Firelands Wind, LLC
Case No. 18-1607-EL-BGN

Application Part 1 of 17

Part 1 includes:

- **Letter**
- **Affidavit of Mark Goodwin, President and CEO, Firelands Wind, LLC**
- **Application Narrative**

Date Filed: January 31, 2019

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January 31, 2019

Ms. Tanowa Troupe, Acting Secretary
Ohio Power Siting Board
Docketing Division
180 East Broad Street, 11th Floor
Columbus, Ohio 43215-3797

Re: Application
Case No. 18-1607-EL-BGN
In the Matter of the Application of Firelands Wind, LLC for a Certificate of Environmental Compatibility and Public Need to Construct a Wind-Powered Electric Generation Facility in Huron and Erie Counties, Ohio.

Dear Ms. Troupe:

Accompanying this letter is an application by Firelands Wind, LLC ("Applicant") for a Certificate of Environmental Compatibility and Public Need to Construct a Wind-Powered Electric Generation Facility in Huron and Erie Counties, Ohio ("Facility"). The original application was electronically filed, and the required number of copies both in hard copy and electronic have been provided to the Docketing Division.

Along with this filing, we also provided the Docketing Division copies of the redacted portions of the application, and have filed a Motion for Protective Order and Memorandum in Support requesting protective treatment of the confidential information contained therein.

The Applicant further notes that the information presented in the preapplication notification letter has been revised to reflect that the Facility will be located in Huron and Erie Counties, Ohio. No facilities will be located in Seneca County. Additionally, the Facility will generate up to 297.66 megawatts ("MW"), rather than the 298.2 MW listed in the preapplication letter.

In accordance with Ohio Administrative Code Rule 4906-2-04, we make the following declarations:

Name of the Applicant:

Firelands Wind, LLC
(Apex Clean Energy Holdings, LLC)
122 East Main Street
Bellevue, Ohio 44811

Name and location of the facility:

Emerson Creek Wind Farm
Groton, Oxford, Lyme, Ridgefield, Sherman, Norwich, and Richmond Townships
Huron and Erie Counties, Ohio

Name of authorized representative:

Christine M.T. Pirik
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Notarized Statement:

See attached Affidavit of Mark Goodwin
President and Chief Executive Officer, Firelands Wind, LLC

Respectfully submitted,

/s/ *Christine M.T. Pirik*
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(*Counsel agrees to receive service by email*.)

Attorneys for Firelands Wind, LLC

CMTP:AP
Enclosures

COLUMBUS 59714-18 107560v2

BEFORE THE
OHIO POWER SITING BOARD

In the Matter of the Application of Firelands Wind, LLC for a Certificate of Environmental Compatibility and Public Need to Construct a Wind-Powered Electric Generation Facility in Huron and Erie Counties, Ohio.	)))))	Case No: 18-1607-EL-BGN

AFFIDAVIT OF PRESIDENT AND CEO OF FIRELANDS WIND, LLC

STATE OF VIRGINIA :
: ss
COUNTY OF ALBEMARLE :

I, Mark Goodwin, being duly sworn and cautioned, state that I am over 18 years of age and competent to testify to the matters stated in this affidavit and further state the following based on my personal knowledge:

1. I am the President and Chief Executive Officer of Firelands Wind, LLC, which is a wholly-owned subsidiary of Apex Clean Energy Holdings, Inc.

2. I have reviewed Firelands Wind, LLC's Application for a Certificate to Construct a Wind-Powered Electric Generation Facility in Huron and Erie Counties, Ohio.

3. To the best of my knowledge, information, and belief, the information and materials contained in the above-referenced Application are true and accurate.

4. To the best of my knowledge, information, and belief, the above-referenced Application is complete.

Mark Goodwin, President and CEO

Sworn to before and signed in my presence this 29 day of January 2019.

Notary Public

COLUMBUS 59714-18 107409v2

KRISTINA GREGORIO PARKER
NOTARY PUBLIC
REGISTRATION # 7712199
COMMONWEALTH OF VIRGINIA
MY COMMISSION EXPIRES
MARCH 31, 2021

APPLICATION

TO THE

OHIO POWER SITING BOARD

FOR A

CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY & PUBLIC NEED

FOR THE

EMERSON CREEK WIND FARM

Townships of Groton, Oxford, Lyme, Ridgefield, Sherman, Norwich, and Richmond

Huron and Erie Counties, Ohio

Case No. 18-1607-EL-BGN

January 2019

Applicant:
Firelands Wind LLC, an indirectly wholly-owned subsidiary of Apex Clean Energy Holdings, LLC (Apex)
122 East Main Street
Bellevue, Ohio 44811
Contact: John Arehart, Project Manager
434.220.6122

Prepared By:
Environmental Design and Research, Landscape Architecture, Engineering, & Environmental Services D.P.C. (EDR)
217 Montgomery Street, Suite 1000
Syracuse, New York 13202
Contact: Benjamin Brazell, Principal
315.471.0688

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EXHIBITS

COMMONLY USED ACRONYMS and ABBREVIATIONS

amsl	Above Mean Sea Level
ASTM	American Society for Testing and Materials
BBS	North American Breeding Bird Survey
dBA	Decibels, A-weighted
EDR	Environmental Design & Research, Landscape Architecture, Engineering, & Environmental Services
EPA	Environmental Protection Agency
ESRI	Environmental Systems Research Institute
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Administration
GIS	Geographic Information System
Hz	Hertz
IEC	International Electrotechnical Commission
kg	Kilogram
kV	Kilovolt
kW	Kilowatt
MW	Megawatts
NAAQS	National Ambient Air Quality Standards
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NREL	National Renewable Energy Laboratory
NTIA	National Telecommunications and Information Administration
NSPS	New Source Performance Standard
O&M	Operations and Maintenance
OAC	Ohio Administrative Code
ODNR	Ohio Department of Natural Resources
ODOT	Ohio Department of Transportation
OPSB	Ohio Power Siting Board
ORAM	Ohio Rapid Assessment Method
ORC	Ohio Revised Code
PJM	PJM Interconnection, LLC
RUMA	Road Use Maintenance Agreement
SPCC	Spill Prevention Control and Countermeasure Plan
SR	State Route
SWP3	Stormwater Pollution Prevention Plan
SWPA	Source Water Protection Area
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VIA	Visual Impact Assessment
WOTUS	Waters of the U.S.

4906-4-01 PURPOSE AND SCOPE

(A) REQUIREMENTS FOR FILING CERTIFICATE APPLICATIONS

Firelands Wind, LLC (Applicant), an indirectly wholly-owned subsidiary of Apex Clean Energy Holdings, LLC (Apex), is proposing to construct the Emerson Creek Wind Farm, a wind-powered electric generation facility located in Huron and Erie Counties (Facility). The materials contained herein and attached hereto constitute the Applicant's submittal (Application) for a Certificate of Environmental Compatibility and Public Need (Certificate), prepared in compliance with Section 4906.06 of the Ohio Revised Code (ORC). This Application was prepared in accordance with Chapters 4906-4-01 through 4906-4-09 of the Ohio Administrative Code (OAC), Certificate Applications for Electric Generation Facilities.

This Application has been prepared by the Applicant, with support from Environmental Design & Research, Landscape Architecture, Engineering & Environmental Services, D.P.C. (EDR) of Syracuse, New York. EDR has nearly 20 years of experience with siting and permitting wind-powered electric generation facilities, including more than 10 years of experience with wind energy facilities in Ohio.

As used in this Application, specific terms will have the meanings set forth below:

- Facility – the "Facility" or "wind-powered electric generation facility" or "wind-energy facility" includes all the turbines, collection lines, access roads, any associated substations, and all other associated equipment. All of the components for the Facility are located in Huron and Erie Counties.
- Project Area – the "Project Area" consists of the location of the Facility components, which are in Huron and Erie Counties, as well as any associated setbacks, which extend into a small portion of the far eastern edge of Seneca County.

(B) WAIVERS

The Ohio Power Siting Board (OPSB) may, upon an application or motion filed by a party, waive any requirement of this chapter other than a requirement mandated by statute. The Applicant is not requesting to waive any requirements.

4906-4-02 PROJECT SUMMARY AND APPLICANT INFORMATION

(A) PROJECT SUMMARY AND FACILITY OVERVIEW

The Applicant is proposing to construct the Facility in rural Erie and Huron Counties. The Facility will consist of up to 87 wind turbine generators, along with access roads, electric collection cables, a Facility substation, a laydown yard for construction staging, an operations and maintenance (O&M) facility, and up to three meteorological towers. The energy generated at the Facility will deliver power to a single point of interconnection (POI) on the existing Beaver – Davis Besse 345-kilovolt (kV) transmission line.

(1) General Purpose of the Facility

The general purpose of the Facility is to produce wind-powered electricity that will maximize energy production from Project Area wind resources in order to deliver clean, renewable electricity to the Ohio bulk power transmission system to serve the needs of electric utilities and their customers. The electricity generated by the Facility will be transferred to the transmission grid operated by PJM Interconnection, LLC (PJM) for sale at wholesale or under a power purchase agreement.

(2) Description of the Facility

The Facility is located within approximately 32,000 acres of leased land in Groton and Oxford Townships (Erie County) and Lyme, Norwich, Richmond, Ridgefield, and Sherman Townships (Huron County). The Facility presented herein consists of up to 87 wind turbine generators[1], each with a nameplate capacity rating of 4.2 to 4.5 megawatts (MW), depending on the final turbine model selected. The total generating capacity of the Facility will not exceed 297.66 MW. Therefore, the number of turbines to be constructed will range between 66 and 71, depending on the model of turbine selected (i.e., if a 4.2 MW turbine is selected, it is expected that up to 71 turbines will be constructed; if a 4.5 MW turbine is selected, it is expected that up to 66 turbines will be constructed). The Facility is expected to operate with an average annual capacity factor of 32.5% to 36.5%, generating a total of approximately 847,000 to 952,000 megawatt-hours (MWh) of electricity each year, depending on the final turbine model selected for the Facility. Figure 03-1 and 03-2 depict the proposed Facility, on topographic mapping and aerial imagery base mapping, respectively. A detailed description of the Facility, including each Facility component, can be found in Section 4906-4-03(B) of this Application.

[1] Although this Application evaluates 87 proposed turbine sites, the total generating capacity of the Facility will not exceed 297.66 MW. Therefore, it is expected that only 66-71 turbines will actually be constructed, depending on the model of turbine selected. However, to allow for flexibility on final site selection (e.g., selecting one turbine site over another based on additional site-specific wind data and/or if a cultural resource is discovered upon excavation and/or if a geotechnical issue is discovered during borings, etc.), the Applicant seeks approval for 87 turbine sites.

(3) Description of the Suitability of the Site for the Proposed Facility

The development of wind power facilities is constrained in that projects must be located in areas suitable for generating wind-powered electricity and delivering it to the Ohio bulk power transmission system. In other words, to be considered suitable, a potential site must have adequate wind resource, be located proximate to electric transmission lines with available capacity, and be situated in locations which can accommodate setback, land use, and environmental considerations. Once a project site has been selected (macro-siting), there is some ability to alter turbine and other component locations on the properties that are participating in the project (micro-siting) within the confines of the private agreements that the Applicant has obtained. The micro-siting of project components within a given project site is governed by site-specific factors, including land use constraints, sound constraints, wind resource constraints, wetland constraints, agricultural constraints, and landowner considerations.

The primary factors evaluated to determine the suitability of the Project Area for the Facility are described briefly below:

- Adequate wind resource – the Applicant determined through initial screening and on-site measurements that the Project Area has an adequate wind resource (see Exhibit A).
- Adequate access to the bulk power transmission system – from the standpoints of proximity and ability of the system to accommodate the interconnection, and to accept and transmit the power from the Facility at a reasonable cost, the Applicant determined that the existing transmission infrastructure was adequately accessible (see Exhibits B and C).
- Willing land lease participants and host communities – the Applicant has obtained lease agreements, and the Applicant has engaged local and state stakeholders and the local community to educate and share information. A public information meeting was held near the Project Area on November 15, 2018 to share information and gather feedback. Additional information about the Applicant's public interaction is presented in Section 4906-4-06(F)(1) of this Application.
- Site accessibility – the Project Area is served by an existing network of public roads (see Exhibit D).
- Appropriate geotechnical conditions – significant geotechnical constraints for the planned construction of the Facility are not anticipated (see Exhibit E).
- Limited population/residential development – the Project Area and the surrounding communities have a low population density as compared to statewide estimates. Areas with limited residential development generally have more available space for siting wind turbines once constraints related to setbacks, sound levels, and shadow flicker are accounted for. See Section 4906-4-08(C)(3)(e) and Exhibit F of this Application for additional detail on demographics in the vicinity of the Project

Area. For additional information on sound, see Section 4906-4-08(A)(3) and Exhibit G. For additional information on shadow flicker, see Section 4906-4-08(A)(9) and Exhibit H.

- Compatible land use – the Project Area is predominantly rural agricultural, which is compatible with the proposed Facility. See Section 4906-4-08(C) of this Application.
- Limited sensitive ecological resources – the proposed Facility is not expected to result in significant adverse impacts to ecological resources. See Section 4906-4-8(B) of this Application, and Exhibits R,S, T, U, V, W, X, Y, and Z).
- Cultural resources – the proposed Facility is not expected to physically impact any identified existing cultural resources. For additional information on cultural resources, see Section 4906-4-08(D) and Exhibit I of this Application.

Additional information about the site selection process and the suitability of the Project Area for the Facility can be found in Section 4906-4-04 of this Application.

(4) Project Schedule

Acquisition of land and land rights began in March 2009 and will continue through February 2020. A public information meeting was held on November 15, 2018 to facilitate public interaction with the Applicant and expert consultants, and included information on visual/aesthetics, ecological studies, and wind turbine technology. This Certificate Application was officially submitted in January 2019, and it is anticipated that the Certificate will be issued in the third quarter of 2019. Final designs will be completed in the fourth quarter of 2019. Construction is anticipated to begin in the first quarter of 2020 and be completed within 12 months, at which point the Facility will be placed in service. Additional information about the project schedule can be found in Section 4906-4-03(C)(1) of this Application.

(B) APPLICANT INFORMATION

(1) Plans for Future Generation Capacity at the Site

Although the Facility presented herein includes up to 87 turbine sites, depending on the turbine model selected, the number of turbines actually constructed may be as low as 66. The Facility will have the capacity to generate up to 297.66 MW of emissions-free electricity that will collect to an electric substation in Oxford Township, Erie County. The PJM queue position associated with the Facility has a maximum capacity of 297.66 MW. Therefore, although Apex is developing other wind generation projects in Ohio, at this time there are no future plans with respect to this point of interconnection or for additional turbines at this site. Other Apex projects under development in the region include Republic Wind, located in Seneca County.

(2) Description of Applicant and Operator

Firelands Wind LLC, an indirectly wholly-owned subsidiary of Apex, will both construct and operate the proposed Facility. Founded in 2009 by a team of successful energy executives, Apex is an independent renewable energy company focused on building utility-scale generation facilities. Apex is building one of the nation's largest, most diversified portfolios of renewable energy resources, capable of producing over 13,000 MW of clean energy. Apex already has a strong track record of success, with wind and solar energy projects successfully operating in Illinois, Oklahoma, Texas, and Colorado.

In 2000, prior to founding Apex, the company's leadership team created Greenlight Energy, Inc. This independent wind energy company was responsible for developing $750 million of facilities now in commercial operation, with a combined generating capacity of 450 MW. Following the sale of Greenlight Energy, Inc. to BP Alternative Energy in 2006, the leadership team reinvested in the clean energy industry through a new venture, Greenlight Energy Resources. In 2006, Greenlight Energy Resources founded Columbia Power Technologies (Columbia Power) and Axio Power in 2007. Columbia Power, a leader in direct-drive wave energy system, is commercializing a patented, next-generation solution that delivers survivability with a competitive cost of energy and a low environmental and stakeholder impact. Axio Power was a successful developer of utility-scale solar photovoltaic (PV) facilities, assembling a large portfolio of projects in the United States (U.S.) and Canada. In just four years, the company had secured power sales contracts for over 100 MW of solar capacity. These projects were subsequently financed and built by SunEdison, which acquired Axio Power in late 2011.

4906-4-03 PROJECT DESCRIPTION AND SCHEDULE

(A) PROJECT AREA DESCRIPTION

The following sub-sections provide information on the Project Area's geography, topography, population centers, major industries, and landmarks.

(1) Geography and Topography Map

Figure 03-1 depicts the geography and topography of the Project Area, and the surrounding area within a 2-mile radius. This mapping was developed from Environmental Systems Research Institute's (ESRI's) "World Topographic Maps" Map Service, which provides seamless topographic maps compiled from numerous sources, including the U.S. Geological Survey (USGS). The mapping used in Figure 03-1 consists of digital versions of the Attica, Bellevue, Centeron, Clyde, Fireside, Flat Rock, Kimball, Monroeville, and Willard quadrangles. Among other information, Figure 03-1 shows the following features:

(a) *The Proposed Facility*
(b) *Population Centers and Administrative Boundaries*
(c) *Transportation Routes and Gas and Electric Transmission Corridors*
(d) *Named Rivers, Streams, Lakes, and Reservoirs*
(e) *Major Institutions, Parks, and Recreation Areas*

(2) Area of All Owned and Leased Properties

Of the approximately 41,000-acre Project Area, approximately 1,000 parcels totaling approximately 32,000 acres are owned and/or under lease by the Applicant for construction and operation of the proposed Facility. However, the Facility footprint will occupy a much smaller area. Table 03-1 presents the estimated area of disturbance for each Facility component, based on the Applicant's experience with the construction and operation of other wind power facilities. The construction impacts presented throughout this Application were calculated using these assumptions.

Table 03-1. Impact Assumptions

Facility Components	Typical Area of Vegetation Clearing	Area of Total Soil Disturbance (temporary and permanent)	Area of Permanent (fill/structures) Disturbance
Wind Turbines and Workspaces[1]	300-foot radius per turbine	300-foot radius per turbine	0.03 acre per turbine
Access Roads[1]	36 feet wide per linear foot of road	36 feet wide per linear foot of road	16 feet wide per linear foot of road
Buried Collection Line[1,2]	50 feet wide per linear foot of cable	25 feet wide per linear foot of cable	none
O&M Building (and associated storage yard)	5 acres	5 acres	5 acres
Laydown Yard	13 acres	13 acres	none
Substation	6.1 acres	6.1 acres	6.1 acres
Meteorological Towers[3]	1 acre per tower	0.06 acre per tower	0.06 acre per tower

[1] At this time, the Applicant is planning to shift some areas of clearing and soil disturbance associated with the temporary workspaces away from sensitive environmental features (e.g., wetlands) to avoid/minimize impacts and ensure impacts to waters of the U.S. can be authorized under Nationwide Permit 12.

[2] These values represent averages for clearing and soil disturbance. Some sections of buried electrical cable will disturb a corridor wider than the 50 feet of vegetation clearing and 25 feet of disturbance shown above, because of the number of collection circuits that need to convene near the collection substation. However, in many other locations the disturbance will be less than 50/25 feet, resulting in overall averages of 50/25 feet across the Project Area.

[3] As described below in Section 4906-4-03(B)(2)(h), the Facility will require up to three permanent meteorological towers. While the impact assumptions in Table 03-1 are per tower, all impacts presented in this Application account for three meteorological towers.

Approximately 1,474.0 acres of land will be disturbed during construction. Much of this disturbance will be temporary, and subject to restoration activities at the end of Facility construction. Following restoration, the permanent operating footprint of the Facility will be approximately 84.5 acres of built facilities, or approximately 0.3% of the total leased lands within the Project Area.

(B) DETAILED DESCRIPTION OF PROPOSED FACILITY

(1) Description Details for the Facility

(a) *Type and Characteristics of Turbine*

Each wind turbine consists of three major components: the tower, the nacelle, and the rotor. The nacelle sits atop the tower, and the rotor hub is mounted to the front of the nacelle. "Hub height" is the height of the center of the rotor, as measured from the base of the tower (excluding the subsurface foundation), while total turbine height is the height of the entire turbine, as measured from the tower base to the tip of the highest blade when rotated to the highest position. Facility construction is not scheduled to begin

until 2020 and due to market factors such as availability and cost, a specific turbine model has not yet been selected for the Facility. However, turbine models that have been determined to be suitable for this site include the Vestas V150 (4.2 MW), Siemens Gamesa SG145 (4.5 MW), and the Nordex N149 (4.5 MW) at two different hub heights.

(b) *Turbine Dimensions*

Table 03-2 presents the dimensions in feet and meters for each of the turbine models under consideration.

Table 03-2. Approximate Turbine Dimensions by Model

Turbine Model	Rated Power	Hub Height	Rotor Diameter	Maximum Total Height
Vestas V150	4.2 MW	105 meters (344 feet)	150 meters (492 feet)	180 meters (591 feet)
Siemens Gamesa SG145	4.5 MW	107.5 meters (353 feet)	145 meters (476 feet)	180 meters (591 feet)
Nordex N149	4.5 MW	109 meters (358 feet)	149 meters (489 feet)	183.5 meters (602 feet)
Nordex N149	4.5 MW	125 meters (410 feet)	149 meters (489 feet)	199.5 meters (655 feet)

(c) *Fuel Quantity and Quality*

Wind turbines generate electricity without burning fuels. Therefore, this section is not applicable to the Facility.

(d) *List of Pollutants Emissions and Quantities*

Wind turbines generate clean, emission-free electricity without releasing airborne pollutants. Therefore, this section is not applicable to the Facility.

(e) *Water Requirement, Source, and Discharge Information*

Wind turbines generate electricity without the use of water. Therefore, no water is treated or discharged, and this section is not applicable to the Facility.

(2) Description of Major Equipment

As previously indicated, the Facility evaluated herein consists of up to 87 wind turbine sites. In addition to the turbines, the Facility will include up to approximately 36 miles of access roads, up to approximately 194 circuit

miles[2] of buried 34.5 kV electrical collection cable, a collection substation, a temporary laydown yard for construction staging, an O&M building, and up to three permanent meteorological towers. Additional information about each of these Facility components is presented below.

(a) *Wind Turbines, Including Towers and Foundations*

Once the access roads are complete for a particular group of turbine sites, construction of the respective turbine foundation will commence on that completed access road section. Foundation construction occurs in several stages, as dictated by the type of foundation to be used. These stages could include hole excavation, outer form setting, rebar and bolt cage assembly, casting and finishing of the concrete, removal of the forms, backfilling and compacting, and site restoration. Excavation and foundation construction will be conducted in a manner that will minimize the size and duration of excavated areas required to install foundations.

Initial activity at each tower site will involve removing vegetative cover as necessary and grading topsoil within a 300-foot radius workspace around each tower (the exact placement of this workspace can be adjusted to avoid sensitive ecological resources). In agricultural land, the topsoil within a 300-foot radius of each tower will be stripped and stockpiled. An excavator will then be used to dig a foundation hole. Excavated subsoil and rock will be segregated from topsoil. Bedrock conditions vary, with shallower karst formations in the western portion of the Facility area, and much deeper bedrock in the eastern portion of the Facility area (Hull, 2019b). However, if bedrock is encountered during Facility construction, it is anticipated to be rippable (i.e., excavated using mechanical means). This assumption will be confirmed by a detailed geotechnical exploration at each turbine site, to be conducted prior to Facility construction. If the bedrock is not rippable, it will be excavated by pneumatic jacking, hydraulic fracturing, or blasting. It is unlikely that blasting would be necessary; however, if it is required, blasting would be conducted in accordance with all applicable laws and regulations. If necessary, dewatering of foundation holes will involve pumping the water to a discharge point, which will include measures to slow water velocities and trap any suspended sediment. Dewatering activities will not result in the direct discharge of water into any streams or wetlands.

Upon completion of the detailed geotechnical exploration, suitable foundation systems will be designed. Two possible types are currently under consideration: spread footing foundations and rock anchored pile-supported foundations. The excavation area around and over the foundation will be backfilled with

[2] In many areas, multiple circuits will be buried in parallel; in such cases, each circuit was summed separately to arrive at the total of 194 circuit miles. The linear distance where one or more circuits will be installed consists of approximately 120 miles.

material excavated from on-site. The top of the foundation will be a nominal 18-foot diameter pedestal that typically extends 6 to 8 inches above grade and is surrounded by a 10-foot wide gravel ring. At the base of each tower, an area approximately 120 feet by 60 feet will be developed as a level, compacted stone crane pad for use during construction.

The Applicant has not made a final determination of the wind turbine model or manufacturer. Included in Table 03-2 are dimensions of the Vestas V150, Siemens Gamesa SG145, and Nordex N149, which represent the range of turbine types anticipated to be used for the Facility. These models represent the tallest class of turbines under consideration at the time of this Application. Because Facility construction is not scheduled to begin until the first quarter of 2020, market factors such as availability and cost will affect this determination and could dictate use of an alternate turbine. However, any turbine ultimately selected will be essentially equivalent to those referenced above in terms of its dimensions, appearance, and electrical output. Each wind turbine results in an operational footprint of approximately 0.03 acre (see Table 03-1 above) and consists of three major components: the tower sections, the nacelle, and the rotor with blades. The hub height will be a maximum of 410 feet (125 meters). The nacelle sits atop the tower, and the rotor hub is mounted to the front of the nacelle. The rotor diameter will be a maximum of 492 feet (150 meters). The maximum total turbine height (i.e., the height at the highest blade tip position) of 655 feet (199.5 meters) is associated with the Nordex N149 model. Descriptions of each of the turbine components are provided below.

Tower: The tubular towers used for megawatt-scale turbines are tubular conical steel structures manufactured in multiple sections. Each tower will have an access door in the base section and internal lighting, along with an internal ladder and/or mechanical lifts to access the nacelle. The towers will be painted white or off-white in accordance with Federal Aviation Administration (FAA) regulations designed to make the structures more visible to aircraft when viewed from above, as light colors contrast sharply against the dark-colored ground. This also has the benefit of reducing visibility from ground vantage points, by making them less visible against the pale background of the sky.

Nacelle: The main mechanical components of the wind turbine are housed in the nacelle. These components include the drive train, gearbox, and generator. The nacelle is housed in a steel reinforced fiberglass shell that protects internal machinery from the environment and dampens noise emissions. The housing is designed to allow for adequate ventilation to cool internal machinery. The nacelle is equipped with an external anemometer and a wind vane that signals wind speed and

direction information to an electronic controller. Attached to the top of the nacelles, per specifications of the FAA, will be one or two medium intensity aviation warning lights[3]. These are anticipated to be flashing red lights (L-864) that operate only at night. The nacelle is mounted on a yaw ring bearing that allows it to rotate ("yaw") into the wind to maximize wind capture and energy production.

Rotor: A rotor assembly is mounted to the nacelle to operate upwind of the tower. Each rotor consists of three composite blades that will be up to 246 feet (75 meters) in length, with a maximum rotor diameter of up to 492 feet (150 meters). The rotor attaches to the drive train at the front of the nacelle. Hydraulic motors within the rotor hub feather each blade according to wind conditions, which enables the turbine to operate efficiently at varying wind speeds. The rotor can spin at varying speeds to operate more efficiently. Depending on the turbine model selected, the wind turbines will begin generating energy at wind speeds as low as 3 meters per second (m/s) [6.7 miles per hour (mph)] and cut out at maximum wind speeds of 22.5 m/s (50.3 mph). Rotor speed will be in the range of 6.9 to 13.9 revolutions per minute.

Beyond the tower, nacelle, and rotor blades, other smaller wind turbine components include hubs (center portion of the rotor assembly), cabling, control panels, and internal facilities such as lighting, ladders, etc. All turbine components will be delivered to the Facility on transport trucks, with the main components typically off-loaded at the individual turbine sites. However, if required due to schedule or weather issues, some turbine components may be delivered to the laydown yard. Turbine erection is performed in multiple stages including setting of the bus cabinet and ground control panels on the foundation; erection of the tower sections; erection of the nacelle; assembly and erection of the rotor; connection and termination of the internal cables; and inspection and testing of the electrical system prior to energization.

Turbine assembly and erection involves mainly the use of large track-mounted cranes, smaller rough terrain cranes, boom trucks, and rough terrain fork-lifts for loading and off-loading materials. The tower sections, rotor components, and nacelle for each turbine will be delivered to each site by specialized trailers and unloaded by crane. A large erection crane will set the tower segments on the foundation, place the nacelle on top of the tower and, following ground assembly, place the rotor onto the nacelle. The erection crane(s) will move from one tower to another along Facility access roads or temporary crane paths.

[3] The exact lighting configuration is to be determined and will depend on the final turbine model selected. The Facility will fully comply with all relevant FAA obstruction lighting requirements.

(b) *Fuel, Waste, Water, and Other Storage Facilities*

Fuel tanks will be stored in the laydown yard during Facility construction. In addition, the O&M building will store lubricants and other fluids used in turbine maintenance. However, wind turbines generate electricity without the use of fuel or water, and without generating waste. As such, the proposed Facility does not include any significant facilities for fuel, waste, water, or other storage.

(c) *Fuel, Waste, Water, and Other Processing Facilities*

Wind turbines generate electricity without the use of fuel or water, and without generating waste. Therefore, the proposed Facility does not include any fuel, waste, water, or other processing facilities.

(d) *Water Supply, Effluent, and Sewage Lines*

The O&M facilities will use water and generate sewage and wastewater comparable to a typical small business office. Waterborne wastes will be disposed of through use of a septic system, and if necessary, the Applicant will obtain a permit to install on-site sewage treatment under OAC Rule 3745-42. No other Facility components will use measurable quantities of water or discharge measurable quantities of wastewater.

