PRAIRIEWINDS SD1, INC.

APPLICATION TO
THE SOUTH DAKOTA PUBLIC UTILITIES COMMISSION
FOR A FACILITY PERMIT

PRAIRIEWINDS SD1 WIND ENERGY FACILITY AND ASSOCIATED COLLECTION SUBSTATION AND ELECTRIC INTERCONNECTION SYSTEM

DECEMBER 2009

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Terracon Project No. B4087002
December 2009

1.0 EXECUTIVE SUMMARY

PrairieWinds SD1, Inc. (the Applicant), a South Dakota corporation, a wholly owned subsidiary of Basin Electric Power Cooperative (BEPC), a North Dakota cooperative corporation, is proposing to construct a 151.5-megawatt (MW) (nameplate rating) wind energy facility to be located in central South Dakota (Figure 1). The PrairieWinds SD1 Project (Project) is proposed for development on the Crow Lake Site (Project Site) and includes approximately 101 wind turbine generators (WTGs), associated access roads, substation (Crow Lake Collection Substation [CLCS]), O&M building and associated transmission and interconnection facilities. The Project Site covers approximately 37,000 acres of land located approximately one half mile south of the area defined as Crow Lake, South Dakota (an unincorporated community) and approximately 15 miles north of White Lake, South Dakota. The Project Site possesses characteristics favorable for the development of a wind energy facility, including available land, excellent wind power resource potential, and nearby high voltage transmission facilities. The wind resource assessment study conducted in the Project Site area projects a net capacity factor in the upper thirty percentile range.

The Project will include the following components:

- **Turbines:** The Applicant plans to install approximately 101 General Electric 1.5sle model wind turbines at the Project Site. Each generator will have a nameplate capacity output of 1.5 MW of power. Each generator will have a hub height of 80 meters (262 feet) and a turbine rotor diameter of 77 meters (252 feet). The total height of each WTG will be 118.5 meters (389 feet) with a blade in the vertical position. The towers will be constructed of tubular steel, approximately 17 feet in diameter at the base, with internal joint flanges. The color of the towers and rotors will be standard white or off-white. During construction, a 190-foot by 210-foot work/staging area at each turbine will include the crane pad and rotor assembly area. The turbine foundations will typically be mat foundations (inverted T-foundations) or a concentric-ring-shell foundation. The excavated area for the turbine foundations will typically be no more than 70 feet by 70 feet (approximately 0.1 acre). Pad mounted transformers (74 inches by 92 inches by 70 inches) will be placed next to the each turbine. In some cases, for step-and-touch voltage compliance, an area around a turbine may be covered in 4 inches of gravel, river rock or crushed stone.

- **Collector System:** Each WTG will be interconnected with underground power and communications cables, called the collector system. The underground collector system will be placed in one trench or two parallel trenches and connect each of the turbines to a central collector substation, the CLCS. This system will be used to route the power from each turbine to the CLCS where the electrical voltage will be stepped up from 34.5 kilovolts (kV) to 230-kV. The CLCS will be enclosed in a fence with dimensions of roughly 400 feet by 160 feet. The estimated trench length, including parallel trenches, is 317,000 feet (60 miles).
- **Fiber Optic Communication Lines:** The fiber optic communication lines for the project will be installed in the same trenches as the underground electrical collector cables and connect each turbine to the Operations and Maintenance (O&M) Building and CLCS.
- **Operations and Maintenance (O&M) Building:** It is anticipated that a 5,500-square foot (50 feet by 110 feet) O&M building will be built within the vicinity of the CLCS. The final location will be determined in consultation with future operations personnel.
- **Roads:** New access roads will be built to facilitate both construction and maintenance of the turbines. This road network will be approximately 70 miles of new or upgraded roads. These roads will be designed to minimize length and construction impact. Initially, turbine access roads will be built approximately 25 feet in width, to accommodate the safe operation of construction equipment. Upon completion of construction, the turbine access roads will be reclaimed and narrowed to an extent allowing for the routine maintenance of the facility. Select existing State, County and Township line roads in the Project area will also be improved as needed to aid in servicing the turbine sites. Approximately 30 to 40 miles of new turbine access roads will be built and 25 to 35 miles of existing roads will be used and where appropriate, improved.
- **Transmission Interconnection:** A new 230-kV transmission line would be required to deliver the power from the CLCS to a new 230-kV point of interconnection at the existing Western Area Power Administration (Western) Wessington Springs Substation. The Wessington Springs Substation is located approximately 13 miles from the CLCS. The proposed line would be built using steel single-pole structures. The single-pole transmission line structures would range in height from approximately 95 to 120 feet and average 110 feet, depending on span distances between structures and area topography. The span between structures would range from 700 feet to 950 feet and average approximately 800 feet, depending on topography; taller structures could be used for crossing existing distribution and transmission lines or where unusual terrain exists.

2.0 FACILITY PERMIT APPLICATION

This Application provides information on the anticipated environmental and other impacts by the

Project on the following resources:

- Physical (geology, economic deposits, soils)
- Hydrology (water)
- Terrestrial ecosystems (vegetation, wetlands, wildlife, threatened and endangered species)
- Aquatic ecosystems
- Land use (agriculture, residential, displacement, noise, aesthetics, electromagnetic interference, safety and health)
- Water quality
- Air quality
- Communities (socioeconomics, cultural resources)

The Project is being evaluated in accordance with the applicable requirements and standards of the National Environmental Policy Act (NEPA), including an Environmental Impact Statement (EIS). Western and Rural Utilities Service (RUS), an agency within the United Stated Department of Agriculture (USDA), are serving as co-lead Federal agencies, as defined at 40 CFR 1501.5, for preparation of the EIS. RUS will serve as the lead Federal agency for consultations with the U.S. Fish and Wildlife Service (USFWS) under section 7 of the Endangered Species Act. Western will serve as the lead Federal agency for consultations with the South Dakota State Historic Preservation Office (SHPO) under section 106 of the National Historic Preservation Act. Based on the EIS work completed as of the date of this Application, the Project is not expected to have significant impacts on the environment.

Approximately 133 acres of permanent disturbance would be broadly dispersed throughout the Project Site and represents less than a half a percent of the total acreage in the Project boundary; therefore, the Project is not expected to cause major changes in runoff patterns or volume of runoff, nor is it expected to have adverse impacts on existing hydrology.

Because wetlands within the Project area are relatively small and widely scattered (approximately one percent of the total Project area), the Applicant anticipates that the Project will be able to avoid locating facilities on most wetland areas. Turbines and access roads will generally be constructed in the upland areas, avoiding the low-lying wetlands and drainage ways.

Significant impacts (activities potentially violating Federal or State wildlife conservation policies or affecting the biological viability of wildlife species populations) are not anticipated for this Project. The majority of land proposed to be directly affected by construction of the Project is cropland or grazed rangeland. Construction of Project facilities in cropland or grazed rangeland

is not expected to negatively affect terrestrial ecosystems. Care will be taken to avoid or minimize impacts to the vegetation resources of the Project Site during construction.

The northeastern and east central limits of the Project Site are predicted areas of occurrence for the Topeka shiner, a federally listed endangered species. According to the South Dakota Department of Transportation website, the species was observed in the West Branch of Firesteel Creek as recently as 2006. Additional consultation will be conducted with the USFWS and South Dakota Game, Fish and Parks (GFP) during the NEPA EIS consultation process.

Existing land uses are not anticipated to be significantly changed or impacted by the Project.. Noise from Project construction activities will be temporary and generally limited to daytime hours. Once the Project is operational, noise from the turbines and other facilities is not expected to be above 50 weighted decibel units (dBA) at sensitive noise receptors (i.e., occupied residences).

Construction activities for this project will be short-term. Therefore, no long-term negative impact to the socioeconomics of the area is expected; any short-term effects likely will be beneficial to local businesses.

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

Cultural resource records review for the Project Site identified previously-recorded archaeological and historic resources located within or near the project boundaries. Additional cultural resource evaluation is in progress for the Project Site through the EIS process. The Applicant will make every effort to physically avoid identified cultural resources.

Mitigation measures proposed for the Project include:

- Turbines will be illuminated as required by Federal Aviation Administration (FAA) regulations.
- Existing roads will be used for construction and maintenance where possible. Road construction will be minimized to the extent possible.
- The Project will comply with all applicable Aurora, Jerauld and Brule County zoning requirements.
- Access roads created for the Project will be located to minimize cuts and fills.
- Temporarily disturbed uncultivated areas will be reseeded with certified weed-free seed mixes to blend in with existing vegetation.
- Best Management Practices (BMPs) will be used during construction to control erosion

and ensure that drainage ways and streams are not impacted by sediment runoff from exposed soils.

- The Project will use solid towers for WTGs instead of lattice tower structures, to minimize potential avian and visual impacts.
- The Applicant will construct overhead transmission lines required for the Project in accordance with the current Avian Power Line Interaction Committee (APLIC) guidelines for preventing raptor electrocutions.
- Sites within the Project boundary which are eligible or potentially eligible for the NRHP will be avoided.
- Approximately 4 acres of wetlands are located in areas proposed for construction of the wind turbines, associated access roads and staging areas, overhead transmission lines and other elements proposed for development. The Applicant plans to avoid impacts to wetlands to the greatest extent practicable.

In this Application, the Applicant has addressed each matter set forth in South Dakota Codified Laws (SDCL) Chapter 49-41B and in Administrative Rules of South Dakota (ARSD) Chapter 20:10:22 (Energy Facility Siting Rules) related to wind energy facilities. Included with this Application is a Completeness Checklist (Table 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 and transmission facilities comply with applicable laws and rules;
- The facilities 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 facilities will not substantially impair the health, safety or welfare of the inhabitants; and
- The facilities 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.

3.0 COMPLETENESS CHECKLIST

The contents required for an application with the Public Utilities Commission of the State of South Dakota (SDPUC) 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 1 with cross-references indicating where the information can be found in this Application.

Table 1 Completeness Checklist

SDCL	ARSD	Required Information	Location
49-41B-11(1)	20:10:22:06	**Names of participants required.** The application shall contain the name, address and telephone number of all persons participating in the proposed facility at the time of filing, as well as the names of any individuals authorized to receive communications relating to the application on behalf of those persons.	Section 4.0
49-41B-11(7)	20:10:22:07	**Name of owner and manager.** The application shall contain a complete description of the current and proposed rights of ownership of the proposed facility. It shall also contain the name of the project manager of the proposed facility.	Section 5.0
49-41B-11(8)	20:10:22:08	**Purpose of facility.** The applicant shall describe the purpose of the proposed facility.	Section 6.0
49-41B-11(12)	20:10:22:09	**Estimated cost of facility.** The applicant shall describe the estimated construction cost of the proposed facility.	Section 7.0
49-41B-11(9)	20:10:22:10	**Demand for facility**. The applicant shall provide a description of present and estimated consumer demand and estimated future energy needs of those customers to be directly served by the proposed facility. The applicant shall also provide data, data sources, assumptions, forecast methods or models, or other reasoning upon which the description is based. This statement shall also include information on the relative contribution to any power or energy distribution network or pool that the proposed facility is projected to supply and a statement on the consequences of delay or termination of the construction of the facility.	Section 6.0
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.	Section 8.0, Figures 1, 11, 12, 13

SDCL	ARSD	Required Information	Location
49-41B-11(6), 49-41B-21, 34A-9-7(4)	20:10:22:12	**Alternative sites.** The applicant shall present information related to its selection of the proposed site for the facility, including the following: (1) The general criteria used to select alternative sites, how these criteria were measured and weighed, and reasons for selecting these criteria; (2) An evaluation of alternative sites considered by the applicant for the facility; (3) An evaluation of the proposed plant, wind energy, or transmission site and its advantages over the other alternative sites considered by the applicant, including a discussion of the extent to which reliance upon eminent domain powers could be reduced by use of an alternative site, alternative generation method, or alternative waste handling method.	Section 9.0
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 affect of the environment as a result of their construction or operation in the transmission site, wind energy site, or siting area	Sections 10.0, 11.0, 12.0, 13.0, 14.0, 15.0, 17.0, 18.0, 20.0

SDCL	ARSD	Required Information	Location
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 site or through which the transmission facility would pass; (2) A topographic map of the transmission site or siting area; (3) A written summary of the geological features of the siting area 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 plan or transmission site; (5) A description of the soil type at the plant site; (6) An analysis of potential erosion or sedimentation which may result from site clearing, construction, or operating activities and measures which would 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.	Sections 11.0, 12.0 Figures 1, 8a, 8b, 9

SDCL	ARSD	Required Information	Location
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 Federal, State or local agencies, indication on a map drawn to scale of the current planned water uses by communities, agriculture, recreation, fish and wildlife which may be affected by the location of the proposed facility and a summary of those effects; (3) A map drawn to scale locating any known surface or groundwater supplies within the siting area to be used as a water source or a direct water discharge site for the proposed facility and all offsite pipelines or channels required for water transmission; (4) If aquifers are to be used as a source of potable water supply or process water, specifications of the aquifers to be used and definition of their characteristics, including the capacity of the aquifer to yield water, the estimated recharge rate, and the quality of ground water; (5) A description of designs for storage, reprocessing and cooling prior to discharge of heated water entering natural drainage systems; (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.	Section 12.0, Figures 11a, 11b

SDCL	ARSD	Required Information	Location
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 ameliorate negative biological impacts as a result of construction and operation of the proposed facility.	Section 13.0
49-41B-11(2, 11); 49-41B-21; 49-41B-22	20:10:22:17	**Effect of aquatic ecosystems.** The applicant shall provide information of the effect of the proposed facility on aquatic ecosystems, and including existing information resulting from biological surveys conducted to identify and quantify the aquatic fauna and flora, potentially affected within the transmission site, wind energy site, or siting area, an analysis of the impact of the construction and operation of the proposed facility on the total aquatic biotic environment and planned measures to ameliorate negative biological impacts as a result of construction and operation of the proposed facility.	Section 14.0

SDCL	ARSD	Required Information	Location
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 districts; and (l) Noise sensitive land uses; (2) Identification of the number of persons and homes which would 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.	Sections 15.0, 20.0 Figures 10, 12
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 would 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.	Section 16.0

SDCL	ARSD	Required Information	Location
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 would comply with all water quality standards and regulations of any Federal or State agency having jurisdiction and any variances permitted.	Section 17.0
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 would comply with all air quality standards and regulations of any Federal or State agency having jurisdiction and any variances permitted.	Section 18.0
49-41B-11(3)	20:10:22:22	**Time schedule.** The applicant shall provide estimated time schedules for accomplishment of major events in the commencement and duration of construction of the proposed facility.	Section 19.0
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 would 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 State and local 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.	Section 20.0

SDCL	ARSD	Required Information	Location
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 10 years of commercial operation in 1-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 would remain within the county and the township in which the facility is located after construction is completed.	Section 20.0, 21.0
49-41B-11(5)	20:10:22:25	**Future additions and modifications.** The applicant shall describe any plans for future modification or expansion of the proposed facility or construction of additional facilities which the applicant may wish to be approved in the permit.	Section 22.0

SDCL	ARSD	Required Information	Location
49-41B-11; 49-41B-21; 49-41B-22	20:10:22:26	**Nature of proposed energy conversion facility.** The application shall contain a description of the operating nature of the proposed facility, the expected source and quantity of its raw materials and energy requirements. The preceding shall be illustrated by means of an annotated map. The description shall include the following: (1) The proposed on-line life of the facility and its projected operating capacity during its on-line life; (2) A general description of the major components of the proposed facility such as boilers, steam generators, turbine generators, cooling facilities, production equipment, pollution control equipment and other associated facilities; (3) An identification of materials flowing into the facility, including all materials such as air, water, coal and chemical compounds that will be utilized by the proposed facility, recorded in accordance with accepted scientific practices regarding their estimated consumption rate; (4) An inventory of all materials flowing out of the proposed facility, including the method of control, treatment, destination and disposal monitoring programs of each of the materials; and (5) The procedures proposed to avoid or ameliorate the possibility that the discharges, emissions, or solid wastes would do any of the following: (a) Constitute a public nuisance; (b) Endanger the public health and safety; (c) Endanger human, animal, or plant life; or (d) Endanger recreational facilities	N/A
49-41B-11	20:10:22:27	**Products to be produced.** The applicant shall describe both in general terms and by technical description the products and by-products to be produced by the proposed facility and their destinations.	N/A
49-41B-11	20:10:22:28	**Fuel type used.** The applicant shall provide a description of the type of fuel used, including: (1) Primary proposed fuel types; (2) Anticipated yield and range (BTU or appropriate unit); and (3) Approximate chemical analysis of the proposed design fuel.	N/A

SDCL	ARSD	Required Information	Location
49-41B-11	20:10:22:29	**Proposed primary and secondary fuel sources and transportation.** On a map drawn to scale, the applicant shall provide the location of proposed primary and secondary sources of fuel and method of its transportation. When possible, the map shall show the location of the proposed facility; where distances are too great to show the facility and proposed primary and alternate supply sources, smaller scale inserts showing relative location shall be presented. The applicant shall also describe any additional transportation facilities needed to deliver raw materials and to remove wastes.	N/A; transportation of construction material described in Section 20.0
49-41B-11; 49-41B-21; 49-34A-97	20:10:22:30	**Alternate energy resources.** The applicant shall provide information concerning the alternate energy resources considered in the construction of the energy conversion facility. The applicant shall also discuss the reasons for selecting the proposed energy resource rather than an alternative resource.	N/A
49-41B-11(2, 11)	20:10:22:30	**Solid or radioactive waste.** The applicant shall provide information concerning the generation, treatment, storage, transport and disposal of solid or radioactive waste generated by the proposed facility and evidence that all disposal of the waste will comply with the standards and regulations of any Federal or State agency having jurisdiction. Any variations from these standards shall be indicated.	N/A
49-41B-11	20:10:22:32	**Estimate of expected efficiency.** The applicant shall provide an estimate of the expected efficiency of the proposed energy conversion process and discuss the assumptions on which the estimate is based.	N/A
49-41B-11; 49-41B-21; 49-41B-22; 34A-9-7(2, 5)	20:10:22:33	**Decommissioning.** The applicant shall provide a plan or policy statement on action to be taken at the end of the energy conversion facility's on-line life. Estimates of monetary costs, site condition after decommissioning and the amount of land irretrievably committed shall be included in this statement.	N/A

SDCL	ARSD	Required Information	Location
49-41B-35(3)	20:10:22:33.01	**Decommissioning of wind energy facilities – Funding for removal of facilities.** The applicant shall provide a plan regarding the action to be taken upon the decommissioning and removal of the wind energy facilities. Estimates of monetary costs and the site condition after decommissioning shall be included in the plan. The commission may require a bond, guarantee, insurance, or other requirement to provide funding for the decommissioning and removal of a wind energy facility. The commission shall consider the size of the facility, the location of the facility and the financial condition of the applicant when determining whether to require some type of funding. The same criteria shall be used to determine the amount of any required funding.	Section 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: (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;	Sections 8.1, 8.2, 8.3, 8.4, 8.5, 8.11, 9.0, 13.2,, 15.4.3, 15.4.5, 16.0, 20.2.4.2, 22.0, 24.0, 25.0 Figures 3, 4, 5, 10, 12, 13

SDCL	ARSD	Required Information	Location
		(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-11(2, 11)	20:10:22:34	**Transmission facility layout and construction.** If a transmission facility is proposed, the applicant shall submit a policy statement concerning the route clearing, construction and landscaping operations and a description of plans for continued right-of-way maintenance, including stabilization and weed control.	Sections 8.2, 8.12
49-41B-11 (2, 11)	20:10:22:35.	**Information concerning transmission facilities.** If a transmission facility is proposed, the applicant shall provide the following information as it becomes available to the applicant: (1) Configuration of the towers and poles, including material, overall height and width; (2) Conductor configuration and size, length of span between structures and number of circuits per pole or tower; (3) The proposed transmission site and major alternatives as depicted on overhead photographs and land use culture maps; (4) Reliability and safety; (5) Right-of-way or condemnation requirements; (6) Necessary clearing activities; and (7) If the transmission facility is placed underground, the depth of burial, distance between access points, conductor configuration and size and number of circuits.	Sections 8.2, 8.11, 8.12.1, 9.3, 9.4 Figures 3, 10, 12
49-41B-7; 49-41B-22	20:10:22:36.	**Additional information in application.** The applicant shall also submit as part of the application any additional information necessary for the local review committees to assess the effects of the proposed facility pursuant to SDCL 49-41B-7. The applicant shall also submit as part of its application any additional information necessary to meet the burden of proof specified in SDCL 49-41B-22.	Section 26.0

SDCL	ARSD	Required Information	Location
49-41B-7	–	**Assessment by local review committee – Factors included.** The local review committee shall meet to assess the extent of the potential social and economic effect to be generated by the proposed facility, to assess the affected area's capacity to absorb those effects at various stages of construction, and formulate mitigation measures. The assessment of the local review committee shall include but not be limited to consideration of the temporary and permanent alternatives in the following areas: (1) Housing supplies; (2) Educational facilities and manpower; (3) Waste supply and distribution; (4) Waste water treatment and collection; (5) Solid waste disposal and collection; (6) Law enforcement; (7) Transportation; (8) Fire protection; (9) Health; (10) Recreation; (11) Government; (12) Energy.	N/A
49-41B-22	–	**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.	Introduction, Section 26.4

SDCL	ARSD	Required Information	Location
49-41B-11; 49-41B-22	20:10:22:37.	**Statement required describing gas or liquid transmission line standards of construction.** . The applicant shall submit a statement describing existing pipeline standards and regulations that would be followed during construction and operation of the proposed transmission facility.	N/A
49-41B-11; 49-41B-22	20:10:22:38.	**Gas or liquid transmission line description.** The applicant shall provide the following information describing the proposed gas or liquid transmission line: (1) A flow diagram showing daily design capacity of the proposed transmission facility; (2) Changes in flow in the transmission facilities connected to the proposed facility; (3) Technical specifications of the pipe proposed to be installed, including the certified maximum operating pressure, expressed in terms of pounds per square inch gauge (psig); (4) A description of each new compressor station and the specific operating characteristics of each station; and (5) A description of all storage facilities associated with the proposed facility.	N/A
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. Such filing would be made consistent with the prehearing conference order.	Section 26.0

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

The Applicant, a South Dakota Corporation, is a wholly owned subsidiary of BEPC. BEPC is a consumer-owned, regional cooperative corporation headquartered in Bismarck, North Dakota, which services more than 120 member rural electric systems in nine states: Colorado, Iowa, Minnesota, Montana, Nebraska, New Mexico, North Dakota, South Dakota and Wyoming. These member systems, in turn, distribute electricity to more than 2.8 million customers. Listed below are the names and contact information for the individuals authorized to receive communications relating to the application on behalf of the Applicant.

- Ron L. Rebenitsch, P.E (Project Manager), BEPC, 1717 E Interstate Bismarck, ND 58503-0564, Phone: (701) 557-5120, ronreb@bepc.com
- Mr. Kevin Solie, (Senior Environmental Analyst), BEPC, 1717 E Interstate Bismarck, ND 58503-0564, Phone: (701) 557-5495, ksolie@bepc.com
- Mr. R. Russell Mather, (Staff Counsel), BEPC, 1717 E Interstate Bismarck, ND 58503-0564, Phone: (701) 223-0441

5.0 NAME OF OWNER AND MANAGER (ARSD 20:10:22:07)

The Applicant will be the sole owner of the proposed Project. Ron L. Rebenitsch, P.E. is the Manager for the Project.

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

The Applicant proposes to construct and operate the Project, a wind energy electric generating facility, and ancillary facilities, approximately one half mile south of the area defined as Crow Lake, South Dakota. The Project Site is located within Patten and Pleasant Valley Townships in Aurora County; Logan, Crow Lake and Anina Townships in Jerauld County; and Willow Lake and Plummer Townships in Brule County, South Dakota (Figure 1).

The purpose of this Project is to develop the wind resource in Aurora, Jerauld and Brule counties of South Dakota to meet a portion of the regional demand for renewable power. Project construction is scheduled for mid-2010. A delay in construction would result in additional costs, including charges for double handling and/or storing project components and potentially charges for contractor acceleration. A late start would also increase the amount of winter weather construction, with associated costs. In addition, a Project delay would result in lost generation opportunity/revenue for the Applicant.

The following sections describe the regional wind resource, the regional demand for renewable power and the transmission facility demand to provide an outlet for renewable power to serve the demand.

6.1 WIND RESOURCE AREAS

The American Wind Energy Association (AWEA) has ranked South Dakota as having the fourth highest wind potential in the United States. However, only 288 MW of wind energy generation has actually been installed; an additional 25 MW was under construction as of June 2009 (AWEA 2009).

The Project Site was identified as an excellent wind resource based upon data obtained from the National Renewable Energy Laboratory (NREL) wind resource map (Figure 2), supplemented by existing meteorological data from a site established by the South Dakota State University Wind Resource Assessment Network (WRAN). Wind Logics, a meteorological consultant from Minneapolis, Minnesota, developed a 500 meter wind map for the Project Site. The map indicates the potential for the Project to be an excellent wind resource. Meteorological (met) towers were erected to measure the wind and correlation of this met tower data with the WRAN site was initiated. In general, subsequent wind measurements have confirmed the wind resource. The wind resource assessment study conducted in the Project Site projects a net capacity factor in the upper thirty percentile range. Table 2 shows the existing and potential wind power development for South Dakota and the surrounding states.

Table 2 Existing and Potential Wind Power

State	Existing[1] (MW) as of June 2009	20% Wind Energy by 2030 (MW)[2]	Renewable Portfolio Standards[3]
South Dakota	288	5,000-10,000	10% by 2015[3a]
North Dakota	714	1,000-5,000	10% by 2015[3b]
Iowa	3,043	>10,000	1000 MW by 2010[3c]
Minnesota	1,805	5,000-10,000	25% by 2025[3d]
Nebraska	153	5,000-10,000	None
Wyoming	816	>10,000	None
Montana	272	5,000-10,000	15% by 2015[3e]
Total	**7,091**	**41,000 - >65,000**	

Sources:

[1](AWEA 2009)

[2](DOE EERE 2008a)

[3] (DOE EERE 2008b)

[3a] objective, not a standard

[3b] objective, not a standard

[3c] voluntary goal set by governor in 2001, not a standard

[3d] Xcel Energy: 30% by 2020, Other utilities: 25% by 2025

[3e]5% in 2008; 10% in 2010; 15% in 2015

6.2 RENEWABLE POWER DEMAND

Between 1999 and 2006, the Applicant's system peak demand increased 752 MW, from 1,195 MW to 1,947 MW, which is approximately 107 MW per year. The Applicant's system energy sales increased 5.3 million MWh, from 6.5 million MWh to 11.8 million MWh, or approximately 760,000 MWh per year. The Applicant forecasts peak demand on its system to grow by 1,834 MW from 2006 through 2021. This will be a growth of approximately 122 MW per year. The load growth is driven mainly by commercial sector growth, which includes energy related development in the form of coal, oil and gas development. There are also increased loads in the residential sector mainly located on the outskirts of larger cities within the service territory. The Applicant's total system deficit was 275 MW in 2008 and is forecasted to increase steadily over time. At present, the deficit is being addressed via power purchases from the market and the addition of generation resources.

