SITE PERMIT APPLICATION

Lakefield Wind Project

Jackson County, Minnesota

November 4, 2009

Prepared For:

Lakefield Wind Project, LLC

10 Second Street Northeast, Suite 107

Minneapolis, Minnesota 55413

Prepared By:

Westwood

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

Lakefield Wind Project

Jackson County, Minnesota

MPUC Docket Number: IP6829/WS-09-1239

Prepared for:

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10 Second Street Northeast, Suite 107
Minneapolis, MN 55413

Prepared by:

Westwood

Westwood Professional Services, Inc.
7699 Anagram Drive
Eden Prairie, Minnesota 55344

Project Number: 20092538

November 4, 2009

Project Name:	Lakefield Wind Project	
Project Location:	Jackson County:	T102N, R35W, Sections 5-8, 17-20 (Des Moines Township) T102N, R36W, Sections 1-5, 8-17, 20-29 (Hunter Township) T103N, R35W, Sections 19, 30-31 (Belmont Township) T103N, R36W, Sections 14-17, 19-29, 33-36 (Heron Lake Township)
Applicant:	Lakefield Wind Project, LLC	
Authorized Representative:	Ms. Kate O'Hair, Regional Project Development Manager	
Signature:	Kate O'Hair	
Address:	10 Second Street Northeast, Suite 107, Minneapolis, MN 55413	
Phone:	(612) 746-0770 x 302	
Fax:	(612) 746-0777	
Email:	katei@enxco.com	
Preparer of Application:	Mr. David M. Weetman	
Signature:	D.M. Weetman	
Company:	Westwood Professional Services, Inc.	
Address:	7699 Anagram Drive, Eden Prairie, MN 55344	
Phone:	(952) 937-5150	
Fax:	(952) 937-5822	
Email:	david.weetman@westwoodps.com	

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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
BOP	Balance of Plant
Capacity	The capability of a system, circuit, or device for storing electronic charge
C-BED	Community-Based Energy Development
Phase Ia	Cultural Resources Literature Search – a large-scale review and compilation of known cultural resource data.
Phase I	Cultural Resources Reconnaissance Survey – physical inspection and identification of cultural resources within a specific area.
COD	Commercial Operation Date
Commission or PUC	Minnesota Public Utilities Commission
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)
Interconnection	To be or become mutually connected
kV	kilovolt
kW	kilowatt
LGIA	Large Generator Interconnection Agreement
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	Lakefield 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
O & M Facility	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	Lakefield 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

1.0 INTRODUCTION

Lakefield Wind Project, LLC (Applicant, or Lakefield Wind), a subsidiary of enXco Development Corporation (eDC), submits this Site Permit Application (Application) to the Minnesota Public Utilities Commission (MPUC) for a site permit to construct and operate the Project. The Project is a 205.5 megawatt (MW) wind farm consisting of up to 137, 1.5 megawatt (MW) wind turbine generators. The Project is located in southwestern Minnesota immediately north, south, and east of Lakefield, Minnesota (**Exhibit 1**).

Associated facilities will include collection lines, an operation and maintenance facility (O & M), two permanent meteorological towers and access roads. The only new transmission lines required for the Lakefield Wind Project will be a short 345kV line connecting the project substation to the Lakefield Junction Substation. The length of the 345kV line is expected to be under a quarter mile (less than 1,500 linear feet). Lakefield Wind is pursuing the purchase of a project substation site adjacent to the existing Lakefield Junction Substation and anticipates that the transaction will be completed by December 1, 2009. The project is expected to be in commercial operation by December 31, 2010.

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 application for the project was initially filed with the MPUC on September 2, 2009, and Lakefield Wind is in the process of coordinating with the OES/PUC for approval. The MPUC Docket Number issued for the CON is 6829/CN-09-1046.

Consistent with the PUC objectives, Lakefield Wind is committed to optimizing the wind resource for the Lakefield 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. Lakefield Wind will evaluate the site to optimize wind resources, transmission interconnection opportunities, and economic factors, while avoiding and minimizing impacts to environmental resources.

1.1 Ownership of the Proposed Facility

Lakefield Wind Project, LLC and its member, eDC, will own and oversee the engineering, procurement and construction of the project and will perform the various aspects of the work itself or through the use of highly qualified contractors. The operator of the Lakefield Wind Project will be enXco Service Corporation (eSC).

eDC has more than twenty years in the renewable energy business and is an industry leader in wind project development, and a premier provider of operation and maintenance services throughout North America. eDC has developed, or is currently developing, projects in locations such as Minnesota, California, Indiana, North Dakota, Iowa, Washington, Alaska, Hawaii, Colorado and Oregon.

eDC has developed and retained an ownership position in three LWEC systems in the State of Minnesota, has developed and sold a fourth LWECS, and is in the process of developing and selling a fifth LWECS in Minnesota. eDC maintains an ownership interest in the 85.5-MW Chanarambie Wind Project, the 205.5-MW Fenton Wind Project, and the 100.5-MW Wapsipinicon North Project. eDC sold its interest in the 100.5-MW Grand Meadow Wind Project to NSP in 2007, and is in the process of developing the Nobles Wind Project for NSP. In all of these cases, eDC performed complete greenfield development, engineering, procurement and construction of the facilities, and in the case of the projects owned by eDC, financed the projects as well.

eSC operates and maintains the Chanarambie, Fenton and Wapsipinicon North Wind Projects. Additionally, eSC has entered into a service contract with NSP for the Maintenance of the Grand Meadow Wind Project.

eDC has a long history of project development in Minnesota. eDC was involved in the development and construction of three 1.98MW projects which came online in 1999 and 2001. eDC was also involved in the financing and construction of the 12MW Viking project which came online in 2003. eDC provides operations and maintenance services to all four of these projects.

1.2 Status of Power Purchase and Interconnection Agreements

Lakefield Wind Project, LLC executed a 20-year Power Purchase Agreement (PPA) with Indianapolis Power & Light Company (IPL) on June 22, 2009.

The Lakefield Wind Project is in the Midwest Independent System Operator (MISO) Queue No. G164. Lakefield Wind executed a Large Generator Interconnection Agreement (LGIA) on September 13, 2005 with MISO and the Interstate Power and Light Company. The agreement was suspended on November 2, 2005. Subsequently the Interstate transmission system was acquired by the International Transmission Company (ITC) and the LGIA was assigned to them.

Original terms of the LGIA estimated approximately $1.3 MM in non-reimbursable interconnection costs and reimbursable network upgrades for the Project. However, MISO recently informed eDC that the Transmission Owner has reserved an interconnection bay at the Lakefield substation for another use and this LGIA would be assigned an additional $6.1 million in interconnection and network upgrade costs. Subsequent discussions with MISO indicate that the total of these costs is estimated to be $6.5 million, plus or minus 20%. The network upgrade portion of those costs will be reimbursable over the period of 90 days.

The Point of Interconnection for the project is at ITC's Lakefield Junction Substation, the same location as the Point of Metering under the PPA. IPL is responsible for selling the power into the MISO market from the Lakefield Junction Substation.

1.3 Project Location and Applicant Information

1.3.1 Project Location

The Project Area is located in Jackson County in south-central Minnesota, approximately 2.0 miles west of Jackson, Minnesota (**Exhibit 2**). The Project is located immediately north, south, and east of the City of Lakefield and is composed of approximately 32,445-acres (50.7 square miles), which is mostly agricultural land. **Table 1-1** below lists the Township, Range, and Section in which the Project is located.

Table 1-1: Project Location

County	Township Name	Township	Range	Section
Jackson	Des Moines	102N	35W	5-8, 17-20
Jackson	Hunter	102N	36W	1-5, 8-17, 20-29
Jackson	Belmont	103N	35W	19, 30-31
Jackson	Heron Lake	103N	36W	14-17, 19-29, 33-36

Lakefield Wind will site the equipment and facilities within the 32,445-acre Project Area as shown in **Exhibit 1**. 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. Lakefield Wind currently has wind rights over approximately 19,000 acres of private land within the Project Area, which is sufficient to support this 205.5 MW Project.

1.4 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 a 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, the Applicant 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.

1.4.1 Certificate of Need

A Certificate of Need (CON) is required for the Project because it is a 205.5 MW wind farm and a "large energy facility", as defined by Minnesota Statute § 216B.2421, subd. 2(1).[1] The Applicant has applied for a Certificate of Need from the MPUC prior to the Site Permit Application.

1.4.2 State Policy

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

2.0 PROJECT AREA AND WIND RESOURCES

2.1 Wind Characteristics in Project Area

The wind resource across Southwestern Minnesota has been documented for more than 20 years by U.S. Department of Energy, Minnesota Department of Commerce, and public utility companies. Extensive wind measurements have been taken and synthesized by various parties. These data suggest that the long-term mean annual 80-m wind speeds across Jackson County in the area of interest for the Lakefield Wind Farm range from 8.1 to 8.5 meters per second (mps) (18.1 to 19 mph).

In October 31, 2008, Lakefield Wind engaged AWS Truewind, LLC (AWS) to conduct a wind resource assessment for the Project. AWS analyzed wind data collected from two 50-m meteorological towers called Mast 306 and Mast 341 to better understand Project Area wind characteristics. Mast 306 and Mast 341 are located in the north-central section of the Project Area. Mast 306 was installed in December 2001 and was decommissioned in 2006 due to interference with farming activities. In December 2005, Mast 341 was erected approximately 60 meters from Mast 306 and remains in operation.

Masts 306 and 341 have nearly identical elevation, terrain characteristics and surface conditions as the Project Area, which consists mostly of rolling pasture land. AWS analyzed nearly 7 years of wind data (December 2001 - October 2008) from these towers. Wind

[1] Under Minn. Stat. § 216B.2421, subd. 2(1), a "large energy facility" is defined as any electric power generating plant or combination of plants at a single site with a combined capacity of 50,000 kilowatts or more and transmission lines directly associated with the plant that are necessary to interconnect the plant to the transmission system.

speeds at Mast 341 are measured at 10.7, 29.9 and 48.5 m above ground. The composite annual mean wind speeds from this tower are summarized below in **Table 2-1**, along with extrapolations to 80-m hub height.

Table 2-1: Mast 341 Tower Wind Speeds

Height (m)	Site 341 (m/s)	Shears Levels (m)	Exponent	Extrapolated to 80 m w/shear 30-50 m
10.7	8.71	10.7-29.9	0.174	8.71 m/s
29.9	8.45	29.9-48.5	0.183	8.45 m/s
48.5	8.49	29.9-48.5	0.196	8.49 m/s

Ground elevations in the Project Area vary only slightly from 1,540 feet above sea level in the southeastern portion of the Project Area to 1,401 feet in the western portion. This part of Minnesota is characterized by gently rolling to level ground moraine topography, with the exception of steep topography along the banks of the rivers and streams. The Project Area lies within a geographic region that has been historically proven viable for the deployment of wind turbine generators. Based on available data from the Mast 306 and Mast 341 tower sites, the Project Area can be judged as having similar wind climates.

2.1.1 Interannual Variation

The average annual wind speeds measured at the long-term reference station at Marshall Ryan, MN and Jackson, MN FAA surface stations varied by 13.36%, and 16.81%, respectively, during the calendar years of 1993-2007, and 1998-2007, respectively. See **Figure 1**.

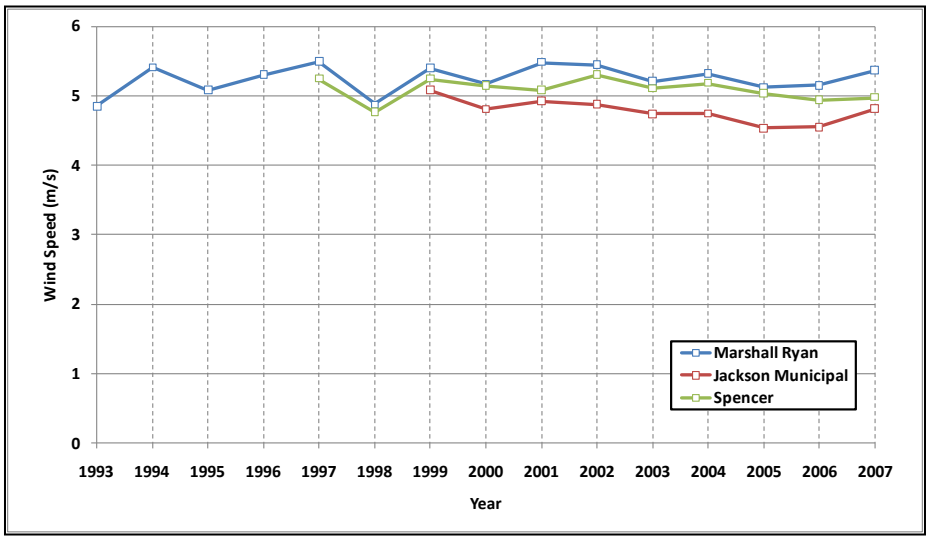

Figure 1. Interannual Variation: Reference Station Annual Mean Wind Speeds

2.1.2 Seasonal Variation

Generally, 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. See **Figure 2**.

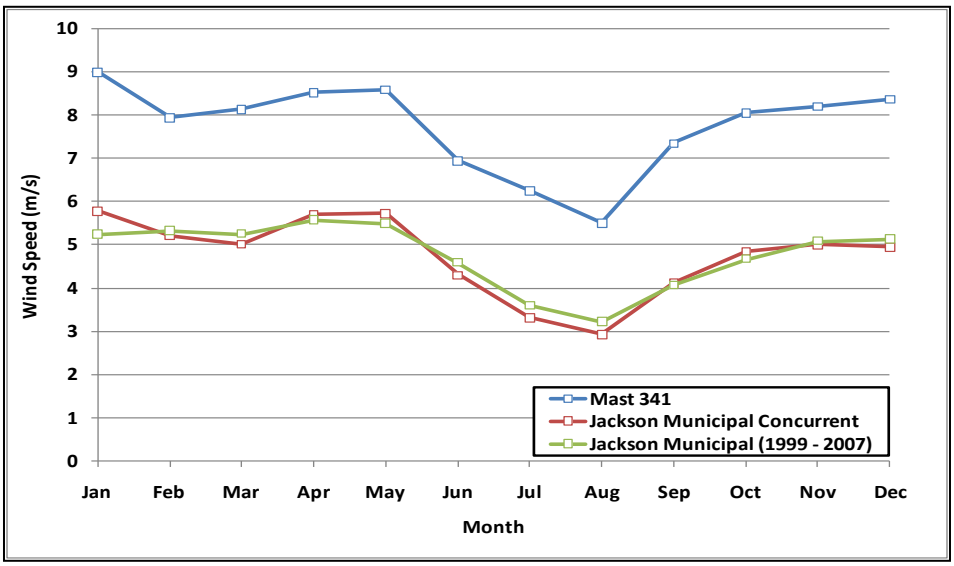

Figure 2. Mast 341 and Reference Station Monthly Mean Wind Speeds

2.1.3 Diurnal Conditions

The highest average wind speed observed at the site occurs during the afternoon and late night. The lowest wind speeds are in mid-morning and early evening. See **Figure 3**.

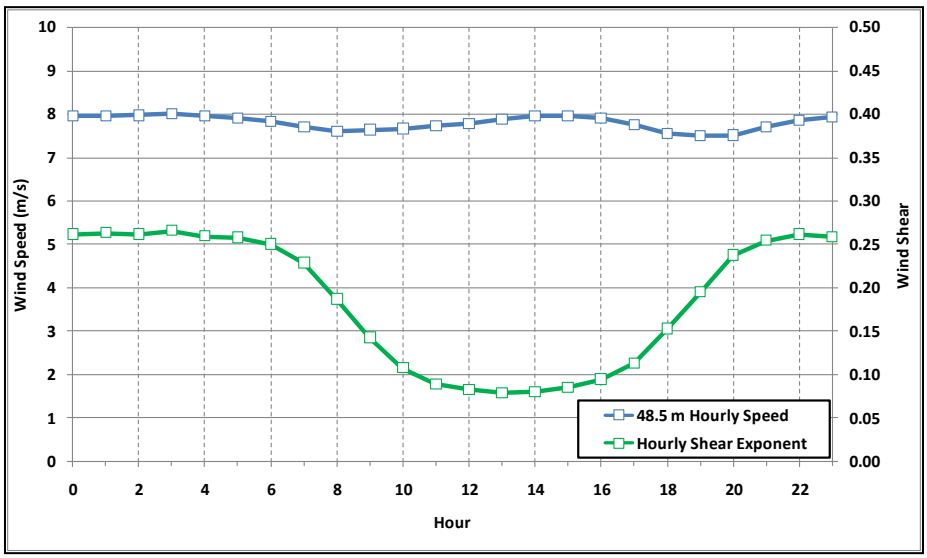

Figure 3. Mast 341 Diurnal Wind Speed and Shear Patterns

2.1.4 Atmospheric Stability

The studies engaged to date to determine wind speed and energy production for LWECS systems do not include these data.

2.1.5 Hub Height Turbulence

The turbulence intensity at hub height was calculated at 9.8%, which is consistent with expectations for the relatively uncomplicated terrain of the site area.

2.1.6 Extreme Wind Conditions

Extreme Wind Conditions		Lakefield Value	IEC Standard Check
Steady Extreme Model			
50-year Extreme Wind Gust @ Hub Height (m/s)	Ve50	54.2	Meets Standard
1-year Extreme Wind Gust @ Hub Height (m/s)	Ve1	43.3	Meets Standard
Turbulent Extreme Model			
50-year Extreme 10-min Average Wind Speed @ Hub Height (m/s)	V50	38.7	Meets Standard
1-year Extreme 10-min Average Wind Speed @ Hub Height (m/s)	V1	31	Meets Standard

Table 1. Extreme Wind Conditions at Lakefield Checked Against IEC Standard.

2.1.7 Wind Speed Frequency Distribution

The following **Figure 4** provides the anticipated long-term annualized wind speed frequency distribution for the Lakefield Wind Project.

