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

Prepared for

Ridgewind Power Partners, LLC

Terracon

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September 2006

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TABLE OF CONTENTS

Page No.

A. INTRODUCTION 1
1. Overview 1
2. Project Summary 1
3. Project Ownership 2
a. Project Resources Corporation 2
B. PROJECT DESCRIPTION 3
1. Description of the Windpower Technology 3
2. General Location 3
3. Physical Description 3
4. Project Layout 4
5. Associated Facilities 4
6. Land Rights 4
C. PROPOSED SITE 5
1. Site Boundaries 5
2. Wind Resource Considerations 5
a. Interannual Variation 5
b. Seasonal Variation 5
c. Diurnal Wind Speed Variation 6
d. Atmospheric Stability 6
e. Turbulence 6
f. Extreme Conditions 6
g. Speed Frequency Distribution 6
h. Variation with Height 7
i. Spatial Variations 7
j. Wind Direction 8
3. Wind Plant Energy Projections 8
a. Base Energy Calculation 8
b. Wind Power Plant Output Variability 8
4. Efficiency of Proposed Plant Layout 9
5. Other Meteorological Conditions 9
6. Existing Wind Turbines within the Area 9
D. COST ANALYSIS 10
1. Capital and Operational Costs 10
2. Site and Design Dependent Costs 10
E. ENGINEERING AND OPERATIONAL DESIGN AND ANALYSIS 12
1. Proposed Array Spacing for Wind Turbines 12
2. Turbine Assemblies and Components 12
3. Associated Facilities Description 16
4. Wind Plant Electrical System 16
a. Low Voltage System and Pad-Mounted Transformers 16
b. Medium Voltage System 16
c. Transformer to Substation Wiring, Design & Routing 17
d. Transmission Line and Interconnection 17
5. Wind Plant Substation 17
a. Grounding System 17
b. Communications System 17
6. Wind Plant Operations 17
7. Wind Plant Construction 18
a. Construction Management 18
b. Foundation Design 19

TABLE OF CONTENTS

Page No.

c. Civil Works 19
d. Commissioning 19
8. Operations and Maintenance 20
a. Site Control and Data Acquisition (SCADA) System 20
b. Maintenance Schedule 20
c. General Maintenance Duties 20
d. Operations and Maintenance Facility 21
9. Project Schedule 21
a. Land Acquisition 21
b. Permits 21
c. Equipment Procurement, Manufacture and Delivery 21
d. Construction 21
e. Construction Financing 21
f. Permanent Financing 21
g. Expected Commercial Operations Date 21
10. Decommissioning and Restoration 22
a. Anticipated Life of the Project 22
b. Estimated Decommissioning Costs 22
c. Method for Updating that Funds are Available and Updating Decommissioning Costs 22
d. Method for Ensuring that Funds are Available for Decommissioning 22
e. List of Decommissioning Activities 22
F. ENVIRONMENTAL ANALYSIS 23
1. Demographics/Homes 23
2. Noise 24
3. Visual 24
4. Public Services/Infrastructures 26
5. Cultural/Archaeological 28
6. Recreation Resources 28
7. Public Health and Safety 29
8. Hazardous Materials 31
9. Land-Based Economics 31
10. Tourism and Community Benefits 32
11. Topography 32
12. Soils 33
13. Geologic and Groundwater Resources 34
14. Surface Water and Floodplain Resources 36
15. Wetlands 36
16. Vegetation 38
17. Wildlife 38
18. Rare and Unique Natural Resources 40
19. Adverse Human and Environmental Effects Which Cannot be Avoided. 42
G. IDENTIFICATION OF REQUIRED PERMITS/APPROVALS 43
1. Minnesota Public Utilities Commission 43
2. Department of Natural Resources (DNR) 43
3. Minnesota Pollution Control Agency (MPCA) 43
4. Minnesota Department of Transportation (MNDOT) 44
5. Pipestone and Murray Counties 44
6. Federal Aviation Administration (FAA) 44
7. Minnesota Historical Society (MHS) 45

TABLE OF CONTENTS

Page No.

FIGURES

Figure 1	General Vicinity Map
Figure 2	Project Vicinity Map
Figure 3	Project Site Map
Figure 4	Diagram of Energy Path
Figure 5	Diurnal Wind Speeds
Figure 6	Wind Speed Frequency Distribution
Figure 7	Wind Direction
Figure 8	View of Adjacent Wind Power Plant
Figure 9	Wind Turbine Design
Figure 10	Electrical Systems
Figure 11	Turbine Access Roads
Figure 12	Noise Levels
Figure 13	Typical Rural Setting of the Project Site
Figure 14	Public Recreation Information Map
Figure 15	General Soil Map of Pipestone and Murray Counties
Figure 16	National Wetland Inventory Map

TABLES

Table 1	Monthly Percent of Annual Energy Budget
Table 2	Linear Adjusted Wind Speed Distribution
Table 3	Energy Estimates on a Per Turbine Basis
Table 4	Average Annual Energy Loss Estimates
Table 5	Facility Acreage Estimates at the Development Site
Table 6	Wetland Types Located within the Development Site

Applicant	Project Resources Corporation
Authorized Representative	Paul White
Address	625 8th Avenue, SE Minneapolis, Minnesota 55414
Phone	612-331-1486
Preparer of Application	Jennifer Mlynek
Signature	
Address	Terracon 3535 Hoffman Road East White Bear Lake, Minnesota 55110
Phone	651-770-1500

A. INTRODUCTION

1. Overview

Project Resources Corporation (PRC) is submitting this application, on behalf of Ridgewind Power Partners, LLC, to the Public Utilities Commission (PUC) for a Site Permit to construct a large wind energy conversion facility with up to a maximum nameplate capacity of 27 megawatts (MW) of wind power generating capacity (the proposed "Project"). The Project will employ utility grade wind turbines and associated power collection systems, including power collection lines, and pad-mounted step-up transformers. The Project site identified in this application is located in Pipestone and Murray Counties (Figure 1).

2. Project Summary

Project Description
PRC proposes to construct the Project near the towns of Lake Wilson and Woodstock, Minnesota.

The Project will employ utility grade wind turbine generators from a major supplier to the wind industry. PRC intends to employ 16 units of 1.5 MW wind turbine generators and associated power collection systems, including power collection lines, and pad-mounted step-up transformers. The final number turbines will depend on the final project design and the model of turbines employed. The wind turbine nacelles will be mounted atop free standing tubular towers. The towers will be up to a maximum anticipated height of 100 meters (328 feet) in height. The blades on the wind turbine will be up to approximately 45 meters (148 feet) long, resulting in a maximum overall height of the wind turbines of up to approximately 145 meters (476 feet) when one blade is in the vertical position. The rotor diameter will be up to a maximum of approximately 90 meters (295 feet).

Certificate of Need
A Certificate of Need will not be required prior to receiving a site permit from the PUC. PRC is currently negotiating power sales with a major Minnesota electric utility company.

Proposed Site
The proposed project site is located in Pipestone and Murray Counties, Minnesota, near the town of Woodstock. The project site is within two townships, Burke (T106N, R44W) and Cameron (T107N, R43W). All turbines will be sited within the project site boundary. The total project site area is approximately 3.5 square miles.

Figure 2 is an aerial photograph of the Project site. Figure 3 is a detailed map showing the project site area including the topography, bodies of water, section numbers, county boundaries, existing roads, railroads, other infrastructure, residences (with 500 to 1,000 foot setbacks noted), wooded areas, and the project site boundaries. The map also depicts a potential design of the proposed facility. It is important to emphasize that the depicted locations of these facilities, including but not limited to the wind turbines and access roads, are likely to change subsequent to further site study and planning activities by the applicant.

Projected Output
Under estimated average wind conditions in the project site, the total Project will deliver approximately 90,000 megawatt hours (MWh) per year (all wind turbines combined).

Siting Plan
The project site is located in southwestern Minnesota along the higher land areas of the Buffalo Ridge between the towns of Lake Wilson (Murray County) and Woodstock (Pipestone County).

The wind turbine siting plan is designed to meet the substantive criteria set forth in Minn. Statute 116C.57, subd. 4. Spacing between the wind turbines is approximately 4 rotor diameters (RD). Spacing between wind turbine strings is approximately 7 to 8 RD. The turbines will be sited to maintain a minimum 500 to 1,000 foot setback from occupied residences. The turbine setbacks from public roads will be 250 feet. Turbines will not be located in wildlife management areas (WMAs), scientific and natural areas (SNAs), or Class 3, 4, or 5 wetlands.

Commercial Operation
The Project is anticipated to be fully commercially operational by December 31, 2007.

Operations and Maintenance
PRC intends to contract with a qualified subcontractor for the operation and maintenance of the project for the life of the project, which is anticipated to be a minimum of 20 to 30 years.

Site Control
As of the date of this application, PRC has obtained lease agreements with landowners for all land within the project site that is required for the Project.

Permits and Licenses
PRC will contract for required environmental review and obtain all permits and licenses that are necessary but not covered by a Site Permit issued by the PUC.

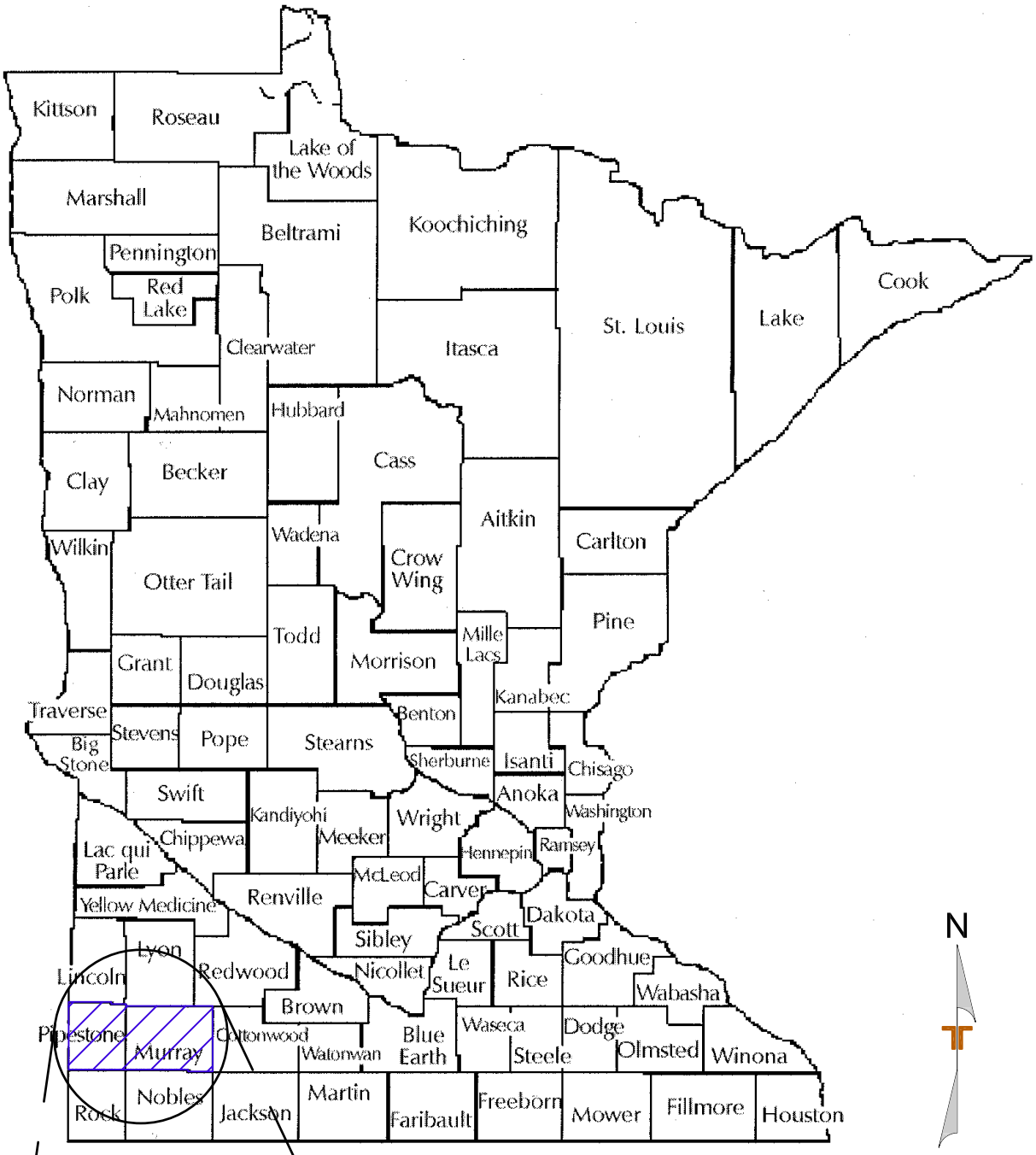
Development and Construction
PRC will supervise all aspects of the development and construction activities, including work by qualified subcontractors.

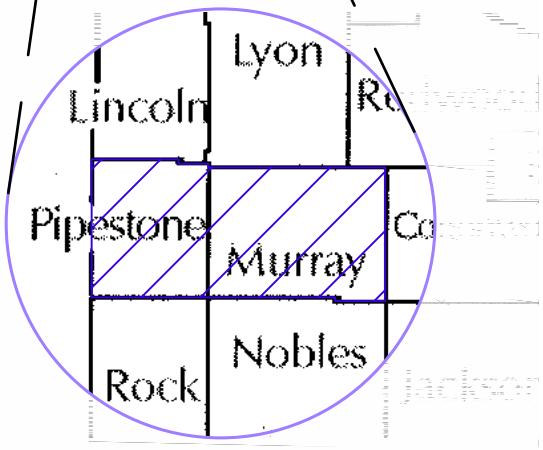
3. Project Ownership

PRC intends to establish ownership that will include Minnesota businesses and individuals. If possible, PRC will incorporate the MN Windshare program.

a. Project Resources Corporation

PRC is a Minnesota small business established in 1997 to provide wind power project development solutions in Minnesota and neighboring states. Since it's start, PRC has successfully developed wind projects both for clients and itself. PRC has extensive track record for hands on development that includes both large and small wind plants, as well as locally-owned plants. For more information about PRC please refer to it's company web site at: www.projectresources.net.





LEGEND:

PROJECT COUNTY

GENERAL VICINITY MAP
RIDGEWIND WIND POWER PLANT

PIPESTONE / MURRAY COUNTIES, MN

Project Mngr:	JLM	Terracon 3535 Hoffman Road East White Bear Lake, MN 55110	Project No.	41067744
Designed By:	JLM		Scale:	NO SCALE
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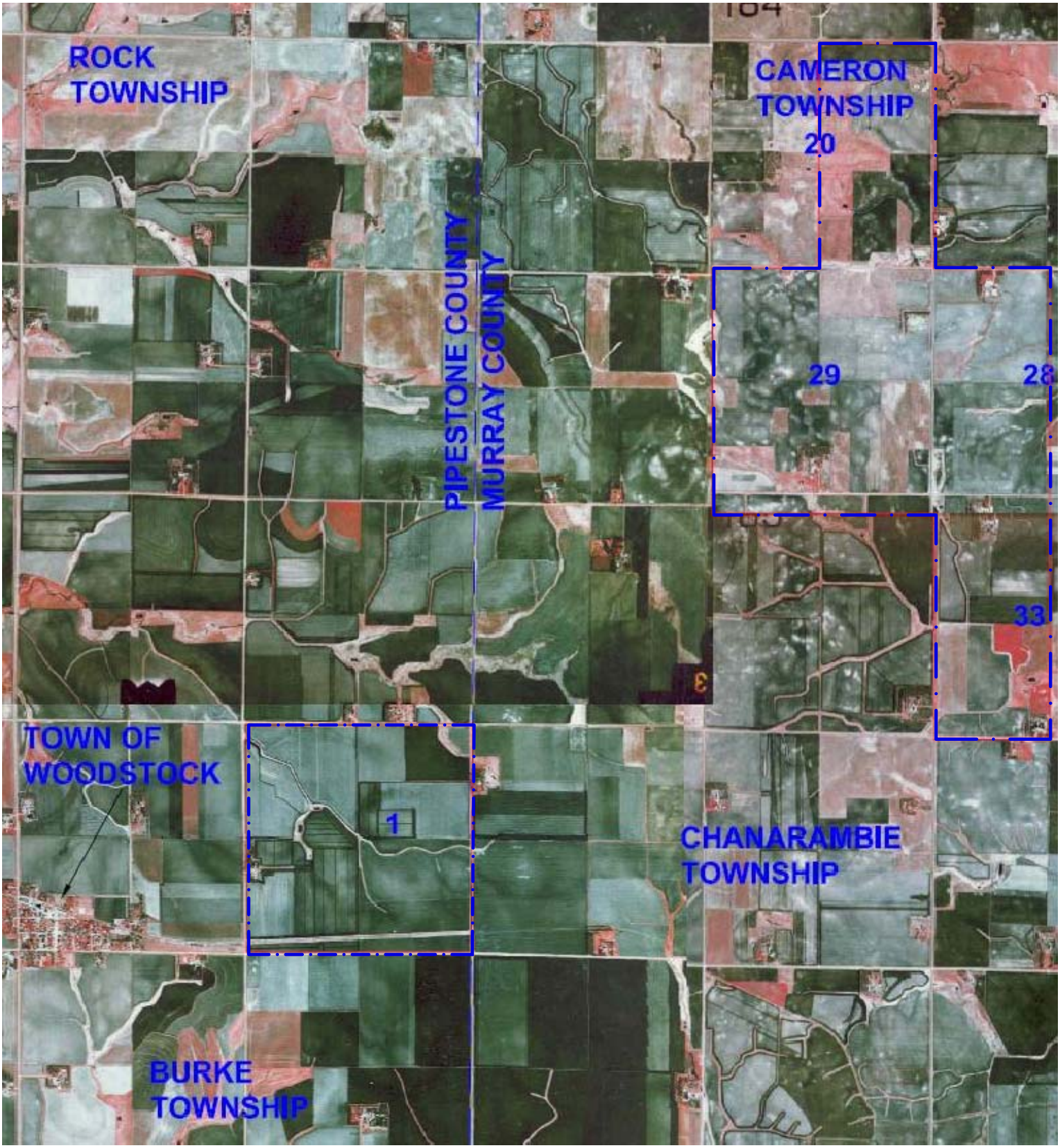