Several states have implemented Renewable Energy Standard (RES) or Renewable Portfolio Standard (RPS) policies that encourage the development of wind energy projects. As of June 2008, 28 states and the District of Columbia have RPS laws and five states have RPS goals (DOE EERE 2008b). In South Dakota, an RPS goal was established in 2008, with the objective that 10 percent of all electricity sold at retail within the State will be obtained from renewable energy and recycled energy sources by 2015 (SDL CL 49-34A-101). The proposed Project will provide a new source of renewable energy and will help meet the United States DOE's goal of reaching 20 percent wind energy by 2030 and South Dakota's renewable/recycled energy objective of 10 percent by 2015.

The Federal government has provided, and is expected to continue to provide until December 2012, production tax credits (PTCs) for wind power to encourage investment and provide some financial stability to allow projects to develop. These mandates and related agreements have led regulated utilities to increase wind power as a percentage of their generation portfolio. The combination of policy and market drivers is creating an increased demand for wind power. Transmission is needed because high-potential wind resources are not coincident with areas of high electric load. This is demonstrated in a number of regional transmission planning studies that cover Minnesota, North Dakota and South Dakota. These studies are consistent in forecasting that wind resources in South Dakota would be one of the primary sources of wind power to meet regional demand. The planning studies include:

- Midwest Independent System Operator (MISO) Northwest Exploratory Study, which forecasts 500 MW of wind power (Grivna 2005);
- MISO Transmission Expansion Plan 2006, which forecasts the addition of 2,810 MW of wind power in the Midwest by 2011 (MISO 2007);
- Xcel Energy will add 2,600 MW of wind power in Minnesota and surrounding states by 2020 (Xcel 2007), and CapX 2020 anticipates a load increase of 6,300 MW between

2009 and 2020 (CapX 2005);

- Buffalo Ridge Incremental Generation Outlet Transmission Study, which forecasts more than 400 MW of wind power (Gonzalez 2005);
- South Dakota Energy Infrastructure Authority's South Dakota Wind Power Report (SDEIA 2007)
- Western Area Power Administration's System Impact Study, Wessington Springs Project, Generation Interconnection GI-0602, 100 MW Generation Addition near Wessington Springs, South Dakota. July 2007. (Western 2007)
- Western Area Power Administration's Dakotas Wind Transmission Study, which assessed the impact of an additional 500 MW of wind energy at seven proposed sites in North Dakota and South Dakota (ABB Inc. 2005)

Applicant and its parent company, BEPC, are striving to make their combined resource mix consistent with the renewable energy goals and objectives described above. BEPC members passed a resolution at their 2005 annual meeting that established a goal for BEPC to "obtain renewable or environmentally benign resources equal to 10 percent of the MW capacity needed to meet its member demand by 2010". The Project is intended to facilitate that goal.

6.3 TRANSMISSION FACILITY DEMAND

The Wessington Springs Wind Farm is an operating wind-energy facility located south of Wessington Springs in Jerauld County, South Dakota northeast of the proposed Project Site. The 51-MW facility began operations in October 2008. Western built and will maintain the Wessington Springs Switchyard that is interconnecting the facility to the Integrated Transmission System and Western's existing Fort Thompson to Sioux Falls 230-kV transmission line.

Power from the Project will be to the Integrated System utilizing the same interconnection facilities as described above via the Applicant's proposed 230-kV transmission line. The Applicant selected Western's Wessington Springs substation because it provides the Project with access to high voltage transmission lines in proximity to the high wind energy resource site. The sole purpose of the proposed transmission line is to carry power from the CLCS to Western's Wessington Springs substation.

A Western transmission study is currently underway, and the Applicant fully expects that at least 151.5 MW of additional transmission capacity will be available for the Project. There is a chance that the final interconnection studies will conclude that other transmission facilities, such as network upgrades remote from the Project Site, would be required. If Western determines that other facilities are needed to support the Project's interconnection request, the appropriate level of environmental review in accordance with regulatory requirements will be conducted.

The Applicant expects to sign a Large Generator Interconnection Agreement (LGIA) with Western for the 151.5-MW interconnection before the Project is completed in 2010.

7.0 ESTIMATED COST OF THE WIND ENERGY FACILITY AND TRANSMISSION FACILITY (ARSD 20:10:22:09)

The estimated capital cost of the Project is approximately $350 million, based on 2009 price estimates. This estimate includes planning, easement acquisition, permitting and construction of WTGs, access roads, electrical collection system, CLCS, interconnection transmission line, O&M facility, supervisory control and data acquisition (SCADA) system, meteorological towers, and sonic detection and ranging (SODAR) unit. Assuming a cost of roughly $400,000 per mile for 13 miles of interconnection line and a $2.5 to $3 Million cost for the CLCS, the total capital cost of the transmission line and other interconnection facilities is estimated at $6.5 to $8 Million.

8.0 GENERAL SITE AND PROJECT COMPONENT DESCRIPTION (ARSD 20:10:22:11, 33.02, 34 AND 35)

The Project will be located on approximately 37,000 acres of land in southern Jerauld County, northwestern Aurora County and northeastern Brule County, South Dakota, and one half mile south of the unincorporated community of Crow Lake (Figure 1). The Project boundary encompasses approximately 58 square miles in Patten and Pleasant Valley Townships in Aurora County; Logan, Crow Lake, and Anina Townships in Jerauld County; and Willow Lake and Plummer Townships in Brule County, South Dakota (Figure 1). Table 3 shows the sections contained within the Project boundary.

Table 3 Sections within the Project Boundary

County	Township Name	Township	Range	Sections
Aurora	Patten	105 N	66 W	1-11, 14-22, 28-32
	Pleasant Valley	105 N	65 W	4, 5, 6
Brule	Willow Lake	104 N	67 W	1-4
	Plummer	105 N	67 W	1-3, 11, 12, 25, 26, 34, 35, 36
Jerauld	Anina	106 N	65 W	20-23, 26-33
	Crow Lake	106 N	66 W	25-36
	Logan	106 N	67 W	25, 26, 35, 36

There are no active railroads or cemeteries within the Project boundary. Figure 12 shows the locations of farmsteads, schools, public lands and other sensitive land uses near the Project.

8.1 WIND FARM FACILITY

The Project will consist of approximately 101 1.5 MW WTGs with an aggregate nameplate capacity of 151.5 MW and a net operating capacity of between approximately 512,175 and 564,706 MW hours per year (MWh/yr), assuming a capacity factor of 39 to 43 percent. The Project will also include electric collector lines, the CLCS, an approximate 13-mile 230-kV transmission line with an interconnection to the Wessington Springs substation (discussed in further detail below), an O&M facility, access roads connecting to each WTG, one to two permanent meteorological towers, a SODAR unit and SCADA system. See Figure 3 (Proposed Wind Farm Project Layout) for the current layout of the Project facilities. Table 4 lists the sections within the Project boundary containing proposed wind farm facilities.

Table 4 Sections Containing Project Facility Components

County	Township Name	Township	Range	Sections
Aurora	Patten	105 N	66 W	2-11, 15-21, 28-32
	Pleasant Valley	105 N	65 W	None (current layout)
Brule	Willow Lake	104 N	67 W	1-4
	Plummer	105 N	67 W	1-3, 11, 12, 25, 34, 35, 36
Jerauld	Anina	106 N	65 W	20-23, 27-29, 31-33
	Crow Lake	106 N	66 W	27, 31-36
	Logan	106 N	67 W	35, 36

Figure 3 shows 110 WTGs. Some of the WTG locations shown ultimately may not be utilized as part of the Project, and it is also possible that additional turbine locations may be required. It is anticipated that as many as ten additional turbines may be installed within the Project Site, pending future load, transmission availability and renewable portfolio standard requirements. The Applicant requests that the permit conditions provide flexibility within the parameters described above, to add or delete WTG locations.

The layout shown on Figure 3 may need to be modified based on the EIS findings. For example, by shifting within already surveyed corridors, the Applicant will be able to place turbines such that sensitive biological and cultural features are avoided, similar to the current layout. However, it is possible that some turbine sites may be placed outside of corridors that were surveyed as part of the current layout. Additional site surveys will be conducted if needed due to layout changes. Additionally, ongoing discussions with the landowners, the Counties, the Townships and South Dakota Department of Transportation (SD DOT) may lead to changes in turbine locations, road alignments and overhead electrical line pole locations. As discussed further in Sections 11, 13, 14 and 20, other factors that could affect ultimate turbine and road

locations include unsuitable soil conditions, or biological or cultural resources.

The Applicant will coordinate with the SDPUC as the final layout is developed for this Project and will submit a final layout to the SDPUC when it is developed. The final layout will adhere to the setbacks described in this Application (such as setbacks from houses, roads, unleased lands and noise setbacks) as well as avoidance and mitigation measures described. New facility locations that were not surveyed as part of the preliminary layout will be surveyed and the results of these surveys will be shared with the SDPUC.

8.2 TRANSMISSION FACILITY

See Figure 3 (Proposed Wind Farm Project Layout) for the route of the proposed 230-kV transmission line. Figure 3 also depicts an alternate transmission line route, which may be also considered (refer to Section 9.4 for site configuration alternatives). The transmission facilities include the following:

- The CLCS, located in the northwest corner of Section 9 in Patten Township where the electrical voltage will be stepped up from 34.5-kV to 230-kV for the approximate 151.5-MW interconnection;
- A new 230-kV transmission line running approximately 13 miles between the proposed CLCS and the Wessington Springs substation; and
- Improvements to the Western interconnection point at the existing Wessington Springs Substation accommodate the interconnection for 151.5 MW.

Table 5 lists sections within the Project boundary crossed by the proposed transmission line route.

Table 5 Sections Crossed by or Bordering Proposed 230-kV Transmission Line

County	Township Name	Township	Range	Sections
Aurora	Patten	105 N	66 W	9, 8, 5
Jerauld	Anina	106 N	65 W	20-23, 29, 31, 32
	Crow Lake	106 N	66 W	32-36

8.3 WIND TURBINE GENERATORS

The Applicant plans to install approximately 101 General Electric 1.5sle model wind turbines for the Project. Each WTG will have a nameplate capacity output of 1.5 MW. Each WTG will have a hub height of 80 meters (262 feet) and a turbine rotor diameter of 77 meters (252 feet). The

total height of each WTG will be 118.5 meters (389 feet) with a blade in the vertical position. Table 6 depicts additional specifications for the turbines.

Table 6 WTG Characteristics

GE 1.5 MW Characteristics	
Cut-in wind speed[1]	3.5 meters per second (7.8 miles per hour)
Rated capacity wind speed[2]	12 meters per second (27 miles per hour)
Cut-out wind speed[3]	25 meters per second (56 miles per hour)
Maximum sustained wind speed[4]	Over 45 meters per second (100 miles per hour)
Rotor speed	10.1 to 20.4 revolutions per minute

NOTES:
[1] Cut-in wind speed = wind speed at which turbine begins operation
[2] Rated capacity wind speed = wind speed at which turbine reaches its rated capacity
[3] Cut-out wind speed (600 second average) = wind speed above which turbine shuts down operation
[4] Maximum sustained wind speed = wind speed up to which turbine is designed to withstand

The General Electric 1.5sle turbines are active yaw- and pitch-regulated machines with power and torque control capabilities. Each WTG has three blades. As the wind passes over the blades of a WTG, it creates lift and causes the rotor to turn. The rotor is connected by a hub and main shaft to a gearbox, which is connected to a generator. Turbine dimensions for this Project (Figure 4) will be as follows: generator hub height of 80 meters (262 feet) and a turbine rotor diameter of 77 meters (252 feet). The total height of each wind turbine will be 118.5 meters (389 feet) with a blade in the vertical position.

Other turbine specifications include:

- Gearbox with three-step planetary spur gear system;
- Programmable logic controller (PLC)
- Double fed three-phase asynchronous generator;
- A braking system for each blade and a hydraulic parking brake (disc brake); and
- Yaw systems that are electromechanically driven.

8.4 WIND TURBINE TOWERS

The tower that supports the wind turbine is a tapered monopole, shown in Figure 4, approximately 80 meters (262 feet) in height. The towers will be constructed of tubular steel, approximately 17 feet in diameter at the base, with internal joint flanges. The color of the tower

will be standard white or off-white. Welds are made in automatically controlled power welding machines and ultrasonically inspected during manufacturing per American National Standards Institute (ANSI) specifications. Surfaces are sandblasted and multi-layer coated for protection against corrosion. Access to the turbine is through a lockable steel door at the base of the tower. Four platforms are connected with a ladder and a fall arresting safety system for access to the nacelle. Tower lighting is discussed in Section 20.2.4.2. A controller cabinet will be located inside each tower base. Towers are typically fabricated in three sections and assembled on-site.

8.5 WIND TURBINE FOUNDATIONS

The turbine foundations will typically be mat foundations (inverted T-foundations) or concentric-ring-shell foundations. The actual foundation design for each turbine will be determined based on site-specific geotechnical information and structural loading requirements for the turbine. The pedestal diameter for an 80 meter tower (262 feet) is approximately 5.2 meters (17 feet). In some cases, for step-and-touch voltage compliance, an area around a turbine may be covered in 4 inches of gravel, river rock or crushed stone. Figure 5 shows a typical foundation design.

The excavated area for the turbine foundations will typically be approximately 70 feet by 70 feet (approximately 0.1 acre). During construction, a larger area will be used to lay down the rotors and maneuver cranes during turbine assembly. During construction, a 190-foot by 210-foot work/staging area at each turbine will include the crane pad and rotor assembly area (Figure 6).

8.6 GENERATOR STEP-UP TRANSFORMERS

A generator step up transformer (GSU) will be installed at the base of each wind turbine to increase the output voltage of the wind turbine to the voltage of the power collection system (34.5-kV). The transformers will be mounted on concrete pads and will be placed next to each WTG.

8.7 ACCESS ROADS

New access roads will be built to facilitate both construction and maintenance of the turbines. This road network will include approximately 70 miles of new or upgraded roads. These roads will be designed to minimize length and construction impact. Initially, turbine access roads will be approximately 25 feet in width, to accommodate the safe operation of construction equipment. Upon completion of construction, the turbine access roads will be reclaimed and narrowed to an extent allowing for the routine maintenance of the facility. Select existing State, County and section line roads will also be improved upon to aid in servicing the turbine sites. Approximately 30 to 40 miles of new turbine access roads will be built and 25 to 35 miles of existing roads will be used and where appropriate, improved.

The WTGs will be accessible from public roads via all-weather Class 5 gravel roads. Figure 3 shows approximately 70 miles of new or upgraded access roads. Access roads will follow fence lines, field lines and existing field access roads to the extent possible. Siting roads in areas with unstable soil will be avoided wherever possible. Roads will include appropriate drainage controls including culverts and will be constructed in a manner to allow farm and/or land owner equipment to cross. The roads will be surfaced with road base designed to allow passage under inclement weather conditions. The access road cross sections will consist of graded soil, overlain by geotextile fabric (if needed), and surfaced with compacted aggregate base course.

8.8 O&M FACILITY

It is anticipated that an O&M building, approximately 5,500-square foot (50 feet by 110 feet), will be built on private land leased by the Applicant within the vicinity of the CLCS. The current proposed location (northwest corner of Section 9 of the Patten Township) of the O&M facility is depicted on Figure 3. The proposed O&M building will house the equipment to operate and maintain the wind farm. A gravel parking pad will provide the building with a parking area.

8.9 METEOROLOGICAL TOWERS AND SODAR UNITS

The Applicant has constructed four temporary meteorological towers within the Project boundary. These temporary meteorological towers are expected to be removed within one year of Project construction. The Applicant anticipates that the Project will include wind measurement equipment which could consist of Light Detection and Ranging (LIDAR) or SODAR unit, or one or two permanent 60-meter (197 feet) or 80-meter (262 feet) meteorological towers to house anemometers to measure the wind speed. The permanent towers will not have guy wires and will be lighted as necessary to comply with FAA guidelines. Each meteorological tower will result in a permanent impact of approximately 6.2 meters by 6.2 meters (20.5 feet by 20.5 feet), or 39 square meters (420 square feet).

A LIDAR or SODAR unit is typically located near (within 300 feet) one of the permanent meteorological towers in a small trailer approximately 3 meters (10 feet) high with an attached 6-meter (20 feet) wind sensor boom. The purpose of the unit is to remotely measure the vertical turbulence structure and wind profile up to 200 meters (656 feet) in 9.8-meter (32-foot) increments.

8.10 TEMPORARY LAYDOWN/STOCKPILE AREAS/BATCHPLANT/CRANE WALKS

During construction, it is likely that a temporary stockpile or laydown area will be selected within the Project boundary. Turbine components may be temporarily stored in an area covering approximately 15 to 20 acres before being moved to the final turbine sites. In addition, one or more concrete batchplants may be necessary during construction in order to prepare concrete

for foundations on site. It has not been determined at this time if on-site batchplants will be necessary for the Project. If they are utilized, each will temporarily impact approximately 3 acres of land, and it is anticipated that they will be located within the temporary laydown area. For purposes of calculating temporary impacts in this application, the Applicant has assumed that one approximate 40-acre laydown/stockpile/batchplant area will be used during construction.

In addition to the approximate 40-acre laydown/stockpile/batchplant area, temporary crane walk disturbances will also be necessary for the Project. Crane walks are estimated to be 40 feet wide and will be located along the approximate 60 miles of temporary collector line disturbances. For purposes of calculating temporary impacts in this application, the Applicant has assumed approximately 291 acres of temporary disturbance from the crane walks.

8.11 ELECTRIC COLLECTOR SYSTEM, COLLECTION SUBSTATION, TRANSMISSION LINE, AND INTERCONNECTION FACILITIES (ARSD 20:10:22:34 AND 35)

8.11.1 34.5-kV COLLECTION SYSTEM

Each WTG within the Project Site will be interconnected by communication and electrical power collection circuit facilities. These facilities will include underground feeder lines (collector lines) that will deliver wind-generated power to the CLCS.

8.11.1.1 Underground 34.5-kV Electric System

This system will be used to route the power from each turbine to the CLCS where the electrical voltage will be stepped up from 34.5-kV to 230-kV. The underground collector system will be placed in one trench or two parallel trenches and connect each of the turbines to the CLCS. The estimated trench length, including parallel trenches, is 317,000 feet (approximately 60 miles). The temporary disturbance associated with the underground collector system is estimated to be 15 feet wide.

The underground collector circuits will consist of three power cables contained in an insulated jacket and buried at a minimum depth of 1.2 meters (4 feet) that will not interfere with farming operations. Access to the underground lines will be located at each turbine site, at junction boxes located at points where the underground collector system cables are spliced and where the cables enter into the CLCS. Due to the power carrying limits of underground cabling, there are several segments of underground collection lines or circuits.

The underground electrical collection and communication systems generally will be installed by plowing or trenching the cables. Topsoil will be segregated and temporarily stockpiled prior to trenching. Using this method, the disturbed soils and topsoil are typically replaced over the buried cable within one day, and the drainage patterns and surface topography are restored to

pre-existing conditions. In rangeland prairie areas, the Applicant will re-vegetate the disturbed soils with a weed-free native plant seed mix.

8.11.1.2 Underground Communication System

The fiber optic communication lines for the Project will be installed in the same trenches as the underground electrical collector cables and connect each turbine to the O&M Building and CLCS.

8.11.2 230-kV TRANSMISSION LINE

A new single circuit 230-kV transmission line would be required to deliver the power from the CLCS to a new point of interconnection at the 230-kV Wessington Springs Substation owned by Western. The Wessington Springs Substation is located approximately 13 miles from the proposed CLCS. The proposed line would be built using steel single-pole structures. The single-pole transmission line structures would range in height from approximately 95 to 120 feet and average 110 feet, depending on span distances between structures and area topography. The span between structures would range from 700 feet to 950 feet and average approximately 800 feet, depending on topography; taller structures could be used for crossing existing distribution and transmission lines or where unusual terrain exists.

The transmission line route will exit the CLCS located in the northwest corner of Section 9 through the extreme northeastern corner of the neighboring section to the west, Section 8, and then proceed northward along the eastern boundary of Section 5. Once at the northeast corner of Section 5, the transmission line will turn eastward and continue east approximately 5 miles along the boundary between Jerauld and Aurora Counties. The proposed route then turns north for two miles, east for about 2.5 miles, and then northeastward about one-half mile toward the Wessington Springs substation. An alternative route is also under consideration and both the proposed and alternative routes are depicted on Figure 3 of Appendix A.

This transmission line route will require a 125-foot right-of-way (ROW). The poles will be located on easements obtained from landowners on private land just outside of road ROW, except in the cross-country segments where the line may be placed within public ROW along the section lines. The conductor type for the 230-kV line is expected to be 1272 kcmil 45/7 Aluminum Conductor, Steel Reinforced (ACSR).

Temporary impacts for construction of this overhead line will occur within the width of the ROW, and within an approximate 12,500-square foot area per pole for temporary laydown impacts. Permanent impacts for this line will be approximately 50 square feet per pole for the single circuit 230-kV structures. The 230-kV line is expected to span wetlands and waterways, thereby avoiding impacts.

Applicant does not anticipate significant deviations from the proposed alignment described in this application. However, the Applicant requests that flexibility be granted for deviations from the proposed route in order to accommodate changes based on landowner preferences and changes in site control, requirements of Township, County and State road departments and engineering requirements. The final pre-construction design plans will be submitted to the SDPUC no later than 45 days before the start of construction.

8.11.3 COLLECTOR SUBSTATION

A new collector substation, the CLCS, will be constructed in the center of the Project area, on private land in the northwest corner of Section 9 of Patten Township of Aurora County. The 34.5-kV wind farm electric collection grid and fiber optic communication network will terminate at the CLCS. The CLCS will include a transformer to step up the voltage of the collection grid from 34.5-kV to 230-kV. Additional facilities located within the CLCS include above ground bus structures to interconnect the substation components, breakers, a building for relays, switchgear, communications and controls and other related facilities required for delivery of electric power to the proposed 230-kV transmission line. A list of the anticipated CLCS components is shown in Table 7.

Table 7 Anticipated CLCS Components

Substation Equipment	Installation (Total)
Control Building	1
34.5-kV Switchgear	1
34.5-kV Capacitor Banks	1
230/34.5-kV Transformer-kV1A	1
230-kV Circuit Breaker	1

Design of the CLCS is not finalized, but the Applicant expects the CLCS will be enclosed by a chain link fence with dimensions of roughly 400 feet by 160 feet. The substation components will be placed on concrete and steel foundations. The preliminary CLCS layout is included in Figure 7.

The CLCS will be designed in compliance with Federal, State and Local regulations, National Electrical Safety Code (NESC) standards and other applicable industry standards and will be interconnected to Western's Wessington Springs Substation via the proposed overhead 230-kV transmission line.

8.11.4 IMPROVEMENTS TO WESSINGTON SPRINGS SUBSTATION

This Project proposes an interconnection to the Wessington Springs substation via the proposed 230-kV transmission line. It is anticipated that a 230-kV circuit breaker (SF6 gas-

insulated) and associated switches, bus work and metering would be installed at the Wessington Springs substation. These improvements are anticipated to occur within the existing footprint of the Wessington Springs substation with little, if any, increases to the existing surfacing of the substation.

8.12 TRANSMISSION CONSTRUCTION METHODOLOGY, SITE STABILIZATION, AND MAINTENANCE (ASRD 20:10:22:34)

The following describes the Applicant's policy regarding the Project construction methodology, site stabilization and maintenance.

8.12.1 Site Clearing

Minimal tree and brush clearing will be required, because the majority of the overhead 230-kV transmission line will be constructed in cultivated agricultural fields, pastures and existing ROWs. In some isolated cases, limited grading could be required at structure locations if there is sloping or uneven ground. Grading may be necessary in that situation to level an access route and/or provide a working area. Equipment used for this grading will likely consist of a front-end loader or a small dozer.

8.12.2 Equipment Delivery and Transportation

The material required for construction of the transmission line (e.g. poles, conductor cable, insulator bells) and CLCS will likely be delivered to a laydown area. These and other needed materials and equipment, including concrete, will be transported to the laydown location and structure sites within the Project ROW as construction progresses.

8.12.3 Excavation, Foundations and Structure Erection

Insulators and other hardware will be attached to each transmission structure while on the ground. Direct burial or foundations for steel pole transmission structures, would require excavating or auguring a hole approximately 15 to 20 feet deep and approximately 5 to 7 feet in diameter. Excavation dimensions will depend upon soil conditions, foundation type, and whether the structures will be constructed on sloped topography.

The transmission poles will be lifted (either directly buried or placed and secured on the foundation) by a crane or similar heavy-duty equipment. The annulus between the poles (and/or foundation) and the sidewalls of the holes will be back-filled with crushed rock. Angle points would require concrete foundations. Concrete trucks will deliver the concrete from a local batchplant. Excess soil will be removed from the site unless otherwise requested by the landowner. Most poles will be directly buried and not require a separate foundation.

8.12.4 Conductor Stringing

Conductors will be installed by establishing stringing setup areas within the ROW, typically every two miles, which will store the spools of conductor cable. Temporary guard or clearance poles will be installed as needed over existing distribution or communication lines, streets, roads, highways, railways, or other obstructions after necessary notifications are made and permits are obtained. This ensures that conductors will not obstruct traffic or contact existing energized conductors or other cables. Once the structures have been erected, crews will drive along the ROW, securing the conductor line through the insulators on the poles and installing shield wire clamps once the final sag is established. The structures will be accessed by a cherry picker or similar vehicle with a hydraulic bucket system.

8.12.5 Access Roads

Access to the structures will be obtained from existing roads where the transmission line parallels existing County or Township roads. Access will be along the ROW for the transmission line on cross-country segments. Access to these cross-country portions of the transmission line may require limited grading and will require construction of temporary access roads along the length of the ROW.

8.12.6 Right-of-Way Restoration Procedures

During construction, crews will attempt to limit ground disturbance wherever possible. Temporary disturbance areas will be restored to their original condition to the extent practical, and as negotiated with each landowner. Reclamation activities will include removing and disposing of debris, dismantling temporary facilities, leveling or filling tire ruts and controlling erosion. Reseeding areas disturbed by construction activities will be done with a seed mix free of noxious weeds, similar to that, which was removed.

8.12.7 ROW Maintenance Procedures

The ROW defines the area where the proposed transmission line can be operated safely and reliably. Maintenance crews will perform inspections, maintain equipment and make repairs over the life of the transmission line. Inspection will occur by aerial or ground patrol. Routine maintenance will be performed as necessary. Vegetation will be removed that may interfere with the safe and reliable operation of the proposed transmission line.

9.0 ALTERNATE SITES AND SITING CRITERIA (ARSD 20:10:22:12)

In addition to access to transmission and sufficient wind, a wind energy project must be located in an area where landowners are willing to grant various easements and leases on commercially reasonable terms and conditions, and where land use provides sufficient space for optimum

turbine spacing. Access to transmission must be such that the power generated by the project can be relatively easily delivered into the grid. The following sections further describe the criteria used in the selection of the Project area and layout.

9.1 GENERAL PROJECT LOCATION SELECTION

The Applicant identified six site alternatives for consideration of the Project. An Alternative Evaluation Analysis and Site Selection Study (BEPC 2009) was conducted to analyze the six site alternatives and determine which sites had the ability to meet the Applicants' purpose and objectives for the proposed Project. Screening criteria included technical feasibility, economic viability (able to be implemented), and public issues and concerns. Table 8 below summarizes the site selection and evaluation criteria for the each of the six sites evaluated as potential proposed Project alternatives.

