June 25, 2009

Site Permit Application for a Large Wind Energy Conversion System

NOBLES WIND PROJECT

Nobles County, Minnesota

PUC Docket Number: IP6646/WS-09-584

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF APPENDICES

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Project Location	Township Name	Sections	Township/Range Numbers
	Larkin	10-15, 22-27, 34-36	T103N, R42W
	Summit Lake	15-17, 19-23, 25-28, 31-35	T103N, R41W
	Olney	1, 2, 11, 12	T102N, R42W
	Dewald	2-10, 15-18	T102N, R41W

A. Introduction

1. Overview

enXco Development Corporation ("eDC"; "enXco") submits this site permit application for the Nobles Wind Farm project on the Buffalo Ridge in southwestern Minnesota in Nobles County. The project involves constructing up to 201 Megawatts (MW) of nameplate capacity. Currently, enXco anticipates using up to 134 General Electric 1.5 MW turbines.

enXco began development of this site in 1999. enXco has over 18,000 acres under easement agreement within the proposed project boundary. In addition, enXco has developed a thorough understanding of the wind resource at the site through the continuous collection of wind data at various locations along the Buffalo Ridge since 1999. Finally, enXco has secured the rights to interconnect up to 200MW of wind capacity through the Midwest Independent System Operator (MISO) Large Generator Interconnection Agreement (LGIA) process.

enXco will site the equipment and facilities within the approximately 25,000 acre area shown in **Figures 1, 2, and 3.** enXco plans to design the turbine layout and electrical collector system such that project collector cables will bring power from the turbines to a collector substation which will contain various metering and protection equipment. From the collector substation the power will be transmitted to the Point of Interconnection. The location of the collector substation will be determined based on final turbine placement with a strong preference for locations close to the Point of Interconnection. The Point of Interconnection is the Nobles Substation. In the event that enXco is unable to site the collector substation in proximity to the Point of Interconnection, overhead 34.5kV lines may be necessary to deliver the power from the collector substation to the Point of Interconnection.

enXco has entered into agreements with Northern States Power Company, a Minnesota Corporation and wholly owned subsidiary of Xcel Energy ("Xcel Energy" or "NSP") to develop, construct and transfer ownership of the project to NSP. Xcel Energy filed a petition for the approval of two wind energy projects (this Nobles project in Minnesota and Merricourt project in North Dakota) on December 3, 2008 under Minn. Stat. 216B.243, subd. 9 and was granted approval of its filing on May 28, 2009. The approvals granted by the Public Utilities Commission included an exemption from the Certificate of Need process pursuant to MN Statute 216B.243 subd8. (7). enXco is coordinating this LWECS Site Permit Application filing with Xcel Energy.

2. Proposed Project Location

The Nobles Wind Project will be located central Nobles County in Larkin, Summit Lake, Olney, and Dewald Townships about seven miles west of Worthington, MN (**Figures 2 and 3).** enXco has designated approximately 25,000 acres as the permit area to provide some siting flexibility and to allow sufficient room for buffer with I-90, MN266, and local residences. The town of Reading is located on the northeast corner of the project area. Interstate 90 runs along the southern limits of the project area.

Electricity generated from the turbines will be routed to a proposed collector substation within the study area. The exact location of this collector substation has not yet been determined, but is tentatively planned to be located adjacent to the Nobles Substation as shown on **Figure 3.** From there, power will be routed to the Nobles Substation.

The turbines will be sited on agricultural land and located to maximize the capture of the wind resources while minimizing impacts to the surrounding area. The turbines will be on 80 meter (262.5 feet) towers with 77 meter (252.6 feet) rotors for a maximum height of 118.5 meters (388.8 feet). Each rotor will have a swept area of 4,654 square meters (50,095 square feet). A final siting plan layout will be developed and submitted as part of this docket prior to the start of construction.

B. Applicant Information

1. Project Ownership

The project is being developed by enXco Development Corp for Xcel Energy.

2. Construction, Operation and Maintenance

enXco will 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.

enXco has signed a multi-year contract with NSP to provide Operations and Maintenance Services for the Project. enXco Service Corp, the service and maintenance company, not only maintains the turbines owned by enXco, but is also recognized as a premier third party service provider to the industry. enXco Service Corp 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 wind turbine planned for use in the Project.

3. enXco interest in other LWECS projects in Minnesota

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

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

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

C. Compliance with Wind Siting Act and Minnesota Rules 4401

1. Certificate of Need

enXco has entered into a contract with NSP for the sale of the 201-MW Nobles Wind Project. Ownership will transfer to NSP in a progressive manner. NSP is responsible for the addressing the requirements under the Certificate of Need Statute (Minn. Stat. 216B.243, subd. 9) and has done so through a filing on which the Public Utilities Commission acted on May 28, 2009. In accordance with the Office of Energy Security comments in this docket (Docket No. E002/M-08-1437) the Commissioners voted to exempt the Nobles Wind Project from the Certificate of Need Requirements, pursuant to Mann Stat. 216B.243.subd8. (7)

2. State policy

enXco will site the project in a manner as to maximize capture of the wind resources while minimizing impact to area. The purpose of this site permit application is to provide information about the wind and environmental resources within the project area to aid in siting the project in an orderly manner that is compatible with environmental preservation, sustainable development, and efficient use of resources.

D. Proposed Site

1. Wind Rights

enXco identified the Nobles County project site in 1999. enXco has secured wind rights with private property owners within the project area sufficient to site 201MW of wind turbines. The agreements allow for approximately 30 years of project operation. Wind rights are currently being acquired from additional property owners in the area in order to optimize the turbine and electrical system layout.

2. Wind Characteristics

a. Interannual variation – The average annual wind speeds measured at the long term reference station at Worthington varied by approximately 20% during the calendar years of 1993 to 2007 (**Figure 4)**.

b. 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 (**Figure 4)**.

c. 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 (**Figure 4)**.

d. Atmospheric stability – The studies engaged to determine wind speed and energy production for LWEC systems do not include this information.

e. Turbulence – The turbulence intensity was measured between 8.7% and 11.3% at wind speeds of 15m/s.

f. Extreme conditions – the highest wind speed measured in the area was a 3 second gust measuring 42m/s at the Fenton Wind Project.

g. Speed frequency distribution – Wind speed frequency distribution is shown on **Figure 4.**

h. Variation with height – Wind speed variation with height, or wind shear, was measured and calculated at each of the sites. The Shear Exponent ranged from 0.157 to 0.233 (**Figure 4)**.

i. Spatial variation – Due to the relatively uncomplicated terrain of the project area significant variation in wind speed is not anticipated within the project area. It is anticipated that there will be less than 0.5m/s variation across all turbines at the site.

j. Wind rose – Please see **Figure 4.**

3. Other Meteorological Conditions including rainfall, snowfall, and temperature information were obtained from the State Climatology Office are in Appendix B.

4. **Other wind turbines in the area**

One other LWECS Site Permit has been approved by the Public Utilities Commission within Nobles County. The 205.5-MW Fenton Wind Power Plant is currently in operation and is partially located in northwest Nobles County. The Nobles Wind Project site is located southeast of the Fenton Wind site. Several smaller wind projects are in operation in Nobles County. These include: The 6.25-MW Wolf Wind Farm, the 3.6-MW Missouri River Energy Services project, the 20-MW Ewington Wind Farm, and the 1.5-MW Wilmont Hills project.

