Application for Site Permit
Prairie Wind Energy Project

Otter Tail County
Minnesota

PRAIRIE WIND ENERGY, LLC

MPUC Docket No: IP-6844/WS-10-438

May 5, 2011

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Dr. Burl Haar
Executive Secretary
Minnesota Public Utilities Commission
121 Seventh Place East, Suite 350
St. Paul, MN 55101

Re: In the Matter of the Application of Prairie Wind Energy, LLC for a Site Permit for the 100 MW Prairie Wind Energy Project in Otter Tail County
PUC Docket No. IP-6844/WS-10-438

Dear Dr. Haar:

Attached is a Site Permit ("Permit") application for the Prairie Wind Project in Otter Tail County, Minnesota (the "Project"). This application is being submitted via the Commission's e-filing system by Fryberger, Buchanan, Smith and Frederick, P.A., on behalf of Prairie Wind Energy, LLC ("PWE"), a Minnesota limited liability company owned by eight individual Minnesota residents. PWE is organized with intent to allow the Project to qualify as a Community-Based Energy Development project under Minn. Stat. § 216B.1612.

PWE filed an application for a Certificate of Need ("CON") on November 29, 2010 under MPUC Docket No. IP6844/CN-10-429.

Prairie Wind Energy, LLC requests a Site Permit authorizing construction of up to a 100 Megawatt (MW) Large Wind Energy Conversion System ("LWECS") in Otter Tail County, Minnesota at the location described herein.

PWE requests that processing this application be combined, to the extent possible, with the associated CON Application.

Sincerely,

/s/ John R. Gasele

John R. Gasele

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List of Acronyms

Acronym	Definition
ANSI	American National Standards Institute
ASN	Aeronautical Study Number
ASTM	American Society of Testing and Materials
BBS	USGS Breeding Bird Survey
CMMS	Computerized Maintenance Management System
CP	Canadian Pacific Railway
CRP	Conservation Reserve Program
dBa	A-weighted decibel
DNR	Department of Natural Resources
DOE	Department of Energy
EMF	Electric and Magnetic Fields
EMF RAPID	Electric and Magnetic Fields Research and Public Information Dissemination Program
EPA	U.S. Environmental Protection Agency
FAA	Federal Aviation Administration
FIRM	Flood Insurance Rate Maps
FmHA	Farm Home Administration Easement
FRACAS	Failure Reporting and Causation Analysis System
FSA	Farm Service Agency
GRE	Great River Energy
IBA	Important Bird Area
kV	Kilovolt
kVA	Kilo Volt-Ampere
kWh	Kilowatt Hour
LWECS	Large Wind Energy Conversion System
M or m	Meters
MDH	Minnesota Department of Health
MET/Met	Meteorological Tower

MISO	Midwest Independent Transmission System Operator
mG	Milligauss
MNBBA	Minnesota Breeding Bird Atlas
MNDoT	Minnesota Department of Transportation
MPUC	Minnesota Public Utilities Commission
MW	Megawatt
MWFRA	Migratory Waterfowl Feeding and Resting Area
NCDC	National Climatic Data Center
NIEHS	National Institute of Environmental Health Sciences
NRCS	Natural Resources Conservation Service
NTIA	National Telecommunications Information Administration
NWI	National Wetlands Inventory
O&M	Operations and Maintenance
OES	Minnesota Office of Energy Security
OTP	Otter Tail Power
PSE	PlainStates Energy
PPA	Power Purchase Agreement
PWE	Prairie Wind Energy, LLC
RIM	Reinvest in Minnesota
SCADA	Supervisory, Control and Data Acquisition
SH	State Highway
SHPO	Minnesota State Historical Preservation Office
SNA	Scientific and Natural Area
TNC	The Nature Conservancy
USFWS	United States Fish and Wildlife Services
VAR	Voltage Amp Reactive
WCFZ	Worst Case Fresnel Zone
WECS	Wind Energy Conversion System
WMA	Wildlife Management Area
WPA	Waterfowl Production Area
WTG	Wind Turbine Generator

1. Applicant Information

1.1 Letter of Transmittal

Please see cover.

1.2 Contact Information

The Applicant

Applicant:	Prairie Wind Energy, LLC
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The Developer

Developer:	PlainStates Energy
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1.3 Signature of Preparer

The application was prepared by the applicant.

1.4 Role of the Applicant in Construction and Operation

PWE, a Minnesota limited liability company formed in 2007, is responsible for the oversight and management of the Project, and will be responsible for construction, operations

and maintenance. PWE is owned by eight individual Minnesota residents, many of whom live within the Project Area.

PWE has been working in conjunction with PlainStates Energy ("PSE"). PSE has been involved with the development, construction, operation and maintenance of large-scale wind projects for 25 years. PSE serves only to facilitate development of the Project under direction of PWE, and has no ownership interest in PWE or the Project.

1.5 Project Operator

PWE intends to operate the Project. This arrangement may change, however, depending on the identity of any equity partner that participates in the Project with PWE. The terms of an equity partner's participation in the Project may require the equity partner to operate the Project for a number of years after the start of commercial operation.

1.6 Permitee

A Site Permit issued for the Project should be issued to the applicant, Prairie Wind Energy, LLC.

2. Certificate of Need

PWE filed its application for a Certificate of Need for the Project on November 29, 2010 under MPUC Docket No. IP6844/CN-10-429. On February 11, 2011, the Minnesota Public Utilities Commission (MPUC) issued an order finding the application complete and initiating the informal review process. On March 31, 2011 the Minnesota Office of Energy Security (OES) recommended approval of the certificate of need pending consideration of the Environmental Report.

PWE has not yet obtained a power purchase agreement or other agreement related to the sale of power generated by the Project. PWE has been and will continue to work diligently to obtain such an agreement.

3. State Policy

The Project, when located at the site proposed in this Application, furthers state policy expressed in Minn. Stat. §216F.03 by siting the Project in an orderly manner consistent with environmental preservation, sustainable development and the efficient use of resources as indicated in this application.

4. Project Description and Overview

4.1 Project Location

The Project is located approximately one mile from the community of Parkers Prairie, Minnesota, in Otter Tail County, west of State Highway (SH) 29 and north of SH 235. Please see Figure 1 for the Project Location.

The Project site is located in the townships of Parkers Prairie, Elmo, Effington and Folden, which are all in Otter Tail County. A complete list of townships, including section numbers, is provided below in Table 4.1.

Table 4.1: Townships, Section and Range Information

Name	Sections	Township	Range
Parkers Prairie Township	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 14, 15, 16, 17, 18, 19, 20, 21	T131N	R37W
Elmo Township	16, 17, 18, 19, 20, 21, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35	T132N	R37W
Effington Township	1, 12, 13, 24	T131N	R38W
Folden Township	25, 36	T132N	R38W

4.2 Project Area Size

PWE has more than 8,000 acres under lease for wind rights and turbine sites for the Project, and is currently working to acquire additional wind rights of approximately 1,500 acres. A map of the Project Site is included as Figure 2. The Project Site includes 23,921 acres. It is estimated that the Project will only impact approximately 135 acres, including turbine sites, roads, substations and associated facilities.

4.3 Project Generator Size

PWE is applying for a Large Wind Energy Conversion System (LWECS) permit to construct a 100 Megawatt (MW) facility. PWE currently intends to use 41 Nordex N117 2.4 MW wind turbine generators ("WTG") with a hub height of 91M. This totals 98.4 MW. However, PWE may consider other turbine manufacturers in the future and requests the ability to modify the turbine selection as deemed appropriate and with the MPUC's approval. Advancements in turbine design continue to be made and many changes in cost or availability may occur prior to construction. Providing flexibility in turbine selection will allow PWE to make the most beneficial choice for the Project during the pre-construction planning.

4.4 Turbine Sites

PWE currently has 43 potential sites identified for turbine locations. Other sites may be identified upon further site analysis. Figure 2 shows potential turbine placements sites.

4.5 Meteorological Towers

The Project has two permanent meteorological towers. The first tower was placed in service in June 2008 and was installed at 380 feet (116 meters) in height with six wind monitoring levels. This tower was destroyed by a tornado on June 17, 2010. It was replaced in September 2010 with a 330 feet (100 meters) tower with five wind monitoring levels. The second tower was installed to 190 feet (58 meters), has 4 levels of instruments and is approximately 3 miles north of the first tower. The towers comply with all necessary Federal Aviation Administration (FAA) regulation and are painted red and white and have aviation wire markers on the guy wires.

4.6 Wind Rights Secured

PWE has 49% of required wind rights secured and is diligently working to secure the remaining wind rights needed for the Project.

4.7 Ownership Statement

PWE does not own any existing LWECS or other wind generation facility, and is only involved in this Project. PSE's owners, however, have interests in other existing or planned projects in Minnesota. These projects are Bear Creek Wind Project and Glacial Ridge Wind Project.

5. Project Design

5.1 Project Layout

The Project optimizes turbine layout while minimizing agricultural impacts. The land within the Project site is mainly agricultural in use with center pivot irrigation systems. These irrigation systems leave dry-land corners on the field that are often less productive than the irrigated portions of the field, and are often not farmed at all. PWE's intent has been to site turbines in a manner that utilizes these dry-land corners in locations that will accommodate current and future agricultural practices in the area.

The layout follows the setbacks outlined MPUC's General Wind Turbine Permit Setbacks and Standards for Large Wind Energy Conversion System pursuant to Minnesota Statute 216F.08. The proposed layout generally employs setbacks of 5 rotor diameters from wind

turbines in the northwest and southeast directions (predominant wind direction) and 3 rotor diameters in the northeast and southwest directions. The setbacks from roads are no less than 250 feet, and in many cases are more than 400 feet. Setbacks from residences are typically more than 1000 feet or a distance necessary to meet state noise standards.

The layout also considers the recommendations of state and federal regulatory agencies, especially those of the Minnesota Department of Natural Resources (DNR), the US Fish and Wildlife Service (USFWS) and the Minnesota State Historical Preservation Office (SHPO). PWE has had substantial discussions with various agencies to minimize environmental impact issues prior to submitting this Application.

Turbine locations are likely to change prior to issuance of the permit, therefore this layout should be considered preliminary.

5.2 Turbines, Towers and Equipment

PWE has modeled the new Nordex N117 – 2.4 MW wind turbine as the turbine of choice for the Project. Turbine choice is based on technology, pricing, future finance partner preference, turbine availability, delivery timeframes and other factors. Technology and pricing continue to change rapidly in the current market. All of these factors may dictate the use of an alternative Nordex turbine model or a different manufacturer altogether. PWE has worked closely with Nordex over the last several years and continues to do so; however, PWE respectfully requests flexibility in turbine choice due to the various factors involved with bringing such a project to commercial operation.

The N117 has a rotor swept area of 10,751 square meters, which is an increase of approximately 27% more than available with the N100 model turbine. The N117 is the largest available rotor in the world for a 2.4 MW nameplate capacity wind turbine and is a true low wind energy conversion system. By utilizing the N117, PWE will be competitive with projects located in the Dakotas, the Buffalo Ridge area and other more robust wind regimes in our region that may be at a somewhat competitive disadvantage because of transmission access issues.

The Project has secured turbine supply commitments from Nordex to provide 41 – 2.4 MW N117 WTGs for a total project capacity of 98.4 MW's. All have proposed hub heights of 91 meters. Additional information is included in Table 5.1.

Table 5.1: Wind Turbine Characteristics – Nordex N117 WTG	
Nameplate Capacity	2.4 MW
Hub Height	91 m (303.5 ft)
Rotor Diameter	117m (383.8 ft)
Total Height	151m (494.5 ft)
Swept Area	10,751 m² (115,722 ft²)
Cut-in Wind Speed	3 m/s (6.7 mph)
Cut-out Wind Speed	20 m/s (44.73 mph)
Rated Wind Speed	11 m/s (24.6 mph)
Rotor Speed	12 rpm

According to Nordex, the N117/2400 has been specially developed for inland locations. Thanks to a rotor diameter of 117 meters and a rotor sweep of 10,751 square meters, the N117/2400 is the highest-yielding IEC 3 turbine in its class. In typical inland regions, Nordex states that it will achieve a capacity of over 3,500 full-load hours, exceeding other turbines in this category by 20 percent. For the Project, this translates into a conservative p50 capacity factor of 38-40 percent. By utilizing the N117/2400 PWE will be able to achieve high and steady electricity production in a region characterized by “low” winds. The Project will demonstrate that low wind sites in Minnesota may compete against some of the more robust, windier areas in the region which PWE believes will lead to an increase in local economic activity in our state.

The acoustic power level is a maximum 105 decibels at the nacelle, allowing the turbine to be used closer to residential areas and ensuring an optimum turbine array in the wind farm. The N117/2400 has also been designed with construction height limits in mind. By using a hub height of 91 meters on the standard tower, this model remains below the critical FAA threshold of 150 meters. This reduces FAA permitting requirements. All turbines will be appropriately marked for safety.

This turbine is the result of Nordex’s eleven years of systematic ongoing technical enhancements to the multi-megawatt platform, 26 years of wind power engineering and the experience gained from over 1,300 installed multi-megawatt wind power systems.

Rotor

The rotor consists of three blades made of high-quality glass fiber-reinforced polyester, a hub, and slewing rings and drives for adjusting the rotor blades mounted to the rotor hub. A pitch system is used to control and optimize output by continually monitoring blade pitch angle and production. If necessary, each rotor blade can be locked in any position to facilitate servicing by means of an innovative locking system.

The pitch angle is held constant under load, and the rotor speed is varied to maximize energy capture. If the rated wind speed is exceeded and load increases above the nameplate rating of the generator, the turbine power output is kept constant by varying the pitch angle to reduce the load and allow the turbine to optimize performance and protect the system in high winds. This is a major attribute of this turbine's variable speed technology and mitigates gearbox torque spikes resulting in longer life and fewer major gearbox issues. Each blade is independent of the others which provides for a safer and more reliable over-speed protection in the event of pitch component failures or grid loss.

Drive Train

The turbine drive train consists of the rotor shaft, the gearbox, an elastic coupling and the generator.

Gearbox

The turbine nacelle is equipped with a two-stage planetary gearbox with a spur gear stage. A differential gearbox is also available. The gearbox is fitted with a cooling circuit with variable cooling output. The gearbox bearing and tooth engagement are kept continuously lubricated with oil.

Generator

The generator is a double-fed asynchronous machine. Nordex has been using this type of generator with variable-speed turbines successfully for many years. The main advantage is that only 25 – 30% of the energy produced needs to be fed into the electricity grid via a frequency converter. The deployment of this generator/frequency converter system thus cuts the total cost of the wind power system. The Nordex N117 uses a proprietary doubly-fed generator and power converter system to ensure the delivery of constant frequency power to the grid. The WTG is also able to provide Voltage Amp Reactive (VAR) support. Variable speed technology provides maximum energy capture, torque control, elimination of voltage flicker as well as power factor control. A major benefit of Nordex power electronics/power conditioning is how it works in conjunction with the pitch system and the mitigation of torque spikes, especially on the drivetrain. Torque transients which cause voltage flicker and damage to drivetrain components, are lessened by allowing an increase or decrease in rotor speeds. Allowing an increase in rotor speeds stores additional energy in the rotational inertia of the rotor blades during a wind gust. This energy can then be extracted and fed into the grid by reducing the rotor speed as the winds

calm, or it can be "dumped" by pitching the blades out of the wind. This translates to more power produced and a longer life span for the drivetrain.

Cooling and Filtration

The gearbox, generator and converter of the turbine each have independent active cooling systems. The cooling system for the generator and frequency converter uses a water circuit, while the gearbox is cooled by an oil-based system. This ensures optimum operating conditions in all types of weather. A separate cooling system room at the rear of the nacelle facilitates access to the cooling units and ensures optimum performance of the individual systems.

Braking System

The three redundant and independently controlled rotor blades can be set at full right angles to the rotation direction for aerodynamic braking. A hydraulic disc brake provides additional support in the event of an emergency stop.

Nacelle

The nacelle consists of the cast machine frame, a welded generator frame, a steel structure for the crane system and for supporting the nacelle housing and the nacelle housing itself, which is made of glass fiber-reinforced plastic. Ergonomically designed, it is spacious and very service-friendly.

Yaw System

The wind direction is continuously monitored by two redundant wind direction sensors on the nacelle. If the permissible deviation is exceeded, the nacelle yaw is actively adjusted by means of up to 4 geared motors. Like many turbines of this size, the turbine incorporates an active yaw drive, 3 independent pitch systems and a double-fed asynchronous generator which incorporates state of the art and patented Nordex converter control technology. The planetary gear box is located on a heavy duty but somewhat flexible frame and mounting to the bedplate. This mitigates torsional twist and other flexing that stems from gyroscopic, thrust and other loading from the rotor and active yaw system.

Tower

The tubular steel tower is designed and certified as a modular tower that complies with industry standards for accessibility and protective measures in the design of the tower interiors (access ladder, platforms and other safety equipment). Nordex offers the N117/2400 on a modular tubular steel tower with a height of 91 meters. The tower is manufactured according to

ANSI and IEC standards, and access to the tower is through a lockable steel door. A ladder with a man-lift is included. The elevator will be inspected annually by certified technicians and the ladder and man-lift will have additional safety descent and ascent devices needed in the event of an emergency.

Control and Grid Connection

The wind turbine has two anemometers. One anemometer is used for controlling the turbine, the second for monitoring the first. All operational data can be monitored and checked on a control screen located in the switch cabinet or via an external laptop. The data and signals are also transmitted via ISDN for remote monitoring, allowing the Project operator to download all key data for the turbine from the Internet. The necessary communications software and hardware will be supplied to PWE by Nordex.

Lightning Protection

Lightning and overvoltage protection of the entire wind turbine is in accordance with industry standards. Receptors are embedded in the blades and serve to conduct the energy produced by lightning from the blade to the turbine where slip rings and brushes provide a conductive path between the rotor and the nacelle, bypassing main/generator and gearbox bearings.

Communications

The Supervisory, Control and Data Acquisition (SCADA) communications system is designed to continually monitor each turbine's status 24 hours a day and 7 days a week. The SCADA will jointly be monitored by Nordex and PWE. The turbines will be interconnected through a network of fiber optic cables in the same trench as the 34.5 kilovolt (kV) collector system that connects the padmount transformers. From the turbines the fiber optic lines will terminate in a central computer center located at the Project Operations Facility. The SCADA system will monitor and perform the following conditions and tasks:

- Remote and local monitoring,
- Alert personnel in event of faults and provide options for remote resets of individual turbines,
- Alert personnel in the event of utility shutdown and those fault instances when a turbine cannot be remotely reset,
- Record turbine performance and historical data to aid in operations and maintenance (O&M),
- Provide inventory information,

- Generate reports concerning operations, maintenance and condition monitoring.

Communication equipment supplied by the utility (for monitoring the wind project by the utility) may be located at either the Project Operations Facility or the Project Substation.

5.3 Description of Electrical System

Padmount Transformers

Step-up transformers will be installed at the base of each turbine to raise the 690 volt generator rating to a collector voltage of 34.5 kV. Power will be run through an underground and/or above-ground collection system to the Project's new Graven Lake Substation, where the voltage will be increased to 115 kV. Junction boxes may be installed between the substation and the various collector circuits to isolate problem areas when needed due to issues such as ground faults.

Electrical Collector System

Underground feeders and J boxes or sectionalizing cabinets are planned, rated at 34.5 kV, to collect power from turbines and subsequent string arrays. The collector system may be constructed on private or public rights-of-way. When installed on or over public property, permits will be obtained from township, county or state authorities. The collector system will be constructed on leased or other property where PWE is able to obtain the necessary rights.

Substation and Switching Station

The Graven Lake Substation is a Facility Upgrade required by Great River Energy (GRE) the interconnecting utility, and the Midwest Independent Transmission System Operator (MISO). The Facility will facilitate a safe and reliable interconnection between a PWE-owned and operated substation and the transmission system to allow flexibility with power flows on the 115 kV transmission system. The completed GRE Facility Study specifies a two breaker scheme, owned and operated by GRE to bring power to the Project from GRE's 115 kV system located on the east side of SH 29 and adjacent to the Project on the west side of SH 29.

The Graven Lake Substation will include breakers, relay equipment and SCADA owned by both GRE and Otter Tail Power Company (OTP). Access to the substation will be secured by a 7 foot fence, and the substation will be lighted as necessary.

A PWE-owned substation will connect to the GRE-owned (Graven Lake) substation at 115 kV. The substation will deliver power through a step-down transformer to the individual

padmount transformers, each rated at 34.5 kV through a series of medium voltage breakers and disconnecting means to protect both the Project owned substation and provide isolation between the Project and GRE. The PWE owned substation consists of a step–down transformer (115 kV/34.5 kV), medium voltage breakers, fusing, relaying equipment and SCADA equipment for both the manufacturer and PWE.

Interconnection

The Project is number G843 in the MISO queue. The Project is a network resource with a maximum summer output of 100MW. PWE has completed its OTP and GRE Facilities Studies, MISO System Impact Study and Feasibility Studies. The only interconnection costs that will be incurred by G843 are those for the interconnecting substation (Graven). Currently, there are no major network transmission upgrades required to interconnect the Project to the grid. PWE plans to interconnect at 115 kV at Township 131N, Range 37W, Section 10 at the proposed GRE Graven Lake Substation.

6. Description and Location of Associated Facilities

6.1 Transmission and Project Substations

PWE plans to interconnect at 115 kV at Township 131N, Range 37W, Section 10 at the proposed GRE Graven Lake Substation, discussed above. The Graven Lake Substation will be located in Parkers Prairie Township in Otter Tail County near the junction of SH 29 and County Road 138. The substation facilities are expected to use a few acres of land that the Project owns or has under lease. The Project does not currently need new transmission lines.

6.2 Collector Lines and Feeder Lines

The miles of collector lines to be used will be determined upon finalization of the layout. PWE estimates that approximately 28 miles of underground and/or overhead collector lines will be required. It is expected that lines will be underground through leased land and overhead along the road right of way to the substation, although this will be determined based on the final layout. The collector line voltage will be 34.5kV. The transformers are expected to be 2500 kVA pad-mounted 34.5kV. PWE expects them to be placed within 50 feet of the turbine.

6.3 Associated Facilities

An operations and maintenance facility, if economically feasible, is eventually planned. This facility will be utilized for operations, maintenance and inventory storage for the Project as well as at least two other projects under development. If built, maintenance and operations for a

total of 167.5 MW, of which 67.5 MW have already been permitted by the MPUC will be aggregated through this facility. The facility and the Prairie Wind Energy Project (100 MW) is somewhat centrally located between the other two projects: Glacial Ridge (20 MW) in SE Pope County and Bear Creek (47.5 MW) in SW Todd and Eastern Otter Tail Counties.

The facility is expected to be built on-site close to the substations; however vacant commercial space in the surrounding community may be considered for the O&M site. A building design has not yet been determined but a typical size for such a facility is 3,000 to 5,000 square feet with additional parking space. This facility is expected to house the SCADA system, serve as an inventory warehouse and be the hub for operations, maintenance, and administrative personnel.

The Project has two permanent meteorological towers. The first tower was placed in service in June 2008 and was installed at 380 feet (116 meters) in height with six wind monitoring levels. This tower was destroyed by a tornado on June 17, 2010. It was replaced in September 2010 with a 330 feet (100 meters) tower with five wind monitoring levels. The second tower was installed to 190 feet (58 meters), has 4 levels of instruments and is approximately 3 miles north of the first tower. The towers comply with all necessary FAA regulations, are painted red and white and have marker balls on the guy wires.

6.4 Permitting for Associated Facilities

Otter Tail County does not have a requirement for building permitting. Otter Tail County did implement a Wind Ordinance, which covers meteorological towers installed after February 15, 2011. The Project's two permanent meteorological towers were built prior to the ordinance and are therefore grandfathered-in. The Project will also need to obtain permits with the Canadian Pacific Railway (CP) to cross railway lines. More information on permitting with CP can be found in Section 8.5.5. The Otter Tail County Wind Ordinance does not apply to commercial-scale facilities such as this Project.

Access road permits for which PWE is responsible will be obtained prior to construction from the various transportation departments located within each township or Otter Tail County. PWE or its construction and/or maintenance contractors will be responsible for obtaining all required permits and licenses that are required following issuance of the LWECS Site Permit. Arrangements and agreements will be made prior to construction with each governing body to ensure ongoing maintenance and upkeep for local traffic use.

7. Wind Rights

The Project is working to obtain the necessary land rights to finalize the site layout. These contracts consist of wind easement contracts solely for the use of the landowner's wind and/or land lease contracts to construct roads, collection lines, turbines or Project facilities. The term of the contracts is 20 years with options for three 10 year extensions. The total Project site is 23,921 acres, and PWE has approximately 8,000 acres currently leased for equipment and roads. PWE expects to have approximately 1,500 acres of wind easement contracts. The area under lease is sufficient to construct and operate the Project. PWE may obtain additional wind rights in the future if necessary.

8. Environmental Impacts

Section 8 provides a description of the environmental conditions that exist within the Project site boundaries. Various exclusion and avoidance criteria were considered in selecting the Project Area as required by MPUC standards for siting LWECS and applicable portions of the Power Plant Siting Act.

8.1 Demographics

The Project is located in Otter Tail County in west central Minnesota. The largest town is the county seat of Fergus Falls. The population of Otter Tail County was estimated to be 56,588 in 2009, down marginally from 57,159 in 2000. Otter Tail County's median household income in 2008 was $42,873[1].

The primary businesses in the Project Area and the surrounding area are agricultural. In 2007, Otter Tail County had 3,296 farms covering 898,703 acres with an average farm size of 273 acres.[2]

The following table provides demographic information for townships within the Project Area:

[1] U.S. Census Bureau. State & County QuickFacts, http://quickfacts.census.gov/qfd/states/27/27111.html. Retrieved February 16, 2011

[2] U.S. Department of Agriculture. 2007 Census of Agriculture County Profile Otter Tail County, Minnesota. http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/County_Profiles/Minnesota/cp27111.pdf. Retrieved February 16, 2011.