(e) *Associated Electric Transmission and Distribution Lines and Gas Pipelines*

The generator lead line and POI substation will be permitted separately, and hence are not addressed in detail within this Application. There are no electric distribution lines or gas pipelines associated with the proposed Facility.

(f) *Electric Collection Lines*

The wind turbine transformer will raise the voltage of electricity produced by the turbine generator up to the 34.5 kV voltage level of the collection system. From the transformer, cables will join the collection circuit and turbine communication cables to form the electrical collection system. Collection cables will be buried to a minimum depth of 36 inches below the surface. The location of the proposed collection system is depicted on Figure 03-2. This 34.5 kV collection system will connect the individual turbines to the collection substation. The total length of the buried 34.5 kV collection lines carrying electricity to the project substation will be up to 194 circuit miles[4], buried on land leased by the Applicant, and to a lesser

[4] In many areas, multiple circuits will be buried in parallel. The linear distance where one or more circuits will be installed consists of approximately 120 miles. This mileage total includes all optionality routes for 87 permitted turbines. More likely, the circuit mileage will range between 105 and 115 miles for between 66 and 71 turbines.

extent, in public road rights-of-way (ROW) (i.e., when crossing public roads between two participating parcels).

With each circuit, collection lines generally run between turbines and back to the substation following the straightest, most direct route. Where buried cable is proposed to cross active agricultural fields, an attempt will be made to determine the location of any subsurface drainage tiles through consultation with the landowner and/or review of public records. Any drainage tiles damaged during construction will immediately be identified, documented, and repaired. It is anticipated that a local drain tile contractor or the farmer tending the land will be involved in repair activities.

Direct burial methods through the use of a trencher will be used during the installation of underground collection lines. The trencher uses a large blade or "saw" to excavate an open trench. A trench, generally 18 to 36 inches wide, is opened with a sidecast area immediately adjacent to the trench. Direct burial installs the cable between 36 inches and 48 inches deep and requires only minor clearing and surface disturbance. An approximately 50-foot wide corridor will be cleared of vegetation, as need for installation machinery and access, while the trenching and associated soils disturbance will occur within an approximately 25-foot wide corridor. Some sections of the buried collection line will disturb a somewhat wider corridor, because of the number of collection circuits that need to convene near the collection substation. However, in many other locations the disturbance will be less than the 50- and 25-foot disturbance assumptions, resulting in approximate averages of 50 and 25 feet across the Project Area.

Installation of collection lines in an open trench will be used in areas where the previously described direct burial methods are not practicable. Areas appropriate for open trench installation will be determined at the time of construction and may include areas with unstable slopes, excessive unconsolidated rock, standing or flowing water, and/or suspected drainage tiles. Open trench installation is generally performed with a backhoe or trackhoe and generally results in a disturbed trench approximately 18 inches wide and a maximum of 48 inches deep. However, the overall temporary footprint of vegetation and soil disturbance will average 50 feet and 25 feet in width[5], respectively, due to machinery dimensions and backfill/spoil pile placement during installation. In agricultural areas, all topsoil within the work area will be stripped and segregated from excavated subsoil. Replacement of spoil material will occur immediately after installation of the buried collection lines. Subgrade soil will be replaced around the cable, and topsoil

[5] Some sections of buried electrical cable will involve clearing vegetation in a swath wider than 50 feet and disturbing soil in a swath wider than 25 feet, due to the number of collection strings that need to convene (run parallel) near the collection substation. However, in many other locations the disturbance will be substantially less than 50 and 25 feet, respectively, resulting in overall average disturbance widths of 50 and 25 feet across the Facility site.

will be replaced at the surface. Any damaged tile lines will be repaired, and all areas adjacent to the open trench will be restored to original grades and surface condition. Restoration of these areas will be completed through seeding and mulching of all exposed soils, or by other appropriate farming methods in active agricultural fields.

(g) *Substations, Switching Substations, and Transformers*

The collection substation will be located along Sand Hill Road in Lyme Township in Huron County. The substation will step up voltage from 34.5 kV to 345 kV, so it can be delivered to the POI substation via a new overhead 345 kV transmission line (to be permitted separately). The substation will include dead-end structures, bus work, two main power transformers, circuit breakers, air break switches, metering units, relaying, communication equipment, and a control house. The transformers will be placed upon a slab foundation with a transformer oil containment reservoir, which may utilize either an oil/water separator with a sump pit or filter sock system with a pump. The collection substation will be approximately 800 by 340 feet in size and enclosed by a chain link fence. It will be accessed via a gravel-surfaced driveway. The proposed location of the collection substation is shown on Figure 03-2.

(h) *Temporary and Permanent Meteorological Towers*

Up to three permanent meteorological wind measurement towers will be installed to collect wind data and support performance testing of the Facility. These towers will be galvanized steel structures equipped with wind velocity directional measuring instruments at three different elevations and a red aviation warning lighting mounted at the top. Each permanent meteorological tower will be self-supporting (i.e., they will be non-guyed, free standing structures), constructed to the hub height of the turbine model ultimately selected for the Facility (i.e., 105 to 125 meters [344 to 410 feet]). The towers will be installed on a gravel substrate within a 50-foot x 50-foot fence line. Alternatively, the Applicant may elect to erect two temporary meteorological towers, which would be removed after 1-2 years, and only one permanent met tower. The locations for the permanent and/or temporary meteorological towers are depicted on Figure 03-2; all three sites are in cultivated agricultural land. If temporary meteorological towers are installed, these structures would also be hub height, but are likely to be guyed.

(i) *Transportation Facilities, Access Roads, and Crane Paths*

The Facility will require the construction of new or improved roads to provide access to the proposed turbines. The proposed location of Facility access roads is shown on Figure 03-2. The total length of private access roads required to service all proposed wind turbine locations is approximately 36 miles. The roads will be gravel-surfaced and typically 16 feet in finished width.

Wherever feasible, existing roads and farm drives will be upgraded for use as Facility access roads, in order to minimize impacts to active agricultural areas, natural communities, and wetland/stream areas. Where an existing road or farm drive is unavailable or unsuitable, new gravel-surfaced access roads will be constructed, also in locations selected to minimize potential impacts. Road construction will involve topsoil stripping and grubbing of stumps, as necessary. Stripped topsoil will be stockpiled along the road corridor for use in site restoration. Any grubbed stumps will be removed, chipped, or buried. Following removal of topsoil, subsoil will be graded, compacted, and surfaced with gravel or crushed stone (depth to be determined on a case-case basis). The roads will either be cement stabilized or a geotextile fabric or grid will be installed beneath the road surface, as necessary, to provide additional support. To the extent practicable, local sources will be used to obtain gravel and other construction materials that may be needed (e.g., sand) in support of Facility construction.

The typical finished access road will be no greater than 16 feet in width with occasional wider pull-offs to accommodate passing vehicles, and temporary earthen shoulders on either side to accommodate crane traffic. A total of 14 streams will be crossed by access roads. Each crossing will utilize a standard culvert with rock fill to create stable road crossing. The Applicant will design these crossing to allow adequate flow and not affect the flow of water within the Project Area. Where access roads are adjacent to (or cross) wetlands, streams, or drainage ditches/swales, appropriate sediment and erosion control measures (e.g., silt fence) will be installed.

During construction, access road installation and use could result in temporary soil disturbance of a maximum width of 36 feet. In agricultural areas, topsoil will be stripped and wind-rowed along the access road to prevent construction vehicles from driving over undisturbed soil and adjacent fields. Once construction is complete, temporarily disturbed areas will be restored, including removal of excess road material and rocks greater than 12 inches, and returned to their approximate preconstruction contours.

(j) *Construction Laydown Areas*

Facility construction will require the development of a temporary laydown yard for construction staging, to be located on leased private lands (see Figure 03-2). The laydown yard will accommodate material and equipment storage, parking for construction workers, and construction management trailers. The area of the laydown yard will not exceed approximately 13 acres. No lighting of the laydown area is currently proposed, but may be added as needed (e.g., to resolve safety issues due to poor visibility [i.e.,

collision risk] or if other problems such as vandalism arise). The proposed location of the temporary laydown yard is shown on Figure 03-2.

(k) *Security, Operations, and Maintenance Facilities or Buildings*

An O&M building and associated storage yard will be required to house operations personnel, equipment, and materials, and to provide operations staff parking. The area of the O&M facility will not exceed approximately 5 acres. The proposed location of the O&M facility is shown on Figure 03-2.

(l) *Other Pertinent Installations*

There are no additional Facility components beyond those already described in the previous subsections of 4906-4-03(B)(2).

(3) Need for New Transmission Lines

The Applicant will construct approximately 9 miles of new 345 kV overhead transmission line, to deliver electricity from the project collection substation to the new POI substation, adjacent to the existing Beaver-Davis Besse 345 kV transmission line. The transmission line will be located within leased agricultural land and will be permitted separately, concurrently with the POI substation.

(4) Project Area Map

The proposed layout of all Facility components is illustrated on Figure 03-2. Prepared at a 1:12,000 scale, Figure 03-2 illustrates the Project Area, along with the following information:

(a) *Aerial Photograph*

This mapping was developed using 2017 aerial photographs from the U.S. Department of Agriculture (USDA) National Agricultural Imagery Program (NAIP) and ESRI's StreetMap North America data.

(b) *The Proposed Facility*

This mapping illustrates Facility components, as discussed above in Section 4906-4-03(B)(2).

(c) *Road Names*

(d) *Property Lines*

(C) DETAILED PROJECT SCHEDULE

(1) Schedule

A Gantt-style chart is presented below, illustrating major activities and milestones including:

(a) *Acquisition of Land and Land Rights*

Acquisition of land and land rights began in March 2009 and may continue through February 2020.

(b) *Wildlife Surveys/Studies*

Wildlife surveys/studies began in February 2009 and continued through October 2018.

(c) *Receipt of Grid Interconnection Studies*

Grid interconnection studies were initiated in 2017. The Feasibility Study was completed in August 2017. The Impact Study was completed in November 2018. The Facilities Study is expected to be completed in early April 2019. The Interconnection Service Agreement (ISA) is expected to be executed in June 2019.

(d) *Preparation of the Certificate Application*

Preparation of the Application occurred in 2018 and early 2019, with data and analyses added as various studies were completed. A public information meeting was held November 15, 2018.

(e) *Submittal of the Application for Certificate*

This Application was officially submitted in January 2019.

(f) *Issuance of the Certificate*

It is anticipated that the Certificate will be issued in the third quarter of 2019.

(g) *Preparation of the Final Design*

It is expected that final designs and detailed construction drawings will be completed in the fourth quarter of 2019.

(h) *Construction of the Facility*

Construction is anticipated to begin in the first quarter of 2020 and be completed within 12 months.

(i) *Placement of the Facility in Service*

The Facility will be placed in service upon completion of construction, anticipated for the fourth quarter of 2020.

(2) Construction Sequence

Project construction is anticipated to proceed in the following sequence, with multiple activities being performed concurrently:

- Grading of the field construction office, laydown yard, O&M facility, and substation areas;
- General clearing and construction of access roads, crane pads, and turn-around areas;
- Construction of turbine tower foundations;
- Assembling and erection of the wind turbines;
- Installation of the electrical collection system;
- Construction and installation of the substations;
- Plant commissioning and energization;
- Final grading and drainage; and
- Restoration activities.

Facility construction will be initiated by clearing (as necessary) all tower sites, access roads, and interconnect routes. As described in Table 03-1, it is assumed that up to a 300-foot radius will be cleared around each tower, a 40-foot-wide corridor will be cleared along access roads, and a 50-foot-wide corridor will be cleared along all underground electric interconnect routes that do not parallel access roads. The actual cleared area will vary on a case-by-case basis depending on factors such as topography and vegetation, and where possible, adjusted to avoid sensitive ecological resources. In addition, approximately 6.1 acres will be cleared for the substation, a total of up to 3 acres for the meteorological towers, 13 acres for the laydown yard, and 5 acres for the O&M building. Section 4906-4-08(B)(2) of this Application quantifies anticipated temporary and permanent impacts from construction activities, including vegetation removal, to ecological communities at the Facility site.

Graded areas will be smoothed, compacted, freed from irregular surface changes, and sloped to drain. Final earth grade adjacent to equipment and buildings will be below the finished floor slab and sloped away from the building to maintain proper drainage. Slopes of embankments shall be protected against rutting and scouring during construction in a manner similar to that required for excavation slopes. Site grading will be compatible with the general topography and use of adjacent properties, ROW, setbacks, and easements.

In addition, a soil erosion and sedimentation control plan will be developed and implemented as part of the Stormwater Pollution Prevention Plan (SWP3) required by the National Pollutant Discharge Elimination System (NPDES) General Permit for the Facility. To protect surface waters, wetlands, groundwater, and storm water quality, erosion and sediment control measures will be installed and maintained throughout site

development. Such measures could include silt fence, hay bales, and/or temporary siltation basins. The location of these features will be detailed on the construction drawings, approved by the Ohio Environmental Protection Agency (EPA) as part of the NPDES review, and reviewed by the contractor prior to construction. A duly qualified individual will also inspect these features throughout the period of construction to assure that they are functioning properly until completion of all restoration work (decompaction, final grading and seeding). Based upon field conditions, additional sediment and erosion control measures may be required, beyond what is depicted on the drawings. Further information on storm water drainage can be found in Section 4906-4-07(C).

Construction of turbine tower foundations, turbine erection and assembly, access road construction, and installation of collection lines are described above in Section 4906-4-03(B)(2).

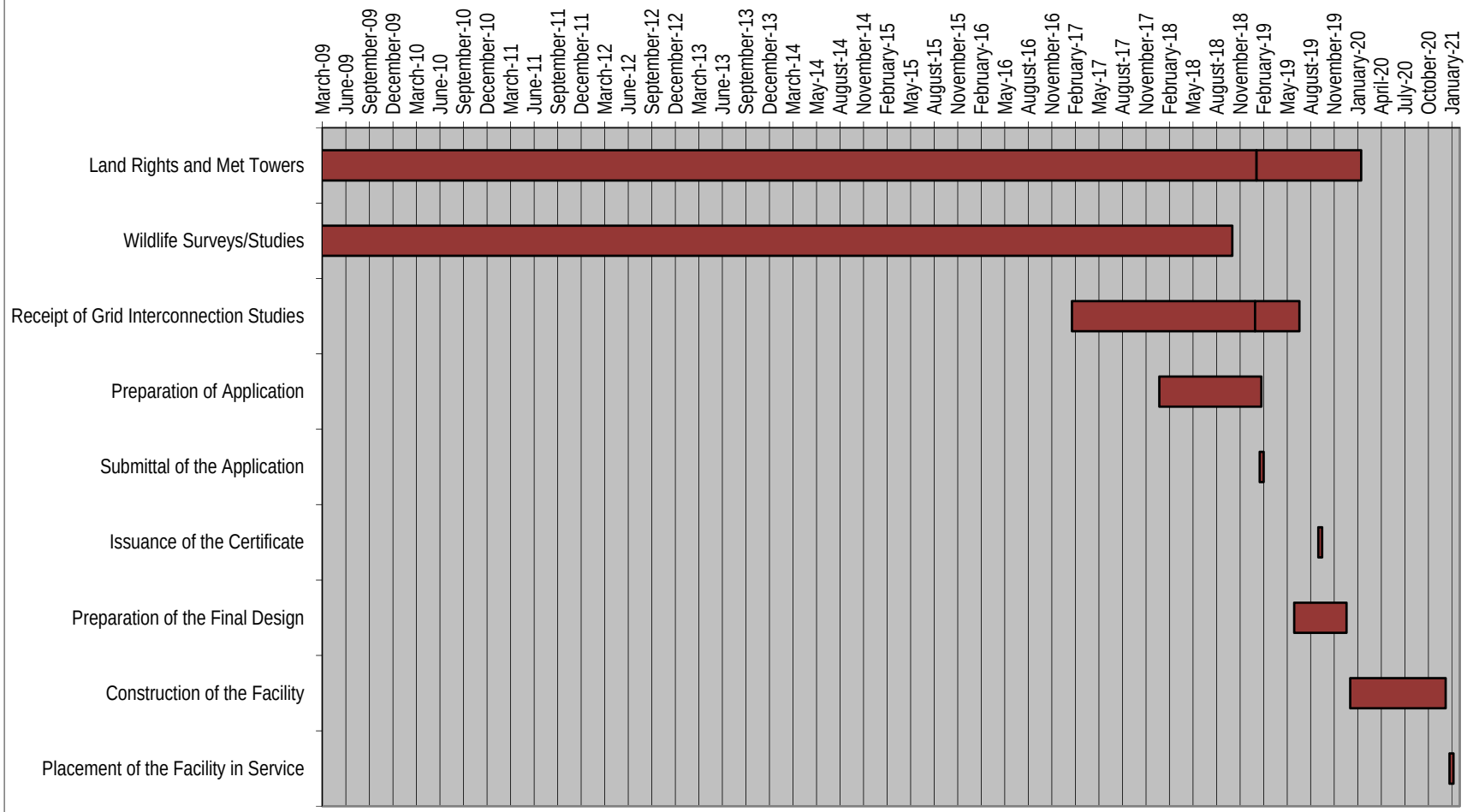
Project construction will generate some solid waste, primarily plastic, wood, cardboard, and metal packing/packaging materials, construction scrap, and general refuse. This material will be collected from turbine sites and other project work areas and disposed of in dumpsters located at the laydown yard. A private contractor will empty the dumpsters on an as-needed basis and dispose of the refuse at a licensed solid waste disposal facility.

Once construction is complete, temporarily disturbed areas will be restored (including removal of excess road construction materials, de-compaction, and rock removal in agricultural areas) and returned to their approximate preconstruction contours. Exposed soils at restored turbine sites and along Facility access roads will be stabilized by seeding, mulching, and/or agricultural planting.

(3) Impact of Critical Delays

Critical delays may have material, adverse effects on Facility financing, including the Applicant's ability to procure turbines and other Facility components. Such delays may push the in-service date back. In addition, considerable costs would be incurred if the delays prevented the Facility from meeting deadlines for federal incentive programs such as the Production Tax Credit.

Estimated Project Schedule



4906-4-04 PROJECT AREA SELECTION AND SITE DESIGN

The selection of appropriate sites for a wind-powered electric generation facility is constrained by numerous factors that are essential considerations for the Facility to operate in a technically and economically viable manner. This section describes the general site selection process, along with associated siting constraints and requirements.

(A) PROJECT AREA SELECTION

The general purpose of the Facility is to produce wind-powered electricity that will maximize energy production from Project Area wind resources in order to deliver clean, renewable electricity to the Ohio bulk power transmission system to serve the needs of electric utilities and their customers. The electricity generated by the Facility will be transferred to the transmission grid operated by PJM for sale at wholesale or under a power purchase agreement.

(1) Description and Rationale for Selecting Project Area

Availability/quality of wind resource and proximity to the bulk power transmission system are the initial screening criteria evaluated in the site selection process for any wind power project. The Applicant's initial evaluation was based on publicly available data, such as the Wind Resource of Ohio map (AWS, 2007), along with site visits and capacity analysis for nearby transmission lines. The wind resource map (see Exhibit A) suggests a suitable wind resource in southwestern Erie County and northwestern Huron County.

Proximity to major transportation routes is another consideration in identifying a site for the Facility. Located approximately 32 miles southeast of Toledo, approximately 33 miles west of Cleveland, and approximately 2.5 miles south of Sandusky, the Facility is adjacent to Interstate (I) 80 and US-20, both of which run through the Project Area, as does State Route (SR) 4. Also in close proximity are US-6 to the north, US-250 to the east, and SR 2 to the north. These major roads provide accessibility for the transportation of turbine components, construction equipment, and staff.

Land use in Erie and Huron Counties is primarily agricultural and characterized by open spaces suitable for hosting a wind power project. Initial site visits to the area provided visual verification that the study area is dominated by agricultural use, and that the land use would be compatible with wind project development.

The availability of interested landowners and host communities willing to host Facility components is another important siting criteria that made the Project Area attractive. The project, in an early development stage, was available for purchase, and included existing signed land leases.

(2) Map of Study Area

A map of the study area evaluated is included as Figure 04-1. In addition, a statewide wind resource map, which is typical of the type of data used in initial screening evaluations, is included in Exhibit A.

(3) List and Description of all Qualitative and Quantitative Siting Criteria

The Applicant does not have the unfettered ability to locate projects in any area or on any parcel of land; facilities can only be sited on property where the landowner has agreed to allow such construction. Moreover, landowner agreements strictly limit the use of land to a wind power project, and as such, do not allow for the siting of other alternative energy production facilities (e.g., solar, hydro, biomass, or fossil fuel). Accordingly, other power generation technologies are not reasonable alternatives, and do not warrant consideration in this Application.

Siting criteria used for the selection of a particular area to host a viable wind power project, such as the Facility proposed herein, include a number of factors/requirements, which are presented below:

- Adequate wind resource – the Applicant determined through an initial screening process utilizing a statewide wind resource map (see Exhibit A), and subsequent on-site measurements, that the Project Area has an adequate wind resource.
- Adequate access to the bulk power transmission system – the Applicant determined that the existing transmission infrastructure was adequately accessible from the standpoints of proximity and ability of the system to accommodate the interconnection, as well as the ability to accept and transmit the power from the Facility at a reasonable cost. This determination was made through an initial internal preliminary assessment and subsequent interconnect request filed with PJM. See Section 4906-4-05 of this Application and Exhibits B and C for additional detail.
- Willing land lease participants and host communities – the Applicant obtained lease agreements, which constitute contiguous areas of land necessary to support the Facility. See Section 4906-4-06(A) of this Application for additional detail. In addition, the Applicant has engaged local and state stakeholders and the local community to educate and share information. A well-attended public information meeting was held at the Bronson-Norwalk Conservation League in the Town of Norwalk near the Project Area on November 15, 2018, to share information and gather feedback. See Section 4906-4-06(F)(1) of this Application for additional detail on public interaction.
- Site accessibility – the Facility site is served by an existing network of public roads, which will facilitate component delivery, construction, and operation and maintenance activities (see Figure 03-2 and Exhibit D).

- Appropriate geotechnical conditions - the Applicant determined that significant geotechnical constraints for the planned construction of the Facility are not anticipated (see Exhibit E).
- Limited population/residential development – the Project Area and the surrounding communities have a low population density as compared to statewide estimates. Areas with limited residential development generally have more available space for siting wind turbines once constraints related to setbacks, sound levels, and shadow flicker are taken into account. See Section 4906-4-08(C)(3)(e) and Exhibit F of this Application for additional detail on demographics in the vicinity of the proposed Facility. For additional information on sound, see Section 4906-4-08(A)(3), Section 4906-4-09(F), and Exhibit G of this Application. For additional information on shadow flicker, see Section 4906-4-08(A)(9), Section 4906-4-09(H), and Exhibit H of this Application.
- Compatible land use – the Project Area is predominantly rural agricultural, which is compatible with the proposed Facility. See Section 4906-4-08(C) of this Application.
- Limited sensitive ecological resources – the proposed Facility is not expected to result in significant adverse impact to ecological resources. See Section 4906-4-08(B), Section 4906-4-09(D), and Exhibits R, S, T, U, V, W, X, Y, and Z of this Application.
- Cultural resources – the proposed Facility is not expected to physically impact any known cultural resources. For additional information on cultural resources, see Section 4906-4-08(D) and Exhibit I of this Application.

Once the Applicant determined that the Project Area was suitable for development of a wind power facility, various siting factors and constraints were identified and evaluated in order to appropriately site the Facility components. These efforts are discussed in detail below in Section 4906-4-04(B).

(4) Description of Process by Which Siting Criteria Were Used

As noted above, the selection of possible sites for development of wind power facilities is constrained. Particularly, projects must be located in areas with adequate wind resource proximate to electric transmission lines with unused capacity sufficient to accept energy from the facility, and situated in locations that can accommodate setback, land use, and environmental restrictions imposed by local, state and federal laws. Once a project area has been selected, there is some ability to alter turbine and other component locations on the properties that are participating in the project within the confines of the private agreements that the Applicant has obtained. The Facility layout design process is described below in Section 4906-4-04(B).

(5) Description of Project Area Selected for Evaluation

Based on the criteria listed in OAC Rule 4906-4-04(A)(3), the Project Area site selection analysis concluded that the site presented herein meets all the factors necessary to support a viable wind energy facility. The proposed site possesses some of the best terrestrial wind resource in the state, manageable access to the bulk power transmission system, sufficiently low population density, positive feedback from landowners and local officials, highly compatible land-use characteristics, and few environmentally sensitive areas.

(B) FACILITY LAYOUT DESIGN PROCESS

(1) Constraint Map

A constraint map of the Project Area showing setbacks, public roads, utility corridors, streams, and wetlands is included as Figure 04-2.

(2) Criteria Used to Determine Site Layout and Comparison of Alternative Site Layouts

The siting of project components within a given project area is governed by site-specific factors, including land use constraints, sound constraints, wind resource constraints, shadow flicker constraints, wetland and other environmental constraints, agricultural constraints, and landowner considerations. Once it was determined that the general project site was adequate, the Applicant worked with various consultants to conduct detailed assessments, which identified and defined the siting factors and constraints discussed below. Through the use of geographic information system (GIS) tools and consultant assessments, the Applicant performed numerous layout design iterations to develop the proposed Facility layout as presented and described in this Application. Once the macro-siting of the project was completed and the site was selected, the site-specific criteria continue to be taken into consideration in the ultimate determination of the site layout and design, right up to the presentation of the final engineering drawings to the OPSB staff, which occurs just prior to construction. This Application sets forth the proposed locations where the Facility's location will be located within the study corridor of the project site. These locations, while not necessarily exact coordinates, may be subject to unsubstantial and minor engineering revisions (micro-siting) prior to construction. Any such micro-siting will: only occur if it is necessitated by one of the many criteria described in this Application, including, but not limited to, state laws and regulations and land use constraints. Such micro-siting will occur only within the environmental study corridor previously evaluated for environmental resources by the Applicant and will be compatible with landowner preferences and in compliance with the agreements the Applicant has with property owners. All micro-siting will be presented at the preconstruction meeting with OPSB with proof of landowner signed lease agreements, all necessary participation agreements, and that the change is within

the environmental study corridors. The constraints used in designing the Facility layout are discussed in additional detail below.

Land Use Constraints

A graphic study of turbine siting constraints for the Facility is included as Figure 04-2, as required by OAC Rule 4906-4-04(B)(1). Suitable areas for Facility development are restricted by setbacks from ROWs and non-participating parcels. Illustrative as it is, this graphic cannot appropriately show all the site-specific constraints and considerations, such as minimizing tree clearing and impacts to wetlands and surface waters, landowner preferences, turbine engineering factors (e.g., minimum separation distances to avoid wake loss), shadow flicker and sound assessments, avoiding impacts to existing aviation networks, access road engineering requirements, and minimizing impacts to agricultural lands, all of which further limit siting alternatives within the participating parcels.

In addition to investigating the layout within the constraints discussed above, numerous expert analyses and field studies have been conducted to assure that the individual turbines are sited so as to minimize environmental impacts to the maximum extent practicable, while still allowing for a successful project. The pertinent studies and analyses are attached hereto as Exhibits and discussed in various sections of this Application.

Wind Resource Constraints

The proposed Facility site underwent a complex wind resource assessment. This type of evaluation is necessary to optimize the turbine layout and assess the energy yield estimation within the context of the existing, site-specific constraints. One objective of siting is to locate wind turbines in the highest energy yield positions with the lowest wake loss influence between these turbines. During the course of the wind analysis, micro-scale modeling tools were utilized to develop the energy yield assessment for the layout proposed herein, which is a result of a comprehensive management of the local constraints with the goal of achieving high energy yield. Inputs to the modeling tools include wind data from on-site meteorological towers and high-resolution terrain/roughness/land cover data from a digital elevation model.

Agricultural Constraints

Agricultural land is the dominant resource within the Project Area. Therefore, the Applicant has designed the Facility footprint in order to minimize impacts to active agricultural land. These efforts included site-specific investigations in order to place turbines and access roads along field edges and minimizing temporary disturbance and permanent loss of active agricultural land to the maximum extent practicable. The Facility

will not physically impact any agriculture-related structures and, aside from temporary disturbance during construction activities, is compatible with farming practices. Furthermore, the Facility will not result in a change in land use and will promote the long-term economic viability of the affected farms by supplementing the income of participating farmers. For additional information on agricultural land, see Section 4906-4-08(E) of this Application.

Sound Constraints

The Facility has been designed to comply with the requirements of OAC Rule 4906-4-09(F), which limits Project-related sound levels at non-participating residences. These constraints influenced the selection of turbine models under consideration for the Facility, as well as determining suitability of individual turbines sites, so as to minimize sound impacts to nearby residences. For additional information on sound, see Section 4906-4-08(A)(3), Section 4906-4-09(F) and Exhibit G of this Application.

Shadow Flicker Constraints

Shadow flicker from wind turbines can occur when moving turbine blades pass in front of the sun, creating alternating changes in light intensity or shadows. These flickering shadows can cause an interruption in sunlight when cast on nearby residences. The Facility has been designed to comply with the requirements of OAC Rule 4906-4-09(H), which requires that turbines be operated so that shadow flicker does not exceed 30 hours/year at non-participating residences. Accordingly, a threshold of 30 hours of shadow flicker per year was used as a design goal for evaluation of potential impact from the Facility. Operational curtailment and/or other mitigation measures will be deployed to ensure that non-participating residences stay below this threshold in accordance with OAC Rule 4906-4-09(H). For additional information on shadow flicker, see Section 4906-4-08(A)(9), Section 4906-4-09(H), and Exhibit H of this Application.