There are three 350-foot wind turbines sited approximately one mile north of the project area in Sections 2 and 3 of Larkin Township. These turbines are components of several Northern Alternative Energy projects, including the Wilmont Hills project. There is also a 214 foot lattice-tower meteorology tower in section 3 and a 174 foot non-commercial wind turbine in section 1 of Larkin Township. **Figure 3** shows the general location of these nearby structures.

E. Design of Project

1. **Project layout, setbacks**

enXco is in the process of acquiring wind rights over additional properties in order to optimize the site layout. In addition, a thorough review of wetland areas and an assessment of microwave beam pathways are being conducted. Completion of all these activities is planned for Mid-July of 2009.

The final layout will incorporate setbacks from occupied residences, road rights of way and land over which the wind rights are not controlled. enXco generally maintains a minimum setback of 1,000 feet from occupied residences (**Figure 5**), 250 feet from road rights of way and 3-5 Rotor diameters from property over which the wind rights are not controlled. The final siting will incorporate the Nobles County Wind Energy Conversion System (WECS) Regulations (729.4) setback requirements including 600 feet from public conservation lands and US Fish and Wildlife Service Type 3, 4, and 5 wetlands.

2. **Description of turbines, towers, foundations, and other equipment** 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 drivetrain resulting in improved long-term reliability.

   a. **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.

   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 drivetrain are eliminated.

b. 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.

c. 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.

d. 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 crossflow 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.

e. 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.

f. 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 and 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 back up assures continuous, reliable operation.

g. 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.

h. 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 uncommented 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.

i. 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.

j. 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 drivetrain 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.

k. 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.

l. 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. Further information regarding the Germanischer Lloyd's Rules and Regulations can be found at http://www.gl-group.com/en/ren/6454.php.

m. 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.

n. 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.

o. 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 drivetrain 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 drivetrain. 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.

p. 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.

q. Service Roads

Each turbine will be accessible by a low profile, all weather gravel road extending from the turbine base to a public road. The roads will have a finished width of approximately 16 feet. Up to 75 feet on either side of the road centerline may be disturbed during construction.

r. Permanent Meteorological Towers

The Project may also include up to 5 permanent meteorological towers which will be used to provide redundancy to the sensors located on the turbines as well as an independent source of wind speed and other information. The permanent met towers are typically located upwind of turbines on leading edges of the project and monitor the wind speed at hub height, 80 meters or 262.5 feet in this case.

3. Description of LWECS electrical system, transformers

enXco 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 design work includes analysis of the Project to ensure the Facility will meet the power factor and voltage control specifications set forth as well as a coordination study which 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 34.5kV/690V pad mount transformers will meet all state code requirements as well as industry standards and 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 collector substation and will be plowed or trenched under the ground to a nominal depth of 48 inches. 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 if conditions should arise that would require the use of overhead lines, such lines will be sited so as to minimize the impact to the landowner.

The collector substation will consist generally of switching, protection and metering equipment as well as a small control house. Power from the turbines will be collected at this substation and transmitted to the Nobles County Substation via 34.5kV transmission lines. MISO completed all the needed study work in 2006 and the LGIA was filed with the Federal Energy Regulatory Commission (FERC) and immediately suspended. enXco is currently working with MISO and the transmission owner to remove the LGIA from suspension and to update the appendices to the LGIA which contain the schedules and costs for the work.

4. Description and location of associated facilities

An operations and maintenance facility will be associated with the project. A final location for this facility has not yet been selected.

The Service facility will consist of approximately 4,000 square feet of space divided roughly in half between staffing space adequate for 10-14 full time employees and work space suitable for maintaining turbine components and storage of equipment and supplies.

F. Environmental Analysis

In conformance with Minnesota Rules 7836, an environmental analysis associated with the Nobles County Project has been completed. As part of this analysis, background information was obtained and reviewed including:

- NRCS Soils map
- National Wetland Inventory map
- Department of Natural Resources Public Waters Map
- United States Geologic Survey map
- Parks mapping
- Public Recreation Information Map
- Natural Heritage Database information
- Topography
- Land use and land cover
- Avian nesting areas and migration routes
- Prime farmland data
- Nobles County Comprehensive Plan
- Federal Emergency Management Agency Floodplain Maps
- State Historical Preservation Office information
- U.S. Census Bureau

Additionally, information request letters were sent to determine if various agencies had additional information or knowledge of the site that would assist in determining potential environmental impacts for this project. These letters were sent to the Minnesota Department of Agriculture, US Fish and Wildlife Service, Department of Natural Resources, Nobles County Soil and Water Conservation District, US Corps of Engineers, and Nobles County Planning and Zoning. Follow up phone calls with some of these agencies were also made to obtain information. The letters and responses that were received are included in **Appendix C.**

Potential environmental impacts associated with the Nobles Wind Project are discussed below.

1. Demographics Analysis

a. Description

The Nobles Wind Project will be located central Nobles County in Larkin Summit Lake, Olney, and Dewald Townships about seven miles west of Worthington, MN (**Figures 2 and 3**)**.** enXco has designated approximately 25,000 acres as the permit area to provide some siting flexibility and to allow sufficient room for buffer with I-90, MN266, wetlands, and local residences. The town of Reading is located on the northeast corner of the project area. Interstate 90 is located along the southern limits of the project area.

The area is a sparsely populated agricultural area. Based on the County's Comprehensive Plan and US Census Bureau information, Nobles County was at the height of its population in 1960 when there were 22,365 residents. Since that time, the County has experienced a general population decline. In 1990 the population was 20,098 and from 1990 to 2000, the population grew to 20,832. The 2008 population is estimated to be 20,365 residents.

With respect to the municipality populations in the County, they steadily increased from 1940 to 1980. Since the 1980's, the population has decreased. From 1980 to 1990, the population decreased 4.6%.

Information from the US Census Bureau from 2000 indicates that the number of households in the County increased by 256 between 1990 and 2000. The average household size in the County was 2.58; the total population was 20,832 and there were 7,939 households.

The primary employment opportunities in the County revolve around agriculture in addition to the Swift pork processing company. The median household income in 2007 was $42,072.

b. Impacts

This project is expected to bring between ten and fourteen full time jobs to the host community and is anticipated to have a negligible impact on the demographics of the area.

c. Mitigation

The project is anticipated to have a negligible impact to the demographics of the area, beyond the ten to fourteen full time jobs which will be created. The project is anticipated to temporarily bring additional employment and business to the area during construction. Post construction, payment to the landowners for easements and leases are expected to be beneficial to the community. No specific mitigation action is needed.

2. Noise

a. Description

The rural setting of the project site typically has background noise levels in the 25-35 decibel range with higher levels near roads. Background noise in the area is a result of wind, farming equipment/operations, and vehicles. A comparison of typical noise generators is outlined below.