LEGEND

PERMIT BOUNDARY

12 SECTION NUMBERS

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PROJECT VICINITY MAP
RIDGEWIND WIND POWER PLANT

PIPESTONE / MURRAY COUNTIES,MN

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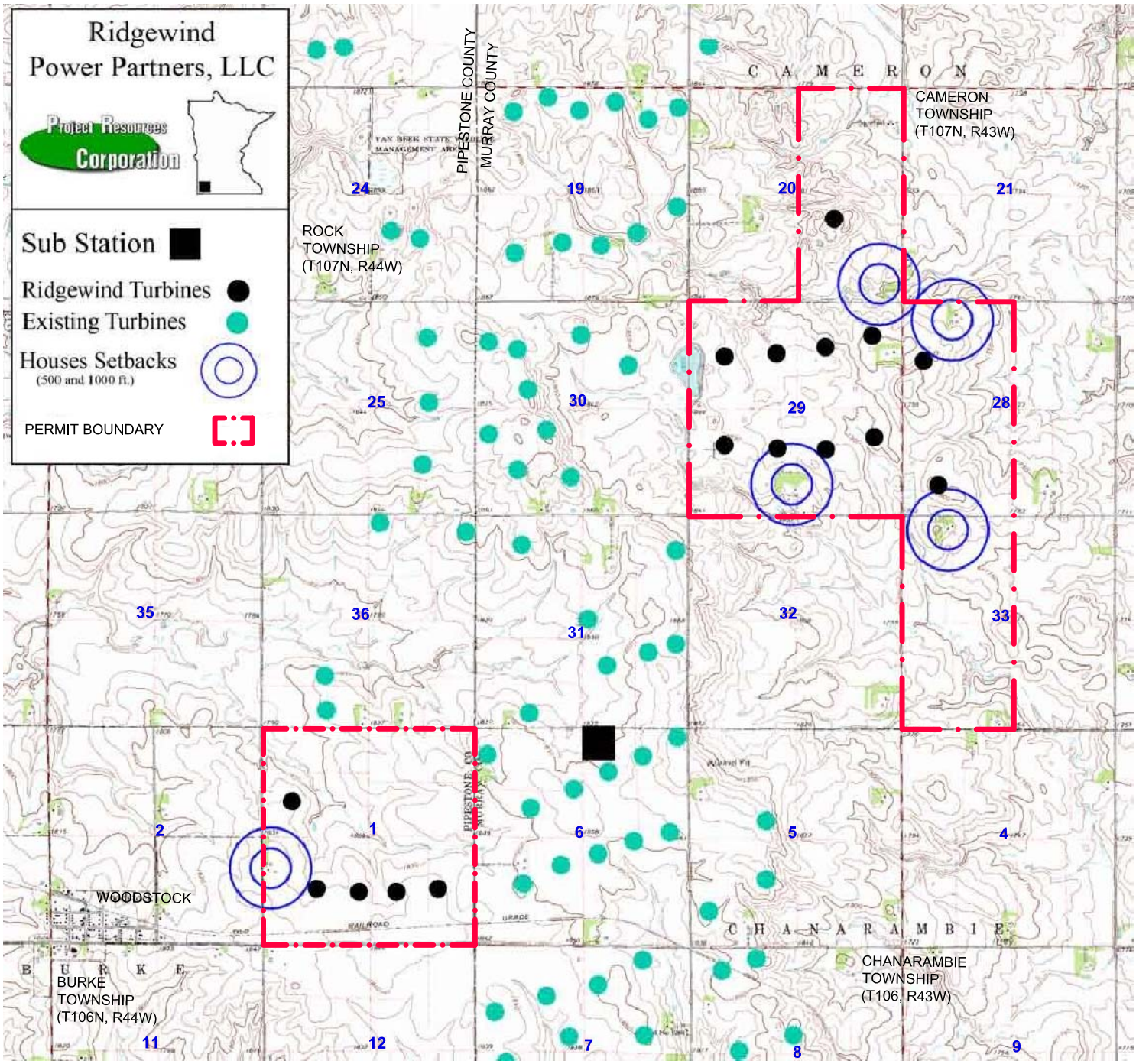

NOTE:
GENERAL PROJECT DESIGN
SUBJECT TO CHANGE.

N

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PROJECT SITE MAP
RIDGEWIND WIND POWER PLANT

PIPESTONE / MURRAY COUNTIES, MN

Project Mngr:	JLM	Terracon	Project No.	41067744
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B. PROJECT DESCRIPTION

PRC is applying for a Site Permit pursuant to the PUC procedures as set forth in Minnesota Rules Chapter 4401, Wind Siting, and Minnesota Statue Section 116C.691-697 for development of wind power plants. The Wind Power Plant permit process was transferred to the PUC on July 1, 2005. The siting is to be made in a manner compatible with environmental preservation, sustainable development, and the efficient use of resources. In submittal of this application, PRC believes that it has complied with the Rules and State Statue.

1. Description of the Windpower Technology

The Project will employ GE 1.5 MW wind turbine generators (or a turbine of comparable utility grade). The GE 1.5 MW wind turbine is a three bladed, upwind, active yaw, and active aerodynamic control regulated wind turbine with power/torque control capabilities. The rotor utilizes blade pitch regulation and variable speed operation to achieve optimum power output at all wind speeds. The variable speed operation minimizes power and torque spikes delivered from the rotor to the drive train resulting in improved long-term reliability. Each wind turbine is equipped with a wind direction sensor. The wind direction sensor communicates with the computer system, which evaluates the measured wind parameters, and within a specified time interval activates the yaw drives to align the nacelle to the wind direction. Each 1.5 MW wind turbine generates output at 575 volts (V).

2. General Location

Available wind monitoring data indicates that the best wind resource in Minnesota occurs on Buffalo Ridge in southwestern Minnesota.

The project site was selected based on topographic and wind resource considerations described in Section C, combined with environmental factors reviewed in Section F. The overall location for the proposed wind plant was selected based on several years of wind monitoring data and related research in Minnesota, specifically in the Buffalo Ridge area. The project site is near existing wind power plants and transmission lines northwest of Buffalo Ridge in Murray and Pipestone Counties.

The specific site boundaries were established to allow for an adequate buffer distance from residences, roads, and other wind turbines in the area.

3. Physical Description

Each tower will be secured by a concrete foundation designed for local soil conditions. At the base of each tubular tower is a lockable steel door that provides access to the wind turbine control system. Each wind turbine is accessible via all-weather gravel roads that follow the turbine strings to the nearest public road. Additionally, a pad-mounted transformer will be installed adjacent to each wind turbine to collect power from the turbines and transfer it to the electrical collection system via underground cables. The collection system in turn connects to the transmission system at the interconnect point near the utility substation. A communication system will also be installed to enable remote monitoring of project operation. The communication system will include underground wire connecting to each turbine. Meteorological towers may be in installed to maintain monitoring of the wind resource. Figure 4 illustrates the general path of energy from the plant to the utility grid.

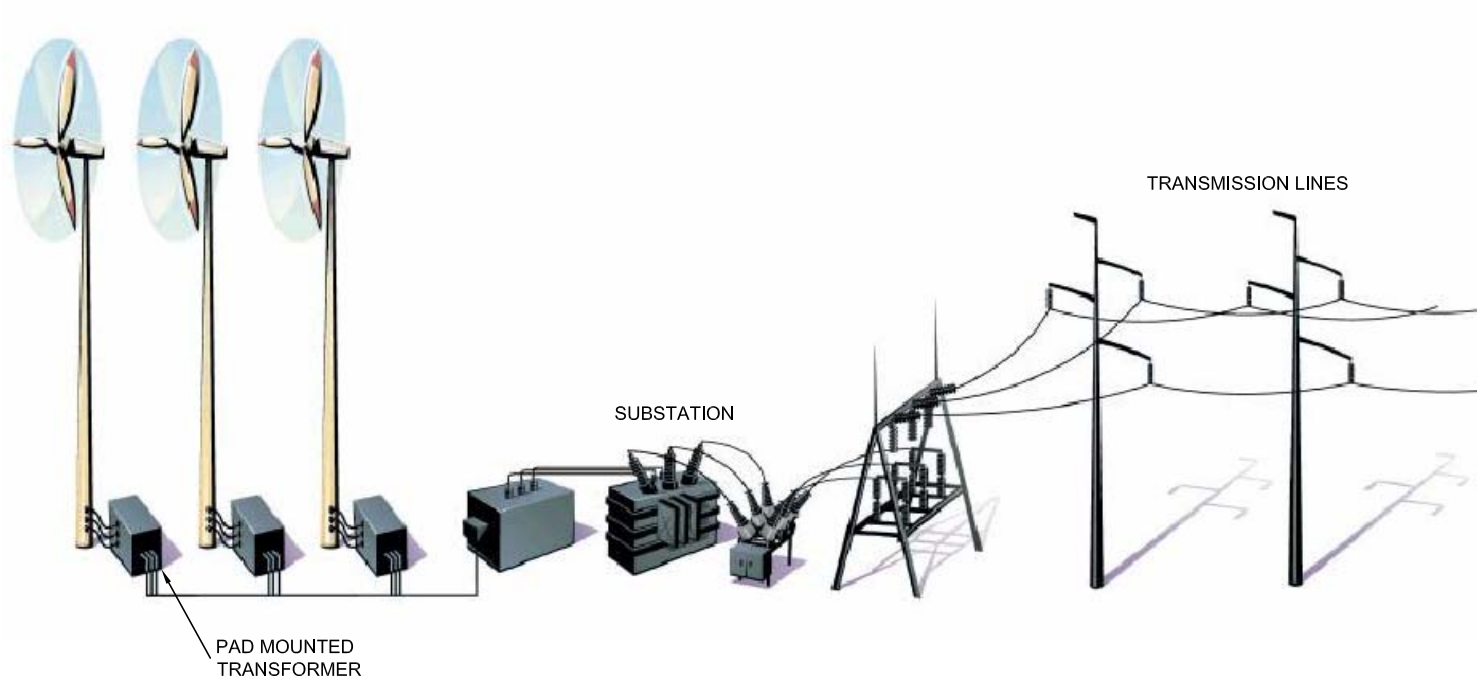

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DIAGRAM OF ENERGY PATH
RIDGEWIND WIND POWER PLANT

PIPESTONE / MURRAY COUNTIES, MN

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4. Project Layout

Wind turbines are sited in high elevation areas within the Project site boundaries to ensure good exposure to the wind. Spacing between the turbines is designed to minimize wake losses between turbines, minimum 3 to 4 rotor diameters. Setback from occupied houses is set at minimum 500 to 1,000 feet. Turbine towers will be setback a minimum 250 to 1,000 feet from the edge of public road right of ways.

5. Associated Facilities

In addition to the wind turbines and step-up pad-mounted transformers, the project site also includes a system of gravel access roads that ensure accessibility to the wind turbines year round. The Project may also include up to two reference meteorological towers (met towers).

6. Land Rights

PRC has obtained lease agreements with landowners for land within the project site boundary necessary for installation of the Project.

C. PROPOSED SITE

1. Site Boundaries

The proposed project site is located in Pipestone and Murray Counties, Minnesota, between the towns of Woodstock (Pipestone County) and Lake Wilson (Murray county) just north of State Highway 30.. The project site is within two townships, Burke (T106N, R44W) and Cameron (T107N, R43W). All turbines will be sited within the project site boundary. The project site boundaries are illustrated on Figure 3, which was generated from U.S. 7.5 Minute Topographical Map Woodstock, Minn. Quadrangle.

2. Wind Resource Considerations

Wind power plant production is determined by the wind resource at the project site. PRC has worked with an independent meteorologist to monitor and define the available wind resource in the area of the proposed Project. Data from both PRC monitoring and State of Minnesota monitoring towers was used to calculate energy production estimates for the project site.

a. Interannual Variation

The wind resource varies from year to year. The data suggests that the maximum variation in energy has been within +/- 15 percent. Based on these data, one would expect the annual variation in energy at the Plant site to be within or above a 10 percent of the mean during most years.

b. Seasonal Variation

On a seasonal basis, the wind speeds measured on the project site are weakest in July and August and increase steadily during the fall. The strongest winds occur between November and May. Table 1 shows the estimated monthly windspeeds.

Table 1.
Monthly Average Windspeeds (MPH)

January	18.9
February	20.0
March	19.3
April	20.1
May	18.5
June	16.3
July	15.4
August	15.1
September	17.8
October	18.0
November	20.9
December	19.7

c. Diurnal Wind Speed Variation

Figure 5 illustrates the average wind speed for a 24 hour period.

d. Atmospheric Stability

The current reports do not include information on atmospheric stability.

e. Turbulence

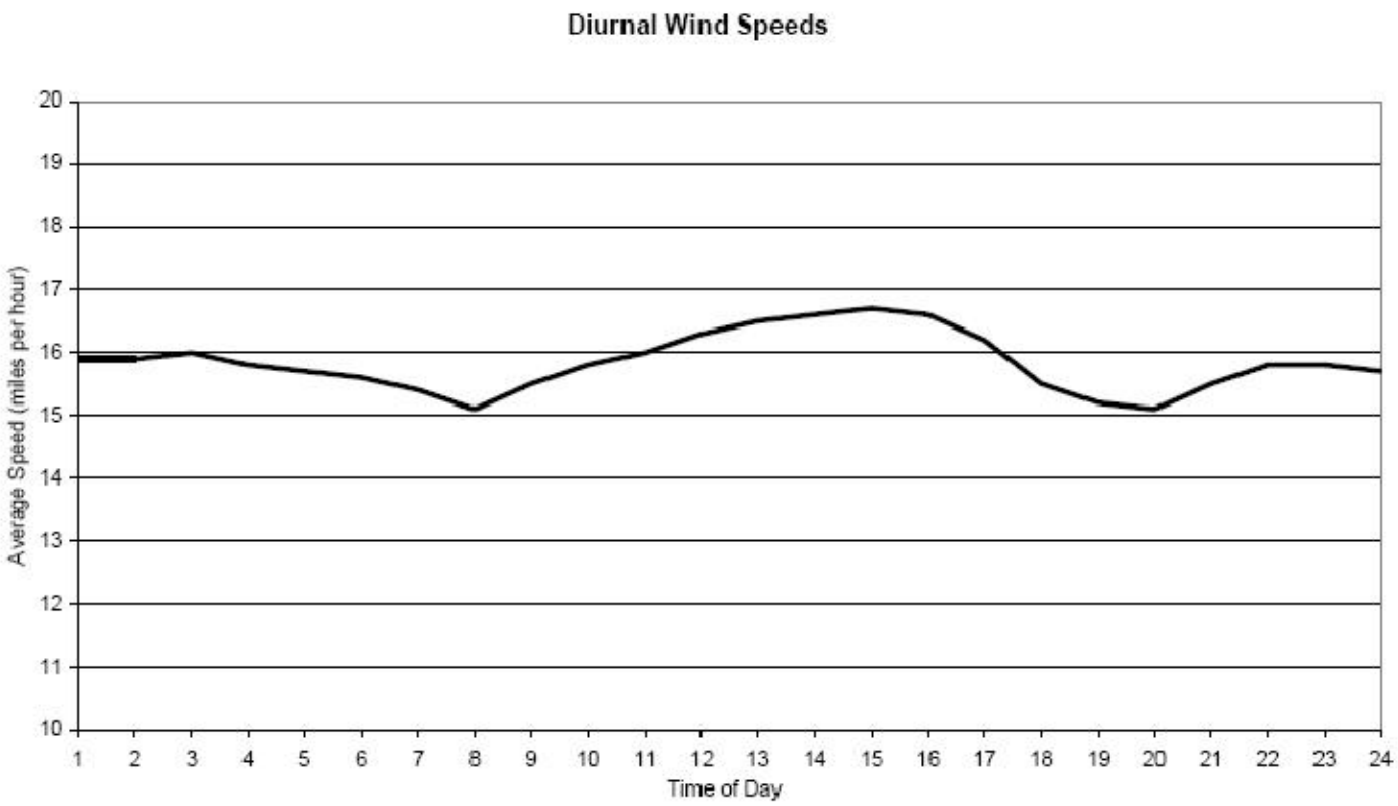
The turbulence intensity averages approximately ten percent or less. This turbulence level is quite low, as would be expected on the relatively smooth terrain on Buffalo Ridge.

f. Extreme Conditions

Extremely high wind speeds are uncommon in southwestern Minnesota. The highest gust recorded at the nearest NWS Sioux Falls' site is 71 mph. On Buffalo Ridge, extreme wind speeds may occur with winds from any of the prevailing directions and may happen during any season. Numerous violent tornadoes have occurred in the general region of the site within the last 50 years. Wind speeds in excess of 200 mph range can occur in a tornado. Wind turbines are not designed to survive tornado-force winds.

g. Speed Frequency Distribution

Table 2 is the estimated wind speed frequency distribution and has been integrated with the density corrected 1.5 MW power curve. Theoretical energy is normalized to 8760 hours (one full year). Figure 6 shows the Wind Speed Frequency Distribution.