Table 8.1-1: Demographic Information within Project Area[3]						
Area	**2009 Population**	**2009 Households**	**Land Area in sq/mi**	**2009 Population Density**	**2000 Population Density**	**2009 Median Household Income**
Effington Township	259	106	32.98	7.9	9.0	$ 29,583
Elmo Township	316	128	36.33	8.7	9.5	36,250
Folden Township	234	110	34.49	6.8	7.7	39,688
Parkers Prairie Township	334	135	32.65	10.2	10.6	54,375

The following table provides demographic information for townships and cities within 5 miles of the Project boundary:

Table 8.1-2: Demographic Information within 5 miles of Project Boundary[4]					
	2009 Population	**2009 Households**	**Land Area in sq/mi**	**2009 Population Density**	**2000 Population Density**
Douglas County:					
Leaf Valley Township	486	199	33.43	14.5	14.5
Miltona Township	766	367	27.11	28.3	30.0
Spruce Hill Township	441	171	35.83	12.3	11.0
Otter Tail County:					
Eastern Township	248	99	35.32	7.0	7.2
Henning, City	792	395	3.09	256.3	232.4
Henning Township	354	146	32.59	10.9	13.1
Inman Township	336	117	36.56	9.2	9.6
Oak Valley Township	331	141	35.70	9.3	10.1
Parkers Prairie, City	1007	415	1.18	853.4	841.8
Urbank, City	54	31	0.73	74.0	80.7
Woodside Township	317	101	36.23	8.7	8.1

[3] 2009 Population and Households from http://www.demography.state.mn.us/estimates.html on February 16, 2011. Land Are in sq/mi and 2000 Population Density from http://www.demography.state.mn.us/a2z.html#Population density on February 16, 2011. The 2009 Population Density was not yet available as of February 16, 2011, therefore it was calculated by dividing the 2009 Population by the Land Area in sq/mi. The 2009 Median Household Income was retrieved from the U.S. Census Bureau http://factfinder.census.gov on February 16, 2011.

[4] 2009 Population and Households from http://www.demography.state.mn.us/estimates.html on February 16, 2011. Land Are in sq/mi and 2000 Population Density from http://www.demography.state.mn.us/a2z.html#Population density on February 16, 2011. The 2009 Population Density was not yet available as of February 16, 2011, therefore it was calculated by dividing the 2009 Population by the Land Area in sq/mi.

Impacts

PWE does not expect the demographics of the area to change due to the construction of the Project. The population within and around the Project Area may be able to hear some sound from the turbines, but as described in section 8.3, the turbine distance from homes will meet state noise standards. As described in section 8.4.3, shadow flicker may occur on some homes at a certain time of day on certain days of the year under sunny weather conditions. Residents will be able to see the turbines, which cannot be avoided. The Project will increase income to local landowners within the Project Area and, as described in section 8.12, will bring jobs and new residents to the Project Area and surrounding community.

Mitigation

As described in section 8.3, the turbine distance from homes will meet state noise standards. Please see section 8.3 for further information on noise. As described in section 8.4.3, PWE has limited shadow flicker through turbine siting. Please see section 8.4.3 for shadow flicker studies. The remaining areas of section 8 provide further detailed analysis of the environmental impacts of the Project.

8.2 Land Use

8.2.1 Local Zoning and Comprehensive Plans

Otter Tail County does not have a comprehensive plan. It does, however, have a Setback ordinance, Shoreland Management ordinance, Subdivision Controls ordinance and Sanitation Code. Otter Tail County enacted a Wind Energy Conversion System Ordinance effective February 15, 2011. The ordinance does not apply to the Project. Its purpose is

> "to regulate the installation and operation of Wind Energy Conversion Systems (WECS) and Meteorological Towers (MET) within Otter Tail County *not otherwise subject to siting and oversight by the State of Minnesota under the Minnesota Power Plant Siting Act (MS 216E.01-216E.18) and/or the Wind Energy Conversion System Act (MS 216F.01-216F.09).*"[5]

PWE will adhere to the State siting standards because the Project is outside the scope of the Otter Tail County ordinance,.

PWE is not aware of any comprehensive plans or zoning ordinance in the four townships within the Project boundary. The city of Parkers Prairie is adjacent to the Project boundary.

[5] Otter Tail County Wind Energy Conversion System Ordinance, Effective February 15, 2011, Section I, part 2, available online at http://www.co.otter-tail.mn.us/land/windenergy/WindEnergyConversionSystemOrd02-15-2011FINAL.pdf (last visited April 28, 2011) (emphasis added).

There are no urban growth boundaries within or adjacent to the Project Area nor is there any zoning that would impact the Project site. PWE discussed the Project's location with the Parkers Prairie city administrator to determine if there are any current or potential future developments that the Project may impact, and learned that there are no such plans. No changes are expected in zoning in Otter Tail County, the city of Parkers Prairie or the townships within the Project site.

Impacts

PWE does not expect the Project to have an impact on any local zoning.

Mitigation

PWE has reviewed zoning and planning documents and ordinances. As discussed above, the Otter Tail County wind siting ordinance does not apply to the Project, and PWE will adhere to the State siting standards.

8.2.2 Conservation Easements

There is one Reinvest in Minnesota (RIM) property within the Project boundary (see Figure 3). The Nature Conservancy (TNC) is a non-profit, private organization that acquires lands for conservation purposes. Based on online review of their Minnesota preserves, there are no known TNC lands within or adjacent to the Project boundary. PWE performed a title search on the property under lease by the Project and no private conservations easements were noted.

There is Conservation Reserve Program (CRP) land within the Project boundary. Some CRP land is leased by PWE for turbine placement and some CRP land over which PWE has wind rights agreements.

No other conservation easements have been found within the Project boundary.

Impacts

No impacts are expected on property with permanent conservation easements because PWE will not place Project facilities within permanent conservation easements.

Mitigation

PWE has been in contact with the DNR as well as the USFWS and Natural Resources Conservation Service (NRCS), to discuss and mitigate impacts in the Project siting process. Project facilities will not be located on any land with a permanent conservation easement. PWE will work with landowners as well as the local U.S. Department of Agriculture's Farm Service Agency (FSA) and NRCS office to ensure necessary regulations are followed if turbines or associated facilities are placed on CRP land. The Project will continue to work with the

necessary agencies to ensure the proper siting and setbacks are followed to protect conservation lands.

8.3 Noise

Noise is defined as any unwanted sound. Noise levels are typically measured in terms of the A-weighted decibel (dBA) scale, which was developed to approximate the human ear's sensitivity to certain frequencies by emphasizing the middle frequencies and de-emphasizing lower and higher frequencies. This scale, expressed as dBA, best correlates the human response to sound and is commonly used as a descriptor for ambient sound levels.

Description of Resource

Noise in the proposed Project Area is predominantly agricultural activity, motor vehicles, the CP trains that pass through the area, wildlife and wind noise. In this rural area, higher noise levels will exist for residents closer to tarred roads and those closer to the railroad. Areas with high wind resources will also experience more ambient wind noise than those with less wind. Ambient noise levels in the Project Area are expected to be between 35 and 44 dB. According to the U.S. Environmental Protection Agency (EPA), wilderness ambient noise is 35 dB, rural residential is 39 dB and agricultural crop land is 44 dB.[6]

Impacts

Noise originates from mechanical equipment inside the nacelles of the turbines (gears, generators, etc.) and from interaction of turbine blades with wind (aerodynamic noise). Newer wind turbines, such as those to be used in the Project, generate minimal noise from mechanical equipment. Aerodynamic noise is the "whooshing" sound of the blade passing through the air. Low frequency noise is byproduct of aerodynamic noise. Noise levels vary by the distance of the listener from the turbine, wind speed and the speed of the turbine.

A significant number of studies and reviews have been performed in recent years regarding wind turbine noise. Epsilon Associates performed an extensive search of scientific research and reports as well as analysis and field testing of two of commonly utilized wind turbines and concluded the following:

> Early down-wind wind turbines in the US created low frequency noise; however current up-wind wind turbines generate considerably less low frequency noise. The results of Epsilon Associates, Inc. (Epsilon) analysis and field testing

[6] U.S. Environmental Protection Agency. *Protective Noise Levels Condensed Version of EPA Levels* Document. November 1978.

> indicate that there is no audible infrasound either outside or inside homes at the any of the measurement sites – the closest site was approximately 900 feet from a wind farm. Wind farms at distances beyond 1000 feet meet the American National Standards Institute (ANSI) standard for low frequency noise in bedrooms, classrooms, and hospitals, meet the ANSI standard for thresholds of annoyance from low frequency noise, and there should be no window rattles or perceptible vibration of lightweight walls or ceilings within homes. In homes there may be slightly audible low frequency noise (depending on other sources of low frequency noise such as refrigerators and traffic); however, the levels are below criteria and recommendations for low frequency noise within homes. In accordance with the above findings and in conjunction with our extensive literature search of scientific papers and reports, there should be no adverse public health effects from infrasound or low frequency noise at distances greater than 1000 feet from the wind turbine types measured by Epsilon: GE 1.5sle and Siemens SWT 2.3-93.[7]

The Minnesota Department of Health (MDH) white paper issued in May 2009 concluded that noise models may under-predict wind speed due to measuring wind velocity at low heights, such as 10m and then modeling it for higher elevation.[8] PWE's met tower number one was originally 380 feet (116m) with six monitoring levels, but was rebuilt to 330 ft (100m) with five wind monitoring levels. These met tower heights allow for accurate wind analysis at hub height (or higher) and results in less data modeling at high heights. PWE's noise modeling uses accurate wind speed data for the Project.

Some additional noise will occur during the construction phase of the Project, which will mostly consist of increased traffic noise to residents during daytime hours.

Mitigation

PWE has diligently considered noise levels during turbine siting. Turbines have been sited using a 1,000 foot setback from residence, unless otherwise arranged with the landowner. In all cases, final locations of the turbines will meet state noise standards. An initial noise study has been performed, and the results are attached as Appendix B.

The noise impacts for the whole Project and a single representative WTG were modeled in WindPRO. Noise information provided by Nordex indicated that the loudest the turbine operates at is 105 dB at the nacelle. No octave data was provided. Two scenarios were modeled within WindPRO, referred to as "worst case" and "realistic". These two scenarios have common

[7] Epsilon Associates, Inc. July 2009. A Study of Low Frequency Noise and Infrasound from Wind Turbines.
[8] Minnesota Department of Health Environmental Health Division. May 22, 2009. Public Health Impacts of Wind Turbines.

settings, except for the ground attenuation methods applied. The worst case scenario assumes no ground attenuation, while the realistic applies the "Alternative" ground attenuation, which takes into account terrain and a set value for attenuation due to land use. The common settings within WindPRO included using the ISO-9613-2 General noise model. The sensors within WindPRO were assumed to be at 1.5 m above the surface and had a threshold of 50 dB applied.

From a single turbine application, Appendix B Figures 1 and 2 as well as Table 1 indicate the noise values compared to distance. The noise level would be below the 50 dB threshold at roughly 200 meters (656 feet) from a single N117 turbine.

When the noise was modeled for the Project collectively, only one sensor had a predicted noise value above 50 dB. Sensor NR 20 is estimated to have a noise level of 50.1 dB(A) assuming no ground attenuation, and 49.3 dB(A) under the realistic case using Alternative ground attenuation data.. The property at sensor NR 20 is owned by members of PWE. A map showing the realistic noise study results is attached as Figure 15.

Turbine noise analysis will continue to be performed as final turbine type and locations are determined.

8.4 Visual Impacts

Agricultural fields, farmsteads, large open vistas and pre-historic glacial deposits with some wooded areas make up the landscape in all directions around the Project site. A combination of cropland and small mixed woodland plots surround the site. Most of the proposed Project is located at an approximate mean elevation of 1400 feet above sea level. The Project is located in a very exposed area.

8.4.1 Visual Impacts on Public Resources

The turbines will be visible from nearby lakes and wetlands, including the Starkey Waterfowl Production Area (WPA). Turbines will also be visible to visitors to Inspiration Peak, a State Wayside Park west of the Project Area. The turbines may be visible from the other public resources described in Section 8.7. Figure 3 identifies public resource areas in and near the Project Area.

8.4.2 Visual Impacts on Private Lands and Homes

Turbines will be visible to residents in and surrounding the Project Area. This includes residents of the nearby city of Parkers Prairie and possibly the city of Henning depending on final turbine layout. Turbines must also be lighted during nighttime hours to meet FAA

requirements. Safety lights will consist of a synchronized flashing red light on the turbine, similar to those used in communications towers. The final nighttime lighting plan will be submitted to the FAA for approval prior to construction.

8.4.3 Shadow Flicker

Shadow flicker occurs when the blades of a turbine pass in front of the sun to create a recurring shadow on an object, such as a residence. Shadow flicker will occur only under certain environmental conditions and is impacted by various factors such as:

- Sun, cloud cover and visibility (such as fog);
- Sun angle and sun path, which varies by season;
- Turbine location to the residence;
- Wind direction;
- Obstacles, such as trees or buildings; and
- Operation of the turbine. If a turbine is not moving, it will not cause shadow flicker.

Shadow flicker for the whole Project and an individual representative turbine were evaluated within WindPRO. Two scenarios were considered, worst case and realistic. The worst case scenarios assume that the wind turbines are always in operation, always facing into the sun, and that there is no cloud cover. These assumptions are unlikely to occur. The realistic case statistically reduces the shadow flicker hours by taking into consideration the wind speed (cut-in wind speed), directional distribution and sunshine probabilities. Both scenarios used "greenhouse" sensors (shadows viewable from all angles), assumed no vegetation or obstacles block the shadows, that a shadow is possible when the sun is 3 degrees above the horizon, and a distance limit of 1,500 m. Although trees, shrubs and out buildings were not considered as part of this initial study they may be considered for in future shadow flicker analysis. The Project will perform an additional shadow flicker analysis upon completion of the final layout. The shadow flicker impact and footprint for a single typical N117 can be found in Appendix B, Table 2 and Figures 3 and 4. A map showing realistic shadow flicker study results is attached as Figure 14.

Shadow flicker mitigation systems will be considered where necessary. These systems utilize light sensors to measure the intensity of the sunlight almost exactly to the second. Based on the monitoring results, it is possible to determine whether the intensity of the direct sunlight and the current position of the sun results in shadow impact in any places of interest, such as a residence. If the shadow impact level is exceeded, the WTG is automatically shut down for the duration of the shadow impact.

8.4.4 Mitigation

The wind turbines will alter the landscape. Wind turbine aesthetic qualities are subjective and depend upon those viewing them and their relationship to the Project, the community and the environment. There is a vast combination of perspectives based on personal beliefs. Feedback received by PWE from the community has generally been very positive for the Project. Many community members contacted by PWE believe the turbines have a rural "feel" and are compatible with traditional farming heritage. Although these wind turbines are industrial in purpose, they are essentially "farming" the wind and thus are not unlike other agricultural activities currently taking place in this community. Other community members are resistant to the visual changes the construction of the Project would bring to the community. PWE has been sensitive to those concerned with the visual perspective of placing turbines within eyesight of existing or future residences.

PWE proposes the following measures to mitigate the visual impact of the Project:

- Wind turbines will not be located in Nature Conservancy Land, State Wildlife Management Areas (WMA), or Scientific and Natural Areas (SNA), native prairies, or wetlands.
- Existing roads will be used for construction and maintenance when possible.
- Road construction will be minimized to the extent possible.
- Access roads created for the Project will be located on gentle grades to minimize visible cuts and fills to the extent possible.
- Temporarily disturbed areas will be reseeded to minimize erosion and to blend in with existing vegetation.
- Turbines will have lighting only to meet the requirements of the FAA.
- Turbines will be uniform in color (white).
- Turbines will be sited to minimize shadow flicker on residence. Shadow flicker will be discussed with owners of impacted residence prior to construction to ensure residents are aware of the potential occurrences.
- Shadow flicker mitigation systems will be considered where necessary.

8.5 Public Services and Infrastructure

The Project is located in a moderately populated, rural area in west central Minnesota. There is an established transportation and utility network that provides access and necessary services to the light industry, small cities, homesteads, and farms existing near the Project Area. The city of Parkers Prairie is approximately one mile east of the Project site. Other nearby incorporated cities include Henning and Urbank which are within 5 miles of the Project

boundaries. The southern portion of the unincorporated town of Almora is included in the Project boundary. Residents and farms in the Project Area use private wells and septic systems. The cities of Parkers Prairie, Henning and Urbank provide sanitary sewer and water services within city limits. Henning and Parkers Prairie have volunteer fire departments and full-time police departments. The city of Parkers Prairie would be most likely to provide police and fire department services to the Project if needed. The townships of Parkers Prairie, Elmo, Folden and Effington and the town of Almora have limited public infrastructure and services.

Impacts

The Project will have some impact on public services. The following sections describe specific impacts the Project will have on roads, telecommunications, communication systems and television signals.

Mitigation

The Project will adhere to all applicable federal, state and local regulations and follow all MPUC permit guidelines when constructing and operating the Project. The Project will work with the local fire and police departments to develop emergency response plans related to the Project.

8.5.1 Roads

The table below provides all roads, road miles and their classification within the Project boundary. The Project will follow a setback of 250 feet from all roads.

Table 8.3: Roads		
Road Name	**Road Miles**	**Road Classification**
SH 29	4.3	State Highway
SH 235	3.9	State Highway
C.R. 6	4.1	County
C.R. 40	2.6	County
C.R. 42	2.5	County
C.R. 65	1.6	County
C.R. 79	.5	County
C.R. 129	1.75	County
C.R. 136	6.5	County
C.R. 138	1.5	County
C.R. 139	.75	County
150th St	4.5	Township
160th St	4	Township
178th St	.5	Township
180th St	2	Township
535th St	.2	Township
540th St.	3.5	Township
550th St.	.4	Township
545th Ave	1	Township
555th Ave	3.2	Township
Elmo Rd	1.1	Township
Heartland Rd	2.4	Township
Horsehead Lake Rd	1.2	Township
Nelson Rd	1.4	Township
Resser Rd	5.3	Township
Schultz Loop	.5	Township
Tomten Rd	3.5	Township

Road Impacts

Traffic will increase during the construction phase of the Project. Short-term issues relating to traffic bottlenecks may occur while bringing construction equipment, wind turbines, concrete and other materials to the site.

Construction of the Project may require some local unimproved roads to be upgraded and creation of new field accesses to facilitate the installation, operation, and maintenance of the wind farm. These accesses will be located along the wind turbine strings, fence lines, and field edges to minimize their number and disturbance to agricultural activities to the extent possible.

Roads will not be installed on steep slopes or in areas which have a tendency towards erosion, which would complicate and increase construction and maintenance costs.

Typical access roads will be designed to accommodate long and large semi trucks hauling rotor blades and heavy equipment. Culverts will be utilized where needed and as directed by local permitting authorities so as not to alter the direction of natural flowing water. Field roads will be approximately 16 feet wide and surfaced with class 5, which is typical of field roads for wind turbine construction. An underlayment of road fabric may be installed to facilitate field travel for heavy loads. Field and/or access roads will not be installed across streams.

Short-term traffic delays may occur to repair the roads during the post-construction phase if any road damage is created by the Project.

The access roads will be used during operation and maintenance of the wind farm by Project crews while inspecting and servicing the wind turbines. The roads will be maintained by periodic grading.

Mitigation

PWE will ensure that all permits and safety procedures are followed to mitigate traffic impacts. PWE will contact local authorities prior to construction to discuss our maintenance plan and to ease any road maintenance concerns they may have. The maintenance plan will include local roads being maintained on a periodic basis or as needed. This plan may include grading and possibly the supply of class 5 from time to time to fill and level areas impacted by the increase in local traffic. PWE will implement dust control measures to minimize impacts. Our upfront approach to working with all agencies should minimize concerns and the roadways will be left in the same condition as prior to construction.

8.5.2 Telecommunications – Description of Resource, Impacts, Mitigation

Telecommunication systems in the Project Area consist of underground telephone and fiber optic services. Construction and operation of the Project is not expected to impact any underground facilities in or to the Project Area. If any interference occurs, the Project will work with the applicable service provider to resolve the problem. Underground facilities will be located in the areas being excavated prior to construction.

8.5.3 Communication Systems - Description of Resource, Impacts, Mitigation

The Project has performed an initial analysis of the site's impact on long-range radars, weather radars and military training routes through the FAA's Obstruction Evaluation-DoD

Preliminary Screening Tool.[9] The initial analysis for long-range radar and Nexrad analysis resulted in a "green" meaning "no anticipated impact." The initial analysis for military operations radar resulted in a result of "The preliminary review of your proposal does not return any likely impacts to military airspace." This preliminary screening does not substitute for the official search process. All necessary filings with the FAA will be completed and approved prior to construction.

PWE contacted the National Telecommunications Information Administration (NTIA), which notified federal agencies represented in the Interdepartment Radio Advisory Committee. No federal agencies identified any concerns with the Project regarding blockage of their radio frequency transmission. The letter from the NTIA is included in Appendix C.

PWE has also completed a microwave beam path study for the Project Area. See Appendix A. The initial study found one potential obstruction within the Worst Case Fresnel Zone (WCFZ). PWE will consider a detailed clearance study to determine if the potential obstruction is an issue, or will micro-site that particular turbine to avoid the WCFZ. Upon final turbine selection and site determination, further microwave beam path analysis will be performed as necessary. PWE will not cause microwave, radio, telephone, or navigation interference contrary to FCC regulations or other law. PWE may consider additional communications studies prior to construction. In the unlikely event the Project or its operation causes such interference, PWE will take the steps necessary to correct the problem.

8.5.4 Television - Description of Resource, Impacts, Mitigation

PWE may perform an off-air television reception analysis of the Project Area prior to construction. Digital signals within the Project Area are listed in the table below, which is based on the signals to the nearest cities within and surrounding the Project boundary. PWE does not intend to site the Project in a manner that would causes television interference contrary to FCC regulations or other law. If interference occurs after construction, PWE will work with affected residents to determine the cause of interference and, where necessary, reestablish acceptable reception in a timely fashion.

[9] Federal Aviation Administration, DoD Preliminary Screening Tool. Retrieved February 21, 2011. https://oeaaa.faa.gov/oeaaa/external/gisTools/gisAction.jsp?action=showLongRangeRadarToolForm

Table 8.5.4: Digital Television Signals in the Project Area[10]			
Project Area Zip Code	**Call Sign**	**Network**	**Signal Strength**
Vining	KVVR	Fox	Strong
Vining	KCCO	CBS	Weak
Vining	KCCW	CBS	No Signal
Vining	KSAX	ABC	No Signal
Vining	KAWB	PBS	No Signal
Henning	KVRR	Fox	Strong
Henning	KCCO	CBS	Weak
Henning	KCCW	CBS	Weak
Henning	KAWB	PBS	Weak
Henning	KSAZ	ABC	Weak
Henning	KFME	PBS	No Signal
Henning	WDAY	ABC	No Signal
Parkers Prairie	KSAX	ABC	Strong
Parkers Prairie	KCCO	CBS	Strong
Parkers Prairie	KAWB	PBS	Weak
Parkers Prairie	KVRR	FOX	Weak
Parkers Prairie	KCCW	CBS	Weak
Parkers Prairie	KWCM	PBS	No Signal

8.5.5 Other Infrastructure – Railroads - Description of Resource, Impacts, Mitigation

The CP railway runs through the Project boundary between the cities of Parkers Prairie and Henning. PWE will need to run underground and overhead collector lines under and above the railroad. PWE will also need to cross the railroad during equipment movement and building. PWE does not expect the Project to have a significant impact to CP. PWE has been in contact with the CP and has identified key personnel and the process for obtaining permits and working within the railroads right-of-way.

Permits will be applied for from CP through its two-part process. An application with a $500 non-refundable fee is sent to CP's Public Utilities Coordinator, where it is evaluated and then sent to another entity within CP (Outside of Public Right of Way) where the application and recommendations are reviewed. A Real Estate Permit is then issued with additional fees. CP has their own "One Call" center to locate underground facilities within CP right-of-way. No work can or will be performed prior to contacting CP's One Call and obtaining clearance from CP.

[10] Federal Communications Commission: http://www.fcc.gov/mb/engineering/maps/ Obtained February 19, 2011

8.6 Cultural and Archaeological Resources

Description of Resource

PWE queried the SHPO database for archaeological sites and historic properties within and near the Project boundary. Mr. Tom Cinadr, Survey and Information Management Coordinator at SHPO, conducted the query (included in Appendix C). The query results provided a listing of recorded archaeological sites and historic architectural properties that are included in the current SHPO databases. Additional research, including a field survey, may be necessary to adequately assess the area's potential to contain historic properties.

Archaeological sites and historic properties within the Project Area were identified in a search of the Minnesota Archaeological Inventory and Historic Structures Inventory. In total eight archaeological sites were identified. Six of those sites are located within the boundaries of the municipality of Parkers Prairie, which is outside the Project boundary. The location of the one site identified in the Project footprint is designated as security information and cannot be disclosed under Minn. Stat. § 307.08, subd. 11. Three mounds and human skeletal materials have been noted in this area. PWE's turbine layout will not impact this site.

Impacts and Mitigation

Because the majority of archaeological sites in the state and many historic architectural properties have not been recorded, important sites or structures may exist within the Project site and may be affected by development projects within the area. Construction within the turbine footprint, cable trenching, and access roads may impact cultural resources.

The Project has been sited to avoid the one site identified within the footprint. 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 will offer recommendations for site avoidance, impact minimization, or other appropriate mitigation measures, if necessary. The Project will adjust the Project plans as necessary to avoid any archaeological resources.

8.7 Recreation

Description of Resource

Recreation in the area consists of fishing, hunting, swimming, camping, boating, snowmobiling, 4-wheeling, cross-country skiing and other outdoor activities.

Inspiration Peak State Wayside Rest is 7.48 miles west of the Project boundary and covers 82.6 acres.

Various snowmobile trails are within 10 miles of the Project boundary. The Prairie Snow Drifters Trail runs through the Project boundary along SH 29. Other snowmobile trails within 10 miles of the boundary include, but are not limited to, Henning Sno Cruisers Trail and the Villard Hood-Up Trails.