Common Outdoor Noise Levels	Noise Level (dBA)	Common Indoor Noise Levels
	110	Rock Band
Jet Flyer at 100 ft.	100	
Gas Lawn Mower at 3 ft.	90	Inside Subway Train (New York)
Diesel Truck at 50 ft.	80	Food Blender at 3 ft.
Noisy Urban Daytime	70	Garbage Disposal at 3 ft. Shouting at 3 ft.
Gas Lawn Mower at 100 ft. Commercial Area	60	Vacuum Cleaner at 10 ft. Normal Speech at 3 ft.
Heavy Traffic at 300 ft.	50	Large Business Office
Quiet Urban Daytime	40	Dishwasher Next Room
Quiet Urban Nighttime Quiet Suburban Nighttime	30	Small Theatre Large Conference Room (Background)
Quiet Rural Nighttime	20	Library Bedroom at Night Concert Hall (Background)

		10	Broadcast and Recording Studio
		0	Threshold of Hearing

Source: Noise Control-New Standards; W.R. Green; California Department of Transportation; Paper presented at AASHO Annual Meeting; November 14, 1973

b. Impact

The wind turbines to be used within the project site are warranted to generate a maximum apparent sound power level no greater than 106 decibels immediately adjacent to the turbine. The decibels decrease as the receptor moves further away from the turbine. The turbines are expected to generate less than 50 decibels at approximately 1,000 feet. The sound a turbine makes can be described as a "whoosh" sound when the rotors are moving. On a windy day, the sound of the turbines is generally masked by the sound of the wind. The Minnesota Pollution Control Agency regulates the State noise level standards for residential and industrial uses between 50-65 decibels.

c. Mitigation

The turbines will be sited to comply with the State of Minnesota's noise standards. In addition, the Public Utilities Commission has previously required a 500 foot minimum setback from an occupied residence. enXco's policy is to site the turbines so as to comply with the State standards and to observe a minimum 250 foot setback from road rights of way. A recent evaluation of possible health effects associated with wind turbines was recently completed by the Minnesota Department of Health. This report can be found in **Appendix D**. Prior to the start of construction the sound emissions of the wind park will be modeled using the final turbine locations and the maximum warranted sound output to ensure compliance with the State standards.

3. Visual Impacts

a. Description

The existing project site is a rural agricultural area. Crops of primarily corn and some soybeans dominate the area with some livestock grazing areas. The topography of the area is generally flat with gently rolling areas that are punctuated by drainageways, a creek and scattered wetlands. Homesteads are also scattered throughout the study area along with grain storage silos from various farming operations. The Nobles substation is located in the northeastern portion of the project area and is visible from approximately two miles. The viewshed is open expanses of agricultural uses and rural residential.

b. Impact

It is anticipated that up to 134 turbines would be placed within the project area. These turbines will be on 80 meter towers with 77 meter rotors for a maximum height of 118.5 meters (389 feet). From a distance, the turbines blend into the surrounding area. While these turbines will have a visual impact on the area, it is a matter of perception of whether this is a negative or positive impact.
There are no significant scenic overlooks or viewsheds in the project area. The view has been altered from pre-settlement time from a tall grass prairie and oak savanna to farmsteads. These turbines are anticipated to be seen from a distance since they will be the tallest structure in the area. However, the gray/white color of the turbines is such that they will blend in with the surrounding area. Additionally, the area will retain its rural nature rather than being converted to a higher density residential or commercial use.

c. Mitigation

The following measures will be used to minimize the visual impact of the turbines in the area:

- The gray/white color of the turbines is designed to blend into the skyline.
- The turbines will not be placed in park areas or sensitive habitat areas.
- Turbines will not be lit unless required by the FAA.
- Collector lines and transmission lines will be buried underground to the greatest extent feasible.
- Areas not used for crop production that are temporarily disturbed to create the turbine sites and access roads will be re-seeded with the same surrounding vegetation.
- Turbines will be placed up to 1,000 feet away from primary residences.

4. Public Services and Infrastructure

a. Description

The project site is located in southwestern Minnesota in a lightly populated, rural area. Existing infrastructure in the area includes paved and gravel roads and utility services.

- **Electrical Service:** Electrical service for the area is provided by Nobles Cooperative Electric.

- **Traffic Routing:** A number of township and county roads cross the area. Interstate-90 is located at the southern boundary of the study area. Information from Mn/DOT for 2006 indicates that the Average Daily Traffic (ADT) for I-90 within the study area is between 8,600 and 9,500 vehicles. The ADT for TH266 located on the northeast side of the study area is 1,100-1,250 vehicles. All other local and county roads have ADT values from 35 vehicles to 600 vehicles. The local roads in the area consist of two-lane paved and gravel roads.

- **Railroad:** The Minnesota Southern Railway passes south of the project area.

- **Water Supply:** On-site wells provide water to the farmsteads in the area. Municipal water is provided by Lincoln Pipestone Rural Water.

- **Sanitary Sewer:** The farmsteads within the study area are served by on-site septic systems.

- **Telephone:** Phone service in Nobles County is provided by Frontier Communications, Centurytel, Citizens Telecommunications Company of Minnesota, Northern Iowa Telephone Company, or Lismore Coop Telephone service.

- **Radio Towers:** Various communication systems within the county are linked by microwave. Wind turbines will not be placed within the microwave paths. **Figure 6** shows the configuration of tower communications connected via microwave beams. enXco will take county setback regulations from these paths into account and will also conduct a frequency coordination review so as to avoid interference with beam paths that may pass through the area.

- **Radar:** See section 7.

b. Impact

The proposed project is not anticipated to have a significant impact on existing public infrastructure and services. A summary of possible impacts is outlined below:

- **Electrical Service:** Construction of the Wind Farm is anticipated to add up to 134 1.5MW wind turbines and associated power collection systems within the 25,000 acre project area. The project will generate a maximum of 201 MW of energy per hour. The turbines will be connected by underground transmission lines. The goal is for the collector system to be underground to the maximum extent possible.

- **Transportation and Roads:** Construction of the turbines will require some access roads to be constructed on private property to accommodate construction and maintenance activities. These roads will be constructed so as to minimize disturbance to agricultural fields and to maximize efficiency of gaining access to the turbines. The access roads will be constructed as gravel roads that area approximately 16 feet in width. Impact to wetlands and wildlife features will be avoided and minimized. If wetland impact is anticipated, appropriate permits and mitigation will be obtained. These access roads will be maintained during construction by enXco Development Corporation and after construction by the project operator. During construction, a temporary increase in traffic is expected in the area. However, due to the minimal traffic in the area and temporary nature of the traffic increase, no significant impacts are anticipated.

- **Water Supply:** Construction and operation of the turbines will not require connection to a water supply, abandonment of wells, or construction dewatering.

- **Sanitary Sewer:** Construction and operation of the turbines will not require connection to sewer or septic systems and will not impact existing septic systems.

- **Telephone:** Construction and operation of the turbines will not impact telephone service to the area.

- **Radio Towers:** Various communication systems within the county are linked by microwave. Wind turbines will not be placed within the microwave paths.

- **Radar:** enXco has retained Aviation Systems and initiated a review process with the FAA to ensure that the final turbine siting does not adversely impact radar installations in the area.

c. Mitigation

Construction, operation, and maintenance of the turbine sites will be in conformance with local, State, and Federal requirements. No significant infrastructure impacts are anticipated by this project and as such, no major mitigation is required. Some roads will need to be upgraded and some access roads constructed.

