropriately designed culverts or low water crossings would be placed to maintain the free flow of water. As such, the Project would not result in changes to existing drainage patterns in the Project Area.

The creation of impervious surfaces reduces the capacity of an area to absorb precipitation into the soil and tends to increase the volume and rate of storm water runoff. The Project would create up to 65 acres of impermeable surface through the construction of turbine pads, access roads, meteorological equipment, overhead collection structures, the O&M facility, and the collection substation (see Table 11-1). The wind turbine pads, access roads, and O&M facility and substation yards would be constructed of compacted gravel and would not be paved. However, this level of compaction may inhibit infiltration and may increase runoff in these areas. As discussed in Section 12.2.2.2, appropriate storm water management BMPs would be implemented during the construction and operation of the Project to control erosion and reduce potential for sediment runoff from exposed soils during precipitation events. These BMPs are anticipated to adequately mitigate for runoff due to the increase in impervious surface. After decommissioning of the Project is complete, no irreversible changes to surface water resources would remain beyond the operating life of the Project.

Due to the lack of NRI-listed rivers within the Project Area, construction and operation of the proposed facility poses no impact to these resources. Therefore, no mitigation is required for impacts to NRI-listed rivers.

13.2.2.1 Impacts to Impaired Waters and Mitigation

SDDENR indicated that because of the beneficial use classifications of the Big Sioux River and the unnamed tributary in Grant County (discussed in Section 13.2.1.3), special construction measures may be necessary to prevent exceedance of the 30-day average total suspended solids (TSS) standard of 90 milligrams per liter (mg/L) for the Big Sioux and 150 mg/L for the unnamed tributary (see letter from SDDENR dated July 26, 2017, in Appendix B). As discussed in Section 12.2.2.2, construction of the Project would require development and implementation of a SWPPP and BMPs in accordance with the General Permit for Storm Water Discharges Associated with Construction Activities issued by the SDDENR. Any special construction measures necessary to prevent exceedance of the TSS standards for the Big Sioux River and the unnamed tributary in Grant County would be identified in the SWPPP.

13.2.2.2 Impacts to Flood Storage Areas and Mitigation

In natural systems, floodplains serve several functions that include storing excess water during high-flow/high-runoff periods, moderating the release of water during high-flow/high-runoff periods, reducing flow velocity, and filtering out sediments and other pollutants. The placement of fill into floodplains reduces the effectiveness of these functions.

As noted previously, wind turbines would be located at higher elevations, and the current layout avoids placing the turbines and new access roads in floodplains. Based on the current layout, the underground collector system and some of the existing roads to be upgraded for the Project would cross floodplains associated with Indian River, Soo Creek, and several tributaries. The underground collection system may temporarily impact flood storage areas during construction if the collection system is trenched through these streams; however, these impacts would be short-term, and existing contours and drainage patterns are expected to be restored within 24 hours of trenching. Where floodplain crossings cannot be avoided for construction of access roads, appropriately designed culverts or low water crossings would be placed to maintain the free flow of water. Construction or fill within floodplains would be designed in accordance with Codington or Grant County floodplain development regulations.

13.3 Current and Planned Water Uses

The current and planned water uses within the Project Area are described below, followed by a discussion of the potential effects of the proposed Project, and avoidance, minimization, and/or mitigation measures.

13.3.1 Current and Planned Water Uses within Project Area

The Grant-Roberts Water District supplies rural water to the Project Area and maintains a network of distribution lines within the Project Area. Private wells that supply water for domestic and irrigation purposes are also located throughout the Project Area. Perennial streams within the Project Area, including the Big Sioux River, Indian River, Soo Creek, Mahoney Creek, Mud Creek, and their tributaries (Figure 10) provide habitat for fish and wildlife and support recreational activities, such as fishing.

13.3.2 Effect on Current or Planned Water Use

The proposed Project facilities would not have impacts on either municipal or private water uses in the Project Area. Water storage, reprocessing, or cooling is not required for either the planned construction or operation of the facilities. The Project facilities would not require deep well injection. The Project operation would not require the appropriation of surface water or permanent dewatering. SDDENR's Drinking Water Program reviewed the Project and does not anticipate any adverse impacts to drinking waters of the State (see letter from SDDENR dated July 26, 2017, in Appendix B).

The Applicant would connect the O&M facility to the rural water system. Water usage at the O&M facility would be similar to household volume, less than 5 gallons per minute. The Applicant would coordinate with the Grant-Roberts Water District to locate and map its network of distribution lines within the Project Area and determine if a rural water supply connection is necessary for the Project. Existing water lines would be avoided by Project design and construction. If necessary, the Applicant would obtain required permits or crossing agreements from the Grant-Roberts Water District.

Alternatively, a water supply well would be required if rural water service is not available. The Applicant would work with the SDDENR to obtain the necessary water rights permit. The specific aquifer to be used and the characteristics of that aquifer would depend on the final location of the O&M facility. Water usage at the O&M facility would be negligible (similar to household volume as stated above). Therefore, regardless of the water supply well location and aquifer source, the Project would not affect aquifer recharge rates. The Project will comply with all applicable permit requirements for water rights and the protection of groundwater quality.

The construction of wind farm facilities can interrupt the availability of groundwater through construction dewatering. Construction dewatering may temporarily lower the water table such that nearby wells may lose some of their capacity. However, the Project is not anticipated to require major dewatering; therefore, interruption of groundwater availability caused by dewatering is unlikely. As a result, no negative impacts on groundwater resources are anticipated.

The Project would have no impact on surface water availability or use for communities, agriculture, recreation, fish, or wildlife. As discussed in Section 14.2.2, boring will be used for the installation of collector lines under two perennial surface water features (both sections of Indian River, thus avoiding impacts to these perennial streams, including water flow and availability.

14.0 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.*

The following sections describe the existing terrestrial ecosystems within the Project Area, potential effects of the proposed Project on these terrestrial systems, and mitigation and minimization measures planned to ameliorate potential impacts to terrestrial systems. Terrestrial ecosystem data were collected from literature searches, Federal and State agency reports, natural resource databases, and field surveys completed for the Project. Specific resources discussed in the following sections include vegetation, wetlands, and wildlife, including federally and state-listed species.

14.1 Vegetation (Flora)

The existing vegetation within the Project Area is described below, followed by a discussion of the potential effects of the proposed Project and mitigation and minimization measures.

14.1.1 Existing Vegetation

The majority of the Project Area is in agricultural use, and, therefore, vegetation is predominantly grassland for grazing (pasture) and cultivated crops. Cultivated crops are primarily a mix of soybean and corn, and additional crop areas are set aside for hay production. Grassland grazing areas are dominated by a mix of grasses, such as smooth brome (*Bromus inermis*), sideoats grama (*Bouteloua curtipendula*), big bluestem (*Andropogon gerardii*), and quackgrass (*Elymus repens*). Additional vegetation includes goldenrod (*Solidago spp*.), white sagebrush (*Artemisia ludoviciana*), thistles (*Cirsium spp*.), asters (*Symphyotrichum spp*.), and areas of sunflowers (*Helianthus spp.*).

Trees within the Project Area are found mainly around housing sites, windbreaks, and floodplains of streams. The most common tree species in the Project Area include eastern cottonwood (*Populus deltoides*), bur oak (*Quercus macrocarpa*), and green ash (*Fraxinus pennsylvanica*). Dense stands of Siberian peashrub (*Caragana arborescens*) are common in many of the windbreaks.

Wetlands, discussed further in Section 14.2, are found in low-lying depressions around crops and in cattle pastures. Vegetation in the wetlands is dominated by prairie cordgrass (*Spartina pectinata*) and cattail (*Typha spp*.).

14.1.1.1 Native Grassland

As recommended by the USWFS and SDGFP during agency coordination completed for the Project (Section 27.2), the Applicant completed an analysis to identify potential native grasslands within the Project Area. Areas of untilled grasslands were identified based on a review of the 2016 U.S. Department of Agriculture (USDA) National Agriculture Imagery Program imagery, verified by review of the 2016 USDA Cropland Data Layer, and then reviewed with the Quantifying Undisturbed (Native) Lands in Eastern South Dakota: 2013 (Bauman et al., 2013) digital data layer to further evaluate potential for past disturbances (see DASK/POSK Habitat Survey in Appendix C).

A total of 2,952 acres of untilled grasslands within the Project Area were identified based on the desktop analysis. These grassland areas are displayed on Figure 11. In subsequent field investigations completed in June 2016 and June 2017, most of these grassland areas were found to be dominated by cool-season invasive grasses such as bluegrass (*Poa pratensis*) and smooth brome (*Bromus inermis*). Some grasslands (e.g., far northeastern half-section of Project Area, south half of T120N R51W Sec. 5) were found to have more healthy populations of native grass species (see DASK/POSK Habitat Survey in Appendix C).

14.1.1.2 Noxious Weeds

Noxious weeds are regulated by State (SDCL 38-22) and Federal (U.S. CFR 2006) 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), 15 listed species of noxious weeds have the potential to occur and are regulated within Codington and/or Grant Counties (SDDOA, 2016a and 2016b) (Table 14-1).

Table 14-1: State and Local Noxious Weeds of South Dakota

Common Name	Scientific Name	Weed Status
Canada thistle	*Cirsium arvense*	State noxious weed
Hoary cress	*Cardaria draba*	State noxious weed
Leafy spurge	*Euphorbia esula*	State noxious weed
Perennial sow thistle	*Sonchus arvensis*	State noxious weed
Purple loosestrife	*Lythrum salicaria*	State noxious weed
Russian knapweed	*Centaurea repens*	State noxious weed
Salt cedar	*Tamarix aphylla, T. chinensis, T. gallica, T. parviflora, and T. ramosissima*	State noxious weed
Absinth wormwood	*Artemisia absinthium*	Local noxious weed – Codington/ Grant
Field bindweed	*Convolvulus arvensis*	Local noxious weed – Grant

Common Name	Scientific Name	Weed Status
Bull thistle	*Cirsium vulgare*	Local noxious weed – Codington
Musk thistle	*Carduus nutans*	Local noxious weed – Codington/Grant
Plumeless thistle	*Carduus acnthoides*	Local noxious weed – Codington/Grant
Poison hemlock	*Conium maculatum*	Local noxious weed – Codington
Spotted knapweed	*Centaurea maculosa*	Local noxious weed – Grant
Yellow toadflax	*Linaria vulgaris*	Local noxious weed – Codington

14.1.2 Vegetation Impacts/Mitigation

Construction activities of the proposed Project would result in approximately 647 acres of temporary disturbance and 65 acres of disturbance (see Table 11-1) to vegetation (predominantly cultivated crops and pasture) during the operational life of the Project. Direct impacts would occur due to construction of the wind turbine foundations, access roads, Project substation, meteorological equipment, and O&M facility during the life of the Project. These impacts would result in a loss of seasonal production of crops; however, these impacts would not be considered biologically significant, because these lands are frequently disturbed by tilling, planting, and harvesting activities associated with crop production. For further discussion of impacts to agricultural cropland, see Section 21.2.2.

The Project facilities have been sited to avoid native grasslands, to the extent practicable (see Figure 11). In areas where impacts cannot be avoided, temporary impacts would be minimized through construction BMPs (i.e., re-vegetation and erosion control devices).

Other indirect impacts could include the potential spread of noxious weed species resulting from construction equipment introducing seeds into new areas, or erosion or sedimentation due to clearing ground in the construction areas. The spread of weeds is generally managed via use of appropriate seed mixes in non-cultivated areas and SWPPP compliance to restore vegetation in disturbed areas. If listed noxious weed infestations are found in non-cultivated disturbed areas after construction activities are completed, each area will be evaluated and addressed separately, in coordination with landowner input.

The Project would not involve any major tree clearing activities. Access roads, crane paths, and underground collector lines were sited to avoid crossing shelterbelts to the extent practicable. In areas where access roads may need to cross shelterbelts due to engineering restrictions or the layout of leased lands, the Applicant would work with the landowner in order to develop an appropriate alignment that would be the least intrusive. As discussed in Chapter 24.0, the facility would be decommissioned after the

end of the Project's operating life, and disturbed surfaces would be graded, reseeded, and restored to their preconstruction conditions to the extent possible. Therefore, after decommissioning for the Project is complete, no irreversible changes to vegetation would remain beyond the operating life of the Project.

14.2 Wetlands and Waterbodies

The wetlands and waterbodies identified within the Project Area are described below, followed by a discussion of the potential effects of the proposed Project, and avoidance, minimization, and/or mitigation measures. While aquatic in nature, wetlands and waterbodies are important functional components of the terrestrial ecosystem and are thus discussed in this section.

14.2.1 Existing Wetlands and Waterbodies

Wetlands are defined in the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory, 1987) 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." The Manual identifies three wetland criteria that must be met in order for a wetland to be present: dominance of hydrophytic vegetation, hydric soils, and sufficient hydrology. Some wetlands, as well as other waterbodies are considered waters of the U.S. under Section 404 of the CWA and are therefore regulated by the U.S. Army Corps of Engineers (USACE) with respect to discharge of fill material into the water features.

Based on a desktop review of USFWS National Wetland Inventory (NWI) maps, there are approximately 546 acres of wetlands or other waterbodies within the Project Area. These wetlands and waterbodies are displayed on Figure 10 and summarized in Table 14-2.

Table 14-2: NWI Wetlands and Waterbodies Mapped Within the Project Area

Wetland Type	Acres within Project Area
Freshwater emergent wetland	425
Freshwater ponds	53
Forested wetland	3
Scrub-Shrub wetland	1
River	18
Freshwater lake	46
Total:	**546**

Source: USFWS NWI data

To more accurately characterize wetlands and waters of the U.S. within the facility footprint, a wetland delineation was completed for the Project in September 2017, in accordance with USACE-approved methodology. All parcels containing proposed Project facilities (turbines, access roads, collector lines, potential substation locations, etc.) were surveyed, for a total of 125 parcels or approximately 17,600 acres.

A total of 122 wetlands were delineated during field surveys, for a total of 567 acres of wetland within the area surveyed. The majority (n=120) of wetlands were identified as emergent (Palustrine Emergent Wetlands [PEM]) with only two wetlands being identified as a mix of scrub-shrub vegetation (Palustrine Scrub/Shrub Wetlands [PSS]).

In addition to the delineated wetlands, a total of 80 other waterbodies were delineated during field surveys. These waterbodies consisted of 60 constructed (cattle) ponds, 10 stream reaches, and 10 impoundments. Most of these waterbodies (n=75) were identified as perennial, followed by 4 intermittent streams, and 1 ephemeral stream. The delineated wetlands and waterbodies are summarized in Table 14-3.