Table 8 Site Selection and Evaluation Criteria

Site	Local Transmission Available	Additional Transmission Line Needed	Sufficient Land Available to Lease
Highmore/ Ree Heights	Yes (Request Submitted)	10-12 Miles	Compromised by other developers
Wessington Springs	Yes	Not investigated	Wildlife Habitat
Reliance	Yes (Non-firm)	20+ Miles	Compromised by other developers
Fox Ridge	Yes (High Risk – weak regional transmission system)	5-6 Miles	Yes
Winner	Yes (Request Submitted)	5-6 Miles	Yes
Crow Lake	Yes (Request Submitted)	9-12 Miles	Yes

Following evaluation of the above proposed Project alternatives by the Applicant, the Winner and Crow Lake alternatives appeared most favorable for development of the Project. The Winner and Crow Lake alternatives are being further evaluated by the Applicant under the NEPA process. Based on the Applicant's review of the current EIS evaluation activities in progress for the Winner and Crow Lake alternatives, the Crow Lake alternative (Project Site) has been selected as the location for Project development. Additional information on the site selection process can be found in the PrairieWinds SD1 Alternative Evaluation Analysis and Site Selection Study (BEPC 2009) included as Appendix B.

9.2 WIND RESOURCE AND LAND AVAILABILITY

9.2.1 Wind Resource

Utility-scale wind farms require the right kind of wind conditions. The Applicant reviewed large-

scale wind resource mapping to identify the highest wind resource areas. The Project Site was identified as an excellent wind resource through the NREL wind resource map, supplemented by existing meteorological data from a site established by the South Dakota State University WRAN.

Large-scale wind resource maps are not of sufficient detail to locate wind turbines, since they are generated over a large geographic region, without detailed verification of the local terrain. In order to make adequate projections of annual electricity output, one must go to the prospective site, verify the wind resource and locate wind resource obstacles such as buildings and trees.

Meteorologists already collect wind data for weather forecasts and aviation, and that information is often used to assess the general wind conditions for wind energy in an area. However, wind speeds are heavily influenced by the surface roughness of the surrounding area, by potential obstacles (such as trees or buildings) and by the contours of the local terrain. Therefore, specific sites within a proposed project area are selected for establishment of a meteorological tower. This enables the wind developer to perform a detailed analysis of site-specific data based on professional experience.

Wind Logics, a meteorological consultant from Minneapolis, Minnesota, was contracted to develop a 500 meter wind map for the area, with the results indicating an excellent wind resource. Met towers were erected to measure the wind and correlation of this met tower data with the WRAN site was initiated. In general, subsequent wind measurements have confirmed the wind resource.

9.2.2 Land Availability

The next step in site selection is land availability and determining if and where appropriate easements and/or leases could be secured from landowners. The Applicant has obtained the easements and leases necessary to develop the Project.

9.3 TRANSMISSION

The third key factor that determines the selection of the site is economically viable access to transmission facilities. In 2007, Western built the Wessington Springs substation in order to interconnect the nearby Wessington Springs Wind farm. The Wessington Springs Substation provides an economically viable transmission interconnection opportunity for the Project. The location of the Wessington Springs Substation provided another criterion that helped define boundaries of the Project. The necessary substation upgrades are scheduled to be completed in time to allow for the Project to be interconnected in the 2010 timeframe.

9.4 SITE CONFIGURATION ALTERNATIVES

An initial turbine layout was developed by the Applicant in 2008. This initial layout was based on an optimal configuration to best capture wind energy. This layout is currently under review for the purpose of eliminating and/or minimizing impacts to the environment and to accommodate landowner preferences. Several turbines and other proposed Project facilities were shifted from their initial location in order to avoid impacts to wetlands, select habitat and/or cultural resources. However, additional changes to the layout are expected prior to construction as the EIS process continues. The current adjusted layout is shown in Figure 3.

The final layout will incorporate the following planned setbacks:

- 400 feet from most public roads, distribution power lines and high voltage transmission lines
- 1,000 feet from occupied residences
- Out of the Worst Case Freznel Zone of microwave paths
- Avoid wetlands
- 500 feet from a wetland of greater than 50 acres
- 0.25 miles from Waterfowl Production Areas

In addition, setbacks defined by County and local ordinances as well as landowner preference setbacks, which help avoid objections to Project component locations, are also planned for incorporation in the final layout.

9.5 EMINENT DOMAIN

The Applicant will strive to avoid use of eminent domain to acquire transmission easements for the Project. Use of required properties for other Project facilities such as WTGs, buildings and the collection system have been obtained through leases and/or easements obtained on a voluntary basis from property owners. Private land will be used for the facilities. The Applicant will also coordinate with Federal, State and local agencies to obtain appropriate permits if necessary.

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

Sections 11.0 through 14.0 and Sections 17.0, 18.0 and 20.0 provide a description of the existing environment at the time of the application submittal, estimates of changes to the existing environment that are anticipated to result from construction and operation of the Project, and irreversible changes that are anticipated to remain beyond the operating lifetime of the facility.

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

11.1 EXISTING PHYSICAL ENVIRONMENT

11.1.1 GEOLOGY

11.1.1.1 Regional Landforms/Surficial Geology

The Project Site's topography is characterized by gently rolling hills with low to moderate relief. Site elevation ranges from approximately 1,500 to 1,900 feet above mean sea level (AMSL). The Project Site is located within the Missouri Plateau of the Coteau (a treeless plain) du Missouri Division of the Great Plains physiographic province. The Coteau du Missouri Division is divided from the main body of the Missouri Plateau by the Missouri River and is characterized by low hummocky, undulating rolling hills, and large undrained areas containing prairie potholes, lakes and sloughs. This highland area is covered with glacial deposits and underlain by the Upper Cretaceous Pierre Shale and older formations. Several broad sags traverse the Coteau, which mark the positions of former stream valleys of eastern continuations of the Grand, Moreau, Cheyenne, Bad and White Rivers.

The general geomorphology of the Project Site consists of physiographic features formed by glacial advancement and retreat during the Pleistocene epoch. Beginning about 1.8 million years ago, continental glaciers advanced southward across North America, covering eastern South Dakota several times. As subsequent ice sheets advanced, they transported large volumes of rock debris frozen into the lower layers of ice. In cases where ice sheets were very thick and heavy, the glaciers scoured and smoothed the underlying terrain. By contrast, in cases where ice sheets were thin, the glaciers overrode obstacles rather than planing them. As the ice melted, sediment called glacial drift (loose and unsorted rock debris distributed by glaciers and glacial meltwaters) was left behind. Glacial till refers to the unsorted rock debris deposited by the glacier. Stagnation moraines of glacial till debris typically outline the boundaries of past glaciations. The following glacial drift deposits are associated with the Upper Wisconsin glaciation of the Pleistocene, and are found within the Project Site boundary (SDGS 2004):

> **Qlo, Outwash, undifferentiated** - 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).
>
> **Qlts, Till, stagnation moraines** - Compact, silty, clay-rich matrix with sand- to boulder-sized clasts of glacial origin. A geomorphic feature characterized by hummocky terrain with abundant sloughs resulting from stagnation of ice sheets. Composite thickness of all Upper Wisconsin till may be up to 300 feet (91 meters).
>
> **Qltg, Till, ground moraine** - 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)
>
> **Qlot**, **Outwash, terrace** (extreme northwest corner of site) - Heterogeneous clay to gravel of glaciofluvial origin. Thickness up to 60 feet (18 meters).

Quaternary-Aged alluvial deposits (Qal) are found within the present-day drainage of East Smith Creek along the northern Project Site boundary. Glacial deposits (on the order of 15 to 200 feet thick) are found across the remainder of the Project Site's surface, and are underlain by the Upper Cretaceous Pierre Shale. Figure 8a depicts the surficial geology within the project boundary and Figure 8b depicts geologic cross section information available for the Project area (SDGS 2001).

11.1.1.2 Bedrock Geology

The South Dakota Geological Survey (SDGS) 2004 Geologic Map of South Dakota indicates that the uppermost bedrock unit underlying the Project area is the Upper Cretaceous-aged Pierre Shale. The Pierre Shale is characteristic of blue-gray to dark-gray, fissile to blocky shale with persistent beds of bentonite, black organic shale, and light-brown chalky shale and contains minor sandstone, conglomerate and abundant carbonate and ferruginous concretions (SDGS 2004). Older Upper Cretaceous formations, including the Greenhorn Formation, underlie the Pierre shale. The Greenhorn Formation has been widely mapped by the SDGS and is commonly used statewide as a reference datum for the bedrock structural contours. At the Project Site, the upper contact of the Greenhorn Formation was mapped at elevation of approximately 1,000 feet AMSL (approximately 500 to 900 feet below ground surface [bgs] elevations). Figure 8a depicts elevation contours for the top of the Pierre Shale formation along with the surficial geology within the Project boundary. Figure 8b depicts geologic cross section information available for the Project area (SDGS 2001).

The following geologic structure information for the Project Site is summarized from the SDGS Bulletin 32: Geology of Aurora and Jerauld Counties, South Dakota, 2001 (SDGS 2001). The Greenhorn Formation has a northerly dip of approximately six feet per mile or a total of 300 feet from White Lake in west-central Aurora County to the northeastern part of Jerauld County. The Dakota Formation is the oldest and deepest Cretaceous-aged formation underlying the Project Site (mapped at approximately 700 feet AMSL or 800 to 1,200 feet bgs at the site). Structural contours for the top of the Dakota Formation indicate an approximate northwestern dip of 8 feet per mile across Aurora and Jerauld Counties. The Dakota Formation directly overlies the Precambrian Sioux Quartzite (estimated to range in age from 1.2 to 1.7 billion years old) and older Precambrian granitic rocks. The Precambrian surface has a marked average northwestern dip of 31 feet per mile and structural contours for the eroded Precambrian surface indicate over 600 feet of relief across Aurora and Jerauld Counties. The Sioux Quartzite is logged at approximately 500 feet AMSL or 1,000 to 1,400 feet bgs at the Project Site and at approximately 794 AMSL in the Town of White Lake's municipal well (850 feet bgs). In north-central Aurora County, the Sioux Quartzite is located on the western extension of the Sioux Ridge structure, which extends westward from southwest Minnesota and northwestern Iowa to east-central South Dakota. Granitic rocks are mapped below the Cretaceous sediments in Jerauld County (the Sioux Quartzite is not mapped in Jerauld County). A potential east-west

trending fault line has been suggested to account for this abrupt Precambrian contact change across the Aurora/Jerauld County line at the Project Site.

11.1.1.3 Economic Deposits

Commercially viable deposits of oil and gas and other mineral resources have not been identified in Aurora, Jerald and Brule Counties. Sand and gravel deposits associated with the Upper Wisconsinan glaciation are the predominant geological resources mined in Aurora, Jerald and Brule Counties in South Dakota. Uneven spatial distribution of these deposits does not make large-scale development of sand and gravel mining operations economically practical.

Review of United States Geological Survey (USGS) 7.5 minute quadrangle mapping, aerial photography and a field review of the Project area revealed gravel pits in the Project boundary (Table 9). The field review also attempted to ascertain whether the pits are currently active, based on observed factors such as obvious signs of activity, or vegetative re-growth of the excavated pit; however, it should be noted that the list in Table 9 is not all inclusive. In addition, gravel pit locations and the status of the gravel have not been verified with landowners. The gravel pit observed in the NW ¼ of Section 8 was the largest of the active gravel pits observed, covering approximately 24.5 acres (NRC 2009). Therefore, this gravel pit location has also been depicted on Figure 10.

Table 9 Gravel Pits within the Project Area

County	Gravel Pit Location
Aurora	NW ¼, S8, T105N, R66W, Patten Township
	SW ¼, S21, T105N, R66W, Patten Township
	SE ¼, S18, T105N, R66W, Patten Township
Jerauld	Central S22, T106N, R65W, Anina Township
	SW ¼, S26, T106N, R67W, Logan Township

11.1.2 SOIL TYPE

Soils in the Project area consist primarily of a variety of loams (silt loams, clay loams, stony loams, silty clay loams) and clays derived from underlying glacial tills (USDA SCS 1985), (USDA SCS 1994). The loamy soils in the Project area are not highly susceptible to erosion. Most of these soils are conducive to agricultural activities including crop production and livestock grazing (for additional information regarding the agricultural nature of the soils in the Project area, see Section 13.1).

Nine soil associations are mapped within the Project area; these general soil unit associations are depicted on Figure 9 and summarized in Table 10 below (USDA NRCS 2009). The

majority of the soils in the Project area have at least one component of the soil unit which is rated as hydric with the exception of the Ree-Delmont-Canning association. Hydric soils located within the Project boundary would be isolated and generally associated with small prairie pothole-type wetlands and drainage ways. In addition, well-drained soils comprise approximately 94 percent of the Project area. Approximately six percent of the area is comprised of moderately well-drained soils and significantly less than 1 percent of the area is comprised of somewhat excessively well-drained soils (Tierra 2009). Potential frost action was noted as low to moderate in all soils.

Table 10 Hydric Soils within the Project Area

Name	Soil Taxonomy	Soil Texture	Flooding Frequency	Representative Slope	Potential Frost Action	Hydric Soils	Corrosion of Steel
Highmore-Ethan-Eakin	Typic argiustolls, fine-silty, mixed, mesic	Silt loam	None	4%	Moderate	Partially hydric	High
Highmore-Eakin-DeGrey	Typic argiustolls, Fine-silty, mixed, mesic	Silt loam	None	1%	Moderate	Partially hydric	High
Talmo-Enet-Delmont	Typic haplustolls, fine-loamy over sandy or sandy-skeletal, mixed, mesic	Loam	None	6%	Low	Partially hydric	Moderate
Ethan-Clarno-Betts	Typic calciustolls, fine-loamy, mixed, mesic	Loam	None	5%	Moderate	Partially hydric	High
Dudley-Bon-Beadle	Typic argiustolls, fine, montmorillonitic, mesic	Loam	None	2%	Moderate	Partially hydric	High
Talmo-Oahe-Durrstein	Typic haplustolls, fine-loamy over sandy or sandy-skeletal, mixed, mesic	Loam	None	1%	Low	Partially hydric	Moderate
Ree-Delmont-Canning	Typic argiustolls, fine-loamy, mixed, mesic	Loam	None	2%	Moderate	Not hydric	High
Mobridge-Java-Highmore	Typic argiustolls, fine-silty, mixed, mesic	Silt loam	None	4%	Moderate	Partially hydric	High
Houdek-Ethan	Typic argiustolls, fine-loamy, mixed, mesic	Loam	None	4%	Moderate	Partially hydric	High

Source: USDA NRCS 2009

11.1.3 SEISMIC RISKS

Seismic activity in South Dakota is low, especially in the eastern portions of the State. The Project Site is located in an area of South Dakota depicted on the USGS 2008 National Seismic Hazard Map as having the second lowest of the seven possible seismic hazard rankings (USGS 2008a). The rankings are based on horizontal shaking forces as a percentage of the acceleration due to gravity (g) likely to be exceeded two out of 100 [2 percent chance] times in a 50-year period. The Project Site is depicted as having a possibility of exceeding shaking forces of approximately 8 percent of g for two occurrences out of 100 times in a 50-year period.

According to the SDGS, three minor earthquakes have been documented in Aurora County since 1872 (SDGS 2008). Two Mercalli scale magnitude IV (Richter scale magnitude 2.9-3.5) earthquakes occurred south of the Site in 1921 and 1931, respectively. A Mercalli magnitude V (Richter scale magnitude 3.5-4.1) earthquake occurred southeast of the site in central Aurora County in 1990. One earthquake (Mercalli scale VI/Richter 4.1-4.7) was recorded in central Jerauld County in 1946 (SDGS 2008). In addition to the minor earthquakes, a potential fault associated with the Precambrian basement rocks was indicated below the Site area (SDGS 2001).

11.2 FACILITY IMPACTS

11.2.1 POTENTIAL FOR IMPACTS TO GEOLOGIC AND SOIL RESOURCES

Potential impacts to geologic and soil resources generally are limited to the potential to render the sand and aggregate resources inaccessible, cause losses to the soil resources through displacement and create erosion and slope instability issues.

11.2.1.1 Inaccessibility of Sand and Aggregate Resources

Construction of infrastructure over sand and aggregate resource areas can limit or eliminate the potential for development of such areas. In general, construction of the Project facilities should not interfere with the sand and aggregate excavation pits within the Project boundary. WTGs, access roads, collector lines and transmission lines have been sited to avoid these identified resource areas, and adverse effects to this land use activity (example: rendering the resources inaccessible) are not anticipated due to the planned construction or operation of the Project. There would likely be an economic benefit due to use of the local sand and gravel resources for Project construction purposes.

11.2.1.2 Loss of Soil Resources

Construction of wind turbine foundations and associated access roads alters the ground surface and removes certain soils in the construction zone. Implementation of the Project would result

in approximately 1,405 acres of temporary disturbance and approximately 133 acres of permanent impacts to soils (Tierra 2009). Construction of the 230-kV transmission line structures will result in some minor removal of soils along the proposed route. These potential impact estimates would be applicable regardless of which transmission line route alternative would ultimately be installed (Figure 3 depicts the current proposed and alternative transmission line routes). During construction, existing vegetation would be removed in the areas associated with the proposed Project components, potentially increasing the risk of erosion. Impacts to agricultural soils from the Project are discussed in Sections 13.2 and 20.2.3.

11.2.1.3 Erosion, Slope Stability and Sedimentation

The Applicant has designed the Project to minimize construction cut and fill work and minimize construction in steep slope areas. The WTGs are generally located at higher elevations to maximize exposure to wind and 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. In general, the overhead lines (230-kV transmission line) are routed parallel to roadways, section lines, or across areas that have gently rolling topography. As an exception, the 230-kV transmission line descends a relatively steep slope at the extreme northeast corner of the Site (along the southern boundary of Section 22 of the Anina Township) heading toward the Wessington Springs substation.

The South Dakota Department of Environment and Natural Resources (DENR) has issued a General Storm Water Permit for Construction Activities for use on construction projects in South Dakota; an application for coverage under this permit will be needed for the Project. One of the conditions of this permit is the development of a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP will be developed once more detailed engineering information on grading and final design is determined for the Project, and will mandate BMPs to control erosion and sedimentation. BMPs may include silt fencing, erosion control blankets, re-vegetating side slopes, temporary storm water sedimentation ponds, or other methods of controlling storm water runoff and minimizing erosion and sedimentation. The SWPPP and National Pollution Discharge Elimination System (NPDES) Notice of Intent (NOI) will be developed after final civil design is completed.

During construction, BMPs will be implemented to control erosion and ensure that drainage ways and streams are not impacted by sediment runoff from exposed soils during precipitation events. In steeper areas, particular care will be taken to minimize cuts and/or fills, and to employ appropriate erosion prevention measures. During operation (and after reseeding and stabilization), the wind farm facilities and 230-kV transmission line are not expected to increase soil erosion rates, and the relatively small amount of permanent areas of disturbance (133 acres of the approximate 37,000-acre Project area) are not expected to impact the soil resources of the area.

11.2.2 GEOLOGICAL CONSTRAINTS ON DESIGN, CONSTRUCTION AND OPERATION

Significant geological constraints potentially affecting the development and operation of the Project were not identified for the Project Site (Terracon 2009). However, soil characteristics may change the design requirements of individual wind turbine tower foundations. Prior to construction, soil borings will be performed at all turbine locations to insure that the foundation design is suitable for the physical conditions. If unsuitable soils are found, the center point of the foundation may be shifted or the turbine may be dropped from construction. It is anticipated that soil borings will be advanced at the proposed WTG locations prior to the proposed Project construction activities.

12.0 EFFECT ON HYDROLOGY (ARSD 20:10:22:14, 20:10:22:15)

12.1 EXISTING HYDROLOGY

The Project Site is located within the prairie pothole region of the northern Great Plains, which was formed by the Wisconsinan glaciation in the Pleistocene. The Project Site is characterized by a combination of hilly well drained and poorly drained topography, which receives approximately 15 to 25 inches of precipitation annually. The poorly drained prairie pothole areas (water-holding sloughs) are mainly located along the site's northeast-southwest trending axis. The well-drained, hilly terrain is predominately located at the northwestern portion of the Project Site and along the eastern boundary where the topography drops in elevation toward the southeast. Intermittent streams are prevalent in the well-drained hilly areas of the Project Site and the stream drainages are mainly dendritic, resembling the branching pattern of blood vessels or tree branches. Various intermittent and perennial lakes and ponds associated with prairie potholes and intermittent streams are located throughout the site.

12.1.1 HYDROGEOLOGY

Aquifers underlying the Project Site are associated with the regional Northern Great Plains Aquifer System (USGS 1996). Shallow, localized sand and gravel aquifers associated with Pleistocene glacial deposits (Wisconsinan glaciation) were generally encountered within 200 feet of the ground surface and were classified by the USGS as the Pleistocene or Crow Lake local aquifers. Water levels reported for the Pleistocene or Crow Lake local aquifers ranged from 1.9 and 100 feet bgs (USGS 2008b). The Crow Lake local aquifer has approximately 190,000 acre-feet of water in storage in Aurora and Jerauld Counties and underlies approximately 50 square miles.

A regional Lower Cretaceous aquifer underlies the near surface glacial sediments and the confining units which underlie the glacial sediments. A potential deeper regional aquifer (Upper Paleozoic) also exists below the Lower Cretaceous aquifer separated by a confining unit (USGS

1996). The regional groundwater flow is generally east-northeast in the Lower Cretaceous aquifer. Local shallow aquifers within the near surface sand and gravel glacial sediments generally flow in variable directions, often driven by topography (DENR/SDGS 2004).

12.1.2 SURFACE WATER RESOURCES

The Project Site is located within the Missouri River Basin surface water drainage system. Based on information obtained from the United States Army Corps of Engineer's (USACE) Final Environmental Impact Statement, Master Water Control Manual, Review and Update Study for the Missouri River (USACE 2004), this drainage system has a total drainage area of approximately 529,350 square miles, including about 9,700 square miles in Canada. The Missouri River flows from the confluence of the Jefferson, Madison and Gallatin Rivers in southwestern Montana, a distance of approximately 2,320 miles (USACE, 2004) prior to converging with the Mississippi River directly upstream of St. Louis, Missouri. There are six mainstem reservoir system dams associated with the Missouri River Basin: Fort Peck, Garrison, Oahe, Big Bend, Fort Randall and Gavins Point, including the major streams and tributaries.

The Missouri River Basin surface water drainage system consists of region, sub-region, basin and sub-basin drainages. The Project Site is associated with both the Missouri-White Sub-region and the James Sub-region of the Missouri Region. The Project Site is also located within two basins that are further divided into sub-basins. The Crow Sub-basin (751,452 acres) of the Fort Randall Reservoir dominates the surface water drainage on the western and northwestern portions of the Project Site while the Lower James (2,255,246 acres) and Fort Randall Reservoir (2,835,206 acres) sub-basins drain the northeastern and southeastern areas of the Project Site, respectively (USGS NHD 2008).

12.1.2.1 The Crow Sub-basin

The East Fork of Smith Creek and Smith Creek, located along the northern boundary of the site, are part of the Crow sub-basin drainage system. This northern area of the Project Site drains north to Smith Creek and the East Fork of Smith Creek, which feed Crow Creek. Crow Creek is a tributary which enters the Missouri River downstream of the Big Bend Dam, one of the six mainstem reservoir system dams associated with the Missouri River Basin. The upper reaches of the Sayles Creek drainage located in the northwestern and western portions of the Project Site also drain northwest and west (respectively) toward Smith Creek.

12.1.2.2 The Lower James Sub-basin

The western upper reaches of the West Branch of Firesteel Creek are located along the northeastern portion of the Project Site. The northeastern portion of the site drains predominately southeast into the West Branch of Firesteel Creek which flows southward and then eastward toward Firesteel Creek. Firesteel Creek flows east-southeast eventually flowing

into the James River at Mitchell, South Dakota. The James River flows south-southeast into the Missouri River downstream of the Gavins Point dam at Yankton, South Dakota.

12.1.2.3 The Fort Randall Reservoir Sub-basin

The southeast and east central portions of the Project Site drain southeast, however, surface water then flows south-southwest toward White Lake and eventually toward Platte Creek which drains into the Missouri River upstream of the Fort Randall dam. The Fort Randall dam is located downstream of the Big Bend dam and upstream of the Gavins Point dam.

The western segment of the proposed 230-kV transmission line is predominately within the Crow sub-basin watershed, which drains generally north and east in the vicinity of the transmission line. The eastern segment of the transmission line is located in areas of the Project Site within the Lower James Sub-basin, which drain toward the West Branch of Firesteel Creek. As Figure 11a shows, the transmission line route does not cross streams (named or unnamed).

12.1.3 FLOODPLAINS

The Project Site does not contain Federal Emergency Management Agency (FEMA) mapped floodplains. According to flood information obtained from FEMA, the unincorporated areas of the Project Site in Brule and Jerauld Counties are unmapped and do not have flood insurance rate maps available for review (FEMA 2009). Unincorporated areas of Aurora County within the Project Site have Flood Insurance Rate Map (FIRM) panel identification numbers, but printed maps are not available. Based on a review of the flood zone classifications associated with these FIRM map panels (Zone D), the areas of the Project Site within Aurora County correspond with unstudied areas where flood hazards are undetermined but possible. Floodplains were not observed at the Project Site, and the site is higher in elevation relative to the surrounding landscape. The lowest elevations within the Project boundary are located in the extreme northwestern portion of the site associated with the Smith Creek drainage and the east boundary line of the site associated with the West Branch of Firesteel Creek. Project facilities are not planned within the lowest-lying areas of the site.

12.1.4 NPS NATIONWIDE RIVERS INVENTORY

The National Park Service (NPS) describes the Nationwide Rivers Inventory (NRI) as “a listing of free-flowing river segments in the United States that are believed to possess one or more ‘outstandingly remarkable’ natural or cultural values judged to be of more than local or regional significance. Under a 1979 Presidential directive, and related Council on Environmental Quality (CEQ) procedures, all federal agencies must seek to avoid or mitigate actions that would adversely affect one or more NRI segments.” There are no NRI-listed rivers within the Project area or near the 230-kV transmission line (NPS NRI 1982).

12.1.5 IMPAIRED WATERS

The Clean Water Act (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 (USEPA 2008). 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 nearest listed 303(d) water bodies to the Project Site are the West branch of Firesteel Creek (abutting the northeast Project boundary) and Wilmarth Lake (approximately six miles southeast of the Project area). Firesteel Creek (from the West Fork of Firesteel Creek to the mouth) is listed as a water body with total dissolved solid (TDS) and temperature impairments that have United States Environmental Protection Agency (USEPA) approved TMDLs (DENR SWQ 2008). Surface water runoff in the northeast area of the Project drains predominately southeast into the West Branch of Firesteel Creek.

Wilmarth Lake is a reservoir that was created by the construction of a dam across Firesteel Creek that is listed for the Trophic State Index (TSI), meaning that at least two years of data showed the lakes receiving “impaired” scores based on nutrient measurements (DENR SWD 2008). Wilmarth gets its water from the East and West Forks of Firesteel Creek and their associated watersheds and is located in a downstream flow path relative to the northeast portion of the Project Site. Outflows exit Wilmarth Lake over the spillway into Firesteel Creek and continue downstream through Lake Mitchell into the James River (GFP 2007b). The James River (from Interstate 90 to the mouth) is also listed as 303(d) water body (total suspended solids and fecal coliform impairments).

