Pleasant Valley Wind, LLC.

Dodge and Mower Counties, MN

Application for Large Wind Energy Conversion System Site Permit

PUC Docket Number IP 6828/WS-09-1197

November 23, 2009

Public Version – Trade Secret Data Excised

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1 Executive Summary

1.1 Introduction

Pleasant Valley Wind, LLC, (the "Applicant") submits this Site Permit Application to construct a Large Wind Energy Conversion System ("LWECS"), for the Pleasant Valley Wind Project (the "Project"), as defined in the Wind Siting Act, Minnesota Statute § 216F.01. The Project site is located in southern Dodge and northern Mower Counties of Southeastern Minnesota approximately six (6) miles northeast of Austin, Minnesota and 15 miles west of Rochester. This site permit application is for the construction of a 300 MW LWECS schedule to start construction in 2010 with operation planned to start by December 2012. Plans are to interconnect the Project with a 138/345 kV autotransformer located adjacent to the Xcel Pleasant Valley 345 kV substation. A short 345 kV connection will then interconnect to the Pleasant Valley substation.

1.2 Project Site Location

The Project Site (the "Site") is shown in Map 1. The Site encompasses approximately 52,000 acres across eighty (80) square miles of land within Hayfield and Vernon Townships of Dodge County; and Waltham, Sargeant, Pleasant Valley, Red Rock and Dexter Townships of Mower County.

1.3 Site Control

Starting in 2007, over 330 property owners have signed long-term easement agreements with the Applicant totaling 72,000 acres across a 100 square mile area. These agreements provide Applicant with the right to develop, construct, and operate wind power facilities, including wind turbines, substations, access roads, transmission lines, and operations and maintenance facilities. The agreements also allow Applicant to harness the free flow of wind for operation of the Project.

1.4 Wind Resource

The Applicant has gathered one (1) full year of on-site wind data, from six (6) temporary Meteorological Towers that were installed during 2007-2008. Long-term mean annual 80 meter wind speed data was gathered in advance to provide sufficient data detailing the expected sustainability of the wind resources. The Applicant expects a range of long-term mean annual 80 meter (262 ft) wind speeds at the proposed site will be 8.38 - 8.61 meters per second (m/s) (18.74 - 19.26 miles per hour) with a net capacity factor of **[TRADE SECRET BEGINS] *** [TRADE SECRET ENDS]** for the GE and Siemens turbines when the prevailing wind directions are south and northwest. Winds are strongest from September though May and lowest in June and July.

1.5 Projected Energy (MWh)

Using GE 1.5 XLE turbines the Project will have a nameplate capacity of 300 MW. The project will consist of two 150 MW phases with an energy output of **[TRADE SECRET BEGINS] *** [TRADE SECRET ENDS],** respectively for each phase.

Using Siemens 2.3/101m turbines the Project will have a nameplate capacity of 299 MW. The Project will consist of two 149.5 MW phases with an energy output of **[TRADE SECRET BEGINS] *** [TRADE SECRET ENDS],** respectively for each phase.

1.6 Siting Plan

The turbines and associated facilities will be sited located in portions of Dodge and Mower Counties in Southeastern Minnesota. The Applicant's proposed siting plans ("Map 2 GE" and "Map 3 Siemens") efficiently use the Site's wind and land resources while minimizing environmental impacts. The Project will utilize either 200 1.5 MW/82.5m GE XLE turbines or 130 2.3 MW/101m Siemens turbines. Both turbines will utilize 80 meter towers. A detailed description of the wind turbines is provided in *Section 5.2 - Wind Turbines*.

1.7 Interconnection and Transmission

The Applicant will sign an interconnection agreement with the Midwest Independent Transmission System Operator, Inc. (MISO) at the conclusion of the Definitive Planning Phase. The MISO interconnection agreement (Queue G 762) will be for 400 MW but the currently proposed Project will be constructed for 300 MW. Further build out of the site may occur at a later date. The Project's output will be transmitted through two 138 kV transmission lines to a future substation that will be located adjacent to the Pleasant Valley 345 kV substation. The voltage will then be stepped up to 345 kV with a 138kV/345 kV autotransformer. A short 345 kV connection of less than a mile will then interconnect to the Pleasant Valley substation. Permitting for the three (3) substations and three (3) transmission lines will be conducted at the county level.

1.8 Environmental Analysis

The Site is located in an agricultural landscape comprised primarily of 320 ± acre farms growing a rotation of row crops such as corn and soybeans on land ditched and drained by agricultural drain tile. There are also livestock operations raising principally hogs with a few dairy, beef, and turkey farms. The Site is sparsely populated with a 2007 estimated density of only 1.17-persons per square mile. The agricultural land use within the Site is compatible with the proposed LWECS. A detailed analysis of environmental impacts is included in *Section 6 – Environmental Analysis*.

1.9 Permits and Licenses

The Applicant and its Contractors will obtain all applicable permits and approvals necessary for the development, construction, and operation of the proposed Project. A detailed list of permits potentially required for the Project is provided in *Section 13 – Identification of Required Permits and Approvals*.

1.10 Construction

The Applicant, the turbine supplier, and RES America Construction Inc. will perform and manage all construction and installation activities. The Applicant will:

- Perform site resource analysis and complete siting;
- Acquire all permits and licenses applicable for the Project.

The turbine supplier and the contractor will:

- Deliver, assemble and install the wind turbines;
- Construct foundations, roads and transformers;
- Perform civil engineering for erection and installation of the Project;
- Install the communication system, including system control and data acquisition (SCADA) software and hardware and telephone or fiber-optic cable;
- Construct the electrical feeder and collection system.

Quality Assurance and Quality Control (QA/QC) procedures will be implemented and are detailed in *Section 7 - Construction*.

1.11 Operation and Maintenance

The Project will be operational by December 2012. The Applicant will be responsible for the operation and maintenance of the wind farm for the Project duration, which is anticipated to be approximately 20 years.

1.12 Decommissioning

After the Project has reached the end of its useful life the Project's facilities will be removed from the site per the terms in the Applicant's agreements with the individual landowners and as described in *Section 12 - Decommissioning Economics and Financial Surety* located on page 91.

1.13 Project Ownership

The Project will be owned and operated by Pleasant Valley Wind, LLC. This entity is a wholly-owned subsidiary by Renewable Energy Systems Americas Inc. (RES Americas) or possibly sold at a later date to a not-yet-identified third party. Operating since 1997, RES Americas is one of the top renewable energy companies in North America and has extensive experience in the development, construction, and operation of wind energy facilities across the country. Headquartered in Denver, Colorado, RES Americas also has offices in Minneapolis, Minnesota; Austin, Texas; and Portland, Oregon. RES Americas has developed and/or constructed over 4,000 MWs of wind energy projects, which represents approximately 14 percent of the operating wind farms in the United States. A list of some of these projects is shown below in Table 1.1.

Name	Location		MWs	Year
Cameron Ridge	Tehachapi, California		60	1999
Pacific Crest	Tehachapi , California		47	1999
Llano Estacado	Clovis, New Mexico		1	2000
Woodward Mountain	Pecos County, Texas		160	2000
King Mountain	Upton County, Texas		278	2001
Nine Canyon I	Tri-Cities, Washington		48	2002
Nine Canyon II	Tri-Cities, Washington		16	2003
Wigton	Manchester Jamaica,		21	2004
Sweetwater II	Sweetwater, Texas		92	2005
Ainsworth	Ainsworth, Nebraska		59	2005
Hopkins Ridge	Dayton, Washington		149	2005
Wild Horse	Ellensburg, Washington		229	2006
Sweetwater IV(b)	Sweetwater, Texas		106	2007
Marengo I	Dayton, Washington		140	2007
White Creek	Roosevelt, Washington		205	2007
Sweetwater V	Sweetwater, Texas		81	2007
Whirlwind	Floydada, Texas		60	2007
Nine Canyon III	Tri-Cities, Washington		32	2008
Mountain Wind I	Fort Bridger, Wyoming		61	2008
Lone Star	Shackelford County, Texas		400	2006
Hackberry	Albany, Texas	Dev./Const./Oper	166	2008
South Trent Mesa	Trent, Texas		101	2008
Mountain Wind II	Fort Bridger, Wyoming		80	2008
Buffalo Gap III	Nolan, Texas		170	2008
Marengo II	Dayton, Washington		71	2008
Butler Ridge	Mayville, Wisconsin		54	2008
Hopkins Ridge II	Dayton, Washington		7	2008

Bull Creek	Gail, Texas		180	2008
Central Plains	Leoti, Kansas		99	2009
Gulf Wind	Kenedy Ranch, Texas		283	2009
	Total MW:		**3,456.0**	

Table 1.1 – List of Operating Wind Farms Developed by RES

2 Applicant

The Applicant is applying for a LWECS Site Permit to allow for the development, construction, and operation of up to a 300 MW installed capacity LWECS, which would connect to the 345 kV Xcel Transmission Line at the Pleasant Valley substation adjacent to the Site. This application has been prepared to meet the requirements of the Minnesota Public Utilities Commission (MPUC) in accordance with Minnesota Statutes §§ 216F.01 through 216F.07, and the specific requirements that are detailed in Minnesota Rule Chapter 7854.

2.1 Contact Information

Pleasant Valley Wind, LLC c/o
Renewable Energy Systems Americas Inc.
Attention: Joe Grennan, Permitting Director
11101 W. 120th Ave Suite 400
Broomfield, CO 80021
USA

Tel: (303) 439-4281
Fax: (303) 439-4299
E-mail: joe.grennan@res-americas.com

2.2 Other LWECS in Minnesota

At this time the Applicant does not own or operate any LWECS in Minnesota.

3 Compliance with the Wind Siting Act and Minnesota Rules 7854

This Application has been prepared in accordance with the MPUC requirements; criteria set forth by the Wind Siting Act and Minn. Rules, Chapter 7854.

All planning, design, construction, and operation of the Project will make the most efficient use of wind and land resources within the Site while also preserving environmental resources such as cultural and archaeological resources, rare and unique natural resources, wetlands, wildlife, water

resources, soils, vegetation, surface water and groundwater, topographic, and geologic resources. Impacts to environmental resources will be avoided or, where unavoidable, mitigated.

The siting of the Project is also consistent with the State's goal to conserve resources, develop renewable energy and reduce greenhouse gas emissions. The approximately 300 MW Project will also help electrical utilities fulfill Minnesota's Renewable Portfolio Standard (RPS). In 2007, the Minnesota Legislature adopted Renewable Energy Standards applicable to all state utility providers requiring that by 2025 25 percent of their electricity come from renewable sources. The policy is outlined in Minnesota Statute § 216B.1691, the Renewable Energy Objectives, which states electric utilities shall make a good faith effort to generate sufficient electricity from an eligible energy technology. Wind energy is considered an eligible energy technology to meet this goal.

3.1 Certificate of Need

The MPUC requires a Certificate of Need (CON) be approved prior to issuing a site permit for a LWECS, as stated in Minnesota Rules Chapter 7854.0500, subp. 2. The Project is a "large energy facility," as defined by Minn. Stat. § 216B.2421, Subd. 2(1)(2008). Under Minnesota Rules 7854.0500 subp. 2, a CON is required from the MPUC for the proposed Project.

On October 27, 2009, Pleasant Valley submitted its application for a CON with the MPUC, which is pending in Docket No. IP-6828/CN-09-937.

3.2 State Policy

Pleasant Valley Wind, LLC achieved site control through easement agreements with property owners in the Project area. As demonstrated in this application, the Applicant proposes a site layout compatible with the environmental preservation, sustainable development, and efficient use of resources provisions required by Minnesota state policy (Minn. Statute § 216F.03 and Minn. Rules Chapter 7854.0500, subp. 3).

4 Proposed Site

4.1 Identification of Project Site

The Project Site is located approximately 6 – 10 miles northeast of Austin, MN, north and east of the intersection of the MN Trunk Highway 56 and Interstate 90. The Site then extends east toward Dexter with the north extent running from the city of Hayfield east through Vernon Township. The area is relatively flat cropland with elevations generally between 1,300 and 1,420 feet above mean sea level (amsl).

The Project Site encompasses approximately 52,000 acres across 80 square miles (Figure 4.1.1). One-hundred-thirty (130) to two hundred (200) wind turbines will be erected across the Site. The number of turbines will depend on the turbine type selected (either 200 1.5 MW/82.5m GE XLE turbines or 130 2.3 MW/101m Siemens turbines). The Site includes portions or the entirety of the following sections in seven (7) townships:

- **Dodge County Townships**
  - Hayfield – Sections 31, 34
  - Vernon – Sections 31
- **Mower County Townships**
  - Waltham - Sections 1, 3, 10-15, 25, 26, 36
  - Sargeant – Sections 3, 6-12, 15-20, 24-25, 27-29, 32-34, 36
  - Pleasant Valley – Sections 9, 10, 16-18
  - Red Rock – Sections 1, 2, 11-13, 15, 24-26
  - Dexter – Sections 2-6, 8-11, 17-23, 26-30

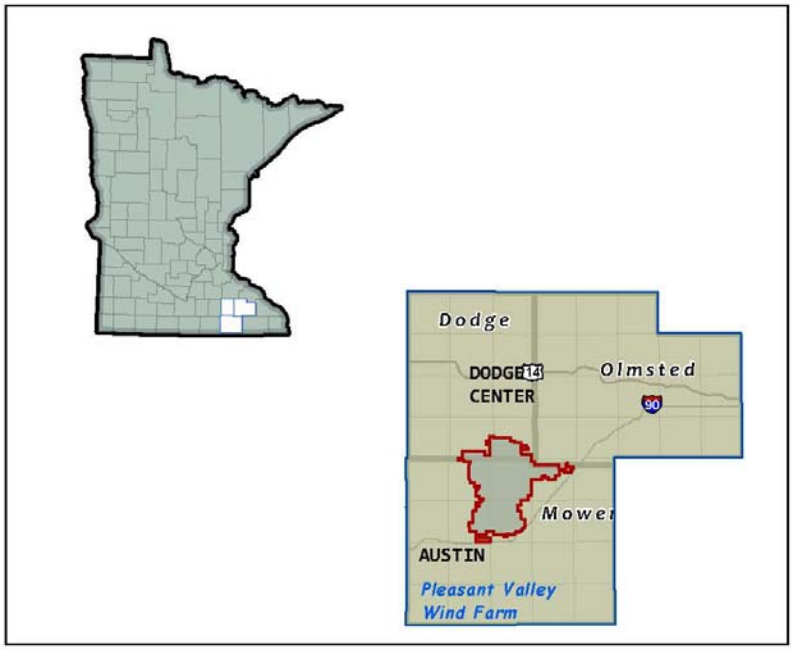


Figure 4.1.1 – Project Location

The Applicant selected this Site because of the excellent wind resource, enthusiastic community support, extensive landowner commitments, close proximity to existing transmission facilities, and multitude of potential electricity customers. The land area directly used for the turbines and associated facilities will be approximately 120 acres and would include up to 200 turbines, three (3) substations, an operation and maintenance building, approximately forty-two (42) miles of access

roads, fourteen (14) miles of overhead electrical transmission lines, and 149 miles of underground cable.

4.2 Wind Rights

Long-term wind energy agreements accepted by the Project's property owners grant the Applicant the necessary wind rights for the operation of a 300 MW LWECS. The agreement provides **[TRADE SECRET BEGINS] *** [TRADE SECRET ENDS].**

4.3 Wind Characteristics in the Project Area

To monitor the wind regime six (6) guyed temporary lattice meteorological towers were erected. One (1) 60 meter tower was erected in late 2007. Four (4) additional 60 meter towers and one (1) 80 meter tower were erected in late 2008 to further characterize the site.

All masts are equipped with quality anemometers (Vector Instruments) that have been individually calibrated in a Measuring Network of Wind Energy Institutes (MEASNET) approved calibration facility. All permanent meteorological towers will be free standing structures.

The masts are also equipped with CR1000 Campbell Scientific data loggers that continually monitor all instruments. These loggers have a sampling rate of 2 Hertz (Hz).

Industry best practices have been observed with respect to the boom length (horizontal separation of instrument from tower), and with respect to the boom orientation to prevailing winds and vertical separation of the instrument from the boom. This attention to detail minimizes the uncertainty in the on-site measurement.

Long-term correlations have been established with available data from the Dodge Center Automated Weather Observing System (AWOS) station.

4.3.1 Interannual Variation

The Inter-Annual Wind Variation has been based on the greater of the measured value at the nearby weather service reference stations and the value determined through analysis of 40 years of National Centers for Environmental Prediction (NCEP) reanalysis surface winds. The latter of the two values indicated a value of 5.0 percent standard deviation of the annual mean wind speed was appropriate for the site.

4.3.2 Seasonal Variation

Figure 4.1.2 below shows the variation in monthly mean wind speeds, measured from 58 meter (m) at the long-term on-site meteorological tower for the period August 2007 to September 2009.

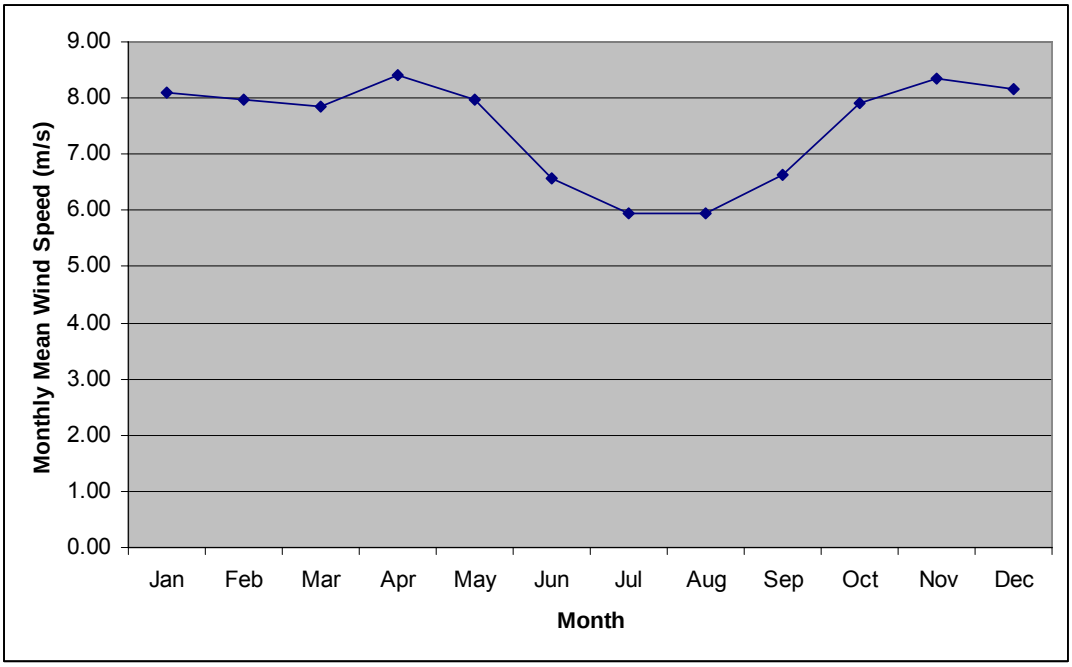


Figure 4.1.2 – Pleasant Valley Monthly Mean Wind Speed Variation

4.3.3 Diurnal Conditions

Figure 4.1.3 below shows the normalized variation in hourly mean wind speeds measured from 58 meters at the long-term on-site meteorological tower for the period August 2007 to September 2009.

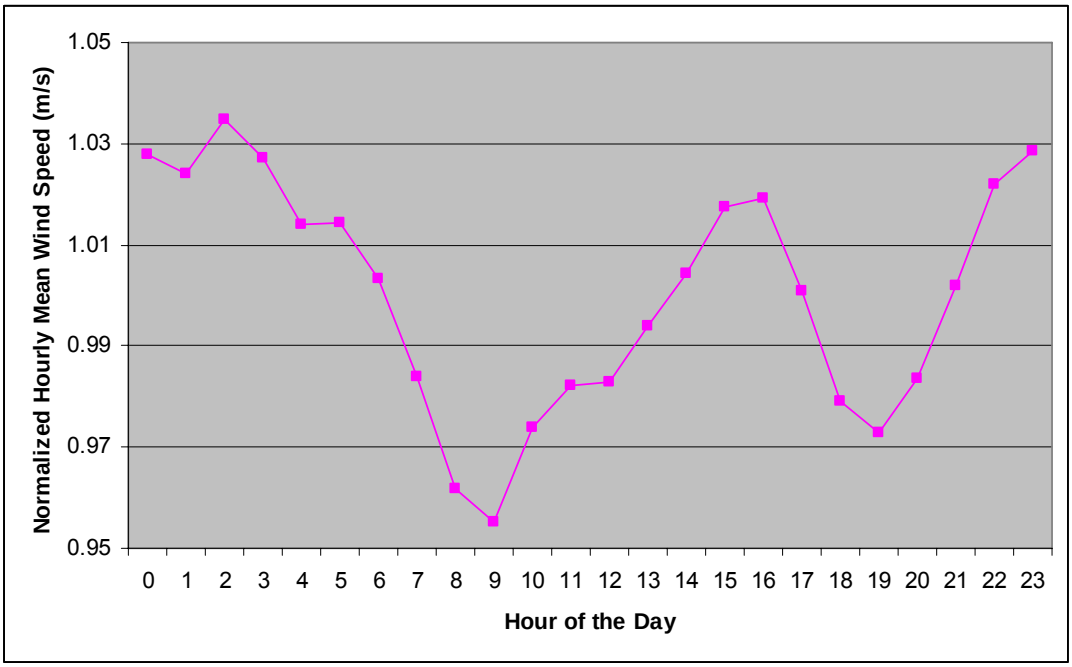


Figure 4.1.3 – Pleasant Valley Normalized Diurnal Wind Speed Variation

4.3.4 Atmospheric Stability

Atmospheric Stability data has not been compiled because the necessary data are not normally collected with on-site meteorological monitoring. Historical information from the Minnesota Climatological Working Group for the Rochester International Airport fourteen (14) miles east of the Project Site shows an average of 39 thunderstorms per year over the last 30 years. The Project Site is the subject of diurnal variation and year round convective storm development that can occur in a three (3) to six (6) hour time frame. The atmospheric temperature, moisture and pressure observations needed for a mesoscale stability model are not part of the Project.

4.3.5 Hub Height Turbulence

For wind speeds greater than 5.0 meters/second (m/s), the nominal turbulence intensity at 80 meters varies from 0.07 to 0.08 m/s across the meteorological tower locations for the Project.

4.3.6 Extreme Wind Conditions

The maximum 10-minute mean wind speed recorded on-site was 24.5 m/s at 58 m, and the maximum 3-second gust was 35.1 m/s at 58 m. Based on the U.S. Design Gust Code, the anticipated 50-year return 3-second gust is approximately 52.5 m/s (117.4 miles per hour) at 80 m.

4.3.7 Wind Speed and Direction Frequency Distribution

An annualized wind speed and direction frequency distribution based on data from the long-term on-site meteorological tower is presented in Table 4.1.1. The frequency distribution represents the long-term predicted mean wind speed of 7.45 m/s at 58 m.

Wind Speed Bin Center (m/s)	Wind Direction Bin Center												Total Hours/Year
	0	30	60	90	120	150	180	210	240	270	300	330	
0.5	7.6	5.2	3.2	3.1	2.5	2.8	3.7	7.2	3.4	4.1	3.2	6.1	52.1
1.5	21.5	19.1	18.2	13.3	14.0	17.6	17.8	15.6	17.6	19.1	20.2	23.1	217.1
2.5	33.5	34.3	36.6	29.0	28.7	29.3	33.1	43.9	40.0	35.6	38.6	39.2	421.8
3.5	52.3	52.6	47.6	39.5	44.9	38.5	44.6	61.5	54.7	47.5	58.0	59.8	601.5
4.5	77.3	58.9	46.3	50.4	57.6	49.1	69.3	72.2	65.3	68.2	77.0	82.5	774.1
5.5	89.0	61.5	52.1	56.6	62.2	60.7	82.8	83.4	73.9	79.0	128.6	121.9	951.7
6.5	94.3	54.3	42.7	54.8	70.0	78.6	108.9	97.0	76.2	92.4	165.2	144.4	1078.8
7.5	82.1	45.3	34.5	41.6	74.2	99.7	139.7	99.0	70.9	84.4	170.5	147.1	1089.0
8.5	67.6	34.4	27.5	34.4	50.4	105.4	155.8	91.0	49.2	67.7	160.8	124.8	969.0
9.5	39.6	25.8	19.4	26.3	34.4	96.4	158.1	71.1	27.4	46.8	127.6	94.6	767.5
10.5	29.7	18.5	8.0	20.4	28.5	86.0	148.7	60.1	16.2	27.5	92.4	73.4	609.4
11.5	23.3	7.3	3.8	14.6	19.3	73.9	121.5	44.7	9.8	24.0	71.2	48.3	461.7
12.5	18.4	1.9	2.5	5.9	14.2	45.9	84.0	19.7	6.7	13.9	68.1	38.0	319.2
13.5	9.4	0.4	1.8	2.3	10.8	24.6	58.7	8.0	5.8	9.0	49.1	25.2	205.1
14.5	3.2	0.0	0.8	0.8	9.1	13.1	24.3	4.4	3.6	7.9	31.4	10.3	108.9
15.5	1.4	0.0	0.5	0.7	6.9	7.5	11.7	2.5	2.5	7.2	20.3	6.0	67.2
16.5	0.2	0.0	0.8	0.2	4.0	4.4	6.7	2.3	1.3	4.3	8.6	2.5	35.3
17.5	0.0	0.0	0.9	0.1	1.2	2.0	4.2	2.1	0.8	1.7	3.6	0.7	17.3
18.5	0.0	0.0	1.2	0.1	0.3	1.2	2.6	1.9	0.7	0.4	1.3	0.1	9.8
19.5	0.0	0.0	1.0	0.0	0.2	1.0	1.6	1.4	0.4	0.1	0.4	0.0	6.1
20.5	0.0	0.0	0.2	0.0	0.0	0.4	0.6	0.8	0.1	0.0	0.1	0.0	2.2
21.5	0.0	0.0	0.2	0.0	0.0	0.3	0.1	0.4	0.0	0.0	0.0	0.0	1.0
22.5	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
23.5	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1
24.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25.5+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 4.1.1 – Pleasant Valley Annual Wind Speed and Direction Frequency Distribution

4.3.8 Wind Variation with Height

Wind shear calculations are taken from a pair of similarly mounted instruments on each meteorological tower. The upper instrument is generally located between 50 m to 55 m, with the lower instrument in the pair being separated from the upper instrument by approximately 15 m. For wind speeds greater than 5.0 m/s, the shear exponent varies from 0.20 to 0.25 across the meteorological tower locations.