DIURNAL WIND SPEEDS
RIDGEWIND WIND POWER PLANT

PIPESTONE / MURRAY COUNTIES, MN

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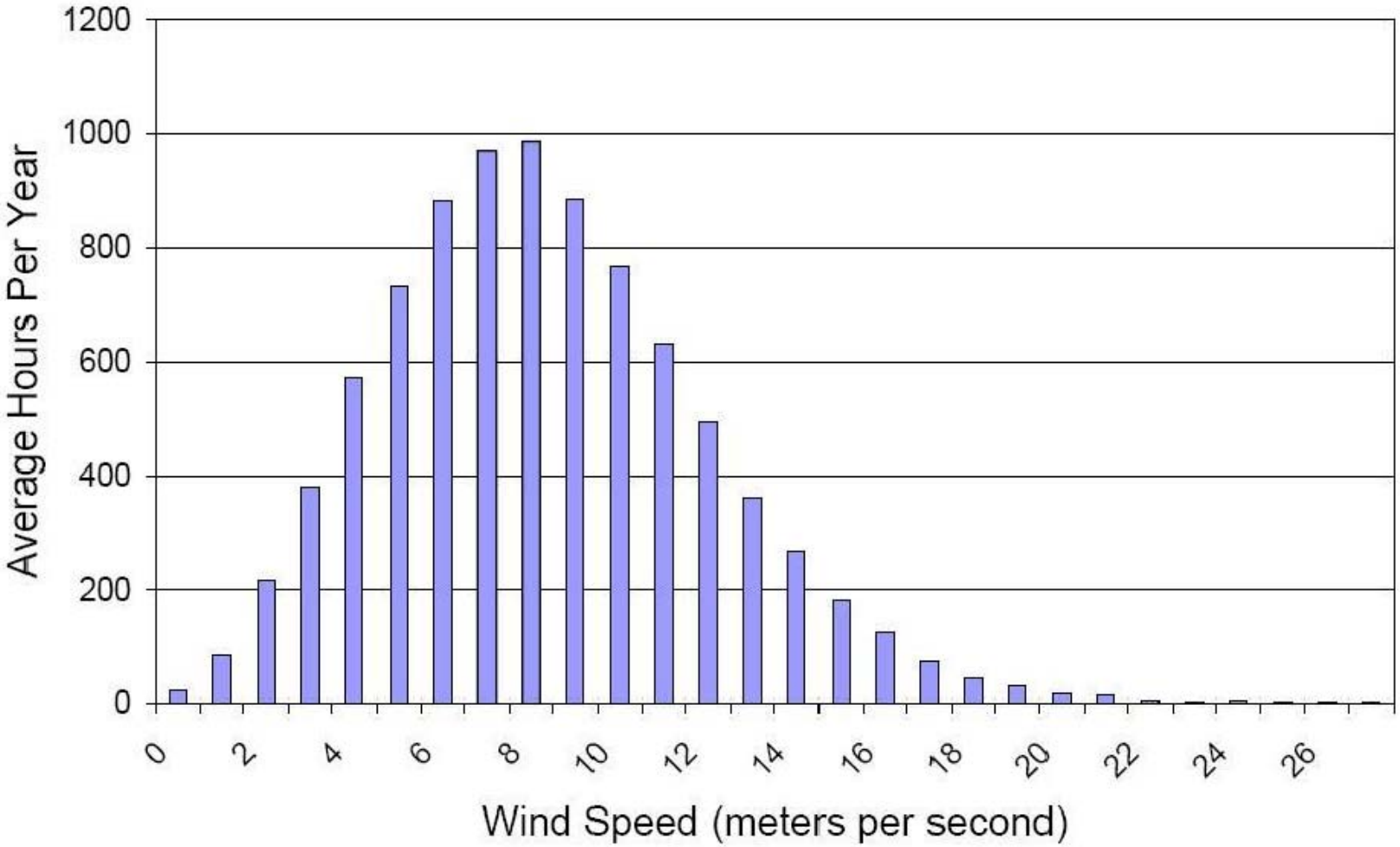
Wind Speed Frequency Distribution



WIND SPEED FREQUENCY DISTRIBUTION
RIDGEWIND WIND POWER PLANT

PIPESTONE / MURRAY COUNTIES, MN

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Table 2.
Linear Adjusted Wind Speed Distribution

Speed (meters per second)	Speed (miles per hour)	Hours	Power kW	Energy kWh
0	0	21	-	-
1	2.237	85	-	-
2	4.474	214	-	-
3	6.711	381	-	-
4	8.948	572	40	22,880
5	11.185	732	125	91,500
6	13.422	881	240	211,440
7	15.659	970	399	387,030
8	17.896	987	615	607,005
9	20.133	885	889	786,765
10	22.37	769	1,151	885,119
11	24.607	630	1,339	843,570
12	26.844	495	1,431	708,345
13	29.081	361	1,476	532,836
14	31.318	265	1,494	395,910
15	33.555	182	1,500	273,000
16	35.792	126	1,500	189,000
17	38.029	75	1,500	112,500
18	40.266	45	1,500	67,500
19	42.503	29	1,500	43,500
20	44.74	17	1,500	25,500
21	46.977	13	1,500	19,500
22	49.214	5	1,500	7,500
23	51.451	4	1,500	6,000
24	53.688	6	1,500	9,000
25	55.925	4	1,500	6,000
26	58.162	3	-	-
27+	60.399	3	-	-
Totals:		8760		6,231,400

h. Variation with Height

Wind shear has been measured at monitoring sites near the Project area. Shear values are computed using the power law. The definition of the power law is, wind speed, and hence power, varies relative to height above the ground. Friction from the earth surface generally causes wind speeds to be lower as distance from the surface decreases. This change in wind speed with change in height is called "wind shear". The general formula for wind shear is: $S/S_o = (H/H_o)^{\alpha}$ where S_o and H_o are speed and height associated with the lower level, respectively, and α is the power law coefficient, typically in the range of 0.14 to 0.3. The power law exponent for the Project site is approximately 0.17 - 0.22.

i. Spatial Variations

Analysis of the project site area indicates that energy production is expected to vary within the site by a maximum of approximately 10 percent.

j. Wind Direction

Regionally, the prevailing wind directions are generally south and north. The chart shows that the winds blow from all directions, with a prevalence of southerly winds. Of the annual energy budget, a high percentage results from southerly winds, which are most frequent in the summer. The north and northwest winds typically occur in winter. Figure 7 is a wind direction frequency chart for the Buffalo Ridge area.

3. Wind Plant Energy Projections

a. Base Energy Calculation

A representative wind speed frequency distribution (adjusted for inter-annual wind variation and for wind shear) for the site is combined with the wind turbine power curve to yield the gross energy production. Net output for each turbine (the actual energy delivered to the interconnect point) is calculated by applying various loss factors.

Table 3 presents the estimated average gross and net annual energy for each turbine in the Project. Table 4 presents the average annual energy loss estimates.

Table 3.
Energy Estimates On A Per Turbine Basis

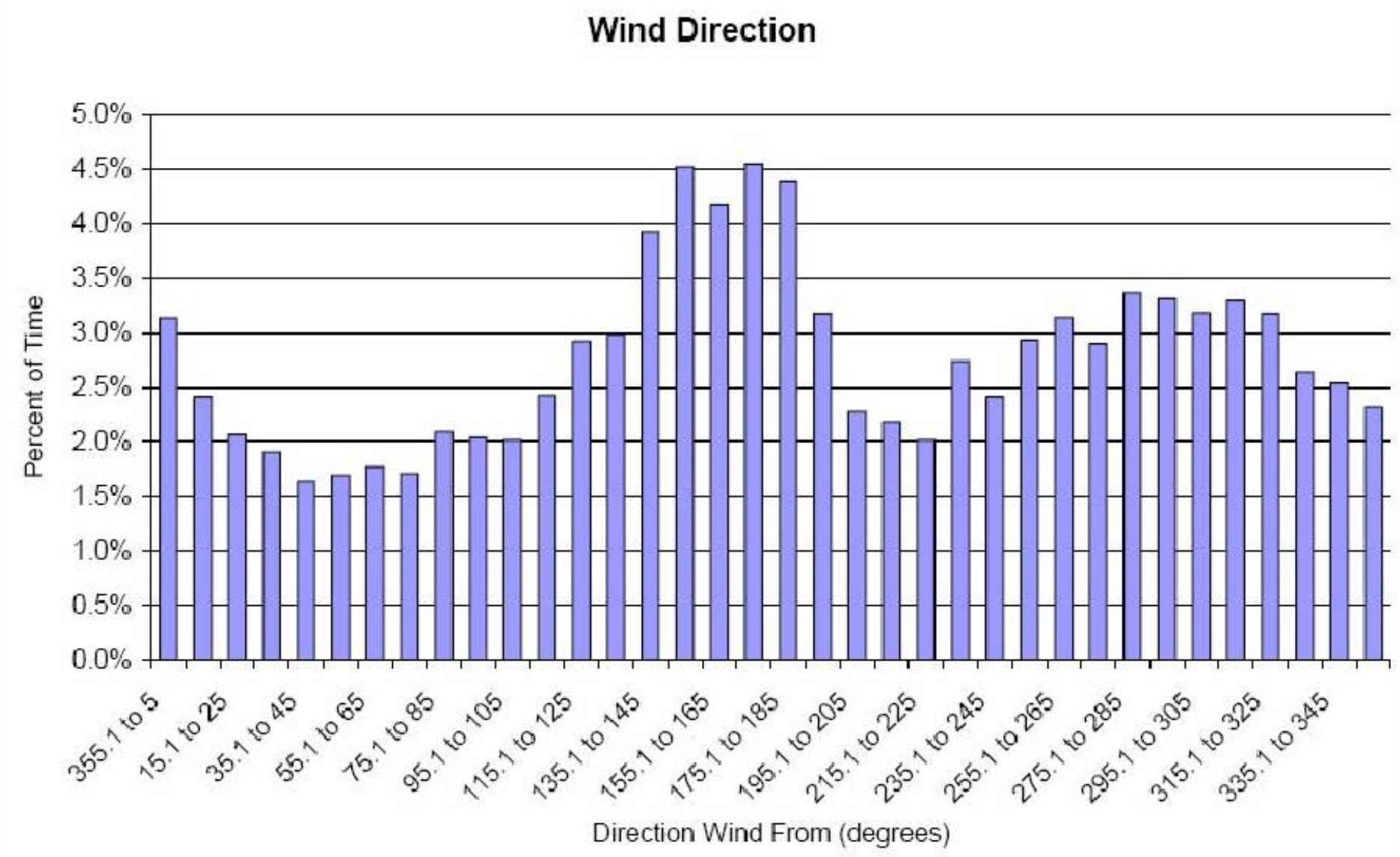
Gross Annual Energy Output (MWh)	Efficiency	Per Turbine Net Annual Energy Output (MWh)
6,231,400	.851	5,302,920

Table 4.
Average Annual Energy Loss Estimates

Loss Accounting	Value
Availability	95%
High Speed Shutdown	99.9%
Icing	98%
Cold Temperature Shutdown	99.75%
Electrical Efficiency	98%
Parasitic	99%
Average Array Loss	96%
Contingency	98.5%
Total	**85.1%**

b. Wind Power Plant Output Variability

The base energy calculation presented above assumes a normal or average wind year. The annual variation in total energy delivered to the interconnect point is expected to be within 10 percent of the long term mean during most years.



WIND DIRECTION
RIDGEWIND WIND POWER PLANT

PIPESTONE / MURRAY COUNTIES, MN

Project Mngr:	JLM	Terracon	Project No.	41067744
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Checked By:	JLM	3535 Hoffman Road East White Bear Lake, MN 55110	Date:	8/1/06
Approved By:	JLM		Drawn By:	MTO (41)
File Name:	41067744wd.dwg	Layout1	Figure No.	7

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4. Efficiency of Proposed Plant Layout

The wind turbines are sited to ensure good exposure to winds from all directions, with emphasis on exposure to the prevailing southerly wind direction. Sufficient spacing between the turbines is utilized to minimize wake losses.

5. Other Meteorological Conditions

Monthly average temperatures range have been reported from a low of 13°F in January to a high of 70°F in July. Extreme temperature conditions recorded at the nearest official weather bureau site were reported to be -36°F and 110°F. Thunderstorms are reported to occur on an average 44 days each year. Tornadoes and sever thunderstorms strike occasionally. These storms are local in extent and of short duration. They result in sparse damage in small areas. Hail occasionally falls in scattered small areas during the warmer periods. Neither hail nor lightning from severe storms presents a problem for operation of the proposed Project. Wind turbines are not designed to survive tornado-force winds, however. In the winter, icing events are variable in frequency. It is expected that the average annual energy loss will be less than 2 percent due to icing.

6. Existing Wind Turbines within the Area

NSP Phase III wind plant located in Pipestone County is northwest of the Murray County portion of the project site. The Moraine wind plant is located to the west of the Murray County portion of the project site. The Chanarambie (NSP Phase IV) wind plant is located between the two areas of the project site. Figure 8 depicts an existing wind power plant in the area.

ADJACENT WIND FARM
RIDGEWIND WIND POWER PLANT

PIPESTONE / MURRAY COUNTIES, MN

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D. COST ANALYSIS

This section describes the estimated costs of design and construction and the expected operating costs.

1. Capital and Operational Costs

The total Project installed capital costs are estimated to be approximately $46 million, including wind turbines, associated electrical and communication systems, roads. Ongoing operations and maintenance costs and administrative costs are estimated to be approximately $750,000 per year, including royalties to landowners for wind easement rights and property taxes.

2. Site and Design Dependent Costs

The overall cost of developing the project will depend primarily on site selection and construction timing. Site-dependent costs will include: the relative ease of access to the individual wind turbine locations; site-specific subsurface conditions which determine foundation design; site access road design and layout, ease of underground trenching; and the layout of the turbine arrays which governs underground cable placement. Table 5 sets forth the estimated acreage and costs for the project site. Both underground and aboveground cable may be employed to connect the individual wind turbine generators to transformers, collection and feeder lines, and the interconnect point. The underground placement of the cables along the wind turbine strings is preferable for land use and aesthetic purposes on all land.

Table 5.
Facility Acreage Estimates at the Project Site

Project Related Facility		Unit Costs*
Access Roads (approximately 16 feet wide)		
Miles of Access Road	4.2	$25.00 per foot
Total Acres of Access Road	8.2	
Turbine Foundations		
Square Feet per Turbine	2,500	$100,000 per foundation
Total Acres of Turbine Foundation	1.1	
Underground Cable		
Miles of cable	4.3	$24.00 per foot
Acres of Cable	N/A	
Overhead Collection Line		
Miles of Collection Line	3.2	$20.00 per foot
Acres of Collection Line	N/A	
Total Wind Power Plant Land Area (acres)	9.3	
Temporary Disturbance of Land for Work Spaces/Staging Areas		
Acres per Turbine	3	
Total Acres	51	
Total Acres of Disturbance	60.3	

* Unit costs are approximate estimates

E. ENGINEERING AND OPERATIONAL DESIGN AND ANALYSIS

Section E provides a summary description of the project layout, turbines, electrical system, and associated facilities that make up the key components of the wind power plants.

1. Proposed Array Spacing for Wind Turbines

Wind turbines are generally sited in clusters, or strings, along higher elevation land within the site boundaries. The wind turbines are sited so as to have good exposure to wind with emphasis on exposure to the prevailing southerly wind direction. Sufficient spacing between the turbines is utilized to minimize array wake losses.

Almost all of the turbine sites are above 1,800 feet above mean sea level in elevation and are considered prime wind locations. Turbine placement has been designed to provide 4 rotor diameter spacing in the east-west direction and 8 rotor diameter spacing in the north-south direction, with respect to the predominant energy production directions. Given the prevalence for southerly winds, the spacing is widest in this direction. Array losses are projected at 4 to 7 percent.

2. Turbine Assemblies and Components

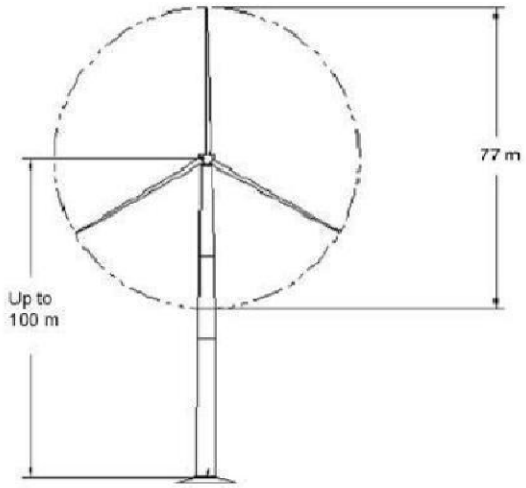
The GE Wind Energy 1.5 MW turbine is a three bladed, upwind, active yaw, and active aerodynamic control regulated wind turbine generator with power/torque control capabilities. The rotor utilizes blade pitch regulation and variable speed operation to achieve optimum power output at all wind speeds. The variable speed operation minimizes power and torque spikes delivered from the rotor to the drive train resulting in improved long-term reliability. Figure 9 depicts the Wind Turbine Design.