The following table lists the only state park within 10 miles of the Project boundary:

Table 8.7-1: State Parks within 10 Miles of Project Boundary

State Park Name	Distance From Project Boundary (Miles)	Direction	Acres
Lake Carlos	9.03	S	1,199.60

The following WMAs are within 10 miles of the Project boundary:

Table 8.7-2: WMAs within 10 Miles of Project Boundary

WMA Name	Distance From Project Boundary (Miles)	Direction	Acres
Almora	Adjacent	N	164
Big Spruce	9.07	SE	48
Eastern	2.31	E	1,027
Elmo	0.49	N	1,508
Folden	1.25	W	320
Hartfiel	3.3	S	63
Inman (Wunderlich)	2.5	N	1352
Inspiration	7.88	W	59
Miltona	2.22	S	107
Schulke	2.67	S	38
Sixteen	2.72	W	119
Spruce Creek	5.9	SE	358
Wrightstown	3.11	E	221

The following table provides Farm Home Administration Easements (FmHA) under the U.S. Fish and Wildlife Service, Fergus Falls Wetland Management District:

Table 8.7-3: FmHA Easements within 10 Miles of Project Boundary			
FmHA Name	**Distance From Project Boundary (Miles)**	**Direction**	**Acres**
Branstner FmHA	8.12	E	119.9
Coyer FmHA	7.43	E	157.3
FmHA (Unnamed)	6.35	NE	106.9
Iliff FmHA	7.44	E	11.2

The following WPAs are within 10 miles of the Project boundary:

Table 8.7-4: WPAs within 10 Miles of Project Boundary			
Name	**Distance From Project Boundary (Miles)**	**Direction**	**Acres**
Starkey	In Project	In Project	94.2
Baumann	1.5	N	489.3
Riedel	2.2	SE	142.0
Downing	2.81	SE	99.9
Rokes	3.78	N	604.1
Millerville	5.27	SW	523.9
Chippewa Valley	5.37	SW	196.1
Rose City	6.15	SE	79.6
Stich	7.09	W	148.6
Tuel	8.24	W	119.9
Bjerkevedt	8.42	W	105.7
Klein	8.86	SW	332.5
Wagner	9.24	SW	162.0

Table 8.7-5: Douglas County WPAs within 10 Miles of Project Boundary			
County Tract Number	**Distance From Project Boundary (Miles)**	**Direction**	**Acres**
145X	2.02	S	244.7
42X	2.33	S	131.3
185X	3.00	S	201.9
69X	3.77	S	117.4
208X	3.90	SE	80.8
147X	3.97	S	243.0
207X	4.60	SW	206.3
90X	5.01	SW	161.3
184X	5.21	SW	159.4
205X	5.47	SE	81.3
98X	5.95	SE	80.8
168X	6.30	SE	78.8
84X	6.36	SW	42.3
293X	7.22	S	42.8
306X	7.24	SW	122.5
307X	7.76	SW	73.9
346X	7.83	SW	128.4
89X	7.84	SE	59.9
101X	8.29	S	83.6
352X	8.46	SW	146.9
234X-2	8.58	SW	87.1
227X-2	8.66	SW	58.0
234X-1	8.95	SW	17.2
232X	9.03	SW	98.6
62X	9.07	SW	101.0
232X-1	9.51	SW	20.5
62X-1	9.54	SW	40.1
191X	9.58	SW	40.2
234X	9.78	SW	100.2
269X	9.81	SE	59.8
213X	9.84	S	75.7
317X	9.98	S	160.1

Table 8.7-6: Otter Tail County WPAs within 10 Miles of Project Boundary

County Tract Number	Distance From Project Boundary (Miles)	Direction	Acres	County Tract Number	Distance From Project Boundary (Miles)	Direction	Acres
761X	In Project	In Project	397.9	**798X**	4.44	W	245.6
251X-1	In Project	In Project	40.6	**808X**	4.47	W	71.7
263X	In Project	In Project	301.5	**351X-1**	4.48	W	123.0
263X-1	In Project	In Project	80.5	**350X**	4.48	W	98.0
234X	In Project	In Project	163.9	**733X**	4.49	W	127.0
237X	In Project	In Project	365.1	**715X**	4.61	N	57.3
269X	In Project	In Project	118.5	**204X**	4.93	W	216.3
536X	In Project	In Project	102.7	**808X-1**	4.93	W	200.0
250X	In Project	In Project	40.9	**799X**	5.15	W	347.1
534X	In Project	In Project	20.2	**734X**	5.4	W	268.0
251X	In Project	In Project	79.7	**146X**	5.41	E	140.9
781X	In Project	In Project	276.1	**733X-2**	5.66	W	24.3
826X	In Project	In Project	99.2	**659X**	6.33	NW	78.7
378X	In Project	In Project	227.3	**802X**	6.36	W	68.0
550X	In Project	In Project	138.3	**635X**	6.46	W	126.7
227X	In Project	In Project	138.3	**698X**	6.51	SW	97.1
791X	0.5	W	78.4	**388X**	6.53	NW	106.3
686X	1.22	N	235.0	**700M**	7.17	SW	40.1
816X	1.23	N	120.5	**634X**	7.18	W	64.1
262X	1.23	E	265.4	**685X**	7.22	W	183.1
807X	1.52	W	156.2	**666X**	7.42	SW	39.2
817X	1.83	NW	157.7	**813X**	7.43	NW	33.1
254X	1.93	E	162.0	**770X**	7.67	SW	76.6
262X-1	2.02	E	40.0	**301X**	7.92	W	279.0
828G-1	2.24	W	30.2	**790X**	8.03	W	118.4
261X	2.49	W	118.2	**706X**	8.13	W	80.7
828G	2.61	W	98.2	**719X**	8.31	SW	234.7
797X	2.74	W	80.7	**410X**	8.44	W	79.3
796X	2.97	W	77.8	**825**	8.93	W	162.0

Table 8.7-7: WPAs within 10 Miles of Project Boundary – Otter Tail County WPAs (Continued)							
County Tract Number	**Distance From Project Boundary (Miles)**	**Direction**	**Acres**	**County Tract Number**	**Distance From Project Boundary (Miles)**	**Direction**	**Acres**
795X	2.97	W	75.4	**52X-1**	9.11	W	41.2
777X	2.97	W	160.9	**557X**	9.15	SW	79.5
804X	2.98	W	81.2	**52X**	9.22	W	80.3
726X	3.23	W	87.5	**424X**	9.23	N	159.2
803X	3.23	W	11.6	**710X**	9.24	W	78.2
728X	3.47	W	40.3	**710X-1**	9.26	W	29.7
765X	3.5	N	79.6	**64X**	9.69	SW	60.7
351X	4.02	W	271.4	**157X**	9.69	W	249.1
780X	4.21	W	76.2	**207X**	9.87	N	121.2

Impacts

The only expected impact to recreation within and surrounding the Project Area are visual. Please see Section 8.4 for a description of visual impacts and mitigative measures.

Mitigation

WTGs will not be located within county or state parks, WMAs, SNAs, WPAs or any other public recreational areas. The Project will follow the required setbacks from public lands of five rotor diameters along the prevailing wind direction and three rotor diameters along non-prevailing wind direction. The Project will continue to work with the applicable agencies to minimize impacts to recreation areas.

8.8 Public Health and Safety

8.8.1 EMF

Electric and magnetic fields (EMFs) are invisible lines of force associated with the production, transmission, and use of electric power such as those associated with high-voltage transmission lines (typically metal poles), distribution power lines (typically wooden poles), and home wiring and lighting. Electric and magnetic fields also arise from the motors and heating coils found in electronic equipment and appliances.[11] Sources with high voltage produce strong

[11] National Institute of Environmental Health Sciences – National Institute of Health, Electric and Magnetic Fields. http://www.niehs.nih.gov/health/topics/agents/emf/. Retrieved February 21, 2011.

electric fields, while sources with strong currents produce strong magnetic fields. The strength of both electric and magnetic fields weaken with increasing distance from the source.[12] Power transmission lines bring power from a generating station to an electrical substation. Power distribution lines bring power from the substation to your home. Transmission and distribution lines can be either overhead or underground. Overhead lines produce both electric fields and magnetic fields. Underground lines do not produce electric fields above ground but may produce magnetic fields above ground. A person standing directly under a high-voltage transmission line may feel a mild shock when touching something that conducts electricity. These sensations are caused by the strong electric fields from the high-voltage electricity in the lines. They occur only at close range because the electric fields rapidly become weaker as the distance from the line increases. Electric fields may be shielded and further weakened by buildings, trees, and other objects that conduct electricity.

Electric field levels directly beneath overhead distribution lines may vary from a few volts per meter to 100 or 200 volts per meter. Magnetic fields directly beneath overhead distribution lines typically range from 10 to 20 milligauss (mG) for main feeders and less than 10 mG for laterals. Such levels are also typical directly above underground lines. Peak EMF levels, however, can vary considerably depending on the amount of current carried by the line. Peak magnetic field levels as high as 70 mG have been measured directly below overhead distribution lines and as high as 40 mG above underground lines.

In general, the strongest EMF around the outside of a substation comes from the power lines entering and leaving the substation. The strength of the EMF from equipment within the substations, such as transformers, reactors, and capacitor banks, decreases rapidly with increasing distance. Beyond the substation fence or wall, the EMF produced by the substation equipment is typically indistinguishable from background levels.

The National Institute of Environmental Health Sciences (NIEHS) of the National Institutes of Health and the Department of Energy (DOE) conducted an evaluation, known as the Electric and Magnetic Fields Research and Public Information Dissemination (EMF RAPID) Program. This was a six-year project with the goal of providing scientific evidence to determine whether exposure to power-frequency EMF involves a potential risk to human health.

[12] California Department of Health Services and the Public Health Institute, California Electric and Magnetic Fields Program. Electric and Magnetic Fields Fact Sheet. 2000.

In 1999, at the conclusion of the EMF RAPID Program, the NIEHS reported to the U.S. Congress that the overall scientific evidence for human health risk from EMF exposure is weak. No consistent pattern of biological effects from exposure to EMF had emerged from laboratory studies with animals or with cells. However, epidemiological studies had shown a fairly consistent pattern that associated potential EMF exposure with a small increased risk for leukemia in children and chronic lymphocytic leukemia in adults. Since 1999, several other assessments have been completed that support an association between childhood leukemia and exposure to power-frequency EMF. These more recent reviews, however, do not support a link between EMF exposures and adult leukemia. For both childhood and adult leukemia, interpretation of the epidemiological findings has been difficult due to the absence of supporting laboratory evidence or a scientific explanation linking EMF exposures with leukemia.[13]

Impacts

EMFs will occur close to the Project's underground and overhead collection systems, transformers, any possible transmission lines and the sub-station transformers. Based on the research performed, we expect the EMFs from the substation to reach background levels at the edge of the substation. Collector system EMF's should be similar to those already in the area from standard utility distribution lines serving local homes and businesses. EMF levels for a typical 115 kV transmission line (similar to the GRE line along SH 29), are as follows:

Table 8.8-1: EMF Levels for Typical 115 kV Transmission Line[12]

Distance	At Line	Approx. Edge of Right-of-Way (50ft)	100ft	200ft	300ft
Electric Field (kV/m	1.0	.5	.07	.01	.003
Mean Magnetic Field	29.7	6.5	1.7	.4	.2

PWE's collector system is 34.5 kV and, as such, we expect the EMFs to be at a level lower than the GRE's 115 kV line already on SH 29 and similar to those on the distribution lines along the county and township roads.

[13] National Institute of Environmental Health Sciences of the National Institute of Health. Electric and Magnetic Fields Associated with the Use of Electric Power. Questions and Answers. June 2002.

Mitigation

Based upon current research regarding EMFs and the setbacks utilized by the Project, EMF's associated with the Project's substation, turbines and collector system are not expected to have an impact on public health and safety.

8.8.2 Aviation

There are no public airports within the Project boundary. Henning (05Y) airport is the only public airport within 10 miles of the Project site and is located approximately 4 miles northwest of the Project site. It is located at a latitude of 46°18.2' and a longitude of 95°26.4'. The runway orientation is north-south. It handles primarily smaller aircraft. This airport is best described as a local service airport, having generally low activity. Though the air field provides access to the community, it provides limited general aviation facilities. There are no registered private airports within the Project boundary or within 10 miles of the Project boundary.

Crop sprayers occasionally spray fields during the summer months, primarily May through September, on property leased for the Project and other property within the Project boundary. Crop spraying is performed by highly maneuverable airplanes or helicopters during daytime hours when ground wind speeds are low enough to spray.

Impacts

The installation of WTGs and aboveground collection lines, if needed, and the two current meteorological towers will create a potential hazard for collisions with crop-dusting aircraft.

Mitigation

PWE has and will continue to work with landowners, operators and aerial sprayers to minimize turbine placement impact. PWE has laid out the Project in the safest possible manner given setback requirements. A linear layout of wind turbines is not possible for the Project because of set-back requirements, the large number of land owners who want to participate, irrigation use, noise and shadow flicker considerations and turbine spacing requirements. Other limits on turbine placement include non-participating landowners, the location of access roads, higher ground, marshes and other obstructions that block the wind flow.

Any above ground collection lines will be similar to existing distribution lines located along the edges of fields and roadways. The turbines themselves will be visible from a distance and lighted according to FAA guidelines. PWE will complete all FAA obstruction evaluations

prior to construction of the Project. The two meteorological towers comply with all necessary FAA regulations, are painted red and white and have aviation wire markers on the guy wires.

Aerial crop spraying is a concern for the owners of PWE. Half of PWE's principals own and farm approximately 20% and lease another 10% of the acres under contract for the Project. The balance of the contracted and surrounding acres within the footprint are either farmed or owned by neighbors, friends or relatives, most of which depend on aerial crop spraying on a regular or incidental basis. PWE is committed to not intruding on the traditional farming practices of the community.

8.9 Hazardous Materials

Description of Resource

The land in the Project Area is primarily used for agricultural activities which use petroleum products. Construction of the Project will require heavy-equipment fuels, gearbox oils, hydraulic fluids, lubricants, cleaning fluids, paints, degreasers and other similar substances. PWE will utilize petroleum-based products during operations, such as gear box oil, hydraulic fluid, and gear grease.

Impacts

We do not expect any hazardous material impacts from Project construction or operations.

Mitigation

PWE will activate a Material Safety Disposal System program to ensure the proper treatment of hazardous materials during disposal. PWE does not plan to permanently store fuel tanks on site and does not anticipate a hazardous waste transportation license will be necessary. However, if handling, processing, treatment, storage or disposal becomes necessary, such a license will be applied for and Project subcontractors will comply with all federal, state and local laws.

8.10 Land-based Economies

Land Based Economies - Agriculture

Agriculture is the primary land use in this area of Otter Tail County. Livestock farming consists mainly of turkeys, beef and dairy. Corn, soybeans, alfalfa, potato, kidney beans and small grains are the major crops in this part of south east Otter Tail County. Land rents from cropland are approximately $60-$130 per year, per acre. Converting cropland to the CRP and

the RIM program is another source of income in the area. Some of the turbines will be located in unirrigated corners of farmland covered by center-pivot irrigation systems. These unirrigated corners are not as productive as those areas being irrigated. Agricultural land income can be maximized by placing the turbines on these less-productive corners.

Trends in land use in the areas show the loss of prime farmland to industrial and residential uses.

Impacts

The Project will reduce the amount of cropland within the Project Area due to turbines, access roads, the operations facility and the substation. PWE estimates that an average of 2 to 4 acres per turbine may be taken out of agricultural production. Specific impacts to agricultural lands will be determined once turbine, road, substation and operations facility locations have been finalized and will be discussed with the landowner. PWE does not expect to significantly alter crop production in the Project Area. Normal agricultural activity may be disrupted during the construction process. PWE will discuss such impacts with landowners and minimize them to the extent possible.

Mitigation

PWE intends to minimize the amount of land exiting agricultural use through appropriate site layout. The wind turbines and access roads will be located so that the most productive farmland will be avoided as much as possible. Only land required for permanent facilities will be taken out of crop production. The surrounding land can still be farmed once the wind turbines and access roads are constructed. No drain tiles are known to be in the area, but PWE will verify that information and avoid impacts to drain tile if possible. If there is damage to drain tile as a result of construction activities or operation of the Project, PWE will work with the property owners to repair the damage. Once construction is finished and heavy equipment moved off-site, property will be restored and reseeded. The only exception will be new access roads and other infrastructure for the Project. In the event that construction causes crop loss, PWE will pay for the loss as specified in the lease agreement with the affected landowner.

Turbine micro-siting discussions have occurred and are still underway with many landowners to identify land features that should be avoided and to discuss placement of access roads and turbines on leased land.

If CRP land is impacted, PWE will work with the landowner and the NRCS to remove the impacted portion of the enrolled parcel from the CRP program. There will be no impacts to RIM land; therefore no mitigation will be necessary. The lost agricultural revenue will be offset by the lease payments received from the Project. Less than 1% of the total Project site will be removed from its current land use and dedicated to the Project for the installation of access roads, turbine foundations and electrical infrastructure.

Land Based Economies – Forestry

This part of Minnesota is on the edge of ancient glacial deposits. There is a mix of hardwood and pulp wood stands in the area. Commercial logging has been sporadic and grove specific in recent decades. There is some logging of pulp wood in the area and one tree farm that sells Christmas and large transplant pine trees.

Impacts

No impacts are anticipated to forestry resources.

Mitigation

No mitigation will be necessary because no impacts are expected.

Land Based Economics- Mining

Glacial deposits in the area consist of unconsolidated rocks and clay. These deposits provide for construction grade road material in the form of “class 5.” There is at least one mining operation within the Project Area.

Impacts

Turbines or other Project facilities will not be located in mining areas unless specifically agreed to with the mine owner. PWE intends to use existing locally available class 5 and fill for access roads and construction. There should be considerable economic benefits to owners and operators of these local facilities.

Mitigation

Turbines will not be located within sand/gravel pit operations, unless agreed to by the mine owner, which is based on their personal beliefs and cost-benefit analysis.

8.11 Tourism

Recreation and tourism in south east Otter Tail County focuses on promoting the area’s fishing, hunting, lake recreation, snowmobiling, all-terrain vehicles, cross-country skiing and other outdoor activities.

Impacts

No direct impacts to recreational facilities, public lands, or other tourism-related activities are expected as the Project will be located on private lands. Setbacks will minimize any indirect impacts to public recreational lands. The Project is not anticipated to have a significant effect on area tourism. It is not expected that wind development would become a significant tourism attraction after the initial construction phase and commencement of the Project.

Mitigation

No impacts are anticipated, therefore, no mitigative actions are proposed.

8.12 Local Economies

8.12.1 Economic Impacts

During the construction phase, PWE expects the Project to have a very positive economic impact on the local economy. PWE expects up to 150 people to be employed on site during construction. PWE intends to use local contractors and suppliers to the extent possible, but much of the construction will be completed by the turbine manufacturer and other contractors with specific experience related to wind turbine construction. PWE does expect to utilize a number of local contractors and suppliers for sub-contracting needs.

The economic benefits to the local community during construction include, but are not limited to, restaurant and retail services, lodging, fuel, and property rental (residences). The construction schedule will be based on the equipment delivery schedule and could take many months to a year to complete.

The Project has the potential to employ up to 15 full-time employees during operations, but this number is dependent on numerous factors such as turbine warranty agreements outsourcing decisions and possible joint ventures. Two proposed projects in the region may use the PWE operations facility as their base as well, which will modify workforce needs. Some of these jobs will be very specialized and all will have competitive salaries.

Landowners with property leased for the Project will benefit from very competitive lease payments for a relatively small amount of land leased, while still being able to farm their land or receive CRP rents.

PWE also has a land lease for turbine placement with the City of Parkers Prairie, which will be of economic benefit to the city. This turbine is located on the sewage treatment facility land owned by the city.

8.12.2 Tax Revenue

The Project will be subject to the State of Minnesota Wind Energy Production Tax at a rate of $.0012 per kWh of electricity produced. The Project is expected to generate over $400,000 of production tax revenue each year, which will be split between Otter Tail County and the townships in which turbines reside. For 2010, statewide distribution of the production tax revenue was 80% to the county and 20% to the townships or cities in which a project resides. Based on the 2010 rates, this would approximate $320,000 for Otter Tail County and $80,000 to be split by the townships based on the output produced in each township. These revenues will be of significant benefit to the county and townships and ultimately to the residents of these communities.

8.12.3 Potential Impacts

The Project will diversify economic activity directly and indirectly through spin off dollars that will be spent during the construction phase and over the life of the Project. As indicated above, these dollars will come through land rents, local turbine ownership, taxes, and a possible operations and maintenance facility. This Project will have a very positive economic impact on the county, townships and local community. We do not expect any mitigative measures to be necessary.

8.13 Topography

The Project site is located with the Hardwood Hills subsection of the Eastern Broadleaf Forest Province of the Minnesota Department of Natural Resources Ecological Classifications System. The Hardwood Hills subsection is defined by steep slopes, high hills and lakes formed in glacial end moraines and outwash plains. The Project site is mostly flat with sporadic wetlands, sparsely populated with trees other than at building sites.

Impacts

Topographical impacts are not anticipated. The Project will not require a significant amount of fill or excavation and material from excavated areas not utilized as backfilling for foundations will be transported off-site and disposed of appropriately.

Mitigation

As no impact is expected, no mitigative measures are necessary.

8.14 Soils

The majority of the soil within and adjacent to the Project Area is Dorsett-Corliss complex. Dorsett consists of loamy mantle over sandy and gravelly outwash deposits. Corliss consists of sandy and gravelly outwash deposits. The next largest complex is the Verndale-Abbeylake. Verndale consists of loamy mantle over sandy outwash deposits and Abbeylake consists of sandy outwash deposits. All of these soil complexes are well to excessively drained.[14]

Impacts

Construction activities in the Project Area will result in soil disturbances and may make the excavated areas more susceptible to wind and water erosion. The exact amount of land to be utilized by the Project will be determined once the site layout has been finalized.

Mitigation

The Project has and will consider the contour of the terrain during site planning in order to minimize erosion due to Project construction and operations. A standard soil erosion and sediment control plan and permit application will be filed with the Minnesota Pollution Control Agency prior to construction. This permit will address what type of erosion control measures will be implemented until the disturbed area is successfully re-vegetated. Best management practices will be utilized during construction and operations to minimize project related soil erosion. Based on the mitigative measures to be implemented, we do not expect a significant loss of soil due to project activities.

8.15 Geologic and Groundwater Resources

Surface geology in the Project Area consists of glacial deposits associated with the Des Moines Lobe and Wadena Lobe, both continental glaciers associated with the last ice age. The southeastern part of the Project boundary consists of stagnation moraine in the geomorphic region of the Altamont Moraine included with the Alexandria Moraine Complex. The remainder

[14] Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at http://websoilsurvey.nrcs.usda.gov/ accessed February 26, 2011.

of the Project Area consists of stagnation moraine within the Henning Till Plain and pitted outwash plain within the Park Rapids-Staples Outwash Plain.[15]

The bedrock in the area consists of Early Proterozoic and Late Archean rocks. The Early Proterozoic rocks are mainly meta- and sedimentary rocks (argillite, slate, shale, greywacke) of the Virginia, Thomson and Rove Formations. The Late Archean rocks are mainly meta-igneous extrusive rocks of mafic to felsic composition (greenstone/amphibolites) and metasedimentary rocks.[16] Bedrock in Otter Tail County is covered by 200 to more than 400 feet of Wisconsin glacial deposits.[17] Two wells drilled by the Minnesota Geological Survey in 1980 and 1981 on land within the Project boundary show the following geologic material and depths:

Table 8.15: Well Drilling - MN Unique Well Number 226767 and 226768

Geological Material	Depth From (feet)	Depth To (feet)	Geological Material	Depth From (feet)	Depth To (feet)
Sandy Loam Topsoil	0	1	Sand and Gravel	0	62
Sandy Loam	1	9	Clayey Till and Carbonate Clasts	62	80
Very Coarse Sand and Gravel	9	62	Sand and Gravel	80	148
Sandy Clayey Till	62	80	Clayey Till and Clasts	148	192
Very Coarse-Coarse Sand and Gravel	80	148	Silty Till and Clasts	192	217
Clay Loam Till (Dark Grey)	148	194	Clayey Till & Clasts	217	265
Clay Loam Till (Olive)	194	217	Clayey Till and Carbonate Clasts	265	343
Sandy Loam Till (Olive Brown)	217	250	Claystone and Friable Loamy Sands	343	346
Sandy Loam Till (Dark Grey)	250	343	Friable Quartz Sandstone	343	395
Organic Clay Loam	343	345	Clay Variegated	395	453
Medium-Fine Quartzose Sand	345	397	Crystal Tuff and Tuffaceous Graywacke	453	468

[15]Natural Resources Conservation Service, U.S. Department of Agriculture, *"Soil Survey of Otter Tail County, Minnesota"*, 2001.
[16] Geologic Map of Minnesota – Simplified Bedrock Geology, Mn/DOT, 2000. Available online at http://www.mrr.dot.state.mn.us/geotechnical/geology/bedrckweb.pdf accessed March 22, 2011.
[17] Otter Tail County, http://www.co.otter-tail.mn.us/gis/soilsurvey07geologic.php accessed March 22, 2011.

Table 8.15: Well Drilling - MN Unique Well Number 226767 and 226768					
Geological Material	**Depth From (feet)**	**Depth To (feet)**	**Geological Material**	**Depth From (feet)**	**Depth To (feet)**
Clay Regolith	397	467			
Hard Crystalline Rock	467	471			

There are two aquifers that run through parts of the Project site. One aquifer has an elevation of approximately 1340 – 1430 feet and the second aquifer has an elevation of approximately 1260 – 1360 feet. The aquifers in Otter Tail County consist of a complex network of surficial and buried deposits of sand and gravel.[18] PWE has reviewed a sample of county well index records for the Project Area, which shows residents and farmers (for irrigation purposes) utilizing both the quaternary water table and quaternary buried artesian aquifers.

Impacts

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

Mitigation

Wind turbine locations will not impact the use of existing water wells because the turbines will not be sited within legally required setbacks from occupied structures.

8.16 Surface Water and Floodplain Resources

Description of Resource

The Project is located in the Upper Mississippi River Basin, Redeye Watershed. See Figures 7 (wetlands inventory) and 11 (Shoreland Management and Surface Waters) for additional surface water information.

PWE is not aware of any outstanding resource value waters within the Project Area. Lake Adley, just outside the Project boundary, is listed on the Minnesota Pollution Control Agency's Impaired Waters Inventory.

[18] Minnesota Geological Survey. *Regional Hydrogeologic Assessment Otter Tail Area, West Central Minnesota*.1999.

There are no designated wildlife lakes in or adjacent to the Project Area.[19]

According to the Flood Insurance Rate Maps (FIRMs), the Project site is located within a minimal flooding area. Consequently the Project footprint has a .2% chance of flooding.

Impacts

Construction of the wind turbines and access roads will disturb some land in the Project Area.

Mitigation

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 been successfully replanted.

8.17 Wetlands

Wetlands located within the proposed Project Area were identified from reviewing National Wetland Inventory (NWI) Maps developed by the USFWS. See Figure 7 for NWI within the Project boundary. The following is a detailed list of the wetlands within the Project boundary:

[19] Minnesota Department of Natural Resources, Wildlife Lake Designation. http://www.dnr.state.mn.us/wildlife/shallowlakes/designation.html. Accessed February 28, 2011.