4.3.9 Spatial Wind Variation

The range of expected long-term mean annual 80 m (262 ft) wind speeds at the proposed turbine sites is 7.4 – 8.1 m/s (16.5 mph – 18.1 mph).

4.3.10 Wind Rose

A wind rose based on measured data from the long-term on-site meteorological tower is shown in Figure 4.1.4.

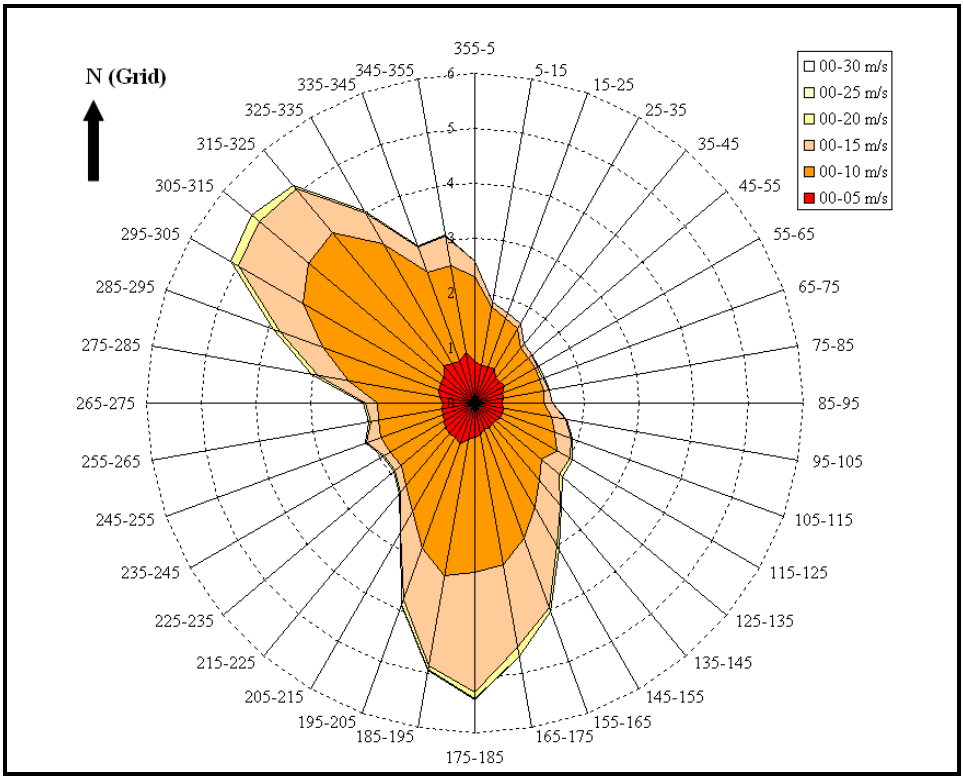


Figure 4.1.4 – Pleasant Valley Wind Rose

4.4 Other Meteorological Conditions

4.4.1 Average and Extreme Weather Conditions

Long-term climate normals from 1971-2000, along with historical extreme temperatures are supplied from Grand Meadow, MN in Table 4.1.2.

Month	Average Temperature (F)	Average High Temperature (F)	Average Low Temperature (F)	Record High Temperature (F)	Record Low Temperature (F)	Average Precipitation (in)
Jan	11.7	20.6	2.8	57	-35	1.03
Feb	17.7	26.6	8.8	63	-35	0.75
Mar	29.3	38.5	20.1	79	-31	1.86
Apr	43.3	54.2	32.3	91	1	3.37
May	56.3	68.0	44.5	107	21	4.27
Jun	66.6	77.6	55.5	105	32	4.37
Jul	70.1	81.1	59.1	106	40	4.82
Aug	67.7	78.9	56.4	102	34	5.07
Sep	59.0	70.9	47.1	98	22	3.5
Oct	47.1	58.4	35.7	92	10	2.43
Nov	31.7	40.2	23.1	78	-16	2.15
Dec	17.5	25.4	9.6	62	-29	1.03
Year	43.2	53.4	32.9	107	-35	34.65

Table 4.1.2 – Climate Normals for Grand Meadow, Minnesota

4.5 Other Wind Turbines in the Area

Name	Units	MW	Owner	Year Completed
High Prairie II (Vestas 1.65 V82)	61	100.65	Horizon	2008
High Prairie I (Siemens 2.3 MW)	43	98.9	FPL	2007
Grand Meadow (GE 1.5 MW)	67	100	Xcel	2008
McNeilus (multiple turbine type)	9	6	McNeilus	2003
McNeilus (multiple turbine type)	1	1.65	McNeilus	2003
McNeilus (multiple turbine type)	6	9.9	McNeilus	2004
Wapsipinicon (GE 1.5 MW)	69	103.5	enXco	2008
Grand Meadow Wind Farm	67	100.5	Xcel	2008

Table 4.1.3 - Existing LWECS in the vicinity of the Pleasant Valley Project

The Grand Meadow and Wapsipinicon Projects, in Grand Meadow and Pleasant Valley Townships respectively, are located directly east and southeast of the Pleasant Valley Wind Project Site and are shown in Figure 4.1.5 GE, and Figure 4.1.6 Siemens. No wind turbines from the Project are within seven (7) rotor diameters of any enXco turbines, a distance specifically agreed upon by both Renewable Energy Systems Americas Inc. and enXco.

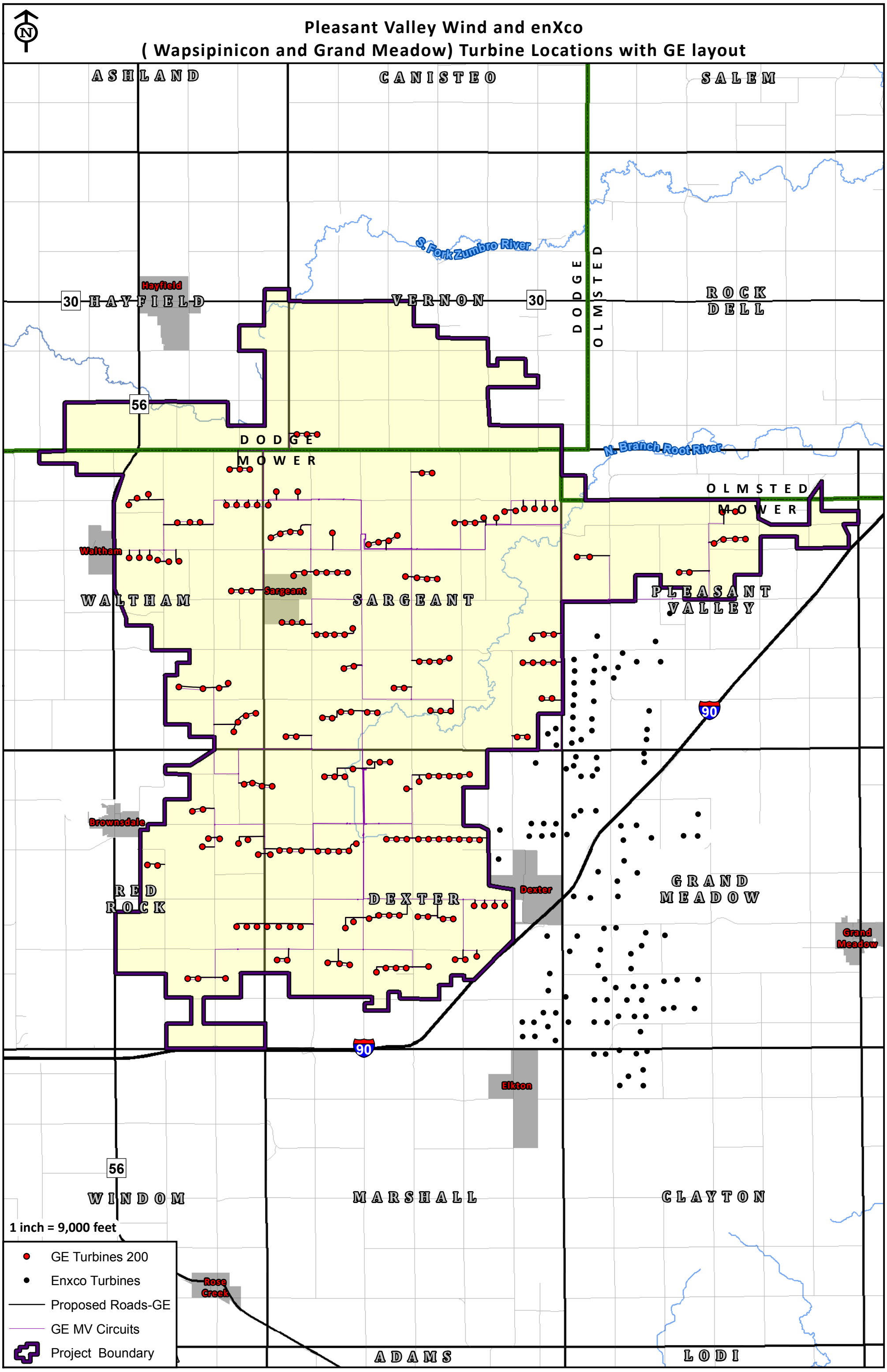


FIGURE 4.1.5 GE

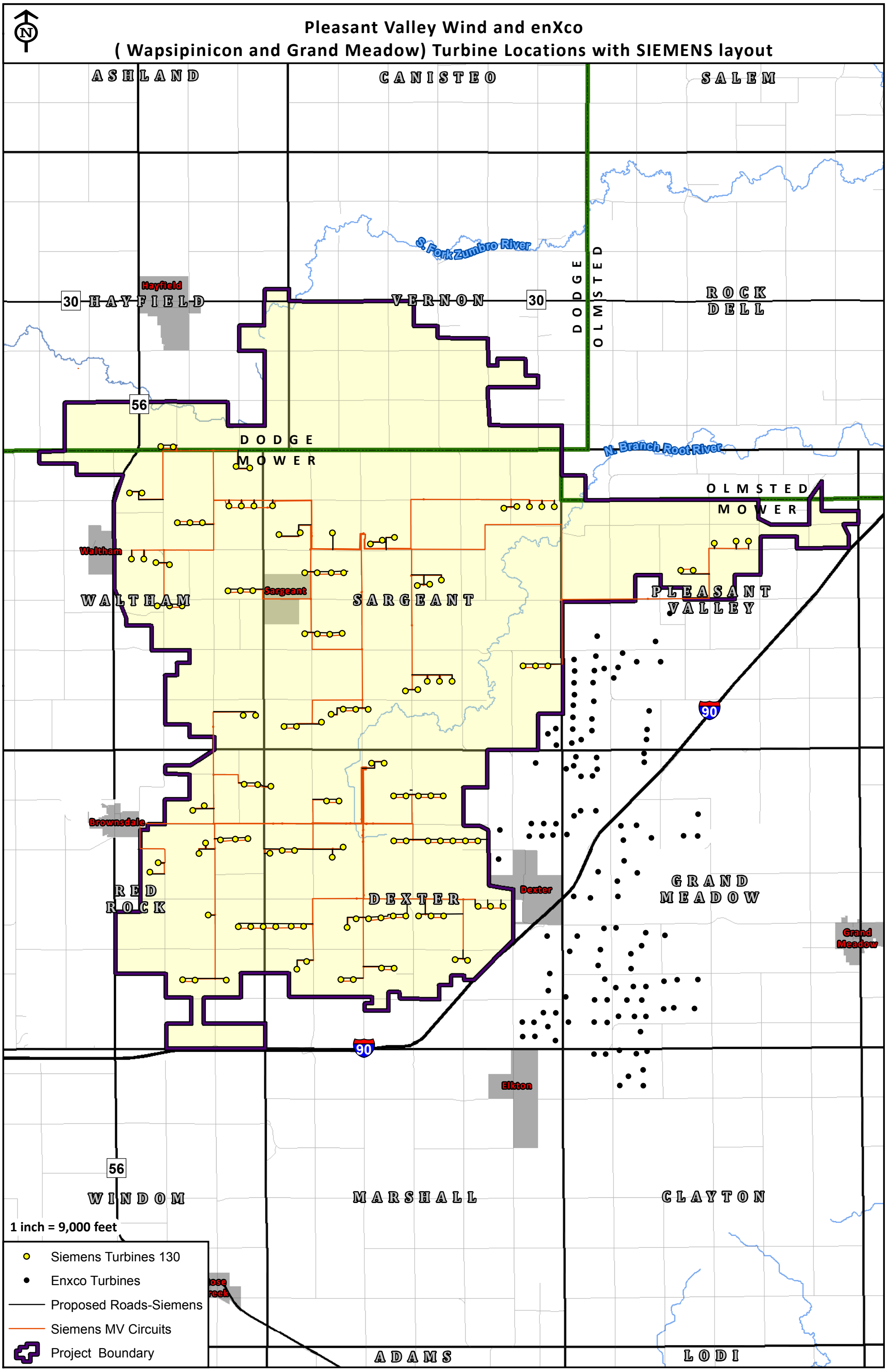


FIGURE 4.1.6 SIEMENS

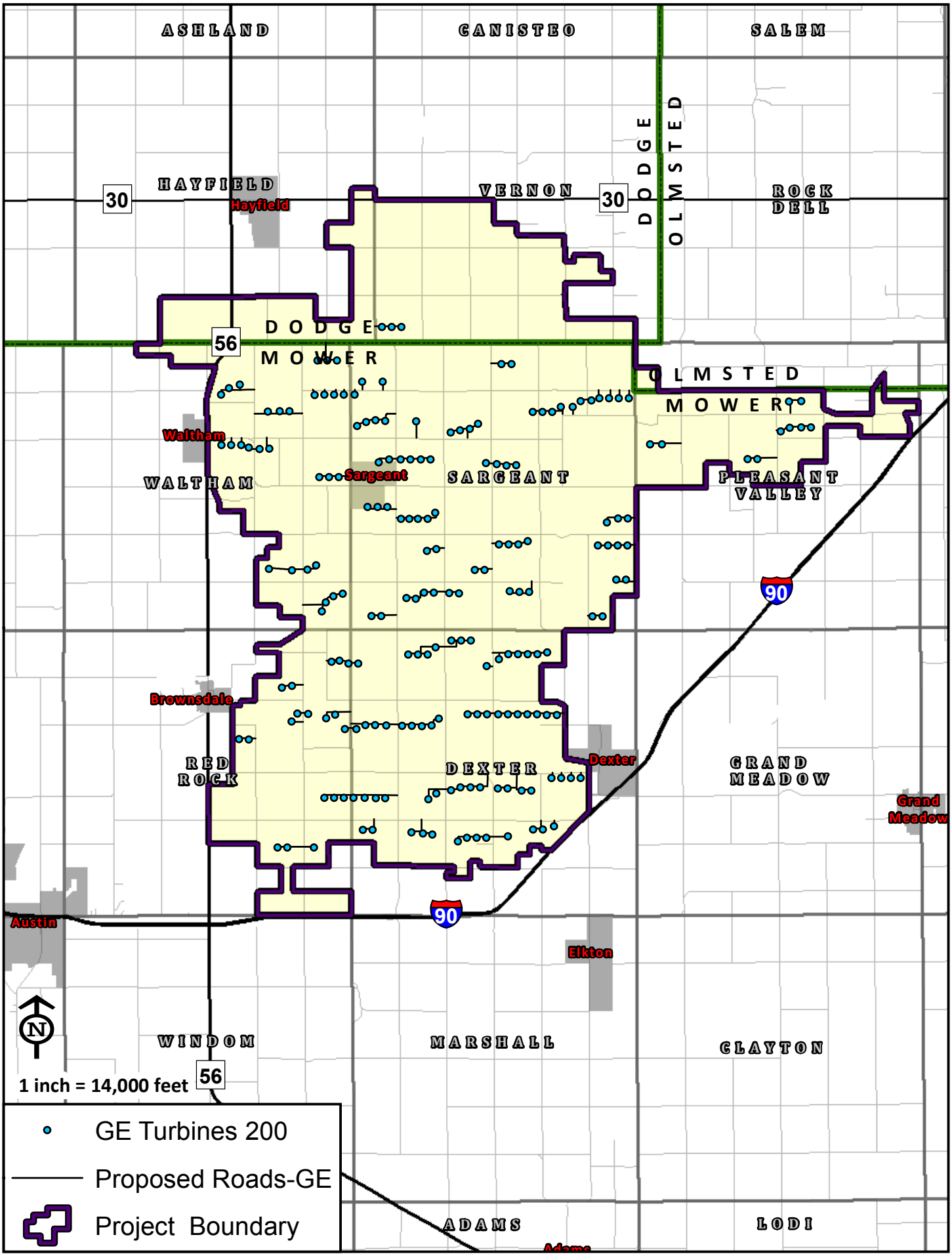
5 Design of Project

5.1 Project Layout

The Project includes wind turbines, meteorological towers, transformers, substations, underground and overhead electrical lines, access roads, and an operations and maintenance facility. Because a turbine type is still under consideration two separate layouts are proposed for this Project. The first layout consists of 200 GE XLE 1.5 MW Wind Extend turbines for a total of 300 MW. The second layout consists of 130 Siemens 2.3 MW SWT 2.3 - 101 turbines for a total of 299 MW. The Project layouts are shown below in Figure 5.1.1 GE and Figure 5.1.2 Siemens, as well as attachments in "Map 2 GE" and "Map 3 Siemens."

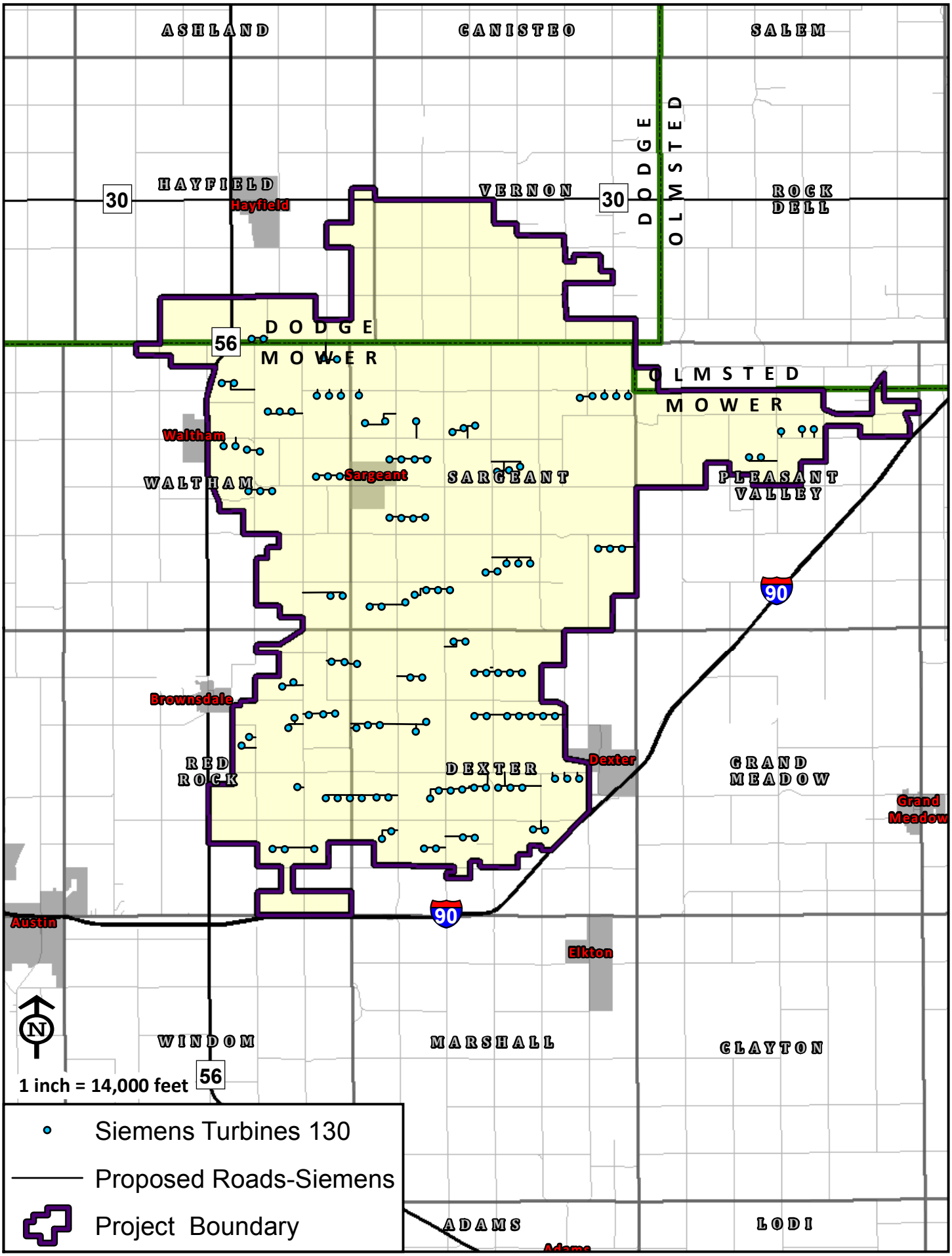
PROJECT LAYOUT WITH GE TURBINES

FIGURE 5.1.1 GE



PROJECT LAYOUT WITH SIEMENS TURBINES

FIGURE 5.1.2 SIEMENS



5.1.1 General Layout and Setback Consideration

The Project includes the required MPUC wind access buffer setbacks for turbines, specifically five (5) rotor diameters from the north and south Project boundaries of the Applicant's leases (prevailing wind direction), and three (3) rotor diameters from the east and west Project boundaries (non-prevailing wind direction).

Turbines will be no closer than 250 feet from the edge of road right-of-ways (ROW) to the center of the tower; however, for the purposes of preparing the Project layout Pleasant Valley Wind, LLC employed a more stringent setback of approximately 1.5 times the tip height from the road centerline. This distance is 596 feet for the GE XLE turbine and 642 feet for the Siemens 2.3/101m turbine. During the final field siting, turbine strings may be relocated closer to the roads to reduce construction costs, but in no case will a turbine be sited closer than 250 feet from the edge of the ROW. All turbines will comply with roadway setbacks when erected.

All substations and transmission lines will be placed in accordance with the requirements of Mower County through a Conditional Use Permit.

In most cases, the Applicant proposes a 1,500 foot residential setback; however, to create a more compact Project layout the Applicant will consider moving turbines closer to consenting landowners' home to compact the layout. A minimum 305 meter (1,000 ft) setback to inhabited structures will be maintained to assure that State sound standards are not exceeded.

5.1.2 Exceptions

There are no exceptions for the Project at this time.

5.2 Wind Turbines

The Project will consist of one of the following two potential layout designs:

- 200 GE 1.5 XLE turbines with a nameplate capacity of 300 MW. The Project will consist of two (2) 150 MW phases with an energy output of **[TRADE SECRET BEGINS]** *** **[TRADE SECRET ENDS]** respectively for each phase. The GE wind turbines have 82.5 meter (270 feet) rotor diameters and hub heights of 80 meters (262 feet).

- 130 Siemens 2.3 MW/101m turbine with a nameplate capacity of 299 MW. The Project will consist of two 149.5 MW phases with an energy output of **[TRADE SECRET BEGINS]** *** **[TRADE SECRET ENDS]** respectively for each phase. The Siemens wind turbines have 101 meter (331 feet) rotor diameters and hub heights of 80 meters (262 feet).

The basic GE and Siemens turbine specifications are included in *Section 5.2.5 – GE Technical Information and Section 5.2.6 – Siemens Technical Information*, respectively.

