



AMENDED APPLICATION FOR A SITE PERMIT FOR A LARGE WIND ENERGY  
CONVERSION SYSTEM MPUC DOCKET NO. IP6701/WS-08-1233

## Goodhue Wind Project

Goodhue County, Minnesota  
October 2009



**Prepared for:**



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**Amended Application to the  
Minnesota Public Utilities Commission  
Site Permit Application for a Large  
Wind Energy Conversion System**

**Goodhue Wind Project**  
Goodhue County, Minnesota

MPUC Docket Number: IP6701/WS-08-1233

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Project Number: 20081147


October 19, 2009

**Project Name:** Goodhue Wind Project

**Project Location:** Goodhue County: T111N, R16W, Sections 1-5, 8-17, 20-29, 32-36 (Belle Creek Township)  
T111N, R15W, Sections 17-19, 30, 31 (Goodhue Township)  
T110N, R16W, Sections 1-5, 8-17 (Minneola Township)  
T112N, R16W, Sections 35, 36 (Vasa Township)  
T110N, R15W, Sections 4-6, 7-9, 16-18

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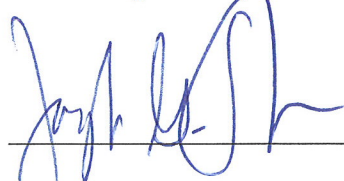
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## DEFINITIONS

AADT	Average Annual Daily Traffic
AEP	Annual Energy Production
Aggregate Surface	Road cover used for proposed access roads
ANSI	American National Standards Institute
APE	Area of Potential Effects
ASTM	American Society for Testing and Materials
BMPs	Best Management Practices; prevents soil erosion and sedimentation
Capacity	The capability of a system, circuit, or device for storing electronic charge
C-BED	Community-Based Energy Development
Class I	Cultural Resources Inventory Existing data inventory – a large-scale review and compilation of known cultural resource data
Class III	Cultural Intensive Resources Inventory field inventory – complete surface inventory of a specific area.
Commission or PUC	Minnesota Public Utilities Commission
COD	Commercial Operation Date
CON	Certificate of Need
CRP	Conservation Reserve Program
dba	A-weighted decibel
Distribution	Relatively low-voltage lines that deliver electricity to the retail customer's home or business
DOE	United States Department of Energy
EBH	Environmental Bore Hole
Electromechanical (or EM)	Of, relating to, or being a mechanical process or device actuated or controlled electrically; especially being a transducer for converting electrical energy to mechanical energy
EMF	Electric and Magnetic Field
EPC	Engineering, procurement, and construction
EPCRA	Emergency Planning and Community Right-to-Know Act
ESA	Environmental Site Assessment
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Maps
FPPA	Farmland Protection Policy Act
ft	foot/feet
GE	General Electric
Gearbox	An assembly of parts including the speed-changing gears and the propeller shaft by which the power is transmitted from an automobile engine to a live axle; the speed-changing gears in such an assembly
Generator	A machine by which mechanical energy is changed into electrical energy
Geotechnical	A science that deals with the application of geology to engineering

Hub	The central part of a circular object (as a wheel or propeller)
IA	Interconnection Agreement
Interconnection	To be or become mutually connected
kV	kilovolt
kW	kilowatt
MAPP	Mid-Continent Area Power Pool
MW	megawatt
m	meter
m/s	meters-per-second
micrositing	The process in which the wind resources, potential environmentally sensitive areas, soil conditions, and other site factors, as identified by local, state and federal agencies, are evaluated to locate wind turbines and associated facilities.
MISO	Midwest Independent Transmission System Operator
mph	miles-per-hour
Nacelle	A streamlined enclosure (as for an engine), which houses the gearbox, generator, brake, cooling system and other electrical and mechanical systems
NESC	National Electric Safety Code
NHIS	Natural Heritage Inventory System
NLCD	National Land Cover Dataset
NPDES	National Pollutant Discharge Elimination System
NRCS	National Resource Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
	Operations and maintenance facility
PII	Potential Impact Index
Pitch	The action or a manner of pitching; especially an up-and-down movement
POI	Point of Interconnection
PPA	Power Purchase Agreement
Project, the	Goodhue Wind Project
PTC	Production Tax Credit
MCBS	Minnesota County Biological Survey
MPCU, PUC or Commission	Minnesota Public Utilities Commission
RECs	Recognized Environmental Conditions
Resistance	The opposition offered by a body or substance to the passage through it of a steady electric current
Rotor	The rotor consists of three blades mounted to a rotor hub
RD	Rotor Diameter: Diameter of the rotor from the tip of a single blade to the tip of the opposite blade
ROW	Right-of-Way

rpm	revolutions-per-minute
SCADA	Supervisory Control and Data Acquisitions (communications technology)
SHPO	Minnesota State Historic Preservation Office
Step-up Transformer	A transformer that increases voltage
Substation	A subsidiary station in which electric current is transformed
SWPPP	Storm Water Pollution Prevention Plan
TI	Turbulence Intensity – a measure of the standard deviation of wind speed over an hour, divided by the mean for the same time period
Torque	A force that produces or tends to produce rotation or torsion; also a measure of the effectiveness of such a force that consists of the product of the force and the perpendicular distance from the line of action of the force to the axis of rotation : a turning or twisting force
Transformer	An electrical device by which alternating current of one voltage is changed to another voltage
Transmission	An assembly of parts including the speed-changing gears and the propeller shaft by which the power is transmitted from an automobile engine to a live axle; the speed-changing gears in such an assembly
USACE	US Army Corps of Engineers
USFWS	US Fish and Wildlife Service
WMD	Wetland Management District
WPA	Waterfowl Protection Area
WRRS	Wildlife Response Reporting System
Yaw	To deviate erratically from a course (as when struck by a heavy sea); especially to move from side to side: to turn by angular motion about the vertical axis

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## 1.0 INTRODUCTION

Goodhue Wind, LLC (Applicant or Goodhue Wind) is a Minnesota limited liability company formed for the purpose of developing the Goodhue Wind project, a 78 megawatt (MW) wind farm in Goodhue County (Project). Goodhue Wind is submitting this revised Site Permit Application (Application) to the Minnesota Public Utilities Commission (MPUC) for a site permit to construct and operate the Project. Goodhue Wind originally filed the Site Permit Application with the PUC on October 24, 2008. The Application was revised because the size of the Project area increased by several thousand acres to address future development concerns of the City of Goodhue.

The Project is a Large Wind Energy Conversion System (LWECS), as defined in the Wind Siting Act, Minnesota Statutes (Minn. Stats.) § 216F.01, and a Site Permit is required for the Project under Minn. Stats. § 216F.04. A Certificate of Need is required for the Goodhue Wind Project pursuant to Minnesota Statutes § 216B.243, subd. 8 (7). Goodhue Wind is preparing a Certificate of Need for the Project, which will be filed concurrent with this Site Permit Application.

Goodhue Wind proposes to construct the Project on approximately 32,684 acres of predominately agricultural land (Project Area) in Goodhue County in southeastern Minnesota, 50 miles southeast of Minneapolis (see **Appendix A, Exhibit A-1**). The Project involves 30-52 turbines (depending on the turbine specifications), with a total nameplate capacity of 78 MW, and includes buried collection cables, two project substations, connection transmission lines, an operation and maintenance (O&M) facility, up to two permanent meteorological towers and associated access roads. Depending on the net capacity factor of the Project, expected to be between 34 and 39 percent, the Project will generate between 230,000,000 and 270,000,000 kilowatt-hours annually. Goodhue Wind selected the General Electric (GE) xle/sle 1.5 megawatt (MW) and the REpower MM92 2.0 MW wind turbine generators for analysis of the net capacity factor and energy production for the Project as a representative mid-range turbine to maintain flexibility in selection of the final turbine.

Goodhue Wind has not made a final selection on turbines for the Project and proposes to permit the Project for a range in turbine sizes from 1.5 to 2.0 MW. Goodhue Wind uses the GE 1.5 MW machine as a representative turbine for the 1.5 MW series wind turbine and the REpower 2.0 MW machine as a representative turbine for the 2.0 MW series wind turbine. These two turbines are representative of the types of turbines in the 1.5 to 2.0 MW series range. Goodhue Wind may elect to select turbines by other turbine vendors in the 1.5 to 2.0 MW range. Goodhue Wind's schedule calls for commencement of construction in mid 2010 and commercial operation by year end 2010.

Consistent with the MPUC objectives, Goodhue Wind is committed to optimizing the generation for the Goodhue Wind Project. All decisions with respect to equipment selection, site layout, and spacing are designed to make the most efficient use of land and wind resources. Goodhue Wind will evaluate the site to optimize wind resources, transmission interconnection opportunities, and economic factors, while avoiding and minimizing impacts to environmental

resources. The turbine selected for the Project will be dependent on price, availability, operating factors (such as noise level, O&M, etc), and site suitability at the time of ordering equipment.

## 1.1 Project Location and Applicant Information

### 1.1.1 Project Location

The Project Area is located in Goodhue County in southeastern Minnesota, 50 miles southeast of Minneapolis (**Exhibit A-2**). The Project is located just north, west and south of the City of Goodhue and it is composed of approximately 32,684 acres which is mostly agricultural land. **Table 1.1** lists the Township, Range, and Sections included within the Project Site.

County	Township Name	Township	Range	Section
Goodhue	Belle Creek	111 N	16 W	1-5, 8-12, 13-17, 20-24, 25-29, 32-36
Goodhue	Goodhue	111 N	15 W	17-19, 30, 31
Goodhue	Vasa	112 N	16 W	35, 36
Goodhue	Minneola	110 N	16 W	1-5, 8-12, 13-17
Goodhue	Zumbrota	110 N	15 W	4-6, 7-9, 16-18

Goodhue Wind will site the equipment and facilities within the 32,684 acre permit area as shown in **Exhibit A-3**. This will allow some siting flexibility and will provide sufficient room for buffers that may be required for avoidance of identified infrastructure and natural resources. Goodhue Wind currently has over 10,200 acres of land under easement for site control and expects to sign an additional 2,000 acres of land within the Project Area, which is sufficient to support the Project.

The Project’s preliminary site layout is for 78 MW and potential alternate turbine locations are shown in **Exhibit A-3**. These are subject to change during the Project preconstruction surveys and, depending upon additional analysis of specific wind data and turbines’ relative performance, site control, micrositing, and the turbine procurement (see discussion in Section 2.0 for additional Project site description).

Goodhue Wind will prepare the final siting layout to optimize generation while minimizing the impact on land resources and potentially sensitive resources. The topography of the site and the selected turbine technology will dictate turbine spacing and layout of electric collection lines. The Project engineering and operational design is summarized in Section 3.0 and includes a description of turbine technology in Section 3.2. Section 4.0 presents a description of the environmental conditions that exist within the Project Area.

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The Minnesota Department of Commerce's Dispersed Renewable Generation (DRG) Study, released in June 2008, revealed two interconnection opportunities in Goodhue County; the Goodhue and Vasa substations. The study identified a total of 40 substations on distribution-sized lines throughout the state that have available capacity. National Wind was the first generator to file interconnection requests for two of these locations, Vasa and Goodhue, (securing MISO queue positions H061 and H062) following the release of the DRG study. Therefore, Goodhue Wind, LLC will benefit from the opportunity to interconnect at these particular spots.

A summary of each of these facilities is described below:

Vasa: MISO Queue number H061. The Vasa POI is located approximately three miles north of the Project Area footprint. A 34.5kV transmission line currently runs from the Vasa substation to a point close to the Goodhue Wind Project footprint. The project's feeder will collect at a proposed 69kV substation near Ryan, from which point a 69kV line must be built from the substation to the Vasa Substation, spanning four to five miles. Goodhue Wind will work with the owner of the existing distribution line extending to the Vasa Substation, which may include replacing existing poles with new structures that can accommodate the planned Project 69 kV transmission line and the existing 34.5 kv line. This will allow the Project to make use of existing road and transmission ROWs.

Goodhue: MISO Queue number H062. The Goodhue POI is located within the Project Area footprint, though we intend to interconnect at a point on the currently existing 69 kV line through a new 69kV substation adjacent to the existing 69kV transmission. No additional transmission line will be required. Similar to the Vasa Substation interconnection, Goodhue Wind will work with the owner of the existing transmission line extending to the Goodhue Substation and make use of existing road and transmission ROWs.

The revised MISO queue process allows uncongested interconnection requests to go straight to Facility Study following a review of the system impact study that MISO will complete by the end of 2009.

### **1.1.2 Applicant Information**

The Applicant is Goodhue Wind, LLC, a Minnesota limited liability company. Currently, a large number of Goodhue area landowners are participating in the Project as investors. Additionally, over 80 landowners have signed leases or participation agreements with Goodhue Wind. Once constructed, Goodhue Wind, LLC will own, operate and maintain the Project throughout its life, which is anticipated to be at least 20-30 years. Goodhue Wind expects to begin construction of the Project in mid 2010 and begin commercial operation by the end of 2010.

Goodhue Wind has received a resolution of support from Goodhue County and is in the process of being certified as a Community-Based Energy Development (C-BED) certification from the

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State of Minnesota. The Goodhue County Commissioner’s meeting minutes reflect this approval (**Appendix B**).

National Wind is the country’s largest developer of community-owned wind farms. National Wind is developing over 15 projects that will produce over 4,000 megawatts of renewable energy, bringing power to over one million homes. The goal for all National Wind projects is to encourage local ownership, local participation, and to draw the community together through community and individual benefits. National Wind shares responsibility for all project development activities from a “green field” through project construction. This includes securing site control and transmission interconnection, obtaining financing for the project, negotiating the Power Purchase Agreement (PPA) and retaining the permitting of the site.

## **1.2 Compliance with the Wind Siting Act and Minnesota Rules 7854**

The Wind Siting Act (Minnesota Statutes § 216F) requires an application for a site permit for a LWECS to meet the substantive criteria set forth in Minnesota Statutes § 216E.03, subd. 7. This Application provides information necessary to comply with these criteria and Minnesota Rules Chapter 7854. The siting of an LWECS is to be made in an orderly manner compatible with environmental preservation, sustainable development, and the efficient use of resources (Minnesota Statutes § 216F.03).

The Wind Siting Rules (Minnesota Rules Chapter 7854) govern the content and treatment of application for a LWECS site permit under the Wind Siting Act. To the extent available, Goodhue Wind has presented information required by the Wind Siting Rules. In addition, sufficient project design, wind resource, and technical information have been provided for a thorough evaluation of the reasonableness of the proposed site as a location for the Project.

### **1.2.1 Certificate of Need**

A Certificate of Need (CON) is required for a large energy facility. Under Minnesota Statutes §§216B.2421 and 216B.243, subd. 2, and Minnesota Rules Chapter 7849, a CON is required for the Goodhue Wind Project because it is larger than 50 MW. However, Minnesota Statutes §216B.243, subd. 9, provides an exemption for CON requirements and an alternate review process for wind energy conversion systems intended to be used to meet or exceed the obligations of the Renewable Energy Standard (RES). While the Goodhue Wind Project falls within this exemption, Goodhue Wind has elected to proceed with a CON application rather than the new alternative permitting contemplated under Minn. Stat. §216B.243, subd. 9, because the procedures and timelines for a CON application are better known to the Applicant. Goodhue Wind plans to follow parallel review paths for its Site Permit and CON applications.

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### 1.2.2 State Policy

Pursuant to Minnesota Statutes § 216F.03, Goodhue Wind will further state policy by siting the Project in an orderly manner compatible with environmental preservation, sustainable development, and the efficient use of resources. Goodhue Wind is designing the Project to space turbines to maximize wind development while minimizing the impact on area land resources.

## 2.0 PROJECT AREA AND WIND RESOURCES

### 2.1 General Wind Characteristics

The United States Department of Energy (DOE) and the Minnesota Department of Commerce (DOC) have conducted wind resource assessment studies in Minnesota since 1982. In 2006, wind speed maps of the state of Minnesota were developed for the DOC by WindLogics. Data used to develop the Wind Maps was statistically adjusted to accurately represent long-term (40 year) wind speeds over Minnesota. In the vicinity of the Project Area, the mean annual wind speed at an elevation of 262 feet (80 meters) above ground level is mapped as 13.7 to 17.7 miles per hour (mph) (6.14 to 7.92 meters per second). At an elevation of 328 ft (100 m) above ground level, mean annual wind speed is mapped as 15.3 to 19.0 mph (6.83 to 8.50 m/s).

### 2.2 Specific Wind Characteristics in Project Area

On February 3, 2009, Goodhue Wind installed a temporary meteorological (met) tower within the Project Area (**Exhibit A-3**). Preliminary data from this met tower indicates favorable wind resources within the Project Area and it supports wind data at sites located near the Project. While data from this met tower is still being collected and analyzed by Goodhue Wind for use in siting and designing the Project, for this Application Goodhue Wind has analyzed wind data for a 229.7 ft (70 m) meteorological (met) tower from the Minnesota DOC to better understand Project Area wind characteristics. The met tower has an elevation of approximately 1,300 ft and is located approximately 50 miles southwest of the Project Area near the city of Clarks Grove, Minnesota. The elevation within the Project Area ranges from 929 to 1,243 feet (283.2 to 378.9 meters). The Project Area lies within a geographic region that has been historically proven viable for the deployment of wind turbine generators and based on the available data, the Clarks Grove met tower and Project Area site can be judged as having similar wind climates.

Wind data was available from June 1996 to July 2007 for the Clarks Grove met tower. However, due to a malfunction of the sensors, data from June 1996 to March 2002 were used for this analysis. Approximately 87 percent of the data from June 1996 to March 2002 was available for analysis after anomalies were excluded from the dataset. Goodhue Wind is in the process of assessing the long term wind climate over the Project site and simulating the performance of various commercial wind turbine generators.

WindPRO software was used to analyze the available wind data from the Clarks Grove met tower and make corrections for the site effects (topography, surface roughness, and obstacles) to produce a characterization of the local wind climate. The resulting local wind climate was applied to predict the spatial wind variations at the Project Area. The description of on-site wind climate presented here is based on measurements recorded at a height of 229.7 ft (70 m) from the Clarks Grove meteorological station. Pertinent resource assessment within the Project Area is presented below.

### 2.2.1 Interannual Variation

The long term value of the average annual wind speed at the 229.7 ft (70 m) height was 16.1 mph (7.2 m/s) for the 5.5 year time period with a range of 15.0 to 18.3 mph (6.7 to 8.2 m/s). This indicates a total variability of roughly 20%.

### 2.2.2 Seasonal Variation

Based on calculated long term monthly average wind speeds at the Clarks Grove met station, it is expected that the monthly wind speeds will vary between 12.5 and 18.1 mph (5.6 and 8.1 m/s) around the mean of 16.1 mph (7.2 m/s) in a normal year. This indicates variability of as much as 34% from the long term average for any given month. By meteorological season, average wind speeds will vary from season to season from the long term average in a normal year. **Table 2-1** presents the deviation from the long term mean. In general, the average wind speeds are highest during the winter and lowest during the summer; average wind speed generally increases through the fall and decreases through the spring.

Month	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Annual Avg.
Wind Speed in mph (m/s)	16.6 (7.4)	17.7 (7.9)	17.9 (8.0)	16.8 (7.5)	17.7 (7.9)	17.4 (7.8)	14.5 (6.5)	13.2 (5.9)	12.5 (5.6)	14.8 (6.6)	18.1 (8.1)	17.2 (7.7)	16.1 (7.2)
Seasonal	17.4 (7.8)			17.4 (7.8)			13.4 (6.0)			16.8 (7.5)			
	Winter			Spring			Summer			Fall			

<sup>a</sup> Based on 5.5 years of data collected between June 1996 and March 2002.

### 2.2.3 Diurnal Conditions

Wind climates for this region of the continent are generally stronger during nighttime hours and early morning hours declining during midday during most seasons (and years). The highest average wind speed is generally greatest during the late night. The lowest wind speeds are in mid-morning and early evening.

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## 2.2.4 Atmospheric Stability

The local wind climate is depended on two atmospheric characteristics: the jet stream and synoptic scale weather systems<sup>1</sup> (Source: National Weather Service Jetstream). The wind regime is influenced by the jet stream's location and strength. In the winter months and the fall transition season, the jet stream dips to the south into the lower plains of the United States, and this protruding dip creates strong pressure gradients in which synoptic scale weather systems travel upon. These strong pressure gradients create strong and high winds in the upper Midwest. In the spring transition season, the jet stream begins to start moving north into the upper plains and into Canada, and continues to do so in the summer months. As the jet stream moves further north the pressure gradient begins to weaken. By the time the summer months approach the pressure gradients are weak, creating weaker synoptic scale systems, and lower wind speeds.

## 2.2.5 Hub Height Turbulence

The Turbulence Intensity (TI) is defined as the measured standard deviation of wind speed over an hour, divided by the mean for the same time period. Average TI at the 229.7 ft (70 m) elevation at the Clarks Grove Station (for all sectors and all wind speeds) is calculated to be 13.2% for the measurement period. The TI is also calculated as 13.2% across the normal operating range for most suitable, commercial wind turbine generators (8.9-55.9 mph or 4-25 m/s).