5. Cultural and Archeological Impacts

a. Description of Resources

The 106 Group was retained to complete a preliminary review of the cultural and archeological features within the project area. The full report of their findings is included in **Appendix E**, for reference. Four recorded archaeological sites were identified within the project area and four were identified adjacent (within one mile) of the project area. One historical structure was recorded within the area. These sites are detailed below in **Table 5-1**. An historic Mail Road was also identified and transects the northwest corner of the project area.

Table 5-1. Previously Identified Archaeological Sites and Historic Properties within the Project Area and Within One Mile of the Development Site

Inventory Number	Site Name	Legal Location	Site Type	Survey Report Reference
Archeological Sites Within or Adjacent to the Project Area				
21NO0022	The Accidental Site	T102N, R41W, Sec. 6	Lithic Scatter	N/A
21NO0024	The Robert Elsing Site	T102N, R42W, Sec. 1	Lithic Scatter	N/A
21NO0032	The Croat Site	T103N, R45W, Sec. 36	Artifact Scatter	N/A
21NO0033	The Bottom Site	T103N, R42W, Sec. 36	Artifact Scatter	N/A
21NO0028	The Indian Hill Site II	T103N, R41W, Sec. 18	Artifact Scatter	N/A
21NO0029	The Indian Hill Site I	T103N, R41W, Sec. 18	Artifact Scatter	N/A
21NO0030	The Elsing Site	T103N, R31W, Sec. 31	Artifact Scatter	N/A
21NOc	N/A	T102N, R41W, Sec. 20	Town of Adrian	N/A
Historic Properties Within on Mile of the Development Site				
NO-LRK-001	Larkin Township Hall	T103N, R42W, Sec. 9	Historic Property	N/A

b. Impacts

The proposed construction activities have the potential to impact archaeological sites and to add to the visual impacts in the region of the site.

c. Mitigative Measures

A Phase I Archaeology Survey is recommended for all the proposed wind turbine locations, access roads, junction boxes, and areas of construction impact for the proposed transmission line to document previously unrecorded archaeological sites within the Development site. A Phase I Archaeology Survey consists of the following tasks: consultation, documentation, and identification. A field survey would be required to determine if the historical Mail Road still exists.

If archaeological sites are found during the Phase I survey or during construction, their integrity and significance should be addressed in terms of the site's potential eligibility to the National Register of Historic Places (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.

6. Recreational Resources

a. Description

Recreational opportunities within the County include hunting, snowmobiling, camping, hiking, and fishing. Information from the Department of Natural Resources and Nobles County was reviewed to determine recreational resources within the Nobles Wind Project study area. Based on this information, there are a few public recreation facilities within the study area. These areas are shown on **Figure 7** and include the following:

- Bluebird Prairie Wildlife Management Area (WMA) is a 78 acre site centrally located within the study area. This WMA is primarily former cropland that has been planted with native prairie vegetation, woody cover, and food plots. The East Branch of Kanaranzi Creek flows through the southern part of the WMA and hunting is allowed.

The following WMA's are located outside of, but in proximity to, the study area:

- Herlein – Boote WMA is located about one half mile east of the study area and hunting is allowed. This WMA is a 250 acre marsh that is managed for waterfowl.

- Lambert Prairie WMA is located about two miles southeast of the study area. This WMA is 82 acres in size and consist of two separate subunits composed of grasslands, woody cover, wetlands, and food plots.

- Dewald WMA is located about 2.5 miles south of the study area. It is 16 acres in size and consists of grassland with Rock River running through its valley.

- Groth WMA (North and South) is located two to three miles northeast of the study area. Groth WMA is comprised of two subunits covering 73 acres. These areas have wetlands and associated grasslands.

One Scientific and Natural Area is located in proximity to the Nobles Wind Project study area. The Compass Prairie SNA is located 4.5 miles south of the project area. Compass Prairie is 20 acres in size and is the largest known prairie remaining in Nobles County.

b. Impacts

The Bluebird Prairie WMA is located within the study area. Turbines will not be located within this site. Any impact on recreational facilities would be visual in nature since some of the turbines may be viewed from the WMA areas. Nobles County requires a 600 foot setback from any public conservation lands managed as grasslands, including the Bluebird Prairie WMA. The DNR recommends a buffer of a minimum of five times the rotor blade diameter around all WMA's.

c. Mitigation

Wind turbines will not be sited within or immediately adjacent to a public park, Wildlife Management Area, or Scientific and Natural Area. Therefore, no mitigation is required.

7. Public Health and Safety (Air Traffic, Electromagnetic Fields, Security and Traffic

a. Description

Air Traffic: There are four public use airports and no heliports located with 20 nautical miles (23 statute miles) of the geographic center of the proposed site. They are the Worthington Municipal, Slayton Municipal, and Quentin Aanenson Field Airports in Minnesota and Sibley Municipal Airport in Iowa.

Long range radars, NEXRAD weather surveillance radar and military operations areas could be impacted by the proposed development.

Electromagnetic Fields: Electromagnetic fields (EMF) can be man-made or natural. Natural EMF's can be created by lightning and static electricity. Man-made EMF's are created wherever people use electricity and an electric current is flowing through a conductor, such as in household appliances or electric transmission lines. Electric fields are produced by voltage and these fields are easily shielded by objects (e.g., trees, buildings, and skin). In contrast, magnetic fields are produced by current and these fields pass through most materials. Both electric and magnetic fields weaken with increasing distance from the source.

There has been concern about EMF's and potential health risks since the 1970's. A number of epidemiological studies have been conducted in an attempt to determine if EMF's pose a health risk. While some of these studies have found a weak association between leukemia and exposure to EMF, other studies have found no connection. Laboratory studies have also been conducted but have not been able to substantiate a direct relationship between increased EMF and increased cancer risks.

Information from the Minnesota Department of Health (MDH) indicates that the results of these studies are insufficient to determine if there is a cause and effect relationship between EMF and health issues. The MDH continues to monitor EMF research and supports avoidance measures. Exposure to EMF can be reduced by increasing the distance between the EMF source and the recipient.

Security: The project is proposed in a lightly populated area. Construction, operation, and maintenance are anticipated to have minimal impacts on residents in the area.

Traffic: The project site is within a rural area with low population density. Existing traffic levels on the surrounding roads is low. Traffic information is included in Item 4.

b. Impacts

Air Traffic: The Federal Acquisition Regulation (FAR) Part 77 surfaces for each airport have been reviewed. Based on our analysis, we have determined that locating a wind turbine within the proposed site will not impact any airport Part 77 surfaces.

Long-range radar consists of Air Defense and Homeland Security radars. The preliminary evaluation determined that there are no anticipated impacts to Air Defense and Homeland Security radars within the proposed development area. Further aeronautical study will be required.

NEXRAD consists of Weather Surveillance Radar - 1988 Doppler radars. The preliminary evaluation determined that there is minimal to no impact to Weather Surveillance Radar - 1988 Doppler (WSR-88D) weather radar operations. Further aeronautical study will be required. National Telecommunications and Information Administration (NITA) notification is advised.

