9.0 SITE CHARACTERIZATION

9.1 SITE WIND CHARACTERISTICS

Access to quality wind resources has guided the site selection. However, other factors, including environmental concerns, relative interest from communities and landowners, and access to cost effective transmission, play a part in the selection of a site. This process allows Black Oak Wind to maximize the use of Minnesota's wind resource in a cost-effective manner.

The United States Department of Energy (DOE) and the Minnesota Department of Commerce (DOC) have conducted wind resource assessment studies in Minnesota since 1982. In October 2002, the DOC published the latest "Wind Resource Analysis Program" report that presents wind analysis data from monitoring stations across Minnesota (Minnesota DOC 2002). Near the Project Area, the mean annual wind speed at an elevation of 80 m (262 ft) is mapped as 7.34 m/s to 7.9 m/s. This variation reflects the rolling topography of the site.

Black Oak Wind has two temporary meteorological towers in the Project Area which have been collecting weather data since April 2009. Additionally, Black Oak Wind has partnered with WindLogics to perform site analysis of the weather regime in the area. The following sections on wind resources are largely based on the analysis conducted by WindLogics and GWE (WindLogics 2009).

Interannual Variation

Interannual variation is the expected variation in wind speeds from one year to the next. There is a very strong correlation between Black Oak Wind's meteorological tower data and the long-term reference data sets available through the National Oceanic and Atmospheric Administration's (NOAA) NCEP/NCAR reanalysis program and the weather monitoring stations available at airports in the vicinity. Based on current analysis, the Black Oak meteorological tower locations are expected to have an average annual wind speed of 7.66 m/s with a potential variation of 5.8 percent or +/- 0.45 m/s.

Seasonal Variation

Seasonal variation is represented by the shift in wind speeds from one month to the next. Table 9-1 shows the estimated average seasonal variation based on long-term correlations with on-site data. The months of October through January are expected to have the highest wind speeds, while the months of July and August are expected to have the lowest wind speeds.

Table 9-1. Average Wind Speed

Month	Wind Speed (m/Sec)
January	8.07
February	7.67
March	7.71
April	7.71
May	7.5
June	7.26
July	6.8
August	7.04
September	7.87
October	8.14
November	8.06
December	8.13
Annual average	**7.66**

Diurnal Conditions

Diurnal variation occurs through the shift in day and nighttime weather patterns. Figure 9-1 shows the expected variation in wind speeds at the site. On average, the wind speeds are higher in the evening and nighttime hours, and lower in the morning and at midday.

Atmospheric Stability

The atmospheric stability is defined by lateral fluctuation of the wind, or sigma theta. Stability level is characterized by sigma theta 0 to 2.5 degrees as stable, 2.5 to 7 as moderately stable, 7 to 9 as neutral, 9 to 15 as moderately unstable, and greater than 15 degrees as very unstable (Slade 1968). The atmospheric stability based on the Black Oak meteorological tower site at the 60 meter level is 6.67 degrees, or moderately stable.

Hub Height Turbulence

The Turbulence Intensity (TI) is defined as the measured standard-deviation of wind speed over an hour, divided by the mean for the same time period. For 15 m/s wind speeds, the average TI is 12.8 percent. For 15 m/s wind speeds, the characteristic TI is 15.7 percent.

Extreme Wind Conditions

The maximum hourly wind speed measured at the Black Oak meteorological tower site was 21 m/s. Site extreme wind events for a one-year event will likely be 21.2 m/s. Table 9-2 provides the 20- through 100-year maximum means and gusts for the site based on the observed weather patterns from the centrally located Black Oak meteorological tower.

Table 9-2. Extreme Wind Events

Period (yr)	Extreme Wind Speed (m/s)	
	10-min means	Gusts
20	29.3	35.6
25	30.2	36.6
50	32.9	39.5
100	35.7	42.5

Wind Speed Frequency Distribution

Figure 9-2 shows the wind speed frequency distribution; a majority of the winds occur between 5 m/sec and 8 m/sec. The characteristics of this distribution are consistent with wind regimes observed elsewhere in Minnesota.

Wind Variation with Height

Wind shear is the relative change in wind speed as a function of height. Wind shear is calculated using a power function based upon the relative distance from the ground. The general equation used for calculating wind shear is $S/S_o = (H/H_o)^{\alpha}$, where S_o and H_o are the speed and height of the lower level and α is the power coefficient. The power coefficient can vary greatly due to terrain roughness and atmospheric stability. The power coefficient will also change slightly with variation in height. The vertical variation with height or shear coefficient, based on the 40 to 60 meter level at the Black Oak meteorological tower site, is approximately 0.21.

Spatial Wind Variation

As noted above, the DOC's wind resource analysis program estimates that the spatial variation in wind speed across the Project Area is between 7.34 and 7.9 m/s. This estimate is confirmed by the onsite data and the analysis performed by GWE and WindLogics.

Wind Rose

A wind rose is a graphical representation of wind speeds based on the direction the wind comes from and the frequency it comes from each direction. Figure 9-3shows the wind rose at the Black Oak meteorological tower location.