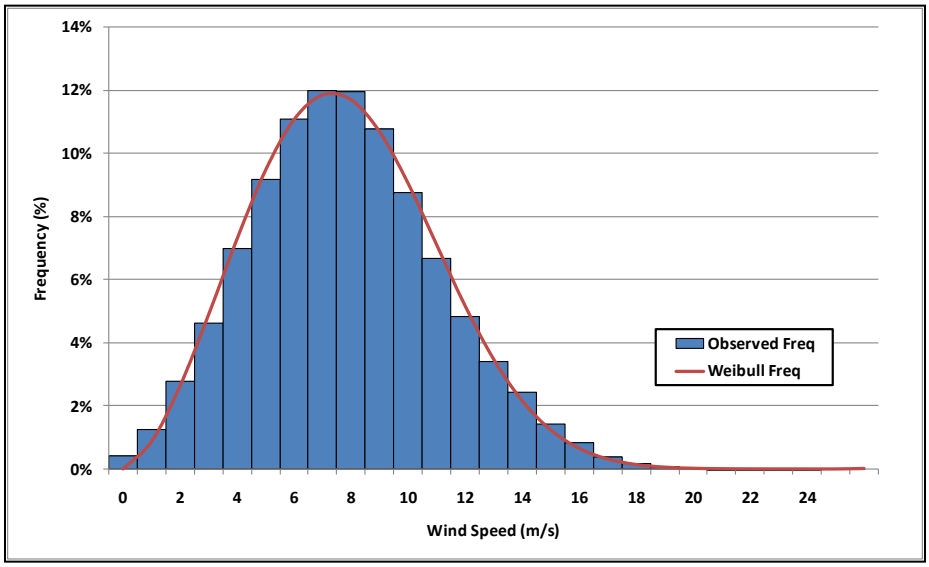

Figure 4. Mast 341 Observed Wind Speed Frequency Distribution and Fitted Weibull Curve

2.1.8 Wind Variation with Height

Wind speed variation with height or wind shear was calculated using the power law. The resulting wind shear exponent, 0.186, is consistent with the relatively flat terrain of the project area.

2.1.9 Spatial Wind Variation

Due to the relatively uncomplicated terrain of the project area, significant variation in wind speed is not anticipated within the project area.

2.1.10 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. The prevailing energy/wind direction is generally from the south-southwest and north-northwest. A wind rose for the monitoring Mast 341 is presented in **Figure 5.**

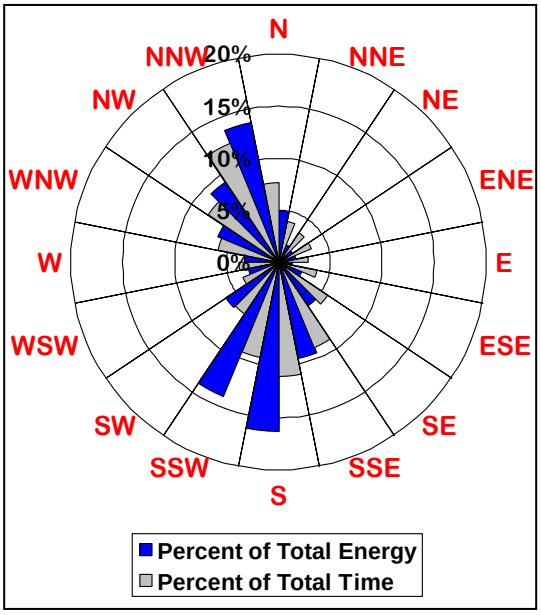

Figure 5. Monitoring Mast 341 Wind Rose

(January 2006 – December 2007)

2.2 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, long-term climatological data does not exist for the Project Area. However, data from a climate station located near Worthington, Minnesota, approximately 20 miles west of the Project Area, was used to represent meteorological conditions at the site. A summary of temperature and precipitation from the Worthington 2 NNE Minnesota climate station No. 219170 (1971-2000) gathered from the National Climatic Data Center is provided in **Table 2-3**.

Table 2-3: Temperature and Precipitation

Month	Temperature (^{o}F)					Precipitation (Inches)	
	Mean Daily Max	Mean Extreme Max	Mean Daily Min.	Mean Extreme Min	Mean	Rainfall Mean	Snowfall Mean
Jan	20.8	26.3	1.9	-3.3	11.4	0.70	6.7
Feb	27.4	30.7	8.5	1.6	18.0	0.61	5.8
Mar	38.8	38.7	19.9	19.6	29.4	1.88	7.1
Apr	54.8	50.4	32.2	36.6	43.5	2.72	3.6
May	69.1	64.8	45.3	51.4	57.2	3.37	0.0
Jun	78.5	72.5	55.4	61.3	67.0	4.60	0.0
Jul	82.3	76.0	59.7	64.1	71.0	3.56	0.0
Aug	79.7	74.8	56.6	63.2	68.2	3.48	0.0
Sept	71.6	65.8	46.5	54.2	59.1	2.55	0.0
Oct	58.9	51.4	34.3	40.1	46.6	1.96	0.9
Nov	39.2	42.0	20.9	20.5	30.1	1.66	6.6
Dec	25.2	25.4	7.8	-0.3	16.5	0.70	6.3
Annual	53.9	76.0	32.4	-3.3	43.2	27.79	37.0

Sources: National Climatic Data Center website accessed July 2009. Historical Climate Data, normals, means, and extremes from Worthington 2 NNE Minnesota climate station No. 219170 (1971-2000).

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 February 2009. Extreme weather events during this period include tornadoes, hail, thunderstorm wind, high wind, winter storms, blizzards, extreme cold, heavy snow, excessive heat, drought, floods, and flash floods. The NCDC recorded 285 extreme weather events in Jackson County during this time period including 17 tornados, 19 high wind events, 68 thunderstorm wind events, and 11 blizzards. Typically, such storms are local in extent, short in duration, and result in damage to relatively small geographic areas.

2.3 Wind Rights

The Applicant has secured the wind rights and easements necessary to support the Project. Within the approximate 32,445-acre Project Area, Lakefield Wind has wind rights for approximately 19,000 acres of private land at this time. The secured lease and easement agreements will ensure access to the Project Area for construction and operation of the Project, and prohibit landowners from engaging in activities that might interfere with the implementation of the Project. The leases and (or) easements allow for approximately 30 years of project operation.

Land right leases and wind easements will encompass the proposed wind farm Project and all associated facilities, including but not limited to wind and buffer easements, wind turbines, access roads, transmission lines, and possibly land to mitigate environmental impacts incurred due to development.

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.

3.1 Project Layout and Associated Facilities

The Project will consist of approximately 137 wind turbines (1.5 MW), transformers, collection lines, a short 345kV transmission line, one Project substation, access roads, an Operation & Maintenance Facility and two permanent meteorological towers. The Project's preliminary turbine locations (which include alternate locations) are shown on **Exhibit 3**, along with the Project Substation location.

The Project's preliminary site layout includes 137 turbine locations employing the GE 1.5 MW turbine. Alternate turbine locations are also provided. Turbine locations are subject to change based upon the findings of Project preconstruction surveys, specific wind data, and turbines' relative performance, site control, and micrositing. The availability of the specific

turbine model proposed, and procurement of that model, may also dictate the ultimate location and placement of the generators within the project area.

The Applicant 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, environmental constraints, as well as the selected turbine technology will dictate turbine spacing and layout of electric collection lines. The Project engineering and operational design is summarized in the following sections of this report.

Land will be graded on-site for the turbine pads, access roads, and associated facilities. Drainage systems, access roads, and storage/laydown areas will be installed as necessary to accommodate construction, operation and maintenance of the wind farm.

3.2 Operational Design

3.2.1 Description of Turbines, Towers and Foundations

Lakefield Wind is currently planning to install a GE 1.5 MW series turbine.
The 1.5 Series turbine, rated 1.5 MW, assembled by GE Wind Energy, is a three bladed, upwind, active yaw, and active aerodynamic control regulated wind turbine generator with power/torque control capabilities. The rotor utilizes blade pitch regulation and variable speed operation to achieve optimum power output at all wind speeds. The variable speed operation minimizes power and torque spikes delivered from the rotor to the drive train resulting in improved long-term reliability.

3.2.2 Rotor

The 1.5 MW turbine Series rotor utilizes an active-pitch controller to provide continuous fine adjustment of the blade angle. This “fine tuning” optimizes wind energy capture at all operating wind speeds. The turbine’s active-pitch controller also enables the wind turbine to dramatically reduce the damaging peak loads associated with large stall-regulated rotors. The turbine can be delivered with one of three blade diameters: 65 meters for high wind speed applications, 70.5 meters for medium wind speed applications, and with a 77-meter rotor diameter for low wind speed applications.

Under partial load, the pitch angle is held constant, and the rotor speed is varied to maximize energy capture. If the rated wind speed is exceeded, the turbine power output is kept constant by varying the pitch angle, independent of air temperature and air density.

A major attribute of the turbines variable speed technology is its ability to minimize torque spikes. By allowing the rotor to increase in speed during sudden gusts, high torque transients in the drive train are eliminated.

3.2.3 Hub Assembly

The hub is manufactured from cast ductile iron and undergoes stringent X-ray quality control procedures. It is mounted directly on the rotor shaft. There is access to the inside

of the hub for inspection and service of the electric pitch system and the blade mounting bolts.

3.2.4 Blades

The rotor blades use airfoils that are specifically designed for the 1.5 MW turbine. These turbine airfoils have reduced sensitivity to blade-surface roughness and provide a smooth blending along the blade. The superior aerodynamic characteristics of the turbine airfoils were verified in wind-tunnel tests, and result in one of the highest performance rotors in the industry.

The white blades are manufactured from fiberglass with a smooth layer of gel coat that provides UV protection. Field tests have proven that the proposed blades perform efficiently and at low noise levels.

3.2.5 Gearbox

The gearbox is a high efficiency, 3-stage planetary/spur gear design with a ratio of 1:72. The entire gearbox is supported by elastomeric bushings, providing noise reduction. The gearbox housing is cast to give a ductile and sturdy construction. The housing is designed to transmit all static and dynamic forces via the yaw system directly into the tower structure. The parking brake is mounted on the high-speed shaft of the gearbox.

The bearings on the main shaft inside the gearbox are of the spherical and cylindrical roller type. These bearings guarantee that parallelism of the shafts is maintained during operation.

All gears and bearings inside the gearbox are continuously force-lubricated through injection of 100% synthetic oil.

The bearings are force-lubricated by cross-flow from individual nozzles. Before the oil is forced through the oil pipes, it passes through a filter and a pressure reduction valve ensuring the delivery of clean oil at the correct pressure to the bearings. This system effectively and continuously cleans and cools the bearings under all operating conditions.

3.2.6 Generators

The generator is a doubly fed, asynchronous design with a wound rotor and slip rings. A frequency converter tied into the rotor circuit varies the rotor field frequency, allowing the generator speed to be adjusted in a range of +/- 30% around the synchronous speed.

The generator meets protection class requirements of the International Standard IP 54 with all electrical and moving parts totally enclosed for safety and protection from the elements. The generator housing is grounded and an air-to-air cooler ensures proper cooling of the windings. The generator is fastened to the bedplate with elastomeric elements to reduce noise and vibration.

3.2.7 Full Span Control System

The 1.5 MW Series wind turbine is equipped with variable pitch control system for each blade, providing safe, sure operation. Through the triple redundancy of individual blade aerodynamic braking capability, the need for high torque mechanical breaking is eliminated. Individual blade pitch angles are controlled by individual electric motor drives located inside the rotor hub. A fail-safe battery backup assures continuous, reliable operation.

3.2.8 Brake System (Aerodynamic Brake)

The electrically actuated individual blade pitch systems act as the main braking system for the wind turbine. Normal braking is accomplished by feathering the blades out of the wind. Any single feathered rotor blade can stop the wind turbine, and each rotor blade has its own battery bank and failsafe controls to ensure safe and reliable emergency feather action after a grid loss.

The turbine is also equipped with a brake located at the output (high-speed) shaft of the gearbox. This emergency brake is only applied on manual emergency-stops (E-stops). Under grid loss conditions, the machine first feathers the blades to slow the rotor, then after a time delay, the mechanical brake system actuates to ensure a safe and controlled shut-down.

3.2.9 Yaw Drive System

A roller bearing attached between the nacelle and tower facilitates yaw motion. Three yaw planetary drives (with electrical failsafe brakes) mesh with the outside gear of the yaw bearing and ensure proper yaw motion. Pre-loaded friction pads produce sufficient friction to prevent un-commanded yawing under normal operational conditions. Extreme yaw moments act in response to the yaw drive brakes. The yaw brakes are actuated when the turbine has reached the end position of a yawing maneuver.

The wind direction sensor on top of the nacelle communicates with a computer, which evaluates the measured wind parameters, and within a specified time interval, activates the yaw drives to align the nacelle to the changing wind directions. The yaw control action is continuously active, even below the cut in speed of the rotor to keep the turbine safely oriented into the wind. On the underside of the yaw deck, a cable twist sensor is mounted to provide an accurate measurement of nacelle rotation. After the sensor detects 900-degree rotation in one direction (net), the controller automatically brings the rotor to a complete stop, untwists the cable by counter yawing and re-starts the wind turbine.

3.2.10 Turbine Control Unit

The machine can be controlled from the control panel inside the nacelle or from the bottom of the tower. It can also be remotely controlled through the SCADA system, with local lockout capability provided at the turbine controller. Using the tower top control panel, the machine can be stopped, started, and turned out of the wind. Service switches at the tower top prevent service personnel at the bottom of the tower from operating certain systems of the turbine while service personnel are in the nacelle. To override any machine operation,

E-stop buttons located in the tower base can be triggered to quickly and safely stop the turbine.

3.2.11 Nacelle

The nacelle is a fiberglass shell enclosure with sound-insulating foam applied to the inside. Access from the tower into the nacelle is through a manhole in the bedplate. The nacelle functions as a housing to protect the mechanical and electrical equipment from the outside environment. It allows sufficient standing room and working space around the drive train for service and maintenance work. The housing is ventilated and well illuminated with a skylight hatch, enabling work to be carried out safely and when convenient. Most service and maintenance work can be carried out from inside the nacelle. A hatch at the front end of the nacelle gives easy and safe access to the blades and the hub. When the rotor is stopped and secured in the right position, there is access through a top hatch in the nose cone to the inside of the hub for maintenance functions. The sound insulating foam inside the nacelle enclosure and the elastomeric mounts of the main machine components reduce the acoustic emissions.

3.2.12 Sensors

To monitor the generator temperature, PT100 temperature sensors are built into the windings. The sensors provide a direct read-out of temperature on the controller display and a signal for an automatic shutdown of the turbine when a certain, user-defined temperature limit is exceeded.

3.2.13 Towers

The 1.5 MW Series turbine is available with a 65, 80, or a 100 meter hub height. The tubular tower offers protection to maintenance workers servicing the turbine in adverse weather conditions. The tubular tower is tapered in shape and is manufactured in three sections from certified steel plates. All welds are made in automatically controlled power welding machines and ultrasonically inspected during manufacturing. All surfaces are sandblasted and multi-layer coated for protection against corrosion. Access to the turbine is through a lockable steel door at the base of the tower. Three platforms are connected with a ladder and a fall arresting safety system for access to the nacelle. Interior lights are installed. An optional man-lift is offered for all tower heights to expedite easy access to the nacelle. This tower configuration is designed in accordance with the Uniform Building Code, the International Electrotechnical Committee's 1400-1 Standard, and Germanischer Lloyd's Rules and Regulations for Wind Turbine design.

3.2.14 Torque Limiting Coupling

To protect the gear drive line from excessive torque loads, a torque-limiting coupling is provided to connect the generator and gearbox output shaft.

3.2.15 Lightning Protection

The rotor blades are equipped with a lightning protection system. The entire turbine is grounded and shielded to protect against lightning, and the foundation has a crow's foot grounding arrangement to facilitate lightning flow into the ground. The lightning protection system has successfully protected the turbine in tests and actual operation.

However, lightning is an unpredictable force of nature, and it is possible that a lightning strike could damage various components notwithstanding the lightning protection deployed in the machine.

3.2.16 Power Conditioning

The 1.5 MW Series turbine variable speed system uses a proprietary doubly fed generator (DFG) and power converter system to ensure the delivery of constant frequency power to the grid. The turbines are also able to provide Voltage Amp Reactive (VAR) support. The turbines variable speed technology provides maximal energy capture, torque control, elimination of voltage flicker and power pulsation, as well as power factor control. A major attribute of the turbines variable speed technology is its ability to mitigate torque spikes. Torque transients, which cause voltage flicker and damage to drive train components, are attenuated by allowing an increase in rotor speed, thereby "storing" the additional energy of a wind gust in the rotational inertia of the rotor blades. This energy can be extracted and fed into the grid by reducing the rotor speed as the wind gust dies or it can be "dumped" by pitching the blades out of the wind. Thus, variable speed operation can dramatically reduce torque transients, which translates to lower costs and longer life of the wind turbine drive train. Additional power conditioning equipment may be necessary and if so will be specified in the Interconnection Agreement (IA) and installed at or near the point of interconnection.

3.2.17 Foundations

The free standing, tubular towers will sit atop a robust foundation designed for the specific soil conditions at the individual turbine site. Due to the wide array spacing of the turbines, a thorough investigation of the soil strengths and characteristics will be performed at each turbine site for optimization of the foundation designs for the Project.

3.2.18 Service Roads

Each turbine will be accessible by a low profile gravel road extending from the turbine base to a public road. The roads will be all weather gravel construction and approximately 15 to 16 feet wide. To facilitate crane movement and equipment delivery, additional temporary, gravel roadways will be installed on either side of the permanent roadway. The temporary roads will be approximately 40 to 45 feet wide.

3.2.19 Setbacks

The Project has been designed to ensure consistency with setbacks established in recent LWECS site permits that have been approved by the PUC and by PUC actions, such as adoption of General Permit Standards for projects under 25 MW.[2] This includes a wind access buffer of 5 RD in the prevailing wind direction and 3 RD in the non-prevailing wind direction; a noise setback meeting Minnesota Noise Standards, Minnesota Rules Chapter 7030; at least a 500-foot setback from homes; a 250-foot setback from public

[2] See *Order Establishing General Wind Permit Standards*, Docket No. E,G-999/M-07-1102, Issue Date January 11, 2008; http://energyfacilities.puc.state.mn.us/documents/19302/PUC%20Order%20Standards%20and%20Setbacks.pdf.

roads and recreational trails; and a 250-foot setback from roads and project boundaries for meteorological towers. Turbines will be sited at least 250 ft from the right-of-way of Interstate 90. While Jackson County maintains a wind energy conversion system (WECS) ordinance, it does not apply to LWECS with a nameplate capacity greater than 5 MW.

