# Site Permit Application for a Large Wind Energy Conversion System (LWECS)

## Big Blue Wind Farm
## Faribault County, Minnesota

## Big Blue Wind Farm, LLC

MPUC Docket Number IP-6851/WS-10-1238

Revised January 24, 2011

By
Collin Rudeen

January 24, 2011

Dr. Burl A. Haar
Executive Secretary
Minnesota Public Utilities Commission
121 7th Place E., Suite 350
Saint Paul, MN 55101-2147

RE: Revised Site Permit Application

Dear Dr. Haar,

I am pleased submit this revised Site Permit Application for the Big Blue Wind Farm. Changes to this edition include a revised turbine layout (including updated maps), a correction on the corporate structure, clarification on the role of the company and other minor corrections.

The reason for these corrections was for clarification and correction of a few minor errors. Additionally, the turbine layout presented in this revised Application is a more accurate layout, given the most current information on landowner participation.

Sincerely,

Collin Rudeen
Lead Project Engineer
Exergy Development Group of Idaho
802 W. Bannock, Suite 1200
Boise, Idaho 83702

January 20, 2011

Mr. Larry B. Hartman
Energy Facility Permitting
Minnesota Department of Commerce
85 7th Place East, Suite 500
St. Paul, MN 55101-2198

Mr. Burl A. Haar
Executive Secretary
Minnesota Public Utilities Commission
121 7th Place E., Suite 350
Saint Paul, MN 55101-2147

RE: PUC Docket No. IP-6851/WS-10-1238

Dear Mr. Hartman and Mr. Haar:

I am pleased to transmit the LWECS Site Permit Application for Big Blue Wind Farm, LLC, in accordance with Minnesota Rule 7854.0500. Please do not hesitate to contact me with any questions regarding the application.

Sincerely,

Collin Rudeen
Lead Project Engineer
Exergy Development Group of Idaho
802 W. Bannock, Suite 1200
Boise, Idaho 83702

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# 1 Applicant Information

The Applicant is applying for a LWECS site permit to allow construction and operation of the 36 MW Project. A site permit for the Project is mandated by Minnesota Statutes Sections 216F.01 through 216F.07, and this application has been prepared to meet the requirements of Minnesota Rules Chapter 7854.

The Applicant is currently owned by Minnesota Wind Partners I, LLC, which is currently wholly owned by Exergy Minnesota Holdings, LLC. However, Minnesota Wind Partners I will have multiple owners in the future, due to its C-BED status. There will also be a development agreement between Exergy Development Group of Idaho, LLC and Big Blue Wind Farm, LLC. Exergy Development Group of Idaho, LLC is the parent company. An ownership diagram is shown below in Figure 1-1.

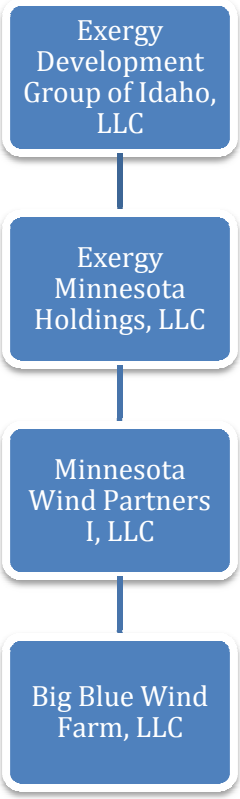



**Figure 1-1 – Organizational Chart**

## *1.1 Letter of Transmittal*

Please see cover.

## 1.2 Contact Information

**Applicant:**
Big Blue Wind Farm, LLC
802 W Bannock, ste 1200
Boise, ID 83702
208-336-9793
Authorized Representative: Collin Rudeen

**Permittee:**
Big Blue Wind Farm, LLC
802 W Bannock, ste 1200
Boise, ID 83702
208-336-9793
Authorized Representative: Collin Rudeen

## 1.3 Signature

This application has been prepared internally by Exergy Development Group of Idaho, LLC, with consultation from Bolton & Menk in Minnesota.

## 1.4 Role of the Applicant

The Applicant will, develop, construct and operate the Project. The Applicant will obtain all necessary permits. Minnesota Wind Partners I, LLC owns Big Blue Wind Farm, LLC.

## 1.5 Operator of the LWECS

The Project will be operated by the Applicant.

## 1.6 Name of the Person to be the Permittee

Big Blue Wind Farm, LLC will be the named permittee for the site permit.

# 2 Certificate of Need

A Certificate of Need (CON) for the Project is not required from the Minnesota Public Utilities Commission because the Project's nameplate capacity is less than 50 MW (Minnesota Statute 216b.2421).

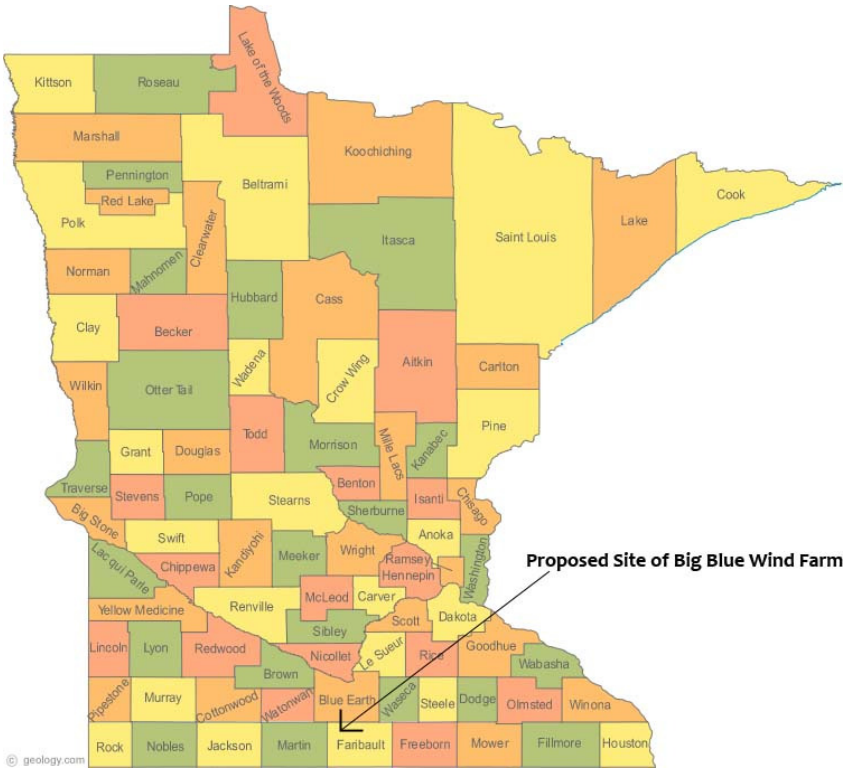
Power generated by the Project will be sold by way of a long-term power purchase agreement. The Project currently has an executed agreement. This document will be provided upon request of the commission.

# 3 State Policy

The Applicant will further the state policy (Minnesota Statute §216F.03) by siting the Project in an orderly manner compatible with environmental preservation, sustainable development, and the efficient use of resources, as demonstrated by the information provided in this Application.

# 4 Project Description and Overview

Big Blue Wind Farm, LLC (the Applicant) submits this application for a Site Permit to construct a large wind energy conversion system (LWECS), the Big Blue Wind Farm (the Project), as defined in the Wind Siting Act, Minnesota Statute §216F.01. The Project site is located in Faribault County approximately 6 miles west of the town of Blue Earth, Minnesota. The Big Blue Wind Farm will be built a total installed capacity of 36 MW, to be constructed in 2010.




Consistent with the Minnesota's LWECS siting objectives (Minnesota Statute §216F.03), the Applicant is committed to optimizing the wind resource for the Project. All decisions with respect to equipment selection, site layout, and spacing have been designed to make the most efficient use of land and wind resources. The factors on which these decisions are based include unique environmental features, topographic features, available technology, and the nature of the prevailing wind resources.

The Big Blue Project site is located approximately six miles west of Blue Earth, Minnesota, and just south of Guckeen. The area has been chosen because of the flat open terrain with low population, high elevation (over 1,100 feet above sea level in places) and the open, treeless nature of the landscape. The turbines will be placed throughout an area of about 15,000 acres in the Township of Jo Daviess.

The Project site was selected based on its excellent wind resources, close proximity to existing transmission infrastructure, the ability to build in multiple

phases, the ability to secure the required land, current land use, and other considerations necessary to allow wind power to be generated from the site. The site boundary encompasses an area of approximately 15,000 acres. However, the land occupied by the wind farm would be less than 1% of this area. It is anticipated that the area of direct land use for the turbines and associated facilities would be approximately 20 acres and this would include approximately 8 miles of 30 foot wide gravel access roads.

## *4.1 Project Location*

The Project site is located in western Faribault County, Minnesota, approximately six miles west of the City of Blue Earth, as shown in and detailed in Map 1. The Project is approximately 120 miles southwest of the Twin Cities metro area and will be visible from Interstate 90 and is accessible from the Guckeen Exit # 113. The Project utilizes land within Jo Daviess Township T-102-N, R-28-W and T-101-N, R-28-W.

## *4.2 Size of the Project Area*

The site boundary encompasses an area of approximately 15,000 acres. However, the land occupied by the wind farm would be less than 1% of this area. It is anticipated that the area of direct land use for the turbines and associated facilities would be approximately 20 acres and this would include approximately 8 miles of 30 foot wide gravel access roads.

## *4.3 Nameplate Size*

There are two turbines being considered for The Project: the REpower MM92 2050 kW wind turbine and the GE xle 1500-1600 kW wind turbine. There will be either 18 REpower turbines or 24 GE turbines. Project output will be limited to 36 MW to satisfy our interconnection agreement.

## *4.4 Turbine Sites*

Depending on the turbine selection, either 18 or 24 wind turbines will be used. A map of turbine placement can be seen in Maps 2A and 2B.

## *4.5 Meteorological Towers*

There are currently three temporary meteorological towers on the project site that have been collecting data for as long as six years. There will be up to three permanent meteorological towers to be constructed in parallel with the project.

They will be placed no closer than 250 ft. from the edge of road rights-of-way and property boundaries that are not a part of the project. Final locations for the permanent met towers have not yet been chosen.

## *4.6 Wind Rights Secured*

The Project has secured approximately 75% of the wind rights within the Project Boundary, as well as additional rights outside of the Project Boundary. The Project may acquire more wind rights, but none are necessary. The long-term leases cover wind turbine and substation locations, access roads, transmission line alignment, ancillary facilities, and wind rights.

## *4.7 Other Facilities*

Neither Exergy Development Group of Idaho, LLC, nor do its successors have any ownership or financial interest in any LWECS located in Minnesota.

# 5 Project Design

The Project will consist of wind turbines, transformers, meteorological towers, access roads, underground and overhead electrical lines, a substation and switchyard. Please see Maps 2A and 2B for a detailed layout.

## *5.1 Layout and Setback Description*

The proposed layout generally employs setbacks of 5 rotor diameters (RD) from wind turbines in the northwest and southeast directions, and 3 RD in the northeast and southwest directions. Exceptions are discussed below.

For the purposes of preparing this layout, setbacks were determined using the Minnesota PUC's General Wind Turbine Permit Setbacks and Standards for Large Wind Energy Conversion System (LWECS) Pursuant to Minnesota Statute 216F.08[1]. One such setback is the minimum 250 foot turbine setback from the edge of public road rights-of-way. Another siting requirement is that no turbines, towers or associated facilities shall be located in public waters wetlands. However, electric collector and feeder lines may cross or be placed in public waters or public water wetlands subject to DNR, FWS and/or USACOE permits.

In most cases, turbines have been setback a minimum of 1,500 feet from homes. If a participating landowner were to consent, the applicant would consider moving turbines closer to such landowner's home if it were possible to compact the layout by doing so, but in any case not closer than 1,000 feet.

This layout is preliminary and should not be considered final. Turbine locations are highly likely to change before this permit is issued.

## *5.2 Turbine Description*

There are two turbines being considered for The Project: the REpower MM92 2050 kW wind turbine and the GE xle 1500 - 1600 kW wind turbine. There will be either 18 REpower turbines or 24 GE turbines. Project output will be limited to 36 MW to satisfy our interconnection agreement. XRG is in advanced negotiations with both REpower and GE for a final turbine supply agreement. Turbine characteristics are summarized in Table 5-1. Detailed turbine specifications are included in Appendix 1a and 1b.

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[1] Minnesota Public Utilities Commission. (2008, January 11) *Order Establishing General Wind Permit Standards.* Retrieved September 10, 2010, from http://energyfacilities.puc.state.mn.us/documents/19302/PUC%20Order%20Standards%20and%20Setbacks.pdf

**Table 5-1 – Turbine Characteristics**

| | GE xle | REpower MM92 |
|---|---|---|
| Nameplate Capacity | 1.5 to 1.6 MW | 2.05 MW |
| Hub Height | 80 m (262 ft) | 80 m (262 ft) |
| Rotor Diameter | 82 m (269 ft) | 92.5 m (303.5 ft) |
| Total Height | 121 m (397 ft) | 126 m (414 ft) |
| Swept Area | 5,281 $m^2$ (56,832 $ft^2$) | 6,720 $m^2$ (72,333 $ft^2$) |
| Cut-in Wind Speed | 3.5 m/s (7.8 mph) | 3.0 m/s (6.7 mph) |
| Cut-out Wind Speed | 20 m/s (44.7 mph) | 24 m/s (53.7 mph) |
| Rated Wind Speed | 12.5 m/s (28.0 mph) | 11.2 m/s (25.0 mph) |
| Rotor Speed | 10.1 – 18.7 rpm | 7.8 to 15.0 rpm |

### 5.2.1 Rotor

The rotor consists of three blades mounted to a rotor hub. The hub is attached to the nacelle, which houses the gearbox, generator, brake, cooling system, and other electrical and mechanical systems. The rotor diameter on REpower turbines is 92.5 m, corresponding to a swept area of 6,720 $m^2$ (72,333 $ft^2$). The rotor diameter on GE turbines is 82 m, corresponding to a swept area of 5,281 $m^2$ (56,832 $ft^2$). The rotor speed will be between 7.8 –15.0 rpm.

### 5.2.2 Tower

The tower is a tapered tubular steel tower with a hub height of 80 m. The tower consists of three to four sections manufactured from certified steel plates. All welds are made in automatically controlled power welding machines and are ultrasonically inspected during manufacturing per American National Standards Institute (ANSI) specifications. All 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. A service platform at the top of each section allows for access to the tower's connecting bolts for routine inspection. An internal ladder runs to the top platform of the tower just below the nacelle. A nacelle ladder extends from the machine bed to the tower top platform allowing nacelle access independent of its orientation. The tower is equipped with interior lighting and a safety guide cable alongside the ladder.

### 5.2.3 Foundations

The foundations used will be the Patrick & Henderson (P&H) Pile type – Post stressed. A formal geotechnical investigation, including soil borings at each foundation site will be performed to analyze soil conditions and test for voids

and homogeneous ground conditions. Excavation for the foundation will be approximately 280 yards and 30 to 35 feet deep. When completed, a foundation would contain approximately 120 cubic yards of structural concrete. The P&H design would consist of a 30-35 foot corrugated metal cylinder (16-18 foot in diameter) placed vertically in the ground. A bolt cage consisting of two concentric rows of anchor bolts extending the entire length of the cylinder would be installed in a pattern matching the tower base flange bolting pattern. Once the bolt cage is placed, concrete would be installed to complete the foundation. When completed, each pier foundation would be filled with approximately 120 yards of fill.

The chosen foundation design will be certified by an experienced and qualified registered structural engineer who has designed several generations of wind turbine towers and foundation systems that have proven themselves well in some of the most aggressive wind regions of the world.

### 5.2.4 Turbine Safety Systems

All turbines are designed with several levels of built-in safety, and comply with the codes set forth by international standards as well as those of the Occupational Safety and Health Administration (OSHA) and of the ANSI. Specifically, turbines feature the following safety systems:

- Individually adjustable blades (electrically controlled) – fail-safe system
- Extensive redundant temperature and speed sensing system
- Fully integrated lightning protection
- Shielded cables and power rails protecting people and machinery
- Rotor holding brake with soft-brake function

Please see Appendix 1a and 1b for additional turbine specifications

**Climbing Safety**

Normal access to the nacelle is accomplished with a ladder inside the tower, which is kept locked. Standard tower safety hardware includes equipment for safe ladder climbing such as lanyards and safety belts for service personnel. All internal ladders and maintenance areas inside the tower and nacelle are equipped with safety provisions for securing lifelines and safety belts, and conform to or exceed current national and state regulations regarding safety requirements for ladders.

**Lightning Protection System**

The turbines are equipped with a lightning protection system that connects the blades, nacelle, and tower to the grounding system at the base of the tower. The

grounding system consists of a copper ring conductor connected to grounding rods driven down into the ground at diametrically opposed points outside of the foundation.

As the rotor blades are nonmetallic, they normally do not act well as a discharge path for lightning; however, as the highest point of the turbine, the blades sometimes provide the path of least resistance for a lightning strike. In order to protect the blades, they are constructed with an internal copper conductor extending from the blade tip down to the rotor hub, which is connected to the main shaft and establishes a path through the nacelle down to the tower base grounding system embedded underground. An additional lightning rod extends above the wind vane and anemometer at the rear of the nacelle. Both the rear lightning rod and blades have conductive paths to the nacelle bed frame that in turn connects to the tower. The tower base is connected to the grounding system at diametrically opposed points.

## *5.3 Electrical System Description*

Each turbine will have a step-up transformer to raise the voltage to distribution line voltage of 34.5 kV. Power will be run through an underground collection system to the Project substation. In locations where two or more sets of underground lines converge, pad-mounted junction panels will be utilized to tie the lines together into one or more sets of larger feeder conductors. At the Project substation, the electrical power from the entire wind plant is converted to 161 kV and is delivered to the interconnection substation via underground transmission line.

### 5.3.1 Transformers

Power from the turbines is fed through a breaker panel at the turbine base inside the tower and is interconnected to a pad-mounted step-up transformer, shown in Figure 5-1, which steps the voltage up from 690 Volts to 34.5 kilovolts (kV). The transformer impedance will be optimized based on the facility power output requirements and feeder circuit-breaker interrupting

rmer

ratings and internal fuses. Protection to the transformer and wind turbine is provided by a switch breaker at the turbine bus cabinet electrical panel, inside the tower. The pad transformers are interconnected on the high voltage side to underground cables to form an electrical collection system described in the following section.