Wetland and Stream Constraints

Section 404 of the Clean Water Act established a program to regulate the discharge of dredged or fill material into waters of the United States, including wetlands. As described by the U.S. EPA (http://water.epa.gov/type/wetlands/outreach/upload/reg_authority.pdf), the basic premise of the program is that no discharge of dredged or fill material may be permitted if: (1) a practicable alternative exists that is less damaging to the aquatic environment, or (2) the nation's waters would be significantly degraded. In other words, an Applicant must show that it has, to the extent practicable:

- Taken steps to avoid wetland impacts,
- Minimized potential impacts on wetlands and streams, and

- Provided compensation for unavoidable impacts, if required by the terms of the permit.

In order to minimize potential impacts to wetlands, on-site investigations were conducted to establish the locations of streams and wetlands, and Facility components were sited in an effort to avoid impacts to these resources to the maximum extent practicable. For all identified stream and wetland crossing points, effective construction techniques will be used to avoid and minimize impacts to the extent practicable. As a result, the vast majority of stream impacts will be temporary in nature. For additional information on estimated wetland and stream impacts and erosion control measures, see Section 4906-4-08(B)(2)(a), Section 4906-4-09(B), and Exhibit Z of this Application.

Landowner Considerations

The Applicant has and will continue to meet with various participating landowners to review the Facility footprint on their respective parcel(s). Among other things, these meetings often involve field analysis to ensure that Facility components are sited in a manner that allows continued efficient use of land for agricultural purposes and avoids any site features of importance to the landowner (or ensure adequate separation distances from such features).

(3) Description of Number and Type of Comments Received

Fifty-five written comments were received at the public information meeting, which was held on November 15, 2018 at the Bronson-Norwalk Conservation League in the Town of Norwalk, Huron County, Ohio. These public comments generally focused on air quality benefits; job creation, increased tax revenue, and other economic benefits; setbacks; visual impacts; potential impacts to ground water; potential to human health and safety; and potential impacts to wildlife. These issues are addressed in this Application. Air quality benefits are discussed in Section 4906-4-07(B); economic benefits are discussed in Section 4906-4-06(E); setbacks are discussed in Section 4906-4-08(C); visual impacts are discussed in Section 4906-4-08(D)(4); groundwater is discussed in Section 4906-4-08(A)(4); human health and safety are discussed in Section 4906-4-08(A); and potential wildlife is discussed in Section 4906-4-08(B).

4906-4-05 ELECTRIC GRID INTERCONNECTION

(A) CONNECTION TO THE REGIONAL ELECTRIC GRID

The proposed Facility will connect to the American Transmission Systems Inc. (ATSI) transmission system along the Beaver – Davis Besse 345 kV circuit via a new 345 kV switching station (i.e., POI) to be permitted separately.

(B) INTERCONNECTION INFORMATION

(1) Generation Interconnection Request Information

As described above, the name of the interconnection queue is Beaver – Davis Besse 345 kV. The queue number is AC2-103, and the queue date is March 10, 2017. The website for the queue is https://www.pjm.com/pub/planning/project-queues/feas_docs/ac2103_fea.pdf.

(2) System Studies

(a) *Feasibility Study*

PJM issued the Feasibility Study in August 2017 (Exhibit B). This report evaluated Queue AC2-103 as a 297.7 MW generating capability to be injected into the existing Beaver – Davis Besse 345 kV circuit. This study evaluated compliance with reliability criteria for summer peak conditions in 2020. Potential network impacts evaluated include generator deliverability, multiple facility contingency, contribution to previously identified overloads, short circuit, potential congestion due to local energy deliverability, and system reinforcements. The network impacts analysis identified several potential concerns:

- Under the multiple facility contingency analysis, the X1-027A TAP-02BEAVER 345 kV line loads from 92.87% to 101.86% of its emergency rating for the line fault with a failed breaker contingency outage. The proposed Facility contributes approximately 156.68 MW to the thermal violation. In order to mitigate this overload, the Beaver substation will need to be reconductored to increase the line rating, at an estimated upgrade cost of $41,800. This network impacts would be caused by the addition of the Facility, and upgrades would be required to mitigate reliability criteria violations.

- Under the generator deliverability analysis, the 02AD Q-2-02AVON 138 kV line loads from 103.17% to 107.28% of its emergency rating, and the 02LRN Q2-02AD Q-2 138 kV line loads from 103.23% to 107.34% of its emergency rating, for the line fault with a failed breaker

contingency outage. The proposed Facility contributes approximately 28.84 MW to the thermal violations. A previously scheduled PJM baseline project on the Admiral – Avon Q2 138 kV line will mitigate this overload; the anticipated in-service date for this upgrade is June 1, 2021.

- Under the generator deliverability analysis, the 02BEAVER-02BLKRVR 138 kV line loads from 113.43% to 116.2% of its emergency rating for a line fault with failed breaker contingency outage. The proposed Facility contributes approximately 23.8 MW to the thermal violation. A previously scheduled PJM baseline project on the Beaver – Black River 138 kV line will mitigate this overload; the anticipated in-service date for this upgrade is June 1, 2020.

- Under the generator deliverability analysis, the 02BLKRVR-02USSTEEL 138 kV line loads from 226.7% to 233.24% of its emergency rating for a tower line contingency outage. The proposed Facility contributes approximately 39.19 MW to the thermal violation. A previously scheduled PJM baseline project on the Black River – US Steel 138 kV line will mitigate this overload; the anticipated in-service date for this upgrade is June 1, 2021.

- Under the contribution to previously identified overloads analysis, the 02BEAVER-02CARLIL 345 kV line loads from 106.79% to 114.47% of its emergency rating for a tower line contingency outage. The proposed Facility contributes approximately 87.52 MW to the thermal violation. In order to mitigate this overload, the limiting relay and wave-trap elements at the Beaver and Carlisle substation will need to be upgraded to increase the line rating, at an estimated upgrade cost of $504,700. This overload was initially caused by prior queue positions with additional contribution to over-loading by this Facility, which may have an allocation cost responsibility to be reported in the System Impact Study.

- Under the contribution to previously identified overloads analysis, the 02BEAVER-02LAKEAVE 345 kV line loads from 101.7% to 108.12% of its emergency rating for the line fault with a failed breaker contingency outage. The proposed Facility contributes approximately 111.77 MW to the thermal violation. In order to mitigate this overload, the conductor line drop at Beaver-Lake Ave will need to be reconductored to increase the line rating, at an estimated upgrade cost of $45,000. This overload was initially caused by prior queue positions with additional contribution to over-loading by this Facility, which may have an allocation cost responsibility to be reported in the System Impact Study.

- Under the contribution to previously identified overloads analysis, the 02USSTEEL-02LRN Q2 138 kV line loads from 214.81% to 221.35% of its emergency rating for a line fault with failed breaker contingency outage. The proposed Facility contributes approximately 39.19 MW to the thermal violation. In order to mitigate this overload, the Lorain substation will need to be reconductored to increase the line rating, at an estimated upgrade cost of $86,500. This overload was initially caused by prior queue positions with additional contribution to over-loading by this Facility, which may have an allocation cost responsibility to be reported in the System Impact Study.

In addition, two potential congestion issues were identified. The 02BLKRVR-02USSTEEL 138 kV line gets overloaded from 104.01% to 106.68% of its emergency rating for contingency conditions, and the X1-027A TAP-02BEAVER 345 kV line gets overloaded from 104.01% to 106.68% of its emergency rating for contingency conditions. The proposed Facility would contribute approximately 15.99 MW and 157.94 MW, respectively, to the identified thermal congestions. These problems are likely to result in operational restrictions to the proposed Facility. The Applicant could elect to proceed with discretionary network upgrades that would eliminate these potential operational restrictions, but such upgrades are not required for reliability. Each of these potential issues summarized here, along with network upgrades that could alleviate these concerns, is described in greater detail in Exhibit B.

(b) *System Impact Study*

PJM issued the System Impact Study Report (Exhibit C) in November 2018. This report evaluated Queue AC2-103 as a 297.7 MW injection into the existing X1-027A 345 kV substation (which is a tap of the Davis Besse – Beaver 345 kV line). A new in-line switching station (i.e., POI) will be located between ATSI's Beaver and Davis Besse stations. The new station design includes three breaker 345 kV ring buses, relaying, metering, phasor measurement units, supervisory control and data acquisition (SCADA), and associated equipment. The Applicant will obtain all necessary permits, as well as the land for the ATSI facilities, and the Applicant will be responsible for construction costs. Ownership of the station will be transferred to ATSI upon successful completion of the construction and energization work. Network impacts were assessed for summer peak conditions in 2020. Network impacts evaluated include generator deliverability, light load analysis, multiple facility contingency, short circuit, contribution to previously identified overloads, new system reinforcements, contribution to previously identified system reinforcements, and potential congestion due to local energy deliverability.

Under the multiple facility contingency, the 02BEAVER-02BLKRVR 138 kV line loads from 95.87% to 100.86% of its emergency rating for a tower line contingency outage. The proposed Facility contributes approximately 22.74 MW to the thermal violation. Two previously scheduled PJM baseline projects will mitigate this overload: (1) rebuilding a section of the Beaver – Black River line [Beaver to Brownhelm Junction]; and (2) reconductoring the Beaver – Black River line. The new rating with these baseline upgrades will be sufficient for AC2-103, and the Applicant has no cost responsibility for these upgrades as scheduled. However, the proposed Facility may need these baseline upgrades in-service in order to be fully deliverable to the PJM system. While the anticipated in-service date for the former upgrade is June 2020, the present projected in-service date for the latter upgrade is June 2021. If the proposed Facility comes into service prior to the completion of these upgrades, an interim study will be required. Alternatively, the Applicant may be responsible for an advancement cost to accelerate the reconductoring upgrade from the summer of 2021 to the summer of 2020.

No other network problems were identified.

(A) OWNERSHIP

The Applicant will construct all structures and equipment associated with the Facility, and the Applicant will own and operate all such structures. As depicted on Figure 03-2, limited portions of the buried 34.5 kV electrical collection lines will be located within public road ROWs where the collection lines cross roads from one participating parcel to another. The proposed Facility will not change the ownership status of such ROWs. All other components of the Facility will be located entirely on leased land, and voluntary lease agreements between the Applicant and landowners will accommodate the Facility. The proposed Facility and associated lease agreements are not expected to change the ownership status of lands within the Project Area, with the possible exception of land that may be purchased for the collection substation and the O&M facilities, for which the Applicant may either lease land or purchase an existing building and associated land.

The Applicant is an indirectly wholly-owned subsidiary of Apex. Founded in 2009 by a team of successful energy executives, Apex is an independent renewable energy company focused on building utility-scale generation facilities. Apex is building one of the nation's largest, most diversified portfolios of renewable energy resources, capable of producing over 13,000 MW of clean energy. Apex already has a strong track record of success, with wind and solar energy projects successfully operating in Illinois, Oklahoma, Texas, and Colorado.

(B) CAPITAL AND INTANGIBLE COSTS

(1) Estimated Capital and Intangible Costs by Alternative

The total estimated capital and intangible costs of the Facility could range between approximately $[redacted] and $[redacted] ($[redacted] per kilowatt [kW] – $[redacted] per kW) depending on the turbine model and installed capacity selected. These costs are broken out in Table 06-1 below, assuming a cost value in the approximate middle of the estimated range.

Table 06-1. Estimated Capital and Intangible Costs

Description	Cost ($'000)
Tangible Costs	
Turbine (including transportation and installation)	$[redacted]
Civil and Electrical Work	$[redacted]
Other	$[redacted]
Total Tangible Costs	$[redacted]

Description	Cost ($'000)
Intangible Costs	
Development/Management	$[redacted]
Insurance	$[redacted]
Legal/Other	$[redacted]
Total Intangible Costs	$[redacted]
Total	$[redacted]
Cost per kW	$[redacted]

As described in Section 4906-4-04, the Applicant has not proposed alternative project areas. Therefore, no cost comparison between alternatives is available.

(2) Cost Comparison with Similar Facilities

Installed project costs compiled by the U.S. Department of Energy (USDOE) in August 2017 indicate that the capital costs of the Facility are in line with recent industry trends. This compilation shows that capacity-weighted average installed costs in 2016 averaged roughly $1,590 per kW. This represents a decrease of $780 per kW or 33% from the apparent peak in average costs of installed projects in 2009 and 2010. Early indications from a limited sample of projects under construction during report preparation and anticipating completion suggest that capacity-weighted average installed costs will remain similar in 2017 (Wiser & Bolinger, 2017).

By way of further comparison, the costs of wind energy facilities recently completed by affiliates of the Applicant in Texas and Oklahoma averaged around $[redacted] per kW. These costs are not substantially different from the average cost estimated for the Facility.

(3) Present Worth and Annualized Capital Costs

Capital costs will include development costs, construction design and planning, equipment costs, and construction costs. The costs will be incurred within a year or two of start of construction. Therefore, a present worth analysis is essentially the same as the costs presented in Section 4906-4-06(B)(1) of this Application. As alternative project areas and facilities were not considered in this Application, the capital cost information in this section is limited to the proposed Facility.

(C) OPERATION AND MAINTENANCE EXPENSES

(1) Estimated Annual Operation and Maintenance Expenses

For the first two years of commercial operation, staffing is estimated to be approximately $[redacted] per year and maintenance could range between $[redacted] and $[redacted] per year.

(2) Operation and Maintenance Cost Comparisons

Operations and maintenance costs are a significant component of the overall cost of wind projects but can vary widely between facilities. The USDOE has compiled O&M cost data for 159 installed wind power projects in the U.S., totaling 13,120 MW of capacity, with commercial operation dates of 1982 through 2015. The data exhibit considerable spread, demonstrating that O&M costs are far from uniform across projects. In general, facilities installed more recently have incurred lower O&M costs. Specifically, capacity-weighted average O&M costs for projects constructed in the 1980s equal $69 per kW-year. The O&M costs dropped to $57 per kW-year for projects installed in the 1990s, to $28 per kW-year for projects installed in the 2000s, and to $27 per kW-year for projects installed since 2010. This decrease in O&M costs is likely due to a combination of factors. O&M costs generally increase as turbines age and manufacturer warranties expire. Furthermore, many of the projects installed in the 2000s may still be within the manufacturers' warranty, and the relatively low costs reported may not include the costs of the turbine warranty. It has also been suggested that the larger, more sophisticated designs used at modern wind energy facilities may experience lower overall O&M costs on a per kW-year basis when compared to older turbine models (Wiser & Bolinger, 2017).

The O&M costs for the Facility are estimated to be approximately $[redacted] per kW-year, depending on the maturity of the project in a given year of its life cycle. These estimated O&M costs exclude any other ongoing expenses related to environmental monitoring, property taxes, land royalties, reverse power, and insurance. These costs will be consistent with the average costs compiled by USDOE, as described above. The O&M costs for the Facility will be consistent with O&M costs at other wind energy facilities operated by affiliates of the Applicant, which ranged from approximately $[redacted] to $[redacted] per kW-year in 2016.

(3) Present Worth and Annualized Operation and Maintenance

The annual operation and maintenance costs itemized in Section 4906-4-06(C)(1) will be subject to real and inflationary increases. Therefore, these costs are expected to increase with inflation after the first two years. Assuming a 25-year project life, an inflation rate of 2.25%, and a 9% discount rate, the pre-tax Net Present Value of the operation and maintenance costs is approximately $[redacted]. As alternative project areas and facilities were not considered in this Certificate Application, the operation and maintenance cost information in this section is limited to the Facility.

(D) COST OF DELAYS

The monthly delay costs would depend on various factors. If the delay were to occur in the permitting stage, the losses would be associated with the time value of money resulting from a delay in the timing of revenue payments. This is estimated to be about $[redacted] per month. If the delay were to occur during construction, the costs would include lost construction days and the costs associated with idle crews and equipment. This is estimated to be approximately $[redacted] to $[redacted] per month.

There could also be penalties associated with failing to meet a delivery deadline under a potential power purchase agreement. In addition, significant losses would be incurred if the delays prevented the Facility from meeting deadlines to qualify for the existing federal Investment Tax Credit. Prorating these delay costs monthly would not be meaningful, as the lost opportunity is triggered at a single deadline and does not accrue over time.

(E) ECONOMIC IMPACT OF THE PROJECT

Information provided in this section was obtained from the Socioeconomic Report, prepared by EDR (see Exhibit F). The proposed Emerson Creek Wind Farm is anticipated to have local and statewide economic benefits. Wind power development, like other commercial development projects, can expand the local, regional, and statewide economies through both direct and indirect means. Income generated from direct employment during the construction and operation phases of the wind farm is used to purchase local goods and services, creating a ripple effect throughout the state. The Job and Economic Development Impact (JEDI) Wind model allows users to estimate the jobs and the economic development impacts from wind power generation projects for both the construction and operation phases of the proposed Facility. The JEDI model was created by the National Renewable Energy Laboratory (NREL), a national laboratory of the USDOE. These economic development impacts, categorized by the levels of impact and indicators described above, include onsite jobs and earnings, economic output from these onsite earnings, local revenue/supply chain jobs and earnings, economic output from these local revenue/supply chain earnings, induced jobs and earnings, and economic output from these induced jobs and earnings (NREL, 2017). JEDI calculates the aforementioned indicators for each level of impact using project-specific data provided by the Applicant and geographically-defined multipliers. These multipliers are produced by IMPLAN Group, LLC using a software/database system called IMPLAN (IMpact analysis for PLANing), a widely-used and widely-accepted general input-output modeling software and data system that tracks every unique industry group in every level of the regional data (IMPLAN Group, 2018).

(1) Construction and Operation Payroll

Based upon JEDI model computations, it is anticipated that the proposed Facility will generate employment, creating an estimated 305 on-site jobs during project construction and operation.

The JEDI model estimates in a total of $19.0 million for annual earnings for the on-site construction positions, which will be for Construction and Interconnection Labor and Construction Related Services. Facility construction labor wages for similar construction positions within the North Northeastern Ohio nonmetropolitan area range from an average of approximately $22 per hour for Construction Laborers, $23 per hour for Electricians, and around $50 per hour for Construction Management occupations (USDOL, 2017). Local, regional, and statewide employment during the construction phase will primarily benefit those in the construction trades, including equipment operators, truck drivers, laborers, and electricians. Facility construction will also require workers with specialized skills, such as crane operators, turbine assemblers, specialized excavators, and high voltage electrical workers. It is anticipated that many of the highly-specialized workers will come from outside the area and will remain only for the duration of construction.

The JEDI model estimates in a total of $0.8 million for annual earnings for the on-site operation and maintenance positions. These jobs are anticipated to be comprised of Project Manager, Wind Technician, and Administrative personnel. Projected wage rates are projected to be consistent with averages within the North Northeastern Ohio nonmetropolitan area, which are estimated to be $18 per hour for Payroll and Timekeeping Clerks, $23 per hour for Mechanical Engineering Technicians, and $48 for General and Operations Managers (USDOL, 2017). These full-time local jobs generated by the wind energy facility comprise the Facility's direct long-term employment impact.

(2) Construction and Operation Employment

Demand for new jobs associated with the Facility will be created during both the initial construction period and the years following construction, in which the Facility is in operation. The money injected into the statewide economy through the creation of these jobs will have long-term, positive impacts on individuals and businesses in Ohio as it ripples through the economy.

Jobs that will be created by the proposed Facility will include approximately 305 workers who will be directly employed to construct and subsequently operate and maintain the wind farm. In addition, other jobs will be created that play a supportive role. The increased wealth from jobs and spending will have a ripple effect in the local economy, thereby creating the need for additional jobs in the area, as the wages of the locally-based workers go toward the support of household and local businesses.

Turbine manufacturing and supply chain industries could in turn generate an additional 553 jobs across the State of Ohio over the course of Facility construction. In addition, Facility construction could induce demand

for 247 jobs statewide through the spending of additional household income. Based on the results of the model, the total impact of potentially 1,096 new jobs could result in up to $62.9 million of earnings, assuming a 2020 construction schedule and wage rates consistent with statewide averages. Operations and maintenance should also generate new jobs in other sectors of the economy through supply chain impacts and the expenditure of new and/or increased household earnings. Increased employment demand throughout the supply chain is estimated to result in approximately 25 jobs with annual earnings of approximately $1.3 million. In addition, it is estimated that 19 jobs with associated annual earnings of $1.0 million will be induced through the increased household spending associated with Facility operations. In total, while in operation, this Facility is estimated to generate demand for 53 jobs per year with annual earnings of approximately $3.1 million. Total economic output could also increase by an estimated $10.6 million as a result of Facility operations and maintenance.

(3) Local Tax Revenues

The proposed Facility will have a significant positive impact on the local tax base, including local school districts and other taxing districts that service the area where the proposed wind farm is to be located. Anticipated taxing districts include nine municipalities (Groton and Oxford Townships in Erie County; and Lyme, Ridgefield, Sherman, Norwich, and Richmond Townships in Huron County), along with seven school districts (Bellevue City School District, Berlin-Milan Local School District, Margaretta Local School District, Monroeville Local School District, Perkins Local School District, Seneca East Local School District,[6] and Willard City School District).

The amount of the annual service payment depends on the ratio of Ohio-domiciled full-time equivalent employees to total full-time equivalent employees during construction or installation during the preceding tax year. The base payment ranges from $6,000 to $8,000 per MW of nameplate capacity. The county could also require that an additional service payment be made to the county's treasurer. However, in accordance with ORC Section 5727.75, the total annual payment cannot exceed $9,000 per MW.

The Applicant anticipates that it will pay real and personal property taxes between the minimum and maximum rate set under ORC Section 5727.75; between $6,000 to $9,000 per MW of nameplate capacity per year during the life of the project. Assuming an aggregate nameplate capacity of 297.66 MW, the increase in local tax revenues will be between approximately $1.8 million and $2.7 million annually for the Facility. It is important to note that the proposed Facility will make few, if any, demands on local government services.

[6] The Seneca East Local School District spans southeastern Seneca County and southwestern Huron County. There are no Facility components sited in Seneca County. However, 21 of the proposed turbine sites in Huron County are located in the Seneca East Local School District.

Therefore, payments made to local governments will be net positive gains and represent an important economic benefit to the local area.

(4) Economic Impact on Local Commercial and Industrial Activities

Wind power development can expand the local economy through ripple effects. Ripple effects stem from subsequent expenditures for goods and services made by first-round income from the development. A direct effect or impact arises from the first round of buying and selling. Direct effects include the purchase of inputs from local sources, the spending of income earned by workers, annual labor revenues, and the income effect of taxes. These direct effects can be used to identify additional, subsequent rounds of buying and selling for other sectors and to identify the effect of spending by local households. The indirect effect or impact is the increase in sales of other industry sectors in the region, which include further round-by-round sales. The induced effect or impact is the expenditure generated by increased household income resulting from direct and indirect effects. The total effect or impact is the sum of the direct, indirect, and induced effects.

The proposed Facility will have a beneficial impact on the local economy. In addition to jobs and earnings, the construction of the Facility is expected to have a positive impact on economic output, a measurement of the value of goods and services produced and sold by backward-linked industries. Economic output provides a general measurement of the amount of profit earned by manufacturers, retailers, and service providers connected to a given project. The value of economic output associated with Facility construction is estimated to be $170.4 million. Between workers' additional household income and industries' increased production, the impacts associated with the Facility are likely to be experienced throughout many different sectors of the statewide economy.

(F) PUBLIC RESPONSIBILITY

(1) Public Interaction

The Applicant has and will continue to make general information about wind power and specific information about the proposed Facility available to community members, elected officials, the media, and local civic organizations. Information has been shared through, among other activities, a public meeting in November 2018; official Board of Trustee and Planning Board meetings; presentations to various schools, churches, and clubs; and through the company website. In addition, the Applicant has a local office in Bellevue, Ohio to help with general project development and community outreach. Representatives and corporate staff have been responsive to questions and requests by local media and will continue to be responsive.

The Applicant maintains an informational website for the Facility (http://www.emersoncreekwind.com). This site provides project information, along with news releases and general information about wind power resources and the benefits of wind power. This website will be updated with new information throughout the planning and review process. In addition, Emerson Creek Wind staff will continue to be available to interact with the community and public officials during the construction and operation phases of the Facility.

(2) Liability Insurance

The Applicant will acquire and maintain throughout the term of the Facility, at its sole cost, insurance against claims and liability for personal injury, death, and property damage arising from operation of the Facility. The insurance policy or policies will insure the Applicant to the extent of its interests. The limits of the insurance policy described will, at a minimum, insure against claims of $1,000,000 per occurrence and $2,000,000 in the aggregate. In addition, the Applicant shall acquire and maintain throughout the construction and operation period, at its sole cost, Umbrella Coverage against claims and liability for personal injury, death, and property damage arising from the operation of the Facility. The limits of the excess liability insurance will, at a minimum, insure against claims of $10,000,000 per occurrence and $10,000,000 in the aggregate.

(3) Roads and Bridges

ORC Section 5727.75 requires the Applicant to repair and restore roads, bridges, and culverts that become damaged by the Facility and requires posting of a bond in favor of the Board of County Commissioners to ensure funding for such work. The statute also empowers the County Engineer to require the Applicant to enter into an agreement regarding roadway use, commonly referred to as a Road Use Maintenance Agreement (RUMA). It is expected that the Erie and Huron County Engineers will each require a RUMA, which will contractually bind the Applicant to its statutory roadway protection responsibilities. This agreement will include procedures for temporary road closures, lane closures, road access restrictions and traffic control. At this point the Applicant has made preliminary determinations with respect to roadway improvements and protection, which shall form the basis of the RUMAs or the Applicant's operations if a RUMA is not required.

State and local roads in the vicinity of the Project Area will experience increased traffic during Facility construction due to the delivery of materials and equipment. Information provided in this section was obtained primarily from the Transportation Study prepared by Hull & Associates, Inc. (Hull), attached hereto as Exhibit D. The study identifies a primary and alternate transportation route to the Facility site and evaluates the existing characteristics of the roadways and bridges, describes the anticipated impacts to roads and bridges from construction vehicles and equipment delivery; and identifies mitigation measures to address identified impacts. Specific to constraints, the Transportation Study identifies roadway limitations for load, pavement

width, pavement condition, height, grades, intersection radii, and sharp curve radii. The evaluation also identifies locations where improvements to the road are likely needed to accommodate the size of the delivery and construction vehicles and are depicted in Figures 3 through 31 in Exhibit D. This study will be submitted to the Huron and Erie County Engineers.

Construction/Delivery Vehicles: To deliver the turbine components, concrete, gravel, equipment, and construction workers to each turbine site during the construction of the Facility, the roads will experience increased truck traffic. Construction traffic will consist of standard construction equipment and specialized hauling trucks to deliver the turbine components. Standard construction traffic consists of gravel/dump trucks, concrete trucks, excavation equipment, conventional semi-trailers, transport/tool vehicles and employee vehicles. Delivery of the wind turbine components will utilize oversize flatbed trucks with multiple axles. Oversize trucks are special hauling vehicles with unique lengths, widths, heights, and weights depending on the component being transported. These trucks require particular clearances due to their size and turning radii and will likely require physical modifications to local roadways.

Turbine components and associated vehicles can be classified as follows:

- *Blade Sections:* Blades are transported on trailers with one blade per vehicle. Blades typically control the length of the design vehicle, and the radii of the curves that can be navigated along the travel route to the site. The blade for the selected wind turbine model is approximately 240-feet long. Blades are transported on trailers, assumed in this evaluation to have a 185-foot trailer component and a total length of 207 feet. The blade tip will overhang the end of the trailer approximately 50.5 feet, for a total transport length of 257.5 feet. Specialized transport vehicles are designed with articulating (manual or self-steering) rear axles to allow maneuverability through curves.
- *Tower Sections:* Towers are typically transported in as many as four sections depending on the supplier. Towers generally do not control design vehicle length but may control design vehicle height and/or width.
- *Nacelle and Hub:* The turbine nacelle, hub, and related elements are typically the heaviest components transported. Generally, the nacelle and hub are transported separately, and the nacelle is the heaviest component.
- *Escort Vehicles:* Light trucks with signs and banners that travel immediately in front and/or behind oversized loads to provide warning to motorists of the oversized vehicle.

The transportation provider (i.e., hauling contractor) delivering the turbine components will further evaluate all primary, secondary, and tertiary roadways prior to construction as part of the Special Hauling Permit process or pursuant to any RUMAs. A Special Hauling Permit is required for vehicles and/or loads that exceed the legal maximum dimensions or weights specified by Special Hauling Permit Section of the Ohio Department of Transportation (ODOT). Transportation of the blades, nacelles, and tower sections will require Special Hauling Permits for criteria that exceed state highway limits. Each overweight or oversized vehicle must receive a separate Special Hauling Permit from ODOT for hauling across State Routes and from those counties, townships, and municipalities whose roadways will be affected, as set forth in ORC Section. 4513.34. Oftentimes township officials will "piggyback" their Special Hauling Permits with those issued by the County Engineer. The specifications of the Special Hauling Permit depend on the characteristics of the vehicle, its cargo, and the duration of the delivery schedule. If any vehicle exceeds 120,000 pounds, 14 feet wide, or 14.5 feet in height, a permit via the "super load" process will be required. See Section 4906-4-06(F)(4) below for further discussion on transportation permits.

Delivery Route: A final delivery route has not yet been finalized, but it is likely that delivery of turbine components to the Facility site will be from the north by way of I-80/90. Alternatively, the Facility site can be accessed from the west side via SR 53 and U.S. Route 20. SR 4 will serve as the primary travel route north and south once inside the Facility site, with connecting county and/or township roads and new gravel access roads used to deliver components to each turbine site. Prior to construction, such factors as highway limitations (height, width, and weight constraints), planned work schedules for state and local roadways, road widening, intersection improvements, utility relocations, and bridge/culvert reinforcement will be assessed by the selected transportation company.