Table 14-3: Delineated Wetlands and Waterbodies

Wetland Type	Acres Delineated
Freshwater emergent wetland	566
Freshwater ponds	95
Scrub-Shrub wetland	1
River	11
Total:	673

Source: Cardno Waters of the U.S. Delineation Report, 2018

14.2.2 Wetland and Waterbody Impacts/Mitigation

Project infrastructure has been sited to avoid and minimize impacts to wetlands and waterbodies, to the extent practicable. Through Project design and avoidance measures, Dakota Range has minimized permanent wetland impacts to five areas, consisting of minor impacts associated with access road crossings of emergent wetlands. During construction, approximately 37 wetlands will incur short-term, small scale, temporary disturbance, but each will be restored to natural contours after construction is complete. These temporary impacts are associated with temporary disturbance from installation of access roads and collector lines. No permanent or temporary wetland impacts will result from turbine foundations, substations, permanent met towers, construction laydown or O&M areas.

Boring will be used for the installation of collector lines under two perennial surface water features (both sections of Indian River), thus avoiding impacts to these perennial streams. No other perennial streams are anticipated to be crossed by Project infrastructure. Any portion of a collector line crossing an ephemeral or intermittent ditch would be crossed via open-cut method or via boring, where appropriate. No permanent impacts are associated with the installation of the collector lines, as once lines are buried the disturbed area is restored to pre-construction conditions.

Based on the impact avoidance and minimization measures described above, impacts to wetlands and waterbodies are minor and would be authorized under the USACE Nationwide Permit (NWP) 12 for utility lines and associated facilities in waters of the U.S., with no pre-construction notification requirement to the USACE. These authorized, permanent impacts to five wetland areas would potentially remain beyond the operational lifetime of the facility. As discussed in Chapter 24.0, disturbed surfaces would be restored as nearly as possible to their preconstruction conditions during Project decommissioning. However, these wetland areas may not reestablish depending on the hydrologic conditions of these areas at the time of decommissioning.

14.3 Wildlife (Fauna)

In order to reduce the potential impacts of wind energy facilities on wildlife species and habitat, the USFWS has developed the Land-Based Wind Energy Guidelines (WEG; USFWS, 2012) and the Eagle Conservation Plan Guidance (ECPG; USFWS, 2013). These voluntary guidelines provide a structured, scientific approach for assessing wildlife risks at wind energy facilities, promote communication between project proponents and federal/state agencies, and provide a practical approach to address wildlife conservation concerns at all stages of land-based wind energy development. The SDGFP, in cooperation with the South Dakota Bat Working Group, has also developed siting guidelines for wind energy projects to address potential impacts to natural resources (SD Siting Guidelines; South Dakota Bat Working Group and SDGFP, Undated). These guidelines are generally consistent with the WEG, but also provide guidance for other non-wildlife resources (e.g., land use, noise, visual resources, soil erosion and water quality).

The Applicant followed the processes outlined in the WEG, ECPG, and SD Siting Guidelines for developing, constructing, and operating wind energy projects. The Applicant has engaged in ongoing coordination with the USFWS and SDGFP to seek input on wildlife resources potentially occurring within the Project Area and to seek guidance on the appropriate studies to evaluate risk and inform development of impact avoidance and minimization measures for the Project. Summaries of coordination meetings from August 12, 2015; March 28, 2017; and September 25, 2017 are included in Appendix B.

14.3.1 Existing Wildlife

The wildlife identified within the Project Area is described below, followed by a discussion of the potential effects of the proposed Project's construction and operation and mitigation and minimization measures.

14.3.1.1 Initial Site Assessment

In accordance with Tiers 1 and 2 of the WEG, Stage 1 of the ECPG, and the SD Siting Guidelines, a review of readily available desktop information was completed to assess potential adverse effects to species of concern and their habitats. Data sources included USFWS Information for Planning and Conservation (IPaC) website; South Dakota Natural Heritage Database; U.S. Geological Services (USGS) Breeding Bird Survey; aerial imagery; and non-governmental organization websites (e.g., Audubon Society, American Wind Wildlife Institute Landscape Assessment Tool, e-Bird, and the Hawk Migration Association of North America). In addition, preliminary agency input was requested from USFWS and SDGFP regarding any instances of federally and state-listed animals and plants, significant natural communities, and other species of concern or significant habitats that occur in the area of interest.

14.3.1.2 Federally Listed Terrestrial Species

There are six federally listed species protected under the ESA that could potentially occur in the Project Area. One is an aquatic species, the Topeka shiner, which is discussed in Section 15.1.1. The other five listed species are terrestrial species and include the Poweshiek skipperling, whooping crane, Dakota skipper, northern long-eared bat, and red knot. Table 14-4 identifies the potential for each of the federally listed terrestrial species to occur in the Project Area.

Table 14-4: Federally Listed Terrestrial Species Potentially Occurring in Project Area

Species	Status	Potential to Occur
Dakota skipper	Threatened	Potential to occur within suitable habitat
Poweshiek skipperling	Endangered	Largely extirpated from region, unlikely to occur
Northern long-eared bat	Threatened	Summer habitat lacking, potential migration risk
Red knot	Threatened	Rarely observed in Midwest, unlikely to occur
Whooping crane	Endangered	Over 150 miles east of migration corridor, unlikely to occur

Source: USFWS IPaC, September 2017

Based on coordination with the USFWS and SDGFP, the only federally listed species with the potential to occur in the Project Area are the northern long-eared bat, Dakota skipper, and Poweshiek skipperling (Appendix B).

Northern Long-Eared Bat

Due to declines caused by white-nose syndrome and continued spread of white nose syndrome caused by a fungus (*Pseudogymnoascus destructans*), the northern long-eared bat was listed as threatened under the ESA on April 2, 2015. However, per Section 4(d) of the ESA, protections for the species are tailored to areas affected by white-nose syndrome and during the bat's most sensitive life stages.

Based on coordination with the USFWS and SDGFP, it was agreed that risk to northern long-eared bats is low, and it was also agreed that no species-specific surveys were warranted to ensure no significant adverse effect or risk noncompliance with federal ESA requirements. To minimize any potential adverse effect, the Project is not planned to involve any major tree clearing activities; however, if tree clearing is required, it would be avoided between June 1 and July 31 to avoid potential impacts during the maternal roost period.

Dakota Skipper and Poweshiek Skipperling

Because the Project Area has the potential to contain suitable Dakota skipper and Poweshiek skipperling habitat, desktop habitat assessments were completed for the Project Area in June 2016 and June 2017 to identify grasslands with potentially suitable Dakota skipper and Poweshiek skipperling habitat (i.e., areas of untilled grasslands; discussed in Section 14.1.1.1; Appendix C). Pedestrian field surveys were then completed to evaluate areas identified during the desktop review as potentially suitable habitat and to confirm areas of unsuitability.

A total of 2,952 acres of potentially untilled grassland within the Project Area were identified as warranting field evaluation. Field evaluations of these areas were completed between June 12-14, 2016 and June 16-19, 2017. One approximate 5-acre area of potential Dakota skipper habitat was identified within the northeast corner of the Project Area. This approximate 5 acres of potential Dakota habitat will be completely avoided through Project design, and therefore, it was determined that no further assessment was needed. No other suitable habitat for Dakota skipper or Poweshiek skipperling was identified within the Project Area.

14.3.1.3 State-Listed Terrestrial Species

State-listed terrestrial species identified as potentially occurring within Grant and Codington Counties are identified in Table 14-5. SDGFP agreed that these species are unlikely to occur wihthin the Project Area, therefore risk to these sepcies is considered low and species-specific surveys were not necessary.

Table 14-5: State-Listed Terrestrial Species in Grant and Codington Counties

Species	Status	Potential to Occur
Peregrine falcon	State-Endangered	Found in a wide variety of habitats, more common near water, especially along coastlines; unlikely to occur.
Osprey	State-Threatened	Found near aquatic areas, rare outside Black Hills; unlikely to occur.
Piping plover	State-Threatened	Barren sandbars in large river systems and on alkaline lakes shores; unlikely to occur
Northern river otter	State-Threatened	Riparian vegetation along wetland margins; unlikely to occur.

Source: https://gfp.sd.gov/wildlife/docs/ThreatenedCountyList.pdf (March 2017); doesn't include federally listed species

14.3.1.4 Studies Conducted to Date

The following wildlife studies have been completed for the Project in accordance with USFWS and SDGFP recommendations (see Appendix B).

14.3.1.4.1 Birds

Federal protection is provided for bald and golden eagles, as well as species of migratory birds, through the Bald and Golden Eagle Protection Act (BGEPA) and the Migratory Bird Treaty Act (MBTA). Both laws are intended to prohibit 'take' and regulate impacts to eagles and other migratory birds from direct mortality, habitat degradation, and/or displacement of individual birds.

To determine the presence of bird species that occur within the Project Area, the Applicant completed various surveys in accordance with Tier 3 of the WEG, Stage 2 of the ECPG, and USFWS and SDGFP guidance. Surveys included raptor nest surveys, eagle/avian use surveys, and prairie grouse lek surveys. Additional avian surveys focused on the migration period (generally defined as spring [March 15 to May 1] and fall [September 1 to October 31]) or breeding period (generally defined as May 1 to August 31) were not recommended by USFWS or SDGFP and were, therefore, not completed, because the agencies agreed that wind projects in this region have overall low effects on avian migrants and breeding birds if turbines are sited to avoid sensitive habitats.

The reports detailing the methods and results of the avian surveys are included in Appendices D-H and summarized below.

Raptor and Eagle Nest Surveys

Aerial raptor nest surveys were completed in April 2016 (Appendix D) and April 2017 (Appendix E) to characterize the raptor nesting community and locate nests for all raptors within the Project Area and 1-mile buffer, and for eagles within 10 miles of the Project.

Aerial surveys were completed prior to leaf-out and during the breeding season when raptors would be actively tending nests, incubating eggs, or brood-rearing. Raptor nest surveys focused on locating stick nest structures in suitable raptor nesting substrate (trees, transmission lines, cliff faces, etc.) within each respective survey area.

Non-Eagle Raptor Nests – During the April 2016 and 2017 surveys, a total of 32 non-eagle raptor nests (15 occupied and 17 unoccupied) were located within the Project Area and 1-mile buffer. The occupied nests were primarily common species (11 red-tailed hawk, 3 great horned owl, and 1 unknown non-eagle raptor), and none of the unoccupied nests exhibited characteristics of eagle nests.

Eagle Nests – During the April 2016 survey, three occupied bald eagle (*Haliaeetus leucocephalus*) nests were recorded, all outside the Project Area approximately 2.3, 3.5, and 7.4 miles from the Project boundary. One unoccupied potential bald eagle nest was also recorded outside of the Project Area, approximately 8.7 miles from the Project boundary. During the April 2017 survey, five occupied bald eagle nests were recorded, all outside the Project Area, approximately 1.8, 3.5, 7.4, 9.0, and 10.7 miles from the Project boundary. Another bald eagle nest that was occupied and active in 2016 was unable to be located in 2017. The nearest occupied bald eagle nest to the Project Area was located approximately 1.8 miles west of the Project boundary. The nearest occupied eagle nest to a proposed turbine location is over 3.7 miles east from a proposed turbine.

Avian Use Surveys

Avian/eagle use point-count surveys were completed for the Project during winter and spring from December 2015 through May 2017 to evaluate species composition, relative abundance, and spatial characteristics of avian use in accordance with agency recommendations (Appendix F).

Because eagles have the potential to occur in the region, eagle surveys were completed using methodology consistent with the USFWS ECPG (USFWS, 2013). The surveys recorded data for small and large bird species, eagles, and species of concern (i.e., federally or state-threatened and endangered species [Endangered Species Act 1973], USFWS Birds of Conservation Concern [BCC; USFWS, 2008], and South Dakota Species of Greatest Conservation Need [SGCN; SDGFP, 2017a]).

Fixed-point avian use surveys were completed approximately once monthly during winter and spring from December 2015 to May 2017 at 40 survey points. The 40 survey plots are representative of areas proposed for development areas and encompass approximately 30 percent of the Project Area. Twenty small bird species, with 753 observations in 153 groups, were recorded during surveys. The most commonly observed small bird species were red-winged blackbird (*Agelaius phoeniceus*; 408 observations) and horned lark (*Eremophila alpestris*; 104 observations). Thirty large bird species, with 1,863 observations in 126 groups, were recorded during surveys. The most commonly recorded species were waterfowl, comprising 84 percent of the total number of large bird observations. Canada goose (*Branta canadensis*), greater white-fronted goose (*Anser albifrons*), and snow goose (*Chen caerulescens*) accounted for most of those observations. Six raptor species were identified during the large bird surveys, which accounted for 20 raptor observations or 1 percent of large bird observations. Red-tailed hawk (*Buteo jamaicensis*; 10 observations) was the most commonly observed raptor, followed by northern harrier (*Circus cyaneus*; four observations).

No federally listed species and one state-listed species (peregrine falcon [*Falco peregrinus*; 1 observation]) were observed during the study. No golden eagles (*Aquila chrysaetos*) were observed during surveys, and one bald eagle was observed in winter (December 3, 2015) and one in spring (March 3, 2017). Four BCC species and four SGCN species were documented in low numbers.

Prairie Grouse Lek Surveys

In 2016, aerial-based lek surveys were completed for sharp-tailed grouse and greater prairie-chicken within the Project Area and a 0.5-mile buffer (Appendix G). The Project boundary was modified after the 2016 surveys to include additional area; therefore, additional ground-based lek surveys were completed in 2017 within the unsurveyed portions of the Project Area and 0.5-mile buffer (Appendix H). In addition, previously documented leks from 2016 were revisited to evaluate 2017 status.

During the 2016 surveys, one potential sharp-tailed grouse lek was documented within the Project Area, and one confirmed greater prairie-chicken lek was documented within the 0.5-mile buffer. During the 2017 surveys, one confirmed and one potential sharp-tailed grouse lek were documented within the Project Area, and the leks documented in 2016 were not found and, therefore, were classified as historic. Results of the 2016 and 2017 surveys indicate that both sharp-tailed grouse and greater prairie chickens are present at low density in and within 0.5 mile of the Project. The nearest known lek is located approximately 0.4 mile from the nearest proposed turbine location

14.3.1.4.2 Bats

There are thirteen species of bats that inhabit South Dakota (SDGFP, 2017b), six of which have the potential to occur within the Project Area (Table 14-6). Of these species, the northern long-eared bat (*Mytois septentrionalis*) is the only state and federally listed bat with the potential to occur within the area.

Table 14-6: Bat Species Potentially Occurring in Project Area

Common Name	Scientific Name
Red bat	*Lasiurus borealis*
Hoary bat	*Lasiurus cinereus*
Silver-haired bat	*Lasionycteris noctivagans*
Northern long-eared bat	*Myotis septentrionalis*
Little brown myotis	*Myotis lucifugus*
Big brown bat	*Eptesicus fuscus*

Source: South Dakota Bat Working Group, 2004

Acoustic bat surveys were completed for the Summit Wind Farm (proposed wind farm adjacent to Dakota Range) from May 15 through October 11, 2015, during which time 1,567 bat passes over 238 detector nights were recorded. Bat activity was higher within areas of potential bat habitat (e.g., treed areas), which recorded 97 percent of the bat passes, when compared to activity in areas where turbines are likely to be placed (e.g., open field habitats). Bat pass rates were higher during the fall monitoring period compared to the summer monitoring period, with a peak during the last week of July through early August. The majority (53 percent) of the bat passes were classified as low-frequency bats (e.g., big brown bat, hoary bat, and silver-haired bat), and 47 percent of the bat passes were classified as high-frequency bats (e.g., red bat and *Myotis* species).