5.2.1 Rotor and Nacelle

The GE and Siemens turbines have a similar rotor and nacelle design. The rotor consists of three (3) blades mounted to the hub. The hub is attached to the nacelle which houses the main components of the wind turbine. The hub contains the blade pitch system and is connected to the main shaft of the nacelle drive train by a circular pattern of bolts. The nacelle contains the main shaft and bearing, gearbox, generator and main control panel. The yaw system automatically directs the orientation of the rotor into the wind based on the wind vane readings from the top of the nacelle.

5.2.2 Tower

The towers provided by GE and Siemens are tapered tubular steel towers approximately 80 meters in height. Each tower has internal ascent and direct access to the yaw control system and nacelle. Each tower consists of three (3) to four (4) sections. A service platform at the top of each tower section allows for access to the tower's connecting bolts for routine maintenance. The tower is equipped with interior lighting and a safety guide cable for ladder safety.

5.2.3 Foundations

The design of the foundations will incorporate site specific geotechnical information. Each turbine foundation will account for the site specific soils and subsurface conditions. A formal geotechnical investigation will be performed at each turbine site with a drill to analyze soil conditions and test for voids and homogeneous ground conditions.

Two (2) foundation designs will be considered depending on the results of the geotechnical study. Both are standard foundation designs in the wind turbine industry. The first option is a spread footing foundation that is typically an octagon spread footing with a four (4) foot pedestal, rebar and anchor bolts. When completed, a spread footing would contain approximately 300-400 cubic yards of structural concrete. The second foundation option is a pier type foundation. It would consist of two (2) concentric 30 foot corrugated metal cylinders (approximately 10 and 15 ft in diameter) placed vertically in the ground. Anchor bolt cages will be designed in accordance with turbine manufacturer requirements. When complete, each pier foundation would be filled with approximately 250-300 cubic yards of structural concrete. The turbine foundation designs will be engineered and certified by experienced Licensed Professional Engineer with years of proven wind turbine foundation design engineering.

5.2.4 Turbine Safety Systems

Each turbine is designed to comply with international standards, as well as Occupational Safety and Health Administration (OSHA). Three (3) safety systems to note include: rotor braking system, ladder safety system, and lightning protection system.

Rotor Braking Systems

Each turbine is equipped with two (2) technologies to slow and stop the rotor. The first safety system is the primary protection against overspeed of the rotor or loss of power. The blade pitch system is designed to pitch each blade individually to optimize power production. However, this system is also used to aerodynamically stop the rotation of the rotor under unsafe operation. Each blade can pitch 90 degrees to make the rotor stall and come to a stop once the rotational inertia has dissipated. The GE turbines use an electric pitch system. Therefore, in the event of a power system failure, there are batteries for backup. The Siemens turbines use a hydraulic pitch system. Therefore, in the event of a power system failure, there are accumulators to provide the required hydraulic pressure to pitch each blade. The second safety system is the mechanical brake. This system is typically used for service and maintenance however it can be used if the pitch system fails. The mechanical brake consists of a hydraulic-disc brake system. Brake pads on the disc brake are spring loaded, therefore in the event of a power failure the brakes will automatically set.

Ladder Safety System and Evacuation

Normal access to the nacelle is achieved by a ladder internal to the tower. Access to the ladder is restricted by a locked tower door. Service personnel will be equipped with lanyards and safety harnesses. The safety harnesses allow for mechanical connection to the ladder safety system. In addition, safety provisions are available to attach lanyards during the connecting and disconnecting of the harness mechanism to the ladder safety system. Evacuation equipment is also located in the nacelle in the event a service person is injured up the tower.

Lightning Protection System

Each turbine is equipped with a lightning protection system. The lightning system connects the rotor, nacelle and tower to the grounding system incorporated with the foundation design. If lightning were to strike a blade, the blade has copper nodes at the tip of the blade and copper wire running the length of the blade to direct the current through the hub, to the nacelle main frame (via ground brushes), around the nacelle (faraday cage design), down the tower and into the ground. The grounding system in the foundation is carefully designed for each turbine site to meet the turbine manufacturer's requirements. The general details of the grounding system include two (2) concentric copper ring

conductors connected to grounding rods driven down into the ground at diametrically opposed points outside the foundation.

5.2.5 GE Technical Information

Brand: GE	Model: 1.5xle (IEC 61400 IIb Turbine Class)
Rating: 1.5 MW	Voltage: 690V
Frequency: 60 Hz	Rotor Diameter: 82.5 m (270.6 ft.)
Swept Area: 5,345.6 m^2	Hub Height: 80 m (262.5 ft.)
Rotor speed: 9-18 rpm	Gearbox ratio: 1.85
Generator speed: 800-1600 rpm	Temperature Limits: -30 to +40 deg. C
Survival Temp. Limits: -40 to +50 deg. C	Max Extreme Wind Gust (3s): 52.5 m/s (117.4 mph)
Cut-in wind speed: 3.5 m/s (7.8 mph)	Cut-out Wind Speed: 25 m/s (55.92 mph)

Please note that the cold weather package has been incorporated above.

5.2.6 Siemens Technical Information

Brand: Siemens	Model: SWT-2.3-101(IEC 61400 Turbine Class IIB)
Rating: 2.3 MW	Voltage: 690V
Frequency: 60 Hz	Rotor Diameter: 101 m (331.36)
Swept Area: 8000 m2	Hub Height: 80 m (262.47)
Rotor speed: 6-16 rpm	Gearbox ratio: 1:91
Generator speed: 600-1800 rpm	Temperature Limits: -25 to 35 deg. C
Survival Temp. Limits: -45 to +45 deg. C	Max Extreme Wind Gust (3s): 59.5 m/s (133 mph)
Cut-in wind speed: 4 m/s (8.9 mph)	Cut-out Wind Speed: 25 m/s (55.9 mph)

Please note that the cold weather package has been incorporated above.

5.3 Description of Electrical System

5.3.1 Description of Resource

The Project electrical system has components typical of a LWECS including wind turbines, underground collection circuits, junction boxes, feeder conductors, substations transmission lines and interconnection switches.

Each turbine will have a step-up transformer to raise the voltage to the 34.5 kV distribution line. The distribution line will run underground to pad mounted junction boxes and larger feeder lines that will also run underground to the two (2) Project substations which will be located on the northern and southern portions of the Project area. At each substation a 34.5kV/138 kV transformer will increase the voltage to 138 kV. Power will then be transmitted via two (2) 138 kV transmission lines to a 138 kV/345 kV transformer located adjacent to the Pleasant Valley substation. A short 345 kV line will then interconnect to the Pleasant Valley substation from the high side of the 138 kV/345 kV transformer.

5.3.2 Transformers

Pad mounted transformers located at the base of the turbines will step-up the voltage from 600 volts to 34.5 kV. Power from the turbines is fed through a breaker panel inside the base of the tower to the transformers. The switch breaker in the turbine bus cabinet protects the transformer and wind turbine which is also grounded through the foundation grounding system described above. The transformer impedance is selected based on the internal fuses, interrupting rating and the facility power.

The transformers are interconnected on the high voltage side to an underground electrical connection circuit.

5.3.3 Electrical Collection Circuits

The high voltage power from the transformers located at each turbine will be fed to an underground feeder system encompassing up to approximately 149 miles of underground 34.5 kV electrical power lines. Where underground lines intersect pad mounted junction boxes will tie lines together into larger connector cables and larger feeder conductors. The underground cable insulation and sheathing will be selected based on line loads, soil conditions and soil conductivity.

The buried cables will be installed in a trench or bored beneath roadways, pipelines, protected waters and sensitive natural areas at minimum depth of five (5) feet deep. The buried cables that are laid in trenches will be bedded in sand or fine gravel before being backfilled by native soils.

In cropland areas with agricultural drain tile the depth of the underground cables will be below the depth of the existing drain tiles. Drain tiles in the area will be identified prior to construction so as to minimize damage. Any damage that does occur will be repaired to the satisfaction of the landowner during construction.

5.3.4 Substations

Two (2) substations will step-up the voltage from the 34.5 kV feeder lines to a 138 kV voltage line which will then be stepped up to 345 kV at a third substation site that will be adjacent to the Xcel Pleasant Valley 345 kV substation. The substation facilities measure two (2) to four (4) acres and are typical for wind power generation with the following components on a concrete foundation: transformers, outdoor breakers and relays, high voltage bus works, steel support structures, overhead lightning protection and a control house. Access will be controlled with a chain link fence, security and safety lighting and a security system. The substations are subject to local zoning requirements and each substation will require a Conditional Use Permit from Mower County, in accordance with Minnesota Rules 7850.5300.

5.3.5 Transmission Line

Two (2) 138 kV transmission lines will be constructed for the Project. A 6.1 mile overhead transmission line will extend from the north substation and a 7.3 mile overhead transmission line will extend from the south substation. Both lines will share the last 0.5 mile to the final point of interconnection. A short 345 kV transmission line of less than a mile will also be constructed from the third proposed substation adjacent to the Xcel Pleasant Valley substation.

A Conditional Use Permit from Mower County will be obtained for all three (3) transmission lines in accordance with Minnesota Statutes § 216E.05. Each substation will also require a Conditional Use Permit from Mower County in accordance with Minnesota Statutes § 216E.05.

5.3.6 Interconnection

The Project will interconnect to the Xcel Pleasant Valley 345 kV substation, approximately 15 miles south of Byron. The Pleasant Valley 345 kV substation is adjacent to the Great River Energy Natural Gas Peaking Plant and to the Project area in Section 19 of Pleasant Valley Township.

The Midwest Independent Transmission System Operator, Inc. (MISO) has concluded the interconnection study determining that the Project has minimal system impacts and is currently in the Definitive Planning Phase (DPP) which began on July 13, 2009. The DPP will define what types of equipment upgrades will be required to interconnect the Project to the MISO grid.

5.4 Associated Facilities

5.4.1 Access Roads

Access roads to the turbines will extend from existing public roads that cross the Project area. Based on the Project layout 42 miles (GE Layout) or 32 miles (Siemens Layout) of new access roads will be required for the Project.

All of the Project's access road will be designed to accommodate heavy loads and large cranes that are needed to construct and maintain the turbines. The temporary roads will be 36' wide and the permanent road will be 20-feet wide crushed rock with 8-foot compacted shoulders. The road design and construction will be in accordance with engineering standards based on soil conditions and will require an Erosion Control Permit for Construction Site Activity.

The movement of turbine blades will require wide turning radii at driveway entrances. Project planning and logistical planning will attempt to minimize the number of large radius driveways in order to minimize the size and length of culverts in the ditches of the public ROW. It is typical to

widen the radius only in the direction of delivery. The Applicant will work with the appropriate road authority for permits and design standards for the widened driveways.

5.4.2 Meteorological Towers

The Project currently has six (6) temporary meteorological towers and proposes to maintain two (2) permanent MET-towers to monitor the wind during the lifetime of the Project. The six (6) existing MET-towers have been approved by Dodge and Mower Counties and are subject to county Conditional Use Permits.

The two (2) proposed permanent MET-towers will be freestanding 50 to 80 meter towers placed in locations to avoid turbulence or wash from the working turbines. The MET-towers will have a grounding system, aviation safety lights and meteorological monitoring equipment. The meteorological data collectors are equipped to electronically transmit digital weather data to the control center.

5.4.3 Operation and Maintenance Center

A project office serving as an operational and maintenance (O & M) center will be constructed in the Project footprint and maintained as the base of the Project operations. The O & M center will provide office space for supervisors and crews who will monitor and maintain the facility. Private water well and Individual Septic Treatment System (ISTS) is proposed to be constructed in accordance with State and local rules and regulations. The building will be built within the Project footprint on leased land or on land purchased for the building. The location and construction of the facility is subject to local approval.

5.4.4 Remote Control Monitoring

The operational control system is proposed to be a sophisticated network of real-time remote control, monitoring, feedback and communication that will allow for site supervisors and workers to download data from the entire network of turbines, transformers, substations, relays and switches. The system will be designed and installed to monitor weather data, power production and provide troubleshooting for mechanical or electrical systems from the facility control center, through an off-site central command center or from a remote location.

6. Environmental Analysis

6.1 Description of Environmental Setting

The Project site encompasses 52,000 acres of leased land inside the 80 square mile. The land is ditched and drained by agricultural drain tile and some farmers raise livestock, principally hogs with a small number of dairy, beef and turkey farms. There are few developments outside the historic

small town of Sargeant (pop 74), the only incorporated City within the footprint of the Project. The small towns of Hayfield (pop 1,338), Waltham (pop 191), Brownsdale (pop 702) and Dexter (pop 325) are all within one (1) mile of the Project area boundary. Fewer than 4,200 people live within the cites and townships of the 80 square mile footprint and fewer than 7,500 people live within three (3) miles of the Project boundary. The nearest City is Austin, MN (pop 23,671), and it is located six (6) miles west of the southwest corner of the Project. The regional retail and service center, the nearest city with a population over 100,000 is the City of Rochester (pop 100,845), located 15 miles to the northeast. Elevations in the Project area range from 1,300 to 1,420 feet above mean sea level (amsl).

According to the EPA's *Ecoregions of the United States in 2009* the area is primarily located within two (2) Level III Ecoregions; the Western Corn Belt Plains and the Driftless Area. A description of each USEPA Ecoregion is provided below:

Western Corn Belt Plains

"Once covered with tallgrass prairie, over 75 percent of the Western Corn Belt Plains is now used for cropland agriculture and much of the remainder is in forage for livestock. A combination of nearly level to gently rolling glaciated till plains and hilly loess plains, an average annual precipitation of 63-89 centimeters, which occurs mainly in the growing season, and fertile, warm, moist soils make this one of the most productive areas of corn and soybeans in the world. Major environmental concerns in the region include surface and groundwater contamination from fertilizer and pesticide applications, as well as impacts from concentrated livestock production (USEPA 2009)."

Driftless Area

"The hilly uplands of the Driftless Area easily distinguish it from surrounding Ecoregions. Much of the area consists of a deeply dissected, loess-capped, bedrock dominated plateaus. The region is also called the Paleozoic Plateau because the landscape's appearance is a result of erosion through rock strata of Paleozoic age. Although there is evidence of glacial drift in the region, the influence of the glacial deposits have done little to affect the landscape compared to the subduing influences in adjacent Ecoregions. Livestock and dairy farming are major land uses and have had a major impact on stream quality (USEPA 2009)."

6.2 Socioeconomics

6.2.1 Description of Resource

The Project is located in Dodge and Mower Counties, MN, a rural agricultural landscape in southeastern Minnesota. Baseline data for the county includes population and demographic data, as well as current business and economic statistical information. Data was obtained from the U.S. Census Bureau based on the 2000 census data and the Minnesota State Demographers 2005 population projections. Three (3) public school districts surround the Project area and include Hayfield, Blooming Prairie, Austin and Grand Meadow.

Dodge County

Dodge County encompasses 439 square miles and had a total population of 17,731 people in 2000 and a projected population of 19,751 in 2008. At the time of the 2000 Census the median age in Dodge County was 34.8 years, with 69.8 percent of the population under the age of 18, approximately 12 percent was 65 years or older. The population of minority and low-income population in the county and state are shown in Table 6.2.1.

Location	Total Population	Percent Minority*	Percent below Poverty (2000)**
Dodge County	17,731	6.4	5.8
State of Minnesota	4,919,479	14.1	9.6

Table 6.2.1 – Minority Populations and Low-Income populations, Dodge County, 2005
Source: U.S. Census Bureau 2005
*Minority populations are persons of Hispanic or Latino origin of any race, Blacks or African Americans, America Indians or Alaska Natives, Asians, and Native Hawaiian and other Pacific Islanders.
**Low-income populations are persons living below the poverty level.

Kasson is the largest city in Dodge County with a population of 4,398 persons in 2005. Mantorville, pop 1,054, is the county seat.

The Project is located in Hayfield Township (pop 445) and Vernon Township (pop 567) and is within the vicinity of the City of Hayfield (pop 1,325), located to the west of the Project footprint.

In 2000, the U.S. Census reports indicated there were 6,642 housing units in Dodge County with 2.73 persons per household and an average population density of 40.4 people per square mile. The County had a home ownership rate of 84.0 percent in 2000, and the median housing value was $97,100, which is $22,500 less than the state average. The median household income was $47,437 in 2000, which is above the state median household income of $47,111 in 2005. The U.S. Census Bureau estimates the Dodge County population is expected to increase by 3,929 persons by 2010.

The 2000 US Census and the Minnesota 2008 census estimates show the number of households, persons per household and the projected population density for the nearby Cities and Townships (Table 6.2.2).

DODGE COUNTY **Pleasant Valley Wind: Demographics by Township and City**						
Township/city	**Area (mi^2)**	**Households**	**Persons per household**	**Population**	**Persons (mi^2)**	**200 to 2008 Population Estimates**
Hayfield Twp.	36.58	137	3.25	445	12.16	Increase 13.63%
Hayfield City	1.26	496	2.67	1325	1049	Increase 0.68%
Vernon Twp.	36.2	210	2.7	567	15.7	Increase 5.64%

Table 6.2.2 – Dodge County Demographics by Township. Source: 2000 U.S. Census and 2008 MN Census Estimates.

Manufacturing (18.3 percent) is the largest industry in Dodge County, followed by retail trade (10.4 percent), construction (8.3percent) and agriculture (7.7 percent) with roughly 80 percent of the land in agricultural production, either for cropland or grazing. In the rural landscape a total of 723 farms are scattered across the Dodge County landscape with the average farm size of 343 acres. According to the 2007 Census of Agriculture the total market value of agricultural products sold in 2007, was $172,962,000, including $91,966,000 in crops and $80,996,000 in livestock and poultry with an average farm income of $239,228.

Dodge County is home to the headquarters of McNeilus Steel and McNeilus Truck and Manufacturing, Inc., (Oshkosh Trucks), where garbage trucks and cement mixer trucks are produced. Within the vicinity of the Project area additional major employers include the Austin Medical Center and the Mayo Clinic in Rochester, Minnesota.

According to the State Department of Employment and Economic Development (DEED) the Dodge County unemployment rate was 7.6 percent, which is slightly lower than the State of Minnesota's seasonally adjusted unemployment rate of 8.1 percent.

Mower County

Mower County encompasses 711 square miles with an average population density 54.3 people per square mile and had a total population of 38,603 people in 2000. The median age in Mower County was 38.9 years, with 74.9 percent of the population under the age of 18 and approximately 19.6

percent is 65 years or older in 2000. The population of minority and low-income population in the county and state are shown in Table 6.1.3.

Location	Total Population	Percent Minority*	Percent below Poverty (2000)**
Mower County	38,603	9.7	9.2
State of Minnesota	4,919,479	14.1	9.6

Table 6.2.3 – Minority Populations and Low-Income Populations, Mower County, 2000
Source: U.S. Census Bureau 2000
*Minority populations are persons of Hispanic or Latino origin of any race, Blacks or African Americans, America Indians or Alaska Natives, Asians, and Native Hawaiian and other Pacific Islanders.
**Low-income populations are persons living below the poverty level.

Austin is the largest city with a population of 23,314 and is the county seat of Mower County. The Project is located in Waltham, Sargeant, Pleasant Valley, Red Rock and Dexter Townships. Several small rural communities are in the vicinity of the Project area including Waltham, Sargeant, Mayville, Brownsdale, Renova, Dexter, Grand Meadow and Elkton. Three (3) public school districts surround the Project area and include Hayfield, Blooming Prairie, Austin and Grand Meadow.

The 2000 US Census and the Minnesota 2008 census estimates show the number of households, persons per household and the projected population density for the nearby Cities and Townships.

MOWER COUNTY **Pleasant Valley Wind: Demographics by Township and City**						
Township/City	**Area (mi^2)**	**Households**	**Persons Per household**	**Population**	**Persons (mi^2)**	**2000 to 2008 population estimate**
Brownsdale Twp.	0.01	290	2.48	702	157.4	Decline 3.06%
Dexter Twp.	34.7	100	2.89	289	8.33	Decline 2.42%
Dexter City	1.45	130	2.56	333	229.8	Decline 3.9%
Pleasant Valley Twp.	30.11	100	3.08	308	10.2	Decline 0.65%
Red Rock Twp.	35.4	271	2.64	715	20.2	Decline 1.12%
Sargeant Twp.	35.38	97	2.68	316	8.93	Decline 8.23%
Sargeant City	0.83	29	2.62	76	91.1	Decline 6.58%
Waltham Twp.	35.9	146	2.85	416	11.6	Decline 1.12%
Waltham City	0.46	68	2.88	196	425.0	Decline 4.59%

Table 6.2.4 – Mower County Demographics by Township. Source: 2000 U.S Census and 2008 MN Census Estimates.

In 2000, the U.S. Census reports indicated there were 16,251 housing units in the county with 2.42 persons per household. The county had a home ownership rate of 78.2 percent in 2000 and the median housing value was $71,400, which is $51,000 less than the state average. The median household income was $36,654 in 2000 or 77 percent of the state median household income of $47,111 in 2005.

According to the 2002 Mower County Comprehensive Plan, the county population is expected to increase by 1,290 persons by 2010, due to the continued outreach of employers located in both the Austin and Rochester urban areas, whereas smaller, isolated communities are projected to lose small portions of their existing resident base.

Manufacturing (21.8 percent) is the largest industry followed by educational, health and social services (25.3 percent), and retail trade (9.5 percent). Agricultural production only accounts for 4.6 percent, however roughly 92.2 percent of the land is in agricultural production, either for cropland or grazing. A total of 1,088 farms are scattered across the Mower County landscape with the average farm size of 386 acres. According to the 2007 U.S. Census of Agriculture the total market value of agricultural products sold in 2007, was $287,603,000 including $166,424,000 in crops and $121,179,000 in livestock and poultry, with an average farm income of $264,341.

Mower County is home to the headquarters of the Hormel Meat Company where production of a variety of meat and food products is manufactured. Within the vicinity of the Project area additional major employers include the Austin Medical Center and the Mayo Clinic.

According to the State Deed Demographer in April 2009 the Mower County unemployment rate was 6.5 percent, which is substantially lower than the State of Minnesota's seasonally adjusted unemployment rate of 8.1 percent.

Table 6.2.5 summarizes employment by industry and class of worker for Dodge and Mower Counties from the 2005 Census data.

Industry	Dodge County		Mower County	
	2005	Percent	2005	Percent
Total Civilian employed population (16 years and over)	9,368	100	18,690	100
Agriculture, forestry, fishing, hunting & mining	724	7.7	869	4.6
Construction	782	8.3	1,299	7.0
Manufacturing	1,710	18.3	4,068	21.8
Wholesale trade	339	3.6	633	3.4
Retail trade	978	10.4	1,767	9.5
Transportation and warehousing utilities	367	3.9	639	3.4
Information	110	1.2	324	1.7
Finance, insurance and real estate	427	4.6	448	2.4
Professional, scientific and technical services	357	3.8	1,150	6.2
Education services, and health care and social assistance	2,579	27.5	4,735	25.3
Arts, entertainment, recreation and food services	376	4.0	1,169	6.3
Other services	362	3.9	916	4.9
Public Administration	257	2.7	673	3.6
Class of Worker	**Dodge County**		**Mower County**	
	2005	**Percent**	**2005**	**Percent**
Private wage and salary workers	7,415	79.2	14,792	79.1
Government workers	934	4.0	2,142	11.5
Self-employed	958	3.9	1,714	9.2
Unpaid family workers	61	2.7	42	0.2

Table 6.2.5 – Employment by Industry and Class of Worker for Dodge and Mower Counties Source: U.S. Census Bureau, 2005

6.2.2 Impacts

Wind power development in the area will provide a value added component to the agricultural landscape, providing a steady stream of income to landowners and rural communities derived from lease payments, new businesses and new jobs for the construction, operation, maintenance and administration of the Project. The economic diversification created by wind power development creates high value jobs including temporary employment during construction and permanent jobs for operations and maintenance. Other recent Minnesota wind power developments have required 0.85 construction jobs per turbine and one (1) permanent position for operation and maintenance for every twelve (12) turbines. Similar employment would be realized for this Project. There is no current economic model to forecast the direct economic impact benefits to the community, however, the increase in land values (the value of the turbine payments will transfer with the ownership of the property) and new jobs will circulate substantial amounts of money through the local economy.

The cost of developing and constructing the proposed approximately 300 MW Project is expected to cost over six (6) hundred million dollars. Construction will take several months to complete and will generate outside income and increase the tax base of the economy within the vicinity of the Project area. Currently construction accounts for 8.3 percent and 7 percent within Dodge and Mower Counties, respectively and is expected to increase during the construction stage of the Project. Job growth provides economic benefits to local communities from retail trade, services, housing and transportation and generates local tax revenue.

6.2.3 Mitigation Measures

The Project will not adversely impact the socioeconomics within the Project area. The positive economic impact to landowners and the professional criteria of the job will all have a positive socioeconomic effect; therefore no mitigation measures are necessary. Dodge and Mower Counties will receive an increase in the local communities' tax base, due to the increased number of jobs for the development of the Project. Annual energy production tax revenues are projected to be **[TRADE SECRET BEGINS] *** [TRADE SECRET ENDS]** depending on turbine type and annual energy production.