### 5.3.2 Electrical Collection System

The Project will utilize approximately 15 miles of 34.5 kV electrical power lines to collect power from the turbines and transmit it to the Project substation. Approximately 15 miles will be overhead and 8miles will be underground. The underground cables are installed in a trench that is approximately 3-4 feet deep as shown in Figure 5-2. These run beside the project's roadways. A clean fill material such as sand or fine gravel will cover the cable before the native soil and rock are backfilled over the top. In locations where two or more sets of underground lines converge, underground vaults and/or pad-mounted switch panels will be utilized to tie the lines together into one or more sets of larger feeder conductors. The underground collection cables feed larger underground and overhead feeder lines that run to the Project substation.

**ector Lines**

The overhead lines utilize County and Township road rights of way and are parallel to existing roads.

### 5.3.3 Substation & Switching Station

The Project substation will step-up the voltage from 34.5 kV to 161 kV so the electricity can be reliably interconnected to the surrounding power grid. The basic elements of the substation are a control house, transformer, outdoor breaker, relaying equipment, high-voltage bus work, steel support structures, and overhead lightning suppression conductors. The substation equipment will be installed on concrete foundations and will consist of a graveled footprint area of approximately two to four acres, a chain link perimeter fence, and an outdoor lighting system. Figure 5-3 shows a typical substation.

The Applicant will be responsible for construction of the substation and ITC Midwest responsible for the switching station.

station

### 5.3.4 Interconnection

The interconnection study for the Project has been completed with MISO in coordination with ITC Midwest Energy. The facilities study confirmed that no major upgrades are required to interconnect the Project to the grid. All utility protection and metering equipment will meet ITC Midwest's standards for parallel operations. The construction manager will work closely with ITC Midwest's engineers to ensure that proper interconnection protection is established. Detailed interconnection information will be supplied to the MPUC as it becomes available.

# 6 Description and Location of Associated Facilities

Facilities associated with the project will include a project substation, collector lines, permanent meteorological towers, access roads and a SCADA building.

## *6.1 Transmission and Project Substations*

No transmission lines will be necessary for the Project, as the new substation will be located on the existing 161 kV Winnebago – WinnCo transmission line. The Project substation location can be seen in Map 2A and 2B. The point of interconnect will be at the 161 kV bus of the Faribault switching station.

The Applicant has an executed interconnection agreement with the Midwest Independent Transmission System Operator (MISO) and ITC Midwest, LLC to connect the Project's 36 MW to the grid. The Project is ready for interconnection.

## *6.2 Collector Lines*

The Project will have approximately 23 miles of overhead and underground collector lines. Lines will be underground between turbines and through landowner parcels. Lines will be overhead along road rights-of-way to the substation. A more detailed description of collector lines can be found in section 5.3.2.

## *6.3 Associated Facilities*

**Access Roads**

Graveled access roads branching from existing graveled section line roads that cross the Project Area will provide access to the various rows of turbines. In some areas new roads will be designed to allow for the transportation of heavy equipment to the Project Area, and will be used throughout the life of the wind farm to allow access to and from the wind turbines, substation, and meteorological towers. The turbine access roads typically may be constructed two different ways. On arid sites where there is substantial subgrade bearing capacity and little danger of precipitation challenging the soil properties, a narrow (approximately 16 foot wide) road would be constructed, with an additional 18-ft to 20-ft width graded and compacted to support the other crawler crane track. However, due to the expected soil conditions and the potential for precipitation at this site, it is anticipated that the graveled access roads must cover the full width of the crane track. The crane track is approximately 33 feet wide requiring road widths of 36 to 40 feet. In either case, the vegetative subgrade will be removed for the depth of the rock to be replaced, approximately 8 to 12 inches deep. Typically, a geotextile fabric will be installed and then the gravel will be placed, graded, and compacted (Figure 6-1). The final road surface will be flush with the original grade, allowing unhindered passage of farm machinery. After construction, all roads will be reduced to 16 feet wide. They will only be widened again in the case that bringing back the tracked crane is necessary.

### Meteorological Towers

Two permanent meteorological towers will be installed at the Project site to monitor the wind during the operation of the wind farm. These towers will be 80 meters (262 ft) tall. Each met tower will have a grounding system similar to that of the wind turbines with a buried copper ring and grounding rods or rods installed at the top of the towers to provide an umbrella of protection for the upper sensors. The met towers will be connected to the wind farm's central Supervisory Control and Data Acquisition (SCADA) system (described below). In

addition, some of the previously permitted temporary meteorological test towers described in Section 4.3 may be kept in place for some period of time during and after construction.

**SCADA System**

An 8' x 40' building will house the Supervisory Control and Data Acquisition (SCADA) system. Each turbine is connected to the central SCADA system through a network of underground fiber optic cable. The SCADA system allows for remote control monitoring of individual turbines and the wind plant as a whole from both the central host computer and from a remote computer. In the event of faults, the SCADA system can also send signals to a fax, pager, or mobile phone to alert operations staff.

**Operations and Maintenance Center**

The Project is currently evaluating options for the O&M facility. There is a possibility that the facility will be located within the Project Boundary. If so, it will be considered part of this LWECS permit, as described below. If it is located outside the Project Boundary, it will be permitted separately through Faribault County.

An O&M facility will be constructed to serve as a center for the Project's O&M efforts, house the Supervisory Control and Data Acquisition (SCADA) system, and will potentially also serve as a visitor center/viewing area. The O&M facility is the base of operations for the wind generating facility maintenance and operation. It provides office space for the crews, as well as a shop/storage area for spare parts and vehicles. It will also house the central monitoring equipment for the generating facility where the turbines are monitored and controlled. The building may either be built on the Project site or an existing facility may be purchased and modified to function as the O&M facility.

**Substation & Switching Station**

The project will have a substation and switching station. They will be adjacent and separated by a common fence. The stations will be located on the 161 kV transmission line. The Applicant will be responsible for construction of the substation and ITC Midwest will be responsible for the construction of the switching station.

## *6.4 Associated Facility Permits*

County permits are required for access roads. A county permit may be required for the O&M facility, depending on the location chosen. These permits will be acquired through Faribault County and not this LWECS Site Permit.

# 7 Wind Rights

The Project has secured wind rights through long term lease agreements. The term of the lease is twenty years with two optional ten year extensions. There are approximately 10,000 acres under lease within the 15,000 acre project boundary. Certain leases within the project are also being renegotiated for financing purposes. Additional wind rights are not necessary to construct the project. However, the Project will secure additional wind rights in the future.

# 8 Environmental Impacts

This section provides a description of the environmental conditions that exist within the Project Area. Consistent with MPUC procedures on siting LWECS and applicable portions of the Power Plant Siting Act, various exclusion and avoidance criteria were considered in the selection of the Project Area shown on Maps 2 through 4, which totals approximately 15,000 acres. To support this siting process, maps of the Project Area were generated from existing data to show the following features:

- Parks and wildlife management areas available from Minnesota GIS sources;
- Monuments, historic sites, and trails shown on USGS 7.5 Minute Quadrangle Maps;
- Soil and geology;
- Roads and railways;
- Topography;
- Surface water hydrology including wetlands; and
- Land use and land cover.

Initial investigations also included agency queries consisting of a request for information relevant to assessment of impacts of Project development. These query letters were sent to the U.S. Army Corps of Engineers (USACE); U.S. Fish and Wildlife Service (USFWS); Minnesota Department of Natural Resources (MNDNR); Minnesota Natural Heritage Program (MNNHP); Faribault County Coordinator; Jo Daviess Township; and Faribault County Planning and Zoning. Query letters and responses are presented in Appendix 2. In addition to these written queries, phone calls were made to staff in these agencies and others. This information was used to prepare the following environmental analysis.

**Description of Environmental Setting**

The Project Area is located approximately 10 miles west of the Blue Earth River on a low ridge serving as a drainage divide between several local watersheds. Elevations in the Project Area range from 1080 to 1130 feet above mean sea level (amsl). The Project Area is agriculturally developed with crop fields, scattered rural housing units, and other agricultural operations dominating the landscape.

## *8.1 Demographics*

**Description of Resources**

Faribault County is located on the Minnesota – Iowa border in south central Minnesota. It is surrounded by Blue Earth County to the north, Martin County to the west, and Freeborn County to the east. Faribault County is a primarily agricultural county with a total population of 14,624, according to the 2008 Census.[2] This is a 9.6% decrease since 2000, and a –39% change from the county's all time high population of 23,941 in 1940.[3] Based on these trends, it is anticipated that the county will continue to see a decline in population in the future.

According to the United States Department of Agriculture, average farm size in Faribault County in 2007 was 477 acres, up from the state average of 342 acres in 1992.[4] The average age of farmers also went up from the state average of 49.6 in 1992[5] to the county average of 54.8 in 2007.[6] These trends show that farms are getting larger and young people are not returning to the farm to take over operations.

According to the 2000 Census, approximately 12,703 of the county's population reside in a rural setting and 3,478 lives in an urban setting.[7] The largest town and county seat is the City of Blue Earth with an estimated 2008 population of 3,395.[8] Faribault County has a total area of 456,723 acres or approximately 713.63 square miles.[9] Population density for the county is approximately 20 people per square mile. The 2009 population of Jo Davies Township is 249 with 98 households.[10] Population density for the state of Minnesota is nearly 60 people per square mile.

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[2] U.S. Census Bureau. (2010, August 16). *State County Quick Facts.* Retrieved September 10, 2010 from http://quickfacts.census.gov/qfd/states/27/27043.html

[3] Forstall, R. (1995). *Population of Counties by Decennial Census: 1900 to 1990.* Retrieved September 10, 2010 from http://www.census.gov/population/cencounts/mn190090.txt

[4] United States Department of Agriculture. *Summary by Size of Farm.* Retrieved on September 10, 2010 from http://www.agcensus.usda.gov/Publications/1992/Volume_1/Minnesota/mn1_49.pdf

[5] United States Department of Agriculture. *Tenure and Characteristics of Operator and Type of Organization for All Farms and Farms Operated by Black and Other Races: 1992, 1987, and 1982.* Retrieved on September 10, 2010. http://www.agcensus.usda.gov/Publications/1992/Volume_1/Minnesota/mn1_16.pdf

[6] United States Department of Agriculture. *2007 Census of Agriculture, County Profile: Faribault County, Minnesota.* Retrieved on September 9, 2010 from http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/County_Profiles/Minnesota/cp27043.pdf

[7] MnGeo: Minnesota Geospatial Information Office. Retrieved on September 10, 2010 from http://www.lmic.state.mn.us/datanetweb/php/census2000/2000Glance.php

[8] MnGeo: Minnesota Geospatial Information Office. Retrieved on September 10, 2010 from http://www.lmic.state.mn.us/datanetweb/php/census2000/estimate/report.php

[9] MapStats: Minnesota. Retrieved September 10, 2010 from http://www.fedstats.gov/qf/states/27/27043.html

[10] Minnesota Department of Administration: Office of Geographic and Demographic Analysis, State Demographic Center. Retrieved on December 2, 2010 from http://www.demography.state.mn.us/resource.html?Id=19243.

There are approximately 28 homes and businesses within the Project Boundary. There are a number of buildings near the Project Boundary, including the town of Blue Earth.

## *8.2 Land Use*

Agriculture crop production is the dominant land use. According to the Minnesota Department of Agriculture, corn harvested for grain (59.6%) and soybeans (37.3%) make up 96.9% of the total acres for crop production in the County. The Minnesota Department of Natural Resources (DNR) classifies the ecological section within the project area as North Central Glaciated Plains Section; the area is further classified as the Minnesota River Prairie Subsection. Loamy ground moraine (till plain) is the dominant landform, but end moraines, and lake plains also occupy a significant area. Level to gently rolling topography is present in the area. Cretaceous shales, sandstones, and clays are the most common kinds of bedrock. Loamy soils formed in gray calcareous till of Des Moines lobe origin are dominant. Clayey and sandy and gravelly soils are present locally, but these account for only a small percentage of soils in the subsection.[17]

### 8.2.1 Local Zoning and Comprehensive Plans

**Description of Resources**

As illustrated in Map 1, the project boundary is located entirely within the unincorporated area of Faribault County, within the Jo Daviess Township. The Faribault County Comprehensive Plan was adopted in August 1967. The guided land use within the project area is agricultural. The Faribault County Zoning Ordinance was passed and approved on December 27, 1994, and regulates land use within the unincorporated areas of the county. As illustrated in Map 10-A all land within the project area is zoned A-1, Shoreland Agricultural and A-2, General Agricultural. Urban land uses are not envisioned within the project area.

At this time, the county has not adopted regulations for WECS. The County Planning Commission is currently working on an WECS ordinance for projects less than 5.0 MW, and staff anticipates it will be adopted in October or November of this year. According to county staff, the ordinance is anticipated to include setback regulations consistent with state requirements. A conditional use permit will be required. The application for the conditional use permit will also require developers agreements for road use and repair and drainage. It is anticipated that the WECS regulations will be in effect at the time application is made to the county.

[17] http://www.dnr.state.mn.us/ecs/251Ba/index.html. Retrieved on October 4, 2010.

The 1977 Blue Earth Municipal Airport Zoning Ordinance regulated property adjacent to the project area to the east in Blue Earth and Elmore Townships. The limits of the area regulated by this ordinance are shown on Map 4A and 4B. A Joint Airport Zoning Board has been recovened for purposes of amending this ordinance consistent with Airport Layout Plan (ALP). The ALP was approved by the Federal Aviation Administrion (FAA) and will ensure that the airspace is protected for FAR Part 77 standards for the 5,300' ultimate airport configuration identified in the ALP. The limits of the Part 77 airspace are also shown on Maps 4A and 4B.

**Impacts**

Proposed wind turbine locations will adhere to state and county minimum setback requirements, and are not anticipated to impact crop production or animal feedlot operations.

The airspace area regulated by the Airport Zoning Board extends a few hundred feet into the project boundary, but does not overlap the proposed turbine locations. The ultimate Part 77 airspace configuration extends approximately one mile into the project boundary but does not overlap the proposed turbine locations. Impacts to the Blue Earth Municipal Airport are not anticipated as a result of the proposed action.

**Mitigation**

Turbine locations comply with all local regulatory requirements. Therefore no mitigative measures are necessary.

### 8.2.2 Conservation Easements

**Description of Resources**

As illustrated in Map 3A and 3B, the project area includes some land known to be within the Reinvest in Minnesota (RIM) program. This program is a permanent conservation easement. Other conservation easements were not discovered within the project area.

**Impacts**

The proposed project does not impact any RIM properties or other known conservation easement areas.

**Mitigation**

No mitigative measures are necessary.

## 8.3 Noise

The Project Area is located in a rural, predominantly agricultural area. Sources of background noise audible to rural residents and visitors to the area include wind, agricultural activity, recreation, and vehicles. Two methods were used to calculate the effects of noise: 1) typical noise level data from USEPA to calculate the minimum distance to a housing unit without violating Minnesota standards, and 2) The ISO 9613-2[12], layout-specific method to show noise levels throughout the project.

| db(A) | Typical Source |
|---|---|
| 130 | Pneumatic drill |
| 120 | Loud car horn one meter away<br>Air raid siren at 50ft |
| 110 | Airport<br>Rock Concert |
| 100 | Along mainline railway |
| 90 | Inside bus<br>Motorcycle at 25ft |
| 80 | Busy residential road |
| 70 | Conversational speech |
| 60 | Living room with music or television playing quietly<br>Air conditioning unit at 100ft |
| 50 | Quiet office |
| 40 | Bedroom<br>Low limit of urban ambient sound |
| 30 | Recording Studio |
| 20 | Broadcasting Studio<br>Leaves rustling |
| 10 | Threshold of hearing |
| 0 | No sound |

**dB(A) Source Levels**

General noise level data from the USEPA and National Transit Institute were used to provide a typical sound pressure level range for rural residential and agricultural cropland uses. Typical baseline average day-night sound levels measured in A weighted decibels [dB(A)] in the Project Area likely range from approximately 38 dB(A) to 44 dB(A).[13] These are relatively low background levels and are generally representative of the site. Higher levels exist near roads and other areas of human activity. The windy conditions in this region may elevate ambient noise levels relative to rural areas with less wind. Typical levels of sounds in various settings and from various sources are presented in Table 8-1.

Noise calculations for the specific turbine layouts being considered were also modeled using WindPRO and the International rule DIN ISO 9613-2. It takes into account both wind turbines and housing unit locations in three-dimensional

[12] Per Nielsen, *WindPRO 2* (Aalborg, Denmark: EMD International A/S, 2006), 208

[13] US Environmental Protection Agency (EPA). 1978. Protective Noise Levels. Condensed Version of USEPA Levels Document. USEPA 550/9-79-100. November 1978. http://www.nonoise.org/epa/Roll4/roll4doc7.pdf

space, turbine noise emission levels at various wind speeds, as well as ground attenuation and typical atmospheric conditions.

### 8.3.1 Noise Estimates

Noise is defined as any unwanted sound. Noise can have such subjective effects as annoyance, nuisance, and dissatisfaction, and can also interfere with activities such as speech, sleep, and learning. Physiological effects such as anxiety, tinnitus, or hearing loss can also occur as a result of noise exposure. Contribution to hearing loss can begin at levels as low as 70 dB(A).[14] The National Safety Council (NSC) recommends no more than 85 dB(A) for eight hours of exposure as the safe limit for farm operations. OSHA requires a hearing conservation program where employees are exposed to an 8-hr time-weighted average of 85 decibels.[15] Industrial standards of the Occupational Safety and Health Administration (OSHA) regulations would apply during construction, operation and maintenance of the facility. Short-term noise issues would be related to construction of the Project; long-term issues would be related to operation of the facility. Noise generated by construction activities would occur intermittently over the construction period during daytime hours and would be generated by an increase in traffic on local roads, as well as heavy equipment operation.

During operation of the Project, noise will be emitted from turbines. This comes in two forms: mechanical noise (such as from the gearbox or yaw motors) and aerodynamic noise. In modern turbines, mechanical noise should not be heard over aerodynamic noise. Aerodynamic noise is caused by the blades creating turbulence as they rotate through the moving air[16]. The level of noise generated by turbines will vary with the wind speed, speed of the turbine, and distance of the listener from the turbine. Noise levels produced by operation of the turbines were modeled to determine at what distance turbine noise would not exceed Minnesota Pollution Control Agency (MPCA) noise standards.