The proposed site was evaluated to determine if any Military Operation Areas (MOA) were in the vicinity. The preliminary review indicated that there were not any likely impacts to military airspace. Confirmation and documentation can be requested from the four Regional Environmental Coordinators at the Air Force, Navy, Army, and Marine Corps.

The addition of 134 turbines within the project area may affect local crop dusting activities. The Minnesota Aeronautical Chart produced by the Minnesota Department of Transportation is available and shows wind turbine locations throughout the state. This chart is updated annually and will include the Nobles Wind Farm Turbines after construction is complete. This chart can be found at www.mndot.gov.

Electromagnetic Fields: There will be Electromagnetic Fields ("EMFs") associated with the collector cables and any equipment through which electricity is flowing. There is not conclusive evidence from research that EMFs pose a significant impact.

Security: There is no impact on security associated with this project for the area.

Traffic: See Item 4.

c. Mitigation

Air Traffic: No mitigation is necessary; however the FAA will require obstruction lighting at each wind turbine location according to FAA AC 70/7460-1K, Obstruction Marking and Lighting. Final clearance and approval from the FAA must be obtained once the final turbine sites are determined by submitting FAA Form 7460-1, Notice of Proposed Construction, or Alteration for each turbine location. In addition, the Mn/DOT Aeronautics Office may require a permit for each wind turbine location.

Electromagnetic Fields: While there is no conclusive evidence of harmful effects of EMF, increasing the distance between the source and receptors decreases the EMF. The project electrical collector system lines will be buried to a nominal depth of four feet underground. The addition of these transmission facilities, turbines, and substation is not anticipated to significantly increase the EMF's in the area. No mitigation is necessary.

Security: No mitigation is necessary.

Traffic: See Item 4.

8. Hazardous Materials

a. Description
An MPCA database review of known or potential contamination sites was completed. Information from State and Federal databases indicates the following known active site within the study area:

> Nobles County Sanitary Landfill – Permitted: This landfill is located in Section 4, R41W, T102N at the corner of 220th Street and Knauf Avenue.

There may be other spill sites or leaking underground storage tanks within the study area, but additional investigation will be required to determine their presence. The active site is not anticipated to have an impact on the project.

b. Impacts
During construction and operation of the turbines, vehicles involved in the construction and maintenance of the turbines will contain gasoline and other petroleum products. The turbines themselves will contain relatively small amounts of petroleum products such as oil, hydraulic fluid and gear grease. enXco has not found any record of hazardous material disposal or dumping in this area and as such does not anticipate encountering any hazardous wastes at the turbine sites.

c. Mitigation The materials within the turbines are not anticipated to create a hazardous condition. If any wastes are generated or identified during this project, it will be addressed in conformance with local, State, and Federal requirements.

9. Land-based Economics

a. Description
The main industry in the study area is agricultural. According to the Farm Service Agency's 2000 data, 88% of the total land area in Nobles County is cultivated. The area has been farmed with corn, soybeans, and other crops for many years. Drain tile has been used in many areas to further increase the production capabilities of the land for agricultural use.

There are no significant forestry resources within the study area. Six percent of the land is used for pasture or hay. Mining operations are minimal in Nobles County and account for only 0.03% of the land use.

b. Impacts

The turbines will be sited on existing agricultural land. A small area of approximately 1 acre or less will be out of production for the construction and operation of each turbine. To provide a high estimate of the footprint of the impact of the turbines, the following assumptions were made:

- Each turbine would have a 0.04 acre footprint. This includes a 45' diameter circle under each turbine that included a 15 foot diameter foundation and a 12' diameter gravel skirt.

- When estimating the amount of surface land that will be occupied by improvements and equipment, enXco assumes 0.5 miles of 16' wide road per turbine. This equates to a total of 42,240 square feet (0.97 acres) per turbine. The average length of road per turbine is anticipated to be less, but this estimate allows for special requests that may be made by property owners. Preliminary road layouts indicate that the majority of the access roads will be less than 0.5 miles long.

With up to 134 turbines being sited, this results in approximately 134 acres of land conversion within the 25,000 acre project area. This represents a 0.5% change in land cover for the project area. Agricultural activity is anticipated to continue between the turbine sites, thereby reducing impacts associated with the creation and operation of the wind energy facility.

c. Mitigation

The turbines will be sited so as to maintain the agricultural use for the landowners to the greatest extent feasible while still allowing access to the turbines. Agricultural activities will still be allowed between the turbine sites.

10. Tourism and Community Benefits

a. Description

There are no significant tourist destinations in the project area. Areas in proximity to the project area that attract tourism include the Pioneer Village and Okabena Lake in nearby Worthington, MN. The Bluebird Prairie WMA is a public hunting area within the project area.

b. Impacts

No impacts on tourism are anticipated by this project.

Citizens in the local communities surrounding the Nobles Wind Project benefit from the payments landowners will receive for wind easements on their property. The landowners will most likely contribute to the local economy by investing these proceeds into products and services in the local community. According to national averages provided by the American Wind Energy Association, a 200 megawatt wind energy project will produce approximately $600,000 in annual farmer/landowner revenue and a 150 megawatt wind energy project will produce approximately $450,000 in annual farmer/ landowner revenue.

Further, according to national averages provided by the American Wind Energy Association, a 200 megawatt wind energy project will create approximately 200 construction jobs, 10 to 14 long-term operation and maintenance jobs and 400 manufacturing jobs. These high-skilled, high-paying positions will contribute payroll dollars to the rural portions of our Minnesota service territory as full-time personnel are likely to live in the immediate or surrounding communities.

The project will contribute significantly to the State and local communities through additional tax revenues and other fees. Although the Nobles wind energy conversion system will be exempt from Minnesota property taxes, the land on which the system will be located will remain taxable. Minn. Stat. § 272.03, subd. 22. In addition, for the Nobles Wind Project, the State of Minnesota will collect approximately **[TRADE SECRET BEGINS** $850,000 **TRADE SECRET ENDS]** per year from the wind energy production tax. Minn. Stat. § 272.029.[1]

c. Mitigation

No mitigation is necessary.

[1] Minn. Stat. § 272.029 also allows wind owners the ability to negotiate with county boards to pay a flat fee in lieu of the energy production tax.

11. Topography

a. Description

Information from the USGS Topographic Quadrangle indicates that this area ranges in elevation from 1570 feet above mean sea level (AMSL) in the southwest near the East Branch of Kanaranzi Creek to 1740 feet AMSL in the northwest corner (**Figure 2 and 7**). The study area is a combination of relatively flat regions with areas of rolling hills. The East Branch of Kanaranzi Creek flows through the central portion of the project area and is associated with multiple small ravines and steeper topography.

b. Impacts

Siting and construction of the turbines and access roads will require some grading of the area. However, this grading is not anticipated to be significant and will be completed in such a manner as to tie into existing contours to the greatest extent feasible.

c. Mitigation

Since significant grading is not anticipated, no mitigation measures are needed.