As documented in Appendix B, the Applicant met with USFWS and SDGFP on multiple occasions to discuss risk to bats and agree upon appropriate response measures. It was agreed that data collected from the adjacent Summit Wind Farm was sufficient to assess risk at the Project due to similarity in habitats (WEST, 2015) and no site-specific acoustic studies were warranted. The Project Area contains very few trees or areas of open water that would provide suitable habitat for bats; therefore, it was agreed that the period of risk to bats, including the listed northern long-eared bat, is primarily during fall migration.

14.3.2 Wildlife Impacts/Mitigation

Terrestrial wildlife species could be impacted at various spatial and temporal scales during the construction and operation of the Project. Direct disruption of habitat and potentially direct mortality

could occur during the construction phase of the Project to some less mobile animals. Permanent wildlife habitat loss and functionality due to construction and operation of the Project would be minimal across the Project Area.

14.3.2.1 Federally Listed Species

The only federally listed species determined to have the potential to occur within the Project Area are the endangered Poweshiek skipperling, and the threatened Dakota skipper and northern long-eared bat. No suitable habitat for the Poweshiek skipperling was identified in the Project Area, and areas identified as potentially suitable Dakota skipper habitat have been avoided through Project design. Due to the lack of suitable habitat and avoidance of potential habitat, impacts to these species are not anticipated.

To minimize potential impacts to the northern long-eared bat, turbines and access roads have been sited to avoid wooded draws and shelterbelts (potential northern long-eared bat habitat) to the extent possible, and minimal tree removal is expected. If tree removal is necessary, removal will occur between August 1 and May 31 to minimize potential impacts to roosting northern long-eared bats, as well as other tree-roosting bats. In addition, risk of collision will be reduced by feathering the turbines to manufacturer's cut in speed from sunset to sunrise during the bat active period (Apr 15-Oct 15) to avoid potential impacts to bats flying and/or migrating through the Project Area. Additional avoidance and minimization measures are identified in Section 14.3.2.5.

14.3.2.2 State-Listed Species

The only state-listed species documented to occur during site-specific studies completed for the Project was peregrine falcon (state-endangered). Only one individual was observed during 221 hours of systematic avian study, suggesting that use of the Project by this species and associated risk of impact is very low. The avoidance and minimization measures identified in Section 14.3.2.5 will be implemented for the protection of wildlife, including state-listed species. Given the low risk of impact to state-listed species, no additional species-specific mitigation measures are necessary.

14.3.2.3 Avian Species

Potential impacts to avian species from the construction and operation of the Project include indirect impacts, such as the removal, degradation, and fragmentation of habitat, and direct impacts, such as turbine blade strikes. Indirect impacts will be minimized by siting facilities within previously disturbed areas and avoiding untilled grassland habitats and forested areas to the extent practicable. Additionally, all areas of temporary disturbance will be reclaimed with vegetation consistent with the surrounding vegetation types.

Direct impacts to birds, including species of concern, from the operation of this Project are anticipated to be low based on pre-construction survey results. Four BCC species and four SGCN species were documented at very low numbers, indicating low risk of significant impacts to these species. The most commonly observed species during the avian use surveys represent common, widespread species. Raptor use documented for the Project Area was low compared to other wind project sites sited in similar habitat, and species documented consisted primarily of common raptors, suggesting risk of impacts are not likely to be significant at the local or regional population level (see data on bird use and fatality estimates in Appendix B and C of the Avian Use Survey Report [Appendix F]). To prevent potential bird strikes with electric lines, collector lines will be buried underground.

The majority of bird species observed during the surveys are widespread and abundant, and most are at low risk of collision with turbines or impacts due to the high amount of agricultural lands and localized habitat fragmentation. Analysis of the data collected during the avian surveys generally indicated that potential impacts to birds, including species of concern, diurnal raptors, grassland species and eagles are expected to be low as evidenced by data from regional wind projects operating in similar habitats (see data on bird use and fatality estimates in Appendix B and C of the Avian Use Survey Report [Appendix F]). Additional avoidance and minimization measures are identified in Section 14.3.2.5.

14.3.2.4 Bats

Potential impacts to bat species from the construction and operation of the Project include indirect impacts, such as removal, degradation, and fragmentation of roosting and foraging habitat, and direct impacts including turbine blade strikes. Turbines and access roads have been sited to avoid wooded draws and shelterbelts to the extent possible and minimal tree removal is expected. To minimize degradation of habitat, all areas of temporary disturbance will be reclaimed with vegetation consistent with the surrounding vegetation types. All publicly available curtailment studies to date show an inverse relationship between cut-in speeds and bat mortality. Feathering below the manufacturer's cut-in speed is expected to reduce overall bat mortality by a minimum of 35 percent (Good et al., 2012; Young et al., 2011; Baerwald et al., 2009). Therefore, risk of direct impact to bats will be reduced by feathering the turbines to manufacturer's cut in speed from sunset to sunrise during the bat active period (Apr 15-Oct 15). Additional avoidance and minimization measures are identified in Section 14.3.2.5.

14.3.2.5 Avoidance, Minimization and Mitigation Measures

Dakota Range is preparing a Bird and Bat Conservation Strategy (BBCS) in accordance with the USFWS WEG that will be implemented to minimize impacts to avian and bat species during construction and operation of the Project. The following impact minimization and avoidance measures, developed in

coordination with the USFWS and SDGFP, will be implemented for the Project to ameliorate potential negative biological impacts as a result of construction and operation of the proposed facility:

- Minimize ground disturbance/clearing of native grasslands;
- Avoid potentially suitable Dakota skipper habitat;
- Avoid siting turbines in wetland/waterbodies;
- Avoid siting turbines within 0.3 mile of active or potential leks and follow construction timing recommendations within 2 miles;
- Feather blades to manufacturer's cut-in speed from sunset to sunrise during the bat active period (April 15 – October 15);
- Avoid tree removal from June 1 through July 31 to minimize risk of impact to northern long-eared bat maternal roosts and other tree roosting habitat;
- Train staff to recognize whooping cranes and eagles, and if observed, evaluate risk and respond appropriately; and
- Monitor during operations in year 1 to assess low risk conclusions.

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

ARSD 20:10:22:17. 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.*

The following sections describe the existing aquatic ecosystems within the Project Area, the potential impacts to aquatic ecosystems as a result of the Project, and mitigation and minimization measures planned to ameliorate potential impacts to aquatic systems.

15.1 Existing Aquatic Ecosystems

As described in Section 13.2.1.1, the majority of the Project Area is located within the Big Sioux watershed, part of the Missouri River Basin surface water drainage system, and the northeastern portion of the Project Area is located within the Minnesota River watershed. Perennial streams and intermittent drainages bisect the terrain. Named perennial streams within the Project Area include Indian River, Soo Creek, Mahoney Creek, and Mud Creek. As described in Section 14.2.1, a total of 122 wetlands were delineated during field surveys, for a total of 567 acres of wetlands within the area surveyed. In addition to the delineated wetlands, a total of 80 other waterbodies were delineated during field surveys. These waterbodies consisted of 60 cattle ponds, 10 stream reaches, and 10 impoundments.

15.1.1 Federally Listed Aquatic Species

There is one federally listed aquatic species, the endangered Topeka shiner, that could potentially occur in the Project Area. Based on coordination with the USFWS and SDGFP, the agencies concurred that habitat for the Topeka shiner is not expected to occur in the Project Area (Appendix B). The nearest suitable habitat to the Project Area is Willow Creek, which is more than 8 miles south of the Project Area.

15.1.2 State-Listed Aquatic Species

State-listed aquatic species identified as potentially occurring within Grant and Codington Counties are identified in Table 15-1. SDGFP agreed that these species are unlikely to occur wihthin the Project Area, therefore risk to these sepcies is considered low and species-specific surveys were not necessary.

Table 15-1: State-Listed Aquatic Species in Grant and Codington Counties

Species	Status	Potential to Occur
Blacknose shiner	State-Endangered	Project outside range; unlikely to occur.
Northern redbelly dace	State-Threatened	Unlikely to occur.

Source: https://gfp.sd.gov/wildlife/docs/ThreatenedCountyList.pdf (March 2017); doesn't include federally listed species

15.2 Aquatic Ecosystems Impacts/Mitigation

As described in Section 14.2.2, impacts to wetlands and other waterbodies would be minimal, because these features have been avoided during design of the Project to the extent possible, and those impacts that are required are managed per State and Federal requirements. The primary potential for impact to aquatic ecosystems would be from increased sedimentation or increased total suspended solids due to soil erosion during Project construction; however, this risk is managed via implementation of the SWPPP required prior to construction. USFWS and SDGFP have been consulted regarding the federally and state-listed aquatic species with potential to occur in or near the Project, and both agencies agree that the species are not anticipated to be affected by the Project.

16.0 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.

The following sections describe the existing land use, sound, and aesthetics within the Project Area, the potential land use impacts of the Project, and measures that will be utilized to avoid, minimize, and/or mitigate potential impacts.

16.1 Land Use

The existing land uses within the Project Area are described below, followed by a discussion of the potential effects of the proposed Project's construction and operation on land use, and the proposed mitigation and minimization measures to ameliorate impacts.

16.1.1 Existing Land Use

Land use within the Project Area is predominantly agricultural, consisting of a mix of cropland, hayland, pastureland, and rangeland. Occupied farm sites and rural residences are located throughout the Project Area. Figure 12 is a land use map of the Project Area based on the classification system specified in ARSD 20:10:22:18(1). The following land use classifications occur within the Project Area:

- Land used primarily for row and non-row crops in rotation
- Irrigated lands
- Pasturelands and rangelands

- Haylands
- Undisturbed native grasslands
- Rural residences and farmsteads, family farms, and ranches
- Public, commercial, and institutional use
- Noise sensitive land uses

The following land use classifications were not identified within the Project Area:

- Existing and potential extractive nonrenewable resources
- Other major industries
- Residential
- Municipal water supply and water sources for organized rural water systems

In Codington County in 2012 (the latest available year for the USDA Census of Agriculture), approximately 69 percent of the farmland area was cropland, with corn for grain being the most common crop (USDA, 2012a). Soybeans for beans was the second most common cultivated crop in the county. Cultivated cropland in Codington County increased by 3 percent from 247,710 acres in 2007 to 255,903 acres in 2012 (USDA, 2012b). In Codington County in 2012, approximately 22 percent of the farmland area was pastureland (USDA, 2012a). Pastureland decreased 15 percent from 99,773 acres in 2007 to 84,359 acres in 2012 (USDA, 2012b).

In Grant County in 2012, approximately 68 percent of the farmland area was cropland, with corn for grain being the most common crop (USDA, 2012c). Soybeans for beans was the second most common cultivated crop in Grant County. Cultivated cropland in Grant County increased by 10 percent from 263,680 acres in 2007 to 290,676 acres in 2012 (USDA, 2012b). In Grant County in 2012, approximately 27 percent of the farmland area was pastureland (USDA, 2012c). Pastureland increased 36 percent from 91,869 acres in 2007 to 125,399 acres in 2012 (USDA, 2012b).

Specific acreages of different crops within the Project Area, which change from year to year, are not available.

16.1.2 Land Use Impacts/Mitigation

Construction of the Project will result in the conversion of land within the Project Area from existing agricultural land uses into a renewable energy resource during the life of the Project. Temporary impacts from the proposed Project will also result. Land use impacts associated with construction staging and laydown areas and underground collector lines will be temporary. Following construction, the areas will

be returned to pre-construction land uses, which primarily consist of cultivated croplands and pastureland/grassland.

The proposed Project is compatible with the existing agricultural land uses in areas surrounding the Project facilities. Agricultural uses will continue within the Project Area during construction and operation. It is estimated that approximately 647 acres of agricultural land would be temporarily impacted by Project construction, and 65 acres of agricultural land would be impacted during the life of the Project (less than 0.2 percent of the total land within the Project Area; see Table 11-1). Areas disturbed due to construction that would not host Project facilities would be re-vegetated with vegetation types matching the surrounding agricultural landscape. Agricultural impacts are discussed further in Section 21.2.2. As discussed in Chapter 24.0, the facility would be decommissioned after the end of the Project's operating life. Facilities would be removed in accordance with applicable State and County regulations, unless otherwise agreed to by the landowner. Disturbed surfaces would be graded, reseeded, and restored as nearly as possible to their preconstruction conditions. After decommissioning for the Project is complete, no irreversible changes to land use would remain beyond the operating life of the Project.

There are 73 occupied residences within the Project Area. Based on the proposed Project layout of turbines, access roads, collector lines, and associated facilities, there would be no displacement of residences or businesses due to construction of the Project facilities.

16.2 Public Lands and Conservation Easements

The existing public lands and conservation easements within the Project Area are described below, followed by a discussion of the potential effects of the proposed Project's construction and operation, and potential avoidance, minimization, and mitigation measures.

16.2.1 Existing Public Lands and Conservation Easements

Figure 13 is a map showing publicly owned or managed lands and conservation easements within or adjacent to the Project Area.

USFWS Wetland and Grassland Easements – Based on data provided by the USFWS Habitat and Population Evaluation Team (HAPET) in January 2017, six wetland easement parcels, eight grassland easement parcels, and one combined wetland/grassland conservation easement parcel managed by the USFWS as part of the Waubay National Wildlife Refuge Complex are within the Project Area. USFWS wetland and grassland easements are part of the National Wildlife Refuge System and are managed for the protection of wildlife and waterfowl habitat. Three of the grassland easements in the Project Area are Dakota Tallgrass Prairie Wildlife Management Areas, which are managed to protect tallgrass prairie.

USFWS Waterfowl Production Areas – There are three Grant County Waterfowl Production Areas, which are managed by the USFWS Waubay Wetland Management District, located adjacent to, but not within, the Project Area. Waterfowl Production Areas are satellite areas of the National Wildlife Refuge System and are managed for the preservation of wetlands and grasslands critical to waterfowl and other wildlife.

SDGFP Game Production Areas – There is one Game Production Area (Mazzeppa) located adjacent to, but not within, the Project Area. Game Production Areas are state lands managed by the SDGFP for the production and maintenance of wildlife.

SDGFP Walk-In Areas – There are four parcels of privately owned lands within the Project Area that are leased for public hunting access by SDGFP (referred to as Walk-In Areas).

16.2.2 Impacts/Mitigation to Public Lands and Conservation Easements

The USFWS Waterfowl Production Areas and SDGFP Game Production Areas are located outside of the Project Area, and, therefore, no direct impacts to these public lands would occur from the Project. The Applicant coordinated with the USFWS regarding the exact boundaries of the USFWS Wetland and Conservation easements within the larger easement parcels shown on Figure 13. The actual easement is a subset of these parcels (i.e., actual wetland areas for wetland easements and the area defined in the lease amendments for the conservation easements). The Project has been designed such that no Project facilities (e.g., turbines, collector lines, access roads) would be placed on these USFWS Wetland, Conservation, or Grassland Easements, and thus, no direct impacts to these easement areas would occur.