6.3 Noise

6.3.1 Description of Resource

The Project is located in a rural agricultural dominated landscape with typical agricultural noise pollution sources, including farm machinery construction and agricultural vehicle operations, recreational activities, (such as hunting and ATVs), motor vehicle traffic and road construction activities. Noise levels depend on the distance from the noise source and the attenuation of the

surrounding environment. Table 6.3.1 provides an estimate of decibel levels of common noise sources.

Sound Pressure Level (dBA)	Typical Source
140	Jet Engine (at 25 m)
130	Jet Aircraft (at 100 m)
120	Rock Concert
110	Pneumatic Chipper, Chain Saw
100	Jackhammer (at 1 m)
90	Chainsaw, Lawn Mower, (at 1 m)
80	Heavy Traffic
70	Business Office, Vacuum Cleaner
60	Conversational Speech, Typical TV Volume
50	Library
40	Bedroom, Rural Residential
30	Secluded Woods, leaves rustling
20	Whisper, Quiet Rural Nighttime
10	Threshold of Hearing
0	No Sound
Common Noise Sources and Sound Levels on the Farm	
74-112	Tractor
81-102	Grain Dryer
80-105	Combine
93-97	Grain Grinding
85-115	Pig Squeals
85-106	Orchard Sprayer
79-89	Riding Mower
88-94	Garden Tractor
83-116	Crop Dusting Aircraft
44	Agricultural Cropland

Table 6.3.1: Decibel Levels of Common Noise Sources. Source MPCA and National Safety Council.

Noise related to wind turbine operation is often cited as a concern when Large Wind Energy Conversion Systems are developed in rural areas. Some earlier wind turbine designs did not consider noise and sited turbines too close to residential receivers, but with improvements in engineering new equipment and the use of setbacks to residences homes, many of the historic complaints have been resolved. The American Wind Energy Association (AWEA) website states, "aerodynamic noise has been reduced by changing the thickness of the blades' trailing edges and by placing machines "upwind" (of the tower) rather than "downwind" so the wind hits the rotor blades first, then the tower."

Changes in decibel levels and the ability for humans to perceive changes in loudness vary, as illustrated in Table 6.3.2, which is based on a logarithmic scale.

dBA	Category
± 1	Not Noticeable
± 3	Threshold of Perception
± 5	Noticeable Change
± 10	Twice (Half) As Loud
± 20	Four Times (one Fourth) As Loud

Table 6.3.2 – Change in Decibel Level and Perceived Change in Loudness. Source: MPCA.

Currently the background noise levels in the Project area are typical of rural residential sound levels. These levels were calculated, no field measurements or data were collected. It should be noted, the perceived sound levels vary across the agricultural area where seasonal farming operations can vary between 44-112 dBA; specifically 100 dBA for tractors and over 110 dBA for chain saws. The highest levels of noise exist near major highways and busy roads.

6.3.2 Impacts

The State of Minnesota noise standards require an L50 level of 50 dBA or less at nighttime (10:00 p.m. – 7:00 a.m.) for residential receptors (Minn. Rule Chapter 7030.0040), which means during a one-hour period of monitoring, the nighttime noise levels cannot exceed 50 dBA for more than 50 percent of the time (L50).

The level of noise generated by turbines will vary with the wind speed, the turbine acoustic emission characteristics, air density and distance from the listener to the turbine. Noise levels produced by operation of the turbines were modeled to determine at what distance turbine noise would not exceed Minnesota Pollution Control Agency (MPCA) noise standards.

Using the formula shown below, the noise impacts at various distances were calculated for a GE 1.5 MW XLE turbine with an 82.5 m rotor diameter; and a Siemens 2.3 MW turbine with a 101 m rotor diameter. Specific characteristics for each turbine model selected are shown in Table 6.3.3.

$$\mathbf{L_p = L_w - 10 \log_{10} (2\pi R^2) - L_a}$$

Where:
L_p = The free field sound pressure level at the receiver (residence).
L_w = The sound power level of the source (wind turbine).
R = The distance between the source (wind turbine) and the receiver (residence) in meters.
L_a = Attenuation of sound due to air absorption (varies with frequency and is measured per meter).

In the above equation, the air absorption value, "a", has been computed for each of the octave bands used (see Table 6.3.4 below).

Turbine Model	**GE 1.5 XLE**	**SWT 2.3/101**
(L_w) Sound Power Level (± 2 dB)	104	108
Measurement Height (m)	10 (32.8')	10 (32.8')
Wind Speed (m/s)	7 (23') - Cutout	7 (23') - Cutout
Roughness Coefficient (m)	0.03 (0.1')	0.05 (0.16')
Hub Height (m)	80 (262.5')	80 (262.5')

Table 6.3.3 – Turbine Noise Emission Characteristics

Octave Band (Hz)	**250**	**500**	**1000**	**2000**	**4000**	**8000**
Air Absorption (dB/m)	0.001	0.002	0.004	0.011	0.039	0.135

Table 6.3.4 - Air Absorption of Sound with RH = 72% and Temp = 6.2°C taken from Grand Meadow reference station and http://www.sengpielaudio.com/calculator-air.htm.

The findings from this analysis indicate that the minimum distance where the Minnesota State noise standard of nighttime L_p = 50/50 dBA would be exceeded for a single isolated wind turbine is 656 feet (200 meters) for the GE and 1,049 feet (320 meters) for the Siemens.

The typical proposed setback of 1,500 feet (460 m) from occupied residences will ensure that cumulative noise levels resulting from multiple turbines and noise drift resulting from wind will not exceed the regulatory limit at any residence. The location of turbines and residences with a buffer of 1,500 feet (460 m) is illustrated in Map 4.

Cumulative noise impacts resulting from turbine strings were analyzed for the project layout. This analysis concluded that noise levels did not exceed 50 dBA at any inhabited structures located in the Project area for either the GE 1.5 XLE layout or the SWT 2.3/101.

6.3.3 Mitigation Measures

Renewable Energy Systems Americas Inc. has considered noise impacts to nearby residents and other potentially affected parties for the turbine micrositing. Turbines will be sited an average of 1,500 feet away from occupied residences in most cases. When warranted due to closer proximity of turbines to nearby residences noise modeling will be completed. The level of noise generated during the turbine construction and operation will not exceed noise levels typical of the area.

Additional mitigation measures that have been considered to reduce noise associated with the Project include:

- Selecting wind turbine models that have been manufactured with noise reduction components, such as:

    - **200 GE 1.5 XLE wind turbines;**
        - Impact noise insulation of the gearbox and generator,
        - Sound reduced gearbox,
        - Noise reduced nacelle,
        - Rotor blades with minimized noise level

    - **130 Siemens SWT-2.3-101;**
        - Uses the latest advances in the fields of aerodynamics and structural dynamics to reduce noise.

Noise levels will not exceed the state standards during the construction and operation of the proposed Project.

6.4 Visual Resources

6.4.1 Description of Resource

The 80 square mile (52,000 acres) Project Site is an agricultural landscape dominated by rural farmsteads, row-crop production of annual crops and Confined Animal Feeding Operations (CAFO's). The Project area is recognized as open space, but, northern Dodge and southern Mower Counties are not renowned or recognized for scenic vistas, commanding views, or natural landscapes. The fertile ground and productive farms have a visual appeal to crop producers, but have little appeal to naturalists or those interested in scenic vistas, artistic or cultural resources. The recent development of a LWECS in the areas to the south, have recently attracted tourists interested in viewing the new wind turbines.

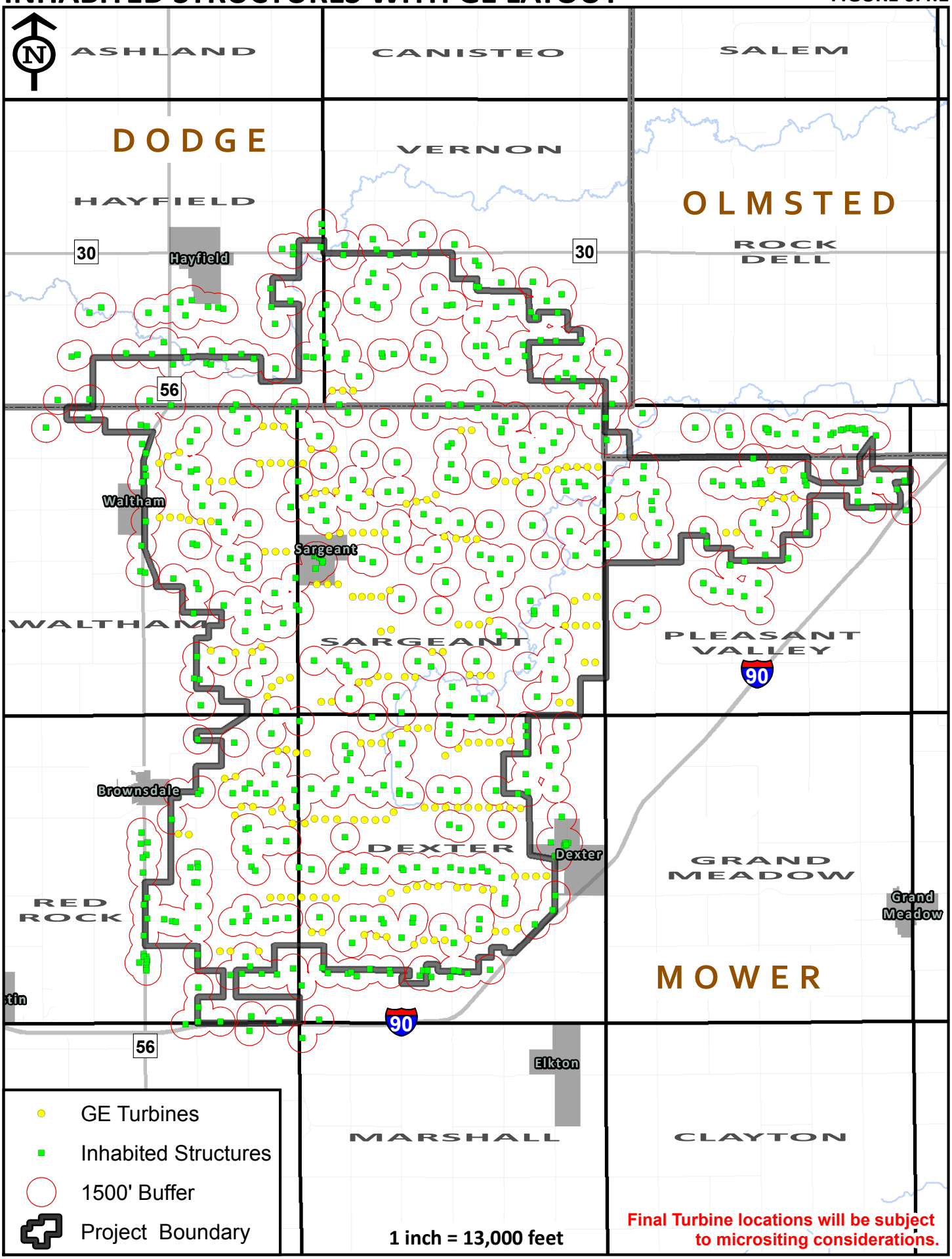
The Project is located on level to gently-sloping land with gradients at topographic elevations that range from 1,230 to 1,415; 25 feet lower than the highest elevations in the region. The Project is at the top of a three-way watershed divide between the Zumbro River headwaters flowing to the east and north, the Cedar River headwaters flowing to the west and southwest and the Root River headwaters flowing to the south and east. Because the Project is in the headwaters there are no major river valleys, no bluffs, ridges or other prominent landscape features that would require protection from visual impairment. The relatively high elevations in the Project area make the turbines, towers and tall structures visible from a distance when viewed from the lower ground of the surrounding region, but also accounts for the relatively high average wind speed and relatively high net turbine capacity factors that make wind energy production feasible in the region.

The visual appeal of the Project Site is seasonally variable and is dominated by cropland. The visual spectrum varies from brown to black fallow cropland during the fall to white snow covered ground through the winter. In the spring, (early to mid-May), the landscape changes to a checkerboard of black cropland and green field margins with the emergence of grasses and leaves on trees. By June through September the visual appearance becomes dominated by green to brown row-crop production. Farmsteads and rural buildings are commonly surrounded by tree and shrub-lined shelter belts and the cities represent older houses set in small urban forests. The proposed 80 m (262 ft) towers with 77 m (252 ft) to 101 m (331 ft) rotor blades will compliment the visual landscape. Except for the short 345 kV transmission line and two (2) 138 kV transmission lines on the east end of the Project; all electrical services will be buried and not visible.

The 80 square mile (52,000 acres) Project Site encompasses 498 farmsteads within one (1) mile of proposed turbines and overhead feeder and transmission lines. The 2000 U.S. Census data estimates by Township 1.17 rural residents per square mile are present in the Project area, indicating low occupation rates for the identified farmsteads. The Project also encompasses the town of Sargeant (2007 estimated population 74), the Wild Indigo Prairie Scientific and Natural Area (SNA) and Minnesota State Highways 56 and 30. The Project borders the towns of Dexter (pop 325), Brownsdale (pop 702), Waltham (pop 191) and Hayfield (pop 1,338) and adjoins Interstate 90 on the south and the Iron Horse Prairie SNA on the north. The occupied parcels, small towns and major transportation routes are all areas where the Project may be visible to viewers. Some of these points are shown in Figure 6.4.1 GE and Figure 6.4.2 Siemens.

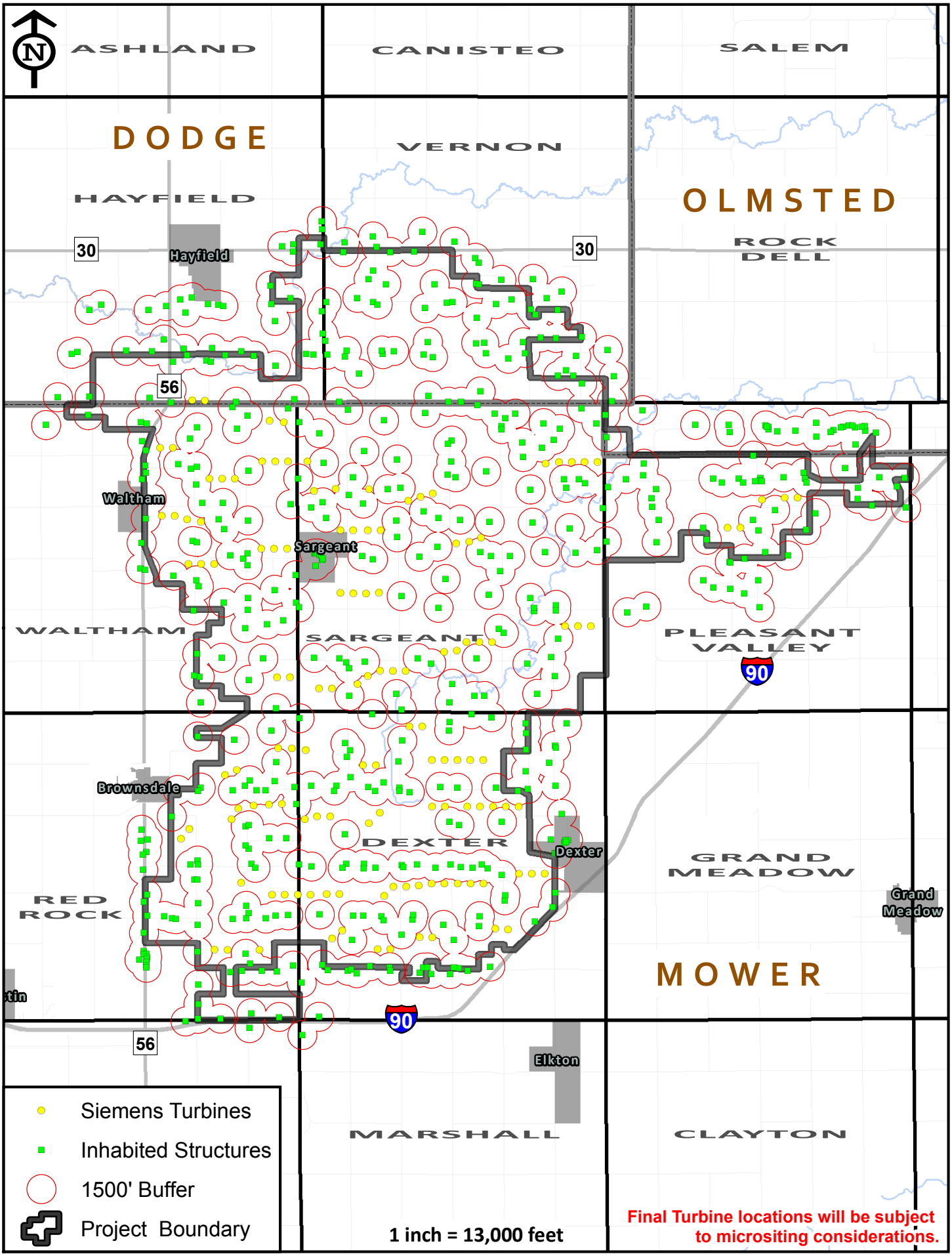
INHABITED STRUCTURES WITH GE LAYOUT

FIGURE 6.4.1



INHABITED STRUCTURES WITH SIEMENS LAYOUT

FIGURE 6.4.2



6.4.2 Impacts

The placement and operation of a LWECS including wind turbines, substations, service roads and overhead feeder lines within the Project Site will change the visual character of the area from a view with few structures taller than the grain bins in the farmstead shelterbelts to an area where the horizon is dominated by towers with turbine blades extending to nearly 500 feet in the air. The Project will include facilities causing a visual change in the landscape including 130 to 200 turbines with aircraft safety lighting, 14 miles of overhead transmission lines, three (3) substations and up to 42 miles of service roads in cropland areas.

The perception of the visual impact is a subjective value judgment that ranges from acceptance of turbines as sleek, and a visually attractive sign of progress, added farm value and energy independence to negative views and perceptions concerning the interruption of open space and domination of the landscape by engineered man-made structures. There is little reconciliation between these value judgments.

Within the Project area turbine setbacks of over 1,500 feet are proposed from occupied structures minimizing shadow flicker. However, the wind turbines will be visible within the Project area. The visual impact will decrease as a function of distance, but, the Project, like the adjoining enXco Xcel High Prairie IHPI and HPII High Prairie LWECS project constructed in Dexter Township in 2008, will be visual for more than thirty (30) miles during daylight hours when viewed from unobstructed ground elevations above 1,275 feet, and the aircraft safety lighting will be visible at a greater distance on a clear night. Because there are no important scenic vistas or important landscape features in this agricultural area unique viewsheds will not be impacted.

6.4.3 Mitigation Measures

Mitigation measures for visual impacts from the Project have focused on facility siting and landowner agreements for site control and construction. The following elements are mitigation measures for the Project:

- In most circumstances, turbines will maintain a minimum setback of 1,500 feet from occupied residences. Turbines inside this distance will be evaluated on an individual basis to determine if the location is appropriate;
- Turbines will maintain at least a 250 foot set back from all roads and in most cases exceed that standard due to more conservative internal standards;
- All turbines will be on cropland or pasture and will not be placed in wetlands or native prairies;
- Collector lines from the turbines to the substations will be buried and out of view;

- Turbines will have strobe lights in accordance with current Federal Aviation Administration (FAA) regulations;
- Overhead collector lines will be limited to link the two (2) substations to the proposed 138kV/345 kV Substation and a short 345kV transmission line to the point of interconnection in the Pleasant Valley Substation.
- Construction disturbance for roads and turbine pads will be temporary and will convert the land from crop production to drivable crushed rock surfaces.

Alternative mitigation measures, such as placement of turbines at lower elevations or using shorter turbines were rejected in order to maximize efficiency and wind power production and minimize the number or turbines rather than proposing more turbines over a wider area.

6.5 Public Services, Infrastructure, and Traffic

6.5.1 Description of Resource

The Project is located in rural southeastern Minnesota immediately north of Interstate 90 with the western boundary located at the Trunk Highway (TH) TH 56/Dexter Exit, east of 740th Avenue and north of State HWY 30. TH 56 runs north and south through the Project area and has an average of 2,500 trips per day in accordance with the 2006 MNDOT average traffic count. Highway 30 roughly parallels I-90 ten (10) miles to the north and runs west-east through Hayfield with an average of 1,900 trips per day. Interstate 90 runs along the southern portion of the Project and averages 11,000 trips per day. County HWY 7 runs north and south through the property with an average of 1,200 trips per day. The communities of Hayfield, Vernon, Oslo, Waltham, Mayville, Brownsdale, Dexter, and Grand Meadow are adjacent to the Project area as shown in Map 5.

Existing public roadway infrastructure for City Streets, Township, County, State and Interstate roads that are in the vicinity of the Project are shown in Map 5. Township Roads are constructed in a one-mile grid throughout the Project area. The Townships maintain gravel roads with a sixty-six (66) foot wide ROW and twenty-four (24) foot wide road deck with ditches on both sides of the road. Some of the Township roads are transportation easements granted by the adjoining landowners, while others are dedicated roadways owned and operated by the Townships.

6.5.2 Impacts

The Project is expected to have minimal effect on the existing infrastructure. Impacts that may occur during the construction and operation phases of the Project are described below:

Roads and Transportation Right-of-ways

The Township roads are typically over 80 years old, were constructed from local materials for the purpose of serving the needs of local farmers, and are of variable construction and quality. Culverts and bridges are maintained as required by the Townships. The turning radii of the township road intersections are typically less than sixty (60) feet.

ROW widths for TH 56 and TH 30 were assessed using the MNDOT Right-of-way Mapping and Monitoring website. TH 56 generally runs north and south through the Project area and connects the Cities of Hayfield, Waltham, and Brownsdale. The typical ROW widths observed along the trunk highways are seventy-five (75) feet from the centerline, but ROW widths vary anywhere from fifty (50) feet to up to one hundred (100) feet when turn lanes are present.

TH 30 generally runs west and east through the Project area and connects the cities of Blooming Prairie, Hayfield and Stewartville. The majority of the ROW widths are also seventy-five (75) feet from the centerline, except where a bypass lane is present and the width increased to one hundred and twenty-five (125) feet.

Trucks hauling equipment will require turning radii of 150 feet and impacts to roads and transportation right-of-ways may occur due to the size and weight of turbine equipment. Easement agreements, providing needed access, will be obtained prior to construction and will be maintained to allow for access to transmission facilities during the operation of the Project.

Planned Public Roadway Improvements

Proposed road constructions Projects in the vicinity of the Project area may interfere with transportation routes requiring additional planning and coordination with MnDOT and/or the Dodge and Mower County Highway Departments, and may warrant alternative transportation routes for some materials and supplies. Planned public infrastructure Projects scheduled from 2009 to 2016 within the vicinity of the Project area displayed in Map 6.

Pipelines

Northern Natural Gas Company (Northern) is the primary owner and operator of the major gas transmission line, which runs through the Project area in southern Dodge County and northern Mower County, as shown in Map 7.

Pipeline easements and ROW agreements were acquired by Northern allowing them the "right to construct, operate, maintain, repair, modify, alter, protect, remove, replace and access a pipeline or pipelines within its easement". When ROW widths are defined they typically vary in width from twenty-five (25) to one hundred and twenty (120) feet, depending on the number and diameter of the

pipeline(s), terrain and terms of the agreement. Often the original ROW easements contained unconfined or blanket legal descriptions, where specific ROW widths or locations where not defined, therefore giving Northern rights to large tracts of land. As a result, work completed within one of Northern's ROW and heavy equipment crossing will require coordination with Northern to prevent encroachments and to protect the buried pipelines.

Electrical Transmission Lines

Two (2) major electrical transmission lines (161 kV and the 345 kV) cross the Project footprint in Mower County Map 8. During the Project creation, local electrical service that is provided by three (3) electrical service providers; Steele-Waseca Cooperative Electric, People's Cooperative Services and Freeborn-Mower Cooperative Services will not be disrupted.

Telecommunication Facilities and Microwave Beam Paths

There is no radio, television or cellular communication transmission or relay towers within the Project area. Even though there are no communication towers within the area, wind turbines may cause radio and television interference due to ghosting. Potential impacts on existing telecommunications infrastructure during the construction and operation phases of the Project was assessed by Evans and Associates to identify which Federal Communications Commission (FCC) licensed microwave paths will pass the proposed Project area.

The report found thirty (30) active FCC licensed microwave paths in the vicinity of the Project area. However, only five (5) active FCC licensed microwave beam paths cross the Project area, including four (4) from the State of Minnesota, and one (1) from KAAL-TV, LLC. According to the Evans Associates analysis, Worst-Case Fresnel Zones (WCFZ) vary from 16.4 – 48.7 meters (Map 9). Since all five (5) paths shown on Map 9 are at an elevation low enough to the ground they would affect turbine siting, creating blackout zones within the Project area. RES has located turbines that will avoid these interferences. Evans Associates recommends turbines should not be sited within a distance to the centerline of any microwave path equal to the sum of the Fresnel Zone distance and the blade radius. Depending on the selected turbine layout, GE or Siemens, the blade radius distances of 40 meters for GE and 50.5 meters for Siemens turbines have been factored into each layout proposed in 2 GE and Map 3 Siemens. Therefore, turbines have been sited so the tower and blades will not penetrate the WCFZs of these facilities.