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. The turbine can be delivered with 1 of 3 blade diameters: 65 meters for high wind speed applications, 70.5 meters for medium wind speed applications, and with a 77 meters rotor diameter for low wind speed applications.

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

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



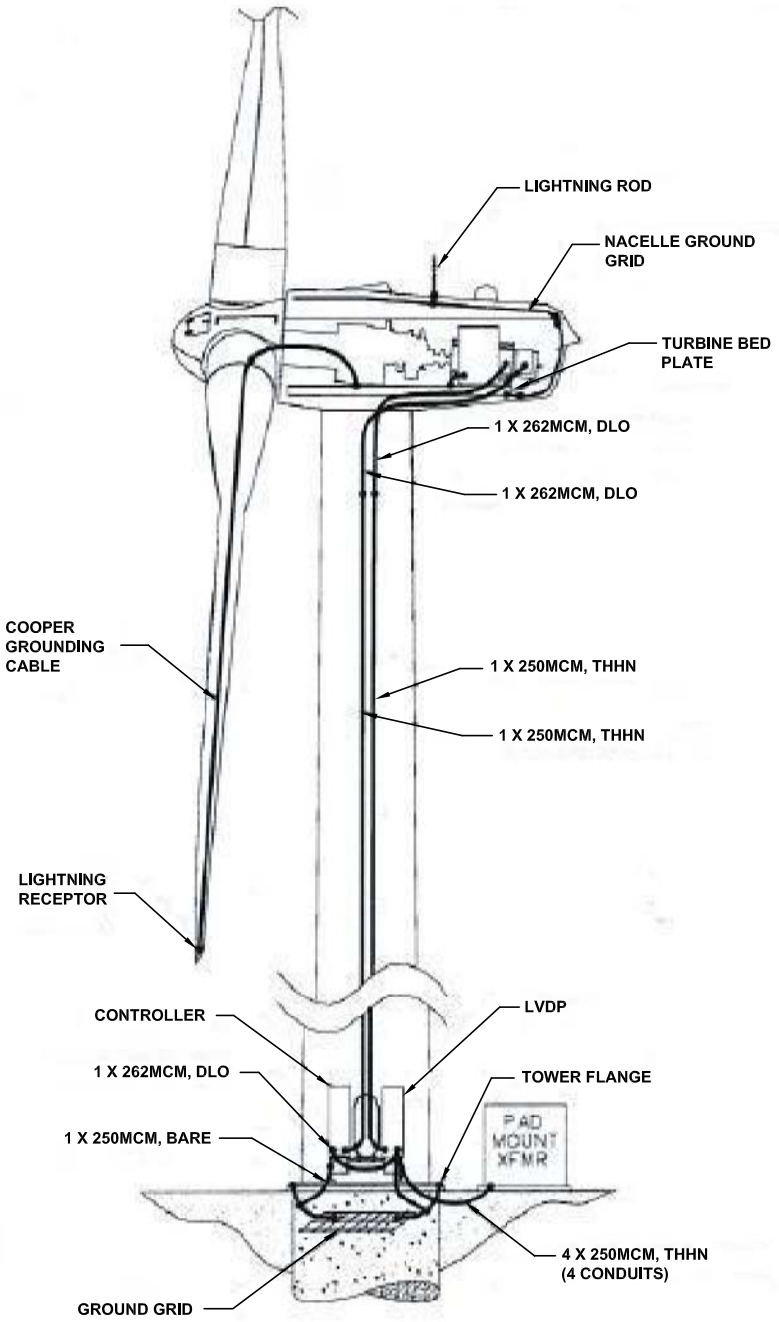


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DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

WIND TURBINE DESIGN
RIDGEWIND WIND POWER PLANT

PIPESTONE / MURRAY COUNTIES,MN

Project Mngr:	JLM	Terracon	Project No.	41067744
Designed By:	JLM		Scale:	NO SCALE
Checked By:	JLM	3535 Hoffman Road East White Bear Lake, MN 55110	Date:	8/1/06
Approved By:	JLM		Drawn By:	MTO (41)
File Name:	41067744wtd.dwg	Layout1	Figure No.	9

b. Hub Assembly

The hub is manufactured from cast ductile iron and undergoes stringent X-ray quality control procedures and 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. Field tests have proven that the proposed blades perform efficiently and at low noise levels.

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 un-commanded yawing under normal operational conditions. Extreme yaw moments act in response to the yaw drive brakes. The yaw brakes are actuated when the turbine has reached the end position of a yawing maneuver.

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

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.

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 area 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 causes 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.

3. Associated Facilities Description

An O&M facility is not anticipated to be constructed.

4. Wind Plant Electrical System

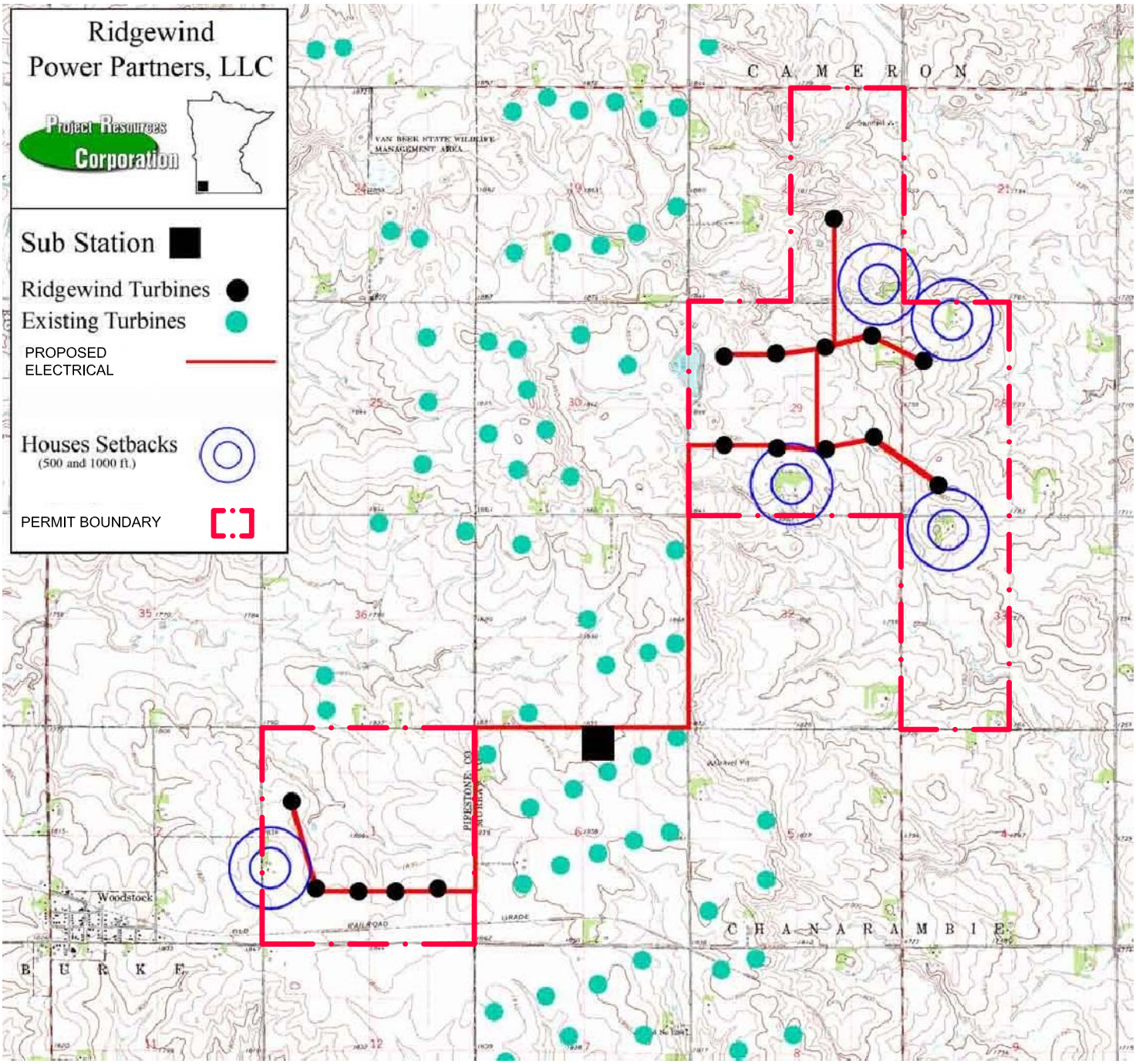
a. Low Voltage System and Pad-Mounted Transformers

Each wind turbine generator output is at 575 V, which feeds down drop cables that extend from the turbine nacelle to a base ground panel inside the tower. Each turbine has a 575/34,500 V step-up transformer installed immediately outside the base of each tower. Each pad-mounted transformer is loop-fed to the neighboring turbine as each turbine is interconnected through an underground electrical collection system at 34.5kV. For safety and control, all pad-mounted transformers are configured with a loop-feed dead front arrangement, oil level and pressure gauges, a lockable front door as well as a LBOR switch to allow individual turbines to be isolated to allow for any special electrical repair or maintenance to the turbine.

b. Medium Voltage System

Each turbine has a 575/34,500 V step-up transformer installed immediately outside the base of each tower. Each pad-mounted transformer is loop-fed to the neighboring turbine as each turbine is interconnected through an underground electrical collection system at 34.5kV. For safety and control, all pad-mounted transformers are configured with a loop-feed dead front arrangement, oil level and pressure gauges, a lockable front door as well as a LBOR switch to allow individual turbines to be isolated to allow for any special electrical repair or maintenance to the turbine.

This collection system makes up the backbone of the electrical collection/distribution system establishing a connection between the individual strings of wind turbines in the field and the substation. The proposed electrical system layout is shown in Figure 10.



NOTE:
TURBINE NUMBER, LOCATION AND GENERAL PROJECT DESIGN SUBJECT TO CHANGE.

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AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

ELECTRICAL SYSTEMS
RIDGEWIND WIND POWER PLANT

PIPESTONE / MURRAY COUNTIES, MN

Project Mngr:	JLM	Terracon	Project No.	41067744
Designed By:	JLM		Scale:	NO SCALE
Checked By:	JLM	3535 Hoffman Road East White Bear Lake, MN 55110	Date:	7/26/05
Approved By:	JLM		Drawn By:	MTO (41)
File Name:	41067744es.dwg	Layout1	Figure No.	10

c. Transformer to Substation Wiring, Design & Routing

The 34.5kV feeder lines from the Project collection system feed to one independent breaker position at the designated substation. The interconnection substation steps up the voltage from the collection system at 34.5kV to the transmission system level at 115kV. Revenue metering will occur at the 34.5kV side of the substation. The collector lines will be aboveground where they meet the designated substation.

d. Transmission Line and Interconnection

The feeder lines associated with the project site are currently planned to be underground. Any aboveground feeder lines, if used, would be wood-pole, 34.5kV typical of wind project feeder lines. Interconnection is proposed to be to the Chanarambie Substation.

5. Wind Plant Substation

The Chanarambie Substation is anticipated to serve as the interconnection location for delivery of electricity to the grid for the Project. The substation is located at 58 111th Street in the northeast ¼ of Section 6 in Chanarambie Township.

a. Grounding System

All equipment, cables, wind turbines and structures will be connected together by a robust metallic, project-wide ground network. This system will serve to manage ground fault currents, step and touch potentials, ground potential rise and lightning surges.

b. Communications System

All turbines will be interconnected with fiber optic communication cable that will be installed underground together with the 34.5kV cable. The communication cables will run back to a central host computer which will be located either at the substation or the Project Operations and Maintenance Facility where a Supervisory Control and Data Acquisition (SCADA) system will located. Signals from the current and potential transformers at each of the delivery points will also be fed to the central SCADA host computer. The SCADA system will be able to give status indications of the individual wind turbines and the substation and allow for remote control of the wind turbines locally or from a remote computer at an operations center. A two-way communication link between the wind project/substation and the purchasing utilities control center will be made by normal microwave system communication.

6. Wind Plant Operations

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.

Generally, the project will be manned five days per week. At all other times, operations and maintenance personnel will be on-call, and equipped with remote monitoring and control capabilities as described below.

If a turbine faults off line or if a collection system circuit breaker trips, an error code is enunciated on the SCADA system, which then pages the on-call technicians who responds by physically going to the equipment to investigate or, if the fault occurs when no technician are on site, he can call up the SCADA from a portable laptop or other remote PC. Once connected to the SCADA System the technician can see more specifically what equipment has been faulted and the exact nature of the fault. The technician can also view current wind speed and production data to determine if an emergency visit to the wind plant is warranted.

7. Wind Plant Construction

a. Construction Management

PRC will supervise all aspects of the construction activities, including work by qualified subcontractors, which will undertake the following activities:

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

PRC will serve as the key contact and interface for subcontractor coordination. The electrical contractor will oversee the installation of communication and power collection lines. The civil contractor will oversee the installation of access roads, concrete foundations, towers, machines and blades, as well as the coordination of materials receiving, inventory and distribution. 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

The construction team will be on site to handle materials purchasing, construction, and quality control. PRC will select and manage the subcontrators to complete all aspects of construction.

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 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.

b. Foundation Design

The free standing, tubular towers will sit atop a 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.

c. Civil Works

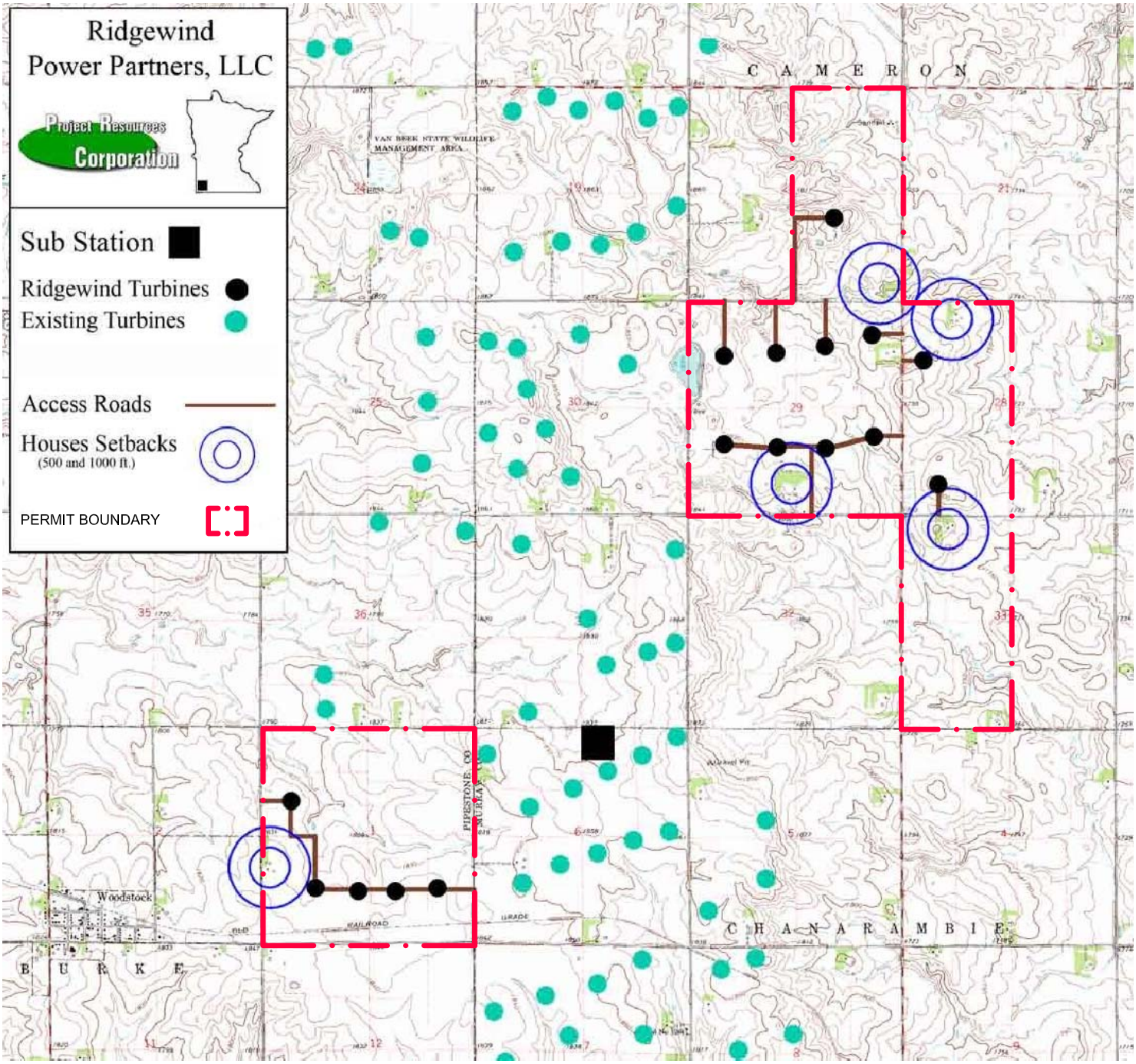
Completion of the project will require various types of civil works and physical improvements to the land. These civil works primarily include the following:

- Improvements of existing roads to the Project 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.
- Trenching for 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 surface. Access roads will be constructed along each turbine string or arrays. These roads will be sited in consultation with local landowners and complete in accordance with state and local requirements. Siting roads in areas with unstable soil will be avoided wherever possible. 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. The proposed access road layout is shown in Figure 11.

d. Commissioning

The Project 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, high voltage collection and distribution system, and wind power plant SCADA System.)