12.2 FACILITY IMPACTS

12.2.1 EFFECT ON CURRENT OR PLANNED WATER USE

The proposed Project facilities will not have impacts on either municipal or private water uses in the Project area. The proposed overhead transmission structures may be located parallel to or may cross over buried rural water lines supplying the site area. However, impacts to the use or operation of the water lines are not anticipated. Water storage, reprocessing, or cooling is not required for either the planned construction or operation of the facility. The Project facilities will not require deep well injection. The Project operation will not require the appropriation of surface water or permanent dewatering.

It is likely that a connection to the rural water supply will be necessary for the O&M facility. Alternatively, a water supply well may be required if rural water service is not available. Water usage at the O&M facility will be similar to household volume: less than 5 gallons per minute.

The Applicant will coordinate with Aurora-Brule Rural Water System (RWS) Inc. to avoid impacts to rural water lines in the Project area during construction.

The construction of wind farm facilities and transmission line structures 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. In the event potential temporary dewatering wells are necessary during construction activities, the temporary wells will be installed and decommissioned as required by South Dakota law.

By maintaining a minimum set-back of approximately 1,000 feet from residences, the areas surrounding residential domestic wells will not be impacted by turbine placement or construction dewatering impacts. Regarding other potential water supply well locations (e.g., a livestock water supply well) that may be located near potential dewatering activities; provisions will be made to ensure that an adequate supply of water is provided until dewatering activities have been completed. The Project will have no impact on surface water availability or use for communities, schools, agriculture, recreation, fish, or wildlife.

12.2.2 POTENTIAL FOR SURFACE AND GROUNDWATER IMPACTS

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, impacts to flood storage areas and increased runoff due to the creation of impervious surfaces. The approximate 133 acres of permanent impacts planned within the Project boundary is broadly dispersed throughout the project and represents less than a half of a percent of the total acreage in the Project boundary; therefore, the Project is not expected to cause major changes in runoff patterns or volume of runoff, nor is it expected to have adverse impacts on existing hydrology.

During construction, BMPs will be implemented to control erosion and ensure that drainage ways are not impacted by sediment runoff from exposed soils during precipitation events. Particular care will be taken in the eastern and northeast portions of the Project Site to minimize cuts and/or fills, and to employ appropriate erosion prevention measures where the proposed Project facilities approach areas that are up-slope relative to impaired waters (West Branch of Firesteel Creek) and potential Topeka Shiner habitat (Topeka Shiner impacts are discussed further in Section 14.2).

12.2.2.1 Groundwater Dewatering

The construction of wind farm and transmission line facilities can require dewatering of shallow groundwater, especially during excavation for WTG foundations or transmission line poles.

Construction dewatering temporarily lowers the water table in the immediate area and may temporarily lower nearby surface water elevations depending on the proximity and connectivity of the groundwater and surface water.

Groundwater dewatering is not anticipated to be a major concern with the Project since WTGs are most likely to be placed at higher elevation where the water table tends to be deeper. Similarly, it is anticipated that the 230-kV transmission line structures will be placed to span wetlands and water features, thereby generally avoiding low areas where the water table may be closer to the surface. Should groundwater be encountered that must be dewatered, the necessary permits will be obtained and the duration of dewatering will be minimized to the extent possible. Dewatered groundwater will be properly handled to allow sediments to settle out and be removed before the water is discharged to minimize soil erosion and sedimentation of surface waters.

12.2.2.2 Deterioration of Water Quality

The excavation and exposure of soils during the construction of wind turbines, access roads, underground collector lines and overhead transmission lines could cause sediment runoff during rain events. These sediments may increase the total suspended solids (TSS) loading in receiving waters.

Since the Project will disturb more than 1 acre, a NPDES permit will be required. It is estimated that approximately 1,405 acres will be temporarily disturbed as a result of construction of turbines, electric collection system, access roads, CLCS, 230-kV transmission line, O&M facility, meteorological equipment, temporary laydown areas and batchplant. In addition, the South Dakota DENR has issued a General Storm Water Permit for Construction Activities; an application for coverage under this permit will be needed for the Project. One of the conditions of this permit is the development of an SWPPP. The SWPPP will mandate BMPs to control erosion and sedimentation. BMPs may include containing excavated material, use of silt fences, protecting exposed soil, stabilizing restored material and revegetating disturbed areas, temporary storm water sedimentation ponds, or other methods of controlling storm water runoff and minimizing sedimentation. Since erosion and sediment control will be in place for construction and operation of the Project, no impacts to water quality are expected as a result of the Project.

12.2.2.3 Impacts to Drainage Patterns

In general, because WTGs will be located at higher elevations within the Project area to maximize wind exposure, impacts to ephemeral streams and drainage ways are not anticipated from the turbine sites. The underground collection system may temporarily impact surface drainage patterns during construction if the collection system is trenched through drainageways; however, these impacts will be short-term, and existing contours and drainage patterns are

expected to be restored within 24 hours of trenching. Named creeks (Sayles Creek and the East Fork of Smith Creek) located within the project boundary will not be crossed by the planned routes of the access roads, collector lines and transmission lines. Where stream/drainageway crossings cannot be avoided, appropriately designed culverts or low water crossings will be placed to maintain the free flow of water. The permanent disturbances introduced by the wind farm facilities (approximately 133 acres) will be spread throughout the approximate 37,000-acre Project area, and are not expected to change existing drainage patterns.

The 230-kV transmission line will be designed to span surface water stream features, and the areas of permanent disturbance resulting from the transmission structures (0.3 acres) is not expected to change existing drainage patterns.

12.2.2.4 Impacts to Flood Storage Areas

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, WTGs will be located at higher elevations, and the current layout avoids placing the turbines, collector systems and transmission lines in the low-lying areas. In addition, FEMA-mapped floodplains have not been identified within the Project Site.

12.2.2.5 Increased Runoff

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 will create up to 133 acres of impermeable surface through the construction of turbine pads, access roads, meteorological equipment, overhead collection and transmission line structures, O&M facility and the CLCS. The WTG pads, access roads and O&M facility and CLCS yards will be constructed of compacted gravel and will not be paved. However, this level of compaction generally inhibits infiltration and may increase runoff.

The 133 acres of permanent disturbance (of which approximately 0.3 acres will occur from construction of the 230-kV transmission line) represents less than 0.4 percent of the total acreage in the Project area; therefore, the Project is not expected to cause significant changes in runoff patterns or volume. As noted above, appropriate storm water management BMPs will be implemented during the construction and operation of the wind farm and transmission line facilities. These BMPs are anticipated to adequately mitigate the effects of increases in runoff volume due to the increase in impervious surface.

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

13.1 EXISTING TERRESTRIAL ECOSYSTEM

Terrestrial ecosystem data were collected from literature searches; Federal and State agency personnel and reports; natural resource databases; and field investigations. Biologists from Western, Tierra Environmental Consultants, LLC (Tierra), Western EcoSystems Technology, Inc. (WEST) and Terracon Consultants, Inc (Terracon) provided regional and site-specific information for terrestrial resources.

13.1.1 VEGETATION

Vegetation resources are discussed in detail in the *Prairie Winds Vegetation Mapping* report submitted by Natural Resource Consultants, Inc. (NRC) dated April 17, 2009 (Appendix C). Vegetative resources and land cover within the Project boundary and along the proposed 230-kV transmission line route are summarized in Table 11 below.

Table 11 Summary of Land Cover Types within the Project Area

Land Cover Type	Area (acres)	Percentage of Project Area
Cover Crop	5431.1	15.15
Deciduous Forest	82.4	0.23
Farmstead	276.4	0.77
Mine/Quarry	24.5	0.07
Pasture	692.3	1.93
Pothole Wetland	257.5	0.72
Prairie	93.3	0.26
Rangeland	22133.7	61.75
Retired Range	87.6	0.24
Row Crop	6247.1	17.43
Shelterbelt	261.1	0.73
Stock Pond	85.4	0.24
Wetland	39.8	0.11
Wetland Fringe	134.3	0.37
Total	**35,846.6**	**100**

The majority of the 230-kV transmission line route is located in rangeland (99 percent) and approximately one percent is cropland. The remaining land cover types make up insignificant

percentages of the landcover along the route. Figure 10 shows the landcover within the Project boundary and along the proposed 230-kV transmission line route. A more detailed description of the vegetation resources within the Project area follows (note that wetlands are discussed in Section 13.1.1.7).

Federally-listed plant species are not listed by the USFWS for Aurora, Brule, or Jerauld Counties and the South Dakota Natural Heritage Program does not list known rare, threatened, or endangered plant species within the Project area (Tierra 2009).

13.1.1.1 Cropland

Approximately 33 percent of the area within the Project boundary, and 1 percent of the land along the 230-kV transmission line, is cultivated cropland (row crop or cover crop). In Aurora County in 2007 (the latest available year for the USDA Census of Agriculture), 63 percent of the land area was cropland, with corn and wheat being the most common crops (USDA NASS, 2007). Other common cultivated crops included soybeans and forage-land. Cultivated cropland in Aurora County increased by four percent from 350,943 acres in 2002 to 364,612 acres in 2007 (USDA NASS, 2007).

In Jerauld County in 2007, 57 percent of the land area was cropland, with wheat and corn being the most common crops (USDA NASS, 2007). Other common cultivated crops included forage-land (hay and haylage, grass silage and greenchop) and soybeans. Cultivated cropland decreased in Jerauld County from 336,424 acres in 2002 to 328,624 acres in 2007 (AGSS 2007).

In Brule County in 2007, 56 percent of the land area was cropland, with wheat and corn being the most common crops (USDA NASS, 2007). Other common cultivated crops included forage-land (hay and haylage, grass silage and greenchop) and soybeans. Cultivated cropland increased 16 percent in Brule County from 446,987 acres in 2002 to 518,462 acres in 2007 (USDA NASS, 2007). Specific acreages of different croplands within the Project area are not available, and change from year to year.

Farmland is classified for the Project Site as “Farmland of Statewide Importance” (land other than Prime Farmland, which has a good combination of physical and chemical characteristics for the production of crops), “Prime Farmland” (land, which has the best combination of physical and chemical characteristics for the production of crops), “Prime Farmland if Irrigated” (land that meets the requirements of prime farmland if irrigated), and “Not Prime Farmland” (land that does not meet qualifications for prime farmland). The approximate total acreage of each farmland classification and the total percentage comprising the Project Site is shown in Table 12 below (USDA NRCS 2003).

Table 12 Farmland Classifications for the Project Site

Farmland Classification	Total Acreage	Percentage
Farmland of Statewide Importance	21,636.8	60.4
Prime Farmland	913.5	2.5
Prime Farmland if Irrigated	1,501.9	4.2
Not Prime Farmland	11,794.1	32.9

13.1.1.2 Planted Grassland/Pasture/Rangeland/Undisturbed Native Prairie

Planted Grasslands consist of previously cropped or disturbed parcels in the Project area where planted prairie grasses are dominant. The "Prairie" vegetation type (considered representative of planted grasslands) covers approximately 93 acres or approximately 0.3 percent of the Project area (none of which are along the proposed 230-kV transmission line). Short-grass prairies observed during the vegetation mapping effort conducted in April 2009 by NRC were dominated by smooth brome *(Bromus inermis)* and prairie beard grass *(Schizachyrium scoparium);* while tall-grass prairies were dominated by big blue-stem *(Andropogon gerardii),* switch grass *(Panicum virgatum),* Kentucky bluegrass *(Poa pratensis)* and sweet-clover. These Planted Grasslands are also potentially enrolled in the Conservation Reserve Program (CRP) or other similar programs.

CRP land is removed from crop production for a specific period (usually 10 years) and is planted with cover designed to conserve soil and water. Haying and livestock grazing are not permitted on CRP land unless specifically allowed during droughts. In Aurora County, approximately 17,140 acres (3.8 percent of the County) was enrolled in the CRP in 2007 (FSA, 2007). Approximately 14,670 acres (4.3 percent) of Jerauld County and approximately 8,370 acres (1.6 percent of the County) of Brule County were enrolled in the CRP in 2007 (FSA, 2007). The CRP program allows for removing land from contract, without penalty, for WTGs. Land contracted in the CRP as of 2007 (FSA no longer reveals acreages or locations of CRP according to the 2008 FSA Handbook) occurring on the Project Site is located in:

- The western ½ of Section 31, Township 106 North, Range 65 West in Jerauld County
- The northwest ¼ of Section 25 and northeast ¼ of Section 32, Township 106 North, Range 66 West in Jerauld County. The CRP located in the northwest ¼ of Section 25 appears to be located beyond the north boundary of the Project Site based on client provided site boundaries.
- Section 10, Township 105 North, Range 66 West in Aurora County;
- The northern ½ of Section 18, Township 105 North, Range 66 West in Aurora County;
- The western ½ of Section 19, Township 105 North, Range 66 West in Aurora County;
- The southwest ¼ of Section 31, Township 105 North, Range 66 West in Aurora County;
- Section 25, Township 105 North, Range 67 West in Brule County;

- Section 35, Township 105 North, Range 67 West in Brule County.

The "Pasture" classification (1.93 percent of the Project area) applies to areas that are regularly grazed and are relatively degraded by nonnative species such as smooth brome grass.

"Rangeland" (61.7 percent of the Project area, and 0.16 percent of the land along the 230-kV transmission line) applies to non-tilled areas with native vegetation (at least 5 to 10 native species present, regardless of dominance) that are used for grazing. Most of these areas were found on steep hillsides in grazed pastures, where topography prevented the areas from being tilled, and discouraged substantial grazing.

"Undisturbed native grasslands" (or undisturbed native prairies) are areas with native prairie plant species that have not been disturbed by cropping or grazing and show no signs of invasive plants or noxious weeds. There is very little "native" prairie in the Project Site area (Tierra 2009) and areas of undisturbed (ungrazed, with no invasive species) native grasslands were not noted during the site visits conducted for the Project to date. However, approximately 93 acres (0.26 percent of the total Project acreage) of naturally occurring or planted grasslands where native prairie grasses are dominant were mapped within the Project Site boundary (NRC 2009) in Section 6 of the Patten Township (Figure 10). Short-grass prairies were dominated by smooth brome and prairie beard grass; while tall-grass prairies were dominated by big blue-stem, switch grass, Kentucky bluegrass and sweet-clover (NRC 2009).

The USFWS has approximately 1,629 acres enrolled in the Grassland Easement program within the Project area (Tierra 2009). In a letter dated November 27, 2007, the USFWS identified easement interests for lands on the Project Site. According to the USFWS, grassland easements are located:

- In the eastern ½ and southwest ¼ of Section 36, Township 105 North, Range 67 West in Brule County.
- In the western ½ of Section 3, Township 105 North, Range 66 West in Aurora County.
- In Section 4, Township 105 North, Range 66 West in Aurora County.
- In the southwest ¼ of the southwest ¼ of Section 31, Township 105 North, Range 66 West in Aurora County.

The USFWS issued a second letter on November 30, 2007 listing additional grassland easements located:

- In the eastern ½ of Section 29 and south ½ of Section 30, Township 106 North, Range 65 West in Jerauld County.

- In the southwestern ¼ and the northeast ¼ of Section 25, Township 106 North, Range 66 West in Jerauld County.

In addition, USFWS grassland easements specified by the USFWS in the letters mentioned above, an additional grassland easement was identified within the Project boundary in the southeast ¼ of Section 26, Township 106 North, Range 66 West in Jerauld County. The USFWS easements are depicted on Figure 12 along with the preliminary Project layout.

Grasslands protected under an easement are prevented from being permanently converted to cropland or development. There are no restrictions on the landowner for grazing and haying. However, mowing, haying and grass seed harvesting must be delayed until after July 15th of each year and the program allows one WTG with associated facilities per 160 acres enrolled in the program (Tierra 2009). Locating Project facilities on grassland easements requires coordination with the USFWS. The Applicant would comply with the conditions allowed under those easements and facilities would not significantly alter habitat quality.

13.1.1.3 Farmsteads

Farmsteads (0.77 percent of the Project area) are classified as the maintained yards around rural residences, usually planted with Kentucky blue grass or other lawn grasses. This land cover does not include the tree rows or shelterbelts that are discussed in the forest/woodlot section, although it may include an isolated tree located in the midst of a farmstead yard.

13.1.1.4 Forest/Woodlot

Shelterbelts and woodlots of deciduous forest are associated with farm buildings and cropped fields throughout the Project area. Trees are planted in cultivated areas to reduce wind erosion and provide wildlife habitat. Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across a field. Several rows of low and high-growing broadleaf and coniferous trees and shrubs provide the most protection. Native trees and shrubs grow on approximately 600 acres of the approximate 340,000 total acres in Jerauld County and on approximately 2000 acres of the acres in Brule County (information for Aurora County was not available). Trees and shrubs commonly grow along drainage ways and in areas of Wessington Hills and on Betts and Ethan soils (Soil survey of Jerauld County 1994). Overall, the deciduous forest areas account for approximately 0.23 percent of the total Project area and shelterbelts account for approximately 0.73 percent of the total Project area. Woodland areas are not located along the proposed 230-kV transmission line.

13.1.1.5 Noxious Weeds

Noxious weeds are regulated by State (SDCL 38-22) and Federal (US 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 (SD DOA), 27 State and local noxious weed species are listed for South Dakota (SD DOA 2008). These noxious weed species are considered "introduced." In addition, 11 noxious weeds are listed as State or local noxious weeds potentially occurring within Aurora, Brule and Jerauld Counties (SD DOA 2008). Based on land use practices (cultivated crops, hay/pasture, etc.) identified on the Project Site, invasive and noxious plants are likely to occur. A list of the species identified in South Dakota by the SD DOA with their State weed status designation is included in Table 13a. Table 13b lists the local noxious weed occurrence for Aurora, Brule and Jerauld Counties.

Table 13a. State and Local Noxious Weeds of South Dakota

Common Name	Scientific Name	State Weed Status
Canada thistle	*Cirsium arvense*	State Noxious Weed
Hoary cress	*Cardaria draba*	State Noxious Weed
Leafy spurge	*Euphorbia esula*	State Noxious Weed
Perennial sowthistle	*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
Bull thistle	*Cirsium vulgare*	Local Noxious Weed
Chicory	*Cichorium intybus*	Local Noxious Weed
Common Burdock	*Arctium minus*	Local Noxious Weed
Common mullein	*Verbascum thapsus*	Local Noxious Weed
Common tansy	*Tanacetum vulgare*	Local Noxious Weed
Dalmatian toadflax	*Linaria dalmatica*	Local Noxious Weed
Diffuse knapweed	*Centaurea diffusa*	Local Noxious Weed
Field Bindweed		Local Noxious Weed
Giant Knotweed	*polygonum sachalinense*	Local Noxious Weed
Houndstongue	*Cynoglossum officinale*	Local Noxious Weed
Musk thistle	*Carduus nutans*	Local Noxious Weed
Phragmites		Local Noxious Weed
Plumeless thistle	*Carduus acanthoides*	Local Noxious Weed
Poison Hemlock	*Conium maculatum*	Local Noxious Weed
Puncturevine	*Tribulus terrestris*	Local Noxious Weed
Scotch thistle	*Onopordum acanthium*	Local Noxious Weed
Spotted knapweed	*Centaurea maculosa*	Local Noxious Weed
St. Johnswort	*Hypericum perforatum*	Local Noxious Weed
Yellow toadflax	*Linaria vulgaris*	Local Noxious Weed

Table 13b Noxious Weed Occurrence - Aurora, Brule and Jerauld Counties

Common Name	Scientific Name	County
Leafy spurge	*Euphorbia esula*	Brule, Aurora and Jerauld
Canada thistle	*Cirsium arvense*	Brule, Aurora and Jerauld
Perennial sowthistle	*Sonchus arvensis*	Brule, Aurora and Jerauld
Hoary cress	*Cardaria draba*	Aurora
Russian knapweed	*Centaurea repens*	Jerauld
Absinth Wormwood	*Artemisia absinthium*	Brule and Aurora
Musk Thistle	*Carduus nutans*	Brule, Aurora and Jerauld
Plumeless Thistle	*Carduus acanthoides*	Brule, Aurora and Jerauld
Field Bindweed	*Convolvulus arvensis*	Brule and Aurora
Puncturevine	*Tribulus terrestris*	Brule
Common Mullein	*Verbascum thapsus*	Brule and Aurora

13.1.1.6 Wetlands

Wetlands perform several important functions within a landscape, including flood attenuation, ground water recharge, water quality protection and wildlife habitat production. In eastern South Dakota (including the Project area) the prairie pothole wetlands are particularly integral in providing waterfowl breeding and foraging habitat. Wetland resources for the Project area were identified by reviewing USFWS National Wetland Inventory (NWI) maps and by field observations. NWI maps are produced by the USFWS and microfilmed by the USGS. NWI maps are prepared primarily by stereoscopic analysis of high altitude aerial photographs. Potential wetland areas are noted on the aerial photographs based on interpretation by the USFWS of vegetation, visible hydrology and geography. However, generally any water body visible on the high altitude aerial photographs will be designated by the USFWS as a "potential" wetland area on the NWI maps. Wetlands identified from NWI maps within the Project boundary and in the vicinity of the 230-kV transmission line are shown in Figure 11b.

Wetlands are defined by the USACE as "Waters of the U.S." and are subject to jurisdiction under Section 404 of the Clean Water Act (1973). Waters of the U.S. include both wetlands and non-wetlands that meet USACE criteria. USACE has authority to regulate the discharge of dredged and fill material into waters of the U.S. Jurisdictional waters of the U.S. include traditional navigable waters and their non-navigable tributaries that typically flow year-round or have flow at least seasonally (e.g., typically three months). Wetlands, which are special aquatic sites, are jurisdictional under Section 404 as a subset of waters of the U.S.

Wetlands as defined by USEPA and the USACE, in the Corps of Engineers Wetland Delineation Manual, (Environmental Laboratory, 1987), are "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." USACE also defines jurisdictional wetlands as having a predominance of hydrophytic vegetation, hydric soil and wetland hydrology. Any impacts to jurisdictional wetlands will be reviewed and permitted through the Section 404 Wetland permit process. The USACE will assert jurisdiction over wetlands adjacent to navigable waters and wetlands that directly abut their non-navigable tributaries.

Based on their "significant nexus" with traditional navigable waters, the USACE will decide jurisdiction over non-navigable tributaries that are not relatively permanent, wetlands adjacent to these tributaries, and wetlands adjacent to, but do not directly abut a relatively permanent non-navigable tributary. A "significant nexus" is based on the flow characteristics and functions of the tributary and the functions of wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical and biological integrity of downstream traditional navigable waters.

The Natural Resource Conservation Service (NRCS) oversees the Wetland Reserve Program where landowners sell conservation easements or enter into a cost-share restoration agreement with the USDA. Any impacts to these wetlands could affect farm benefits to landowners. The Applicant has notified the NRCS Field Office of the proposed Project location and activity. The NRCS indicated that they have no easements in the proposed project area (NRCS 2007).

The USFWS has been purchasing wetland easements in the prairie pothole region since 1958 and grassland easements (see Section 13.1.1.3) since 1989 for waterfowl habitat management. These easements provide perpetual protection of the wetlands and grasslands within the easement lands. The USFWS has approximately 2,836 acres in 15 parcels enrolled in the Wetland Easement program within the Project area (Tierra 2009). In letters dated November 27 and 30, 2007 addressed to Mr. Jim Berg of Basin from the USFWS (USFWS 2007), the USFWS identified wetland easements on portions of two Sections of Brule County, seven Sections in Aurora County, and three Sections in Jerauld County. As changes were made to the Project boundary and the Applicant had further contact with the USFWS, additional USFWS wetland easements were identified in one additional Section in Aurora County and three additional Sections in Jerauld County. Specific locations for the wetland easements and the current number of identified easements in the updated project boundary are depicted on Figure 12.

There are approximately 477 acres of NWI wetlands within the Project area (approximately 1.3 percent of the total Project area). Freshwater forested/shrub wetlands make up less than 1 percent of the wetlands in the Project area, freshwater ponds make up approximately 19 percent, and freshwater emergent wetlands make up the majority (81 percent) of the wetlands in the Project area (USFWS NWI 2008). NWI Wetlands in the Project boundary and in the vicinity of the 230-kV transmission line are shown in Figure 11b. The NWI-mapped wetland resources for the Project Site are shown on Table 14.

Table 14 NWI Acres within the Project Site

Wetland Type	Cowardin Classification*	Acres
Freshwater Emergent Wetland	PEMA (Palustrine-Emergent-Temporarily flooded)	385
	PEMC (Palustrine-Emergent-Seasonally flooded)	
	PEM/ABFx (Palustrine-Emergent/Aquatic Bed-Semipermanaently flooded and excavated)	
	PEM/AB (Palustrine-Emergent/Aquatic Bed)	
	PEMAd (Palustrine-Emergent-Temporarily flooded and Partially drained/ditched)	
	PEMCd (Palustrine-Emergent-Seasonally flooded and Partially drained/ditched)	
	PEMCh (Palustrine-Emergent-Seasonally flooded and diked/impounded)	
Freshwater Forested/Shrub Wetland	PFOA (Palustrine-Forested-Seasonally flooded and partially drained/ditched)	<1
Freshwater Pond	PAB/EMFh (Palustrine-Aquatic Bed/Emergent-Semipermanaently flooded and diked/impounded)	91
	PABFh (Palustrine-Aquatic Bed-Semipermanaently flooded and diked/impounded)	
	PABFhx (Palustrine-Aquatic Bed-Semipermanaently flooded and diked/impounded and excavated)	
	PABFx (Palustrine-Aquatic Bed-Semipermanaently flooded and excavated)	
	PUBGx (Palustrine-Unconsolidated Bottom-Intermittently exposed and excavated)	
TOTAL		**477**

*Cowardin Classification System: Elements of the Cowardin et al. (1979) classification system used in eastern South Dakota and NWI codes for systems, subsystems, classes and modifiers. There are no subsystems in the palustrine system.

Please note that the NWI wetland acreage shown above (477 acres) is larger than the overall wetland landcover acreage (approximately 432 acres of wetland, pothole wetland and wetland fringe) listed in Table 11 of Section 13.1.1.1. The USFWS developed the NWI maps for the Project area in the 1980s using older aerial photographs. Therefore, the NWI maps only provide guidance in determining areas to be evaluated for wetland characteristics, and should not be used as the sole basis for wetland determinations. The 39.8 acres of wetlands, 257.5 acres of pothole wetland and 134.3 acres of wetland fringe in the site-specific landcover data of Section 13.1.1.1 incorporates data gathered from on-site field mapping.

The wetlands in the Project area are isolated pothole wetlands, many of which have been degraded by agricultural practices and grazing. The areas where ranchers have bermed natural drainage features or seasonal wetlands to create a persistent water supply for livestock were observed to be heavily grazed and did not contain a perimeter of hydrophytic vegetation, unlike the prairie pothole wetlands where hydrophytic vegetation was present along the perimeter of open water (Tierra 2009).

13.1.2 WILDLIFE

Species present within the Project area are those typically found in aquatic habitats, wetlands, grasslands, prairie, deciduous woodlands, agricultural and developed settings. Agricultural practices have reduced the amount and continuity of prairie and wetland habitat over the past 150 years and wildlife now share the region with cattle and other livestock in intermixed habitats (Tierra 2009).