Five turbines (and associated access roads and collector lines) would be placed on three of the privately owned Walk-In Areas. During Project construction, there could be temporary access disruptions to these Walk-In Areas for hunting during construction, although it is unlikely. During operation of the Project, impacts to these lands would result due to placement of turbines and access roads. South Dakota's Walk-In Areas allow public hunting on private lands. Lands enrolled in the program do not require permission for private individuals to hunt on the land, and landowners receive lease payments from SDGFP as compensation. The Applicant would coordinate with landowners regarding impacts and access to Walk-In Hunting Areas.

16.3 Sound

The existing sound levels within the Project Area are described below, followed by a discussion of the potential effects of the proposed Project's construction and operation, and potential avoidance, minimization, and mitigation measures.

16.3.1 Existing Sound Levels and Regulatory Framework

The Project Area is located in rural Codington and Grant Counties. The Project Area contains cropland, grassland, and rural residences scattered throughout. Farming activities and vehicular traffic are assumed to be the largest contributor to sound, although ambient sound measurements have not been recorded for the Project Area at this time. A sound level modeling study was conducted for the Project in December 2017 (Appendix I). Following is information from the report on sound terminology and noise regulations applicable to the Project.

16.3.1.1 Sound Terminology

There are several ways in which sound (noise) levels are measured and quantified. All of them use the logarithmic decibel (dB) scale. The decibel scale is logarithmic to accommodate the wide range of sound intensities found in the environment. A property of the decibel scale is that the sound pressure levels of two or more separate sounds are not directly additive. For example, if a sound of 50 dB is added to another sound of 50 dB, the total is only a 3-decibel increase (53 dB), which is equal to doubling in sound energy but not equal to a doubling in decibel quantity (100 dB). Thus, every 3-dB change in sound level represents a doubling or halving of sound energy. Relative to this characteristic, a change in sound levels of less than 3 dB is imperceptible to the human ear.

Another mathematical property of decibels is that if one source of noise is at least 10 dB louder than another source, then the total sound level is simply the sound level of the higher-level source. For example, a sound source at 60 dB plus another sound source at 47 dB is equal to 60 dB.

A sound level meter (SLM) that is used to measure sound is a standardized instrument.[8] It contains "weighting networks" (e.g., A-, C-, Z-weightings) to adjust the frequency response of the instrument. Frequencies, reported in Hertz (Hz), are detailed characterizations of sounds, often addressed in musical terms as "pitch" or "tone". The most commonly used weighting network is the A-weighting because it most closely approximates how the human ear responds to sound at various frequencies. The A-weighting network is the accepted scale used for community sound level measurements; therefore, sounds are frequently reported as detected with a sound level meter using this weighting. A-weighted sound levels emphasize middle frequency sounds (i.e., middle pitched – around 1,000 Hz), and de-emphasize low and high frequency sounds. These sound levels are reported in decibels designated as "dBA". Sound pressure levels for some common indoor and outdoor environments are shown in Figure 14.

[8] *American National Standard Specification for Sound Level Meters*, ANSI S1.4-1983 (R2006), published by the Standards Secretariat of the Acoustical Society of America, Melville, NY.

Because the sounds in the environment vary with time, many different sound metrics may be used to quantify them. There are two typical methods used for describing variable sounds. These are exceedance levels and equivalent levels, both of which are derived from a large number of moment-to-moment A-weighted sound pressure level measurements. Exceedance levels are values from the cumulative amplitude distribution of all of the sound levels observed during a measurement period. Exceedance levels are designated L_n, where "n" is a value (typically an integer between 1 and 99) in terms of percentage. Equivalent levels are designated L_{eq} and quantify a hypothetical steady sound that would have the same energy as the actual fluctuating sound observed. The two sound level metrics that are commonly reported in community noise monitoring are described below.

- L_{90} is the sound level in dBA exceeded 90 percent of the time during a measurement period. The L_{90} is close to the lowest sound level observed. It is essentially the same as the residual sound level, which is the sound level observed when there are no obvious nearby intermittent noise sources.
- L_{eq}, the equivalent level, is the level of a hypothetical steady sound that would have the same energy (*i.e.,* the same time-averaged mean square sound pressure) as the actual fluctuating sound observed. The equivalent level is designated L_{eq} and is commonly A-weighted. The equivalent level represents the time average of the fluctuating sound pressure, but because sound is represented on a logarithmic scale and the averaging is done with time-averaged mean square sound pressure values, the L_{eq} is mostly determined by occasional loud noises.

16.3.1.2 Noise Regulations

There are no Federal or State community noise regulations applicable to this Project. The portion of the Project within Codington County is subject to the following sound level requirements in Section 5.22.03(12) of Ordinance #65 Zoning Ordinance of Codington County, Noise subsection of General Provisions for Wind Energy Systems (WES):

> *Noise level shall not exceed 50 dBA, average A-weighted Sound pressure including constructive interference effects at the property line of existing off-site residences, businesses, and buildings owned and/or maintained by a governmental entity.*

The portion of the Project within Grant County is subject to the following sound level requirements in Section 1211.04(13) of the Zoning Ordinance for Grant County, Noise subsection of General Provisions for Energy Systems (WES):

Noise level shall not exceed 50 dBA, average A-weighted Sound pressure including constructive interference effects at the perimeter of the principal and accessory structures of existing off-site residences, businesses, and buildings owned and/or maintained by a governmental entity.

16.3.2 Sound Level Impacts/Mitigation

The sound level modeling study, conducted for the Project in December 2017, is included in Appendix I. Following is information from the report on the anticipated sound levels from construction and operation of the Project.

16.3.2.1 Construction Sound Levels

The majority of the construction activity related to the Project will occur around each of the wind turbine sites. Full construction activity will generally occur at one wind turbine site at a time, although there will be some overlap at adjacent sites for maximum efficiency. There are generally three phases of construction at a wind energy project – excavation, foundations, and turbine erection. Table 16-1 presents the equipment sound levels for the louder pieces of construction equipment expected to be used at this site along with their phase of construction.

Table 16-1: Sound Levels for Construction Noise Sources

Phase	Equipment	Sound Level at 50 feet (dBA)
Excavation	Grader	85
Excavation	Bulldozer	82
Excavation	Front-end loader	79
Excavation	Backhoe	78
Excavation	Dump truck	76
Excavation	Roller	80
Excavation	Excavator	81
Excavation	Rock drill	89
Foundation	Concrete mixer truck	79
Foundation	Concrete pump truck	81
Foundation	Concrete batch plant	83
Turbine erection	Large crane #1	81
Turbine erection	Large crane #2	81
Turbine erection	Component delivery truck	84
Turbine erection	Air compressor	78

Source: Sound Level Modeling Report, Appendix I

Construction of the Project is expected to take multiple months. Construction of a single wind turbine from excavation to foundation pouring to turbine erection is roughly a three-week process. However, work will not proceed in that order for each wind turbine to be erected. For example, all foundations will be poured before any turbine erection work begins. Sound impacts would be reduced by scheduling heavy construction work during daylight hours, to the extent possible. Excavation work is expected to occur from early morning to the evening. Concrete foundation work and turbine erection work could extend into the overnight hours depending on the weather and timing of a concrete pour which must be continuous. Excavation work will be daytime only. Construction sound would comply with applicable county and State requirements, regulations, and ordinances.

16.3.2.2 Operational Sound Levels

The sound level modeling analysis conservatively included the 72 proposed primary wind turbine locations, as well as the 25 proposed alternate turbine locations. The analysis used a technical report from Vestas[9] which documented the expected sound power levels associated with the Vestas V136-4.2 wind turbine. According to these technical documents, which included broadband and third octave-band A-weighted sound power levels for various wind speeds, the maximum sound power level for the V136-4.2 of 103.9 dBA occurs at hub height wind speeds of 9 m/s (and above). These sound power levels represent an "upper 95% confidence limit for the wind turbine performance" and do not include any additional uncertainty factor. Octave-band sound levels were calculated from the third octave-band levels representing the maximum sound power level for the sound modeling.

In addition to the wind turbines, there will be a collection substation associated with the Project. Two 167 megavolt-ampere (MVA) transformers are proposed for the substation. Octave-band sound power levels were estimated using the MVA rating provided for the transformer and techniques in the Electric Power Plant Environmental Noise Guide (Edison Electric Institute), Table 4.5 Sound Power Levels of Transformers.

The noise impacts associated with the proposed wind turbines were predicted using the Cadna/A noise calculation software developed by DataKustik GmbH. This software uses the ISO 9613-2 international standard for sound propagation (Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation). The benefits of this software are a more refined set of computations due to the inclusion of topography, ground attenuation, multiple building reflections, drop-off with distance, and atmospheric absorption. The Cadna/A software allows for octave band calculation of sound from

[9] Vestas Wind Systems A/S, V136-4.0 MW Third octave noise emission, 2017. Confidential documentation and information.

multiple sources as well as computation of diffraction. The inputs and significant parameters employed in the model are described in the Sound Level Modeling Report in Appendix I.

The highest wind turbine sound power level for each wind turbine type including uncertainty (105.9 dBA) was input into Cadna/A to model wind turbine generated sound pressure levels during conditions when worst-case sound power levels are expected. Sound pressure levels due to operation of all 97 wind turbines and the substation transformer were modeled at 189 sensitive receptors (i.e., occupied structures) in Codington and Grant Counties. In addition to modeling at discrete points, sound levels were also modeled throughout a large grid of receptor points, each spaced 25 meters apart to allow for the generation of sound level isolines.

Table B-1 in the Sound Level Modeling Report (see Appendix I) shows the predicted "Project-Only" broadband (dBA) sound levels for the 86 receptors in Codington County. These sound levels range from 17 to 43 dBA. The predicted "Project-Only" broadband sound levels at 267 accessory structures in Codington County ranged from 14 to 43 dBA. Table B-2 in the Sound Level Modeling Report (see Appendix I) shows the predicted "Project-Only" broadband (dBA) sound levels for the 103 receptors in Grant County. These sound levels range from 22 to 45 dBA. The predicted "Project-Only" broadband sound levels at 288 accessory structures in Grant County ranged from 23 to 47 dBA. In addition to these receptor points, sound level isolines generated from the modeling grid are presented in Figure 5-2 in the Sound Level Modeling Report (see Appendix I).

Codington County – The sound level limit in Codington County regulation for a WES is 50 dBA at a property line of an existing off-site occupied structure. The predicted worst-case sound levels from the Project are well below the 50-dBA limit at all modeled occupied structures in Codington County. The highest sound level at a receptor in Codington County is modeled to be 43 dBA. This is at an off-site occupied structure. Sound levels at the modeled accessory structures do not exceed 43 dBA. Sound level isolines in Figure 5-2 of the Sound Level Modeling Report show no location where Project-related noise exceeds 50 dBA at any off-site property line. Therefore, the Project meets the requirements with respect to sound in the county regulation.

Grant County – The sound level limit in the Grant County regulation for a WES is 50 dBA at the perimeter of an existing off-site principal (occupied) structure and accessory structure. The predicted worst-case sound levels from the Project are well below the 50-dBA limit at all modeled occupied structures in Grant County. The highest sound level at a receptor in Grant County is modeled to be 45 dBA. This is at a participating occupied structure. The highest modeled sound level at a non-participating

receptor is 44 dBA. Additionally, the highest sound level modeled at an accessory structure in Grant County is 47 dBA. This is at a participating accessory structure, and the highest modeled sound level at a non-participating accessory structure is 44 dBA. Therefore, the Project meets the requirements with respect to sound in the county regulation.

Because the wind turbines have been sited to avoid exceeding county regulatory sound level limits, no further mitigation for sound is required.

16.4 Shadow Flicker

A shadow flicker modeling study was conducted for the Project in December 2017 (Appendix J). Following is information from the report on the modeling methodology and results.

With respect to wind turbines, shadow flicker can be defined as an intermittent change in the intensity of light in a given area resulting from the operation of a wind turbine due to its interaction with the sun. While indoors, an observer experiences repeated changes in the brightness of the room as shadows cast from the wind turbine blades briefly pass by windows as the blades rotate. In order for this to occur, the wind turbine must be operating, the sun must be shining, and the window must be within the shadow region of the wind turbine, otherwise there is no shadow flicker. A stationary wind turbine only generates a stationary shadow similar to any other structure.

Shadow flicker was modeled using a software package, WindPRO version 3.1.617. WindPRO is a software suite developed by EMD International A/S and is used for assessing potential environmental impacts from wind turbines. Using the Shadow module within WindPRO, worst-case shadow flicker in the area surrounding the wind turbines was calculated based on data inputs including: location of the wind turbines, location of discrete receptor points, wind turbine dimensions, flicker calculation limits, and terrain data. Based on these data, the model was able to incorporate the appropriate sun angle and maximum daily sunlight for this latitude into the calculations. The resulting worst-case calculations assume that the sun is always shining during daylight hours and that the wind turbine is always operating. The WindPRO Shadow module can be further refined by incorporating sunshine probabilities and wind turbine operational estimates by wind direction over the course of a year. The values produced by this further refinement, also known as the “expected” shadow flicker, are presented in the report.

The shadow flicker modeling analysis conservatively included the 72 proposed primary wind turbine locations, as well as the 25 proposed alternate turbine locations. The inputs and significant parameters employed in the model are described in the Shadow Flicker Modeling Report in Appendix J.

WindPRO was used to calculate shadow flicker at the 189 discrete modeling points in Codington and Grant Counties and generate shadow flicker isolines based on the grid calculations. Table B-1 in the Shadow Flicker Modeling Report (see Appendix J) presents the modeling results for these modeling receptor locations. Utilizing the conservative modeling parameters, the shadow flicker modeling results indicate that 20 of the 189 receptors may experience shadow flicker levels between 10 and 30 hours per year, with the annual maximum expected level of shadow flicker at a non-participating residence at 29 hours. While the modeling indicates that 11 participating residences could experience annual shadow flicker levels above 30 hours per year, since the modeling treated homes as "greenhouses" and assumed no vegetation or other existing structures, the "expected" levels are likely higher than actual levels will be. Dakota Range plans to discuss the results with participating landowners and, if concerns are raised, will conduct modeling using site-specific data to further refine results. Additionally, mitigation measures, such as vegetative screening or darkening shades, can be implemented to address shadow flicker concerns should they arise after the Project is operational.

As discussed in Section 10.2 (see Table 10-1), the Project has committed to limit shadow flicker to 30 hours per year or less at non-participating residences, businesses, and buildings owned and/or maintained by a governmental entity, per industry guidelines. Even using the conservative modeling methodology described above, the Project is not projected to result in shadow flicker levels above 30 hours per year at any non-participating residence, business, or building owned and/or maintained by a governmental entity.