## 2.2.6 Extreme Wind Conditions

While extreme wind conditions are rare in southeastern Minnesota, they are possible. The maximum recorded gust at the 70 meter elevation at the Clarks Grove Station for the period was recorded at 26.33 m/s. Using a conservative gust factor of safety of 1.3, the maximum probable gust would still not be in excess of the design parameters of most suitable, commercial wind turbine generators. Extreme temperature range is expected be between 97.7 and -20.2° F (36.5 and -29° C). Glaze icing may occur up to 6 percent of the operating hours of the year for wind turbines, which will be mitigated by siting the wind turbines in accordance with required setbacks and operational controls.

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<sup>1</sup> The word synoptic means "view together" or "view at a common point". Therefore, synoptic meteorology is primarily concerned with viewing the weather at a common point -- time. Also known as large scale or cyclonic scale, the size of weather patterns we are looking at range upwards from about 620 miles (1,000 kilometers) across to about 1,500 miles (2,500 kilometers). See [http://weather.about.com/gi/o.htm?zi=1/XJ&zTi=1&sdn=weather&cdn=education&tm=28&gps=60\\_191\\_1260\\_644&f=00&tt=8&bt=0&bts=0&zu=http%3A//www.srh.noaa.gov/jetstream//synoptic/synoptic\\_intro.htm](http://weather.about.com/gi/o.htm?zi=1/XJ&zTi=1&sdn=weather&cdn=education&tm=28&gps=60_191_1260_644&f=00&tt=8&bt=0&bts=0&zu=http%3A//www.srh.noaa.gov/jetstream//synoptic/synoptic_intro.htm)

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### 2.2.7 Wind Speed Frequency Distribution

According to the Clarks Grove data, nearly 86.37% of all hourly average wind speed frequencies are calculated to fall between 7.8-57.0 mph (3.5-25.5 m/s). On-site data generally confirms this information. A histogram of the expected wind speed frequency distribution based upon data from the existing met tower located within the Project Area is displayed in **Exhibit A-4**.

### 2.2.8 Wind Variation with Height

The tendency for wind speed to increase with height above ground is called wind shear. The general equation used for calculating wind shear is  $S/S_0 = (H/H_0)^\alpha$ , where  $S_0$  and  $H_0$  are the speed and height of the lower level and  $\alpha$  is the power coefficient. The power coefficient can vary greatly due to the terrain roughness and atmospheric stability. The power coefficient will also change slightly with variation in height. Wind shear coefficients (alpha values) are a commonly accepted descriptor of wind variation across vertical distance in the wind energy industry. The wind shear alpha value calculated for the period of measurement at the Clarks Grove Station between 196.9-229.7 ft (60-70 m) was 0.16, which is assumed normal for the topography and land cover typical to southeastern Minnesota.

### 2.2.9 Spatial Wind Variation

The Project site power variation is expected to be minimal due to the gradual elevation changes on site. The Clarks Grove wind resource map in **Exhibit A-4** demonstrates that higher wind speeds in the Project Area. These high wind speed sites correspond to the area with higher elevation. The local topography shows no extreme slopes that would create wind to shift from one direction to another, changing the wind regime. The ground cover is composed of farmland and farm homesteads with windbreaks. The roughness of the site will not to play a major factor in losses.

### 2.2.10 Wind Rose

A wind rose is a graphical presentation that shows the various compass points, and specifies the frequency that the wind is observed to blow from a given compass point. Small-scale variations are expected at the proposed site depending on individual turbine height and exposure. Data from the on-site met tower indicates that the prevailing energy/wind direction is WNW, with significant wind energy from the S and SSE sectors. A wind rose for the Project Area met tower is presented in **Exhibit A-5**.

## 2.3 Other Meteorological Conditions

Minnesota has a continental-type climate characterized by frequent occurrences of continental polar air throughout the year, with occasional Arctic outbreaks during winter and occasional

periods of prolonged heat during the summer, especially in southern Minnesota when warm air moves in from the Gulf of Mexico and southwestern United States. Pacific Ocean air masses moving across the western United States allow for mild and dry weather conditions during all seasons. While the climate within the Project Area is fairly uniform due to relatively little topographic relief and lack of large water bodies, extreme weather events, such as tornados, high thunderstorm winds, high winds and blizzard conditions, do occur and are discussed further in this section.

Specific climatological data does not exist for the Project Area. However, data from a climate station located near Red Wing approximately 13 miles northeast of the Project Area should be representative of the Project Area. A summary of temperature and precipitation from the Red Wing Dam 3 climate station is provided in **Table 2-2**.

Month	Temperature (°F)					Precipitation (Inches)	
	Avg. Daily Max	Avg. Extreme Max	Avg. Daily Min.	Avg. Extreme Min	Avg.	Rainfall Average	Snowfall Average
Jan	21.5	26.7	2.5	3.8	12.0	0.81	10.5
Feb	28.0	31.1	8.9	10.4	18.5	0.64	6.1
Mar	40.0	40.3	21.9	23.01	31.0	1.71	6.5
Apr	55.6	51.5	36.0	40.6	45.8	2.73	1.7
May	69.4	64.5	47.6	52.6	58.5	3.49	0.0
Jun	78.6	72.3	56.6	64.0	67.6	4.03	0.0
Jul	82.6	76.4	61.5	65.1	72.1	4.25	0.0
Aug	80.2	74.1	59.5	65.0	69.9	3.97	0.0
Sept	71.1	65.9	50.1	54.9	60.6	3.48	0.0
Oct	58.5	54.3	38.0	46.4	48.3	2.17	0.1
Nov	40.1	45.2	24.4	23.6	32.3	1.81	4.5
Dec	26.8	28.4	10.2	7.5	18.5	0.86	7.6
Annual	54.4	48.3	34.8	39.9	44.6	29.95	37.0

Sources: National Climatic Data Center website accessed October 2008 and Midwest Regional Climate Center accessed October 2008. Historical Climate Data, normals, means, and extremes from Red Wing Dam 3 climate station No. 216822 (1971-2000), State Climatology Office.

Extreme weather events in the Project Area have been recorded by the National Climatic Data Center (NCDC) for the period of time from January 1950 through June 2008. Extreme weather events include tornadoes/funnel clouds, hail, thunderstorm wind, high wind, blizzards, extreme cold/low wind chill, glaze, heavy ice and snow, blowing snow, excessive heat, fog, floods, and flash floods.

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For the City of Goodhue, the NCDC records indicate the occurrence of one tornado (1997), one funnel cloud (2004), six hail events (1998, twice in 2001, twice in 2002, and 2006), and four thunderstorm wind events (twice in 1998, 1999, and 2006). None of these events resulted in injuries, death or property damage. The NCDC also recorded additional thunderstorm wind, high wind, tornadoes, hail, flooding, and excessive heat events in Goodhue County in the vicinity of the Project Area during this period. Typically, such storms are local in extent, of short duration and result in damage to relatively small geographic areas.

In 2005 the Minnesota DOC, with the assistance of WindLogics, Inc., prepared a wind resource map called the Regional Wind Analysis State Wind Speed Map for the state of Minnesota (Wind Map). Data used to develop the Wind Map was statistically adjusted to accurately represent long-term (40 year) wind speeds over Minnesota. Based on this information, wind speed across Goodhue County at 262.5 ft (80 m) ranges from 13.6 to 17.7 mph (6.1 to 7.9 m/s) and at 328 ft (100 m) it ranges from 15.2 to 19.0 mph (6.8 to 8.5 m/s), with lower wind speeds concentrating in the northeast portion of the county along the Mississippi River Valley.

## **2.4 Wind Rights**

Goodhue Wind has obtained wind right options and easements that are near sufficient to support the Project. Within the approximate 32,684 acre Project Area, Goodhue Wind has easements for over 10,200 acres and indications for land rights for an additional approximately 3,000 acres at the time of this Application. Land right leases and wind easements will encompass the proposed wind farm and all associated facilities, including but not limited to wind and buffer easements, wind turbines, access, transmission feeder lines, and mitigation of environmental impacts incurred due to development.

In addition to wind resource considerations, the Project Area was selected based on its close proximity to available transmission infrastructure and points of interconnection. Land-use patterns and environmentally sensitive features were factored into the site selection criteria. While the Project Area encompasses approximately 32,684 acres, the land occupied by the wind farm would be approximately  $\frac{3}{4}$  of one acre per turbine, including roads - less than one half of one percent ( $>0.05\%$ ) of this area, assuming up to 52 turbines and associated facilities and access roads.

It is anticipated that the area of direct land use for 52 x 1.5 MW turbines and gravel access roads would be approximately 39 acres. This is a generous estimate. If 39 x 2.0 MW turbines are used, approximately 30 acres of direct land use will be required for the turbines and access roads. An additional 8 acres is anticipated to be required for the Project Substations and O&M facility.

## **3.0 ENGINEERING AND OPERATIONAL DESIGN OF PROJECT**

This section provides a summary description of the Project layout and associated facilities, wind turbines and related structures, electrical system, construction, operation and maintenance, costs, schedule and decommissioning/restoration of the site.

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### 3.1 Project Layout and Associated Facilities

The Project will consist of an array of wind turbines, transformers, collection and transmission lines, two project substations, access roads, two meteorological towers, and an O&M building. The Project's preliminary site layout is for 78 MW and potential alternate turbine locations are shown in **Exhibit A-3**, which are subject to change during the Project preconstruction surveys and micrositing.

The electrical system design and interconnection details will be determined based on studies currently underway. The turbines will be interconnected by communication and electric power collection lines within the wind farm. The communication and electric power collection lines are planned to be underground.

In addition, the wind farm facilities will include electrical collection lines and junction boxes that deliver the electricity to the Project Substations, which are planned to be connected in two locations. First, the southern 39 MWs will be connected to the transmission system through an existing 69 kV line to the POI near the Goodhue substation, which is owned by Xcel Energy in Goodhue County located in Goodhue Township as indicated in **Exhibit A-3**. The second interconnection will be through a new 69kV line leading to a switching substation adjacent to the Vasa Substation. A 69kV line would then tap into the 69kV system in the Vasa substation, a cooperative facility operated by Great River Energy (GRE) in Goodhue County located at the intersection of County Road 19 and County Road 51 in Vasa Township (**Exhibit A-3**). The layout will also take into account the locations of existing wind turbines in the vicinity of the Project (**Exhibit A-6**), for both setback and operational efficiency considerations.

Land will be graded on-site for the turbine pads. Drainage systems, access roads, storage areas, and shop and O&M facilities will be installed as necessary to fully accommodate all aspects of the construction, and operation and maintenance of the wind farm.

The Project includes a computer-controlled communications system that permits automatic, independent operation and remote supervision, thus allowing the simultaneous control of the wind turbines. Each wind turbine will be programmed to operate autonomously, and will make its own control "decisions" under normal conditions. The turbines will continuously communicate with a Supervisory Control and Data Acquisition (SCADA) system that monitors operation and energy production. The SCADA system monitors the wind farm status and alerts operations personnel to operational conditions that require attention. The SCADA system collects data on wind turbine generation, availability, alarms and communication error information, and meteorological and communications data. Performance data and parameters for each machine can also be viewed in real time, and machine status can be changed. The SCADA system also reports and archives generation data. Design of the SCADA system is not yet finalized.

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The 39 to 52 turbines will be monitored and operated remotely. Goodhue Wind, LLC will enter into contractual agreements with a third party(ies) to provide off-site operations, and on-site service and maintenance for the Project.

On-site service and maintenance activities include routine inspections, regular preventive maintenance on all turbines and related facilities, and unscheduled maintenance and repair. Routine minor maintenance on the wind turbines, electrical power system, and communications system may include maintenance of oil levels and filters, tightening of bolts, minor electrical repairs, upgrading of computer software, and system testing. Civil maintenance includes maintaining project structures, access roads, drainage systems, and other facilities. The third party may also provide labor, services, consumables, and parts required to perform scheduled and unscheduled major maintenance on the wind farm, including repairs and replacement of parts and removal of failed parts.

## **3.2 Operational Design**

### **3.2.1 Description of Turbines, Towers and Foundations**

Wind-powered electric generation is entirely dependent on the availability of the wind resource at a specific location. The energy available from the wind is proportional to the cube of the wind velocity. Therefore, a doubling of the wind velocity will increase the available energy by a factor of eight times. Analysis of wind direction data suggests that the optimal turbine string alignments are generally from southwest to northeast. Design of the turbine array and collection system will minimize energy loss due to wind turbine wakes, turbulence, and electrical line losses.

The Project will have a nameplate capacity of up to 78 MW. Assuming a NCF of 34 to 39 percent, the projected average annual output will be between approximately 230,000,000 and 270,000,000 kilowatt-hours (KWh). As with all wind energy projects, output will depend on final design, site-specific features, and equipment.

Goodhue Wind is currently in the process of determining which turbine manufacturers it would like to procure turbines from. The criteria used in turbine selection are: 1) availability of turbines; 2) cost of turbines; 3) proximity of turbine manufacturer to project footprint; and 4) turbine suitability for the Project's wind data.

The Application uses the GE 1.5 MW xle series wind turbine as a representative turbine for the 1.5 MW Class and the REpower MM92 wind turbine as a representative turbine for the 2.0 MW Class. Goodhue Wind may select turbines by other turbine vendors in the 1.5 to 2.0 MW range; these turbines may have slightly different hub heights and/or rotor diameters (RDs). **Table 3-1** shows the characteristics for the GE and REpower turbines.

<b>Table 3-1: Wind Turbine Characteristics</b>		
<b>Design Features</b>	<b>REpower MM92 Wind Turbine</b>	<b>GE 1.5 MW xle Wind Turbine</b>
Nameplate Capacity	2.0 MW (39 units X 2.0 MW = 78 MW)	78 MW (52 units X 1.5 MW = 78 MW)
Hub Height	262.5 ft (80 m)	262.5 ft (80 m)
Total Height	414.2 ft (126.3 m)	397 ft (121 m)
Rotor Diameter	303.5 ft (92.5 m)	271 ft (82.5 m)
Design Life	Minimum of 20 years	Minimum of 20 years
Cut in Wind Speed	6.7 mph (3.0 m/s)	7.8 mph (3.5 m/s)
Rated Capacity Wind Speed	25 mph (11.2 m/s)	25.7 mph (11.5 m/s)
Cut out Wind Speed	53.6 mph (24.0 m/s)	20 mph (8.9 m/s)
Rotor Speed	7.8 to 15.0 rpm	10.1 to 22.2 rpm (variable)
Distance to 50 dBA Noise Level	656 ft (200 m)	725 ft (221 m)
Power Regulation	Electrical blade angle adjustment; pitch and speed control	Each turbine will be equipped with GE's patented WindVAR Control capability (active blade pitch control) and Low Voltage Ride-Thru technology (LVRT) for demanding reliability standards.
Generation	690 V (50 Hz)	690 V per turbine
Tower	Steel tubular tower	Multi-coated, conical tubular steel with safety ladder to the nacelle (service platform for 10 m hub height)
Nacelle bedplate	Steel	Cast Iron
Main Bearings	Spherical roller bearing	Dual bearing main shaft to reduce axial and radial loads on the gearbox
Supervisory Control and Data Acquisition (SCADA)	Each turbine is equipped with a REguard SCADA system	Each turbine is equipped with SCADA controller hardware, software and database storage capability.
FAA Lighting	Standard FAA lighting	Standard FAA lighting
Foundation	Reinforced concrete foundation with foundation insert, adjusted on site conditions	Per manufacturer specifications, foundation structural engineer design, and site conditions

A control panel inside the base of each turbine tower houses communication and electronic circuitry. Each turbine is equipped with a wind speed and direction sensor that communicates to the turbine's control system to signal when sufficient winds are present for operation. The development site will also include an automated SCADA system located at the project substations. The turbines feature variable-speed control and independent blade pitch to assure aerodynamic efficiency.

The towers are either conical tubular steel or cylindrical/tapered tubular steel. The turbine towers, where the nacelle is mounted, typically consist of three to four sections manufactured from certified steel plates. Welds are typically made in automatically controlled power welding machines and ultrasonically inspected during manufacturing per American National Standards Institute (ANSI) specifications. All surfaces are typically sandblasted and multi-layer coated for protection against corrosion. Access to the turbine is typically through a lockable steel door at the base of the tower. Platforms are connected with a ladder or lift and a fall arresting safety system for access to the nacelle.

The foundations will be designed by a licensed foundation structural/geotechnical engineer in accordance with manufacturer’s specifications based upon site soil conditions and applicable load criteria (e.g. inertia, mass and aerodynamic forces). Typical foundation design include freestanding towers connected by stud races embedded in concrete or by anchor bars embedded in the foundation with high quality grout (e.g. L-flange tower base or T-flange tower base). Geotechnical surveys, turbine tower load specifications and cost considerations will dictate final design parameters of the foundations.

### 3.2.2 Setbacks

Article 18 of the Goodhue County Zoning Ordinance (Ordinance) regulates the installation and operation of Wind Energy Conversion Systems (WECS) within Goodhue County (**Appendix C**) not otherwise subject to siting and oversight by the State of Minnesota under the Minnesota Power Plant Siting Act (Minn. Stats. Chapter 116C.57-116C.697). The 78 MW Project is considered a commercial WECS under the Ordinance because it is a WECS of equal to or greater than 100 kilowatts in total nameplate generating capacity.

In accordance with the Ordinance, Goodhue County has established setback requirements for commercial WECS as indicated in **Table 3-2**.

<b>Table 3-2: Goodhue County Commercial WECS Setbacks</b>	
Property Lines <sup>a</sup>	1.25 times the total turbine height
Neighboring Dwellings <sup>b</sup>	750 feet (229 m)
Road Rights-of-Way <sup>c</sup>	1.1 times the height (may be reduced for minimum maintenance roads or a road with an average daily traffic count of less than 10)
Other Rights-of-Way (railroads, power lines, etc.)	The lesser of 1.1 times the total turbine height or the distance of the fall zone, as certified by a professional engineer plus 10 feet
Public Conservation Lands Managed as Grasslands	600 feet (183 m)
Wetlands	NA
Other Structures	The fall zone, as certified by a professional engineer, plus 10 feet (3 m) or 1.1 times the total turbine height.

Other Existing WECS	To be determined through Conditional Use Permit review based upon: 1) relative size of the existing and proposed WECS; 2) alignment of the WECS relative to the predominant winds; 3) topography; 4) extent of wake interference impacts on existing WECS; 5) other setbacks required; 6) waived for multiple turbine projects including aggregated projects.
Bluffs	1,350 feet (412 m) from top of bluff (Mississippi River and Cannon River), 500 feet (152 m) from top of bluff from other bluffs in shoreland areas or for non-shoreland bluffs.

<sup>a</sup> The Ordinance defines “Property line” as the boundary line of the area over which the entity applying for a WECS permit has legal control for the purposes of installation of a WECS. This control may be obtained through fee title ownership, easement, or other appropriate contractual relationship between the project developer and landowner.

<sup>b</sup> The setback for dwellings shall be reciprocal in that no dwelling shall be constructed within 750 feet of a commercial wind turbine.

<sup>c</sup> The setback shall be measured from future rights-of-way if a planned changed or expanded right-of-way is known.

Pursuant to Section 4 of Article 18, minimum setback standards for substations and feeder lines for a WECS are governed by Article 15 (Essential Services) of the Ordinance. Substation setbacks are 0 feet per structure setback from road right-of-way located wholly outside the right-of-way and 0 feet per structure setback from property lines and side yard. Additional Ordinance requirements and standards, such as safety, height, tower configuration, met towers, color and finish, lighting, etc. for WECS are provided in Section 5, Article 18. The WECS ordinance incorporates other applicable standards, including noise (Minnesota Rules, Chapter 7030), electrical codes and standards (National Electrical Code and other applicable standards), FAA, Uniform Building Code, and requires the applicant minimize or mitigate interference with electromechanical (EM) communications.

**Table 3-3** identifies the most conservative setbacks applicable to the Project, based on the representative turbines discussed above and Ordinance setback requirements. To the extent possible, Goodhue Wind plans to design and construct Project turbines, substations and associated facilities in accordance with Goodhue County Ordinances. Goodhue Wind has voluntarily implemented an occupied residence setback of 1,500 feet. Goodhue Wind reserves the right to setback 1,000 feet from participating residents that agree to a shorter setback. The exact residence setback will be determined by number of turbines in proximity to the residence and the preferences of the landowner. Goodhue Wind will work with Goodhue County to address any proposed turbine sites whereby a road ROW of less than 1.1 times the height may be appropriate.

<b>Turbine Description</b>	<b>Property Lines</b>	<b>Neighboring Dwellings<sup>a</sup></b>	<b>Road ROW<sup>b</sup></b>	<b>Other ROWs (railroads, power lines, etc.)<sup>c</sup></b>	<b>Public Conservation Lands Managed as Grasslands</b>	<b>Other Structures</b>
1.5 MW GE xle turbine with 397 ft (121 m) total height	496 ft (151 m)	750 ft (229 m)	437 ft (133 m)	437 ft (133 m) or distance of fall zone plus 10 feet (3 m)	600 ft (183 m)	437 ft (133 m) or distance of fall zone plus 10 feet (3 m)
REpower MM92 turbine with 412 ft (126 m) total height	515 ft (158 m)	750 ft (229 m)	453 ft (139 m)	453 ft (139 m) or distance of fall zone plus 10 feet (3 m)	600 ft (183 m)	453 ft (139 m) or distance of fall zone plus 10 feet (3 m)

<sup>a</sup> The setback for dwellings shall be reciprocal in that no dwelling shall be constructed within 750 feet (229 m) of a commercial wind turbine (see Ordinance, Section 4).