With regard to bridge impacts, Hull contacted the Huron and Erie County Engineers to determine if there are any restrictions on bridges and roadways on the routes that were evaluated. No information was provided by the County Engineers. However, two bridges were listed as "Structurally Deficient", according to information available through the ODOT website: one on County Route (CR) 30 and one on CR 64. County and township bridge and culvert impacts will be identified and addressed during the Special Hauling permitting process or pursuant to any RUMAs.

During the Transportation Study, Hull investigated the state routes for height limitations, such as bridges and overpasses. Permanent structures that cross over the road and restrict the clearance for oversized loads (such as bridges and overpasses) were not found along the evaluated routes. For overhead cables, the national standard for minimum clearance over roads is 15.5 feet, and cables cross over the studied routes in

numerous locations. The height of the cables was not measured; however, there were no overhead cables that appeared to be obstructive. In the event a cable presents an obstruction, utility providers can temporarily or permanently raise the cables and/or move the poles. Therefore, cables should not be a limiting feature for use of the roads. The roads were also investigated for width restrictions. A number of single-lane roads exist in the area surrounding the Facility with pavement widths at or less than 12 feet (see Table 1 in Exhibit D for road widths). Although delivery vehicles may have total widths up to 14.1 feet, these vehicles can travel on roads with single-lane pavement widths, and no width restrictions above the ground surface were identified. Therefore, no width restrictions are anticipated along the preferred transportation routes.

Impacts and Mitigation: Local roads will experience increased truck traffic during the construction of the Facility due to the delivery of turbine components, concrete, gravel, equipment, and construction workers to each turbine site. Oversized construction vehicles could cause minor delays on public roads in the vicinity of the Facility, but these are unlikely to be significant given the relatively low traffic volume through the area. Most of the impacts will be to transportation infrastructure due to roadway improvements for oversized vehicles. Temporary turn-outs may be installed to allow uninterrupted flow of traffic, and spot radii widening may be used to accommodate the turning radius of over-length vehicles. Overhead utility line re-location projects will be needed in some areas to accommodate over-height vehicles and turning radii. Culvert and/or bridge reinforcement projects are also likely along main delivery routes for heavy vehicles. All such improvements will be first approved by the relevant public authority and identified in any RUMAs or Final Transportation Routing Plan. There are locations along the identified routes where component delivery vehicles and construction traffic will cross into opposing lanes of traffic. Maintenance of traffic will be addressed with the assistance of law enforcement officers, escorts, and/or flaggers.

During operation and maintenance of the Facility, there will be very little increase in traffic as wind-powered electric generating facilities are normally unmanned. There will be occasional maintenance vehicles and additional traffic will be negligible.

Prior to construction, the selected transportation provider will obtain all necessary permits from ODOT and the Huron and Erie County Engineers and any affected Townships (see Section 4906-4-06(F)(4) below for further discussion on transportation permits). All public upgrades that may be required to accommodate construction vehicles will be identified as part of the Final Transportation Routing Plan, or any RUMAs, based on the routes selected. The following mitigation techniques may be utilized to avoid or minimize transportation-related impacts and/or to provide long-term improvement to the local road system:

Insufficient Roadway Width

- Widening roadway width to accommodate construction vehicles.
- Rerouting over-width vehicles to wider roadways.

Insufficient Vertical Clearance

- Temporarily relocating overhead utility lines and poles.
- Permanently relocating overhead utility lines and poles.
- Rerouting over-height vehicles to roadways with sufficient vertical clearance.

Poor Pavement Condition or Insufficient Pavement Durability

- Roadside drainage improvements
- Pavement Patching
- Replacing pavement prior to construction (may include subgrade improvements).
- Replacing pavement during or after construction if damaged by construction traffic (may include subgrade improvements).
- Rerouting heavy-loaded vehicles to avoid insufficient pavement

Insufficient Cover over Drainage Structures

- Adding temporary gravel.
- Using bridge jumpers to clear structures.
- Repairing structures during or after construction if damaged by construction traffic.
- Rerouting heavy-loaded vehicles to avoid structures.

Poor Structure Condition

- Replacing structure during or after construction if damaged by construction traffic.
- Using bridge jumpers to clear structures.
- Rerouting heavy-loaded vehicles to avoid structures.

Inadequate Bridge Capacity

- Using bridge jumpers to clear bridges.
- Rerouting heavy-loaded vehicles to avoid bridges.

Insufficient Roadway Geometry

- Constructing appropriate turning radii at intersections where construction traffic is anticipated. This includes clearing and grubbing of existing vegetation, grading of the terrain to accommodate the improvement, extension of existing drainage pipes and/or culverts, re-locating utility poles if necessary, re-establishment of ditch line if necessary, and construction of a suitable roadway surface to carry the construction traffic, based on the existing geotechnical conditions.
- Rerouting over-sized vehicles to avoid insufficient roadway geometry.
- Profile adjustments to roadways with insufficient vertical geometry.

The selected roadways will also be video-documented to establish existing conditions prior to, and after construction. Upon completion of the Facility, the Applicant will return all roadways to their preconstruction conditions (i.e., the condition of the roadway will be the same or better than it was prior to construction). The process of documenting roadway conditions and restoring impacted roads after construction will be performed in conjunction with local permitting and any RUMAs. In addition, ODOT may review all bridges to be used for construction during the Special Hauling Permit application process.

Based on information collected during the Transportation Study field investigation, delivery vehicle assumptions, and information available from ODOT, sufficient infrastructure exists via primary and secondary roads to transport the turbine components to the Facility site. A number of intersection radii improvements will be required (see Figures 3 through 31 in Exhibit D). A transportation provider experienced with oversized loads will be engaged to provide a Final Transportation Routing Plan including all primary, secondary, and tertiary roads. The plan will be performed in conjunction with the special hauling permit process for ODOT and County and any Township authorities, as well as any RUMAs, as discussed in Section 4906-4-06(F)(4) below. Construction plans will be prepared for any roadway or intersection improvements in accordance with any RUMAs or the Final Transportation Routing Plan. All temporary improvements will be restored to their preconstruction condition following completion of construction. All work will be coordinated and approved by the appropriate public authority prior to construction.

(4) Transportation Permits

Prior to construction, the selected transportation provider will obtain all necessary permits from ODOT, the Huron and Erie County Engineers, and Township officials. It is anticipated that permits will be required for oversized loads, new access points, improving existing roadways, and crossing highways with buried electrical interconnects. To the extent that public roads will be utilized and damaged from actual construction

or construction-related traffic, the Applicant will restore the roadway consistent with its ORC Section. 5727.75 responsibilities, any RUMAs, and permit conditions.

ODOT special hauling permits are required when loads exceed legal dimensions or weights. Transportation of the blades, nacelles, tower sections, and cranes will require special hauling permits for a variety of criteria. Each vehicle must receive an individual special hauling permit from the ODOT Central Office, as the specifications of the permit depend on the characteristics of the vehicle, its cargo, and duration of the delivery schedule. If any vehicle exceeds 120,000 pounds, 14 feet wide, or 14.5 feet in height, a permit via the "super load" process is required. Table 06-2 presents the criteria for special hauling permits, as well as the approximate dimensions for the project delivery vehicles.

Table 06-2. Criteria for Special Hauling Permits

Vehicle Characteristic	State Highway Limit	State Highway Limit with Special Hauling Permit	Approximate Dimension of Component and Transport Vehicle		
			Blade	Nacelle	Tower Sections
Width of vehicle, inclusive of load	8.5 feet	None	13.8 feet	14.1 feet	14.1 feet
Height of vehicle, inclusive of load	13.5 feet	None	15 feet	15.4 feet	15.1 feet
Length of vehicle, inclusive of load and bumpers	85 feet	None	257.5 feet	110 feet	188 feet
Total Weight of vehicle with 3 or more axles	80,000 pounds	None	79,000 pounds	207,000 pounds	228,000 pounds

Source: Hull, 2019a.

Based on the criteria in Table 06-2, both the primary route and alternate route will require special hauling permits based on the height and weight for many components. However, specialized transport vehicles with numerous axles can be used to distribute the weight, minimize the effects to the roadway, and comply with the special hauling permit requirements.

In addition to coordinating with state, county, and township authorities to obtain transportation permits, the Applicant will also coordinate with appropriate authorities for temporary or permanent road closures, lane closures, road access restrictions, and traffic control necessary for construction and operation of the proposed facility. There are locations along the identified routes where component delivery vehicles and construction traffic will cross into opposing lanes of traffic. Maintenance of traffic will be addressed with the assistance of law enforcement officers, escorts, and/or flaggers. The Final Transportation Routing Plan will be provided to

the government agencies prior to the start of the project, and all work will be coordinated and approved by the appropriate regulatory agency prior to construction.

(5) Decommissioning

Megawatt-scale wind turbine generators typically have a life expectancy of 20 to 25 years. The current trend in the wind energy industry has been to replace or "re-power" older wind energy projects by upgrading older equipment with more efficient turbines. However, if not upgraded, or if the turbines are non-operational for an extended period of time (such that there is no expectation of their returning to operation), they will be decommissioned. The Applicant's plan for decommissioning is comprised of two primary components: removal of Facility components/improvements and financial assurance. Each of these is described in additional detail below:

Removal of Facility Improvements

At the termination of the lease, the Applicant will dismantle and remove Facility improvements and other above-ground property owned or installed by Emerson Creek Wind. Below-ground structures, such as turbine foundations/footings and buried interconnect lines, will be removed to a minimum depth of 36 inches. Any underground infrastructure installed to a greater depth will remain in place. The Applicant will re-grade disturbed areas, restoring slopes and contours to their original grade, to the extent possible. Upon request of the landowner, the Applicant may consider allowing roads, foundations, buildings, structures, or other improvements to remain in place. However, Emerson Creek Wind will not be obligated to leave any components or improvements and will only consider such action so long as it does not violate any permits or legal requirements.

Financial Assurance

The Applicant will post and maintain a performance bond in an amount equal to the per-turbine decommissioning costs multiplied by the sum of the number of turbines constructed and under construction. The performance bond will ensure the faithful performance of all requirements and reclamation conditions of the most recently filed and approved decommissioning and reclamation plan. At least 30 days prior to the preconstruction conference, the Applicant will provide an estimated timeline for the posting of decommissioning funds based on the construction schedule for each turbine. Prior to commencement of construction, the Applicant will provide a statement from the holder of the performance bond demonstrating that adequate funds have been posted for the scheduled construction. Once the performance bond is provided, the Applicant will maintain such funds or assurance throughout the remainder of the applicable term.

Every five years throughout the operational life of the Facility, the Applicant will provide a revised decommissioning plan and a new performance bond, based on updated decommissioning cost estimates.

For additional information about decommissioning, see Section 4906-4-09(I).

4906-4-07 COMPLIANCE WITH AIR, WATER, SOLID WASTE, AND AVIATION REGULATIONS

(A) PURPOSE

This section provides environmental data regarding air, water, and solid waste in terms of current site conditions, potential impacts of the proposed Facility, and any proposed mitigation measures.

(B) AIR

(1) Preconstruction

(a) *Ambient Air Quality*

The Ohio EPA Division of Air Pollution Control publishes air quality data for the State of Ohio annually. The most recent summary of air quality data available for the state is the *Division of Air Pollution Control 2017 Annual Report* (Ohio EPA, 2018a). Included in this report are a summary of 2017 air quality data, a discussion of toxics monitoring projects, and trend studies for selected pollutants. No air monitoring sites are located in Huron or Erie Counties, or in adjacent Sandusky, Seneca, Crawford, Richland, or Ashland Counties. Ozone and particulate matter are monitored in adjacent Lorain County, and recorded values are among the lowest in the State. There were no violations of National Ambient Air Quality Standards (NAAQSs) reported at monitoring stations in the vicinity of the Project Area (Ohio EPA, 2018a).

Air emissions in the area are related primarily to farm operations, vehicular travel, and manufacturing. Vehicles traveling area roads and operating farm equipment produce exhaust emissions, along with dust from unpaved road surfaces and exposed agricultural soils. In addition, routine odors are associated with certain farming practices (e.g., manure-spreading). The greatest sources of manufacturing emissions in the vicinity of the Project Area originate from Materion Brush Inc. in Ottawa County, approximately 22 miles northwest of the proposed Facility; Carmeuse Lime, Inc. – Maple Grove Operations in Seneca County, approximately 18 miles west of the proposed Facility; Martin Marietta Magnesia Specialties, Inc. in Sandusky County, approximately 29 miles northwest of the proposed Facility; Avon Power Power Plant in Lorain County, approximately 34 miles northeast of the proposed Facility; and Bunge N.A. in Huron County, which is located within the Project Area (Ohio EPA, 2018b).

(b) *Air Pollution Control Equipment*

Wind turbines generate electricity without releasing pollutants into the atmosphere. Therefore, air pollution control equipment is not required for the proposed Facility.

(c) *Air Quality Standards and Limitations*

In accordance with Section 111 of the Clean Air Act Extension of 1970, the EPA established New Source Performance Standards (NSPSs) to regulate emissions of air pollutants from new stationary sources. The OAC does not contain any NSPS regulations for the Project Area beyond those promulgated at the federal level. These standards apply to a variety of facilities including landfills, boilers, cement plants, and electric generating units powered by fossil fuels. Because wind turbines generate electricity without releasing pollutants into the atmosphere, NSPSs do not apply to the proposed Facility.

The Clean Air Act, as amended by the Clean Air Act amendments of 1990, requires the EPA to set NAAQSs (40 CFR part 50) for pollutants considered harmful to public health and the environment. The EPA Office of Air Quality Planning and Standards has set NAAQSs for six principal pollutants, which are called "criteria" pollutants and include carbon monoxide, lead, nitrogen dioxide, particulate matter, ozone, and sulfur dioxide. As described above, no air quality monitoring currently occurs in Erie or Huron Counties; however, monitoring occurs in adjacent Lorain County. No violations of NAAQSs were reported in the vicinity of the Project Area (Ohio EPA, 2016).

Prevention of Significant Deterioration (PSD) applies to new major sources of pollutants, and/or major modifications at existing sources for pollutants where the source is located in an area in attainment or unclassifiable with the NAAQS. The proposed Facility will not be a major source of any pollutants. Therefore, PSD does not apply.

All new sources of air emissions in Ohio are required to obtain a Permit to Install (PTI) for large (Title V) facilities, or a Permit to Install and Operate (PTIO) for non-Title V facilities. Because wind turbines generate electricity without releasing pollutants into the atmosphere, the proposed Facility will not require a PTI or PTIO.

Administered by the EPA, the Acid Rain Program was established by the Clean Air Act Amendments of 1990 to reduce emission of SO_2 and NO_x through regulatory and market-based approaches. Because wind turbines generate electricity without releasing pollutants into the atmosphere, the proposed Facility will not require an acid rain permit.

(d) *List of Required Air Pollution Permits*

Wind turbines generate electricity without releasing pollutants into the atmosphere. Therefore, air pollution permits are not required for the proposed Facility.

(e) *Air Quality Map*

As per OAC Chapter 4906-4-07(B)(1)(e), this requirement does not apply to wind farms.

(f) *Compliance with Permits and Standards*

As indicated above, wind turbines generate electricity without releasing pollutants into the atmosphere. Therefore, no air pollution permits are required. However, fugitive dust rules adopted pursuant to the requirements of ORC Chapter 3704 may be applicable. The Applicant will control fugitive dust through the use of several practices, as described below in Section 4906-4-07(B)(2).

(2) Plans to Control Air Quality During Site Clearing and Construction

Best management practices will be implemented to minimize the amount of dust generated by construction activities, to include minimizing and restoring/stabilizing the extent of exposed/disturbed areas on the site at any one time as soon as possible, applying water or a dust suppressant such as calcium carbonate to suppress dust on unpaved roads (public roads, as well as Facility access roads) as needed throughout the duration of construction activities, and temporary paving of certain locations to stabilize dusty surfaces if necessary (e.g., the laydown yard). Temporary paving methods (e.g., oil and stone) will not be applied within or immediately adjacent to sensitive areas, such as streams or wetlands. Any unanticipated construction-related dust problems will be identified and immediately reported to the construction manager and contractor. In addition, all construction vehicles will be maintained in good working condition to minimize emissions from construction related activities.

(3) Plans to Control Air Quality During Facility Operation

As per OAC Chapter 4906-4-07(B)(3), this requirement does not apply to wind farms.

(C) WATER

(1) Preconstruction

(a) *List of Required Permits to Install and Operate the Facility*

Prior to the start of construction, the Applicant will obtain the following permits:

- The Ohio NPDES construction storm water general permit, Ohio EPA Permit No. OHC000004
- An individual permit or nationwide permit under Section 404 of the Clean Water Act, (if necessary as determined after final engineering)
- A Water Quality Certification from the Ohio EPA (if necessary as determined after final engineering)
- An Ohio Isolated Wetland Permit (if necessary as determined after final engineering)
- An Ohio PTI on-site sewage treatment under OAC Rule 3745-42 (if necessary)

(b) *Water Quality Map*

The Facility will not discharge water or waste into streams or water bodies, nor will Facility operation require the use of water for cooling or any other activities. Furthermore, the Facility will add only small areas of impervious surface, which will be dispersed throughout the Project Area, and will have a negligible effect on surface water runoff and groundwater recharge. Therefore, measurable impacts on the quality of surrounding water resources are not anticipated. Since there are no bodies of water likely to be affected by the proposed Facility, the requirements of OAC Rule 4906-4-07(C)(1)(b) are not applicable to Emerson Creek Wind Farm.

(c) *Description of Water Monitoring and Gauging Stations*

As described above in Section 4906-4-07(C)(1)(b), there are no bodies of water likely to be affected by the proposed Facility. Therefore, this section is not applicable.

(d) *Existing Water Quality of Receiving Stream*

The Facility will not discharge water or waste into streams or water bodies. Therefore, there will be no receiving streams and this section is not applicable.

(e) *Permit Application Data*

The Facility will not discharge any water. Therefore, this section is not applicable.

(2) Construction

(a) *Water Quality Map*

As described above in Section 4906-4-07(C)(1)(b), measurable impacts on the quality of surrounding water resources are not anticipated. Since there are no bodies of water likely to be affected by the proposed Facility, this section is not applicable.

(b) *Quantity/Quality of Construction Runoff*

The proposed Facility will not result in wide-scale conversion of land to impervious surfaces. Tower bases, access roads, and the substation in total will add approximately 84.5 acres of impervious surface to the approximately 32,000 acres of leased land within the Project Area (i.e., conversion of approximately 0.26%). Consequently, no significant changes to the rate, make-up, or volume of storm water runoff are anticipated.

Construction of the proposed Facility could result in certain localized impacts to groundwater. Installation of turbine foundations has the greatest potential for such impacts. Based on the preliminary turbine design information, shallow foundations may be able to support the turbines. Due to the anticipated depth of bedrock in the area, blasting is not anticipated for construction. When required, blasting can generate seismic vibrations, fracture bedrock, and potentially impact localized groundwater levels. However, the turbine setback from residences helps to ensure that private wells would not likely be damaged or suffer reduced well yields, since private wells are typically located within 100 feet of residences. Therefore, construction is not anticipated to physically damage private wells or affect well yields.

In addition to potential impacts to groundwater due to turbine foundation installation, minor impacts could result from other Facility activities. Soil compaction from the use of construction equipment could temporarily limit the efficiency of surface water infiltration to groundwater. When soils are compressed, the pore spaces within the soil are decreased, which reduces water percolation. Construction of access roads will result in minor increases in storm water runoff that otherwise would have infiltrated into the ground at the road locations. However, areas so affected will be a miniscule percentage (0.26%) of the ground surface within the leased lands and will not have a noticeable impact on groundwater recharge.

A final potential impact to groundwater is the possible introduction of pollutants to groundwater from accidental discharge of petroleum or other chemicals during construction. Such discharges could occur in the form of leaks from fuel and hydraulic systems, or as more substantial spills that could occur during refueling of vehicles or due to mechanical failures and other accidents. As described below, a Spill Prevention, Control, and Countermeasure (SPCC) Plan will be prepared that outlines procedures to be

implemented to prevent the release of hazardous substances into the environment. In the event of a release, the SPCC Plan discusses how to contain and respond to the release.

(c) *Mitigation*

As described above, groundwater is not expected to be directly encountered, even in the unlikely event that blasting is necessary. However, the construction process could potentially impact groundwater, should excavation or blasting occur below the water table or alter fractures in the rock that carry ground water. Although it is not anticipated, any blasting necessary for construction of wind turbine foundations will be designed with appropriate charge weights and delays to localize bedrock fracturing to the proposed foundation area, thus minimizing the already unlikely chance of impacting water levels in residential wells. For additional information on blasting, see Section 4906-4-09(A)(2)(c) of this Application.

Should groundwater be encountered during excavation, water removal shall be conducted in accordance with the following best management practices:

- A sump pit shall be used to trap and filter water for pumping to a suitable discharge point.
- Clean pumped water shall be discharged to a vegetated and stabilized area (or to an appropriately sized level spreader or riprap energy dissipater) to prevent scouring of the receiving area.
- Sediment-laden water shall be pumped through a filter bag or into a sediment trapping device prior to discharge.
- No discharges shall occur directly to a receiving water body.

As mentioned in Section 4906-4-07(C)(1)(a), the Facility will require a NPDES Construction Storm Water General Permit from the Ohio EPA. This permit is required for all construction sites disturbing 1.0 or more acres of ground. To obtain this permit, the Applicant will develop a SWP3 and file a Notice of Intent (NOI) letter with the Ohio EPA at least 21 days prior to the commencement of construction activities.

The SWP3 will address all minimum components of the NPDES permits and conform to the specifications of the Rainwater and Land Development manual, which describes Ohio's standards for storm water management, land development, and urban stream protection. The SWP3 will identify potential sources of pollution that may reasonably be expected to affect the quality of storm water discharges associated with construction activities. If applicable, the SWP3 will clearly identify all activities that will be authorized

under Section 401 of the Clean Water Act. The SWP3 will also outline best management practices that the Applicant will implement to reduce pollutants in storm water discharges during construction.

In addition to the SWP3, an SPCC Plan will be prepared in accordance with 40 Code of Federal Regulations (CFR) 112 that outlines procedures to be implemented to prevent the discharge of oil into the environment. Any spills will be reported in accordance with Federal and Ohio EPA Division of Emergency and Remedial Response regulations.

As described below in Section 4906-4-08(E)(2)(c), topsoil removal and de-compaction will occur in agricultural areas, which constitute the majority of the Facility footprint. These practices will also mitigate any potential impacts that soil compaction could have on infiltration of rain and snowmelt, thereby further reducing any potential impact to groundwater recharge. The construction footprint will be minimized by defining/delineating the work area in the field prior to construction and adhering to work area limits during construction. These measures will limit potential impacts of soil compression on normal infiltration rates.

On-site investigations were conducted to establish the locations of streams and wetlands, and Facility components were sited to avoid impacts to these resources to the maximum extent practicable. Impacts to surface waters will be minimized by utilizing existing or narrow crossing locations whenever possible. Horizontal directional drilling (HDD) will be used in some locations to avoid impacting certain waterbodies. Equipment restrictions and erosion and sediment control measures will also be utilized to reduce adverse impacts to water quality, surface water hydrology, and aquatic organisms. In addition, vegetation clearing along stream banks and in wetland areas will be kept to an absolute minimum. For more information on mitigation measures to protect wetlands and surface water, see Section 4906-4-08(B)(2)(b).

These mitigation measures will ensure that impacts to groundwater, surface waters, and wetlands are avoided or minimized to the maximum extent practicable during Facility construction.

(d) *Changes in Flow Patterns and Erosion*

As a result of the limited impacts discussed in Section 4906-4-07(C)(2)(b) and the mitigation measures discussed above in Section 4906-4-07(C)(2)(c), changes to flow patterns are not anticipated.

(e) *Equipment for Control of Effluents*

Facility construction will not involve the discharge of effluents into streams or water bodies. Therefore, this section is not applicable.

(3) Operation

(a) *Water Quality Map*

As described above in Section 4906-4-07(C)(1)(b), measurable impacts on the quality of surrounding water resources are not anticipated. Since there are no bodies of water likely to be affected by the proposed Facility, this section is not applicable.

(b) *Water Pollution Control Equipment and Treatment Processes*

The Facility will not require any water pollution control equipment or treatment processes. As such, this section is not applicable.

(c) *NPDES Permit Schedule*

As mentioned above, Facility construction will require an Ohio NPDES construction storm water general permit, Ohio EPA Permit No. OHC000004. The Applicant anticipates full and complete compliance with this permit. The NOI and associated fee for the Construction Activities General Permit will be filed at least 21 days prior to commencement of construction activities.

(d) *Quantitative Flow Diagram*

As explained in the following sub-sections, flow diagram information is not applicable to the proposed Facility.

(i) Sewage

The O&M building will generate sewage comparable to a typical small business office. These waterborne wastes will be disposed of through use of a septic system or municipal sewage treatment system, and if necessary, the Applicant will obtain a PTI on-site sewage treatment under OAC Rule 3745-42. No other Facility components will discharge measurable quantities of wastewater.

(ii) Blow-down

This section is not applicable, as wind turbines do not utilize blow-down equipment.

(iii) Chemical and Additive Processing

This section is not applicable because the Facility will not require the use of chemical and/or additive processing.

(iv) Waste Water Processing

Aside from the sewage discussed above in Section 4906-4-07(C)(3)(d)(i), the Facility will not process or generate waste water. Therefore, this section is not applicable.

(v) Rim-off and Leachates

This section is not applicable because the Facility is not expected to generate any run-off or leachates.

(vi) Oil/water Separators

In the rare occurrence that either over 3 inches of rain falls in one storm event or a transformer fails, there is potential for an oil leak to occur at the substation. While the Applicant does not anticipate either of these events occurring, an oil/water separator may be installed at the transformer to mitigate such risks. The Applicant is considering two different options for this separator, a sump pump or a utility sock. The sump pump will pump water while containing oil and the utility sock will absorb any oil leaks. Additional detail will be provided to staff upon completion of final design.

(vii) Run-off from Soil and Other Surfaces

Following completion of construction, temporarily impacted areas will be stabilized and restored to their preconstruction condition. Facility operation will not result in further soil disturbance, aside from occasional repair activities. Therefore, this section is not applicable.

(e) *Water Conservation Practices*

Staff operating out of the O&M building will use water at a rate comparable to a typical small business office. No other Facility components will require measurable quantities of water. Therefore, water conservation practices are not applicable.

The USDOE Office of Energy Efficiency and Renewable Energy issued a report detailing the water conservation benefits of wind energy as compared to thermoelectric power. According to this report, a 297.66 MW windfarm such as the proposed Facility will conserve approximately 469 million gallons of water annually because wind-powered electric generation facilities do not use or consume water as do conventional thermal power plants such as coal (NREL, 2006).

(D) SOLID WASTE

(1) Preconstruction

(a) *Nature and Amount of Solid Waste*

The Applicant is not aware of any debris or solid waste within the Project Area that would require removal for Facility development.

(b) *Plans for Waste Removal*

No waste removal is necessary or planned.

(2) Construction

(a) *Nature and Amounts of Construction Waste*

Facility construction will generate some solid waste, primarily plastic, wood, cardboard and metal packing/packaging materials, construction scrap, and general refuse. There may also be some hazardous wastes such as used oil, used antifreeze, and solvents/paints. The amount of construction waste will be minimal.

(b) *Methods for Storage and Disposal of Construction Waste*

Construction waste will be collected from turbine sites and other Facility work areas and disposed of in dumpsters located at the laydown yard and at the turbine sites. Where appropriate, construction waste will be sorted for recycling (e.g., corrugated cardboard, rebar, cable, pallets, cable spindles). A private contractor will empty the dumpsters on an as-needed basis and dispose of the refuse at a licensed solid waste disposal facility. Used oil, used antifreeze, solvents/paints, and universal waste will be handled, managed and disposed of in accordance with federal, state and local regulations.

(3) Operation

(a) *Nature and Amounts of Waste*

For the most part, Facility operation will not result in significant generation of debris or solid waste. Waste generated from the O&M facilities could include wood, cardboard, metal packing/packaging materials, used oil, general refuse, universal waste, and used antifreeze. The O&M facility offices will generate solid wastes comparable to a typical small business office.

(b) *Methods for Storage and Disposal of Waste*

The O&M facilities will utilize local solid waste disposal and recycling services. Used oil, used antifreeze and universal waste will be handled, managed and disposed of in accordance with federal, state and local regulations.

(4) Licenses and Permits

Facility operation will not require acquisition of waste generation, storage, treatment, transportation, and/or disposal licenses or permits.

(E) COMPLIANCE WITH AVIATION REGULATIONS

(1) Aviation Facilities List and Map

Figure 07-1 illustrates all airports, helicopter pads, and landing strips within 5 miles of the Project Area. This mapping was developed from ESRI ArcGIS "World Topographic Map" map service at a 1:24,000 scale. There are no known private or public use airports, helicopter pads, or landing strips within or adjacent to the Project Area.