3.3 Related Equipment and Facilities

3.3.1 O & M Facility

Because of its size, the Project will require an O & M facility to maintain the turbines and associated facilities. Lakefield Wind is looking to purchase existing buildings at 502 South Highway 86 in the City of Lakefield to serve as the Operation & Maintenance headquarters for the Lakefield project. The two buildings total approximately 19,300 square feet.

The first structure was constructed in 1977 and contains approximately 14,000 square feet. This building includes three offices, a large meeting room, lobby area with kitchen facilities, two conference rooms, and a utility room. It also has approximately 10,000 square feet of warehouse with electric overhead doors capable of accommodating large equipment and trucks. The second steel and pole-construction building was constructed in 1976 and is approximately 5,300 square feet in size. The building contains an office area and storage.

3.3.2 Step-Up Transformers, Collection Lines, Substation, and POI

Lakefield Wind will contract to have the electrical system designed by a professional, experienced and qualified electrical system design firm and reviewed by the purchasing utility. The entire collection system will be designed to meet National Electric Safety Code (NESC), National Electric Code (NEC), American National Standard Institute (AANSI), National Electrical Manufacturers Association (NEMA) and Occupational Safety and Health Administration (OSHA) standards. The design work includes a load flow analysis for the Project to ensure the facility will meet the power factor and voltage control specifications. A coordination study will determine the appropriate protective relay settings for optimum protection and selectivity for the Project's electrical system, as well as the purchasing utilities system.

Power from each turbine will be fed down the tower from the generator through the power conditioning equipment and breaker panel out to a pad mount transformer. The pad mount transformer steps the voltage up to an internal collector system voltage of 34.5kV. The electricity will run through the collection lines to the project substation, and then to the Point of Interconnection (POI) on the power grid. Construction of the collector Project Substation and interconnection into the POI will be in accordance with

MISO standards. As previously indicated, an LGIA has been submitted and is in the process of being reviewed by the ITC.

The pad mounted transformers will be configured in a loop fed, dead front arrangement. All transformers will be equipped with locking doors to prevent unauthorized entry.

Direct burial collector cables will run from the turbine strings to a centrally located substation and will be plowed, trenched, or directional bored under the ground to a nominal depth of 36-48 inches. The method of installation will vary across the site based on the presence or absence of sensitive resources (e.g. wetlands) and agricultural drain tile. A non-degradable warning tape will be installed 12 inches above the collector cables. All collector cables are currently planned to be installed underground. However, should conditions arise that would require the use of overhead lines, such lines will be sited so as to minimize the impact to the landowner.

The project will require the installation of a 345kV project substation which will generally consist of two 345/34.5kV transformers, and associated switching and protection equipment as well as metering equipment and a small control house. Power from the turbines will be collected at this substation and transmitted to the Lakefield Junction Substation via approximately ¼-mile of overhead 345kV transmission line. The Lakefield Junction Substation is the POI for the project.

Lakefield Wind will permit the project substation and associated transmission line to the point of interconnection through Jackson County. Because this transmission line will not exceed 1,500 feet in length, a route permit from the Minnesota Public Utility Commission will not be required.

3.3.3 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 measure approximately 15 to 16 feet wide. Service roads will be designed and constructed to adequately support the size and weight of maintenance vehicles and to withstand inclement weather. The Applicant will site these roads in consultation with local landowners, and meet state and local requirements.

Specific turbine locations will determine the amount of roadway that will be required for the Project. To the extent possible, the Applicant will design and site roads to minimize the length of road required for the Project.

In general, a 50-foot diameter gravel work area centered on the base of each turbine will be needed during construction. Work areas will be located to facilitate both construction (cranes) and subsequent operation and maintenance. Siting roads in areas with unstable

soil will be avoided wherever possible. Roads will include appropriate drainage and culverts while 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 40 to 45 feet wide.

Turbine and rotor assembly, gravel crane pad, and component lay down areas, extending from the access road to the turbine foundation, will be graded to specific slope specifications.

Temporary construction areas adjacent to the turbine pads, access roads and collection lines will be restored after construction is completed. The site will be graded to natural contours, soil will be loosened if needed, and the site will be seeded if needed. Access roads will be regraded, filled, and dressed as needed after construction is completed.

3.3.4 Permanent Meteorological Towers

Once the Project is constructed, the Applicant will install two permanent meteorological towers within the Project Area that will remain for the duration of the Project. The permanent met towers will be free standing, galvanized steel towers, with medium dual-intensity day and night lights (the same as on the wind turbines). This allows for complete integration and monitoring of the notification system.

The towers will be constructed at sites selected based upon the final locations of the wind turbines and for proper operation of wind assessment equipment. The towers will contain instruments such as anemometers, data loggers, wind direction sensors, temperature probes and communication system that can be configured at various elevations. The area required to construct the permanent met towers is expected to be approximately 400 by 400 feet. This is a temporary construction easement for equipment storage, materials lay down, and construction staging. The permanent impact area will be significantly smaller than the temporary easement area.

3.4 Construction

eDC will perform construction management services for the Project. eDC is a leading renewable energy company that provides development engineering, procurement and construction services for wind and other renewable power plants in North America. eDC maintains a high level of expertise in construction methods, budgets and schedules, knowledge of project design standards and engineering practices, and a knowledge of owner, operator and lender requirements. eDC also maintains ongoing relationships with qualified

contractors having experience in the engineering procurement and construction of wind energy facilities.

Generally, eDC, by itself or in coordination with qualified contractors, will undertake the following activities:

- Securing building, electrical, and grading permits,
- Performing detailed civil, structural, and electrical engineering,
- Scheduling execution of construction activities,
- Completing surveying and geotechnical investigations, and
- Forecasting project labor requirements and budgeting.

eDC oversees all aspects of the construction process including the installation of communication and power collection lines, substation, access roads, concrete foundations, towers, and the erection of the wind turbines.

The proposed project will be constructed under the direct supervision of eDC's on-site construction manager and will employ qualified contractors. Construction consists of the following tasks:

- Site development, including access roads,
- Foundation excavation,
- Concrete foundation installation,
- All electrical and communications installation,
- Tower assembly and machine erection, and
- System testing.

Throughout the construction phase, ongoing coordination occurs between the project development and construction teams. The on-site project manager helps to coordinate all aspects of the Project, including ongoing communication with local officials, citizens groups and landowners. Even before the Project becomes fully operational, the O & M staff is integrated into the construction phase of the Project. The eDC construction manager and O & M staff manager work together continuously to ensure a smooth transition from construction through wind power plant commissioning and, finally, operations.

Civil Works

Completion of the development will require various types of civil works and physical improvements to the land. These civil works primarily include the following:

- Improvement of existing roads to the development site,
- Construction of access roads adjacent to the wind turbine strings to allow construction and continued servicing of the wind turbines,
- Clearing and grading for wind turbine tower foundation installations,
- Plowing, boring, or trenching underground cabling for connecting the individual wind turbines,
- Installation of an on-site transmission line for connecting wind turbine strings for delivery to the electricity collection/metering location, and
- Clearing and grading for pad-mounted transformers and other installations.

Improvements to existing roads will primarily consist of re-grading and filling with gravel. Access roads will be constructed to each turbine; landowner input will be solicited prior to finalizing the road locations. Roads will be sited in areas with stable soils. Access roads will include appropriate drainage and culverts while still allowing for the crossing of farm equipment. Access roads will be approximately 16 feet wide and will be covered with road base designed to allow passage under inclement weather conditions.

Electrical and communications wires and cables will be plowed or trenched into the ground to a nominal depth of 36-48 inches. Plowing in the cables minimizes the surface disturbance and the amount of time spent with equipment in the landowners' fields while trenching can make the identification of broken drainage tile easier. Adequate spacing between the communication and electrical wires will ensure no interference between the two.

Permanently impacted areas will be limited to exposed portions of the turbine foundations, permanent access roads, transmission line, and Project Substation site. Additional areas will be temporarily impacted during construction. 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 staging and support purposes. Disturbed soil will be reclaimed, and temporarily disturbed areas will be restored to their previous use upon turbine commissioning.

Commissioning

The Development will be commissioned after completion of the construction phase. Acceptance of the five major subsystems that comprise a wind power plant and the wind power plant, as a whole, is achieved through detailed inspection and testing procedures. The manufacturer's inspection criteria applicable to wind power plant components augment this process, as wind power plant acceptance is dependent upon the cooperation of each component within the major wind power plant subsystems (e.g., turbines, communication system, meteorological system, electrical collection system, and wind power plant SCADA System).

3.5 Operation and Maintenance

eSC, the service and maintenance arm of enXco, will be responsible for operation and maintenance of the Project. eSC not only maintains the turbines owned by eSC and its subsidiaries, but is also recognized as a premier third party service provider to the industry. eSC currently maintains well over 4,000 turbines of all makes and models across the United States and is a licensed service and warranty provider for the GE 1.5MW planned for use in the Project.

eSC's operations and maintenance team will be responsible for daily operations, scheduled and unscheduled maintenance as required by the equipment manufacturers and in accordance with good utility practice for the term of the contract.

The project will be staffed with approximately ten full time site technicians, a Wind Power Plant Supervisor and additional support staff as appropriate. The site technicians will be responsible for performing daily plant checks and resets as well as scheduled and non-scheduled maintenance.

In general, the Project will be manned five days per week. At all other times, operations and maintenance personnel will be on-call, and the project will be monitored by remote monitoring and control capabilities as described below.

Site Control and Data Acquisition (SCADA) System

The wind turbines, as well as certain circuit breakers, metering and meteorological equipment are monitored by a centralized SCADA system. The SCADA system is designed to monitor the condition of the wind plant equipment, alert service technicians to any fault or alarm conditions and also record and sort data relating to availability, kWh production and turbine performance.

If a turbine faults off line or if a collection system circuit breaker trips, an error code is enunciated on the SCADA system, which is monitored by eDC's Operations Control Center ("OCC"). The OCC technician then notifies the on-site technicians who respond as appropriate. During times when the plant is not staffed, the OCC technicians take into account the type of fault being shown, current energy production, projected energy production, time until a regularly scheduled technician will be available and special instructions by the owner. Using these criteria, the OCC technician notifies the plant operator and, if appropriate, deploys an "on call" technician at the site to correct the fault.

Maintenance Schedule

The Project will require scheduled maintenance of the individual wind turbines, transmission facilities, and other site improvements (roads, gates, fences, etc.). Estimates of the duration and scheduling of the maintenance activities are based on eDC's experience in operating and maintaining similar projects, as well as those recommended by the equipment manufacturer.

Scheduled maintenance of the wind turbines and transmission facilities will be completed, whenever possible, at times when the wind speed at the site is insufficient for the Project to produce power.

General Maintenance Duties

Each wind turbine requires periodic scheduled maintenance in accordance with schedules and procedures required by the turbine manufactures. Generally, scheduled maintenance is conducted in two separate inspections at approximately six-month intervals. The turbines will require 40 to 50 person hours of scheduled mechanical and electrical maintenance per year on average. Typically no more than two turbines are being serviced at any one time.

In addition to the turbine manufacturer supplied O & M Manuals, eDC has developed extensive tracking and documentation procedures and systems which enhance its ability to optimize scheduling, track labor and parts usage and analyze parts failure and trending.

In connection with its many O & M contracts, eDC also maintains multiple high voltage substations and associated collection and employs a staff of highly experienced personnel who are well versed in maintenance and repair procedures for the type of electrical equipment anticipated for the project. eDC places particular emphasis on preventative and predictive maintenance testing and procedures.

eDC will coordinate the timing cycle for service of collection system equipment with any scheduled outages planned whenever possible. If coordination of these service activities in conjunction with the purchasing utility is deemed impractical, eDC will attempt to schedule these service outages during low wind periods. eDC will provide data that may be required by the purchasing utility to respond to information requests from the following: MAPP, NERC, ISO, and RTO guidelines.

The Preventative Maintenance Schedule includes, but is not limited to, inspection of the following:

- Switch cupboards (door and floor plate and cable clamps) on an annual basis,
- Control box/top cabinets (sensors, emergency stop switch) on a semi-annual basis, and the safety chain with centrifugal switch on an annual basis,
- Low Tension Main Distribution (power switch) on a semi-annual basis,
- Converter Cabinets (low tension part, power switch, network contact) on an annual basis,
- Tower components including climb protection and resting platforms on an annual basis,
- Wind direction tracking (gliding areas, yaw drive, yaw position sensor, cable torsion safety switch, slide bearing, wind flag, anemometer) on a semi-annual basis,
- Rotor blades, external on a semi-annual basis and blade fastenings on an annual basis,

- Rotor hub (rotor shaft fastening, pitch bearing fastening - outer ring, pitch bearing fastening - inside ring) on an annual basis,
- Machine strap on an annual basis,
- Pitch motors on an annual basis,
- Pitch adjustment (pitch gearing, position switch) on an annual basis and switch cupboards on a semi-annual basis,
- Nose cone (general, entry to the hub) on an annual basis,
- Drive land (pillow block, shaft, gear box, oil cooler, decoupling for structure-borne noise, coupling, decoupling for the generator) on an annual or semi-annual basis depending on the component,
- Generator on a semi-annual basis,
- Braking hydraulics unit (brake disc, coatings, calipers) on an annual or semi-annual basis depending on the component,
- Hydraulics (valves, hydraulics tubes, control block, pipe work, hydraulic oil) on a semi-annual basis, and
- Cable in the machine head and in the tower on an annual basis.

3.6 Financing and Costs

Lakefield Wind is capitalized by enXco Development Corporation, and the Project will ultimately be financed at or after the Commercial Operation Date (COD). Final costs for the Project have not been confirmed and specific cost information is confidential to Lakefield Wind. However, based upon similar projects, Lakefield Wind estimates that the total ultimate capital cost of the wind farm Project to be approximately $2,400 per installed kilowatt (kW) of nameplate capacity, which includes development, engineering, procurement and construction costs. The bulk of Project costs are borne by the wind turbines.

eDC anticipates average operating costs for the full 205.5 MW project to total approximately $10,000,000 per year over the life of the project. Of this, approximately one half will be costs associated with the operation and maintenance of the project with the balance being comprised of taxes and fees including landowner payments and the MN production tax.

3.7 Project Schedule

The Applicant anticipates initiating construction of the Project in spring 2010, with a goal of beginning commercial operation by December 31, 2010. To accomplish this, Lakefield Wind has obtained necessary easements from landowners. Lakefield Wind expects the LWECS Site Permit to be issued within approximately six months of filing this Application. Preconstruction surveys and studies are currently underway and will continue through spring 2010. Equipment procurement is also in process. **Table 3-1** provides the anticipated project schedule.

Table 3-1: Anticipated Project Schedule		
Milestone Description	**Target Start Date**	**Deadline**
Land Acquisition	In Process	June 15, 2009
Site Permit	May 15, 2009	November 4, 2009
Preconstruction Studies	In Process	November 15, 2009
Equipment Procurement	In Process	Various
Construction	May 2010	December 31, 2010 (Operation Date)

Lakefield Wind will be responsible for undertaking environmental review and obtaining all permits and approvals required for the Project in accordance with issuance of the LWECS Site Permit. The commercial operation date is dependent on the completion of the interconnection, permitting, and other development activities.

3.8 Energy Projections

Lakefield Wind has performed detailed wind and energy analysis based on measurements taken from equipment on the site and correlated to long term references. The net annual energy production from the project, assuming various losses aggregating to roughly 16 percent, is estimated at approximately 750,000 MWh (Megawatt hours) utilizing the GE 1.5 MW turbines. Final energy estimates will be analyzed after the final design of the wind farm has been completed.

3.9 Decommissioning and Restoration

eDC and eSC have extensive experience operating and maintaining wind turbines of all vintages, and anticipates that the life of the Project will be approximately 30 years. Over the 30 year period, the Applicant will budget funds to cover decommissioning costs. enXco has a contractual obligation to its landowners to set aside security sufficient to accommodate the decommissioning of all towers and remediation of the properties back to a condition comparable to that of the property prior to the installation of the wind project. The exact dollar amount necessary to cover decommissioning costs has not been determined at this stage in the project; however, adequate funds will be set aside to fund decommissioning and site restoration after Project operations cease, to the extent that the salvage value does not cover decommissioning costs. However, the salvage value of the turbines and other components should ensure that sufficient funds will be available to pay for decommissioning and restoration costs. A set-aside guarantee will be executed on behalf of the Project with an independent administrator of such funds. The independent administrator will report annually to the Project on the status of decommissioning funds. The Project will report every eight years to the independent administrator with an updated budget for the cost of decommissioning the plant in current-year and decommissioning-year dollars.

The Project decommissioning and restoration plan will be in general accordance with the requirements of Minnesota Rules 7854.0500, subp. 13. Within 18 months from the time the facility ceases to operate, decommissioning will be complete. The Applicant 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.

Decommissioning will involve removal of all above-ground wind facilities including wind turbine nacelles, blades, towers, foundations, cables, roads, and other ancillary facilities. Foundations will be removed to a depth of 36 inches below grade. All access roads will be removed unless the affected landowner provides written notice that the road or portions of the road can remain. Additionally, disturbed surfaces shall be graded, reseeded, and restored as nearly as possible to their preconstruction condition.

Lakefield Wind requests the right to re-evaluate decommissioning alternatives at the end of the LWECS Site Permit term and to update decommissioning costs. Lakefield Wind requests the right to re-apply for a LWECS Site Permit and continue operation of the Project upon expiration of the original LWECS Site Permit, depending on sale of power from the Project. Lakefield Wind may also decide to retrofit, repower or replace the turbines and power system with upgrades based on new or available technology to continue to operate the Project.

4.0 ENVIRONMENTAL ANALYSIS

In accordance with Minnesota Rules Chapter 7854, the Applicant provides the following description of the environmental conditions of the Project Area. Lakefield Wind has considered exclusion and avoidance criteria in selecting the Project Area, consistent with MPUC procedures on LWECS siting criteria.

Lakefield 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 A**. Responses from agencies that responded with comments regarding the proposed Project are discussed in the following sections. A copy of agency responses is included in **Appendix B**.