Wildlife, and other biological resources, are discussed in detail in the *Wildlife Studies for the PrairieWinds SD1 Crow Lake Wind Resource Area Aurora, Brule and Jerauld Counties, South Dakota March 19, 2009 – July 7, 2009* report by WEST included in Appendix D.

Element Occurrence Records for Crow Lake Project Area dated December 5, 2007, provided by the South Dakota Natural Heritage Database (NHD) does not indicate the record of occurrence of protected or sensitive invertebrate or mammalian species within the Project Site. In addition, avian species are the primary wildlife potentially affected by a project within the terrestrial ecosystem located in the Project area. Therefore, the following wildlife discussion sections in this permit application focus on avian wildlife.

The National Waterfowl Production Area (NWPA) lands, State Game Production Areas (GPA) areas and USFWS easements (wetland, grassland and conservation) can provide grassland and/or wetland habitat for wildlife. The following are conservation or natural areas located near, but not within, the boundaries of the Project Site:

- A NWPA associated with White Lake which is located approximately three miles southeast of the Project Site.
- GPAs:
  Crow Lake GPA, located adjacent to the north of the Project Site (Figure 12)
  Horseshoe Lake GPA, located along the north border of the Project Site (Figure12)

Hunting is a popular recreational activity in and around the Project area. Game species pursued most often in and around the area include pheasants and other upland gamebirds, white-tailed deer, fox, coyotes and waterfowl (Tierra 2009).

13.1.2.1 Migratory Birds

The Project Site is located within the Central Flyway migration corridor and Prairie Pothole Region and as such contains important habitat for waterfowl production. The Central Flyway migration corridor is utilized by thousands of birds during spring and fall migrations each year. Migratory avian species may utilize the many habitats of the Project Site during stopovers. The 1918 Migratory Bird Treaty Act protects most species of migratory birds.

The Project area contains both wetland and upland bird habitat. Birds, including passerines, raptors and waterfowl, migrate through the Project area. Woodlots, wetlands and riparian areas scattered throughout the Project Site may provide stopover habitat for migrants or individuals during post-breeding dispersal. Harvested grain crops, such as the corn that was observed during the site visits, could serve as feeding areas that could attract migrating and wintering waterfowl. However, these types of habitats are found throughout the region and therefore their presence in the Project Site should not concentrate bird use as compared to adjacent areas.

13.1.2.2 Raptors

Seasonal bird studies conducted in the Crow Lake Project area indicate that spring and fall migration of songbirds, waterfowl and raptors occurs in the region and throughout the area. Although no cliff or rock outcrops were identified, potential raptor nesting sites in the form of trees (scattered and in planted shelterbelts and woodlots) occur throughout the Project area.

During the field studies conducted for the Project on behalf of the Applicant in July 2008 (Terracon 2009), October 2008 (Terracon 2009) and March through July 2009 (WEST 2009), the following raptors were identified within the Project boundary:

- American kestrel, *Falco sparverius*
- Northern harrier, *Circus cyaneus*
- Prairie falcon, *Falco mexicanus* (State listed species of concern)
- Red-tailed hawk, *Buteo jamaicensis*
- Rough-legged hawk, *Buteo lagopus*
- Snowy owl, *Bubo scandiacus*
- Great horned owl, *Bubo virginianus*
- Cooper's hawk, *Accipiter cooperii* (State listed species of concern)
- Broad-winged hawk, *Buteo platypterus* (State listed species of concern)
- Swainson's hawk, *Buteo swainsoni* (State listed species of concern)
- Unidentified buteo

Potential raptor nest structures for above ground nesting species could be present within Project boundary in the form of living and dead trees. Farmsteads observed during the site visit usually had tree rows or woodlots associated with them. Grassland areas could provide nesting habitats for the ground-nesting raptors, such as the northern harrier. In addition, black-tailed prairie dogs were also observed incidentally during the surveys and some studies have indicated that prairie dog colonies or other colonies of ground squirrels can locally increase raptor use at those locations, as raptors will use the towns for hunting areas (WEST 2009). Although raptor nests were considered likely in the Project area, actual nest locations were not observed and the overall raptor use was considered low for the Project area in comparison to other areas of the United States (Tierra 2009).

13.1.2.3 Bats

Bats are a concern in proposed wind farm projects, due to the potential for increased bat mortality associated with wind turbines. Thirteen species of bats are currently known to be found in South Dakota and are considered summer, year-round residents, or migratory residents.

Table 15 South Dakota Bat Species

Common Name	Scientific Name	State Residency
Big brown bat	*Eptesicus fuscus*	Year-round resident
Fringed myotis	*Myotis thysanodes*	Year-round resident
Little brown myotis	*Myotis lucifugus*	Year-round resident
Long-eared myotis	*Myotis evotis*	Year-round resident
Townsend's big-eared bat	*Corynorhinus townsendii*	Year-round resident
Northern myotis	*Myotis septentrionalis*	Year-round resident
Long-legged myotis	*Myotis volans*	Year-round resident
Western small-footed myotis	*Myotis ciliolabrum*	Year-round resident
Hoary bat	*Lasiurus cinereus*	Summer resident
Red bat	*Lasiurus borealis*	Summer resident
Silver-haired bat	*Lasionycteris noctivagans*	Summer resident
Evening bat	*Nycticeius humeralis*	Migratory
Eastern pipistrell	*Pipistrellus subflavus*	Unclassified

Source: SD GFP 2007a

Based on a study conducted in the Buffalo Ridge area of Minnesota, the big brown bat, silver-haired bat, hoary bat and red bat species are known to be directly killed due to strikes with wind turbines (GFP 2007a). The South Dakota GFP indicated six species of bats occurring near the Project Site: big brown bat, silver-haired bat, hoary bat, red bat, little brown myotis and northern myotis (GFP 2007a). Of these six species, the silver-haired bat and northern myotis are considered rare and monitored by the GFP.

There has been limited research conducted on bats in South Dakota. In 2004, the South Dakota Bat Working Group, Wildlife Division, published a report to protect bats and bat habitat through action, education and cooperation with Federal, State and private landowners. Objectives include raising awareness concerning the role bats play in maintaining healthy ecosystems, and working with public land managers and private landowners to reduce possible disruptions to bats and their habitat. The GFP seeks to inventory, protect and manage species and habitats in a manner that meets the needs and desires of the people of the State while protecting South Dakota's biological diversity. The following are State specific management notes for the silver-haired bat and northern myotis as stated in the Plan.

Silver-haired bats are susceptible to forest habitat alterations. This bat is reliant on live and dead trees and selects a range of trees with diverse age structure. Snags are particularly important for the survival of young bats. Reductions in snag numbers will lead to less roosting

opportunities and more competition among snag roosting species. Forest management practices (e.g., silviculture) must retain large snags through time to maintain this species (Tigner and Dowd Stukel 2003).

Northern myotis are vulnerable to threats associated with humans. Because northern myotis have an affinity towards buildings as maternity roosts, public awareness of maternity roosts is particularly important with protecting this bat (Tigner and Dowd Stukel 2003). Also, this bat species is dependent on live trees, dead trees (e.g., snags), caves and mines, which require protection of these roost sites as well.

Bat echolocation call surveys were recently conducted for the Project area (from May 1 to October 15, 2009) on behalf of the Applicant by Western EcoSystems Technology Inc. (WEST); results were not available at the time of submittal of this application. The surveys were performed using Anabat, a system to identify and survey bats by detecting and analyzing their echolocation calls.

13.1.3 SENSITIVE TERRESTRIAL SPECIES

According to the USFWS county by county database, there are two Federal threatened and endangered (T&E) avian species listed for Aurora, Brule and/or Jerauld Counties in South Dakota, the whooping crane (*Grus americana*) and the piping plover (*Charadrius melodus)*. Of those listed terrestrial T&E species, the USFWS has indicated (USFWS 2009) that the whooping crane and piping plover may occur in the Project area (aquatic species are addressed in Section 14). The GFP Natural Heritage Database (NHD) does not identify State listed T&E species as potentially occurring in the three counties (GFP NHD 2007). However, the GFP identifies the State and Federally listed endangered whooping crane as potentially occurring within the Project Site as a migratory species (GFP 2007a). Although records of nesting bald eagles (State listed threatened species) within the Project Site were not identified by the GFP, the GFP indicated that bald eagles nest in Brule County in increasing numbers each year.

The Federal and State listed terrestrial T&E species occurrences identified by the USFWS and GFP databases for Aurora, Brule and Jerauld Counties are summarized in Table 16 below.

Table 16. Terrestrial Threatened and Endangered Species

Common Name	Scientific Name	State and Federal Status
Piping plover	*Charadrius melodus*	State listed Threatened (not listed by GFP NHD), Federally listed Threatened (Brule County)
Whooping crane	*Grus americana*	State listed Endangered (Not listed by GFP NHD), Federally listed Endangered (Aurora, Brule and Jerauld Counties)

Since these T&E species could potentially be found within the proposed Project Site, additional information for each species and their potential occurrence is summarized below (USFWS SDFO 2008a). However, it is important to note that whooping cranes and piping plovers were not observed within the Project bounds during the field studies conducted for the Project on behalf of the Applicant in July 2008 (Terracon 2009), October 2008 (Terracon 2009) and March though July 2009 (WEST 2009). The field studies conducted by WEST between March 19, 2009 and July 7, 2009 consisted of: fixed-point bird use surveys (FP), breeding bird transect surveys (Trans.) and incidental wildlife observations (Inc.). Although terrestrial T&E species were not observed in the surveys, several State bird species of concern were documented during the surveys (refer to survey details in Appendix D).

Wildlife use may vary greatly by season, thus a wind-energy facility may have low use by wildlife during one season, but may be higher during another (WEST 2009). Because of this, rigorous impact assessments are generally based on at least one full year of surveys. The studies implemented at the Project Site during the spring and summer of 2009 are part of a larger one-year study. Seasonal interim reports are designed to give the Applicant an early indication if high wildlife use is documented during surveys or if sensitive species are observed.

13.1.3.1 Whooping Crane

Whooping cranes are the tallest birds in North America. Adults are white with black primaries and a bare red face and crown. The bill is olive-gray, eyes are yellow, and legs and feet are gray-black. Whooping cranes live an average of 25 years and are often confused with sandhill cranes, snow geese and white pelicans (Lewis 1995). Whooping cranes are one of the most endangered birds in North America with 21 wild birds left by 1941. Strict protection has brought numbers slowly up, with over 200 now in the wild, and nearly 300 in captivity. Whooping Cranes are monogamous and mate for life (USFWS SDFO 2008e).

Past threats to whooping cranes consisted largely of the conversion of the Northern Great Plains to agriculture, especially the conversion of prairie pothole habitat and the increased human activity associated with these practices. In addition, rural electrification resulted in the widespread construction of power lines, and collisions with power lines are known to have caused death or injury to at least 19 whooping cranes since 1956. Whooping crane population recovery is slow due to delayed sexual maturity, small clutch size and low recruitment rates.

Current threats include obstacles encountered during migration, snow and hail, low temperatures and drought that causes navigational problems and results in collisions with obstructions. Predators, disease and shooting are also current threats, as are hurricanes and drought on wintering grounds.

Whooping cranes typically migrate from their breeding grounds in Wood Buffalo National Park, Canada to their wintering areas in Aransas National Wildlife Refuge, Texas. During the

migration, most birds pass through central South Dakota (USFWS SDFO 2008e). Whooping cranes breed and nest along lake margins or among rushes and sedges in marshes and meadows and winter on estuarine marshes, shallow bays and tidal salt flats. The water in these wetlands is anywhere from 8 to 10 inches to as much as 18 inches deep. Many of the ponds have border growths of bulrushes and cattails, which occasionally cover entire bays and arms of the larger lakes. Nesting has also been reported on muskrat houses and on damp prairie sites. Whooping cranes prefer sites with minimal human disturbance. Wetlands provide the whooping crane with protection from terrestrial predators (Lewis 1995).

Migrating whooping cranes could use wetlands or uplands in the vicinity of the proposed project for feeding or roosting. GFP lists the whooping crane as a migrant, passing through the State along the Central Flyway corridor.

Whooping cranes are known for their flight altitude and duration during migration with altitudes ranging from 1,900 feet to over 3,000 feet; well above the height of wind turbines. Normal flight duration for the whooping crane ranges from 7.5 to 10 hours a day during migration (Kuyt 1992).

Aquatic habitats (wetlands, streams, shallow lakes, etc.) of the Project Site would potentially provide migration stopover habitat for the whooping crane during the spring and fall migrations. In addition, the whooping crane may utilize nearby agricultural fields when feeding during the day, returning to the aquatic habitats in the evening. Whooping cranes may migrate through the Project area and possibly utilize in the Project area's agricultural fields to feed; however, they would be infrequent visitors to the area, mostly in spring and fall.

13.1.3.2 Piping Plover

The piping plover was listed threatened (50 FR 50726-50734, December 11, 1985) in its entire range except for the Great Lakes watershed where it was listed as endangered. The breeding range of the Northern Great Plains population of the piping plover extends from alkali wetlands in southeastern Alberta, through southern Saskatchewan, Manitoba and Ontario, and into Minnesota, northeastern Colorado (Prewitt Reservoir), northwestern Oklahoma, northeastern Montana, North Dakota, South Dakota, Nebraska and Iowa. The piping plover winters primarily on the gulf coast in Texas, Louisiana, Alabama and Florida. Critical wintering habitat for the Northern Great Plains population was designated in Texas, Louisiana, Alabama and Florida; critical breeding habitat has been designated in areas of Minnesota, Montana, North Dakota, South Dakota and Nebraska (USFWS SDFO 2008b).

The piping plover is known to nest from mid-April to mid-August on sparsely vegetated sandbars in rivers and on sand piles resulting from sand and gravel mining operations. Current threats are primarily the loss of vegetated sandbars and river islands due to flood control and navigation activities. Rapidly rising water levels caused by water level regulation policies during nesting and brood-rearing reduces reproductive success. Some sand pit operations entice piping

plovers to nest in relatively sterile environments, making it difficult for chicks to find adequate food (USFWS SDFO 2008b).

According to the USGS Breeding Birds of South Dakota Database, there have been no documented occurrences of the piping plover in the Project area to date. USFWS notes that the primary threats to the piping plover are habitat modification and destruction, and human disturbance to nesting adults and flightless chicks. Damming and channelization of rivers also have reduced or eliminated sandbar nesting habitat.

While it is possible that piping plovers could collide with turbines or overhead lines, such collisions would be unlikely because the birds tend to fly at altitudes well above the height of wind turbines. Also, since piping plovers primarily occur along river corridors, they are unlikely to occur in the upland portions of the Project Site. Piping plovers may migrate through the Project area during spring and fall migration. Due to the absence of rivers and reservoirs within or near the project, they would be infrequent visitors to the area, mostly in spring and fall.

13.2 IMPACTS TO TERRESTRIAL SYSTEMS

13.2.1 VEGETATION

Federal or State listed rare or sensitive plant species are not known to occur in the Project area (Tierra 2009). Unmitigated loss of native or unique vegetation or introduction of noxious weeds could result in an impact to vegetation resources. Damage to field crops that occur on cultivated lands during construction will be compensated for by the Applicant. Impacts to agricultural cropland are discussed further in Section 20.2.3.

Construction of the Project (both the wind farm facilities and the 230-kV transmission line) will result in temporary and permanent impacts to existing vegetation within the Project area (Table 17). Direct permanent impacts will occur due to construction of the WTG foundations, access roads, transmission lines, SCADA, meteorological equipment, O&M facility and CLCS. These impacts will result in a loss of production of crops and pasture grasses. Other indirect impacts could include the 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. Vegetation communities most sensitive to disturbance are native prairies, rangelands with native plant communities, wetlands and natural woodlands. The wind farm facility has been sited to avoid, to the greatest extent possible these sensitive populations.

The Proposed Project would result in the temporary disturbance of approximately 1,009 acres of mixed-grass prairie (includes rangeland, pastureland and CRP/prairie), 391 acres of cropland, 4 acres of wetlands (includes stock pond areas) and 1 acre of shelterbelts (Table 17). The permanent disturbance would occur with approximately 97 acres of mixed-grass prairie, 36 acres of cropland and <1 acres of shelterbelts and wetlands (Table 17). Mixed-grass prairie is

principally rangeland and pasture. Impacts that would occur to cultivated lands are not considered biologically significant because these lands are frequently disturbed by tilling, planting and harvesting activities associated with crop production.

Turbines, access roads, collection lines and the 230-kV transmission line have all been sited to avoid sensitive habitats to the extent possible. Where avoidance is not possible, siting will attempt to minimize impacts to these sensitive habitats. Temporary impacts will be mitigated through BMPs such as re-vegetation and erosion control devices. These measures will minimize any temporary impacts to vegetative communities adjacent to the turbine and road sites. Noxious weeds will be controlled using weed control measures such as re-vegetating as soon as possible after construction with certified weed-free seed mixes and controlled spraying as necessary.

Specific BMPs will be used for any construction within mixed-grass prairie, including the 230-kV transmission line, and will include the following measures:

- Crews will limit ground disturbance wherever possible during construction in rangelands and limit the areas where construction vehicles drive to the transmission line ROW.
- Exposed subgrade in areas where the native soil has been removed will be regraded to the original ground contour and the soil will be replaced to follow the original soil profiles to the extent practicable.
- The Applicant will reseed disturbed areas with a weed-free native plant seed mixture at an appropriate application rate.

Temporary and/or permanent construction impacts could occur to the grassland easement located within the Project area. The USFWS is responsible for the review and regulation of grassland easement impacts, and the Applicant will coordinate with this agency to obtain potential construction access and determine appropriate mitigation (if necessary). Special Use Permits and/or ROW access permits may also be required.

The Project will not involve any major tree clearing activities. Turbines are sited in open areas. Whenever feasible, access roads have been sited to avoid crossing tree rows. The 230-kV transmission line route and the 34.5-kV collection routes were sited to avoid impacts to tree rows and woodlots whenever feasible. Some minor clearing of brush may be required for collection lines and access roads. In areas where access roads may need to cross windrows due to engineering restrictions or the layout of leased lands, the Applicant will work with the landowner in order to develop an appropriate alignment that will be the least intrusive.

Table 17 Summary of Disturbance Acres for Vegetation Types within the Project Site

Vegetation Type	Total Temporary Disturbance (Acres)	Total Permanent Disturbance (Acres)
Mixed-grass Prairie	1,008.9	96.8
Cropland	390.6	35.8
Wetlands (includes stock pond areas)	4.0	0.0
Farmstead	0.1	<0.1
Woodlands	1.0	0.6
Total Acreage	**1,404.6**	**133.2**

Source: *NRC 2009 and PrairieWinds SD1, Inc.*

13.2.2 WETLANDS

Impacts to wetlands resources could occur by directly filling wetlands due to Project construction, or by otherwise negatively altering their quality. Wetland resources in the Project area were observed during field investigations conducted by Western, Tierra, WEST and Terracon between 2008 and 2009. The wetlands present within the Project area are seepage-fed drainages with isolated pothole wetlands interspersed. The results of the field and desktop analyses were used to refine the current layout to avoid permanent impacts to identified wetlands to the greatest extent practicable. The Applicant has committed to comply with USACE mitigation requirements for wetlands, if required.

Because wetlands within the Project area are relatively small and widely scattered, the Applicant anticipates that the Project will be able to avoid most wetland areas. WTGs will be constructed in the upland hill areas, avoiding the low-lying wetlands. Wetland areas will also be avoided to the extent possible when positioning access roads and feeder lines. Because most wetlands are small and isolated, the Applicant anticipates that overhead 230-kV lines will be able to span wetlands without placing structures within the wetlands. To further protect wetlands, BMPs for sediment and erosion control will be implemented. In order to minimize the risk of contamination of wetlands due to accidental spilling of fuels or other hazardous substances, all construction equipment will be refueled in secure areas away from wetlands or drainage areas, and a spill kit will be available at the construction site. The current layout shows approximately 4 acres of temporary impacts to wetlands due to installation of collection lines, overhead lines and other infrastructure. Permanent impacts to wetlands are not anticipated.

The current layout avoids temporary and permanent impacts to wetlands within most of the USFWS conservation easements. In addition, the Applicant is planning to keep a 500-foot set back from wetlands greater than 50 acres and a 0.25-mile setback from waterfowl production areas. The Applicant will ensure to the extent possible that construction of the wind farm facilities will avoid or minimize impacts to wetlands and will employ appropriate BMPs during

construction. The 230-kV transmission line is anticipated to span wetlands and waters of the U.S., avoiding permanent impacts.

If the final layout results in unavoidable impacts to wetlands or waters of the U.S., the Applicant will work with the jurisdictional agencies (USACE and/or USFWS) to permit the activity and determine the best ways to minimize the impacts and create appropriate mitigation, if necessary.

13.2.3 WILDLIFE

Construction of the proposed Project could impact wildlife by causing temporary or permanent loss of or changes to habitat and mortality. Temporary impacts would be associated with the construction phases of the Project and permanent impacts (example: mortality to birds and bats resulting from collisions with wind turbines) may be associated with the operation of the Project.

Approximately 1,405 acres of habitat would be temporarily disturbed, while approximately 133 acres would become permanently unavailable. The areas of temporary disturbance would be reclaimed and reseeded with an approved seed mix. Permanent habitat loss due to construction of WTGs, the CLCS and access roads will be minimal, restricted to localized areas primarily within cultivated fields or rangelands.

Temporary disturbance (noise, habitat destruction, increased vehicle traffic etc) related to the construction phase, will be localized and minimal. Construction crews would be instructed to avoid disturbing or harassing wildlife. Potential mortalities due to the construction phase are not expected to impact populations. Following construction, wildlife species would be expected to become accustomed to the routine facility operation and maintenance activities and return to continue use of the Project area.

During construction, good housekeeping practices will be employed in order to minimize the production of loose wastes that could temporarily attract scavengers to the Project area. Avoiding an increased presence of scavengers by removing trash from the Project area will reduce impacts to nesting species and other wildlife sensitive to scavengers.

Potential impacts to sensitive terrestrial species are currently being evaluated under the EIS as part of the NEPA process (one year of wildlife surveys in progress for the Project). In addition, Section 7 consultations with the USFWS are being conducted (the lead agencies have initiated the government-to-government consultations) during the development of the EIS.

13.2.4 SENSITIVE TERRESTRIAL SPECIES

Federally listed species, including the whooping crane (identified by USFWS and GFP) and piping plover (identified by USFWS) have not been observed during surveys conducted for the Project Site through July 2009 (WEST 2009). The Project area contains very little potential migratory habitat for whooping cranes or suitable habitat for piping plovers. However, sightings of whooping cranes have occurred in Brule and Aurora Counties according to the GFP (GFP 2007a). There are no topographic features, such as mountain passes or large rivers, which would serve to funnel or direct migratory paths of whooping cranes to the area. Several other State and Federal bird species of concern, indicated by the State of South Dakota and USFWS, were also documented during the surveys (refer to survey details in Appendix D). However, patterns of occurrence were not identified for these species of concern that would dictate that specified areas should be avoided by construction (WEST 2009).

Although there are no known bald eagle nests within or near the Project area, it is possible that bald eagles occur within the Project area as a transient during winter months. Construction personnel will be instructed to report any bald eagle sightings. Construction activities would be modified or curtailed when bald eagles are present to reduce disturbance. Raptor mortality has been relatively low at wind farms and there have been no reported bald eagle fatalities at wind facilities in the western U.S. (Tierra 2009).

13.2.5 BIRD AND BAT MORTALITY

Field surveys are in progress to further assess birds and bat populations at the Project Site (WEST 2009). Construction is not anticipated to last longer than one nesting season (construction would occur from mid-2010 to mid 2011) for many bird species. The literature on long-term effects of wind turbines on breeding habitat shows that although there appears to be a decrease in breeding songbird density in the immediate vicinity of turbines, broader scale changes were absent (Leddy 1999).

A variety of measures will be used to avoid and minimize bat and bird fatalities that may result from the Project. The Project will use tubular structures and newer generation turbines (GE 1.5 sle WTGs) to eliminate the creation of perching sites within the Project area and pose a lower risk of avian collisions. A post-construction monitoring program to assess avian mortality would be designed and implemented in coordination with the USFWS, Western, RUS and SDGFP. The Applicant will construct overhead power lines required for the Project in accordance with the current Avian Power Line Interaction Committee (APLIC) guidelines for raptor-safe design. If final design shows that temporary impacts would potentially occur within a USFWS grassland easement, the Applicant would coordinate with the agency to obtain the proper temporary access permits.

Baseline surveys have been initiated to assess pre-construction avian abundance and habitat use in the Project area. The Applicant will complete one year of pre- and one year of post-construction monitoring to determine avian and bat use of the Project area before and after Project construction, and also to determine mortality rates associated with Project operation.

Raptors, waterfowl and other bird species may also be affected by the construction and placement of the overhead transmission lines. Waterfowl, wading birds and shorebirds are typically more susceptible to transmission line collision, especially if the transmission line is placed between agricultural fields that serve as feeding areas or between wetlands and open water, which serve as resting areas. For this Project, the 230-kV transmission line runs adjacent to property lines and roadways for the majority of its length. Wetland and open water features are not abundant in the vicinity of the line.

Electrocution of large birds, such as raptors, is a concern related to distribution and sub-transmission lines. Electrocutions occur when birds come in contact with either two conductors or a conductor and a grounding device. The Applicant's transmission line design standards follow APLIC design standards and provide adequate spacing between the conductors to minimize the risk of raptor electrocution. Thus there should be minimal risk of electrocution from the transmission line.

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

Aquatic ecosystem data were collected from literature searches; Federal and State agency personnel and reports; natural resource databases; and field investigations. Biologists from Western, Tierra, WEST and Terracon also provided regional and site-specific information for aquatic resources.

14.1 EXISTING AQUATIC ECOSYSTEM

Surface waters are described in Section 12.1, and shown on Figures 11a and 11b. The Project facilities and proposed 230-kV transmission line lie in the Crow, Fort Randall Reservoir and James River watersheds (Figure 11a).

As described in Section 13.1.1.6, there are approximately 477 acres of NWI wetlands within the Project area (approximately 1.3 percent of the total Project area). Freshwater forested/shrub wetlands make up less than 1 percent of the wetlands in the Project area, freshwater ponds make up approximately 19 percent and freshwater emergent wetlands make up the majority (81 percent) of the wetlands in the Project area (USFWS NWI 2008). The majority of wetlands within the Project boundary were classified as Prairie pothole wetlands, naturally occurring depressional wetlands where native and non-native wetland vegetation persists (NRC 2009). Dominant vegetation observed in several wetlands during the site visits consisted of prairie cord grass (*Spartina pectinata*), reed canary grass (*Phalaris arundinacea*), narrow-leaved cat-tail

(*Typha angustifolia*) and river bulrush (*Bolboschoenus fluviatilis*).

14.1.1 SENSITIVE AQUATIC SPECIES

According to the USFWS county by county database there are two Federal T&E aquatic species listed for Aurora, Brule and/or Jerauld Counties in South Dakota; the pallid sturgeon (*Scaphirhynchus albus*) and Topeka shiner (*Notropis topeka*). The USFWS indicated in a letter dated May 13, 2009 (USFWS 2009) that the Topeka Shiner may occur in the Project area. The pallid sturgeon was not identified by USFWS in the letter as potentially occurring in the Project area (listed for Brule County but not Aurora or Jerauld Counties on the USFWS county by county database). The GFP Natural Heritage Database (NHD) does not identify State listed aquatic T&E species as potentially occurring in the three Project Site counties. The aquatic T&E species occurrences identified for Aurora, Brule and Jerauld Counties by the Federal and State databases are summarized in Table 18 below.