16.5 Electromagnetic Interference

There is the potential for communication systems to experience disturbances from electric feeder and communication lines associated with wind farms. Based on a desktop review, eight Federal Communications Commission (FCC)-regulated systems were identified within the Project Area. The turbines are sited so as to not create disturbances to communications system by ensuring that the rotors are outside of any communication beam paths. If, after construction, the Applicant receives information relative to communication systems interference potentially caused by operation of the wind turbines in areas where reception is presently good, the Applicant would resolve such problems on a case-by-case basis.

16.6 Visual Resources

The existing visual resources within the Project Area are described below, followed by a discussion of the potential effects of the proposed Project's construction and operation and mitigation and minimization measures.

16.6.1 Existing Visual Resources

Cropland, grassland, large open vistas, and gently rolling topography visually dominate the Project Area landscape. Vegetation in and near the Project Area is predominantly cropland and grassland/pasture. Existing structures in the Project Area consist of occupied residences dispersed throughout, as well as scattered farm buildings. Interstate 29, State Highway 20, and county and township roads extend through the Project Area.

Visual impacts to the landscape attributable to the Project would depend on the extent to which the existing landscape is already altered from its natural condition, the number of viewers (residents, travelers, visiting recreational users, etc.) within visual range of the area, and the degree of public or agency concern for the quality of the landscape. There are 73 occupied residences within the Project Area (Figure 12). Travelers through the Project Area would include local or regional traffic along Interstate 29 and State Highway 20. USFWS Waterfowl Production Areas, USFWS Wetland and Grassland Easements, SDGFP Game Production Areas, and SDGFP Walk-In Areas for public hunting and recreation are present within the Project Area.

16.6.2 Visual Impacts

Visual impacts can be defined as the human response to the creation of visual contrasts that result from the introduction of a new element into the viewed landscape. These visual contrasts interact with the viewer's perception, preferences, attitudes, sensitivity to visual change, and other factors that vary by individual viewer to cause the viewer to react negatively, positively, or neutrally to the changes in the viewed landscape.

Construction, operation, and decommissioning of the proposed Project would potentially introduce visual contrasts in the Project Area that may cause visual impacts. The types of visual contrasts of concern include the potential visibility of wind turbines, electric transmission structures and conductors, and associated facilities such as roads; marker lighting on wind turbines and transmission structures as well as security and other lighting; modifications to landforms and vegetation; vehicles associated with transport of workers and equipment for construction, operations and maintenance, and facility decommissioning; and the construction, operation, maintenance, and decommissioning activities themselves. A subset of potential visual impacts associated with wind turbine generator structures are blade movement, blade glinting[10], and shadow flicker (discussed in Section 16.4).

[10] Reflection of sunlight from moving wind turbine blades when viewed from certain angles under certain lighting conditions.

The primary visual impacts associated with the Project would result from the introduction of the numerous vertical lines of the wind turbines into the generally strongly horizontal landscape found in the Project Area. The visible structures would potentially produce visual contrasts by their design attributes (form, color, and line) and the reflectivity of their surfaces and potential glare. In addition, marker lighting would be visible at night.

For nearby viewers including the rural residences dispersed throughout the Project Area, the large sizes and strong geometric lines of both the individual turbines themselves and the array of turbines could dominate views, and the large sweep of the moving rotors would tend to command visual attention. Structural details, such as surface textures, could become apparent, and the O&M facility and other structures could be visible as well, as could reflections from the towers and moving rotor blades (blade glint). Measuring the aesthetic value of a specific landscape is difficult and may vary based on an individual's personal values, experiences, or preferences. The degree of visual contrast will vary based on the viewpoint distance and location in relation to the Project.

As discussed above, viewers within the Project Area include the occupied residences, travelers along Interstate 29 and State Highway 20, and hunters utilizing the public hunting areas. For these viewers, the magnitude of the visual impacts associated with the Project would depend on certain factors, including:

- Distance of the proposed wind energy facility 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.

To minimize visual impacts of the Project, Dakota Range has incorporated setback requirements and commitments into the design of the Project. As identified in Table 10-1 (see Section 10.2), turbines would be set back at least 1,000 feet from off-site residences, businesses, churches, and government buildings and at least 500 feet from on-site or lessor's residences, per Codington and Grant County requirements. Turbines would also be set back at least 110 percent the height of the turbines from the centerline of public roads and from any surrounding property line. In accordance with FAA regulations, the towers would be painted off-white to reduce potential glare and minimize visual impact. At the end of the Project's operating life, the facility would be decommissioned (see Chapter 24.0), and all wind turbines, electrical cabling, electrical components, roads, and any other associated facilities would be removed in

accordance with applicable State and County regulations, unless otherwise agreed to by the landowner. As such, no visual impacts would remain beyond the operating life of the Project.

Scenic resources with sensitive viewsheds can include national parks, monuments, and recreation areas; national historic sites, parks, and landmarks; national memorials and battlefields; national wild and scenic rivers, national historic trails, national scenic highways, and national wildlife refuges; State- or locally designated scenic resources, such as State-designated scenic highways, State parks, and county parks; and other scenic resources that exist on Federal, State, and other non-Federal lands. No scenic resources with sensitive viewsheds are located within the Project Area or within viewing distance of the Project. Therefore, no impacts to scenic resources would result from construction or operation of the Project.

17.0 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.*

As noted previously, the Project is located in portions of Grant County and Codington County. Both counties have enacted zoning ordinances in which wind energy facilities are identified as conditional uses within the area zoned as the Agricultural District. As a result, proponents of wind energy facilities must obtain a conditional use permit prior to constructing a wind energy facility in the Agricultural District of either county.

The Project is located within the Agricultural District in both Grant County and Codington County. Dakota Range was unanimously granted a conditional use permit for the Project by Grant County on June 12, 2017, and by Codington County on June 19, 2017. Copies of each permit, as well as a letter of support from the Grant County Commission, are provided in Appendix K. Prior to construction, Dakota Range will submit a final Project layout to each county in connection with obtaining building permits. The final layout will comply with all applicable zoning ordinance requirements and permit conditions, including the setbacks, noise standard, and shadow flicker commitment set forth in Table 10-1 in Section 10.2. No organized townships with separate zoning jurisdiction are located within the Project boundary.

Dakota Range also plans to enter into road use and maintenance agreements with each county governing the use, improvement, repair, and restoration of roads within the applicable county. In addition, Dakota Range will obtain from each road authority any road crossing, approach, and/or utility permits required for the Project.

18.0 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 Chapter 13.0. As discussed in Section 13.2.2, the excavation and exposure of soils during the construction of wind turbines, access roads, underground collector lines, and other Project facilities could cause sediment runoff during rain events. This sediment may increase TSS loading in receiving waters. However, erosion control BMPs would keep sediments onsite that might otherwise increase sediment loading in receiving waters.

As discussed in Section 12.2.2.2, construction of the Project would require coverage under the General Permit for Storm Water Discharges Associated with Construction Activities issued by the SDDENR. A condition of this permit is the development and implementation of a SWPPP. The SWPPP would be developed during civil engineering design of the Project and would prescribe BMPs to control erosion and sedimentation. The BMPs may include use of silt fence, wattles, erosion control blankets, temporary storm water sedimentation ponds, re-vegetation, or other features and methods designed to control storm water runoff and mitigate erosion and sedimentation. The BMPs would be implemented to reduce the potential for impacts to drainage ways and streams by sediment runoff. Because erosion and sediment control would be in place for construction of the Project, impacts to water quality are not expected to be significant.

SDDENR's Ground Water Quality Program reviewed the Project for potential impacts to groundwater quality and does not anticipate the Project will adversely impact groundwater quality (see letter from SDDENR dated July 26, 2017, in Appendix B). SDDENR indicated that there are records of petroleum and other chemical releases in the vicinity of the Project, as there are throughout the State. The records for these releases indicate that all cases are either closed or require no further action, and none are indicated as open/being monitored. As such, it is not anticipated that Project construction activities would encounter soil contamination from these releases. However, in the event that contamination is encountered during construction activities or caused by the construction work, Dakota Range would report the contamination to SDDENR in accordance with State and Federal regulations.

19.0 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.*

The following sections discuss the existing air quality conditions within the Project Area and the potential air quality impacts from the Project.

19.1 Existing Air Quality

The entire State of South Dakota is in attainment for all NAAQS criteria pollutants (EPA, 2017a). The nearest ambient air quality monitoring site to the Project Area is located in Watertown, approximately 10 miles south of the Project Area (EPA, 2017b). The primary emission sources that exist within the Project Area include agricultural-related equipment and vehicles traveling along roads.

19.2 Air Quality Impacts/Mitigation

During construction of the Project, fugitive dust emissions would temporarily increase due to truck and equipment traffic in the Project Area. Additionally, there would be short-term emissions from diesel trucks and construction equipment. However, air quality effects caused by dust or vehicle emissions would be short-term, limited to the time of construction or decommissioning, and would not result in any NAAQS exceedances for criteria pollutants. Implementation of the Project components would not result in a violation to Federal, State, or local air quality standards and, therefore, would not result in significant impacts to air quality. SDDENR's Air Quality Program reviewed the Project and does not anticipate any adverse impacts to air quality of the State (see letter from SDDENR dated July 26, 2017, in Appendix B). Temporary minor sources of air pollution emissions from Project construction equipment, such as a concrete batch plant, would be permitted by the balance-of-plant contractor or concrete batch plant operator through the SDDENR. The operation of the Project would not produce air emissions that would impact the surrounding ambient air quality. Potential complaints regarding fugitive dust emissions would be addressed in an efficient manner (i.e., implementation of best management practices to suppress fugitive dust emissions during construction such as spraying the roads with water).

20.0 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.*

A variety of factors influence the timing of the Dakota Range Project schedule. Table 20-1 includes a best estimate at this time of the schedule. The construction of the Project could be delayed or accelerated depending on a number of factors, including permitting, financing, turbine supply, and the construction of the Big Stone South to Ellendale transmission line that the Project would interconnect to. After development of Dakota Range is complete and the necessary development permits have been obtained, ownership will transfer from Apex to Northern States Power Company. This transfer is scheduled to occur in late 2018; thus, Dakota Range needs to acquire an Energy Facility Permit for the Project prior to the scheduled closing date. Northern States Power Company, due to internal scheduling factors, will not begin construction until the second half of 2020. Dakota Range expects construction to be completed sometime between Q2 and Q4 2021. Closeout activities from construction may not end until Q1 2022.

Table 20-1: Preliminary Permitting and Construction Schedule

Milestone	Date
Land leasing	January 2015 to April 2017
Environmental studies	December 2015 to March 2018
County conditional use permits	May 2017 to June 2017
SDPUC Facility Permit	December 2017 to June 2018
Pre-construction engineering	August 2018 to February 2019
Finalize layout	February 2019
Construction	May 2020 to December 2021
Commercial operation date	December 2021

21.0 COMMUNITY IMPACT (ARSD (20:10:22:23)

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.

The following sections describe the existing socioeconomic and community resources within the Project Area, the potential community impacts of the proposed Project, and measures to avoid, minimize, and/or mitigate potential impacts.

21.1 Socioeconomic and Community Resources

The existing socioeconomic resources within the Project Area are described below, followed by a discussion of the potential effects of the proposed Project and mitigation and minimization measures.

21.1.1 Existing Socioeconomic and Community Resources

The Project Area is located in northeastern South Dakota in Codington and Grant Counties. Codington and Grant Counties had estimated populations of 28,063 and 7,148, respectively, in 2016 (U.S. Census Bureau, 2016). Watertown, with an estimated 2016 population of 22,172, is the largest city in Codington County (U.S. Census Bureau, 2016). Watertown is located approximately 10 miles south of the Project Area. In Grant County, Milbank is the most populous community near the Project Area with an estimated 2016 population of 3,203. The populations of these communities, as well as other communities in Codington and Grant Counties and their distances from the Project Area, are shown in Table 21-1.

Table 21-1: Population Estimates of Communities and Distance from Project Area

Community	2016 Population Estimate	County	Distance and Direction from Project Area
Watertown	22,172	Codington	9.8 miles south

Community	2016 Population Estimate	County	Distance and Direction from Project Area
Florence	369	Codington	10.3 miles west
South Shore	226	Codington	3.1 miles east
Kranzburg	177	Codington	11.3 miles southeast
Wallace	84	Codington	17.5 miles west
Marvin	32	Grant	3.3 miles northeast
Twin Brooks	66	Grant	9.0 miles east
Milbank	3,203	Grant	15.5 miles east
Summit	288	Roberts	4.3 miles north

Source: U.S. Census Bureau, 2016

The population in Codington County is predominantly white (96.0 percent), while 3.6 percent of the population is American Indian and 0.4 percent is some other race. In Grant County, 97.9 percent of the population is white, while 1.9 percent is American Indian. The remaining 0.2 percent is some other race (U.S. Census Bureau, 2015). In the State of South Dakota as a whole, 87.5 percent of the population is white, 10.3 percent is American Indian, and 2.2 percent is some other race (U.S. Census Bureau, 2015).

The median household income in 2015 in Codington and Grant Counties was $48,912 and $51,272 respectively. In 2015, 10.3 and 8.1 percent of the population, respectively, were below the poverty level in Codington and Grant Counties. By comparison, the median household income for the State ($50, 957), was between the reported median income for the counties and the poverty level (14.1 percent) was higher than both counties.

In Codington County, the top industries in terms of employment in 2015 were: (1) manufacturing (comprising 20.2 percent of employment); (2) educational services, health care, and social services (16.4 percent); and (3) retail trade (12.2 percent). In Grant County, the top industries in terms of employment in 2015 were: (1) agriculture, forestry, fishing and hunting, and mining (comprising 18.1 percent of employment); (2) educational services, health care, and social services (16.3 percent); and (3) wholesale trade (8.7 percent). The unemployment rates in Codington and Grant Counties in April 2017 were 3.0 and 3.2 percent, respectively, and the South Dakota unemployment for that same month was 2.9 percent (South Dakota Department of Labor and Regulation [SDDLR], 2017).

21.1.2 Socioeconomic and Community Impacts/Mitigation

This section describes the potential impacts of the proposed Project on economics, population and housing, and property values.

21.1.2.1 Economic Impacts

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

During construction, a typical 300-MW wind project such as Dakota Range typically generates an immediate need for up to 300 temporary construction jobs over 9 months. Construction and operation of a typical 300-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 Facility will employ approximately 10 full-time personnel as facility managers, site managers, and turbine technicians. A breakdown of the typical construction and operation jobs for a 300-MW wind energy project are shown in Table 21-2. It is expected the construction of the Project will take approximately 400,000 man-hours.