An analysis of TV broadcast facilities was completed and noted eight (8) digital television facilities within the Project area. However, according to the Evans Associates analysis the number of instances of multipath disruption to over-the-air reception of the local stations (Austin-Mason City-Rochester market) is expected to be relatively small since the transmitters are fairly close to the Project area and thus provide strong signals. A total of nineteen (19) FM broadcast facilities were

identified within the Project area, but no significant impacts are anticipated. One (1) authorized AM station located 3.8 miles west of the nearest Project boundary, KQAQ in Austin, MN was identified and is outside of the notification distance of 1.9 miles. Therefore, there is no reasonable expectation of disruption in transmitted radiations on the AM band due to the presence of turbines in the Project area.

Two (2) telephone and telecommunications operators are within the Project area, including Qwest and Citizens.

The MNDOT, Office of Electronic Communications maintains a network of emergency communication towers throughout the state that rely on microwaves, which require an uninterrupted line of sight between all of the towers in the network. While there are no microwave beam towers in the Project area, five (5) critical microwave beam paths cross the Project footprint. Wind turbines are prohibited within the designated sixty (60) foot wide microwave beam paths (from path centerline to blade tip) and turbine siting will be completed in a manner that avoids these areas as shown in Map 9.

Airports and Navigation Aids

The Rochester International Airport (RST), the Austin Municipal Airport (AUM) and the Dodge Center Municipal Airport (TOB) are the three (3) major airports in the vicinity of the Project area. The Minneapolis-St. Paul International Airport (MSP) is located sixty (60) miles northeast of the Project (Map 10). Each municipal airport has land use safety zones that are protected under Minn. Rules Chapter 8800.2400, which restricts structure heights and land uses that may be hazardous to the operational safety of aircraft using the airports. The three (3) nearby airports include:

- RST: located 7.6 miles east of the Project, operates scheduled passenger and air freight service from a field elevation of 1,317 feet at 43º54.5' North Latitude and 92º30' West Longitude. The airport is classified for stage three (3) operations capable of handling large aircraft including 747's. The two (2) airport runways include: runway (RWY) 13-31, a 8,500 X 150-foot northwest/southeast runway; and RWY 2-20, a 9,033 X 150 foot north/northeast runway. Nav-aids include a control tower operating from 0500-2300 hours and Instrument Landing System (ILS), Very High Frequency Omnidirectional (VOR), Airport Surveillance Radar (ASR), Global Positioning System (GPS), VOR/Distance Measuring Equipment (DME) and Area Navigation (RNAV). RST is subject to an approved Airport Zoning Ordinance that defines the conical surface that extends approximately one (1) mile beyond the airport property to an elevation of 1,617 and the approach zones that extend at a 40:1 slope beyond the conical surface. The Project is outside of the defined safety zones, conical surface and approach zones.

- AUM: located 4.5 miles southwest of the Project, operates general aviation and charter services, but has no scheduled flights. AUM operates a single 5,800 foot long, north/northwest trending runway; elevation of 1,234 feet, at 43º39.8' North Latitude and 92º56.0' West Longitude. Nav-aids include GPS, VOR, ILS, RNAV, VOR/DMR. AUM is subject to airport zoning with a defined horizontal surface, conical surface and approach. To avoid conflicts with future development, the Austin - Airport Long-Range Plan, 1999 (ALP) was consulted to determine if structures within the Project would interfere with navigable airspace. The Austin - ALP identifies the airport MSL elevation at 1,233 feet and defines the imaginary conical surface extending 14,000 feet from the airport runway at a MSL elevation of 1,583 feet, therefore the maximum height at which structures can be erected within the 14,000 foot safety zone is 350 feet. The Project does not interfere with the Austin Airport approaches or conical surfaces.

- TOB: located 3.7 miles northeast of the Project, operates general aviation and charter services, but has no scheduled flights from RWY 16-34, a 4,500 X 75 foot paved runway and RWY 4-22, a 2,390 X 200 foot grass runway at an elevation of 1,305 feet at 44º01.8' North Latitude and 92º49.9' West Longitude. The grass RWY 4-22 is closed during the winter months. Nav-aids are limited to GPS and VOR. The Project is outside of the defined safety zones, conical surface and approach zones.

The Project is outside of all of the designated air safety zones of the Rochester Airport.

Placement of the turbines within the Project area could have an effect on electronic airport navigation aids, but impacts are not expected with the current turbine layout. The Project is outside of the area where the turbines would interfere with nav-aids at the Rochester Airport. In addition, aviation studies have indicated that the Project is also outside the areas where turbines would interfere with approaches to the Dodge Center and Austin Airports. The Project is sixty 60 miles south of the MSP and according to officials at MNDOT the Project will not interfere with MSP nav-aids.

Public Drainage Systems

Within the Project footprint, Dodge and Mower Counties have extensive networks of publicly maintained drainage ditches that are operated for the mutual benefit of adjoining landowners, in accordance with Minnesota Statutes (Minn. Statutes, Chapter 103E). The public ditches are defined by easement or fee title and serve to collect and convey water from private ditches, drainageways and subsurface tile lines that convey water from farm fields to the public ditches (Map 11). The drainage authority in each respective county is responsible for the management and maintenance of established drainage systems. Property owners served by the ditches are assessed a proportional share of the cost to maintain and improve the public ditches. Private drainage systems are owned and maintained by the landowners. Interruption of the public drainage system requires permits from the

local Drainage Authority and impacts to the private drainage system will be subject to the landowner's approval.

Public Water and Waste Water Treatment Systems

The City of Sargeant Municipal Waste Water Treatment Plant (MWWTP) is located within the Project footprint and the MWWTP's for Hayfield is located on the western boundary, within the one-mile buffer of the Project footprint. Sargeant and Hayfield both operate a sewer system and wastewater stabilization ponds within the City Limits. The ponds are subject to National Pollution Discharge Elimination System/State Disposal Systems (NPDES/SDS) Permits from the MPCA and are subject to volume controls, pollution discharge limits and sludge handling and disposal criteria. All other septic treatment for homes and businesses within the Project area is handled by Individual Septic Treatment Systems (ISTS).

Radar

Wind turbines are required to be constructed at a certain minimum distance from a radar facility, determined by the height of the wind tower, so that construction and operation of the Project does not effect radar operations. Specific information on longitude, latitude and elevation will be submitted to the Federal Aviation Administration (FAA) to ensure compliance with these requirements.

6.5.3 Mitigation Measures

Construction and operation of the proposed Project will be in accordance with all associated Federal, State, and local laws, as well as industrial construction and operation standards.

Damage to public roads will be repaired in accordance with applicable laws and permits and damage to private roads will be promptly repaired unless otherwise negotiated with the affected landowner. The Applicant will construct and operate the Project in a manner that minimizes impacts to potential individual residences TV antennas, which are considered off-air. In the event residents experience such disruption or interference after the turbines are placed in operation, Evans and Associates will provide data that can be used to determine whether the Project is the cause of the disruption or interference of television reception.

The Applicant will not operate the Project in a manner that will cause communication interference contrary to FCC regulations or other laws. However, in the event of a material problem after construction, the Applicant will take measures necessary to correct the problem. In the event of a material problem with television reception after construction, the Applicant will work with affected residents to determine the cause of interference and where necessary reestablish acceptable reception quality in a timely fashion. Prior to commencement of construction, the results of consultation with

Evans and Associates will be submitted to the MPUC. A response from Evans and Associates will only be received if any issues are discovered. It is not anticipated that any issues will arise with the Project.

Roads and Transportation Right-of-ways

In order to minimize the damage of public roads during construction, the Applicant anticipates turbine equipment will be delivered during the winter months (December through February) when vehicles are allowed to operate with gross weight and axel weights 10 percent over the standard maximum load on both 10-ton and 9-ton routes in designated zones. Trucks will comply with current registration weight laws and will not exceed gross weight limits and associated axle limits for various axle combinations as described in (Appendix 1). Gross vehicle weight is capped at 80,000 pounds on 9-ton township and city routes. Signs posted on roadways specify the load limit.
Oversized, Overweight Load Permits and Moving Permits will be obtained prior to construction commencement from the MnDOT's Office of Freight and Commercial vehicle Operations and the Dodge and Mower County Highway Departments, respectively. In the event that damage to public roads occurs the Applicant will repair them in accordance with applicable laws and permits. Damage to private roads will be repaired through agreements with the affected landowners.

Planned Public Roadway Improvements

The Applicant will work in conjunction with the MnDOT and the Dodge and Mower County Highway Departments to select alternate transportation routes that will avoid planned public infrastructure improvements.

Pipelines

To avoid impacts to Northern's gas transmission lines, all construction work (work completed within one of Northern's ROW or a heavy equipment crossing) will be completed after an Encroachment Agreement or Encroachment Permit is obtained to protect the buried pipelines.

Electrical Transmission Lines

Construction and operation of the Project will not impact electrical services provided by Steele-Waseca Cooperative Electric, People's Cooperative Services and Freeborn-Mower Cooperative Services. Service providers will be contacted prior to construction to locate existing underground facilities that have the potential to be impacted during the construction phase. In the event electrical services are impacted the Applicant and the affected provider will negotiate the mitigation measures.

Telecommunication Facilities and Microwave Beam Paths

There are no radio, television or cellular communication transmission or relay towers within the Project areas. Even though there are no communication towers within the area, wind turbines may cause radio and television interference due to ghosting. Currently, under Minnesota Rules, Chapter 7854 a study of potential local tele-communication interference and a determination of necessary mitigation measures is not required; however an interference study has been conducted. Results from this study indicate no interference is anticipated from the proposed wind energy facility. In instances when interferences to local over-the-air TV receivers from HDTV sets (or analog TV sets connected to a digital converter) occurs mitigation measures, such as installing a directional high(er)-gain outside antenna may be necessary to increase the strength of the direct wave and reduce reflections.

The MNDOT, Office of Electronic Communications maintains a network of emergency communication towers throughout the state that rely on microwaves, which require an uninterrupted line of sight between all of the towers in the network. While there are no microwave beam towers in the Project area, two (2) critical microwave beam paths cross the Project area. Wind turbines are prohibited within the designated sixty (60) foot wide microwave beam paths (from path centerline to blade tip) as shown on Map 8.

Airports and Navigation Aids

MNDOT - Office of Aeronautics operates and maintains electronic navigation aid services for the State of Minnesota and the FAA promotes air safety and the efficient use of navigable airspace by conducting aeronautical studies. In accordance with Title 14 of the Code of Federal Regulations (CFR) Part 77 any construction exceeding 200 feet above ground level is required to file FAA form 7460-1 and 7460-2, which begins the process of the aeronautical studies for each wind turbine location. Wind turbines determined not to cause interference with navigable airspace are granted project clearance with a “no hazard to navigable air navigation” designation and may commence construction. To determine if the proposed wind turbine locations will cause interference to the Dodge Center and Austin Airports that will result in mitigation measures, consultation with the FAA to conduct aeronautical studies will be completed prior to project construction.

Public Drainage Systems

No infrastructure impacts are expected during the project construction and operation, therefore mitigation measures are not anticipated.

Public Water and Waste Water Treatment Systems

The Project will not interfere with the operations of permits of the Municipal Waste Water Treatment Plants (MWWTP) during the construction and operation of the Project; therefore mitigation measures are not anticipated.

6.6 Cultural and Archaeological Resources

6.6.1 Description of Resource

A desk top review has been conducted of cultural and archaeological resources with data requests from the Minnesota Archaeological Inventory, Historic Structures Inventory, the current State Historic Preservation Office (SHPO) and interviews with local residents. Archeological sites, cemeteries and historic structures are regulated under state and federal laws.

The SHPO Archeological Site Location Database does not identify any archeological sites within the Project. However, the following two (2) sites were identified within one (1) mile around the east side of the Project area, as shown in Map 12. A detailed report from the SHPO is included in Appendix 2. The following sites were identified within the Project boundary:

- Dodge County, site number 21DOp in Section 27, Vernon Township (T105N R16W) is identified by two historic descriptions of Native American sites. The historic nature of the records suggests that both sites were post-contact tribal encampment and are located within the Project one-mile buffer. However, no disturbance is proposed.

- Mower County, site number 21MWw found in the SW ¼ of Section 26 in Grand Meadow Township (T103N R16W) is located in the southeast corner of the Project area. This site is also identified by a historic description suggesting a tribal encampment. It is unlikely disturbance will occur to this feature, since the site since no disturbance is proposed.

Human prehistory of the Project area extends to the end of the last glaciation approximately 10,000 years Before Christ (BC). The retreat of the last continental ice sheet, the Des Moines Lobe, left a retreating margin of glacial debris, termed till, within six (6) to ten (10) miles west of the Project. The Cedar River is now the location of the terminal outwash margin. The regional Native American pre-history is broken down into five (5) ages:

- Paleo-Indian culture, 10,000 - 6,000 BC: Small groups of Native Americans migrated along the retreating ice margin and pursued the mega-fauna that inhabited the windswept prairies, wetlands and streams of the outwash plain. Recorded habitation sites are extremely rare in the region and are known from the sandstone bluffs in the headwaters of Silver Creek near Rochester, from cache sites in Fillmore and Houston Counties and from rock shelter sites

along the Mississippi River, but, none have been found in the Project area. Three (3) to four (4) miles west of the Project, north of Grand Meadow on the south side of Interstate 90, lays a significant pre-historic chert quarry that was used for over 9,000 years by Native Americans as a source of the stone used for lithic spears, arrows, scrapers, knives and other tools. Tools made of Grand Meadow Chert are found throughout the Upper Midwest and eastern Great Plains. In the Project area there is a low probability of having similar chert quarry sites because more than fifty (50) feet of glacial till covers the chert containing bedrock. There is no exposed bedrock in the Project footprint. The Wapsipinicon/Grand Meadow Wind Project (PUC docket No IP6646/WS-07-839, issued July 26, 2007) located four (4) miles southeast of the Project encompasses the Grand Meadow Chert Quarry and the Public Utilities Permit specifies measures for identifying and protecting cultural resources within the Project area.

- Archaic Indian Tradition, 6,000 - 1,000 BC: Small nomadic groups of Native Americans adapted to the disappearance of the mega-fauna, the changing climate and changing regional vegetation. In Wisconsin, Archaic burial sites are known from burial pits that are clustered and believed to roughly mark territorial boundaries.

  Archaic culture artifacts such as spear points and knives are uncommon isolated surface finds and are best known from rock shelter sites along forested valleys in areas to the east and lakes to the north. In the Project area the probability of archaic habitation or burial sites is low and most probable in the valleys along rivers and streams. Archaic artifacts are present in the area of the Grand Meadow Chert Quarry a few miles to the east.

- Woodland Tradition, 1,000 BC - 900 AD: The Woodland Tradition is marked by evidence of horticulture with the domestication of maize, squash and beans of tropical origin. Woodland culture marks the first manufacture of pottery and the occurrence of earthen burial mounds. Woodland cultures are also known as "mound builders" responsible for the creation of large earthen burial and ceremonial mounds in a variety of geometric shapes. Some of the mounds were seventy (70) feet high covering several acres at their base and required skill and organized labor. Late Woodland cultures constructed elaborate effigy mounds representing birds, bears and spirits. Larger population centers of Woodland Indians are known from habitation sites in Fillmore, Houston, Wabasha and Goodhue Counties, but are not known in the Project area. Woodland artifacts, including pottery are known from the Grand Meadow Chert Quarry.

- The Mississippian Traditions 900 - 1,450 AD: The Mississippian Tradition is marked by the Oneonta culture that shows archeological evidence of intensified agriculture and shell-tempered pottery. Artifacts include ceramics, pottery vessels, bone tools used for agriculture, grinding stones and a variety of more exotic trade items such as ornamental marine shells and

catlinite (pipestone) pipes. Large, complex Oneonta habitation sites are known from up and down the Mississippi, Minnesota, Root and Cannon River valleys, however, there are no known Oneonta villages in the Project area. Mississippian artifacts, including pottery are known from the Grand Meadow Chert Quarry.

- Historic Post Contact 1450 AD - present: The tribal cultures of the Winnebago (Ho-Chunk), Dakota, and Chippewa were encountered by the first white explorers of the region. Historic records are not precise enough to determine the territorial range of the tribes, but the headwaters of small creeks and rivers are often noted as historic Native American campsites. Diseases spread by white settlers decimated Native American populations in the decades before Dodge and Mower Counties were settled.

The SHPO database indicates the presence of a historic Native American encampment in the Root River headwaters in Section 27 of Pleasant Valley Township within one (1) mile the Project. Great Plains is known from historic records of encampments throughout the region.

The SHPO report also identifies thirteen (13) historic structures within the Project area, and four (4) historic structures in the one-mile buffer (Map 12). According to the available information, the historic 19th Century buildings and structures that still exist within or near the Project area are churches, schools, Town Halls, warehouses, general stores, barns and homesteads that date to the early settlement of the area in the 1850's. Two (2) bridges, one located in Sargeant Township on 670th Avenue and the other located in Red Rock Township on County State Aid Highway (CSAH) 2/265th Street (at the intersection of CSAH 2/265th Street and 615th Avenue), were identified in Mower County as having historical and architectural integrity. The bridges identified in the historic structures inventory may impact the turbine transportation routes due to low-posted gross weight limits. Mower County Highway Department has established seasonal weight limits for roadways throughout the county. Seasonal weight restrictions for the roadways leading up to the CSAH 2/265th Street and 670th Avenue bridges have weight limits of seven (7) tons and five (5) tons, respectively. In accordance with Minnesota Statutes Chapter 169, the gross weight of any vehicle driven on such bridges shall not exceed the posted safe capacity limit.

Cemeteries

We found no official State record of Dodge and Mower County cemeteries. However, all cemeteries and human remains are protected under Minnesota Statute 307, the Private Cemeteries Act. Cemeteries or human remains are highly regulated and disturbance of these areas will be avoided within the Project area.

6.6.2 Impacts

The probability of discovering archeological sites or pre-historic human remains is small in the Project footprint. If artifacts are discovered on public land, including within the public ROW, the State of Minnesota reserves the "right and privilege" of conducting the archeological investigations. If artifacts are found on private property the landowner and the parties discovering the materials are encouraged to report the findings to the State. In other nearby LWECS projects the MPUC Permit requires all archeological finds to be reported and work in the area of the artifacts must stop for a period of up to three (3) days, allowing the State Archeologists time to investigate and to recover artifacts and information. Any human remains discovered must be reported and left undisturbed in accordance with Minnesota's Private Cemeteries Act.

6.6.3 Mitigation Measures

The Applicant does not anticipate the need for a comprehensive archeological assessment of the potential to impact archaeological sites or historic architectural properties. However, currently a Phase I archeological survey is in progress targeting of areas with proposed land disturbance within the Project boundary. In addition, the Applicant will require a systematic means of training personnel to identify and report the occurrence of artifacts. If any should be discovered during construction the MPUC and Minnesota Historical Society will be contacted and construction will cease in accordance to the MPUC Permits.

6.7 Recreational Resources

6.7.1 Description of Resource

The Project lies in an area where the natural resources have been degraded due to agricultural practices. Almost all the natural environments including prairies, oak savannas and wetlands have been tilled for row crop practices or drained with tile. Agricultural practices dominate over 90 percent of the land use within the Project boundary. We anticipate no adverse effects to recreational resources including snowmobile trails, hunting land, six (6) creeks and rivers and one (1) Scientific and Natural Area (SNA) will occur within the Project.

<u>State Trails</u>

One of the regions most popular wintertime recreational activities is snowmobiling. The Minnesota Department of Natural Resource, in cooperation with Snowmobile Clubs and local landowners designate "Grant-in-aid" snowmobile trails that designate routes and provide funds for trail development and maintenance. Snowmobile routes within the Project footprint were compiled and noted in Map 13. Two (2) primary corridor Grant-in-aid snowmobile trails cross the Project area including:

- MNUSA 79, a north/south trail on the west side of the Project area runs roughly parallel to MNTH 56, connecting Dodge Center on the north with Rose Creek on the south;

- MNUSA 8, an east/west trail on the south end of the Project area, connecting Dexter on the east with Austin on the west.

Two (2) smaller grant-in-aid snowmobile trails cross the Project area, including an east-west trail that connects Stewartville on the east with Hayfield on the west and a north-south trail that extends north from Dexter.

Trail easements should be recorded on property titles and the trails are clearly marked during the winter months. The Project should not adversely affect snowmobiling; however, further information is needed to determine whether construction and operation of the LWECS complies with the terms of the easements.

There are no other State designated trails within the Project area. The Wild Indigo SNA is developed along a former railroad grade, however, access is limited and the SNA will not be developed as a recreational trail.

Wildlife Management and Waterfowl Production Areas

No WMA's are located within the Project area or one-mile buffer (Map 13). There are no Federal Waterfowl Production Areas within the Project area. The Minnesota Department of Natural Resources does not recognize any local goose populations within the Project boundary.

Scientific and Natural Areas

One SNA is located within the Project area and one SNA adjoins the Project (Map 13):

- The 145-acre, Wild Indigo Prairie SNA extends from Ramsey to Dexter through the Project area, and is located along a 12-mile-long strip of abandoned railroad right-of-way in Mower County. Wild Indigo SNA is one of the few mesic tall grass prairie remnants located in SE Minnesota;

- The 35-acre Iron Horse Prairie SNA is located within the Project buffer, two (2) miles south of Hayfield on MN HWY 56 and one-half (0.5) of a mile east on CR M in Dodge County. The Iron Horse Prairie SNA is a triangular shaped site with high species diversity and is the largest example of contiguous mesic tallgrass prairie in SE Minnesota.

SNAs are established to protect and perpetuate in an undisturbed state those natural features which possess exceptional scientific or exceptional values. SNAs areas are created if they meet seven (7) criteria as outlined in Minnesota Statute § 86A.05, subd.5, where they embrace natural features of exceptional scientific and educational values, included but not limited to any of the following:

- *Natural formations or features which significantly illustrate geological processes;*
- *Significant fossil evidence of the development of life on earth;*
- *An undisturbed plant community maintaining itself under prevailing natural conditions typical of Minnesota;*
- *An ecological community significantly illustrating the process of succession and restoration to natural condition following disruptive change;*
- *A habitat supporting a vanishing, rare, endangered, or restricted species of plant or animal;*
- *A relict flora or fauna persisting from an earlier period; or*
- *A seasonal haven for concentrations of birds and animals, or a vantage point for observing concentrated populations, such as a constricted migration route.*

The MNDNR has established a process, as outlined in Minnesota Statute § 84.415, which requires that a license is obtained for the passage of any utility over, under or across any state land, including SNAs. In the event of a utility line crossing any of the above mentioned SNAs a $500 application fee for "A License to Cross Public Lands or Waters" will be required and shall be submitted to the MNDNR. Additional fees for utility crossings over or under public lands are based on the width of right-of-way (feet) and the total length of crossing in rods. The MNDNR encourages "low impact" crossings which does not disturb the resource and utilizes directional underground boring.

Water Resources

The most notable water resources found within the Project area are designated Public Waters, Surface Water and Floodplains Resources. None of the identified Public Waters have significant recreational resources for fishing, swimming or boating and are utilized principally as drainage conveyance for agricultural cropland. There are no Public Water Access points maintained by local or State government units. The Public Waters located within the Project area include:

- The Cedar River in Hayfield Township of Dodge County. The headwaters begin within the Project area east of Hayfield and flows west and then south through the City of Austin;

- The South Fork Zumbro River located in Hayfield and Vernon Townships of Dodge County also has its headwaters east of Hayfield, but flows east through the City of Rochester on to the Mississippi River near Wabasha;

- The North Branch Root River located in Vernon Township of Dodge County and Sergeant and Dexter Townships of Mower County has numerous tributaries that form the headwaters of the Root River;

- Roberts Creek in Waltham and Red Rock Townships of Mower County. The headwaters begin between Waltham and Brownsdale and flows west toward Austin and the Cedar River;

- Wolf Creek and Dobbins Creek in Red Rock Township of Mower County have their headwaters between Sergeant and Brownsdale and flow west toward the Cedar River;.

- Rose Creek in Dexter Township of Mower County. Its headwaters begin southwest of Dexter and flows south and west toward the Cedar River.

Parks and Recreation Areas

There are no local, County, State or Federal Parks or Recreation Areas within the Project area.

6.7.2 Impacts

Recreational activities would not be significantly impacted by the Project. Game populations within Dodge and Mower counties would not decline as a result of the Project. Moreover, the Project would not reduce recreational activities such as camping or hiking opportunities. Visual impacts would be the most prominent impact to people who recreate in the Wild Indigo Prairie SNA and individuals that recreate in the Hayfield, Waltham, Sargeant, Brownsdale, and Dexter areas.

6.7.3 Mitigation Measures

Wind turbines will not be located in WMA's, SNA's, State Parks or other areas with exceptional value for recreation; therefore, no mitigation measures will be required.