Table 18. Aquatic Threatened and Endangered Species

Common Name	Scientific Name	Status in South Dakota
Topeka shiner	*Notropis topeka*	Federally listed Endangered (Aurora and Jerauld Counties)
Pallid sturgeon	*Scaphirhynchus albus*	Federally listed Endangered (Brule County), State listed Endangered (not listed by GFP NHD)

14.1.1.1 Topeka Shiner

This species was listed by USFWS in December 1998. The Topeka shiner is a small pool dwelling minnow that is found in prairie streams of the lower Missouri River Basin and upper Mississippi River Basin. The range of this fish covers eastern South Dakota, southwest Minnesota, eastern Nebraska, Iowa, northern Kansas and Missouri. In South Dakota, the Topeka shiner has been found in about 40 streams in the James River, Big Sioux River and Vermillion River Watersheds (USFWS SDFO 2008a). The Topeka shiner currently retains its historic distribution and is locally abundant in South Dakota; however, population trends are unclear. Most stream crossing projects constructed in the James River, Big Sioux River and Vermillion River Basin will impact the Topeka shiner. Special Provisions are required for construction on streams inhabited by or likely to be inhabited by the Topeka shiner (SD DOT 1997-2007).

The USFWS has identified several actions which may threaten the shiner or modify the species existing habitat. These actions include direct handling or unauthorized collection of the species (such as bait minnow collections); destruction or modification of the species habitat (such as channelization, stabilization and damming or other impoundment activities); introduction of nonnative species into Topeka shiner habitat; improper use of pesticides or fertilizers (failure to comply with labeling requirements); contamination of soils, streams and groundwater (such as

from spills or discharges); and discharging or dumping of chemicals, silt or other pollutants (such as material discharges from manufacturing plants, runoff from livestock confinements and construction operations).

According to the South Dakota Gap Analysis Project (project conducted to identify where native animals and plant communities occur in relation to existing protected lands), there are predicted areas of occurrence for the Topeka shiner in the West Branch of Firesteel Creek. Unnamed tributaries located in the northeastern and east central limits of the Project Site flow into the West Branch of Firesteel Creek. According to the South Dakota Department of Transportation website, the species was observed in the West Branch of Firesteel Creek as recently as 2006. A management document for the Topeka shiner, prepared by GFP and published in the summer 2003, lists the BMPs for crossing streams inhabited by the Topeka shiner (Shearer 2003). BMPs are project specific and based on probability of occurrence and construction timing. Additional consultation with the USFWS and GFP will be conducted during the NEPA process.

14.1.1.2 Pallid Sturgeon

The pallid sturgeon was listed endangered throughout its entire range on September 6, 1990 (USFWS SDFO 2008b). It is known to occur in Arkansas, Iowa, Illinois, Kansas, Kentucky, Louisiana, Missouri, Montana, North Dakota, Nebraska, South Dakota and Tennessee. It is one of the rarest fishes in North America (USFWS 2009). Since 1980, it has been reported most frequently in the Missouri River between the Marias River and Fort Peck Reservoir; between Fort Peck Dam and Lake Sakakawea; within the lower 70 miles of the Yellowstone River downstream of Fallon, Montana; and in the Missouri and Platte Rivers near Plattsmouth, Nebraska.

Past and current threats to the pallid sturgeon are the destruction and alteration of riverine or aquatic habitats, which have adverse effects on reproduction, growth and survival. Impoundments have resulted in reduced sediment discharge and loss of introduced organic matter and woody debris, which in turn has increased river bed degradation and loss of hydrologic connection with shallow backwater areas that are important nursery habitat for larval fish. Channelization, channel stabilization and snag removal for navigation have also resulted in loss of habitat and food production areas for pallid sturgeon (USFWS 1993).

Habitat for pallid sturgeon does not occur within the Project Site. The species requires turbid water, diverse habitat types and flow rates afforded by large, free flowing rivers. (USFWS SDFO 2008b). The pallid sturgeon is a species of concern in Brule County (USFWS SDFO 2008a) because water depletions in the Missouri River located in the western portion of Brule County may affect the species and/or critical habitat.

14.2 IMPACTS TO AQUATIC ECOSYSTEMS AND MITIGATION

Direct and indirect impacts on the pallid sturgeon would be unlikely because the species requires flow rates afforded by large, free flowing rivers which are not located within the Project footprint or immediately down-flow of the Project area. Direct impacts on the Topeka shiner would be unlikely because Project facilities are sited in upland areas and are not proposed in locations that cross the West Branch of Firesteel Creek (located east of the Project boundary) where Topeka shiner has been identified. However, to minimize indirect impacts due to increased sedimentation from construction in areas up flow of the Topeka shiner habitat, the Applicant will avoid impacts either by limiting potential trenching activities in ephemeral tributaries to trenching during the dry periods (avoiding any remaining pools from wet periods that may contain species) or by directional boring.

As described in Section 13.2.2, impacts to wetlands will be minimal, because wetlands will be avoided to the extent possible when positioning access roads, collection feeder lines and the overhead 230-kV transmission lines. The primary potential for impact to aquatic ecosystems will be from increased sedimentation or increased total suspended solids due to soil erosion from the Project construction sites. In general, surficial soils on flat areas are less prone to erosion than soils in sloped areas. Construction on or adjacent to steep slope areas can render soils unstable, accelerate natural erosion processes and cause slope failure.

The loamy soils in the Project area footprint are not highly susceptible to erosion; however, care will be taken to avoid or minimize excavation in steep slope areas. Since wind turbines are generally located at higher elevations to maximize exposure to wind, excavation in steep slope areas should be limited to small sections of access roads. Where possible, access roads will be sited to avoid steep slopes. There may also be limited trenching of underground cabling in steep slopes, although that will be minimized as much as possible. During construction, BMPs will be implemented to ensure that drainage ways and streams are not impacted by sediment runoff from exposed soils during precipitation events. Overhead transmission poles will not be placed in streambeds and special care will be taken where the proposed 230-kV transmission line descends from a ridgeline to the valley below along the southern boundary of Section 22 of Anina Township in Jerauld County.

The South Dakota DENR has issued a General Storm Water Permit for Construction Activities similar to the proposed Project; an application for coverage under this permit will be needed for the Project. One of the conditions of this permit is the development of a SWPPP. The SWPPP will be developed once more detailed engineering information on grading is determined, and will mandate BMPs to control erosion and sedimentation for areas where slopes make soil erosion a particular concern. BMPs may include silt fencing, erosion control blankets, re-vegetating side slopes, temporary storm water sedimentation ponds, or other methods of controlling storm water runoff and minimizing erosion and sedimentation.

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

15.1 EXISTING LAND USE

The predominant land use within the Project area is agricultural (a combination of rangeland and cultivated row crops). Soils in the Project area consist of a variety of loams, silt loams, silty clay loams and sandy loams derived from underlying glacial tills that are considered rich agricultural soils. The majority of the land, approximately 60 percent, within the Project area is considered farmland of statewide importance. Approximately 3 percent is considered prime farmland, 4 percent is considered prime farmland if irrigated and the remaining 33 percent is not considered prime farmland (USDA NRCS 2009). Federal regulations define farmland of statewide importance as "land other than Prime Farmland, which has a good combination of physical and chemical characteristics for the production of crops" (US CFR 2001).

Other land uses within the Project area are scattered rural residences, farmsteads, roads, stock ponds, woodlands, lakes, mixed-prairie grasslands, rangelands, wetlands, gravel pits, transmission lines and the Wessington Springs substation (Figure 10). The Project area is zoned agricultural. Existing transmission lines are located along the northeast Project boundary (Fort Thompson to Sioux Falls 230-kV double circuit transmission line) and power distribution lines and telephone lines also are found throughout the Project area.

GFP maps do not depict walk-in hunting areas within the Project boundary (GFP 2008). In addition, health facilities, cemeteries, active railroads, irrigated lands and other major industrial land uses (other than Western's existing Wessington Springs substation and the adjacent Wessington Springs Wind Farm northeast of the Project Site) were not identified within the Project Area. Sensitive land uses that would necessitate land use setback requirements, other than occupied residences addressed in Section 15.4.3 and potentially the Patten Consolidated School addressed in Section 20.1.4, were not identified within the Project boundary (Figure 12).

15.2 EXISTING NOISE

The proposed Project Site is located in a rural area with primarily agricultural land use (rangeland and cropland). The primary sources of noise include: agricultural activity (farming equipment), recreation (primarily hunting), wind and vehicles traveling on county roads and low-traffic gravel roads (Tierra 2009). There are no baseline noise evaluations available for the Project area. Noise may be comprised of a variety of sounds of different intensities, across the entire frequency spectrum and is measured in units of decibels (dB) on a logarithmic scale. A dBA scale corresponds to the sensitivity range for human hearing because human hearing is not equally sensitive to all frequencies. Noise levels capable of being heard by humans are measured in dBA.

A noise level change of 3 dBA is barely perceptible to average human hearing. A 5 dBA change

in noise level is clearly noticeable; a 10 dBA change in noise level is perceived as a doubling or halving of noise loudness; and a 20 dBA change is considered a dramatic change in loudness. Table 19 shows noise levels associated with common, everyday sources, and places the magnitude of noise levels discussed here in context.

Table 19 Common Noise Sources and Levels

Sound Pressure Level (dBA)	Typical Sources
120	Jet aircraft takeoff at 100 feet
110	Same aircraft at 400 feet
90	Motorcycle at 25 feet
80	Garbage disposal
70	City street corner
60	Conversational Speech
50	Typical office
40	Living room (without TV)
30	Quiet bedroom at night

Source: (Rau et al 1980)

Average noise levels in rural agricultural areas are typically in the 30 to 40 dBA range. Ambient noise in rural areas is commonly made up of rustling vegetation and infrequent vehicle pass-bys. Higher ambient noise levels, typically 40 to 55 dBA, are expected near roadways, such as State Route 45 (approximately five miles west of the Project boundary) and in more urban areas, such as the nearby towns of White Lake, Wessington Springs, and Kimball, South Dakota.

15.3 EXISTING AESTHETICS

Cropland, rangelands, farmsteads, large open vistas and gently rolling topography visually dominate the Project Site landscape. Vegetation in and near the Project area is predominantly agricultural rangeland and cropland creating a low uniform cover. A mix of deciduous and coniferous trees, planted for windbreaks, typically surround farmsteads. In the Prairie Pothole wetlands interspersed throughout the Project Site, dominant vegetation includes prairie cord grass, reed canary grass, narrow-leaved cat-tail and river bulrush (NRC 2009).

The existing structures in the Project area are residences and farm buildings (occupied and unoccupied) scattered along the rural roads. These structures are focal points in the dominant open space character of the vicinity. Typically, the farmsteads and residences are located at lower elevations to avoid winds common to the area. The paved highways and two-lane paved and gravel roads carry varying amounts of traffic, most of which is local. The rural character of the area is especially apparent along the local two-lane roads that typically will not have

expansive views of the proposed wind farm; instead, they will have close views of the site and vicinity. However, in the general area of the Project Site where the roads are at higher elevation, there will be intermittent expansive views of the area.

Visual impacts to the landscape attributable to the Project will depend on the extent to which the existing landscape is already altered from its natural condition, the number of receptors (residents, travelers, visiting recreators, etc.) within visual range of the area, and the degree of public or agency concern for the quality of the landscape. Currently, there is an operating wind farm in the general Project area (Wessington Springs Wind Farm). The Wessington Springs Wind Farm is located along the northeast boundary of the Project Site, and is visible from many areas within the Project boundary.

Three key observation points (KOPs) for the Project Site were identified for the evaluation of potential aesthetic impact relative to the Lewis and Clark Driving Tour Route (LCDTR), part of the Lewis and Clark National Historic Trail (NHT). The first KOP, KOP1, is the view northeast from the intersection of interstate 90 and State Route 50, where the LCDTR is at its closest point (17 miles) to the Crow Lake Site. The second KOP, KOP2 is the Lewis and Clark Interpretive Center (LCIC), located in the Chamberlain Rest Area on I-90 between exits 263 and 265. The LCIC is approximately 24 miles away from the closest point of the project boundary. KOP3 is an area along State route 50 looking east from near the Township of Grosse. This KOP is approximately 22 miles away from the Project Site.

At the identified KOP distances, the turbines would be a minimal addition to the existing landscape, but would be indistinguishable from the existing transmission line structures (Tierra 2009). Development of the Proposed Project would not substantially alter or degrade scenic resources and would not substantially degrade the visual quality of the Project Site as viewed from the LCTDR or LCIC; therefore, impacts to visual resources would be less than significant.

15.4 LAND USE IMPACTS ANALYSIS

Section 20.2.3 discusses impacts to the agricultural land uses for the Project Site.

15.4.1 DISPLACEMENT

There are approximately 20 occupied residences out of 27 residences identified in the Project boundary (Figure 12). Based upon the proposed Project layout of WTGs, access roads, collector lines, CLCS and the interconnection facilities (Figures 3 and 12), there will be no displacement of residences or businesses due to construction of the Project facilities. The minimum distance between an occupied residence and a proposed turbine location is currently 1,270 feet.

The minimum distance between an occupied residence and the proposed centerline of the 230-

kV transmission line is approximately 1,900 feet (Figure 12). The 230-kV transmission line route has been designed to avoid and minimize direct impacts to occupied residences, and displacement of residences or businesses will not occur due to the transmission line's construction.

15.4.2 RECREATIONAL IMPACTS

Walk-in hunting areas were not identified within the Project boundary and impacts to recreational land uses are not anticipated from the Project. South Dakota waters are to be maintained and protected in accordance with their beneficial use classifications. In addition to other beneficial uses, each of South Dakota's lakes and streams are assigned the beneficial use of recreation. Impacts to the recreational uses of the lakes and streams located within or downstream of the Project facilities are not anticipated during the construction or operation phases of the Project.

15.4.3 NOISE ANALYSIS

Noise concerns for this Project may be associated with both the construction phase of the Project and operation of the Project facilities. Examples of construction and decommissioning related noise-emitting sources include: heavy equipment used in earthmoving, foundation preparation and demolition, structure assembly and other activities. When in motion, the wind turbines emit a perceptible sound and the level of this noise varies with the speed of the turbine and the distance of the listener from the turbine. Operational noise-emitting sources also include the low, continuous vibrational "hum" which can be heard from the active transmission lines and the CLCS facility. The CLCS will be located in the northwest corner of Section 8 in Patten Township. The closest residence to this substation is located at least 6,700 feet away. The closest residence to the proposed 230-kV transmission line is 1,900 feet. It is not anticipated that the CLCS or 230-kV transmission lines will noticeably increase the noise levels at the occupied residences.

The closest occupied residence to a proposed WTG location is 1,270 feet. In addition to the planned noise set-back distances for the Project facilities, which will reduce noise impacts, the turbines (GE 1.5sle MW turbine model) have noise reduction technology employed in the following components:

- Impact noise insulation of the gearbox and generator
- Sound reduced gearbox
- Noise reduced nacelle
- Rotor blades with minimized noise level

15.4.3.1 Construction and Decommission

Construction noise levels associated with a wind farm vary greatly depending on equipment, operation schedule, and condition of the area being worked (Tierra 2009). Table 20 identifies noise levels for typical construction equipment.

Table 20 Noise Levels at Various Distances from Typical Construction Equipment

	Noise Level $L_{eq(1-h)}$[a] at Distances [dB(A)]					
Construction Equipment	**50 feet**	**250 feet**	**500 feet**	**1,000 feet**	**2,500 feet**	**5,000 feet**
Bulldozer	85	71	65	59	51	45
Concrete mixer	85	71	65	59	51	45
Concrete pump	82	68	62	56	48	42
Crane, derrick	88	74	68	62	54	48
Crane, mobile	83	69	63	57	49	43
Front-end loader	85	71	65	59	51	45
Generator	81	67	61	55	47	41
Grader	85	71	65	59	51	45
Shovel	82	72	62	56	48	42
Truck	88	74	68	62	54	48

Source: Tierra 2009
[a] $L_{eq(1-h)}$ is the equivalent steady-state sound level that contains the same varying sound level during a 1-hour period.

15.4.3.2 Operation

Table 21 provides a comparison of wind turbine noise to other noise sources.

Table 21 Comparison of Wind Turbine Noise to Other Noise Sources

Noise Source	Typical dB(A)
Threshold of pain	140
Fire engine siren at 100 feet	130
Flyover of an F-16 aircraft at 500 feet	104
Average street traffic	85
Vacuum cleaner	70
Normal conversation	55
Large wind turbine at base of tower	**55**
Soft music, moderate rainfall	50
Background noise in a rural environment	48
Typical living room	40
Large wind turbine from 0.25 mile	**35**
Whisper, quiet library	35
Rustling leaves	20
Threshold of hearing	0

Source: Tierra 2009

In 1974, the USEPA identified safe noise levels that could be used to protect public health and welfare, including prevention of hearing damage, sleep disturbance and communication

disruption. Outdoor noise values of 55 dBA were identified as desirable to protect against activity interference in residential areas. When annual averages of the daily level are considered over a period of 40 years, the USEPA identified average noise levels equal to or less than 70 dBA as the level of environmental noise that will prevent any measurable hearing loss over the course of a lifetime.

The Wessington Springs Wind Project located in Jerauld County, South Dakota, modeled operational noise impacts associated with the same make and model wind turbine as identified for the proposed Project. Based on these results, the anticipated noise level at the base of the wind turbine would be 55dBA and would be between 50dBA and 45dBA at a distance between 660 feet and 1,320 feet from the wind turbine (Tierra 2009). As noted above in Section 8.1, it is possible that the proposed Project layout will change as a result of landowner preference or ongoing discussions with landowners and agencies though the EIS process. Although the turbines may be shifted or added within leased lands in the Project boundary, turbines will not be moved closer than 1,000 feet to an occupied residence. For any change in layout, the Applicant will re-evaluate noise levels at the occupied residences in order to ensure that appropriate noise levels will not be exceeded.

The nearest residence to Western's existing Wessington Springs Substation is approximately 1,500 feet away. If the proposed Project is approved, Western system modifications at the existing Wessington Springs Substation would result in short-term, temporary construction impacts and be expected to result in less than significant noise impacts (Tierra 2009).

15.4.4 AESTHETIC IMPACTS

The placement of turbines will have an effect on the visual quality within the site vicinity. The following discussions regarding aesthetics were obtained from the Buffalo Ridge II LLC PUC application for a facility permit (HDR 2008). Discussion of the aesthetic effect of the proposed wind farm is based on subjective human response. The wind farm will have a combination of effects on the visual quality/rural character of the area. By one measure, the proposed Project could be perceived as a visual intrusion, characterized as metal structures, 80 to 100 meters high at hub height, standing on formerly undisturbed ridgelines, intruding on the natural agricultural aesthetic value of the landscape.

On the other hand, wind farms have their own aesthetic quality, distinguishing them from other nonagricultural land uses. First, the wind farm does not generate much traffic or generate a noticeable increase in day-to-day human activity in the area. Therefore, the Project Site will retain the rural sense and remote characteristic of the vicinity. Second, although "industrial" in form and purpose, turbines are essentially "farming" the wind for energy. The proposed land use will not involve any ongoing industrial use of non-renewable resources or emissions into the environment. Although the turbines are high-tech in appearance, they are compatible with the rural, agricultural heritage of the area.

The installation of the Project will modify the visual quality of the area within and adjacent to the Project boundary. The topography in the Project area is generally flat and the vegetation cover is uniformly low, making the ridgelines of the landform in the vicinity vulnerable to visual disruptions. Wind turbines already existing near the Project have altered the landscape in the area from agricultural to wind farm/agricultural. The proposed Project will intensify the visual character imposed by the existing wind turbines.

To attain maximum efficiency, wind power technology requires as much exposure to the wind as possible. As a result, the turbines are located on the ridge tops, which make them highly visible to a wide range of surrounding areas. Mitigation measures that would result in shorter towers or placement of the turbines at alternate locations off the ridgelines would result in a nonviable project.

Public input received during the Project scoping identified a low level of local residential sensitivity to visual changes associated with the Project (Tierra 2009). The visual character of the area would be altered from minimally developed agricultural land use to somewhat industrial. Some of the turbines would require lights on top of the nacelle, for aircraft safety, potentially changing the view from nearby rural residences and roadways. Turbines would not be sited near trees or cause trees to be removed. The regional landscape is generally uniform, does not contain highly distinctive or important landscape features, is not densely populated or used and the local residents' sensitivity to visual changes associated with the proposed Project is low; therefore, impacts to the existing visual character or quality from development of the proposed Project would be less than significant.

15.4.5 ELECTROMAGNETIC INTERFERENCE

There are a number of underground and overhead telecommunications lines in the Project area. Telecommunications firms located in areas with wind development have sometimes experienced disturbances to their communications infrastructure from electric feeder and communications lines associated with wind farms (HDR 2008). The Applicant has conducted a Comsearch in order to minimize the potential for interference problems. If, after construction, interference with communications infrastructure is detected, the Applicant will work with the communication firm in order to alleviate the problem.

15.4.5.1 Wind Farm Facility

If, after construction, the Applicant receives information relative to television interference, potentially caused by operation of the WTGs in areas where good reception is presently obtained, the Applicant would resolve such problems on a case-by-case basis.

15.4.5.2 230-kV Transmission Line

Corona from transmission line conductors can generate electromagnetic "noise" at the same frequencies that radio and television signals are transmitted. This noise can cause interference with the reception of these signals depending on the frequency and strength of the radio and television signal. Tightening loose hardware on the transmission line usually resolves the problem. If radio interference from the 230-kV transmission line corona does occur on reception of AM radio, the problem can be rectified by appropriate modifications to the receiving antenna system. Moreover, AM radio frequency interference typically occurs immediately under a transmission line and dissipates rapidly with distance.

FM radio receivers usually do not pick up interference from transmission lines because corona-generated radio frequency noise currents are quite small in the FM broadcast band, and the interference rejection properties inherent in FM radio systems makes them virtually immune to amplitude type disturbances.

Television interference is rare but may occur when a large transmission structure is aligned between the receiver and a weak distant signal, creating a shadow effect. Loose and/or damaged hardware may also cause television interference. If television or radio interference is caused by or from the operation of the proposed 230-kV transmission line in areas where good reception is presently obtained, the Applicant will inspect and repair loose or damaged hardware in the transmission line, or take other necessary action or restore reception to the present level.

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

The Project will be constructed on agricultural land in South Dakota regulated by Aurora, Jerauld and Brule Counties. The Applicant will coordinate with the respective County zoning offices to comply with any required setback distances and applications will be filed for the appropriate permits as necessary.

The following minimum set-backs are planned for the Project facilities, which are expected to meet or exceed the local County zoning requirements for this Project:

- 400 feet from most public roads, distribution power lines and high voltage transmission lines
- 1,000 feet from occupied residences
- Out of the Worst Case Freznel Zone of microwave paths
- Avoid wetlands
- 500 feet from a wetland of greater than 50 acres
- 0.25 miles from Waterfowl Production Areas

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

Potential impacts to water quality are addressed in Section 9.0. The excavation and exposure of soils during the construction of wind turbines and access roads may cause sediment runoff during rain events. Erosion control BMPs will contain sediments that might otherwise increase loading in receiving waters.

An NPDES permit is required for land disturbing activities of greater than 1 acre. The Project will temporarily disturb approximately 1,405 acres because of the construction of turbines, electric collection system, access roads, CLCS, O&M facility, meteorological equipment, temporary laydown areas and batchplant, and the 230-kV transmission line. The South Dakota DENR has issued a General Storm Water Permit for Construction Activities; and the Applicant will apply for coverage under this permit for the Project. One of the conditions of this permit is the development of a SWPPP that will identify BMPs to control erosion and sedimentation. BMPs may include silt fencing, erosion control blankets, temporary storm water sedimentation ponds, or other methods of controlling storm water runoff and minimizing sedimentation.

As a result of implementation of the conditions of the General Storm Water Permit process (SWPPP mandated BMPs) the Project is not expected to have detrimental impact on water quality, either during construction or operation of the wind farm and 230-kV transmission line facility.

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

18.1 EXISTING AIR QUALITY

The Project area is currently in attainment for both national and South Dakota Ambient Air Quality Standards. The entire State of South Dakota is in attainment for all criteria pollutants (USEPA 2009). The nearest Ambient Air Quality Monitoring Site to the Project is located in Pierre, Hughes County, South Dakota, which is northwest of the Project (DENR AQD 2008). The primary emission sources that exist near the proposed facility components include agriculture related facilities.

The circuit breakers of the existing Wessington Springs substation likely contains small amounts of sulfur hexafluoride gas (SF6), which is used for its high quality electrical insulating and thermal stability properties (HDR 2008). SF6 is a greenhouse gas and if released into the atmosphere, can contribute to greenhouse gas emissions (HDR 2008).

18.2 AIR QUALITY IMPACTS

18.2.1 WIND FARM FACILITY

During construction of the Project, fugitive dust emissions will increase due to truck and equipment traffic in the area. Additionally, there will be short term emissions from diesel trucks, construction equipment, and the batchplant, if used. Air quality effects caused by dust would be short-term, limited to the time of construction or decommissioning, and would not exceed South Dakota Ambient Air Quality Standards (SDAAQS) for particulate. The Project is not located in a non-attainment area for particulate matter (USEPA 2009). Implementation of the Proposed Project Components would not result in a violation to Federal, State or local air quality standard and therefore would result in less than significant impacts to air quality. The operation of the Project will not produce air emissions that would impact the surrounding ambient air quality. Potential complaints regarding fugitive dust emissions would be addressed in an efficient and effective manner.

18.2.2 230-kV TRANSMISSION LINE

Construction impacts from the 230-kV transmission line will include fugitive dust emissions along the alignment due to equipment traffic. The potential air emissions from a transmission line result from corona. Corona can produce ozone and oxides of nitrogen in the air surrounding the conductor. Corona consists of the breakdown or ionization of air within a few centimeters or less immediately surrounding conductors. For 230-kV single-circuit transmission lines, the conductor gradient surface is usually below the air breakdown level. The Project area presently meets the Federal air quality standards. Studies designed to monitor the production of ozone under transmission lines have generally been unable to detect increases due to a transmission line facility. Given this, there will be no measurable impacts relating to ozone for the facility.

The circuit breakers of the proposed CLCS and the addition to the Wessington Springs Substation likely will contain small amounts of SF6. Release of SF6 from a breaker or other electrical device can occur during the initial filling process or due to leaks after filling. However, there are very tight regulations and penalties surrounding release of SF6. Therefore, leakage is monitored closely and repaired promptly if detected. The very small amounts of SF6 used in the proposed CLCS components are not anticipated to cause an air quality impact.

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

The Applicant proposes to have the Project operational as early as December 2010. A preliminary permitting and construction schedule for the Project is outlined below.