9.1.1 OTHER METEOROLOGICAL CONDITIONS

Average and Extreme Weather Conditions

Long term average temperatures and precipitation were evaluated from the Midwest Regional Climate Center (2009) Melrose Station (215325) located approximately 15 miles east of the Project Area. The average minimum temperature in the area ranges from 0.2 degrees Fahrenheit in January to 60.2 degrees in July; the average maximum temperature ranges from 20 degrees in January to 83.6 degrees in July. Average precipitation in the area ranges from 0.64 inches in December to 4.29 inches in June.

Extreme weather events for Stearns County include thunderstorms, tornadoes, hail, heavy snow and ice, extreme cold, heat waves, flash floods/floods, heavy rain, lightning, and drought. Tornadoes, thunderstorms, and extreme winds strike occasionally. The state of Minnesota experiences approximately 15 to 20 tornadoes per year. National Climatic Data Center (NCDC 2006) records include 164 thunderstorms, eight high wind events, and 39 tornadoes from January 1950 to February 2010. Such storms are usually of short duration and localized, leading to damage in small geographic areas. Wind turbines are built to withstand hail and lightning, but are not designed to survive tornado-force winds of 89 + m/s (200+ mph).

Turbines under consideration for this project are capable of withstanding the extreme weather conditions that occur in the area. All turbines being considered have lightning protection systems, turbine blades that "feather" into the prevailing wind direction during high wind events to minimize the risk of damage, and turbines that shut down above the cut-out wind speed (generally 45 mph).

During the winter, there is potential for icing events to result in ice accumulation on turbine blades with variable frequency. Although the turbines are not equipped with specific ice-sensing equipment, the turbine will stop turning if significant ice accumulation causes an imbalance. The mechanical safeguards and turbine setbacks mitigate the potential hazard associated with ice throw, and minimize the potential that ice thrown from turbine blades could reach public roads and residences. Ice throw is not expected to be a hazard for this Project.

9.2 LOCATION OF OTHER WIND TURBINES WITHIN 10 MILES OF PROJECT BOUNDARY

Based on the FAA obstacle database, there is an existing turbine in the northwest corner of Todd County, about 45 miles north of the Project Area, and another 39 miles west of the Project Area in Morris, Minnesota. Though not constructed, applications for proposed wind projects for Todd, Ottertail, and Pope counties have been filed with the PUC. There are no known commercial-scale wind turbines in operation within 10 miles of the Project boundary. The FAA obstacle database does not list any existing turbines within 20 miles of the Project boundary.