6.8 Public Health and Safety

6.8.1 Description of Resource

The Project extends across portions of Dodge and Mower counties where clean and renewable energy is promoted to protect public health, safety and general welfare. Development of the proposed Project will be completed in a manner that promotes public health and safety for all residents, including air traffic, electromagnetic fields, traffic and security.

Air Traffic

Three (3) major airports are in the vicinity of the Project area including the Rochester International Airport (RST), located 7.6 miles east, the Austin Municipal Airport (AMU), located 4.5 miles southwest and the Dodge Center Municipal Airport (TOB), located 3.7 miles northeast of the Project area, where electronic navigation aid services are used on a regular basis. The Minneapolis-St. Paul International Airport (MSP) is located sixty (60) miles northeast of the Project area.

Electromagnetic Fields

According to the Word Health Organization (WHO) electromagnetic fields (EMF) occur naturally in our environment or are human induced; created from a combination of electric and magnetic fields when coupled together create high frequency radiating fields. Electric fields are generated when two objects have opposite electrical charges. Magnetic fields are produced when a continuous electrical, or current flows through a wire or medium. Together these terms represent EMFs and are present whenever lines are energized and electricity is produced. However, their strength attenuates (reduces) as the distance from the source increases.

Electrical power is transmitted through HTVL's to help minimize the loss of electricity through transmission. Extremely low frequency (ELF) fields are common in homes and are generated from typical household appliances, and power lines. At higher frequencies radios, TV signals, X-rays, electric transmission or distribution lines (high voltage transmission lines (HTVL) and substations all contribute EMF's to our environment. Table 6.8.1 demonstrates the typical electric and magnetic field levels generated from overhead power lines.

Line Voltage	Centerline	Approx. edge of right-of-way	100 feet	200 feet	300 ft
115kV					
Electric field (kV/m)	1.0	0.5	0.07	0.01	0.003
Magnetic field (mG)	30	6.5	1.7	0.4	0.2
230kV					
Electric field (kV/m)	2.0	1.5	0.3	0.05	0.01
Magnetic field (mG)	57.5	19.5	7.1	1.8	0.8
500kV					
Electric field (kV/m)	7.0	3.0	1.0	0.3	0.1
Magnetic field (mG)	86.7	29.4	12.6	3.2	1.4

Table 6.8.1 – Typical 60Hz electric magnetic field levels from overhead power lines. Source: National Institute of Environmental Health Services / National Institutes of Health: EMF Associated with the Use of Electric Power.

Two (2) existing transmission lines cross the Project boundary including, the 161 kV line that runs west to east through Waltham, Sargeant and Pleasant Valley Township, and the 345 kV line that runs north to south through Rock Dell, Pleasant Valley and Grand Meadow Townships. In addition, one (1) substation is located within the Project area, in the Sargeant Township. All these existing facilities produce measurable EMFs. One (1) substation is planned in Dexter Township.

Pleasant Valley Wind LLC will need to construct approximately fourteen (14) miles of new transmission lines and three (3) new substations for the proposed Project. This will include two 138 kV line of 6.1 and 7.3 miles, two (2) new 34.5 kV/138kV substations, one (1) 345 kV line of less then a mile and one (1) 138 kV/345 kV substation. The 138 kV/345 kV substations will interconnect to the Pleasant Valley substation and ultimately Xcel Energy's 345kV High Voltage Transmission Line (HVTL) at the Pleasant Valley Substation located in Pleasant Valley Township. The proposed turbine layout and HVTL's will all produce some level of EMFs, but will be similar to EMFs already present within the Project Site. The Applicant will work with federal, state and local agencies to ensure proper siting of HVTLs are installed along field edges or within road rights-of-way where possible.

Security and Safety

The Project is planned in a rural community, with a low population therefore, the security and safety of the general public will not be compromised.

Traffic

See *Section 6.5 – Public Services, Infrastructure and Traffic* for a detailed description of traffic resources.

6.8.2 Impacts

Air Traffic

Per independently conducted air space studies, the Applicant does not expect there to be any impacts to airport air traffic at the Rochester Airport. The Project is outside the areas where turbines would interfere with approaches from the Dodge Center and Austin Airports. Federal Aviation Administration (FAA) aeronautical studies are in progress to receive clearance of "no hazard to navigable air navigation." According to officials at MNDOT the Project will not interfere with MSP nav-aids.

Electromagnetic Fields

EMFs have been a concern regarding potential affects to human health and have been widely studied for more than 30 years. Overall, current research does not indicate EMFs causes any health concerns. According to a white paper published by the Minnesota Department of Health in 2002, they concluded "that the current body of evidence is insufficient to establish a cause and effect relationship between EMF and adverse health affects."

The development of additional transmission and substation facilities is not expected to significantly increase the general public's exposure to EMFs.

Security and Safety

Due to the relatively low population density in the Project area, the rural nature of the landscape and the avoidance from inhabited structures, it is not anticipated that the proposed Project will have any adverse effects to the security and safety of the surrounding community.

Traffic

City, Township, County, State, Interstate road traffic will be temporarily impacted for the hauling of wind turbine components. Township roads were constructed in a one-mile grid throughout the Project area. The Townships maintain gravel roads with a sixty-six (66) foot wide ROW and twenty-four (24) foot wide road deck with ditches on both sides of the road. The Township roads are typically over 80 years old, were constructed from local materials for the purpose of serving the

needs of local farmers, and are of variable construction and roadability. Culverts and bridges are maintained as required by the Townships. The turning radii of the township road intersections are typically less than sixty (60) feet. Existing road width dimensions and intersections may need to be temporarily expanded and will cause minor delays in traffic flow.

The Applicant will conduct an engineering survey of all haul routes including an assessment of the existing condition and the location and condition of all bridges and culverts prior to project construction.

6.8.3 Mitigation Measures

Air Traffic

Currently, the Applicant is in the process of completing Federal Aviation Administration (FAA) aeronautical studies to promote air safety and the efficient use of navigable airspace. Any mitigation measures will be identified after the completion of the study.

Each turbine is equipped with a lightning protection system and lights are mounted on the turbine gearboxes to identify their location at nighttime for the safety of navigational aids.

Electromagnetic Fields

Electrical utilities can implement various methods to reduce the effects of EMF exposures when installing transmission and distribution lines, such as increasing the distance from the line, using phase cancellation, shielding, and limiting voltage and current flow levels.

Security and Safety

The proposed turbines and infrastructure will not interfere with the surrounding communities' security or safety. Safety will be addressed during project construction by monitoring access within the construction footprint at all times and unauthorized personnel will be escorted off site. The Applicant does not foresee any security issues that will need to be addressed. If safety issues arise, the Applicant will address them with their standard safety protocols and policies.

Traffic

In order to minimize the impacts to publically travelled City, Township, County, State, Interstate roads, transportation right-of-ways (ROW) and other infrastructure the Applicant will work in cooperation with local and state agencies to coordinate efforts. Coordination among agencies will ensure public safety and general welfare is maintained. The following permits will be obtained from state and local agencies and will serve as the primary mitigation strategies:

State Agencies

- MNDOT
  - A Wind Energy Transportation Permit will be obtained from the Office of Freight and Commercial Vehicle Operations, which is required for transporting oversized and overweight loads, necessary for hauling wind turbine components. If damage to MNDOT managed roads occurs, roads will be restored at the Applicants expense to MNDOT standards and fees will be calculated based on MNDOT's Damage Fee Assessment Chart.

  - A Utility Permit on trunk highway ROWs for a majority of utility placements and relocations, whether longitudinal, oblique, or perpendicular to the centerline of the highway (long form), and Utility Permits for miscellaneous work on trunk highway ROWs (short form) for minor work, such as installations of utility service connections that do not cross or parallel the roadway within the trunk highway ROW will be obtained when necessary to comply with public health and safety requirements.

  - An Access Driveway Permit will also be obtained for all planned access roads that enter and exit onto MNDOT managed trunk highways and will be used as a precautionary measure for line of sight hazards within road ROWs.

  - State Patrol escorts will be utilized to minimize road safety hazards when turbine wind components are transported to the Project site.

Local Agencies

- Dodge and Mower County Highway Departments
  - Moving permits will be obtained from the corresponding County Highway Department's for the transportation of oversized loads or equipment.

The Applicant will comply with all road weight restrictions, seasonal weight limits, weight laws and trucks will not exceed gross weight limits or associated axle limits.

Safety concerns related to increased traffic during the construction phase will be managed by the construction manager. All haul roads will be designated prior to construction to minimize impacts to publicly traveled roads. The Applicant will ensure drivers of the oversized trucks are cautious when transporting wind turbine equipment to reduce traffic accidents.

6.9 Hazardous Materials

6.9.1 Description of Resource

An investigation of potential environmental risks throughout the Project area was performed by gathering information from the Minnesota Pollution Control Agency (MPCA), the Minnesota Department of Agriculture (MDA) and the Minnesota Health Department (MDH) databases, which includes information concerning permitted soil waste facilities, state closed landfills, and known un-permitted dumps, State or Federal Superfund Sites, De-listed State Superfund Sites, and Comprehensive, Environmental Response, Compensation, and Liability Act (CERCLA) Sites, State Voluntary Investigation and Cleanup (VIC) Sites, Resource Conservation Recovery Act (RCRA) Investigation and Cleanup sites, RCRA Treatment-Storage-Disposal Facilities, No Further Remedial Action Planned (NFRAP), Leaking Underground Storage Tank Sites, Agricultural Chemical Incident Response sites, Drinking Water Advisory Areas and Hazardous Waste site health investigations. Data available from the MPCA and the MDH sources indentified no sites present within the Project area as shown in Map 14.

The dominance of agricultural production is evident from environmental cleanup data from the MDA. There are five (5) historic ag-chemical incident response sites within the Project footprint; all listed incident responses investigations have been resolved without requiring extensive cleanup (Map 15).

The MDH does not list any Drinking Water Advisory areas with contaminated groundwater, or identify any Hazardous Waste health risk studies in the Project area. Two (2) communities, Brownsdale and Dexter, have defined Drinking Water Supply Management Areas (DWSMA); defined geographic areas where the Cities can regulate any activities that could be a risk to drinking water supplies. The construction of a LWECS does not pose a risk to drinking water supplies and would not be regulated under the DWSMA's.

Older farmsteads may also have lead-based paint, asbestos shingles, and polychlorinated biphenyls (PCB) in transformers. Trash and farm equipment dumps are common in rural settings. Potentially hazardous materials associated with the Project include fluids found in association with turbines. There will be three types of fluids used in the operation of the wind turbines that are petroleum products including gear box oil, hydraulic fluid and gear grease.

6.9.2 Impacts

The Applicant does not anticipate encountering any hazardous waste sites.

6.9.3 Mitigation Measures

Since there are no proposed impacts to hazardous waste sites, no mitigative measures are necessary. If any wastes are generated during any phase of the Project, they will be handled and disposed of in accordance with the applicable local, State and Federal regulations. If any hazardous waste sites are discovered, they too will be handled and disposed of in accordance with the applicable local, State and Federal regulations.

6.10 Land Use and Land-Based Economics

6.10.1 Description of Resource

Row crop and feedlots are the dominant land use and main economic base within the Project boundary. Row crops consisting of a three-year rotation (corn/corn/soybeans) dominate the landscape, with minor production of alfalfa and cannery vegetables. Most of the soils in the Project area are designated as Prime Soils with high productivity ratings and drainage improvements including subsurface drainage tile and private and public drainage ditches enhance the yields by allowing earlier planting. Urban development, forestry and mining are not significant land uses within the Project area.

The agricultural land in the Project area is divided into square mile sections bounded by public roads. According to the most recent U.S. Department of Agriculture census the farms in the Project area average slightly more than 300 acres. Crops are produced in expansive fields ranging from 40 to 640 acres that are generally uninterrupted by fences. Each section has an average of two farms and cropland covers over 95 percent of the land area. Field size and configuration is an important consideration to local farmers who utilize large equipment, such as 24-row corn planters and 12-row combines that require wide turning radii.

Cropland is both owner-operated and tenant-operated. Farm rental rates are an indicator of land values and are used by farmers and landowners to evaluate the financial impact of retiring land from production. Farm rental rates for 2007, the most current year available based on a five-year average. In 2007, Dodge County had a five-year average farm rental rate of $151/ac and the Mower County average was $161/ac. The University of Minnesota study noted that from 2003 to 2007 farm rental rates increased 10.21 percent per year. Local sources have told us that rental rates driven by high commodity process in 2007 and early 2008 were as high as $350/ac on some farms; however, falling commodity prices in late 2008 and 2009 have substantially lowered the rental rates for the 2009 crop year.

The highly productive soils of the Project area result in exceptional crop yields that are much higher than the regional average. Test plot data published by the Mower County Corn Growers in 2008, showed corn yields of 187-191 bushels/ac and soybean yields of 46-47 bushels/ac.

A large proportion of the cropland is drained with agricultural pattern tile that discharges to private and public drainageways and ditches. The tile line installations date back to the early to mid 1900's and consists of clay tile; concrete and perforated plastic pipe typically buried less than four (4) feet deep on 50-100 foot spacing.

Livestock production is a major industry in the area that is dominated by confined hog feeding operations. The feedlots are regulated by local and state authorities. According the United States Department of Agriculture (USDA) Ag Census, the hog feedlots in the Project area typically have fewer than 1,000 animal units.

Hormel Foods and Quality Port Producers provide a healthy local hog market. Quality Pork Producers of Austin, less than five (5) miles from the south end of the Project, slaughters an average of 16,000 hogs per day to supply the Hormel processing facility in Austin. Most of the hogs slaughtered in Austin are raised within a 100-mile radius of Austin.

Feedlot production generates manure that is stored in open pits and tanks and is utilized as a crop nutrient. Manure management plans in the area require a minimum of nine-month storage capacity. Manure management is associated with odors and the challenges of managing large volumes of liquid wastes.

6.10.2 Impacts

The development of the Project will result in temporary and permanent disturbance and crop-land conversion. There is no anticipated impact to feedlots or other land based economies within the Project area. Issues of turbine sites, temporary and permanent land disturbance and concerns for agricultural drainage systems have been addressed with landowners and farm tenants during lease negotiations and community meetings. Leases and agreements have been negotiated to address landowner concerns such as orientation of roads, turbines and other infrastructure to minimize crop damages.

The temporary land conversion will be necessary for operational areas during construction including lay-down yards, buried cables for underground circuits and roads for construction equipment. The largest temporary disturbance will be from buried cables for the underground circuits. The buried cables will disturb agricultural drain tile lines. Other surface disturbances will include land clearing, soil compaction and the temporary placement of fill and road base materials. The temporary impacts will be restored to crop production.

Permanent conversion of cropland will be required for service roads, turbine pads, and three (3) substations with smaller permanent disturbances for the utility poles associated with the proposed transmission facilities which will be located along county and township road right-of-way to the

extent practicable. The service roads and turbine pads will be converted from cropland to load bearing crushed rock or grassy surfaces that will no longer support crop production. Based on the proposed Project layout the permanent land conversions are summarized in Table 6.10.1 and 6.10.2.

FACILITY	Permanent Impacts (acres)	Temporary Impacts (acres)
Service Roads (up to 42 miles)	102	81
GE Turbines (200 sites including lay down area and turbine foundations at pads @ 0.73ac/site)	40	106
3 Substations and 1 Operations Center	15	0
Transmission Lines (14 miles with 124 poles approximately every 600 feet)	0.15	0
4 Meteorological Towers	2	0
TOTAL (Approximate)	160	187

Table 6.10.1 – Summary of Permanent and Temporary Land Use Impacts for GE Layout

FACILITY	Permanent Impacts (acres)	Temporary Impacts (acres)
Service Roads (up to 32 miles)	78	50
Siemens Turbines (130 sites including lay down area and turbine foundations at pads @ 0.73ac/site)	26	69
3 Substations and 1 Operations Center	15	0
Transmission Lines (14 miles with 124 poles approximately every 600 feet)	0.15	0
4 Meteorological Towers	2	0
TOTAL (Approximate)	121	119

Table 6.10.1 – Summary of Permanent and Temporary Land Use Impacts for Siemens Layout

The estimated 160 acres of permanent land conversion for the Project represents less than 0.3 percent of the total Project area (72,000 acres).

For the GE layout at current land rental rates of $170/ac/year the retirement of 160 acres represents an estimated annual cumulative financial loss of $27,200/year spread among 200 sites, an average of $136/turbine site. An analysis based on crop yields is slightly higher and would fluctuate with yields and commodity prices. The Project facilities will not represent a major loss of productive land and lease payments will represent a substantial net financial gain of the landowners in the area.

Some farmers and landowners have expressed concerns over the placement of service access roads to wind turbines. Farmers have commented that when service roads to turbines are not parallel to field edges the angled corners at the field ends are difficult to farm with large equipment and have the effect of leaving fallow or unproductive land in the triangular corners.

The installation of underground cables between the turbines and the substations will result in cutting drain tile 4 + feet deep because the cable will be buried deeper than the drain tile. Drain tile maps are available for many, but not all fields, allowing designers to avoid the drain tiles disturbance in some area. During the underground installations constant inspection is required to identify field tiles that must be repaired. Future drain tile installations occurring after the installation of the underground cables will require private field location services to avoid accidental cutting of live electrical circuits during drain tile installation and maintenance.

6.10.3 Mitigation Measures

Pleasant Valley Wind, LLC has proposed the following mitigation measures based on the identified impacts:

Mitigation for Temporary Impacts

- The producer will be compensated for any impact or loss of growing crops resulting from the Project. Compensation will be provided only in the year the crop damage occurs,

- Cropland areas temporarily disturbed by the Project from grading or compaction will be reclaimed,

- All agricultural drain tile damage will be repaired in accordance with specific landowner agreements.

Mitigation for Permanent Impacts

- Permanent loss of cropland for service roads, turbine pads are addressed, negotiated and mitigated through landowner compensation on a case-by-case basis,
- Service roads will be constructed at grade wherever practicable to allow farm equipment to drive across the roads,
- Land for the substation and operations facility will be purchased from willing landowners,
- The Project owner will utilize private underground utility location services for the buried cables such as the Gopher State One Call system.

6.11 Tourism and Community Benefits

6.11.1 Description of Resource

Recreational resources within the Project area are discussed in greater detail in *Section 6.7 – Recreational Resources*. One of the largest local recreational attractions within the Project boundary is snowmobiling, as indicated by the four (4) state grant-in-aid snowmobile trails that cross the Project footprint (Map 13). One Scientific and Natural Area (SNA) is located within the Project area and extends from Ramsey to Dexter, located along a 12-mile-long strip of abandoned railroad right-of-way in Mower County, and one (1) SNA adjoins the Project located north of the Project boundary, two (2) miles south of Hayfield on MN Hwy 56 and one-half (0.5) of a mile east on CR M in Dodge County (Map 13). Several Wildlife Management Areas are present within the vicinity, northeast of the Project boundary and provide additional tourist attractions for hunters and trappers. There are no local, County, State or Federal Parks within the Project area.

6.11.2 Impacts

The Applicant will not adversely affect the recreational resources and tourist attractions that exist within the Project area.

6.11.3 Mitigation Measures

No mitigation measures are required, since tourism within the Project area will not be impacted. The local and surrounding community will benefit from an economic stand point by an increase in revenues and jobs from the development of this Project.

6.12 Topography

6.12.1 Description of Resources

The Project site is in approximately 52,000 acres or 80 square miles and includes portions of Dodge and Mower Counties. Glacial till plains with periodic glaciations, gently rolling hills with gentle side slopes ending in drainageways characterize the area surrounding the Project area. Elevations in within the Project boundary range between 1,275 feet Mean Sea Level (MSL) along the southwest part of the Project to 1,385 feet MSL in the northeast portion of the Project area. The Project crosses a landscape with relatively high elevations for Minnesota, being along the central divide at 1,350 to 1,420 feet MSL, as shown in Map 16.

6.12.2 Impacts

Construction within the Project boundaries will include minor grading turbine site locations, Project access roads and underground utilities. The intensity and level of land disturbance required for the Project will not significantly impact the existing topography.

6.12.3 Mitigation Measures

No mitigation measures are necessary required due to no anticipated impacts to existing topography.

6.13 Soils

6.13.1 Description of Resource

Farming is the dominant land use for the Project area. Dodge and Mower County Soil Surveys were reviewed to determine the dominant general soil associations encountered within the Project boundaries. The following are dominant soil associations:

- Dodge County: Association No. 6 - Dark colored to moderately dark colored, well drained to somewhat poorly drained soils formed in glacial till on uplands: Racine, Kasson and Floyd soil series.

- Mower County: Tripoli-Oran-Readlyn Association – Nearly level and gently sloping, poorly drained and somewhat poorly drained, silty soils on till plains. This association consists on low ridges separated by broad drainageways. Slopes are mostly long and uniform. Relief ranges from 20 to 50 feet. A well formed dendritic drainage system dissects association: Tripoli, Oran and Readlyn soil series.

6.13.2 Impacts

Disturbance of soils within the Project boundary will occur during construction of turbine foundation sites, access roads and underground power lines. Protective measures will be required to prevent contamination, soil loss due to erosion and compaction of soil. Implementing mitigation measures will be important in preventing soil impacts during and post construction.

6.13.3 Mitigation Measures

The Project will require disturbance of soil, removal of soil from areas of permanent disturbance include access roads and turbine pads. Areas of permanent disturbance will require removal of existing topsoil. The topsoil will be stockpiled and spread over areas on site upon completion of construction. Installation of silt fence and other Best Management Practices (BMPs) for erosion control measures will be used on areas subject to disturbance. In addition, minimizing the total area required by all facilities will limit the area exposed to compaction due to surface activity.

A Stormwater Discharge Permit for construction activity under the National Pollutant Discharge Elimination System (NPDES), administered by the MPCA is required and will be completed prior to onsite construction. In addition a Stormwater Pollution Protection Plan (SWPPP) will be developed to minimize soil erosion and identify BMPs to be employed during construction of the Project to protect existing site conditions and adjacent resources by minimizing soil erosion. The construction management team will be responsible to ensure implementation and compliance with the permit conditions.

6.14 Geologic and Groundwater Resources

6.14.1 Description of Resource

The Project lies on glaciated terrain that overlies a thick sequence of Paleozoic carbonate rocks of Upper Ordovician and Devonian age. The Project lies on the southern end of the "Minnesota and Northeast Iowa Morainal" ecological section; a long band of prairie and deciduous forest that stretches 350 miles along the eastern margin of the Des Moines ice lobe that was deposited during the last glaciation.

The area is nearly level to gently sloping with few areas having slopes more than 6 percent. The soils and subsoil are unconsolidated Quaternary sediments consisting mostly of unsorted till deposits of clay to boulder size materials laid down directly from glacial ice. In the Project area there are no bedrock outcrops. Water well logs from Ripley, Vernon and Dexter Townships within the Project area show depths of glacial till ranging from 155 to 175 feet overlying the Galena Limestone.

Geologic interpretations by the Minnesota Geological Survey (MGS) suggest that the Laurentide Continental Ice Sheet advance in five (5) distinct pulses from the Labrador ice sheet in the northeast and from the Keewatin ice sheet in the northwest. The maximum eastward advance of the Des Moines lobe was four (4) or five (5) miles west of Brownsdale, roughly along the western edge of the Cedar River that formed as the major melt water flow path.

Each of the five (5) major glacial advances brought a different mix of sediment that covered interglacial paleosoils and lake sediment deposits, which typically contain fine grained and organic rich sediments including compressed peat. At least two (2), and perhaps five (5), interglacial periods left irregularly buried patches of organic soils, which can create soil stability concerns. Site investigations for each wind turbine site should be evaluated for soil stability, compressibility and organic content.

The high ridge that runs north-south through Dexter, Sergeant and Hayfield Townships within the Project area is believed to be a landscape feature that is an eroded remnant of an ice-stagnation moraine of Browerville age that has interbedded lenses and thick beds of silty to sandy lake sediments. The stranded glacial ice allowed lakes to form while the ice loading is thought to cause glaciotectonic thrusting of deeper, older glacial sediment, squeezing slabs of till to the east and creating a ridge of older glacial till at a higher elevation. This glaciotectonic ridge corresponds to an elevation above 1,300 feet and represents the areas of the highest average wind speeds in the project area.

Bedrock is not exposed in the Pleasant Valley footprint, however, outcrops and quarries of limestone and dolomite suitable for aggregate and road building materials are available ten (10) miles to the east between Grand Meadow and Racine and fifteen (15) miles south near LeRoy.

Local groundwater resources are provided by wells into bedrock aquifers that range from 150 to 350 feet deep with a few high volume wells extending up to 900 feet deep in the area. The area benefits from high water quality and potential groundwater yields. Rare shallow alluvial wells usually associated with historic properties relied on alluvial aquifers that are more susceptible to contamination.

6.14.2 Impacts

Geologic and groundwater resource impacts are not anticipated within the Project boundary. One or two domestic-size wells will easily satisfy maintenance and operation requirements for the Project. Existing groundwater supplies are adequate for the Project.