12. Soils

a. Description

Information from the Soil Survey for Nobles County was reviewed. The soil in the area is a complex mix of soils, most of which are clay loam, silty loam, and silty clay loam. There are some areas, mostly near streams, where the soil is more coarse grained. The mixing of specific soil types is at a level of detail that cannot be adequately described without considerable study. The mixing is due to the deposition by moving ice, which moved strata around piecemeal throughout the area as the glaciers waxed, waned, and flowed. Additional detail is found in Section 13: Geologic and Groundwater Resources (below). **Figure 9** shows the detailed soil information for the project area.

b. Impacts

As with any soil disturbance, construction of the turbines and access roads can increase the potential for erosion and sedimentation. Construction of the turbine sites and access roads will involve temporarily disturbing at the most approximately 5-10 acres of land per turbine. This equates to 670 – 1,340 acres of temporary disturbance. Erosion control methods such as silt fence and temporary mulch will be used during construction. The topsoil is generally salvaged and stockpiled where the roads and turbines are constructed and then spread back over the disturbed areas. Upon completion of the project, approximately 134 acres of land will be converted to turbines and associated infrastructure.

c. Mitigation

Wind turbine and road access will be sited to take into account the contours of the land and prime farmland locations to minimize impact. An erosion and sediment control plan and Storm Water Pollution Prevention Plan (SWPPP) will be prepared for the construction project and the disturbed areas will be seeded after construction to stabilize the area. The project will also be subject to the requirements of the NPDES Construction permit.

13. Geologic and Groundwater Resources

a. Description

The Nobles County LWECS is located on deposits of glacial till more than 300 feet thick (**Figure 10**). The underlying bedrock is Cretaceous shale and sandstone. The glacial sediments are mostly unsorted till that is primarily clay and silt. The eastern half of the project is located on till that was deposited beneath glacial ice. The western half of the project is located on till that was deposited as a moraine or sediment piled up by the edge of the moving ice. Both of these tills are locally stream- washed and coarser grained than typical for the area. Finally, there is sand and gravel deposited by melting ice, located generally in the center of the area. No unusual geological conditions, such as sinkholes, are expected at this site.

The vast majority of wells in Nobles County draw water from any of several buried confined sand and gravel aquifers. Turbine foundation construction is unlikely to affect local water supply from the buried confined sand and gravel aquifers. One possible exception is penetrating the confining layer for one of these aquifers with a driven pile, soil boring, etc. when that particular aquifer is artesian (confined under pressure). This could disturb the aquifer hydraulics and cause problems with local wells. However, artesian conditions have not been identified in this area and further investigation will be undertaken to determine the actual conditions for any site and foundation design. Geotech testing will occur at all turbine locations and will consist of core-penetration testing.

b. Impacts

The project is not anticipated to have any impacts on groundwater or geologic resources. Water supply needs will be minimal and can be accommodated locally. There is the risk of construction impacting any shallow artesian aquifers that might be located beneath the site. Since these conditions have not been identified, the risk is quite small. Worst case involves compromise of a confining layer that causes water level to drop locally, effectively causing interference with the operation of some nearby wells.

c. Mitigation

Soil borings at the turbine sites will be obtained for structural design purposes, and special attention paid to sealing the borings in areas where buried confined aquifers are encountered to ensure that the construction activity does not affect the hydraulics of the confined aquifer. A brief study could be undertaken to identify local aquifers and determine which if any of them are artesian, but the foundation design used might make this unnecessary.

14. Surface Water and Floodplain Resources

a. Description

Storm water runoff is directed overland and via drain tile over agricultural areas to ditches, intermittent streams, and eventually into the various tributary creeks. The main water bodies within and adjacent to the study area are shown on **Figure 8** as follows:

East Branch Kanaranzi Creek
Kanaranzi Creek
Elk Creek
Little Rock Creek
Okabena Creek
Jack Creek

The DNR has jurisdiction over the DNR Public streams and waters. There are also a number of public ditches and intermittent streams within the study area and are shown on **Figure 8**. There are no lakes in the project area.

Based on the FEMA Flood Insurance Maps, there is a designated 100-year flood zone in the areas associated with Kanaranzi Creek, the East Branch of Kanaranzi Creek, Judicial Ditch number 113, and County Ditch Number 5 (**Figure 11**). Additionally, other ditches in the area do carry water and are subject to localized flooding during snow melt or heavy rain conditions.

There is one impaired waterbody in proximity to the project area (**Figure 12**). Elk Creek is located approximately one mile northeast of the study area. Elk Creek is impaired for fecal coliform and turbidity.

b. Impacts

Construction of the turbines and associated roads will result in disturbing up to 5-10 acres of land per turbine over the 25,000 acre site. This equates to 670 – 1,340 acres of temporary disturbance. Upon completion of the project, approximately 134 acres of land will be converted to turbines and associated infrastructure. The siting of the turbines will avoid low points in the landscape, thus preventing impact on wetlands, streams or associated floodplains. Access roads will be located to avoid floodplains and wetlands to the greatest extent feasible.

The project will not result in additional fecal coliform or turbidity directed to Elk Creek.

c. Mitigation

The additional impervious surface created by the project is anticipated to be up to 1 acre per turbine, including the turbine foundation, gravel skirt, and access roads. For the total project, this equates to 134 acres over the 30 square mile site. These areas will be disconnected and separated by vegetation so as to reduce impact of a small amount of increased storm water volume.

Turbines and access roads will be sited to avoid the low areas of the area. However, If access roads need to be constructed in drainageways, culverts to allow cross drainage and to prevent impounding water will be created. An NPDES Construction permit will be obtained and the project will adhere to the requirements of this permit.

15. Wetlands

a. Description

The National Wetland Inventory (NWI) map and aerial photo was reviewed for the study area. A cursory site inspection of the wetlands in the study area was completed on March 5, 2009. An additional review of the study area is anticipated to be completed by mid-June. The wetlands that are present have been impacted by agricultural activities through drain tile, tilling, or sedimentation from runoff. Many of the wetlands and drainage swales are dominated by reed canary grass. The field review indicated that there may be more wetlands than shown on the NWI. A more complete field review will be necessary during the turbine-siting stage of the project to ensure avoidance of wetlands.

The 30 square mile study area contains approximately 250 acres of wetland based on the NWI as shown on **Figure 13.** There are a number of intermittent streams and the wetlands generally correspond to these stream locations. The DNR has jurisdiction over some of the water courses as noted in Item 14. There are a few larger wetland complexes that are fed by a number of drainage swales. These areas are primarily Type 1 and 3 wetlands dominated by reed canary grass and cattail. These areas have been impacted by the surrounding agricultural uses. The drainage area associated with the Bluebird Prairie WMA (**Figure 7**) is listed by the DNR as having native wet prairie vegetation present. Additionally, a wetland in Section 4 of Dewald Township is in the process of being restored for mitigation banking purposes. **Table 15-1** summarizes the wetlands that are present within the site based on wetland type according to the NWI map.