Table 8.17: NWI Wetland Type and Acreage			
National Wetland Index Name	**Attribute**	**Count of Wetlands**	**Acres in Project**
Lake	L1UBH	15	806.4
	L1UBHh	1	20.7
	L2UBG	1	0.0
Freshwater Emergent Wetland	PEM/FO1C	1	0.1
	PEM/FO6C	1	2.5
	PEM/SS1C	22	80.2
	PEM/SS1Cd	7	74.4
	PEM/UBF	5	28.6
	PEMA	168	50.5
	PEMAd	29	9.9
	PEMB	5	16.7
	PEMC	477	390.8
	PEMCd	99	248.2
	PEMCx	1	0.1
	PEMF	126	447.6
	PEMFd	33	125.3
Freshwater Forested/Shrub Wetland	PFO1/EMCd	1	6.4
	PFO1A	1	0.1
	PFO1C	64	28.9
	PFO1Cd	9	5.6
	PFO2Bg	1	43.8
	PFO6/SS1Bg	1	21.6
	PFO6/SS1C	3	19.0
	PFO6Bg	1	175.9
	PFO6C	6	24.5
	PFO6Cd	2	25.6
	PSS1/EMBdg	1	209.5
	PSS1/EMC	13	61.7
	PSS1/EMCd	2	18.2
	PSS1A	3	0.9
	PSS1B	2	12.8
	PSS1C	95	74.7
	PSS1Cd	16	16.5

Table 8.17: NWI Wetland Type and Acreage (Continued)			
NWI Name	**Attribute**	**Count of Wetlands**	**Acres in Project**
Freshwater Pond	PUB/EMF	17	54.8
	PUB/EMFd	2	4.6
	PUBF	48	30.9
	PUBFd	3	1.5
	PUBFx	3	0.7
	PUBG	28	135.1
	PUBGx	12	2.5
	PUBH	1	0.7
	PUBKGx	2	10.6

Impacts

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

Mitigation

Wetlands will be avoided during the construction phase of the Project. If it appears that wetlands could be affected, the Project will work with the DNR, the U.S. Army Corps of Engineers and any other governing entities prior to construction in order to avoid or mitigate any impacts.

8.18 Vegetation

Description of Resource

The following table provides the land vegetation and cover types within the Project boundary. It also provides the estimated acreage that will have permanent and temporary impacts.

Table 8.18: Vegetation in Project Boundary			
Land Use Type	Acres	Estimated Permanent Impacts (Acres)	Estimated Temporary Impacts (Acres)
Open Water	1,274	0.00	0.00
Developed, Open Space	903	0.00	0.00
Developed, Low Intensity	77	0.00	0.00
Developed, Medium Intensity	4	0.00	0.00
Barren Land	6	0.00	0.00
Deciduous Forest	2,784	0.00	0.00
Evergreen Forest	173	0.00	0.00
Mixed Forest	23	0.00	0.00
Scrub/Shrub	950	0.00	0.00
Grassland/Herbaceous	579	4.00	10.00
Pasture/Hay	3,672	4.00	10.00
Cultivated Crops	12,120	127.00	150.00
Woody Wetlands	101	0.00	0.00
Emergent Herbaceous Wetland	1,255	0.00	0.00
Total Acres	**23,921**	**135.00**	**170.00**

Impacts

The amount of vegetation that will be disturbed or removed as a result of the Project will be determined once the site layout is finalized, but the vast majority is anticipated to be crop land and a small portion of CRP land. Vegetation will be permanently replaced by wind turbines, access roads, the operations and maintenance facility, and the substation. Some vegetation will be temporarily disturbed during the construction phase while installing the collector system as well as the Project management site.

Mitigation

The Project is sited to avoid wooded areas to maximize output as much as feasible. Any removal of wooded areas will be discussed and negotiated with landowners during the siting phase. Areas that are temporarily disturbed will be restored to blend with existing vegetation. Additionally, vegetative disturbances will be reduced by limiting the Project's impact on wetlands and native prairie grasses.

8.19 Wildlife

Description of Resource

Information on the existing wildlife in the proposed Project site was obtained from the MNDNR, USF&W and other sources as referenced in the below paragraphs. 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 farmlands with few wetland and forested areas. The majority of the migratory wildlife species are birds including waterfowl, raptors, and song birds. Wildlife considered to be threatened, endangered or of special concern is discussed in Section 8.20. There are a number of WMAs and WPAs within the Project Area, which are listed in Section 8.7.

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.

We reviewed the Minnesota Breeding Bird Atlas (MNBBA) for the most recent bird counts and sightings within the Project boundary. The MNBBA divides land areas into blocks, which are then surveyed by volunteers. Three blocks are located within the Project Site. Block T132R38a had one confirmed case each of a Canada goose and mallard feeding their young. It also had one possible great egret on its habitat.

Block T132R37d had confirmed cases of barn swallows feeding young, a house wren on its nest and an American robin on its nest. This block also had probable a sighting of a wood duck pair in habitat, a singing male ruffed grouse, and multiple wild turkeys. This block had possible sightings of great egret on habitat, northern flicker on habitat, blue jay on habitat and song sparrow on habitat. One great egret was observed.

Block T132R37a had confirmed cases of wild turkey, barn swallows and house wren feeding their young. This block had probable cases of wood duck, American robin and mallard pairs in habitat, as well as a probable singing male ruffed grouse and red-winged blackbird. This block had possible instances of great egret, northern flicker, blue jay and song sparrow on habitat.[20]

[20] Minnesota Breeding Bird Atlas. www.mnbba.org. Accessed March 29, 2011.

The USGS Breeding Bird Survey (BBS) results for the Ashby route, southeast of the Project boundary, provided the following bird survey information:

Table 8.19: Ashby Breeding Bird Summary (Updated through 2007)[21]

Common Name	Species	Birds/route	Common Name	Species	Birds/route
Common Loon	*Gavia immer*	3	Warbling Vireo	*Vireo gilvus*	1.6
Pied-billed Grebe	*Podilymbus podiceps*	2.8	Red-eyed Vireo	*Vireo olivaceus*	10.8
Red-necked Grebe	*Podiceps grisegena*	0.2	Blue Jay	*Cyanocitta cristata*	8.2
American White Pelican	*Pelecanus erythrorhynchos*	8.6	American Crow	*Corvus brachyrhynchos*	32.8
Double-crest. Cormorant	*Phalacrocorax auritus*	3	Horned Lark	*Eremophila alpestris*	21.6
Great Blue Heron	*Ardea herodias*	6.4	Purple Martin	*Progne subis*	1.2
Great Egret	*Ardea alba*	5.8	Tree Swallow	*Tachycineta bicolor*	26.4
Green Heron	*Butorides virescens*	0.8	N. Rough-winged Swallow	*Stelgidopteryx serripennis*	1.2
Black-crn. Night Heron	*Nycticorax nycticorax*	0.6	Bank Swallow	*Riparia riparia*	0.8
Turkey Vulture	*Cathartes aura*	0.4	Cliff Swallow	*Petrochelidon pyrrhonota*	0.2
Canada Goose	*Branta canadensis*	17.2	Barn Swallow	*Hirundo rustica*	24.2
Wood Duck	*Aix sponsa*	4.6	Black-capped Chickadee	*Poecile atricapillus*	2.8
Mallard	*Anas platyrhynchos*	11.2	White-breasted Nuthatch	*Sitta carolinensis*	6.8
Blue-winged Teal	*Anas discors*	4	House Wren	*Troglodytes aedon*	16.6
Canvasback	*Aythya valisineria*	9.8	Sedge Wren	*Cistothorus platensis*	12
Ring-necked Duck	*Aythya collaris*	0.8	Marsh Wren	*Cistothorus palustris*	20.2
Northern Harrier	*Circus cyaneus*	0.2	Eastern Bluebird	*Sialia sialis*	3.2
Cooper's Hawk	*Accipiter cooperii*	0.8	Veery	*Catharus fuscescens*	0.4

[21] Sauer, J. R., J. E. Hines, J. E. Fallon, K. L. Pardieck, D. J. Ziolkowski, Jr., and W. A. Link. 2011. The North American Breeding Bird Survey, Results and Analysis 1966 - 2009. Version 3.23.2011 USGS Patuxent Wildlife Research Center, Laurel, MD

Table 8.19: Ashby Breeding Bird Summary (Updated through 2007)[21]					
Common Name	**Species**	**Birds/route**	**Common Name**	**Species**	**Birds/route**
Red-shouldered Hawk	*Buteo lineatus*	0.2	American Robin	*Turdus migratorius*	13.4
Red-tailed Hawk	*Buteo jamaicensis*	2	Gray Catbird	*Dumetella carolinensis*	5.4
American Kestrel	*Falco sparverius*	0.2	Brown Thrasher	*Toxostoma rufum*	1.8
Ring-necked Pheasant	*Phasianus colchicus*	8.4	European Starling	*Sturnus vulgaris*	11.4
Virginia Rail	*Rallus limicola*	0.2	Cedar Waxwing	*Bombycilla cedrorum*	2.4
Sora	*Porzana carolina*	1.8	Yellow Warbler	*Dendroica petechia*	25.4
Killdeer	*Charadrius vociferus*	8	American Redstart	*Setophaga ruticilla*	4.8
Common Snipe	*Gallinago gallinago*	2.8	Ovenbird	*Seiurus aurocapillus*	2
Ring-billed Gull	*Larus delawarensis*	0.2	Common Yellowthroat	*Geothlypis trichas*	68.6
Black Tern	*Chlidonias niger*	2.2	Scarlet Tanager	*Piranga olivacea*	1.4
Rock Dove	*Columba livia*	21.6	Chipping Sparrow	*Spizella passerina*	4.8
Mourning Dove	*Zenaida macroura*	35.6	Clay-colored Sparrow	*Spizella pallida*	12.4
Black-billed Cuckoo	*Coccyzus erythropthalmus*	2	Field Sparrow	*Spizella pusilla*	7.6
Great Horned Owl	*Bubo virginianus*	0.2	Vesper Sparrow	*Pooecetes gramineus*	6.4
Ruby-thr. Hummingbird	*Archilochus colubris*	0.4	Savannah Sparrow	*Passerculus sandwichensis*	14.2
Belted Kingfisher	*Ceryle alcyon*	0.4	Grasshopper Sparrow	*Ammodramus savannarum*	7
Red-bellied Woodpecker	*Melanerpes carolinus*	0.6	Song Sparrow	*Melospiza melodia*	41
Downy Woodpecker	*Picoides pubescens*	0.8	Swamp Sparrow	*Melospiza georgiana*	3.8
Hairy Woodpecker	*Picoides villosus*	0.4	Northern Cardinal	*Cardinalis cardinalis*	1.4
Northern Flicker	*Colaptes spp.*	0.8	Rose-breasted Grosbeak	*Pheucticus ludovicianus*	2

Table 8.19: Ashby Breeding Bird Summary (Updated through 2007)[21]					
Common Name	**Species**	**Birds/route**	**Common Name**	**Species**	**Birds/route**
Pileated Woodpecker	*Dryocopus pileatus*	2	Indigo Bunting	*Passerina cyanea*	3
Eastern Wood-Pewee	*Contopus virens*	5.4	Bobolink	*Dolichonyx oryzivorus*	18.4
Alder Flycatcher	*Empidonax alnorum*	0.2	Red-winged Blackbird	*Agelaius phoeniceus*	253.2
Willow Flycatcher	*Empidonax traillii*	0.4	Eastern Meadowlark	*Sturnella magna*	5
Willow/Alder Flycatcher	*Empidonax spp.*	0.6	Western Meadowlark	*Sturnella neglecta*	2.6
Least Flycatcher	*Empidonax minimus*	9.6	Yellow-head. Blackbird	*Xanthocephalus xanthocepha*	24.2
Eastern Phoebe	*Sayornis phoebe*	0.2	Common Grackle	*Quiscalus quiscula*	5.8
Grt. Crested Flycatcher	*Myiarchus crinitus*	10.8	Brown-headed Cowbird	*Molothrus ater*	15
Eastern Kingbird	*Tyrannus tyrannus*	1.4	Baltimore Oriole	*Icterus galbula*	3.4
Yellow-throated Vireo	*Vireo flavifrons*	1.6	American Goldfinch	*Carduelis tristis*	39.4
			House Sparrow	*Passer domesticus*	11.6

Other animals expected to occur within the Project site include, but are not limited to, jackrabbits, chipmunks, woodchucks, squirrels, mice, muskrat, fox, raccoons, minks, badgers, skunks, coyote, and deer. These species use the food and cover available from agricultural fields, grasslands, woods, wetland areas, and wooded ravines. White-tailed deer, an economically important species, also enjoy agricultural crops and use farm woodlots, wooded ravines and intermittent stream bottoms for shelter.

Reptile and amphibian species, which are likely present within the Project site include: Great Plains Toad, Canadian Toad, Northern Leopard Frog, Western Chorus Frog, American Toad, Wood Frog, common snapping and western painted turtles, various salamanders, the northern prairie skink lizard and the various snakes.

There are many insect species which are important to the local vegetation and wildlife, but honeybees are the only species of economic importance within the Project site.

There are no Migratory Waterfowl Feeding and Resting Areas (MWFRA) within or adjacent to the Project site.[22]

There are no Important Bird Areas (IBA's) within or adjacent to the Project site.[23]

Impacts

Impacts will include a small percentage reduction in the available habitat, which the resident wildlife uses for forage or cover. Generally, operation and maintenance of the wind facility is not expected to change the existing land use nor have a significant impact on wildlife habits or habitat.

Based on studies of existing wind power projects in Minnesota, the United States and Europe, the greatest impact to wildlife would occur to avian and bat populations. Numerous avian and bat pre and post construction studies have been performed in the United States, the closest in location to the Project being the Buffalo Ridge Minnesota Wind Resource Area four year study issued in September 2000. Within the study, average avian fatality ranged from .98 to 4.45 birds per turbine per year at the three different plant sites. The data also indicated that the avian mortality primarily involved nocturnal migrants and mortality of the resident breeding birds appeared low. The researchers concluded that these results would not likely have any bird population consequence. The mortality for the bat population ranged from 1.62 to 2.04 bats per turbine per year.[24] According to the National Wind Coordinating Collaborative's review of mortality studies, all development studies reviewed had reported less than 14 bird fatalities per nameplate MW per year and most have reported less than 4 fatalities per nameplate MW per year. They also stated that, although some studies reported high level of bat mortalities, most had low fatality rates.[25]

Mitigation

PWE has considered the USFWS Draft Land Based Wind Turbine Guidelines in siting the Project. PWE has conducted a tiered approach for assessing impacts to wildlife and habitats.

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[22] Minnesota Department of Natural Resources, Migratory Waterfowl Feeding and Resting Areas. http://www.dnr.state.mn.us/wildlife/shallowlakes/mwfra.html. Accessed February 28, 2011.
[23] Audubon, Minnesota's Important Bird Area Program, http://iba.audubon.org/iba/viewState.do?state=US-MN, Accessed February 28, 2011.
[24] Western EcoSystems Technology, Inc. 2000. Final Report - Avian Monitoring Studies at Buffalo Ridge, Minnesota Wind Resource Area: Results of a four-year study. Prepared for Northern States Power Company.
[25] National Wind Coordinating Collaborative. Spring 2010.. Wind Turbine Interactions with Birds, Bats, and their Habitats: A Summary of Research Results and Priority Questions.

The tiers are as follows:

- Tier 1 - Preliminary evaluation or screening of potential sites (landscape – scale screening of possible sites).
- Tier 2 - Site characterization (broad characterization of one or more potential project sites)
- Tier 3 – Pre-Construction monitoring and assessment (site-specific assessments at the proposed project site)
- Tier 4 – Post-construction monitoring of effects (to evaluate fatalities and other effects)
- Tier 5 – Research (to further evaluate direct and indirect effects, and assess how they may be addressed)

PWE's Tier 1 and Tier 2 assessment consisted of the following:

- The owner's of PWE have lived in the Project Area for four generations and were already familiar with the wildlife in the area. However, to supplement this knowledge, PWE reviewed publicly available maps for wetlands and managed wildlife areas such as WMAs and WPAs. Public recreation areas and areas of importance to wildlife are described in Sections 8.7 and 8.17.
- PWE reviewed the MNBBA and BBS listings for the Project Area as described above.
- PWE reviewed the DNR's Guide to the Nongame Mammals of Northwest Minnesota Region 1S[26] and Guide to Reptiles and Amphibians of Northwest Minnesota Region 1S[27].
- PWE reviewed the Rare Animals in the Hardwood Hills and Pine Moraines and Outwash Plains Ecological Subsections of West-Central Minnesota Final Report.[28]
- PWE contacted the DNR and USFWS to request a review of the Project site. See Appendix C for agency correspondence.
- A representative from the DNR toured the Project site with PWE to provide guidance and recommendations on siting and set-backs. PWE has had continued conversations with the DNR over the past few years.
- PWE also reviewed the Natural Heritage Information System (NHIS) and Minnesota County Biological Survey (MCBS), which is described in more detail in Section 8.20.

[26] Henderson, C. and J. Reitter. 1979. Guide to the Nongame Mammals of Northwest Minnesota - Region 1S. Report by the Minnesota Department of Natural Resources.
[27] Henderson, C. 1980. Guide to the Reptiles and Amphibians of Northwest Minnesota - Region 1S. Report by the Minnesota Department of Natural Resources.
[28] Harper, E., G. Nordquist, S. Stucker, and C. Hall. 2006. Rare Animals in the Hardwood Hills and Pine Moraines and Outwash Plains Ecological Subsections of West-Central Minnesota. Final report submitted to the State Wildlife Grants Program.

Based on the Tier 1 and Tier 2 assessments, PWE decided to perform certain Tier 3 assessments. PWE engaged a certified wildlife biologist to perform the DNR's Avian Flight Characteristics Survey Methods for Commercial Wind Energy Sites in Minnesota – Draft (dated April 5, 2010) and a Raptor Nest Survey. These studies will be performed during the spring, summer and fall of 2011. PWE will assess the results of these studies and any recommendations for further study and/or potential mitigation measures.

The DNR recommends two years of post construction mortality studies using the Minnesota Protocols to Monitor Bat & Bird Mortality at Large Wind Energy Conversion Systems (see Appendix C). Yearly mortality reports can be sent to the DNR on January 1 of each year. The Post-Construction Report Guidelines includes the information that should be contained in the reports and where they should be sent. An additional year of surveys is recommended if any state or federally listed species are killed due to operation of the wind farm. Based on PWE's Tier 3 studies and continued communication with the DNR and USFWS, PWE will then determine if any Tier 4 studies, for example mortality studies, or Tier 5 research is necessary.

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

- Exclude established wildlife management, recreation and scientific natural areas from consideration for wind turbine locations, access road or electrical/transmission line placement and follow recommended setbacks from such areas.
- 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.
- Replant non-cropland and range areas with wildlife conservation species.
- Wind turbines will be a tubular monopole tower, which reduces perches for the avian population.
- Continue to assess USFWS and DNR recommendations.

PWE is committed to minimizing the Project's impact on wildlife and wildlife habitat. PWE continues to consult with the DNR, USFWS and MPUC regarding the impact of turbine locations and necessary mitigative measures.

8.20 Rare and Unique Natural Resources

Description of Resource

PWE reviewed the NHIS 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. PWE also contacted the DNR and the USFWS for their input regarding the Project. PWE has met with the DNR staff regarding the Project and has had conversations with the USFWS regarding the Project. Correspondence with these agencies is included in Appendix C.

The USFWS is not aware of any federally-listed threatened or endangered species within the Project Area.

Based on our query of the NHIS the red-shouldered hawk (*Buteo lineatus*), a state-listed species of special concern, has been documented in nearby woodlands. Red-shouldered hawks are most commonly found in large tracts of mature deciduous forest with scattered wetland openings. Suitable habitat typically occurs in uplands with diverse topography characterized by numerous small hills, ridges, and depressional wetlands or small lakes. Red-shouldered hawks also frequent mature floodplain forests.[29]

The query also determined that the MCBS has identified one site of Moderate Biodiversity Significance and two sites ranked "below" within and adjacent to the Project boundary. These sites have varying levels of native biodiversity and are ranked based on the relative significance on a statewide level. Factors taken into account during the ranking process included the number of rare species documented, the quality of the native plant communities in the site, the size of the site and the context of the site within the landscape. Although the sites ranked as "below" do not meet the minimum biodiversity threshold for statewide significance, they may have conservation value at the local level as habitat for native plants and animals, corridors for animal movements, buffers surrounding higher quality natural areas, or as areas with high potential for restoration of native habitat.

[29] Minnesota Department of Natural Resources, Rare Species Guide, Buteo lineaus, http://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=ABNKC19030. Accessed February 18, 2011.

The NHIS query also pointed out that there are several WMAs within the vicinity of the Project. See Section 8.7 for more information on the WMAs. There is a WPA within the Project boundary. See Section 8.7 for more information on the WPA.

Given that the Project is within an important complex of ecologically significant areas and state conservation lands, the potential for a state-listed hawk to use the surrounding area, and the potential for wind turbines to cause avian mortality, the DNR strongly encouraged PWE to engage in pre- and post-construction avian monitoring. See Section 8.19 for information regarding avian studies.

PWE has been in contact with the DNR regarding native prairies. Based on a 2009 site review, the DNR noted that all proposed turbine locations and associated infrastructure appear to be in areas that have been previously tilled and that the DNR does not believe the Project will affect areas of native prairie. Some turbine locations have been modified since this initial DNR review, but PWE has continued to avoid areas of native prairies and will continue to work with the DNR to avoid such areas.

Impacts

The Project is not expected to impact any endangered or threatened species. The red-shouldered hawk, a species of special concern, has been spotted in within the Project Area and may be impacted by the wind turbines. The Project is in the vicinity of areas of ecological significance. Due to set-back requirements, PWE will not be building wind turbines within state management and recreation areas, however, there will be a visual impact on such areas.

Mitigation

As recommended by the USFWS, PWE will reassess the impact of the Project on federally-listed or proposed species or designated critical habitat prior to start of construction. A meeting, walk-through and correspondence with the DNR has already produced a modified layout taking into account concerns the DNR had with respect to potential impacts. The Project will continue to work with the DNR and the USFWS to minimize impacts and will conduct a pre and post construction inventory of biological/wetland and native prairie resources if necessary. The Project will implement a variety of mitigative measures to limit the Project’s impact on wildlife, as described in Section 8.19.

9. Site Characterization

The Project has two permanent meteorological (met) towers. The first tower was placed in service in June 2008 and was installed at 380 feet (116 meters) in height with six wind monitoring levels. This tower was destroyed by a tornado on June 17, 2010. It was replaced in September 2010 with a 330 feet (100 meters) tower with five wind monitoring levels. The second tower was installed to 190 feet (58 meters), has 4 levels of instruments and is approximately 3 miles north of the first tower. Measurements were taken at actual turbine hub heights.

A wind resource assessment was completed by a consulting meteorologist in 2010 based on data from July 5, 2008 through June 17, 2010 for the “first” tower and February 15, 2009 through July 3, 2010 for the “second” tower. The data from the met towers were correlated to airports in Alexandria and Wadena, approximately 25 and 30 miles away, respectively. Both airports have wind speed measurements at 10m, have been operating for decades and are used as long-term benchmark sites. It is normal practice to correlate short-term data sets with long-term reference sites for these types of estimates. Based on the correlation and terrain modeling, the long term estimate at the site is 7.24 mps at the 92.5m hub height (which has subsequently been modified by Nordex to 91m). The Danish WindPro model was used to make estimates at the 43 individual turbine sites.

9.1.1 Interannual Variation

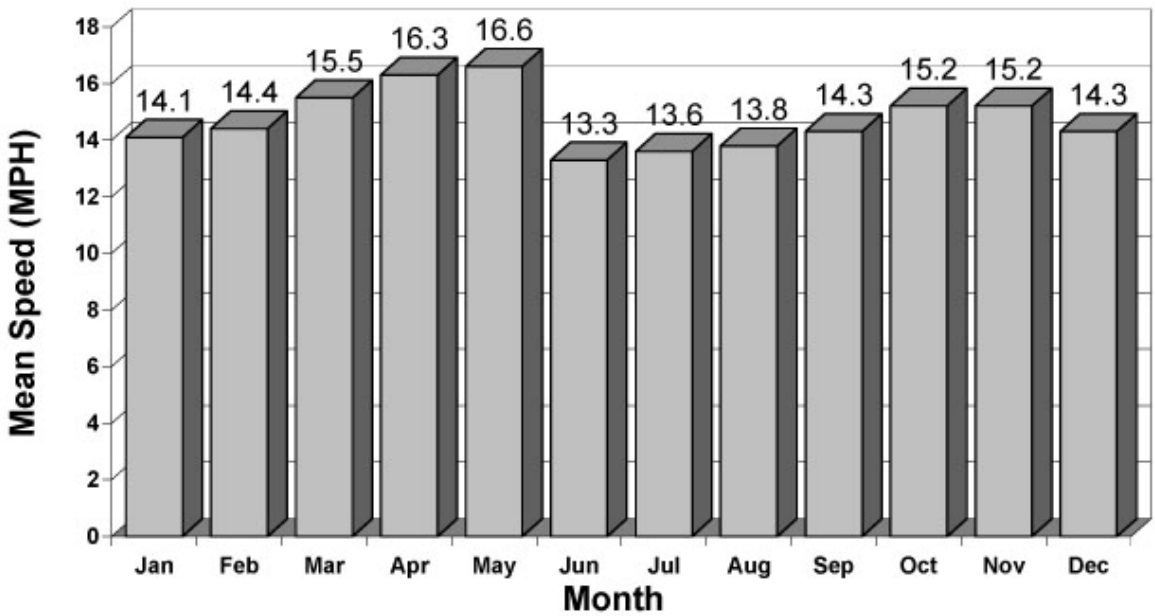
The range of speeds was 10.0 – 10.9 mph, a deviation of +/- 5% which is considered very low. Listed below are annual mean speeds at Alexandria Airport:

Table 9.1.1: Interannual Variation at Alexandria Airport	
Year	**Wind Speed Averages (mph)**
1997	**10.7**
1998	**10.0**
1999	**10.8**
2000	**10.5**
2001	**10.6**
2002	**10.9**
2003	**10.7**
2004	**10.9**
2005	**10.5**
2006	**10.2**
2007	**10.8**
2008	**10.3**
2009	**9.1**
2010	**9.0 (Through June 7, 2010, Correlated to PWE Wind Data)**

9.1.2 Seasonal Variation

The chart below presents the monthly variation at 80 meters on PWE's met tower 1 from the period July 5, 2008 to June 17, 2010.