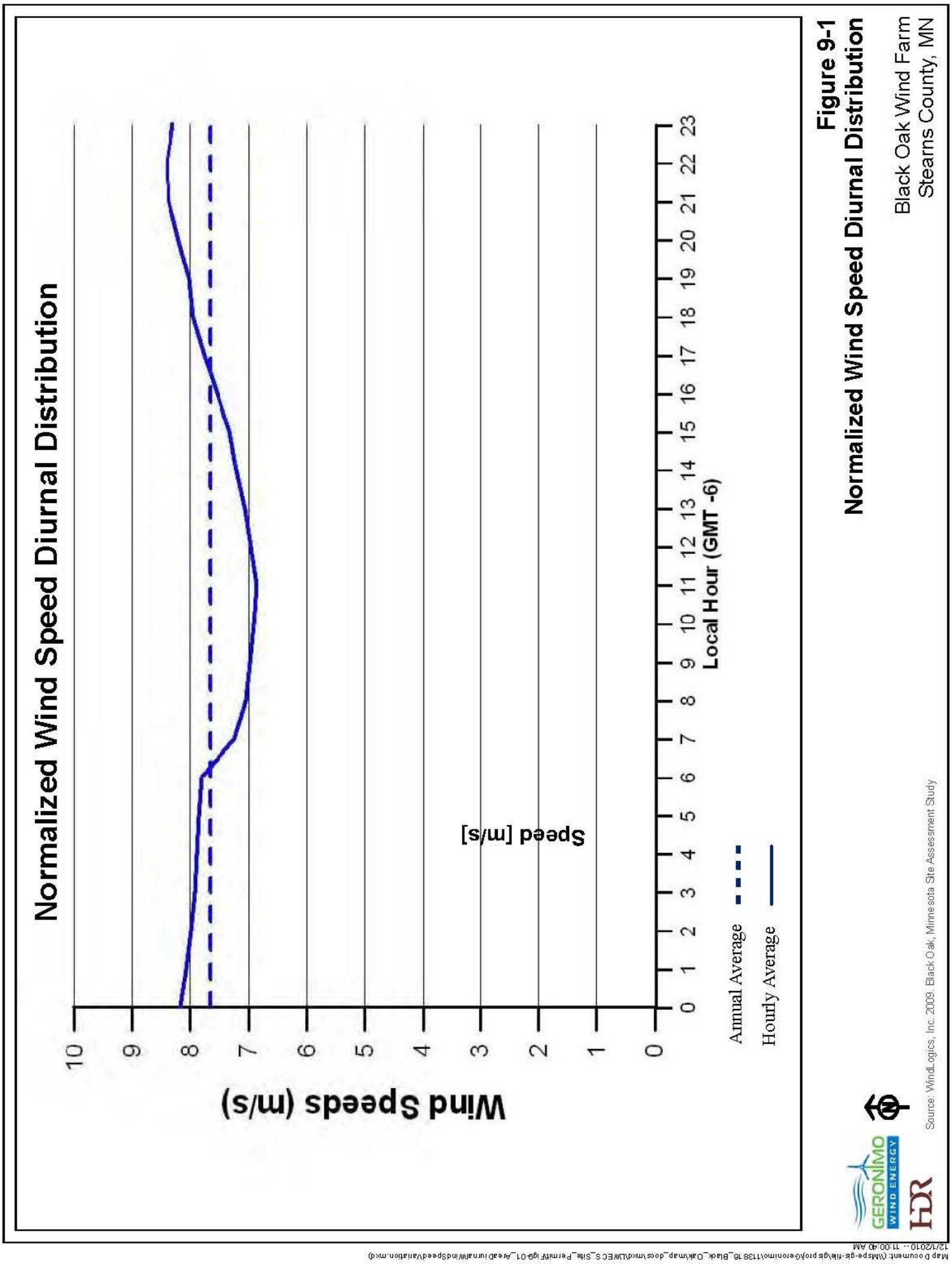

Figure 9-1
Normalized Wind Speed Diurnal Distribution
Black Oak Wind Farm
Stearns County, MN

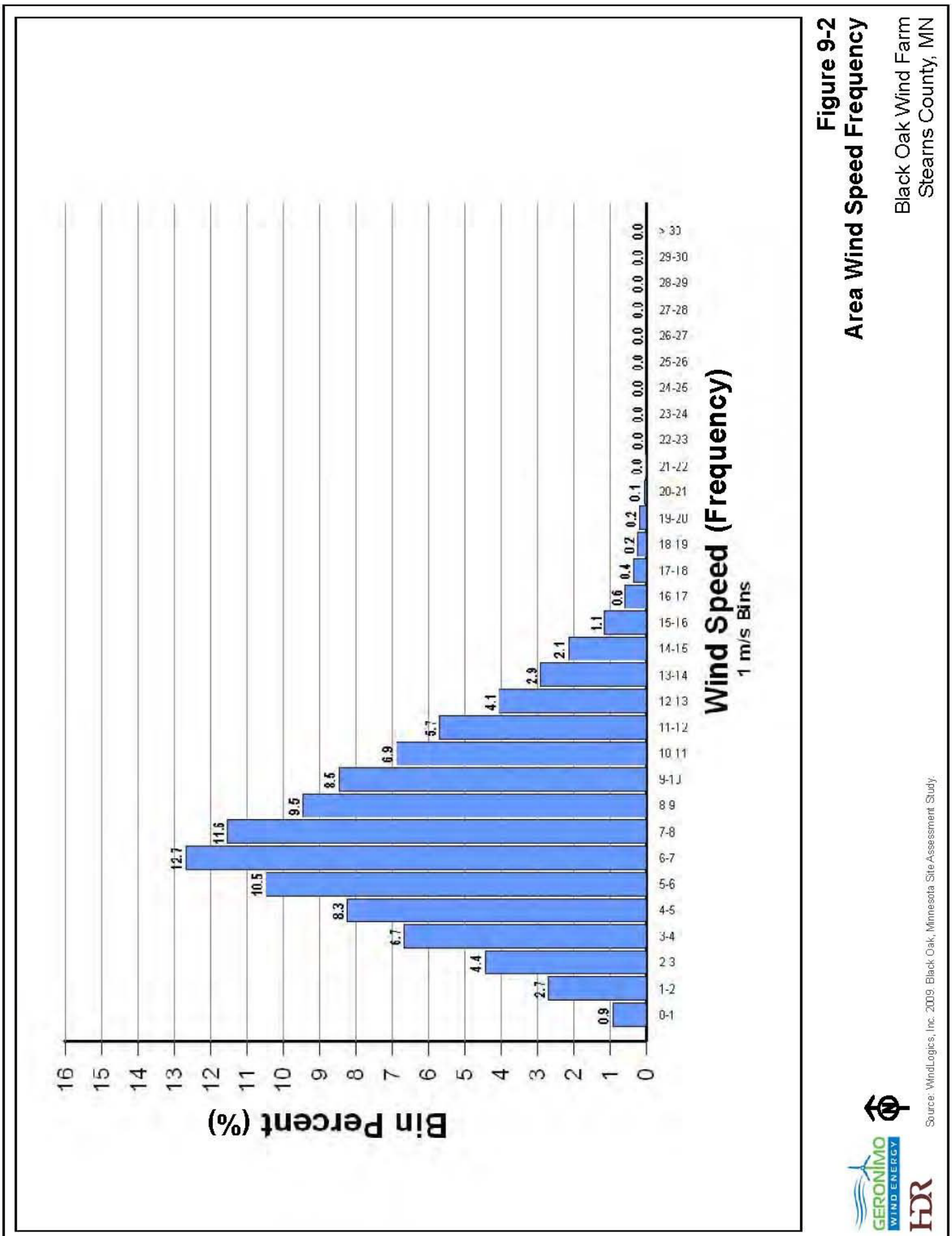

Figure 9-2
Area Wind Speed Frequency

Black Oak Wind Farm
Stearns County, MN

Source: WindLogics, Inc. 2009. Black Oak, Minnesota Site Assessment Study.