Typical noise levels were modeled using the following equation for a hemispherical point source:

$$Lp = Lw - 10\log_{10}(2\pi r^2) - ar$$

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[14] National Safety Council. Retrieved on September 10, 2010 from http://www.nsc.org/members_get_more/MemberResources/Documents/Noise.pdf

[15] United States Department of Labor, Occupational Safety & Health Administration. *Occupational Noise Exposure.* Retrieved on September 10, 2010 from http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=standards&p_id=9735

[16] Public Health Impacts of Wind Turbines, *Minnesota Department of Health, Environmental Health Division,* 22 May, 2009

Where:
Lp = sound pressure level at the distance of interest
Lw = turbine sound power level
r = distance of interest
a = sound absorption coefficient

The sound power level provided by the turbine manufacturer is approximately 104 dB(A) for both turbines. Based on these findings, the maximum distance where an exceedence of a state noise standard would no longer occur is approximately 604 ft (184 meters) for the residential area nighttime $L_{50}$ standard of 50 dB(A) (Minn. Rule 7030.0040). This model is conservative, as it does not allow for all noise attenuation that may occur from the elevated source (turbine), but it also does not account for wind or cumulative effects.

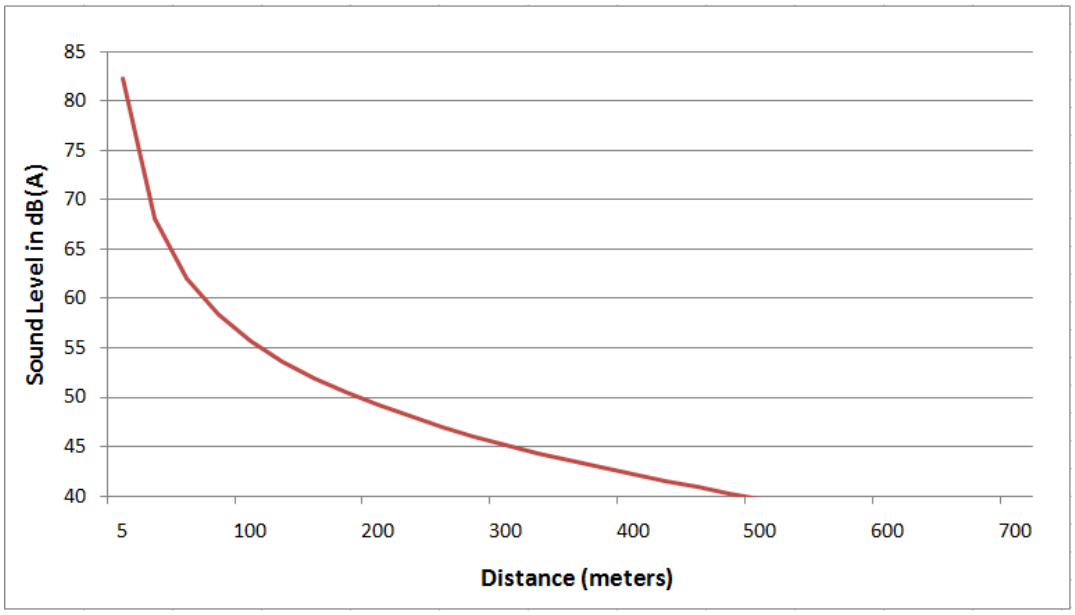


**Figure 8-1 – Sound Levels vs. Distance**

Additionally, the layout was modeled using noise data specific to both of the turbine layouts, using the ISO 9613-2 model. A conservative approach was taken with this methodology by applying a 2 dB(A) uncertainty. All results from this study reflect this uncertainty. A full report on the ISO 9613-2 method can be seen in Appendix 4A and 4B. Resulting isopleths can be seen in Maps 13A and 13B.

### 8.3.2 Noise Impacts

The Project will observe a minimum of 1,000 feet from turbines to housing units. Additionally, the Project will strive to maintain a distance of 1,500 feet, if possible. Should this not prove feasible, the Project will negotiate with the owners of the affected housing units and an agreement procured. In no case will turbines be placed closer than 1,000 to housing units.

The typical proposed setback of 1,500 feet (457 meters) and minimum setback of 1,000 feet (228 meters) from housing units will ensure that cumulative noise levels resulting from multiple turbines and noise drift resulting from wind will not exceed regulatory limits at any housing unit. Both methods used to estimate noise impacts validate this assumption. Using a typical noise level equation, it was shown that a turbine would have to be within 604 feet of a housing unit – much closer than any turbines are currently sited – to exceed regulatory limits. Further, the ISO 9613-2 model shows that noise levels do not exceed Minnesota Pollution Control Agency standards, as outlined in Table 8-2.

Epsilon Associates conducted a study of noise, concentrating on low frequency effects on several NextEra wind farms and concluded that:

> Wind farms at distances beyond 1000 feet meet the ANSI standard for low frequency noise in bedrooms, classrooms, and hospitals, meet the ANSI standard for thresholds of annoyance from low frequency noise, and there should be no window rattles or perceptible vibration of lightweight walls or ceilings within homes. In homes there may be slightly audible low frequency noise (depending on other sources of low frequency noise); however, the levels are below criteria and recommendations for low frequency noise within homes. In accordance with the above findings and in conjunction with our extensive literature search of scientific papers and reports, there should be no adverse public health effects from infrasound or low frequency noise at distances greater than 1000 feet from the wind turbine types measured by Epsilon: GE 1.5sle and Siemens SWT 2.3-93.[17]

This further validates the calculations performed, specific to the current Project layout. It also illustrates that, though low frequency noise tends to be more of an annoyance than higher frequencies[18], they should not be a problem, given the distance from turbines to housing units.

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[17] O'Neal, Robert, Hellweg, Robert and Lampeter, Richard. 2009. "A Study of Low Frequency Noise and Infrasound from Wind Turbines" Epsilon Associates, Inc., July, 2009

[18] Public Health Impacts of Wind Turbines, *Minnesota Department of Health, Environmental Health Division,* 22 May, 2009

Results from the 9613-2 modeling show that the average cumulative effect of noise on housing units was 26.6 dB(A) for the REpower turbine and 27.2 dB(A) for the GE turbine. In no case was the effect on a housing unit greater than 42.8 dB(A). See Table 8-2. This worst case scenario will only occur at wind speeds greater than 8 m/s and in specific wind directions. This worst case scenario should be a fairly rare event, in reality.

**Table 8-2 – Effects of Noise**

| | REpower MM92 | GE xle |
|---|---|---|
| Avg. Effect (dB(A)) | 26.6 | 27.2 |
| Worst Case (dB(A)) | 41.9 | 41.4 |

The impacts from noise on nearby residents and other potentially affected parties has been an integral part of turbine siting. A conservative approach has been taken in each methodology to ensure adequate buffer, and has been validated by third-party analyses. Maps 13A and 13B show that noise impacts on housing units will be minimal.

### 8.3.3 Methods Used

Two methods were used to estimate noise levels, pre-operation. The first was by using a typical noise level propagation equation and the second was by modeling cumulative effects of the park with ISO 9613-2. Both methods are further described in section 8.3.1. The ISO 9613-2 method was done with the following assumptions:

- Modeled wind speeds between 3 and 15 m/s (6.7 and 33.6 mph). Sound emissions from the turbines do not increase above 15 m/s.
- Ground factor of 1 (porous ground) was used, as the model recommends for most conditions
- Penalty of 2 dB(A) applied for uncertainty

Further, testing will be done post-construction to validate modeling data. Post-construction noise test results will be provided upon request.

It was determined that noise levels would not exceed Minnesota Pollution Control Agency noise standards. The equation shown in section 8.3.1 was used to calculate the maximum distance of the exceedance of noise standards. Maps 13A and 13B also show results of the park calculations using the ISO9613-2 model. Results from both noise and shadow flicker studies were used extensively to guide turbine placement.

## *8.4 Visual Impacts*

**Description of Resources**

Scenic quality is determined by evaluating the overall character and diversity of landform, vegetation, color, water, and cultural or manmade features in a landscape. Typically, more complex or diverse landscapes have higher scenic quality than those landscapes with less complex or diverse landscape features.

The Project Area lies in a rural location with farming, livestock grazing, and related agricultural operations dominating land use. Agricultural fields, farmsteads, fallow fields, and large open vistas visually dominate the Project Area and the topography is relatively flat with gently rolling hills. The landscape can be classified as rural open space where the visual resources of the area are neither unique to the region nor entirely natural. Structure and color features in the visual region of influence include those associated with wetlands, cultivated cropland, pasture, forested shelterbelt, and additional anthropogenic features such as farmsteads and other structures. Colors are seasonally variable and include green crop and pasture land during spring and early summer, green to brown crops and pasture during late summer and fall, brown and black associated with fallow farm fields year round, and white and brown associated with late fall and winter periods. The settlements in the Project Area are primarily housing units and farm buildings (inhabited and uninhabited) surrounded by forested shelterbelts located along the rural county roads. These structures are focal points in the dominant open space character of the vicinity. All housing within the Project Boundary were analyzed for shadow flicker (see Map 4A and 4B).

Currently, no distinctive landscape features exist in the Project Area that would require specific protection from visual impairment.

**Impacts**

The placement of turbines will have an effect on the visual quality within the site vicinity. Discussion of the aesthetic effect of the proposed wind farm is based on subjective human response. The wind farm will have a combination of perceived effects on the visual quality/rural character of the area. From one measure of standards, the Project could be perceived as a visual intrusion. On the other hand, wind farms have their own aesthetic quality, distinguishing them from other non-agricultural land uses.

Wind turbines, transmission lines and structures, and construction of access roads would result in changes to public views. The uppermost portion of the turbine blades would reach approximately 420 feet above ground surface and

would be visible for up to several miles, changing the visual character of the area from agricultural to quasi-industrial. These structures would be visible from all of the identified KOPs. In addition, some of the turbines would require red lights for aircraft safety, potentially further altering the view from KOPs. Visual effects would decrease as the distance from these facilities increases. Impacts on visual resources within the Project Area were determined by considering the post-construction views from the KOPs, as discussed above. Implementation of setbacks during facility siting and the process of negotiating agreements with the landowners in the Project Area lessen the perceived impacts in the area. The Project Area does not contain any highly distinctive or important landscape features, registered cultural resources, or unique view sheds.

**Mitigative Measures**

The following are proposed measures to mitigate visual impacts:

- Collector lines shall be buried to minimize aboveground structures within the turbine array
- Turbines will not be located in biologically sensitive areas such as wetlands or relict prairies
- Turbines will be illuminated to meet FAA regulations
- Existing roads will be used for construction and maintenance where possible, minimizing the need for new roads
- Access roads created for the wind farm will be constructed either at-grade or minimally above-grade to minimize changes to the landscape texture
- Temporarily disturbed areas will be converted back to cropland or otherwise reseeded to blend in with existing vegetation
- Turbines will maintain minimum setbacks of 250 feet from public roads and a minimum of 1,000 feet from occupied housing units.
- Turbines will be sited to minimize shadow flicker on housing units

To attain maximum efficiency, wind power technology requires as much exposure to the wind as possible. Mitigation measures that would result in shorter towers or placement of the turbines at alternate locations off the ridgelines have not been considered as they would result in less efficiency per unit.

### 8.4.1 Public Resources

Public resources that may be impacted are the Wildlife Management Areas (WMAs), and the town of Blue Earth. Both areas are several miles from the nearest turbine. Impacts are described above, but will be lesser because of the

distance to the wind turbines. Reference Paragraph 8.7 for further discussion on WMA's in the area.

### 8.4.2 Private Lands and Homes

There are approximately 69 housing units within the Project Boundary, as well as a number of parcels of land. All will be impacted as described above. Because of the low population density in this area, the impacts will be felt by a low number of people.

### 8.4.3 Shadow Flicker

Shadow flicker is the result turbine blades rotating between the sun and a housing unit, which creates a flickering shadow effect. This occurs usually when the sun is coming up or going down and is close to the horizon. Detailed analysis on flicker was performed using WindPRO, which takes into account the angle and azimuth of the sun throughout the year, operating hours, based on wind data collected and a 3-D model of the terrain, housing units and wind turbines. Cloudiness also plays a role in shadow flicker. Flicker does not occur on days with heavy cloud cover. This model used data from the Minneapolis/St. Paul airport[19]. A conservative approach was taken, as it did not account for days that were only partly cloudy.

**Table 8-3 – Frequency of Cloud Cover**

| Month | Cloudy |
|---|---|
| January | 50% |
| February | 54% |
| March | 47% |
| April | 49% |
| May | 52% |
| June | 59% |
| July | 69% |
| August | 68% |
| September | 61% |
| October | 56% |
| November | 40% |
| December | 41% |

[19] Normals, Means and Extremes, retrieved on October 4, 2010 from http://climate.umn.edu/pdf/normals_means_and_extremes/2005_Annual_LCD_MSP_page_3.pdf

To minimize shadow flicker effects, an iterative approach has been taken. Each layout is modeled for shadow flicker in WindPRO, adjusted and tested again until the turbine siting has been optimized. Special care has been taken to minimize the effects of shadow flicker on non-participating landowners. In most cases, turbines are no closer than 1,500 feet from housing units, which further diminishes the effects of shadow flicker. For detailed analysis, see Appendix 3A and 3B. Flicker effects from the turbines can also be seen in Maps 14A and 14B.

The model showed flicker on housing units in the area was minimal. On average, housing units within the project boundary receive a minimal amount of shadow flicker per year. The worst case scenarios are shown below in Table 8-4 and Table 8-5 – Worst Cases of Flicker – GE Layout.

**Table 8-4 – Worst Cases of Flicker – REpower Layout**

| House | Hours/Year | Max Shadow Days/Year |
|---|---|---|
| H42 | 9.95 | 72 |
| H14 | 7.45 | 46 |
| H58 | 7.15 | 76 |
| H2 | 5.8 | 63 |
| *Average* | *0.7* | *6.2* |

**Table 8-5 – Worst Cases of Flicker – GE Layout**

| House | Hours/Year | Max Shadow Days/Year |
|---|---|---|
| H10 | 6.4 | 74 |
| H4 | 5.6 | 97 |
| H2 | 5.0 | 42 |
| H47 | 4.8 | 74 |
| *Average* | *0.7* | *9.6* |

A full analysis of flicker on each housing unit can be seen in Appendix 3A and 3B.

## 8.5 *Public Services and Infrastructure*

**Description of Resources**

The Project Area is located in a lightly populated, rural area in southeastern Minnesota. There is an established transportation and utility network that provides access and necessary services to the light industry, small cities, homesteads, and farms existing near the study area. The Project is expected to have a minimal effect on the existing infrastructure.

**Mitigative Measures**

Construction and operation of the proposed Project will be in accordance with all associated federal and state permits and laws, as well as industry construction and operation standards. Due to the minor impacts expected on existing infrastructure during project construction and operation, mitigation measures are not anticipated.

Damage to public roads will be repaired in accordance with applicable laws and permits and damage to private roads will be promptly repaired unless otherwise negotiated with the affected landowner.

The Applicant will not operate the Project in a manner that will cause communication interference contrary to FCC regulations or other laws. However, in the event of a material problem after construction, the Applicant will take the measures necessary to correct the problem. In the event of a material problem with television reception after construction, the Applicant will work with affected residents to determine the cause of interference and where necessary reestablish acceptable reception quality in a timely fashion.

If requested by the issuing authority, the results of consultation with the NTIA will be submitted to the MPUC. A response from the NTIA will only be received if any issues are discovered. It is not anticipated that any issues will arise with the Project.

Comsearch, Inc., a consultant specializing in microwave beam path and telecommunications systems analysis, has studied the project for potential interference. Details of their results are outlined below. Bolton & Menk is currently documenting the location and type of communication towers in the project vicinity.

### 8.5.1 Roads

**Description of Resources**

There are approximately 48 miles of roads contained within the project boundary, of which 14.25 are county roads under the jurisdiction of Faribault County, and 33.75 miles of township roads under the jurisdiction of Jo Daviess Township. The listing of roads in the project boundary is provided in Table 8-6.

**Table 8-6 – Roads in Project Boundary**

| Road Name | Classification | Miles |
|---|---|---|
| C.R. 1 | County | 4.0 |
| C.R. 6 | County | 5.75 |
| C.R. 9 | County | 2.0 |
| C.R. 16 | County | 2.25 |
| C.R. 18 | County | .25 |
| 70th St. | Township | 4.0 |
| 80th St. | Township | 1.25 |
| 85th St. | Township | 4.0 |
| 90th St. | Township | 0.75 |
| 95th St. | Township | 2.5 |
| 100th St. | Township | 3.5 |
| 103rd St. | Township | 0.25 |
| 105th St. | Township | 2.0 |
| 310th Ave. | Township | 4.0 |
| 330th Ave. | Township | 3.5 |
| 335th Ave. | Township | 1.5 |
| 340th Ave. | Township | 0.5 |
| 345th Ave. | Township | 2.0 |
| 347th Ave. | Township | 1.0 |
| 353rd Ave. | Township | 1.0 |
| 355th Ave. | Township | 1.0 |
| 365th Ave. | Township | 1.0 |
| | Total County | 14.25 |
| | Total Twp | 33.75 |
| | Total | 48.00 |

**Impacts**

There will be additional traffic generated on the local public roads during construction of the wind farm, and some short-term traffic disruption may occur during delivery of the large loads to the site. However, both the additional traffic and the disruptions are anticipated to be minor and short-term in nature. Upon completion of the project traffic levels should return to pre-project levels with

the exception of maintenance vehicle which will need to visit the sites on occasion. The applicant will ensure that all applicable permits and safety procedures are followed to mitigate negative traffic impacts and will use necessary traffic control when bringing equipment and materials to the construction areas. Damage to public roads created by the additional construction traffic will be repaired. Faribault County is also in the process of creating a Development Agreement. The Agreement will ensure that any damage done to the roads during the course of construction will be repaired to its original state.

Some damage to gravel township and county roads is anticipated given the weak structural nature of these roads. Damage could consist of rutting, heaving and potholing of the driving surface. Damage to paved county roads is possible, but not as likely. Damage could consist of isolated pavement break-up and potholing.

**Mitigative Measures**

Damage to public roads created by the additional construction traffic will be repaired. Faribault County is creating a Road Use and Repair Agreement, which will ensure that any damage to County roads is repaired. Under this Agreement, the County requires the Developer to perform detailed pre and post-construction inspections of all proposed county and township haul routes. The County will require that damaged roads be repaired to its pre-construction condition. Repairs could include surfacing spot removal and replacement and supplemental aggregate and/or pavement.

### 8.5.2 Telecommunications

Construction and operation of the Project will not impact telephone and/or fiber optic service to the Project Area. These service providers will be contacted prior to construction to locate and avoid underground facilities. To the extent project facilities cross or otherwise affect existing telephone or fiber optic lines or equipment, the Applicant will enter into agreements with service providers so as to avoid interference with their facilities.