Chart 9.1.2: Monthly Mean Wind Speeds
PWE Met Tower
July 5, 2008 to June 17, 2010



9.1.3 Diurnal Conditions

Monthly diurnal power output has been calculated for the Project. The method for doing this involves calculating 288 (24 times 12) separate wind speed distributions similar to the one shown below in Table 9.1.3. A single distribution is calculated for all the Januaries, for all the hours from midnight until 1 am, then from 1 am until 2 am, etc. This is repeated 288 times. The 288 distributions apply power curves that vary slightly for the differing air densities over the course of a day and year. Air density is highly dependent on temperature, so a winter night has very high air density, compared to a summer afternoon.

Table 9.1.3: Monthly Diurnal Mean Wind Speeds

Monthly Diurnal Mean Wind Speeds

Central Minnesota
Railroad tower 190-ft (MPH)

Feb 15, 2009 - Jul 3, 2010

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01	12.4	12.8	15.0	14.7	15.4	12.7	13.5	13.3	12.4	13.4	13.3	12.1	**13.7**
02	12.3	12.7	14.8	14.7	15.8	12.3	14.1	13.2	11.5	12.9	13.5	12.3	**13.6**
03	12.0	12.5	14.5	14.9	15.4	12.5	14.0	12.8	11.8	13.1	13.7	12.4	**13.6**
04	11.8	12.8	14.2	15.0	15.3	12.2	14.1	12.0	11.8	12.7	13.9	12.2	**13.5**
05	12.0	13.0	14.3	15.0	14.9	11.8	14.0	11.8	12.1	12.7	13.8	12.6	**13.4**
06	12.4	13.5	14.1	14.9	14.6	12.4	14.0	11.1	11.7	13.1	13.8	12.4	**13.4**
07	12.0	13.8	14.1	14.9	13.9	11.9	13.2	11.5	12.3	12.1	13.6	12.3	**13.2**
08	12.2	13.7	13.9	14.3	13.9	11.5	12.2	10.7	11.6	12.4	13.7	12.7	**12.9**
09	12.9	13.1	14.0	13.7	14.7	12.2	12.7	11.0	10.5	12.2	14.3	12.8	**13.1**
10	13.0	11.8	14.2	14.6	15.9	12.9	13.9	11.9	10.5	12.5	14.2	12.2	**13.4**
11	11.9	10.8	14.0	15.0	16.9	13.6	14.5	13.0	11.7	12.9	13.8	11.7	**13.7**
12	10.5	10.8	13.6	15.5	17.5	13.5	15.2	13.3	12.5	13.1	13.9	11.2	**13.9**
13	10.0	10.7	13.7	16.1	17.7	13.9	15.0	13.5	12.8	13.9	14.4	11.3	**14.1**
14	11.2	10.5	14.0	16.3	18.2	13.8	15.1	14.2	13.3	13.6	14.1	11.8	**14.3**
15	11.6	11.2	14.5	16.4	18.4	14.2	15.5	14.4	13.3	13.7	14.3	12.2	**14.6**
16	11.4	11.4	14.7	16.3	17.9	14.6	15.6	14.3	13.1	13.6	13.5	12.8	**14.6**
17	11.3	11.6	14.5	16.3	17.0	14.4	15.1	13.2	12.7	13.1	12.8	12.8	**14.2**
18	12.2	11.7	14.1	15.5	16.4	14.0	13.7	12.3	12.2	12.5	12.3	12.7	**13.7**
19	12.4	12.0	14.0	14.9	15.8	13.7	12.8	11.3	11.1	12.8	12.8	13.3	**13.4**
20	11.9	12.8	14.0	14.5	15.1	12.8	11.6	11.2	11.7	12.8	13.1	13.0	**13.2**
21	11.9	13.3	15.0	15.2	14.6	11.9	11.7	12.0	12.6	13.0	13.5	13.3	**13.4**
22	12.5	13.4	15.3	15.2	14.8	12.2	12.2	12.5	13.0	13.5	13.3	13.3	**13.7**
23	12.3	13.5	15.1	14.7	14.7	12.6	12.7	12.2	13.3	13.3	13.5	13.1	**13.7**
24	12.4	13.3	14.8	14.8	14.9	12.9	13.5	12.9	13.4	13.5	13.0	12.6	**13.7**
Mean	**11.9**	**12.4**	**14.4**	**15.1**	**15.8**	**12.9**	**13.7**	**12.5**	**12.2**	**13.0**	**13.6**	**12.5**	**13.7**

Valid Hrs	500	959	1442	1440	1488	1433	816	744	720	733	720	673
Missing Hrs	244	49	46	0	0	7	0	0	0	11	0	71

11,668 hours of valid data, 428 hours missing, 96.5% data recovery

Mean of monthly means: 13.3

9.1.4 Atmospheric Stability

The atmospheric stability is defined by lateral fluctuation of the wind, or sigma theta. Stability level is characterized by sigma theta 0 to 2.5 degrees as stable, 2.5 to 7 as moderately stable, 7 to 9 as neutral, 9 to 15 as moderately unstable, and greater than 15 degrees as very unstable. PWE's sigma theta value is 6.0 degrees (moderately stable). PWE's daytime value is 8

degrees (neutral) and nighttime value is 4.8 degrees (stable). This coincides with PWE's wind shear which is high at night and low during the day, which is typical in the Upper Midwest.

9.1.5 Turbulence

11.7% at 15 meters/second and 100 meter hub height.

9.1.6 Extreme Conditions

Otter Tail County experiences hot summers and cold winters. Southerly summer winds bring up warm, moist air from the Gulf region creating hot and humid conditions during summer months. The Project Area has experienced extreme thunderstorm events which bring lightening, hail and tornadic activity during summer months which is not atypical for this area of Minnesota. Winter winds typically bring extremely cold temperatures and drier air from the Canadian Rockies. Winter winds dominate and benefit the performance of wind turbines because of the increased air density. There will be times during the year that the Project's production will be minimized because of extreme weather conditions. The highest recorded wind speed going back to 1997 was 56 mph or 25 m/sec. as recorded at the Alexandria, MN Airport.

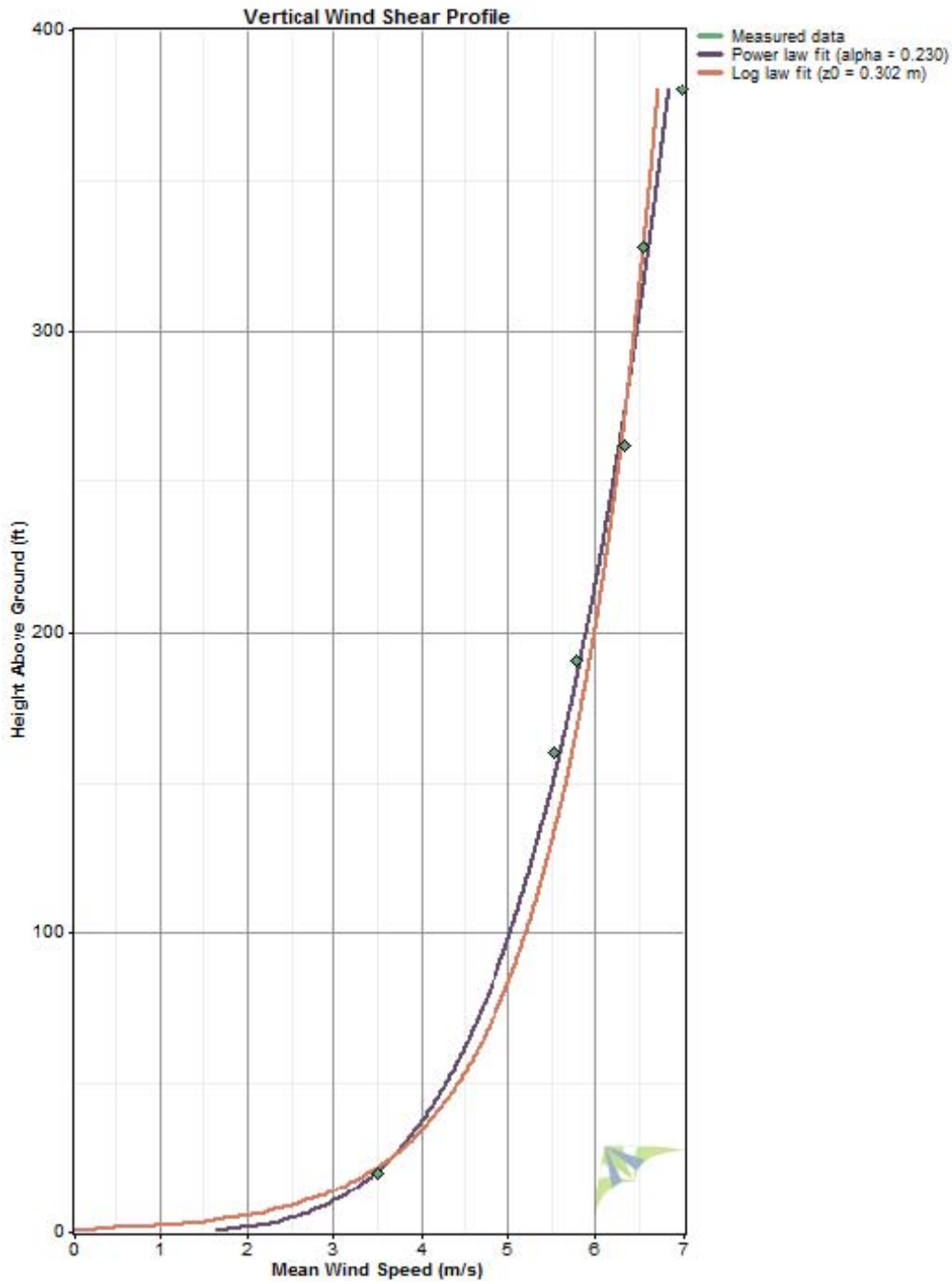
9.1.7 Speed Frequency Distribution

The wind speed distribution for calculating theoretical energy is based on the wind data from the Project's 116m met tower. The distribution is linearly adjusted so that the mean speed of the adjusted dataset is the same as the long-term estimate at 92.5m. The Wind Resource Assessment's Table 3 (Appendix E) is the frequency distribution for the 92.5m level in metric units (mps) and has been integrated with the density (1.188 kg/m3) corrected Nordex 117m power curve. At the bottom of the table, the theoretical energy is normalized to 8760 hours (one full year). It shows the annualized gross energy yield is 10,181 MWh. The table also shows the distribution plotted as a bar chart.

9.1.8 Variation with Height

Wind shear is being measured and correlated between two on site met towers that have been collecting data since mid 2008. Anemometers are measuring actual wind speeds at 116, 100, 80, 58, 49 and 6 meter. From 80 to 100 meters, measured wind speed averages increase approximately 5.5% which corresponds to an approximate 12% increase in power produced at the 100 meter hub height.

Chart 9.1.8: PWE Wind Shear Profile



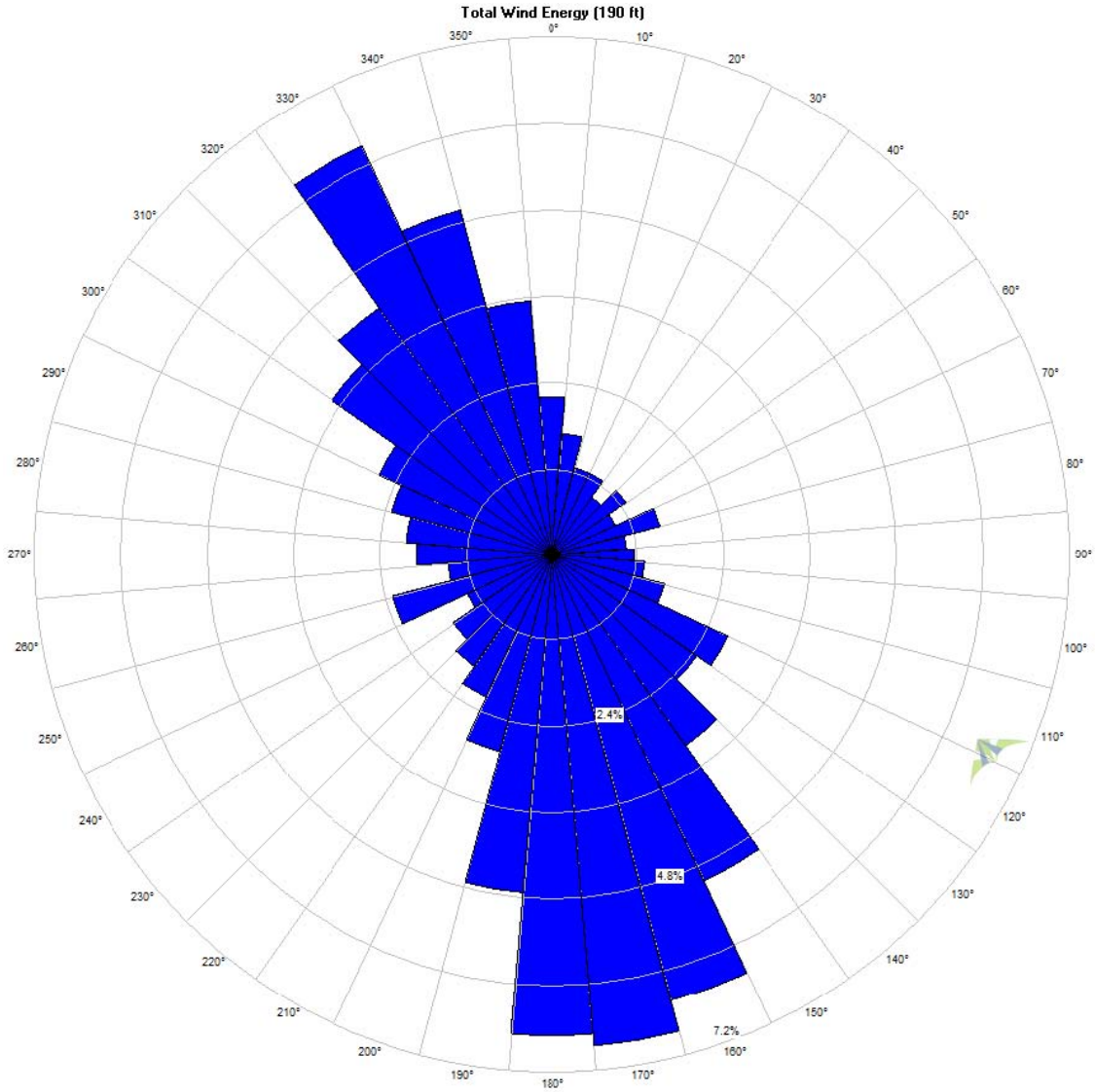
9.1.9 Spatial Variations

Analysis of the Project Area indicates that energy production across the site from turbine to turbine is expected to vary by no more than 10 percent.

9.1.10 Wind Rose

The rose shows the percent of the annual energy budget in 36 10-degree bins. The wind energy rose shows that the winds blow from all directions, with a prevalence of south-southeast winds and northwesterly winds.

Diagram 9.1.10: PWE Wind Rose, 58m Level



9.1.11 Other Meteorological Conditions

The average yearly high temperature for Alexandria, Minnesota (closest weather station to the Project) is 81 degrees in July. The average yearly low temperature is -1 degree in January. The highest recorded temperature was 104 degrees in 1983 and the lowest recorded temperature

was -38 degrees in 1977. Average precipitation ranges from a high of 4.38 inches in June to .58 inches in December.[30] According to the National Climatic Data Center (NCDC), 60 tornados have been recorded within Otter Tail County between January 1, 1950 and December 31, 2010.[31] The NCDC has recorded two tornados by the Parkers Prairie area. However, PWE's owners are aware of three different tornado events that have occurred within the Project Area over the last thirty years.

9.2 Other Turbines

There are no utility scale wind turbines within ten miles of the Project boundary. The closest utility scale turbine is a 2.5MW turbine located in Hewitt, approximately 12 miles from the Project boundary. There is one small residential wind turbine within the footprint of the Project. This turbine is owned by a landowner leasing some acreage to PWE. The turbine is rated at 10 kW and is used primarily for farm/residential load on the property. Energy that cannot be utilized by the owner is exported back onto the grid (using net metering) controlled by Lake Region Electric Cooperative. There are many other small wind turbines within 10 miles of the Project Area used for residences, farms and small businesses. These small wind turbines will not have any impact on the Project, nor will the Project impact these small wind turbines.

10. Project Construction

10.1 Roads and Infrastructure

Numerous roads are within the Project boundary and are described in Section 8.5. Traffic in this area of Otter Tail County increases during the summer months because of recreational lakes located nearer to Alexandria, MN and northwest towards the cities of Battle Lake and Otter Tail. Short-term issues relating to traffic bottlenecks may occur while bringing trucks with large loads in to the site. PWE will work with MNDoT, Otter Tail County and the local townships to ensure quick and easy access by widening out entry points on roads to mitigate in and out-bound traffic congestion. The Project will ensure that all permits and safety procedures are followed to mitigate traffic impact. Once constructed, the Project will not generate a significant amount of traffic.

[30] Weather.com. "Average Weather for Alexandria, MN" http://www.weather.com/weather/wxclimatology/monthly/graph/USMN0017. Accessed March 23, 2011.
[31] U.S. Department of Commerce, National Climatic Data Center "Storm Events for Minnesota". http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms. Accessed March 23, 2011.

Local authorities will be contacted prior to construction to discuss PWE's maintenance plan and to ease any road maintenance concerns they may have. The plan will include local roads being maintained on a periodic basis or as needed. This will include grading and possibly the supply of class 5 from time to time to fill and level areas impacted by the increase in local traffic. PWE will also use water or sodium chloride for dust control to minimize impacts within the Project Area. Our upfront approach to working with all agencies should minimize concerns and the roadways will be left in the same condition as prior to construction

10.2 Access Roads

The Project will utilize existing access roads to the extent possible. Current estimates for the Project require approximately 12 miles of access roads. The total length of access roads will ultimately be determined by the final turbine layout and the amount and location of participating land. Some local unimproved roads will need to be upgraded with the addition of new or widened field accesses to facilitate construction, installation, operation, and maintenance of the wind farm. Where existing accesses are widened the Project will consult with local authorities to either return accesses to their previous width or maintain the new access widths to accommodate future work. The accesses will be located along the wind turbine strings, fence lines, and field edges to minimize the number of accesses and minimize disturbance to agricultural activities to the extent possible. Roads are not expected to be installed on steep slopes or in areas which have a tendency towards erosion unless otherwise arranged with the landowner. PWE or its construction contractors will coordinate with local permitting authorities to obtain necessary road access permits for overweight and over width vehicles.

Access roads and pads will be built adjacent to each turbine to accommodate construction, operation and maintenance traffic to and from turbines. The exact width and surface of the access roads will be determined once the Project has completed all pre-construction soil testing. The roads will be built to accommodate compaction necessary for cranes and large equipment. One scenario would be for approximately six inches of topsoil to be scraped off and a layer of road fabric laid down and topped off with 10 to 14 inches of class 5 road gravel shaped to prevent pooling from rains. The roads are expected to be 16 feet wide and approximately 6 to 8 inches thick after compaction and settling, but again, this will be determined by soil testing and equipment size. The roads are low profile and constructed to

minimize problems for farm operations. Culverts will be utilized where needed and as directed by local permitting authorities so as not to alter the direction of natural flowing water.

During operation and maintenance of the wind farm, 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 and snow removal when needed.

10.3 Associated Facilities

A facility is planned for operations, maintenance and inventory storage for this Project as well as possibly two other projects under development. A total of 167.5 MW, of which 67.5 MW have already been permitted by the MPUC is expected to be aggregated through this one management facility. The facility and the Prairie Wind Energy Project (100 MW) is somewhat centrally located between the other two projects; Glacial Ridge (20 MW) located in SE Pope County and Bear Creek (47.5 MW) which is located in southwest Todd and eastern Otter Tail Counties.

PWE currently has two meteorological towers located within the footprint. The first is located in Parkers Prairie Township in the SE ¼ SE ¼ of Section 8. This tower has a FAA Aeronautical Study Number (ASN) of 2008-WTE-3042-OE. It was placed in service in June 2008 and was a 380 foot tall guyed tower with red lights and paint in accordance with the FAA and U.S. Department of Transportation "Advisory Circular AC 70/7460-1k Obstruction Marking and Lighting" and had marker balls on the guy wires as well. This tower was destroyed by a tornado on June 17, 2010. It was replaced in September 2010 with a 330 feet (100 meters) tower with five wind monitoring levels. The second met tower is located in the NE ¼ NW ¼ Section 33 of Elmo Township. This tower is not regulated by the FAA as it is only 190 feet in height, just under the 200 foot FAA guidelines. PWE voluntarily painted the tower red and white according to Circular guidelines, and the longest 3 guy cables have two marker balls placed in layers of about 1/3 tower height. PWE may utilize additional meteorological equipment in the future. These towers will be used to measure the site's performance prior to construction and to calculate lost revenue during times of curtailment or energy loss.

10.4 Turbine Site Location

Tower foundation design "loading" calculations and the shape of the foundations are provided by the manufacturer and are based on the current American/North American building standards.

Geotechnical recommendations for the Project will be based on subsurface exploration and engineering evaluations with net allowable bearing pressures of 2,000 pounds per square foot. Stripping, excavating, grading and sub grade preparation will be performed in a manner and sequence providing proper drainage throughout construction and provide for proper erosion control. Backfill material over and around the foundation will be placed in "lifts" specified by engineering and compacted to no less than 95 percent "dry" density or 145 percent "wet" density. The Project anticipates the reuse of onsite materials to be acceptable. However, material samples from each turbine site location will be evaluated prior to construction and an onsite geotechnical engineering technician will monitor and test compaction to ensure proper fill. An onsite qualified representative of an engineering firm will monitor and confirm all geotechnical aspects prior to and during the foundation construction. We anticipate approximately 2,000 yards excavated per foundation.

Turbine foundation placement adjacent to man-made or natural slopes will be laterally set-back from the top of the slope. The set-back distance will be determined by establishing a 45 degree angle extending downward from the edge of the foundation. The turbine foundation will not be located any closer than 25 feet from the edge of the slopes. If a proposed turbine location violates this set-back the foundation will be moved horizontally a sufficient distance to meet our set-back requirements.

The Project will utilize an octagonal shaped "inverted T" type foundation which will be designed by an engineering firm licensed in the state of Minnesota. A lean concrete mat will be placed below the concrete foundation to facilitate the support for approximately 100,000 pounds of reinforcing steel ("rebar"), forms and to provide a good working surface for personnel.

The foundation base will have the approximate dimensions of 78 feet x 78 feet. The edges will be approximately 1 foot 6 inches that slope or angle to the top of the base which will have a height of approximately 8 feet 2 inches and will be approximately 32 feet across. In the center of the top of the foundation base a tower pedestal will be located which will have dimensions of 1 foot 7" high x 17 feet across. The overall height of the foundation will be approximately 9 feet 9 inches. A 28 day 5,000 pound per square inch concrete mix will be utilized for the foundation base; a 28 day 6,000 pound per square inch concrete mix will be utilized for the pedestal. A leveling ring, embedment ring, anchor bolts and nuts will be supplied by the manufacturer. The leveling ring will be leveled and pre-grounded prior to erecting which

will reduce construction costs through saving crane time by avoiding the need to level the ring during tower erection. Electrical and communication conduits will be installed prior to pouring concrete, along with a robust grounding system meeting stringent manufacturer grounding requirements.

Mill certifications for the rebar to ensure engineering specifications will be strictly adhered to by the supplier by utilizing the American Society of Testing and Materials (ASTM) criteria. Concrete mixing, placement and testing will be in conformance to ASTM and will be performed by a Minnesota engineering firm specializing in concrete testing to ensure compliance with engineering specifications.

Transformer foundations will be placed on the edge and on top and contiguous to the foundation base to mitigate fire damage risk to the tower and potential settling of the foundation. These soils will be compacted to 97% dry density.

10.5 Post-Construction Cleanup and Site Restoration

Post construction clean-up and site restoration will be completed during suitable weather conditions after all heavy construction activities have been concluded. Site restoration will consist of landscaping, earthwork and seeding in areas other than graveled areas. Disturbed areas outside of graveled areas will be shaped, smoothed (cultivated) and reseeded to control erosion. This includes areas near or adjacent to access roads, substation and turbine areas. Other clean-up activities may include washing of towers, painting and/or covering of bolts as well as other miscellaneous tasks that are part of normal post construction activities. Where construction equipment damaged farmland or crops, damages will be paid as per lease agreements and steps will be taken to restore areas by either PWE or the landowner. Construction clean-up will require the use of a graders, tractors, dump trucks, front-end loaders, and light trucks for transportation of waste materials as well as dumpsters to accommodate rubbish, packaging, etc. Clean and site restoration, including the establishment of grass should take no longer than 6 – 9 months.

10.6 Operation of Project

PWE will have a robust operations and maintenance system for the Project. This system will include Nordex, the WTG manufacturer, PSE and PWE.

PWE will have on-site service and maintenance facilities and will conduct regular maintenance activities, including routine inspections, regular preventive maintenance,

unscheduled maintenance and repair, and routine minor maintenance on the wind turbines and associated facilities. For unscheduled maintenance it is our intent that personnel will be available 24 hours and 7 days a week to operate and facilitate minor troubleshooting repairs. The Project has modeled a 2 year manufacturer operations and maintenance plan into the pro forma and subsequent PPA pricing which covers everything related to the turbine itself. This 2 year warranty may be extended up to 10 years. Initially these services will be performed by Nordex trained personnel. It is the Project's intent to become fully engaged in O&M to eventually become responsible for O&M activities. A smart training program will be initiated to work along-side Nordex personnel to gain expertise with the Nordex operating and maintenance platform and to devise safe working procedures.

WTG maintenance will be on a scheduled, rotating basis that will typically involve one or more WTG's offline for maintenance each day, on an as-needed basis. Maintenance on the interconnection points will, to the extent possible, be scheduled for low wind periods.

In conjunction with Nordex, PSE has an innovative O&M approach that combines traditional preventative maintenance methodologies with condition monitoring and predictive maintenance. This approach has been successfully applied by principals of PSE in the past at other firms to achieve true availability on average between 98.5% to 99% fleet-wide, while the industry average is approximately 94.5%.

During the initial warranty period, PSE personnel will be overseeing the WTG manufacturer's maintenance team, and analyzing the SCADA and condition monitoring data to quickly and effectively identify and resolve issues. All failures will be entered in a Computerized Maintenance Management System (CMMS) and a Failure Reporting and Causation Analysis System (FRACAS). Use of this dual-system approach will promote the most efficient maintenance management and any serial issues will be identified and corrected site-wide once a trend is identified. Once the databases are sufficiently populated, the intent is to build a systematic approach that should actually identify many problems before they occur and direct predictive maintenance to correct the upcoming issue, and hence minimize collateral damage to components. PSE and PWE personnel will work with Nordex personnel to assist in achieving the highest availability possible and to perform maintenance in low wind times, when possible.