6.14.3 Mitigation Measures

Construction of the Project is not expected to impact the existing domestic water wells within or adjacent to the Project boundaries. Turbine tower footings within the Project boundaries are generally not deeper than eight (8) to ten (10) feet below the ground surface, depending on soil conditions which is in the glacial till ranging from 155 to 175 feet overlying the Galena Limestone and stratigraphically higher than the top of the Cedar Valley Aquifer. This aquifer generally occurs at depths greater than 75 feet below ground surface.

6.15 Surface Water and Floodplain Resources

6.15.1 Description of Resource

A review of the United States Geological Survey (USGS) maps and the Flood Insurance Rate Maps (FIRM) produced by Federal Emergency Management Agency (FEMA) identified the following streams, rivers and tributaries within the Project boundary. The Project lies on a ridge that separates three (3) main watersheds. Three (3) rivers and their tributaries have their headwaters within the Project boundary. The named and unnamed tributaries by County and Township include:

Dodge County

- The Cedar River in Hayfield Township of Dodge County. The Cedar River flows south, then west in the central portion of the Project;
- Zumbro River: The Lower Branch of the Middle Fork Zumbro River and the South Fork of the Zumbro River flows east in the northeast portion of the Project;
- Root River and the named tributaries runs northeast through the southeast portion of the Project.

Mower County

The Cedar River is located three to four miles west of the Project boundary in Udolpho, Lansing and Austin Townships. There is no Cedar River Floodplain or Flood Fringe in the Mower County Project area. Tributaries to the Cedar River in Mower County include:

- Roberts Creek in Waltham Township;
- Wolf Creek in Red Rock and Dexter Townships;
- Dobbins Creek in Dexter and Red Rock Townships;

- The North Branch of the Root River is located in Dexter, Sargeant and Pleasant Valley Townships.

Wetlands adjoining identified drainage systems are discussed in *Section 6.16 - Wetlands*.

A review of the FEMA floodplain maps and detailed floodplain maps provided by Dodge County Environmental Quality Department for the Project area found there are no documented floodplains at proposed turbine locations within the Project area.

The 2008 Minnesota Impaired Waters lists three (3) rivers and streams in the area as impaired waters; the North Branch Root River (aquatic life impairments), Wolf Creek (Aquatic recreation, Fecal Coliform impairments) and the Cedar River (Aquatic recreation and Fecal Coliform impairments). The Project will not create any illicit discharges nor contribute to the impairments. The proposed BMPs for stormwater runoff will be discussed in the NPDES Permit application and Stormwater Pollution Prevention Plan.

6.15.2 Impacts

The wind turbine pads and substations are proposed in the upland portions of the landscape. Construction impacts will be avoided in streams, creeks and surface water drainage systems to prevent flooding issues and untreated surface water discharge. BMPs will be implemented during the construction phase of the Project as discussed in *Section 6.13 - Soils* to reduce erosional sediments from discharging into adjacent water sources, streams or rivers. Any subsurface tile drainage systems impacts will be addressed and repaired during construction. Mitigation measures will be utilized where sedimentation issues are a risk.

6.15.3 Mitigation Measures

If any impact to Waters of the United States or Minnesota Public Waters is proposed within the Project limits, application of necessary permits will be completed prior to construction. Prior to construction a NPDES permit application and SWPPP plan will be submitted by the Applicant for the Project. Inspections by the construction project manager of all BMPs proposed in the NPDES permit will be completed on a routine basis to assure no erosion or sedimentation issue occur within or outside of construction limits of the Project.

6.16 Wetlands

6.16.1 Description of Resource

McGhie and Betts Environmental Services Inc. (MBESI) has completed a wetland reconnaissance survey that includes identifying all existing wetlands encountered within the boundaries of the Project Site. A wetland delineation report will be completed determining all wetland boundary locations adjacent to areas of proposed project construction. The wetland delineation report and permit application required by Minnesota Wetland Conservation Act (WCA) and the U.S. Army Corps of Engineers (COE) will be submitted following completion of the wetland reconnaissance survey.

6.16.2 Impacts

The wetland reconnaissance survey will include a review of the location of the proposed Project infrastructure and where it may potentially impact wetland areas. Areas to be assessed include turbine locations, access roads, buried underground cable, transmission line corridors and locations for operation and maintenance facilities. A review of National Wetland Inventory (NWI) maps indicates minimal wetland impacts are expected within the Project area, as shown in Map 17. If wetland impacts do occur, the proposed mitigation measures discussed in *Section 6.16 Wetlands* would be implemented during construction, as required by the Minnesota WCA, U.S. Army Corps of Engineers and MNDNR.

6.16.3 Mitigation Measures

Existing wetlands will be avoided to the extent feasible for the Project. If any wetland impacts are required during the construction phase of the Project, a wetland sequencing and replacement plan report and permit application will be completed as required by the MNWCA and U.S. Army Corps of Engineers prior to construction. If any public waters impacts are proposed a public waters permit application will be completed and submitted to the MNDNR prior to construction. All proposed wetland impacts will be mitigated and replaced offsite through direct wetland replacement or purchase of wetland credits from an approved wetland bank as required by the Minnesota WCA and the U.S. Army Corps of Engineers.

6.17 Vegetation

6.17.1 Description of Resource

Dodge and Mower County are dominated by agricultural land use. Virtually all the pre-white settlement native prairie, wetlands and woodlands have been converted to row crop agriculture consisting of corn, soybeans and alfalfa. Over 98 percent of the Project area is now cropland. Minimal amounts of pasture land occur in the Project area.

A desk top review of land use/land cover (Map 18) generated by townships, prepared by the Environmental Quality Department in Dodge County and McGhie and Betts Environmental Services Inc. included the following significant vegetative features within the Project boundaries:

- A small remnant native prairie is known to exist in the area and is confined to the abandoned rail line that is now protected as the Wild Indigo Prairie Scientific and Natural Area (SNA). The Wild Indigo SNA does not show up on the land cover map due to the prairie classification as grassland;

- Linear arrays of shrub land are principally along fencerows, road ditches and drainage features surrounded by cropland. Theses shrub areas could be used as breeding bird habitat for some species in the area;

- Upland deciduous forest tracts are small and confined to the headwater corridors of the Zumbro River, Root River and Cedar River.

A majority of the existing wetlands in the Project area have been drained due to agricultural practices and do not show up on the land-cover map.

6.17.2 Impacts

The wind turbine sites are located in agricultural fields at high elevation points within the Project boundary. Substations, underground buried cable, overhead power lines, access roads and supporting facilities will be designed to minimize impacts to existing grassland and woody vegetation. Impacts to the Wild Indigo Scientific and Natural area will be avoided within the Project area in accordance with the Minnesota Utility Crossing Rules Chapter 6135. Minimal impacts to grasslands or woody vegetation will occur in drainageways at road crossing sites; these areas will require mitigation measures discussed in *Section 6.17 - Vegetation*.

6.17.3 Mitigation Measures

During the construction phase of the Project impacts to grassland and forested areas will be avoided or minimized if these habitats cannot be avoided. Mitigation of unavoidable impacts will occur by restoring area grades and re-vegetating where required upon completion of construction. All proposed impacts to wooded areas will be discussed and approved by landowners prior to construction.

6.18 Wildlife

6.18.1 Description of Resource

A desktop analysis was completed for the Project area identifying existing wildlife and rare animals encountered within and adjacent to the Project boundary. The 80 square mile Project Site is more than 98 percent cropland leaving little land for wildlife. Deer, turkey, pheasants, Canada geese, ducks, squirrel, rabbit and coyote were formerly abundant and still occur in the area, but hunting is limited to field edges, waterways, farm sites and stream corridors. The Project area is not within a migratory flyway and use of the area by migratory birds is limited due to the dominance of row crops and the lack of suitable foraging and breeding habitat. According to a correspondence letter dated February 11, 2009 from the MNDNR, there are no major goose concentration areas within the Project area.

The only big game animal in the area is the white tailed deer, which is hunted by local sportsmen from September through January. The firearm deer season, in November of each year, only allows the use of shotguns. Wild Turkeys are hunted in the spring and fall seasons; however, the turkey habitat in the Project area is limited to the wooded areas where oak trees produce an acorn mast crop that is essential to winter survival of the wild turkey.

The MNDNR Natural Heritage Information System (NHIS) lists three (3) other rare animals in the Project area (Map 19); one reptile, a fish and a freshwater mussel.

Blanding's turtles were identified in the NHIS report, as State Threatened species known to occur within the one-mile buffer (T105N R16W S15) and adjacent lands (T105N R16W S10 and S9), where they use wetlands, creeks and streams as travel corridors between wetlands. Typically Blanding's turtles are known to travel long distances over land (up to a mile) and use sandy upland areas for nesting, basking and periods of dormancy.

Streams and rivers within the Project area provide habitat for the Ozark minnow *(Notropis nubilus)*, and the freshwater mussel, the Creek heelsplitter *(Lasmigona compressa)*, both listed as State Species of Special Concern that are known to occur within the one-mile buffer (T105N R16W S15 and S16, T106N R18W S20, respectively) and adjacent lands (T105N R16W S9 and S10; and T106N R18W S17, S18 and S20, respectively). Erosion and sediment control practices should be implemented and maintained near these waterways, especially when construction activities occur on lands mentioned above.

<u>Wildlife Management Areas</u>

State owned and managed Wildlife Management Areas (WMAs) are important outdoor recreational areas but none were located within the Project area. Several WMAs are located in Dodge and

Mower County beyond the footprint of the Project. The WMA's were established to protect wildlife habitat for future generations, along with land and water resources that have a high potential for wildlife production, public hunting, trapping, fishing, and other uses.

Bird Survey Data

The desktop survey includes the North American Breeding Bird Survey (BBS) conducted by the USGS is a continental program established to monitor all breeding birds by conducting annual roadside surveys during peak nesting season. According to the U.S. Geological Survey, Patuxent Wildlife Research Center, three (3) North American Breeding Bird Survey (BBS) routes are monitored in the vicinity of the Project area; Le Roy, Austin and Hartland. Since the survey began in 1966, a cumulative record has been kept documenting all bird species observed on individual routes.

In addition, the BBS data for each route and the MNDNR listing of "Species in Greatest Conservation Need" (SGCN), as identified in the MNDNR *Tomorrow's Habitat for the Wild and Rare: An Action Plan for Minnesota Wildlife Comprehensive Wildlife Conservation Strategy* and the MNDNR Natural Heritage Database were cross-referenced.

The cross-referenced lists indicate the Loggerhead Shrike *(Lanius ludovicianus)* has been identified on the MNDNR Natural Heritage Database and two (2) of the BBS transects, the Austin and Hartland routes. The Loggerhead Shrike is considered threatened by the state of Minnesota, and according to MNDNR reports it is likely to become a state-listed endangered species within the foreseeable future throughout all or a significant portion of its range in Minnesota. However, the species is widely distributed throughout most of the continental United States. The Loggerhead Shrike is robin-sized with slate gray upperparts, black mask and a white patch on the otherwise black wings. The Loggerhead Shrike is a summer resident that inhabitants open country and dry upland prairies where hedgerows, shrubs and small trees occur and is known to occur around farmsteads. The Loggerhead Shrike is a small predator and has the unique behavior of impaling unused prey items such as frogs, mice and invertebrates on thorns and barbwire.

In addition to the desktop survey, bird and bat surveys will be conducted at the site to assess site usage. These studies will also identify any threatened or endangered avian populations encountered within the Project boundary in accordance to the MNDNR endangered species lists.

The NHIS database also provides information about other rare species in the general vicinity of the site; however, none of the other listed wildlife was noted to have occurred within the Project area.

6.18.2 Impacts

Wildlife

The turbine sites, substations, access roads and associated utilities are located in areas of agricultural use minimizing impacts to areas of suitable wildlife habitat. Temporary impacts will result to local wildlife during the construction phase of the Project. Identification of Blandings Turtles, Ozark Minnows, freshwater Mussels or Creek Heelspliters listed on the Minnesota and MNDNR threatened or endangered species lists will result in avoidance of habitat impacts as feasible for the Project. If impacts occur mitigation measures will follow in accordance to the Minnesota and MNDNR regulations (Appendix 3).

Impacts to bats will be determined upon completion of a desktop and field analysis. Avian impacts will be determined once avian surveys are complete for the Project. Avian and bat surveys conducted for similar wind energy Projects in the area include the Buffalo Ridge Study and the Top of Iowa Study where the studies concluded minimal impacts to bird and bat populations.

6.18.3 Mitigation Measures

The Project location was selected due to the available wind resources. Due to the existing agricultural practices, minimal habitat for wildlife discussed in *Section 6.18 – Wildlife* is encountered within the Project boundary. The layout of the wind turbines, access roads, substations and utilities is designed to avoid habitats. Impacts to these habitats are minimal resulting in no necessary mitigative measures.

6.19 Rare and Unique Natural Resources

6.19.1 Description of Resource

A desktop analysis inventory of rare and unique natural features was compiled for the Project area by contacting Federal and State agencies that have information about or vested interests in conserving Minnesota's ecological resources.

The United States Fish and Wildlife Service (FWS) responded to an inquiry letter dated November 19, 2008, indicating there are currently no Federally Endangered or Threatened Species known to occur within the Project area.

A request was made to the MNDNR National Heritage Information System (NHIS) to determine if any rare plants, animals, native plant communities, unique geologic features or other rare natural features were located within the Project area. Pleasant Valley LLC acquired the most up to date information through the NHIS Database based on recently completed 2008 field survey data. The

Dodge and Mower County Biological Surveys were completed during the 2008 field season and survey results were entered into the NHIS Database in the spring of 2009 and used in this report. The publication of exact location information, however, may threaten the continued existence of some rare species and is not included in the data query results. The data represented in the NHIS Database is not an exhaustive inventory and does not represent all of the occurrences of rare features within the Project area. Results from the MNDNR NHIS Database query are provided in Appendix 3.

Vascular plant species listed on Minnesota's List of Endangered, Threatened, and Special Concern Species, the Federally Endangered, Threatened, Proposed, and Candidate Species, and results from the MNDNR Rare Features Database known to occur in Dodge and Mower counties are listed below in Table 6.19.1.

Species	State Status	Federal Status
Dwarf Trout lily (Erythronium propullans)	E	E
Wild Quinine* (Parthenium integrifolium)	E	NL
Prairie bush-clover (Lespedeza leptostachya)	THR	THR
Sullivant's Milkweed* (Asclepias sullivantii)	THR	NL
Tuberous Indian-plantain* (Arnoglossum plantagineum)	THR	NL
Valerian* (Valeriana edulis ssp.)	THR	NL
Western prairie fringed orchid* (Platanthera praeclara)	THR	THR
Rattlesnake-master* (Eryngium yuccifolium)	SPC	NL
Small White Lady's-slipper* (Cypripedium candidum)	SPC	NL
Yellow-fruited Sedge* (Carex annectens)	SPC	NL
Plains Wild Indigo* (Baptisia bracteata var. leucophaea)	SPC	NL
Cowbane* (Oxypolis rigidior)	T	NL

Table 6.19.1: State and Federal Endangered and Threatened Vascular Plant Species. E = Endangered, THR = Threatened, SPC = Special Concern Species, NL = Not Listed, T = Tracked by State, but no legal status, * Denotes species observed in Pleasant Valley Project vicinity by the NHIS Detailed Report Results.

Based on the information reviewed from the NHIS Report several rare features, birds, reptiles, amphibians and plant species have been known to occur within the Project area (Map 19). Due to environmental degradation from agricultural land conversion, significant migratory bird paths were not encountered within the Project boundary. However, the Loggerhead Shrike, a state-listed Threatened bird discussed in more detail in the wildlife *Section 6.18 - Wildlife* has been observed within the Project area. The Blanding's turtles, also discussed in *Section 6.18 - Wildlife* were identified in the NHIS report, as a State Threatened species known to occur adjacent to the Project area.

Streams and rivers within the Project area provide habitat for the Ozark minnow and the Creek Heelsplitter, both discussed earlier are listed as State Species of Special Concern that are known to

occur adjacent to the Project area. It is unlikely that any activities for the Project will affect aquatic organisms. However, stormwater management plans for construction may be required to address protective measures.

The NHIS report identifies several rare vascular plants, which are listed as either, State Endangered or Threatened species known to occur within the Project area's native prairie remnants. Appendix 3 summarizes the vascular species found in the vicinity of the Project area. Most commonly the prairie remnants observed were located in publicly owned areas, such as road right-of-ways or protected areas owned and managed under the Minnesota Scientific and Natural Area Program.

6.19.2 Impacts

Impact of any Federal or State listed threatened or endangered species will be avoided. The desktop analysis, current in process site reconnaissance, consultations with the MNDNR, FWS, and the query of the National Heritage Database indicate that there are no occurrences of documented federal or endangered species within the Project boundary. State listed or rare species that may occur within the Project area are species dependent on wetlands and aquatic areas. Any impacts proposed in these areas will be minimized or avoided when feasible. Wildlife areas that could be potentially directly or indirectly impacted will be minimized or avoided.

Impacts to resources that include state management areas and recreation areas will not be directly impacted by the Project. Some indirect aesthetic impacts may occur to areas of recreation such as state grant-in-aid snowmobile trails, scientific and natural areas and water resources.

6.19.3 Mitigation Measures

Mitigation measures for potential impacts of crossing public lands and waters require licensing under Minnesota Statute, 84.415, Minnesota Rules, Chapter 6135 when any construction activities are planned in locations where publicly owned native prairie remnants have been documented regardless of the numbers of crossings. The licenses are issued for 25 or 50 years, depending on the nature of the proposed construction.

Additional mitigation measures associated with the wildlife, recreational resources and visual resources include avoiding turbine locations in biologically sensitive areas that include wetlands and native prairies and wildlife management areas, use of existing roads for construction and maintenance and minimizing construction of new roads where feasible for the Project, minimizing areas that will require excavation or filling and restoring existing vegetation in temporally disturbed areas due to utility crossings.

7 Construction

Construction of the Project will commence following the necessary approvals. Renewable Energy Systems Americas Inc. designs and manages construction projects with experienced staff at the project management and quality control levels. Subcontractors are utilized for completion of most construction tasks. The Project design is completed by RES-Americas, Inc. professionals supplemented by design professionals licensed by the State of Minnesota. The construction phase actually begins early in a project before the actual site activities start. The major tasks associated with construction are presented in Table 7.1.1.

The improvements that will be visible at the site include the grading and shaping of construction access aggregate surfaced roads of 18-20 feet in width with eight (8) foot compacted shoulders. In most areas, the shoulders will be allowed to re-vegetate following construction and the final road width will be 18-20 feet. All roads will be sited to minimize disturbance and maximize the efficiency of operations and maintenance activities.

Phase	Major Construction Phases – Pleasant Valley Wind Energy Conversion Site
Planning/Design	1. Preliminary site layout.
	2. Site Survey identifying site conditions, physical features, including property lines and land section breakdown.
	3. Review and final adjustment of turbine sites as required based on environmental and detailed site conditions.
	4. Geotechnical Exploration – provide data for foundation design, roadway sub-grade parameters and earth resistivity.
	5. Complete plans and quality control review for construction and erosion control during land disturbance.
Construction	1. Field Staking of improvements.
	2. Construct access roads and complete improvements to existing roadways.
	3. Construct over head power lines to interconnection point.
	4. Construction of two (2) substations.
	5. Installation of underground cabling.
	6. Construction of turbine foundations.
	7. Turbine setting.
	8. Start-up and adjustment.
	9. Final Testing.
	10. Project Completion – Facility in operation.

Table 7.1.1 - Major Construction Phases

7.1 Construction Management

Construction management will be the responsibility of Renewable Energy Systems Americas Inc. staff, where they have experience in managing similar projects and bring a wide range of experience to the project management duties. In selected areas, Renewable Energy Systems Americas Inc. staff will be supplemented by professional consultants and qualified technicians for specific duties such as site inspection, quality-control testing and detailed design. Figure 7.1.1 presents the management team for this Project.

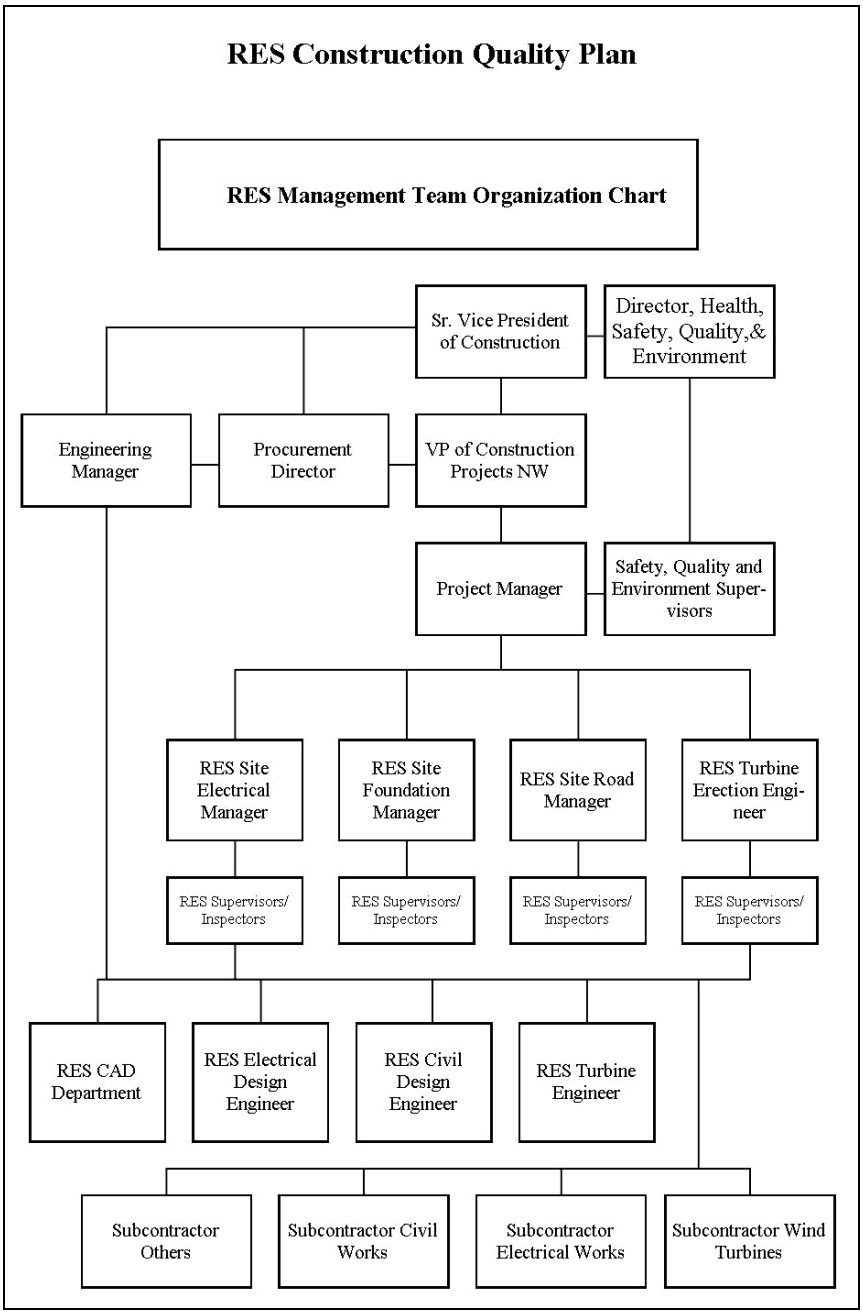


Figure 7.1.1 – Management Team

7.1.1 Construction Management Organization

Management of construction is a key function for timely project completion. This Project will involve various design and supervisory individuals, as well as subcontractors and suppliers for the manufacturing and installation of the project components. Management of the various tasks are divided up between the RES Americas Engineering Manager and the RES Americas Project Manager and are specialists in the area of wind conversion facilities and management of construction projects.

Engineering Manager

The Project design phase provides the necessary documents for material fabrication and delivery, specifications for the Project components and the control and details to complete the construction. The design operations are under the direction of the Engineering Manager. The Engineering Manager is experienced in the design and management of wind power facilities. A team of engineering and technical staff will work under the direction of the Engineering Manager. This staff will include a Computer Aided Drafting (CAD) department for production of plans, an electrical engineer for layout and design of the power collection network, an engineer experienced in the design and production of the turbines and a civil engineer to provide the roadway layout, address site drainage and erosion control, design of foundations, and related civil engineer aspects. The design staff will also receive input from field staff during the design process that will result in the most efficient design for the site selected.

Project Manager

Individual work tasks necessary to complete the site construction and the various subcontractors are managed by the RES project manager. This individual will also work closely with the project safety, quality control and environmental supervisor to assure integration of these key factors into all construction tasks. As shown in Figure 7.1.1 for the individual site management responsibilities, the project manager is assisted by four (4) individuals in the following areas:

- Electrical Manager
- Foundation Manager
- Site & Road Manager
- Turbine Erection

7.1.2 Quality-Assurance/Control, Environmental, Health and Safety Compliance

A Quality Assurance and Quality Control program (QA/QC) will be in effect during all phases of the Project. This program begins at the Project conception, continues through the design process and into construction.