The closest known private airports are Colvin Airport (OH86), located approximately 1.7 miles northwest of the nearest turbine; Dougherty Airport (1OH2), located approximately 1.8 miles west of the nearest turbine; Missler-Bellevue Airport (6OH1), located approximately 2.9 miles west-southwest of the nearest turbine; Zorn Acres Airport (60OI), located approximately 3.5 miles northeast of the nearest proposed turbine; Lake Air Ranch Airport (87OI), located approximately 3.8 miles southeast of the nearest turbine; Mather Field (1OH3), located approximately 3.8 miles north of the nearest turbine; Galloway Airport (0OI3), located approximately 3.9 miles north of the nearest turbine; and Zoellner Airport (10OH), located approximately 5.8 miles northeast of the nearest turbine. The closest private heliports are Bellevue Hospital Heliport (4OH9), located approximately 3.6 miles west-southwest of the nearest turbine; and Valley View Heliport (3OI4) located approximately 3.7 miles south of the nearest turbine. The closest public use airports are Willard Airport (8G1), located approximately 4.2 miles southeast of the nearest turbine; Bandit Field Airdrome (5D9), located approximately 6.4 miles west of the nearest turbine; and Norfolk-Huron County Airport, located approximately 7.4 miles southeast of the nearest turbine.

The Applicant has contacted the owners of aviation facilities to provide notification of the proposed Facility. Copies of these letters are attached hereto in Exhibit J. As discussed below, the Applicant is working with the FAA and ODOT Office of Aviation to ensure there will be no aviation impacts as a result of the Project.

(2) FAA Filing Status and Potential Conflicts

The FAA is the authority in the U.S. government responsible for regulating all aspects of civil aviation, including issuing determinations on petitions for objects that penetrate the nation's airspace. The FAA conducts aeronautical studies for new structures that will exceed 200 feet in height under the provisions of Title 49 of the U.S. Code, Section 44718, and applicable 14 CFR Part 77 and ORC Section 4561.32, respectively. The FAA can issue two types of determinations, one that identifies a hazard and another that identifies no hazard.

Aeronautical studies for the proposed Facility are currently underway. The Applicant submitted completed Notices of Proposed Construction, Form 7460-1, for each of the 87 proposed turbine sites[7] on December 20, 2018. Upon receipt of these forms, the FAA obstruction group automatically notifies the ODOT Office of Aviation, thereby fulfilling the state permit application requirements as set forth in OAC Section 5501:1. The FAA and ODOT Office of Aviation will evaluate the proposed turbines and determine whether they are in compliance with the standards set forth in 14 CFR Part 77 and the ORC. The FAA receipt for submittal of the Facility's 7460-1 Forms is included in Exhibit J. It is anticipated that the proposed turbines will not exceed obstruction standards and will not be a hazard to air navigation.

Turbines will be marked and/or lit in accordance with FAA Advisory Circular 70/7460-1 K Change 2, Obstruction Marking and Lighting. Because no turbine will be constructed until the respective Determination of No Hazard has been issued, neither construction nor operation of the proposed Facility is expected to create any adverse impacts on the existing air travel network. Once the Determinations of No Hazard are received, they will be shared with the OPSB.

[7] One turbine location has shifted since the December 2018 FAA submittal, but due to the federal government shutdown, a revised filing cannot currently be submitted. The Notice of Proposed Construction for T20 will be submitted to the FAA once the government resumes normal operations, and appropriate documentation provided to Staff as a supplemental filing.

4906-4-08 HEALTH AND SAFETY, LAND USE, AND ECOLOGICAL INFORMATION

(A) HEALTH AND SAFETY

(1) Equipment Safety and Reliability

(a) *Public Safety*

Public safety concerns associated with Facility construction include: 1) the movement of large construction vehicles, equipment, and materials; 2) falling overhead objects; 3) falls into open excavations; and 4) electrocution. These concerns are addressed through construction safety plans that identify exposure areas and risk mitigation protocols. These issues are most relevant to construction personnel who will be working in close proximity to construction equipment and materials and exposed to construction-related hazards on a daily basis and who will be trained in all appropriate safety and regulatory requirements. The risk of construction-related injury will be minimized through safety policies and procedures, daily safety meetings, safety training, and the use of appropriate safety equipment.

Construction activities will adhere to industry safety standards and will occur primarily on private land well removed from adjacent roads and residences; therefore, exposure of the general public to construction-related risks/hazard is expected to be very limited. However, there is a chance that the general public could be exposed to construction-related hazards due to the passage of large construction equipment on area roads and unauthorized access to the work site (on foot, by motor vehicle, ATV, or snowmobile). Therefore, to ensure that local first responders are aware of these potential issues, the Applicant will meet with the local emergency service personnel (fire, police, and EMS) to review and discuss the planned construction process.

The Applicant's Emergency Action Plan (EAP) will include procedures for responding to fires and medical emergencies within the tower or the nacelle. Although the turbines contain relatively few flammable components, they do contain electrical generating equipment and electrical cables, along with various oils (lubricating, cooling, and hydraulic). This, in combination with the elevated location of the nacelle and the enclosed space of the tower interior makes response to a fire or other emergency difficult, and beyond the capabilities of most local fire departments and emergency service providers. The presence of high voltage electrical equipment also presents potential safety risks to local responders. As explained further below, the Applicant will coordinate with local responders and will share the EAP with the local responders.

All turbines and electrical equipment will be installed according to all applicable regulatory standards and manufacturer specifications prior to being brought on line. Equipment integrity management, preventative maintenance, remote monitoring, and built-in safety systems minimize the chance of fire occurring in the turbines or electrical substations. However, fire at these facilities could result from a lightning strike, short circuit, or mechanical failure/malfunction. Any of these occurrences at a turbine would be sensed by the System Control and Data Acquisition system and reported to the Facility control center. Under these conditions, the turbines would automatically shut down and Facility maintenance personnel would respond as appropriate.

Lightning protection systems were first added to rotor blades in the mid-1990s and are now a standard component of modern turbines. These systems rely on lightning receptors and diverter strips in the blades that provide a path for the lightning strike to follow to the grounded tower. Lightning is effectively and safely intercepted at several receptor points, including the outermost blade tip and the blade root surface, and transmitted to the wind turbine's lightning conductive system. The turbines' blade monitoring system provides documentation of all critical lightning events. If a problem is detected, the turbine will shut down automatically, or at a minimum, be inspected to assure that damage has not occurred.

In the unlikely event that a wind turbine were to catch fire, it would typically be allowed to burn itself out while maintenance and fire personnel maintain a safety area around the turbine to protect against the potential for spot ground fires that might start due to sparks or falling material. If a turbine does catch fire, the circuit to that turbine or the entire Facility would be de-energized. An effective method for extinguishing a turbine fire from the ground does not exist, and the events generally do not last long enough to warrant attempts to extinguish the fire from the air. However, since the public does not have access to the private land on which the turbines are located, risk to public safety during a fire event is essentially non-existent. In addition, transformers at the substation are equipped with a fire suppression system. This system will quickly extinguish any fires that occur at the project substation.

Generally, any emergency/fire situations at a wind turbine site or substation that are beyond the capabilities of the local service providers will be the responsibility of the Facility owner/operator. Construction and maintenance personnel (and properly trained and equipped regional responders) will be trained and will have the equipment to deal with emergency situations that may occur at the Facility site (e.g., tower rescue, working in confined spaces, high voltage, etc.). Consequently, such an incident would generally not expose local emergency service providers or the general public to any public health

or safety risk. The Applicant will include local rescue workers in regular joint training for the emergency procedures specific to the turbine model used for the Facility. This would provide additional trained rescue personnel in the unlikely case of injury or other accident occurring in the turbines.

The turbines proposed for the Facility will utilize appropriate ice detection equipment. For example, systems currently in place monitor the temperature and conditions on the detection unit. If ice starts to form on this unit, the system will send a command to the turbine to shut down. Most modern wind turbines also monitor the wind speed to power output ratio. If ice accumulates on the blades, this ratio becomes too high and the turbine will stop itself.

(b) *Equipment Reliability*

Equipment reliability is an important criterion in turbine selection. As described in Section 4906-4-03(B)(1)(a), turbine models that have been determined to be suitable for this site include the Vestas V150, Siemens Gamesa SG145, and Nordex N149. These turbines are independently certified as meeting international design standards by independent product safety certification organizations such as Germanischer Lloyd and Underwriters Laboratories. These certifications require that the wind turbines have a design life of at least 20 years for the specified wind regime. The wind regime considers factors such as weather extremes, average wind speed, wind gusts, and turbulence intensity. In addition to stringent design standards, turbines are equipped with monitoring equipment that will shut down the turbines in the event of excessive blade vibrations or when wind speeds exceed maximum values. This equipment is regularly maintained on a preventative maintenance schedule to ensure continued operation.

(c) *Generation Equipment Manufacturer's Safety Standards and Setbacks*

Exhibit N consists of safety manuals for the three turbine models under consideration for the proposed Facility, submitted under seal. These manuals address safety measures specific to operations and maintenance employees, such as first aid, protection against falls, and personal protective equipment.

(d) *Measures to Restrict Public Access*

The public does not have access to the private land on which the Facility turbines are located; hence, the public would encounter the proposed Facility only by trespassing. There will be signs at the intersection of public roads and access roads identifying the turbine(s) served by the access road and prohibiting unauthorized entry. If a fence already exists, then a gate will be installed; otherwise access roads will

not have gated entrances. The project substation will be enclosed by a chain link fence. The doors at the base of the turbines are locked to prevent unauthorized access to the interior of the turbines.

(e) *Fire Protection, Safety, and Medical Emergency Plans*

All Facility employees and contractors will be required to adhere to a Health and Safety Policy (HSP) and Facility Safety Manual, as well an EAP. Preliminary versions of these documents are attached as Exhibit O and P, respectively. The final HSP and EAP will be developed with consultation from all necessary local emergency services, including medical facilities. To ensure that local first responders are aware of potential issues, the Applicant will consult with the local emergency service personnel (fire, police, and EMS) to review and discuss the planned construction process. The Applicant will include local rescue workers in regular joint training for the emergency procedures specific to the turbine model used for the Facility. In addition to training, the Applicant will equip fire and emergency responders with proper equipment to enable them to respond to emergency situations.

(2) Probable Impacts due to Failures of Air Pollution Control Equipment

Wind turbines generate electricity without combusting fuel or releasing pollutants into the atmosphere. Therefore, this section is not applicable.

(3) Sound

Resource Systems Group, Inc. (RSG) was retained by the Applicant to evaluate potential sound impacts from the proposed Facility (see Exhibit G). The study consists of two principal phases: 1) a background sound level survey; and 2) a computer modeling analysis of future turbine sound levels. The report also includes a primer on the science of sound, an overview of relevant standards and precedents that apply to the proposed Facility, a discussion of sound issues particular to wind turbines, and an evaluation of construction sound impacts.

The purpose of the background sound level survey was to determine what minimum environmental sound levels are consistently present and available to mask or obscure potential sound from the Facility at locations representative of potentially sensitive receptors (e.g., a dwelling, business, etc.) close to project turbines. High levels of background sound, such as insects or the rustling of leaves on trees or corn stalks, act to reduce audibility of the wind farm, while low levels of natural sound would permit operational sound from the turbines to be more readily perceptible. For a broadband sound source such as a wind farm, the audibility and potential impact of the new sound source is a function of how much, if at all, it exceeds the pre-existing background sound level.

An additional factor that is important in establishing the minimum background sound level available to mask potential wind turbine sound is the natural sound generated by the wind itself. The sound from a wind turbine can often be masked by wind sound at downwind receivers because the frequency spectrum from wind is very similar to the frequency spectrum from a wind turbine. In general, wind turbines only operate and produce sound when the wind exceeds a minimum cut-in speed of roughly 3 m/s (7 mph) at hub height. Turbine sound levels increase with wind speed up to about 7 or 8 m/s (15-18 mph), when the sound produced generally reaches a maximum and no longer increases because the rotor has reached a predetermined maximum rotational speed. Consequently, at moderate to high wind speeds – when turbine sound levels are most significant – the level of natural masking sound is normally also relatively high due to tree or grass rustle thus reducing the perceptibility of the turbine noise.

Background sound levels were measured at nine locations around the Project Area (see Figure 2 in Exhibit G). Monitoring was conducted over two periods. The sound levels in the northern half of the Project Area (Monitors 1 through 5) were measured from March 14 to 28, 2018, while sound levels in the southern half of the Project Area (Monitors 6 through 9) were measured from September 13 to 27, 2018. The microphones were mounted on 1.5-meter (5-foot) tall wooden stakes and covered with weather resistant windscreens. Wind data was logged at each site using an ONSET anemometer that recorded data once per second and was installed at microphone height. Sound level data was collected using either Cesva SC-310, Svantek SV979, which are both ANSI/IEC Type 1 instruments. All sound level meters logged A-weighted equivalent sound levels and 1/3-octave-band spectral sound levels once each second. Data was summarized into 10-minute periods. All periods that contained precipitation, wind speeds above 11 mph, anomalous sound sources, seasonal sound sources, and readily noticeable sounds that were due to interaction of animals or humans with the sound monitors were eliminated during post-processing.

The meters continuously recorded a number of statistical parameters, such as the average (Leq), along with various percentile sound levels (L90, L50, L10). Of these, Leq and L90 levels are the most meaningful. The Leq is the average sound pressure level over specified period of time, or equivalent sound level. Since Leq describes the average pressure, loud and infrequent sounds have a greater effect on the resulting level than quieter and more frequent sounds. Because it tends to weight the higher sound levels and is representative of sound that takes place over time, the Leq is the most commonly used descriptor in sound standards and regulations. The L90, or residual sound level, is commonly used to conservatively quantify background sound levels. The L90 is the sound level exceeded during 90% of the measurement interval (i.e., it is louder than the L90 level most [90%] of the time). This measure has the quality of filtering out relatively loud, sporadic,

short-duration sound events thereby capturing the quiet lulls between such events. It is this consistently present, near-minimum "background" level that forms a conservative basis for evaluating the audibility of a new source. The L10 is the sound level that is exceeded 10% of the time, while the L50 is the median sound level, or the sound level exceeded 50% of the time.

The overall average nighttime Leq sound for the nine measurement positions was 44 decibels, A-weighted (dBA), and the daytime average was 48 dBA. In all cases, the nighttime Leq levels are less than or equal to the daytime Leq levels, which is typical. There is also a generally large spread between the Leq and L90 values, indicating that the soundscapes at most sites are dominated by intermittent sounds (such as cars driving nearby and airplanes flying overhead) instead of constant sound sources (such as streams and distant traffic). The nighttime and daytime sound are summarized below in Table 08-1.

Table 08-1. Sound Monitoring Summary

Monitoring Location	Sound Level (dBA)							
	Night				Day			
	Leq	L90	L50	L10	Leq	L90	L50	L10
Monitor 1	50	42	48	54	51	42	50	54
Monitor 2	44	31	38	46	47	35	42	50
Monitor 3	45	33	41	48	47	37	43	50
Monitor 4	43	32	39	46	45	35	41	49
Monitor 5	40	27	32	41	44	29	36	47
Monitor 6	52	25	38	54	58	34	47	60
Monitor 7	35	20	25	35	42	24	31	41
Monitor 8	36	22	31	37	41	27	34	41
Monitor 9	52	25	47	53	56	34	51	59

Source: RSG, 2019.

(a) *Construction Sound Levels at the Nearest Property Boundary*

Sound from construction activities associated with the Facility is likely to temporarily constitute a moderate unavoidable impact at some of the homes in the vicinity of the Project Area. The sound levels resulting from construction activities vary significantly depending on several factors such as the type and age of equipment, the specific equipment manufacture and model, the operations being performed, and the overall condition of the equipment and exhaust system mufflers. The development of the Facility will involve construction to establish access roads, excavate and pour the wind turbine foundations, preparation of the site for crane-lifting, and wind turbine assembly and commissioning.

In general, the maximum potential sound impact at any single residence might be analogous to a few days to a few weeks of repair or repaving work occurring on a nearby road or to the sound of machinery operating on a nearby farm. More commonly (at houses that are some distance away), the sounds from project construction are likely to be faintly perceived as the far-off sound of diesel-powered earthmoving equipment characterized by such things as irregular engine revs, back up alarms, gravel dumping, and the clanking of metal tracks. According to the geotechnical desktop review (Hull, 2019b), excavation within bedrock may be necessary to install foundations in the western portion of the Project Area. Therefore, the need for blasting, rock breaking/hammering, and/or pile driving may arise during construction. It is expected that any such activities would occur intermittently and only for limited periods of time. Furthermore, the location of such activities, if needed, would not be widespread (i.e., would most likely be confined to limited areas). Prior to construction, initial geotechnical investigation and test borings will be conducted to confirm/refine the information presented in Exhibit E, and to facilitate final foundation design and engineering. The locations of test borings will be at appropriate turbine sites, as determined necessary by the geotechnical engineer. The borings will extend to the proposed depth or competent bedrock, whichever is encountered first (Hull, 2019b).

Construction of the Facility is anticipated to consist of the following seven major activities:

- Site clearing: The initial phase includes establishing temporary site offices, workshops, stores, and other on-site facilities. Installation of erosion and sedimentation control measures, as well as the preparation of initial haulage routes. This phase also includes grubbing and stripping of topsoil along the collection route and in advance of access road construction.
- Access road construction: private access roads will be stripped of topsoil, subgrade compacted and cement stabilized and capped with rock or similar, per the engineer of record.
- Collection cable installation: The collection route will be grubbed and stripped of topsoil. Thereafter, a trencher (or similar) will be used to install the conductors, communications and ground wires. The trench will be backfilled in lifts and compacted to meet the engineer of record's specifications.
- Excavation: This phase includes the preparation of laydown areas, and excavation for the concrete turbine foundations.
- Foundation work: This phase consists of construction of the reinforced concrete turbine foundations and installation of the electrical interconnection network. As indicated above, excavation within bedrock may be necessary to install foundations in the eastern portion of the

site. Construction methods in such areas could include rock breaking/hammering, pile driving, and/or blasting.

- Wind turbine installation: This phase includes the delivery of the turbine components, followed by their installation and commissioning.
- Restoration: Once construction is complete, temporarily disturbed areas will be restored and returned to their approximate preconstruction contours. Exposed soils will be stabilized by seeding, mulching, and/or agricultural planting.

As required by OAC Rule 4906-4-08(A)(3)(a)(i) through (vi), the individual pieces of equipment likely to be used for each of these phases and sound levels at 50 feet (near) and 1,468 feet (far), which is the closest distance between a turbine site and non-participating residence, are summarized below in Table 08-2. The expected construction sounds levels at the nearest property boundary will be variable, given the varying distances between the turbine sites and property lines. As currently sited, the distance between proposed turbines and the nearest non-participating property line ranges from 1,372 feet to 3,854 feet, and averages 1,596 feet. Construction sound levels at property lines are expected to be within the range of sound levels presented in Table 08-2.

Table 08-2. Maximum Sound Levels from Various Construction Equipment

Equipment	Maximum Sound Pressure Level at 50 feet (dBA)	Maximum Sound Pressure Level at 1,468 feet (dBA)
M-250 Liftcrane	83	48
2250 S3 Liftcrane	78	43
Excavator	83	50
Dump truck being loaded	86	54
Dump truck at 25 mph accelerating	76	44
Tractor trailer at 25 mph accelerating	80	49
Concrete truck	81	46
Bulldozer	85	50
Rock drill	100	62
Loader	80	42
Backhoe	80	45
Wood chipper	96	64

Source: RSG, 2019.

The values in Table 08-2 generally indicate that sound levels ranging from 76 to 100 dBA might temporarily occur at property boundaries, which is within the Occupational Safety and Health

Administration (OSHA) permissible daily sound exposure limits for two hours per day (29 CFR 1910.95). Such levels would not generally be considered desirable on a permanent basis or outside of normal daytime working hours, but as a temporary, daytime occurrence, construction sound of this magnitude may well go unnoticed by many in the vicinity of the Project Area. This is especially true in agricultural areas, where the sounds of tractors, trucks, and other agricultural machinery are commonplace.

Sounds generated by construction activities are typically exempt from state and local oversight provided that they occur within weekday, daytime periods as may be specified under local zoning or legal codes. All reasonable efforts will be made to minimize the impact of sound resulting from construction activities. When construction scheduling is finalized, the construction engineer will notify the community via public notice (or similar method) of expected project construction commencement and duration to help minimize the effects of construction sound. In addition, the location of stationary equipment and the siting of potential construction laydown areas have been carefully selected to be as far removed from existing sound sensitives areas as is practical.

As currently sited, the distance between proposed turbines and the nearest non-participating residential structure ranges from 1,468 feet to 4,218 feet, and averages 2,079 feet. However, there may be some cases where access road construction or trenching operations occur closer to homes, which could result in higher sound levels if this work occurs very close to residences. In such cases, every effort will be made to give affected residents advanced notice about when this kind of work will be occurring and how long it is expected to last.

Increased traffic will be generated throughout the construction period with personnel, equipment, and materials deliveries. The volume, vehicle type, and roadways utilized will be dependent on the construction activities taking place or scheduled to occur. According to the Transportation Study (Exhibit D) prepared in support of the Facility, construction traffic will consist of standard construction equipment including dump trucks, concrete trucks, semi-trailers, and pick-up trucks, as well as specialized hauling trucks for delivery of turbine components. All component delivery traffic is currently assumed to enter the Project Area from the north. The specialized hauling trucks will use permitted over-size/over-weight trucks to bring the components from the manufacturer to the Project Area (Hull, 2019a).

Nearly all vehicle traffic produces sounds. However, the source and magnitude of the sound may vary significantly due to several factors including road grade, vehicle type, and speed. Typical sound levels for passenger vehicles traveling 55 mph are 72 to 74 dBA at 50 feet. Comparatively, sound levels for

heavy trucks traveling 55 mph range from 84 to 86 dBA at 50 feet. Of the construction traffic generated, approximately 50% is expected to be heavy vehicles based on construction of similar wind energy facilities. The greatest impact in traffic sound will be on roadways that are expected to have their peak average daily traffic volumes increase by more than a factor of two, which is equivalent to a 3 dBA increase in the hourly Leq sound level. This scenario is expected to be limited to relatively isolated roadways with low existing traffic volumes. For all other access routes, construction of the project is unlikely to cause increases in the existing traffic in excess of 3 dBA.

Major construction work, such as clearing for the access roads and any drilling and blasting, will occur during the day. Some construction activity such as extended concrete pours, blade lifts, and minor construction work may extend earlier or later. Work on the turbine sites will be more than 0.2 mile from the nearest residence. Due to the distances between residences and construction locations, the time-of-day restrictions on drilling and blasting, and the limited duration of construction, construction sound will not create an undue adverse impact (RSG, 2019).

(b) *Operational Sound Levels at the Nearest Property Boundary*

Sound levels from wind power projects are regulated under OAC Rule 4906-4-09(F)(2), which states:

> The facility shall be operated so that the facility noise contribution does not result in noise levels at any non-participating sensitive receptor within one mile of the project boundary that exceed the project area ambient nighttime average sound level (Leq) by five A-weighted decibels (dBA). During daytime operation only (seven a.m. to ten p.m.), the facility may operate at the greater of: the project area ambient nighttime Leq plus five dBA; or the validly measured ambient Leq plus five dBA at the location of the sensitive receptor. After measured ambient Leq plus five dBA at the location of the sensitive receptor. After commencement of commercial operation, the applicant shall conduct further review of the impact and possible mitigation of all project-related noise complaints through its complaint resolution process. Non-participating, as used in this context, refers to a property for which the owner has not signed a waiver or otherwise agreed to be subject to a higher noise level.

Based on ambient sound monitoring conducted at nine locations throughout the Project Area, as described above and in greater detail in Exhibit G, the existing nighttime background Leq in the area is 44 dBA. Applying the OPSB sound level limit results in a nighttime sound level limit of 49 dBA.

(i) Operational sound from generation equipment

The starting point for any wind turbine sound modeling study is the sound level, or more specifically, the sound power level, of the turbine model. A manufacturer of a wind turbine must test and report sound emissions from its turbines using two international standards:

1. International Electrotechnical Commission (IEC) standard 61400-11:2002(E), "Wind Turbine Generator Systems – Part 11: Acoustic Noise Measurement Techniques"
2. IEC standard 61400-14:2005(E), "Wind Turbine Generator Systems – Part 14: Declaration of Apparent Sound Power Level and Tonality Values"

These standards provide sound power emission levels from a turbine, by wind speed and frequency. They also provide a confidence interval. Since the specific make and model of turbine to be installed in the Project Area has not yet been determined, the sound characteristics of all turbines under consideration were reviewed. Sound propagation modeling was performed for each of four possible combinations of turbine models and hub heights (i.e., Vestas V150, Siemens SG145, and Nordex N149) at all 87 turbine locations. The Vestas V150 was modeled at a 105-meter hub height, the Siemens Gamesa SG145 was modeled at a 107.5-meter hub height, and the Nordex N149 was modeled twice, once each for the 109-meter and 125-meter hub heights. In addition, a cumulative model was run that included the 87 Siemens Gamesa SG145 Emerson Creek turbines, along with 27 Siemens Gamesa SG145 turbines from the proposed Republic Wind Farm (Case No. 17-2295-EL-BGN, Amended Application, December 26, 2018) and 31 GE 2.5-127 and 2.3-116 turbines from the proposed Seneca Wind Farm (Case No. 18-0488-EL-BGN, Application, July 16, 2018). Turbines from the proposed Republic and Seneca facilities were only included in the cumulative impacts analysis in cases where located within 3 miles of the proposed Emerson Creek Facility.

Modeling for the project was completed using the International Standards Organization (ISO) 9613-2 standard, "Acoustics – Attenuation of sound during propagation outdoors, Part 2: General Method of Calculation." The ISO standard states,

> This part of ISO 9613 specifies an engineering method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a variety of sources. The method predicts the equivalent continuous A-weighted sound pressure level … under meteorological conditions favorable to propagation from sources of known sound emissions. These conditions are for downwind propagation … or, equivalently, propagation under a well-developed moderate ground-based temperature inversion, such as commonly occurs at night.

The model takes into account source sound power levels, surface reflection and absorption, atmospheric absorption, geometric divergence, meteorological conditions, walls, barriers, berms, and terrain. Model input data is provided in Appendix C of Exhibit G. The ISO standard was implemented in the Cadna A acoustical modeling software. Made by Datakustik GmbH, Cadna A is

an internationally accepted acoustical model, used by many other sound control professionals in the U.S. and abroad. Standard modeling methodology takes into account moderate nighttime inversions or moderate downwind conditions. In the RSG study, sound propagation was modeled in accordance with ISO 9613-2 with spectral ground attenuation, mixed ground (G=0.5[8]), a 2 dB uncertainty factor added to the manufacturer-published wind turbine apparent sound power, and foliage was not modeled. These model parameters have been shown to yield conservative results for wind turbine sound. Results calculated with these parameters represent the highest one-hour equivalent sound level that will be emitted by the project. A 50-meter by 50-meter grid of receivers was set up in the model covering 500 square miles around the proposed Facility. In addition, more than 3,200 discrete receivers were modeled at residences and other sensitive locations. A receiver is a point above the ground at which the computer model calculates a sound level. The coordinates for each receiver are provided in Appendix C of Exhibit G.

All residences, both non-participating and participating, are projected to experience sound levels of 49 dBA or less from all four model runs that include only the Emerson Creek turbines. All non-participating residences are projected to be at 48 dBA or less from all four model runs that include only the Emerson Creek turbines. That is less than the 49 dBA limit that is applicable to this Facility. The highest sound level modeled at a participating sensitive receptor is 54 dBA, which is at a residence located adjacent to the collection substation. The modeled sound level at that receptor is due to the two transformers during stage two cooling (Oil Natural Air Forced [ONAF]), which involves the operation of cooling fans. The cooling fans typically only operate intermittently during daytime hours when the ambient temperature is high (i.e., hot summer days). At night, the transformers typically operate with natural convection cooling (Oil Natural Air Natural [ONAN]), which does not involve cooling fans. Under ONAN conditions the sound level at the closest residence (a participating receptor) to the substation will be 49 dBA. A summary of the maximum modeled sound pressure levels for each turbine model is provided below in Table 08-3. Appendix D in Exhibit G provides a list of the calculated overall sound pressure levels at each discrete receiver for all five model runs, along with maps showing all receiver identification numbers for reference to the chart.

[8]The ground absorption coefficient (from ISO 9613-2) ranges from 0 for water or hard concrete surfaces to 1 for absorptive surfaces such as farm fields, woods, or sand. Consequently, a ground absorption coefficient on the order of 0.8 or 0.9 could be justified here. However, a value of 0.5 has been used to present worst-case impacts.

Table 08-3. Summary of Maximum Modeled Sound Pressure Levels (dBA) for Each Model

Receptor Type	V150	N149 109-meter hub height	N149 125-meter hub height	SG 145	Cumulative (Emerson, Republic, & Seneca)
All	54	54	54	54	54
Participating	54	54	54	54	54
Non-Participating	46	47	47	48	51

Source: RSG, 2019.
Note: This table only presents maximum possible sound level values to demonstrate compliance with the 49 dBA limit at non-participating receptors. Mean and minimum modeled sound pressure levels are provided in Table 4 of Exhibit G.

As shown above in Table 08-3, if the Emerson Creek, Republic Wind, and Seneca Wind facilities were all constructed and operating simultaneously, the highest sound level at a modeled non-participating receptor within 1 mile of Emerson Creek is 51 dBA. In total, there are three receptors (ID 2175, 2964, & 3022 in Appendix D of Exhibit G) that would exceed 49 dBA of cumulative sound. These receptors are located on the border between Emerson Creek and Seneca Wind in the southwest corner of the Emerson Creek Project Area, between 4,757 feet and 5,085 feet west of T80. The cause of the sound levels in excess of 49 dBA at these three receivers is due primarily to turbines from the proposed Seneca Wind Farm. The sound attributable to the Emerson Creek project alone is 37 dBA at ID 2175 and ID 3022, and 36 dBA at ID 2964. It is important to note that Noise Reduced Operations (NRO) were proposed by Seneca Wind for some turbines, but it is not apparent from their sound report which turbines would implement that technology. If Seneca Wind plans to implement NRO for the operation of the turbines closest to IDs 2175, 2964, and 3022, then the projected sound levels at those receptors from the cumulative model run would likely be less than what is reported here.