4.1 Description of Environmental Setting

The Project location is rural with an agricultural-based economy. Corn, soybeans, forage-land (hay), wheat, and silage corn are the predominant crops in Jackson County. The County also produces livestock including: hogs and pigs, chickens, cattle and calves, pigeons or squab, and sheep and lambs. The landscape in the Project Area is gently undulating. Typical landscapes photographs of the project area are provided on **Exhibit 4**. Elevations in the

Project Area range from 1,540 feet above mean sea level in the southeastern portion of the site to 1,401 feet near South Heron Lake.

4.2 Demographics

4.2.1 Description of Resources

The Project is located in southwestern Minnesota in a rural/agricultural region within Jackson County. The 2000 census population for Jackson County was 11,268, and the estimated 2008 population was 10,734, resulting in a decrease of 4.7%. The average household size for Jackson County in the year 2000 was 2.40 people, with 5,092 housing units. The Project is further located in parts of Des Moines, Hunter, Belmont and Heron Lake Townships. The population of these four townships was 1,155 in 2008, resulting in a population density of 8 people per square mile. In addition, these four townships contain 488 housing units with an average household size of 2.36. The estimated 2008 population is 1,110, resulting in a decrease of 3.9%.

According to the 2002 U.S. Economic Census, the largest industries employing residents in Jackson County are manufacturing and health care and social assistance, which employ approximately 65% of the workforce.

Jackson County had a median household income of $36,746 in 1999. Due to its population size, no updated economic estimates are produced for Jackson County by the Census Bureau. Income and poverty levels within the Project Area vary greatly from one township to the next. In three of the four townships where the Project is located, the per capita incomes of the townships are higher than the overall county. Also, poverty levels within those three townships are below that of the overall county. In the fourth township, the per capita income is lower than the overall county. Poverty levels within the fourth Project Area township are also above that of the overall county. **Table 4-1** summarizes population and economic characteristics of the townships in which the project is located.

Table 4-1: Population and Economic Characteristics

Location	Population	Per Capita Income	Population Below Poverty Line (%)
Jackson County	**11,268**	**17,499**	**8.6%**
Des Moines Township	273	21,496	1.1%
Hunter Township	258	18,729	3.2%
Belmont Township	223	23,215	6.4%
Heron Lake Township	401	14,380	9.8%

4.2.2 Impacts

A number of full time jobs in the area are expected to result due to construction and operation of the Project. Ten to twelve full time jobs are expected for operating the Project. The communities near the Project are also expected to receive substantial positive economic impacts. Short-term impacts to the areas socioeconomic resources are expected to be minor. Some land which is currently being used for agriculture will be removed from production for the length of the lease. Landowners will be compensated for this loss. 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 expected to stimulate some local industries and should have no negative impacts to the local industries as a whole. 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, Lakefield Wind plans to use local contractors and suppliers for portions of the construction. Wages and salaries paid to contractors and workers in Jackson 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 Lakefield 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 rent 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 wind energy in this area of Minnesota has been important in diversifying, supporting and strengthening the personal income and property tax base of southwestern Minnesota.[3]

In addition to creating jobs and personal income, lowering property taxes and improving infrastructure, the Project will pay an energy production tax to the local units of government of 0.0012 cent per kWh of electricity produced, resulting in an annual wind energy production tax of approximately $900,000. Indirect economic benefits include creation of new jobs in manufacturing, operations and technology.

[3] 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.

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 rent 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_5 is defined as the noise level exceeded 5% of the time, or for three minutes in an hour. The L_{50} is the noise level exceeded 50% of the time, or for 30 minutes in an hour. Land use 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_{50} is the dBA that may be exceeded 50 percent of the time within an hour, while L_{10} is the dBA that may be exceeded 10 percent of the time within the hour.

Table 4-2: Noise Standards by Noise Area Classification

Noise Area Classification	Daytime		Nighttime	
	L_{50}	L_{10}	L_{50}	L_{10}
1	60	65	50	55
2	65	70	65	70
3	75	80	75	80

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.

A noise level change of 3 dBA is barely perceptible to human hearing. A 5 dBA change in noise level, however, is clearly noticeable. A 10 dBA change in noise level is

perceived as a doubling of noise loudness, while a 20 dBA change is considered a dramatic change in loudness. **Table 4-3** shows noise levels associated with common, everyday sources.

Table 4-3: Common Noise Sources and Levels

Sound Pressure Level (dBA)	Noise Source[a]
140	Jet Engine (at 25 meters)
130	Jet Aircraft (at 100 meters)
120	Rock and Roll Concert
110	Pneumatic Chipper
100	Jointer/Planer
90	Chainsaw
80	Heavy Truck Traffic
70	Business Office
60	Conversational Speech
50	Library
40	Bedroom
30	Secluded Woods
20	Whisper

[a]Source: Minnesota Pollution Control Agency (1999)

Nighttime noise levels are low to mid-30 dBA within the Project Area, which are typical of those in such rural settings. The dBA scale is A-weighted decibels based on the range of human hearing. 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 rural areas.

4.3.2 Impacts

Operation and maintenance of the Project wind turbines and associated facilities will create increased noise levels. The sound level varies with the speed of the turbine, the distance of the receptor from the turbine, and surface characteristics of the site. The turbine speed, in turn, depends on the weather conditions. Generally, on more windy days turbines can create more sound. However, increases in noise levels within the Project Area are expected to be minimal due to the noise levels produced by the wind itself, especially at the setback distances required to meet the minimum 500-foot setback from homes and the noise setbacks in the Minnesota Noise Standards under Minnesota Rules Chapter 7030. Turbines will be located at least 500 feet from homes plus the distance necessary to meet Minnesota Noise Standards.

At the Project substation, the source for noise is primarily the transformers, which can create a humming noise. The nearest occupied home to the proposed Project substation is

located approximately 1,000 feet away. It would be unlikely that substation noise would be audible at this farmstead/home.

4.3.3 Mitigation

Lakefield Wind is taking into account in the design, siting and construction of the proposed wind farm Project possible noise impacts to nearby rural residences/farmsteads and other potentially affected parties. The GE 1.5 MW wind turbine is being considered for the Project. The calculated noise setback is based on the highest noise level of the wind turbine under consideration for the Project.

Lakefield Wind evaluated the sound power level (Lp) information provided by the manufacturer of the GE 1.5 MW wind turbine to assess representative noise levels for the Project. 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). The highest sound power level of 104.0 dB in addition to a 2 dB margin of error was used to calculate the distance to the noise setback. The 106 dBA sound power level was converted to the sound pressure level and compared to the Nighttime L50 limit of 50 dBA for NAC 1, the most stringent limit (see **Tables 4-2** and **4-3**). The turbine was modeled to determine at what distance turbine noise would not exceed the 50 dBA limit, using the following equation for a hemispherical point source: $Lp = Lw - 10 \log (2\pi r^2)$-Aatm where Lp is defined as the sound pressure level at the distance of interest (r); Lw is the sound power level provided by the turbine manufacturer; and Aatm is defined as the attenuation provided by the atmospheric absorption. The distance to the 50 dBA noise setback is 252 meters (827 feet).

As described in Sections 3.2.19, and based on the above evaluation, Lakefield Wind has incorporated setbacks of at least 1,000 feet (303 m) from inhabited residences and 250 feet (76 m) from public roads in the preliminary site layout shown in **Exhibit 3**. Lakefield Wind will maintain an appropriate setback from inhabited residence to stay below the MPCA Nighttime Noise Limit of 50 dBA. The 1,000 feet (305 m) noise setback is based upon the calculated distance to the 50 dBA noise level for the highest noise output associated with the wind turbines being considered plus another 173 feet (53 m) as a safety factor to account for GIS-based mapping accuracy. This analysis indicates that the preliminary turbine locations meet the requirements for the State noise setback of 50 dBA for the turbines being considered for the Project.

Lakefield Wind is in the process of analyzing noise levels within the Project Area and has contracted with a noise expert to assess the impact of the wind farm on the area. Prior to the start of construction, Lakefield Wind's consultant will model the sound footprint of the Project using the final turbine locations and maximum sound level outputs of the GE 1.5 MW wind turbine to ensure compliance with state noise standards. A modeling

program such as WindPRO version 2.6.1.252 (Decibel for Noise Impact Calculation), or other, will be used to model the sound outputs of the project.

In accordance with the standards established in other LWECS site permits issued by the PUC, Lakefield Wind will use at least a 5 RD setback from the boundaries of leased areas within the Project Area perimeter along the north-south axis (downwind spacing) and a 3 RD setback on the east-west axis (crosswind spacing). A 250-foot setback from all public roads will be employed. Based on the recently issued Minnesota Department of Health the white paper *Public Health Impacts of Wind Turbines*, the Minnesota Public Utilities Commission is currently gathering information to determine if the current setbacks are appropriate and reasonable.

If the sound characteristics of the selected turbine are different from those discussed in the Application, Lakefield 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 interrupted only by a small number of county judicial ditches and intermittent streams which drain the Project Area (**Exhibit 4**). Elevations range from 1,401 to 1,540 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.

The majority of landscape within the Project Area may be classified as agricultural and rural open space. Within the Project Area, local vegetation is predominantly agricultural crops, including almost entirely corn and soybeans, with a few small grains and forage crops, which visually create a low uniform cover. Little or no pasture ground was observed. A mix of deciduous and coniferous trees planted for windbreaks typically surrounds farmsteads, which were established to prevent wind erosion and to shelter dwellings. Occasional patches of native plants and wetland grasses surround ditches within the project area.

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 19th and early 20th centuries and are representative of that era of Minnesota farm architecture.

Five towers exist within the Project Area and have slightly altered the landscape from being strictly agricultural. There is a met tower and a microwave tower located at the Lakefield Junction Substation in section 3 of Hunter Township along 460th Avenue

approximately 0.25 mile south of CSAH 14 (see **Exhibit 3**). There is an unspecified tower in section 12 of Hunter Township along County Road 70. There are two other towers adjacent to the City of Lakefield near the west boundary of the Project Area.

In addition to the above towers, 37 FAA registered obstacles (as of January 2008) exist within a 10 mile buffer of the Project Area. These towers appear to consist of a fairly even mix of towers and windmills, with the windmills located to the northeast and west of the Project Area.

To date, southwestern Minnesota in general has seen the majority of wind farm development relative to other parts of the state. Of the local area counties, Murray has seen the most wind development (see **Table 4-4** and **Exhibit 5**). According to the Minnesota Department of Commerce Energy Facility Permitting/ Department of Administration's Land Management Information Center, Minnesota as a whole has 1,331 wind turbines based on December 2008 FAA Obstruction Database. According to the American Wind Energy Association (AWEA), as of June 27, 2009, there were 1,421 existing wind turbines in the state. Minnesota currently ranks 4th in the nation for existing wind energy capacity. The presence and visual effect of towers and turbines already exists in the general vicinity of the Project Area.

Table 4-4: Wind Turbines in Surrounding Counties (FAA/AWEA)

Counties	January 2009
Murray	219
Nobles	23
Cottonwood	33
Jackson	43
Martin	44

4.4.2 Impacts

The visual effect of the Project will depend largely upon perceptions of 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. Post-construction 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 would not involve 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 adjacent counties, they are not located in the immediate vicinity of the Project and therefore 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 commercial structures in the Project Area, and the presence of turbines may be less intrusive than these human activities. Several Wildlife Management Areas (WMAs) exist within the Project Area, and although these areas will be avoided, it is possible that the proposed turbines could be visible from these locations.

A response letter was received from the Department of Natural Resources dated August 17, 2009 (**Appendix B**). The letter indicates that the DNR recommends a viewshed analysis be conducted for a distance of 5 miles from the boundary of Kilen Woods State Park to address potential viewshed concerns, and suggests that a setback from the park be based on the viewshed analysis.

Lakefield Wind met with the Department of Natural Resources at their office in New Ulm on Tuesday, August 25 to discuss comments received in their letter. Lakefield Wind demonstrated that due to City of Jackson Airport flight paths, the nearest turbines would be roughly 2.5 to 3.0 miles southwest of the state park. The DNR indicated that there may not be the need for a viewshed analysis if turbines are a significant distance away from the park and area topography helps to naturally shield the turbines. Lakefield Wind will continue to coordinate with the DNR on this issue.

4.4.3 Mitigation

Lakefield Wind will work to avoid or minimize, to the extent possible, visual impacts into the final design and siting of the Project. Lakefield Wind will work with landowners to identify concerns related to Project aesthetics and to address visual impacts. Lakefield Wind proposes 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;
- 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 southwest Minnesota. Public services to farmsteads and rural residences within the Project Area include transportation/roadways, electric and telephone. The closest city to the Project Area is the City of Lakefield (City) bordering the western boundary of the Project Area (**Exhibit 2**). The City provides sanitary sewer, water, electric, natural gas, phone and cable services to its residents. Additionally, the City's emergency services include a full time police department, volunteer fire department and ambulance service.

Natural Gas

There are three natural gas pipelines within or near the Project Area as indicated by **Exhibit 6**. A 6" buried natural gas pipeline runs east-west through the Project Area south of and parallel to CSAH 34. From that pipeline, 2" and 3" pipelines run north to the City of Lakefield parallel to State Trunk Highway 86. Another 6" buried natural gas pipeline runs adjacent to the eastern boundary of the Project Area. The pipelines are reportedly owned by Northern Natural Gas Company.

Electrical Service

There are currently five utility transmission lines and one substation within the Project Area. The Lakefield Junction Substation is located approximately ½-mile east of the City of Lakefield along 460th Avenue approximately ¼-mile south of CSAH 14. A MidAmerican Energy Company (MidAmerican) 345kV transmission line runs through the Project Area from the southwest corner to the Lakefield substation. A Northern States Power Company (NSP) 345kV transmission line bisects the Project Area from west to northeast, running through the Lakefield substation. ITC Midwest (ITC) has 161kV transmission lines that run north, east and generally southwest from the Lakefield substation. ITC also has a 69kV transmission line that runs west from the Lakefield substation to the City of Lakefield and then turns north through the northwestern portion of the Project Area. There is also a substation within the City of Lakefield, adjacent to the Project Area. The alignment of transmission lines and substations are indicated on **Exhibit 6**.

Water Supply and Sanitary Service

Townships within the Project Area have limited public infrastructure services. Red Rock Rural Water (RRRW) is the water utility for the townships. RRRW has a water tower located within the Project Area, as well as water distribution lines that provide water to parts of the Project Area, while other homes and farmsteads utilize on-site water wells as verified by the county well index (CWI) **(Exhibit 6).** Homes and farmsteads typically utilize on-site septic systems for individual household sanitary needs. The Lakefield Wind O & M Facility will utilize the City of Lakefield water supply.

Roads

Existing roadway infrastructure in and around the Project Area consists of state, county and township roads that generally follow section lines, with private unpaved farmstead driveways and farming access roads. In addition, Interstate Trunk Highway 90 (I-90) runs through the southern portion of the Project Area. There is a full traffic interchange at I-90 and State Trunk Highway 86, which runs north-south through the western portion of the Project Area.

There are also a number of County State Aid Highways (CSAHs) within the Project Area. CSAH 17 runs north-south through the eastern portion of the Project Area. CSAH 24 runs along the northern boundary of the Project Area. CSAH 16 runs east-west through the northern portion of the Project Area. CSAH 14 runs east-west through the center of the Project Area and through the City of Lakefield. CSAH 12 runs east-west at the western edge of the Project Area and turns into County Road 70 east of State Trunk 86. County Road 70 then ends at CSAH 17. CSAH 10 runs east of CSAH 17 to the City of Jackson. CSAH 34 runs east-west though the southern portion of the Project Area.

The CSAHs and County Roads are two-lane paved roads. The remaining roads within the Project Area are two-lane gravel roads. The topography of the area allows for the creation of a road network providing good access to most locations within the Project Area. This is a strength of this specific Project location as impacts such as new roads having to be constructed will be held to a minimum so existing uses, namely agriculture, can continue unaltered (**Exhibits 2** and **3**).

Traffic

The existing traffic volumes on the area's federal, state, and county roads and highways are documented in **Table 4-5** and on **Exhibit 7**. I-90 has the highest Annual Average Daily Traffic (AADT) count at 7,600 vehicles per day. The next highest AADT count within the Project Area is 2,800 for State Trunk Highway 86 between I-90 and the City of Lakefield. For purposes of comparison, the functional capacity of a two-lane paved rural highway is in excess of 5,000 vehicles per day. For the county road system, the highest existing AADT in or near the Project Area is 890 vehicles per day for CSAH 14.

Table 4-5: Existing Daily Traffic Levels		
Roadway Segment Description		**Existing Annual Average Daily Traffic (AADT)**
Interstate Trunk Hwy	I-90 (Bisecting the southern portion of Project Area)	7,600
Minnesota Trunk Highway	Minnesota 86 (north of Lakefield)	1,450
	Minnesota 86 (between Lakefield and I-90)	2,800
	Minnesota 86 (south of I-90)	2,200
Lincoln County	CSAH 17	290
	CSAH 24	70
	CSAH 16	180
	CSAH 14	890
	CSAH 12	280
	CSAH 10	265
	CSAH 16	350

Source: MnDOT 2008 Traffic Volumes General Highway Map Jackson County, MN. MnDOT 2008 (http://www.dot.state.mn.us/traffic/data/maps/trafficvolume/2008/counties/jackson.pdf)

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. Lakefield Wind has retained Evans & Associates to complete a microwave search and interference study on existing non-Federal Government microwave telecommunication systems, including digital television broadcast systems. A copy of the microwave study is included as **Appendix C**. The study identified eight unique microwave paths, 26 land mobile radio facilities, 5 digital TV stations and 14 FM stations within the search area (within two miles beyond the project boundary). Land mobile radio facilities are wireless communication systems intended for use by users in vehicles, such as those used by emergency first responder organizations, public works organizations, or companies with large vehicle fleets or numerous field staff.

4.5.2 Impacts

The Project is anticipated to have minimal effect on the existing services and infrastructure of the area. Lakefield Wind will design the Project in accordance with the results of the telecommunication study to minimize 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.

Natural Gas

Possible impacts include coming into contact with pipelines which transport gas products during construction activities.

Electrical Service

Impacts to the electrical service could be possible due to construction equipment coming into contact with the transmission lines.

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 water supply wells are installed or abandoned, it will be accomplished in accordance with applicable law and requirements of the Minnesota Department of Health (MDH). Lakefield Wind will coordinate with RRRW to avoid impacts to their water lines in the Project Area.

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. Water use during construction may occur to provide dust control and water for concrete mixes and other construction purposes.