<sup>b</sup> The setback shall be measured from future rights-of-way if a planned change or expanded right-of-way is known (see Ordinance, Section 4).

<sup>c</sup> The lesser of 1.1 times the total height or the distance of the fall zone, as certified by a professional engineer, plus 10 feet (see Ordinance, Section 4).

### **3.3 Related Equipment and Facilities**

#### **3.3.1 O&M Facility**

An operations and maintenance facility will be constructed as part of this Project. The location for the O&M facility has not yet been determined. Buildings used for O&M measure approximately 3,000 to 5,000 square feet (914.4 to 1,524 square meters), and they house equipment to operate and maintain the wind farm. The O&M facility will house the medium voltage (MV) switchgear for the Project and will be located near the Project Substation and interconnect transmission line. A gravel parking lot will be installed adjacent to the O&M facility.

#### **3.3.2 Step-Up Transformers and Project Substations**

Based on preliminary design plans, power will be collected from each turbine and transformed at the turbine pad to 34.5 kV via a pad mount transformer. All of the turbine transformers will be connected via an underground 34.5 kV collection system to two collector Project Substations. Power cables and communication lines, if a wireless system is not used for communication, will be buried in trenches adjacent to the Project access roads on private property under easement or under consideration for easement for this service. The cable system will be routed to two nominally rated 60 megavolt amp (MVA) 34.5 kV/69 kV transformers located at two separate

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collector Project Substations within the collector footprint. Power will then be transmitted to the point of grid interconnection at the Goodhue and Vasa Points of Interconnection, located just east and north of the Project Area.

The construction of the collector substations and interconnection into the Points of Interconnection will conform to MISO standards. An Interconnection Agreement (IA) is currently being studied by MISO. The IA will be in place prior to commencement of commercial operation of the 78 MW Project.

### **3.3.3 Power Collection Lines and Interconnection**

In addition, the wind farm facilities will include electrical collection lines and junction boxes that deliver the electricity to the Project Substations, which are planned to be connected in two locations. First, the southern 39 MWs will be connected to the transmission system through an existing 69 kV line to the POI near the Goodhue substation, which is owned by Xcel Energy in Goodhue County located as indicated in **Exhibit A-3**. The second interconnection will be through a new 69 kV line leading to a switching substation adjacent to the Vasa Substation. A 69 kV line would then tap into the 69 kV system in the Vasa substation, a cooperative facility operated by Great River Energy (GRE) in Goodhue County located at the intersection of County Road 19 and County Road 51 in Vasa Township (**Exhibit A-3**).

### **3.3.4 Roads and Temporary Construction Areas**

Permanent service roads will be built adjacent to the towers, allowing access both during and after construction. The permanent roads will be approximately 16 feet (4.9 m) wide and have gravel as cover, adequate to support the size and weight of maintenance vehicles and to allow passage under inclement weather conditions. These roads will be sited in consultation with local landowners and will meet state and local requirements. The specific turbine locations will determine the amount of roadway that will be constructed for this Project. In addition, there will be a 35 foot (10.7 m) diameter gravel work area centered on the base of each turbine. They will be located to facilitate both construction (cranes) and continued operation and maintenance. Siting roads in areas with unstable soil will be avoided wherever possible. All roads will include appropriate drainage and culverts while still allowing for the crossing of farm equipment.

The roads will consist of graded dirt, overlaid with geotechnical fabric (if needed) and covered with gravel. To facilitate crane movement and equipment delivery, additional gravel roadway will be temporarily installed on either side of the permanent roadway. The temporary roads will be approximately 45 feet (13.7 m) wide.

In addition, turbine assembly will require an approximate 40 by 120 foot (12.2 by 36.6 m) gravel crane pad area extending from the access road to the turbine foundation which will be graded to a minimum of one percent, and an approximate 260 to 335 foot (79.3 to 102.1 m) area for

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component lay down and rotor assembly centered close to the turbine foundation which will be graded to a minimum of 5 percent.

After construction, the temporary construction areas adjacent to the turbine pads and access roads will be restored. The site will be graded to natural contours, soil will be loosened if needed, and the site will be seeded if needed. Once construction is completed, the access roads will be regraded, filled, and dressed as needed.

### **3.3.5 Permanent Meteorological Towers**

Upon complete construction of the Project, Goodhue Wind will install up to two permanent meteorological towers at the Project site. One to two 80 m (262.5 ft) towers would be constructed in an appropriately sited location for proper operation of the wind assessment equipment. The towers are equipped with a Symphonie logger (or equivalent) connected to calibrated anemometers, wind direction sensors, and a temperature probes that can be configured at 40 m, 50 m and 60 m levels. Ground area required to install the meteorological towers measures approximately 340 by 385 feet (103.6 by 117.4 m), with additional land required for access roads to the met tower site.

## **3.4 Construction**

An Engineering/Procurement/Construction (EPC) contractor will be hired for the construction management of the Project. Other contractors may be hired for individual areas of expertise, such as civil work, electrical work, noise analysis and turbine erection. The services of local contractors to assist in Project construction will be secured where possible. The construction team will be on-site to handle materials purchasing, construction, and quality control. An on-site project manager will coordinate all aspects of the work, including ongoing communication with local officials, citizens groups, and landowners.

The EPC contractor will also oversee the installation of roads, concrete foundations, towers, turbines and blades, electrical infrastructure, as well as the coordination of materials receiving, inventory, and distribution.

The permanently impacted area is considered to be only the land that will be disturbed by the exposed portions of the turbine foundations and the permanent access roads. Approximately 38-47 acres of the Project site will be permanently impacted by the Project by roads and turbine laydown areas. The collector system will be underground.

During construction, additional areas will be temporarily impacted. Activities causing temporary disruption include the widening of access roads for equipment transport, installation of turbine foundations, installation of electrical collector and communication cables, and for staging and support purposes. Disrupted soil will be reclaimed, and temporarily disturbed areas will be restored to their previous use (*e.g.*, agricultural use) upon turbine commissioning. See Section

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4.5 for more details on the impact and mitigation of infrastructure including roads during construction.

### 3.5 Operation and Maintenance

Goodhue Wind plans to enter into a contractual agreement with the turbine manufacturer to provide service to and maintain the Project through the warranty period given by the manufacturer. Thereafter, Goodhue Wind will contract a qualified O&M contractor for the Project's service and maintenance. The Project's operations manager will oversee all maintenance, management and service activities of the turbines and supporting facilities, ensuring utility interconnection is sound and that O&M response to turbine outages is timely.

On-site service and maintenance activities include routine inspections, regular preventive maintenance on all turbines and related facilities, unscheduled maintenance and repair, and routine minor maintenance on the wind turbines, electrical power systems, and communications systems. The O&M contractor will assess the condition of oil levels and filters, see to the tightening of bolts, repair minor electrical issues, upgrade computer software as needed, and periodically test the SCADA and other monitoring systems. Civil maintenance will include maintaining Project structures, as well as access roads, drainage systems, and other facilities.

The O&M contractor is expected to address both scheduled and unscheduled major maintenance on the wind farm, including repairs, replacement of parts and removal of failed parts. The O&M technicians will be equipped with all necessary tools, instruments for routine service, repairs and Project/site operational control. Turbine maintenance will be performed as an on-going cyclical function during the Project lifetime. Transformer and 69 kV line maintenance will be accomplished on an annual basis and will be scheduled and performed during non- or low-wind periods.

Other maintenance activities include cooperation with the local governmental agencies dealing with environmental concerns, including the management of lubricants, solvents, and other hazardous materials, and the implementation of appropriate security methods.

During turbine commissioning and initial commercial operation, turbines will be inspected on-site daily to see that they are operating within their expectations. Following the "break-in" period during the initial commercial operation date, the turbines will be remotely monitored on a daily basis with planned service and maintenance at the following intervals:

1. **First service inspection.** The first service inspection will take place approximately two months after the turbines have been commissioned. Activities include tightening bolts, greasing bearings, filtering gear oil, and other routine maintenance activities.
2. **Semiannual service inspection.** Routine service inspections commence six months after the first inspection. The semiannual inspection consists of lubrication and a safety test of the turbine.

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### **3.6 Financing and Costs**

Goodhue Wind is being developed with dollars raised from C-BED eligible individuals and local entities, including National Wind. Construction and permanent financing will be provided by an equity partner. Goodhue Wind is currently evaluating proposals from prospective equity partners. This equity partner is necessary to monetize the federal tax incentives available to wind projects.

Goodhue Wind has estimated the capital cost for the wind farm to be approximately \$2.3 million per installed MW of nameplate capacity, depending on final interconnection costs, as well as infrastructure costs for access road construction and electrical collection systems. The largest portion of the total cost is the wind turbines. Capital costs include costs of development, engineering, permitting, procurement and construction.

Based upon similar projects, Goodhue Wind estimates operating costs of the complete 78 MW Project to range from approximately \$4 million to \$5 million per year. Operating costs include costs associated with operating and maintaining the Project, repairs and warranties, transmission and infrastructure maintenance, management and financing fees, land lease payments, energy production tax, insurance, royalties and electric usage costs.

### **3.7 Project Schedule**

Goodhue Wind expects to begin construction of the Project in mid 2010 and hopes to begin commercial operation by December 31, 2010. To accomplish this, Goodhue Wind has acquired wind energy leases from landowners, which should be completed by the second quarter of 2010. Goodhue Wind expects the Site Permit to be issued within approximately six months of this Application's acceptance. Preconstruction surveys and studies are currently underway and will continue through Spring 2010. Equipment procurement will be initiated upon the issuance of the Site Permit and will continue through construction.

Goodhue Wind will be responsible for undertaking all required environmental review and will obtain all permits and licenses that are required following issuance of the LWECs Site Permit. The commercial operation date is dependent on the completion of the interconnection, permitting, and other development activities. Goodhue Wind anticipates signing an interconnection agreement in Spring 2010. Goodhue Wind is currently in active discussions regarding two PPAs (each for 39 MWs) and expects to enter into the PPAs very soon to support construction of the Project.

### **3.8 Energy Projections**

Goodhue Wind's preliminary assessment of energy production for the Project indicates an annual energy production (AEP) of 230,000 to 270,000 MWh net. The net capacity factor is estimated to be between 34 and 39%, which includes array losses.

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This is based upon existing wind data from the Minnesota DOC for a 229.7 ft (70 m) meteorological (met) tower located approximately 50 miles southwest of the Project Area near the city of Clarks Grove. The elevation of the Clarks Grove met tower is approximately 1,300 feet (396.2 m), and the Project Area elevation ranges from 929 to 1,243 feet (283.2 to 378.9 m). Approximately nine years of data from June 1996 to July 2004 was used for this analysis. Using the WASP model, the 262.5 ft (80 m) mean wind speeds for the Project Area were calculated to be from 17 to 17.5 mph (7.6 to 7.8 m/s).

The preliminary assessment assumed a 78 MW wind farm layout at the Project Area to estimate the AEP. The Repower MM92 2.0 MW and GE xle/sle 1.5 MW wind turbine generators were used for this layout. The MM92 has a 303.5 ft (92.5 m) rotor diameter, a nominal power rating of 2.0 MW, and a hub height of 262.5 ft (80 m). The estimated gross AEP includes array losses and the estimated net AEP includes an additional energy loss of 10%. The 262.5 ft (80 m) mean wind speed for the layout is 17.2 mph (7.7 m/s).

Final energy estimates will be analyzed after the final design of the wind farm has been completed. Wind data from planned met towers to be installed within the Project Area will be used to develop the final energy estimates.

Goodhue Wind intends to enter into two 20 year PPAs with a utility off-taker for the sale of the power that is generated from the Project. Goodhue Wind anticipates a commercial operation date (COD) of December 31, 2010, and a PPA termination date of December 31, 2030. Goodhue Wind will provide the PUC additional information regarding the PPAs once they are completed.

### **3.9 Decommissioning and Restoration**

The Project decommissioning and restoration plan is in general accordance with the requirements of Minnesota Rules 7854.0500, subp. 13, and Goodhue County Ordinance, Article 18, Section 5, Subd. 10. Goodhue Wind anticipates that the life of the Project will be no less than 25 years and it requests the right to re-apply for a LEWCS Site Permit and continue operation of the Project upon expiration of the original LEWCS Site Permit. As the Project reaches the design life of the turbines, issues of decommissioning vs. repowering will be evaluated.

Goodhue Wind will begin decommissioning the facility within 12 months from the time the facility ceases to operate. Decommissioning will be completed within 18 months from the time the facility ceases to operate.

As stated above, Goodhue Wind requests the right to explore alternatives regarding Project decommissioning at the end of the LEWCS Site Permit term. One such option may be to re-apply for a LEWCS Site Permit and continue operation of the Project, providing energy under a new long-term contract or on a merchant basis. Retrofitting, repowering or replacing the turbines

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

The estimated decommissioning cost in current dollars is expected to be \$58,000 per turbine, including associated facilities. Goodhue Wind will be responsible for all costs to decommission the Project and associated facilities. Based on estimated costs of decommissioning and the salvage value of decommissioned equipment, the salvage value of the wind farm is expected to exceed the costs of decommissioning, but this will depend upon the prevailing rates for salvage value of the equipment and labor costs. This methodology provides a conservative estimate of the Project's residual value because:

- Long-term average scrap metal prices were used instead of recent years' scrap metal values that are much higher, and
- During the majority of the wind farm's life, the components would be sold as used equipment at significantly higher prices than their underlying scrap metal value.

In summary, the salvage value of the turbines and other components ensures that sufficient funds will be available to cover decommissioning and restoration costs. Because the uncertainty surrounding future decommissioning cost and salvage value increases with time, Goodhue Wind will review and update the cost estimate of decommissioning and restoration for the Project in December 2025, 15 years after Project commissioning. This revised cost estimate of decommissioning and salvage value will then be submitted to the MPUC and Goodhue County for review and comment.

Beginning in year 15 of the Project's operational life, the Applicant will either create a reserve fund or enter into a surety bond agreement and create an escrow account, or provide for a combination of both a reserve and surety bond, that will ultimately fund decommissioning and site restoration costs after Project operations cease, to the extent that the salvage value does not cover decommissioning costs. The exact amount to be allocated for decommissioning will be determined by a third party study in year 14 that will assess the difference between estimated decommissioning costs and the salvage value.

Decommissioning will involve removal of all above-ground wind facilities including towers, turbine generators, transformers, overhead cables, buildings, and ancillary equipment. Foundations will be removed to a depth of 4 feet below grade. All access roads will be removed unless the affected landowner provides written notice that the road or portions of the road shall be retained. Additionally, any disturbed surface shall be graded, reseeded, and restored as nearly as possible to its preconstruction condition.

#### **4.0 ENVIRONMENTAL ANALYSIS**

In accordance with Minnesota Rules Chapter 7854, Goodhue Wind provides the following description of the environmental conditions of the Project Area. Goodhue Wind has considered

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exclusion and avoidance criteria in selecting the Project Area, consistent with MPUC procedures on LWECS siting criteria and applicable provisions of the Power Plant Siting Act.

Goodhue Wind sent letters to various regulatory and governmental authorities to request review of the Project Area for applicable comments and concerns. A list of the agencies who received this letter is included in **Appendix D**. Responses from agencies that responded with comments regarding the proposed Project are discussed in the following sections. A copy of agency correspondence and responses is included in **Appendix E**, as further discussed in the following sections.

#### **4.1 Description of Environmental Setting**

The Project is located in an area that is entirely rural with an agricultural-based economy. Corn, wheat, oats, soybeans and hay are the predominant crops in Goodhue County. The County is also produces livestock, including hogs, beef and dairy cows. The landscape in the Project Area ranges from gently undulating to steeply rolling and hilly. The proposed Project Area is approximately 32,684 acres and elevations range from 929 to 1,243 feet above mean sea level.

#### **4.2 Demographics**

##### **4.2.1 Description of Resources**

The Project is located within a rural/farming area in southeastern Minnesota in an area of relatively low population density and adjacent to the City of Goodhue, which is more densely populated. The low population density is based upon the average population density of the five townships where the Project is located, which is approximately 17.04 people per square mile. Goodhue Wind received indication from the City of Goodhue that, in the undetermined future, the City plans to expand to the South. The City of Goodhue asked that Goodhue Wind remain at least two miles away in all directions from the city limits and, in August 2008, the City Council documented this request in the City Council meeting minutes.

The entirety of the Project is located in Goodhue County. The 2000 population of Goodhue County was 44,127, and the estimated 2006 population was 45,807. The Project is further located in parts of Belle Creek, Goodhue, Minneola, Vasa and Zumbrota Townships. For Goodhue County the average household size in the year 2000 was 2.53 people, and by 2006 estimates 19,872 housing units existed.

According to the 2002 U.S. Economic Census, the largest industries employing residents of Goodhue County are manufacturing, accommodation and food services, and health care/social assistance.

Goodhue County had a median household income of \$46,972 in 2000 which grew to \$52,141 by 2004. In general, the per capita incomes are lower in the Project Area townships compared to the overall county levels. Poverty levels within the Project Area vary greatly from one township

to the next, however if averaged the levels are below those of the county. **Table 4-1** summarizes some of the population and economic characteristics within the Project Area. The 2000 per capita income and poverty level data are the most recent data available at the township level.

<b>Table 4-1: Population and Economic Characteristics</b>			
<b>Location</b>	<b>Population</b>	<b>Per Capita Income</b>	<b>Population Below Poverty Line (%)</b>
<b>Goodhue County</b>	<b>44,127</b>	<b>\$21,934</b>	<b>5.7</b>
Belle Creek Township	437	\$20,226	7.6
Goodhue Township	530	\$19,786	2.7
Minneola Township	657	\$23,329	0
Vasa Township	872	\$23,629	4.9
Zumbrota Township	591	\$21,372	6.6

#### **4.2.2 Impacts**

The Project is anticipated to bring approximately 200 temporary construction-related jobs and 8 full time jobs related to Project operation to the area. The Project is expected to have a substantial positive economic impact on the communities near the Project Area. Short-term impacts to socioeconomic resources are expected to be minor. Though some agricultural land will be permanently removed from production, landowners will be compensated for such loss through a lease, and the areas surrounding each turbine will likely still be farmed. Both landowners within the Project Area who receive a wind turbine on their property and those who do not will be compensated for wind rights through easements. Construction is not expected to cause negative impacts to industries within the Project Area. There is no indication that any minority or low-income population is concentrated within the Project Area, or that the wind turbines will be placed in an area occupied by a minority group.

To the extent possible, Goodhue Wind plans to use local contractors and suppliers for portions of the construction. Wages and salaries paid to contractors and workers in Goodhue County will contribute to the overall personal income of the region. Additional personal income will be generated for residents in the counties and state by circulation and recirculation of dollars Goodhue Wind pays for business expenditures and for state and local taxes. Equipment, fuel, operating supplies, and other product and service expenses will benefit businesses in the counties and the state. Landowners having a turbine or other Project facilities on their land will receive a royalty or lease payment annually for the life of the Project. Such payments should strengthen the local economy.

Construction and operation of the Project will provide long-term beneficial impacts to the counties' tax bases and it will contribute to improving the local economy in this part of Minnesota. As described in other nearby wind farm site permit applications, the development of

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wind energy in this area of Minnesota has been important in diversifying, supporting and strengthening the personal income and property tax base of southeastern Minnesota.<sup>2</sup>

In addition to creating jobs and personal income, and improving infrastructure, the Project will pay a local energy production tax to the local units of government of \$0.012 per kWh of electricity produced, resulting in an annual wind energy production tax ranging from approximately \$275,000 to \$325,000. Indirect economic benefits include creation of new jobs in manufacturing, operations and technology.

### 4.2.3 Mitigation

Effects to regional socioeconomics as a result of the proposed Project will be primarily positive due to an influx in wages and expenditures at local businesses during construction and an increase in the counties' tax bases from the construction and operation of the wind turbines and associated infrastructure. In addition, the lease payments paid to landowners will offset potential financial losses associated with removing land from agricultural production and wind rights. Therefore, because no impacts are anticipated, no mitigative measures are proposed.

## 4.3 Noise

### 4.3.1 Description of Resources

In Minnesota, statistical sound levels (L Level Descriptors) are used to evaluate noise levels and identify noise impacts. The L<sub>5</sub> is defined as the noise level exceeded 5% of the time, or for three minutes in an hour. The L<sub>50</sub> is the noise level exceeded 50% of the time, or for 30 minutes in an hour.

Land areas, such as picnic areas, churches, or commercial spaces, are assigned to an activity category based on the type of activities or use occurring in the area. Activity categories are then categorized based on their sensitivity to noise. The Noise Area Classification (NAC) is listed in the Minnesota Pollution Control Agency (MPCA) noise regulations to distinguish the categories.