- Submit PUC Permit Application November 2009

- PUC Permit (and other permits) Received May 2010
- Western and RUS NEPA Approval July 2010
- Road Clearing and Construction July-Dec. 2010
- WTG Foundation Construction July-Dec. 2010
- Grading, Trenching of Underground Facilities July-Dec. 2010
- 230-kV Transmission Line Construction July-Dec. 2010
- WTG Assembly, Communication & SCADA System Installation July-Dec. 2010
- CLCS Construction July-Oct. 2010
- WTG Testing Nov. 2010

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

20.1 EXISTING SOCIOECONOMIC AND COMMUNITY RESOURCES

20.1.1 COMMUNITIES

The Project area lies within seven named Townships considered the affected socioeconomic environment in this analysis. Socioeconomic information is available from the US census bureau for each of the seven named townships (Logan, Crow Lake, Anina, Plummer, Patten, Pleasant Valley and Willow Lake). Additional socioeconomic information for Aurora, Jerauld and Brule Counties are provided to place this area in a larger context.

The population in this area is generally white (95 to 100 percent) and is slightly less diverse, in terms of racial composition, than the populations of Aurora, Jerauld and Brule Counties (88.2 percent to 98.7 percent) and the state of South Dakota as a whole (88.4 percent) according to 2000 census information. The area is rural and the primary commercial activity is agriculture. Other major industries are not located within the Project boundary, with the exception of the existing transmission and substation infrastructure and the Wessington Springs Wind Farm. According to the 2000 census information for the townships within the Project area, the number of families and individuals below the poverty level varied widely from township to township. For example, no families or individuals were listed below the poverty line for the Willow Lake Township while 81.3 percent of families and 70.9 percent of individuals were listed below the poverty line in the Anina Township. In comparison, Aurora County was 10.5 percent below the poverty level, Jerauld County was 15 percent, and Brule County was 12.6 percent, and the state of South Dakota was 13.2 percent (U.S. Census Bureau 2000).

Unemployment rates measured 4.3 percent in Aurora County, 2.7 percent in Jerauld County, and 4.3 percent in Brule County in June 2009, slightly lower than the 4.9 percent statewide unemployment rate (SD DOL 2009). Median annual household incomes in 2000 ranged between $13,942 (Anina) and $41,250 (Willow Lake) for the townships in the Project area, compared to $29,783 in Aurora County, $30,690 in Jerauld County, and $32,370 in Brule County, and $35,282 for South Dakota.

The two nearest towns to the proposed Project are White Lake (2008 population: 378) and Wessington Springs (2008 population: 846). Wessington Springs is the Jerauld County Seat and is located approximately 10.5 miles northeast of the Project area.

20.1.2 COMMERCIAL AND INDUSTRIAL SECTOR

As stated above, the primary commercial activity in the Project area is agriculture. Aurora County's 379 farms (364,612 acres) produced a total market value of agricultural products of more than $102.7 million in the year 2007 (the latest year with available data), including $47.3 million in crops and $55.4 million in livestock products (USDA NASS 2007).

Jerauld County's 239 farms (328,624 acres) produced a total market value of agricultural products of more than $68.7 million in the year 2007, including $33.9 million in crops and $34.8 million in livestock products (USDA NASS 2007).

Brule County's 370 farms (518,462 acres) produced a total market value of agricultural products of more than $99.7 million in the year 2007, including $45.1 million in crops and $54.6 million in livestock products (USDA NASS 2007).

20.1.3 TRANSPORTATION

20.1.3.1 Surface Transportation

The Project Site is transected by and is accessible via a two-lane paved roadway, 373 Avenue. 373 Avenue intersects interstate 90 to the south and State Route 34 to the north. The general alignment of this road is straight and flat. As an exception, 373 Avenue curves to the west and then back to the east around the west side of Crow Lake before continuing north toward State Route 34.

The SD DOT average daily traffic (ADT) counts are not available for 373 Avenue. State Route 45 parallels 373 Avenue approximately 6 to 7 miles to the west of the Project boundary in Brule County. The latest available 2008 ADT counts on State Route 45 between State Route 34 and interstate 90 indicate approximately 475 to 565 total vehicles per day (vpd) of which approximately 103 to 123 of the vehicles are trucks (SD DOT 2008).

Numerous gravel and unimproved or low maintenance roads provide access to various portions of the Project area. Most vehicular traffic is limited to local commuters and farm equipment. Table 22 lists roads within the Project area.

Table 22 Area Roads

County	Road	Condition		
		Paved Asphalt	Gravel Surface	Low Maintenance
Aurora County	238 Street		X	X
	239 Street		X	
	241 Street		X	
	242 Street		X	
	243 Street		X	X
	244 Street		X	
	369 Avenue		X	
	370 Avenue		X	
	371 Avenue		X	X
	372 Avenue		X	
	373 Avenue	X		
	374 Avenue			X
	377 Avenue		X	
Brule County	242 Street		X	
	244 Street		X	
	245 Street		X	
	366 Avenue		X	X
	367 Avenue		X	
	368 Avenue		X	
	369 Avenue		X	
	370 Avenue		X	
Jerauld County	236 Street		X	X
	237 Street		X	X
	238 Street		X	X
	376 Avenue		X	
	367 Avenue		X	
	373 Avenue	X		
	377 Avenue		X	
	379 Avenue		X	

20.1.3.2 Aviation

Regional or municipal airports are not located within the Project boundary or in the immediate vicinity of the Project area. The closest municipal airport, Kimball Municipal Airport, is located in Kimball, South Dakota, approximately seven miles southwest of the Project Site. The Wessington Springs Municipal Airport is located southeast of Wessington Springs, South Dakota approximately 12 miles northeast of the Project. These two closest airports provide

regular commercial service, as well as private and charter plane service. Evidence of private airstrips (accommodating small single engine planes) was not found within the Project area during site visits, on USGS topographic maps, or on aerial photos. The closest private airstrip identified near the Project Site was Drake Farms located northwest of White Lake, South Dakota approximately five miles south of the southern Project boundary.

20.1.4 CULTURAL RESOURCES

The cultural resources literature review that has been performed for the Project is provided in Appendix E. A brief summary of cultural resources identified within the Project boundary is described below. Several other cultural resource sites, previous cultural resource surveys, and historic structures were also identified within a one-mile buffer of the Project area. These sites, surveys and structures located outside the Project boundary are not discussed below; however, they are depicted on Figure 13 with the current cultural resources identified for the Project Site. It is important to note that additional cultural resource sites, structures and/or surveys may be identified for the Project during further cultural resource evaluations during the EIS preparation activities. In May 2008 through December 2008, the Applicant sponsored desktop reviews of existing cultural resources records on file at:

- The South Dakota State Historical Society (SDSHS),
- The National Register of Historic Places (NRHP), and
- State Historical Preservation Office (SHPO).

The desktop reviews included a review of archaeological and historic standing structure reports to identify historic properties or archaeological resources located within the Project Site boundaries. The NRHP did not identify historic listed properties or properties previously determined eligible for listing within the Project boundary. However, it is important to note that sites with undetermined or unevaluated eligibility are considered potentially eligible for the NRHP. Two historic farmsteads within the northeast bounds of the Project Site were previously recorded by SHPO. Both farmsteads (Jerry Bennett Place and the H.C. Lyle Farm) were determined not eligible for the NRHP. These properties are discussed below.

> THE JERRY BENNETT PLACE (SHPO ID 47536) is located in Section 27, Township 106 North and Range 65 West of the Crow Lake USGS Quadrangle. Historic structures within the Jerry Bennett Place include a water pump, collapsed windmill tower, collapsed gable roof barn, shed roof attachment to the barn, chicken coop and an abandoned single-family dwelling. The dates of construction range from 1883 to 1940. This farmstead was determined not eligible for the NRHP by the SDSHS.
>
> THE H.C LYLE FARM (SHPO ID 47533) is located in Section 27, Township 106 North and Range 65 West of the Crow Lake USGS Quadrangle. Historic structures within the H.C. Lyle Farm include a cast iron water pump, a corrugated galvanized metal stock

tank, windmill tower and pump housing, galvanized metal angle iron with steel rod cross-bracing, a two-hole privy and an abandoned deteriorated single-family dwelling. The dates of construction range from 1900 to 1920. This farmstead was determined not eligible for the NRHP by the SDSHS.

The desktop review also included databases of previously recorded archaeological sites from the SDSHS and previous cultural resource surveys conducted within the Project Site. Two eligible or potentially eligible archaeological sites identified in the database within the Project boundary are summarized in the following Table, Table 23.

Table 23. Previously-Recorded Eligible or Potentially Eligible Archaeological Sites in the Project Site

Sites	Site Type	Author	Year	Eligibility
39AU0007	Foundation	Vaillancourt	2006	Eligible
39JE0039	Stone Circle	Stine	2007	Unevaluated/potentially eligible

Site No. 39AU0007
According to a 2001 Archaeological Site File, a survey conducted by Jeff Buechler noted a poured concrete basement partially filled with “modern” trash and a carcass trench dating to as early as 1861. In the opinion of the SDSHS, this site appears to meet eligibility criteria for the NRHP.

Site No. 39JE0039
According to a 2007 Archaeological Site File, a survey conducted by Ed Stine noted a single stone circle of 31 granitic rocks of an unknown time period. A determination of eligibility for this site has not been made, but in the opinion of the SDSHS, this site may meet the NRHP eligibility criteria. Therefore the site is to be considered potentially eligible and treated as an eligible site for the NRHP.

Additional cultural resource evaluations for the Project area have identified an additional historic site within the Project area, the Patten Consolidated School, which is listed on the NRHP (Site No. AU00000059). The Patten Consolidated School would be evaluated for visual impacts and avoidance or mitigation of historic properties would ensure that there is no impact, or a less than significant impact (Tierra 2009). Avoidance or mitigation of historic properties would ensure that there is no impact or a less than significant impact (Tierra 2009).

The two previously recorded historical sites described above (39AU0007 and 39JE0039) were also evaluated for impacts relative to the Project during the EIS preparation activities. Measures would be taken to ensure that site 39AU0007 is avoided and protected during construction; therefore, no impact would occur (Tierra 2009). Site 39JE0039 requires additional review to determine eligibility for the NRHP. This site would also be avoided; therefore, there

would be no impact (Tierra 2009). Cultural resource sites, previous cultural resource surveys and historic structures identified within a one-mile buffer of the Project area are currently being evaluated during the EIS process. In addition, there may be areas of interest to Native Americans, such as traditional use areas or traditional cultural properties (TCPs) located within the geographic boundaries of the proposed Project area. The Native American concerns will be considered through consultation with interested tribes (Tierra 2009).

A complete survey of sites within the Proposed Project footprint is not yet available; however, the BMPs and mitigation measures identified for the cultural resources by the EIS process will be followed by the Applicant. Figure 13 depicts the current cultural resources identified for the Project Site.

20.2 SOCIOECONOMIC AND COMMUNITY IMPACTS

20.2.1 COMMUNITY IMPACTS

Construction impacts to social and economic resources should be short-term. Revenue will increase for some local businesses, such as hotels, restaurants, gas stations and grocery stores, due to Project construction workers. Other local businesses such as ready-mix concrete and gravel suppliers, hardware stores, welding and machine shops, packaging and postal services and heavy equipment repair and maintenance service providers will also likely benefit from Project construction (HDR 2008). Impacts to social services will be unlikely because of the short-term nature of the construction Project. Given the short-term duration of construction activities, no significant increase in permanent population to local communities would be expected as a result of construction and operation of the Proposed Project. The Proposed Project would not result in significant increased need for public services, including fire protection. In addition, there would be no discernible impact on local utilities, government, or community services attributable to the Project construction workforce.

Project construction crews will include personnel needed for installation of each of the facility components (WTGs, CLCS, 230kV transmission line, collector line installations, O&M building etc.). The number of construction jobs is anticipated to peak around 250, provided there is not a requirement for a major acceleration due to a late start. Assuming a 9 month construction schedule and an average of 175 employees over that time, labor expenditures are estimated to be on the order of 10 to 15 million dollars. A general list of typical personnel required for wind farm construction activities is as follows (HDR 2008):

- Carpenter Journeyman
- Carpenter Foreman
- Operator
- Crawler Operator (for larger cranes)
- Oiler

- Operator Foreman
- Iron Worker
- Laborer
- Laborer Foreman
- Millwright
- Millwright General Foreman
- Lineman
- Groundwater/Truck driver
- Groundman

Minor employment or population changes are anticipated as a direct result of implementation of the proposed Project. With the demand for qualified wind operations and maintenance workers at a peak across the country, the Applicant anticipates that there will not be enough trained local people to fill the available number of jobs. Any increase in the local population would be for the duration of the construction period, and would be small relative to the total population (Tierra 2009). Most of the non-local construction workforce would likely reside within a 60-mile commuting distance of the proposed Project area, so there would be very little demand for additional temporary or permanent housing near the site in Aurora, Brule or Jerauld counties.

Benefits to the local population would also result from wages paid to the construction workforce. There would be beneficial long-term impacts to the counties' tax base for the life of the proposed Project as a result of the construction and operation of the facilities. Aurora, Brule and Jerauld Counties would receive revenues from property taxes, fees and permits. Additional personal income would be generated for residents in the counties and for the State of South Dakota by circulation and recirculation of dollars paid out as business expenditures, and as State and local taxes. The most direct beneficial impact would be the net economic benefit to participating landowners from lease and easement payments, which would provide a supplementary source of income. An increase in the Aurora, Brule and Jerauld County tax base would also provide benefits to County residents. Indirect economic benefits would accrue to businesses in the area from construction workers purchasing goods and services. There would also be economic benefits for the counties from added taxes paid on real property. Increased tax revenues collected as a result of the proposed Project operation could be utilized to benefit or improve local government or community services.

Construction work is anticipated to be completed as early as December 2010. Construction activities for this Project will be short-term. Therefore, no long-term impact from construction to the socioeconomics of the area is expected; any short-term effects likely will be beneficial to local businesses. The Project will have no lasting adverse impact on the industrial sector, housing, labor market, health facilities, sewage and water systems, existing energy facilities, solid waste facilities, schools, law enforcement, other community and government facilities, or recreation facilities.

The operation and maintenance of the Project will result in several long-term positions, which will likely have a positive impact on income levels in the Project area. The Project will would be operated by ten individuals, including an O&M Supervisor, a lead wind technician, and eight additional wind technicians. Employee compensation would amount to approximately $550,000 per year, plus an additional 40% for benefits. Salaries are expected to increase by about 3% per year, based on inflation. These positions will likely remain steady through the life of the Project. The Project will have no impact on population, overall occupation distribution, or the integration and cohesion of communities.

20.2.2 PROPERTY VALUE IMPACTS

A 2003 Renewable Energy Policy Project (REPP) study (Sterzinger et al 2003) of the effect of wind development on property values found no statistical effects of changes in property values over time due to wind-energy projects. This study examined changes in property values within five miles of 10 wind-energy projects that came on-line between 1998 and 2001, looking at the three-year period before and after each project came on-line and using a simple linear-regression analysis. The study found no major pre-post differences, and it also found no major differences when property-value changes in the 5-mile radius area around the wind-energy projects were compared with selected “comparable communities”.

Property values for lands crossed by or adjacent to the proposed 230-kV transmission line are not anticipated to measurably change. Impacts are the greatest for lands where the transmission lines interfere with agricultural cultivating paths and spraying practices, high-end vacation properties and small homesteads (HDR 2008).

20.2.3 AGRICULTURAL IMPACTS

Minimal existing agricultural land will be taken out of crop and forage production by the proposed Project, primarily areas around WTG foundations, access roads and electric collection and interconnection facilities. Landowners will 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 will not alter agricultural activities. The impacts to agriculture from the 230-kV transmission line structures will be minimized by aligning the transmission line along and near the field edge where practicable.

Approximately 391 acres of cropland will be temporarily impacted by Project construction. It is estimated that approximately 36 acres of agricultural cropland will be permanently impacted, which constitutes less than 0.3 percent of the total cultivated cropland in the Project area. Construction and operation of the Project would result in approximately 12 acres temporary impact and approximately 1.8 acres of permanent impacts to prime farmlands and approximately 976 acres temporary impact and approximately 99 acres of permanent impact to farmland of statewide importance (Tierra 2009). It is noted that much of the identified prime

farmland and farmland of statewide importance has been identified as having other land cover uses such as rangeland within the Project Site.

Acres disturbed due to construction of the Project would be re-vegetated with crops matching the surrounding agriculture landscape. In addition, there is a small acreage of prime farmland that if irrigated, could be impacted by the proposed Project; however, the land is not currently used for agricultural purposes and therefore would not result in a reduction in active agriculture (Tierra 2009). The magnitude of the loss of farmland is de minimus relative to the 364,612 acres of cropland in Aurora County, 328,624 acres in Jerauld County and 518,462 in Brule County (USDA NASS 2007).

20.2.4 TRANSPORTATION IMPACTS

20.2.4.1 Ground Transportation

The Project area contains several gravel roads and a local two-lane asphalt paved roads. During construction, it is anticipated that several types of light, medium and heavy-duty construction vehicles will 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 during construction would cause a relatively short-term increase in traffic on local roadways during the construction period. Most equipment (example: heavy earthmoving equipment and cranes) would remain at the site for the duration of construction activities (Tierra 2009). Shipments of materials, such as gravel, concrete and water would not be expected to substantially affect local primary and secondary road networks. That volume will occur during the peak construction time when the majority of the foundation and tower assembly is taking place (HDR 2008). At the completion of each construction phase, this equipment will be removed from the site or reduced in number.

The Project will not result in any permanent impacts to the area's ground transportation resources. There may be some improvements to gravel roads and temporary impacts to local roads during the construction phase of the Project. The Applicant will work with the SD DOT, Aurora, Jerauld and Brule Counties, and the local Townships to obtain the appropriate access and use permits, and to minimize and mitigate impacts to area transportation.

20.2.4.2 Air Traffic

Prior to construction, the Applicant will consult with the FAA and the South Dakota Aeronautics Commission (SDAC) to identify applicable lighting requirements and to assure the FAA and SDAC that the Project does not cause significant impacts to air traffic. The proposed Project would not impact an FAA-designated air safety zone. The construction, operation and

decommissioning of the proposed Project would result in less than significant impacts to aviation through the implementation of the measures as prescribed by the FAA. The final layout will be submitted to the FAA for approval prior to construction. The Applicant will provide the SDPUC a copy of the No Hazard letter received from the FAA if requested.

20.3 CULTURAL RESOURCE IMPACTS

The Applicant will physically avoid previously recorded resources (Section 20.1.4) during Project construction and operation activities.

In addition, in recognition that Project activities may coincide with as yet unidentified archaeological resources, the Applicant is currently sponsoring an evaluation of archaeological properties that may exist within proposed construction limits in the Project footprint. This archaeological investigation is ongoing and will be documented in a technical report that will meet Federal and State technical standards. The Applicant will make every reasonable effort to physically avoid identified potentially eligible resources.

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

See Section 20.2.1.

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

Figure 3 depicts 110 proposed turbine locations. As noted in Section 8.1, the Applicant requests that the SDPUC approve the Project based on the preliminary layout shown in this application, with the understanding that some of the turbine locations shown ultimately may not be constructed as part of the Project; or, alternately, that additional turbine locations may be required. At this time, up to ten additional turbines may be installed within the Project Site, pending future load, transmission availability and renewable production standard requirements.

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

The Applicant has entered into long term lease and easement agreements for placement of the WTGs and associated Project infrastructure with private landowners within the Project area. The Applicant anticipates that the life of the Project will be no less than 20 years and 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 Applicant will begin decommissioning the Project facilities within 12 months from the time the Project ceases to operate. Decommissioning will be completed within 18 months from the time the Project ceases to operate. The Applicant will be responsible for the costs to decommission the Project and associated facilities.

Decommissioning will involve removal of wind facilities including: towers, turbine generators, transformers, overhead and underground cables, foundations, buildings and ancillary equipment down to a depth of 4 feet below grade. Based on the historical average scrap steel salvage value, it is anticipated that the total decommissioning costs of the Project will be essentially covered by the salvage value of recovered Project components. The access roads will be removed unless the affected landowner provides written notice that the road or portions of the road will be retained. Additionally, disturbed surfaces will be graded, reseeded and restored as nearly as possible to its preconstruction condition within eighteen months of Project decommissioning.

24.0 RELIABILITY AND SAFETY (ARSD 20:10:22:33.02)

24.1 WIND FARM FACILITY

24.1.1 Reliability

Reliability is defined as the ability of the turbine to generate electricity when sufficient wind is available. As of June 2008, over 8,500 GE 1.5 MW turbines were in use worldwide (with more than 5,200 installed in the U.S.). Reliability was greater than 98 percent (HDR 2008).

24.1.2 Safety

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

- The towers will be placed at distances away from existing roadways and residences per the applicable planned setback requirements described in Section 9.4.
- Security measures will 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 will sit on solid steel enclosed tubular towers. Access to each tower is only through a solid steel door that will be locked and accessed only by authorized personnel.
- Tower exteriors are designed to be unclimbable.
- Turbines will conform to applicable industry standards.
- A professional engineer will certify that the foundation and tower design of the turbines is within accepted professional standards, given local soil and climate conditions.

24.2 230-kV TRANSMISSION LINE RELIABILITY AND SAFETY

As part of the studies done for LGIA with Western, the Applicant determined that the proposed 230-kV transmission line system was the most reliable method of delivering the power generated by the proposed Project into the Wessington Springs Substation. Factors considered in this decision included energy losses, reliability and cost.

To ensure safety and reliability, the transmission line will be constructed according to standards of the RUS, the NESC, the Institute of Electrical and Electronics Engineers, the American Society of Civil Engineers, the American Institute of Steel Construction and the American Concrete Institute. In addition, the Applicant has its own standards.

The transmission line will be constructed on self-supporting galvanized steel single-pole structures. The line will be three-phase, meaning it uses three current carrying conductors. The conductors will be 1.3 inches in diameter. Above the conductors will be one ½-inch diameter optical ground wire. This wire provides lightning protection and optical fibers for communications. To ensure reliable and safe operation, the minimum clearances over various features are as follows:

- Cultivated Land or Pasture - 26 feet
- Roads - 28 feet
- Highway - 31 feet
- Railroad - 38 feet
- Line Crossings - 2 to 16 feet, depending on voltage of the line.

These clearances are provided at a maximum conductor temperature of 212°F. The clearance at lower temperatures will be greater.

The transmission line right-of-way will be 125 feet wide. The Applicant must follow requirements of the Federal Energy Regulatory Commission and North American Energy Reliability Council regarding vegetation that could cause a line outage. Applicant must also clear vegetation that exceeds a maximum height of 12 feet within the right-of-way.

The proposed transmission line will be equipped with protective devices to safeguard the public should an accident occur and a structure or conductor fall to the ground. The protective devices will be breakers and relays located where the transmission line connects to the CLCS. The protective equipment will de-energize the transmission line should such an event occur. In addition, the CLCS will be fenced and access limited to authorized personnel. The costs associated with these measures have not been tabulated separately from the overall facility costs since these measures are standard practice for the Applicant.

24.2.1 Stray Voltage

Electric current flows through the earth at each point where the electrical system is grounded. Stray voltage is a natural phenomenon that is the result of low levels of electrical current flowing between two points that are not directly connected. Electrical systems, including farm systems and utility distribution systems, must be adequately grounded to the earth to ensure continuous safety, reliability and to minimize this current flow. If the ground connection is not strong enough, a small voltage can develop between ground points. This voltage is called neutral-to-earth voltage (NEV). Stray voltage is the result of a person or animal coming in contact with NEV. Stray voltage does not cause electrocution and is not related to ground currents, EMF or earth currents.

Stray voltage is a particular concern for dairy farms because it can impact operations and milk production. Problems are usually related to the distribution and service lines directly serving the farm or the wiring on a farm affecting confined farm animals. In those instances when distribution lines have been shown to contribute to stray voltage, the electric distribution system directly serving the farm or the wiring on a farm was directly under and parallel to the transmission line. These circumstances are considered in installing transmission lines and can be readily mitigated. Problems related to distribution lines are also readily managed by correctly connecting and grounding electrical equipment.

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

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

- Configuration Of The Wind Turbines – Sections 8.1, 8.3, 8.4, 8.5 and Figures 4 and 5
- Number Of Wind Turbines – Sections 8.1 and 22.0 and Figure 3
- Warning Lighting Requirements For The Wind Turbines – Section 20.2.4.2
- Setback Distances – Section 9.4 and 16.0
- Noise Levels During Construction and Operation – Section 15.4.3
- Electromagnetic Interference – Section 15.4.5
- Site And Major Alternatives – Section 9.0 and Figures 10,12, and 13
- Reliability And Safety – Section 24.0
- Right-Of-Way Or Condemnation Requirements – Section 8.0
- Clearing Activities – Sections 8.12 and 13.2
- Configuration Of Towers And Poles – Sections 8.2 and 8.11

- Conductor And Structure Configurations – Section 8.2 and 8.11
- Underground Electric Interconnection Facilities – Section 8.11

Please refer to Section 3.0 Completeness Checklist (ARSD 20:10:22:33.02, Information concerning wind energy facilities) for additional requirement details.

26.0 ADDITIONAL INFORMATION IN APPLICATION (ARSD20:10:22:36)

26.1 PERMITS AND APPROVALS

The Project must comply with Federal, State and local laws requiring permits or approvals. Table 24 lists the permits and approvals that are anticipated as part of the Project.