Before reaching the end of the warranty period, a complete analysis of all WTG's will be conducted, including vibration analysis utilizing Expert Software. Any issues identified will be

directed to the WTG's manufacturer warranty team for resolution before accepting the WTG's out of warranty. If any serial issues remain, negotiations will be undertaken to extend the warranty on any unresolved issues.

After accepting the WTG's at the end of the warranty period, PSE personnel will then begin a sophisticated maintenance approach using the populated database of equipment history in the CMMS and FRACAS. Utilizing data analysis from those databases in conjunction with information from the CMMS, preventative and predictive maintenance will be conducted on the WTG's. This maintenance will be conducted during the lowest wind periods available to maximize availability. Additionally, the spare parts inventory will be optimized based on data from the CMMS and FRACAS databases to further enhance availability and minimize downtime due to the logistics of obtaining spare parts. As part of the Project, PWE intends to build an operations and maintenance facility that will also be utilized by two other projects under development by PSE.

10.7 Costs

Project timing is important for several reasons, including low interest rates, grant availability and there is a turbine supply glut on the market. Other cost considerations include copper and steel pricing, international exchange rates and inflation. Investor return expectations will also factor in to installed capital costs. Although PWE has constructed a solid pro forma based on current expectations and discussions with potential investors, until there is a power purchase agreement in place and finance arrangements have been solidified, it is difficult to determine the installed Project cost with a high degree of certainty. PWE expects the cost to increase when the economy rebounds and renewable energy projects are aggressively being constructed across the country once again. The Project's current estimated cost to design, construct and operate is $232 million installed capital costs and $5.83 million dollars in annual administration, operation and maintenance costs.

10.8 Schedule

The schedule depends upon the Project obtaining a power purchase agreement (PPA) or some form of power sales agreement with a utility. The Project has replied to various requests for power and continues to work diligently on obtaining such agreements. If the Project were to

be notified of shortlist negotiations by a utility in the summer of 2011, PWE would expect the development schedule to be as follows:

Table 10.8: Project Schedule		
Activity	**Expected Commencement**	**Expected Completion**
Certificate of Need Application	Commenced November 30, 2010	October 2011
Complete site design work	Underway	June 2011
Site Permit process	February 2011	October 2011
Complete financing	July 2011	November 2011
Complete turbine supply arrangements	July 2011	September 2011
Construction design and planning	March 2011	December 2011
Construction	December 2011	October 31, 2012
Operational Testing	No Later than November 1, 2012	December 1, 2012
Commercial Operation		No later than December 31, 2012

10.9 Energy Projections

The Project has a net capacity factor of 39.4% using the Nordex N117 2.4 MW WTG, yielding a total yearly output estimate per turbine of 8,282.42 MWh and an estimated total P50 output of 339,579 MWh.

10.10 Decommissioning and Restoration

10.10.1 Anticipated Life of the Project

The signed Land Lease and Wind Easement contracts are long term, going up to 50 years with extensions. It is anticipated that there will be extensions to the PPA after the initial contract term or the Project may have the ability to market its power using other pricing methods if it is so feasible. Updating or repowering of the turbines may be likely in years 20 to 25. In the event that the Project's economical life or 50 year contracts have expired and decommissioning becomes a reality on portions or the entire Project, a decommissioning fund will have been established and funded by year 20.

10.10.2 Costs to Decommission

Labor costs and scrap value of the materials and equipment contained in the Project infrastructure (steel towers, electric) fluctuates dramatically over time with variations in

commodity prices. It is not possible to accurately estimate decommissioning costs twenty years in advance. However, PWE has estimated in the Project pro forma a cost of 3.5 million dollars will be accumulated in an interest bearing account by year 20. Assuming very conservative interest rates accruing at 1.5% per year on this through year 50 the Project expects a total of 5.47 million dollars to be in this account. In addition to the monies accrued, proceeds from steel, copper, etc. will be utilized to pay any additional costs over the monies accumulated in the decommissioning account.

10.10.3 Method and Schedule for Updating the Costs of Decommissioning and Restoration

The cost of decommissioning and restoration is an estimate and is expected to change in the future based on various economic factors. As such, PWE will analyze and update decommissioning and restoration estimates throughout the term based on the economic environment and annual accounting regulations. This revised cost estimate of decommissioning will be submitted to the MPUC for review and comment as necessary.

10.10.4 Method of Ensuring that Funds will be Available for Decommissioning and Restoration

The method for ensuring available funds for a Decommissioning, Restoration and Operating Reserve will be a contingency fund which sets aside $7,500 per year, per turbine, starting no later than year 11. That funding process will proceed through year 20, at which time the funds should have accumulated to approximately $3.5 million dollars. This money will be placed in an interest bearing account accessible for turbine overhauls, if needed, which will be replenished with interest at the start of the following year.

However, we believe that repowering will take place long before the 50 year timeframe in which the leases run out and that decommissioning costs should be reevaluated to ensure the Project is on track with respect to decommissioning costs.

If repowering takes place as anticipated, a reevaluation could conclude that a letter of credit or some other means of establishing security for decommissioning could supplant funds. This may or could be based on a potentially different off take and possible ownership structure. The Project respectfully requests flexibility with the MPUC along with a reservation of the right to establish decommissioning based on best practices. Best practices will likely evolve over the next several years. We anticipate the Project would notify the MPUC of its intent and get prior

approval if any changes take place with respect to the way in which decommissioning is funded and secured for the Project.

10.10.5 Anticipated Manner in which the Project will be Decommissioned and the Site Restored

Upon decommissioning, each turbine will be taken down, foundations removed to a depth of 4 feet and all other equipment and roads will be removed unless other arrangements are made with the current landowner. The property will be landscaped back to match surrounding contours and soil profiles. If the land surrounding the turbine property is tilled annually, a cover crop will be seeded otherwise a native prairie grass and/or legume mix will be planted to minimize soil erosion and control invasive weeds.

11. Other Permits

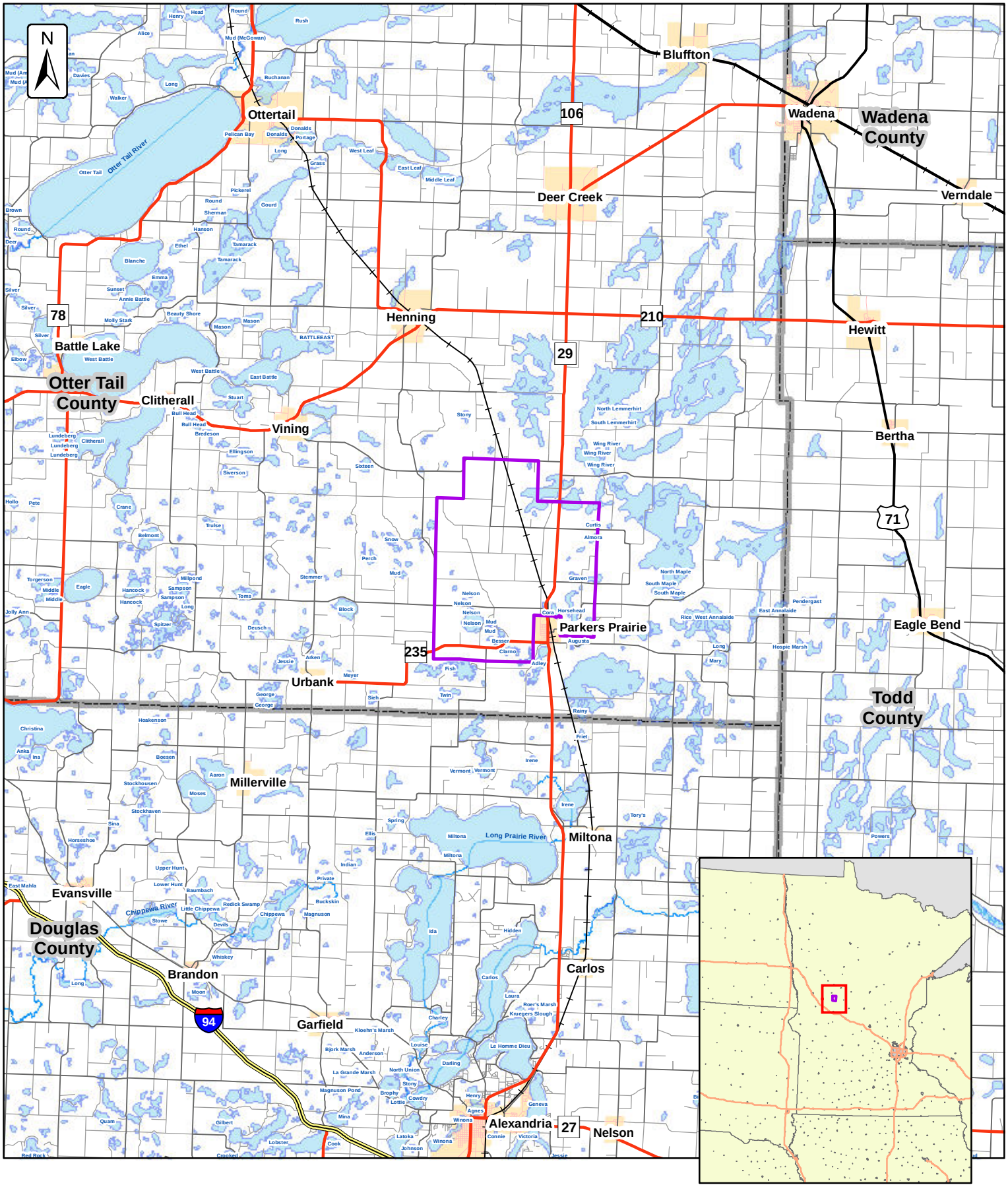
The following chart provides a complete picture of the permits required by PWE for the Project and the anticipated permitting schedule.

Table 11.1: Project Permits and Approvals

Agency	Permit/Approval	Description	Status
Federal Permits			
US Fish and Wildlife Service (USFWS)	Threatened and Endangered Species – Section 7 Consultation	Determination of effect on federally listed species	Not anticipated
Federal Aviation Administration (FAA)	Form 7460-1, Notice of Proposed Construction or Alteration	Required if construction or alteration is within 6 miles of public aviation facility and for structures higher than 200 ft	Ongoing
U.S. Army Corps of Engineers (USACE)	Section 404 Permit	Complete an application under the Clean Water Act for impacts to wetland and waters of the U.S.	As required following MPUC Site Permit Issuance
U.S. Department of Agriculture (USDA)	Conservation Reserve Program (CRP) Coordination	Coordinate with the USDA regarding Project facilities in CRP parcels	As required following MPUC Site Permit Issuance
	USDA Loan Coordination	Coordinate with the USDA regarding Project facilities in parcels under USDA loans	To be filed if necessary
Native American Tribes	Section 106 Consultation	Determination of effect on Native American cultural resources	Not anticipated
State of Minnesota Permits			
Minnesota Public Utilities Commission (MPUC)	Certificate of Need	Application required for Large Energy Facility	In process.
Minnesota State Historic Preservation Office (SHPO) and Office of State Archaeologist (OAS)	Section 106 Consultation (not anticipated), consultation per Minnesota Wind Siting Act (anticipated)	Determination of effect on archaeological and historical resources	Ongoing review.
Minnesota Pollution Control Agency (MPCA)	General NPDES Permit for Stormwater Discharges Associated with Construction Activities	Stormwater permit required for construction activities	SWPPP will be prepared and NOI will be submitted prior to construction

Table 11.1: Project Permits and Approvals			
Agency	**Permit/Approval**	**Description**	**Status**
	Section 401 Water Quality Certification	Impacts to waters of US (USACE Section 404 permit)	As required following MPUC Site Permit Issuance
	Small Quantity Hazardous Waste Generator License	Generation more than 100 pounds of hazardous waste each year	As required following MPUC Site Permit Issuance
	Temporary and Permanent Soil Erosion and Sediment Control Plans	Plans will be incorporated into final plans and specifications for Project	To be submitted prior to construction and maintained until disturbed areas have been re-vegetated
	Small Quantity Generator Permit	Necessary if any used lubricating oil will be accumulated and temporarily stored on the site	Can be obtained within 45 days after Project is placed in operation, if necessary
Minnesota Department of Natural Resources (DNR)	Public Water Works Permit	Any construction activities that impact DNR public waters	As required following MPUC Site Permit Issuance.
	License to Cross Public Land and Waters	Siting facilities on, or crossing over, any State administered Public Lands or Waters	As required following MPUC Site Permit Issuance.
	Wetlands Survey	Determination of effects on public waters and wetlands by tower and road placement	Ongoing process.
Minnesota Board of Water and Soil Resources (BWSR)	Wetland Conservation Act Approval	Any construction activities that impact wetlands	As required following MPUC Site Permit Issuance
Minnesota Department Health	Well Construction Notification	Installation of private well(s) or O&M building	As required following MPUC Site Permit Issuance
	Plumbing Plan Review	Plumbing system for O&M building	Will be obtained prior to construction
Minnesota Department of Transportation (MNDOT)	Highway Access Permit	Permit required for any access roads abutting state roads	As required following MPUC Site Permit Issuance
	Utility Access Permit	Permit required for any utility crossing or use within state road ROW	As required following MPUC Site Permit Issuance
	Oversize and Overweight Permit	Permit required for heavy equipment transport over state roads during construction	As required following MPUC Site Permit Issuance
	Tall Structure Permit	Permit for wind turbines and other tall structures	As required following MPUC Site Permit Issuance
	Routing Permit for Power Lines	Permit required for any utility crossing of county roads	As required following MPUC Site Permit Issuance
Local Permits			
Otter Tail County	Driveway Permit	Permit required for access roads abutting county roads	As required following MPUC Site Permit Issuance
	Utility Permit	Permit required for any utility crossing of county roads	As required following MPUC Site Permit Issuance
	Moving Permit	Permit required for heavy equipment transport over restricted county highways during construction	As required following MPUC Site Permit Issuance

Table 11.1: Project Permits and Approvals			
Agency	**Permit/Approval**	**Description**	**Status**
	Individual Septic Tank Systems (ISTS) Permit	Connection to existing or approval of onsite sewage and water (O&M building)	If necessary, will be obtained prior to construction
	Utility permit for Ditch Crossings	Any construction activities that impact a County Judicial Ditch	As required following MPUC Site Permit Issuance
	Wetland Conservation Act Compliance	Set back of 300 feet is required, but no permit needed	As required following MPUC Site Permit Issuance
Townships	Township Road Access	Possible permit or approval required for township road access	As required following MPUC Site Permit Issuance
Canadian Pacific Railroad (CPR)	Determination of process and permits for working within railroads right-of-way	The Project is working with CPR personnel	Ongoing



ProjectArea
USGS Lakes
Major Rivers
Urban Areas
MNDOT Interstate
MNDOT_US_hwys
MNDOT_State_hyws
MNDOT Railroad

Figure 1

Prairie Wind Energy Project Location

Miles
0 2.5 5

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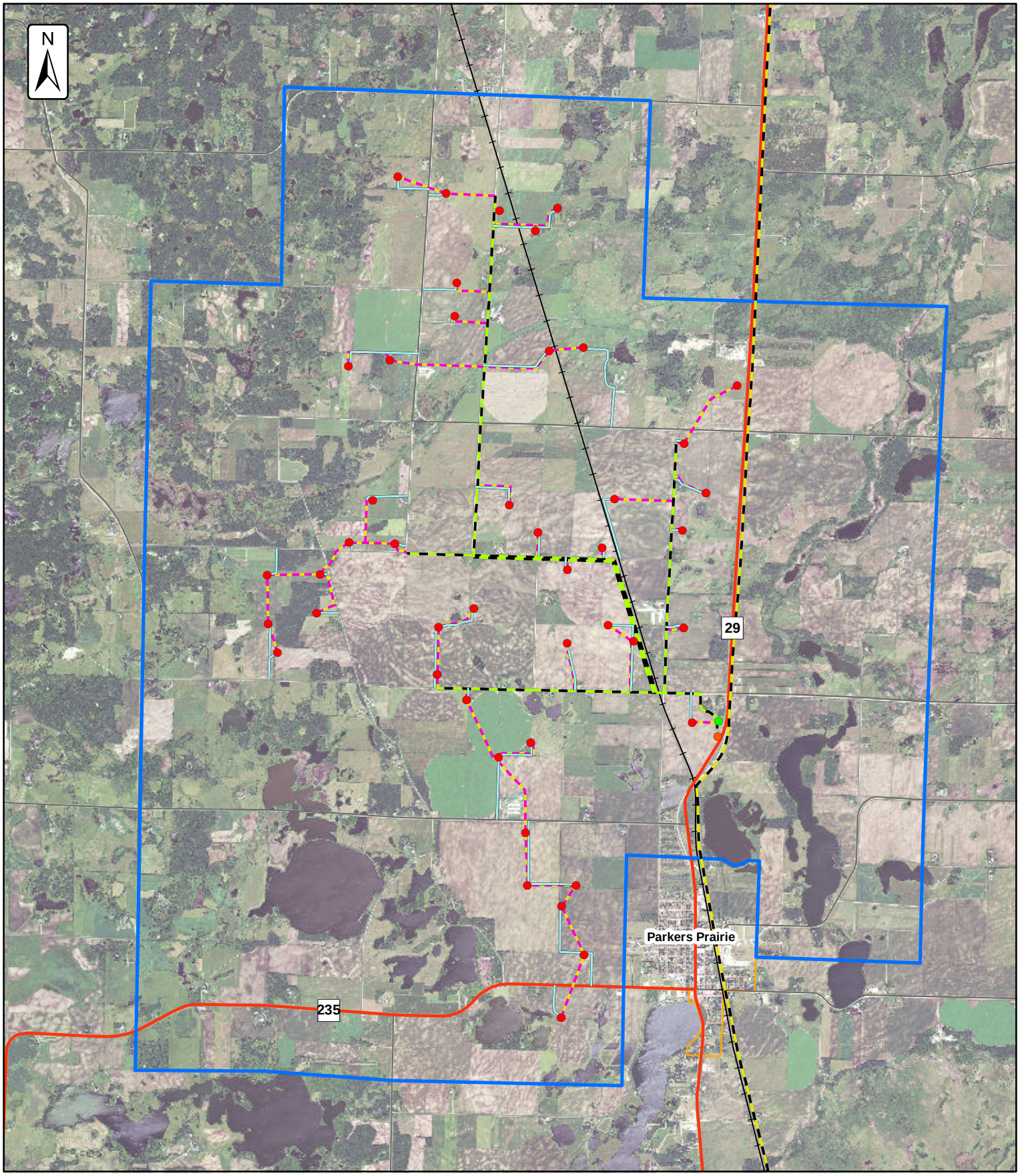

- Wind Turbines
- Future Office - Laydown Yard
- Future Substation - TAP
- Overhead Power 115 kV
- Overhead Power 34.5 kV
- Underground Transmission
- Access Roads
- MNDOT Interstate
- MNDOT_US_hwys
- MNDOT_State_hyws
- MNDOT Railroad
- Urban Areas
- Project Area

Miles
0 0.5 1

Figure 2

Prairie Wind Energy
Project Area and Facilities

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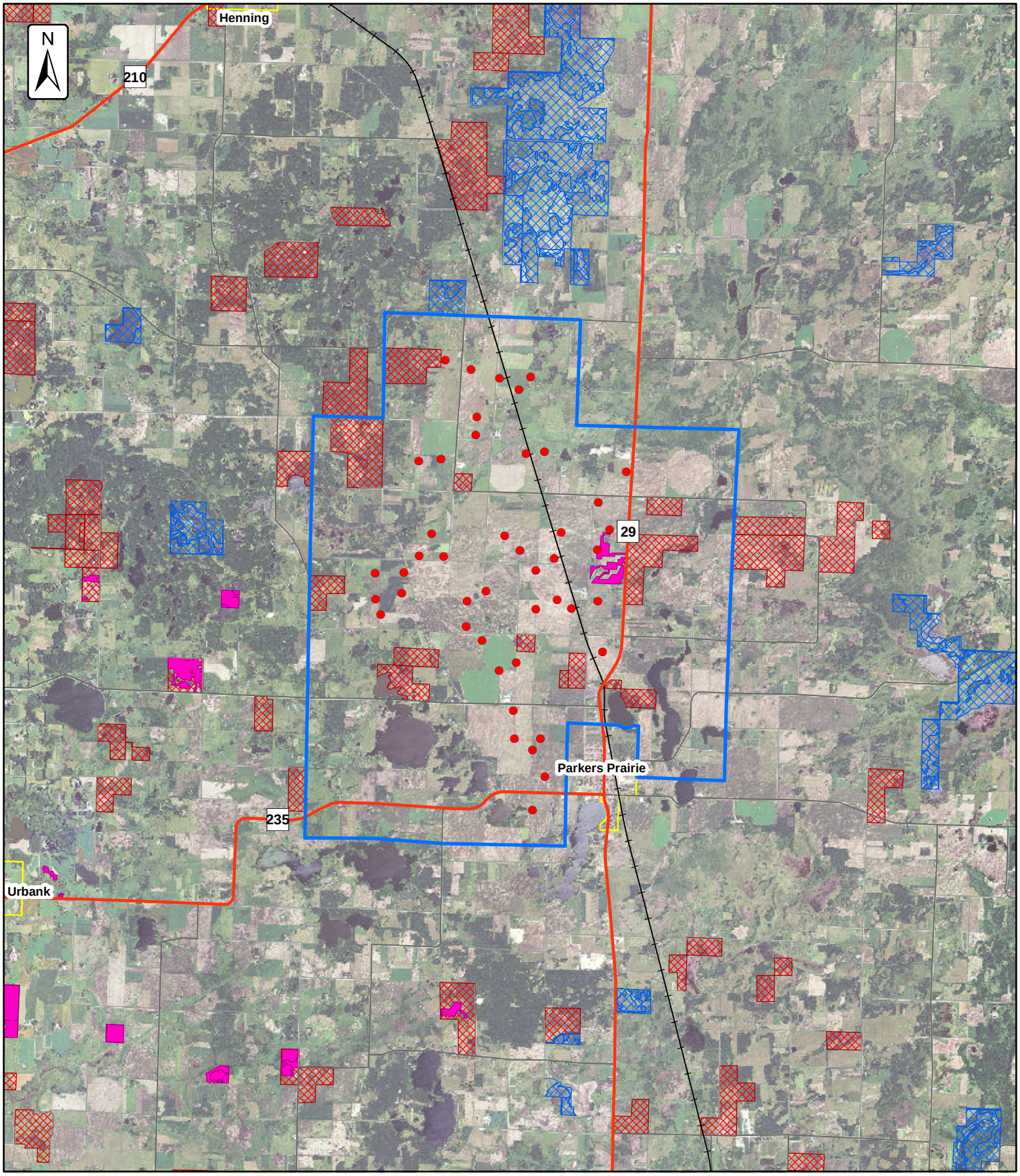


Wind Turbines
Project Area
Urban Areas
MNDOT Interstate
MNDOT_US_hwys
MNDOT_State_hyws
MNDOT Railroad

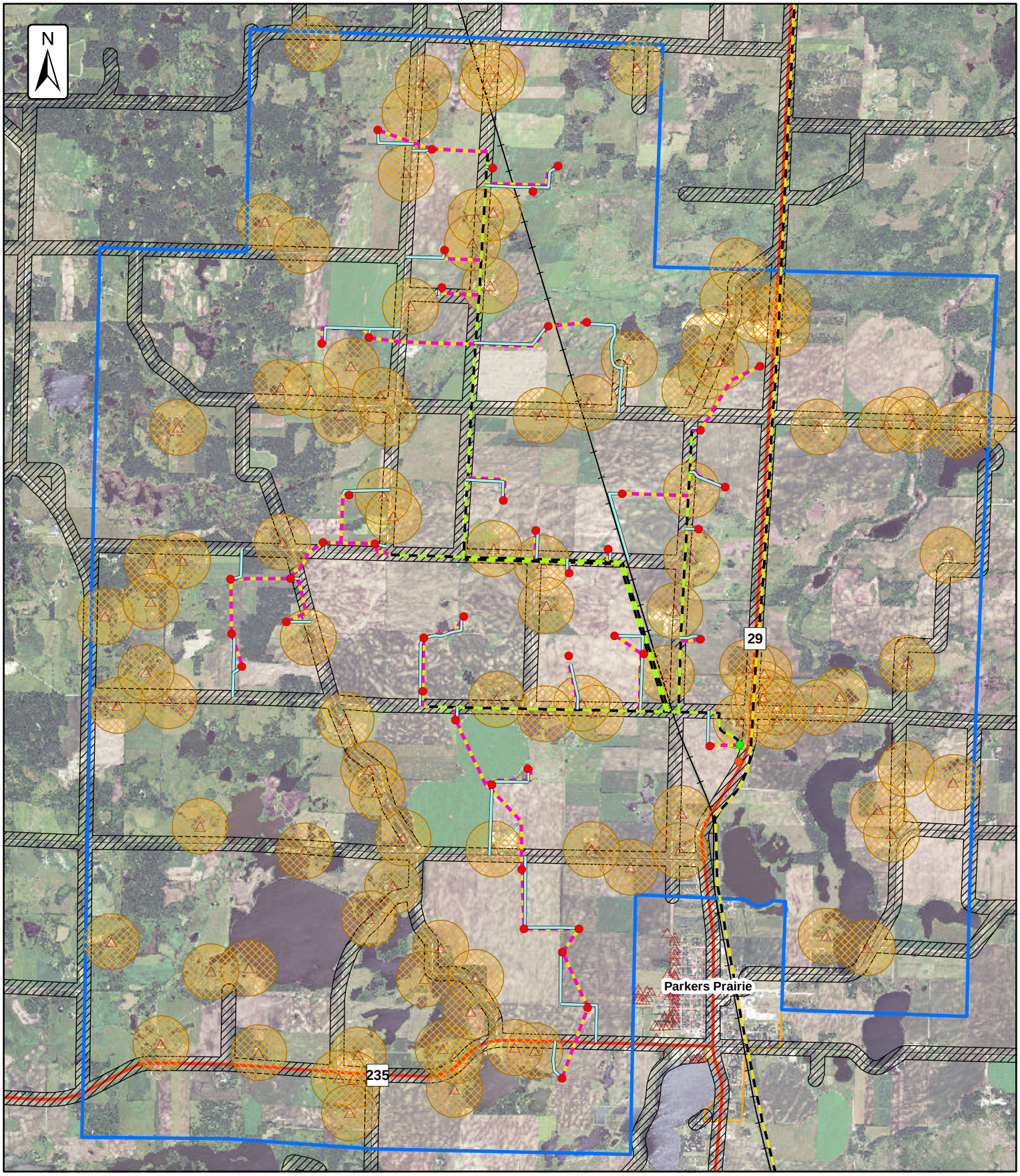
Public Land
Wildlife Management Area (DNR)
State, Reinvest in Minnesota
Waterfowl Production Areas (USFWS)
State Forests (DNR) (Not in Project)
State Parks (DNR) (Not in Project)
National Forests (Not in Project)
Sientific and Natural Areas (Not in Project)