**Table 4-2** identifies the established daytime and nighttime noise standards by NAC. The standards are expressed as a range of permissible dBA within a one hour period; L<sub>50</sub> is the dBA that may be exceeded 50 percent of the time within an hour, while L<sub>10</sub> is the dBA that may be exceeded 10 percent of the time within the hour.

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<sup>2</sup> See Minnesota Public Utilities Commission, Docket Nos. IP6631/WS-07-388 (Site Permit Application for a Large Wind Energy Conversion System for the Elm Creek Wind Project in Jackson and Martin Counties, Minnesota (June 15, 2007); NSP-WGR-1-95 (NSP Phase II). See also *Assessing the Economic Development Impacts of Wind Power* (2003), Northwest Economic Associates, which analyzes the NSP Phase II/Lake Benton I Wind Project in Lincoln County, MN.

Noise Area Classification	Daytime		Nighttime	
	L <sub>50</sub>	L <sub>10</sub>	L <sub>50</sub>	L <sub>10</sub>
1	60	65	50	55
2	65	70	65	70
3	75	80	75	80

The sounds that humans hear are actually waves of varying sound pressures, which are referred to as sound pressure levels. Sound pressure levels are measured in decibels (dB). Because human hearing is not equally sensitive to all frequencies of sound, the most noticeable frequencies of sound are given more “weight” in most measurement schemes. The A-weighted scale corresponds to the sensitivity range for human hearing. Noise levels capable of being heard by humans are measured in dBA, which is the A-weighted sound level recorded in units of decibels. **Table 4-3** shows noise levels associated with common, everyday sources.

Sound Pressure Level (dBA)	Noise Source <sup>a</sup>
140	Jet Engine (at 25 meters)
130	Jet Aircraft (at 100 meters)
120	Rock Concert
110	Pneumatic Chipper
100	Jackhammer (at 1 meter)
90	Chainsaw, Lawn Mower (at 1 meter)
80	Heavy Truck Traffic
70	Business Office, Vacuum Cleaner
60	Conversational Speech, Typical TV Volume
50	Library
40	Bedroom
30	Secluded Woods
20	Whisper

<sup>a</sup>Source: *A Guide to Noise Control in Minnesota Acoustical Properties, Measurement, Analysis and Regulation*, Minnesota Pollution Control Agency (Figure 3, 2008)

Nighttime ambient (or background) noise levels (not including the affects of wind) are low to mid-30 dBA in the Project Area, which are typical of those in such rural settings. Low to mid-30 dBA are relatively low background levels and higher levels may exist near roads, farmsteads and other areas of human activity. Wind conditions in the Project Area tend to increase ambient noise levels compared to other, less windy rural areas.

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### 4.3.2 Impacts

Operation and maintenance of the wind turbines and associated facilities will create increased noise levels within the Project Area. The sound level varies with the speed of the turbine and the distance of the listener from the turbine. The turbine speed, in turn, depends on the weather conditions. In general, on more windy days turbines can create more sound. In addition, the noise level of the wind itself tends to mask or overcome turbine noises, especially as distance from the turbines increases.

GE provided the sound power level at the turbine hub for the GE 1.5 MW xle turbine is 104 dBA. The term “sound power level” means a logarithmic measure of the sound power in comparison to a specified reference level. The sound power level of a source is expressed in decibels (dB) and is equal to 10 times the logarithm to the base 10 of the ratio of the sound power of the source to a reference sound power. The reference sound power in air is normally taken to be  $10^{-12}$  watt.

Goodhue Wind used these sound power levels at the hub to model the sound pressure levels at various distances from the hub and to compare these pressure levels with Minnesota Daytime and Nighttime L10 and L50 Limits for residential receptors (NAC-1) as stated in the Minnesota Rules part 7030.0040. The Nighttime L50 limit of 50 dBA is the most stringent limit. The turbine was modeled to determine at what distance turbine noise would not exceed the 50 dBA limit.

Goodhue Wind analyzed the noise footprint of the Project from the proposed GE 1.5 MW xle wind turbine model using the WindPRO version 2.6.1.252 module Decibel for Noise Impact Calculation (see **Exhibit A-7**). According to the manufacturer’s noise data, the sound power level of the GE 1.5 MW xle wind turbine at a 10 meter height for an 80 meter hub height ranges from less than 96 dB (at 3 m/s wind speed) to less than or equal to 104.0 dB (at 9 m/s wind speed to the cut out speed). Using the highest sound power level of 104.0 dB, the distance to the 50 dBA noise setback distance from a single GE 1.5 MW xle wind turbine averages 531 feet (162 meters). As shown in **Exhibit A-7**, no residences are located within the 50 dBA setback area.

Goodhue Wind is in the process of analyzing background noise levels within the Project Area and in the later stages of the Project anticipates contracting a noise expert to assess the impact of the wind farm on the area. With this information, Goodhue Wind may conduct noise testing or modeling to evaluate various wind turbine scenarios for the planned Project to determine possible noise impacts and address required noise setbacks.

As described in Sections 3.2.1 and 3.2.2 and based on the following evaluation, Goodhue Wind has voluntarily implemented an occupied residence setback of 1,500 feet. Goodhue Wind reserves the right to setback 1,000 feet from participating residents that agree to a shorter setback. Goodhue Wind will maintain an appropriate setback from inhabited residence to stay below the MPCA Nighttime Noise Limit of 50 dBA. The exact residence setback will be determined by number of turbines in proximity to the residence and the preferences of the landowner.

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At the Project Substations, the source for noise is primarily the transformers, which can create a humming noise. The nearest occupied home to the proposed Project Substations is located several hundred feet away from the proposed Project Substation sites. It would be unlikely that substation noise would be audible at this farmstead/home.

### **4.3.3 Mitigation**

Possible noise impacts to nearby rural residences/farmsteads and other potentially affected parties will be considered in the design, siting and construction of the proposed wind farm Project. In accordance with Goodhue County Ordinance and Minnesota Rules 7030, and to maintain adequate health and safety standard requirements, Goodhue Wind has voluntarily implemented an occupied residence setback of 1,500 feet. Goodhue Wind reserves the right to setback 1,000 feet from participating residents that agree to a shorter setback. Goodhue Wind will maintain an appropriate setback from inhabited residence to stay below the MPCA Nighttime Noise Limit of 50 dBA. The exact residence setback will be determined by number of turbines in proximity to the residence and the preferences of the landowner. Upon review and approval of PUC, Goodhue Wind may revise the noise setbacks if the results of noise testing or modeling indicate variation from the above setback. Goodhue Wind will provide the PUC a copy of the results of the noise testing or modeling.

Goodhue Wind will use at least a 5 RD setback from the Project Area perimeter along the north-south axis (downwind spacing) and a 3 RD setback from the Project Area perimeter on the east-west axis (crosswind spacing). In accordance with the Goodhue County Ordinance, Goodhue Wind will work with Goodhue County to address any proposed turbine sites whereby a road ROW of less than 1.1 times the height may be appropriate. Furthermore, in the development period, all wind conversion systems will abide by future rights-of-way setbacks for roads, if a planned changed or expanded right-of-way for the road is known. If the sound characteristics of the selected turbine are different from those discussed in the Application, Goodhue Wind will address setbacks to ensure compliance with MPCA noise standards.

## **4.4 Visual Impacts**

### **4.4.1 Description of Resources**

The topography of the Project Area is relatively flat and is typified by stream-dissected terrain forming gently rolling hills and ridges with elevations that range from 929 to 1,243 feet above mean sea level. The typical visual landscape within the Project Area consists of agricultural fields, farmsteads with trees planted as windbreaks, and active or fallow fields (see **Exhibit A-8**). Many drainage ditches and intermittent streams exist in the area though few have running water on a year round basis.

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The majority of landscape within the Project Area can be classified as agricultural and rural open space. The entire Project Area is zoned either A1 – Agricultural Protection Zone or A2 – Agricultural per Goodhue County (see **Exhibit A-10**). Within the Project Area local vegetation is predominantly agricultural crops and pasture, including corn, soybeans, small grains, and forage crops, which visually create a low uniform cover. A mix of deciduous and coniferous trees planted for windbreaks typically surrounds farmsteads which were established to prevent wind erosion and shelter dwellings. Occasional patches of native willows and wetland grasses surround streams and ditches.

Aside from the local vegetation the main focal points present in the agricultural landscape are the farm residences and buildings. Of the structures present a portion date back to the 19<sup>th</sup> and early 20<sup>th</sup> centuries and are representative of that era of Minnesota farm architecture.

A recently installed communication tower exists in the Project Area and has slightly altered the landscape from being strictly agricultural. The tower is located in section 13 of Belle Creek Township along 171<sup>st</sup> Avenue approximately 0.5 miles north of 370<sup>th</sup> Street (see **Exhibit A-2**). The tower is physically located on some of the highest and flattest land that the Project Area contains. The base elevation of the tower is 1,202 ft., which is about 41 ft. lower than the Project Area's highest elevation. The tower has a height of 255 feet and is visually apparent throughout the Project Area save areas guarded by trees, buildings etc. Via visual inspection, the tower would appear to be utilized for communication, although the exact function of the tower is unknown at this time as data for the tower has not been released.

In addition to the tower onsite, 57 towers including microwave, am, fm, and FAA permitted “towers” exist within 10 miles of the Project Area. It is estimated that 9 of the towers from these datasets are overlapping though without visiting the entire buffer area this cannot be confirmed.

To date, southeastern Minnesota has not seen as many wind farms as other parts of the state (**Exhibit A-6**). A substantial number wind farms have been built in other areas, while others are in various phases of approval. Minnesota as a whole had approximately 788 “wind turbines” as of January 31, 2008, a number which grew to 869 by February 19, 2009, according to FAA data.

According to the American Wind Energy Association (“AWEA”), more wind turbines are located in Minnesota than those indicated by the FAA. According to AWEA, as of June 27, 2009 the existing wind power capacity in Minnesota was about 1,805 MW, and the power capacity of projects under construction totaled 40.4 MW. Of the local area counties near Goodhue County, Mower County has seen the most wind development. For example, AWEA indicates that Mower County has 109 wind turbines with capacity for 208 MW. See <http://www.awea.org/projects/Projects.aspx?s=Minnesota>.

Minnesota currently ranks 4<sup>th</sup> in the nation for existing wind energy capacity. The presence and visual effect of towers and turbines have existed or will exist in the general vicinity of the Project Area. In January 2009 the Minnesota Department of Commerce Energy Facility Permitting/Department of Administration's Land Management Information Center prepared a

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map of Minnesota indicating the locations and numbers of wind turbines in the state (see [http://www.state.mn.us/mn/externalDocs/Commerce/Map\\_Wind\\_Turbine\\_Locations\\_02240911\\_1000\\_WindTurbineMap.pdf](http://www.state.mn.us/mn/externalDocs/Commerce/Map_Wind_Turbine_Locations_02240911_1000_WindTurbineMap.pdf)). According to this information, a total of 1,331 wind turbines have been installed in Minnesota (1,040 wind turbines permitted by the MPUC and 291 wind turbines permitted by non MPUC authorities).

#### **4.4.2 Impacts**

The visual effect of the Project will depend largely upon the perceptions of the observers. The visual contrast added by wind farms may be perceived as a visual disruption or as points of visual interest with their own aesthetic quality and appeal. Operation of the wind farm will not generate much traffic or significantly increase day-to-day human activity in the area. The Project Area will therefore retain its rural sense and remote character. The proposed Project will not involve any ongoing industrial use of non-renewable resources or emissions into the environment.

Wind farms may appear industrial to some. However, the turbines function to “farm” the wind for energy. While existing wind farms are located in the region of the Project Area, because the existing wind farms are not located in the immediate vicinity of the Project, the proposed Project should not cumulatively contribute to the visual effect of the existing wind farms. Additionally, the location of the proposed Project relative to the existing wind farms will limit the extent to which the proposed Project is viewed as a disruption to the area’s scenic integrity.

The presence of turbines within the viewshed of natural areas may also affect the aesthetic quality of those areas being used by persons. It can be argued that seeing turbines from a natural area may detract from that experience. However, the same is true of other human habitation or structures in the Project Area, and the presence of turbines may be less intrusive than these human activities. No WMAs, or other protected natural areas, exist within the Project Area though it is possible that the proposed turbines could be visible from such nearby locations (**Exhibit A-9**).

#### **4.4.3 Mitigation**

Goodhue Wind will work to avoid or minimize, to the extent possible, visual impacts into the final design and siting of the Project. Goodhue Wind will work with landowners to identify concerns related to Project aesthetics. To address visual impacts of the proposed Project, Goodhue Wind proposed the following mitigative measures:

- Turbines will be uniform in color;
- Turbines will not be located in biologically sensitive areas such as public parks, WMAs, SNAs, WPAs, or wetlands;

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- Turbines will be illuminated to meet the minimum FAA requirements for obstruction lighting of wind turbine farms (e.g. reduce number of lights on turbines and synchronized red strobe lights);
  - Collector lines will be buried to minimize aboveground structures within the turbine array;
  - Existing roads will be used for construction and maintenance where possible to minimize the amount of new roads constructed;
  - Access roads created for the wind farm facility will be located on gentle grades to minimize erosion, visible cuts and fills; and
  - Temporarily disturbed areas will be converted back to cropland or otherwise reseeded to blend in with existing vegetation.

## 4.5 Public Services and Infrastructure

### 4.5.1 Description of Resources

#### Local Services

The Project is located in a lightly populated, rural/farming area in southeastern Minnesota adjacent to the more densely populated City of Goodhue. Public services to farmsteads and rural residences within the Project Area include transportation/roadways and electric. The closest city to the Project Area is the City of Goodhue (City) bordering the eastern boundary. The City provides sanitary sewer, water, and communication services to its residents. Additionally, the City's emergency services include a volunteer fire department.

A buried refined petroleum pipeline, which is 10 inches in diameter and buried at varying depths, runs north-south through the Project Area parallel to County Road 47 (**Exhibit A-3**). The pipeline is reportedly owned by BP/Amoco. A buried natural gas pipeline runs through the southwestern portion of the Project Area, north of and parallel to U.S. Hwy 52. The pipeline is reportedly owned by Magellan Pipeline Company LP.

#### Electrical Service

There are currently three utility transmission lines within the Project Area. Great River Energy (GRE) has a 69 kV transmission line running across the southeast portion of the Project Area. Xcel Energy (Xcel) has a 345 kV transmission line spanning the Project Area north to south near the eastern boundary. Additionally Xcel has a 69 kV line running parallel to US Hwy 52 in the southwestern corner of the Project Area as indicated by **Exhibit A-3**.

#### Water Supply

Townships within the Project Area have limited public infrastructure services. Homes and farmsteads typically utilize on-site water wells and septic systems for individual household and farming needs as verified by the county well index (CWI).

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## Roads

Existing roadway infrastructure in and around the Project Area consists of county and township roads that generally follow section lines, in addition to private unpaved farmstead driveways and farming access roads. Various County State Aid Highways (CSAHs), County Roads (CRs), township roads, a State Trunk Highway (STH) and a U.S. Highway (US) provide access to the Project Area. The State Trunk, County State Aid Highways, and County Roads are two-lane paved roads and the U.S. Highway is four lane paved road. The remaining roads in the Project Area are 2-lane gravel roads. The topography of the area allowed for the creation of a road network providing good access to most areas most locations within the Project Area. This is a strength to this specific Project location as impacts such as new roads having to be built will be held to a minimum so existing uses, namely agriculture, can continue unaltered (**Exhibits A-2 and A-3**).

Besides U.S. Highway 52 (U.S. Hwy 52), there are no other federal roads within the Project Area. U.S. Hwy 52 is located within the southwestern corner of the Project Area and it runs in a northwest/southeast direction.

There are a number of CSAHs within the Project Area. Three CSAHs are paved asphalt (6, 7 and 9) and the remaining roads are dirt and gravel. In Goodhue County, STH 58 runs south-north along the eastern boundary of the Project Area, intersecting it briefly north of the City of Goodhue.

## Traffic

The existing traffic volumes on the area's county roads and highways are documented in **Table 4-5** and **Exhibit A-10**. U.S. Hwy 52 has the highest Annual Average Daily Traffic (AADT) count at 18,100 vehicles per day. For purposes of comparison, the functional capacity of a two-lane paved rural highway is in excess of 5,000 vehicles per day. Except for U.S. Hwy 52, the highest existing AADT in or near the Project area is 3,150 vehicles per day on STH 58. STH 58 runs through the city of Goodhue and only intersects a small portion of the Project Area's extreme northeastern corner. CSAH 6 runs parallel to STH 58 along the western boundary of the city of Goodhue has a maximum AADT of 1,750 in the Project Area. The maximum AADT for CSAH 9 running east-west through the southern half of the Project Area is 1,500. Along the remaining county highways and roads, the AADTs are at or below 375 vehicles per day within the specified area.

<b>Roadway Segment Description</b>		<b>Existing Annual Average Daily Traffic (AADT)</b>
U.S. Trunk Highway	US Hwy 52 (southwestern corner of Project Area)	18,100
Goodhue County	STH58 from Zumbrota to U.S. 61	3,150
	CSAH 6 n/s through city of Goodhue	1,750 then 1,100

<b>Roadway Segment Description</b>		<b>Existing Annual Average Daily Traffic (AADT)</b>
	CSAH 9 from City of Goodhue west	1,500 then 990
	CSAH 8 outside of Project Area to west	550 then 395
	CSAH 7 n/s through western portion of Project Area	510 then 375

Sources: MnDOT 1992 – 2008 AADT (Annual Average Daily Traffic), Goodhue County, MN; MnDOT 2009

#### Telephone, Microwave, and Other Communication Reception

Existing communication towers are discussed in Section 4.4.1. Telephone service is provided by Qwest and other local telephone companies to farmsteads, rural residences and businesses in the area. Goodhue Wind has retained Comsearch to complete a microwave search and interference study on existing non-Federal Government microwave telecom systems, including digital television broadcast systems. Comsearch’s Wind Power GeoPlanner, Land Mobile, AM/FM analysis, and off-air television reception analysis reports provides a graphical representation of affected telecommunications and microwave paths, and provides supporting technical parameters. The Comsearch results are included in **Appendix F**.

#### **4.5.2 Impacts**

The Project is anticipated to have minimal effect on the existing services and infrastructure of the area. Goodhue Wind will design the Project in accordance with the results of the Comsearch study to avoid minimal impacts to the existing communication infrastructure and other existing infrastructure. The following is a brief description of the impacts that are possible during the construction and operation of the Project.

##### Local Services

No impacts are expected to local services. Goodhue Wind will design the Project to avoid impacts to the buried refined petroleum and natural gas pipelines and pipeline easements. If impacts cannot be avoided to the pipelines, Goodhue Wind will contact the respective owner prior to construction and coordinate appropriate permitting and approvals prior to construction.

##### Electrical Service

No disruption of power to residences or local businesses is anticipated to occur as a result of construction or operation of the proposed Project. The Project will require station service from the local electric provider when the wind project is not generating electricity.

##### Water Supply

Construction and operation of the proposed Project will not affect the water supply. No installation or abandonment of water supply wells is anticipated for the Project. However, if any wells are abandoned, it will be accomplished in accordance with applicable Minnesota law.

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On October 29, 2008 the Minnesota Department of Health (MDH) provided written response to the proposed Project (see **Appendix E**). The MDH indicated that a boring drilled for the Project will likely be an Environmental Bore Hole (EBH), and that EBH's, wells and borings in Minnesota are regulated by the MDH.

It is not anticipated that the Project will require the appropriation of surface water or permanent dewatering. Temporary dewatering may be required during construction for specific turbine foundations and/or electrical trenches. A water supply will be necessary for the O&M facility, and a water supply well will be constructed for this purpose in accordance with applicable MDH and related state and local requirements. Water flow rate during the operating period will be similar to household uses; less than 5 gallons-per-minute (gpm). Water use during construction may occur at a higher flow rate to provide dust control and water for concrete mixes and other construction purposes.

#### Roads

Letters requesting comments from the Minnesota Department of Transportation (MnDOT) and the Goodhue County Highway Department have been sent. At this time no correspondence has been received from the Goodhue County Highway Department. National Wind, having dealt with such an agency on similar projects, is willing to work with all parties involved to address any concerns, and adhere to any requirements they may have in relation to their transportation infrastructure.

On October 16, 2008 and January 5, 2009, the Minnesota Department of Transportation (MnDOT) provided comments regarding the Project (see **Appendix E**). In the October 16, 2008 correspondence, MnDOT provided the following comments: 1) MnDOT indicated that there is a potential for impact to MnDOT interests in the vicinity of Minnesota State Highway 58; 2) MnDOT advised of potential detours in stating that a bridge and culvert replacement are scheduled over the north fork of the Zumbro River in Zumbrota for 2010, and ; 3) MnDOT expects Goodhue Wind to obtain, file and submit all required MnDOT permits, including Right of Way permits for all temporary and permanent accesses.