### 8.5.3 Communication Systems

**Weather & Military Radar**

The proposed site has been evaluated to determine impacts to NEXRAD Weather Surveillance Radars (WSR-88D). A preliminary evaluation determined that there is minimal to no impact to WSR-88D weather radar operations. The National Telecommunications and Information Administration (NTIA) has been advised of the Project.

A preliminary evaluation to Long-range radar including Air Defense and Homeland Security radars has also been completed. The preliminary evaluation determined there are no anticipated impacts to Air Defense and Homeland Security radars within the proposed Project area.

### Other Radar

Wind turbines are required to be constructed at a certain minimum distance from a radar facility, determined by the height of the wind turbine and tower, so that construction and operation of the Project does not affect radar operation. Specific information on longitude, latitude, and elevation of the turbines will be submitted to the FAA to ensure compliance with these requirements.

### Microwave

There are no towers located within the Project Area. The closest towers are located more than 2 miles away from the Project Area in the city of Blue Earth. Comsearch has done a microwave beam pathway study, and calculated the Worst Case Fresnel Zones (WCFZ) for each beam intersecting the project boundary. Turbines that are sited outside of the WCFZs will not cause any interference with microwave communication. The WCFZs can be seen in Maps 12A and 12B and the Comsearch report in Appendix 5. No turbines have been sited within these WCFZs.

### Emergency Services

Comsearch has studied the effect of the Project on emergency communication systems and has concluded that interference with any of these systems is unlikely. Emergency services communications are typically unaffected by wind turbines; the frequencies they operate on allow them to propagate through wind turbines. It is recommended that turbines should not be placed within 50 meters of any land mobile fixed base stations, as a conservative approach. In the unlikely event that the Project causes some interference with emergency services, there are many mitigative measures that can be taken, such as optimization of a nearby base station or adding a repeater site.

Comsearch evaluated the registered frequencies for the following types of first responder entities: police, fire, emergency medical services, emergency management, hospitals, public works, transportation and other state, county, and municipal agencies. They also identified all industrial and business land mobile radio (LMR) systems and commercial E911 operators within the proposed wind energy facility boundaries. The full report can be seen in Appendix 6.

**Cellular Towers**

There are no cell towers in the project area. There is one tower located in the City of Blue Earth and one northeast of the project area, both approximately two miles from the project area.

### 8.5.4 Television

The closest NTSC towers are in Fairmont, 13 miles west of the project area, and in Frost, 10.5 miles east of the project area. The Applicant is committed to constructing and operating the Project in a manner that minimizes impacts to off-air TV reception. It is possible the turbines will cause disruption with some resident's TV reception. In these cases, the Applicant will ensure continued reception quality by constructing a larger antenna, paying for cable services or similar measures.

## *8.6 Cultural and Archaeological Resources*

### 8.6.1 Historic and Archaeological Sites

**Description of the Resource**

Background research and evaluation of existing datasets was conducted to identify and explicate known areas of archaeological concern, and to identify and provide a framework for investigating areas that warrant Phase I level field investigation. This standard background research consisted of: investigation of known archaeological records and previous archaeological research as documented in State Historical Preservation Office (SHPO) records; investigation of known archaeological sites and previous archaeological research as documented in published sources; location and analysis of available historic maps; location and analysis of current and historical environmental information; information from the County Assessor's office; and comparison to known archaeological sites.

Factors such as the climate, vegetation, wildlife, geographic and geological characteristics of a landscape influence patterns of human activity. Understanding a region's natural history greatly enhances an archaeological study by providing indications of the availability of local resources, such as animal and vegetable food sources, water, shelter, or lithic raw materials throughout time.

**Previous Archaeological Work**

No known professional archaeological research has been conducted within the project Study Area.

### Recorded Archaeological Sites

The known archaeological sites in the region are shown on Maps 8A and 8B. A visit to the SHPO to review files found six archaeological sites in township 102 north, range 28 west, section 34 and township 101 north, range 28 west, sections 3 and 4. These are listed in Table 8-7. These six sites are just south of the Study Area. All of these sites are found on the shoreland of a former drained lake.

**Table 8-7 – Archaeological Sites**

| Site | Location | Contents |
|---|---|---|
| 21 FA23 | T101, R28, Section 3 | Ceramics |
| 21FA24 | T101, R28, Section 4 | Ceramics |
| 21FA25 | T101, R28, Section 4 | Late Archaic |
| 21FA26 | T101, R28, Section 3 | Late Archaic and Middle Woodland |
| 21FA85 | T102, R28, Section 34 | Projectile points and tools |
| 21FA116 | T101, R28, Section 3 | Late Archaic and Middle Woodland |

### Prehistoric Period

The majority of archaeological sites found north of south of the Study Area are called the Correctionville – Blue Earth Phase. These are village sites that are normally found by lakes, rivers and creeks that were surrounded by dense forests, with large expanses of prairie filling the spaces in between. The Blue Earth people most likely subsisted on large harvests and seasonal hunting. They had large base camps from which they sent out smaller parties to hunt. The smaller groups lived in semi-permanent sites near the seasonal resources. Some examples of the food in the area are plums, nuts, cherries, deer, bison, beaver, and elk. The known Blue Earth sites are approximately 2 miles north of the project location. There have been unofficial reports of other sites on local farmer's lands. The Iowa sites begin just south of the border from the Project.

### Historic Period

Locations of known archaeological sites are indicated on Maps 8A and 8B. According to the Faribault County Assessor's office, there are at least two buildings on the farmsteads within the Project Area that are older than 50 years. These buildings will be included as part of the Phase I investigation.

### 8.6.2 Project Impact

**Impacts**

There is a possibility that the Big Blue project location will contain archaeological sites, according to the SHPO 2006 letter and SHPO site file research. Our goal is to avoid, minimize or mitigate any cultural resource finds during the field review of the Big Blue Project. The ultimate goal is to avoid archaeological/historical sites.

**Mitigative Measures**

Prior to commencement of any construction a Phase I Archaeological Survey (pedestrian survey, shovel testing, soil probes) shall be conducted within the areas that will be permanently or temporarily impacted during construction or operation of the Project. The footprint of the wind turbine towers, along with new access roads, plus a reasonable buffer will receive a Phase I investigation. The remaining Study Area between towers will not be subjected to a Phase I investigation.

Pedestrian survey will be lead by personnel that meet the Department of the Interior's guidance for professional archaeologists, who shall be called Principal Investigators (PI). Field Investigators and crew will have considerable experience in upper Midwestern Archaeology. Field work methodology will follow the guidelines set forth in *SHPO Manual for Archaeological Projects in Minnesota* (Anfinson, 2005). Pedestrian surveys will follow the SHPO guidelines and shovel testing will be conducted in areas of high probability for pre-contact or contact sites. Archaeological field crews will be in contact with sponsor engineers to inform them if project locations and alignments will impact archaeological/historical sites. Archaeological/historical sites will be evaluated for their National Register Evaluation, Archaeological Sits forms and Historic Inventory forms will be completed. Final Cultural Resource Reports, findings and recommendations will be sent to the State Historic Preservation Office (SHPO) for review and a courtesy copy be sent to the Office of the State Archaeologist (OSA).

If human remains are found, the Faribault County Sheriff's Office will be contacted and the Office of the State Archaeologist (OSA) will be informed. All work will cease in this portion of the project until proper authorities give clearance to continue or ordered to abandon this portion of the project.

## 8.7 Recreation

### Description of the Resource

Recreational opportunities in Faribault County include: hunting, fishing, snowmobiling, wildlife viewing, campgrounds, and trails. Hunting is permitted in designated state MNDNR wildlife management areas (WMAs), unless posted otherwise.

Hunting in Faribault County focuses mainly on whitetail deer, upland gamebirds and waterfowl. WMAs are managed to provide wildlife habitat, improve wildlife production, and provide public hunting and trapping opportunities. These MNDNR lands were acquired and developed primarily with funds from hunting license fees. WMAs are closed to all-terrain vehicles and horses because of potential detrimental effects on wildlife habitat. There is one WMA located within 3 miles of the Project Area (Maps 2A and 2B):

- Lake Guckeen hunting options include: deer, small game, pheasant, and waterfowl. Wildlife viewing options include wetland wildlife and prairie wildlife.

The Pilot Grove Lake Waterfowl Production Area, a US FWS Production area, is located in the southeast portion of the Project Area. The WPA is approximately 1.5 miles from the nearest proposed turbine location.

### Impacts

Recreational activities would not be significantly impacted by the Project. Game populations within Faribault County would not decline as a result of the Project. Likewise, the Project would not reduce the camping or hiking opportunities. Visual impacts would be the most evident impact to people who use the WMAs and WPA's for recreation.

Recreationists in the towns of Blue Earth, Elmore, and Guckeen would not be visually affected by the Project because they are not within close proximity.

### Mitigative Measures

Wind turbines will not be located in WMAs or other areas with exceptional value for recreation. The DNR recommends a 5 rotor diameter buffer in the prevailing wind direction, and 3 rotor diameter buffer in the secondary direction – the same as required for non-participating landowners. No turbines are within that distance of a WMA; therefore, no mitigative measures will be required.

## 8.8 Public Health and Safety

### 8.8.1 EMF

Extremely low-frequency electric and electromagnetic fields (ELF-EMF) may currently exist in the Project Area where electric conductors exist with an electrical current flow. EMFs result from electrically charged particles, which may cause effects some distance from the line. The electrical effects relating to a transmission line would be characterized as "corona effect" or "field effect." Examples of conductors to be used in the Project include high-voltage transmission lines, distribution (feeder) lines, substation transformers, house wiring, and electrical appliances. Transmission lines are not fundamentally different from other electrical conductors and also exhibit ELF-EMFs. Safety concerns have been identified with regards to the EMF surrounding transmission lines.

Since 1979, there has been considerable attention focused on understanding the effects of electric and magnetic fields (EMF) on humans. The question of whether exposure to power-frequency (60 Hz) magnetic fields can cause biological responses or even health effects has been the subject of considerable research for the past three decades. There is presently no Minnesota statute or rule that pertains to magnetic field exposure. The most recent and exhaustive reviews of the health effects from power-frequency fields conclude that the evidence of health risk is minimal. The National Institute of Environmental Health Sciences (NIEHS) issued its final report, "NIEHS Report on Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields"[20] on June 15, 1999, following six years of intensive research. NIEHS concluded that there is little scientific evidence correlating ELF-EMF exposures with health risk.

The Minnesota State Interagency Working Group on EMF Issues, consisting of members from the Minnesota Department of Health, Department of Commerce, Public Utilities Commission, Pollution Control Agency, and Environmental Quality Board conducted research related to EMF, which resulted in similar findings to the NIEHS report. The group issued "A White Paper on Electric and Magnetic Field (EMF) Policy and Mitigation Options"[21] in September of 2002 wherein it concluded:

- Research on the health effects of EMF has been carried out since the 1970s. Epidemiological studies have mixed results – some have shown no

[20] National Institute of Environmental Health Sciences, National Institutes of Health. (1999, May 4). *Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields.* Retrieved on September 10, 2010 from http://www.niehs.nih.gov/health/docs/niehs-report.pdf

[21] The Minnesota State Interagency Working Group on EMF Issues. (2002, September). *A White Paper on Electric and Magnetic Field (EMF) Policy and Mitigation Options.* Retrieved on September 10, 2010 from http://energyfacilities.puc.state.mn.us/documents/EMF%20White%20Paper%20-%20MN%20Workgroup%20Sep%202002.pdf

statistically significant association between exposure to EMF and health effects, and some have shown a weak association. More recently, laboratory studies have failed to show such an association, or to establish a biological mechanism for how magnetic fields may cause cancer.

- The Minnesota Department of Health (MDH) concludes that the current body of evidence is insufficient to establish a cause and effect relationship between EMF and adverse health effects. However, as with many other environmental health issues, the possibility of health risk from EMF cannot be dismissed.

The conclusions of the Minnesota State Interagency Working Group are also consistent with those reached by the MDH in 2000 and the 1999 Final Report by the NIEHS.

The addition of these transmission facilities is not expected to add significantly to the presence of ELF-EMF exposure in the vicinity. A study of magnetic field profiles can be provided upon request.

### 8.8.2 Aviation

**Description of Resources**

The nearest airport is the Blue Earth Municipal, which is located 3 miles east of the project area. The Fairmont Municipal Airport is located 10 miles west of the project area. The Wells Municipal Airport is located 21 miles northeast of the project area.

**Impacts**

The Federal Aviation Regulation (FAR) Part 77 airspace surfaces for each public use airport have been reviewed. Based on this analysis, we have determined that locating a wind turbine within the project area will not impact any Part 77 surfaces for these airports. Specific information on the longitude, latitude, and top elevation of the turbines will be submitted to the FAA to ensure compliance with all FAA Part 77 airspace requirements. The Project will follow all applicable Federal and State aviation regulations, guidelines, and determinations for tall tower heights and obstruction lighting.

A preliminary evaluation of Military Operations Areas (MOA) was completed as part of this Project. A preliminary review of the Project area did not return any likely impacts to military airspace.

Given that the vast majority of current land use is agriculture, aerial spraying or crop dusting is employed periodically. Crop dusting is typically carried out during the day by highly maneuverable airplanes or helicopters. The installation

of wind turbines and met towers in active croplands and installation of overhead distribution lines could create a potential for collisions with these aircraft. Overhead transmission lines are expected to be similar to those already present throughout the region (similar heights and located along the edges of fields and roadways) and the turbines and met towers themselves would be visible from a distance.

**Mitigative Measures**

FAA will require obstruction lighting of wind turbines according to FAA AC 70/7460-1K *Obstruction Marking and Lighting*. Final clearance from the FAA must be obtained once the final sites are determined by submitting FAA Form 7460-1 *Notice of Proposed Construction* for each turbine location. In addition, Mn/DOT Office of Aeronautics requires tall tower permits for wind turbines located near public use airports. In an initial review of the proposed locations, multiple wind turbine sites require a permit from Mn/DOT Office of Aeronautics.

## *8.9 Hazardous Materials*

**Description of Resources**

A thorough regulatory database search for hazardous waste sites did not identify any hazardous waste sites within the Project Area.[22] Potential hazardous materials within the Project Area would be associated with agricultural activities, and include petroleum products (fuel and lubricants), pesticides and herbicides. Older farmsteads may also have lead-based paint, asbestos shingles, and polychlorinated biphenyls (PCB) in transformers. Trash and farm equipment dumps are common in rural settings.

Potentially hazardous materials associated with the Project include fluids found in association with turbines and substation/transformer equipment. There will be three types of fluids used in the operation of the wind turbines that are petroleum products. These fluids are necessary for the operation of each turbine and include gearbox oil, hydraulic fluid, and gear grease. The transformers contain mineral oil.

**Impacts**

The Applicant does not anticipate encountering any hazardous waste sites. All fluids will be contained within the wind turbines and electrical equipment.

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[22]Agency for Toxic Substances & Disease Registry. *Environmental Health WebMaps.* Retrieved on September 10, 2010 from http://gis.cdc.gov/ncehatsdrwebmaps/main2.aspx?state=MN, Minnesota Department of Health. *Hazardous Sites and Substances in Minnesota.* Retrieved on September 10, 2010 from http://health.state.mn.us/divs/eh/hazardous/sites/sitesbycounty.html#faribault

### Mitigative Measures

Because there are no proposed impacts to hazardous waste sites, no mitigative measures are necessary. If any wastes, fluids or pollutants are generated during any phase of the operation of the Project, they will be handled, processed, treated, stored and disposed of in accordance with Minnesota Rules Chapter 7045.

## *8.10 Land-based Economies*

### Description of Resources

The majority of the site is cultivated farmland, with corn and soybeans being the predominant crops. Further emphasizing this land use, nearly all of the soil within the Project Area is designated prime farmland due to the high suitability of the soils for agricultural production. Drain tiles have been installed to improve drainage and enhance productivity of soils where drainage was the limiting factor. Land cover, farmland, vegetation, and artificial drainage are further discussed in the soils and vegetation sections. An illustration of the local land cover is shown on Map 5A and 5B.

Economically important forestry is not found in the Project Area, with the only existing trees occurring in association with homes in the form of woodlots and along drainages. The region does not have a significant amount of mineral resources.

### Impacts

The loss of agricultural land to the construction of the wind farm will reduce the amount of land that can be cultivated. Generally, only a very small percent of the total acreage used for the wind farm is directly impacted by the turbines, foundations, roads, and other infrastructure. The estimated acreage of permanent (for the life of the Project) facilities for the Project is shown in Table 8-8.

**Table 8-8 – Project Land Use**

| | |
|---|---|
| Turbines | 0.15 Acres |
| New Permanent Access Roads | 15.5 Acres |
| Substation | 0.2 Acres |
| Laydown Area (if not reclaimed) | 3.00 Acres |
| Transmission Line (at 20 structures per mile) | 0.18 Acres |
| Permanent Towers | 0.04 Acres |
| **Total acres** | **19.07 Acres** |
| **Percent of Project Area (15,000 acres)** | **0.13%** |

Turbine micro-siting will include discussions with property owners to identify features on their property, including drain tile, which should be avoided. Impacts to drain tile due to project construction and operation are anticipated during project construction. Damage to drain tile resulting from construction activities or operation of the Project will be repaired according to the agreement between the Project owner and the owner of any damaged tile.

### Mitigative Measures

The wind turbines and access roads will be located so that the most productive farmland will be avoided as much as possible. Only land required for permanent facilities will be taken out of crop production. Once the wind turbines are constructed, prompt reclamation will allow all land surrounding the turbines and access roads to be farmed. In the event that there is damage to drain tile as a result of construction activities or operation of the LWECS, the Applicant will work with affected property owners to repair the damaged drain tile in accordance with the agreement between the Project owner and the owner of any damaged tile. Non-recoverable impacts to land-based economics will be mitigated through landowner compensation determined through negotiation.

## *8.11 Tourism*

### Description of Resources

At present, there is no significant tourism in Faribault County. Wildlife management areas, public parks, and local events create some tourism.

### Impacts

No negative impacts are anticipated to tourism resources. Positive impacts to the community may arise due to the presence of the Project if it becomes a tourist attraction. Communities in southwest Minnesota have benefited not only from the financial benefits of wind farms, but have also used them to educate

the community about alternative energy resources and to promote tourism to the area.