Table 21-2: Construction and Operation Jobs for 300-MW Wind Energy Project

Project Phase	Job Title	Affiliation	Number On-Site	Approximate Hourly Salary
Construction	Site Superintendent	Xcel	1	$75
Construction	Civil Superintendent	Xcel	1	$50
Construction	Electrical Superintendent	Xcel	1	$50
Construction	Site Administrator	Xcel	1	$30
Construction	Tower Climbers	Xcel Subcontractor	2	$90
Construction	Concrete Crews	General Contractor	18 (6 per crew)	$15
Construction	Re-Bars Crews	General Contractor	18 (6 per crew)	$22
Construction	Crane Crews	General Contractor	15 (5 per crew)	$30
Construction	Main Erection Crane	General Contractor	15 (5 per crew)	$30
Construction	Laborers	General Contractor	120	$15
Construction	Office Staff	General Contractor	6	$20

Project Phase	Job Title	Affiliation	Number On-Site	Approximate Hourly Salary
Construction	Electricians	Subcontractor	30	$30
Construction	Heavy Equipment Operators	Subcontractor	30	$20
Construction	Laborers	Subcontractor	40	$15
Operation	Facility Manager	Operator	1	$100,000/year
Operation	Deputy Facility Manager	Operator	1	$90,000/year
Operation	Wind Turbine Technicians	Operator	8	$25/hour
Operation	Lead Technician	Operator	1	$34/hour
Operation	Site Admin	Operator	1	$12/hour

Furthermore, the Facility represents an approximately $400 million investment in Grant and Codington Counties. Dakota Range will pay taxes on the Facility, which will significantly increase the revenue available for a variety of local needs. A breakdown of this tax information over 25 years is shown in Table 21-3.

Table 21-3: Projected Tax Revenue for the Dakota Range Project

	Annual Tax Revenue (Approximate)	Total Tax Revenue (Approximate)
Codington County	$80,000	$2,000,000
Leola Township	$6,000	$150,000
Germantown Township	$30,000	$700,000
Grant County	$280,000	$6,900,000
Lura Township	$25,000	$600,000
Mazeppa Township	$90,000	$2,300,000
Waverly School District	$225,000[a]	$5,600,000[a]
Summit School District	$280,000[a]	$7,000,000[a]
South Dakota	$420,000	$10,600,000

(a) After the fifth year of receiving the total annual tax revenue as well as South Dakota State-aid funds for the school districts, the amount of the wind energy tax revenue that is considered local effort funding will increase by 20 percent each year until year 10, after which all wind energy tax revenue will be considered local effort funding in the South Dakota School Funding Formula, which may decrease the State-aid funds the school districts receive. However, as shown in the table, 100 percent of the wind tax revenue allocated to the school districts will still be received by the school districts.

Over the expected 25-year life of the Project, the Project would generate over $92 million in direct economic benefits for local landowners, new local employees, local communities, and the State of South

Dakota. Some of these payments are outlined in Table 21-4. Further benefits that are not quantified below include local spending on operations and maintenance needs such as automotive repair, tires, gas,

Table 21-4: Direct Economic Benefit from the Dakota Range Project

Payment	Direct Beneficiary	Approximate Total
Lease Payments	Project Landowners	$39,000,000
Operations and Maintenance	~10 Employees	$17,000,000
Taxes	Townships, Counties, School Districts, and South Dakota	$36,000,000

21.1.2.2 Population and Housing

There is the potential for residents within 60 or more miles from the Project Area to take advantage of these employment opportunities during Project construction. During construction, non-local workers would relocate to the area, resulting in a temporary increase in population. These non-local construction workers would need temporary housing. Temporary housing for workers will likely include available facilities at several towns throughout the area, with larger towns, such as Watertown likely having more available facilities.

The proposed Project could increase demand on the local labor force and for local housing during construction; however, the construction period is only temporary. Overall, Dakota Range anticipates that the Project will be socioeconomically beneficial to the local population and will not impact long-term population trends. Therefore, no mitigation measures are anticipated to be required.

21.1.2.3 Property Value Impacts

Extensive statistical studies have demonstrated that large-scale wind energy facilities do not substantially injure the value of adjoining or abutting property. The Massachusetts Clean Energy Center published a report in January 2014 entitled *Relationship between Wind Turbines and Residential Property Values in Massachusetts*. This study analyzed more than 122,000 home sales near the current or future location of a wind farm in Massachusetts and found no net effect on prices attributed to the proximity of the dwelling to the wind energy project. Jennifer Hinman at Illinois State University completed a study based on 3,851 property transactions over a 9-year period near a 240-turbine wind energy facility in Illinois. This study, entitled *Wind Farm Proximity and Property Values: A Pooled Hedonic Regression Analysis of Property Values in Central Illinois* found a negative location effect on property values before the wind farm was approved, a concept known as anticipation stigma, but the study found that property values rebounded to levels higher in real terms than before the wind farm was approved (Hinman, 2010).

In 2009, the Ernest Orlando Lawrence Berkeley National Laboratory published a study entitled *The Impact of Wind Power Projects on Residential Property Values in the United States: A Multi-Site Hedonic Analysis* (see Appendix L). This study analyzed data from approximately 7,500 sales of single-family homes within 10 miles of 24 existing wind facilities in nine different states and found "no evidence… that home prices surrounding wind facilities are consistently, measurably, and significantly affected by either the view of wind facilities or the distance of the home to those facilities." The author of this study, Ben Hoen, completed a second study on this topic at the Ernest Orlando Lawrence Berkeley National Laboratory in 2013 entitled *A Spatial Hedonic Analysis of the Effects of Wind Energy Facilities on Surrounding Property Values in the United States* (see Appendix L). This study is based on more than 50,000 home sales within 10 miles of 67 different wind facilities in 27 states, and found "no statistical evidence that home prices near wind turbines were affected in either the post-construction or post-announcement/pre-construction periods."

The Lawrence Berkeley National Laboratory hedonic analyses studied wind farms in landscapes primarily similar to those of Grant and Codington Counties in terms of population, income, home value, and how much of the counties are considered rural. The 2009 and 2013 studies examined 36 unique counties in the United States. Codington County is 22 percent rural and Grant County is 55 percent rural, and 18 of the 36 counties included in the studies are in that range of rural percentage, with only 6 of the other counties having a lower rural percentage than 22 percent. See Table 21-5 for demographic data on the counties included in the Lawrence Berkeley National Laboratory 2009 and 2013 studies compared to Grant and Codington Counties. Based on these national studies of property value impacts of constructed wind farms in rural areas, it is expected that Dakota Range will not have an impact on property values near the Project.

Table 21-5: Demographic Data On Counties in Lawrence Berkeley National Laboratory Studies

County	State	Population	Population/ Square Mile	Median Age	Median Home Value	Median Income	Percentage Rural
Lawrence Berkeley National Laboratory, 2009 Study							
Buena Vista	IA	20,578	36	37	$99,744	$46,469	44
Lee	IL	34,735	48	42	$140,291	$51,682	53
Livingston	IL	37,903	36	40	$102,523	$55,287	41
Madison	NY	72,369	110	39	$135,300	$52,300	59
Oneida	NY	232,871	192	40	$113,600	$43,702	33
Custer	OK	29,500	30	31	$114,228	$45,179	30
Umatilla	OR	76,705	24	35	$138,600	$48,514	29

County	State	Population	Population/ Square Mile	Median Age	Median Home Value	Median Income	Percentage Rural
Somerset	PA	76,218	71	44	$103,900	$43,429	71
Wayne	PA	51,401	70	45	$179,354	$47,932	88
Howard	TX	36,651	41	38	$67,485	$47,906	20
Benton	WA	184,486	109	35	$176,500	$48,997	11
Walla Walla	WA	58,844	47	36	$186,784	$45,875	17
Door	WI	27,766	58	49	$187,484	$50,586	69
Kewaunee	WI	20,444	60	42	$145,344	$52,929	72
Average		**68,605**	**67**	**40**	**$135,081**	**$48,628**	**46**
Lawrence Berkeley National Laboratory, 2013 Study							
Carroll	IA	20,562	36	42	$107,911	$50,074	52
Floyd	IA	16,077	32	43	$92,087	$44,152	53
Franklin	IA	10,436	18	42	$89,330	$48,715	60
Sac	IA	10,035	17	46	$81,367	$48,451	100
DeKalb	IL	105,462	166	29	$160,600	$52,867	20
Livingston	IL	37,903	36	40	$102,523	$55,287	41
McLean	IL	172,418	146	32	$160,300	$61,846	16
Cottonwood	MN	11,633	18	44	$83,197	$45,949	62
Freeborn	MN	30,840	44	44	$99,683	$46,698	43
Jackson	MN	10,629	15	44	$93,644	$52,428	69
Martin	MN	20,220	29	45	$98,341	$51,865	54
Atlantic	NJ	275,209	491	39	$218,600	$52,127	13
Clinton	NY	81,632	79	39	$121,200	$43,892	64
Franklin	NY	51,262	31	39	$93,529	$45,580	63
Herkimer	NY	63,744	45	42	$89,098	$43,754	52
Lewis	NY	27,220	21	40	$103,257	$47,990	87
Madison	NY	72,369	110	39	$135,300	$52,300	59
Steuben	NY	98,394	71	41	$90,900	$47,046	60
Wyoming	NY	41,188	69	40	$96,515	$50,949	64
Paulding	OH	18,989	46	40	$89,619	$44,650	82
Wood	OH	129,590	210	35	$147,300	$51,680	30
Custer	OK	29,500	30	31	$114,229	$45,179	30
Grady	OK	53,854	49	38	$111,956	$50,677	64
Fayette	PA	134,086	170	43	$89,100	$38,903	48
Somerset	PA	76,218	71	44	$103,900	$43,429	71

County	State	Population	Population/ Square Mile	Median Age	Median Home Value	Median Income	Percentage Rural
Wayne	PA	51,401	70	45	$179,354	$47,932	88
Kittitas	WA	42,522	19	31	$234,150	$43,849	40
Average		**62,718**	**79**	**40**	**$118,037**	**$48,454**	**55**
South Dakota Counties Dakota Range is Located In							
Codington	SD	27,938	41	37	$140,909	$46,361	22
Grant	SD	7,241	11	45	$105,054	$48,354	55
Average		**17,590**	**26**	**41**	**$122,982**	**$47,358**	**39**

Furthermore, increased tax revenue will positively impact the Counties, Townships, and local school districts, providing improved services for the community which can positively impact property values in the long-term. Research has shown that an increase in school funding results in an increase in housing value. In a paper for the National Bureau of Economic Research (2002), the authors found that "a $1.00 increase in per pupil state aid increases aggregate housing values per pupil between $19 and $20." In this scenario, the increase in per pupil aid would come from wind energy property taxes, rather than state aid. Details on the projected tax funding provided to the local school districts due to the Dakota Range project can be seen in Table 21-3, with over $500,000 being paid annually to Summit and Waverly School Districts combined.

21.2 Commercial, Industrial, and Agricultural Sectors

No commercial or industrial sectors occur within the Project Area. The existing agricultural sector within the Project Area is described below, followed by a discussion of the potential effects of the proposed Project and mitigation and minimization measures.

21.2.1 Existing Agricultural Sector

The Project Area is predominantly agricultural, consisting of a mix of cropland, rangeland, and pastureland. In 2012, Codington County's 713 farms (totaling 369,235 acres of land) produced $172.4 million in agricultural products (USDA, 2012a). Thirty-seven percent was from livestock sales, and 63 percent was crop sales. Cattle and calves were the top livestock inventory item in the county, and corn (for grain) was the top crop in terms of acreage. Codington County ranked 23 out of the 66 South Dakota counties in total value of agricultural products sold (USDA, 2012a).

In 2012, Grant County's 618 farms (totaling 428,624 acres of land) produced nearly $240.8 million in agricultural products (USDA, 2012b). Forty-four percent was from livestock sales, and 56 percent was

crop sales. Cattle and calves were the top livestock inventory item in the county, and corn (for grain) was the top crop in terms of acreage. Grant County ranked 12 out of the 66 South Dakota counties in total value of agricultural products sold (USDA, 2012b).

21.2.2 Agricultural Impacts/Mitigation

Minimal existing agricultural land would be taken out of crop and forage production by the proposed Project, primarily the area around wind turbine foundations, access roads, and electric collection and interconnection facilities. Landowners would be compensated by the Applicant 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 would not alter agricultural activities.

It is estimated that approximately 647 acres of agricultural land would be temporarily impacted by Project construction, and 65 acres of agricultural land would be impacted during the life of the Project (less than 0.2 percent of the total land within the Project Area, see Table 11-1). Areas disturbed due to construction and that would not host Project facilities would be re-vegetated with vegetation types matching the surrounding agricultural landscape.

21.3 Community Facilities and Services

The existing community facilities and services within the Project Area are described below, followed by a discussion of the potential effects of the proposed Project and mitigation and minimization measures.

21.3.1 Existing Community Facilities and Services

The majority of community facilities and services near the Project Area are located in the town of Watertown, which is approximately 10 miles south of the Project Area. Watertown contains a hospital, police, fire and ambulance services, schools, churches, and parks and recreational facilities. One church and an associated cemetery are located within the Project Area (Figure 13).

Electrical service in the Project Area is provided by Otter Tail Power Company, Whetstone Valley Electric Power Cooperative, and Codington-Clark Electric Cooperative. The Grant-Roberts Water District supplies rural water to the Project Area and maintains a network of distribution lines within the Project Area.

21.3.2 Community Facilities and Services Impacts/Mitigation

The additional workers moving into the region during construction of the proposed Project could temporarily add an additional demand on some of the existing community facilities and services. However, this demand would be temporary, and it is anticipated that the existing facilities would have

sufficient capacity to meet this demand. Therefore, no mitigation measures are anticipated to be required. SDDENR's Drinking Water Program reviewed the Project and does not anticipate any adverse impacts to drinking waters of the State (see letter from SDDENR dated July 26, 2017, in Appendix B). SDDENR's Waste Management Program also reviewed the Project and does not anticipate any adverse impacts, because all waste material would be managed according to SDDENR's solid waste requirements (see same letter from SDDENR in Appendix B).

21.3.3 Emergency Response

The proposed wind farm is located within a rural portion of Codington and Grant Counties. During the Project construction period and during subsequent operation, it is expected that the Project would have no significant impact on the security and safety of the local communities and the surrounding area. Some additional risk for worker or public injury may exist during the construction phase, as it would for any large construction project. However, work plans and specifications would be prepared to address worker and community safety during Project construction. During Project construction, the Project's general contractor would identify and secure all active construction areas to prevent public access to potentially hazardous areas.

During Project construction, the Project contractor would work with local and county emergency management to develop procedures for response to emergencies, natural hazards, hazardous materials incidents, manmade problems, and potential incidents concerning Project construction. The contractor would provide site maps, haul routes, project schedules, contact numbers, training, and other requested project information to local and county emergency management.

During Project operations, the Project operator would coordinate with local and county emergency management to protect the public and the property related to the Project during natural, manmade or other incidents. The Project would register each turbine location and the O&M building with the rural identification/addressing (fire number) system and 911 systems.

21.4 Transportation

The existing transportation resources within the Project Area are described below, followed by a discussion of the potential effects of the proposed Project and mitigation and minimization measures.

21.4.1 Existing Transportation

This section describes the existing surface transportation and aviation within the Project Area.