In addition to the above comments, MnDOT provided the following additional comments on January 5, 2009: 1) State Project 2510-37 on Minnesota State Highway 58 is scheduled for 2010, which replaces Bridge 5188 and box culvert 6160 over the north fork of the Zumbro River in Zumbrota; and 2) a District 6 Access Management & Safety Plan is underway for US 52 in this area and is progressing toward the vision for US 52 to become a Freeway/Expressway from Rochester to the Twin Cities area. While MnDOT activities may take place within the Project Area, Goodhue Wind does not anticipate that the Project will impact these activities because they will be located at existing bridge and roadway locations; however, Goodhue Wind will work with MnDOT regarding its concerns over these projects.

Temporary and permanent gravel access roads will be constructed for the Project. Temporary roads will be approximately 35-40 feet wide to accommodate delivery of the turbines, towers, and related equipment and supplies, and to provide access to cranes required for construction of

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the wind tower generators. The final amount of new roads is dependent on the size of turbine selected and final design which are still in contention. The permanent access roads will also be used during operation of the Project by operation and maintenance crews for gaining access to inspect and service the wind turbines. In general, the access roads will be located between the towers. The permanent roads will be approximately 16 feet wide and low profile to allow cross-travel by farm equipment.

#### Traffic

Letters requesting comments on the possible traffic impacts to the local roads have been sent to the City of Goodhue, as well as Belle Creek, Goodhue, and Minneola Townships, and Goodhue County. The applicant is in the process of sending letters to Zumbrota and Vasa Townships. At this time no correspondence has been received from any of the parties in which contact was attempted.

Construction traffic will use the existing road systems for access to the Project Area. Except for U.S. Hwy 52, current traffic levels on the affected roadways in the Project Area are well below roadway capacities and construction traffic will be perceptible but similar to seasonal variations in traffic, such as autumn harvest. U.S. Hwy 52 will likely be used for delivery of the tower components, turbines and related construction materials. However, the timing of such deliveries will be managed to avoid significant impacts to traffic on U.S. Hwy 52. Therefore, construction activities are not expected to affect traffic levels. Operation and maintenance activities will also not noticeably increase traffic within the Project Area.

#### Telephone, Microwave, and Other Communication Reception

Construction and operation of the proposed wind farm is intended to not impact the telephone service to the Project Area. Goodhue Wind is also evaluating possible impacts on digital television reception. Goodhue Wind is using the Comsearch telecommunication studies for siting turbines and associated facilities to avoid interference with any microwave paths found in the Project Area. Therefore, no detrimental impacts to radio and television reception are anticipated. Goodhue Wind will not operate the wind farm so as to cause microwave, radio, telephone, television or navigation interference contrary to FCC regulations or other law. If operation of the Project causes such interference, Goodhue Wind will take the steps necessary to correct the problem.

### **4.5.3 Mitigation**

Construction and operation of the Project will be in accordance with all associated federal, state, and local permits and laws, as well as industry construction and operation standards. The Project is anticipated to have minor effects on the existing infrastructure during Project construction and operation. Therefore, extensive mitigation measures are not proposed.

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## Local Services

With the addition of substation and transmission capacity, no impact to local services is anticipated and no mitigation is required. No impacts are anticipated to the buried refined petroleum and natural gas pipelines and therefore no mitigative measures are proposed.

## Electrical Service

Goodhue Wind will purchase station service from a local electrical utility. MAPP will suggest appropriate configurations for the electrical system and Goodhue Wind will abide by the recommendations to prevent impacts to the existing transmission system. Goodhue Wind has established a setback of 420 feet from existing transmission lines. No additional mitigation is necessary.

## Water Supply

In the event that wells are abandoned or EBHs are installed, Goodhue Wind will do so in accordance with applicable Minnesota law and MDH requirements. If temporary dewatering is required during construction activities, discharge of dewatering fluid will be conducted under the requirements of the National Pollutant Discharge Elimination System (NPDES) permit and Storm Water Pollution Prevention Plan (SWPPP).

## Roads

Goodhue Wind will work with Belle Creek, Goodhue, Minneola, Vasa and Zumbrota Townships and MnDOT regarding roadway concerns, right-of-way work (if any), and setbacks during construction of the Project. Goodhue Wind will also work closely with the landowners in the placement of access roads to minimize land-use disruptions during construction and operation of the Project to the extent possible.

## Traffic

Goodhue Wind will work with Belle Creek, Goodhue, Minneola, Vasa and Zumbrota Townships, Goodhue County and MnDOT regarding traffic, access, and permitting oversized loads during construction of the Project. No other mitigation measures are necessary.

## Telephone, Microwave, and Other Communication Reception

Gopher One Call will be contacted prior to construction to locate and avoid all underground facilities. To the extent Project facilities cross or otherwise affect existing telephone lines or equipment, Goodhue Wind will make arrangements with applicable service providers to avoid interference with such facilities. Goodhue Wind is using the Comsearch studies to site turbines and associated facilities to avoid interference with telecommunication facilities. At this time, no impacts are anticipated to microwave or television and, therefore, no mitigative measures are proposed. In the event that avoidance or relocation of Project facilities is not possible, Goodhue Wind will contact the owner of the affected facility and work with it to mitigate, permit, design, and construct planned structures to minimize potential interference.

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## 4.6 Cultural and Archaeological Resources

### 4.6.1 Description of Resources

The proposed Project Area is located within the Southeast Riverine Archaeological Region (3) (Anfinson 1990). The Southeast Riverine Region is located in southeastern Minnesota and includes Dodge, Fillmore, Goodhue, Houston, Mower, Olmsted, Wabasha, and Winona counties and portions of Dakota, Freeborn, Rice and Waseca counties. The Southeast Riverine Archaeological Region encompasses all of the defined Project Area. Topography is typified by stream-dissected terrain. This portion of the state is unique in that it remained ice-free during the most recent glacial period. Habitation sites in this region are commonly located near wooded areas and on major river terrace systems. Resource procurement sites may be located anywhere in the region and would be dependent on which resource was being sought.

In Fall 2009, Goodhue Wind conducted a review of records at the Minnesota State Historic Preservation Office (SHPO) and Office of the State Archaeologist (OSA) for the Project Area and industry standard one mile buffer. The background literature search identified eighty-five documented cultural resource properties located within the proposed Project Area and a one mile buffer (see **Exhibit A-13**). Of the eighty-five properties, twelve are archaeological sites and seventy-three are historic architectural properties. A summary of the identified historic properties is provided in the following **Tables 4-5** and **4-6** below.

During a records search nine archaeological properties were identified within the defined Project Area and an additional three were located within the one-mile buffer. Four of the nine properties (21GDe, 21GDn, 21DGp, and 21DGz) are recorded as provisional archaeological sites. An additional three archaeological sites (21GD0057, 21DG0196, and 21DG0198) are located within the one-mile buffer and are included in **Table 4-5**. Previous surveys in the area have been limited to Section 106 compliance. Most of the surveys were linear surveys covering small amounts of ground generally limited to immediate project areas. The lack of previously recorded archaeological sites in the immediate area of the proposed Project is most likely due to the paucity of survey performed in the area.

Site Number	Site Type	Cultural Period	Location
21GD0047	Habitation	Prehistoric	Project Area
21GD0057	Quarry, Habitation	Prehistoric	Buffer
21GD0087	Pits, Depressions	Prehistoric	Project Area
21GD0126	Mound Site	Prehistoric	Project Area
21GD0196	Lithic Scatter	Prehistoric	Buffer
21GD0198	Lithic Scatter	Prehistoric	Buffer
21GD0199	Lithic Scatter	Prehistoric	Project Area
21GD0209	Lithic Scatter	Prehistoric	Project Area
21GDe	Artifact Scatter	Historic	Project Area

Site Number	Description	Cultural Period	Location
21GDn	Lithic Scatter	Prehistoric	Project Area
21GDp	Lithic Scatter	Prehistoric	Project Area
21GDz	Documented Ghost Town	Historic	Project Area

(Key: Site Number = site designation applied by OSA; Site Type = defined site use type; Cultural Period = reported culture historic period affiliation; Location = denotes if listed site is within the defined Project Area or within the one-mile buffer.)

A total of twenty-two historic structures were identified during the records search of the Project Area. Of the structures within the Project Area nine are historic farmsteads or farmhouses, six are churches or church associated structures, three are schools, one commercial building, one bridge, one township hale, and one historic milepost marker. None of the documented historic structures located within the defined Project Area and the associated one-mile buffer have been evaluated for listing on the NRHP. An additional fifty-one properties were identified within the one-mile buffer of the defined Project Area and are included in **Table 4-6** below.

Site Number	Description	Location	Location
GD-BCK-001	Commercial Building	T111N, R16W, Sec.5	Project Area
GD-BCK-002	Farmhouse	T111N, R16W, Sec.5	Project Area
GD-BCK-003	Farmhouse	T111N, R16W, Sec.5	Project Area
GD-BCK-004	Belle Creek Store	T111N, R16W, Sec. 8	Buffer
GD-BCK-005	Belle Creek Creamery	T111N, R16W, Sec. 8	Buffer
GD-BCK-006	Octagonal Hog Building	T111N, R16W, Sec. 8	Buffer
GD-BCK-007	Farmhouse	T111N, R16W, Sec. 10	Project Area
GD-BCK-008	St. Columbill's Catholic Church	T111N, R16W, Sec. 14	Project Area
GD-BCK-009	St. Columbill's Parsonage	T111N, R16W, Sec. 14	Project Area
GD-BCK-010	Belle Creek Townhall	T111N, R16W, Sec. 15	Project Area
GD-BCK-011	District School No. 135	T111N, R16W, Sec. 15	Project Area
GD-BCK-012	Farmstead	T111N, R16W, Sec. 17	Buffer
GD-BCK-014	Samuel Poole Chandler Farmhouse	T111N, R16W, W1/2 Sec. 20	Buffer
GD-BCK-015	Episcopal Church	T111N, R16W, E1/2 Sec. 20	Project Area
GD-BCK-016	Henry Schweiger Farmhouse	T111N, R16W, W1/2 Sec. 20	Buffer
GD-BCK-017	Farmhouse	T111N, R16W, Sec. 21	Project Area
GD-GDC-001	Wedge Lumber Company	T111N, R15W, Sec. 21	Buffer
GD-GDC-002	Cargill Store	T111N, R15W, Sec. 21	Buffer
GD-GDC-003	Goodhue Elevator Association	T111N, R15W, Sec. 21	Buffer

**Table 4-6: Previously Recorded Architectural Resources**

GD-GDC-004	Chicago Great Western Depot	T111N, R15W, Sec. 21	Buffer
GD-GDC-005	Goodhue Elevator Association	T111N, R15W, Sec. 21	Buffer
GD-GDC-006	Sign	T111N, R15W, Sec. 21	Buffer
GD-GDC-007	Goodhue State Bank	T111N, R15W, Sec. 21	Buffer
GD-GDC-008	Black Building	T111N, R15W, Sec. 21	Buffer
GD-GDC-009	Sawyer Block	T111N, R15W, Sec. 21	Buffer
GD-GDC-010	Commercial Building	T111N, R15W, Sec. 21	Buffer
GD-GDC-011	Residence	T111N, R15W, Sec. 21	Buffer
GD-GDC-012	Allers Hardware Store	T111N, R15W, Sec. 21	Buffer
GD-GDC-013	Residence	T111N, R15W, Sec. 21	Buffer
GD-GDC-014	Methodist Church (razed)	T111N, R15W, Sec. 21	Buffer
GD-GDC-015	St. Luke's English Lutheran Church	T111N, R15W, Sec. 21	Buffer
GD-GDC-016	Residence	T111N, R15W, Sec. 21	Buffer
GD-GDC-017	Coal Silo	T111N, R15W, Sec. 21	Buffer
GD-GDC-018	Goodhue School	T111N, R15W, Sec. 21	Buffer
GD-GDC-019	Fire Hydrant	T111N, R15W, Sec. 21	Buffer
GD-GDC-020	Goodhue Waterworks	T111N, R15W, Sec. 21	Buffer
GD-GDC-021	Goodhue Watertower	T111N, R15W, Sec. 21	Buffer
GD-GDT-002	District School No. 105	T111N, R15W, Sec. 7	Buffer
GD-GDT-003	Farmhouse	T111N, R15W, Sec. 9	Buffer
GD-GDT-009	Goodhue Townhall	T111N, R15W, Sec. 16	Buffer
GD-GDT-010	Farmhouse	T111N, R15W, Sec. 20	Buffer
GD-GDT-011	Zion Lutheran Church	T111N, R15W, Sec. 18	Project Area
GD-GDT-016	Prigge/Hadler Farmstead	T111N, R15W, Sec. 9	Buffer
GD-GDT-019	Bridge No. 126 (razed)	T111N, R15W, Sec. 9	Buffer
GD-MNO-001	Farmstead	T110N, R16W, Sec. 2	Project Area
GD-MNO-002	Farmstead	T110N, R16W, Sec. 2	Project Area
GD-MNO-003	School	T110N, R16W, Sec. 3	Project Area
GD-MNO-004	St. John's Lutheran Church	T110N, R16W, Sec. 3	Project Area
GD-MNO-005	Farmstead	T110N, R16W, Sec. 5	Buffer
GD-MNO-006	Minneola Lutheran Church	T110N, R16W, Sec. 5	Project Area
GD-MNO-007	John Dorn Farmstead	T110N, R16W, Sec. 5	Project Area
GD-MNO-008	Farmstead	T110N, R16W, E1/2 Sec. 8	Buffer
GD-MNO-010	Walter H. Field Farmstead	T110N, R16W, N1/2 Sec. 21	Buffer
GD-MNO-013	Minneola Township Hall	T110N, R16W, N1/2 Sec. 22	Buffer

**Table 4-6: Previously Recorded Architectural Resources**

GD-MNO-014	Bridge No. 4763	T110N, R16W, N1/2 Sec. 23	Buffer
GD-MNO-015	Bridge	T110N, R16W, N1/2 Sec. 23	Buffer
GD-MNO-022	Farmstead	T110N, R16W, N1/2 Sec. 22	Buffer
GD-MNO-027	Bridge No. L3910	T110N, R16W, Sec. 14	Project Area
GD-MNO-028	Bridge No. L0704	T110N, R16W, N1/2 Sec. 23	Buffer
GD-VSA-014	Barn	T112N, R16W, S1/2 Sec. 26	Buffer
GD-VSA-015	District School No. 131	T112N, R16W, S1/2 Sec. 26	Buffer
GD-VSA-018	Dancehall	T112N, R16W, Sec. 32	Buffer
GD-VSA-019	C. O. Miller Block	T112N, R16W, Sec. 32	Buffer
GD-VSA-020	C. O. Miller House	T112N, R16W, Sec. 32	Buffer
GD-VSA-021	O. S. Strom House	T112N, R16W, Sec. 32	Buffer
GD-VSA-022	White Rock State Bank	T112N, R16W, Sec. 32	Buffer
GD-VSA-023	Quarry Site	T112N, R16W, Sec. 33	Buffer
GD-ZBT-002	Farmhouse & Kitchen	T110N R15W, Sec. 5	Project Area
GD-ZBT-003	Farmstead	T110N R15W, Sec. 5	Project Area
GD-ZBT-004	School	T110N, R15W, Sec. 9	Project Area
GD-ZBT-008	Zumbrota Township Hall	T110N, R15W, S1/2 Sec. 16	Buffer
GD-ZBT-022	Milepost Marker	T110N, R15W, Sec. 9	Project Area
GD-ZBT-024	Bridge No. L0705	T110N, R15W, Sec. 10	Buffer

(Key: Site Number = reference number for recorded property; Description = name of historic structure or description of type of structure; Location = amended legal description of recorded property; NRHP Status = status of structure as either “Listed” on the NRHP or as of yet “Unevaluated”; Location = denotes if listed site is within the defined Project Area or within the one-mile buffer.)

#### 4.6.2 Impacts

On October 6 and December 17, 2008, Goodhue Wind sent the Minnesota SHPO a letter informing it of the Project requesting comments. On January 21, 2009 SHPO provided response and recommended that an archaeological survey be completed that meets the requirements of the Secretary of the Interior’s Standards for identification and evaluation, and should include an evaluation of the National Register eligibility for any properties that are identified (**Appendix E**). Goodhue Wind will work with SHPO regarding this recommendation. While Goodhue Wind will attempt to avoid archeological sites, the proposed construction activities for the Project have the potential to impact such sites or to add to the visual impacts in the region of the Project Area. In the event that an impact would occur, Goodhue Wind would determine the nature of the

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impact and consult with the SHPO on whether or not the resource was eligible for listing in the National Register of Historic Places (NRHP).

### **4.6.3 Mitigation**

As requested by SHPO, Goodhue will conduct an archeological study of the area prior to construction. Goodhue Wind will attempt to avoid impacts to identified archeological and historic resources to the extent possible. If archaeological sites are found during archaeological investigations or during construction, the integrity such sites and significance would be addressed in terms of the site's potential eligibility to the NRHP. If such sites are found to be eligible for the NRHP, appropriate mitigative measures will need to be developed in consultation with Minnesota SHPO, the State Archaeologist, and consulting American Indian communities. While avoidance would be a preferred action, mitigation for Project-related impacts on NRHP-eligible archaeological and historic resources may include resource or additional documentation through data recovery.

Mitigation for Project-related impacts on NRHP-eligible archaeological resources may include adjustment of the array during the micrositing phase of the Project if necessary to minimize Project impacts on a resource and/or additional documentation through data recovery.

Should previously unknown archaeological resources or human remains be inadvertently encountered during Project construction and/or operation, the discoveries will be reported to the SHPO. With regard to a discovery of human remains, procedures would be followed to ensure that the appropriate authorities would become involved quickly and in accordance with local and state guidelines.

## **4.7 Recreational Resources**

### **4.7.1 Description of Resources**

Information from the U.S. Fish & Wildlife Service (USFWS), Minnesota Department of Natural Resources (DNR), and Goodhue County were reviewed to identify recreational resources within and nearby the Project Area. Available resources are shown on **Exhibit A-9**. The population of Goodhue County swells by over one million visitors every year who come to enjoy the many scenic areas and recreational opportunities available in the County. The County is rich in natural resources such as bluffs, streams and waterways, which draw visitors from across the state. Approximately one-third of the County consists of lands protected by state and federal agencies. Most of these lands exist within the northern third of the County, and provide recreational opportunities such as hiking, biking, boating, fishing, snowmobiling, golfing, cross-country skiing, hunting, and nature viewing.

Significant recreational resources identified within Goodhue County include the Mississippi River Valley, Frontenac State Park, the Richard J. Dorer Memorial State Forest, four DNR

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Scientific and Natural Areas (SNAs), and multiple recreational trails, and creeks. There are no DNR Wildlife Management Areas (WMAs), Scientific and Natural Areas (SNAs), USFWS Waterfowl Production Areas (WPAs), State Parks, or State Forests within the Project Area.

SNAs are managed to protect rare and endangered species habitat, unique plant communities, and significant geologic features that possess exceptional scientific or educational values, and provide important recreational and wildlife viewing opportunities for visitors. While no SNAs were identified within the Project Area, four SNAs exist within Goodhue County and include River Terrace Prairie SNA, North Fork Zumbro Woods SNA, Cannon River Turtle SNA, and Spring Creek Prairie SNA. Three of the four are located north of the site, and the fourth is located south and west of the site near Wanamingo.

There are no county parks or state parks within or near the Project Area. There are only two parks owned by the County and they are both located on Lake Byllesby. This lake is located west of Cannon Falls, in the northwest corner of Goodhue County. Amenities at Lake Byllesby Park include a fishing dock, boat launch, swimming area, play area, volley ball court, walking trails, and picnic areas and shelters. An additional boat launch and picnic area owned by the County is also located on the shore of Lake Byllesby, approximately 2.5 miles west from the main Park area. This location offers a fishing boat launch and picnic benches.

Frontenac State Park is the nearest state park located northeast of the Project Area along the southern edge of Lake Pepin and the Mississippi River. Frontenac State Park offers recreational opportunities for visitors such as camping, biking, and fishing. The Richard J. Dorer Memorial State Forest is located directly north of the Project Area, and occupies most of Welch, Vasa, Red Wing, Featherstone, Hay Creek, and Florence Townships. This state forest offers recreational opportunities to visitors such as hiking and wildlife viewing.

There are no natural lakes within Goodhue County, but numerous drainages, creeks and rivers. The only large lake within the County is Lake Byllesby, located directly west of Cannon Falls. This lake was artificially created by damming the Cannon River, and provides recreational opportunities such as fishing and swimming. Drainages in the western half of the Project Area drain to Belle Creek (outside of the Project Area) which becomes a designated trout stream approximately four miles downstream. Hay Creek also becomes a designated trout stream approximately two miles downstream of the Project Area. Trout fishing is an important recreational draw in this portion of the state. The Cannon River, located north of the Project Area is also a significant recreational destination for canoeists, cyclists, and anglers. The Mississippi River, located east of the Project Area, is an important recreational destination for boaters, fisherman, and wildlife enthusiasts.