Figure 3

Prairie Wind Energy Public Land Ownership and Recreation

Miles
0 1 2

Houston Engineering Inc



Wind Turbines
Future Office - Laydown Yard
Future Substation - TAP
Overhead Power 115 kV
Overhead Power 34.5 kV
Underground Transmission
Access Roads
MNDOT Interstate
MNDOT_US_hwys
MNDOT_State_hyws
MNDOT Railroad
Urban Areas
Project Area
Residence in Project Area
Residence Noise Setback 1000 ft
Road Setback 250ft

Miles
0 0.5 1

Figure 4

Prairie Wind Energy Turbine Layout and Constraints

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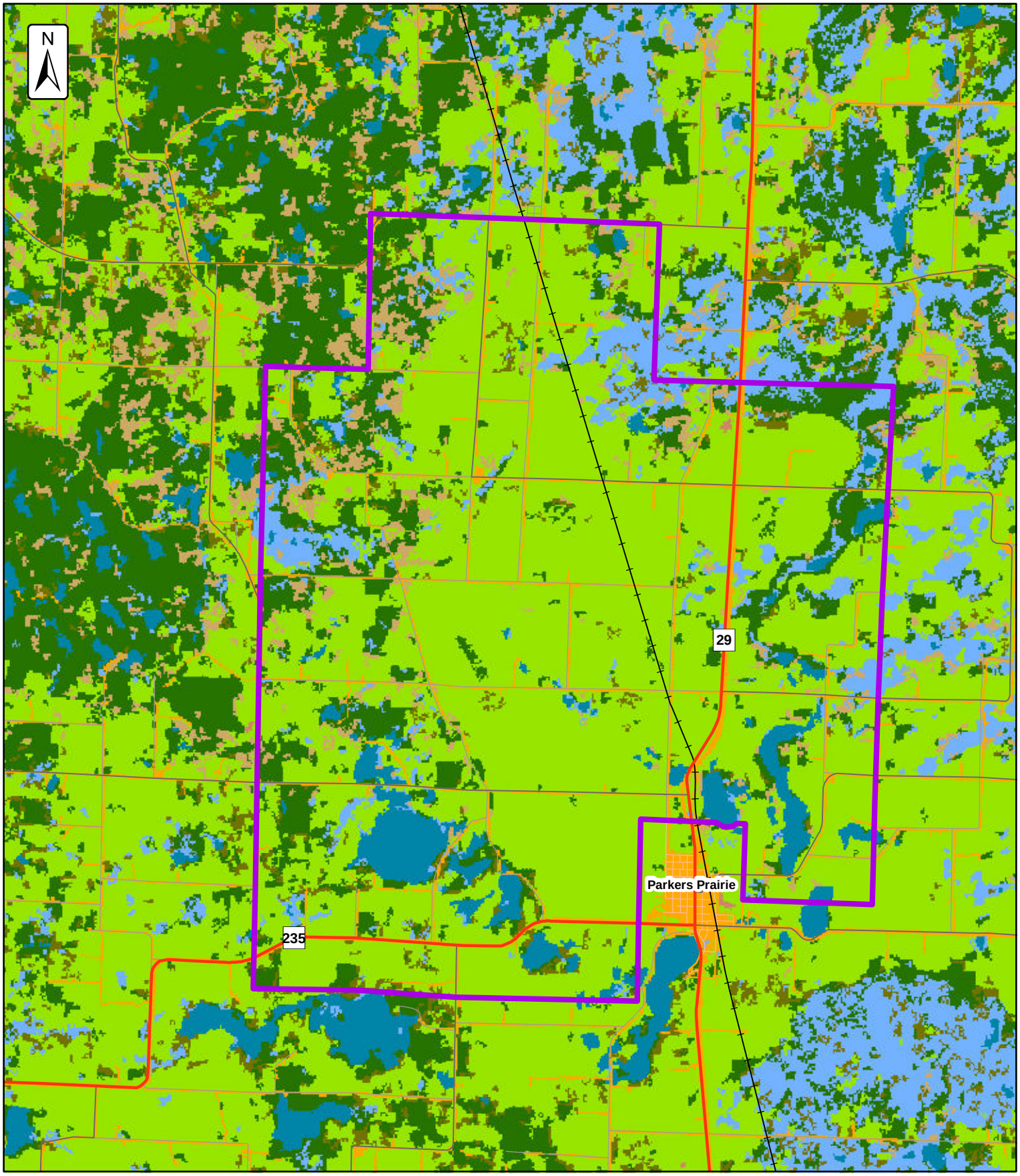

NLCD
LANDUSE TYPE
- Barren Land
- Cultivated/Pasture
- Forest
- Developed
- Wetland
- Grassland
- Open Water
- Scrub/Shrub

- Project Area
- Urban Areas
- MNDOT Interstate
- MNDOT_US_hwys
- MNDOT_State_hyws
- MNDOT Railroad

Miles
0 0.5 1

Figure 5

Prairie Wind Energy
Land Cover

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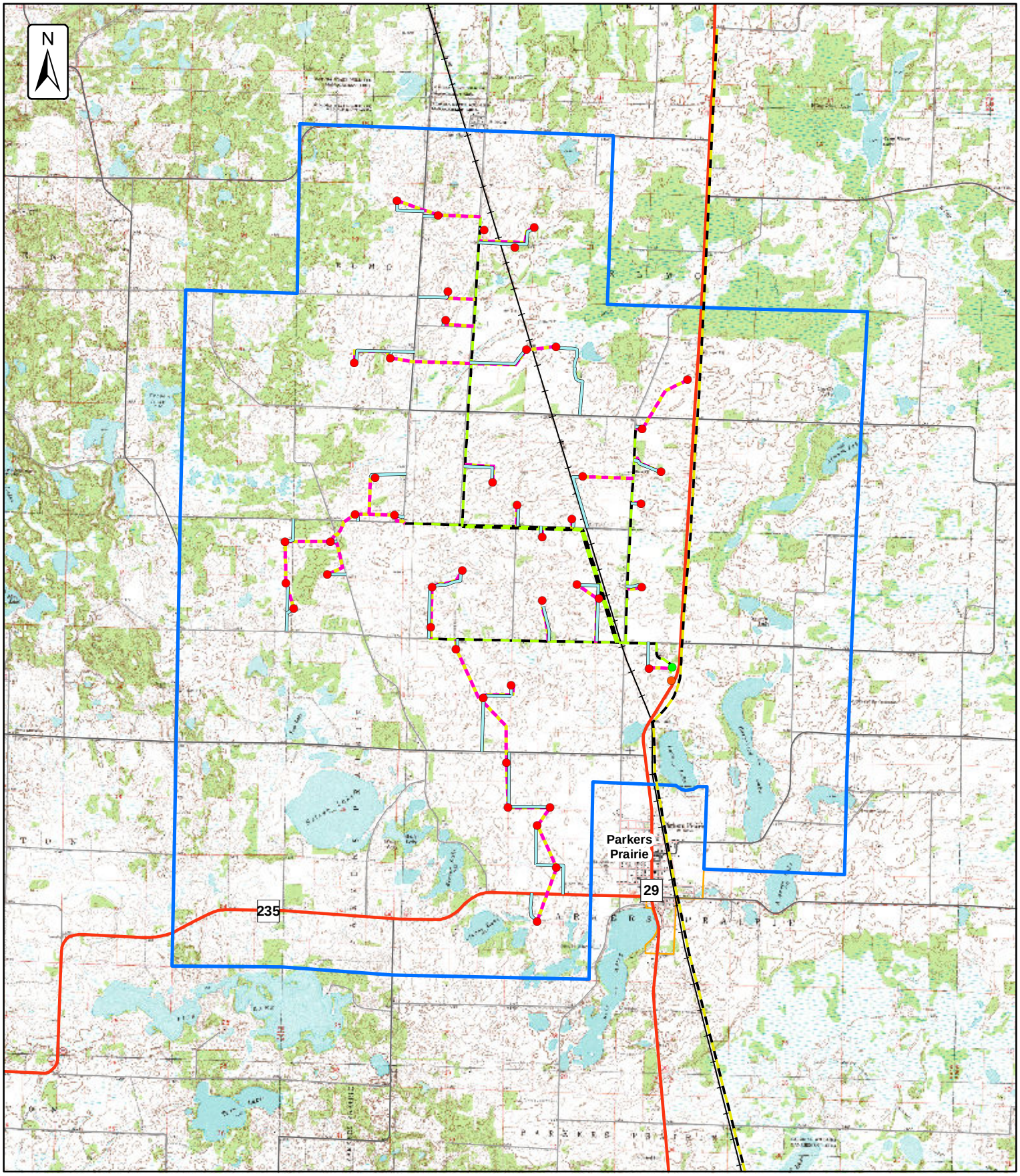

Wind Turbines
Future Office - Laydown Yard
Future Substation - TAP
Overhead Power 115 kV
Overhead Power 34.5 kV
Underground Transmission
Access Roads
MNDOT Interstate
MNDOT_US_hwys
MNDOT_State_hyws
MNDOT Railroad
Urban Areas
Project Area

Miles
0 0.5 1

Figure 6

Prairie Wind Energy Topographic Map

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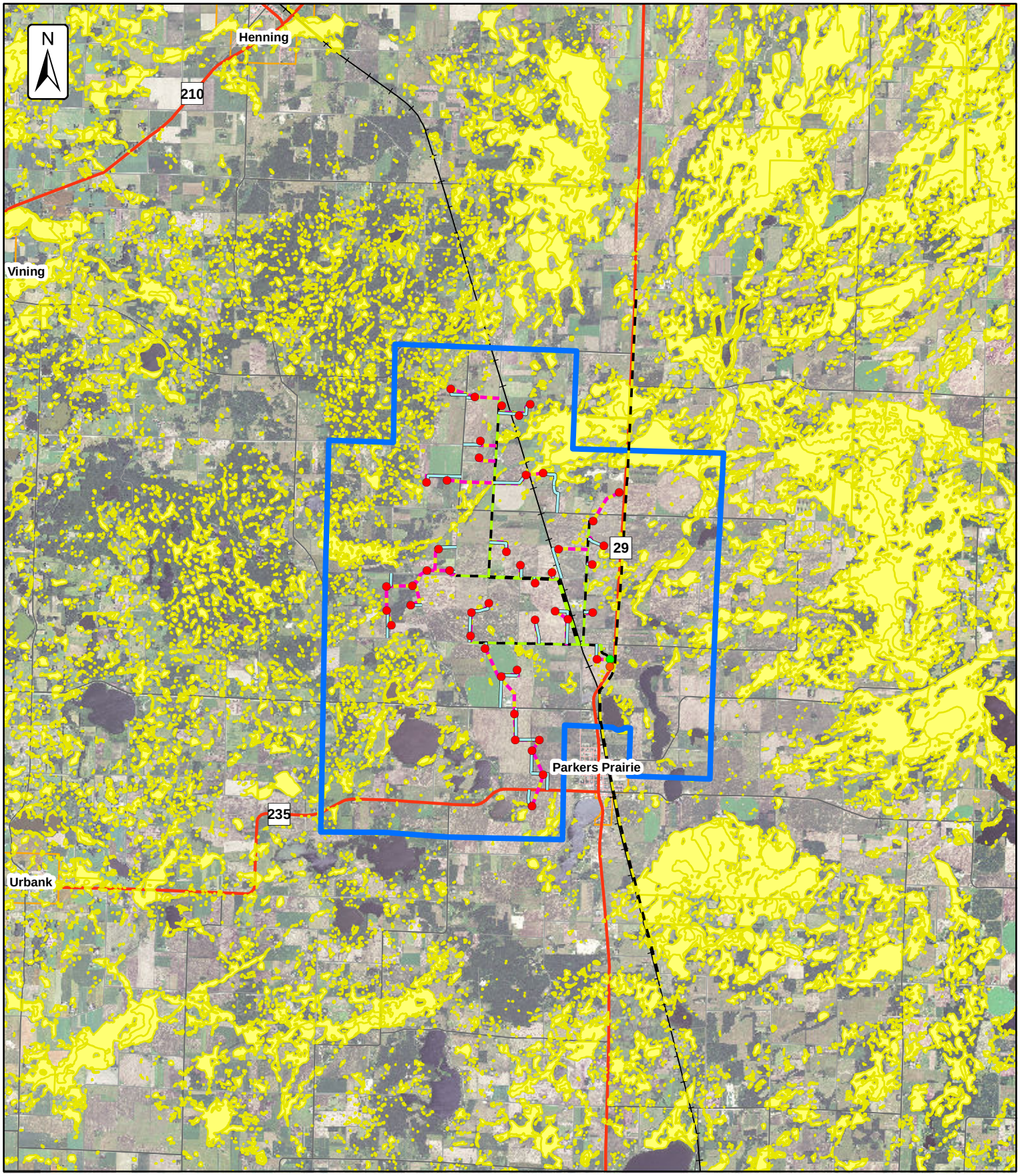

Wind Turbines
Future Office - Laydown Yard
Future Substation - TAP
Overhead Power 115 kV
Overhead Power 34.5 kV
Underground Transmission
Access Roads
MNDOT Interstate
MNDOT_US_hwys
MNDOT_State_hyws
MNDOT Railroad
Urban Areas
Project Area
National Wetlands Inventory

Miles
0 1.25 2.5

Figure 7

Prairie Wind Energy Wetlands Inventory

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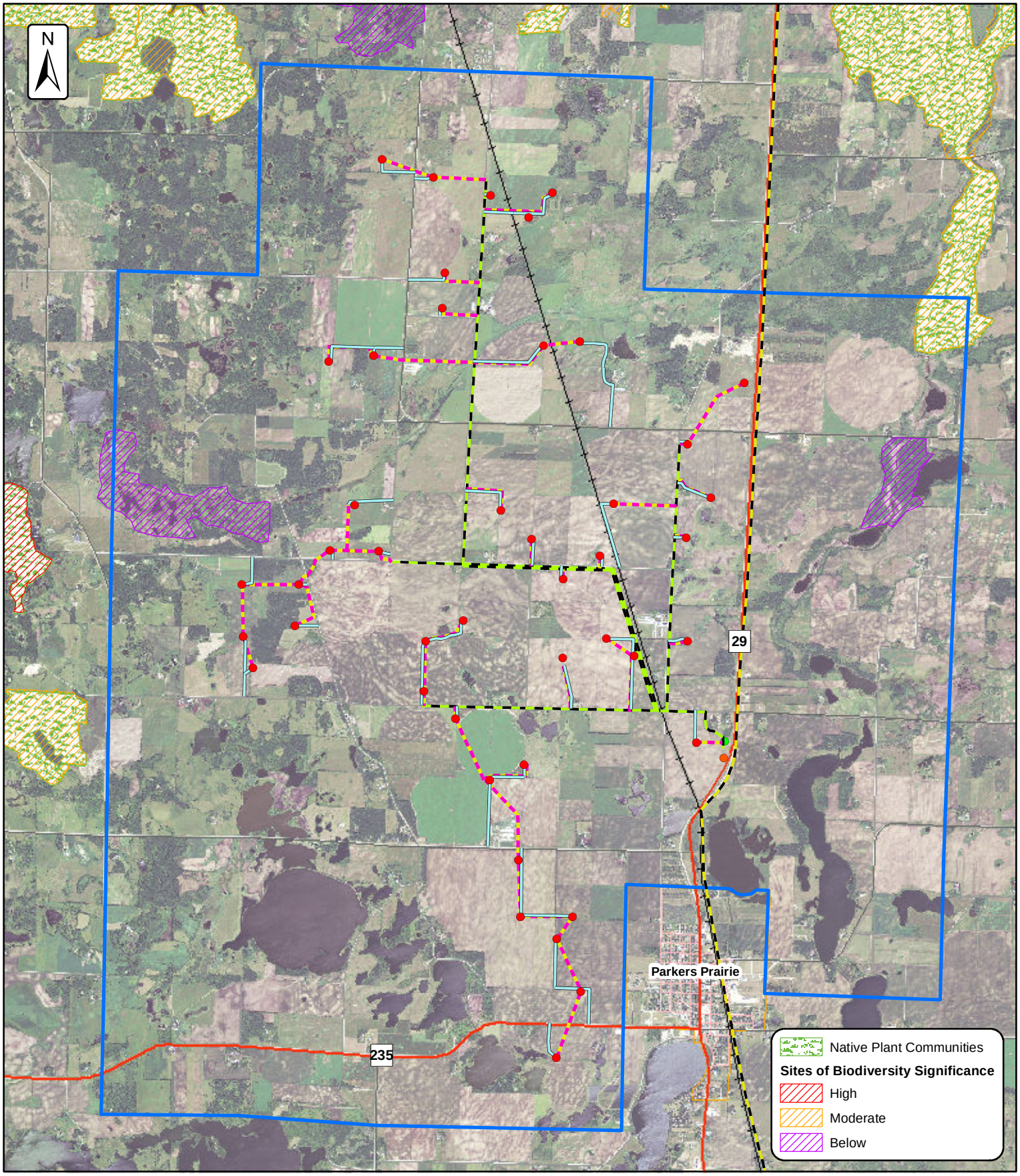

Wind Turbines
Future Office - Laydown Yard
Future Substation - TAP
Overhead Power 115 kV
Overhead Power 34.5 kV
Underground Transmission
Access Roads
MNDOT Interstate
MNDOT_US_hwys
MNDOT_State_hyws
MNDOT Railroad
Urban Areas
Project Area

Figure 8

Prairie Wind Energy
Unique Natural Features

Miles
0 0.5 1

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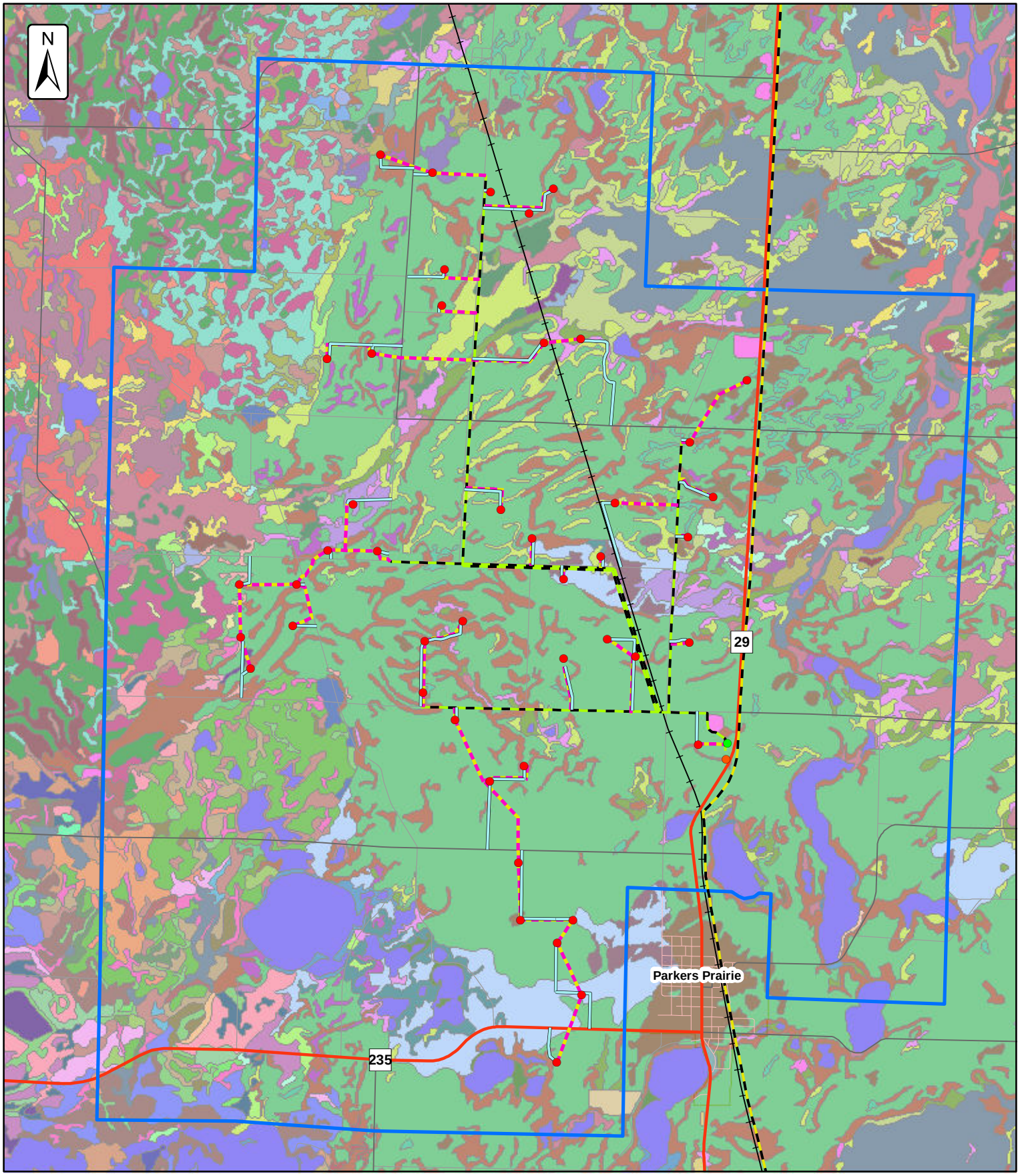

Wind Turbines
Future Office - Laydown Yard
Future Substation - TAP
Overhead Power 115 kV
Overhead Power 34.5 kV
Underground Transmission
Access Roads
MNDOT Interstate
MNDOT_US_hwys
MNDOT_State_hyws
MNDOT Railroad
Urban Areas
Project Area

Figure 9
Prairie Wind Energy
Soils
Symbolized by Map Unit Name

0 0.5 1 Miles

To see more detailed information please visit the following website:
http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

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SSURGO Soils

MUName

- Abbeylake-Verndale complex, 6 to 12 percent slopes
- Almora loam, 0 to 2 percent slopes
- Almora loam, 2 to 6 percent slopes
- Almora loam, 6 to 12 percent slopes
- Arveson loam, depressional
- Bluffcreek-Clearriver complex
- Bluffcreek-Epoufette complex
- Bluffcreek-Rosy complex
- Bluffton loam, moderately permeable
- Brandsvold fine sandy loam, thick solum
- Bygland silty clay loam, 1 to 6 percent slopes
- Bygland silty clay loam, 6 to 15 percent slopes
- Cathro muck
- Clitherall sandy loam
- Clitherall-Wykeham complex
- Clotho loam, moderately permeable
- Corliss loamy sand, 12 to 20 percent slopes
- Corliss loamy sand, 20 to 35 percent slopes
- Corliss loamy sand, 6 to 12 percent slopes
- Corliss-Dorset complex, 12 to 20 percent slopes
- Dent silt loam, 1 to 6 percent slopes
- Dorset sandy loam, 0 to 2 percent slopes
- Dorset sandy loam, 2 to 6 percent slopes
- Dorset-Corliss complex, 1 to 6 percent slopes
- Dorset-Corliss complex, 6 to 12 percent slopes
- Duelm loamy sand
- Egeland fine sandy loam, 1 to 6 percent slopes
- Egglake loam
- Egglake-Wykeham complex, 0 to 5 percent slopes
- Epoufette sandy loam
- Forada and Leafriver soils, depressional
- Fordville loam
- Gonvick loam
- Hamerly loam
- Hangaard loamy sand, lake beaches
- Haslie and Nidaros soils, ponded
- Haslie muck
- Haslie, Seelyeville, and Cathro soils, ponded
- Hillview fine sandy loam
- Isan sandy loam
- Kandota sandy loam, 12 to 20 percent slopes
- Kandota sandy loam, 2 to 6 percent slopes
- Kandota sandy loam, 6 to 12 percent slopes
- Kandota-Egglake, depressional, complex, 0 to 8 percent slopes
- Knute fine sandy loam, thick solum
- Knute-Brandsvold complex, thick solum
- Kratka sandy loam, thick solum, depressional
- Lida-Almora-Dent complex, 1 to 8 percent slopes
- Lida-Almora-Lizzie complex, 8 to 15 percent slopes
- Lida-Two Inlets complex, 1 to 8 percent slopes
- Lida-Two Inlets complex, 15 to 30 percent slopes
- Lida-Two Inlets complex, 30 to 50 percent slopes
- Lida-Two Inlets complex, 8 to 15 percent slopes
- Lindaas silty clay loam, morainic
- Lizzie silt loam, 12 to 20 percent slopes, eroded
- Lizzie silt loam, 2 to 6 percent slopes
- Lizzie silt loam, 6 to 12 percent slopes, eroded
- Mahkonce clay loam, 1 to 4 percent slopes
- Mehurin clay loam, 1 to 4 percent slopes
- Naytahwaush clay loam, 8 to 15 percent slopes, eroded
- Naytahwaush loam, 15 to 30 percent slopes
- Naytahwaush-Mahkonce complex, 1 to 8 percent slopes
- Nidaros muck
- Nitche-Kandota-Lida complex, 1 to 6 percent slopes
- Nitche-Kandota-Lida complex, 6 to 12 percent slopes
- Oakcreek loam
- Oylen sandy loam
- Parnell silt loam
- Parnell silty clay loam, depressional
- Peever clay loam, 12 to 18 percent slopes
- Peever clay loam, 6 to 12 percent slopes
- Peever-Mehurin complex, 2 to 6 percent slopes
- Pinelake sandy loam
- Pinelake, loamy substratum-Brandsvold complex
- Pits, gravel-Udipsamments complex
- Quam silt loam
- Radium loamy sand
- Roliss clay loam
- Rushlake sand
- Rushlake-Hangaard complex
- Sandberg-Arvilla complex, 12 to 20 percent slopes
- Sedgeville, Nidaros, and Aquolls soils, channeled
- Seelyeville muck
- Seelyeville muck, seep land, 1 to 10 percent slopes
- Snellman sandy loam, 15 to 30 percent slopes
- Snellman sandy loam, 2 to 8 percent slopes
- Snellman sandy loam, 30 to 45 percent slopes
- Snellman sandy loam, 8 to 15 percent slopes
- Snellman-Lida complex, 1 to 8 percent slopes
- Snellman-Lida complex, 15 to 30 percent slopes
- Snellman-Lida complex, 8 to 15 percent slopes
- Sybil-Eagleview complex, 0 to 2 percent slopes
- Sybil-Eagleview complex, 15 to 30 percent slopes
- Sybil-Eagleview complex, 2 to 8 percent slopes
- Sybil-Eagleview complex, 8 to 15 percent slopes
- Udipsamments (cut and fill land)
- Udorthents, wet substratum (fill land)
- Urness mucky silt loam
- Vallers silty clay loam
- Verndale sandy loam, 0 to 2 percent slopes
- Verndale-Abbeylake complex, 1 to 6 percent slopes
- Water
- Water, miscellaneous
- Waukon loam, 12 to 20 percent slopes, eroded
- Waukon loam, 2 to 6 percent slopes
- Waukon loam, 20 to 30 percent slopes
- Waukon loam, 6 to 12 percent slopes, eroded
- Waukon-Dorset complex, 1 to 6 percent slopes
- Waukon-Dorset complex, 12 to 20 percent slopes, eroded
- Waukon-Dorset complex, 6 to 12 percent slopes, eroded
- Waukon-Lida complex, 20 to 35 percent slopes
- Wykeham fine sandy loam