21.4.1.1 Surface Transportation

Table 21-6 lists the major roads that intersect the Project Area. The primary access to the Project Area is via Interstate 29 which extends through the central portions of the Project Area (Figure 1). Secondary access to turbine locations would be via existing County and Township gravel roads. Paved County roads would be avoided wherever possible due to their light construction. Roads would be assessed for strength and condition prior to construction. County and Township gravel roads determined to be insufficient for construction use would be upgraded and strengthened prior to construction at the Project's expense. County and Township gravel roads would be maintained during construction at the Project's expense. Paved roads would be returned to preconstruction or better condition if damage occurs. The Project would enter into Road Use Agreements with each road authority, as required, to define use and restoration of roads utilized during construction of the Project.

Table 21-6: Project Area Roads

Road	Surface Type	Surface Width	Total Lanes
Interstate 29	Concrete	24 feet	4 (divided)
State Highway 20	Bituminous	24 feet	2
Secondary County roads	Gravel or crushed rock / Bituminous	22 to 28	2
Secondary Township roads	Gravel or crushed rock	16 to 20	2

Source: SDDOT, 2017

In 2016, Average Daily Traffic (ADT) volume was 6,600 trips along Interstate 29 through the Project Area, and 303 trips along State Highway 20 (SDDOT, 2016). ADT along the county roads through the Project Area were generally less than 200.

21.4.1.2 Aviation

There are no airports located within the Project Area. The closest airport is Watertown Regional Airport, which is a city owned public airport located in Watertown, South Dakota, approximately 10 miles southwest of the Project Area. The closest private airport to the Project Area is the Whipple Ranch airstrip, located 13 miles north of the Project Area in Wilmot, South Dakota. The nearest U.S. air military installation is Grand Forks Air Force Base, located approximately 185 miles north of the Project Area (U.S. Air Force, 2017). The nearest South Dakota National Guard Air National Guard installation is the 114th Fighter Wing, located approximately 100 miles south of the Project Area at Joe Foss Field Base, in Sioux Falls, South Dakota.

21.4.2 Transportation Impacts/Mitigation

This section addresses the potential impacts of the proposed Project on ground transportation and air traffic.

21.4.2.1 Ground Transportation

The Project Area contains Highways, one paved four-lane interstate highway, and several paved County roads as well as County and Township gravel roads. During construction, it is anticipated that several types of light, medium, and heavy-duty construction vehicles would travel to and from the site, as well as private vehicles used by the construction personnel. Construction hours are expected to be from 6:00 a.m. to 9:00 p.m. on weekdays, and possibly on weekends. Some activities may require extended construction hours, and nighttime construction may be necessary to meet the overall proposed Project schedule. The movement of equipment and materials to the site would cause a relatively short-term increase in traffic on local roadways during the construction period. Most equipment (e.g., heavy earthmoving equipment and cranes) would remain at the site for the duration of construction activities. Shipments of materials, such as gravel, concrete, and water would not be expected to substantially affect local primary and secondary road networks. That volume would occur during the peak construction time when most of the foundation and tower assembly is taking place. At the completion of each construction phase, this equipment would be removed from the site or reduced in number, and replaced with equipment for the next phase, as appropriate.

The Project would not result in any permanent impacts to the area's ground transportation resources. There would be improvements to most gravel roads and temporary impacts to local roads during the construction phase of the Project. The Applicant would work with each County and Township on Road Use Agreements so that all parties understand how the Project would proceed prior to construction starting. Within the Project Area, oversized and overweight loads would be strictly confined to roads designated in the Road Use Agreement. The Applicant would work with SDDOT, Codington and Grant Counties, and the local townships to obtain the appropriate access and use permits, and to reduce and mitigate the impacts to area transportation.

21.4.2.2 Air Traffic

The air traffic generated by the airports listed above would not be impacted by the proposed Project. The Applicant would follow FAA guidelines for marking towers and would implement the necessary safety lighting. Dakota Range applied for and received Determinations of No Hazard from the FAA for a preliminary layout in February 2016 and for the current layout in December 2017, and these included a condition for the turbines to be marked/lighted in accordance with FAA Advisory Circular 70/7460 L

Change 1, Obstruction Marking and Lighting, white paint/synchronized red lights. The Applicant expects Determinations of No Hazard to be issued for the finalized layout, and for the Determinations to include the same lighting/marking condition. Notification of construction and operation of the wind energy facility would be sent to the FAA, and the Project will comply with all applicable FAA requirements. The Applicant would also file Tall Structures Aeronautical Hazard Applications with the South Dakota Aeronautics Commission for a permit approving the proposed wind turbine and permanent meteorological tower locations.

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 turbine towers in active croplands and installation of aboveground collector and transmission lines would create potential hazards for crop-dusting aircraft. However, aboveground collection and transmission lines are expected to be similar to existing distribution lines (located along the edges of fields and roadways), and the turbines and meteorological tower(s) themselves would be visible from a distance and lighted and marked according to FAA guidelines.

21.5 Cultural Resources

The following sections provide information on the cultural resources potentially affected by the construction, operation, and maintenance of Project facilities and how impacts to these resources will be avoided and/or minimized.

21.5.1 Existing Cultural Resources

This section describes the existing cultural resources within the Project Area.

21.5.1.1 Regulatory Framework

South Dakota state law (SDCL 1-19A-11[1]) requires that state agencies or political subdivisions of the state, or any instrumentality thereof (i.e. county, municipal, etc.) may not undertake any project which will encroach upon, damage or destroy any historic property included in the National or State Registers of historic places until the SHPO has been given notice and an opportunity to investigate and comment on the proposed project. Any permits required by the state, county, or municipalities, including an SDPUC Energy Facility Permit, will invoke this law.

Furthermore, ARSD 20:10:22:23 states that an application for a Facility Permit shall include a forecast of the impact on landmarks and cultural resources of historic, religious, archaeological, scenic, natural, or other cultural significance. The Applicant has completed cultural resources investigations for the Project, as described in the following sections, in accordance with SDCL 1-19A-11(1) and ARSD 20:10:22:23, to

enable forecasting of potential impacts and respond with appropriate field studies and impact avoidance or minimization measures.

21.5.1.2 Level I Records Search

A Level I Cultural Resources Records Search was completed for the Project in June 2017 in accordance with SHPO survey guidelines (Appendix M). The records search was completed to provide an inventory of previously recorded cultural resources within the Project Area and a 1-mile buffer. The records search was requested from the South Dakota Archaeological Research Center (SDARC) on June 16, 2017.

The records search indicated that 29 cultural resources surveys have been completed within or partly within the Project Area, and 10 more have been performed in the 1-mile buffer. One hundred and five archaeological sites have been previously recorded in or within 1 mile of the Project Area. Of these, 41 sites are located within the Project Area and 64 are within the 1-mile buffer. Forty of the 41 sites within the Project Area have been determined eligible for listing in the National Register of Historic Places (NRHP), and 1 site has been determined not eligible for listing. Twenty-six of the 64 sites located within the 1-mile buffer have been determined eligible for NRHP listing, 6 have been determined or recommended not eligible for listing, and 32 sites are unevaluated for NRHP listing. All of the eligible sites previously recorded within the Project Area and 1-mile buffer are Native American cairns, stone circles, or alignments, and may also be traditional cultural properties.

Ninety-two historic/architectural resources have been previously inventoried, including 43 within the Project Area and an additional 49 within the 1-mile buffer. These resources include 73 structures, 16 bridges, and 3 cemeteries. One structure, a farmstead, is listed in the NRHP and two other structures have been determined eligible for an NRHP listing.

21.5.1.3 Cultural Resources Monitoring and Management Plan

A CRMMP (Appendix N) was developed for the Project in coordination with the SHPO to avoid or minimize potential impacts to cultural resources during design and construction of Project facilities and to comply with the SDPUC Energy Facility Permit requirements. The CRMMP identifies the methodology for completing Level III intensive cultural resources surveys and historical/architectural surveys for the Project. The CRMMP also identifies the proposed management plan for archeological or architectural resources that are identified during the surveys and provides a plan for unanticipated discovery of sensitive cultural resources, should any be unearthed during construction.

21.5.1.4 Level III Intensive Survey

Level III intensive cultural resource surveys were completed for the Project footprint in December 2017 in accordance with the CRMMP. As discussed in the CRMMP, Level III surveys were proposed for areas of potential ground disturbance from Project construction activities within the Project footprint that are identified as High Probability Areas (HPAs). HPAs consist of areas most likely to contain intact archaeological sites in the region and are primarily found on uncultivated and undisturbed land areas and around water sources such as rivers, streams, and lakes. The survey results are pending; however, based on preliminary data, no cultural resources were identified that would require turbine location modifications.

Level III Intensive Survey Methodology

During the Level III intensive surveys, the historic and prehistoric HPAs within the Project footprint were visually inspected and shovel tested if the ground surface visibility was poor. If surface rock features such as cairns or tipi rings were identified, no shovel testing or other disturbance to the site area and features occurred. They were recorded and photographed and recommended for avoidance. Shovel testing or coring was used to delineate the vertical and horizontal limits of other types of sites investigated. Any cultural resources were photo-documented and recorded with GPS equipment with sub-meter accuracy. Archaeological sites were documented on archaeological site forms from the SDARC. Potentially sensitive tribal resources were reported to the SWO for review and recommendations.

21.5.1.5 Architectural Survey

A historical/architectural survey (Appendix O) was completed for the Project in accordance with the CRMMP in November 2017. As discussed in the CRMMP, the proposed architectural survey consisted of windshield reconnaissance within the Project footprint and 1-mile buffer (indirect or visual area of potential effects [APE]) to document all resources 45-years-of-age or older that have not been recorded in previous surveys or have been previously recorded but have undetermined NRHP-eligibility status. Following field documentation, additional research was conducted to understand prior ownership, land usage patterns, building distributions, configurations, materials, and ages. Each recorded structure was evaluated for its State and NRHP eligibility.

The results of the survey indicate a low concentration of NRHP-eligible architectural resources. No historic architectural resources were identified within the proposed Project footprint, or direct APE. Within the indirect or visual APE, there were three structures (two farmsteads and one barn) recommended eligible for listing on the NRHP. While the turbines will be visible from these properties, when viewed from the right-of-way, the turbines will be behind the viewer with the settings of the farms

intact. Therefore, the survey concluded that there will be no adverse effect to historic properties in the Project's visual APE.

21.5.1.6 Tribal Coordination

As discussed in Section 27.2, the Applicant has engaged in ongoing voluntary coordination with the SWO to seek input on cultural resources in the Project Area and to seek input on the CRMMP and proposed cultural resources surveys for the Project. The Level III surveys are being completed in coordination with the SWO, allowing the SWO opportunities to review findings and participate in eligibility recommendations and avoidance plans for sensitive tribal resources.

21.5.2 Cultural Resource Impacts/Mitigation

The CRMMP outlines the proposed management plan for cultural and tribal resources that are identified during the Level III intensive surveys and provides a plan for unanticipated discovery of these resources, should any be unearthed during construction. Both SHPO and SWO have agreed that the measures outlined in the CRMMP are appropriate to avoid negatively impacting landmarks and cultural resources of historic, religious, archaeological, scenic, natural, or other cultural significance.

For cultural resources identified during the surveys, the following steps, as identified in the CRMMP, will be taken:

- The cultural resource specialist will make a recommendation on the NRHP eligibility of the resource and request SHPO concurrence on the recommendation. There is no federal agency with jurisdiction over this Project, and, therefore, this recommendation will be made directly to SHPO.
- Sites identified as potentially eligible for NRHP listing will be addressed by micrositing facilities to avoid impacts. If complete avoidance cannot be achieved, Dakota Range Wind will work with SHPO to minimize impacts to the maximum extent practicable.
- In accordance with the Siting Guidelines for Wind Power Projects in South Dakota 8(c), and in accordance with informal consultation completed between the Project and tribes, disruption of sensitive resources that are identified as important to Native Americans will be avoided by marking them with orange snow fencing and ensuring facilities are set back in accordance with recommendations from the SWO, or as practicable and consistent with applicable State and Federal regulations.

22.0 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 21.1.2.1, the Project is expected to employ approximately 300 temporary workers over 9 months to support Project construction. It is likely that general skilled labor is available in either Codington and Grant 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.

23.0 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.*

With the exception of the final micrositing flexibility requested in Section 9.1, the Applicant does not have any current plans for future additions to or modifications of the Project. Apex does hold interconnection queue positions for an additional 400 MW of capacity at the same POI through MISO and is exploring the potential for future projects depending on available transmission capacity.

24.0 DECOMMISSIONING OF WIND ENERGY FACILITIES (ARSD 20:10:22:33.01)

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.*

The Applicant has entered into long-term lease and easement agreements for placement of the wind turbines and associated Project infrastructure with private landowners within the Project Area. The Applicant anticipates that the life of the Project would be approximately 25 years but reserves the right to extend the life of the Project as well as explore alternatives regarding Project decommissioning. One such option may be to retrofit the turbines and power system with upgrades based on new technology, which may allow the wind farm to produce efficiently and successfully for many more years.

The Project will be decommissioned in accordance with applicable State and County regulations. Current decommissioning requirements in Grant and Codington Counties require that all towers, turbine generators, transformers, overhead collector and feeder lines, foundations, buildings, and ancillary equipment be dismantled and removed to a depth of 4 feet. To the extent possible, the site shall be restored and reclaimed to its pre-project topography and topsoil quality. All access roads shall be removed unless written approval is given by the landowner requesting roads be retained.

The Decommissioning Plan for the Project is included in Appendix P.

The estimated net decommissioning costs for the Project are summarized in Chapter 6 of the Decommissioning Plan in Appendix P. The net decommissioning cost (in 2017 U.S. dollars) is estimated to be $2,906,000, assuming no resale of Project components. The net decommissioning cost is estimated to be a positive return of $1,883,500, assuming resale of some of the Project's major components. The second scenario, assuming partial resale, is considered to be the more likely option. The estimates are based on the decommissioning approach outlined in the Decommissioning Plan.

25.0 RELIABILITY AND SAFETY (ARSD 20:10:22:33.02(8))

The following sections discuss the reliability and safety of the wind farm facility.

25.1 Reliability

Reliability (Availability) is defined as the ability of the turbine to generate electricity when sufficient wind is available. Vestas has over 59,000 wind turbines (85 GW) currently installed globally. In the Vaisala Wind Energy Due Diligence Report completed for the Project and discussed in Section 7.1, Vaisala "observed that turbine availability at newly constructed wind farms achieve 96.0% or higher availability when averaged over an entire calendar year." To further provide for reliability and to protect the Project financially, availability guarantees are included in turbine supply agreements with the turbine manufacturer. Availability guarantees require the turbine manufacturer maintain the turbine at 96 percent availability or higher. If the turbine manufacturer fails to maintain the required level of availability, then the turbine manufacturer is required to pay a project liquidated damages for the lost revenue from lost energy production. Typically, the turbine manufacturer maintains the turbine for the first 2 years, then the turbines are maintained under O&M service contracts with terms of 5 or 10 years.