It should also be noted that, in order to present worst-case impacts at all receptors, all five modeled scenarios included 87 turbines for the proposed Emerson Creek Facility. However, the number of turbines that will actually be constructed and operated will range between 66 and 71, depending on the model of turbine selected (i.e., if a 4.2 MW turbine is selected, it is expected that 71 turbines will be constructed; if a 4.5 MW turbine is selected, it is expected that 66 turbines will be constructed). It is expected that the process of reducing the layout from 87 turbines to either 66 or 71 turbines will reduce the modeled sound pressure levels in some areas. A preconstruction sound analysis will be conducted to determine the Facility-related sound levels based on the final turbine model selected, and the associated turbine sites. Regardless of turbine model and sites selected, the Facility will be

operated so that it does not result in sound pressure levels in excess of 49 dBA at any non-participating sensitive receptor.

(ii) Processing equipment

There is no processing equipment associated with this Facility. Therefore, this section is not applicable.

(iii) Associated road traffic

Transportation sound during Facility construction is addressed above in Section 4906-4-08(3)(a). Once operational, the proposed Facility will not significantly contribute to traffic on local roads. Post-construction traffic will be associated with operations personnel traveling to and from the O&M building and wind turbine sites. Routine maintenance will typically be required on a quarterly basis at each wind turbine, as well as at the collection substation. These service visits will usually involve one or two pick-up trucks. Therefore, significant impacts from traffic sound are not anticipated.

(c) *Location of Sound-Sensitive Areas within One-Mile of the Facility*

The predicted sound contour plots in Exhibit G depict residential structures within one mile of the proposed Facility. There are no libraries, nursing homes, hospitals, or schools within one mile of the proposed turbines. However, six churches are located within one mile of the Facility (Master's Hand Church of God, St. John's Lutheran Church, St. John's United Church of Christ, Bellevue Alliance Church, First Baptist Church, and Sorrowful Mother Shrine). The closest school, Bellevue Elementary, is located 1.2 miles from the nearest turbine. Adverse impact to sound-sensitive areas from Facility-related sound is not anticipated (i.e., sound levels from the Facility will not exceed 49 dBA at these sites). See Section 4906-4-08(D)(3) of this Application for information on impacts to recreational areas.

(d) *Mitigation of Sound Emissions during Construction and Operation*

Over the last decade, the wind industry has invested heavily in reducing turbine sound through improvements in turbine technology, engineering, and insulation. According to a 2006 report prepared by the Renewable Energy Research Laboratory, sound levels emitted by wind turbines have decreased as technology has advanced. Improvements in blade airfoil efficiency have resulted in more wind energy being converted into rotational energy, and less into acoustic energy. Vibration dampening and improved mechanical design have also significantly reduced sound from mechanical sources. Furthermore, aerodynamic sound generation is very sensitive to speed at the blade tips. Modern variable speed wind turbines, like those proposed for the Facility, rotate at slower speeds in low winds, increasing in higher

winds. This results in quieter operation in low winds when compared to older, constant speed wind turbines (Rogers et al., 2006). These findings are consistent with a USDOE report (2008), which found "advances in engineering and insulation ensure that modern turbines are relatively quiet; concerns about sound are primarily associated with older technology, such as the turbines of the 1980s, which were considerably louder."

Although residential sound impacts are anticipated to be minor, additional mitigation measures will include the following:

- Implementing best management practices for sound abatement during construction, including use of appropriate mufflers, proper vehicle maintenance, and limiting hours of construction to normal working hours, unless there is a compelling reason to work beyond those hours.
- Notifying landowners of certain construction sound impacts in advance, e.g., if blasting becomes necessary.
- The highest possible sound levels produced by the proposed wind turbine models were used for modeling, when the turbine will not actually produce such high levels during many operating conditions (i.e., sound levels will often be lower than those presented herein, which represent the worst-case scenario).
- Sound levels at many locations will be lower than those modeled and presented herein, since these results are based on 87 turbines, when only 67-71 turbines will actually be built.

In addition, if adverse sound impacts are identified from wind turbine operations, a reasonable complaint resolution procedure will be implemented to ensure that any complaints regarding construction or operational sound are adequately investigated and resolved. A hotline will be setup to receive and formally document all sound complaints, which will then be investigated by onsite Facility staff. A draft Complaint Resolution Plan is attached hereto as Exhibit M.

(e) *Preconstruction Background Sound Study*

A preconstruction sound analysis will be conducted to determine the Facility-related sound levels based on the final turbine model selected, and the associated turbine sites.

(4) Water Impacts

Hull & Associates, Inc. (Hull, 2019b) conducted a desktop review of available hydrogeology and geotechnical information for the proposed Facility, attached as Exhibit E. Information was summarized from available on-

line databases and/or documents produced by the following federal, state, and local agencies: the Federal Emergency Management Administration (FEMA); the USGS; the USDA Soil Conservation Service Soil Surveys of Erie, Huron, and Seneca Counties; the ODOT Districts 2 and 3; the Ohio EPA; the Ohio Department of Agriculture (ODA); the Ohio Department of Natural Resources (ODNR); the Huron, Erie, and Seneca County Health Departments; and the Ohio State University Agricultural Extension Office. In addition, Hull mailed a brief well survey to landowners that were under contract with the Applicant as of March 2018. The survey included questions regarding the owner, address, and the number, depth, installation date, and construction of water wells on the subject properties. Additional information was requested regarding the aquifer type, depth to water, and yield of each well. The survey also requested information regarding problems, if any, experienced by the property owners with their wells.

(a) *Impacts to Public and Private Water Supplies from Construction and Operation*

In general, the proposed Project Area lies within rural areas of Huron, Erie, and Seneca Counties. Consequently, many residents in the vicinity of the Project Area rely upon private wells for their potable water. Several source water protection areas (SWPAs) overlap portions of the Project Area. Construction of the proposed Facility will not constitute an activity that would be restricted within either a surface water or groundwater SWPA; see further discussion below in Section 4906-4-08(A)(4)(d). The principal source of groundwater in the Project Area is a carbonate limestone bedrock aquifer. Figure 7 in Exhibit E depicts aquifers, along with well locations compiled from information provided by ODNR, Ohio EPA, and the Huron, Erie, and Seneca County Health Departments. It should be noted that Hull (2019b) has not reviewed specific information such as depth, boring logs, or construction associated with any of the wells depicted on Figure 7 in Exhibit E, nor has there been any attempt to differentiate whether the private wells were installed within the carbonate aquifer, the unconsolidated aquifers, or another aquifer.

Hull received completed well surveys from 94 of the 140 property owners to which the surveys were mailed (67%). Of these, 50 respondents indicated that they had no wells on the property; most of these respondents indicated that they were connected to a municipal water supply. Of the 44 respondents with wells, 22 reported that they had one well, while 14 noted two wells, and seven reported three or more wells. Wells were used for potable water for residents, as well as for livestock and agricultural purposes. Approximately half of the respondents were able to provide information regarding the total depth and diameter of their wells, depth to water, and well yield. Drilled well diameters were generally 3 to 8 inches, and several dug wells were reported at 3 to 6 feet in diameter. Reported well depths ranged between 16 and 200 feet. Respondents that provided information as to the depth to water in their wells indicated that water depths varied between 8 and 100 feet. Well yields were reported to vary between 4 and 50 gallons

per minute. Four respondents indicated poor water yield, one of whom specified that the low yields were due to a drought year.

Based on the requirements of OAC Rule 4906-4-08(C)(2)(b) and the dimensions of the proposed turbines, setbacks from non-participating property line must be at least 1,371 feet, based on the longest rotor blades under consideration for the Facility[9]. All turbine locations will comply with these setbacks. As currently sited, the distance between proposed turbines and the nearest non-participating property line ranges from 1,372 feet to 3,854 feet, and averages 1,596 feet. In addition, the distance between proposed turbines and the nearest non-participating residence ranges from 1,468 feet to 4,218 feet, and averages 2,079 feet. Although the exact location of each potable use well cannot be determined with the information obtained to date, it is assumed that the potable wells are located in close proximity to each property owners' residence. Due to the distance between residences and construction activities at proposed turbine sites, this setback will protect wells from negative impacts. Therefore, no impact to public or private water supplies is anticipated from the construction or operation of the proposed Facility (Hull, 2019b).

(b) *Impacts to Public and Private Water Supplies from Pollution Control Equipment Failures*

Wind turbines generate electricity without combusting fuel or releasing pollutants into the atmosphere. Therefore, this section is not applicable.

(c) *Water Resources Map*

Figure 08-1 depicts existing aquifers, water wells, and drinking water source protection areas that may be directly affected by the proposed Facility. The water resources mapping was developed from publicly available data from the Ohio EPA (2017).

(d) *Compliance with Local Water Source Protection Plans*

Ohio's Source Water Assessment and Protection Program, also known as "Wellhead Protection" and "Drinking Water Source Protection", assists communities with protecting their sources of drinking water (streams, rivers, lakes, reservoirs, and aquifers) from contamination. SWPAs, as defined and approved by Ohio EPA for the protection of drinking water sources, were also evaluated during the Groundwater Hydrogeological and Geotechnical Desktop Document Review Summary Report prepared by Hull (see

[9] According to OAC Rule 4906-4-08(C)(2)(b), "The wind turbine shall be at least one thousand, one hundred, twenty-five feet in horizontal distance from the tip of the turbine's nearest blade at ninety degrees to the property line of the nearest adjacent property at the time of the certification application." Of the turbine models under consideration for the proposed Facility, the Vestas V150 has the largest rotor diameter at 492 feet (150 meters), meaning the turbine's blade would extend out 246 feet when at ninety degrees. [1,125 feet + 246 feet = 1,371 feet].

Exhibit F). Environmental regulatory programs within the Ohio EPA, as well as other regulatory agencies such as the Ohio Bureau of Underground Storage Regulations, have adopted regulations that restrict specific activities within SWPAs. These activities include concentrated animal feeding operations, sanitary, industrial or residual waste landfills, land application of biosolids, and voluntary brownfield cleanups. Construction activities such as those that occur on a wind farm are not restricted by regulatory agencies within SWPAs. The restrictions typically apply to SWPAs relying on groundwater as their drinking water source. Figure 7 in Exhibit E shows the estimated 1-year and 5-year time of travel distances from the respective supply wells.

Numerous SWPAs have been established in Erie, Huron, and Seneca Counties. A ground water protection area is located on the western portion of the Project Area boundary (Capital Aluminum and Glass SWPA; Figure 7 in Exhibit E), protecting the groundwater associated with the karst formations of the Columbus Limestone. Four turbines are located inside the Capital Aluminum and Glass SWPA. Due to the high groundwater flow rates (3,500-8,600 ft./day) and a relatively high vulnerability (shallow depth to bedrock, sinkholes and rapid flow of groundwater), the Ohio EPA delineated the entire region contributing water via the karst system as a SWPA. The Capital Aluminum and Glass SWPA is a non-transient, noncommunity public water system located near Bellevue. The system operates one well and pumps approximately 2,600 gallons per day from the carbonate bedrock aquifer.

Additionally, there are six Inland Surface Water Protection Areas located in the eastern (City of Bellevue) and southeastern (Monroeville Village) portions of the Project Area, as presented in Figure 7 in Exhibit E and Figure 08-1 of this Application. The Bellevue City Inland SWPA encompasses two surface water intakes. Frink Run and Berry Creek serve as the surface water sources for the City of Bellevue. Frink Run is approximately 16.1 miles long, has a drainage area of 29.8 square miles and flows into the West Branch Huron River. The SWPA covers approximately 25.8 square miles, and two turbines are located within these SWPAs.

The Monroeville Village Inland SWPA encompasses the West Branch Huron River, which serves as the surface water source for the Village of Monroeville. The West Branch Huron River is approximately 46 miles long and has a drainage area of 262 square miles. The West Branch Huron River flows into the Huron River. The water system intake is located approximately 8.52 miles from the mouth of the Huron River. The protection area covers approximately 217 square miles and 40 turbines are located within the SWPA.

The Aqua Ohio – Tiffin, City of Fremont and the Attica Village Inland SWPAs all overlap in the southwest corner of the Project Area boundary. The Aqua Ohio – Tiffin protection area covers approximately 961 square miles; the City of Fremont protection area covers approximately 1,255 square miles; and the Attica Village protection area covers approximately 76 square miles. There are three turbines located within these SWPAs.

Hull (2019b) has reviewed the range of programs that have adopted rules related to the presence of SWPAs and have concluded that construction of the proposed wind turbine Facility will not constitute an activity that would be restricted within either a surface water or groundwater SWPA. Furthermore, the Applicant will implement best management practices during construction and operation of the turbines and associated facilities that will protect against negative impacts to the SWPAs (Hull, 2019b).

(e) *Prospects of Floods in the Area*

A floodplain is flat land adjacent to a stream or river that experiences occasional or periodic flooding. For regulatory purposes, the floodplain is divided into two areas, based on water velocity: the floodway and the flood fringe. The floodway includes the channel and the portion of the adjacent floodplain required to pass the 100-year flood without increasing flood heights. Typically, this is the most hazardous portion of the floodplain where the fastest flow of water occurs. Due to the high degree of hazard, most floodplain regulations require that proposed floodway developments do not block the free flow of flood water, as this could dangerously increase that water's depth and velocity. The flood fringe is the remaining portion of the floodplain, outside of the floodway, that usually contains slow-moving or standing water. Development in the fringe will not normally interfere as much with the flow of water. Therefore, floodplain regulations for the flood fringe typically allow development to occur but require protection from floodwaters through flood proofing so that water cannot enter the structure (ODNR, 2017).

Surface water flow within the Project Area is generally to the northeast. The entire Project Area is located within the Lake Erie Drainage Basin. Surface water bodies present within the Project Area include several small streams, ditches, ponds, and above ground reservoirs. The streams generally flow from the southwest to the northeast. The majority of the surface water inside the Project Area flows into Megginson Creek and Seymour Creek, located in the central northern portion of the Project Area. These water bodies connect to the West Branch Huron River, which flows into the Huron River, which discharges into Lake Erie. Several small un-named tributaries in the northwestern portion of the Project Area connect to Mills Creek, which parallels the western Project Area before discharging into Lake Erie.

Information on floodplains in the vicinity of the Project Area was obtained from ODNR and FEMA, as part of the Groundwater Hydrogeological and Geotechnical Desktop Document Review Summary Report prepared by Hull (2019b) and attached hereto as Exhibit E. Several areas designated as 100-year floodplains are present within the Project Area, mostly along portions of Megginson Creek, as well as several unnamed tributaries in the south-central portion of the Project Area and portions of Mill Creek in the northwestern portion of the Project Area (see Figure 6 in Exhibit E). There are no turbine sites proposed within designated 100-year floodplains (Hull, 2019b).

(5) Geological Features Map

Figure 08-2 depicts the geologic features of the proposed Facility site, as well as topographic contours, existing gas and oil wells, and injection wells.

As previously discussed, Hull prepared a desktop review of available hydrogeological and geotechnical information in the vicinity of the Project Area, which is attached hereto as Exhibit E. The data in Exhibit E were compiled by Hull (2019b) through a literature search of existing and readily available documents related to the surface and subsurface soils, agricultural resources, geologic/bedrock conditions, surface water flows, and groundwater resources in the Project Area. This information was reviewed to develop a generalized understanding of the suitability of the soils within the Project Area for grading, compaction, and drainage for the Project Area. Sources consulted include: FEMA; ODA; the ODNR; Ohio EPA; the ODOT Districts 2 and 3; the Ohio State University Agricultural Extension Office; the Erie and Huron County Engineers; the Erie, Huron, and Seneca County Health Departments; the USDA Soil Conservation Service Soil Survey of Erie, Huron, and Seneca Counties; and USGS.

(a) *Geologic Suitability*

Existing Conditions

The Project Area lies within the Central Ohio Clayey Till Plain, Erie Lake Plain, and Bellevue-Castalia Karst Plains Regions of the Huron-Erie Lake Plains and Till Plains Sections of the Central Lowland Physiographic Province within the Interior Plains Division. The southern portion of the Project Area lies within the Central Ohio Clayey Till Plain Region, which is characterized as having a surface of clayey till with well-defined moraines, intervening flat-lying ground moraine, and intermorainal lake basins. Surface elevations range from approximately 700 feet to 1,150 feet above mean sea level (amsl). The north portion of the Project Area is located within the Erie Lake Plain Region, which is characterized as the edge of a very low-relief Ice-Age lake basin separated from modern Lake Erie by shoreline cliffs and major streams in deep gorges. Low physiographic relief (about 10 feet) is generally present in this region.

Surface elevations range from approximately 570 to 800 feet amsl. The extreme northwestern portion of the Project Area is located in the Bellevue-Castalia Karst Plains Region and is characterized as a hummocky plain of rock knobs and numerous sinkholes, large solution features, caves, and springs. Moderate to high physiographic relief (about 25 feet) is generally present in this region. Surface elevations range from approximately 570 to 825 feet amsl (Hull, 2019b).

The surface topography within the Project Area is the result of ice-deposited ground moraine, which was planed by waves in glacial lakes following deposition, resulting in a relatively flat surficial topography. Small areas of lake-deposited material, or lacustrine deposits, are present on the surface in the extreme northeastern portion of the Project Area. These lacustrine deposits are generally laminated and were formed in the calm waters of glacial lakes. Lacustrine deposits are a heterogeneous mixture of all sizes of soil particles inclusive of clay, silt, sand, and gravel, and may also contain streaks, seams, layers or lenses of sand and gravel, which may or may not be water-bearing. The lacustrine deposits have a greater thickness to bedrock (up to 147 feet) on the western portion of the Project Area, than they do on the eastern portion (less than 10 feet). The area was passed over by both Pre-Illinoian and Wisconsinan glaciers (Hull, 2019b).

Bedrock underlying the western portion of the Project Area is Devonian Columbus Limestone, a unit that includes limestone and dolomite. Delaware Limestone is deposited beneath the Columbus Limestone in the western portion of the Project Area. The west-central portion of the Project Area is composed of additional Devonian units: Olentangy Shale, Prout Limestone, and Plum Brook Shale. The remaining eastern portion of the Project Area is composed of the Devonian Ohio Shale, which is characterized by thin bedded laminations and fissile parting. The approximated bedrock topographic surface is shown on Figure 3 in Exhibit E, which shows that bedrock elevations in the vicinity of the Project Area range from approximately 720 in the north to approximately 880 in the south.

Depths-to-bedrock within the Project Area were approximated based on information obtained from the ODNR database of water well drilling logs. Documented bedrock depths for water wells drilled into bedrock in the vicinity of the Project Area range from approximately 30 to 70 feet in the eastern portion of the Project Area, and between four and 30 feet in the western portion of the Project Area. Information obtained from ODNR, Division of Geological Survey, indicates that the western edge of the Project Area lies within a probable karst area. Six (6) of the 87 proposed turbines are located in the probable karst area (see Figure 4 in Exhibit E).

A review of documented geologic structural and seismic information was conducted for the Project Area. Seismic information was obtained from the ODNR, Division of Geological Survey. No epicenters lie within the Project Area. However, the Tiffin Fault extends to approximately 15 miles west of the western boundary of the Project Area. The Seneca Anomaly also lies approximately 8 miles west of the western boundary of the Project Area. Other faults and fault systems in the vicinity of the Project Area include the Outlet Fault, part of the Bowling Green Fault System, situated approximately 25 miles west-southwest of the Project Area. Recorded seismic information shows that no earthquakes have originated in Erie County. However, two earthquakes occurred in Huron County in 1998 and 2001 and produced a magnitude of 3.2 and 2.7 mbLg, respectively. The closest seismic event to the Project Area was in 1936 when a 3.1-magnitude earthquake occurred in Seneca County, Ohio. The epicenter was located approximately 18 miles west of the Project Area (Hull, 2019b).

Site Suitability

Based on their experience with earthwork in the region, Hull (2019b) indicates that conventional, shallow foundations are expected to be able to support most turbines. However, this assumption will need to be confirmed by a detailed geotechnical exploration and evaluation at each turbine site, access road, and the substation site. If it is determined that shallow foundations are not suitable for structural support at a specific location, extended type foundation systems (such as driven H-piles or auger cast piles) may be necessary to bear in suitable material or on bedrock. Additionally, other suitable foundation types may be utilized according to their compatibility with the geotechnical parameters of the specific turbine site.

The geotechnical engineer, or a designated representative, will examine foundation designs and compatibility with the supporting soils, and approve the work prior to placement of foundation components. See Exhibit E for additional information.

Hull contacted the Erie County Engineer's Office regarding their knowledge and experience of previous construction projects, subsurface conditions, and maintenance history in the vicinity the Project Area boundary. A response was received indicating that sinkholes are the primary geotechnical issue encountered within the area. For many municipalities, sinkholes function as the primary source for drainage. The Erie County Engineer's Office indicated that the only roadway issues encountered have been flooding associated with sinkholes (Hull, 2019b). Hull also contacted the County Engineer's Offices in Huron County on multiple occasions regarding their knowledge and experience of previous issues within the Project Area, and to ask about permits that may be necessary for construction.

Hull (2019b) contacted the ODOT District 2 to discuss typical maintenance issues encountered in the area. Bryan Spero, Transportation Manager for Seneca County, ODOT District 2 indicated that the most common geotechnical issue encountered in the vicinity of the Project Area are sinkholes resulting from karstic features. These sinkholes are typically encountered within agricultural fields and have not impacted ODOT roads to Mr. Spero's knowledge. Mr. Spero further indicated that a sinkhole developed south of Bloomville, Ohio years ago but no new sinkholes have been reported within the last several years. Mr. Spero indicated that historical use of injections wells by industrial operations within the district may have enhanced or contributed to the development of karst. Finally, Mr. Spero mentioned that an "underground river" associated with the cave system in the area flows between Bloomville and Bellevue, Ohio. It should be noted that the consultation with Seneca County officials occurred in an earlier phase of project development, when the Applicant was considering a layout that extended into Seneca County. The current Facility, as presented in this Application, is located entirely within Huron and Erie Counties; there are no Facility components in Seneca County. However, Mr. Spero's thoughts have still been included herein due to their relevance to the general area.

As previously mentioned, due to the glacial history and presence of karst topography within the Project Area, the depth to bedrock varies considerably throughout. Bedrock is generally shallower within the western portion of the Project Area and deeper within the eastern portion. Consequently, foundation considerations vary depending on the location of each turbine. Due to the anticipated depth of bedrock, excavation within bedrock may be necessary in the western portion of the Project Area to install foundations. Furthermore, karst areas may include sinkholes, solution cavities, and cave systems. Where determined reasonable and appropriate, these voids may be grouted in order to provide adequate foundation support. Initial geotechnical investigation and test borings will be conducted prior to construction to confirm/refine the information presented in Exhibit E and facilitate final foundation design and engineering. The locations of test borings will be at appropriate turbine sites and associated access roads, as determined necessary by the geotechnical engineer. In addition, borings will be taken at the proposed substation locations. The borings will extend to fifty feet or competent bedrock, whichever is encountered first (Hull, 2019b).

(b) *Soil Suitability*

Existing Conditions

The USDA Soil Conservation Service Soil Surveys of Erie, Huron, and Seneca Counties were reviewed. Soil surveys furnish surface soil maps and provide general descriptions and potentials of the soil to support specific uses and can be used to compare the suitability of large areas for general land uses.

Approximately 23.4% of the Project Area is comprised of Pewamo Silty Clay Loams, while Bennington Silt Loams cover approximately 31.0% of the Project Area. The remainder of the Project Area is covered by various clay, silt, and sand loams as presented in Figure 8 in Exhibit E. Pewamo Silty Clay Loams have a 0 to 2% slope and are very poorly drained soils. The permeability is moderately slow, the available water capacity is high, and the seasonal high water table is near or slightly above the surface during extended wet periods. Bennington Silt Loams have a 2 to 5% slope and somewhat poorly drained soils. The permeability is slow, the available water capacity is moderate and the seasonal high water table is 12 to 30 inches below ground surface. The Hornell Silty Clay Loam has a 0 to 2% slope and are somewhat poorly drained soils. The permeability is very slow to slow, the water capacity is high, and the seasonal high water table is 0.5 to 1.5 feet below ground surface. The soil surveys indicate that these soils do not frequently flood; however, the Pewamo Silty Clay Loams frequently pond surface water runoff (Hull, 2019b).

Site Suitability

To maintain soil stability during construction, adequate surface water run-off drainage will be established and properly controlled at each proposed construction site to minimize any increase in the moisture content of the subgrade material. Positive drainage of each construction site will be created by gently sloping the surface toward drainage swales. It should be noted that sub-grade soils are subject to shrinking and swelling due to variation in seasonal moisture contents, and consideration should be given during constructability reviews to determine how best to deal with potential moisture fluctuations (Hull, 2019b).

Based on a review of the soil survey information and Hull's experience with earthwork in the area, the soils on-site should be suitable for grading, compaction, and drainage when each site is prepared as discussed in Appendix D of Exhibit E.

Site Restoration

Construction will involve topsoil stripping and grubbing of stumps, as necessary. Stripped topsoil will be stockpiled along the road corridor for use in site restoration. Following removal of topsoil, subsoil will be graded, compacted, and surfaced with gravel or crushed stone (depth to be determined on a case-by-case basis), and a geotextile fabric or grid will be installed beneath the road surface if necessary, to provide additional support. In agricultural areas, all topsoil within the work area will be stripped and segregated from excavated subsoil. Once construction is complete, the soil will be restored. Exposed subsoils will be de-compacted with a deep ripper or heavy-duty chisel plow to a minimum depth of 18

inches. Following de-compaction of the subsoil, the surface of the subsoil will be picked over to remove rocks four inches in size or larger. Following rock picking, stockpiled topsoil will be returned to disturbed agricultural areas. The topsoil will be re-graded to match original depth and contours to the extent possible. The surface of the re-graded topsoil will be disked, and rocks over four inches in size will be removed from the soil surface. Restored topsoil will be stabilized with seeding and/or mulching, unless other arrangements have been made with the landowner. All access roads will be re-graded as necessary to create a reasonably smooth travel surface, allow crossing by farm equipment, and prevent interruption of surface drainage. Temporary water bars and culverts shall be removed if they are no longer necessary.

(c) *Plans for Test Borings*

Due to the glacial history and presence of karst topography within the Project Area, the depth to bedrock varies considerably throughout. Bedrock is generally shallower within the western portion of the Project Area (evidenced by the presence of limestone quarries and karst) and deeper within the eastern portion (evidence by thick deposits of glacial drift). Consequently, foundation considerations vary depending the location of each turbine. Initial geotechnical investigation and test borings will be conducted prior to construction to confirm/refine the information presented in Exhibit E, and to facilitate final foundation design and engineering. A Generalized Geotechnical Exploration Work Plan is attached as Appendix E to Exhibit E. This work plan describes the planned reconnaissance, drilling/sampling, geotechnical laboratory testing, and report to be prepared.

After the geotechnical engineer has reviewed all available desktop information, s/he will determine the number of borings to be drilled for the initial geotechnical investigation. The locations of test borings will be at appropriate turbine sites. In addition, borings will be taken at the proposed substation locations. The Applicant may forego the initial preliminary geotechnical investigation and instead proceed to the full final investigation if the balance of plant pricing schedule allows. The turbine, O&M, and substation borings will extend to 50 feet below grade or competent bedrock, whichever is encountered first. The geotechnical engineer typically bores beyond the proposed depth of the foundation, because they need to know the competency of the bearing strata. Split-barrel sampling of soil will be performed in accordance with American Society for Testing and Materials (ASTM) D1586 for each boring in increments of 2.5 feet to the depth of 50 feet, and at 5-foot intervals below 50 feet to the depth of the borings. In all the borings, Standard Penetration Test (SPT) data will be developed and representative samples preserved. Water observations in the boreholes will be recorded during (and at the completion of) drilling. A truck-mounted drill rig will be used to perform the borings, unless unfavorable weather conditions make

the site inaccessible, in which case an ATV-mounted drill rig will be used. At the completion of drilling, all borings will be backfilled with drill cuttings and/or bentonite chips (Hull, 2019b).

A laboratory testing program will be established by the geotechnical engineer based on the observations made during the drilling activities and experience. All samples will be classified in the laboratory based on the visual-manual examination (ASTM D 2488) Soil Classification System and the laboratory test results. Formal boring logs will be prepared using the field logs and the laboratory classifications. For a limited number of samples considered to be representative of the foundation materials encountered by the borings across the Project Area, laboratory testing will include moisture content, particle-size analyses, and Atterberg limits. Unconfined compression and consolidation tests will be performed if low strength and/or highly compressible cohesive soils are encountered, as deemed necessary by the geotechnical engineer. All laboratory testing will be performed in accordance with ASTM or other specified standards. A report will be prepared documenting the findings of the borings and laboratory testing, including subsurface soil properties, static water levels, rock quality descriptions, percent recovery, and depth and description of bedrock contact (Hull, 2019b). This report will be provided to OPSB Staff prior to commencement of Facility construction.