Roads

Equipment and materials used in the erection of wind farms can be extremely heavy. Possible weight related impacts to roads include physical damage to the structure of the road itself and/or damage to culverts and bridges.

On July 20, 2009 Lakefield Wind sent letters to the Minnesota Department of Transportation (MnDOT) and Jackson County Highway Department for comments on the Project. On July 21, 2009 MnDOT Office of Freight and Commercial Vehicle Operations provided comments regarding the Project. Their Oversize/Overweight Permit Section is responsible for reviewing and issuing oversize/overweight vehicle permits for Minnesota Trunk, US and Interstate roadways.

Westwood also received a response letter from the Minnesota Department of Transportation District 7 Planner (Mankato and Windom). The letter states the following:

- *Any work in the state right-of-way will require a District permit. This includes, but is not limited to, public streets, private driveways, utilities, radii extensions, sign moving, additional storm water, and moving heavy equipment [cranes] through the right-of-way.*

- *On some highways, controlled access has been acquired by the state and there are no new access points allowed in these areas. All of I-90 is in this status. TH 86 does not appear to have controlled access except for some sight corners, but the District has not reached all of the areas that might potentially be used.*

- *No installations will be allowed in the Interstate right-of-way, but transmission lines are possible.*

Lakefield Wind will work with all parties involved to address concerns related to roadway use, and adhere to state, county, and township requirements for transportation infrastructure.

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 the wind tower generators. The final length of new roads is dependent on the size of turbine selected, turbine layout and final design which are still in process. 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. Permanent roads will be approximately 15 to 16 feet wide and low profile to allow cross-travel by farm equipment.

Traffic

Construction traffic will use the existing road system for access to the Project Area. 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. Therefore, construction activities are not expected to affect traffic levels. Operation and maintenance activities will also not noticeably increase traffic within the Project Area.

Letters requesting comments on the possible traffic impacts to the local roads have been sent to Jackson County and Des Moines, Hunter, Belmont and Heron Lake Townships. At this time, no written correspondence has been received. However, a telephone call was received from the Jackson County engineer on August 25, 2009 indicating that the County would be providing comments on the formal Site Permit Application.

Telephone, Microwave, and Other Communication Reception

Construction and operation of the proposed wind farm is not intended to impact telephone service to the Project Area. Lakefield Wind will also evaluate possible impacts on digital television reception. The microwave search and interference study (**Appendix C**) recommended setbacks from the microwave paths and land mobile radio stations to avoid interference. For television reception, an interference advisory area was identified, and it was recommended to minimize the number of turbines within this area in order to

reduce the number of interference complaints. No detrimental impacts to FM radio reception are anticipated.

4.5.3 Mitigation

Construction and operation of the Project will be in accordance with 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.

Local Services

Because no impact to local services is anticipated, no mitigation measures are proposed.

Natural Gas

Lakefield Wind will contact Gopher One Call prior to construction to locate all underground facilities. Lakefield Wind will design the Project to avoid impacts within the Project Area. If impacts cannot be avoided to a pipeline, Lakefield Wind will contact the respective owner prior to construction and coordinate appropriate permitting and approvals prior to construction.

Electrical Service

Lakefield Wind will purchase station service from a local electrical utility. MAPP will suggest appropriate configurations for the electrical system and Lakefield Wind will abide by the recommendations to prevent impacts to the existing transmission system. Lakefield Wind has established a setback of 400 feet from existing transmission lines. No additional mitigation is necessary.

Water Supply

In the event that water supply wells are abandoned or installed, or EBHs are installed, Lakefield Wind will do so in accordance with applicable Minnesota law and Minnesota Department of Health (MDH) requirements as described in the response letter received from the MDH on August 17, 2009. 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

Prior to construction Lakefield Wind will coordinate with the applicable local and state entities to ensure that the weights being introduced to area roads are acceptable. Lakefield Wind will work with the Cities of Lakefield and Jackson; Belmont, Heron Lake, Des Moines and Hunter Townships; Jackson County and MnDOT regarding

roadway concerns, right-of-way work (if any), and setbacks during construction of the Project. Lakefield 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

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. Minnesota State Highway 86 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 State Highway 86.

Lakefield Wind will work with the Cities of Lakefield and Jackson; Belmont, Heron Lake, Des Moines and Hunter Townships; Jackson County and MnDOT regarding traffic, access, and permitting oversize loads during construction of the Project. No other mitigation measures are necessary.

Telephone, Microwave, and Other Communication Reception

Prior to construction, Gopher One Call will be contacted to locate underground facilities so they can be avoided. To the extent Project facilities cross or otherwise affect existing telephone lines or equipment, Lakefield Wind will make arrangements with applicable service providers to avoid interference with such facilities. At his time, no impacts are anticipated to microwave or radio, and therefore, no mitigative measures are proposed. The telecommunications study identifies possible mitigation methods for TV interference. The extent of mitigation measures needed will depend upon the final turbine layout. Lakefield Wind will initially attempt to relocate planned structures to locations which avoid interference. In the event that relocation is not possible, Lakefield 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.

Lakefield Wind will not operate the wind farm so as to cause microwave, radio, telephone, television or navigation interference contrary to FCC regulations or other applicable law. If operation of the Project causes such interference, Lakefield Wind will take the steps necessary to correct the problem.

4.6 Cultural and Archaeological Resources

4.6.1 Description of Resources

The proposed Project Area is located within the Prairie Lakes South Archaeological Region (2s) (Anfinson 1990). The Prairie Lakes South Region is located in southwestern Minnesota and includes Brown, Cottonwood, Jackson, Lac Qui Parle, Lyon, Martin, Redwood, Watonwan and Yellow Medicine counties and portions of Blue Earth,

Faribault, Lincoln, Murray, Nobles and Pipestone Counties. The Prairie Lakes South Archaeological Region encompasses all of the defined Project Area.

Topography is typified by ground moraine swell and swale terrain. 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 summer 2009, Lakefield 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 a two-mile buffer around the Project Area. The background literature search identified 67 historic architectural properties located within two miles of the proposed Project Area (**Exhibit 8**). A summary of the identified historic architectural resources is provided in the following **Table 4-6**.

Only nine of the historic architectural properties were originally located within the defined Project Area. It is indicated that six of the nine properties (JK-JCC-055 through JK-JCC-060) originally recorded within the Project Area boundaries have been moved from their original position in Section 19 of Des Moines Township (T102N, R35W) and relocated to the Jackson County Fairgrounds in the City of Jackson, Minnesota, beyond the defined Project Area and two-mile buffer. This lowers the number of inventoried historic structures located within the defined Project Area to three.

Table 4-6: Previously Recorded Historic/Architectural Resources

Site Number	Site Name	Twp	Rng	Sec	NRHP Status	Project Area / Buffer
JK-BEL-001	Kilen State Park	103	35	16	unevaluated	Buffer
JK-BEL-002	Belmont Town Hall	103	35	9	unevaluated	Buffer
JK-BEL-003	Erick R. Kilen Farmhouse	103	35	16	unevaluated	Buffer
JK-BEL-004	Erick R. Kilen Sheds	103	35	16	unevaluated	Buffer
JK-BEL-005	Erick R. Kilen Barn	103	35	16	unevaluated	Buffer
JK-BEL-006	Erick R. Kilen Granary	103	35	16	unevaluated	Buffer
JK-BEL-007	Erick R. Kilen Log House	103	35	16	unevaluated	Buffer
JK-BEL-008	Erick R. Kilen Hog Barn	103	35	16	unevaluated	Buffer
JK-BEL-009	Erick R. Kilen Hog Corncrib	103	35	16	unevaluated	Buffer
JK-BEL-010	Bridge	103	35	16	unevaluated	Buffer
JK-BEL-011	Lars Hjornevik Log Cabin	103	35	17	unevaluated	Buffer
JK-BEL-012	Elmer Dahlin Farmhouse	103	35	17	unevaluated	Buffer
JK-BEL-013	Elmer Dahlin Barn & Outbuildings	103	35	17	unevaluated	Buffer
JK-BEL-019	Belmont Lutheran Church	103	35	19	unevaluated	Buffer
JK-DSM-001	J. N. Prokes Farmhouse	102	35	16	unevaluated	Buffer
JK-DSM-002	J. N. Prokes Barn	102	35	16	unevaluated	Buffer

Table 4-6: Previously Recorded Historic/Architectural Resources

Site Number	Site Name	Twp	Rng	Sec	NRHP Status	Project Area / Buffer
JK-DSM-003	J. N. Prokes Small Barn	102	35	16	unevaluated	Buffer
JK-DSM-004	J. N. Prokes Chicken House	102	35	16	unevaluated	Buffer
JK-DSM-005	J. N. Prokes Granary	102	35	16	unevaluated	Buffer
JK-DSM-006	J. N. Prokes Machine Shed	102	35	16	unevaluated	Buffer
JK-DSM-007	School	102	35	22	unevaluated	Buffer
JK-HLT-001	St. Peter Church	103	36	5	unevaluated	Buffer
JK-HLT-002	St. Peter Church School	103	36	5	unevaluated	Buffer
JK-HLT-003	Heron Lake Town Hall	103	36	8	unevaluated	Buffer
JK-HUN-001	Four Mile Corner Store	102	36	20	unevaluated	**Project Area**
JK-HUN-002	Hunter Town Hall	102	36	28	unevaluated	**Project Area**
JK-HUN-003	Orr Post Office	102	36	30	unevaluated	Buffer
JK-JCC-055	School District No. 5 (moved)	102	35	19	unevaluated	Moved
JK-JCC-056	John Paul Lumber Company (moved)	102	35	19	unevaluated	Moved
JK-JCC-057	Depot Hill Store (moved)	102	35	19	unevaluated	Moved
JK-JCC-058	Milwaukee Road Depot (moved)	102	35	19	unevaluated	Moved
JK-JCC-059	Olson Log House (moved)	102	35	19	unevaluated	Moved
JK-JCC-060	Stall Lutheran Church (moved)	102	35	19	unevaluated	Moved
JK-JCC-061	Chicago Milwaukee St. Paul & Pacific Depot	102	35	19	unevaluated	**Project Area**
JK-LKC-001	House	103	36	32	unevaluated	Buffer
JK-LKC-002	Bethlehem Lutheran Church	103	36	33	unevaluated	Buffer
JK-LKC-003	St. Joseph Rectory	103	36	33	unevaluated	Buffer
JK-LKC-004	St. Joseph Catholic Church	103	36	33	unevaluated	Buffer
JK-LKC-005	House	103	36	33	unevaluated	Buffer
JK-LKC-006	H. J. Leigh Hospital	103	36	33	unevaluated	Buffer
JK-LKC-007	Immanuel Lutheran Church	103	36	33	unevaluated	Buffer
JK-LKC-008	Lakefield Public School	103	36	33	unevaluated	Buffer
JK-LKC-009	Methodist Episcopal Church	103	36	33	unevaluated	Buffer
JK-LKC-010	House	103	36	33	unevaluated	Buffer
JK-LKC-011	House	103	36	33	unevaluated	Buffer
JK-LKC-012	A. N. Douglas House	103	36	33	unevaluated	Buffer
JK-LKC-013	Chris Kelly House	103	36	33	unevaluated	Buffer
JK-LKC-014	House	102	36	4	unevaluated	Buffer
JK-LKC-015	Bridge	102	36	4	unevaluated	Buffer
JK-LKC-016	House	102	36	5	unevaluated	Buffer
JK-LKC-017	**Winter Hotel (razed)**	103	36	33	**Listed**	Buffer
JK-LKC-018	Ernst Schumacher Block	103	36	33	unevaluated	Buffer
JK-LKC-019	Jackson County State Bank	103	36	33	unevaluated	Buffer

Table 4-6: Previously Recorded Historic/Architectural Resources

Site Number	Site Name	Twp	Rng	Sec	NRHP Status	Project Area / Buffer
JK-LKC-020	Coast To Coast	103	36	33	unevaluated	Buffer
JK-LKC-021	Commercial building	103	36	33	unevaluated	Buffer
JK-LKC-022	Commercial building	103	36	33	unevaluated	Buffer
JK-LKC-023	Commercial building	103	36	33	unevaluated	Buffer
JK-LKC-024	Commercial building	103	36	33	unevaluated	Buffer
JK-LKC-025	Commercial building	103	36	33	unevaluated	Buffer
JK-LKC-026	Commercial building	103	36	33	unevaluated	Buffer
JK-LKC-027	Commercial building	103	36	33	unevaluated	Buffer
JK-LKC-028	Bridge	102	36	4	unevaluated	Buffer
JK-LKC-029	Kilen House	103	36	33	unevaluated	Buffer
JK-LKC-030	Park Gazebo	103	36	33	unevaluated	Buffer
JK-LKC-031	Fritz Koenecke House	103	36	33	unevaluated	Buffer
JK-LKC-032	Bridge No. L5908	102	36	4	unevaluated	Buffer
JK-LKC-033	Bridge No. L5909	102	36	4	unevaluated	Buffer

Key: Site Number = site designation applied by State Historic Preservation Office; Site Name = unofficial site name as listed on site form; Twp = Public Land Survey (PLS) Township designation; Rng = PLS Range Designation; Sec = PLS Section Designation; NRHP Status = evaluation status of recorded property in regards to National Register of Historic Places Eligibility; Project Area / Buffer / Moved = denotes if listed site is within the defined project area, within the two-mile buffer, or moved outside study area.

Previous recorded cultural resource investigations within the Project Area and the two-mile buffer yielded evidence of 15 previously recorded archaeological locations. Two of the archaeological sites are located within the proposed Project Area with the other 13 being located in the two-mile buffer (**Exhibit 8**).

Sites 21JKg and 21JK25 are the two archaeological sites located within the defined Project Area. Site 21JKg is an alpha site which is a site identified through either historical documentation or an informant's report, but has not yet been verified by professional archaeological investigation. 21JKg has been identified as an artifact scatter. Site 21JK25, a verified site, has been identified as a lithic scatter.

4.6.2 Impacts

On July 20, 2009, Westwood, on behalf of Lakefield Wind, sent the Minnesota SHPO a letter informing them of the Project and requesting comments. In a letter dated August 19, 2009 Minnesota SHPO responded, requesting an archaeological survey be completed (**Appendix B**). While Lakefield 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, Lakefield Wind would determine the nature of the 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

Lakefield 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 of 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. 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 impacts on a resource. 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.

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 Jackson County were reviewed to identify recreational resources within and near the Project Area. Significant recreational resources identified within this portion of Jackson County include the Des Moines River, Kilen Woods State Park, DNR Scientific and Natural Areas (SNAs), multiple Wildlife Management Areas (WMAs) and Wildlife Production Areas (WPAs), several County parks, Nature Conservancy Lands, and recreational lakes and trails (**Exhibit 9**).

The Des Moines River is located approximately 1 to 2 miles northeast of the project boundary, and is identified on the DNR's recreational compass website as a state canoe route. The river also provides fishing opportunities for northern pike, walleye, crappie, channel catfish, yellow perch, and black bullheads.

Kilen Woods State Park is the nearest state park located approximately ½-mile northeast of the project boundary along the Des Moines River. This 228-acre park offers

recreational opportunities for visitors such as camping, canoeing, fishing, picnicking and hiking.

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, two SNAs exist northeast of the project boundary along the banks of the Des Moines River. These SNAs include the Des Moines River SNA and Holthe Prairie SNA. Holthe Prairie SNA is located approximately 2 miles northeast of the project boundary near Kilen Woods State Park. The Des Moines River SNA is located approximately 4 miles north of the project boundary on the east banks of the Des Moines River.

Wildlife Management Areas (WMAs) are part of Minnesota's outdoor recreation system and represent a large portion of the Minnesota DNR's wildlife management efforts in the state. The areas were established to protect certain lands and waters that have a high potential for wildlife production, public hunting, trapping, fishing, and other compatible recreational uses. These areas are integral to protecting wildlife habitat for future generations, providing citizens with opportunities for hunting, fishing and wildlife watching, and promoting important wildlife-based tourism in the state (MnDNR 2009).

Five WMAs are located within the project boundary and an additional eight were identified outside the project boundary and within four miles of the site. **Table 4-7a** identifies each WMA, its general location, and distance from the site boundary.

Table 4-7a: Vicinity WMAs

Resource Name	General Location	Distance from Project
Toe WMA	East of Lakefield	Within project boundary
Summers WMA 1	South of Lakefield	Within project boundary
Summers WMA 2	North side of Clear Lake	Within project boundary
Husen WMA	Southwest corner of project area	Within project boundary
Dead Horse WMA	Southeast corner of project area	Within project boundary
Bootleg Lake WMA	North of Boot Lake; East of Lakefield	Directly adjacent to project boundary
Caraway WMA	NE of Lakefield	3 miles north of project boundary
Heron Lake WMA	NW of Lakefield	3 miles west of project boundary
Teal Lake WMA	NW of Lakefield	4 miles NW of project boundary
Pletz Slough WMA	South of Lakefield	1.5 miles south of project boundary
Little Sioux WMA	South of Lakefield	1.5 miles south of project boundary
Pavelko WMA	South of Lakefield	3.5 miles south of project boundary

Table 4-7a: Vicinity WMAs		
Resource Name	**General Location**	**Distance from Project**
Sangl WMA	South of Lakefield	4.5 miles south of project boundary

Wildlife Production Areas (WPAs) are public, National Wildlife Refuge lands managed by the U.S. Fish and Wildlife Service for the purpose of preserving wetlands and grasslands critical to waterfowl and other wildlife. While no WPAs were identified within the project boundaries, nine were identified within approximately 4 miles of the project area. Table 4-7b identifies each WPA and provides a location and distance from the project boundary. The nearest WPA is Boot Lake, which adjoins the eastern project boundary.

Table 4-7b: Vicinity WPAs		
Resource Name	**General Location**	**Distance from Project**
Timber Lake WPA	East of Heron Lake	4.5 miles north of project boundary
Boot Lake WPA	East of Lakefield	Directly adjacent to eastern project boundary
Ulbricht WPA	West of Lakefield	4.0 miles west of project boundary
Holy Trinity WPA	Southeast of Lakefield	0.5 miles south of project boundary
Pletz Marsh WPA	South of Lakefield	1.0 miles south of project boundary
Bisaillon WPA	South of Lakefield	2.0 miles south of project boundary
Sioux Forks WPA	South of Lakefield	3.0 miles south of project boundary
Minneota WPA	South of Lakefield	3.5 miles south of project boundary
Rush Lake WPA	Southeast of Lakefield	4.0 miles south of project boundary

Several County Parks were identified within the vicinity of the project area. County parks offer recreational opportunities including camping, fishing, hiking, and environmental education.