NOTE:
TURBINE NUMBER, LOCATION AND GENERAL PROJECT DESIGN SUBJECT TO CHANGE.

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TURBINE ACCESS ROADS
RIDGEWIND WIND POWER PLANT

PIPESTONE / MURRAY COUNTIES, MN

Project Mngr:	JLM	Terracon	Project No.	41067744
Designed By:	JLM		Scale:	NO SCALE
Checked By:	JLM	3535 Hoffman Road East White Bear Lake, MN 55110	Date:	7/26/06
Approved By:	JLM		Drawn By:	MTO (41)
File Name:	41067744tar.dwg	Layout1	Figure No.	11

DIAGRAM IS FOR GENERAL LOCATION ONLY,
AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

8. Operations and Maintenance

The Project will enter into a long-term agreement will a qualified contractor to operate and manage the facility, which will be responsible for daily operations, scheduled and unscheduled maintenance as required by the equipment manufacturers, and in accordance with good utility practice.

a. 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 then pages the on-call technicians who responds by physically going to the equipment to investigate or, if the fault occurs when no technician are on site, he can call up the SCADA from a portable laptop or other remote PC. Once connected to the SCADA System the technician can see more specifically what equipment has been faulted and the exact nature of the fault. The technician can also view current wind speed and production data to determine if an emergency visit to the wind power plant is warranted. As required or deemed appropriate, remote access to the SCADA system can be made available to the local utility and the turbine manufacturers.

b. Maintenance Schedule

Each wind turbine requires periodic scheduled maintenance in accordance with schedules and procedures required by the turbine manufactures.

c. General Maintenance Duties

The O&M duties include performing all scheduled and unscheduled maintenance including periodic operational check and test, regular preventive maintenance on all turbines, related plat facilities and equipment, safety systems, controls, instruments, and machinery including:

- Maintenance on the wind turbines and on the mechanical, electrical and communication system
- Performance of all routine inspections
- Maintenance of all oil levels and changing oil filters
- Maintenance of the control systems, all structures associated with the wind farm, access roads, drainage systems, and other facilities necessary for the operation of the wind farm
- Maintenance of all O&M field maintenance manuals, service bulletins, revisions, and documentation for the wind farm
- Maintenance of all parts, price lists, and computer software
- Maintenance and operation of interconnection facilities
- Provide all labor, services, consumables, and parts required to perform scheduled and unscheduled maintenance on the wind farm, including repairs and replacement of parts and removal of failed parts
- Manage lubricants, solvents and other hazardous materials as required by local and/or state regulations
- Maintain appropriate levels of spare parts in order to service equipment

- Obtain all necessary equipment including the rental of industrial cranes for removal and reinstallation of turbine components
- Hire, train, and supervise a work force necessary to meet the general maintenance requirements
- Maintain site security

d. Operations and Maintenance Facility

It is not anticipated that the Project will require construction of a dedicated O&M Facility.

9. Project Schedule

a. Land Acquisition

Lease agreements are in place for all land within the Project site area necessary to build and operate the Project.

b. Permits

PRC will supervise required environmental review and all permit and license acquisition that is required following the issuance of the PUC Site Permit.

c. Equipment Procurement, Manufacture and Delivery

Equipment procurement and turbine manufacturing will begin prior to commencing construction of the wind power plant. Turbine delivery will be completed approximately the same time that site construction is complete.

d. Construction

PRC will plan wind power plant construction including civil, mechanical, and electrical work. Construction will take approximately 6 months to complete. Site preparation may occur as early as May, 2007. Construction and operation of the facility is planned for 2007.

e. Construction Financing

PRC will supervise financing all pre-development, development and construction activities. PRC anticipates financing the cost of all pre-development activities through internal funds.

f. Permanent Financing

PRC anticipates that long-term financing for the Project may include debt and equity sourced in Minnesota.

g. Expected Commercial Operations Date

The commercial operation date of the proposed wind power plant is anticipated to be December 31, 2007.

10. Decommissioning and Restoration

a. Anticipated Life of the Project

A 30-year operational life is anticipated for the Project.

b. Estimated Decommissioning Costs

Approximately $250,000 is budgeted for decommissioning the Project. Estimates of the net cost of decommissioning the Project (after scrap value) are less than half of this amount.

c. Method for Updating that Funds are Available and Updating Decommissioning Costs

The administrator will report annually to the Project on the status of decommissioning funds. The Project will report substantial changes in anticipated decommissioning costs and provide to the administrator an updated budget for the cost of decommissioning the plant in current-year and decommissioning-year dollars.

d. Method for Ensuring that Funds are Available for Decommissioning

Decommissioning funds will be set aside as a specific budget item. A set-aside guarantee will be executed on behalf of the Project with the administrator of such funds.

e. 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.

F. ENVIRONMENTAL ANALYSIS

This section provides an analysis of the potential impacts of the projects, proposed mitigative measures, and any adverse environmental effects that cannot be avoided in the following areas:

- Demographics
- Noise
- Visual Impacts
- Public Services and Infrastructure
- Recreation Resources
- Public Health and Safety
- Hazardous Materials
- Land Based Economics
- Tourism and Community Benefits
- Topography
- Soils
- Geologic and Groundwater Resources
- Surface Water and Floodplain Resources
- Wetlands
- Vegetation
- Wildlife
- Rare and Unique Natural Resources

1. Demographics/Homes

a. Site Description of Resources

The proposed Development is located within a lightly populated rural area in southwestern Minnesota. The Project site is located in Pipestone and Murray Counties, Minnesota. Information on demographics and housing for this section was taken from the 2000 U.S. Census Bureau. The population of Pipestone County is 9,895. The average household size is 2.38 and the total number of households is 4,434. The major employment types in Pipestone County are Retail Trade, Manufacturing, and Agricultural related. The median household income for Pipestone County was $31,909.

The population of Murray County is 9,165. The average household size is 2.42, and the total number of households is 4,357. The major employment types in Murray County are Retail Trade and Agricultural related. The median household income for Murray County was $34,966.

b. Impacts

Demographics and residences are not anticipated to be affected by the proposed construction and operation of the wind power plant.

c. Mitigative Measures

PRC proposes to use a minimum setback for turbines from occupied houses of 500 feet and a minimum of 250 feet from public roads.

2. Noise

a. Site Conditions

Background noise levels in the Development site area are typical of those in rural settings, where decibel levels are commonly in the low to mid-30 decibels (dBA). These ratings are relatively low background levels and generally representative of the Project site. Higher levels exist near roads and other areas of human activity. In addition, the windy conditions in this region tend to increase ambient noise levels compared to other rural areas. A Noise Diagram is included as Figure 12.

b. Impact

The wind turbines will create sources of additional noise. The wind turbines will be sited so as to comply with or to exceed the existing noise standards established by the Minnesota Pollution Control Agency (MPCA) Daytime and Nighttime L10 and L50 Limits for residential receptors as stated in the MN Rule 7030.0040.

c. Mitigative Measures

PRC proposes a minimum setback for turbines of 500 feet from occupied residences. To the extent that the sound characteristics of the selected turbine vary, PRC will ensure compliance with the MPCA noise standards.

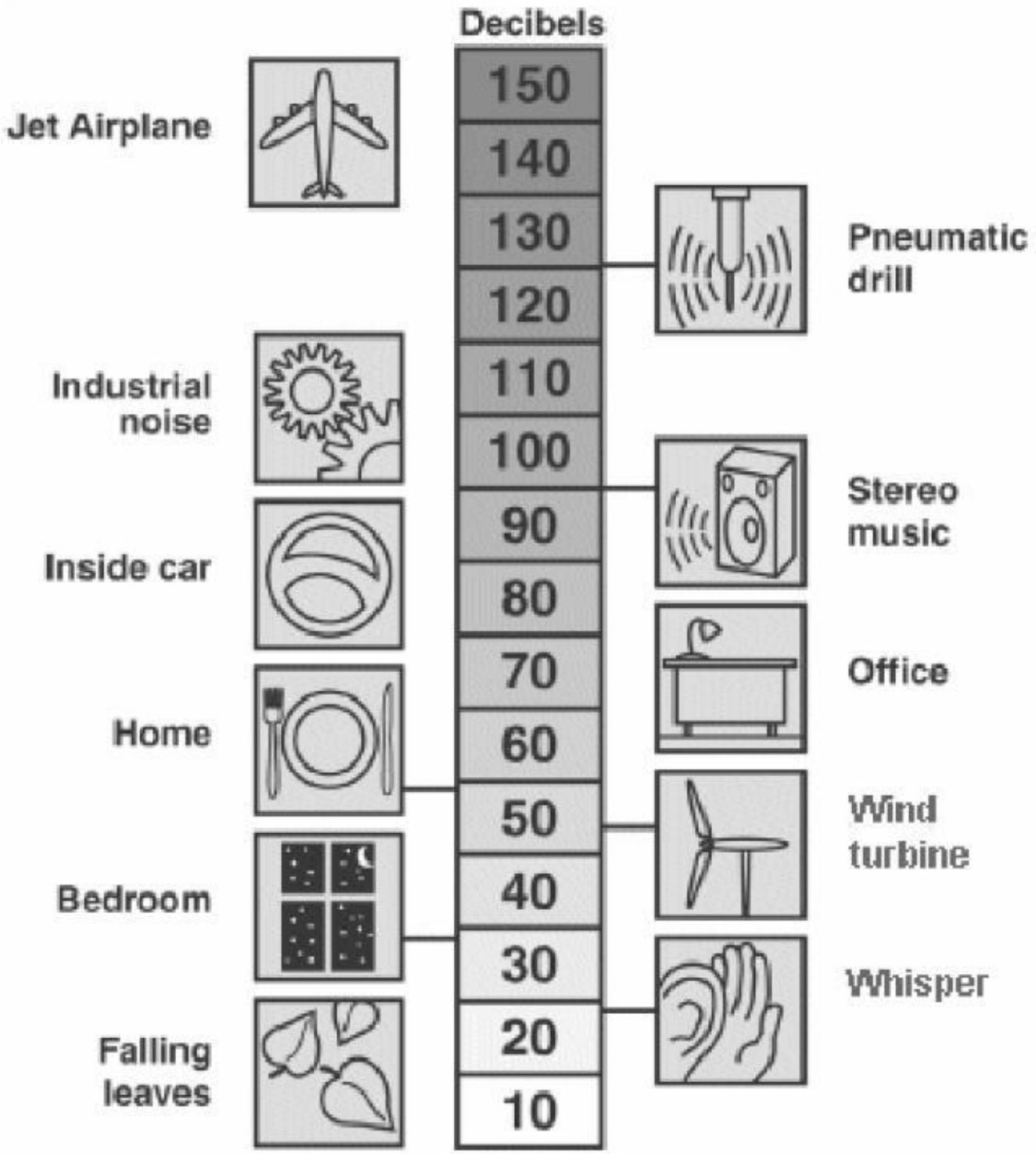
3. Visual

a. Site Description

The Project site is visually dominated by agricultural fields, farmsteads, fallow fields, large open vistas, and gently rolling topography. The landscape can be classified as rural open space. Local vegetation in the area is predominantly pasture with corn, small grains and forage crops, creating a low uniform cover. Farmsteads are typically surrounded by a mix of deciduous and coniferous trees planted for windbreaks. In the swales, there is occasional riparian growth of native willows, cattails, sedges, and rushes. Figure 13 depicts the typical rural setting of the Project site.

The settlements in Pipestone and Murray Counties are residences and farm buildings (occupied and unoccupied) scattered along the rural county roads. These structures are focal points in the dominant open space character of the vicinity. A number of the farm structures date back to the late nineteenth or early twentieth centuries and are representative of that era of Minnesota farm architecture. Typically, the farmsteads and residences are located at lower elevations to avoid winds common to the area.

Several wind power plants to the north, west, and south of the Project site are currently in operation in Pipestone and Murray Counties. The turbines can be seen from county roads adjacent to the project.



N

NOISE LEVELS
RIDGEWIND WIND POWER PLANT

PIPESTONE / MURRAY COUNTIES, MN

Project Mngr:	JLM	Terracon	Project No.	41067744
Designed By:	JLM		Scale:	NO SCALE
Checked By:	JLM	3535 Hoffman Road East White Bear Lake, MN 55110	Date:	8/1/06
Approved By:	JLM		Drawn By:	MTO (41)
File Name:	41067744fig12.dwg	Layout1	Figure No.	12

DIAGRAM IS FOR GENERAL LOCATION ONLY,
AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

SITE PHOTOGRAPH
RIDGEWIND WIND POWER PLANT

PIPESTONE / MURRAY COUNTIES, MN

Project Mngr:	JLM	Terracon	Project No.	41067744
Designed By:	JLM	3535 Hoffman Road East White Bear Lake, MN 55110	Scale:	NO SCALE
Checked By:	JLM		Date:	8/4/06
Approved By:	JLM		Drawn By:	MTO (41)
File Name:	41067744s-pic.dwg	Layout2	Figure No.	13

DIAGRAM IS FOR GENERAL LOCATION ONLY,
AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

b. Impact

At a distance, the wind turbines can be distinguished from vertical forms in the landscape, such as overhead transmission lines or trees. The aesthetic effect is primarily based on a subjective human response. The wind power plant will most likely have a combination of effects on the visual quality/rural character of the area. From one perspective, the proposed Development site might be perceived as a visual intrusion on the natural aesthetic value of the landscape, characterized as tubular steel structures, standing on formerly undisturbed ridgelines. This view is largely diluted by the numerous existing wind turbines already visible around the project site.

On the other hand, wind plants have their own aesthetic quality, distinguishing them from other non-agricultural land uses. First, the wind plant does not generate much traffic or significantly increase day-to-day human activity in the area. Therefore, the Development site will retain the rural nature of the area. Second, although "industrial" in form and purpose, wind turbines are essentially "farming" the wind for energy. The proposed land use would not involve any ongoing use of non-renewable resources or emissions into the environment. Fossil fuels will not be refined, transported, or burned for the production of electricity. Emissions or toxic substances will not be produced by the wind plant. Although the turbines are "hi-tech" in appearance, they are compatible with the natural environment and rural area.

As stated above, the installation of the existing wind power plants near the project site have already substantially altered the visual character of the area. The additional turbines proposed will alter this current visual effect somewhat. The existing wind power plants altered the landscape in the area from agricultural to wind plant/agricultural. The cumulative effect of the proposed project will incrementally add to the "industrial" appearance of the wind power plants on Buffalo Ridge.

c. Mitigative Measures

The following are proposed mitigative measures:

- Wind turbines will not be located in Nature Conservancy Land, State Wildlife Management Areas, or Scientific and Natural Areas, native prairies, or wetlands.
- Turbines will be illuminated to meet the minimum requirements of FAA regulations.
- Existing roads will be used for construction and maintenance where possible. Road construction will be minimized.
- Access roads created for the wind power plant will be located on gentle grades to minimize visible cuts and fills.
- Temporarily disturbed areas will be reseeded to minimize erosion and to blend in with existing vegetation.

Wind power technology requires as much exposure to the wind as possible to attain maximum efficiency. Therefore, the wind turbines are located at higher elevations within the Buffalo Ridge area, which makes them visible to a wider range of surrounding areas. Mitigation measures that would result in alternative locations at lower elevations would result in less efficiency per turbine.

4. Public Services/Infrastructures

a. Description of Resources

The proposed Project is located in a lightly populated, rural area in southwestern Minnesota. There is an established transportation and utility network, which provides access and necessary services to the light industry, small cities, homesteads, farmsteads, and the existing wind power plants in the area. The closet town is Woodstock, located west of the Project site.

Electrical Service. Xcel Energy provides electrical service to the area. The power collection system will connect to the Chanarambie substation.

Traffic Routing. The major traffic routes to and from the Development site include Minnesota State Highway 30. In addition, several county and township roads provide access to the Project site, including two-lane paved and gravel roads and minimum maintenance gravel roads. In the agricultural areas, many landowners use single-lane farm roads and driveways on their property.

Water Supply. A majority of the Project site is not connected to a municipal water supply system. Wells provide the water needed for human consumption, farming, commercial and industrial uses.

Sanitary Sewer. Sanitary sewer systems are only available to the residences, commercial, and industrial operations located within the cities near the Project site. The majority of the occupants residing within the Project site have individual septic systems to handle their sanitary wastes.

Railroad. A converted railroad grade (Casey Jones Trail) runs west to east through the southern edge of Section 1, T106N, R44W in Burke Township within the Project site. The old railroad grade continues east towards the town of Lake Wilson.

Telephone. Service is provided by several telephone companies to the cities, rural developments, and homes in the proposed vicinity of the Project site.

Radio Towers. Radio towers are not located in the Project site.

Radar. An FAA radar site is located in Ruthton, Pipestone County, approximately 6 miles north of the Project site. The Pipestone Municipal Airport is located in Pipestone, Minnesota approximately 12 miles west of the Project site. According to a Murray County representative, FAA radar installations are not located within Murray County with the exception of the Slayton Municipal Airport, located in Slayton, Minnesota approximately 12 miles east of the Project site.

b. Impacts

The Project is expected to have minimal effects on the existing public service and infrastructure. The following is a brief description of the impacts, which may occur during the construction, operation, and maintenance of the wind power plant.