**Mitigative Measures**
No impacts on tourism are anticipated, and as such, no mitigation is necessary.

## *8.12 Local Economies*

### 8.12.1 Impacts

Construction of the Project is anticipated to cost approximately $16 million and be complete within nine months following commencement of construction. During construction and operation, the Project will function as a "basic industry" in Faribault County, the south central region, and the State of Minnesota. Basic industries are those business and government activities that bring outside income into an area economy. Income from sources outside the area that is received as paychecks and spent generates additional income and employment in the area, which is called the multiplier effect. Construction employment accounts for less than four percent of the state workforce.[23] If local contractors are employed for portions of the construction, total wages and salaries paid to contractors and workers in Faribault and adjacent counties will contribute to the total personal income of the region. Additional personal income will be generated in the local, regional, and state economies due to the multiplier effect of each dollar paid in salaries and wages. Multipliers used for basic industries are estimated to be between one and three times the original salary and wages. This multiplier effect occurs as earners buy goods and services locally with the money earned and contribute to local, state and national taxes. Purchase of goods such as energy, fuel, lodging, meals, operating supplies, and equipment also generate sales tax revenues.

Long-term impacts to the Faribault County tax base, as a result of the construction and operation of the Project, will contribute to the local economy in southeastern Minnesota. Development of wind energy projects in this region is important in diversifying and strengthening the economic base and encouraging economic growth of the region and the local counties where wind power projects are located. In addition to new jobs and increased personal income, wind energy projects pay a Wind Energy Production Tax of $0.00036 per kWh of electricity produced in Faribault County. Tax revenue by the Project will be approximately $43,000 annually for Faribault County. County government expenses are not expected to increase because of the Project.

[23] Department of Employment and Economic Development. *Current Employment Statistics.* Retrieved on September 10, 2010 from http://www.deed.state.mn.us/lmi/tools/ces/Results.aspx

Leading industries in Faribault County, including Seneca Foods, are not expected to be impacted during construction or operation of the Project.

The Project will support approximately 20 local jobs during construction and 5 jobs on a permanent basis.

**Mitigation Measures**

Socioeconomic impacts associated with the Project will be primarily positive. These positive impacts result from the influx of wages and purchases made at local businesses during Project construction, as well as the increase in the County's tax bases from the construction and operation of the wind turbines. Since impacts resulting from the Project are expected to be beneficial to the local community rather than detrimental, specific mitigation is not required.

### 8.12.2 Taxes

Long-term impacts to the Faribault County tax base, as a result of the construction and operation of the Project, will contribute to the local economy in southeastern Minnesota. Development of wind energy projects in this region is important in diversifying and strengthening the economic base and encouraging economic growth of the region and the local counties where wind power projects are located. In addition to new jobs and increased personal income, wind energy projects pay a Wind Energy Production Tax of $0.00036 per kWh of electricity produced in Faribault County. Tax revenue by the Project will be approximately $43,000 annually for Faribault County. County government expenses are not expected to increase because of the Project. Leading industries in Faribault County, including Seneca Foods, are not expected to be impacted during construction or operation of the Project.

### 8.12.3 Analysis and Mitigation

Socioeconomic impacts associated with the Project will be primarily positive. These positive impacts result from the influx of wages and purchases made at local businesses during Project construction, as well as the increase in the County's tax bases from the construction and operation of the wind turbines. Since impacts resulting from the Project are expected to be beneficial to the local community rather than detrimental, specific mitigation is not required.

## *8.13 Topography*

**Description of Resources**

The project area is located within the Minnesota River Prairie Subsection (DNR ECS). Loamy ground moraine (till plain) is the dominant landform and is level to gently rolling. Elevations in the project area range from 1130 in the southwest corner to 1050 in the northeast corner. Natural drainage occurs through Badger Creek and Little Badger Creek which drain to the northeast out of the project area. The drainage in the project area is supplemented by a series of public drainage ditches and tiles.

**Impacts**

Minimal site leveling will occur at each turbine location. No major impacts to topography are anticipated. Wind turbines and access roads will not require significant excavation or fill.

**Mitigative Measures**

No impacts are anticipated, and as such, no mitigative measures are necessary.

## *8.14 Soils*

**Description of Resources**

Due to the dominance of farming as a land use in Faribault County, soil is an important resource to landowners. Map 7 illustrates the soil associations in the proposed Project Area. A soil association is a mapping unit used to delineate a landscape that has a distinctive pattern of soils. Overall, the soils are mostly hydric and are mostly prime farmland if drained.

**Management Concerns**

The primary management concerns for soils in the Project Area include drainage management and erosion control. In most areas, artificial drainage such as tiling and excavated channels is needed. Some soils are so wet that crop production is impractical unless they are artificially drained. Water erosion and blowing soil are concerns for most soils in the Project Area. Erosion control practices and conservation tillage provide a protective surface cover, reduce runoff and increase infiltration of water.

*Prime Farmland Soils*

Prime farmland is land that has the best combination of physical and chemical characteristics for use as cropland, pastureland, rangeland, or forestland, but not urban built-up land or water. It has the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when managed according to acceptable farming methods. Specifically, prime farmlands have an adequate water supply, favorable temperature and growing season, acceptable pH and salt content, and few rocks. Prime farmlands are not excessively erodible or saturated with water for long periods of time. Based on

the County Soil Survey, all soils in the Project Area, with the exception of a few very wet areas along drainages, are Prime Farmland or could be converted to Prime Farmland with adequate drainage.

**Impacts**

Construction activities including road construction and turbine pad excavations will result in surface disturbances throughout the Project Area. Topsoil could become contaminated or lost if protective measures are not taken as an initial step in project construction. Excavations can leave soil exposed and susceptible to wind and water erosion if mitigation measures are not implemented. Increased surface traffic can lead to compaction if soils are moist and mitigation measures are not implemented.

**Mitigative Measures**

Initial project development will include soil removal from areas of permanent disturbance including new access roads and turbine pads. Soil will be salvaged to a depth of as much as 12 inches in order to preserve the desirable physical and chemical properties of the topsoil. The topsoil will be bladed to the side and placed on top of adjacent soils in a manner that will make it available for future reclamation should these facilities ever be removed. A National Pollutant Discharge Elimination System (NPDES) permit application to discharge storm water from construction activities will be acquired prior to construction. As part of this application, a stormwater pollution protection plan (SWPPP) will be developed to minimize soil erosion. This plan will identify best management practices (BMPs) to be employed during construction and operation of the Project to protect topsoil and adjacent resources and to minimize soil erosion. Practices may include a combination of a number of BMPs including silt fence, temporary seeding and mulching, rock construction entrances, etc.

Compaction will be minimized by salvaging topsoil prior to construction and tilling soil as part of the final reclamation treatment measures. In addition, minimizing the total area required by all facilities will limit the area exposed to compaction due to surface activity.

Through implementation of these environmental protection measures, soil erosion, compaction, and other related disturbance will be short-term. With the proper implementation of environmental protection measures intended to prevent, minimize, and/or reclaim soil erosion, compaction, and spill effects, no unmitigated loss of highly productive soil will result from the Project.

## *8.15 Geologic and Groundwater Resources*

**Description of Resources**

The baseline geology of the Project Area was determined through review of the Faribault County Geologic Atlas, published by Mankato State University, July 1991. The surficial geology in the Project Area consists of glacial till, which is chiefly composed of unsorted silt and clay sediments containing pebbles, scattered cobbles, and boulders. Bedrock thickness ranges from 50 to over 250 feet.

The bedrock that underlies the Project Area is part of a sequence of Late Cambrian to Middle Ordovician sedimentary rock which consists of three major rock types: sandstone, shale and carbonates. The bedrock was deposited under tectonically stable geologic conditions in shallow marine waters that flooded southern Minnesota about 500 million years ago.

The soils in Faribault County formed during the Quaternary Period. They are quite diverse, ranging from highly organic soils, such as the Hisosols, to very young, mineral soils that have an underdeveloped profile, such as the Entisols. Glacial drift of Wisconsin age forms the uppermost geologic unit in Faribault County. It ranges to several hundred feet in thickness. Glacial till sediments cover about 46%, and glacial outwash deposits of sand and gravel cover 4%. About 5% of the county is covered by alluvium on flood plains. It is unlikely that bedrock would outcrop in the Project Area because the depth of the bedrock is 100 to 150 feet deep.

The principal aquifer in the Project Area is the St. Peter – Prairie du Chien – Jordan Aquifer System. The Aquifer System is as much as 650 meters thick and in the Project Area it generally occurs at depths greater than 75 feet below ground surface. Groundwater in these bedrock formations is confined and generally flows toward the southeast.

The Minnesota Department of Health County Well Index was reviewed for the Project Area and 7 domestic wells were identified, however over 10 wells have not been disclosed to the Department of Health. Groundwater resources for these wells are derived from the Cambrian-Ordovician Aquifer. The average depth of these wells is 162 feet below ground surface.

**Impacts**

Impacts for geologic and groundwater resources are not anticipated. It is probable that Project operations and maintenance requirements will be limited and easily satisfied with a single domestic-size water well. Local groundwater supplies are adequate for the Project.

**Mitigation Measures**

Wind turbine locations are not expected to impact existing domestic water wells because the turbines typically will be located over 1,500 feet from occupied housing units where wells most commonly occur. Also, the turbine tower footings are generally not deeper than 35 feet below ground surface, which is in the glacial till sediments and stratigraphically higher than the top of the Prairie du Chien Aquifer.

## *8.16 Surface Water and Floodplain Resources*

### 8.16.1 Surface Water and Floodplains

Faribault County is in the Blue Earth River Watershed, which is primarily an area of a ground water recharge. Some recharge occurs in the upland as precipitation percolates through the soil to aquifers. They may also function as major discharge areas within the river basin, which is evident by continued flow during periods of drought and low flow.

Faribault County has three major watersheds. The Blue Earth River Watershed covers the majority of the county, the Le Sueur River Watershed covers a portion of the county, and the Winnebago River Watershed covers a very small part of the county. Watershed information is necessary to understand the effect of activities in one area of the county on other areas downstream, and the direction, quantity and quality of surface water movement. Current watershed information is being evaluated for future addition to the county's database.

The predominant surface waters in the vicinity of the site are portions of Little Badger Creek and Judicial Ditch # 12. The Little Badger Creek joins the Blue Earth River. The shallow hydrogeologic gradient is not known for all areas, but may be inferred to be parallel to the topographic gradient.

The wind turbines will be built on uplands, and this will avoid streams located in topographically lower positions in the landscape. Risk for contamination of surface waters will be reviewed after determining all final facility locations. Where discharge of hazardous waste or sediment is a risk, mitigation measures will be employed.

If it is determined that the Project will impact U.S. or Minnesota Public Waters, the Applicant will apply for the necessary permits prior to construction. Access roads constructed adjacent to streams and drainage ways will be designed in such a manner that runoff from the upper portions of the watershed can flow unrestricted to the lower portions. A NPDES permit application and SWPPP will

be prepared by the Applicant and submitted to the MPCA prior to the construction of the Project. Compliance with this permit and the associated SWPPP will ensure that surface water is not adversely affected by runoff from disturbances and construction areas. If required, a Spill Prevention, Control, and Countermeasure (SPCC) plan will be developed and implemented.

### 8.16.2 Wildlife Lakes

There are no natural lakes in the Project Area.

### 8.16.3 100-Year FEMA Floodplains

The FEMA Floodplain maps identify the Project Area as Zone C – minimal flooding. Flood zones can also be seen in Maps 9A and 9B.

"According to National Climatic Center Data, there are several flooding events that have occurred in Faribault County since 1950. The first even took place on June 18, 2002, when four to five inches of rain fell across much of the county, mainly from Delavan to Frost and Walters. Water covered a few roads in several townships, and washed away 35 acres of corn near Frost. A similar event occurred on July 21, 2002, when a swath of four to seven inches of rain from Wells to Kiester fell and caused flash floods. The rainfall left two to three feet of water standing in the city of Wells. County Road #2 closed southeast of Kiester."[24]

On-site or off-site flooding would not likely result from the construction and grading of roads and other facilities related to the Project. Implementation of environmental protection measures such as installation of adequately-sized and appropriately placed culverts, and avoidance of channels and other areas of concentrated flow, would ensure that such on-site or off-site flooding does not occur.

## *8.17 Wetlands*

**Description of Resources**

The National Wetland Inventory (NWI) map and aerial photo was reviewed for the study area. See Map 9A and 9B. An additional review of the study area is anticipated to be completed during the growing season of 2010. The wetlands that are present have been impacted by agricultural activities through drain tile, tiling or sedimentation from runoff. The aerial photo review indicated that there

[24] Faribault County All-Hazard Mitigation Plan, http://www.rndc.org/documents/FaribaultCo.MitgationPlanPart3.pdf

may be more wetlands than shown on the NWI. A more complete field review will be necessary during the turbine-siting stage of the project to ensure avoidance of wetlands.

The approximately 15,000 acre study area contains approximately 5.56 acres of wetland based on the NWI. Badger Creek and Little Badger Creek cross through the study area in a couple different locations with wetlands possibly existing in these locations. The DNR has jurisdiction over these two water courses. Many of these wetland areas have been impacted by the surrounding agricultural uses. Table 8-9 summarizes the wetlands that are present within the site based on wetland type according to the NWI map.

**Table 8-9 – Wetlands within Project Site**

| Circular 39 Type | Cowardin Type | Acres within Study Area |
|---|---|---|
| Type 1 – Seasonally flooded basin or floodplain | PEMA, PEMAd | 1.75 |
| Type 3 – Shallow marsh | PEMC | 0.20 |
| Type 4 – Deep marsh | PUBGx | 0.45 |
| Type 3/6 – Shrub swamp | PEM/SS1C | 3.16 |
| | Total | 5.56 |

Wetlands preliminarily identified as falling under the jurisdiction of state or federal agencies will be delineated in the growing season of 2010. Ongoing consultation and the results of these delineations will determine if state or federal wetland development permits will be required. Literature review, queries of state and federal natural resource-related databases, and interviews of state and federal management personnel were the primary sources used for the background investigation.

### Impacts

Most construction activities associated with the Project would be sited outside of ephemeral channels and the depression areas of wetlands. However, the proposed buried and overhead power lines along with the access roads may bisect ditches and ephemeral drainages and wetlands. Construction of these facilities may result in some temporary and permanent disturbances. However, efforts will be made to avoid and minimize wetland impacts with the construction of these facilities.

Temporary impacts to waters may occur where access for construction requires installation of temporary crossing structures at channels, wetlands, or other wet

areas. If required at these sites, one of the following types of temporary crossings would be constructed:

1) At-grade crossings without dredge or fill of wetlands, possibly including wetland crossings using wooden matting;

2) Culverted crossings using geotextile, coarse rock fill and culverts. Equipment crossings in wetland areas which do not have defined channels would be restricted to crossing on wooden mats to prevent compression and or disturbance of wetland soils. Areas with water in defined channels would be crossed at temporary, at-grade crossings or culverted crossings to prevent permanent impacts to these areas. Crossing of areas which have a combination of a defined channel and adjacent wetland areas may require the use of wooden mats and installation of a temporary at-grade or culverted crossings. Permanent impacts to wetlands would occur where new access roads or underground collector lines are installed within a wetland or across a channel. Based on site observations only as many as 3 permanent crossings may be required for project development, with only collector lines.

**Mitigation Measures**

Wetlands will be avoided to the extent practicable during the construction phase of the Project. If wetland impacts cannot be avoided, the Applicant will submit Section 404 and Minnesota Wetland Conservation Act permit applications to the U.S. Army Corps of Engineers, the State and local permitting authorities prior to construction. Wetlands in Minnesota are regulated under a variety of local, state, and federal programs. Many times two or more of these programs have jurisdiction over a particular wetland or waterway. In some cases, various portions of the same wetland will be regulated by different programs.

Where crossings are required, construction activities would include implementation of BMPs, such as silt fence, rock checks, biorolls, stabilization blankets, floating silt curtain, etc. to control erosion and otherwise minimize impacts to wetland properties. Fill material placed below the high water mark would be free of topsoil, decomposable materials, and toxic concentrations of persistent synthetic organic compounds. Temporary crossings would be inspected as needed in accordance with applicable BMPs.

Temporary crossings would be removed immediately when they are no longer needed. All construction materials (e.g., rock, geotextile fabric, culvert, etc.) would be removed and the site would be restored to its original grade. The disturbed area would be smoothed and appropriately stabilized with silt fence

or erosion control blankets as necessary to control erosion. The site would be seeded with local native species adapted to site conditions as necessary to promote prompt revegetation. Due to the temporary nature of impacts, it is likely that onsite propagules (e.g., living plants and seeds) would regenerate vegetative cover similar to that found prior to the disturbance without additional seeding. Silt fences would remain in place to continue capturing sediment until the crossing site is fully stabilized and revegetated as determined in consultation with all reviewing agencies. Soils at risk of erosion would be identified prior to disturbance and the need for placement of additional silt fence or erosion control matting would be evaluated and implemented as needed.

If required by agencies governing wetland resources, off-site mitigation of wetland losses will be employed to reduce the overall effect of the Project. The Applicant will work with local, state, and federal agencies to first avoid and if avoidance cannot be done, minimize wetland impacts. Any impacts proposed to existing wetlands will be mitigated in accordance with the requirements set forth in the Minnesota Wetland Conservation Act.

## *8.18 Vegetation*

### Description of Resources

The site vicinity is in an area predominantly used for agriculture with scattered rural housing units. The dominant land cover is row-crop agriculture, with minor amounts of pasture/ hayland. Native grasslands are virtually non-existent within the Project Area. Some grasslands exist in association with modified drainages, as filter strips located between drainages and row-crop production areas; however, most of these areas appear to be hayed or mowed on an annual basis.

A summary of the various land cover types in the Project Area is provided in Table 8-10. See Map 5A and 5B for locations of these land cover types.

**Table 8-10 – Land Cover Types**

| Land Cover Class | Area (acres) | Percent of Project Area |
|---|---|---|
| Agriculture | 3,960.5 | 93.5% |
| Forest | 4.0 | 0.1% |
| Grassland | 36.6 | 0.9% |
| Shrubland | 3.2 | 0.1% |
| Urban/Developed | 231.4 | 5.5% |
| Wetlands | 1.5 | <0.1% |
| Total | 4,237.3 | 100% |

Minimal, highly-fragmented areas of the Project Area contain deciduous/coniferous forest, woody wetlands and emergent herbaceous wetlands. Woody habitat is generally restricted to small riparian corridors bordering highly modified drainages, and/or planted shelterbelts around residential and agricultural buildings or livestock/feedlot areas.

**Impacts**

Wind turbine sites are optimally located in areas of higher elevations within the Project Area, effectively placing the majority of the turbine sites in agricultural production areas. Access roads and supporting facility features will be designed to minimize impacts to existing grassland and woody vegetation. However, some impacts to woody vegetation in drainages will be unavoidable at road crossing sites.