GERONIMO WIND ENERGY
HDR

Map Document: (Mspe-gis-file\gis proj\geronimo\113816_Black_Oak\map_docs\mxd\LW\ECS_Site_Permit\Fig9-02_AreaWindSpeedFrequency.mxd)
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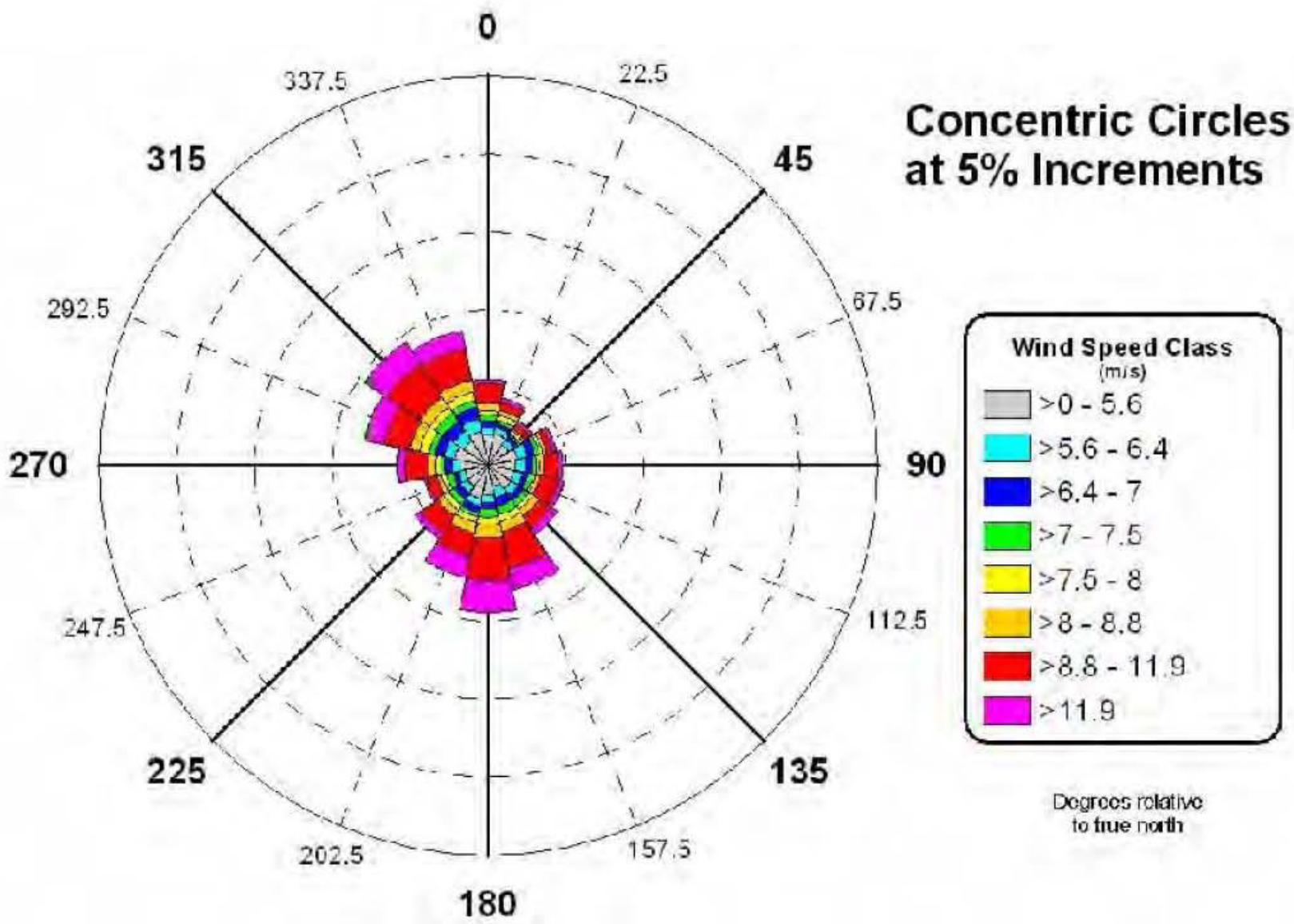

Mean quantities normalized to long-term average.
Data distributions representative of modeled year.

GERONIMO WIND ENERGY

HDR

Source: WindLogics, Inc. 2009. Black Oak, Minnesota Site Assessment Study.

Figure 9-3
Area Energy Rose

Black Oak Wind Farm
Stearns County, MN

Map Document: (\\Mspe-gis-file\gisproj\Geronimo\113816_Black_Oak\map_docs\mxd\LW\ECS_Site_Permit\Fig9-03_AreaEnergyRose.mxd)
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10.0 PROJECT CONSTRUCTION

Land will be graded on site for the turbine pads. Drainage systems, access roads, storage areas, and shop facilities will be installed as necessary to fully accommodate all aspects of the construction, operation, and maintenance of the wind farm.