Electrical Service. Construction of the Project will add the following facilities to the existing electrical service in the Project site: 16 wind turbines and associated power collection system, including power collection cable and pad-mounted transformers. Approximately 4.3 miles of

electrical cable will be installed. The power generated by the wind turbines and collected at the substation will be delivered to electric customers via the existing electric power grid.

Roads. Construction of the Project will require some local unimproved roads to be upgraded and the addition of new access roads to facilitate the installation, operation, and maintenance of the wind power plant. The access roads will be routed along the wind turbine strings, fence lines, and field edges to minimize disturbance to agricultural activities. The roads will be installed on gentle slopes or flat areas to reduce their visibility. The typical access road will be approximately 16 feet in width and surfaced with a granular wearing course. If access roads must be installed across streams or drainage ways, they will be located and shaped so as not to alter the original water flow or drainage patterns.

During operation and maintenance of the wind power plant, the access roads will be used by operation and maintenance crews while inspecting and servicing the wind turbines. The roads will be maintained by periodic grading.

Water Supply. Construction, operation, and maintenance of the Project will not significantly impact the water supply for the area. The Project will not require the appropriation of ground or surface water nor will any dewatering take place into ground or surface waters. The installation or abandonment of any wells is not required for the project. However, in the event wells are abandoned, they will be sealed and capped as required by Minnesota Law and the Minnesota Department of Health.

Railroad. The Project will not impact the railroads.

Telephone. Construction, operation, and maintenance of the proposed wind power plant will not impact the telephone service to the area. PRC will work with local telephone companies if the Project affects existing telephone lines or equipment.

Radio Towers. Radio towers were not identified within the Project site. Impacts are not expected on the telecommunication or commercial radio activities by the operation of the wind power plant.

Radar. Construction and operation of the wind power plant will not impact radar operations in Pipestone or Murray Counties.

Television Reception. Operation of the wind power plant may or may not impact the quality of television reception in the area. Previous work on this subject indicates that in some cases new antenna or tuning of antennas has solved the problem. PRC will attempt to work with the residents in the area of the Project site before and after the project are constructed to document and mitigate impacts that might occur.

Microwave Towers.
Microwave towers installed within the Project site maybe the same height as the turbines. The project will be designed to avoid impacting microwave towers.

c. Mitigative Measures

Construction, operation, and maintenance of the proposed wind power plant will be in accordance with associated federal and state permits, as well as, industry construction and operation standards. Because the anticipated impacts on the existing infrastructure during construction, operation, and maintenance of the proposed wind power plant are minor, extensive mitigation measures will not be required for this wind plant.

5. Cultural/Archaeological

The cultural/archaeological information was obtained from maps with known cultural resources derived from previous completed surveys at the Minnesota State Historic Preservation Office (SHPO).

a. Description of Resources

The Project site is located in a range of hills running from North Dakota through the southwest former of Minnesota down to Iowa. The geographical prominent of this ridge made it a significant location for Native Americans. Recorded archaeological sites were not identified within the Project site. Two lithic scatters and one single artifact were identified within one-mile of the Project site. The lack of previously recorded sites within certain areas of the Project site is thought to be the result of a sampling bias, as no systematic archaeological surveys have been conducted in these areas.

Also identified on the maps were a historical geographic feature and several historical structures. The historical geographic feature, Buffalo Ridge, was depicted southeast of the Project site. One historical structure was depicted in the town of Woodstock located west of the Project site.

b. Impacts

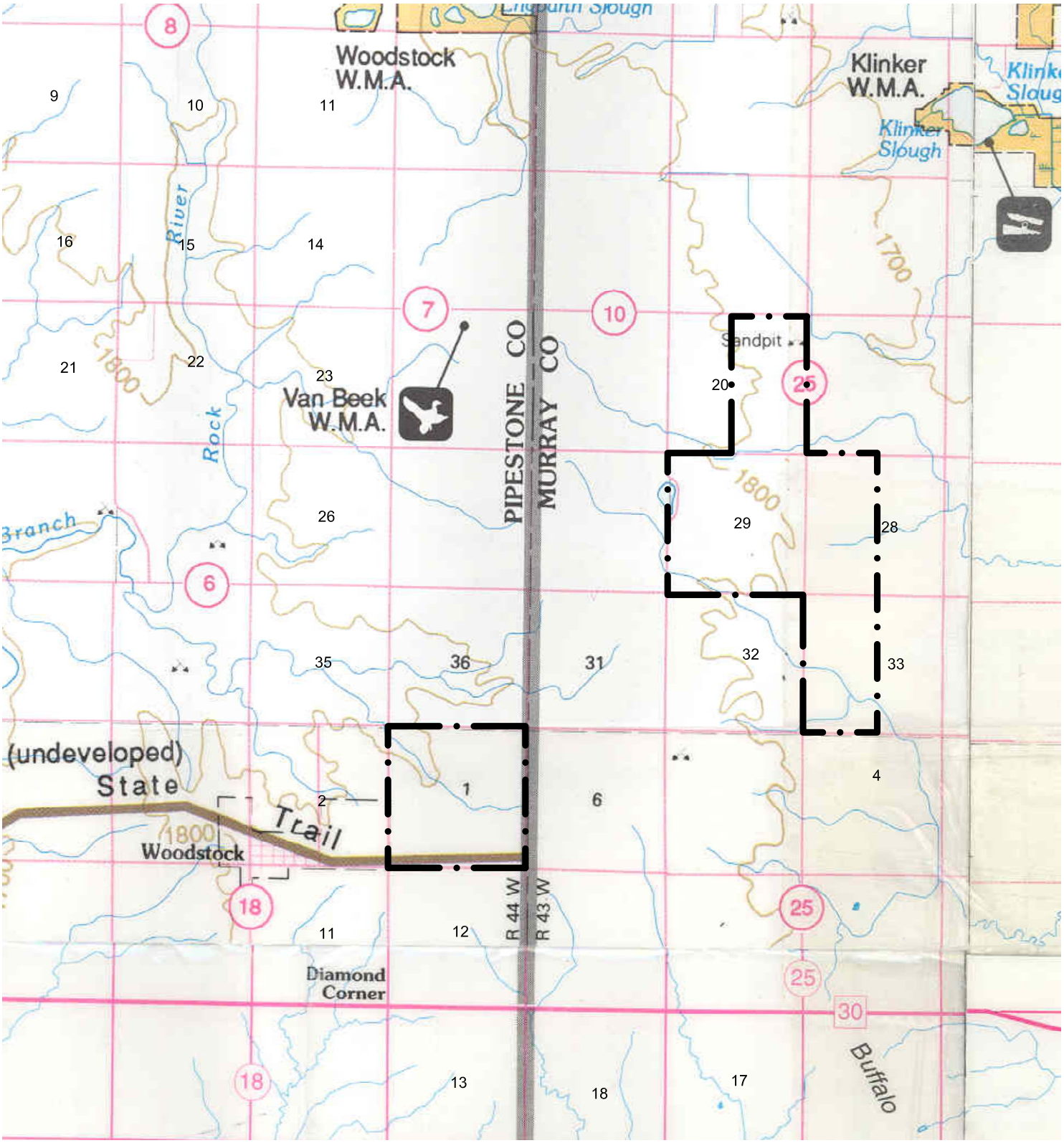
Construction within the turbine footprint, cable trenching, and access roads could impact cultural resources. The turbines may impact the view shed integrity.

c. Mitigative Measures

A Phase I Archaeological Resources Survey is recommended for areas proposed for Project construction, including the wind turbine locations, access roads, and other construction areas. If cultural resources are identified during the Phase I survey, the archeologist will provide recommendations for National Register eligibility, and offer recommendations for site avoidance, impact minimization, or appropriate mitigative measures if necessary.

6. Recreation Resources

Recreation resources were obtained from the Minnesota Department of Natural Resources (MDNR) Public Recreation Information Maps of the Worthington and Marshall areas (Figure 14).



N

0 2500 5000

1" = 5,000'

LEGEND

PERMIT BOUNDARY

DIAGRAM IS FOR GENERAL LOCATION ONLY,
AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

PUBLIC RECREATION INFORMATION MAP
RIDGEWIND WIND POWER PLANT

PIPESTONE / MURRAY COUNTIES, MN

Project Mngr:	JLM	Terracon	Project No.	41067744
Designed By:	JLM		Scale:	AS SHOWN
Checked By:	JLM	3535 Hoffman Road East White Bear Lake, MN 55110	Date:	7/17/06
Approved By:	JLM		Drawn By:	MTO (41)
File Name:	41067744rec2.DWG	Layout1	Figure No.	14

a. Description of Resources

Recreational opportunities in Pipestone and Murray Counties include hunting, fishing, snowmobiling, campgrounds, and trails. Hunting is permitted in designated state MDNR wildlife management areas (WMAs), unless posted otherwise.

WMAs are managed to provide wildlife habitat, improve wildlife production and provide public hunting and trapping opportunities. These MDNR lands were acquired and developed primarily with hunting license fees. WMAs are closed to all-terrain vehicles and horses because of potential detrimental effects on wildlife habitat. There are two WMAs located within a two-mile radius of the Project site and one state trail

- Klinker WMA is located to the northeast of the northern portion of the Project site in Rock Township (S ½ Section 1 and SE ¼ Section 2, T107N, R44W).

- Van Beek WMA is located to the west of the northern portion of the Project site in Rock Township (NE ¼ of Section 24, T107N, R44W).

State Trail located within the Project site:

- Casey Jones State Trail is located within the Project site in Burke Township running west to east along the southern edge of Section 1 (T106N, R44W).

b. Impacts

The Project will avoid al WMAs, SNAs, and public parks. In general, visual impacts will be the most evident to recreationalists using the WMAs, within a 2-mile radius of the Project site.

c. Mitigative Measures

Turbines and associated facilities will not be located within WMAs, SNAs, or public parks.

7. Public Health and Safety

a. Air Traffic, Electromagnetic Fields, Security, and Traffic

Air Traffic. There are no airports located within the proposed Project site. However, the vast majority of the current land use is agricultural, which may require periodic overhead spraying or crop dusting. Crop dusting is typically carried out during the day by highly maneuverable airplanes or helicopters. The installation of the wind turbines in active cropland will create a potential for collisions with crop-dusting aircraft. However, distribution lines are expected to be similar to those which may be already present (located along the edges of fields and roadways) and the wind turbines themselves would be visible from a distance and lighted according to FAA guidelines.

Electromagnetic Fields. Electromagnetic fields (EMF) are invisible lines of force that surround an electrical device and occur where an electric conductor exists with an electrical current flowing through it. Examples of such conditions include high-voltage transmission lines, distribution (feeder) lines, substation transformers, house wiring, and electrical appliances. EMFs also occur

in nature, in the form of the earth's direct current magnetic field and in electric and magnetic fields generated during lightning storms.

Security. The proposed Project site is located in an area which has a low population density. Construction, operation, and maintenance of the Project will have minimal impacts on the security and safety of the local population.

Traffic. The existing traffic levels for the State Highways and County Roads in the project area are relatively low. The most active route is State Highway 30. County and township roads are the least traveled.

b. Impacts

Air Traffic. The Project will not have a significant impact on air traffic in the region because there is not an airport in close proximity.

Electromagnetic Fields. The wind power plant should not substantially increase public exposure to EMF; therefore, no adverse impacts to health or safety are expected.

Security. Construction and operation of the Project will not have a significant impact to security and safety of the local residents.

Traffic. No significant permanent changes in traffic patterns or volume are expected. During the construction phase, several types of light, medium, and heavy-duty vehicles will travel to and from the Project site, as well as private vehicles used by the construction personnel. The operations and maintenance phase of the project will require approximately three (3) people to monitor and maintain the wind turbines. There would be a slight increase in traffic for occasional turbine repair.

c. Mitigative Measures

Air Traffic. Notification of construction and operation of the Project will be completed to the FAA and the wind turbines will have lighting to comply with FAA requirements.

Electromagnetic Fields. Impacts due to EMFs are not anticipated there fore no mitigation is necessary.

Security. The following measures will be taken to reduce the risk of personal injury and property damage:

- The wind turbines will be setback a minimum 500 to 1,000 feet from occupied homesteads and a minimum 250 to 500 feet from public or developed roads.

- Security measures will be taken during construction, operation, and maintenance of the project, including temporary and permanent fencing, warning signs, and locks on equipment and wind power plant facilities.

- Each turbine door will be clearly labeled alphanumerically to identify each unit and a map of the site with the labeling system will be provided to local authorities as part of the fire protection plan.

Traffic. Significant permanent changes in traffic patterns or volume are not expected; therefore mitigation will not be necessary.

8. Hazardous Materials

a. Description of Resources

PRC is not aware of hazardous waste sites within the Project site. The land is primarily used for agricultural activities. Petroleum products will be used in the operation of the wind turbines.

b. Impacts

PRC will conduct a Phase I Environmental Site Assessment prior to construction to assess potential environmental concerns.

Any petroleum products used will be contained with the wind turbine. The products will be monitored during regular turbine maintenance.

c. Mitigative Measures

If any wastes are generated during the construction and operation of the Project, they will be handled, stored, processed, treated, and disposed of in accordance with applicable state and/or local rules.

9. Land-Based Economics

a. Description of Resources

Agriculture/Farming. The land of the Project site is used mainly for growing crops with some areas used for grazing. Farming is the most important enterprise in the county. Corn, oats, flax, soybeans, and hay are the main crops. The main livestock are beef cattle and hogs with dairying and sheep raising also important. Approximately 92 percent of the land in the Murray County is utilized for agricultural purposes. Corn is the most widely grown crop in the proposed project area, followed by soybeans. Alfalfa, small grains, and pasture are additional crops in the area. Feeding cattle and hogs, raising livestock and dairy farming are also major sources of income in the proposed project area. The Conservation Reserve Program (CRP) and Reinvest in Minnesota (RIM) Program are other sources of farm income. Cropland is planted to conservation grasses and legumes to protect and improve the soil and cannot be harvested or pastured. Within the Buffalo Ridge area, the trend is toward fewer and larger farms.

Forestry. Pipestone and Murray Counties are historically known for its grasslands. Forest resources are not found in the Project site area. Small forested areas are found near homes and are utilized as wind blocks.

Mining. Mineral deposits in southwestern Minnesota consist of sand and gravel from unconsolidated surficial deposits, building stone from quartize rock units, and scattered clay/shale deposits for brickmaking. According to the Public Recreation Information Maps for

the Marshall and Worthington areas and the U.S. 7.5 Minute Topographic Map Quadrangles of Woodstock, there is one sand/gravel pit operation located in the northeast corner of the Project site. Turbines, access roads, or utilities are not anticipated to be located in the area of the sand/gravel pit.

b. Impacts

The proposed Project is compatible with existing land use plans. Less than 5 percent of the total Project site area will be removed from its current use and dedicated to the Project (ie. majority of project site remains open and in current use). No impacts are anticipated to forestry resources or sand/gravel operations.

c. Mitigative Measures

The wind turbines and access roads will be located so that the most productive farmland (prime farmland) will be avoided as much as possible. Once the wind turbines and access roads are constructed, the surrounding land may still be farmed. If there is damage to drain tile as a results of construction activities or operations of the wind power plant, PRC will work with the property owner to repair the damage. No impacts to forests are anticipated therefore no mitigation is necessary. Turbines will not be located within sand/gravel pit operations.

10. Tourism and Community Benefits

a. Description of Resources

Tourism in southwestern Minnesota's Pipestone and Murray Counties focuses on promoting the areas abundant game and wildlife, lakes, farms, and villages. Other popular attractions are cultural and historical sites (End-O-Line Railroad Park & Museum, Pipestone Monument, etc.) and recreational activities such as county and state parks, hiking trails, fishing, snowmobiling, golf courses, and skiing. The county hosts a variety of festivities, fairs, and cultural events throughout the year.

b. Impacts

Wind development may become a significant tourism attraction, bringing more visitors to the community. Potentially, the community could benefit from revenues generated by tourism dollars for hotel rooms, restaurants and other goods and services. Wind generation could become a new addition to the community's calendar of events.

c. Mitigative Measures

No impacts are anticipated, therefore, no mitigation actions are necessary.

11. Topography

Topography information was obtained from U.S. 7.5 Minute Topographic Map Woodstock, Minnesota Quadrangle.

a. Description of Resources

The Project site includes some of the highest elevations in Minnesota. Elevations range between 1,780 and 1,875 feet above sea level, on the Bemis Moraine, which crosses through the center of the Project site from northwest to southeast. The Bemis Moraine is strongly expressed in Cameron and Chanarambie Townships in Murray County and know locally as Buffalo Ridge. The relief of Bemis Moraine is predominately hilly, with slopes that are gently, rolling to steep. A topographic map of the Project site is depicted in Figure 3.

The area northeast of the Bemis Moraine is gently undulating. Slopes are short and irregular and closed depressions are common. South and west of the Bemis Moraine are broad ridgetops and long, smooth gentle slopes that end in drainageways. There are no closed depressions because loess (wind deposited soil) has filled the irregularities of the glacial till plain.

The Bemis Moraine forms the divide between the Mississippi River and Missouri River basins. Streams northeast of the moraine drain into the Mississippi River drainage basin, and those southwest of it drain into the Missouri River drainage basin.