To further improve reliable operation of the region's power grid, wind energy projects are required to provide short-term forecasts of wind speed and energy that would be produced. Accurately anticipating weather conditions allows wind energy project owners and operators to maximize facility output and efficiency. Transmission system operators need to know how much energy wind facilities can deliver and when to dispatch generators on the system to match load to generation. Typically, wind projects provide a next-day, next-hour, and next-15 minutes forecast, updated every 15 minutes to the off-taker, balancing authority, and/or regional TO. These predictions of energy generation through in-depth, site-specific weather forecasting are used to integrate wind energy into the region's power grid and to schedule turbine and transmission maintenance windows, improving overall reliability. As wind forecasting has improved, the reliability of wind energy generation forecasts provided to the transmission operators has also improved.

25.2 Safety

The Project Area is located in an area of low population density; therefore, construction and operation of the Project would have minimal impacts on the security and safety of the local population. The following safety measures would be taken to reduce the chance of property damage, as well as personal injury, at the site:

- The towers would be placed at distances away from existing roadways and residences per the applicable setback requirements described in Section 10.2;
- Security measures would be implemented during the construction and operation of the Project, including temporary (safety) and permanent fencing, warning signs, and locks on equipment and wind power facilities;
- Turbines would sit on solid steel enclosed tubular towers; access to each tower would be only through a solid steel door that would be locked and accessed only by authorized personnel;
- Tower exteriors would be designed to be unclimbable;
- A professional engineer would certify that the foundation and tower design of the turbines is within accepted professional standards, given local soil and climate conditions.
- Prior to construction, the Project contractor would request utility locates through the One-Call program to avoid impacting existing underground infrastructure.
- Prior to construction, the Project contractor would work with local and county emergency management to develop procedures for response to emergencies, natural hazards, hazardous materials incidents, manmade problems, and potential incidents concerning Project construction. The contractor would provide site maps, haul routes, project schedules, contact numbers, training, and other requested project information to local and county emergency management.
- During Project operations, the Project operator would coordinate with local and county emergency management to develop an emergency management plan to be implemented in the event of an emergency at the Project site. The Project would register each turbine location and the O&M building with the rural identification/addressing (fire number) system and 911 systems.
- Following construction, the Project will register Project underground facilities with the One-Call program.

26.0 INFORMATION CONCERNING WIND ENERGY FACILITIES (ARSD 20:10:22:33.02)

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.

The following information requirements concerning wind energy facilities have been discussed in previous sections of this Application, as indicated below.

- Configuration of wind turbine – Section 9.2
- Number of wind turbines – Section 9.1
- Warning lighting requirements for wind turbines – Section 21.4.2.2
- Setback distances – Section 10.2
- Sound levels during construction and operation – Section 16.3.2
- Electromagnetic interference – Section 16.5
- Site and major alternatives – Chapter 10.0
- Reliability and safety – Chapter 25.0
- Right-of-way or condemnation requirements – Chapter 9.0 and Section 10.3
- Clearing activities – Sections 9.10 and 14.1.2
- Configuration of interconnection towers and poles – Section 9.6
- Conductor and structure configurations – Section 9.6
- Underground electric interconnection facilities – Section 9.4

Please refer to Chapter 4.0 Completeness Checklist (ARSD 20:10:22:33.02, Information concerning wind energy facilities) for additional requirement details.

27.0 ADDITIONAL INFORMATION IN APPLICATION (ARSD 20:10:22:36)

The following sections discuss permits and approvals, agency coordination, public and agency comments, and burden of proof.

27.1 Permits and Approvals

The Project must comply with Federal, State, and local laws requiring permits or approvals. Table 27-1 lists the permits and approvals that are applicable to the Project.

Table 27-1: List of Applicable Permits or Approvals

Agency	Permit/Approval	Description	Status
USFWS	Compliance with Section 10 of the ESA	Private non-federal entities undertaking projects may not result in the take of an endangered or threatened species, unless an incidental take permit is issued by the USFWS.	Wildlife studies and coordination with USFWS determined low risk to threatened and endangered species warranting permitting under the ESA. No incidental take permit warranted. BBCS to be prepared and implemented for the Project.
USFWS	Compliance with the BGEPA	Projects may not result in the take of bald or golden eagles, unless an eagle take permit is issued by the USFWS.	Wildlife studies and coordination with USFWS determined low risk to eagles. No permit warranted. BBCS to be prepared and implemented for the Project.
FAA	Form 7460-1, Notice of Proposed Construction or Alteration	Required if construction or alteration is within 6 miles of public aviation facility and for structures higher than 200 feet	Received Determinations of No Hazard from FAA for a preliminary layout in February 2016 and for current layout in December 2017. Notices of Proposed Construction for the final layout will be filed after final design is complete.
USACE	Section 404 permit	Authorization under the Clean Water Act for impacts to wetlands and waters of the U.S.	Impacts will comply with USACE NWP 12 requirements.

Agency	Permit/Approval	Description	Status
South Dakota SHPO	Coordination	Coordination regarding potential effects on archaeological and historical resources	A CRMMP was developed in coordination with SHPO; cultural resources surveys completed in December 2017 in accordance with CRMMP. Avoidance and mitigation measures will be implemented per the CRMMP to protect archaeological and historic resources.
Native American tribes	Coordination	Coordination regarding potential effects on Native American cultural resources	Cultural resources surveys are being completed in coordination with the SWO, allowing the SWO opportunities to review finds and participate in eligibility recommendations and avoidance plans for sensitive tribal resources.
SDPUC	Energy Facility Site Permit	Application required for wind facilities with nameplate capacity greater than 100 megawatts	Submitted January 2018
SDGFP	Coordination	Coordination regarding effects on state-listed threatened or endangered species	Wildlife studies and coordination with SDGFP complete. Site determined low risk to state-listed species. Avoidance and minimization measures will be implemented to address potential impacts. BBCS to be prepared and implemented for the Project
SDDENR	Section 401 Water Quality Certification	Complete an application under the Clean Water Act, only if Individual Permit is required for Section 404	Project-specific certification is not anticipated due to NWP 12 compliance.
	General Permit for Storm Water Discharges Associated with Construction Activities	Storm water permit required for construction activities	SWPPP will be prepared and Notice of Intent will be submitted after final design is complete.

Agency	Permit/Approval	Description	Status
	Temporary Water Use Permit	Temporary permits for the use of public water for construction, testing, or drilling purposes; issuance of a temporary permit is not a grant of water right	If necessary, will be obtained prior to construction.
	General Permit for Temporary Discharges	Temporary permit for the use of public water for construction dewatering	If necessary, will be obtained prior to construction.
	Water Rights Permit for Nonirrigation Use	Needed if water will be appropriated for O&M facility	If necessary, will be obtained prior to construction.
SDDOT, Aeronautics Commission	Aeronautical Hazard Permit	Permit lighting plan determined with FAA coordination	Will be completed after final design is complete.
SDCL 49-32-3.1	Notice to telecommunications companies	Telecommunication companies review the preliminary electrical layout and may suggest revisions to reduce impact to their systems	Will be completed after final design is complete.
SDDOT	Highway Access Permit	Permit required for any access roads abutting State roads	If necessary, will be obtained after final design is complete.
	Utility Permit	Permit required for any utility crossing or use within State road right-of-way	If necessary, will be obtained after final design is complete.
	Oversize & Overweight Permit	Permit required for heavy equipment transport over State roads during construction	Will be obtained prior to transport of overweight/oversized loads.
Codington County	Conditional Use Permit	Permit required for construction of the Project	Obtained June 19, 2017.
	Individual Building Permits	Permit required for construction of each turbine and building	Will be obtained prior to construction.
	County Road Permits	County Road Permits are required for right-of-way occupancy, utility crossings, road approaches, and overweight loads	Will be obtained prior to activity requiring permit.
	County Road Use Agreement	Road use agreement may be required	Will be obtained in Q3 2018.
Grant County	Conditional Use Permit	Permit required for construction of the Project	Obtained June 12, 2017.

Agency	Permit/Approval	Description	Status
	Individual Building Permits	Permit required for construction of each turbine and building	Will be obtained prior to construction.
	County Road Permits	County Road Permits are required for right-of-way occupancy, utility crossings, road approaches, and overweight loads	Will be obtained prior to activity for which permit is required.
	County Road Use Agreement	Road use agreement may be required	Will be obtained in Q3 2018.

27.2 Agency Coordination

Throughout Project planning and development, the Applicant has coordinated with various Federal, State, Tribal, and local agencies to identify potential concerns regarding the proposed Project. Copies of agency correspondence and meeting summaries are included in Appendix B. Following is a summary of the primary agency meetings completed to date:

USFWS and SDGFP

- **August 12, 2015 Coordination Meeting at SDGFP Office in Pierre**: The Applicant met with the USFWS and SDGFP to discuss the proposed Project. The purpose of the meeting was to introduce the agencies to Dakota Range, present results of the Tier 1 and 2/Stage 1 reviews, agree on Tier 3/Stage 2 studies to be completed to assess risk, and discuss potential impact avoidance and minimization measures for the Project.
- **March 28, 2017 Coordination Meeting at SDGFP Office in Pierre**: The Applicant met with the USFWS and SDGFP to continue coordination on the Project in accordance with the WEG, ECPG, and SD Guidelines. The purpose of the meeting was to review the current Project boundary, discuss the results of wildlife studies completed to date, and agree on next steps.
- **September 25, 2017 Coordination Meeting at SDGFP Office in Pierre**: The Applicant met with the USFWS and SDGFP to continue coordination on the Project in accordance with the WEG, ECPG, and SD Guidelines. The purpose of the meeting was to discuss the results of wildlife studies completed to date, agree on avoidance and minimization measures, and discuss the SDPUC Energy Facility Permit application requirements.
- USFWS and SDGFP coordination and recommendations regarding federally listed species, state-listed species, eagles/avian species, and bats are discussed in Sections 14.3.1 and 15.1.

SHPO

- **June 13, 2017 Coordination Meeting at SHPO Office in Pierre**: The Applicant met with the SHPO to discuss the Project. The purpose of the meeting was to introduce SHPO to Dakota Range, discuss the Level I cultural resources records search, and discuss recommendations for Level III cultural resources surveys.
- **August 29, 2017 Coordination Meeting at SHPO Office in Pierre**: The Applicant met with the SHPO to continue coordination on the Project. The purpose of the meeting was to review Dakota Range's proposed CRMMP and solicit SHPO's recommendations and comments on the CRMMP.
- SHPO coordination and recommendations regarding cultural resource surveys and the CRMMP are discussed in Sections 21.5.1.3 and 21.5.2.

SWO

- **October 10, 2017 Coordination Meeting at SWO Office in Agency Village, SD**: The Applicant met with the SWO to continue coordination on the Project. The purpose of the meeting was to review Dakota Range's proposed CRMMP and solicit SWO's recommendations on tribal monitoring and cultural resources surveys for the Project.
- Tribal coordination is discussed in Section 21.5.1.6.

SDDENR

- **July 2017 Correspondence with SDDENR**: A letter was sent to SDDENR on July 7, 2017, requesting input regarding environmental resources in the Project area that should be considered in the SDPUC application. SDDENR provided comments on the Project in a letter dated July 26, 2017.
- SDDENR comments regarding impaired waters, drinking waters, groundwater quality, air quality, and waste management are discussed in Sections 13.2.2.1, 13.3.2, 18.0, 19.2, and 21.3.2, respectively.

Codington County

- **March 1, 2017 Pre-Application Meeting at Codington County Zoning Office in Watertown, SD**: The Applicant met with the Codington County Zoning Office to discuss county zoning and land use permitting requirements for the Project.
- **May 16, 2017 Punished Woman's Lake Association Meeting in South Shore, SD**: The applicant met with the Punished Woman's Lake Association to inform the community about the Project and address concerns related to potential viewshed impacts at Punished Woman's Lake.

- **June 19, 2017 Codington County Planning Commission Public Hearing in Watertown, SD**: The Codington County Planning Commission unanimously approved Dakota Range's application for a Conditional Use Permit for the Project during their June 19, 2017 meeting.
- Codington County permitting is discussed in Chapter 17.0.

Grant County

- **February 28, 2017 Pre-Application Meeting at County Planning and Zoning Office in Milbank, SD**: The Applicant met with the Grant County Planning and Zoning Office to discuss county zoning and land use permitting requirements for the Project.
- **June 12, 2017 Grant County Planning and Zoning Board Public Hearing in Milbank, SD**: The Grant County Planning and Zoning Board unanimously approved Dakota Range's application for a Conditional Use Permit for the Project during their June 12, 2017 meeting.
- Grant County permitting is discussed in Chapter 17.0.

Dakota Range will continue coordinating with these agencies throughout Project development.

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

The Applicant is submitting testimony and exhibits in support of this Application. The individuals identified in Table 28-1 are providing testimony in support of the Application. Dakota Range reserves the right to provide supplemental and/or rebuttal testimony, as needed, to further support this Application.

Table 28-1: List of Individuals Providing Testimony

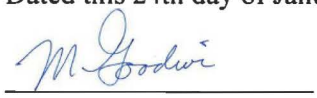
Individual	Title	Company	Subject Matter
Mark Mauersberger	Senior Development Manager	Apex Clean Energy Holdings, LLC	Project development
David Phillips	Vice President of Environmental	Apex Clean Energy Holdings, LLC	Wildlife; vegetation; cultural resources
Robert O'Neal	Certified Consulting Meteorologist	Epsilon Associates, Inc.	Sound; shadow flicker

28.1 Applicant Verification

Mr. Mark Goodwin, the President and Chief Executive Officer and authorized representative of the Applicant, is authorized to sign this Application on behalf of the Project Owner/Applicant, Dakota Range.

He further states that he does not have personal knowledge of all the facts recited in the Application and Exhibits and Attachments attached hereto, but the information has been gathered from employees and agents of the Owner/Applicant, and the information is verified by him as being true and correct on behalf of the Owner/Applicant.

Dated this 24th day of January 2018.



Mr. Mark Goodwin
President and Chief Executive Officer
Apex Clean Energy Holdings, LLC
On Behalf of Dakota Range I, LLC and Dakota Range II, LLC

29.0 REFERENCES

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APPENDIX A – FIGURES

APPENDIX B – AGENCY COORDINATION

APPENDIX C – DASK/POSK HABITAT SURVEY

APPENDIX D – 2016 RAPTOR NEST SURVEY

APPENDIX E – 2017 RAPTOR NEST SURVEY

APPENDIX F – AVIAN USE SURVEY

APPENDIX G – 2016 GROUSE LEK SURVEY

APPENDIX H – 2017 GROUSE LEK SURVEY

APPENDIX I – SOUND LEVEL MODELING REPORT

APPENDIX J – SHADOW FLICKER MODELING REPORT

APPENDIX K – COUNTY CONDITIONAL USE PERMITS

APPENDIX L – PROPERTY VALUE EFFECTS STUDIES

APPENDIX M – LEVEL I CULTURAL RESOURCES REPORT (NOT FOR PUBLIC DISCLOSURE)

APPENDIX N – CULTURAL RESOURCES MONITORING AND MANAGEMENT PLAN

APPENDIX O – ARCHITECTURAL SURVEY REPORT (NOT FOR PUBLIC DISCLOSURE)

APPENDIX P – DECOMMISSIONING PLAN

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