Goodhue County also has three existing regional recreational trails within its boundaries, including the Cannon Valley Trail, the Goodhue Pioneer Trail and the Douglas State Trail. None of these trails currently run through the Project Area. The Cannon Valley Trail is a 19.7 mile-long multi-use trail running through the diverse scenery of the former Chicago Great Western Railroad line and connecting the cities of Cannon Falls, Welch and Red Wing. This trail is

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utilized by approximately 100,000 people each year for bicycling, in-line skating, skateboarding, cross-country skiing, hiking and walking. Another regional trail, the Douglas State Trail, begins in Pine Island City Park and travels through the town of Douglas (for which the Trail is named), and terminates in northwestern Rochester. The trail is a multi-use state trail developed on the abandoned Chicago Northwestern Railroad grade and offers activities for bicyclists, hikers and cross-country skiers, horseback riders and snowmobilers. The Goodhue Pioneer trail is a proposed 37-mile state trail which will connect Red Wing, Goodhue, Zumbrota, Mazeppa, Bellechester and Pine Island, when completed. The four-mile section from Red Wing to Hay Creek has been constructed. This crushed limestone trail will provide recreational opportunities for bicycles, pedestrians, horseback riders and snowmobilers.

According to the Minnesota Department of Natural Resources website, Minnesota offers over 20,000 miles of groomed snowmobile trails, and 18,000 miles are maintained by local snowmobile club volunteers. State trail 25 runs between Cannon Falls and Goodhue and through the central portion of the Project Area as shown on **Exhibit A-9**. A second trail, 317, connects Belle Creek to Goodhue, and runs north from Goodhue passing Claybank on its western side. Trail 317 also splits south of Goodhue and runs south to Zumbrota. This trail dissects the northeastern portion of the proposed Project Area and clips the extreme southeastern edge of the proposed Project Area. The DNR Trails and Waterways Division owns 6.2 acres of trail lands along the southeastern edge of the Project Area. Both of these trails are shown on **Exhibit A-9**. There are no public off-highway vehicle (OHV) trails or facilities located within the Project Area or the County.

#### **4.7.2 Impacts**

Goodhue Wind will design the Project to avoid all direct impacts to recreational resources. There could, however, be impacts to recreational resources that are visual in nature, which indirectly affect the experience of individuals using public lands near the Project Area. Section 4.4 discusses visual impacts and proposed mitigation. Visual impacts will be most evident to visitors using recreational resources within a one to four-mile radius of the Project Area, such as the state snowmobile trail that transects the site between Cannon Falls and Goodhue. Significant impacts, however, are not anticipated.

#### **4.7.3 Mitigation**

Encroachments by the Project into SNAs, county and state parks, and recreational trails are not planned or expected. If impacts to such lands are determined necessary in the final design stages of the Project, Goodhue Wind will further coordinate with the appropriate agency, including the USFWS, the DNR, or the affected county for necessary permits and approvals prior to construction.

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## 4.8 Human Health and Safety

### 4.8.1 Description of Resources

#### Air Traffic

There are no airports located within the Project Area. A review of the AirNav, LLC database revealed the nearest registered airports are the Fairview Red Wing Medical Center and Hospital Heliports (97MN & MN82) located approximately 11.3 and 11.6 statute miles north-northeast, respectively. The next closest are the Stewart Farms Airport (8MN1) located approximately 12.7 statute miles northwest, and the Red Wing Falls Regional Airport (RGK) located approximately 14.7 miles northwest. No unregistered private airstrips were observed during the field review of the Project Area completed by Westwood Professional Services.

#### Electromagnetic Fields

Electric and Magnetic Fields (EMF) are the electric and magnetic fields that are coupled together, such as in high frequency radiating fields. The term EMF refers to electric and magnetic fields that are present around electrical devices. Electric fields arise from the voltage or electrical charges and magnetic fields arise from the flow of electricity or current that travels along transmission lines, power collection (feeder) lines, substation transformers, house wiring, and electrical appliances. The intensity of the electric field is related to the voltage of the line and the intensity of the magnetic field is related to the current flow through the conductors (transmission line wire). Once energized, the proposed facility will generate electromagnetic fields.

Extensive research by the National Institute of Environmental Health Sciences (NIEHS) has determined that extra low frequency EMF exposures pose any health risks to humans is weak.<sup>3</sup> This evaluation, known as the Electric and Magnetic Fields Research and Public Information Dissemination (EMF RAPID) Program, included a six-year project designed to provide scientific evidence to determine whether exposure to power-frequency EMF involves a potential risk to human health. In 2002 NIEHS prepared a booklet that summarized worldwide EMF health research studies conducted after 1999.<sup>4</sup> The NIEHS determined that since 1995, the two major U.S. reports concerning the impact of EMF exposure on human health both concluded that “limited evidence exists for an association between EMF exposure and increased leukemia risk, but when all the scientific evidence is considered, the link between EMF exposure and cancer is weak.” *Id.* NIEHS concluded that the scientific evidence linking EMF exposures with health risks is weak and that this finding does not warrant aggressive regulatory concern. However, because of the weak scientific evidence that supports some association between EMF and health

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<sup>3</sup> National Institute of Environmental Health Sciences (“NIEHS”), *NIEHS Report on Health Effects from Exposure to Power-line Frequency Electric and Magnetic Fields*, June 15, 1999.

<sup>4</sup> National Institute of Environmental Health Sciences (“NIEHS”), *EMF Electric and Magnetic Fields Associated with the Use of Electric Power, Questions and Answers*, June 2002.

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effects, and the common exposure to electricity in the United States, passive regulatory action, such as providing public education on reducing exposures, is warranted.

Minnesota, California, and Wisconsin have all recently conducted literature reviews or research to examine this issue. In 2002, Minnesota formed an Interagency Working Group to evaluate the body of research and develop policy recommendations to protect the public health from potential problems resulting from high voltage transmission line EMF effects. The Working Group consisted of staff from various state agencies. The Working Group published its findings in a White Paper on EMF Policy and Mitigation Options in September 2002 (Minnesota Department of Health, 2002). The findings of the Working Group are summarized below.

Research on the health effects of EMF has been carried out since the 1970s. Epidemiological studies have mixed results — some have shown no statistically significant association between exposure to EMF and health effects, 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. A number of scientific panels convened by national and international health agencies and the United States Congress have reviewed the research carried out to date. Most researchers concluded that there is insufficient evidence to prove an association between EMF and health effects; however, many of them also concluded that there is insufficient evidence to prove that EMF exposure is safe.

The Minnesota EQB addressed the matter of EMF with respect to new transmission lines in a number of separate dockets from 2003 to 2005. See Docket Nos. 03-64-TR-XCEL (161 kV Lakefield Junction to Fox Lake Substation line); 03-73-TR XCEL (345 kV Split Rock Substation to Lakefield Junction Substation line); 04-84-TR-XCEL (115 kV Buffalo Ridge Substation to White Substation line) and 04-81-TR-Air Lake-Empire (115 kV line in Dakota County).<sup>5</sup> In June 2005, in Docket No. 03-73-TR-XCEL for the 345 kV line connecting the Split Rock and Lakefield Junction substations, the EQB made the following finding with regard to EMF:

118. No significant impacts on human health and safety are anticipated from the Project. There is at present insufficient evidence to demonstrate a cause and effect relationship between EMF exposure and any adverse health effects. The EQB has not established limits on magnetic field exposure and there are no Federal or Minnesota health-based exposure standards for magnetic fields. There is uncertainty, however, concerning long term health impacts and the Minnesota Department of Health and the EQB all recommend a "prudent avoidance" policy in which exposure is minimized.

Goodhue Wind will continue to follow developments concerning EMF and will respond to new information regarding EMFs as applicable to the Project. While there is no conclusive research evidence that EMFs pose a significant health impact from power lines and wind turbines, the

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<sup>5</sup> Documents from those matters are available on the Commission webpage: [www.energyfacilities.puc.state.mn.us](http://www.energyfacilities.puc.state.mn.us).

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new facilities will be installed no closer than 1,000-1,500 feet from occupied residences, where EMF is expected to be at background levels.

## Security

Goodhue Wind will coordinate with Goodhue County Emergency Management (EM) for the purpose of saving lives and protecting property related to the Project during natural, manmade or other incidents. Goodhue Wind will provide required information and work with the County EM to develop procedures for response to emergencies, natural hazards, hazardous materials incidents, manmade problems (e.g. fire, etc.) and related incidents concerning the Project. Goodhue Wind will also work with the County EM to be registered with the Rural Identification/addressing (fire number) system and 911 system coordination emergency response.

The proposed wind farm Project Area is also located in an area that has a relatively low population density. According to the 2000 U.S. Census, there were 44,127 people residing in Goodhue County. Approximately two-thirds of the population lives within one of the ten cities in the County. Over one-third (36.5 percent) of the population were found to reside in Red Wing, the largest urban area and the county seat. Between 1980 and 2000, Goodhue County's population increased by 13 percent, mostly in the cities of Cannon Falls, Wanamingo, Zumbrota, and Florence Township. An additional 12 percent increase occurred in the northeastern corner near the Mississippi River, and in Stanton Township. Seven townships actually lost population between 1980 and 2000. Belle Creek, Goodhue, Minneola, Vasa and Zumbrota Townships, the proposed location of the Project, lost between 4 and 16 percent of their populations during this 20 year period.

The populations of Belle Creek, Goodhue, Minneola, Vasa and Zumbrota Townships in 1980 were 518, 576, 684, 847, and 613, respectively. As of 2000, with the exception of Vasa Township, those numbers had dropped to 437 (Belle Creek), 530 (Goodhue), 657 (Minneola), and 591 (Zumbrota), respectively. The County's Transportation plan estimates that the population of Belle Creek Township will not recover to 1980 levels until the year 2025, and those levels will still be below the 1970 Census data population estimate of 628 individuals. Only four other townships in the County have a lower population density than Belle Creek Township, which amounts to approximately 12 people per square mile.

Given that the population within this general location of the County is on the decline, and low in overall density, it is not anticipated that construction and operation of the Project will have any meaningful impacts on the security and safety of the local population.

## Traffic

The existing Annual Average Daily Traffic (AADT) levels for roadways in the vicinity of the Project Area are discussed in Section 4.5 and summarized in **Exhibit A-10**. The additional traffic anticipated by the construction and operation of the Project is not expected to reach levels that would create problems for the regional roadway system.

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## 4.8.2 Impacts

### Air Traffic

The Project is not expected to create significant impacts on air traffic in the region because there are no airports located within the Project Area and only three other facilities are known to be registered within approximately eleven miles of the Project (Fairview Red Wing Medical Center and Hospital Heliports, Stewart Farms Airport, and the Red Wing Falls Regional Airport). The installation of wind turbine towers in active croplands and installation of overhead collection lines, if needed, increases a potential for collisions with crop-dusting aircraft. However, overhead collection lines are expected to be similar to existing distribution lines (located along the edges of fields and roadways) and the turbines would be visible from a distance and lighted according to FAA requirements.

While all known airports are a significant distance from the Project Area, Goodhue Wind will coordinate with the FAA to confirm that the Project will not interfere with local aviation operations. Goodhue Wind contacted the FAA on October 6 and December 19, 2008 for comments on the proposed Project. On December 22, 2008, the FAA provided comments regarding the Project and requested that Goodhue Wind provide FAA Aeronautical Study Numbers for the Project, the latitudes and longitudes for each proposed turbine site, and indicated that a permit may be needed for structures more than 200 feet above the highest point of land within one mile of an airport and for structures within ten miles of an airport (**Appendix E**). Goodhue Wind will submit an application for a hazard determination by the FAA for the Project and work with the FAA regarding the hazard determination and coordinate siting the wind turbines.

Goodhue Wind also contacted the Minnesota DOT Office of Aeronautics (MnDOT OA) on October 6 and December 19, 2008 for comments on the proposed Project. On December 22, 2008, MnDOT OA provided comments and requested that Goodhue Wind provide FAA Aeronautical Study Numbers and the latitudes and longitudes for each turbine site (**Appendix E**). With the requested information, the MnDOT OA indicated it would review the site locations and provide its recommendations at that time.

### Electromagnetic Fields

While there is no conclusive research evidence that EMFs pose a significant health impact from power lines and wind turbines, the new facilities will be installed no closer than 1,000-1,500 feet from occupied residences, where EMF is expected to be at background levels. Based on the most current research on EMFs, and the distance between any turbines or collector lines and occupied homes, the proposed Project is not anticipated to have significant impact to public health and safety due to EMFs.

### Security

The Project will add to the number of emergency response locations that will be part of the County EM system. Wind turbines constructed as part of the Project will be registered with the

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County EM emergency response system and Goodhue Wind will work with the County EM to develop appropriate response procedures.

The Project Area is also located in a lightly populated rural/farming area. Project construction and operation is expected to have little impact on the security and safety of local residents. As with any large construction project, some risk of worker or public injury exists during construction. However, Goodhue Wind and its construction representatives and workers will prepare and implement work plans and specifications in accordance with applicable worker safety requirements during construction of the Project. Goodhue Wind will also control public access to the Project during construction and operation.

During operation of some past wind farm projects, wind turbines have posed hazards to human safety. The Project Area is within a region considered to have low seismic activity. Minnesota has one of the lowest occurrence levels of earthquakes in the United States, but a total of 19 small to moderate earthquakes have been documented since 1860. Current knowledge indicates that, although weak to moderate earthquakes do occur occasionally in Minnesota, a severe earthquake is very unlikely (V.W. Chandler, 1994). Furthermore, modern turbine technology, in addition to proactive maintenance and inspections, has reduced these risks to insignificant rates.

Under certain weather conditions wind turbines can build up ice on the exposed parts of the turbine and ice may break off and be cast from the turbine. Most ice shedding occurs as temperatures rise and ice thaws from the rotors and wind sensors as the turbine is started. While cases of blade drop/throw have occurred, these incidents are not frequent and in some cases have been linked to improper assembly or design exceedances. Today, the improved wind turbine design, engineering and operational controls make the likelihood of such an occurrence remote.

Therefore, safety issues from seismicity and blade throw are not considered likely for the proposed Project.

#### Traffic

While the Project is located in an area of relatively low population density, increased road traffic is expected in the short term during construction of the Project. Increased wear and tear of local roads is also expected from delivery of Project materials and equipment.

The maximum construction traffic is expected to be approximately 275 additional vehicle trips per day, and the functional capacity of a two-lane paved rural highway is in excess of 5,000 vehicles per day. Except for U.S. Hwy 52 located at the southwestern corner of the Project Area, currently, the heaviest traffic within the Project Area is on County State Aid Highway 6, a paved roadway running along the western edge of the City of Goodhue, and along the far eastern portions of the Project Area. According to the MnDOT 2006 Traffic Volume General Highway Map, the AADTs on CSAH 6 north and south of the City of Goodhue are 1,750 and 1,100, respectively.

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County State Aid Highway 9, which traverses the site from east to west through the lower third of the Project Area, has an AADT of 1,500. Most of the remaining CSAHs and county roads within the Project Area have AADTs at or well below 375. Because many of the area roadways have AADTs currently well below capacity, the addition of 275 vehicle trips would be perceptible, but similar to seasonal traffic increases such as observed during autumn crop harvest. Use of U.S. Hwy 52 for construction of the Project Area will be managed to avoid significant impacts to traffic on this highway. Truck access to the northern portion of the Project Area is generally served by CSAHs 6 and 7, and the southern portions by CSAH 9. Once the Project is completed, maintenance crews will periodically drive through the Project Area to monitor and maintain the wind turbines. Turbines and substations will occasionally require repair, which will create a temporary slight increase in area traffic.

### **4.8.3 Mitigation**

#### **Air Traffic**

In accordance with FAA requirements and FAA correspondence to Goodhue Wind dated December 22, 2008, Goodhue Wind will work with and coordinate siting for the wind turbines with the FAA. The wind turbines and temporary meteorological towers will be equipped with lighting in compliance with FAA requirements. Temporary meteorological towers will also have supporting guy wires which will be marked with colored safety shields. Permanent meteorological towers installed at the Project's completion will be painted in compliance with FAA requirements and they will be free-standing with no guy wires. Goodhue Wind will also work with MnDOT OA and provide the requested information, and obtain MnDOT OA recommendations. Goodhue Wind will notify local airports, aerial applicators, and hospitals regarding the new towers and turbines to reduce the risk to crop dusters, emergency helicopters, and other local aircraft.

#### **Electromagnetic Fields**

Although there is no conclusive evidence of harmful effects of EMFs, increasing the distance between source and receptors decreases the strength of EMFs. Therefore, the planned distances between occupied residences and proposed facilities should mitigate possible harmful effects of EMFs and, therefore, no impacts due to EMFs are anticipated. Consequently, no mitigative measures are proposed.

#### **Security**

While no impact to the security of local residents is expected as a result of construction or operation of the Project, Goodhue Wind will use the following security measures to reduce the possibility of property damage or personal injury at the Project site:

- The Project wind turbine locations will be registered with the County EM and Goodhue Wind will work with the County EM to develop appropriate procedures for emergency responses related to the Project;
- Towers will follow the setback and zoning requirements issued by Goodhue County's Zoning and Land Use Management Department's July 17, 2007

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“Amendment to Goodhue County Zoning Ordinance Re-numbering of Existing Articles and Addition of New Article to Establish Regulations to Govern Wind Energy Conversion Systems” (Article 18, Amended October 2, 2007 – see **Exhibit B**). Goodhue Wind has voluntarily implemented an occupied residence setback of 1,500 feet. Goodhue Wind reserves the right to setback 1,000 feet from participating residents that agree to a shorter setback. The exact residence setback will be determined by number of turbines in proximity to the residence and the preferences of the landowner. Goodhue Wind will work with Goodhue County to address any proposed turbine sites whereby a road ROW of less than 1.1 times height may be appropriate. These distances are consistent with prior LWECS site permits issued by the Minnesota PUC;

- Contractors will use proper construction and maintenance methods to ensure minimal impacts to workers and public health and safety;
- Goodhue Wind and its contractors provide temporary (safety) and permanent fencing, warning signs, and locks on equipment and wind power facilities during construction and operation of the Project;
- Goodhue Wind will conduct regular operation and maintenance and inspections during the life of the Project to address potential blade failures, minimizing the potential for blade throw. If problems are identified, Goodhue Wind will perform immediate repairs;
- Turbines will be situated on solid steel enclosed tubular towers where electrical equipment will be located, except for the pad-mounted transformer. Access to the tower will only be allowed through a solid steel door that will be locked when not in use. External electrical equipment will be clearly marked with appropriate warning signs;
- One to two permanent meteorological towers will be included in the Project and the guy wires on any temporary towers will have color sleeves at ground level to increase visibility to people at ground level;
- Where necessary or requested by landowners, Goodhue Wind will construct gates or fences around the facilities; and
- Goodhue Wind will conduct analysis of shadow flicker using an industry standard WindPro module when the turbine layout has been more developed.

#### Traffic

Because of the rural location of the Project, and the relatively low volumes of traffic on adjacent roadways, significant impacts to area traffic are not anticipated. Consequently, no mitigation is being considered. However, Goodhue Wind will create and submit a transportation/route plan for construction of the Project with applicable Township and County road officials to mitigate construction related traffic concerns. Goodhue Wind will repair road damage occurring during construction of the Project. Specific additional truck routes will be dictated by the location

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required for delivery. Additional operating permits will be obtained for oversized truck movements.

## **4.9 Hazardous Materials**

### **4.9.1 Description of Resources**

Potential hazardous materials within the Project Area would be associated with agricultural use of the land, which includes use of petroleum products (diesel fuel, gasoline, natural gas, heating oil, lubricants, and maintenance chemicals), pesticides and herbicides. Older farmsteads may also contain lead-base paint, asbestos-containing building materials (e.g. shingles and siding), and polychlorinated biphenyls (PCBs) in electrical transformers. Unmarked farmstead waste dumps which may contain various types of wastes are also commonly found in rural/farming areas.

Goodhue Wind will conduct a Phase I Environmental Site Assessment (Phase I ESA) to assess the environmental condition of the Project Area. Recognized Environmental Conditions (RECs) present within the project area will be identified and evaluated. Wind turbines and associated Project facilities will be sited in locations that avoid RECs.

During construction, vehicles and equipment will use gasoline, diesel and other petroleum products. In operation, the Project is not expected to generate significant amounts of hazardous waste or materials. The wind turbines will use synthetic gear box oil, hydraulic fluid, and gear grease. Diesel and gasoline may be stored at the O&M facility for use by operation and maintenance personnel.

### **4.9.2 Impacts**

Goodhue Wind has voluntarily implemented an occupied residence setback of between 1,000 and 1,500 feet, thereby avoiding potential hazardous materials and unmarked waste dumps. Therefore, impacts associated with hazardous materials are not anticipated. The exact residence setback will be determined by number of turbines in proximity to the residence and the preferences of the landowner.

Hydraulic oils and lubricants used within the wind turbines will be contained within the turbine nacelle, or within the O&M facility in accordance with applicable regulation for such storage. Fuels and lubricants for vehicles and maintenance equipment will be properly stored and contained according to applicable local, state and federal regulations at the O&M facility. Transformer oil will be contained within the electric transformers, and fluid levels will be monitored during scheduled maintenance at each turbine and transformer location. Small amounts of hydraulic oil, lube oil, grease, and cleaning solvent may be stored in the O&M facility. When fluids and lubricants are replaced, the waste products will be handled and disposed of according to local, state and federal regulations through an approved waste firm.

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### 4.9.3 Mitigation

No impacts are anticipated and therefore no mitigative measures are proposed.