(6) Wind Velocity

The wind turbines proposed for the Facility are rated to withstand wind speeds well in excess of those likely to occur in the Project Area. International standards for wind turbines are developed by working groups of Technical Committee-88 of the IEC, a world-recognized body for standards development. All turbines under consideration for the Facility are designed to meet the standards of the IEC-61400 series and are rated to specific IEC wind classes. The Vestas V150 is certified for class IIIB/IEC S winds; the Siemens Gamesa SG145 is certified for Class IIB winds; and the Nordex N149 is certified for class IEC S winds. IEC IIIB provides that the structure is designed to operate under average wind speeds of 7.5 m/s (17 mph) and withstand extreme 10-minute average wind speeds of 37.5 m/s (84 mph), while class IIB provides that the structure is designed to operate under average wind speeds of 8.5 m/s (19 mph) and withstand extreme 10-minute average wind speeds of 42.5 m/s (95 mph). IEC class S is user defined. It is important to note that these IEC standards represent minimum design values.

(7) Blade Shear

A potential public safety concern with wind power projects is the possibility of a wind turbine tower collapsing or a rotor blade dropping or being thrown from the nacelle. While extremely rare, such incidents have

occurred; however, to the best of the Applicant's knowledge, no member of the public has ever been injured as a result of these incidents.

The reasons for a tower collapse or blade throw vary depending on conditions and tower type. The main causes of blade and tower failure are a control system failure leading to an over speed situation, a lightning strike, or a manufacturing defect in the blade. Technological improvements and mandatory safety standards during turbine design, manufacturing, and installation have significantly reduced the instances of blade throw. The reduction in blade failures coincides with the widespread introduction of wind turbine design certification and type approval. The certification bodies perform quality control audits of the blade manufacturing facilities and perform strength testing of construction materials. These audits typically involve a dynamic test that simulates the life loading and stress on the rotor blade (Garrad Hassan, 2010).

Modern utility-scale turbines are certified according to international engineering standards. These include ratings for withstanding different levels of hurricane-strength winds and other criteria (American Society of Civil Engineers [ASCE] & American Wind Energy Association [AWEA], 2011). The engineering standards of the wind turbines ultimately used for this Facility will meet all applicable engineering standards. State of the art braking systems, pitch controls, sensors, and speed controls on wind turbines have greatly reduced the risk of blade throw. The wind turbines to be used for the Facility will be equipped with two fully independent braking systems that allow the rotor to be brought to a halt under all foreseeable conditions. In addition, the turbines will automatically shut down at wind speeds over the manufacturer's threshold (i.e., 25 m/s [56 mph]). As described above, the turbines will also cease operation if significant vibrations or rotor blade stress is sensed by the monitoring systems. For all of these reasons, the risk of catastrophic blade throw is minimal.

Although the risk of blade throw is minimal, the Applicant will have procedures in place in the event of a blade throw incident. These procedures will include emergency shutdown procedures, post event site security measures, immediate notification of state and local officials, and the implementation of turbine manufacturer specific blade throw safety procedures, if any. In addition, the Applicant will conduct annual training for operating staff, as well as local first responders, on the procedures to be implemented in the event of a blade throw incident.

Given the low risk of tower collapse and blade throw, the potential impact is negligible. The Facility's setbacks from permanent residences and adjacent property lines will adequately protect the public from tower collapse and blade throw. The Facility setbacks consist of a minimum of 1,371 feet between turbine sites and adjacent property lines. As currently sited, the distance between proposed turbines and the nearest non-participating

residential structure ranges from 1,468 to 4,218 feet, and averages 2,079 feet. The distance between proposed turbines and the nearest non-participating property line ranges from 1,372 feet to 3,854 feet, and averages 1,596 feet.

(8) Ice Throw

Ice throw refers to the release of an ice fragment from a rotating turbine blade. Its occurrence is the product of ice accretion on the blades and the appropriate conditions to allow release from the blade. For ice throw to occur, a control breakdown within the turbine is necessary. Modern wind turbines have control systems in place to shut down during significant icing events, mitigating most ice throw. Ice accumulation from icing on a turbine blade occurs in two primary ways, precipitation icing and in-cloud icing. Precipitation icing forms as liquid precipitation comes into contact with a turbine blade. During a narrow temperature range, precipitation icing may result from wet snow, though this generally occurs on structures at a standstill. In contrast, freezing rain can affect rotating blades, demonstrates a high rate of adhesion, and results in an ice with a high density. In-cloud icing forms as supercooled water droplets deposit onto the blade surface. A wider range of accretion and density result from this process, influenced by the thermodynamics at the surface (Battisti, 2015). The following analysis of potential ice throw assumes a control breakdown within the turbine to allow for ice throw.

When ice fragments are released from the blade their trajectory is influenced by the wind strength and direction, along with the mass and size of the fragments, amongst other factors (Battisti, 2015). Limited data on the impact of these individual factors exist; however, a limited number of observational studies have been undertaken to quantify ice throw behavior. In a 2-year study in the Swiss Alps, Cattin et. al. (2007) collected 121 fragments in the area surrounding a turbine with a rotor diameter of 40 meters, with a maximum weight of 1.8 kilogram (kg) and a maximum throwing distance of 92 meters. Forty percent of the ice found was recovered within 20 meters of the turbine base and over 95% of the fragments were less than 500 grams (g). A Swedish study carried out from 2014 to 2016 collected 421 ice fragments, of which 336 have a recorded mass. Fifty percent of these 336 fragments were less than 500 g and 85% less than 1 kg. A maximum throwing distance of 142 meters was recorded for a 0.10-kg ice fragment at a wind speed of 8.4 m/s (Pöyry, 2017).

EDR performed an ice throw analysis to evaluate the probability of ice throw impact at the nearest property boundary and public road in the unlikely event that the control system monitoring ice accumulation fails. The methodology, as detailed in the ice throw analysis (Exhibit L), included identifying conditions under which ice throw could occur, analyzing trends in local wind conditions, and modeling the trajectory of released ice

fragments. Further, the probabilities of impact across an (x,y) grid surrounding each turbine was calculated. A localized regression model was applied to the results to determine probability contours around each turbine.

Ohio, in general, experiences a humid continental climate with hot humid summers and cold winters. While ice forms on turbine blades in two primary ways, as discussed above, there are minimal studies on the accretion of ice on turbine blades, and no such studies in Ohio. However, beyond Ohio there are records of the occurrence of ice accretion on turbine blades due to freezing rain. This method is thought to be the most common method of ice accretion in nearby Southern Ontario and is more likely to impact low-lying lands such as those of the Project Area (Biswas et. al., 2012; Tammelin, 1998). Chagnon & Karl (2003) considered historic trends in freezing rain between 1948 and 2000 for the continental U.S. and found an average of five freezing rain days a year in Northwestern Ohio. Five days per year is considered a moderate level of icing event occurrence within the existing body of ice throw literature (Morgan et al., 1998). Chagnon & Karl (2003) also found the earliest occurrence of freezing rain in the area to be November and the latest occurrence in April. This 6-month range, between November and April, is taken as the time frame during which ice throw could occur.

In addition to the accretion of ice on the turbine blades, conditions must exist for ice fragments to release from the blades, including the failure of control systems responsible for preventing the turbine from spinning when ice is accumulating. A simplified method has been developed in the literature from observations of ice accretion and ice throw at existing turbines (Battisti, 2015). The ratio of daily ice accretion to the average mass of fragments found around the turbines results in roughly 200 throws per icing event for a 0.36-kg ice fragment. Using the same average daily ice accretion, for a 1-kg ice fragment, this results in 75 throws. To provide a conservative assessment, the number of 100 throws per day was used. Together with the icing events per year, as discussed above, this results in approximately 500 throws of 1-kg ice fragments per year. Additional detail is provided in Exhibit L.

The Applicant operates a meteorological tower on-site that measures wind speed and direction at multiple heights up to 59 meters. Wind speed and direction between November and April over an 8-year period between 2010 and 2018 were analyzed for trends. Between November and April, winds dominate from the southwest, primarily at 8.5 m/s to 14.5 m/s.

A ballistic model described in Biswas et. al. (2012), is used to model the three-dimensional trajectory of ice fragments released from turbine blades. The turbine considered for the study, the Nordex N149 4.5-MW turbine with a hub height of 125 meters, was selected from a list of potential turbine models under

consideration for the site, for its long blade length and height. The Nordex N149 turbine has a rotor diameter of 149 meters. In addition to turbine dimensions, and precipitation and wind data, other input parameters included, air density, drag coefficient, Von Karman constant, gravitational acceleration, ice fragment mass, roughness length, and ice fragment frontal area.

The results of the study yielded an annual probability "impact" (i.e., the location where a given fragment of ice is modeled to land) for every 1 square meter in a 17,281-hectare grid with a turbine at the center. For ease of interpretation and visualization the results were fit with a local regression model (LOESS) which identifies trends in the probabilities, generating impact probability contours around a turbine. As localized topography was not included, and the model input data is considered consistent across the Project Area, the impact probability contours are the same for each proposed turbine.

Impact probabilities in impacts/m^2/year for a 1 kg ice fragment are shown in Figure 4 of Exhibit L. Northeast of the turbine the 1% impact contour approaches 75 meters (246 feet) as measured diagonally from the turbine base. In contrast, this distance is 35 meters (115 feet) to the south direction, and 45 meters (148 feet) to the west. The minimum distance between a proposed turbine and the nearest public road is 659 feet and the distance between a proposed turbine and the nearest non-participating property is 1,372 feet. These distances greatly exceed the distance of the 1% impact contour (Figures 5 and 6 of Exhibit L).

In summary, the analysis presented here finds that for a 1-kg fragment of ice, an impact probability of 1% extends approximately 75 meters, the same length as the blade length of the Nordex N149 turbine model. Further, the analysis determines the probabilities at the nearest public road and nearest non-participating property boundary to be 0.1% and less than 0.01%, respectively. This meets the requirements set by OAC Rule 4906-4-09(E)(3). While uncertainty exists in the rate of ice accretion and release during icing events given the limited available data on field observations presented in the literature, reasonable assumptions were made in this analysis which are consistent with the methodologies presented in multiple sources. Using multiple moderate assumptions generates conservative impact probabilities which likely overestimate the modeled impacts. As indicated above, modern wind turbines have control systems in place to shut down during significant icing events, mitigating most ice throw. Therefore, the actual risk of ice throw will be much lower than the calculated 0.1% and less than 0.01%, because the analysis assumed that the control system that shuts down the turbines when ice accumulates on the blades has failed (in itself an unlikely event).

(9) Shadow Flicker

Shadow flicker refers to the moving shadows that an operating wind turbine casts at times of the day when the turbine is between the sun and a receptor's position. The spatial relationship between a wind turbine and a receptor, along with weather characteristics such as wind direction and sunshine probability, are key factors related to shadow-flicker impacts. At distances beyond roughly 10 rotor diameters (approximately 1,500 meters based on the Vestas V150 turbine model) shadow-flicker effects are generally considered negligible (BERR, 2009; DECC, 2011; MassDOER, 2011). This is because shadow flicker intensity diminishes as the distance between receptors and turbines increases.

Although shadow flicker has been alleged to cause or contribute to health effects, blade pass frequencies for modern commercial scale turbines are very low. According to the Epilepsy Society, approximately 5% of individuals with epilepsy have sensitivity to light (Epilepsy Society, 2012). Most people with photosensitive epilepsy are sensitive to flickering around 16-25 Hertz (Hz; equivalent to 1 flash per second), although some people may be sensitive to rates as low as 3 Hz and as high as 60 Hz. Modern wind turbines (including the proposed Vestas V150 and Nordex N149 models) typically operate at a frequency of 1 Hz or less, and there is no evidence that wind turbines can trigger seizures (British Epilepsy Association, 2007; Ellenbogen et al., 2012; NHMRC, 2010; DECC, 2011).

Although setback distances for turbines will significantly reduce shadow flicker impacts to homes, some impact may still occur. OAC Rule 4906-4-09(H)(1) requires that:

> The Facility shall be designed to avoid unreasonable adverse shadow flicker effect at any non-participating sensitive receptor within one thousand meters of any turbine. At a minimum, the facility shall be operated so that shadow flicker levels do not exceed thirty hours per year at any such receptor.

The OPSB has used this threshold of acceptability (i.e., 30 annual hours of shadow flicker) in certifying all commercial wind power projects to date in Ohio (OPSB, 2011a, 2011b, 2012, 2013, 2014). Accordingly, a threshold of 30 shadow flicker hours per year was applied to the analysis of the proposed Facility to identify any potentially significant impacts on residences.

EDR conducted a shadow flicker analysis for the Facility, attached hereto as Exhibit H. The study evaluates the potential impact of 84 Nordex N149 turbines and three Vestas V150 turbines[10], which represent the largest

[10] The Nordex N149 has a similar rotor diameter to the Vestas V150, but a larger hub height; therefore, this model was selected for this analysis since it is the overall largest turbine and would produce the greatest amount of shadow flicker. However, the Nordex N149 with a 125-meter hub height is not a feasible turbine model to use at three of the proposed turbine locations (T67,

turbines under consideration and therefore, represents a worst-case analysis with respect to shadow flicker (i.e., presents maximum potential impacts). Furthermore, this analysis assumes all 87 proposed turbine locations are constructed, even though 16-21 of these locations will not be built. The shadow flicker analysis for the proposed Facility used *WindPRO 3.2.737* software and associated Shadow module. *WindPRO* is a widely accepted modeling software package developed specifically for the design and evaluation of wind power projects. Input variables and assumptions used for shadow flicker modeling calculations for the proposed Facility include:

- The latitude and longitude coordinates of 87 proposed wind turbine sites (provided by the Applicant). All 87 proposed wind turbine sites are included in the model, even though only 66 to 71 turbines will be constructed throughout the site.
- The latitude and longitude coordinates of 1,495 potential sensitive receptors located within the 10-rotor diameter (1,500 meter) Study Area (provided by the Applicant).
- USGS 1:24,000 topographic mapping and USGS 10-meter resolution digital elevation model (DEM) data.
- The rotor diameter (150 meters) and hub height (105 meters) for the Vestas V150 turbine model.
- The rotor diameter (149 meters) and hub height (125 meters) for the Nordex N149 turbine model.
- Annual wind rose data (provided by the Applicant), which is depicted in Table A1 of Attachment A of the Shadow Flicker Report (to determine the approximate directional frequency of rotor orientation throughout the year).
- To account for the occurrence of cloudy conditions, the average monthly percent of available sunshine for the nearest National Oceanic and Atmospheric Administration (NOAA) weather station with a similar latitude (Toledo, Ohio) was used. Data was obtained from NOAA's "Comparative Climatic Data for the United States through 2015" (see Table A2 of Attachment A) (http://www.ncdc.noaa.gov).
- No allowance was made for wind being below or above generation speeds. Blades are assumed to be moving during all daylight hours when the sun's elevation is more than 3 degrees above the horizon. Shadow flicker is generally considered imperceptible when the sun is less than 3 degrees above the horizon (due to the scattering effect of the atmosphere on low angle sunlight) (States Committee for Pollution Control, 2002).

T70, and T82). If the N149 model with a 125-meter hub height is selected as the final turbine model for the Facility, turbines would not be built at those locations. However, if a different turbine model is selected, turbines could potentially be built at those locations. Therefore, the Vestas V150 turbine model was used for the shadow flicker analysis at those three locations as it would produce the most shadow flicker after the N149 turbine.

- The possible screening effect of all existing trees and buildings adjacent to the receptors was not taken into consideration in the modeling. In addition, the number and/or orientation of windows in residential structures were not considered in the analysis. The analysis assumes that any shadow touching a residential structure would be a visible shadow flicker impact, which would only be the case in instances where a home is designed with entirely transparent walls (such as a greenhouse).

The model calculations include the cumulative sum of shadow hours for all Facility turbines. This omni-directional approach reports total shadow flicker results at a receptor regardless of the presence or orientation of windows at that particular residence (i.e., it assumes shadows from all directions can be perceived at a residence, which may or may not be true). A receptor in this "greenhouse" model is defined as a one square meter area located one meter above ground; actual house dimensions are not taken into consideration. Because the shadow flicker analysis conducted for the proposed Facility was based on the conservative assumptions that: 1) 87 turbines will be built; 2) the turbines are in continuous operation during daylight hours; and 3) shadow flicker can be perceived at a receptor structure regardless of the presence or orientation of windows or the screening effects of all surrounding trees and buildings, the analysis presented herein is a conservative projection of the shadow-flicker effects at ground level. Local sunshine and wind direction frequency data were used to more accurately predict rotor alignment and the percent of daylight hours when shadows are likely to be cast. The analysis evaluated the potential impact of 84 Nordex N149 turbines, with a rotor diameter of 149 meters and a hub height of 125 meters and three Vestas V1590 turbines with a rotor diameter of 150 meters and a hub height of 105 meters.

Figure 3 in Exhibit H illustrates the results of the shadow flicker analysis. A summary of the projected shadow flicker at each of the 1,495 receptors located with 1,500 meters of a proposed turbine site is presented below:

- 642 (43%) of the receptors are not expected to experience any shadow flicker,
- 17 (1%) of the receptors may be affected 0-1 hour/year,
- 432 (29%) of the receptors may be affected 1-10 hours/year,
- 204 (14%) of the receptors may be affected 10-20 hours/year,
- 88 (6%) of the receptors may be affected 20-30 hours/year,
- 112 (7%) of the receptors may be affected for more than 30 hours/year.

Of the 112 receptors predicted to receive more than 30 hours of shadow flicker per year, 57 are located on participating parcels, while 55 are non-participants. The details regarding anticipated shadow flicker at the 55 non-participating receptors are summarized below in Table 08-4. Please note that these predicted shadow

flicker values will not actually be experienced at these receptors, as the Applicant will implement the necessary mitigation measures through operational design, following the realistic shadow flicker analysis using the specific turbine array for construction, to achieve compliance at all non-participating receptors.

Table 08-4. Daily Effect to Non-Participating Receptors Predicted to Exceed 30 Hours of Shadow Flicker per Year

Receptor ID	Predicted Annual Shadow Flicker (hh:mm/year)	Turbine Contributing to Shadow Flicker	Approximate Times of Day Receptor Potentially Affected by Flicker[1]
1422	30:28	T48	3:00 PM – 5:15 PM
1204	30:42	T20, T21, T22	7:00 AM – 9:00 AM 3:30 PM – 5:45 PM
824	30:45	T3, T4, T5	6:15 PM – 7:30 PM 7:45 PM – 8:30 PM
986	31:06	T4, T5	6:30 AM – 7:30 AM
304	31:14	T37, T38	7:15 AM – 8:45 AM
861	31:14	T42, T44, T77	6:30 AM – 9:00 AM
1137	31:17	T37, T38	7:15 AM – 8:45 AM
1583	31:35	T9, T11, T72, T73, T74	6:30 AM – 8:00 AM 9:00 AM – 10:30 AM 4:15 PM – 6:15 PM
228	32:21	T42, T44, T77	6:30 AM – 9:00 AM
1620	32:23	T42, T44, T77	6:30 AM – 8:45 AM
1022	32:31	T42, T44, T77	6:30 AM – 9:00 AM
869	32:32	T40, T41, T42, T76	8:00 AM – 8:45 AM 4:00 PM – 5:30 PM 6:30 PM – 8:30 PM
1438	33:00	T21, T22	7:30 AM – 8:30 AM 7:30 PM – 8:30 PM
328	33:06	T43	6:30 AM – 7:45 AM
385	33:45	T3, T4, T5	4:00 PM – 7:00 PM 7:15 PM – 8:00 PM
145	33:58	T35, T36	7:00 AM – 7:45 AM 7:15 PM – 8:15 PM
1314	34:10	T10, T12, T13	4:15 PM – 7:15 PM 7:45 PM – 8:45 PM
477	34:14	T40, T41, T42, T76, T77	7:45 AM – 8:45 AM 3:30 PM – 4:45 PM 5:00 PM – 6:15 PM 7:00 PM – 8:30 PM
344	34:21	T4, T5	6:30 AM – 7:30 AM
834	34:23	T42, T44, T77	6:30 AM – 9:00 AM
569	34:26	T35, T36	7:00 AM – 7:45 AM 7:15 PM – 8:15 PM

Receptor ID	Predicted Annual Shadow Flicker (hh:mm/year)	Turbine Contributing to Shadow Flicker	Approximate Times of Day Receptor Potentially Affected by Flicker[1]
1253	34:28	T4, T5	6:45 AM – 7:45 AM
1174	34:39	T59, T78	6:30 PM – 7:30 PM 7:45 PM – 8:30 PM
1264	34:49	T39	7:15 AM – 8:30 AM
1396	34:52	T34, T37, T38, T39	8:00 AM – 8:45 AM 6:00 PM – 7:15 PM 8:00 PM – 8:45 PM
1040	34:58	T3, T4, T5	4:30 PM – 7:15 PM 7:30 PM – 8:15 PM
1551	35:29	T40, T41, T42, T76, T77	7:45 AM – 8:45 AM 3:30 PM – 6:15 PM 7:00 PM – 8:30 PM
740	35:32	T35, T36	6:45 AM – 7:30 AM 7:30 PM – 8:30 PM
1461	35:37	T3, T4, T5	6:30 PM – 8:30 PM
611	35:45	T4, T5	6:30 AM – 7:30 AM
1146	35:54	T23	7:00 PM – 8:15 PM
255	36:47	T39	6:45 AM – 8:00 AM
422	36:55	T40, T41, T42, T77	6:15 AM – 7:15 AM 7:30 AM – 9:00 AM
1158	37:19	T36	7:00 PM – 8:00 PM
855	39:13	T17, T19, T20	2:30 PM – 3:30 PM 5:00 PM – 7:00 PM 7:15 PM – 8:15 PM
596	39:37	T9, T10, T12, T13	4:00 PM – 7:00 PM 7:45 PM – 8:45 PM
319	39:45	T62, T79	6:15 PM – 7:45 PM
423	39:50	T42, T41, T76, T77	7:45 AM – 8:45 AM 3:30 PM – 4:45 PM 5:00 PM – 7:15 JPM 7:30 PM – 8:15 PM
693	39:50	T34, T37, T38	5:00 PM – 7:15 PM 7:45 PM – 8:30 PM
880	40:02	T41, T42, T76, T77	7:45 AM – 8:45 AM 5:15 PM – 8:45 PM
1493	40:16	T41, T42, T76, T77	7:45 AM – 8:45 AM 3:30 PM – 5:00 PM 5:30 PM – 7:15 PM 7:30 PM – 8:15 PM
718	40:29	T41, T42, T76, T77	7:45 AM – 8:30 AM 5:15 PM – 8:45 PM
1106	41:14	T34, T37, T38	5:00 PM – 7:15 PM 7:45 PM – 8:30 PM
7	41:28	T57, T59, T78	5:30 PM – 8:45 PM

Receptor ID	Predicted Annual Shadow Flicker (hh:mm/year)	Turbine Contributing to Shadow Flicker	Approximate Times of Day Receptor Potentially Affected by Flicker[1]
770	42:52	T67, T68, T69	7:30 AM – 10:00 AM 3:45 PM – 5:45 PM
501	44:47	T27, T28, T30, T31	7:00 AM – 9:00 AM 5:00 PM – 6:45 PM 7:15 PM – 7:45 PM
1136	47:11	T27, T28, T30, T31, T36	7:00 AM – 9:00 AM 5:00 PM – 6:45 PM 7:15 PM – 8:00 PM
1473	53:04	T17, T19, T20,	2:00 PM – 3:15 PM 5:00 PM – 7:00 PM 7:15 PM – 8:15 PM
857	53:34	T24, T25, T26, T75	3:30 PM – 4:45 PM 5:30 PM – 7:45 PM
104	53:54	T30, T31, T35, T36	7:00 AM – 9:00 AM 3:30 PM – 5:00 PM 7:30 PM – 8:30 PM
232	56:33	T54, T55, T56, T58	7:00 AM – 8:30 AM 6:30 PM – 7:45 PM
870	61:49	T27, T29, T32	6:45 AM – 7:30 AM 4:15 PM – 6:15 PM 6:45 PM – 8:00 PM
827	64:02	T24, T25, T26, T75	6:30 AM – 10:15 AM
1375	92:01	T67, T68, T69, T71	6:45 AM – 8:30 AM 8:45 AM – 9:45 AM 6:00 PM – 7:15 PM
1179	94:40	T67, T68, T69, T71	6:45 AM – 8:15 AM 8:30 AM – 9:30 AM

[1] The times of day represent the range of times during which each structure could potentially experience shadow flicker throughout the year; however, no structures will experience shadow flicker every day during all those hours. See Attachment B of Exhibit H for detailed calendars that illustrate the specific time of year and day that each structure may experience shadow flicker.

Although the predicted shadow flicker at these receptors exceeds the 30-hour per year threshold, these calculations do not take into account the actual location and orientation of windows, or the screening effects associated with existing, site-specific conditions such as vegetation and/or buildings. This analysis also assumes turbine rotors are continuously in motion during daylight hours, which will not necessarily be the case (i.e., the blades do not spin below the cut-in speed). In addition, many of the modeled shadow-flicker hours are expected to be low intensity because they would occur during the early morning or late afternoon when the sun is low in the sky. As the sun sinks below the horizon, more of its light is scattered by the atmosphere, which has the effect of dampening its brightness and, therefore, reducing its ability to cast dark shadows (EMD, 2013). Furthermore, as indicated above, the Applicant will implement the necessary mitigation measures through operational design, following the realistic shadow flicker analysis using the

specific turbine array for construction, to reach shadow flicker compliance of 30 hours per year at all non-participating receptors.

As stated earlier, the number of turbines proposed for the Facility will depend on the turbine model chosen. This will provide additional opportunities for minimizing shadow-flicker effects. Specifically, if a 4.5 MW turbine is selected, it is expected that up to 66 turbines will be constructed. However, because the final turbine model is not known, and to provide a conservative, maximum-case analysis, this study evaluates the potential impact of 84 Nordex N149 and three Vestas V150, when in fact this scenario will never be implemented for this Facility. Therefore, given all the maximum-case scenario assumptions, shadow flicker impacts on non-participating and pending receptors will be significantly reduced prior to construction, and may possibly be entirely eliminated at some receptors. A preconstruction shadow flicker analysis will be conducted to determine the actual shadow flicker effects based on the final turbine model selected, and the associated turbine sites. Based on the preconstruction shadow flicker analysis, the Applicant will design and implement the necessary mitigation measures through operational design to achieve shadow flicker compliance at all non-participating receptors.

Because the proposed Facility is located adjacent to the proposed Republic Wind Farm and the proposed Seneca Wind Farm, the potential for cumulative shadow flicker impacts exists at certain receptors (i.e., those receptors located within a 10-rotor diameter distance of Emerson Creek Wind turbines that are also within a 10-rotor diameter distance of turbines in one or more of the proposed wind farms). To evaluate the potential for cumulative shadow flicker impacts from the other proposed wind farms, a second shadow flicker analysis was run for selected turbines. The largest turbine models proposed for each project are:

- Republic Wind Farm – Vestas V150 turbines with a rotor diameter of 150 meters,
- Seneca Wind – GE 2.5-127 turbines with a rotor diameter of 127 meters

To determine receptors that would be potentially affected by turbines from all three projects, a buffer defining the maximum distance of potential effect was applied to the proposed turbines (1,500 meters for Republic Wind Farm turbines, 1,270 meters for Seneca Wind turbines, and 1,500 meters for Emerson Creek Wind turbines). Sixty-eight receptors are located within the area where the other proposed wind farms buffers and the proposed Facility buffer overlap. Therefore, these receptors have the potential for cumulative shadow flicker impacts (Figure 4 of Exhibit H).

The analysis was run using the same software and methodology as described above, along with latitude and longitude coordinates for the 68 receptors that were located in the area of potential cumulative impact and the latitude and longitude coordinates for the other proposed turbines. Results of the cumulative shadow flicker analysis are presented in Table 08-5 below, with the "predicted" columns representing shadow flicker from the Facility only, and the "cumulative predicted" columns representing the combined shadow flicker impacts from the Facility and one or more of the other proposed projects.