Table 4-7c: County Parks		
Resource Name	**General Location**	**Distance from Project**
Sandy Point	Heron Lake	1.5 miles west of project boundary
Community Point	Heron Lake	Less than 1.0 mile west of project boundary
Sparks Environmental Park	Lakefield	Less than 1.0 mile from project boundary
Belmont	North of Jackson	2.0 miles east of project boundary

The City of Lakefield has three parks: North, South, and West City Parks. These parks feature playground equipment, shelters, skateboard facilities, grills, gazebos, horseshoes, softball diamonds, and tennis courts.

There are a few natural lakes within proximity to the Project including Heron Lake, South Heron Lake, Flahtery Lake, Clear Lake, and Bootleg Lake. These lakes offer recreational opportunities including fishing and boating.

The Nature Conservancy has several easement lands located within the vicinity of the Project Area and are identified in the table below. These areas are used primarily for hiking, bird watching, photography, educational and other passive recreational uses.

Table 4-7d: Nature Conservancy Lands

Resource Name	General Location	Distance from Project
Lindgren-Traeger Bird Sanctuary	North Heron Lake	5 miles northwest of project boundary
R&J Traeger Preserve	South Heron Lake	3.5 mile west of project boundary
Blue Gentian Prairie	Northeast of Lakefield	Adjoins northeastern property boundary

According to the Minnesota Department of Natural Resources Recreational Compass Website, there are no state trails, state forests, national forests, or national wildlife refuges within the vicinity of the project area.

4.7.2 Impacts

The Project will be designed in a way that will avoid direct impacts to recreational resources within the Project Area. Recreational resources within the project area include five Wildlife Management Areas (WMAs). All other identified recreational resources are outside of the existing project boundary where physical land disturbance is not planned. Impacts to recreational resources will be visual in nature, and will affect individuals utilizing public open spaces within approximately 4 miles of the project vicinity. More details regarding visual impacts are provided in Section 4.4 of this report. No scenic vistas located along the De Moines River Valley are expected to be impacted. The top of bluff along most of the river in this area is predominantly forested, including areas adjacent to Kilen Woods State Park. Consequently, the turbines will not likely be noticeable from these vantage points.

No impacts to tourism and community benefits are anticipated. Renewable energy production has become very important to the U.S. economy. As a result, interest in wind farms has increased. 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.

4.7.3 Mitigation

Encroachments by the Project into WPAs, WMAs, SNAs, Nature Conservancy Lands, county and state parks, and recreational trails are not planned or expected. Therefore, mitigation measures are not proposed.

4.8 Human Health and Safety

4.8.1 Description of Resources

Air Traffic

There are two registered airports and one heliport located within approximately 10 miles of the Project Area. A review of the AirNav, LLC (AirNav 2009) database revealed the nearest registered airports within 20 miles, which are provided in **Table 4-8**. Distances are from the approximate center of the project area.

Table 4-8: Nearby Airports and Heliports

Airport ID	Airport Location	Airport Name	Approximate Distance from Project Center
03MN	Lakefield, MN	Nauerth Land Ranch Airport	6.0 mi WSW
1MN9*	Jackson, MN	Jackson Medical Center Heliport	6.7 mi ESE
MJQ	Jackson, MN	Jackson Municipal Airport	6.9 mi ESE
40MN	Bingham Lake, MN	Turner Field Airport	14.5 mi NNE
MWM	Windom, MN	Windom Municipal Airport	16.8 mi N
IA99*	Spirit Lake, IA	Dickinson County Memorial Hospital Heliport	17.5 mi S
0F3	Spirit Lake, IA	Spirit Lake Municipal Airport	19.6 mi S

* Heliport.

In addition to the registered airports, there is one unregistered private airstrip within the Project Area approximately 1 mile north of Lakefield (Reder Airfield). A second unregistered landing strip is located east of Okabena and approximately 6 miles west of the northwestern project boundary.

Electromagnetic Fields

Possible health effects associated with wind turbines and transmission of electricity generally include Electric and Magnetic fields (EMF) and noise.

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.

Security

Jackson County and local municipalities maintain procedures and infrastructure to aid in protecting the public and mitigating damage in the event of an emergency. The Jackson County Emergency Management Department (EMD) is currently developing an All-Hazard Mitigation Plan that will satisfy the requirements of the Disaster Mitigation Act of 2000 and 44CFR 201.6. The plan will identify, analyze, and prioritize significant disasters that may impact the county. The plan will outline mitigation strategies to effectively lessen the impacts of those disasters. The City of Lakefield is participating in this planning process.

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 (U.S. Census Bureau 2000), there were 1,153 individuals and 450 households residing in Des Moines, Hunter, Belmont and Heron Lake Townships. The population density was 8 people per square mile, and there were 488 housing units at an average density of 3 per square mile. Census data collected over the last ten years suggest that the population of the area is steadily decreasing. Between the year of 1990 and 2000, the population of Des Moines, Hunter, Belmont and Heron Lake Townships decreased by 161 individuals.

Given that the population within the project area 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 7**. 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.

4.8.2 Impacts

Air Traffic

The Project may impact air traffic and safety due to construction of the wind turbines and associated facilities; however, the Project is not expected to create significant impacts on air traffic in the region. There are no registered airports located within the project

boundary, and all registered airports and helipads are at least 3 to 5 miles away from the project boundary, with most registered airports being at least 5 to 10 miles away from the project. While impacts are not anticipated, the applicant will coordinate with these listed airports to ensure that the proposed facility will not cause disruptions of use or dangerous operating conditions.

As previously mentioned, there is a small, unregistered airfield located within the project boundary (Reder Airfield) directly north of Lakefield. The Applicant will coordinate with this independent owner to ensure that turbines are not placed in locations that would be a detriment or danger to the continued use of the airfield for small aircraft. The Applicant will also coordinate with the owner of the small landing strip located near Okabena to ensure that they are aware of the project and the location of proposed infrastructure.

The installation of wind turbine towers in active croplands and installation of overhead collection lines, if needed, increase the potential for collisions with crop-dusting aircraft. However, overhead collection lines are expected to be minimal and similar to existing distribution lines (located along the edges of fields and roadways). The turbines would be visible from a distance and lighted according to FAA requirements. Permanent meteorological towers will be free standing and have lighting consistent with the turbines. Crop-dusting operations are conducted during daylight hours and usually by local pilots with knowledge of the area. This coupled with the visible nature of the towers is expected to result in no impact to local air traffic.

Lakefield Wind contacted the Minnesota Airports District office of the FAA on July 20, 2009 for comments on the proposed Project. On August 10, 2009, the Minneapolis Airports District Office (ADO) indicated that they had identified an airport within 5 miles, two airports within 20 miles, and two airports within 40 miles of the project area. The letter indicated that the applicant should consider adding these airports to the project distribution list to allow these airports an opportunity to provide comment on the proposed facility. The letter also indicated that although all five airports are located outside the project area, and Obstruction Evaluation/Airport Airspace Analysis (OE/AAA) is required to determine if the proposed project will have any impact on the airspace for each airport (**Appendix B**). As suggested by the Minneapolis ADO, the Applicant will contact these airports and work closely with them to ensure opportunity for comment. Lakefield Wind will also complete the necessary OE/AAA studies as required.

The City of Jackson and the Jackson Airports Commission responded to the request for comments letter on July 23, 2009. The response letter indicated that the City is planning to rezone the Jackson Municipal Airport and surrounding area to support a new runway (rezoning is pending). The Applicant is actively coordinating with the City of Jackson Airports Commission to ensure that the project does not interfere with flight paths for the proposed runway expansion project.

Electromagnetic Fields

Extensive research by the National Institute of Environmental Health Sciences (NIEHS 1999) has determined that extra low frequency EMF exposures pose any health risks to humans is weak.[4] In 2002 NIEHS prepared a booklet that summarized worldwide EMF health research studies conducted after 1999 (NIEHS 2002). 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*.

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). 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.

While there is no conclusive research evidence that EMFs pose a significant health impact from power lines and wind turbines, the turbines will be installed no closer than 1,000 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

Wind turbines constructed as part of the Project will be registered with the Jackson County Emergency Management Department and Lakefield Wind will work with the County EMD 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

[4] See Electric and Magnetic Fields Research and Public Information Dissemination (EMF RAPID) Program.

construction. However, Lakefield 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. Lakefield Wind will also control public access to the Project during construction and operation.

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. An increase in traffic will also create the possibility of an increased chance of traffic accidents in the local area. Additionally, increased wear and tear of local roads is also expected from delivery of Project materials and equipment which has the potential of creating hazardous conditions for traffic.

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. The existing traffic volumes on the area's county roads and highways are documented in **Table 4-5** in Section 4.5 and on **Exhibit 7**. Apart from Interstate Highway 90 (7,600 vehicles per day), Minnesota State Highway 86 has the highest Annual Average Daily Traffic (AADT) count at 2,800 vehicles per day. County State Aid Highway 14, which runs east/west through Lakefield has traffic volumes in the neighborhood of 890 vehicles per day. Aside from these roads, all other roads within the project area have AADTs below 350 vehicles per day, and most of them well below 200 vehicles per day.

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 surrounding roadways for construction of the Project Area will be managed to avoid significant impacts to existing traffic. 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

Lakefield Wind will work with and coordinate siting the wind turbines with the FAA. The wind turbines and permanent meteorological towers will be equipped with lighting in compliance with FAA requirements. Temporary meteorological towers will have supporting guy wires which are marked with colored safety shields. Temporary towers are generally under 200 feet, and thus do not require FAA obstruction lighting. Permanent meteorological towers will be installed at the Project's completion. Permanent meteorological towers are typically hub height (80m) and are free standing

(no guy wires), have galvanized steel tower construction, and medium dual-intensity day and night lights (the same as on the wind turbines).

Lakefield 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. Lakefield Wind will continue to follow developments concerning EMF and will respond to new information regarding EMFs as applicable to the Project.

Security

Lakefield Wind will coordinate with the Jackson County Emergency Management Department (EMD) for the purpose of saving lives and protecting property related to the Project during natural, manmade or other incidents. Lakefield Wind will provide required information and work with the County to develop procedures for response to emergencies, natural hazards, hazardous materials incidents, manmade problems (e.g. fire, etc.) and related incidents concerning the Project. Lakefield Wind will also work with the County Planning Office for assignment of 911 addresses for coordination of emergency response.

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

- The Project wind turbine locations will be registered with Jackson County's Emergency Management Department and Planning Office to develop appropriate procedures for emergency responses related to the Project;
- Towers will follow the PUC setback requirements;
- Contractors will use proper construction and maintenance methods to ensure minimal impacts to workers and public health and safety;
- Lakefield Wind and its contractors will provide temporary and permanent safety fencing, warning signs, and locks on equipment and wind power facilities during construction and operation of the Project;
- Lakefield 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, Lakefield 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;
- Two permanent, free standing meteorological towers will be included in the Project, and will feature medium dual-intensity day and night lights (the same as on the wind turbines). Guy wires on temporary towers will have color sleeves at ground level to increase visibility; and
- Where necessary or requested by landowners, Lakefield Wind will construct gates or fences around the facilities.

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 proposed. However, Lakefield Wind will notify Township and County road officials of the construction schedule and will repair road damage occurring during construction of the Project. Specific additional truck routes will be dictated by the location required for delivery. Additional operating permits will be obtained for oversized truck movements and potential access permits to the site from State and County roadways, as necessary.

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. Lakefield Wind is in the process of conducting a Phase I Environmental Site Assessment (Phase I ESA) in accordance with ASTM Standards E1527-05 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.

The Minnesota Pollution Control Agency "What's In My Neighborhood?" database (MPCA 2009) of known and potential sources of soil and ground water contamination was consulted for the Project Area. The nearest mapped sites are listed in the following table. None of the identified sites are located within the project boundary.

Table 4-9: What's In My Neighborhood Sites

Site Name	Type	General Location
Hugo Shultz, Inc	CERCLIS	0.25 miles from western boundary; east of Lakefield
Lakefield South Dump	Unpermitted Dump; CERCLIS	1.0 mile west of western boundary; south of Lakefield
Lakefield North Dump	Unpermitted Dump	2.0 miles west of western boundary; north of Lakefield
Jackson County Landfill	State Closed Landfill	0.9 miles west of southwestern boundary; south of Lakefield

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. Materials used for operating the wind farm will be maintained by eSC and brought to the Project Area as needed.

4.9.2 Impacts

Possible impacts associated with the introduction of hazardous materials into the environment might occur from use of the O & M Facility. Minimal amounts of hydraulic oil, lube oil, grease and, possibly, cleaning solvents will likely be used on the site to maintain the wind turbines. If not properly managed, these materials have the capacity to leach into the soils and potentially contaminate the local aquifer and possibly surrounding surface waters.

4.9.3 Mitigation

Lakefield Wind has prepared a turbine layout that avoids farmsteads and other buildings by at least 1,000 feet, thereby avoiding potential encounters with hazardous materials and unmarked waste dumps. Consequently, impacts associated with hazardous materials are not anticipated.

Hydraulic oils and lubricants used within the wind turbines will be contained within the turbine nacelle, or within specially designated areas within the O & M facility. Potential hazardous materials will be properly managed, stored and used in compliance with local,

state and federal guidelines for their use. Lakefield Wind will ensure that wastes generated by the Project are properly disposed of using certified waste handlers.

Fuels and lubricants for vehicles and maintenance equipment will also be properly stored and contained within 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 solvents may be used on site and properly stored at 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.

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 10**). In 2007, over 92% of the land in Jackson County (roughly 400,531 acres) was used for agriculture by approximately 969 farms (USDA, 2007 Census Report). Major crops grown in Jackson County include: corn, soybeans, wheat, and hay. Predominant livestock raised in the counties includes hogs and pigs, chickens, cattle and calves, pigeons, and sheep/lambs. Jackson County ranks in the top 10 counties in the state for production of corn for grain, soybeans, hogs and pigs, and chickens. Drain tiles and storm water management structures related to farming operations are located within the Project Area.

As shown on **Exhibit 11**, 31% of the farmland within the Project Area is considered prime, 39.7% is prime farmland when drained and 24.1% is considered farmland of statewide importance. Very little land (approximately 5%) is neither non-prime farmland nor farmland of statewide importance.

Jackson County offers conservation programs that encourage setting aside wetlands and grasslands for conservation purposes, or implementation of conservation practices on private land. These programs can 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.

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. However, Jackson County is delegated to

administer the MPCA's feedlot program according to MN Rule Chapter 7020 for those feedlots that do not require a NPDES system permit. There are currently 596 registered feedlots in Jackson County (MPCA 2009).

Forestry

There are no significant forestry resources within the Project Area. Minnesota Land Cover Classification mapping (**Exhibit 10**) indicates that approximately 1% of the Project Area is forested. According to public land survey data collected between 1847 and 1907, the original land cover of Jackson County was predominantly upland prairie and prairie wetland, with small amounts of oak woodland and brushland interspersed (Tester 1995). Consequently, this portion of the state has, in recent history, had a significant amount of forestry resources. Because of Jackson County's agricultural history, much of the once native oak woodlands were removed to make way for agricultural production within fertile prairie soils. Most of the remaining forested areas in the County are association with farmsteads, which typically contain woodlots and shelterbelts. Therefore, Jackson County does not currently represent an economically important source for forestry products.

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. Based on a review of the MN/DOT Aggregate Source mapping for Jackson County (Mn/DOT 2001), there are approximately 15 gravel pits located within the Project Area (**Exhibit 12**). Most of these gravel pits are located in the southwestern portion of the project are near the Interstate 90 corridor, and were likely used as sources of gravel for the construction of this roadway. Several others are located north and west of Lakefield.

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 agricultural lands will be determined once turbine, road and the Project Substation locations have been finalized. Drain tiles may be impacted by construction activities.

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 Lakefield Wind to complete repairs, or clear vegetation around a turbine or facility, which could result in additional temporary

impacts to agricultural operations. These interruptions are anticipated to be infrequent and short term.

Some livestock operations and pasture land may be temporarily disrupted during the installation of the wind turbines and associated infrastructure. Lakefield 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 significant 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; however, some of the identified aggregate resources may be used for access road construction. The Applicant will coordinate with the Minnesota Department of Transportation prior to utilizing materials from these aggregate resource locations.

4.10.3 Mitigation

Agriculture

To the extent possible, Lakefield Wind will design the Project and locate wind turbines, access roads and associated facilities to avoid or minimize temporary and permanent impacts to farmland. Turbine and facility siting will include discussions with landowners to identify features on their property, including drain tiles and other encumbrances that should be avoided. Potential project construction encumbrances are detailed by the landowner upon the initial wind easement or land lease agreement, which will then be located by Lakefield Wind prior to construction activities.

The only land that will be taken permanently out of crop production will be those areas encumbered by turbines, access roads, and supporting infrastructure. The total amount affected and permanently taken out of agricultural use is estimated to be less than two-percent (2%) of the total Project Area. Additional farmland may be temporarily impacted for use during construction as staging and access areas. Soil compaction is a temporary impact. The construction equipment used in the erection of wind turbines, much like agricultural equipment, is designed with wide tires and tracks to distribute their weight over a larger area. This minimizes the degree of soil compaction resulting from

construction. Once construction is complete, Lakefield Wind will assess disturbed areas and determine whether excessive soil compaction has occurred (in conjunction with the affected landowners). In areas where excessive soil compaction has occurred from project activities, Lakefield Wind will work with the landowner and negotiate appropriate corrective action measures (e.g. by tilling, chiseling, or other methods).

To the extent practicable, staging areas will be placed in previously disturbed locations to minimize the impact to agricultural production. While significant impacts to drain tiles and other existing facilities due to Project construction and operation are not anticipated, Lakefield Wind will develop and implement a drain tile mitigation plan. The plan will address steps that will be taken to avoid, repair or replace drain tile that may be impacted by the Project. Prior to beginning site work, Lakefield Wind will contact the landowner where the work will be conducted, review the location of the work, and identify the presence of drain tiles or other drainage structures. Lakefield Wind will design and construct access roads, buried utilities, overhead utilities and other ground disturbing activities to avoid existing drain tiles to the extent possible. In the event a drain tile becomes inadvertently damaged, Lakefield Wind will repair or replace the impacted tile.