Several activities must be completed prior to the proposed commercial production date. The majority of the activities relate to equipment ordering lead-time, as well as design and construction of the facility. Below is a preliminary schedule of activities necessary to develop the Project. Preconstruction, construction, and postconstruction activities for the Project include:

- Order all necessary components including towers, nacelles, blades, foundations, transformers, etc.
- Finalize turbine micro-siting
- Complete survey to establish locations of structures and roadways
- Complete soil borings, testing, and analysis for proper foundation design and materials
- Complete construction of access roads, to be used for construction and maintenance
- Construct aboveground or underground feeder lines
- Design and construct the metering station adjacent to the interconnection substation
- Design and construct the step-up substation
- Determine potential upgrades to the interconnection substation as determined by MISO
- Install tower foundations
- Install underground cables
- Place towers and set wind turbines
- Complete facility acceptance testing
- Commence commercial production

Black Oak Wind and Black Oak Wind's engineering contractor will perform or manage all development activities. Specifically, Black Oak Wind will:

- Perform site resource analysis
- Undertake environmental review
- Obtain specific permits and licenses for the Project

Under the oversight of GWE's staff, the engineering and construction contractors will:

- Perform civil engineering for access roads and turbine foundations
- Construct foundations, towers, and transformers
- Assemble and install turbines
- Install the communication system, including telephone and fiber-optic cable, and SCADA software and hardware
- Construct the project substation
- Construct the electrical feeder and collection system
- Construct radial interconnection

10.1 ROADS AND INFRASTRUCTURE

During the construction phase, several types of light, medium, and heavy-duty construction vehicles will travel to and from the site, as well as private vehicles used by construction personnel. The Applicant estimates that there will be 75 large truck trips per day and up to 175 small-vehicle (pickups and automobiles) trips per day in the area during peak construction periods. That volume will occur when the majority of the foundation and tower assembly is taking place. Prior to construction, the Applicant will coordinate with local jurisdictions (county and township) in order to obtain the necessary road access and overwidth/overweight permits. At the completion of each construction phase this equipment will be removed from the site or reduced in number.

Any improvements to existing access roads will consist of re-grading and filling of the gravel surface to allow access even in inclement weather, and potentially widening select intersections where necessary to accommodate truck traffic. No asphalt or other paving is anticipated. Black Oak Wind will coordinate with the county and township road authorities to develop a road improvement agreement prior to construction.

10.2 ACCESS ROADS

Constructing the Project will require approximately 4 to 6 miles of gravel access roads, depending on the size of turbine selected and final design. They will be located to facilitate both construction access (cranes) and access by operation and maintenance crews while inspecting and servicing the wind turbines. The access roads will be between towers, with one road required for each string. The roads will be approximately 16 feet wide and of low profile to allow cross-travel by farm equipment. The Applicant will work closely with the landowners to locate access roads to minimize land-use disruptions. Siting will be completed in accordance with state and local requirements. Siting roads in areas with unstable soil will be avoided wherever possible. All roads will include appropriate drainage and culverts while still allowing for farm equipment crossing.

The roads will be approximately 4.9 m (16 ft) wide and will be improved with class-5 (gravel) cover, adequate to support the size and weight of maintenance vehicles. These roads will meet state and local requirements. The specific turbine locations will determine the amount of roadway that will be constructed for this Project. In addition, an up to 30-foot-wide gravel work area will surround each turbine base.

The roads will consist of graded dirt, overlaid with geotechnical fabric (if needed) and covered with gravel. To facilitate crane movement and equipment delivery, an additional 3.5 to 12 feet of gravel roadway will be temporarily installed on either side of the permanent roadway (40 ft total width).

After construction, temporary construction laydown areas adjacent to turbine pads will be restored, and access roads will be restored to their permanent 4.9 m with. The site will be graded to natural contours, soil will be loosened if needed, and the site will be seeded if needed. Once construction is completed, the access roads will be regraded, filled, and dressed as needed.

The applicant will repair or replace any existing fences or gates that are impacted during construction, and will coordinate with participating landowners to provide suitable fencing or gates where access roads cross into existing pastures.

10.3 ASSOCIATED FACILITIES

10.3.1 OPERATION AND MAINTENANCE FACILITY

An O&M building will be constructed on or near the site and will provide access and storage for project maintenance and operations. Such buildings are typically 3,000 to 5,000 square feet and house the equipment to operate and maintain the wind farm. The parking lot adjacent to the building is typically 3,000 sq ft.

10.3.2 METEOROLOGICAL TOWERS

Currently Black Oak Wind is operating two temporary meteorological towers within the site. Black Oak Wind proposes to remove the temporary towers and construct a single, permanent meteorological tower with the potential for a SODAR or LIDAR unit (See Figure 4-2 through Figure 4-4).