Control during the design phases is directed by a series of checklists to ensure design standards have been met. Also, a review of the preliminary plans by the permitting staff will assure compliance with permit conditions and site constraints. The entire QA/QC program is integrated into all Project areas.

QA/QC Program Characteristics

All phases of the Project will include QA/QC program. These programs will describe the activities and responsibilities of individuals and the measures to be taken to assure quality work. Topics will include design control, management, and drawing control and permit compliance. Independent QA/QC personnel will review all deliverables for compliance with standards.

QA/QC programs during construction will address the need for inspections related to rebar placement, concrete testing, soil conditions, fill compaction, etc. The goal of these programs is to incorporate standard test procedures such as American Society for Testing Materials (ASTM), American Association of State Highway and Transportation Officials (AASHTO), American Concrete Institute (ACI), etc. into the construction phases. The Project plans and specifications will present the standards and field quality control will be by technicians certified in each area of trade.

Environmental

The construction personnel and construction Project Managers will be responsible for environmental permit compliance. This is expected to include the State of Minnesota National Pollutant Discharge Elimination System (NPDES) Permit Conditions for construction sites, as well as the individual conditions that result from site specific permit conditions and environmental review.

Health-and-Safety Program

All employers will be responsible for construction health-and-safety programs. A Health and Safety Coordinator will be responsible for meeting regulations and standards concerning health and safety of all workers. Individual health and safety plans will be prepared by each employer for their staff. If needed, site monitoring of conditions will be completed and safety training of workers will be mandated. Each Health and Safety Plan will incorporate “Stop Work” condition if unsafe conditions are present. The “stop work” authority is also within the Project’s Construction Manager’s authority.

7.2 Construction Methodology

Project plans will show the location and construction details for the turbine sites and access roads. The materials and equipment needed to construct a LWECS project are large and heavy and access is critical. An important part of the Design effort is to identify the local roads that will be used for the construction and to determine their suitability. This process will consider a number of factors including:

1. Pavement Condition
2. Sub-grade Soils
3. Construction Timing
4. Bridge & Culvert Condition
5. Existing Traffic Volumes
6. Road Authority Approval

The construction plans must address these ground transportation issues, as well as the foundation conditions and support for the turbines and collection lines.

7.2.1 Geotechnical Investigations

Geotechnical investigation will be performed to identify subsurface conditions and design parameters for the site roads, foundations, underground trenching and electrical grounding systems. The explorations typically include both standard penetration borings, as well as cone penetrometer readings. The results of the explorations are supplemented by laboratory tests of recovered soil samples, and a report is prepared by a licensed engineer trained in geotechnical engineering. These explorations include resistivity testing to measure the soil's electrical properties.

7.2.2 Site Preparation and Road Construction

Site preparation includes the construction of access entryways from public roads, rough grading of the roads, and constructing a temporary field office and staging area.

All roads will be aggregate surfaced and constructed in multiple phases starting with the rough grading. The organic and soft soils will be removed and the sub-grade proof rolled. In poor soil conditions, additional thickness of aggregate and layers of geo-grid reinforcement will be placed prior to gravel placement, grading and compaction.

Site grading will require the use of dozers, backhoes, trucks, and other similar equipment. This Project will require the disturbance of land; therefore the State of Minnesota NPDES Permit will apply. The utilization of Best Management Practices (BMPs) for erosion control will be part of the

grading activities. It is expected the BMP's will include temporary and permanent sediment basins, silt fence, ditch checks, temporary diversion berms, and other similar erosion control measures. All construction traffic will leave the site via a stabilized vehicle exit to minimize tracking of soils onto public roadways. A site specific Storm Water Pollution Prevention Plan (SWPPP) will also be prepared for the construction activities.

7.2.3 Foundation Construction

Foundation construction occurs in several stages including excavation, form setting, rebar and bolt cage assembly, casting and finishing of the concrete, removal of the forms, backfilling and compacting.

Excavation and foundation construction will be scheduled to minimize the size and duration of excavated areas required to install foundations. Foundation work will commence immediately after excavation of the area is complete. The Project will utilize on-site excavated materials for backfill to the extent possible, which minimizes construction traffic and the potential for erosion.

The foundation work requires heavy machinery including track-hoe excavators, drill rigs, front-end loaders, dump trucks, transportation trucks for materials, cranes and boom trucks for off-loading and assembly, compactors, concrete trucks, concrete pump trucks and backhoes.

7.2.4 Electrical Collection System Construction

An underground cable system is used for energy collection. The underground cables are installed typically 48 inches deep. Where feasible, the collection system will run between turbines in the shortest route possible. Unless limited by the terrain or leasing agreements, the collection cables will be located along the backside of the turbines which will require clearing of a 40 foot right-of-way for trenching and installation. This trench will be bedded with sand and fill material depending on the properties of the soil.

The underground cables are fed into conduits at the pad mounted transformers at each turbine. The cables connect to the pad mounted transformers high-voltage terminals. Low-voltage cables are fed through another set of underground conduits from the pad mounted transformer to a cabinet inside the base of the wind turbine tower.

Two (2) overhead transmission lines will be constructed within the Project Site from the two proposed project substations to the proposed 138kV/345 kV Substation adjacent to the existing Pleasant Valley Substation. The transmission structures will be assembled and fitted with cross-arms, cable supports and insulator hardware on the ground at each pole location. Holes for each pole will be excavated and set in place using a small crane or boom truck. Once it is set in place, concrete will be poured in place around the base of the pole, or a clean fill will be compacted around the pole

base according to the engineer's specifications. The overhead lines will connect the project substations to the proposed 138kV/345kv Substation adjacent the existing Pleasant Valley Substation.

7.2.5 Project Substation

The three (3) Project substations require ordering and delivery of major equipment such transformers, breakers, capacitors, outdoor relaying equipment, control house, and various other equipment. Construction involves several stages including: grading, foundations for the transformers, steel work, breakers, control houses, and other outdoor equipment; the erection and placement of the steel work and all outdoor equipment; and electrical work for all of the required terminations. All excavation, trenching and electrical system construction work will be done in accordance with the NPDES permit and site specific SWPPP required as part of the permit.

7.2.6 Wind Turbine Assembly

The turbines consist of three (3) main components: the towers, machine housing and blades. Turbine components will be delivered to the Project site on flatbed transport trucks. Trucks will be off-loaded at the turbine location. A typical laydown area and crane pad is presented in Figure 7.1.2.

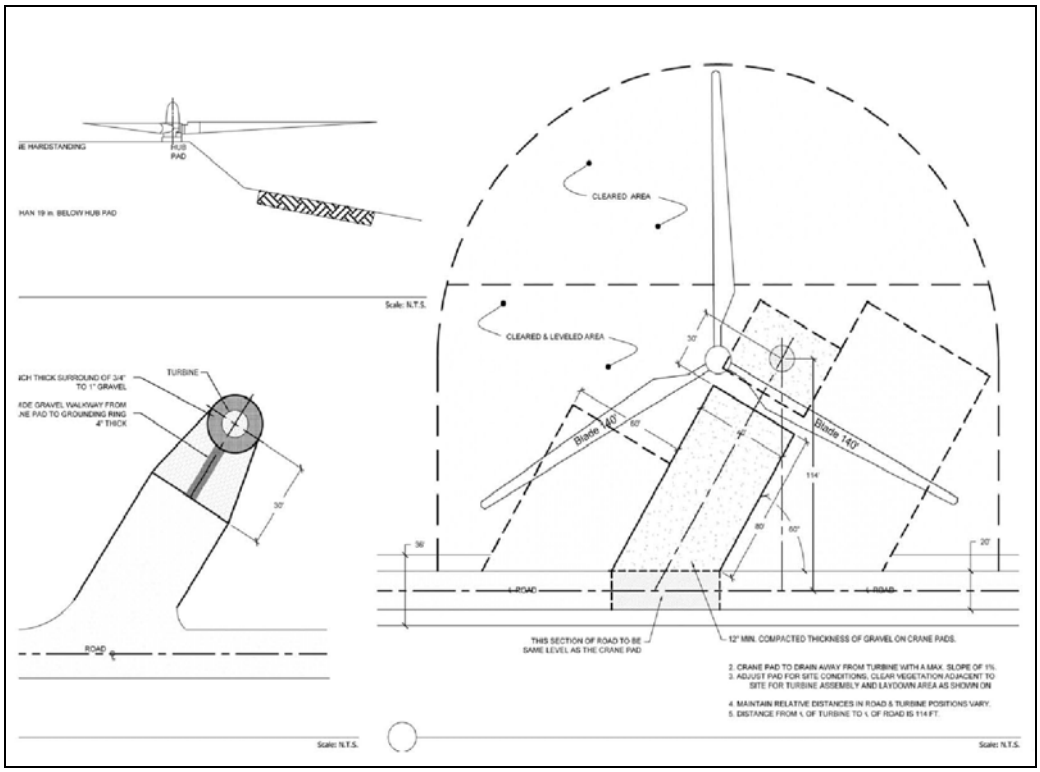


Figure 7.1.2 – Typical Turbine Construction Site Laydown Areas. Configuration may vary depending on turbine type.

7.2.7 Plant Energization and Commissioning (Start-up)

The entire Project will undergo detailed inspection and testing procedures as construction progresses. Each turbine will be commissioned as installation tasks are completed. Inspection and testing will occur for each component of the wind turbines, as well as the communication system, meteorological system, medium voltage collection and feeder system, substation and the Supervisory Control and Data Acquisition (SCADA) system.

7.2.8 Project Construction Clean-up

Project clean-up will be performed continually as work progresses. This includes clean up of all construction waste, vegetation and other debris. The initial grading activities will not create much debris. However, work on foundations through start-up will require daily clean up of excess materials, packaging, miscellaneous containers, and other unwanted refuse. RES America Construction Inc. project managers will monitor the subcontractors for site clean-up.

Disposal of all construction wastes will be off-site. Renewable Energy Systems Americas Inc. or the subcontractors will contract with a licensed waste hauler for the transportation and disposal of all excess materials. Recycling will be conducted when possible.

Final site stabilization will be performed in stages as construction allows. This work includes placing salvaged topsoil and stabilizing by seeding and mulching. Seed types will be coordinated with the landowners when possible.

8 Operations and Maintenance

8.1 Project Control, Management, and Service

Immediately following construction, the turbine equipment manufacturer, will be responsible for operations and maintenance during the warrantee period. In addition, Renewable Energy Systems Americas Inc. will have technicians trained in turbine operating and maintenance. The other equipment operation and maintenance is the responsibility of the Owner. Maintenance of substations will typically be handled by a high voltage contractor trained in substation operations.

Each wind turbine in the Project will communicate directly with a Supervisory Control & Data Acquisition System (SCADA) for performance monitoring, energy reporting, and trouble-shooting. Under normal conditions each wind turbine operates independently, making its own control decisions.

The SCADA system allows monitoring of production data and aids in scheduling of maintenance activities.

The SCADA system allows the operators to:

- Monitor the LWECS status;
- Provide an interface for monitoring wind turbines;
- Collect meteorological performance data from turbines;
- Monitor field communications;
- Provide diagnostic capabilities of wind turbine performance for operators and maintenance personnel;
- Collect wind turbine and wind farm material and labor resource information;
- Provide for reporting and archiving of operational data.

8.2 Maintenance Schedule

The Project will be monitored daily by inspections, various daily checks and inspections consistent with industry practice.

Following Installation and Start-up, the service and maintenance is carefully divided into the following intervals:

- A 500 hr service inspection;
- A detailed annual inspection and service;
- Multi-year service

First Service Inspection: Service inspection will take place one to three months after the turbines have been commissioned. Typical activities include tightening of bolts, greasing and filtering of gear oil.

Annual Service: The yearly service inspections will consists of a semi-annual inspection and an annual component check.

Multi-Year Service: Inspections and preventative maintenance are performed consistent with industry practice and manufacturer recommendations based upon turbine hours, age and performance history. Items such as checking and tightening of terminal connectors, inspection of the wind braking system, checking and testing of oil and grease and balance check are normal multi-year checks.

8.3 General Maintenance Duties

The O&M involves scheduled and unscheduled maintenance including periodic operational checks and tests, regular preventive maintenance on all turbines, related plant facilities, equipment, safety systems, controls, instruments and machinery. These tasks are completed on an "as-needed basis" and are determined by the visual inspections and monitoring data. The general notes are:

- Perform routine inspections;
- Maintain all oil levels;
- Maintain the control systems, access roads, drainage systems and other facilities necessary for the operation and access;
- Update all manuals with new bulletins;
- Maintain interconnection facilities;
- Provide an inventory of all consumables, and parts required to perform scheduled and unscheduled maintenance on the wind farm;
- Manage lubricants, solvents, and other hazardous materials as required by local and/or state regulations;
- Train and supervise a work force necessary to meet the general maintenance requirements;
- Implement appropriate security measures.

8.4 Operations and Maintenance Facility

The daily operation and maintenance of the LWECS will be performed from a maintenance facility constructed on-site. It is anticipated that the maintenance building will be located near one of the substations. Final location will be dependent on access and input from the property owners. The maintenance facility will house an inventory of parts, provide office space for staff and a location for monitoring the performance of the facility.

Typically, maintenance structures are of moderate size and wood or steel structure. An overhead door will be provided for equipment entering and exiting and restocking of materials. The facility will be heated to maintain the equipment and materials in operable state. The operations and maintenance facility will also function as a meeting place for crew safety meetings and for tool box training of operators.

9 Cost Analysis

The Applicant has used its expertise in wind project development, design and construction to develop an estimated project cost to be approximately **[TRADE SECRET BEGINS] *** [TRADE SECRET ENDS]**. For purposes of comparison, a service life of 20 years has been assumed in order

to estimate annualized costs. The actual price that the Project will obtain from sale of its energy and environmental attributes is proprietary and confidential.

10 Project Schedule

10.1 Land Acquisition

The Applicant has entered into option/easement agreements to secure land and wind rights for the entire Project Site with options expected to be exercised by Fall 2010.

10.2 Permits

All necessary permits will be obtained prior to project constructions. For a detailed list of potential permits required for the development of the LWECS refer to *Section 13 – Identification of Required Permits and Approvals.*

10.3 Equipment Procurement, Manufacture and Delivery

The longest lead time items for wind power projects are usually substation transformers, which can require 10 to 14 months from time of order to delivery, and wind turbines which can require 8 to 18 months from time of order to delivery. RES Americas. is working with several turbine suppliers to provide turbines for projects scheduled for construction.

10.4 Construction

Construction will begin once all necessary permits are obtained and the LWECS Site Permit is issued by the MPUC.

10.5 Financing

The Applicant will be responsible for all pre-development, development, and construction activities, as well as permanent financing for the Project. The financing plan also anticipates sale of 50 percent of the Project to another party upon the Project achieving commercial operation.

10.6 Expected Commercial Operation Date

The Applicant anticipates that the Project will begin operation in December 2012.

11 Energy Projections

Using a GE 1.5 XLE turbine the Project will have a nameplate capacity of 300 MW. The Project will consist of two 150 MW phases with an energy output of **[TRADE SECRET BEGINS] *** [TRADE SECRET ENDS]** respectively for each phase.

Using a Siemens 2.3 MW/101m turbine the Project will have a nameplate capacity of 299 MW. The Project will consist of two 149.5 MW phases with an energy output of **[TRADE SECRET BEGINS] *** [TRADE SECRET ENDS]** respectively for each phase.

12 Decommissioning and Restoration

The existing easement agreements between the Applicant and the landowners require that all above ground wind project facilities be removed from the Project Site within one (1) year of the expiration of the easement term. This agreement also requires all physical improvements be removed if they are within three (3) feet of final grade at the termination of the agreement. The ground surface will be restored and graded smooth. If the landowners prefer, the access roads will also be removed and soil tilling completed to restore the area to a "farmable" condition.

The value of the proposed Project is with the proven renewable energy wind source, transmission line access and the agreements with the property owners. To continue generating renewable energy from the Project site beyond the useful operating life of original equipment, it is likely that easements agreements would be re-negotiated and the turbines will be upgraded or replaced with more efficient equipment when the design life of the existing equipment is needed. If this is not the case, all physical improvements will be removed in accordance with the existing landowner agreements.

The Project substations and transmission lines will later revert to the ownership of the local utility if the site is decommissioned. If the local utility has no need for the improvements, all structures, conductors and cables would be removed. The reclamation procedures would be based on site-specific requirements and the expected final use of the area. Re-vegetation would be with appropriate seed mixes.

The current design life of the turbines, transformers, substations and related equipment is estimated at 20 years by today's standards. With proper operation and maintenance of these facilities, it is expected that the useable life will easily be 30 years or more. The uncertainties of the useable life is what the future advances in efficiency and generating abilities will have on the current technology. It is generally expected within the wind energy industry that most facilities will be upgraded and refitted with more efficient equipment within the 30 year period. Many of the

components such as foundations and the towers have design life much longer than 20-30 year which will accommodate this retrofitting.

12.1 Decommissioning Economics and Financial Surety

The funds for decommissioning the Project will be provided by the scrap value of the equipment and a decommissioning fund that is set up to cover costs in excess of the scrap value. The scrap value is a market driven amount and currently varies with economic and regulation changes. Much of the value is in the metals, steel in the towers, copper wiring and other metals. Each tower has a scrap weight at up to 150 tons. At today's scrap iron prices of $150.00 – $200.00/ton, a considerable contribution would be made to offset decommissioning costs.

The Applicant's wind energy option and easement agreements include a provision for removal of all facilities within one year of the termination of agreement. The Applicant also has the right to explore alternatives for decommissioning. Options include re-application for a site permit and operation under a long-term contract or on a merchant basis. Also, retrofitting the generating equipment to produce energy efficiently could extend the life for many years. To provide the financial securities and establish a decommissioning fund in an amount of **[TRADE SECRET BEGINS] *** [TRADE SECRET ENDS]** and will be placed in escrow to the benefit of landowners. The Applicant will establish this decommissioning security when it has paid 75 percent of the original principal amount of its initial financing for the Project. The Applicant will review and update the cost estimate of decommissioning and restoration for the Project in December 2020, 15 years after the Project commissioning. This revised cost estimate of decommissioning and salvage value will then be submitted to the MPUC for review and comment.

13 Identification of Required Permits and Approvals

A detailed list of permits and approvals that may be necessary for the construction of the proposed Project is listed in Table 13.1.1. The Applicant will work in conjunction with all local, state and federal organizations to obtain all the necessary permits prior to project construction.

Agency	Permit/Approval	Authority	Description
Private			
Northern Natural Gas Company (NNG)	Encroachment Agreement or Permit	Northern rights-of-way	The NNG's handbook details the standards and procedures Northern typically requires to protect its facilities.
Federal Permits			
Federal Aviation Administration (FAA)	Notice of Proposed Construction or Alteration/Determination of No Hazard	14 CFR Ch.1 Subchapter E Part 77	Determines if proposed structures greater than 200 feet above ground level will pose an aviation hazard and is the basis for notice to FAA of proposed construction.
US Fish and Wildlife Services (FWS)	Consultation and Review of the Proposed project regarding Federally Threatened and Endangered Species	Endangered Species Act of 1973	The Act ensures that habitat for endangered species is protected and all projects must be reviewed by the FWS prior to commencement.
US Army Corps of Engineers (COE)	Section 404 Permits	Clean Water Act	Permits are required for the dredging and filling of waters and wetlands.
Federal Energy Regulatory Commission (FERC)	Exempt Wholesale Generator Status	1992 Energy policy Act	Self-Certification of exempt wholesale generator requires filing with FERC.
State of Minnesota Permits			
Minnesota Public Utilities Commission (MPUC)	Site Permit	Wind Siting Act, MN Stat. § 216F.05	Provides information necessary to grant approval to construct Large Wind Energy Conversion System (LWECS).
MN State Historic Preservation Office (SHPO)	Cultural and Historic Resources Review	National Historic Preservation Act; Historic Sites Act (Minn. Stat. §§ 138.661, 138.669); Field Archaeology Act (Minn. Stat. §§ 138.31-138.42); Private Cemeteries Act (Minn. Stat., Ch. 307)	Cultural Resources Review and State and National Register of historic Sites Review.
Minnesota Pollution Control Agency (MPCA)	401 Certification	Clean Water Act	When a federal permit is required (i.e., Section 404 Permit with the Corps of Engineers) a State Water Quality Certification/Waiver is needed.

MPCA	NPDES Stormwater Permit for Construction	Clean Water Act	Permits are required when one acre or more of soil is disturbed during construction activity.
	Small Quantity Generator	MN Rules 7045	Hazardous Waste rules regarding storage and disposal of turbine lubricating oil.
Minnesota Department of Natural Resources (MNDNR)	Consultation and Review of the Proposed Project regarding information on Minnesota's rare plants and animals, native plant communities, and other rare features.	Minn. Stat. § 84.0895	Protection of Threatened and Endangered Species.
	Public Water Works Permit	Minn. Stat. § 103G.005	Applies to activities conducted below the Ordinary High Water Level of public waters and public water wetlands.
	License to Cross Public Lands and Waters	Minn. Rules, Ch. 6135; Minn. Stat. § 84.415	Permits are required for the passage of any utility over, under or across any state land or public waters.
MN Department of Health (MDH)	Water Well Permit	MN Well Code (Minn. Stat. §103I); State Drinking Water Act	Establish standards for the protection of public drinking water.
MN Board of Soil and Water Resources (BWSR)	Wetland Conservation Act Approval	Minn. Stat. §§103G.222-103G.2373; MN Rules 8420	Requires approval of proposed wetland impacts be reviewed, avoided and mitigated.
Minnesota Department of Transportation (MNDOT)	Driveway Permit	MN Rule 8810.3300	Required if access road will connect to a State road.
	Utility Access Permit	Minn. Stat. § 161.45	Provides for proper placement of utilities in road rights-of-way.
	Highway Access Permit	Minn. Stat. Ch. 505	Permits access to State roads.
	Work within Right-of-way Permit		Allows for construction activity in MnDOT R.O.W.
MnDOT Office of Freight & Commercial Vehicle Operations (OFCVO)	Oversize and Overweight Vehicles: Single Trip Permit	Minn. Stat. 169.862	Permit is required for oversized, overweight loads to travel on state roads.
MNDOT Office of Aeronautics	Tall Towers Permit	Minnesota Structure Height Regulations	Required for wind turbines and other tall structures located outside the zoned territory of any public use airport with airport zoning in place.

County/Local Permits			
Dodge County Highway Department	Moving Permit	Highway Dept.	Permit required when moving oversized, overweight loads, equipment and building.
	Access Drive and Entrance Permit	Highway Dept. Access Policy and Dodge County Zoning Ordinance	A permit is required for the construction of a drive and must be constructed according to Dodge County Highway Department Regulations.
	Utility Permit	Highway Dept.	The permit establishes rules and standards for the placement of "utilities" on or across, or under on County Highway rights-of-way.
	Working in the Right of Way Permit	Highway Dept.	Required for working in the right-of-way on C.S.A.H; County Municipal Streets and County Highways.
Dodge County Environmental and Land Use Department	Wetland Permit	Dodge County Ordinance and the Wetland Conservation Act	Any work that drains or fills any part of a wetland in any part of the County is prohibited without a permit or approval from Dodge County.
	Septic System Permit	Dodge County Sewage and Wastewater Treatment Ordinance No. 3; MN Rules Chapter 7080	Required for any new septic systems constructed.
Dodge County Planning & Zoning Department	Building Permits	Dodge County Zoning Ordinance	Establishes rules and standards for construction of any new buildings.
	Conditional Use Permits	Dodge County Zoning Ordinance	Approves the siting and construction of the substation and transmission line.
Dodge County Townships: Ripley, Ashland, Westfield, Hayfield and Vernon	Township Approvals		
Mower County Highway Department	Moving Permit	Highway Dept.	Permit required when moving oversized, overweight loads, equipment and building.
	Access Drive and Entrance Permit	Highway Dept.	A permit is required for the construction of a drive and must be constructed according to Mower County Highway Department Regulations.

Mower County Highway Department	Utility Permit	Mower County Ordinance Section 14-8.2	The permit establishes rules and standards for the placement of "utilities" on or across, or under on County Highway rights-of-way.
	Right-of-Way Obstruction, or Excavation Permit	Mower County Right-of-Way Ordinance	Required for working in the right-of-way on C.S.A.H; County Municipal Streets and County Highways.
Mower County Planning & Zoning and Environmental Land Use Offices	Permit to construct Sewage Treatment System	Mower County ISTS Ordinance; MN Rules Chapter 7080	Required for any new septic systems constructed.
Mower County Planning & Zoning Department	Building Permits	Mower County Ordinance	Establishes rules and standards for construction of any new buildings.
	Conditional Use Permits	Mower County Ordinance Section 14-140.1	Approves the siting and construction of the substation and transmission line.
Soil and Water Conservation District (Mower County)	Wetland Permitting	Wetland Conservation Act	Any work that drains or fills any part of a wetland in any part of the County is prohibited without a permit or approval from Mower County.
Mower County Townships: Waltham, Sargeant, Pleasant Valley, Red Rock, and Dexter	Township Approvals		

Table 13.1.1: Potential Permits and Approvals Required for Construction and Operation of the Proposed Facility