## 4.10 Effects on Land-Based Economics

### 4.10.1 Description of Resources

#### Agriculture

Land use within the Project Area is primarily agricultural as shown in the Land Cover Map (**Exhibit A-11**). In 2001, over 72 percent of the land (roughly 23,730 acres) in Goodhue County was used for agriculture by approximately 1,679 farms (USDA, 2002 Census Report; USGS National Land Cover Data). Major crops grown within Goodhue County include: corn, wheat, oats, soybeans, and hay. Predominant livestock raised in the County includes beef and dairy cows and hogs. Drain tiles and storm water management structures are located within the Project Area.

As shown on **Exhibit A-14**, 54 percent of the farmland within the Project Area is considered prime, and 24 percent is considered farmland of statewide importance. Approximately 15 percent is non-prime farmland and 7 percent is prime farmland when drained. Goodhue County's farms are highly productive compared with the average size and yields on Minnesota farms state-wide. The average acreage of a farm in Minnesota is 354 acres, nearly 100 acres larger than the average farm in the County (254 acres), yet Goodhue County farms are ranked among the top ten counties in Minnesota for production of oats and hay (Minnesota Agricultural Stats Report for 2002).

Goodhue County offers conservation programs that compensate landowners for setting aside wetlands and grasslands for conservation purposes, or implementing conservation practices on their land. These programs provide another source of income for local farms and landowners. Some of these programs include the Conservation Reserve Program (CRP), Reinvest in Minnesota (RIM), Wetland Reserve Program (WRP), and the Environmental Quality Incentive Program (EQIP). These programs vary in their requirements, payments, and the length of time for which a piece of property must be enrolled. Some of these easements are perpetual in nature. **Exhibit A-15** displays CRP lands within the Project Area.

Large-scale animal production has been a growing component of the agricultural industry in recent years, and feedlots used for the confined feeding, breeding or holding of animals are a common practice for animal production. The MPCA is the state agency charged with regulating animal feedlots in Minnesota. Counties may also be delegated by the MPCA to administer the program for feedlots that are not under federal regulation. There are currently 777 registered feedlots in Goodhue County that have 50 or more (10 in shoreland districts) animal units (MPCA 2007).

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## Forestry

There are no significant forestry resources within the Project Area. USGS National Land Cover Dataset (NLCD, 2001) mapping (**Exhibit A-11**) indicates that only a small percent of the Project Area is forested. According to the County Inventory completed in 2004, only one-fifth of the Goodhue County land area is covered by deciduous forest. These woodlands are concentrated along the bluff areas near the Mississippi River and along rivers and streams throughout the County. Because of Goodhue County's agricultural history, much of the once native woodlands were removed for agricultural production of spring wheat and other crops. Therefore, economically important forestry resources are no longer found in this portion of Goodhue County. Farmsteads within the Project Area typically contain forested areas in the form of woodlots and shelterbelts.

## Mining

There are no significant mining resources within the Project Area. However, crushed rock, sand, and gravel are extracted from mines around the County primarily for the purpose of building roads (**Exhibit A-15**). The Geologic Atlas of Goodhue County identifies several of these sand and gravel resource areas within the Project Area. Sand and gravel resources occur in glacial till and outwash deposits.

Based on a review of the April 19, 2002 MnDOT Aggregate Source maps for Goodhue County, four rock quarries are located within the Project Area. Quarries #25081 and #25082 are located in the western portion of the Project Area, south of the town of Belle Creek. Quarry #25098 is located in the northwestern portion of the Project Area, east of the town of White Rock. Quarry #25109 is located in the northern portion of the Project Area, north of the town of Ryan. An additional quarry identified as #25037 is located near the eastern boundary of the Project Area. At this time it appears that this last quarry does not fall within the Project Area. No further information is available regarding the current status of these quarries. MnDOT maps also show no active or inactive gravel pits, commercial aggregate mines, nor MnDOT pits located within the Project boundaries.

### **4.10.2 Impacts**

#### Agriculture

The Project will permanently impact some cropland and rangeland for construction of structures, access roads, and associated infrastructure. Construction activities associated with the Project (e.g. grading, soil compaction, access roads, turnaround areas, temporary construction staging areas, etc.) will also temporarily impact agricultural land. Specific temporary and permanent impacts to all agricultural lands will be determined once turbine, road, Project Substation, and O&M facility locations have been finalized.

Overall, impacts to agriculture as a result of the Project are anticipated to be short term, minimal and are not anticipated to significantly alter crop production. Once in operation, it may occasionally be necessary for Goodhue Wind to complete repairs, or clear vegetation around a

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turbine or facility, which could result in additional temporary impacts to agricultural operations. These interruptions are anticipated to be infrequent and short term.

Turbine and facility siting will include discussions with property owners to identify features on their property, including drain tiles and other encumbrances that should be avoided. All potential project construction encumbrances are detailed by the landowner upon the initial wind easement and land lease agreement, and will be researched and sited, in completion, by Goodhue Wind prior to construction activities.

While impacts to drain tiles and other existing facilities due to Project construction and operation are not anticipated, Goodhue Wind will develop and implement a drain tile plan. The repair plan will address steps that will be taken to avoid, repair or replace drain tile that may be impacted by the Project. Goodhue Wind will design and construct access roads, buried utilities and other ground disturbing activities to avoid existing drain tiles. In the event a drain tile becomes inadvertently damaged, Goodhue Wind will implement the drain tile plan and repair or replace the impacted drain tile. Prior to beginning any site work, Goodhue Wind will contact the landowner where the work will be conducted and review the location of the work and identify the presence of drain tiles or other drainage structures.

Some livestock operations and pasture land may be temporarily disrupted during the installation of the wind turbines and associated infrastructure. Goodhue Wind will keep landowners informed about work being completed on their property, and contractors will ensure fenced pasture land remains secure. Aside from the specific areas where wind turbines, roads, and infrastructure are physically located, the remaining portions of the property will be available for grazing and use by livestock. The Project will have little, if any, long-term effects on the ability of the land to be productive for raising livestock.

#### Forestry

No impacts to forestry resources are anticipated. Forested areas near farmsteads and waterbodies will be, for the most part, avoided by the proposed Project. While significant tree removal is not anticipated, some trees and limbs may occasionally need to be removed to install access roads, or trimmed to prevent damage to electrical lines from wind and ice, and to ensure reliable operation.

#### Mining

No impacts to mining resources or operations are anticipated.

### **4.10.3 Mitigation**

#### Agriculture

To the extent possible, Goodhue Wind will design the Project and locate wind turbines, access roads and associated facilities to avoid or minimize temporary and permanent impacts on farmland. Only land for the turbine, access roads, and supporting infrastructure will be

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permanently taken out of crop production. Additional farmland may be temporarily impacted for use during construction as staging and access areas. To the extent practicable, staging areas will be placed in previously disturbed locations to minimize the impact to agricultural production. In the event that there is damage to drain tiles or other property as a result of construction activities or operation of the Project, Goodhue Wind will work with affected property owners to repair or replace the damaged drain tiles or repair the damaged property. Drain tile repair and as-needed repair of other property damaged as a result of the Project's construction is included in the Project's land lease and wind easement. However, impacts to drain tiles are not expected.

Impacts of the proposed Project on agricultural crops, livestock, native vegetation, and landscaped areas are anticipated to be minimal. Landowners will be reimbursed for potential damage incurred to crops, livestock, and property in a manner consistent with the terms of the easement agreement. Once the Project is completed, Goodhue Wind will restore vegetation within disturbed areas as close as practicable to its original condition. Post construction restoration will largely depend upon the amount of disturbance occurred on the site and the soil types at each location. Sites used for temporary storage of material staging and access areas typically experience significant amounts of traffic which will likely require tilling prior to seeding to loosen compacted soils.

Goodhue Wind plans to avoid impacts to RIM land, and will minimize impacts to CRP land to the extent possible. If CRP land is impacted, Goodhue Wind will work with the USDA NRCS, as well as the landowner to remove the impacted portion of the parcel from the CRP program.

#### Forestry

No impacts to forestry resources are anticipated and no mitigative measures are proposed. However, Goodhue Wind will coordinate with affected landowners for replacement of trees lost on private property as a result of the Project.

#### Mining

No impacts to mining resources are anticipated and no mitigative measures are proposed.

### **4.11 Tourism and Community Benefits**

#### **4.11.1 Description of Resources**

As previously discussed, approximately one million visitors come to Goodhue County each year to enjoy the natural resource, recreational, and cultural opportunities that are available. Tourism represents a significant source of revenue to the County and small business owners. Promotion of tourism focuses primarily on the area's natural history, parks, historical sites, and specific sites such as Welch Village, Treasure Island Resort and Casino, and the Cannon Valley recreational trail. Also publicized are cultural (museums, art, and antiques) and recreational activities (parks, trails, camping, horseback riding, fishing, snowmobiling, golfing and cross

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country skiing). Goodhue County also hosts a variety of local festivities which benefit the community and community services (fire, police, education, etc.).

#### **4.11.2 Impacts**

The presence of wind turbines may affect the viewshed in the vicinity of the wind farm. However, no impacts to tourism and community benefits are anticipated because the Project will not be located within tourist or recreational areas. Wind farms are becoming an important tourism attraction and the addition of this Project to the community is expected to increase the draw of travelers to this area rather than deter visitors and tourism.

#### **4.11.3 Mitigation**

No impacts to tourism and community benefits are anticipated and no mitigative measures are proposed.

### **4.12 Topography**

#### **4.12.1 Description of Resources**

Elevations in the Project Area range from 1,243 feet above mean sea level (AMSL) in the east-central portion of the site (west of Goodhue) to 929 feet AMSL in the northwest corner near Belle Creek. An elevation map of the Project Area is shown in **Exhibit A-12**. Southeastern Minnesota is often referred to as the driftless region due to the lack of glacial “drift” materials deposited during the Wisconsin glacial period. Drift is considered any material (sand, clay, gravel, and boulders) left behind by glacial activity (Bray, 1985). This area of the state is characterized by gently rolling uplands, deep wooded ravines, and large, slowly flowing rivers. The basic geologic framework includes several hundred feet of flat-lying Paleozoic rock (350-600 million years ago) overlain in places by glacial debris and everywhere cut by surface water and groundwater (Sansome, 1983). This is easily observed on **Exhibit A-12**. The central portion of the site is relatively high and flat and falls off in all directions into deep ravines that connect with area creeks such as Belle and Hay. These creeks eventually make their way to the Mississippi River.

#### **4.12.2 Impacts**

Siting and construction of the turbines, associated facilities, access roads and collection/transmission lines will require some grading. There are a number of public roads across the Project Area that will make it possible for Goodhue Wind to significantly minimize the length of Project access roads. Therefore, significant impacts to topography are not anticipated because the layout and siting will be done in such a way as to tie into existing public roads and existing topographic contours to avoid steep terrain, and minimize cut and fill requirements.

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### 4.12.3 Mitigation

As shown on the turbine location map (**Exhibit A-3**), consideration has been given to the location of the proposed turbines in relation to steep slopes and bluffs. These areas are being avoided. Care will also be taken when siting cable and access road locations to minimize grading activities within and near steep terrain to the extent possible. Best management practices will be used surrounding graded areas in accordance with state standards (e.g. silt fence and biologs) to prevent erosion into regional waterways and wetlands.

### 4.13 Soils

#### 4.13.1 Description of Resources

Approximately 68 percent of the Project Area lies within the Seaton Association, 19 percent within the Timula-Seaton-Frontenac-Chaseburg Association, 9 percent in the Seaton-Racine-Maxfield-Marleen-Klinger Association, and 5 percent in the Timula-Seaton-Frontenac Association (**Exhibit A-15**). The Seaton Association was formed in 5 to 10 feet of loess (silty soil deposited by wind) overlying glacial till. The Timula-Seaton-Frontenac-Chaseburg and Timula-Seaton-Frontenac associations consist of narrow to broad upland ridges, dissected by broken, very steep valley walls and narrow valley bottoms. Soils are generally well drained and of medium texture. Chaseburg soils are found in floodplains and drainageways. The mapped soil series at the preliminary turbine locations are summarized in **Table 4-7**.

Series Name	Texture	Slope Class	Drainage Class	Hydric ?
Mt. Carroll	Silt loam	2-18%	Well drained	No
Hersey	Silt loam	2-18%	Well drained	No
Joy	Silt loam	1-3%	Somewhat poorly drained	No
Massbach	Silt loam	6-12%	Moderately well to well drained	No
Barremills	Silt loam	1-5%	Moderately well drained	No
Vasa	Silt loam	1-4%	Moderately well drained	No
Lilah	Sandy loam	12-18%	Excessively drained	No
Billett	Sandy loam	12-18%	Moderately well to well drained	No
Schapville	Silt loam	6-12%	Moderately well drained	No
Shullsburg	Silt loam	6-12%	Somewhat poorly drained	No
Kasson	Silt loam	1-6%	Moderately well drained	No

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<b>Table 4-7: Soils Series Mapped at Preliminary Turbine Locations</b>				
Bassett	Loam	6-12%	Moderately well drained	No

Approximately 54 and 24 percent of the Project Area qualifies as prime farmland and farmland of statewide importance, respectively (**Exhibit A-14**). Virtually all of the preliminary turbine locations are on land falling within these two classifications. It is anticipated that access roads will also be placed on lands in these two classifications. The soils that are not in these classifications are either highly erodible soils on steep slopes or are hydric soils associated with streams or wetlands.

#### **4.13.2 Impacts**

Construction of the wind turbines, associated facilities, access roads and collection/transmission lines will require grading. Based on preliminary turbine locations, this earthwork would occur mostly in moderately well-drained to well-drained silt and sandy loam soils. None of the soils mapped for the preliminary turbine locations are hydric and most are moderately sloping. None of the soils in the preliminary turbine locations appear to pose significant constraints for construction activities. As part of turbine micrositing, turbines locations may be shifted if preliminarily sited on slopes that are unsuitable for construction. Geotechnical investigations will also be undertaken at each individual turbine location to confirm suitability for turbine foundation construction. If any locations are found unsuitable, adjustments will be made to ensure that all turbine locations are suitable from a soils standpoint. Because the design of the Project is in the preliminary stages, the amount of land to be converted to wind power facilities cannot be accurately quantified. However, it is anticipated that a very small percentage of Project Area soils will be affected.

#### **4.13.3 Mitigation**

In order to minimize the potential for construction-related soil erosion, turbines and access roads are being sited so as to avoid highly erodible soils on steep slopes. In addition to minimizing disturbance of highly erodible soils, avoiding steep topography will reduce the size of cut and fill area footprints. Goodhue Wind will work with the landowners in the Project Area to site turbines and access roads so as to minimize impacts to high quality cropland and farming operations to the extent practicable.

Goodhue Wind will obtain a National Pollutant Discharge Elimination System (NPDES) permit from the Minnesota Pollution Control Agency (MPCA) to discharge storm water from construction activities. A Stormwater Pollution Prevention Plan (SWPPP) will be prepared and submitted to the MPCA at the time the NPDES permit application is submitted. Appropriate Best Management Practices (BMPs) will be used during construction and operation of the project to protect topsoil and adjacent resources and to minimize soil erosion. Typical BMPs include: (1) encompassing excavated material and disturbed soil with silt fences; (2) protecting exposed soil; and (3) stabilizing restored material.

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## 4.14 Geologic and Groundwater Resources

### 4.14.1 Description of Resources

Detailed information about the geology of the Project Area is contained in the Goodhue County Geologic Atlas (MGS 1998). Bedrock in the Project Area lies at depths ranging from 0 to 100 feet and consists of consolidated sandstone, limestone and shale, most of which is beneath a layer of unconsolidated drift (glacial till, sand and loess) more than 50 feet thick. Bedrock outcrops are generally along riparian bluffs and ravines, though a few isolated outcrops exist in uplands within the Project Area.

While much of Goodhue County is underlain by karstified bedrock, the Project Area does not encompass any known karst landforms. Karst is defined as “[a]n efficiently drained landscape that forms on soluble rock, typified by caves, sinkholes and other landforms. It is mainly but not exclusively, formed on limestone” (Minnesota Pollution Control Agency 2008). Significant sinkhole areas have been mapped in those areas where Galena limestone is the uppermost bedrock unit. In these areas, rapid transport of surface flow to the ground water is likely occurring. Sinkholes are also found in those parts of the County where the St. Peter and Prairie du Chien formations are the uppermost bedrock layer. Karst features in Goodhue County include 153 springs, six stream sinks or sieves, and 347 sinkholes.

The Minnesota DNR has developed GIS-based mapping of sinkholes, springs, seeps and sinkhole probability for Goodhue County (Minnesota Department of Natural Resources 2008). Most of the Project Area is classified as having a low probability of sinkhole development, though some areas in the northeast and western portions of the Project Area are classified as having low to moderate probability.

The County Well Index (CWI) indicates that twenty-one (21) domestic wells are located within the Project Area. About 95 percent of the groundwater used in Goodhue County is drawn from bedrock aquifers, with about 80 percent being drawn from the Prairie du Chien Group, Jordan Sandstone and Franconia Group. Domestic groundwater supply appears to be fairly accessible in the Project Area.

Recharge to the water table occurs throughout the region via infiltration of precipitation, surface water runoff from area of lower to higher infiltration, and subsurface groundwater movement from adjacent areas. Most recharge in the Project Area occurs on the more level upland areas through percolation. The Project Area contains very few depressional water bodies that would potentially be groundwater recharge areas. Groundwater discharge areas occur mainly along stream corridors as springs or seeps.

The Project Area contains limited minable aggregate resources. The Goodhue County Geologic Atlas indicates that the Project Area encompasses a few small areas classified as secondary or tertiary aggregate resources. Secondary resources are defined as having less than 35 percent

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gravel, being less than 20 feet thick, or having more than 10 feet of cover. Tertiary resources are defined as having severely limited quantity and quality and being suitable only as common fill or for applications that require mostly sand.

#### **4.14.2 Impacts**

No impacts to geologic and groundwater resources are anticipated as a result of construction or operation of the Project. Karst conditions appear unlikely in the Project Area and proposed turbine locations appear to be in areas where bedrock will not be encountered during construction. No turbines are sited in locations with mapped potentially minable secondary and tertiary aggregate resources aggregate resources. Water supply needs for the Project will be limited and relate to domestic water supply for the O&M facility which will be satisfied with either an on-site well or rural water service (if available).

#### **4.14.3 Mitigative Measures**

No impacts to geologic and groundwater resources are anticipated and no specific mitigation measures are proposed. While the potential appears low for karst conditions, Goodhue Wind will ensure that the geotechnical investigations done for turbine locations include site-specific assessments for potential issues with karst.

### **4.15 Surface Water and Floodplain Resources**

#### **4.15.1 Description of Resources**

The Project Area is dissected by a number of intermittent streams (**Exhibit A-16**). None of the streams in the Project Area are designated trout streams but those in the northeast quarter and west half are in the headwaters of streams with trout stream designations in their downstream reaches (Minnesota Department of Natural Resources 2008c). A major north-south drainage divide traverses the center of the Project Area. Drainages in the western half of the Project Area drain to Belle Creek, which lies about one mile west of the Project Area boundary and becomes a designated trout stream roughly four miles downstream. Belle Creek flows north and is a tributary of the Cannon River. Drainages in the southeast portion of the Project Area drain south to Trout Brook, a tributary of the Zumbro River. Contrary to its name, Trout Brook is not a designated trout stream. Drainages in the northeastern part of the Project Area drain northeast to Hay Creek, a tributary of the Mississippi River. Hay Creek becomes a designated trout stream roughly two miles downstream of the Project Area boundary.

The Project Area encompasses a small number of widely scattered surface water bodies. Two small ponds and several quarry pits exist in the southwest corner of the Project Area. The Project Area also encompasses two watershed reservoirs, one in Section 11 and one in Section 29 of Township 111 North, Range 16 West. These reservoirs are under the management of the Belle Creek Watershed District, which encompasses approximately the western half of the

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Project Area. Based on the Goodhue County plat map, the Belle Creek Watershed District owns small parcels upon which the two dams are located.

Federal Emergency Management Agency (FEMA) floodplain mapping was reviewed in a digital format to determine the extent of floodplains within the Project Area (see **Exhibit A-16**). Belle Creek west of the Project Area has a mapped floodplain but only a very small portion crosses into the Project Area boundary. The lower reach of Hay Creek in the northeastern corner of the Project Area also has a mapped floodplain. A portion of Trout Brook also contains mapped floodplain, which partially extends into the Project Area.

#### **4.15.2 Impacts**

None of the turbines shown on the preliminary layout would affect streams, surface water bodies or floodplains. All turbines would be located on topographically elevated uplands and this is not expected to change during turbine micro-siting activities. The Project Area is served by an extensive network of county and township roads, from which all turbines can be accessed without crossing any streams, wetlands or floodplains. Based on the data available at this stage, no impacts to streams, wetlands or floodplains are anticipated. As the design of the Project moves forward, Goodhue Wind will coordinate with the St. Paul District U. S. Army Corps of Engineers and Goodhue County (the responsible local government unit administering the Minnesota Wetland Conservation Act) to obtain concurrence that stream and surface water body impacts are being avoided.