Table 15-1. Summary of Wetland Types within the Study Area*

Circular 39 Type	Cowardin Type	Acres within Study Area
Type 1 – Seasonally flooded basin or floodplain	PEMA	57
Type 2 – Wet meadow	PEMB	9
Type 3 – Shallow marsh	PEMC, PEMF	163
Type 4 – Deep marsh	PUBF, PUBG, PUBK	18
Type 6 – Shrub swamp	PSS1C	2
Type 7 – Forested swamp	PFO1C	1
	Total	**250**

*Data based on NWI Map.

b. Impacts

The wind turbines will be sited to avoid the low points within the study area, thus eliminating possible impacts to wetlands. Additionally, turbines will be sited in accordance with the Nobles County WECS regulations, which require a 600 foot setback from Type 3, 4, and 5 wetlands. Access roads may need to be located through or near wetlands. However, efforts will be made to avoid and minimize wetland impact associated with road access.

c. Mitigation

Access roads and turbine locations will be designed around the wetlands to avoid impacts as much as possible. If wetlands will be impacted by the access roads, the wetland edge will be delineated, mitigation will be provided, and a permit will be obtained from the regulatory agencies. The strategy will be to avoid the wetlands within the project.

16. Vegetation

a. Description

Based on aerial photos, the USGS map, and a field review, the vegetation within the site consists mainly of agricultural, cropped areas. Few wooded areas are present on the site and those present were associated with the farmsteads. **Table 16-1** summarizes the land cover present at the site during the most recent land cover survey of the area (1990). **Figure 14** shows the land use. The wetland acreage is significantly different than the NWI above. This is likely due to varying wetland identification methods and many Type 1 wetlands were probably included in the “grassland” category. Field review of the site supports the NWI estimates above.

Table 16-1: Existing Land Cover

Land Cover	Acres	Percent of Project Area
Row crops/Agricultural	17350	90%
Wooded	156	0.8%
Grasslands	1466	7.5%
Wetlands/water	15	<0.1%
Commercial/Industrial	12	<0.1%
Farmstead/Rural Residential	305	1.6%
Gravel Pits/Exposed Soils	42	0.2%

b. Impacts

Of the study area, approximately 134 acres will be used for the turbines and access roads. The vegetation that will be disturbed will primarily be agricultural in nature. With the annual planting of row crops, the vegetation in the area is routinely disturbed. Turbines will not be constructed in wooded areas or in wetland areas since the turbines need to be sited to maximize the capture of the wind. The operation and maintenance of the turbines will not impact vegetation in the area.

c. Mitigation

The vegetation at the turbine locations and access roads will be disturbed and removed. Topsoil will be removed and stockpiled in the disturbed areas. Once construction is complete, the topsoil will be used to cover and revegetate the disturbed areas.

17. Wildlife

a. Description

The wildlife on this site is a result of the plant communities/land cover present. The land cover present consists of significant tracts of agricultural field punctuated by drainage ways and a few wetlands. Wooded areas are mainly associated with farmsteads. The area has been in agricultural production since at least the late 1930's based on the historic photos. Wildlife typical of this area would be those accustomed to disturbance and human presence.

Based on a site visit and review of the historic photos, the majority of this site does not provide significant wildlife habitat. Areas where disturbance has been minimized include the Bluebird Prairie WMA. This area provides habitat for wildlife within an area that is mostly impacted by agriculture. A map showing the general land cover is shown on **Figure 14. Appendix F** contains listings of typical animal species that could be found in Nobles County.

Avian and Bat Species

With wind farm sites, resident and migratory birds as well as bats are wildlife of particular interest. There have been a number of studies throughout the United States, including Minnesota and Iowa that show varying degrees of impact on bird and especially bat species. The common result of these studies is that the degree of impact on these species is related to the habitat within or near the study area and the migratory routes of the various species.

In Minnesota, there are a variety of resident as well as migratory bird species as well as a number of bat species. Again, the presence of birds or bats would be dependent on the habitat present. Due to the lack of significant woodland cover, greenway corridors, and waterfowl habitat, the study area does not provide suitable sites for significant wildlife habitat.

Mammals
Agricultural fields provide some cover in later summer months as well as a food source for some species. While sparse, the larger wetland complexes also provide cover and food sources for some species. Typical species in these areas would include mice, rabbits, and other rodents. Larger mammals such as fox, raccoon, and coyotes would also be anticipated in the area. White-tailed deer would also likely be present, feeding off the corn in the fall.

Reptiles and Amphibians
A number of reptile and amphibian species are expected to use the area. Frogs are anticipated to breed in the wet, unplowed areas. Snakes would forage for food in the grassy areas within the site.

b. Impacts

General Wildlife Impacts
The general disturbance that occurs with agricultural activities is expected to be the main impact on wildlife in the area. The temporary disturbance associated with construction of the turbines is anticipated to have a minimal affect on wildlife.

Turbines will be located to avoid low areas and wooded areas. By avoiding low areas and wooded areas the project is not expected to have an impact on wildlife.

Avian and Bat Impacts
There have been a number of studies done throughout the Country on the impact of turbines on bird and bat species. Three studies and one review that have been conducted include:

- *Avian mortality associated with the Top of Iowa Wind Farm*
- *Avian monitoring studies at the Buffalo Ridge, Minnesota Wind Resource Area: Results of a 4-Year Study*
- *Avian issues in Development of Wind Energy in Western Minnesota*
- *Patterns of Bat Fatalities at Wind Energy Facilities in North America*

The results of these studies indicate that while there are fatalities to birds and bats associated with the turbines, these fatalities can be minimized by siting turbines away from significant habitat, possibly changing blade “cut-in” speeds, or change the times when turbines are harnessing wind power or are in a dormant state. The United States Fish and Wildlife Service have developed guidelines to avoid and minimize impacts from wind turbines on birds and bats.

c. Mitigation
The site area was chosen due to its wind resource and due to the land cover present. The lack of significant habitat within or near the study area reduces the chance for impacts to wildlife in the area. Further, turbines and access roads will be sited to avoid the wetlands and wooded areas. This will further limit the impacts on wildlife. Based on these mitigation measures as well as erosion control measures discussed in this document, the project is not anticipated to have a significant impact on wildlife in the area.

18. Rare and Unique Natural Resources

a. Description
The DNR Natural Heritage Database has been contacted for information about rare and unique natural resources. Four known records of the Topeka Shiner (*Notropis topeka*, MN Special Concern, Federally listed Endangered) fish are located within the project area and are associated with the creeks and ditches.

b. Impacts

The turbine and access roads will be sited to avoid the wetlands, creeks, wooded areas, and areas with native remnant prairie. By siting the tubines away from wetlands and creeks, impacts to the Topeka Shiner habitat are not anticipated.

c. Mitigation

DNR has recommended a 1,000 foot setback buffer around wetlands and native prairie tracts, which would include the Bluebird Prairie WMA. This currently is only a recommendation and is not required. A more detailed wetland review of the areas within the permit area will be completed by mid-June. enXco will share these results with the DNR and use this information for turbine siting to avoid remnant prairie or endangered species. If additional botanical surveys are needed by the DNR at that time, this will be completed to assist in siting the turbines to avoid impact to rare and endangered species. The document *Recommendations for Construction Projects Affecting Waters Inhabited by Topeka Shiners (*Notropis topeka*) in Minnesota* by the U.S. Fish and Wildlife Service is located in **Appendix G** for reference.

G. Construction of the Project

1. Construction Management

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

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

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

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

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

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

Throughout the construction phase, ongoing coordination occurs between the project development and the 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 enXco 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.