Impacts 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 lease or easement agreement. Once the Project is completed, Lakefield 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 occurring on the site and the soil types at each location. Sites used for temporary storage, material staging, and access areas typically experience significant amounts of traffic which will likely require tilling prior to seeding to loosen compacted soils.

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

On August 14, 2009 Lakefield Wind received a comment letter from the USDA **(Appendix B).** The letter indicates that if the project is affecting agricultural lands, and federal monies are involved, it is a requirement that a Farmland Policy Protection Act (FPPA) site assessment be appropriately filed. If the project will impact agricultural lands, a Farmland Conversion Impact Rating form should be completed (Form AD-1006). According to the letter, FPPA land evaluations are conducted by local NRCS personnel who review the project for possible effects on unique, prime or statewide important farmland. Lakefield Wind will coordinate with the USDA to determine if the FPPA applies to this project, and submit the appropriate documentation, as necessary.

Forestry

No impacts to forestry resources are anticipated and no mitigative measures are proposed. However, Lakefield 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

Jackson County has multiple recreational opportunities available. Tourism is an important part of the Jackson County economy and the economies of local municipalities such as the Cities of Lakefield and Jackson. Important tourism resources in the county include Kilen Woods State Park, Heron Lake and South Heron Lake, Historic Fort Belmont Park, and Jackson Speedway. Jackson County is also home to nearly 10,000 acres of Waterfowl Production Areas and Wildlife Management Areas open for public hunting, which provide a significant tourism draw for anglers and hunters. Local town festivals and fairs are other important tourism draws. The City of Lakefield is the closest city to the Project Area and hosts a number of annual events including: Summer Fest, the Pork Chop Open, and Holiday Fest. The City of Jackson features annual events such as: Summer Crazy Days, the Jackson Speedway Nationals, and Fort Belmont Rendezvous Days.

4.11.2 Impacts

No negative impacts to tourism and community benefits are anticipated. Renewable energy production has become very important to the U.S. economy. As a result, interest in wind farms has increased and they are becoming an important tourism attraction. The addition of this Project to the community is not expected to impact travelers to this area; however, it could possibly increase local tourism. The community will benefit with the addition of jobs related to construction and O & M of the Project. It is estimated that one full time position is created for every 13 turbines erected, thus the Project will create at least 10, possibly 12, new jobs for project operation.

4.11.3 Mitigation

No negative impacts to tourism and community benefits are anticipated and no mitigative measures are proposed. The potential increase in traffic volumes on local roadways generated from visitors to the Project Area is not anticipated to rise to a level that would necessitate mitigative actions.

4.12 Topography

4.12.1 Description of Resources

Elevations in the Project Area range from 1,540 feet above mean sea level (amsl) in the southeastern portion of the site to 1,401 feet amsl in the near South Heron Lake. An elevation map of the Project Area is shown in **Exhibit 13**. According to the Soil Survey of Jackson County, topography within the Project Area was defined by glacial activity during the late Wisconsin glacial period. Glacial drift was carried to the area by the Des Moines lobe of the continental ice sheet.

The Project is situated atop the Altamont moraine, which is a recessional moraine left behind by the Des Moines lobe, which is some of the highest land in the county. Altamont moraine characteristically has more topographic relief than surrounding portions of the county. The topography of Jackson County can be generally described as nearly level or gently undulating with smaller areas of hilly and steep topography. The site is located on the watershed divide, with the southwestern portion flowing to the Little Sioux River and eventually to the Missouri River, and the northern and eastern portions of the county flowing to the Mississippi River.

The basic geologic framework of the Project Area is glacial till from the receding moraines. According to the Soil Survey of Jackson County, the till is high in shale and calcium carbonate and dominated by loam or clay loam.

4.12.2 Impacts

Siting and construction of the turbines, associated facilities, access roads and collection/transmission lines will require grading. The site has very good access from existing public roadways across the Project Area, which will make it possible for Lakefield Wind to minimize the overall length of access roads. Reduction in access road length will also reduce the amount of grading required to construct the project. Significant impacts to existing topography are not anticipated because layout and siting of access roads will be completed in such a way as to tie into existing public roads, where possible and steep terrain will be avoided. Minimizing cut and fill requirements will reduce erosion control potential as well as decrease overall construction costs.

4.12.3 Mitigation

As shown on the preliminary layout map (**Exhibit 3**), Lakefield Wind is considering the location of the proposed turbines in relation to steep slopes and other topographic features. Areas of steep slopes are being avoided to the degree possible. Care will also be taken when siting the locations of collection/feeder lines, transmission lines and access roads to minimize grading activities within and near steep terrain. Best management

practices will be used surrounding graded areas in accordance with state standards (e.g. silt fence and/or bio-rolls) to prevent erosion into regional waterways and wetlands.

4.13 Soils

4.13.1 Description of Resources

The Project Area is mapped as Delft- Clarion Association (**Exhibit 12**). According to the Soils Survey of Jackson County, this association is characterized by nearly level to hilly, well drained and poorly drained, loamy soils that formed in glacial till on uplands. The association is located on uplands with knolls and hills that tend to be separated by draws and swales. Management hazards for this soil association included erosion and wetness. The mapped soil units within the Project Area are summarized in **Table 4-13**.

Table 4-13: Soil Series Mapped Within Project Area

Soil Number	Soil Name	Hydric Soil	Drainage Class	Prime Farmland Classification	Acres
392	Biscay clay loam	All hydric	Poorly drained	Prime farmland if drained	104.68
35	Blue Earth mucky silt loam	All hydric	Very poorly drained	Farmland of statewide importance	466.92
86	Canisteo clay loam	All hydric	Poorly drained	Prime farmland if drained	3,919.53
102B	Clarion loam, 2 to 6 percent slopes	Not hydric	Well drained	All areas are prime farmland	5,627.8
102B2	Clarion loam, 4 to 8 percent slopes, eroded	Not hydric	Well drained	Farmland of statewide importance	4,916.54
921C2	Clarion-Storden loams, 6 to 12 percent slopes, eroded	Not hydric	Well drained	Farmland of statewide importance	1,211.93
887D	Clarion-Swanlake loams, 12 to 18 percent slopes	Not hydric	Well drained	Not prime farmland	33.04
887C	Clarion-Swanlake loams, 6 to 12 percent slopes	Not hydric	Well drained	Farmland of statewide importance	6.63
1833	Coland clay loam, occasionally flooded	All hydric	Poorly drained	Prime farmland if protected from flooding or not frequently flooded during the growing season	165.7
1834	Coland loam, frequently flooded	All hydric	Poorly drained	Not prime farmland	57.59
96	Collinwood silty clay	Not hydric	Moderately well drained	All areas are prime farmland	110.5
118	Crippin clay loam	Not hydric	Somewhat poorly drained	All areas are prime farmland	1,076.24

Table 4-13: Soil Series Mapped Within Project Area					
Soil Number	**Soil Name**	**Hydric Soil**	**Drainage Class**	**Prime Farmland Classification**	**Acres**
336	Delft clay loam	All hydric	Poorly drained	Prime farmland if drained	5,911.12
27B	Dickinson sandy loam, 1 to 6 percent slopes	Not hydric	Well drained	All areas are prime farmland	901.62
27C	Dickinson sandy loam, 6 to 12 percent slopes	Not hydric	Well drained	Not prime farmland	123.1
327B	Dickman sandy loam, 1 to 6 percent slopes	Not hydric	Somewhat excessively drained	Farmland of statewide importance	971.07
327C	Dickman sandy loam, 6 to 12 percent slopes	Not hydric	Somewhat excessively drained	Not prime farmland	530.37
41A	Estherville sandy loam, 0 to 2 percent slopes	Not hydric	Somewhat excessively drained	Farmland of statewide importance	57.24
41B	Estherville sandy loam, 2 to 6 percent slopes	Not hydric	Somewhat excessively drained	Farmland of statewide importance	287.74
41C	Estherville sandy loam, 6 to 12 percent slopes	Not hydric	Somewhat excessively drained	Not prime farmland	164.15
114	Glencoe clay loam	All hydric	Very poorly drained	Prime farmland if drained	1,716.58
1051	Glencoe clay loam, ponded	All hydric	Very poorly drained	Not prime farmland	126.65
197	Kingston silty clay loam	Not hydric	Moderately well drained	All areas are prime farmland	38.15
1907	Lakefield silty clay loam	Not hydric	Somewhat poorly drained	All areas are prime farmland	2.4
211	Lura silty clay	All hydric	Very poorly drained	Prime farmland if drained	40.59
255	Mayer loam	All hydric	Poorly drained	Prime farmland if drained	71.38
362	Millington clay loam, frequently flooded	All hydric	Poorly drained	Not prime farmland	67.84
130	Nicollet clay loam	Not hydric	Moderately well drained	All areas are prime farmland	1,447.45
539	Palms muck	All hydric	Very poorly drained	Farmland of statewide importance	48.57
813	Spicer-Lura complex	All hydric	Poorly drained	Prime farmland if drained	93.53
313	Spillville loam, occasionally flooded	Not hydric	Moderately well drained	Prime farmland if protected from flooding	16.16

Table 4-13: Soil Series Mapped Within Project Area					
Soil Number	**Soil Name**	**Hydric Soil**	**Drainage Class**	**Prime Farmland Classification**	**Acres**
				or not frequently flooded during the growing season	
960D2	Storden-Clarion loams, 12 to 18 percent slopes, eroded	Not hydric	Well drained	Not prime farmland	199.07
595E	Swanlake loam, 18 to 25 percent slopes	Not hydric	Well drained	Not prime farmland	27.76
94B	Terril loam, 2 to 6 percent slopes	Not hydric	Moderately well drained	All areas are prime farmland	234.56
101B	Truman silty clay loam, 2 to 6 percent slopes	Not hydric	Well drained	All areas are prime farmland	375.92
1030	Udorthents-Pits complex	Unknown		Not prime farmland	35.15
39A	Wadena loam, 0 to 2 percent slopes	Not hydric	Well drained	All areas are prime farmland	17.73
39B	Wadena loam, 2 to 6 percent slopes	Not hydric	Well drained	All areas are prime farmland	158.32
229	Waldorf silty clay	All hydric	Poorly drained	Prime farmland if drained	434.77
W	Water	Unknown		Not prime farmland	155.1
113	Webster clay loam	All hydric	Poorly drained	Prime farmland if drained	412.2

4.13.2 Impacts

Construction of the wind turbines, associated facilities, access roads and collection/transmission lines will require grading. Approximately 95% of the Project Area qualifies as prime farmland or farmland of statewide importance. Soils excluded from these classifications are generally highly erodible soils on steep slopes or are hydric soils associated with streams or wetlands. Consequently, 122 of the proposed 137 turbines are proposed within prime farmland categories.

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 completed at each individual turbine location to confirm suitability for turbine foundation construction. If locations are found unsuitable, adjustments will be made to the turbine location. Because the design of the Project is in preliminary stages, the precise amount of land to be disturbed cannot be accurately quantified. However, it is anticipated that a very small percentage of soils within the Project Area will be affected.

4.13.3 Mitigation

According to the Jackson County Local Water Management Plan (2008), approximately 50% of the soils in the county are prone to erosion from wind and water. The potential for construction-related soil erosion will be minimized by siting turbines and access roads so as to avoid highly erodible soils on steep slopes to the degree possible. Avoiding steep topography will also reduce the size of cut and fill areas. Lakefield Wind will work with landowners in the Project Area to site turbines and access roads so as to minimize impacts to high quality farmland to the extent practicable.

Lakefield 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 to minimize soil erosion. Typical BMPs include: (1) encompassing excavated material and disturbed soil with silt fence and/or bio-rolls; (2) protecting exposed soil with temporary seed mixes or hydro-mulches; (3) covering slopes with erosion control blankets and mulches, and (4) restoring disturbed areas as soon as practicable.

4.14 Geologic and Groundwater Resources

4.14.1 Description of Resources

Bedrock in the Project Area consists dominantly of marine shale, sandstone, and lesser amounts of limestone from the Cretaceous and Precambrian periods. These materials are buried, in most cases, beneath clayey glacial drift and outwash materials deposited by the Des Moines lobe of the continental ice sheet. Geological mapping from the Land Management Information Center indicates that the depth to bedrock within the project area generally ranges from 200 to 500 feet, with most of the site in the range of 400 to 500 feet below grade. The southwestern corner has the shallowest bedrock at approximately 200 feet below the ground surface. No bedrock outcrops were identified within the Project Area. Additionally, no karst features within the Project Area were indicated in Minnesota Geologic Survey data or Minnesota Karst Lands mapping (E. Calvin Alexander, University of Minnesota, 2002).

The County Well Index (CWI) indicates that approximately forty-six (46) domestic wells are located within the Project Area (**Exhibit 6**). According to the Jackson County Local Water Management Plan (2008), groundwater used in Jackson County is drawn from the deep Paleozoic bedrock unit and from Precambrian Sioux Quartzite. Domestic groundwater supply appears to be fairly accessible in the Project Area, although it is not as reliable a source as in some other areas of the region. There are currently no wellhead

protection plans in place in the County, and the Minnesota Department of Health has not considered Jackson County a high priority area for these programs.

Recharge of groundwater occurs throughout the region primarily from infiltration of precipitation 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 relatively few depressional wetland areas that could potentially serve as groundwater recharge areas, although there are several rather large lakes in the area that likely function in this capacity (South Heron, Heron Lake, Boot Lake, Clear Lake). Groundwater discharge areas are likely to occur mainly along stream corridors as springs or seeps. According to the National Hydrography Dataset, streams and ditches primarily occur at the fringes of the Project Area, with the majority occurring in the southwestern portion of the site (**Exhibit 14**).

4.14.2 Impacts

No impacts to geologic and groundwater resources are anticipated as a result of construction or operation of the Project. Proposed turbine locations appear to be in areas where bedrock will not be encountered during construction. No turbines are sited in locations with mapped and potentially minable secondary and tertiary 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 by existing city water service.

4.14.3 Mitigation

No impacts to geologic and groundwater resources are anticipated and no specific mitigation measures are proposed. Lakefield Wind will follow MDH regulations concerning EBHs and well installation, if any, for the Project.

4.15 Surface Water and Floodplain Resources

4.15.1 Description of Resources

Several watercourse systems are mapped within the Project Area (**Exhibit 14**), and appear to be a mix of natural streams and judicial drainage ditches. Minnesota DNR mapping indicates that a roughly two mile section of Public Watercourse exists in the far southwestern portion of the project area between Summers and Husen WMAs (MnDNR 1983). This Public Watercourse turns into a public ditch system east of Summers WMA, and continues north of Interstate 90. Two other public ditch systems are located east of the DNR Watercourse. One other public ditch system is located north of Clear Lake and another east of South Heron Lake in the northwestern portion of the Project Area. There are no designated trout streams within the Project Area.

National Wetland Inventory (NWI) Mapping indicates 529 acres of wetland within the Project Area (**Exhibit 14**) (USFWS 1991), representing approximately 1.6% of the project area. A preliminary field review of the Project Area conducted by Lakefield Wind indicates that the majority of these wetland basins have been tiled and drained for row crop agriculture. Wetlands are discussed in detail in Section 4.16.

Five DNR Public Waters are mapped within or directly adjoining the Project Area. The tip of South Heron Lake (32-57P) extends onto the northwestern project boundary just north of Lakefield. Boot Lake (32-15P) is associated with Bootleg Lake WMA and directly adjoins the project boundary. Clear Lake (32-22P), located south of Interstate 90, extends slightly into the southeastern project boundary. Two smaller lakes (32-40P and 32-42P) are located in the southwestern corner of the project area and are associated with Summers and Husen WMAs. The use of shoreland, land within 300 feet of a Public Watercourse or 1,000 feet of a Public Water, is regulated by the statewide minimum shoreland conservation standards (Chapter 6120).

Jackson County does have a floodplain ordinance, which it administers based on the January 1981 version of the Federal Emergency Management Agency (FEMA) floodplain mapping panels. These panels were reviewed in a digital format to determine the extent of floodplains within the Project Area. **Exhibit 15** is an index of the areas containing FEMA Floodplains within the project area. The Actual Flood Insurance Rate Maps (FIRMs) are provided in **Exhibits 15-1 and 15-2**. The panels revealed two floodplains areas within the project boundary. One floodplain area is located around the southern tip of South Heron Lake in the northwestern portion of the site. The second area is located around the Little Sioux River in the southwestern corner of the project. A narrow band of floodplain also exists along the Des Moines River, but outside of the project boundary.

4.15.2 Impacts

Turbines are expected to be located on topographically elevated uplands, and are not expected to affect streams, surface water bodies or floodplains. The Project Area is served by an extensive network of state, county and township roads, from which turbines will most likely be readily accessible. Based on the current site layout, no impacts to streams, wetlands, floodplains, or shorelands are anticipated. As the design of the Project moves forward, Lakefield Wind will coordinate with the St. Paul District of the U.S. Army Corps of Engineers (USACE), and the Jackson Soil & Water Conservation District (SWCD) to obtain concurrence that stream and surface water body impacts are being avoided. Jackson SWCD is the Local Government Unit (LGU) responsible for administering the Minnesota Wetland Conservation Act in this area, and the St. Paul District of the U.S. Army Corps of Engineers administers Section 404 of the Federal Clean Water Act. If wetlands cannot be avoided, the permitting process to be followed is described in Section 4.16.

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, Lakefield 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. Measures included in the SWPPP should be sufficient to ensure that streams and surface waters on the project site do not incur adverse construction-related stormwater impacts.

A response letter was received on August 20, 2009 from the MPCA (**Appendix B**). The letter indicated that both South Heron Lake and Clear Lake are listed on the MPCA 2008 303(d) Total Maximum Daily Load (TMDL) List of Impaired Waters for aquatic recreation due to excess nutrients. The impairment will likely dictate additional increased stormwater treatment during construction and require additional increased permanent treatment in the post construction setting. The MPCA also indicated that any project that will result in over 50 acres of disturbed area and has a discharge point within one mile of any impaired water is required to submit their SWPPP to the MPCA for a review at least 30 days prior to the commencement of land disturbing activities.