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- MNDOT Interstate
- MNDOT_US_hwys
- MNDOT_State_hyws
- MNDOT Railroad
- Urban Areas
- Project Area

Figure 9
Prairie Wind Energy
Soils
Symbolized by Map Unit Name

0 0.5 1 Miles

To see more detailed information please visit the following website:
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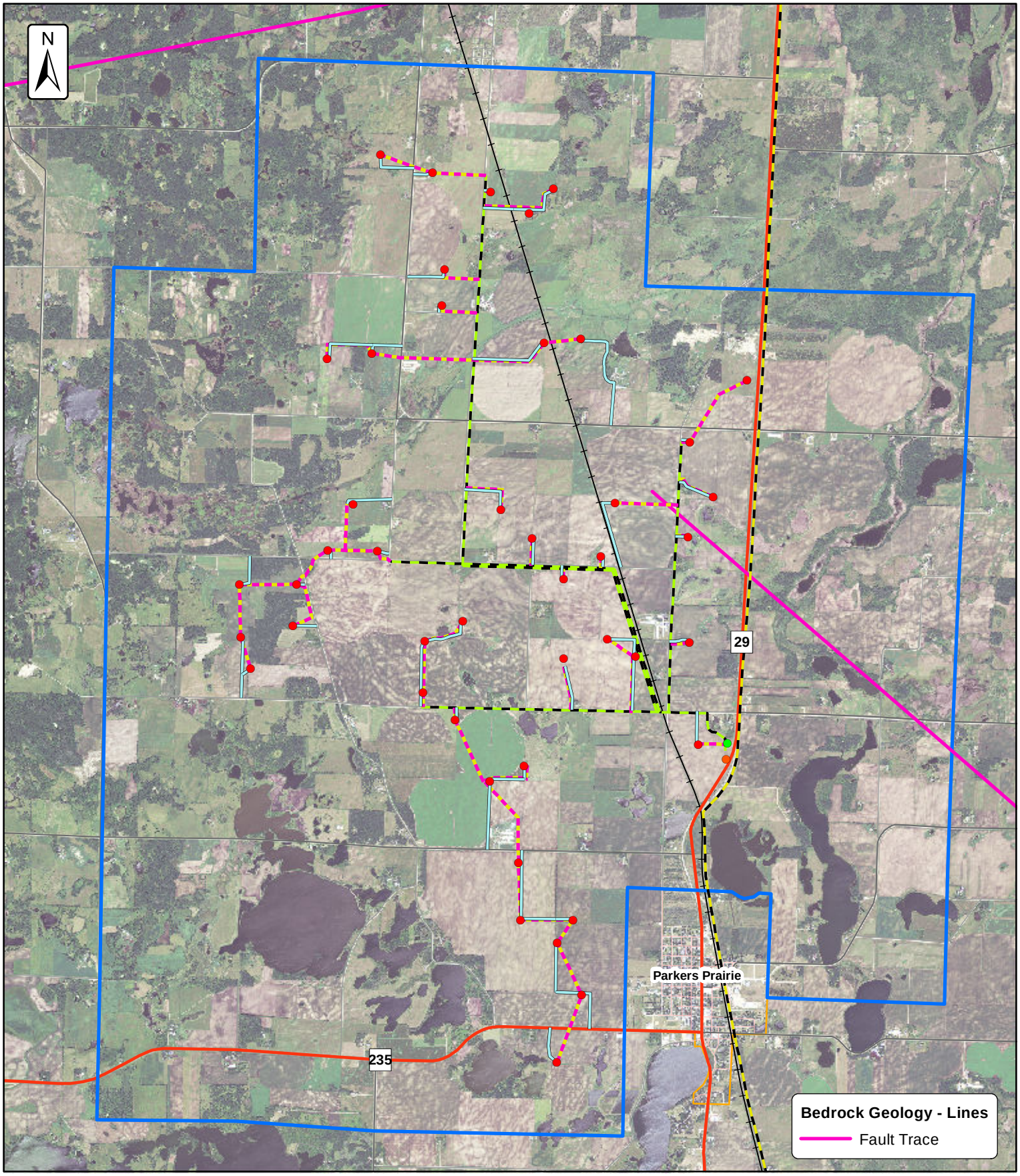

Wind Turbines
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Underground Transmission
Access Roads
MNDOT Interstate
MNDOT_US_hwys
MNDOT_State_hyws
MNDOT Railroad
Urban Areas
Project Area

Figure 10

Prairie Wind Energy Site Geology and Depth to Bedrock

Depth to Bedrock

100 - 200 Feet

0 0.5 1 Miles

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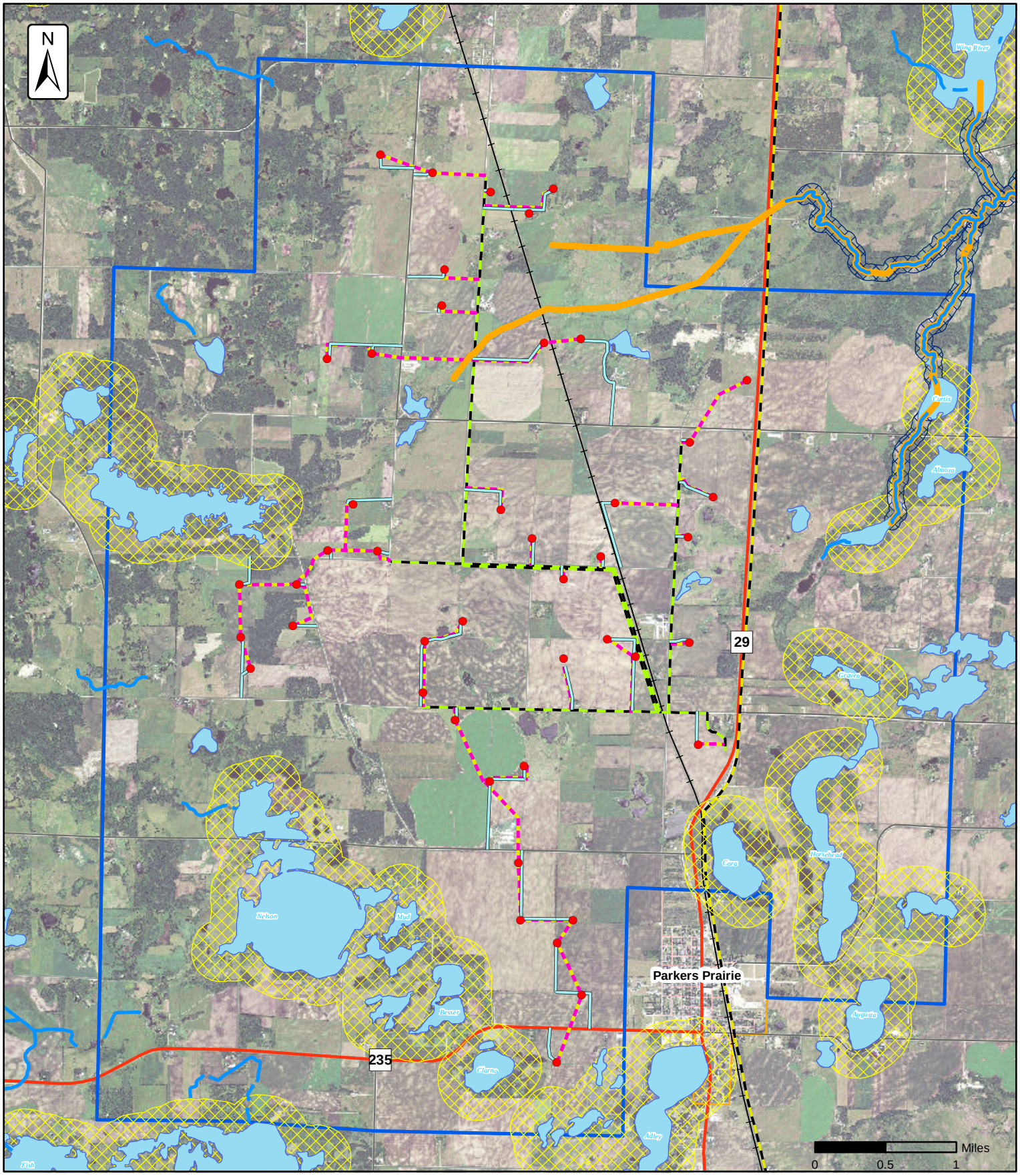

Wind Turbines
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Overhead Power 34.5 kV
Underground Transmission
Access Roads
MNDOT Interstate
MNDOT_US_hwys
MNDOT_State_hyws
MNDOT Railroad
Urban Areas
Project Area
Protected Waters (Rivers)
Lake Shoreland Management 1000ft Buffer
Protected Waters (Lakes)
River Shoreland Management
Stream/River (Meandering Waters)

Figure 11

Prairie Wind Energy Shoreland Management and Surface/Meandering Waters

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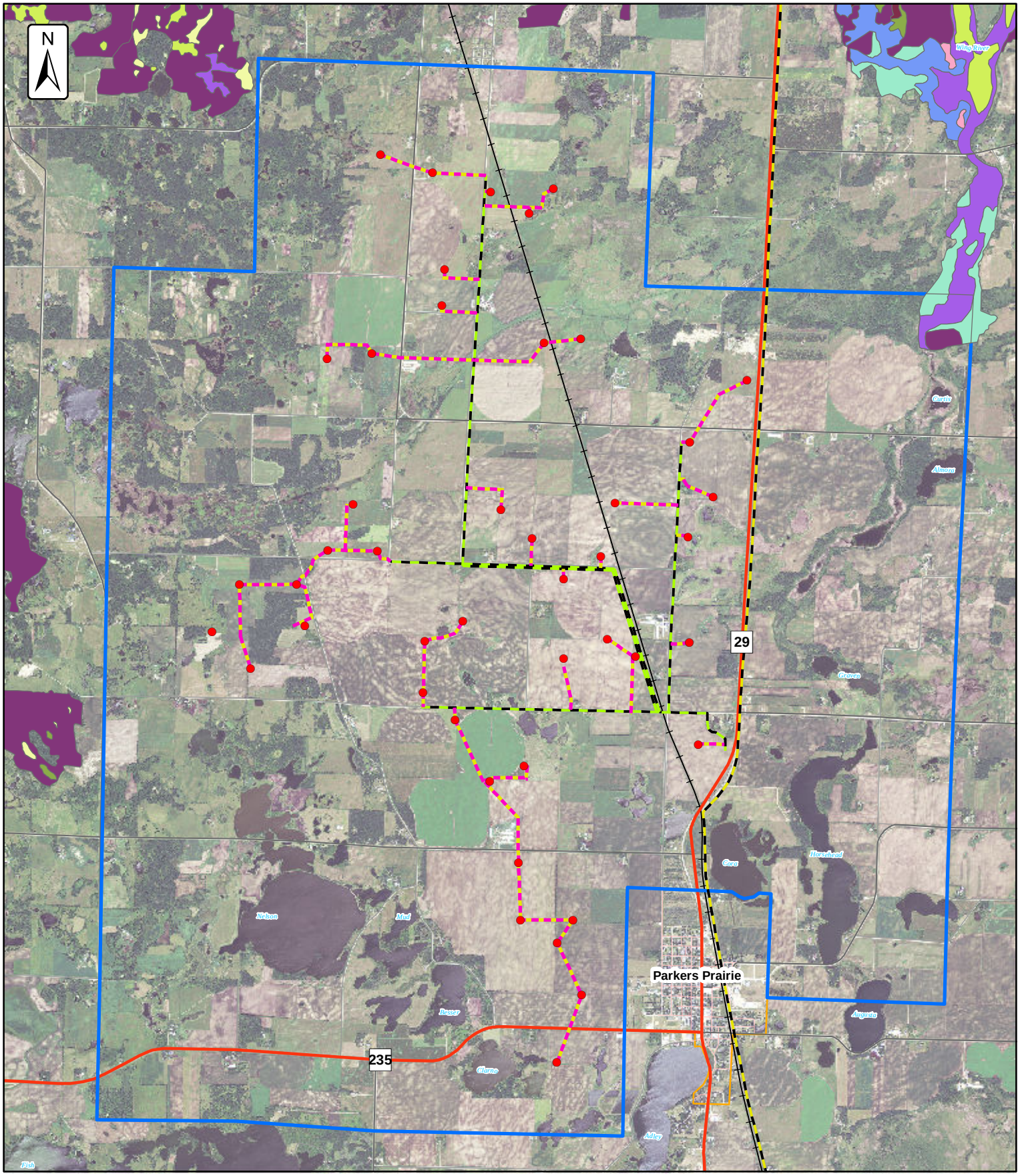

Wind Turbines
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MNDOT Interstate
MNDOT_US_hwys
MNDOT_State_hyws
MNDOT Railroad
Urban Areas
Project Area
Black Ash - Alder Swamp (Northern)
Cattail - Sedge Marsh (Northern)
Pin Oak - Bur Oak Woodland

In Project Native Plant Communities

0 0.5 1 Miles

Figure 12
Prairie Wind Energy
Minnesota County Biological Survey
Native Plant Community and Rare Species

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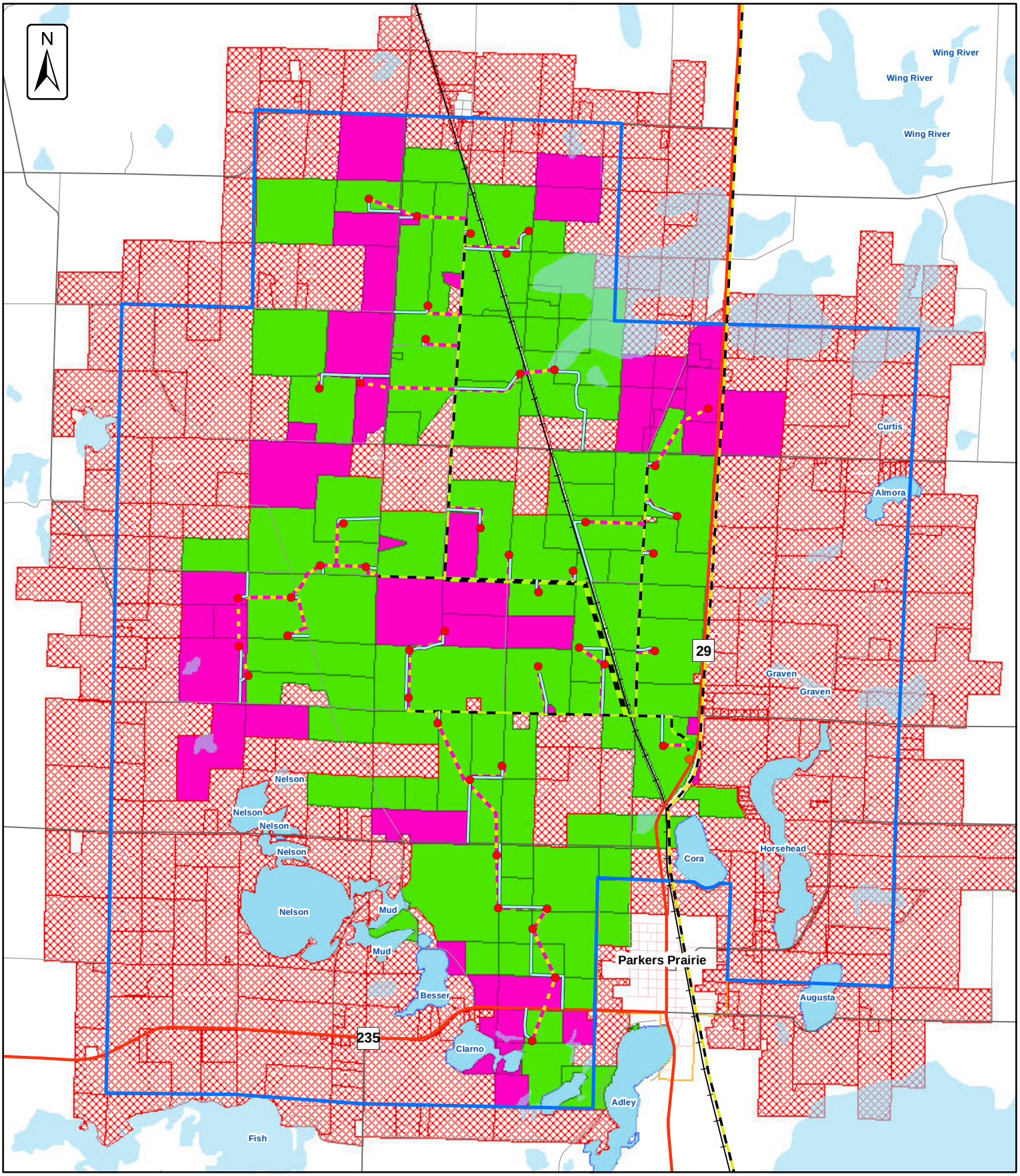

Wind Turbines
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Underground Transmission
Access Roads

MNDOT Interstate
MNDOT_US_hwys
MNDOT_State_hyws
MNDOT Railroad
Urban Areas
Project Area

Land Participation
Non-Participating Landower
Participating Landowner
Pending/Undecided Land Lease/Easement
Water

Miles
0 0.5 1

Figure 13

Prairie Wind Energy Land Ownership

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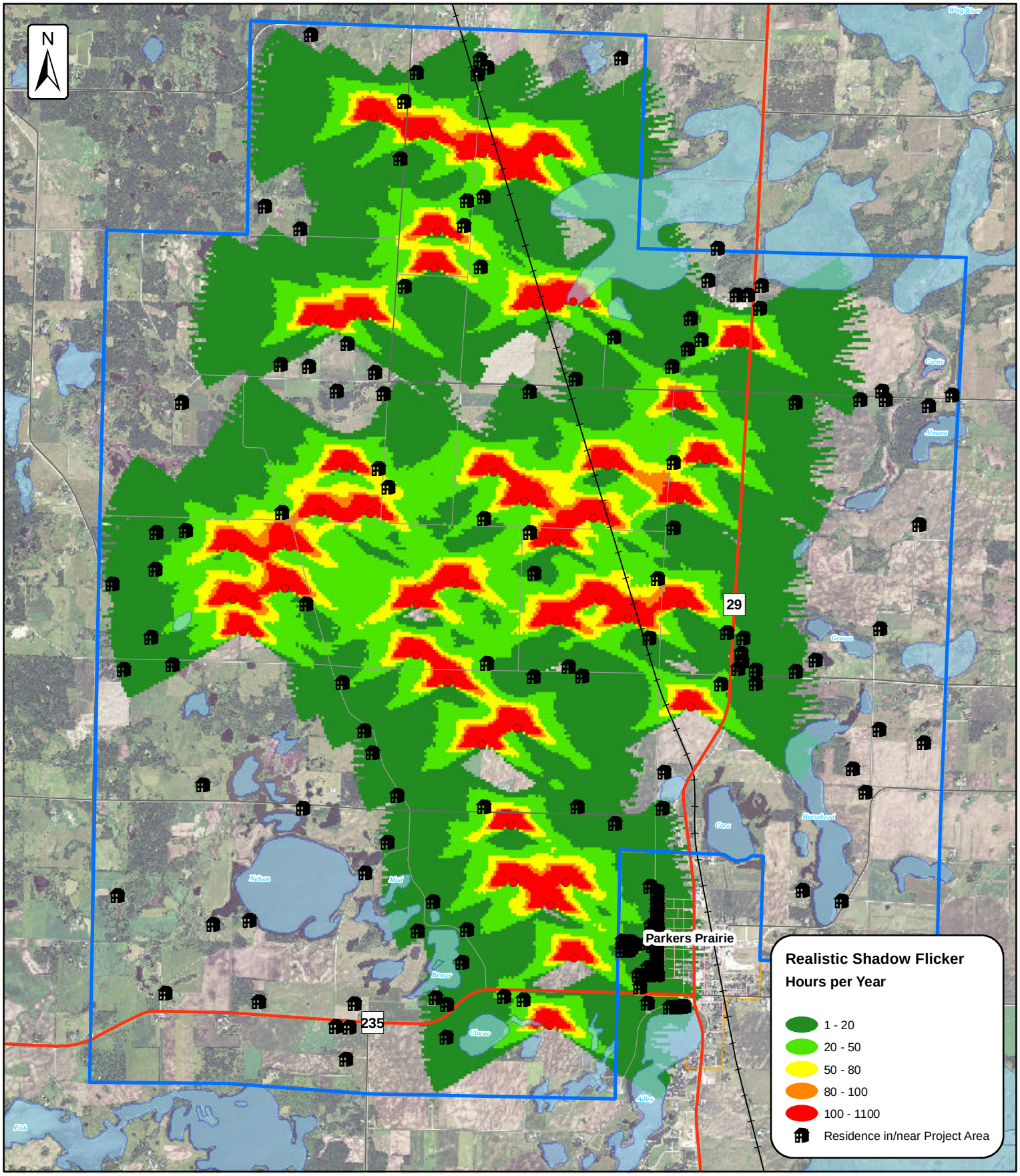

Wind Turbines
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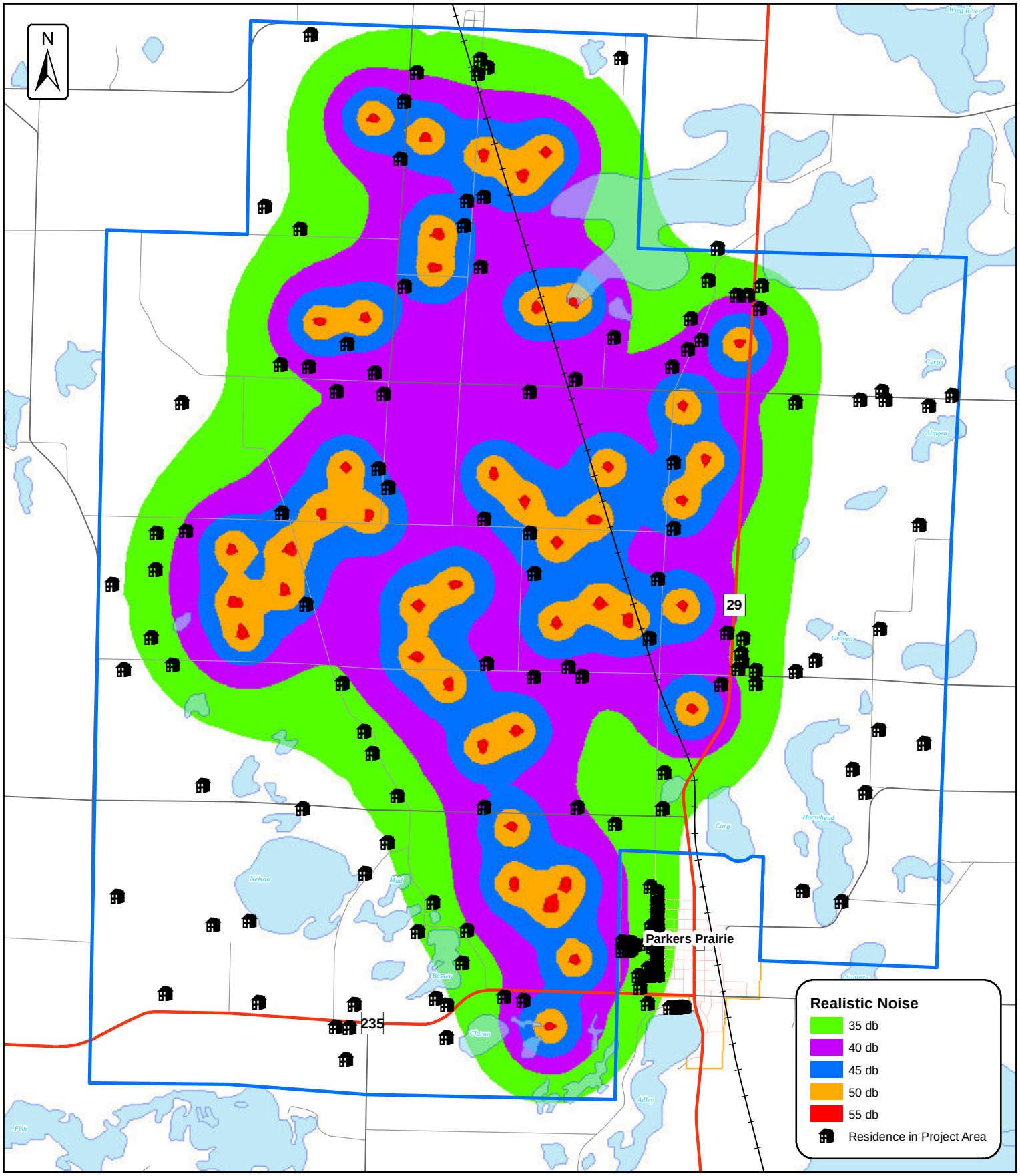
Underground Transmission
Access Roads
MNDOT Interstate
MNDOT_US_hwys
MNDOT_State_hyws
MNDOT Railroad
Urban Areas
Project Area

Miles
0 0.5 1

Figure 14
Prairie Wind Energy
Shadow Flicker

HoustonEngineering Inc



Wind Turbines
Future Office - Laydown Yard
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Overhead Power 34.5 kV
Underground Transmission
Access Roads
MNDOT Interstate
MNDOT_US_hwys
MNDOT_State_hyws
MNDOT Railroad
Urban Areas
Project Area

Miles
0 0.5 1

Figure 15
Prairie Wind Energy
Noise Analysis

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