10.4 TURBINE SITE LOCATION

Construction of the turbines will include temporary impacts of approximately an additional 12 ft of gravel roadway on either side of the permanent roadway (40 ft total width), a 40-ft-by-120-ft gravel crane pad extending from the roadway to the turbine foundation which will be graded to a minimum of 1 percent, and a component laydown and rotor assembly area centered close to the turbine foundation which will be graded to a minimum of 5 percent. The component laydown area will range from approximately 260 by 260-ft to 335 by 335 ft, depending on the turbine size selected. In addition to the disturbances associated with temporary travel roads for cranes, it is possible that temporary impacts could occur when cranes move cross-country between strings of turbines.

Each turbine is equipped with a lightning protection system. The turbine is grounded and shielded to protect against lightning. The grounding system will be installed during foundation work and must be accommodated to local soil conditions. The resistance to neutral earth must be in accordance with local utility or code requirements. Lightning conductors are placed in each rotor blade and in the tower. The electrical components are also protected.

10.4.1 FOUNDATION DESIGN

The wind turbines' freestanding 80 to 100 m (262 to 328 ft) tubular towers will be connected by anchor bolts to a concrete foundation. Turbine foundations will use a pad-and-pier tower mounting system consisting of top and bottom templates. These templates consist of anchor bolts and reinforcing steel bar (rebar); they are placed within the excavated portion of the turbine footing and filled with concrete. The anchor bolts protrude from the concrete pad surface and the turbine base is fastened to these bolts. The excavated portion of the concrete turbine pad ranges from approximately 291 to 737 cu yd depending on soil requirements and turbine size. Turbine pad dimensions generally range from 50 to 65 ft in diameter and typically range in depth from 4 to 6 ft. Approximately 2 to 3 ft of turbine pad remains above grade.

Geotechnical surveys, turbine tower load specifications, and cost considerations will dictate final design parameters of the foundations.

In addition, turbine assembly will require a 40- by 120-ft gravel crane pad extending from the access road to the turbine foundation, which will be graded to a minimum of 1 percent, and an approximate 260- by 260-ft to 335- by 335-ft area for component laydown and rotor assembly centered close to the turbine foundation, which will be graded to a minimum of 5 percent.

10.4.2 TOWER

The towers are conical tubular steel with a hub height of 80 to 100 m (262 to 328 ft). The turbine towers, where the nacelle is mounted, consist of three to four sections manufactured from certified steel plates. Welds are made in automatically controlled power welding machines and are ultrasonically inspected during manufacturing per American National Standards Institute specifications. All surfaces are sandblasted and multi-layer coated for protection against corrosion. Access to the turbine is through a lockable steel door at the base of the tower. Access to the nacelle is provided by a ladder connecting four internal platforms and equipped with a fall arresting safety system.

10.5 POSTCONSTRUCTION CLEAN-UP AND SITE RESTORATION

After construction, temporary construction areas, such as crane pads adjacent to the turbine pad and access road additional width, will be restored. The site will be graded to natural contours and soil will be loosened and seeded if necessary. Once construction is completed, the access roads will be regraded, filled, and dressed as needed. Although few, if any, temporary roads will be constructed with the project, all temporary roads will be decommissioned and restored. Erosion control methods will depend on the contours of the land, as well as requirements of the general contractor. The applicant anticipates that the postconstruction clean-up and site restoration process will last approximately 30 days.

10.6 OPERATION OF PROJECT

Each wind turbine in the Project will communicate directly with the SCADA system for performance monitoring, energy reporting, and trouble-shooting. The SCADA system also provides the overall control of the wind farm.

The Applicant will augment its O&M staff as needed with appropriate contractors to service and maintain the Project.

10.6.1 PROJECT CONTROL, MANAGEMENT, AND SERVICE

In addition to providing wind farm control, the SCADA system offers access to wind turbine generation or production data, availability, and meteorological and communications data, as well as alarm and communication error information. Performance data and parameters for each machine (generator speed, wind speed, power output, etc.) can be viewed, and machine status can be changed. There is also a snapshot facility that collects frames of operating data to aid in diagnostics and problem troubleshooting.

The primary functions of the SCADA are to:

- Control and monitor the wind farm
- Alert operations personnel to wind farm conditions requiring resolution
- Provide a user/operator interface for controlling and monitoring wind turbines
- Collect performance data from turbines
- Monitor field communications
- Provide information on wind turbine performance for operators and maintenance personnel
- Collect data on wind turbine and wind farm maintenance
- Serve as an information archive
- Provide spare parts inventory control
- Generate operations and maintenance reports

General Maintenance Duties

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

- Maintenance on the wind turbines and on the mechanical, electrical power, and communications system
- Performance of all routine inspections
- Maintenance of all oil levels and changing oil filters
- Maintenance of the control systems, all structures associated with the wind farm, access roads, drainage systems, and other facilities necessary for the operation of the wind farm
- Maintaining all O&M field maintenance manuals, service bulletins, revisions, and documentation for the wind farm
- Maintaining all parts, price lists, and computer software
- Maintenance and operation of interconnection facilities
- Providing all labor, services, consumables, and parts required to perform scheduled and unscheduled maintenance on the wind farm, including repair and replacement of parts and removal of failed parts
- Assisting as needed with avian and other wildlife studies
- Management of lubricants, solvents, and other hazardous materials as required by local and/or state regulations
- Maintenance of all appropriate levels of spare parts in order to service equipment
- Obtaining all necessary equipment including the rental of industrial cranes for removal and reinstallation of turbine components
- Hiring, training, and supervising a work force necessary to meet wind farm general maintenance requirements
- Maintaining site security

Maintenance Schedule

Equipment will be monitored by local O&M staff and remotely by the Applicant's operations and power scheduling desk, which is staffed 24 hours a day. When needed during off hours, local personnel will be dispatched to the site by the remote monitoring staff. Performance testing is done during the early months of operation to see that the wind farm is operating within expected parameters.