12. Soils

The dominant parent material in Pipestone and Murray Counties is glacial. Most of the soils formed in glacial till that was deposited directly by glacial ice. Other soils formed in deposits derived from glacial till that were sorted and redeposited by wind and water. The soil association map in Figure 15 illustrates the soil associations in the proposed project area. A soil association is a mapping unit used to delineate a landscape that has a distinctive pattern of soils. It is composed of one or more major soils and at least one minor soil and is named for the major soils. The soils in one association may occur in another, but in a different pattern. A soil association map is useful in providing a general idea of the soils in a large tract of land, such as the Project site. It is a useful guide in managing a watershed, a wooded tract, a wildlife area, or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field, or selecting the exact location of a road, building, or similar structure because the soils in each association differ in slope, depth, stoniness, drainage, or other characteristics that affect their management. The association located within the Pipestone County portion of the site is Kranzburg-Vienna. The association located within the Murray County portion of the site is Barnes-Buse.

a. Description of Resources

Kranzburg-Vienna Association consists of well drained, mainly gently sloping soils that formed in loess and loamy glacial till on uplands. This association consists of broad ridgetops and side slopes that end in drainageways. Most areas of the association are covered by a thin mantle of loess that overlies glacial till. Slopes are long, smooth, and gentle because most irregularities in the glacial till have been filled in and leveled by wind deposited silty material. It is about 56 percent Kranzburg soils, 16 percent Vienna soils, and 38 percent minor soils. Erosion is the major limitation to the use of the soils in this association. The long, smooth slopes make these soils well suited to contour farming. Drainage is needed and waterways should be constructed in some the drainageways. Corn, small grain, and alfalfa grow well on these soils if erosion is controlled. Fertility is adequate, and rainfall is ample. Most of the farms are used to raise livestock.

LEGEND - PIPESTONE

1 Estelline-Lamoure association: Well drained and poorly drained, mainly nearly level soils that formed in wind- and water-deposited silty materials on stream terraces and bottom lands

2 Brookings-Hidewood association: Moderately well drained and somewhat poorly drained, mainly nearly level soils that formed in loess on uplands

3 Kransburg-Vienna association: Well-drained, mainly gently sloping sloping soils that formed in loess and loamy glacial till on uplands

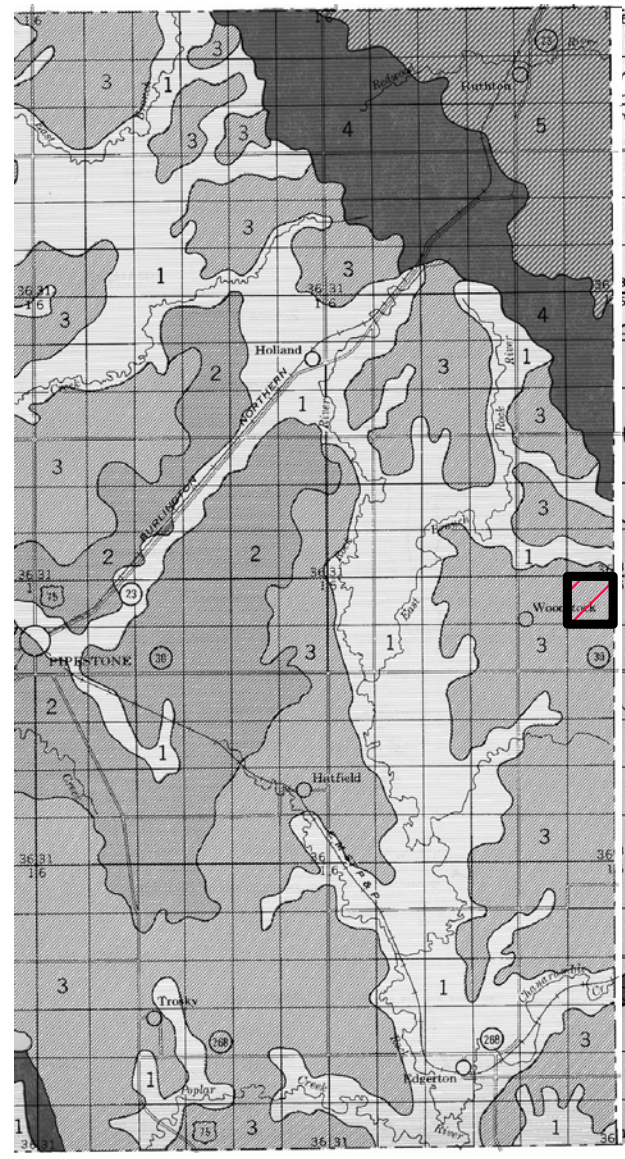
4 Barnes-Buse association: Well-drained, gently undulating to steep soils that formed in loamy glacial till on uplands

5 Barnes-Flom association: Well drained and poorly drained, mainly gently undulating and nearly level soils that formed in loamy glacial till on uplands

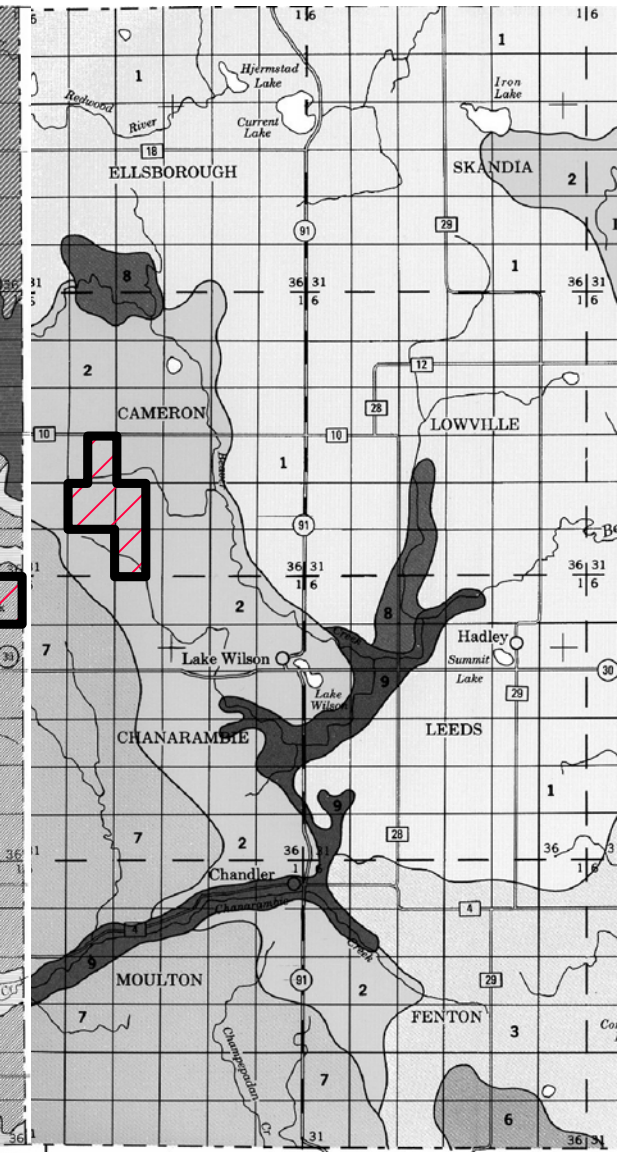
6 Ihlen-Rock outcrop association: Well -drained, nearly level an gently sloping soils that formed in loess and rock outcrop on uplands

7 Moody-Trent-Whitewood association: Well drained, moderately well drained, and somewhat poorly drained, nearly level and gently sloping soils that formed in loess on uplands

PIPESTONE



MURRAY



1 0 1 2 3 Miles

1 0 3 6 Km

LEGEND - MURRAY

AREAS DOMINATED BY SOILS THAT FORMED IN FRIABLE GLACIAL TILL

1 Barnes-Flom-Vallers association: Well drained and poorly drained, nearly level to moderately steep soils that formed in loamy glacial till

2 Barnes-Buse association: Well drained, gently undulating to very steep soils that formed in loamy glacial till

3 Clarion-Webster-Nicollet association: Well drained, poorly drained, and moderately well drained, nearly level to hilly soils that formed in loamy glacial till

4 Clarion-Storden association: Well drained, undulating to very steep soils that formed in loamy glacial till

AREAS DOMINATED BY SOILS THAT FORMED IN FRIABLE AND FIRM GLACIAL TILL

5 Everly-Letri-Wilmonton association: Well drained, poorly drained, and moderately well drained, nearly level to moderately steep soils that formed in loamy glacial till

AREAS DOMINATED BY SOILS THAT FORMED IN GLACIOLACUSTRINE SEDIMENTS OR GLACIAL TILL

6 Collinwood-Clarion-Waldorf association: Moderately well drained, well drained, and poorly drained, nearly level to sloping soils that formed in clayey lacustrine sediments or loamy glacial till

AREAS DOMINATED BY SOILS THAT FORMED IN LOESS AND GLACIAL TILL

7 Vienna-Hidewood-Lismore association: Well drained, poorly drained, and moderately well drained, nearly level to hilly soils that formed in loess and in glacial till

AREAS DOMINATED BY SOILS THAT FORMED IN GLACIAL OUTWASH AND ALLUVIUM

8 Arvilla-Egeland-Maryland association: Somewhat excessively drained, well drained, and poorly drained, nearly level to moderately steep soils that formed in loamy material over sandy and gravely deposits

9 Lamoure-La Prairie association: Poorly drained and moderately well drained, nearly level soils that formed in silty and loamy alluvial material

LEGEND

PROJECT SITE

N

GENERAL SOIL MAP
RIDGEWIND WIND POWER PLANT

PIPESTONE / MURRAY COUNTIES, MN

Project Mngr:	JLM	Terracon	Project No.	41067744
Designed By:	JLM		Scale:	AS SHOWN
Checked By:	JLM	3535 Hoffman Road East White Bear Lake, MN 55110	Date:	7/17/06
Approved By:	JLM		Drawn By:	MTO (41)
File Name:	41067744so.dwg	7-17-06	Figure No.	15

MAPS FROM THE SOIL SURVEYS OF MURRAY AND PIPESTONE COUNTIES

Barnes-Buse Association consists of well drained, gently undulating to very steep soils that formed in loamy glacial till. This association is mainly on irregular, complex slopes on end moraines. The elevation is one of the highest in the county. Drainage patterns are complex; the landscape has many short, deep drainage ways. This association consists of 55 percent Barnes soil and 20 percent Buse soil. Permeability of these soils is moderate and available water capacity is high. Surface runoff is medium to rapid due to slopes. The natural fertility is medium with a moderate to high organic matter content. Most areas of this association are used for crops, pasture, and range. The major limitation to use these soils for cropland is the susceptibility to erosion. If the range land is well-managed, native grasses are the dominant vegetation, however, if the vegetation is heavily grazed, the native grasses are replaced with the less desirable Kentucky bluegrass. The Barnes-Buse association has slight to severe limitations for building site development and sanitary facilities. The limitations for building site development and sanitary facilities increase as the slope of the soil increases.

b. Impacts

Construction of the wind turbines and access roads will increase the potential for soil erosion during construction and convert prime farmland from agricultural uses to industrial uses. The exact amount of land that will be converted to wind power plant use will be determined once the site layout has been finalized. This is anticipated to remain less than five percent of the overall project site area.

c. Mitigative Measures

The placement of wind turbines and access roads will be planned so that the conversion of prime farmland will be minimal. In addition, care will be taken in the planning and design of the wind power plant to take into account the contour of the terrain so as to minimize erosion. A standard soil erosion and sediment control plan prior to construction. This plan will address what type of erosion control measures should be implemented during each phase of construction and during the operations and maintenance of the wind power plant to minimize soil erosion and revegetate throughout construction, operation, and maintenance until disturbed areas have been successfully revegetated.

13. Geologic and Groundwater Resources

The geomorphology in southwestern Minnesota is dominated by the Minnesota River Valley, a deep and wide trench, and the Coteau Des Prairies (Coteau), a broad regional topographic highland. The Coteau, of which Buffalo Ridge is part, acts as a divide for the major drainage patterns in southwestern Minnesota. The Development site itself is situated along the ridge and flanks of the Coteau. The southwest side of the Coteau drains into the Big Sioux River and Rock River and the northeast side drains into the Minnesota and the Des Moines Rivers. The northeastern flank of the Coteau consists of regional benches and terraces expressed as poorly drained belts of hummocky terrain, separated by steeper, fairly well-drained areas.

a. Description of Resources

The surficial geology of the Development site consists of ice and stream deposits including Till of the Bemis Moraine, Till of the Verdi position, Stream sediment behind the Bemis Moraine, and Stream sediment beyond the Bemis Moraine.

Till of the Bemis Moraine consists of till with tenses of sorted sediment. Texture of till matrix is loam to clay loam. Yellow-brown where oxidized, gray were unoxidized. The till contains pebbles of carbonate; felsic and mafic igneous rocks; shale; chert; and some lignite.

Till of the Verdi position consists of eroded till having low relief. The matrix texture is loam to clay loam. The pebble assemblage and color are similar to Till of the Bemis Moraine, although the till in this unit is slightly more oxidized and leached and locally covered with a thin layer, approximately five feet thick, of windblown sediment.

Stream sediment beyond the Bemis Moraine consists of sand and gravel deposited by meltwater that issued from Bemis ice front. The texture is generally finer to sand and silt. The unit also includes sediment of contemporaneous nonglacial tributaries and younger postglacial streams.

Three types of bedrock underlie the glacial deposits of the Development site including Sioux Quartzite, Migmatitic gneiss and amphibolite, and Cretaceous Rocks, undivided.

- Sioux Quartzite (Early Proterozoic Era) consists of red and purple to light gray quartzite and related claystone (catlinite).
- Migmatitic gneiss and amphibolite (Middle Archean Rocks) consist of units of younger Archean granite, as well as units of Early Proterozoic gneiss and granite.
- Cretaceous Rocks (Mesozoic Rocks) consist dominantly of marine shale, including some sandstone and lesser amounts of limestone.

Geologic-related mineral resources at the site include groundwater and minor sand and gravel deposits. Groundwater resources at the site are derived from four general hydrogeologic units:

- Quaternary surficial sand and gravel
- Quaternary buried sand and gravel
- Cretaceous sandstone
- Precambrian Sioux Quartzite

Municipal water supplies are obtained from groundwater sources, commonly completed in outwash sand and gravel aquifers. The aquifer produces adequate yields and has a good recharge rate. The aquifer is easily defined; however, there is limited distribution and the aquifer is easily contaminated.

b. Impacts

Impacts to geologic and groundwater resources are not anticipated. Water supply needs will be quite limited and local supplies are adequate.

c. Mitigative Measures

Wind turbine locations will not impact the use of existing water wells because the turbines will not be sited within 500 feet of occupied structures.

14. Surface Water and Floodplain Resources

Surface water and floodplain resources for the proposed Development site area were identified by reviewing U.S. Geological Survey Topographic Maps, Wetland Maps, and Flood Insurance Rate Maps (FIRM) produced by the Federal Energy Management Agency (FEMA).

a. Description of Resources

The major surface water located within the Project site include: East Branch Rock River intermittent stream, North Branch Chanarambie Creek intermittent streams, several unnamed lakes and ponds, and marsh or swamp areas. Figure 3 and 16 depicts the surface water bodies.

According to the Flood Insurance Rate Maps (FIRMs) for Pipestone County the Project site is located within Zone C – areas of minimal flooding. According to the FIRMs for Murray County, the Project site is located within Zone X – areas determined to be outside 500-year flood plain.

b. Impacts

Construction of the wind turbines and access roads is anticipated to result in the disturbance of approximately 60.3 acres. The wind turbines will be built on higher elevations within the project site, and will thus generally avoid lakes and streams.

c. Mitigative Measures

If access roads are constructed across streams and drainage ways, the access roads will be designed in a manner so runoff from the upper portions of the watershed can flow unrestricted to the lower portion of the watershed. A storm water discharge permit will be acquired prior to the construction of the wind turbines and access roads. Erosion control measures will be installed prior to construction and maintained throughout construction until areas disturbed have successfully revegetated.

15. Wetlands

Delineated wetlands for the proposed Project site were identified from reviewing National Wetland Inventory (NWI) Maps developed by the United States Department of the Interior and Fish and Wildlife Service. Figure 16 depicts the wetlands are overlain on an aerial photograph.

LEGEND

PERMIT BOUNDARY

Freshwater Emergent Wetland

DIAGRAM IS FOR GENERAL LOCATION ONLY,
AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

N

WETLANDS MAP
RIDGEWIND WIND POWER PLANT

PIPESTONE / MURRAY COUNTIES, MN

Project Mngr:	JLM	Terracon 3535 Hoffman Road East White Bear Lake, MN 55110	Project No.	41067744
Designed By:	JLM		Scale:	NOT TO SCALE
Checked By:	JLM		Date:	7/28/06
Approved By:	JLM		Drawn By:	MTO (41)
File Name:	41067744wlm.dwg	Layout1	Figure No.	16

a. Description of Resources

The major wetlands within the proposed Project site mainly include: Paulstrine wetlands and small areas defined as a riverine wetland.

The Paulstrine System was developed to group the vegetated wetlands traditionally called by such names as marsh, swamp, bog, fen, and prairie. It also includes the small, shallow, permanent or intermittent water bodies often called ponds. Paulstrine wetlands may be situated shoreward of lakes, river channels, or estuaries; on river floodplains; in isolated catchments; or on slopes. They may also occur as islands in lakes or rivers. The erosive forces of wind and water are of minor importance except during severe floods.