Table 24 List of Potential Permits or Approvals

Agency	Permit/Approval	Description	Status
US Fish and Wildlife Service (USFWS)	Threatened and Endangered Species - Section 7 Consultation	Determination of effect on federally listed species	Consultation is in progress.
	Temporary Right of Way Access	Required for temporary disturbance in grassland easements	To be determined if necessary
Federal Aviation Administration (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	Ongoing
U.S. Army Corps of Engineers (USACE)	Section 404 Permit	Complete an application under the Clean Water Act for impacts to wetland and waters of the U.S.	Unlikely, but to be determined once layout is finalized
US Department of Agriculture (USDA)	Conservation Reserve Program (CRP) Coordination	Coordinate with the USDA regarding project facilities in CRP parcels	To be determined once layout is finalized
	USDA Loan Coordination	Coordinate with the USDA regarding project facilities in parcels under USDA loans	To be determined if necessary
Native American Tribes	Section 106 Consultation	Determination of effect on Native American cultural resources	Ongoing

Agency	Permit/Approval	Description	Status
SD State Historic Preservation Office (SHPO)	Section 106 Consultation	Determination of effect on archaeological and historical resources	Ongoing
SD Public Utilities Commission (PUC)	Energy Facility Site Permit	Application required for facilities with nameplate capacity greater than 100 MW	Submitted November 2009
SD Game, Fish, and Parks Department	Coordination	Coordination as part of EIS process	Ongoing
SD Department of Environment & Natural Resources (DENR)	401 Water Quality Certification	Complete an application under the Clean Water Act, only if Individual Permit required for Section 404	Not anticipated unless individual Section 404 permit is needed from the USACE
	General Storm Water Permit for Construction Activities (NPDES)	Stormwater permit required for construction activities	SWPPP will be prepared and NOI will be submitted after final design is complete
	Temporary water use permit for construction activities	Temporary permits for the use of public water for construction, testing, or drilling purposes; issuance of a temporary permit is not a grant of a water right	If necessary, will be obtained prior to construction
	General Permit for Temporary Dewatering	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 0&M facility	If necessary, will be obtained prior to construction
	Mine License Permit	Required to mine sand, gravel, or rock to be crushed and used in construction	If necessary, will be obtained prior to construction
South Dakota Aeronautics Commission	Aeronautical Hazard Permit	Permit lighting plan determined with FAA coordination	Ongoing
SDCL 49-32-3.1	Notice to Telecommunications Companies	Telecommunication companies review the preliminary electrical layout and may suggest revisions to minimize impact to their systems	Ongoing

Agency	Permit/Approval	Description	Status
SD Department of Transportation (DOT)	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 ROW	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 after final design is complete
Aurora County / Jerauld County/ Brule County	Conditional Use Permit (CUP)	Required by Aurora, Brule, and Jerauld Counties	To be submitted Spring 2010
	Building Permit	Required by Brule and Jerauld Counties	To be submitted Spring 2010
	County Road Driveway Permit	Permit required for any access roads abutting County roads	Will be obtained after final design is complete
	County Highway ROW Occupancy	Permit required for use within County roads' ROW	Will be obtained after final design is complete
	Utility Permit for Feeder Lines Crossing Road Right of Ways	Permit required for any utility crossing of County roads	Will be obtained after final design is complete

26.2 AGENCY CONSULTATION AND PUBLIC SCOPING PROCESS

Applicant has consulted with various Federal, State and local agencies to identify agency concerns regarding the proposed Project (Appendix F) in various manners of communication at different stages of the Project as far back as 2007. In addition, an interagency meeting was held in April 28, 2009 to discuss the current project information as part of the scoping process required for the EIS. The following list summarizes the agencies represented at the interagency meeting:

- Aurora County Weed Supervisor
- Bureau of Indian Affairs (BIA)
- Intertribal Council on Utility Policy (Intertribal COUP)
- Mayor of Wessington Springs, South Dakota
- South Dakota Aeronautics Commission
- South Dakota Department of Environment and Natural Resources
- South Dakota Game, Fish and Parks (GFP)

- South Dakota Governor's Office
- SDPUC
- SHPO
- South Dakota State Land Department
- U.S. Army Corps of Engineers (USACE)
- USFWS
- Wessington Springs Area Development Corporation

Currently, Wessington Springs Area Development Corporation and USFWS Refuge Division are the only agencies that have expressed interest in participating as a cooperating agency. Wessington Springs Area Development Corporation is a non-profit non-governmental organization and will participate as an interested party. As of May 13, 2009, the USFWS has formally accepted the invitation to participate as a cooperating agency. The agencies, regardless of cooperating agency status, will be kept informed of the proposed project and receive updates as they become available.

In addition to the agency consultations, information was included in direct mailings that were sent to potentially interested persons in and near the proposed Project area. The venue for public participation included an open house scoping meeting. The open-house format was chosen to allow for an informal one-on-one exchange of information. In addition to accepting comments at meetings, interested individuals were invited to submit their comments via U.S. Postal Service, fax and/or email.

Notices announcing the public scoping meeting were published in Indian Country Today, Mitchell Daily Republic and Plankinton South Dakota Mail. Indian Country Today is a national, Native-American-interest publication, while the others are local newspapers. Publications in each newspaper provided information on the proposed project, scoping meeting information and contact information for questions pertaining to the proposed project. The second notice publication in Indian Country Today and Mitchell Daily Republic, provided the same information as the initial announcements.

Post card scoping notices were mailed on April 6, 2009. This post card mailing provided information on the proposed project, details for the April 28 and April 29, 2009, scoping meetings, and contact information for questions pertaining to the proposed project and/or the NEPA process. In addition to the post card scoping mailings, a letter was sent to 15 Native American tribes, (tribes, communities and representative councils) on April 13, 2009, providing information on the proposed project, EIS scoping meeting details and contact information for questions pertaining to the proposed project. The letter also served to initiate Government-to-Government consultation; and invited the tribes to participate in the reviews conducted under

NEPA and section 106 of NHPA.

The Applicant will continue working with the public and interested Federal, State and local agencies to address any comments they may have regarding the Project. Additional opportunities for public and agency comments will be held as part of the review process for this Application.

26.3 PUBLIC AND AGENCY COMMENTS

A summary of the agency comments (telephone conversations, email and letter replies), as well as oral and written comments received, are included in Appendix F. The Prairie Winds EIS Scoping Report (dated July 2009), which includes summaries of the input that has been received on the proposed Project through the end of the EIS scoping process is included as Appendix G. Specific comments relative to this permit approval are summarized below and grouped by subject. Representatives of Western, one of the two co-lead agencies, managed and recorded the comments received.

Layout
Landowners have not had specific comments regarding the proposed layout during the EIS scoping process to date. Criteria that may be used to determine final turbine layout are addressed in Sections 11.0, 12.0, 13.0, 14.0 and 20.0.

Biological Resources
The USFWS and GFP provided comments on the Project, particularly on its potential to impact avian, bat and special status species. USEPA Region 8 also provided comments regarding the Project. The agency comments regarding biological resources are summarized on Table 4-1 of Appendix G. Project impacts on biological resources are addressed in Sections 13.0 and 14.0.

Telecommunications
Midstate Communications, Inc. (Midstate) is the local telecommunications provider in the Project area. The Applicant will coordinate with Midstate regarding potential areas within the Project area where the Project facilities may parallel Midstate's infrastructure, with the potential for interference. Project impacts on telecommunications are addressed in Section 15.4.5.

Land Use and Grasslands
The Applicant received letters from USFWS regarding grassland easements. NRCS indicated that it does not have grassland easements within the Project boundary. The agency letters are provided in Appendix F and the comments regarding biological resources are summarized on Table 4-1 of Appendix G. Project impacts on these resources are discussed in Sections 13.2.1.

Lighting
Applicant received comments from the SDAC with recommendations regarding turbine lighting. Applicant will coordinate with the FAA and the SDAC regarding the final lighting plan for the project. Lighting for the Project is discussed in Section 20.2.4.2.

Socioeconomics
Many people expressed support for this project during the scoping process. The Project manager has received requests that additional lands be considered for WTG placement. Project impacts on socioeconomics are discussed in Section 20.2.

Cultural Resources
During the scoping process an individual expressed that the potential cultural impacts of the Project be addressed. Project impacts on cultural resources are discussed in Sections 20.1.4 and 20.3.

26.4 APPLICANT'S BURDEN OF PROOF – 49-41B-22

As described in the Executive Summary, the Applicant has addressed the matters set forth in SDCL Chapter 49-41B and in ARSD chapter 20:10:22 (entitled Energy Facility Siting Rules), related to wind energy facilities.

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

- The proposed wind energy and transmission facilities comply with applicable laws and rules.
- The facilities 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 facilities will not substantially impair the health, safety, or welfare of the inhabitants.
- The facilities 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.

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

27.1 LIST OF PREPARERS

The following individuals contributed to this report:

Group	Individual	Title
PrairieWinds SD1, Inc./BEPC	Kevin L. Solie	Senior Environmental Analyst
	Ron Rebenitsch	Manager of Alternative Technologies (Project Manager)
	Erin Fox Dukart	Environmental Analyst
	R. Russell Mather	Staff Attorney
	Amanda Wangler	Project Engineer
	Aaron Ramsdell	Distributed Generation Engineer
	Jason Brekke	GIS Analyst
Terracon Consultants, Inc.	Jim Van Blaricon	Senior Environmental Project Manager
	Kathleen Cameron	Project Geologist
	Mary E. Wells	Principal
GIS Training Solutions, Inc.	Kelly Sparks	GIS Analyst

27.2 APPLICANT VERIFICATION

Mr. Ron Rebenitsch, P.E., being duly sworn, deposes and states that he is the Project Manager of the Project, and as the authorized representative of the Applicant is authorized to sign this application on behalf of the Project Owner/Applicant, PrairieWinds SD1, Inc.

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____day of December2009

Mr. Ron Rebenitsch

Subscribed and sworn to before me this ___ day of _____, _____

28.0 AGENCY ACRONYMS

ARSD	South Dakota Legislature Administrative Rules
AWEA	American Wind Energy Association
BEPC	Basin Electric Power Cooperative
CFR	United States Code of Federal Regulations (also referenced as Federal Regulation or FR)
DENR	South Dakota Department of Environment and Natural Resources
DENR AQD	South Dakota Department of Environment and Natural Resources, Air Quality Division
DENR SWD	South Dakota Department of Environment and Natural Resources, Surface Water Division
DENR WRD	South Dakota Department of Environment and Natural Resources, Water Rights Department
DOE	United States Department of Energy
DOE EERE	United States Department of Energy, Energy Efficiency and Renewable Energy
DOE NREL	United States Department of Energy, National Renewable Energy Laboratory
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FSA	Farm Service Administration, Conservation Reserve Program
FSA CRP	Farm Service Administration
GFP	South Dakota Department of Game, Fish and Parks
GFP NHD	South Dakota Game, Fish and Parks, Natural Heritage Database
GE	General Electric
HDR	HDR Engineering, Inc.
MISO	Midwest Independent System Operator

NPS NRI	National Park Service, Nationwide Rivers Inventory
NRC	Natural Resources Consulting, Inc.
NRCS	Natural Resource Conservation Service
RUS	Rural Utilities Service
RWS	Rural Water Service
SDCL	South Dakota Legislature Codified Laws
SD DOA	South Dakota Department of Agriculture
SD DOL	South Dakota Department of Labor
SD DOT	South Dakota Department of Transportation
SD EIA	South Dakota Energy Infrastructure Authority
SDGS	South Dakota Geological Survey
SD PUC	South Dakota Public Utilities Commission
Tierra	Tierra Environmental Consultants, LLC
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USDA NASS	United States Department of Agriculture, National Agricultural Statistical Service
USDA NRCS	United States Department of Agriculture, Natural Resource Conservation Service
USDA SCS	United States Department of Agriculture, Soil Conservation Service
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USFWS NWI	United States Fish and Wildlife Service, National Wetland Inventory

USFWS SDFO	United States Fish and Wildlife Service, South Dakota Field Office
USGS	United States Geological Survey
USGS NHD	United States Geological Survey National Hydrography Dataset
Western	Western Area Power Association
WEST	Western EcoSystems Technology Inc.

29.0 REFERENCES

ABB Inc., Electric Systems Consulting. 2005. *Dakotas Wind Transmission Study: Study Summay Task 1 Through Task 4*, October 3, 2005 (revised October 19, 2005). www.wapa.gov/ugp/PlanProject/DakotasWind/Study%20Summary%20Revised%2001-16-07.pdf. Retrieved April 10, 2009.

ARSD. Beneficial Uses of South Dakota Lakes. 74:51:02:39 Jerauld County, uses of Crow Lake*;* 74:51:02:04 *Aurora County,* uses of certain lakes; and 74:51:02:10 Brule County, uses of certain lakes.

ARSD. Beneficial Uses of South Dakota Stream Segments. 74:51:03:05 *Missouri River and certain small tributaries' beneficial uses.* Additional beneficial uses assigned to stream segments listed in *§§* 74:51:03:04 to 74:51:03:27, inclusive.

ARSD. *12:62:03:01.06. State Noxious Weeds.* http://legis.state.sd.us/rules/DisplayRule.aspx?Rule=12:62:03:01.06. Retrieved June 29, 2009.

AWEA. 2009. *South Dakota Wind Energy Development as of June 27, 2009.* http://www.awea.org/projects/projects.aspx?s=South+Dakota Retrieved June 29, 2009.

BEPC. 2009. *DRAFT PrairieWinds SD1 Alternative Evaluation Analysis and Site Selection Study* dated January, 2009.

CapX 2020. 2005. CapX 2020 *Technical Update: Identifying Minnesota's Electric Transmission Infrastructure Needs.* http://www.capx2020.com/Images/5-11-05_CapX2020_Tech_Update.pdf Accessed August 7, 2009

CFR. 1967. "32 FR 4001. March 11, 1967. Native Fish and Wildlife; Endangered Species"

CFR. 2001. "Title 7, Chapter VI F, Part 657 Prime and Unique Farmlands." *Code of Federal Regulations*. http://edocket.access.gpo.gov/cfr_2001/janqtr/7cfr657.5.htm Retrieved June 29, 2009.

CFR. 2004. "Title 40, Chapter V F, Part 1508. Council on Environmental Quality: Terminology and Index." *Code of Federal Regulations.* http://edocket.access.gpo.gov/cfr_2004/julqtr/40cfr1508.1.htm. Retrieved June 29, 2009.

CFR. 2006. "Title 7, Chapter III, Part 360 – Noxious Weed Regulations." *Code of Federal Regulations.* http://www.access.gpo.gov/nara/cfr/waisidx_08/7cfr360_08.html. Retrieved June 29, 2009.

DENR. 2009. Watershed Protection. Nonpoint Source Total Maximum Daily Load Schedule and Summaries. http://denr.sd.gov/dfta/wp/tmdlpage.aspx. Retrieved June 29, 2009.

DENR AQD. 2008. Map of Monitoring Sites. http://denr.sd.gov/des/aq/monitoring/state-mo.aspx Retrieved on June 29, 2009.

DENR SWD. 2002. Storm Water Permit for Construction Activities. http://denr.sd.gov/des/sw/StormWaterandConstruction.aspx. Retrieved on June 29, 2009.

DENR SWD. 2008. *The 2008 South Dakota Integrated Report For Surface Water Quality Assessment,* South Dakota Department of the Environment and Natural Resources, http://denr.sd.gov/des/sw/documents/08IRFinal.pdf Retrieved June 29, 2009.

DENR WRD, 2008. Private well registration and water appropriations information (provided by Mr. Ken Buhler DENR August 18, 2008)

DENR/SDGS. 2004. First Occurrence of Aquifer Materials in Aurora County, South Dakota. Department of Environment and Natural Resources Division of Financial and Technical Assistance and Geological Survey, Aquifer Materials Map 20, Ann R. Jensen, 2004.

DOE EERE. 2008a. *20% Wind Energy By 2030: Increasing Wind Energy's Contribution to US Electric Supply.* July 2008. Retrieved April 10, 2009.

DOE EERE. 2008b. Database of State Incentives for Renewable Energy. *State-Level Renewable Energy Portfolio Standards (RPS)*. http://apps1.eere.energy.gov/states/maps/renewable_portfolio_states.cfm

DOE NREL. 2008. *2008 Year End Wind Power Capacity (MW).* February 24, 2009. Retrieved April 10, 2009.

DOE NREL . *Wind Powering America: South Dakota Wind Resource Map.* http://www.windpoweringamerica.gov/images/windmaps/sd_50m_800.jpg Retrieved June 29, 2009.

FEMA. 2009. Aurora, Jerauld and Brule Counties, South Dakota. http://msc.fema.gov. June 29, 2009.

FSA CRP. 2007a. Locations of Conservation Reserve Program lands in Aurora County, SD. Letter from S. Hargens, FSA, Plankinton, SD, to J. Berg, Basin Electric Power Cooperative, Bismarck, ND. November 21, 2007.

FSA CRP. 2007b. Locations of Conservation Reserve Program lands in Jerauld County, SD. Letter from M. Johnson, FSA, Wessington Springs, SD, to J. Berg, Basin Electric Power Cooperative, Bismarck, ND. November 26, 2007.

FSA CRP. 2007c. Locations of Conservation Reserve Program lands. Provided by J. Jost, FSA, Fargo, ND, to R. Patzman, Tetra Tech, Bismarck, ND, on December 10, 2007.

GE. 2009. GE energy 1.5 MW Wind Turbine Technical Specifications. http://www.gepower.com/prod_serv/products/wind_turbines/en/15mw/specs.htm Retrieved July 13, 2009

GFP. 2004. South Dakota Public Lands Information Website. http://www.sdgfp.info/Wildlife/publiclands/publand.htm. Retrieved June 29, 2009.

GFP. 2005. *Rare, Threatened or Endangered Animals Tracked by the South Dakota Natural Heritage Program*. http://www.sdgfp.info/Wildlife/Diversity/RareAnimal.htm. Retrieved June, 29, 2009.

GFP. 2007a. Environmental review of two potential wind power projects near the cities of Reliance and Crow Lake, SD. Letter from S. Kempema, GFP, Pierre, SD, to J. Berg, Basin Electric Power Cooperative, Bismarck, ND. December 14, 2007.

GFP. 2007b. South Dakota Statewide Fisheries Survey 2102-F-21-R-40 May 30, 2007. http://www.sdgfp.info/Wildlife/fishing/SELakes/Wilmarth07.pdf

GFP. 2008. South Dakota Hunting Lands Website. http://www.sdgfp.info/Publications/Atlas/Index.htm. Retrieved June 29, 2009.

GFP NHD. 2007. *Element Occurrence Record for Crow Lake Project Area,* South Dakota Natural Heritage Database, dated December 5, 2007.

Gonzalez, Richard; Standing, Jason 2005. *Xcel Energy Transmission Reliability & Assessment. Buffalo Ridge Incremental Generation Outlet Electric Transmission Study*. http://www.bigstoneii.com/TransmissionProject/BSTpdf/appendixE.PDF

Grivna, Walt. 2005. Midwestern Independent System Operator Northwest Exploratory Study.

Presentation to Midwestern Transmission Workshop, June 22, 2005. http://www.nationalwind.org/events/transmission/midwest/2005/ presentations/grivna-nw.pdf. Accessed August 7, 2009.

Hammond, R. H. 1993. *Recorded Earthquakes in South Dakota, 1872-1992*. South Dakota Geological Survey.

HDR. 2008. Buffalo Ridge II LLC Application to the South Dakota Public Utilities Commission For a Facility Permit. Buffalo Ridge II Wind Farm and Associated Collection Substation and Electric Interconnection System. HDR. Minneapolis, Minnesota. October 2008.

Kuyt, E. 1992. *Aerial radio-tracking of Whooping Cranes migrating between Wood Buffalo National Park and Aransas National Wildlife Refuge*, 1981-1984. Occas. Pap. 74. Canadian Wildlife Service, Ottawa. 53 pp.

Leddy, K.L., K.F. Higgins, and D.E. Naugle. 1999. *Effects of Wind Turbines on Upland Nesting Birds in Conservation Reserve Program Grasslands*. Wilson Bulletin 111(1): 100-104.

Lewis, J. C. 1995. Whooping crane (GRUS AMERICANA). In A. Poole and F. Gill (editors). The Birds of North America, No. 153. The Academy of Natural Sciences, Philadelphia, Pennsylvania, and The American Ornithologists' Union, Washington, D.C. 28 pp.

MISO. 2007. *MISO Transmission Expansion Plan 2006*. http://www.midwestiso.org/publish/Document/4ad10b_1114b6b848b_-7fef0a48324a/Growing%20the%20Grid%20-%20MTEP%2006%20Summary.pdf?action=download&_property=Attachment Retrieved June 29, 2009.

NPS NRI. 1982. Rivers, Trails and Conservation Program – South Dakota Segments. http://www.nps.gov/ncrc/programs/rtca/nri/states/sd.html. Retrieved on June 29, 2009.

NRC. 2009. *Prairie Winds Vegetation Mapping.* Letter report addressed to Mr. Pat Golden at Heritage Environmental Consultants of Denver, CO from Scott Yanco of Natural Resources Consulting, Inc. of Denver, CO dated April 17, 2009.

Rau, J.G., and D.C. Wooten. 1980. Environmental Impact Analysis Handbook. McGraw Hill, Inc. New York, New York. 656 pp.

SDCL. 49-34A-101. *State renewable, recycled, and conserved energy objective established.*

SD DOA 2008. *State and Local Noxious Weeds and Pests*. http://www.state.sd.us/doa/das/hp-w&p.htm. Retrieved June 29, 2009.

SD DOL. 2009. Labor Market Information Center. http://www.state.sd.us/applications/ld54lmicinfo/labor/LFCOUNTYMAPM.asp?Saytitle=Labor%20Force%20Statistics%20%20County%20Map. Retrieved July 30, 2009.

SD DOL 2008. Labor Market Information Center. Labor Force Statistics Website, http://www.state.sd.us/applications/ld54lmicinfo/labor/LFLISTPUBM.ASP June 29, 2009.

SD DOT. 1997-2007. SDDOT / Project Development / Environmental / Endangered Species / Topeka Shiner. http://www.sddot.com/pe/projdev/environment_endsp_ts.asp. Retrieved June 29, 2009.

SD DOT. 2008. South Dakota Traffic Flow Map. http://www.sddot.com/pe/data/Docs/trafficmaps/Traffic_2008.pdf. Retrieved June 29, 2009.

SDGS. 2001 *Bulletin B-32: Geology of Aurora and Jerauld Counties*, *South Dakota,* Lynn S. Hedges, 2001.

SDGS. 2004. Geologic Map of South Dakota, 2004. Department of Environment and Natural Resources Division of Financial and Technical Assistance and Geological Survey, 2004.

SDGS. 2008. *Earthquakes in SD 1872-2007*, Digital Map Series http://www.sdgs.usd.edu/digitalpubmaps/quakemap.html, Retrieved 2008.

SD EIA. 2007. *South Dakota Wind Power Report.* December 2007.

SD PUC. 2009. *Wind Energy Handout.* February 2009.

Shearer, J.S. 2003. *Topeka shiner (Notropis topeka) management plan for the State of South Dakota*. South Dakota Department of Game, Fish and Parks, Pierre, Wildlife Division Report No. 2003-10, 82 pp.

Sterzinger, George; Beck, Fredric; Kostiuk, Damian. 2003. *The Effect of Wind Development on Local Property Values*. Renewable Energy Policy Project. http://www.repp.org/articles/static/1/binaries/wind_online_final.pdf Retrieved June 29, 2009.

Terracon. 2009. *Prairiewinds SD1, Inc. Project - Compilation of Resource Technical Memorandums - Crow Lake Project Site*, Terracon Consultants, Inc., January 30, 2009.

Tetra Tech 2008. *Opportunities and Constraints Analysis of Two Potential Sites for the Proposed Wind-Powered Electricity Generation Project South Dakota*, Tetra Tech, Inc.- Boulder, Colorado, February 2008.

Tierra. 2009. *Preliminary Draft EIS (work in progress) South Dakota PrairieWinds Project EIS,* Tierra Environmental Consultants, LLC, September 2009.

Tigner, J., and E. Dowd Stukel. 2003. *Bats of the Black Hills: a description of status and conservation needs.* South Dakota Department of Game, Fish and Parks, Wildlife Division Report 2003-05, Pierre, South Dakota, USA. 94pp.

Tomhave, Dennis W. and Schultz, Layne D. 2004. Bedrock Geologic Map Showing Configuration of the Bedrock Surface in South Dakota East of the Missouri River. South Dakota Geological Survey General Map 9.

USACE. 2004. *Missouri River Final Environmental Impact Statement*, Master Water Control Manual, Review and Update (Study), United States Army Core Of Engineers, 2004.

United States Census Bureau. 2007. *Aurora, Jerauld, and Brule Counties* http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/County_Profiles/South_Dakota/index.asp Retrieved May 19, 2009.

United States Census Bureau. 2000. *State and County Quick Facts, Patten, Logan, Anina, Crow Lake, Willow Lake, Pleasant Valley, and Plummer Townships, South Dakota*. http://quickfacts.census.gov/qfd/index.html Retrieved June 29, 2009.

USDA NASS. 2007. *Census of Agriculture, State and County Reports*. http://www.nass.usda.gov/census/. Retrieved May 19, 2009.

USDA NRCS. 2003. SSURGO Soils Data, Aurora, Brule, and Jerauld Counties.

USDA NRCS. 2007. Locations of Wetlands Reserve Program (WRP). Letter from J. Schaar, NRCS, Huron, SD, to J. Berg, Basin Electric Power Cooperative, Bismarck, ND. December 6, 2007.

USDA NRCS. 2009. Web Soil Survey. http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx. Retrieved January 2009.

USDA SCS. 1994. *Soil Survey of Jerauld County, South Dakota.*

USDA SCS. 1985. *Soil Survey of Brule and Buffalo Counties, South Dakota.*

USEPA. 2009. Green Book: Nonattainment Area Map. "Counties Designated Nonattainment" http://www.epa.gov/oar/oaqps/greenbk/mapnpoll.html. Retrieved June 29, 2009.

USEPA. 2008. South Dakota 303(d) Listed Waters for Reporting Year 2008. http://iaspub.epa.gov/waters10/attains_impaired_waters.impaired_waters_list?p_state=SD&p_c

ycle=2008. Retrieved June 29, 2009.

USGS. 1996. Groundwater Atlas of the US – Segment 8 Montana, North Dakota, South Dakota & Wyoming, Hydrogeologic Investigations Atlas 730-I, United States Geological Survey, Reston, VA, 1996.

USGS. 2008a. Documentation for the 2008 Update of the United States National Seismic Hazard Maps Open-File Report 2008–1128, USGS and U.S. Department of the Interior, 2008.

USGS. 2008b. National Water Information System: Web Interface Groundwater levels for South Dakota. http://nwis.waterdata.usgs.gov/sd/nwis/gwlevels

USGS NHD. 2008. http://nhd.usgs.gov/data.html. Retrieved August 2008.

USFWS 1993. Dryer, Mark P., et. al. Recovery Plan for the Pallid Sturgeon. Pallid Sturgeon Recover Team. November 7, 1993.

USFWS 2007. *Locations of USFWS Grassland and Wetland Easements.* Letter from M. Heisinger, USFWS, Lake Andes, SD, to J. Berg, Basin Electric Power Cooperative, Bismarck, ND. November 27, 2007.

USFWS 2009. *Notice of intent to Prepare and Environmental Impact Statement for PrairieWinds SD1 Windfarm, South Dakota.* Letter from Pete Gober SD Field Office USFWS to Ms. Liana Reilly of Western and Mr. Dennis Rankin of RUS. May 13, 2009.

USFWS NWI. 2008. Wetland Mapper. http://www.fws.gov/wetlands/data/index.html. Accessed August 11, 2008.

USFWS SDFO. 2008a. Endangered Species By County, September 2008. http://www.fws.gov/southdakotafieldoffice/endsppbycounty.htm Accessed June 29, 2009.

USFWS SDFO. 2008b. Pallid Sturgeon. http://www.fws.gov/southdakotafieldoffice/STURGEON.HTM. Retrieved June 29, 2009.

USFWS SDFO. 2008c. Piping Plover. http://www.fws.gov/southdakotafieldoffice/PLOVER.HTM. Retrieved June 29, 2009.

USFWS SDFO. 2008d. Topeka Shiner. http://www.fws.gov/southdakotafieldoffice/TOPEKA.HTM. Retrieved June 29, 2009.

USFWS SDFO. 2008e. *Whooping Crane. http://www.fws.gov/southdakotafieldoffice/CRANE.HTM.* Retrieved June 29, 2009.

WEST. 2009. *Wildlife Studies for the PrairieWinds SD1 Crow Lake Wind Resource Area, Aurora, Brule, and Jerauld Counties, South Dakota March 19, 2009 – July 7, 2009.*

Western. 2007. *System Impact Study, Wessington Springs Project, Generation Interconnection GI-0602, 100 MW Generation Addition near Wessington Springs, South Dakota.* July 2007.

Western. 2008. *Wessington Springs, S.D., Welcomes New Wind Farm* http://www.wapa.gov/es/pubs/esb/2008/dec/dec082.htm

Xcel Energy. 2007. News Release: *Conservation, renewable energy, carbon cuts featured in Xcel Energy's Minnesota Resource Plan* http://www.capx2020.com/Newsroom/Xcel_Energy_Resource_Plan_news_release.pdf Retrieved August 7, 2009.