The Minnesota Pollution Control Agency (MPCA) administers the National Pollutant Discharge Elimination System (NPDES) permit program in Minnesota and regulates construction activities that disturb more than one acre of land. As part of its NPDES permit application, Goodhue Wind will develop a Storm Water Pollution Prevention Plan (SWPPP) to identify erosion and sedimentation control measures to prevent adverse water quality impacts to streams and wetlands during and after construction. The measures included in the SWPPP should be sufficient to ensure that streams and surface waters on the project site do not incur any adverse construction-related stormwater impacts.

The Project will not affect any FEMA floodplains, as all turbine locations are readily accessible without floodplain crossings.

On October 6 and December 19, 2008 Goodhue Wind contacted the Minnesota Department of Natural Resources (MnDNR) regional environmental assessment ecologist regarding the proposed Project. On January 13, 2009 the MnDNR provided comments and indicated that the expanded Project Area will encompass three public watercourses: the headwaters of Hay Creek and two tributaries to Belle Creek (**Appendix E**). The MnDNR indicated that none of these stream reaches are designated as trout streams and that the MnDNR assumes impacts to these streams can be completely avoided. As indicated above, based on the data available at this stage, no impacts to streams, wetlands or floodplains are anticipated.

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### **4.15.3 Mitigation**

No stream, surface water body or floodplain mitigation should be required, since all such resources are being avoided. Potential impacts from construction storm water discharges will be mitigated through the application of the BMPs that will be described in the SWPPP for the Project.

## **4.16 Wetlands**

### **4.16.1 Description of Resources**

Wetland resource data was obtained from the U.S Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) and the U. S. Geological Survey National Hydrography Dataset (NHD). These datasets have been combined to show the approximate locations of wetlands and streams in the Project Area (**Exhibit A-17**). A follow-up field review was performed to confirm the accuracy of wetland mapping data. GIS wetland data was found to be reasonably accurate and almost all wetlands observed were directly associated with drainages and intermittent streams.

### **4.16.2 Impacts**

No wetland impacts are anticipated with the proposed Project, as all turbine locations appear to be located on upland and can be accessed without crossing streams or associated wetlands. To confirm this, Goodhue Wind will conduct a wetland assessment of developable areas of the Project Area.

### **4.16.3 Mitigation**

No wetland mitigation should be required, since it appears that all wetlands should be avoided. Based on the findings of the wetland assessment of developable areas and siting of turbines, access roads, collection lines and associated facilities for the Project, wetland delineation may be required in for those wetlands that cannot be avoided. If conducted, the wetland delineation will assist Goodhue Wind in final siting decisions and wetland permitting requirements, if needed.

## **4.17 Vegetation**

### **4.17.1 Description of Resources**

The Project Area lies on the transition between Minnesota's Deciduous Forest-Woodland and Prairie zones. With the exception of steep slopes and drainages, virtually all of the native vegetation in the Project Area has been converted to agriculture. The National Land Cover Dataset (NLCD) indicates that the vast majority of the Project Area consists of agricultural land

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**(Exhibit A-11).** Crops grown in the Project Area consist almost exclusively of corn, soybeans and alfalfa. Some remnant deciduous forest stands exist but most are associated with farmsteads or lie on steep slopes.

The only portions of the Project Area shown in the Minnesota County Biological Survey (MCBS) as being of any significance for biodiversity are a few wooded bluffs and ravines along and tributary to Belle Creek at the western end of the Project Area (**Exhibit A-9**; Minnesota Department of Natural Resources 1995). However, all such areas are designed as disturbed in the MCBS. A few grassland areas persist on steep slopes and may potentially harbor small prairie remnants. However, the MCBS data does not depict any native prairies within the Project Area. Minnesota DNR Natural Heritage Program (NHIS) data (discussed in Section 4.19) indicates the presence of a remnant dry hill oak savanna in the northeastern corner of the project site. However, based on a site field review, this stand lies almost entirely off-site and would not be affected by any preliminary turbine locations.

All wetlands observed in the Project Area appeared to be highly disturbed by agricultural activity. These wetlands were generally narrow bands of reed canary grass dominated wet meadow along drainage ways with some forested wetlands dominated by box elder, green ash and black willow.

#### **4.17.2 Impacts**

No impacts to native vegetation are anticipated as a result of the proposed Project. All proposed turbine locations lie on agricultural land and access roads can be sited and connected to public roads without crossing through any woodlands, grasslands or wetlands. Similarly, it is anticipated that O & M facilities and collection cables can be sited to avoid such resources.

#### **4.17.3 Mitigation**

Because no impacts to native vegetation are anticipated, no mitigation measures are proposed.

### **4.18 Wildlife**

#### **4.18.1 Description of Resources**

Wildlife species in the Project Area are those common to agricultural areas. Mammals using the area include white-tailed deer (*Odocoileus virginianus*), red fox (*Vulpes fulva*), gray fox (*Urocyon cinereoargenteus*), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), cottontail (*Sylvilagus floridanus*), woodchuck (*Marmota monax*), pocket gopher (*Geomys bursarius*), thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*), gray and fox squirrels (*Sciurus carolinensis* and *S. niger*), southern flying squirrel (*Glaucomys volans*), mink (*Mustela vison*), striped skunk (*Mephitis mephitis*), badger (*Taxidea taxus*), meadow vole (*Microtus pennsylvanicus*) and white footed mouse (*Peromyscus leucopus*).

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Bird species found in the cultivated portions of the Project Area include crows (*Corvus brachyrhynchos*), rock doves (*Columbia livia*), brown-headed cowbirds (*Molothrus ater*), house sparrows (*Passer domesticus*), mourning doves (*Zenaida macroura*), European starlings (*Sturnus vulgaris*), robins (*Turdus migratorius*), tree swallows (*Tachycineta bicolor*), common nighthawks (*Chordeiles minora*). The cultivated areas of the site also are likely to support ring-necked pheasants (*Phasianus colchicus*), red-tailed hawks (*Buteo jamaicensis*) and American kestrels (*Falco sparverius*). Forested areas along drainageways and in ravines are used by various common songbirds such as catbirds (*Dumetella carolinensis*), brown thrashers (*Toxostoma rufum*) and several species of warblers, flycatchers and sparrows. The Project Area has almost no habitat for waterfowl, wading birds (e.g. herons and egrets) or shorebirds.

Amphibian and reptile species found in the Project Area are limited due to the scarcity of wetlands and the very intermittent nature of most streams and drainages. This is particularly true of frog and turtle species that require surface water. Common upland snakes in the area include common garter snake (*Thamnophis sirtalis*), redbelly snake (*Storeria occipitomaculata*), fox snake (*Elaphe vulpina*), bull snake (*Pituophis catenifer sayi*).

#### **4.18.2 Impacts**

Wildlife habitat impacts are expected to be minimal because turbines and access roads will be placed exclusively on agricultural land. Less than one percent of the land area within the Project boundaries will be affected by construction and grasslands, forested areas, streams/drainages and wetlands are being altogether avoided.

The Project Area has similar general habitat and wildlife species composition as many other wind farms in the upper Midwest, and it is anticipated that bird fatality rates documented at other locations will be similar to the proposed Project. Studies outside of California have identified an average of 1.83 fatalities/turbine/year for all birds (0.006 are raptors). Studies at Buffalo Ridge in Minnesota estimated 0.98 fatalities/turbine/year (West 2001). Potential indirect impacts to breeding birds due to displacement by turbines and roads are anticipated to be negligible because turbines will be exclusively on cropland.

Potential bat roosting habitat at the site includes trees and old farm buildings. Stands of trees are relatively sparse. One large stand of trees exists adjacent to the Bell Creek Watershed Reservoir in the northern part of the Project Area. There are also several large stands of trees associated with bluffs and ravines in the western part of the Project Area. Bats may forage over the entire project area, although the extent of use is not known. Bat fatalities have been reported for most wind farms where post-construction monitoring data is available. Reported estimates of bat mortality at wind farms through 2001 ranged from 0.07 to 10 bats/turbine/year. Bat fatality rates in the Upper Midwest are estimated at 1.7 bats/turbine/year or 2.7 bats/MW/year (NWCC 2004). Most bat casualties at wind farms have been migratory species that conduct long migrations between summer roosts and winter hibernacula. The proposed site does not appear to contain topographic features that would funnel bat movements during migration.

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The overall impact of the proposed Project on wildlife is expected to be minimal. Operation of the wind farm will not change adjacent land uses and only a small portion of the Project Area will be affected by construction activities. Also, because all wind farm facilities will be sited on cultivated land, habitat impacts are expected to be negligible. There is some potential for avian and bat collisions with facility turbines and meteorological towers but these impacts are unlikely to be significant.

#### **4.18.3 Mitigation**

Wildlife habitat impacts have been mitigated by: (1) siting turbines, roads and other facilities on cultivated land rather than natural wildlife habitat; (2) using tubular towers to minimize perching; (3) placing electrical collection lines underground; and (4) minimizing other Project infrastructure. Other wildlife-related mitigation measures include:

- Goodhue Wind will implement a Wildlife Response Reporting System (WRRS) once turbine construction is completed. The WRRS will include protocols for field technicians, during routine maintenance operations, to report and document avian mortalities.
- Goodhue Wind will construct wind turbines using tubular monopole towers and turbines will be minimally lit according to FAA requirements.
- Goodhue Wind proposes to place the electrical collection system from the turbines to the Project Substation underground wherever site conditions allow.
- The Project is being designed to avoid impacts to wetlands, streams and forested areas.

### **4.19 Rare and Unique Natural Resources**

#### **4.19.1 Description of Resources**

Westwood explored publicly available sources of information regarding federal and state-listed threatened and endangered species known or likely be found within the Project Area. Formal Natural Heritage Information System (NHIS) data requests were submitted to the Minnesota DNR (MnDNR) Natural Heritage Program, which maintains the most up-to-date database of rare species observations. On October 24, 2008 the MnDNR provided the initial NHIS response (see below).

#### **Federally Listed Species**

The USFWS maintains a list of federally listed threatened and endangered species that are known or have the potential to exist in Minnesota counties (USFWS 2008). Two federally listed species known or potentially occurring in the Goodhue County are the dwarf trout lily (*Erythronium propullans*) and the Higgins eye pearl mussel (*Lampsilis higginsii*). The Project

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Area is a significant distance from the known range of the dwarf trout lily and the Higgins eye pearl mussel is only found in the Mississippi and St. Croix Rivers. Accordingly, no federally listed threatened and endangered species are expected to exist in the Project Area.

On October 6 and December 19, 2008 Goodhue Wind contacted the USFWS for comments regarding the proposed Project. The USFWS responded on December 19, 2008 that the St. Paul agency representative was no longer with the USFWS (**Appendix E**). On February 12, 2009 the USFWS contacted Westwood Professional Services, Inc. by telephone and requested additional information regarding the status of any bird and bat studies for the Project. The USFWS was also in contact with the MnDNR regarding concerns of threatened or endangered species regarding the Project.

### **State-Listed Species**

The Goodhue County Biological Survey (published in 1995) indicated that no state-listed natural communities or rare species has been located within the Project Area (MnDNR 1995). The response from the MnDNR Natural Heritage Information System (NHIS) database confirms that that County Biological Survey data is mostly valid (see below). In order to further assess the likelihood that state-listed threatened, endangered and special concern species might be potentially found in the Project Area, the life histories and distribution data for each listed species were researched. All of the listed plant species are associated with habitat types that do not exist in the Project Area. Most listed plant species are associated with sand and gravel prairies, calcareous fens, acid bogs, cliffs/ledges, sedge meadows and floodplain forests along larger rivers. Some species are associated with high quality remnants of habitat types that could occur in the Project Area but do not appear to be present (e.g. mesic prairie, oak savannas, moist bottomland forest). Due to the extent of agricultural disturbance, it is unlikely that any state-listed plant species exist in the project area.

The Minnesota DNR lists 7 endangered bird species, 6 threatened bird species, and 15 special concern bird species known to occur in the state. All seven endangered species are either not found in Goodhue County or require habitat types that do not exist within the Project Area. The same is true for five of the six threatened bird species. Peregrine falcons (*Falco peregrines*) migrate along the eastern edge of Goodhue County along the Mississippi River and would be unlikely to utilize the Project Area.

State-threatened loggerhead shrikes (*Lanius ludovicianus*) occur in Goodhue County and have been observed around the eastern edge of the Project Area east of the City of Goodhue (see Section 4.19 below). Loggerhead shrikes are predatory birds that inhabit open country and dry upland prairie with hedgerows, shrubs and small trees. It is also found around shelterbelts, old orchards, pastures, cemeteries and farmsteads where this type of habitat is present (Coffin, B. and L. Pfannmueller, 1988). Recent surveys have found fewer than 30 nests in southern and western Minnesota, with a small concentration in Dakota, Rice, and Goodhue counties (see <http://www.dnr.state.mn.us/volunteer/marapr00/loggerhead.html>). The Minnesota DNR conducted a statewide survey for loggerhead shrikes in 1995 and 1996. In 1995, thirteen locations were surveyed in Goodhue County and one nest was found about 14 miles west of the Project Area near Dennison (Eliason, B. 1996). One location in Goodhue County was surveyed in 1996 but no nests were observed. As described below under NHIS Response, loggerhead

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shrikes were documented immediately east of the City of Goodhue in 1998. The Project Area encompasses scattered patches of potentially suitable nesting habitat for loggerhead shrikes and they are likely to be present in small numbers.

Seven of fifteen special concern bird species are not found in Goodhue County and the remaining eight utilize habitat types that are not present in the Project Area. Red shouldered hawks (*Buteo lineatus*) are known to occur in Goodhue County but typically utilize floodplain forest habitats which are not present in the Project Area. Louisiana waterthrushes (*Seiurus motacilla*) are also known to occur in Goodhue County but are found in wooded ravines with rapidly flowing streams. Streams in the Project Area appear to be too ephemeral to support waterthrushes. Bald eagles (*Haliaeetus leucocephalus*) are also found in Goodhue County, primarily along the Mississippi River. However, as described below under NHIS Response, in 2005 a bald eagle nest was observed nesting along Belle Creek about one mile west of the Project Area. Acadian flycatchers (*Empidonax vireescens*) inhabit river bottoms and mature, closed canopy forests, which are lacking in the Project Area. Hooded warblers (*Wilsonia citrina*) and cerulean warblers (*Dendroica cerulea*) both require relatively mature closed-canopy floodplain or moist upland forests. These habitat types are generally not present in the Project Area, though it is possible that several forest stands in the northwest corner of the Project Area could support these species. Special concern species have no legal protective status under Minnesota state law.

No suitable habitat exists in the Project Area for any of the listed fish or mollusk species. Most of the listed reptile species are only designated special concern due to their vulnerability to harvesting (e.g. snapping turtles) or collecting for the pet trade (fox snakes, racers, eastern hognose snakes, milk snakes, gopher snakes). The Project Area does not encompass suitable habitat for Blanding's turtles or wood turtles. Timber rattlesnakes could potentially occur in the Project Area in the summer months but would be more likely to be found farther east along the Mississippi River and its major tributaries.

Two state-listed special concern bat species are found in the Project Area. The northern myotis (*Myotis septentrionalis*) and eastern pipistrelle (*Pipistrellus subflavus*) are both found in Goodhue County. They are not uncommon but they are vulnerable to impacts in and near their hibernacula and nursery colonies (Coffin and Pfanmueller 1988). These are usually in caves or old mines but could also be barns, old buildings and rock crevices. No caves or old mine sites are known to exist on the Project Area. Several quarry pits are known to exist but the potential for bat roosting in these features is currently unknown.

### **MnDNR NHIS Response**

On October 24, 2008, the Minnesota DNR responded to the initial request for a search of the NHIS database (**Appendix E**). The response indicated that a loggerhead shrike was observed during the 1998 breeding season immediately east of the City of Goodhue and that it was possible that the species might breed in or near the Project Area (**Exhibit A-18**). The response indicated that a bald eagle nest was documented about one mile west of the Project Area along Belle Creek. The response indicated that a MCBS Site of Outstanding Biodiversity Significance

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was located on the northern edge of the Project Area northwest of the former Clay Bank town site (the site referred to is the dry hill oak savanna described above, which lies almost completely off-site). A red oak-white oak forest and populations of beach heather (*Hudsonia tomentosa* – special concern) and kitten-tails (*Bessya bullii* – threatened) were identified north of the Project Area. A freshwater mussel concentration area was also identified southwest of the Project Area on a tributary of the North Fork of the Zumbro River. Creek heelsplitters (a special concern mussel species; *Lasmigona compressa*) and snow trilliums (a special concern plant species; *Trillium nivale*) have been observed along the South Fork of the Zumbro River, about one mile south of the Project Area.

#### **4.19.2 Impacts**

Rare and Unique Resources impacts are expected to be minimal because turbines, access roads, collection lines, and associated facilities will be placed exclusively on agricultural land. Less than one percent of the land area within the Project boundaries will be affected by construction and grasslands, forested areas, streams/drainages and wetlands are being altogether avoided.

#### **4.19.3 Mitigation**

Mitigation of potential impacts to Rare and Unique Resources will be in the form of avoidance. The siting of turbines, access roads and other infrastructure will be carried out in a manner that avoids impacts to rare plant communities and threatened, endangered or special concern plant and animal species. Turbine and access road locations are expected to be entirely on cropland so as to avoid any potential rare or unique natural resources. A preconstruction biological preservation survey will be conducted in consultation with the MnDNR and USFWS to facilitate the micrositing of turbines and roads so as to avoid such resources. Goodhue Wind is also discussing with the USFWS and MnDNR their concerns. Goodhue Wind is conducting an avian and bat risk assessment, loggerhead shrike habitat assessment, and pre-construction avian spring migration survey to address such concerns. The results of this work will be provided to the USFWS and MnDNR.

#### **4.20 Summary of Preconstruction Inventories**

Goodhue Wind will conduct the following resource inventories for the Project Area prior to construction, and as determined necessary through ongoing regulatory agency coordination efforts. Goodhue Wind will submit copies of these preconstruction inventories to the PUC at the preconstruction meeting (date to be determined).

- Inventory of biological resources (desktop and field identifications of existing WMAs, SNAs, USFWS lands, recreation areas, native prairies, forests, and other biologically sensitive areas within the Project Area);
- Avian and bat risk assessment, loggerhead shrike habitat assessment, and pre-construction avian spring migration survey;

- Wetland avoidance surveys and, as required, formal delineation in accordance with Section 404 Permit requirements;
- Phase I Environmental Site Assessment; and
- Phase I Archeological Survey.

## 5.0 IDENTIFICATION OF POTENTIAL PERMITS/APPROVALS

The federal, state and local permits or approvals that have been identified as potentially being required for the construction and operation of the Project are shown in **Table 5-1**. Permits dependent on the final site layout will be applied for after receiving PUC approval, but prior to construction.

<b>Table 5-1: Potential Permits and Approvals Required for Construction and Operation of the Proposed Facility</b>			
<b>Agency</b>		<b>Name and Type of Approval</b>	
Federal	Federal Aviation Administration	Notice of Proposed Construction or Alteration (within six miles of Public Aviation Facility and structures over 200 feet to complete a 7460 Proposed Construction or Alteration Form)	
		Determination of No Hazard	
	Natural Resources Conservation Service	Prime Farmland Filing	
	U.S. Army Corps of Engineers	Section 404 Permit (for discharges of dredged or fill material into waters of the United States, and adjacent wetlands)	
State of Minnesota	Minnesota Public Utilities Commission	Large Wind Energy Conversion System (LWECS) Site Permit	
	Minnesota State Historic Preservation Office	Cultural and Historical resources review; State and National Register of Historic Sites review	
	Minnesota Board of Water and Soil Resources	Wetland Conservation Act (WCA) Approval	
	Minnesota Department of Natural Resources		Public Water Works Permit
			License to Cross Public Lands and Waters
	Minnesota Pollution Control Agency		NPDES Permit for Construction Activities and Storm Water Pollution Prevention Plan (SWPPP)
			License for Very Small-Quantity Generator of Hazardous Waste
			Aboveground Storage Tank (AST) Notification Form
			Spill Prevention, Control and Countermeasure (SPCC) Plan
		Section 401 Water Quality Certification	

**Table 5-1: Potential Permits and Approvals Required for Construction and Operation of the Proposed Facility**

<b>Agency</b>		<b>Name and Type of Approval</b>
	Minnesota Department of Health	Plumbing Plan Review
		Water Well Permit
	Minnesota Department of Transportation	Utility Access Permit
		Highway Access Permit
		Aviation clearance from Office of Aeronautics (review and approval of FAA 7460 permit, if needed)
		Oversize and Overweight Program
Local	Goodhue County	Building Permits(O&M Building)
		Conditional Use Permit (O&M Building)
		Zoning Compliance Certificate (O&M Building)
		Individual Septic Tank Systems (ISTS) Permits (O&M Building)
		Driveway Permit
		Utility Permit
		Moving Permit
		Overwidth/Overweight Permits
	Goodhue Soil and Water Conservation District	Wetland Conservation Act Approval
	Goodhue, Belle Creek, Minneola, Vasa and Zumbrota Townships	Road Access Permits

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## 6.0 REFERENCES

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