**Mitigation Measures**

Grassland and forested areas will be avoided during the construction phase of the Project. If impacts to these habitats cannot be avoided, the Applicant will mitigate impacts by replanting woody and grassland species in areas of disturbance as practicable. Landowner approval will be negotiated prior to any removal of trees during construction.

## *8.19 Wildlife*

Due to the migratory and transient behavior of many of the wildlife species within the region, the information presented includes a discussion of wildlife and habitat within the Project Area, as well as at a regional level. The status and distribution of wildlife species was determined based on the completion of a Tier I background investigation in accordance with the U.S. Fish and Wildlife (FWS) Draft Wind Turbine Guidelines. The Tier I investigation identified potential wildlife species and habitats with the potential to be impacted by the proposed development. Literature review and queries of state and federal natural resource related databases were the primary sources used for the background investigation. Due to the information gathered during the Tier I investigation, the Applicant has decided to gather further information, as suggested in the FWS: Tier II; Site Characterization guidelines, of the proposed turbine locations within the Project Area by means of site visits and an avian and bat survey. An avian and bat survey is not required by any agency. However, it is Exergy Development Group of Idaho's policy to always conduct these surveys as a matter of environmental responsibility; conducting these surveys is a voluntary measure.

Wildlife use of the Project Area is largely affected by the types of habitat found there. The dominant land cover is row-crop agriculture, with very minor amounts

of pasture/hayland. Native grasslands and public lands such as WMA's and WPA's are non-existent within the Project Area. Woody habitat is generally restricted to small riparian corridors bordering highly modified drainage ditches or planted shelterbelts around residential and livestock/feedlot areas. Woody cover types provide food, hiding and thermal cover, and nesting habitats for a variety of species, especially migratory birds. Resident and migratory birds, mammals, reptiles and amphibians, and insects occupy the region both continually and intermittently throughout the year.

The following section does not include a discussion on wildlife species listed as threatened, endangered or of special concern by state or federal management agencies. Refer to Section 8.20, Rare and Unique Natural Resources, for information on these resources.

## 8.19.1 Existing Wildlife

**Resident and Migratory Birds**

Resident birds are those that occupy woody, riparian, and grassland habitats within the proposed Project Area throughout the year. Migratory birds are those birds that utilize the habitats within the Project Area during the breeding and nesting season. The principal migratory route for many of these species is the Mississippi Flyway.

The Minnesota Ornithologist's Union[25] has compiled a checklist of avian species noted in Faribault County. The checklist indicates the species seen in Faribault County, their seasonal abundance, and whether or not the species has been recorded nesting there. The list should not be considered a comprehensive list of the migratory birds that could potentially occur in the proposed Project Area. However, the listed species represent the majority of species that are regularly present in the vicinity of the Project.

The Pilot Grove Lake Waterfowl Production Area, a US FWS Production area, is located in the southeast portion of the Project Area. The WPA is approximately 1.5 miles from the nearest proposed turbine location.

**Mammals**

The agricultural fields, grasslands, woodlands, and wetland areas provide habitat for a variety of large and small mammals that inhabit the Project Area. Agricultural crops and native flora provide year round food sources and thermal/hiding cover for species. Smaller mammals occupying the grassland and

[25] M.O.U. *County Checklists.* Retrieved on September 10, 2010 from http://moumn.org/cgi-bin/countychecklist.pl

woody vegetation areas provide a food source for larger carnivorous and omnivorous mammals and birds.

White-tailed deer, the dominant big game species in the area, favor the open wooded areas in the region for cover. Deer consume agricultural crops during warmer months and browse on acorns and the leaves, needles, buds, and twig ends of trees and shrubs during the winter. A review of the MNDNR Deer Population Model for pre-fawning deer density (2008) indicates that deer density within Faribault County is approximately one to ten deer per square mile. This density occurs over almost all of southern/southwestern Minnesota.[26]

### Reptiles and Amphibians

Several reptile and amphibian species, such as frogs, toads, turtles and snakes, may use the grassland, wetland, and deciduous forested habitats within the region. However, the majority of these species are typically concentrated in wetland or aquatic habitats.

### Avian Surveys

The Applicant has engaged Western EcoSystems Technology, Inc. to conduct an avian and bat survey of the Project Area near the proposed turbine locations. The avian surveys will provide information that can be used to predict potential impacts and identify methods of avoiding and/or mitigating impacts. The survey results will be utilized to estimate temporal and spatial use of the general project area by raptors as well as other birds (e.g., waterfowl). The avian use survey includes planned monitoring in pre-construction spring, summer, fall, and winter periods. The pre-construction surveys will be conducted weekly or bimonthly at approximately eight fixed points during all seasons through 2011. The avian use surveys consist of counts of birds observed within circular plots. A sampling approach will be used to ensure that the most likely locations of turbine strings are well represented, with many of the proposed turbine string locations within observation viewsheds.

The resulting avian use data will be compared to data collected at numerous other wind resource areas using similar protocols. Many of these wind resource areas also have post-construction fatality data, which will allow the prediction of levels of avian mortality based on raptor and other bird use at the proposed projects. This comparison along with a description of bird use at the Project Area will be included in the final monitoring report prepared after the 2011 field season.

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[26] Minnesota Department of Natural Resources, Fish & Wildlife. *2008 Pre-Fawn Deer Density from Deer Population Model.*
http://files.dnr.state.mn.us/outdoor_activities/hunting/deer/deer_density_prefawn_2008.pdf

### Raptor Nest Survey

A raptor nest structure survey will be conducted during leaf-off conditions in the late winter or early spring 2011 from public roads in the Project Area. The survey timing will not allow for species determination or occupancy in 2011, but an early survey is needed to view nests from roads. Follow up surveys may be needed to determine occupancy in nest structures located near proposed turbine locations later in the spring. In addition to this, field biologists map raptor nest structures that are observed during avian use surveys. Both avian use and raptor nest surveys will help determine the kind and quantity of birds present but especially those under federal protection (i.e. Migratory Bird Treaty Act and Bald and Golden Eagle Act) that are using the project area during the pre-construction period. This information can then be used to reduce impacts to these potentially affected birds.

### Bat Surveys

Bats in the project area will be surveyed using ultrasonic sensors that detect bat echolocation calls. Bat detectors are widely used to index and compare habitat use by bats. The use of bat detectors for calculating an index of potential bat impacts has been used at several wind projects, and is currently being recommended by Bat Conservation International (E. Arnett, pers. comm.) as a primary and economically feasible bat risk assessment tool.

We propose to use Anabat® detectors (Titley Electronics Pty Ltd., NSW, Australia). These detectors can easily be set up at multiple survey sites, do not require constant attention by the researcher, and are considered a valuable tool for comparing relative amounts of bat activity. Anabat® detectors record bat echolocation calls with a broadband microphone. The echolocation sounds are then translated into frequencies audible to humans by dividing the frequencies by a predetermined ratio.

Two Anabat units are proposed to be deployed in May 2011 and left in the field until October 2011. Units may be placed at the met towers and/or near wetlands or tree areas (areas of likely higher bat use). Met tower deployments will use at least one “bat-hat”. This will allow data to be collected at varying heights, allowing for comparisons between call data. Bimonthly visits are proposed to occur during the monitoring period.

The total number of bat passes, regardless of species, will be used as an index of bat use of the project area. To predict potential for bat mortality (i.e., low, moderate, high), the mean number of bat passes per detector-night will be compared to existing data at other wind plants where both bat activity and mortality levels have been measured. The estimate of bat passes, species

composition, comparison to other studies, and other relevant information will be included in the monitoring report prepared after the field data collection.

**Impacts**

Nationwide, the potential for avian mortality has been addressed by selecting project locations outside of known concentrations of birds and by adjusting turbine sites within the project location to avoid sensitive avian habitats. Despite these efforts, mortality to birds resulting from collision with wind turbines has occurred. Avian collisions with turbines may be influenced by such factors as annual migration and local movement patterns, turbine size, and weather.

Reports describing avian mortality at wind energy facilities were reviewed during the analysis of the Project. The Top of Iowa (TOI; Koford et al. 2004[27] and 2005[28]) and Buffalo Ridge sites (WEST 2000[29]) were the primary studies reviewed. These studies identified several site-specific factors that warrant consideration in the context of the Project. The following section presents details of both studies and the implications of those findings regarding the potential effects of the proposed project on birds and bats.

It is expected that avian and bat interactions with the proposed Project would be similar in nature, but of a much smaller scale, to those found at the Top of Iowa (TOI) and Buffalo Ridge sites, which are located in areas with similar habitats. The low impact of the Project relative to the TOI and Buffalo Ridge projects results from fewer and taller turbines proposed for this Project. In addition the two comparison sites would be expected to have greater potential for impacts, based on the site-specific conditions. Fewer, larger towers are expected to result in fewer bird and bat strikes.

**Top of Iowa Study:** The Top of Iowa Wind Farm (TOI) is located near Joice in Worth County, Iowa and was completed in 2001. The facility is composed of 89 turbines mounted on 71.6 m (235-foot) high tubular towers. Each turbine is equipped with three 25.9 m (85-foot) blades. Blade speed at the tips is approximately 337 km/h (130 mph).

The TOI site is centrally located between three large, state-owned WMAs which provided a wide variety of habitat under state management (wetland, grassland

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[27] Dr. Koford, R. (2004, February 28) *Avian Mortality Associated With The Top of Iowa Wind* Farm http://www.wind.appstate.edu/reports/TopIowaAvianReport2003(1)(1).pdf

[28] Dr. Koford, R. (2005, February 2) *Avian Mortality Associated With The Top of Iowa Wind* Farm http://www.horizonwind.com/images_projects/what_were_doing/TOI_Avian_Annual_Interim_Report_2004_020205.pdf

[29] Johnson, G. Erickson, W., Strickland, D. Shephard, M. Shepherd, D. (200, September 22). *Avian Monitoring Studies At The Buffalo Ridge, Minnesota Wind Resource Area: Results of a 4-Year* Study. http://www.west-inc.com/reports/avian_buffalo_ridge.pdf

and forest habitat). The proximity of these WMAs provides attractive habitat for migrating birds in an otherwise intensively farmed region of northern Iowa. In addition, the complex of the three WMAs provides important avian breeding habitat, particularly for wetland and grassland bird species. In contrast to the Project area, The TOI site has exhibited historically high bird use with migrant and resident birds historically moving between the WMAs. Even though the TOI has a high degree of bird activity, avian impacts are low.

Important site-specific factors at the TOI site include:

- The habitat present around the TOI is vastly superior in both quality and quantity to both the Buffalo Ridge and the Project sites.
- The proximity of the TOI site to three Iowa WMAs has been demonstrated to increase avian and bat usage within and near the TOI project area.
- The TOI study demonstrated that the location of a wind energy facility near and within habitat that experiences high avian usage does not seem to adversely affect avian use at turbine sites.
- High avian use of the TOI site is an important consideration when making comparisons and extrapolating potential avian and bat interactions to the Project site.
- Wind farm-related mortality during 2003 and 2004 was a total of seven birds.
- Wind farm-related bat mortality during 2003 and 2004 was 74 bats.
- Avian interactions and mortality were low, given the high avian use of the project area. The 2003 and 2004 field studies indicated there was no consistent significant difference between relative avian sites in and adjacent to the wind farm.
- Both the 2003 and 2004 field studies found no significant difference between bat activity at wind tower sites and adjacent crop fields without towers.

**Buffalo Ridge Study:** Buffalo Ridge is a large wind energy center with a total of 354 wind turbines in operation. Buffalo Ridge is a segment of the 62-mile-long Bemis Moraine in southwest Minnesota and southeast South Dakota. Habitats in the study area were characterized as being primarily agricultural crops, hay and pasture. Relatively minor vegetation types in the study area include deciduous woodlots associated with farmsteads, wooded ravines, and wetlands.

The intensive agriculture within Buffalo Ridge provides habitat similar to habitat present at the Project site. Both sites are located in an area where intensive modifications have been made to the natural environment to facilitate agricultural production. Buffalo Ridge is not located in a major waterfowl staging

area or within significant waterfowl migration routes. However, the proximity of some areas of the Buffalo Ridge project to moraine escarpments would raise the potential for migratory pathways to pass near the project. The Buffalo Ridge area was broken into three study areas (P1, P2, and P3).

- Total avian mortality in the wind development area was estimated to be 0.98 birds per turbine in the P1 study area, 2.27 birds per turbine in the P2 study area, and 4.45 birds per turbine in the P3 study area
- Total avian mortality in reference (non-turbine) plots was estimated to be 1.10 birds per plot in the study areas.
- Total bat mortality was estimated to be 0.26 bats per turbine in the P1 study area, 1.78 bats per turbine in the P2 study area, and 2.04 bats per turbine in the P3 study area.

**Big Blue Project:** While it is likely that there would be impacts to individual birds because of collisions with wind turbines and/or transmission lines of the proposed Project, there is no evidence available that indicates that the proposed location or project facilities present a high risk for impacts to wildlife populations at the site. Operation and maintenance will not significantly change the existing land use or have an effect on species within the Project Area and it is not suited within or in close proximity to seasonal migration routes.

Based on the lack of woody habitat and the current condition of riparian corridors in the proposed Project Area, bat use is expected to be similar to use at the Buffalo Ridge site. As such, bat mortality rates on a per turbine basis would also be expected to be similar. However, cumulative impacts to bat populations should be less for the proposed Project, which will have significantly fewer turbines.

Wildlife, bird and bat losses are anticipated to be minimal in the Project Area. Such losses are not expected to cause a significant decline in overall wildlife populations. Therefore, no significant impacts to wildlife resources are expected to occur.

Construction activities that remove vegetation and disturb soil may cause direct impacts to individuals of less mobile species (e.g., small mammals, amphibians, reptiles) through direct mortality or displacement and exposure to predators. The cultivated croplands where most disturbances would occur are not considered to be particularly productive habitats for those species because of low habitat diversity. Permanent habitat loss from construction of access roads and tower foundations would be minimal and restricted to localized areas, while other construction disturbances would be temporary. Re-vegetation of disturbed areas would mitigate these short-term effects. More mobile species

(medium to large mammals and birds) would be expected to disperse from the area of disturbance and re-enter the area following the completion of construction.

Disturbance to wildlife due to noise, vehicles, and human presence would be localized, of short duration, and similar to the agricultural activities within the Project Area. Vehicles traveling on access roads could kill small mammals, reptiles, or birds, though more mobile species would be able to avoid impacts from vehicles. Ground nesting birds could be potentially impacted by construction activities that occur during spring and early summer months.

**Mitigation Measures**

The primary environmental concerns are potential for impacts to wetlands, streams, and forested areas. In addition to minimizing disturbances to these resources, it is recommended to leave as much buffer as possible between the outermost turbines and Badger Creek.

Proposed mitigation measures include:

1) The Project Area has been selected, in part, due to the low use of area by migratory birds and relatively low value of the area for wildlife habitat relative to sites in the other portions of the state.
2) Facilities have been sited in locations where impacts to locally important habitats (e.g., wetlands and grasslands) are minimized.
3) Construction shall avoid disturbance of individual wetlands, drainage systems, existing trees and shrubs, which are important to the wildlife present in the area during construction activities.
4) Construction sequencing will maintain soil conservation practices during construction, operation, and maintenance phases. This will protect topsoil and minimize erosion.
5) Surface disturbances and above-ground facilities have been minimized to the extent practicable and all temporary disturbances will be promptly reclaimed.

Based on implementation of these and other mitigation measures noted elsewhere in this document, no significant impacts to wildlife would be expected to occur due to the construction and operation of the proposed Project.

### 8.19.2 Waterfowl Feeding and Resting Areas

**Description of Resources**

The Pilot Grove Lake Waterfowl Production Area (WPA), a US FWS Production area, is located in the southeast portion of the Project Area. The WPA is approximately 1.5 miles from the nearest proposed turbine location.

**Impacts**

Due to the distance from the WPA to the nearest proposed turbine location, no significant impacts to wildlife would be expected to occur due to the construction and operation of the proposed Project.

**Mitigative Measures**

No impacts are anticipated; therefore no mitigative measures are necessary.

### 8.19.3 Important Bird Areas

**Description of Resources**

A review of the Important Bird Area (IBA) identified by the Audubon website indicated that no IBAs within the county or adjacent counties.

**Impacts**

Due to the distance from the nearest IBA to the Project location, no significant impacts to wildlife would be expected to occur from the construction and operation of the proposed Project.

**Mitigative Measures**

No impacts are anticipated; therefore no mitigative measures are necessary.

## *8.20 Rare and Unique Natural Resources*

### 8.20.1 Rare and Unique Natural Resources

**Description of Resources**

For the purpose of this discussion, Rare and Unique Natural Resources are considered to be those species identified as threatened, endangered, candidate or sensitive by state and federal management agencies, or other natural resource features identified by state or federal management agencies to be unique within the region of the Project Area.

**Federally Listed Species**

The Endangered Species Act of 1973, as amended, requires protection of those species federally listed as threatened or endangered, as well as protection of habitat designated as critical to the recovery of those listed species. Projects that could potentially have an adverse effect on listed species or critical habitat require consultation with the USFWS.

### State Listed Species

Minnesota's Endangered Species Statute (Minnesota Statutes, Section 84.0895) requires the MNDNR to adopt rules designating species meeting the statutory definitions of endangered, threatened, or species of concern, and authorizes the MNDNR to adopt rules that regulate treatment of designated species. A comprehensive list of all state-listed threatened species, endangered species, and species of concern can be found on the MNDNR website at: http://files.dnr.state.mn.us/eco/nhnrp/endlist.pdf.[30]

The MNDNR maintains the Natural Heritage Information System (NHIS), a database which is the most complete source of data on rare, endangered, or otherwise significant plant and animal species, plant communities, and other natural features in the state.

The results of a NHIS query for the Project Area indicated that there were no known occurrences of rare species within a search area of an approximate one-mile radius of the proposed Project. However, a remnant prairie is located approximately three miles to the north of the project area within a railroad right-of-way.

### Unique Natural Resources

State owned lands that are managed or preserved for their unique qualities include Scientific and Natural Areas (SNAs), Wildlife Management Areas (WMAs) and State parks. The objectives of these areas include: preservation of the ecological diversity of Minnesota's natural heritage, including landforms, fossil remains, plant and animal communities, and rare and endangered species; or other biotic features and geological formations for scientific study and public edification as components of a healthy environment.

The Project Area is privately owned and does not contain these management areas. No State parks are within the region of the Project Area. There are no SNAs located within the vicinity of the Project Area.

### Impacts

[30] Minnesota's List of Endangered, Threatened, and Special Concern Species, Minnesota Department of Natural Resources, July 1, 1996.