2. 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:

- Improvements of existing roads to the development site.
- The 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 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.
- Clearing and grading for pad-mounted transformers and other installations.
- Installation of any site fencing and security.

Any improvements to existing roads will primarily consist of re-grading and filling of the gravel. Access roads will be constructed to each turbine and landowner input will be solicited prior to finalizing the road locations. Roads will be sited in areas with stable soils. All access roads will include appropriate drainage and culverts while still allowing for the crossing of farm equipment. The 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 plowed or trenched into the ground to a nominal depth of 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.

3. 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.).

H. Operation of the Project

1. Operations and Maintenance

enXco develops all project sites with the intention of owning and operating them for the life of the project. enXco periodically enters into agreements to develop and sell complete projects to qualified third parties. In the case of the Nobles Wind Farm project the entire project will be sold to Xcel Energy. enXco Service Corporation has entered into a multi-year contract to Operate and Maintain the Nobles Wind Project. enXco'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.

Generally, 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.

2. 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 enXco'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.

3. Maintenance Schedule

The Project will require scheduled maintenance of the individual wind turbines, the transmission facilities, and the site improvements (roads, gates, fences, etc.). Estimates of the duration and scheduling of the maintenance activities are based on enXco'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.

4. 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. On average the turbines will require 40 to 50 person hours of scheduled mechanical and electrical maintenance per year. Usually, no more than two turbines are being serviced at any one time.

In addition to the turbine manufacturer supplied O & M Manuals, enXco 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, enXco 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 of the type electrical equipment anticipated for the project. enXco places a particular emphasis on preventative and predictive maintenance testing and procedures.

enXco 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, enXco will attempt to schedule these service outages during low wind periods. enXco 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.
- Cable in the machine head and in the tower on an annual basis.

I. Costs

1. Capital Costs

The cost for the Project will be approximately **[TRADE SECRET BEGINS** $2,500 **TRADE SECRET ENDS]** per installed kW of nameplate capacity. This includes development costs, engineering, procurement and construction costs.

2. Operating Costs

enXco anticipates average operating costs for the full 200MW project to total approximately $6,000,000 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 made up of taxes and fees including landowner payments and the MN production tax.

J. Schedule

enXco plans to have the Nobles Wind Project in service and in Commercial Operation on or before December 31, 2010. To achieve this enXco has set the following Milestones:

Milestone Description	Target Start Date	Deadline
Land Acquisition	In Process	June 15, 2009
Site Permit	May 15, 2009	October 15, 2009
Preconstruction Studies	In Process	November 15, 2009
Equipment Procurement	In Process	Various
Construction	May 2010	December 31, 2010

enXco does not anticipate a need for third party financing. However, enXco maintains a presence in the financing markets. Should third party financing be required enXco will procure it in the normal course of business.

K. Energy Projections

enXco 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 14.5%, is estimated at approximately 700,000 MWh (Megawatt hours). enXco has estimated the following loss breakdown:

- Wake: 4.4%
- Availability: 5.8%
- Electrical: 2.1%
- Turbine Performance: 0.1%
- Environmental: 2.9%

L. Decommissioning and Restoration

1. Estimated Life of the Project

enXco has extensive experience operating and maintaining wind turbines of all vintages. Based on this experience it is anticipated that the project can be operated for approximately 30 years.

2. Estimated Decommissioning Costs, Method for Ensuring that Funds are Available for Decommissioning and Method for Updating that Funds are Available and Updating Decommissioning Costs

Xcel Energy, the ultimate owner of the project is a regulated utility in Minnesota. As such, funds for removal and dismantling are set in depreciation rates approved by the Commission in accordance with MPUC Docket No. E002/D-77-1086A, Minn. Stat. § 216B.11, and Minn. Rules 7825.0500 through 7825.0900.

3. List of Decommissioning Activities

Decommissioning activities include the removal of wind turbine nacelles, blades, towers, foundations, cables, roads, and other facilities to a depth of 36 inches below grade.

M. Identification of Required Permits/Approvals

There are a number of permits or approvals that are or may be required prior to construction of the Nobles Wind Project. These permits/approvals are outlined in the table below.

Agency	Permit/Approval	Authority	Description
US Army Corps of Engineers	General Permit or Letter of Permission	Section 404 of the Clean Water Act	Requires proposed impacts to waters of the United States be avoided and minimized.
FAA	Notice of Proposed Construction or Alteration	14 CFR Chap 1 Subchapter E Part 77	Determination of No Hazard to Air Navigation
USFWS	Consultation and review of the proposed project regarding federally threatened and endangered species	Endangered Species Act of 1973	The Act requires all projects that are in areas designated to be habitat for endangered species to be reviewed by FWS
MN PUC	LEGF Certificate of Need	MN Stat.216B.243, subd. 9 Rules 7849[2]	For wind turbines and transmission interconnections and associated facilities
MN PUC	Site Permit	MN Rules 7836	For wind turbines – meet threshold for LWECS requiring permit.
MN State Historical Preservation Office	Cultural and Historical Resources Review	National Historic Preservation Act; Historical Sites Act (Minn. Stat. 138.661-138.669); Field Archaeology Act (Minn. Stat. 138.31-138.42); Private Cemeteries Act (Minn. Stat. 307)	Cultural Resources Review and State and National Register of Historic Sites Review.
MPCA	NPDES Stormwater Permit for Construction and Storm Water Pollution Plan (SWPPP)	Clean Water Act	Program designed to reduce the amount of sediment and pollution entering surface and groundwater during and after construction projects.
MPCA	Small Quantity Generator	MN Rules 7045	Hazardous Waste rules regarding storage and disposal of turbine lubricating oil.
MN DNR	Work in Public Waters	Minn. Stat. §103G.005	Applies to activities conducted below the Ordinary High Water Level of public waters and public waters wetlands.
MN DNR	License to Cross Public Lands and Waters	Minn. Stat. §84.415	Required for utilities passing over, under, or

[2] Based on 2008 legislation, the Certificate of Need statue was modified for renewable projects and requires the project to meet four requirements as an alternative to the Certificate of Need process.

			across state lands and public waters.
MDH	Plumbing Plan Review	MN Rules 4715.3130	Ensures healthy and safe plumbing installation.
Nobles County SWCD	Wetland Conservation Act Approval	Minn. Stat. §103G.222-103G.2373; MN Rules 8420	Requires proposed impacts to wetlands be avoided and minimized
Nobles County	Building Permits	County Ordinance	For Operations and Maintenance Facility
Nobles County	Conditional Use Permit	County Ordinance	For Operations and Maintenance Facility
Nobles County	Individual Septic Tank Systems (ISTS) Permit	County Ordinance	For Operations and Maintenance Facility
Nobles County	Driveway Permits		If Turbine road will connect to a county road
Nobles County	Utility Permits	County Right of Way	
Nobles County	Moving permits		Need to permit oversized loads on county roads.
Mn/DOT	Driveway Permits		If access road will connect a state road.
Mn/DOT	Utility Accommodation Permit		
Mn/DOT	Work within Right of Way Permit		
Mn/DOT	Haulage Permits		
Mn/DOT	Aviation clearance from Office of Aeronautics		Review and approval of FAA 7460 permits