Project inspection and maintenance is performed on the following intervals:

A. **First Service Inspection.** The first service inspection will take place one to three months after the turbines have been commissioned. At this inspection, particular attention is paid to tower bolt tensioning and equipment lubrication.
B. **Semi-Annual Service Inspection.** Regular service inspections commence six months after the first inspection. The semi-annual inspection consists of lubrication and a test of the turbine trip system.
C. **Annual Service Inspection.** The yearly service inspection consists of a semi-annual inspection plus a full component check. Bolts are checked with a torque wrench. The check covers 10 percent of the bolts. If any bolts are found to be loose, all bolts in that assembly are tightened and the event is logged.
D. **Two Year Service Inspection.** The two year service inspection consists of the annual inspection, plus checking and tightening of electrical terminal connectors.
E. **Five Year Service Inspection.** The five year inspection consists of the annual inspection, an extensive inspection of the wind braking system, checking and testing of oil and grease, balance check, and tightness of terminal connectors.

10.7 COSTS

10.7.1 CAPITAL AND OPERATIONAL COSTS

The total Project-installed capital costs are estimated to be approximately $82 million, including wind turbines, associated electrical and communication systems, and roads. Ongoing operations and maintenance costs and administrative costs are estimated to be approximately $2.5 million per year, including royalties to landowners for wind easement rights and property taxes.

10.7.2 SITE AND DESIGN DEPENDENT COSTS

The overall cost of developing the project will depend primarily on site selection and construction timing. Site-dependent costs will include: the relative ease of access to the individual wind turbine locations, site-specific subsurface conditions that determine foundation design, site access road design and layout, ease of underground work, and the layout of the turbine arrays which affects road and electrical cable cost. Both underground and aboveground cable may be employed to connect turbines, transformers, and the interconnect point. The underground placement of the cables is preferable.

10.8 SCHEDULE

10.8.1 LAND ACQUISITION

The Applicant will be responsible for all land acquisition and will obtain the necessary easements from landowners.

Permits

The Applicant will be responsible for undertaking all required environmental review and will obtain all permits and licenses that are required following issuance of the LWECS Site Permit.

10.8.2 EQUIPMENT PROCUREMENT, MANUFACTURE AND DELIVERY

Black Oak Wind is in the process of procuring turbines for the Project and its other wind farm sites. Turbines will be allocated to the Project after meteorological and economic studies are completed to achieve the best match of turbines and sites. Turbines could arrive on site in second quarter 2011.

10.8.3 CONSTRUCTION

Black Oak Wind personnel will oversee the primary contractors performing Project construction, including roads, wind turbine assembly, electrical, and communications work. The construction will take approximately 12 months to complete; however, depending upon seasonal or weather-related constraints (i.e. minimal work would occur during winter months) it may take less time.

10.8.4 CONSTRUCTION FINANCING

The Applicant will be responsible for financing all predevelopment, development, and construction activities. The Applicant anticipates financing the cost of all predevelopment activities through internal funds. Construction will be financed with internal funds or a combination of internal funds and third-party sources of debt and equity capital.

10.8.5 PERMANENT FINANCING

Permanent financing will be provided with the Applicant's internal funds or a combination of internal funds and third-party sources of debt and equity capital. GWE typically retains a long-term interest in its wind projects.

10.8.6 EXPECTED COMMERCIAL OPERATION DATE

The Applicant anticipates that the Project would begin commercial operation in the third quarter of 2012. The commercial operation date is dependent on the completion of the interconnection, permitting, and other development activities. Black Oak Wind has not yet determined who will ultimately purchase the Project's output; however, once the final determination is made, Black Oak Wind plans to negotiate a PPA with the purchasing utility. Although Black Oak Wind is confident that it will be able to secure one or more PPAs, if it is unable to do so, Black Oak Wind plans to offer the Project's output for sale directly to wholesale customers, including MISO utilities and cooperatives.

10.9 ENERGY PROJECTIONS

10.9.1 PROPOSED ARRAY SPACING FOR WIND TURBINES

Wind turbines will be placed on lands under control of Black Oak Wind, primarily along the higher elevation features of the site to provide the best exposure to wind. The proposed internal array spacing for Project turbines is a minimum of three RD in a crosswind spacing (non-prevailing direction) and a minimum of five RD in a downwind spacing (prevailing direction) with up to 20 percent of the turbines spaced closer. The spacing is dependent upon the selected equipment and the site topography. Black Oak Wind will develop the site to minimize array wake losses and to optimize efficient use of wind and land resources.