The Project would not impact any federal- or state-listed threatened or endangered species. As previously discussed, the query of the NHD indicates that there are no federal or state threatened or endangered species documented to occur within the Project Area. In addition, a variety of mitigation measures will be implemented to avoid and minimize impacts to all wildlife species. For more discussion on mitigation measures, see the Wildlife section of this document.

Unique resources, such as state management areas and recreation areas, will not be directly impacted by the Project. However, some of the areas may experience indirect impacts, most notably, visual impacts to recreation areas.

**Mitigation Measures**

There are a variety of mitigation measures associated with various resource areas that will assist in minimizing impacts to rare and unique natural resources. The mitigation measures associated with the Wildlife section, Recreation Resources and Visual Resources are all measures that will protect Rare and Unique Natural Resources. Some specific proposed mitigative measures are:

- Turbines will not be located in biologically sensitive areas such as wetlands, relict prairies, or in close proximity to wildlife management areas and impacts to important habitats will be avoided where practicable.
- Existing roads will be used for construction and maintenance where possible, and new road construction will be minimized;
- Access roads created for the wind farm will be located on gentle grades to minimize visible cuts and fills; and
- Temporarily disturbed areas will be reseeded to blend in with existing cover and land uses.

The nearest significant wildlife/recreational feature, a Waterfowl Production Area (WPA), is located over 1.5-miles from the nearest tower area proposed for this project. In addition, the project is situated to the north of the WPA which would further reduce potential impacts to the generally southward migration of birds produced in the WPA. This would avoid significant impacts to birds, and reduce the visual impacts associated with the recreational use of the WPA.

## 8.20.2 Native Prairie

**Description of Resources**

There are no native prairie communities in the project area enrolled in the Native Prairie Bank Program. There are also no known native prairie communities of any type within the Project area. However, a remnant prairie is

located approximately three miles to the north of the project area within a railroad right-of-way.

**Impacts**
No impacts to this remnant prairie are anticipated as a result of the Project.

**Mitigative Measures**
No impacts are anticipated; therefore no mitigative measures are necessary.

# 9 Site Characterization

## 9.1 *Site Characteristics*

The United States Department of Energy (DOE) and the Minnesota Department of Commerce (MDOC) have conducted wind resource assessment studies in Minnesota since 1982. In October 2002, the MDOC published a "Wind Resource Analysis Program" (WRAP) report[31] that presents wind analysis data from monitoring stations across the state of Minnesota.

Since mid 2003, the Applicant has maintained one 50-meter and two 60-meter tall meteorological test towers on the site. Each of the freestanding towers has individual anemometers mounted at 10, 30 and 50 meters (33, 98, and 164 ft). The on-site anemometer towers were strategically located to obtain a topographic and geographic diversity across the Big Blue Wind Farm area.

In order to capture the long-term inter-annual variability of the wind, data from four NOAA weather stations were collected and utilized in the wind resource assessment. These long-term references included (1) Blue Earth Airport (15 years), (2) Fairmont Municipal Airport (10 years), (3) Albert Lea (23 years), and (4) Estherville (22 years). The hourly correlation coefficients between Big Blue and these references were good.

The expected long-term mean annual 80 meter (262 ft) wind speed at the proposed turbine sites is 7.7 m/s (17.2 mph), and the prevailing directions are south and northwest. Winds are strongest in late winter and early spring, and during nighttime and early morning hours.

The substantial amount of on-site wind data, combined with the excellent correlation with the reference site, has allowed Big Blue's third party meteorologist to make sound predictions of the wind characteristics at the site. These characteristics are further described below.

### 9.1.1 Interannual Variation

There are six complete years of on-site data (2003-2009). Annual Average wind speeds typically do not vary by more than 10% from year to year.

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[31] Minnesota Department of Commerce. (2002, October). *Wind Resource Analysis Program 2002.* http://www.state.mn.us/mn/externalDocs/Commerce/WRAP_Report_110702040352_WRAP2002.pdf

### 9.1.2 Seasonal Variation

Figure 9-1 below shows the composite mean winds at tower BB-01 during the period September 2003-May 2007. Winds are strongest in late winter and early spring, and are weakest in summer.

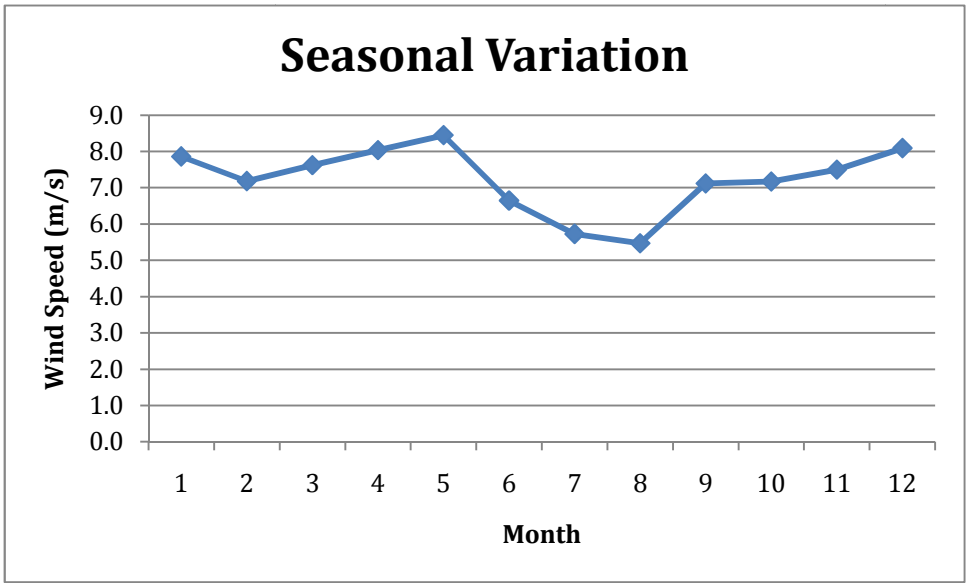



Figure 9-1 – Seasonal Wind Variation

### 9.1.3 Diurnal Conditions

Diurnal wind speeds tend to have little variation throughout the day. In winter months, wind speeds tend to be higher during daylight hours. See Figure 9-2 below.

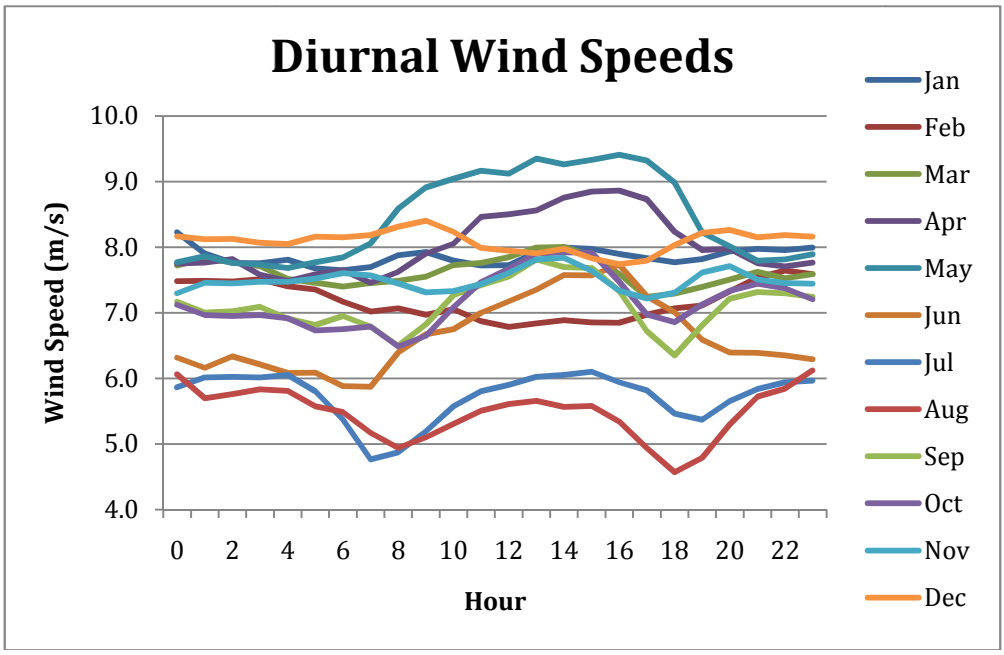



**Figure 9-2 – Diurnal Wind Speeds**

### 9.1.4 Atmospheric Stability

Such data have not been compiled, as the required inputs are normally not collected with on-site meteorological monitoring.

### 9.1.5 Turbulence

The turbulence intensity is defined as the standard deviation of the wind speed divided by its concurrent mean wind speed for a given averaging period, in this case hourly. For wind speeds greater than 4 m/s (8.9 mph), the typical turbulence intensity at 80 m (262 ft) above ground is between 0.08 and 0.11.

### 9.1.6 Extreme Conditions

The maximum hourly mean wind speed recorded at the Project was 36.0 m/s (80.5 mph), and the maximum gust was 50.4 m/s (112.7 mph).

### 9.1.7 Speed Frequency Distribution

An annualized wind speed frequency distribution based on on-site data is presented in Figure 9-3.

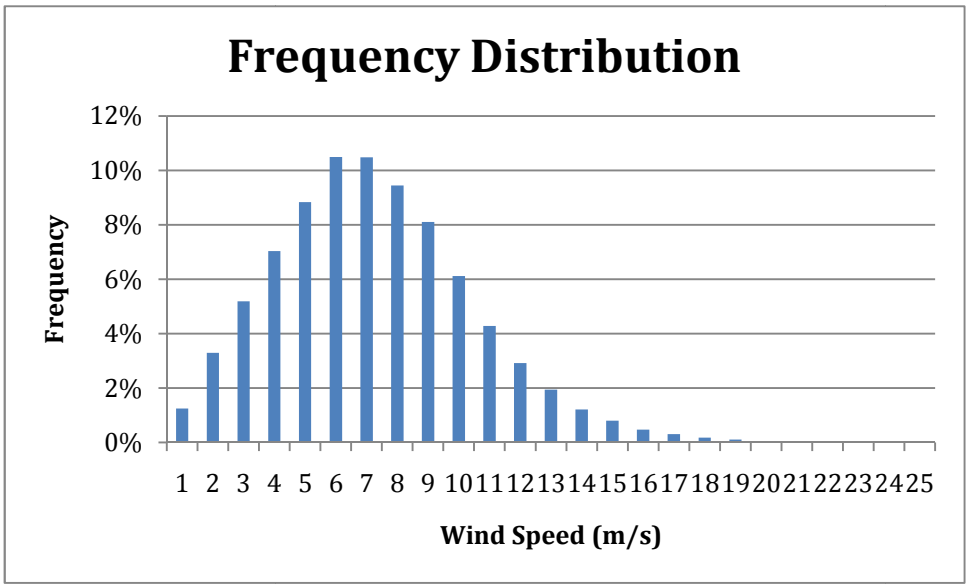



Figure 9-3 – Wind Frequency Distribution

### 9.1.8 Variation with Height

Wind shear is the relative change in wind speed as a function of height. Wind shear is calculated using a power function based upon the relative distance from the ground. The general equation used for calculating wind shear is,

$$\propto = \frac{\ln (S_1/S_0)}{\ln (H_1/H_0)}$$

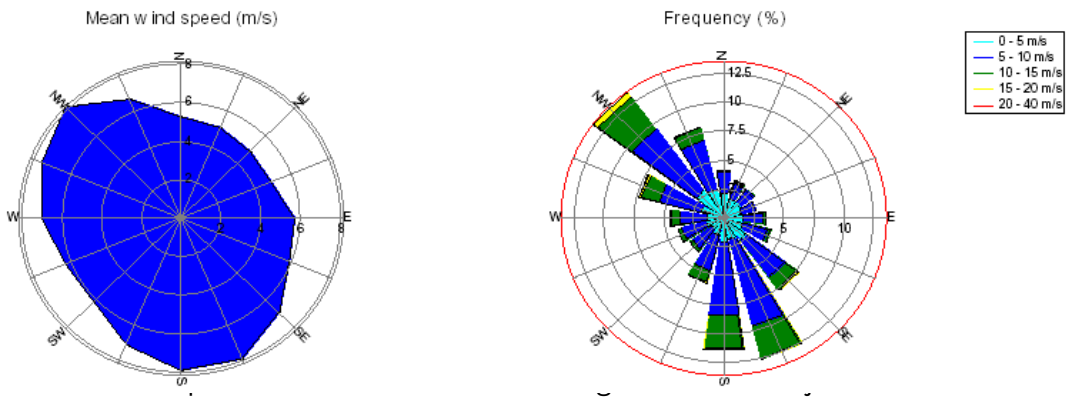
Where $S_0$ and $H_0$ are the speed and height of the lower measurement level, $S_1$ and $H_1$ are the speed and height of the upper measurement level and $\propto$ is the power coefficient. The power coefficient can vary greatly due to the terrain roughness and atmospheric stability, and will also change slightly with variation in height. The meteorological towers measure winds at a minimum of three levels, 10, 30 and 50 m (33, 98, and 165 ft). The 10-50 m wind shears typically range from 0.17 – 0.21. The shear at the 101 m (331 ft) tower above the 50 m level is 0.24.

### 9.1.9 Spatial Variations

The range of expected long-term mean annual 80 m (262 ft) wind speeds at the proposed turbine sites is a constant 7.7 m/s (17.2 mph) across the site, reflecting the fairly flat conditions of the Project site.

### 9.1.10 Wind Rose

A wind rose for the Project Area is presented in Figure 9-4 below. Prevailing direction sectors are south-southeast and northwest.




### 9.1.11 Other Meteorological Conditions

On average there are 87 clear days per year, 98 partly cloudy days per year, and 180 cloudy days per year. Precipitation (0.01 inch or more) occurs on average 118 days per year, with snow (1.0 inch or more) on 15 days per year. There are 40 days with thunderstorms per year. On average, there are 15-20 tornadoes across the entire state of Minnesota each year.

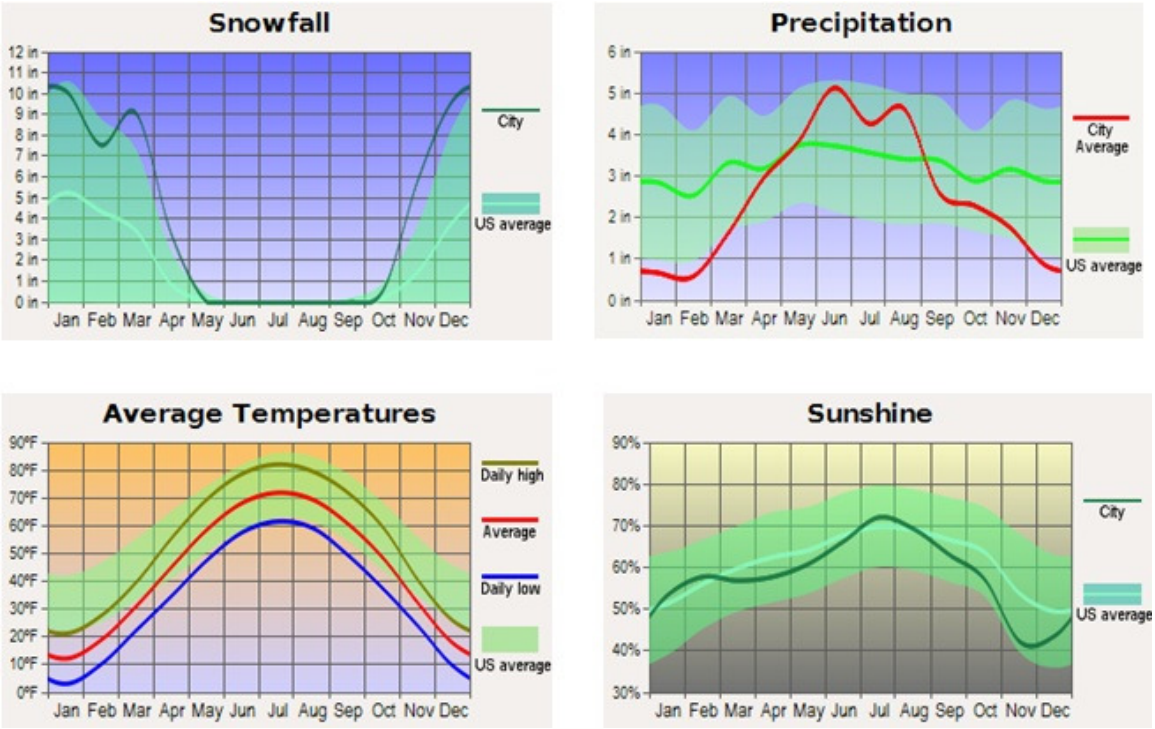



**Figure 9-5 – Blue Earth Climatic Conditions**

## *9.2 Other Wind Turbines*

The only other operating wind farm in the area is the Blue Breezes project owned by Blue Breezes, LLC. This project is approximately four miles north from the Big Blue Wind Farm, a sufficient distance to avoid any wind wake interference. Dan Moore and Roger Moore are the owners of Blue Breezes, LLC and are in full support of the efforts of Big Blue.

The Big Blue Project would not be considered an expansion of the Blue Breezes project under MN Rules 7854.0300, Subp. 3. The Moores do not have an ownership interest in Big Blue Wind Park, LLC. Further, the project was operational in 2006 – more than three years before this Application was submitted.

# 10 Project Construction

The turbines and associated facilities will be sited on agricultural land in Faribault County, Minnesota. The Applicant's proposed siting layout (included in Maps 2A and 2B) optimizes wind and land resources at the site while minimizing Project impacts. The turbines will have a rotor diameter (RD) of between 82 meters (269 ft) and 92 meters (302 ft) and the Project will have, on average, east-west spacing between individual turbines of 5 RD and north-south spacing of 20 RD. A description of turbine technology is presented in Section 5.2. A final as-built siting layout will be provided once the project has reached commercial operation.

## *10.1 Roads and Infrastructure*

Tower sections, nacelles, blades, pad-mount transformers, and all other hardware components will be delivered via semi truck from Interstate 90. The staging area for the hardware will be located within the Project Area so the parts can be unloaded and stored until they are needed at the individual site locations.

Impacts to the existing local roads will be minimal. It may be necessary to increase the radius of some corners, but this has not been determined yet. Any damage to the roads caused by turbine delivery and project construction will be repaired. Faribault County is currently creating a wind power ordinance that contains protections for County roads.