Jackson County has a Local Water Management Plan that was amended in 2008. This is a 10-year plan with a 5-year implementation schedule (2008-2017). Jackson County also has a Water Management Task Force that helped prepare the plan. The plan highlights existing and potential water issues and sets specific actions to achieve goals for sound hydrological management of water resources in the County. Priority concerns in the County include: (1) Improving Surface Water Quality, (2) Feedlots and Subsurface Sewage Treatment Systems, (3) Drainage Management, and (4) Protection of Groundwater. The project proposer is committed to addressing these priority concerns as they apply to the project by: insuring minimum development impacts to surface waters, using best management practices to reduce soil erosion, and by adhering to shoreland and floodplain requirements.

4.15.3 Mitigation

No stream, surface water body or floodplain mitigation is anticipated, because such resources are being avoided by the proposed site layout. Potential impacts from construction storm water discharges will be mitigated through the application of BMPs that will be implemented as part of 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 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 14**).

Lakefield Wind conducted a follow-up field review to confirm the accuracy of wetland mapping data. Additional wetlands not mapped on the NWI were noted in the field review, as indicated on **Exhibit 14**. The review found most to be Type 1 or 2 wetlands located on agricultural fields and were partially drained. No Type 3, 4 or 5 wetlands were observed other than on Waterfowl Production Areas or State Wildlife Management Areas.

NWI mapping indicates that there are 267 wetlands within the Project Area covering approximately 529 acres. NWI mapping labels 58 of these wetlands with the "d" modifier indicating that they are partially drained. Another 37 of the basins have the "x" modifier signifying that they have been partially or completely excavated.

NHIS records from MnDNR show one calcareous fen located in the northwestern part of the project area near South Heron Lake. The fen number as identified by the Minnesota DNR is 9198. This calcareous fen is designated as an outstanding resource value water and has special protections under Minnesota Statues Chapter 7050.0180.

4.16.2 Impacts

Possible impacts to wetlands associated with projects like this would include converting wetlands into upland area so that turbines, roads or associated facilities can be constructed. No wetland impacts are anticipated with the proposed Project, as all turbine locations are expected to be located on upland and should be accessed without crossing streams or wetlands. If it is determined that wetland impacts are unavoidable, impacts will be minimized as much as practicable for road construction in accordance with sequencing and replacement requirements of the Minnesota Wetland Conservation Act (WCA) and Section 404 of the Federal Clean Water Act (CWA).

On August 5, 2009 Lakefield Wind received a comment letter from Brian Nyborg, Jackson Soil & Water Conservation District (Jackson SWCD) which indicated that they are the Local Governmental Unit (LGU) for the WCA in Jackson County. Jackson SWCD will need additional details on the locations of wind turbines, access roads and any other activities that could impact wetlands. The SWCD also indicated that an on-site

wetland delineation for all work areas that are not obvious uplands should be conducted (**Appendix B**).

Westwood received a response letter from the St. Paul District of the U.S. Army Corps of Engineers dated August 13, 2009 for the Lakefield Wind project. The letter indicates that any discharges to waters of the U.S. would require authorization by a General Permit (GP) or a Letter of Permission (LOP).

Regulated activities include the installation of underground utilities through waters of the U.S. if there is discharge of dredge or fill material. However, underground utilities installed using vibratory plow and directional bore methods would not require a permit unless there is the need to excavate or backfill at the location of connecting points. Temporary placement of fill material into any waterbody or wetland for purposes of constructing bypass roads, temporary stream crossings, cofferdams, or storage sites may require a Corps permit as well.

The St. Paul District of the USACE will require that the project proposer submit a permit application and obtain authorization for discharge of dredged and fill material if jurisdictional wetlands are unavoidable.

4.16.3 Mitigation

Lakefield Wind is currently evaluating wetlands within the Project Area which coincide with proposed Project features. A wetland delineation will be conducted along proposed access road corridors, crane paths, and turbine locations as the site layout is finalized. The design of the Project is continually being altered accordingly to avoid impacting wetlands to the degree practicable. However, if wetland impacts are determined to be unavoidable, permit applications will be submitted to the proper authorities including the USACE, USDA NRCS, Jackson SWCD and possibly the Minnesota DNR. Wetland mitigation for impacts that exceed de-minimus exemption levels (e.g. the maximum amount of wetland fill permitted without replacing impacts) would require wetland replacement. If wetland replacement is required, a wetland replacement area will be constructed on-site, or Wetland Bank Credits from an approved wetland bank in the same Wetland Bank Service Area will be purchased.

4.17 Vegetation

4.17.1 Description of Resources

The Project Area lies within a portion of the state that was historically covered predominantly with upland prairie and prairie wetland, with small amounts of oak woodland and brushland. However, 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 (**Exhibit 10**). About 87.7% of the Project Area is mapped as Agriculture on the NLCD, 6.4% Developed land (Farmsteads and Roads), 2.5% Grassland, 1.1% Forestland, 1.5% wetland, 0.4% Open Water and 0.2% Shrubland.

Vegetation was observed in the field during site reviews conducted during August 11 to 13, 2009. Vegetation within the Project Area consists mainly of agricultural crops including predominantly corn and soybeans with smaller amounts of wheat, alfalfa, and hay. Road ditch vegetation was dominated by smooth brome. Other plants observed in the ditches include common milkweed, Canada thistle, giant ragweed, reed canary grass and burdock. Some native plants were observed in ditches in scattered patches including prairie cord-grass and grey-headed coneflower. Very few fence rows were observed; however, vegetation in fence rows was almost entirely smooth brome. Forested areas were entirely contained in woodlots at active or abandoned homesteads. Dominant trees in the woodlots consisted of eastern cottonwood, box-elder and green ash. A few silver maple and American walnut were also observed. Understory vegetation mainly consisted of honeysuckle and burdock. Several suspected areas of CRP were observed in the Project Area. Vegetation on these potential CRP lands was mostly dominated by smooth brome, with areas of big bluestem, Indian grass, prairie cord-grass and switch grass also observed. Some remnant grassland and deciduous forest stands exist, but most are associated with farmsteads and side slopes of stream and drainage ditches.

All wetlands observed within the Project Area outside the Waterfowl Production Areas and State Wildlife Management Areas appeared to be highly disturbed by agricultural activity. These wetlands were generally along drainage ways or drained and farmed wetlands in agricultural fields, and were dominated by reed canary grass, bare ground or drowned crops.

The Minnesota County Biological Survey for Jackson County was completed between 1987-2008. However, Native Plant Communities and Rare Species records were obtained through the NHIS request. These records indicate that two mesic prairies and one calcareous fen, located in the northeastern portion of the Project Area, are the only native plant communities or rare plant species in the Project Area. No state-listed plants have been recorded in the project area. Additionally, MnDNR mapping shows many native prairies associated with the Des Moines River Valley and some with Heron and South Heron Lakes (**Appendix D** and MnDNR 2009b).

4.17.2 Impacts

No impacts to native vegetation are anticipated as a result of the proposed Project. Proposed turbine locations will be located 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 collection/feeder lines and transmission lines 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 of south-central Minnesota. Mammals using the area include white-tailed deer (*Odocoileus virginianus*), red fox (*Vulpes fulva*), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), cottontail (*Sylviligus floridanus*), pocket gopher (*Geomys bursarius*), thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*), gray and fox squirrels (*Sciurus carolinensis* and *S. niger*), striped skunk (*Mephitis mephitis*), badger (*Taxidea taxis*), meadow vole (*Microtus pennsylvanica*) and white-footed mouse (*Peromyscus leucopus*).

Bird species found in the cultivated portions of the Project Area include crows (*Corvus brachyrynchos*), rock doves (*Columbia livia*), brown-headed cowbirds (*Molothrus ater*), house sparrows (*Passer domesticus*), mourning doves (*Zenaida macroura*), European starlings (*Sturnus vulgaris*), American robins (*Turdus migratorius*), barn swallows (*Hirundo rustica*), and American goldfinches (*Carduelis tristis*). The cultivated areas of the site also are likely to support red-tailed hawks (*Buteo jamaicensis*) and American kestrels (*Falco sparverius*). The Project Area has some habitat for waterfowl, wading birds (e.g. herons and egrets) or shorebirds on scarce wetlands and lakes adjacent to the Project Area. Waterfowl species observed on site include wood duck (*Aix sponsa*) and blue-winged teal (*Anas discors*).

Amphibian and reptile species found in the Project Area are limited due to the scarcity of wetlands. This is particularly true of frog and turtle species that require surface water. Only the Northern leopard frog (*Rana pipiens*) was observed in the Project Area. Other species of amphibians such as the Western chorus frog (*Pseudacris triseriata),* American toad (*Bufo americanus)* and the Tiger Salamander *(Ambystoma tigrinum)* may utilize the habitat along the drainage ditches and streams in the Project Area. Common upland snakes in the area include common garter snake (*Thamnophis sirtalis*), redbelly snake (*Storeria occipitomaculata*) and fox snake (*Elaphe vulpine).*

4.18.2 Impacts

Wildlife habitat impacts are expected to be minimal because turbines and access roads will be placed exclusively on agricultural land. Approximately 2% of the land area

within the Project Area will be affected by construction. Grasslands, forested areas, streams/drainages and wetlands will be avoided whenever possible.

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 nearby Buffalo Ridge in Lincoln County, 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. More suitable roosting habitat occurs along the wooded areas surrounding the Des Moines River, approximately one mile northeast of the Project. 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 fatalities at wind farms have been migratory species that conduct long migrations between summer roosts and winter hibernacula. The flat nature of the Project Area does not appear to contain topographic features that would funnel bat movements during migration.

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.

A letter from the MnDNR Division of Ecological Services (Region 4) was received on August 17, 2009. The state agency recommends both pre- and post-construction avian monitoring at the Lakefield Wind Project. The DNR recommends that CRP, Reinvest in Minnesota (RIM), Wildlife Management Area (WMA), and Waterfowl Production Area (WPA) lands be surveyed for breeding birds in spring 2010. The DNR indicates that these conservation properties contain blocks of habitat that may attract higher concentrations of birds and bats that may result in increased fatality if turbines are placed in close proximity. In addition, the larger blocks may attract area sensitive birds that may be less tolerant of turbines being in close proximity to their habitat. The DNR indicates that these surveys would help determine if any rare or listed species or any area sensitive birds are present.

The DNR also recommends 2 years of post-construction fatality studies of birds and bats. The DNR has developed a voluntary protocol to be used that would standardize monitoring methods statewide and therefore allow for better comparison of data amongst Minnesota projects. The DNR recommends an additional year of surveys if bald eagles, tundra swans, white pelicans, or state or federal listed species are killed due to operation of the wind farm.

Lakefield Wind is currently in the process of coordinating with the DNR to address avian issues within the project area.

4.18.3 Mitigation

Wildlife habitat impacts will be 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/feeder lines underground; and (4) minimizing other Project infrastructure. Other wildlife-related mitigation measures include:

- Implementing 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;
- Constructing wind turbines using tubular monopole towers and turbines will be minimally lit according to FAA requirements;
- Placing the electrical collection/feeder system from the turbines to the Project Substation underground wherever site conditions allow; and
- Designing to avoid impacts to wetlands, streams and forested areas to the extent practicable.

4.19 Rare and Unique Natural Resources

4.19.1 Description of Resources

Lakefield Wind reviewed publicly available sources of information regarding federal and state-listed threatened and endangered species known or likely to be found within the Project Area. A formal Natural Heritage Information System (NHIS) data request was submitted to the Minnesota DNR (MnDNR) Natural Heritage Program, which maintains the most up-to-date database of rare species records. The request included a 2-mile buffer of the project area. A response with comments and rare species records was received September 14, 2009. Only 10 of the 67 records identified in the data search are in the Project Area; the other 57 records occur in the 2-mile buffer.

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 2009). One federally listed species known or potentially occurring in Jackson County is the Prairie bush-clover *(Lespedeza leptostachya*). Prairie bush-clover is found in gravelly soil in dry to mesic prairies. This plant species is listed as threatened by the USFWS. According to MnDNR NHIS records, one mapped mesic prairie occurs in the east-central portion of the Project Area, near the eastern project boundary. Another occurs immediately adjacent to the northeast project boundary, and is likely associated with the Blue Gentian Prairie (owned and managed by The Nature Conservancy). There are no records of Prairie bush-clover at this site and none of the soils mapped within the Project Area are identified as dry, gravelly soils. Accordingly, no federally listed threatened and endangered species are expected to exist in the Project Area.

On July 20, 2009 Lakefield Wind contacted the USFWS for comments regarding the proposed Project. As of this time, the USFWS has not yet responded. Lakefield Wind will follow up with the USFWS and coordinate potential concerns it may have regarding threatened or endangered species and the Project. Once a more complete understanding of USFWS concerns is developed, Lakefield Wind will work with the USFWS to address them.

State-Listed Species

As previously discussed, the Minnesota County Biological Survey data for Jackson County are not yet published by the MnDNR. However, Native Plant Communities and Rare Species records were obtained through the NHIS request. These data indicate that the mesic prairies mentioned above and one calcareous fen, located in the northeastern portion of the Project Area, are the only native plant communities or rare plant species in the Project Area. No state-listed plants have been recorded in the project area. MnDNR mapping also shows native prairie communities associated with the Des Moines River Valley to the northeast and some associated with Heron and South Heron Lakes to the northwest (**Appendix D** and MnDNR 2009b).

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 of the listed species for Jackson County were researched from the Minnesota DNR Website (MnDNR 2009a). None of the listed plant species are known to occur in the Project Area. Whorled Nut-rush has high potential to occur in the project area as it typically inhabits calcareous fens, one of which is present in the Project Area. Most listed plant species are associated with sand and gravel prairies, high quality native dominated 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 prairies). Due to the limited extent of agricultural disturbance, it is unlikely that state-listed plant species exist in the Project Area.

The Minnesota DNR lists eight bird species, five insect, and five mussel species found in Jackson County as endangered, threatened or special concern. Seven of the listed avian species, Bald Eagle (*Haliaeetus leucocephalus*), Common moorhen (*Gallinula chlopus*), Forster's tern (*Sterna forsteri*), Trumpeter swan (*Cygnus buccinator*), King Rail (*Rallus elegans*), Franklin's Gull (*Leucophaeus pipixcan*), and Wilson's Phalarope (*Phalaropus tricolor*), are birds associated with wetlands/lake complexes and are moderately likely to occur on the water resources within the Project Area. According to MnDNR NHIS, there are two separate records of Common Moorhen, one Trumpeter Swan record, and one Upland Sandpiper (*Bartramia longicauda*) record in the Project Area. Common Moorhen is state-listed special concern, Trumpeter Swan is state-listed threatened, and Upland Sandpiper is not state listed, but listed in Minnesota's Wildlife Action Plan as a Species in Greatest Need of Conservation. The Loggerhead Shrike (*Lanus ludovicianus*) is associated with uncultivated prairies and pastures and has low potential to occur within the Project Area due to the lack of suitable nesting habitat.

Five species of mussel are listed for Jackson County. All of these species are associated with the Des Moines River system. Due to the lack of suitable aquatic habitat, it is unlikely that any of the listed mussel species exist within the Project Area.

The five listed insect species include four butterflies and one jumping spider. The butterflies are found on native prairies and are unlikely to occur within the Project Area. There are three NHIS butterfly records, one each of Argos Skipper (*Atrytone arogos*), Regal Fritillary (*Speyeria idalia*), and Ottoe Skipper (*Hesperia ottoe*), immediately adjacent to the northeast project boundary and likely associated with the Blue Gentian Prairie. The jumping spider is typically associated with sedges and emergent vegetation around wetlands, a habitat type that is present in the Project Area.

Westwood requested comment from the MnDNR via an NHIS database query request on July 20, 2009. The NHIS letter addresses several rare species concerns in the project vicinity (see **Appendix B**). However, the project design and layout minimize potential effects on these species and communities by maintaining a separation of at least 5 rotor diameters between turbines and sensitive features, including:

1. Identified Minnesota County Biological Survey (MCBS) sites of biodiversity significance, including the site which is below biodiversity threshold for statewide significance. All other MCBS sites in the project area are of moderate biodiversity significance and many are associated with managed lands.
2. Managed lands including Wildlife Management Areas, Waterfowl Production Areas, Scientific and Natural Areas, and lands owned and managed by The Nature Conservancy. However, there are two alternate turbines within 5 rotor diameters of the Toe WMA.
3. Identified Calcareous Fens.
4. Identified native prairie remnants.
5. Records of identified populations of the federally threatened Prairie Bush Clover.
6. Rare butterfly records (in accordance with avoiding their native prairie habitats).

Lakefield Wind has also completed an Ecological Risk Assessment for the project area. This report assesses the risks of the Lakefield Wind Project on: (1) species of federal and state conservation importance, including threatened and endangered species; (2) bird and bat mortality and habitats; (3) wetlands regulated by federal, state, and local agencies; and (4) sensitive habitats such as managed lands. This report is based on a desktop study supported by a field review completed during August 11-13, 2009. No point counts of avian species, acoustic monitoring of bats, wetland delineations, or native plant community inventories were performed during the field review. This report includes a review of rare species known to occur in or near the project area, bird and bat species lists, a summary of relevant literature concerning wind power and birds and bats, wetland mapping, a regulatory analysis of wetlands, and a review of managed lands and other sensitive habitats. Results of coordination with staff of the Minnesota Department of Natural Resources Natural Heritage Information System (NHIS) and Division of Ecological Services, U.S. Army Corps of Engineers (USACE), and Jackson Soil and Water Conservation District (SWCD) are included to address regulatory implications and agency concerns relative to birds, bats, rare species, key habitats, and wetlands. Agency feedback, inventory information, and experience with comparable projects and studies were used to address the risk of project effects, identify measures that may reduce and mitigate this risk, and discuss the potential need for further studies.

4.19.2 Impacts

Based on the results of the Ecological Risk Assessment, no adverse impacts to rare and unique resources are anticipated from the Project.

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.

4.20 Summary of Preconstruction Inventories

Lakefield Wind will conduct the following preconstruction inventories concerning the Project:

- Biological preservation study;
- Archaeological survey; and,
- Phase I Environmental Site Assessment.

Lakefield Wind will submit copies of these preconstruction inventories to the PUC as they become available.

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 provided in **Appendix E**. Permits dependent on the final site layout will be applied for after receiving PUC approval, but prior to construction.

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Exhibits