10.9.2 BASE ENERGY PROJECTIONS

The Black Oak Wind Project will have a nameplate generation capacity of up to 40 MW and a net capacity factor of between 35 to 40 percent. Black Oak Wind projects an average annual output of between approximately 122,640 and 140,160 MWh. Annual energy production output will depend on final design, site specific features, and the equipment selected. Gross to net calculations take into account, among other factors, energy losses in the gathering system, mechanical availability, array losses, and system losses. An industry-wide estimate of energy losses ranges from 8 to 10 percent of maximum output.

10.10 DECOMMISSIONING AND RESTORATION

The Project decommissioning and restoration plan is in accordance with the requirements of Minn. Rule 7836.0500, subp. 13. At the end of commercial operation, the Project owners will be responsible for removing wind facilities, and removing the turbine foundations to a depth of 4 ft below grade. Project owners reserve the right to extend options instead of decommissioning at the end of the site permit term. These options may include applying for an extension of the site permit, if necessary, and continuing operation of the Project. In this case, a decision may be made on whether to continue operation with existing equipment or to retrofit the turbines and power system with upgrades based on newer technologies.

10.10.1 ANTICIPATED LIFE OF THE PROJECT

The anticipated Project life is approximately 30 years beyond the date of first commercial operation.

10.10.2 COST TO DECOMMISSION

The estimated decommissioning cost in current dollars is expected to be around $58,000 per turbine, including associated facilities. Geronimo's current estimates for the salvage value of the turbines and associated facilities show that the cost to decommission would be fully covered by the sale of scrap from the Project. Black Oak Wind will be responsible for all costs to decommission the Project and associated facilities. Based on estimated costs of decommissioning and the salvage value of decommissioned equipment, the salvage value of the wind farm is expected to exceed the costs of decommissioning, but this will depend upon the prevailing rates for salvage value of the equipment and labor costs. This methodology provides a conservative estimate of the Project's residual value because:

- Long-term average scrap metal prices were used instead of recent years' scrap metal values that are much higher, and
- During the majority of the wind farm's life, the components would be sold as used equipment at significantly higher prices than their underlying scrap metal value.

The salvage value of the turbines and other components ensures that sufficient funds will be available to cover decommissioning and restoration costs.

10.10.3 THE METHOD AND SCHEDULE FOR UPDATING THE COSTS OF DECOMMISSIONING AND RESTORATION.

Because the uncertainty surrounding future decommissioning cost and salvage value increases with time, Black Oak Wind will review and update the cost estimate of decommissioning and restoration for the Project 15 years after Project commissioning. This revised cost estimate of decommissioning and salvage value will then be submitted to the PUC and Stearns County for review and comment.

10.10.4 METHOD OF ENSURING FUNDS WILL BE AVAILABLE FOR DECOMMISSIONING AND RESTORATION.

Beginning in year 15 of the Project's operational life, the Applicant will either create a reserve fund or enter into a surety bond agreement and create an escrow account, or provide for a combination of both a reserve and surety bond, that will ultimately fund decommissioning and site restoration costs after Project operations cease, to the extent that the salvage value does not cover decommissioning costs. The exact amount to be allocated for decommissioning will be determined by a third party study in year 14 that will assess the difference between estimated decommissioning costs and the salvage value.

10.10.5 LIST OF DECOMMISSIONING AND RESTORATION ACTIVITIES

In addition to any requirements under the site permit, each individual land lease requires proper decommissioning of turbines. Decommissioning of the site would include removal of turbines and related facilities. Removal of related facilities would include access roads, equipment, towers, buildings, transformers, and cables or wires. Foundations will be removed to a depth of 4 ft below grade and buried back to grade. Additionally, any disturbed surface would be graded, reseeded, and restored as nearly as possible to its preconstruction condition.

11.0 IDENTIFICATION OF OTHER PERMITS

The potential federal and state permits or approvals that have been identified as being required for the construction and operation of the Project are shown in Table 11-1. A permit from Stearns County is not required since this project is going through the state application process.

The Applicant plans to meet existing county regulations and setbacks regardless of the lack of need for the county permit.

Table 11-1. Permits and Approvals

Regulatory Authority	Statute	Permit/ Approval	Description	Trigger	Fee	Application Timeline	Website
Federal Approvals							
FAA	49 USC 44718	Notice of Proposed Construction (Form 7461-1) Hazard Determination	Notifies FAA of proposed structures that might affect navigable airspace. Form requires proposed markings and lighting. FAA must review possible impacts to air safety and navigation, as well as the potential for adverse effects on radar systems.	All turbines/ structures over 200 feet tall; and/or turbines/ structures fewer than 200 feet tall near an airport.	No fee.	One week to prepare application; submit notice at least 30 days prior to anticipated start of construction or before the application for construction permit is filed.	http://www.faa.gov/
USACE	Clean Water Act	Section 404 Permit	Required for the discharge of dredged or fill material into waters of U.S. Minimal levels of file may be covered under existing General Permits/Letters of Permission	Presence of waters of the U.S.	No fee.	Depending on level of fill and type of permit required (individual vs. Letter of Permission)	http://www.usace.army.mil/
State Approvals							