The Riverine System includes all wetlands and deepwater habitats contained within a channel, with two exceptions: wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens and habitats with water containing ocean derived slats in excess of 0.5 percent. The Riverine System is bounded on the landward side by upland, by the channel bank, or by wetland dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens. Water is usually, but not always, flowing. Upland islands or Paulstrine wetlands may occur in the channel, but they are not included in the Riverine System. Paulstrine Moss-Lichen Wetlands, Emergent Wetlands, Scrub-Shrub Wetlands, and Forested Wetlands may occur adjacent to the Riverine System, often on a floodplain.

Table 6 lists the wetland types found within the Project site. The information was obtained from the Minnesota Department of Natural Resources Water Division.

Table 6.
Wetland Types located within the Development Site

Type	NWI Symbol	Acres in Murray County	Acres in Pipestone County
Type 1 – Seasonally Flooded Basin or Flat	PEMA	1,521	1,264
Type 3 – Shallow Marsh	PEMC, PEMF	11,719	3,221
Type 4 – Deep Marsh	PUBF	450	177
Type 7 – Wooded Swamp	PFO1	423	18
Riverine	R4SBC	80	29

b. Impacts

The wind turbines will be built on ridges, which will avoid wetlands on the lower positions in the landscape. Access roads will be designed to minimize impacts on the wetlands.

c. Mitigative Measures

Wetlands will be avoided during the construction phase of the Project. If it appears that wetlands could be affected, PRC will work with the U.S. Army Corps of Engineers and governing entities prior to construction.

16. Vegetation

Information on the former and existing vegetation in the Project site was obtained from the Minnesota Department of Natural Resources.

a. Description of Resources

The presettlement vegetation within the Project area consisted of medium and tallgrass prairie with wet prairie covering a small proportion of the Project area. Agriculture is the current primary land use in the Project site area and few remnants of presettlement vegetation remains.

b. Impacts

The amount of land that will be converted to wind power plant use will be determined once the site layout has been finalized. It is anticipated that less than five percent of the Project site will be dedicated to wind plant facilities. Some vegetation will be permanently removed and converted to wind turbines and access roads. Some additional acreage will be temporarily disturbed during the construction and operation and maintenance of the wind power plant (contractor staging areas, underground, power lines).

c. Mitigative Measures

The following measures will be used to avoid or alleviate potential conflicts and impacts on the vegetation of the area during the final siting of the wind power plant and its subsequent development and operation:

- Conduct a pre-construction inventory of existing wildlife management areas, scientific and natural areas, recreation areas, wetlands, native prairie, and forests.
- Exclude established wildlife management, recreation and scientific natural areas from consideration for wind turbine locations, access roads, or electrical/transmission line placement.
- Avoid disturbance of wetlands during construction of the Project.
- Protect existing trees and shrubs.
- Maintain sound water and soil conservation practices during construction and operation of the Project to protect topsoil and adjacent resources and to minimize soil erosion. Practices may include containing excavated material, protecting exposed soil and stabilizing restored material, revegetating non-cropland and range areas with wildlife conservation species and wherever possible, planting native tallgrass prairie species in cooperation with landowners.
- Prepare a prairie protection and management plan with the advice of the DNR and submit it to the PUC after issuance of the site permit and prior to construction.

17. Wildlife

Information on the existing wildlife in the proposed Project site was obtained from a variety of sources, including the MDNR, USFWS, “The Avian Monitoring Studies at the Buffalo Ridge, Minnesota Wind Resource Area: Results of a 4-Year Study.”, and “The Mammals of Minnesota. The following sections do not include any discussion on wildlife species considered by the state to

be threatened or endangered or of special concern. Refer to Section 17 for information on these resources.

a. Description of Resources

Wildlife within the Project site consists of birds, mammals, fish, reptiles, amphibians, and insects, both resident and migratory, which utilize the area habitat for forage, breeding, and/or shelter. The resident species are representative of Minnesota game and nongame fauna which are associated with upland grass and farm lands with few wetland and forested areas. The majority of the migratory wildlife species are birds including waterfowl, raptors, and song birds. Following is a discussion of resident and migratory birds, mammals, reptiles and amphibians, and insects that are expected to exist in the Project area.

Resident Birds/Migratory Birds.
Resident bird species are those that occupy the Project site throughout the year. The resident bird species include the game birds, which form the most important economic component of this group.

Migratory bird species are those which may use the Project site for only a portion of the year. The principle migration routes for the large numbers of waterfowl which pass through Minnesota each year in the spring and fall, to and from northern breeding grounds, lie outside of the Project site.

218 bird species were documented in the Buffalo Ridge study area. The bird species observed during the survey included: waterbirds, waterfowl, shorebirds, upland game birds, doves, raptors, woodpeckers, flycatchers, finches, blackbirds, corvids, swallows, sparrows, chickadees, nuthatches, tanagers, orioles, thrushes, longspurs, wrens, vireos, warblers, and others.

Mammals. The mammals expected to occur with in the Project site include: jackrabbits, chipmunks, woodchucks, squirrels, mice, muskrat, fox, raccoons, minks, badgers, skunks, and deer. These species expected to occur within the Project site use the food and cover available from agricultural fields, grasslands, farm woodlots, wetland areas, and wooded ravines. Agricultural crops provide seasonal food sources for the herbivores and omnivorous species. Grassland areas and woody vegetation are also habitat for a variety of small mammals including mice, which serve as food base for the larger carnivorous and omnivorous mammals and birds. White-tailed deer, an economically important species, have a strong affinity for agricultural crops and use farm woodlots, wooded ravines and intermittent stream bottoms for shelter.

The avian study conducted on Buffalo Ride also collected data on bats and bat mortality. The following bats were observed during the study: Hoary, Red, and Silver Haired bats, and Little Brown bats. The estimated annual mortality rate for bats at the Xcel Phase III project site was 1.87 bats per turbine. Bat mortality increased when turbines had a decreased distance from wetlands and wooded areas.

Reptiles and Amphibians. Reptile and amphibian species, which may be present within the Project site include: Great Plains Toad, Northern Leopard Frog, Western Chorus Frog, American Toad, Snapping Turtle, Common Garter Snake, Plains Garter Snake, Fox Snake, and Bullsnake.

Insects. While many insect species are important to the indigenous vegetation and wildlife, honey bees are the only species economically important within the Project site.

b. Impacts

Development of the wind power plant, including the construction and operation of the project, is expected to produce a minimal impact to the wildlife. Based on studies of existing wind power projects in the United States and Europe, the greatest impact to wildlife would occur to avian and bat populations. The avian monitoring study at Buffalo Ridge identified the following impacts:

- There is a reduction of use of the area within 100 meters of the wind turbines by some bird species. Researchers stated that "on a large scale basis, reduced use by birds associated with windpower development appears to be relatively minor and would not likely have any population consequences on a regional level." A positive impact of the reduced use around the turbines would be reduced potential for bird collisions with the turbine.
- Compared to other wind plants in the United States, avian mortality is relatively low on Buffalo Ridge. Data indicated that avian mortality primarily involved nocturnal migrants and that mortality of resident birds appeared very low and involved common species. Researchers stated that based on the estimated number of birds that migrate through Buffalo Ridge each year the number of avian fatalities on Buffalo Ridge is likely inconsequential from a population standpoint.

The impact of the Project on resident wildlife is expected to be minimal. There is the potential for avian and bat collisions with the turbines. Additional impacts may include a small percentage reduction in the available habitat, which the resident wildlife uses for forage or cover. Operation and maintenance of the wind power plant will not change the existing land use.

c. Mitigative Measures

The following measures will be used to help avoid or alleviate potential conflicts and impacts on the wildlife of the area during the final siting of the wind power plant and its subsequent development, operation, and maintenance:

- Conduct a pre-construction inventory of existing wildlife management areas, scientific and natural areas, recreation areas, wetlands, native prairie and forests.
- Exclude established wildlife management, recreation and scientific natural areas from consideration for wind turbine locations, access road or electrical/transmission line placement.
- Avoid disturbance of wetlands or drainage systems during construction of the project.
- Avoid placement of turbines in high quality native prairie land.
- Protect existing trees and shrubs, which are important to the wildlife present in the area.
- Avoid construction activities within deer-wintering yards during the winter.
- Maintain sound water and soil conservation practices during construction, operation, and maintenance of the wind power plant to protect topsoil and adjacent resources and to minimize soil erosion. Practices may include containing excavated material, protecting exposed soil, and stabilizing restored material.
- Revegetate non-cropland and range areas with wildlife conservation species.

18. Rare and Unique Natural Resources

The Endangered Species Act of 1973, as amended, requires that a consultation pursuant to Section 7 be conducted to insure that a proposed project will not affect the continued existence of

any endangered or threatened species or adversely affect their habitats, and that corrective action be taken if adverse impacts may occur. The MDNR maintains a Natural Heritage Database (NHD) through their Natural Heritage and Nongame Research Program, which is the most complete source of data on Minnesota's rare, endangered or otherwise significant plant and animal species, plant communities and other natural features. The MDNR was contacted by Letter on July 13, 2006. The U.S. Fish and Wildlife Service was also contacted; however a response has not yet been received.

a. Description of Resources

The MDNR responded in a letter dated August 3, 2006. The MDNR has accessed the NHD to determine if rare plant or animal species or other significant natural features are known to occur within an approximate one-mile radius of the Project site. Based on the NHD review, there are no known occurrences of rare species or native plant communities in the area searched; however the East Branch of the Rock River provides critical habitat for the Topeka shiner, a federally listed Endangered and state-listed Special Concern species. The MDNR stated that "Topeka shiners are adversely impacted by actions which alter stream hydrology or decrease water quality, including sedimentation, dredging and filling, stream dewatering, impoundment, eutrophication, channelization, and pollution/contamination. Intermittent streams in T106N, R44W Section 1 feed into the East Branch of the Rock River.

According to the MDNR, prairie remnants may be near or within the project site that have not yet been identified. The Minnesota County Biological Survey program is currently in the process of surveying Pipestone and Murray County. The MDNR recommends that they be contacted following the 2006 field season for an update on native plant communities in the vicinity of the project site.

During the Xcel Energy avian monitoring study, no species listed as endangered were observed in the study area. Six species listed as threatened were observed, including the bald eagle, peregrine falcon, common tern, Wilson's pharlarope, horned grebe, and loggerhead shirke.

b. Impacts

No impacts to the Topeka Shiners are anticipated for the Project construction or operation. Impacts to the Topeka Shiner are not anticipated as construction activities for wind turbines and access roads will in general be limited to ridges and will avoid area streams and wetlands.

c. Mitigative Measures

The following measures will be used to avoid potential impacts to federal and state-listed species and rare or sensitive habitats in the area during final siting of the wind turbines and assess roads:

- PRC will implant best management practices during construction to control erosion at the Project site.
- PRC will conduct a pre-construction inventory of the existing biological resources, native prairie, or wetlands in the Project site.
- PRC will avoid disturbance of wetlands, streams, and native prairie remnants.
- PRC will consult with the MDNR regarding the Topeka Shiner should waterway crossing become necessary.

- PRC will contact the MDNR for additional information regarding the Minnesota Biological survey Program.

19. Adverse Human and Environmental Effects Which Cannot be Avoided.

Visual. The wind turbine arrays will be prominent features in the landscape. By design, these structures are placed in open areas of higher elevations. Some mitigative measures, as described in Section 3, can be implemented to somewhat limit visual impacts. However, it is inevitable that the wind turbines will be noticed. The degree to which the visual impacts are considered adverse is subjective, and can be expected to vary depending on the viewer's perspective.

Commitment of Land. The Project will be sited on land for which PRC currently has legal, valid, and binding contracts for wind easements. It is anticipated that less than five percent of the overall project site area will actually be impacted with turbines and related equipment, access roads, and maintenance facilities. The existing use of this land can continue as agricultural or open fields.

Noise. When in motion, the wind turbines emit a perceptible sound. The level of this noise varies with the speed of the wind turbine and the distance of the listener to the turbine. On relatively windy days, the turbines create more noise; however, the ambient, or natural, noise level simply from the wind tends to override the wind turbine noise as distance from the turbines increases.

Wildlife. Occasionally, birds and bats will collide with wind turbines. The mortality associated with the collisions has been identified as inconsequential from a population standpoint. A reduction of use of the area within 100 meters of the wind turbines by some bird species may also result.

G. IDENTIFICATION OF REQUIRED PERMITS/APPROVALS

The following items summarize potential applicable permits & licenses for the wind power plant:

1. Minnesota Public Utilities Commission

Site Permit
The primary regulatory approval required for the construction and operation of the Project is a Site Permit, which is issued by the Minnesota Public Utilities Commission ("PUC" or "MPUC").

The Minnesota Wind Generation Siting Law (the "Law") establishes responsibility and authority to accept, evaluate and grant permits for wind farm developments in Minnesota. This responsibility and authority was transferred to the MPUC on July 1, 2005. The Law provides that *"No person may construct an LWECS without a site permit issued by the environmental quality board"* (Section 116C.694(a)). The Law defines an LWECS as any combination of wind turbines and associated facilities with a nameplate rating equal to or greater than 5,000 kW. Furthermore, Section 116C.697 of the Law states that, *"A permit under sections 116C.691 to 116C.697 is the only site approval required for the location of an LWECS. The site permit supersedes and preempts all zoning, building, or land use rules, regulations, or ordinances adopted by regional, county, local and special purpose government*."

The PUC has prepared *Wind Siting Minnesota Chapter 4401* (the "Site Permit Procedures"). The Site Permit Procedures describe the process used for the application, review and approval of a site permit.

2. Department of Natural Resources (DNR)

Utility Crossing of Public Land and Water
In case transmission lines cross state lands, rivers, or streams, a DNR permit would be required. At present PRC does not anticipate any such crossings that would trigger DNR review.

Wetlands Survey
The DNR has a permit program for "public waters wetlands". A wetland survey will be conducted to determine if there are any public waters wetlands on the Project site that may be affected by tower or road placement and construction. If it appears that wetlands could be affected, PRC will strictly follow the requirements of the DNR and work cooperatively with the DNR and all other governing entities to reduce or eliminate wetland impacts, or if necessary, replace or substitute wetland value or resources where avoidance is not feasible or prudent.

3. Minnesota Pollution Control Agency (MPCA)

Water Discharge to Surface Waters (NPDES)
Developer will submit an application for General Storm Water Permit with the Minnesota Pollution Control Agency ("MPCA"). Because Minnesota is an Environmental Protection Agency ("EPA") delegated state, all NPDES requirements will be met upon MPCA approval.

Storm Water Discharge

As required by MPCA's General Storm water Permit, Developer will prepare both a Temporary and a Permanent Soil Erosion and Sediment Control Plan prior to construction. Both the Temporary and Permanent Erosion and Sediment Control Plans will be incorporated into the Project's final plans and specifications. Erosion control plans will be implemented prior to construction and maintained until construction has been completed and disturbed areas have been successfully re-vegetated.

Small Quantity Generator Permit

A Small Quantity Generator Permit from the MPCA will be necessary if any used lubricating oil will be accumulated and temporarily stored on the site. There is no fee for the permit. The permit can be obtained within 45 days after the Project is placed into operation. No permit is required for virgin lubricants.

4. Minnesota Department of Transportation (MNDOT)

Permit for Access Roads

PRC plans to install accessways at each point where the project access roads meet existing state, county, or township roads or highways. PRC will obtain all necessary accessway permits with the appropriate regulatory entity (MNDOT, County, Township).

Routing Permit for Power Lines

PRC plans to run below ground lines within the Project site to the edge of each landowner's property. This collection system will connect to feeder lines that run above or below ground inside road right of ways to the point of interconnection. PRC will obtain a routing permit with the appropriate regulatory entity (MNDOT, County, Township) for power line installation for any power lines required outside the Project site boundaries.

5. Pipestone and Murray Counties

Wetlands Conservation Act

Based on previous contacts with representatives of the Minnesota Board of Water & Soil Resources, it was determined that the Wetlands Conservation Act (WCA) is administered at the local (county) level. PRC will coordinate with county procedures relating to the Wetland Conservation Act.

6. Federal Aviation Administration (FAA)

Notice of Proposed Construction or Alteration

PRC is proposing to use tubular towers that will result in a hub height of greater than 200 feet for the wind turbines. Federal Aviation Regulations (FAR), Part 77, states that any structure of more than 200 feet in height requires a formal airspace review. A "Notice of Proposed Construction or Alteration" (FAA Form 7460-1) will be filed with the FAA Great Lakes Regional Office when the location and height of the wind turbines has been finalized. Additionally, the siting of the turbines in the Project will be in compliance with any pertinent setback requirements of FAA. PRC anticipates the installation of FAA approved obstruction lighting on some or all wind turbines.

7. Minnesota Historical Society (MHS)

Phase I Archaeology Survey

A Phase I archaeology survey consists of the following tasks: consultation, documentation, and identification. If any archaeological sites are found during the Phase I survey, their integrity and significance should be addressed in terms of the site's potential eligibility to the National Register of Historic Places (NRHP). Any sites recommended as potentially eligible will need to be further tested to determine their eligibility for the NRHP. If such sites are found to be eligible for the NRHP, appropriate mitigative measures will need to be developed in consultation with Minnesota State Historical Preservation Office (SHPO), the State Archaeologist, and consulting American Indian communities.