## *10.2 Access Roads*

Graveled access roads branching from existing graveled section line roads that cross the Project Area will provide access to the various rows of turbines. In some areas new roads will be designed to allow for the transportation of heavy equipment to the Project Area, and will be used throughout the life of the wind farm to allow access to and from the wind turbines, substation and meteorological towers. The turbine access roads typically may be constructed two different ways. On arid sites where there is substantial subgrade bearing capacity and little danger of precipitation challenging the soil properties, a narrow (approximately 16 foot wide) road would be constructed, with an additional 18-ft to 20-ft width graded and compacted to support the other crawler crane track. However, due to the expected soil conditions and the potential for precipitation at this site, it is anticipated that the graveled access roads must cover the full width of the crane track. The crane track is approximately 33 feet wide requiring road widths of 36 to 40 feet. In either case, the vegetative subgrade will be removed for the depth of the rock to be replaced, approximately 8 to 12 inches deep. Typically, a geotextile fabric will be installed and then the gravel will be placed, graded, and compacted (Figure 10-1). The final road surface will be flush with the original grade, allowing unhindered passage of farm machinery. Approximately 8 miles of new access roads will serve the Project.

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Project road construction will involve the use of several pieces of heavy machinery including bulldozers, track-hoe excavators, front-end loaders, dump trucks, motor graders, water trucks and rollers for compaction. Storm water controls, such as hay bales, silt fences and diversion ditches in some areas will control storm water runoff during construction in accordance with local, state and federal regulations.

## 10.3 Associated Facilities

### Meteorological Towers

Two permanent meteorological towers will be installed at the Project site to monitor the wind during the operation of the wind farm. These towers will be 80 meters (262 ft) tall. Each met tower will have a grounding system similar to that of the wind turbines with a buried copper ring and grounding rods or rods installed at the top of the towers to provide an umbrella of protection for the upper sensors. The met towers will be connected to the wind farm's central Supervisory Control and Data Acquisition (SCADA) system (described below). In addition, some of the previously permitted temporary meteorological test towers described in Section 4.3 may be kept in place for some period of time during and after construction.

### SCADA System

An 8' x 40' building will house the Supervisory Control and Data Acquisition (SCADA) system. Each turbine is connected to the central SCADA system through a network of underground fiber optic cable. The SCADA system allows for remote control monitoring of individual turbines and the wind plant as a whole from both the central host computer and from a remote computer. In the event of faults, the SCADA system can also send signals to a fax, pager, or mobile phone to alert operations staff.

## 10.4 Turbine Site Location

The Project will require several foundations, including bases for each turbine and pad transformer, and the substation equipment. Once the roads are complete for a particular row of turbines, turbine foundation construction will commence on that completed road section. Foundation construction occurs in several stages including excavation, outer form setting, rebar and bolt cage assembly, casting and finishing of the concrete, removal of the forms, backfilling and compacting, construction of the pad transformer foundation, and foundation site area restoration.

Excavation and foundation construction will be conducted in a manner that will minimize the size and duration of excavated areas required to install foundations. Foundation work for a given excavation will commence after excavation of the area is complete. Backfill for the foundations will be installed immediately after approval by the engineer's field inspectors. The Applicant plans on using on-site excavated materials for backfill to the extent possible.

The foundations used will be the Patrick & Henderson (P&H) Pile type – Post stressed (Figure 10-2). A formal geotechnical investigation, including soil borings at each foundation site will be performed to analyze soil conditions and test for voids and homogeneous ground conditions. When completed, a foundation would contain approximately 120 cubic yards of structural concrete. The P&H design would consist of a 30-35 foot corrugated metal cylinder (16-18 foot in diameter) placed vertically in the ground. A bolt cage consisting of two concentric rows of anchor bolts extending the entire length of the cylinder would be installed in a pattern matching the tower base flange bolting pattern. Once the bolt cage is placed, concrete would be installed to complete the foundation. When completed, each pier foundation would be filled with approximately 120 yards of fill. Foundation statistics are as follows:

- Depth: 30 feet
- Diameter: 16 – 18 feet
- Soil excavated: 280 cubic yards
- Materials: structural concrete and minimal rebar
- Tower mounting system: 140 thirty foot long anchor bolts

The chosen foundation design will be certified by an experienced and qualified registered structural engineer who has designed several generations of wind turbine towers and foundation systems that have proven themselves well in some of the most aggressive wind regions of the world.

The foundation work requires the use of several pieces of heavy machinery including track-hoe excavators, drill rigs, front-end loaders, dump trucks, transportation trucks for materials, cranes and boom trucks for off-loading and

assembly, compactors, concrete trucks, concrete pump trucks, backhoes and small Bobcat-type loaders.

## 10.5 Post-Construction Cleanup and Site Restoration

Since Project clean-up generally consists of landscaping and earthwork, it is very weather- and season-sensitive. Landscaping clean-up is generally completed during the first allowable and suitable weather conditions after all of the heavy construction activities have been completed. Disturbed areas outside of the graveled areas will be reseeded to control erosion by water and wind. All construction clean-up work and permanent erosion control measures will be done in accordance with the formal SWPPP for the Project.

Other Project clean-up activities might include landscaping around the substation area, washing of towers, painting of scratches on towers and exposed bolts as well as other miscellaneous tasks that are part of normal construction clean-up.

Construction clean-up will require the use of a motor grader, dump trucks, front-end loaders, and light trucks for transportation of any waste materials, packaging, etc.

## 10.6 Operation of Project

**Project Control, Management, and Service**

Contractual agreements will be arranged with the most appropriate supplier to provide on-site service and maintenance for the Project. For the first 5 years, REpower or GE, the equipment manufacturer, will be responsible for operations and maintenance for the turbines. The Applicant will have Prod Technicians seconded in the REpower or GE operating and maintenance staff. Balance of plant equipment operation and maintenance is the responsibility of the Applicant. The service and maintenance activities will be performed by qualified technicians who will report to the site operations leader.

Each wind turbine in the Project will communicate directly with the SCADA system for the purposes of performance monitoring, energy reporting, and trouble-shooting. Under normal conditions each wind turbine operates autonomously, making its own control decisions.

The SCADA system provides the O&M team with access to wind turbine generation or production data, availability, meteorological, and communications data, as well as alarms and communication error information. Performance data

and parameters for each machine (generator speed, wind speed, power output, etc.) can also be viewed, and machine status can be changed.

There is also a "snapshot" facility that collects frames of operating data to aid in diagnostics and troubleshooting of problems.

- The primary functions of the SCADA system are to:
- Monitor wind farm status
- Allow for autonomous turbine operation
- Alert operations personnel to wind farm conditions requiring resolution
- Provide a user/operator interface for controlling and monitoring wind turbines
- Collect meteorological performance data from turbines
- Monitor field communications
- Provide diagnostic capabilities of wind turbine performance for operators and maintenance personnel
- Collect wind turbine and wind farm material and labor resource information
- Provide information archive capabilities
- Provide inventory control capabilities
- Provide information reporting on a regular basis

**Maintenance Schedule**

The Applicant will remotely monitor the Project on a daily basis. This will be accompanied by a visual inspection by a maintenance manager. Several daily checks will be made in the first three months of commercial operation to see that the Project is operating within expected parameters. Once installed, the Project service and maintenance is carefully planned and divided into the following intervals:

1) First Service Inspection. The first service inspection will take place one to three months after the turbines have been commissioned. At this inspection, particular attention is paid to the tightening up of all bolts by 100 percent, a full greasing, and filtering of gear oil.
2) Annual Service Inspection. The yearly service inspection consists of a semi-annual inspection plus a full component check. Bolts are checked with a torque wrench. The check covers 10 percent of every bolt assembly. If any bolts are found to be loose, all bolts in that assembly are tightened 100 percent and the event is logged.
3) Two Years Service Inspection. The two years service inspection consists of the annual inspection, plus checking and tightening of terminal connectors.

4) Five Years Service Inspection. The five years inspection consists of the annual inspection, an extensive inspection of the wind braking system, checking and testing of oil and grease, balance check, and tightness of terminal connectors.

### General Maintenance Duties

The O&M field duties involve performing all scheduled and unscheduled maintenance including periodic operational checks and tests, regular preventive maintenance on all turbines, related plant facilities, equipment, safety systems, controls, instruments and machinery. Specific tasks include:

- Maintain the wind turbines and the mechanical, electrical power, and communications system
- Perform all routine inspections
- Maintain all oil levels and change oil filters
- Maintain the control systems, all Project structures, access roads, drainage systems and other facilities necessary for the operation
- Maintain all O&M field maintenance manuals, service bulletins, revisions, and documentation for the Project
- Maintain all parts, price lists, and computer software
- Maintain and operate interconnection facilities
- Provide all labor, services, consumables, and parts required to perform scheduled and unscheduled maintenance on the wind farm, including repairs and replacement of parts and removal of failed parts
- Manage lubricants, solvents, and other hazardous materials as required by local and/or state regulations
- Maintain appropriate levels of spare parts in order to maintain equipment
- Provide all necessary equipment including industrial cranes for removal and reinstallation of turbines
- Hire, train, and supervise a work force necessary to meet the general maintenance requirements
- Implement appropriate security methods

### Operations and Maintenance Facility

The Applicant will construct a facility to house the O&M efforts for the Project. The approximately 5,000 sq ft facility will provide office space for the crews, and a shop/storage area for spare parts and vehicles. The building may either be built on the Project site by a local contractor, or, if the location is convenient, an existing facility may be purchased and modified to function as the O&M facility in the City of Blue Earth.

## 10.7 Costs

Total installed cost for the project is estimated to be $89 million. Operation and maintenance is estimated to be $1.8 million per year.

## 10.8 Schedule

**Land Acquisition**

Exergy Minnesota Holdings, LLC has entered into options to lease land and wind rights for all of the property required to support the Project. However, the Applicant may pursue additional land to optimize the Project.

**Permits**

The Applicant will be responsible for undertaking all required environmental review, and aspires to obtain a LWECS Site Permit by April, 2011. Additional permits and agreements as required in Section 13 will be obtained prior to construction.

**Equipment Procurement, Manufacture and Delivery**

Exergy is in advanced negotiations for an agreement with both REpower and GE to provide turbines for the Project. The anticipated delivery for turbines is after spring load limits are lifted for state and county roads, generally late April or early May. Exergy has also ordered the substation transformer for the Project. Equipment delivery is pending PUC Site Permitting.

**Construction**

The construction and commissioning phase will take approximately four months to complete. Construction will commence upon PUC approval of site permit and procurement of Faribault County building permits.

**Financing**

The Applicant will be responsible for financing all pre-development, development, and construction activities, as well as permanent financing for the Project. Prior to obtaining permanent financing, the Applicant anticipates financing these activities through internal funds of its parent company.

**Expected Commercial Operation Date**

The Applicant anticipates that the Project will be commercially operational in September, 2011.

**Table 10-1 – Project Schedule**

| | |
|---|---|
| Land Acquisition | Finalized December, 2010 |
| External Financing in Place | April, 2011 |
| LWECS Site Permit Issued | April, 2011 |
| Commence Construction | May, 2011 |
| Energization Date | August, 2011 |
| Commercial Operation Date | September, 2011 |

## *10.9 Energy Projections*

When built, the Project will have a nameplate capacity of 36 MW. Assuming net capacity factors of approximately 38.2%, projected average annual output will be approximately 120,000 MWh. Net calculations take into account, among other factors, energy losses in the gathering system, mechanical availability, array losses, and system losses.

## *10.10 Decommissioning and Restoration*

The Project will be designed to meet utility-grade standards as well as a number of other stringent codes and requirements. As a result, the design life of all of the major equipment such as the turbines, transformers, substation and supporting plant infrastructure is at least 20 years.

### 10.10.1 Anticipated Project Life

Based on the site conditions, it is expected that the proposed turbine technology will continue to perform well into its third decade of operation. The current trend in the wind energy industry has been to replace or "repower" older wind energy projects by upgrading older equipment with more efficient turbines. A good portion of the value in the Project is in its proven wind resource, land agreements and in-place infrastructure. It is likely that after mechanical wear takes its toll the Project would be upgraded with more efficient equipment and therefore will be capable of sustaining a design life far beyond 20 years.

### 10.10.2 Estimated Decommissioning Cost

As the scrap value of the materials and equipment contained in the project infrastructure (steel towers, electric generators, copper wires/cables, etc.) fluctuates dramatically over time with variations in commodity prices, it is not possible to accurately estimate decommissioning costs twenty years in advance. The Applicant has conservatively included a decommissioning expense of $1.5

million in 2009 dollars in the Project's financials. This represents $2.3 million in 2029 dollars.

### 10.10.3 Updating Decommissioning Costs

Given that the planned decommissioning expense is $2.3 million in 2029, the scrap value of the project, and the likelihood that the park will be operating well beyond twenty years, it is anticipated that updating decommissioning costs will not be necessary.

### 10.10.4 Ensuring Funds Availability

To assure that the Project will meet its obligation to dismantle the wind Project, the Applicant will either establish a decommissioning fund in the amount of $25,000 per wind turbine generator to be held in escrow for the benefit of landowners, provide the landowners a corporate guaranty of the Project's decommissioning obligations from a company with an investment grade credit rating, or provide similar security acceptable to the landowners. The Applicant will establish the decommissioning security during the seventh year of the Project.

The Applicant's lease agreements with the landowners provide that all Project facilities will be removed following the end of the Project's useful life. The Applicant also reserves the right to explore alternatives regarding Project decommissioning at the end of the Project Site Permit term. One such option may be to re-apply for a Site Permit and continue operation of the Project, providing energy is sold under a new long-term contract or on a merchant basis.

Retrofitting the turbines and power system with upgrades based on new technology may allow the wind farm to produce energy efficiently and successfully for many more years.

### 10.10.5 Manner of decommissioning and restoration

Except for the underground collection system (which is provided for under a perpetual easement), the Applicant's lease agreements with the landowners provide that all wind Project facilities will be removed following the end of the Project's useful life. In particular, all foundations would be removed to a depth of 36 inches below grade and unsalvageable material would be disposed at authorized sites. The soil surface would be restored as close as reasonably possible to its original condition. The Project substation is generally valuable, and often times in older power projects the substation would revert to the

ownership of the utility. If the overhead power lines could not be used by the utility, all structures, conductors, and cables would be removed.

Reclamation procedures would be based on site-specific requirements and techniques commonly employed at the time that the area is to be reclaimed, and would include re-grading, adding topsoil, and re-vegetation of all disturbed areas. Re-vegetation would be done with appropriate seed mixes, based on vegetative cover in the Project Area. Decommissioned roads would be reclaimed or left in place based on landowner preferences, and rights-of-way would be vacated and surrendered to the landowners. Demolition or removal of equipment and facilities, to the extent necessary, will occur to meet environmental and health regulations, to salvage economically recoverable materials or to recycle the Project site for future uses.

# 11 Identification of Other Permits

The federal, state and local permits or approvals that have been identified as being required for the construction and operation of the Project are shown in Table 11-1:

**Table 11-1 – Permits and Approvals**

| Agency | Permit/Approval | Authority | Description |
|---|---|---|---|
| FAA | Notice of Proposed Construction or Alteration | 14 CFR Chap 1 Subchapter E<br>Part 77 | Establishes standards for determining obstructions and sets requirements for notice to Administrator for proposed construction. |
| USFWS | Consultation and Review of the Proposed Project regarding Federally Threatened and Endangered Species | Endangered Species Act of 1973 | The Act requires all projects that are in areas designated to be habitat for endangered species to be reviewed by FWS. |
| COE | Section 404 Permit | Clean Water Act | Required for activities that involve dredging or filling wetlands and waters of the U.S. |
| MN PUC | LEGF Certificate of Need | MN Rules 7849 | For wind turbines and transmission interconnection (as associated facility). |
| MN EQB | Site Permit | MN Rules 7854 | For wind turbines-meet threshold for LWECS requiring permit. |
| MN EQB | Route Permit | MN Rules 4400 | For transmission interconnection-meet threshold for HVTL requiring permit. |
| MN State Historic Preservation Office | Cultural and Historic Resources Review | National Historic Preservation Act; Historic Sites Act (Minn. Stat. 138.661-138.669); Field Archaeology Act (Minn. Stat. 138.31-138.42); Private Cemeteries Act (Minn. Stat. 307) | Cultural Resources Review and State and National Register of Historic Sites Review. |
| MPCA | 401 Certification | Clean Water Act | When a federal permit is required (i.e. Section 404 Permit with the Corps of Engineers) a State Water Quality |

| Agency | Permit/Approval | Authority | Description |
|---|---|---|---|
| | | | Certification/Waiver is needed. |
| MPCA | NPDES Stormwater Permit for Construction | Clean Water Act | Program designed to reduce the amount of sediment and pollution entering surface and groundwater during and after construction projects. |
| MPCA | Small Quantity Generator | MN Rules 7045 | Hazardous Waste rules regarding storage and disposal of turbine lubricating oil. |
| MN DNR | Consultation and Review of the Proposed Project regarding State Threatened and Endangered Species | Minn. Stat. §84.0895 | Establishes Guidelines for the protection of Threatened and Endangered species in the State of Minnesota. |
| MN DNR | Public Water Works | Minn. Stat. §103G.245 | Applies to activities conducted below the Ordinary High Water Level of public waters and public waters wetlands. |
| MN DNR | License to Cross Public Lands and Waters | Minn. Stat. §84.415 | Required for utilities passing over, under, or across state lands and public waters. |
| MDH | Water Well Permit | MN Well Code (Minn. Stat. §103I); Safe Drinking Water Act | Ensures development and protection of groundwater in an ordinary, healthful, and reasonable manner. |
| MDH | Plumbing Plan Review | MN Rules 4715.3130 | Ensures healthy and safe plumbing installation. |
| MDH | Wetland Conservation Act Approval | MN Stat. §103G.222-103G.2373; MN Rules 8420 | Requires proposed impacts to wetlands be avoided and minimized. |
| Faribault County | Building Permits | County Ordinance | |
| Faribault County | Individual Septic Tank Systems (ISTS) Permit | County Ordinance | |
| Faribault County | Driveway Permit | Highway Department | |

| Agency | Permit/Approval | Authority | Description |
|---|---|---|---|
| Faribault County | Utility Permit | Highway Department | |
| Faribault County | Moving Permit | Highway Department | Needed to permit oversized loads on county roads. |
| Faribault County | Overwidth/Overweight Permit | Highway Department | Needed to permit oversized loads on county roads. |
| Faribault County | Development Agreement | County Ordinance | Outlines development standards and repair protocol |
| Faribault County | Drainage Agreement | County Ordinance | Ensures damage to drainage system is repaired |
| Faribault County | | County Ordinance | Ensures damage to highways is repaired |
| Jo Daviess | Township Approvals | Jo Daviess Township | |