Table 08-5. Daily Effect to Structures with Potential Cumulative Shadow Flicker[1]

Receptor ID	Receptor Status	Predicted Annual Shadow Flicker – Emerson Creek Wind Only (hh:mm/year)	Cumulative Predicted Annual Shadow Flicker (hh:mm/year)	Predicted Max Daily Shadow Flicker – Emerson Creek Wind Only (hh:mm/day)	Cumulative Predicted Max Daily Shadow Flicker (hh:mm/day)
254	Non-Participating	0:26	13:56	0:05	0:33
2175	Non-Participating	2:08	22:53	0:23	1:27
3022	Non-Participating	2:08	22:59	0:23	1:27
2964	Non-Participating	2:12	19:51	0:23	1:16
1206	Non-Participating	2:22	2:22	0:24	0:24
539	Non-Participating	2:24	2:24	0:24	0:24
909	Non-Participating	2:58	37:10:00	0:28	1:09
467	Non-Participating	3:05	18:56	0:15	0:47
489	Non-Participating	3:09	38:37:00	0:29	1:09
198	Non-Participating	6:41	6:41	0:27	0:27
1592	Non-Participating	6:49	19:43	0:42	0:42
1127	Non-Participating	6:51	40:26:00	0:35	1:02
476	Non-Participating	6:56	40:03:00	0:35	1:01
815	Non-Participating	7:10	11:04	0:26	0:26
1224	Non-Participating	7:21	26:48:00	0:24	0:54
743	Non-Participating	8:07	19:26	0:45	0:45

Receptor ID	Receptor Status	Predicted Annual Shadow Flicker – Emerson Creek Wind Only (hh:mm/year)	Cumulative Predicted Annual Shadow Flicker (hh:mm/year)	Predicted Max Daily Shadow Flicker – Emerson Creek Wind Only (hh:mm/day)	Cumulative Predicted Max Daily Shadow Flicker (hh:mm/day)
451	Non-Participating	9:22	19:03	0:48	0:48
908	Non-Participating	9:35	17:35	0:49	0:49
1309	Non-Participating	9:59	14:34	0:56	0:56
15	Non-Participating	10:03	24:26:00	0:30	0:55
95	Non-Participating	10:13	19:00	0:50	0:50
1119	Non-Participating	11:17	32:18:00	0:30	1:01
1362	Non-Participating	12:51	20:32	0:53	0:53
1190	Non-Participating	14:19	32:18:00	0:30	0:58
1395	Non-Participating	14:21	31:50:00	0:30	0:57
1586	Non-Participating	14:24	22:58	0:46	0:46
968	Non-Participating	14:44	29:26:00	0:30	0:55
1091	Non-Participating	14:44	19:27	0:59	0:59
199	Non-Participating	14:58	38:00:00	0:48	0:54
418	Non-Participating	15:02	22:24	0:45	0:45
826	Non-Participating	16:04	23:39	0:46	0:46
94	Non-Participating	17:07	24:47:00	0:47	0:47
772	Non-Participating	17:25	25:07:00	0:47	0:47
114	Non-Participating	17:31	25:38:00	0:48	0:48
1105	Non-Participating	18:32	27:27:00	0:49	0:49
864	Non-Participating	19:18	31:25:00	0:49	0:49
127	Non-Participating	19:45	32:29:00	0:40	0:50
1177	Non-Participating	20:18	32:50:00	0:41	0:49

Receptor ID	Receptor Status	Predicted Annual Shadow Flicker – Emerson Creek Wind Only (hh:mm/year)	Cumulative Predicted Annual Shadow Flicker (hh:mm/year)	Predicted Max Daily Shadow Flicker – Emerson Creek Wind Only (hh:mm/day)	Cumulative Predicted Max Daily Shadow Flicker (hh:mm/day)
1319	Non-Participating	21:26	43:21:00	1:01	1:01
1191	Non-Participating	21:56	42:19:00	0:54	1:26
999	Non-Participating	23:17	31:06:00	0:55	0:55
447	Non-Participating	23:36	34:18:00	0:55	0:55
626	Non-Participating	23:50	42:25:00	0:54	1:25
304	Non-Participating	31:14:00	44:12:00	1:18	1:31
1137	Non-Participating	31:17:00	43:12:00	1:29	1:37
665	Participating	9:52	15:15	0:52	0:52
496	Participating	12:52	33:54:00	0:55	1:12
1013	Participating	14:43	17:12	1:27	1:27
275	Participating	42:47:00	51:12:00	1:11	1:35
923	Participating	49:42:00	58:01:00	1:04	1:20

[1] Only receptors that were originally predicted to have shadow flicker from Emerson Creek Wind are included in this table.

Given all the maximum-case scenario assumptions, shadow flicker impacts on non-participating receptors will be significantly reduced prior to construction and may possibly be entirely eliminated at some receptors. A preconstruction shadow flicker analysis will be conducted to determine the actual shadow flicker effects based on the final turbine model selected, and the associated turbine sites. Upon completion of that more realistic analysis, the Applicant will develop appropriate site-specific mitigation measures, as needed, to ensure that the operating Facility does not cause shadow flicker in excess of 30 hours per year at non-participating residences. Shadow flicker mitigation measures could include screening such as vegetative planting, and/or curtailment of certain turbines operation during select times.

(10) Radio and Television Reception

To evaluate the potential for the Facility to impact existing telecommunication signals, Evans Engineering Solutions (Evans) was contracted to conduct analyses of off-air television reception and AM/FM broadcast station operations in the vicinity of the Project Area (see Exhibit Q). Potential impacts to each of these resources are described below.

Off-Air Television Analysis: Rotating wind turbine blades have the potential to disrupt over-the-air broadcast television receptor within a few miles of the turbine when the direct path from the viewer's residence is obstructed by terrain. There is potential for disruption for residences that have outdoor antennas pointed through the Project Area, or that utilize "rabbit ear" antennas and/or older HDTV receivers. This disruption is typically dissipated for locations three or more miles from a turbine. The disruption is usually intermittent pixilation or freezing of the digital TV picture. Based upon Evans' previous experience, approximately 10% of the receiver locations within 3 miles of a turbine are affected when the turbine is between the TV station and receiver.

The television stations serving the Project Area are listed in Table 08-6, below. There are approximately 7,780 households within an area that could be subject to degradation of TV signals (approximately 228 square miles). Evans conservatively estimated that 70% of these households receive television programming through satellite dish or cable, leaving at estimated 2,334 households relying on off-air television signals. Based on the 10% criteria described above, up to 233 households may be affected to varying degrees.

Table 08-6. Licensed Off-Air TV Stations with Signals Over the Project Area

Call Sign	Virtual Channel	RF Channel	Distance to Nearest Turbine (km)	Distance to Nearest Turbine (mi)
WJW	8	8	87.6	54.4
WOIO	19	10	89.7	55.7
WTOL	11	11	67.7	42.1
WMFD-TV	68	12	58.8	36.5
WTVG	13	13	70.6	43.9
WEWS-TV	5	15	87.6	54.4
WKYC*	3	19	90.1	56.0
WVPX-TV	23	22	100.8	62.6
WVIZ*	25	35	90.1	56.0
WBGU-TV	27	22	97.8	60.8
WUAB*	43	10	89.7	55.7
WGTE-TV	30	29	70.1	43.6
WBNX-TV*	55	17	89.6	55.7
WQHS*	61	36	89.0	55.3
WOSU-TV*	34	16	125.5	78.0
WOHZ-CA*	41	20	58.8	36.5
WGGN-TV*	52	3	34.5	21.4
WUPW*	36	26	70.8	44.0
WDLI-TV*	17	22	100.8	62.6
WNWO-TV*	24	23	65.8	40.9
WEAO*	49	24	96.8	60.1

Call Sign	Virtual Channel	RF Channel	Distance to Nearest Turbine (km)	Distance to Nearest Turbine (mi)
New (Permit)	-	33	89.4	55.6
New (Permit)	-	9	98.1	61.0

* TV stations that will soon be moving to the FG channels that are specified above. This may involve one or more stations moving to a different site and/or operating at different power levels.

In the event that interference is observed in households, it is recommended that the household antenna is relocated to receive a better signal, a better antenna or one with a higher gain is installed outside, or cable or satellite television is installed. Any disruptions to television broadcast signals, if they occur, can be resolved satisfactorily. Residents that experience degraded off-air television service after the installation of the Facility can issue a formal complaint with the Applicant. A hotline will be setup to receive and formally document all complaints, which will then be investigated by onsite Facility staff, as is the standard at most recently constructed wind farms. The complaint resolution process will be developed with OPSB Staff before construction begins.

AM/FM Analysis: FM broadcast station signals are fairly insensitive to wind turbines, even in cases where the FM transmitting antenna is surrounded by turbines that are higher than the FM antenna and significant disruptions to FM signals are not expected. Received signals may vary with the blade rotation at some receiver locations in the immediate area; however, good quality FM radios would likely factor out time-varying signals. Evans Engineering identified 33 FM stations that place a predicted primary signal over at least part of the Project Area. Details of these stations are provided in Exhibit Q. There is one FM broadcast transmitter (Call Sign WOHF) on the western boundary of the Project Area, located approximately 503 meters (1,650 feet) from the nearest turbine. However, for the reasons listed above, the signals are not expected to be adversely impacted.

Turbines have the potential to adversely affect the transmitted signals of AM broadcast stations up to 3 kilometers (1.86 miles) away. According to broadcast engineering practice, metal vertical structures more than 30 meters (98 feet) tall (such as communications towers and wind turbines) that are within 10 wavelengths distant from a directional AM station transmitter should be considered to have the potential for disrupting the technical operation of the AM station (Evans, 2019). One AM directional transmitter is located 3.37 kilometers (2.1 miles) from a Facility turbine, which is beyond 10 wavelengths. Therefore, there should be no reasonable expectations of disruptions in transmitted signals due to the turbines.

(11) Radar Interference

Evans was also contracted to send written notification of the proposed Facility to the National Telecommunications and Information Administration (NTIA) of the U.S. Department of Commerce. Upon receipt of notification, the NTIA provides plans for the proposed Facility to the federal agencies represented in the Interdepartment Radio Advisory Committee (IRAC), which include the Department of Defense, the Department of Education, the Department of Justice, and the FAA. The NTIA then identifies any Facility-related concerns detected by the IRAC during the review period. If the Facility had the potential to interfere with military or civilian radar systems, this conflict would be identified during IRAC review.

A notification letter was sent to NTIA on November 30, 2018; a response has not yet been received. The NTIA response letter will be provided to Staff when it becomes available. Based on similar correspondence related to other wind energy facilities in the area, concerns regarding communication systems are not anticipated.

(12) Navigable Airspace Interference

As described above in Section 4906-4-07(E)(2), aeronautical studies for the proposed Facility are currently underway. The Applicant submitted completed Notices of Proposed Construction, Form 7460-1, for each of the 87 proposed turbine sites[11] on December 20, 2018. Upon receipt of these forms, the FAA obstruction group automatically notifies the ODOT Office of Aviation, thereby fulfilling the state permit application requirements as set forth in OAC Rule 5501:1. The FAA and ODOT Office of Aviation will evaluate the proposed turbines and determine whether they are in compliance with the standards set forth in 14 CFR Part 77 and the ORC. The FAA receipt for submittal of the Facility's 7460-1 Forms is included in Exhibit J. It is anticipated that the proposed turbines will not exceed obstruction standards and will not be deemed a hazard to air navigation. Because no turbine will be constructed until the respective Determination of No Hazard has been issued, neither construction nor operation of the proposed Facility is expected to cause interference with navigable airspace.

(13) Microwave Communication Interference

Microwave telecommunication systems are the telecommunication backbone of the country, providing long-distance and local telephone service, backhaul for cellular and personal communication service, data interconnects for mainframe computers and the Internet, network controls for utilities and railroads, and

[11] One turbine location has shifted since the December 2018 FAA submittal, but due to the federal government shutdown, a revised filing cannot currently be submitted. The Notice of Proposed Construction for T20 will be submitted to the FAA once the government resumes normal operations, and appropriate documentation provided to Staff as a supplemental filing.

various video services. These systems are wireless point-to-point links that communicate between two antennas and require clear line-of-sight conditions between each antenna. To assure an uninterrupted line of communications, a microwave link should be clear, not only along the axis between the center point of each antenna, but also within a mathematical distance around the center axis known as the Fresnel Zone. Microwave bands that may be affected by the installation of wind turbine facilities operate over a wide frequency range (900 megahertz [MHz] – 23 gigahertz [GHz]). To determine the likely effect of the proposed Facility upon the existing microwave communications in the area, Evans conducted an extensive Fresnel zone analysis.

Evans identified 42 unique licensed microwave paths from the Federal Communications Commission (FCC) database that are within 0.5 mile of the Project Area boundary (see Table 1 in Exhibit Q). For each microwave path, Evans calculated a Worse Case Fresnel Zone (WCFZ). The WCFZ is defined by the cylindrical area whose axis is the direct line between the microwave link endpoints and whose radius varies based on the length and frequency of the microwave path. This is the zone where the siting of obstructions, such as turbines, should be avoided. Based upon the dimensions of the largest turbine model under consideration, Evans determined that none of the proposed turbine locations will obstruct a WCFZ. Consequently, no turbine would conflict with any FCC-licensed or known planned microwave link, and no degradation of microwave telecommunications is anticipated (Evans, 2019).

(B) ECOLOGICAL IMPACT

(1) Ecological Resources in the Project Area

(a) *Open Spaces and Facility Map*

Figure 08-3 shows the proposed Facility and lands within a 0.5-mile radius of the Project Area. This mapping was developed from ESRI ArcGIS Online "World Topographic Map" map service. Among other information, Figure 08-3 shows the following features:

(i) The proposed Facility and Project Area boundary

(ii) Undeveloped or abandoned land such as wood lots or vacant tracts of land subject to past or present surface mining activities

(iii) Wildlife areas, nature preserves, and other conservation areas

(iv) Surface bodies of water

(v) Highly erodible soils and steep slopes

(b) *Field Survey and Map of Vegetative Communities and Surface Waters within 100 Feet of Construction*

The Mannik Smith Group (MSG) prepared an Ecological Assessment for the proposed Facility (Exhibit Z) that included a desktop review of readily available GIS data, as well as data and field observations from vegetation and surface water surveys completed in the fall of 2018 and early winter 2019. MSG evaluated a study area comprised of 23,024 acres, which includes all areas within 100-feet of the potential construction impact area of the Facility. GIS datasets reviewed include the Ohio Wetland Inventory (OWI); National Wetland Inventory (NWI); USGS topographic maps; the USDA Soil Conservation Service Soil Surveys of Erie, Huron, and Seneca Counties; historical aerial photographs and farmed wetland maps from the USDA Farm Service Agency; the USGS National Hydrography Dataset; ODNR State-listed Species by County lists; USFWS Ohio County Distribution lists; Audubon Important Bird Areas data; the Cornell Lab of Ornithology eBird data; and recent aerial imagery. Wetland and waterbody delineation surveys were completed to determine the extent and jurisdiction of wetlands and waterbodies in the areas to be disturbed by Facility construction. The data obtained during the field survey was found to be consistent with the results of the desktop review (MSG, 2019a).

Vegetative Communities

The dominant ecological communities in the study area are agricultural (crops), with lesser amounts of forestland and disturbed/developed land. Each of these vegetative communities is described below:

Agricultural fields consist primarily of corn and soybean. The majority of the study area is used for agricultural production, including the majority of the area within 100 feet of potential construction impact. During the winter months, fields may be planted in a cover crop such as winter wheat (*Triticum aestivum*) to control erosion and restore soil nutrients. Most agricultural fields within the Study Area are currently active or recently fallowed. Many of the fields and roadsides have man-made or modified ditches that help maintain drainage for proper growing conditions.

Forestland within the entire study area (and within 100 feet of potential construction impact) is limited to windrows and isolated woodlots. Windrows were comprised of narrow forested strips between cultivated areas, and likely served as property boundaries historically. Typically ranging between 30 and 60 feet in depth, windrows occasionally contain man-made ditches, which may have been originally constructed to improve drainage from adjacent agricultural fields. The woodlots observed ranged in size and were often surrounded by agricultural land along at least two sides. Larger woodlots are likely utilized for recreational purposes. Both the windrows and woodlots have a dominance of weedy vegetation along the edges including blackberry (*Rubus* spp.), and poison ivy (*Toxicodendron radicans*). Mature trees along windrows and inside of the woodlots included: maples (*Acer* spp.), oaks (*Quercus* spp.), American elm (*Ulmus americana*), American beech (*Fagus grandifolia*), American sycamore (*Platanus occidentalis*) and hickories (*Carya* spp.).

Developed/disturbed lands are found in low densities throughout the study area and within 100 feet of potential construction impact, and are characterized by the presence of buildings, parking lots, paved and unpaved roads, and lawns/landscaped areas. Vegetation in these areas is generally either lacking or highly managed, including ornamental plantings and managed lawns of tall fescue (*Festuca arundinacea*). In areas that are not intensely managed, weedy herbaceous species such as dandelion (*Taraxacum officinale*), thistle (*Cirsium vulgare*), ragweed (*Ambrosia artemesiifolia*), clover (*Trifolium* spp.), and common purslane (*Portulaca oleracea*) were observed.

The habitats surveyed during field efforts appeared to lack significant or obvious evidence of rare, threatened, or endangered species due to the high level of habitat fragmentation and degradation by current and historic land use manipulation and practices. Many of the waterbodies delineated were identified as potentially providing habitat, but at reduced quality due to surrounding land use impacts on water quality (i.e., high sediment loading during storms and fertilizer in runoff). During the field surveys, minimal wildlife use was observed and no rare, threatened, or endangered species were detected.

Wetland and Stream Delineations

Wetland delineations were completed throughout the study area in accordance with the 1987 U.S. Army Corps of Engineers (USACE) Wetlands Delineation Manual and the applicable regional supplements (i.e., the *2010 Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region, Version 2.0* and *2012 Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region, Version 2.0*). The Manual defines a wetland as any area that contains a predominance of wetland vegetation, hydric soils, and positive indicators of wetland hydrology.

In addition to wetlands, all stream features were documented for their general dimensional, substrate, morphology, and flow regimen characteristics where possible. Potentially regulated water boundaries were mapped with sub-meter accuracy Global Positioning System (GPS) equipment.

Wetland qualitative assessments were completed by the MSG team utilizing the Ohio Rapid Assessment Method for Wetlands, version 5.0 (ORAM). The ORAM wetland functional assessment was developed to determine the ecological "quality" and level of function of a particular wetland. Wetlands are scored on the basis of hydrology, upland buffer, habitat alteration, special wetland communities, and vegetation communities. Each of these subject areas is further divided into sub-categories under ORAM resulting in a score that describes the wetland using a range from 0 (low quality and high disturbance) to 100 (high quality and low disturbance). Based on these scores, there are three possible categories to which wetlands may be assigned:

- Category 1 – Lowest value category. Wetlands in this category are generally limited to small, low-diversity wetlands and wetlands with a predominance of non-native invasive species. The designation 'Category 1' is assigned to wetlands whose ORAM scores fall between 0 and 29.9. Wetlands whose ORAM scores fall between 30 and 34.9 fall in a scoring 'gray area', and additional testing is needed to determine whether they belong in Category 1 or the next higher Category.

- Category 2 – Middle value category. Wetlands in this category are of moderate diversity but do not contain rare, threatened or endangered species. They are generally degraded but are capable of restoring some of the lost functionality and attaining a higher value. Most wetlands in Ohio are expected to fall into this category. The designation of 'Modified' is assigned to wetlands whose ORAM scores fall within the lower end (ORAM = 35-44.9) of the scoring range that defines Category 2 (ORAM = 35-59.9). Wetlands whose ORAM scores fall between 60 and 64.9 in a scoring 'gray area', and additional testing is needed to determine whether they belong in Category 2 or the next higher Category.

- Category 3 – Highest value category. Wetlands in this category have high levels of diversity, a high proportion of native species, and/or high functional values. The designation 'Category 3' is assigned to wetlands whose ORAM scores fall between 65 and 100.

A total of 129 wetlands covering approximately 577 acres were identified within the study area. The majority (n=85) of wetlands were identified as forested, followed by emergent (n=19), and scrub-shrub (n=2). The remaining wetlands were a mix of multiple types, including scrub/shrub, forested, and/or emergent. In general, wetlands in the study area exhibited characteristics as expected given their position in a landscape dominated by working agriculture. Based on the ORAM scores, 21 of the wetlands were classified as Category 1 wetlands, 48 as Category 2 wetlands, 32 as Modified Category 2 wetlands, and 14 as Category 3 wetlands. In addition, seven wetlands fell in the gray area between Class 1 and Class 2, and seven wetlands fell in the gray area between Class 2 and Class 3 (MSG, 2019a).

All 129 of the delineated wetlands are expected to fall under the Clean Water Act jurisdiction of federal and state government. Delineated wetlands are mapped in Figure 08-4, which illustrates all delineated resources and vegetative communities within 100 feet of Facility components at a 1:12,000 scale. Additional information on the wetland delineation, including mapping showing a closer view of each delineated feature, can be found in Appendix C of Exhibit Z.

MSG (2019a) evaluated streams with potential to be impacted using the Ohio Headwater Habitat Evaluation Index (HHEI) and/or the Ohio Qualitative Habitat Evaluation Index (QHEI) scoring method, as applicable. Both methods yield a numerical score for the section of streams evaluated, which MSG used to estimate the probable existing aquatic life use of each stream. Jurisdictional streams were identified as those waters that had an Ordinary High Water Mark (OHWM), a defined channel, and an open water feature, such as surface water or at least a non-vegetated area through the channel that indicated periodic flowing water. Channels that parallel the roadway, do not have an identifiable OHWM, are dominated by upland vegetation, and do not represent a relocation of a natural channel are not considered jurisdictional.

The HHEI is used to determine the status of smaller streams as one of three classes of primary headwater habitats (PHWH). The method scores streams on a range of 0 to 100 based on physical characteristics. Scores less than 30 indicate a Class I PHWH (ephemeral streams); scores 30 to 70 indicate a Class II PHWH (intermittent, interstitial or perennial, warm water streams); scores greater than 50 can be either Class II or Class III depending on their conditions; and Scores 70 or greater indicate a Class III PHWH (perennial, cool water streams).

The QHEI is used to determine the status of larger streams: those potentially having a drainage area of greater than one square mile (259 ha) or with predominant pools having maximum pool depths over 40 cm. The QHEI assessment examines a number of stream characteristics and yields a score ranging from

0 to 100. A score of 60 typically indicates a stream has the physical characteristics needed to support diverse macroinvertebrate and fish populations and attain the WWH designation. Scores of 32 to 60 may be indicative of a modified warmwater habitat, meaning a WWH that has been disturbed but could potentially recover. Scores less than 32 typically indicate a limited resource water (LRW). Scores that are greater than 75 are indicative of a possible exceptional warmwater habitat (EWH).

A total of 115 streams and 24 waterbodies were delineated in the study area. Of the total 115 streams, 14 were identified as Class I according to the HHEI scoring matrix, 40 scored as Class II, and 31 could be classified as either Class II or Class III. In addition, two streams were classified as LRWs, 19 as modified WWHs, and five as WWHs. Only three features scored highly enough on the HHEI score to be considered Class III waterbodies, and only one feature scored highly enough on the QHEI to be considered a possible EWH. The 24 waterbodies identified consist of constructed waters such as farm and stock watering ponds, irrigation ponds, settling basins, and ornamental ponds. Additional information on the delineated streams and waterbodies, including mapping showing a closer view of each delineated feature, can be found in Appendix C of Exhibit Z.

(c) *Literature Review of Plant and Animal Life within 0.25 Mile of Construction*

This section provides the results of a literature survey of the plant and animal life within at least one-fourth mile of the Project Area boundary, with a focus on aquatic and terrestrial plant and animal species that are of commercial or recreational value, and species designated as endangered or threatened. The literature survey is broken out into two sections: (i) plant resources and (ii) animal resources.

(i) Aquatic and Terrestrial Plants

The review of plant resources within 0.25 mile of the Project Area boundary focuses on species of commercial or recreational value, and species designated as endangered or threatened. This information was compiled through review and analysis of existing data sources, including the United States Fish and Wildlife Service (USFWS), NatureServe, NRCS PLANTS, and ODNR Natural Heritage databases.

<u>Species of Commercial or Recreational Value</u>

American ginseng (*Panax quinquefolia*) occurs from Quebec, Canada, west to Minnesota and south to Georgia and Oklahoma. American ginseng is a slow-growing perennial herb that grows in the understory of deciduous forests. It typically grows to a height of 8 to 15 inches. Ginseng prefers mature woodlands, frequently on slopes, where it favors rich soil and dense shade. It is a plant that

can be found throughout Ohio, but its populations are often small and scattered (ODNR, 2018a). American ginseng has been documented in Seneca, Erie, and Huron Counties (USDA NRCS, 2018). Although the Project Area is predominantly open agricultural land, ginseng could occur in low numbers in area woodlots.

American ginseng has long been valued for the medicinal qualities of its roots. It can be considered a commercial species because collectors harvest the roots from wild plants and sell them to ginseng dealers, who must hold a Ginseng Dealer Permit from the ODNR Division of Wildlife. The rules for ginseng harvest in Ohio are prescribed in OAC Rules 150: 31-40 of the OAC. Ginseng harvesting is enforced by the Division of Wildlife, much like hunting seasons for game animals, with a digging season running from September 1 to December 31 of each year (ODNR, 2018a). These regulations are designed to prevent overharvesting of ginseng. American ginseng is listed in Appendix II of the Convention of International Trade in Endangered Species of Wild Fauna and Flora (CITES), an international agreement between countries to ensure that international trade in certain plants and animals does not threaten their survival in the wild. Appendix II includes species that are not currently threatened with extinction but may become so without trade controls. Legal trade is allowed, provided that it is biologically sustainable. In order to ensure that American ginseng roots are legally and sustainably harvested, CITES permits issued by the USFWS are required to export American ginseng (USFWS, 2018a). There are no Ginseng Dealer Permit holders in either Seneca, Erie, or Huron Counties, nor in any adjacent county except Ashland County (ODNR, 2018a). This suggests that ginseng harvesting may not be a common pursuit in the area.

Agricultural impacts, including impacts to crops and other commodity plants, are addressed in Section 4906-4-08(E). Aside from crops and possibly American ginseng, there are no other plant species of commercial or recreational value within 0.25 mile of the Project Area boundary.

Threatened and Endangered Species

Based on ODNR records for state-listed species, there are 19 endangered and 39 threatened plant species known to occur in Erie, Huron, and/or Seneca Counties (i.e., the counties within one-fourth mile of the Project Area boundary) (ODNR, 2016, 2018b). The status and generalized habitat requirements for each of these species are summarized below in Table 08-7.

Table 08-7. Threatened and Endangered Plant Species in Erie, Huron, and Seneca Counties

Scientific Name	Common Name	General Habitat	County[1]	Ohio Status[2]
Ammophila breviligulata	American beach grass	sand dunes along Lake Erie	E	T
Anemone cylindrica	prairie thimbleweed	dry open woods, slopes, prairies	E	T
Artemisia campestris	beach wormwood	sand dunes along Lake Erie, prairies	E	T
Betula pumila	swamp birch	open and forested wetlands	S	T
Carex bicknellii	Bicknell's sedge	prairies, sandy knolls, sand dunes	E	T
Carex conoidea	field sedge	moist open areas, wet prairies/meadows	E	T
Carex garberi	Garber's sedge	wet open areas, seepages, dune swales	E	E
Carex limosa	mud sedge	sphagnum bogs in full sun, fens	E	E
Carex mesochorea	midland sedge	oak woods and clearings, fields, borders	E	T
Carex projecta	necklace sedge	sunny wet areas, meadows, thickets	E	T
Carex pseudocyperus	northern bearded sedge	sunny wet areas	S	E
Carex viridula	little green sedge	sunny wet areas	S, E	T
Coeloglossum viride	long-bracted orchid	wet/mesic woodlands, thickets, borders	E	E
Cyperus schweinitzii	Schweinitz's umbrella-sedge	open sandy sites, shores, beaches	E	T
Cypripedium candidum	white lady's-slipper	sunny wet areas with basic substrates	S, E	E
Descurainia pinnata	tansy mustard	dry open areas, fields, disturbed areas	E	T
Dichanthelium lindheimeri	Lindheimer's panic grass	open moist gravelly shores	E	T
Dichanthelium meridionale	southern hairy panic grass	sand barrens, dry open woods & fields	E	T
Draba reptans	Carolina Whitlow-grass	dry sandy areas, fields, dunes, pastures	E	T
Eleocharis engelmannii	Engelmann's spike-rush	mudflats, lake and pond edges	S	E
Eleocharis flavescens	green spike-rush	sunny wet areas, shores, ponds	E	T
Eleocharis geniculata	Caribbean spike-rush	sunny wet areas, shores, mudflats	E	E
Eleocharis ovata	ovate spike-rush	sunny wet areas	E	E
Eleocharis quinqueflora	few-flowered spike-rush	open wet calcareous sites	S	T
Eleocharis tenuis	slender spike-rush	limestone prairies, wet meadows, shores	E	T
Euthamia remota	Great Lakes goldenrod	sandy open areas near Lake Erie	E	T
Gratiola virginiana	round-fruited hedge-hyssop	shady wet places, swamps, streambanks	E	T
Gymnocarpium dryopteris	common oak fern	mesic woods and slopes	E	E
Helianthus mollis	ashy sunflower	sunny dry areas, prairies, borders	E	T
Hypericum canadense	Canada St. John's-wort	wet, sunny areas, shores	E	E
Hypericum gymnanthum	least St. John's-wort	sunny wet areas	E	E
Hypericum kalmianum	Kalm's St. John's-wort	sunny wet areas	E	T
Iris brevicaulis	leafy blue flag	shady wet places, swamps, floodplains	E	T

Scientific Name	Common Name	General Habitat	County[1]	Ohio Status[2]
Juncus alpinoarticulatus	alpine rush	sunny wet areas, often in calcareous soils	E	T
Juncus greenei	Greene's rush	shores, dunes, swales, fields, clearings	E	T
Juncus platyphyllus	flat-leaved rush	shores, mudflats, floodplains	E	E
Liatris scariosa	large blazing-star	oak savannas, prairies	E	T
Lipocarpha micrantha	dwarf bulrush	lacustrine sand plains	E	T
Myriophyllum sibiricum	American water-milfoil	lakes, ponds, streams	E	E
Packera paupercula	balsam squaw-weed	open calcareous sites	E	T
Panicum philadelphicum	Philadelphia panic grass	open woods, fields, shores, streambanks	E	E
Panicum tuckermanii	Tuckerman's panic grass	open sandy shores and fields	E	E
Plagiothecium latebricola	lurking leskea	swamps, fens, marshes	H	T
Potamogeton gramineus	grass-like pondweed	lakes, ponds, streams	S	E
Potentilla paradoxa	bushy cinquefoil	wet, sunny areas, shores, sandbars	E	T
Prenanthes aspera	rough rattlesnake-root	prairies, rocky woodlands	E	T
Ranunculus fascicularis	early buttercup	calcareous prairies, pastures, and woods	E	T
Sagittaria cuneata	wapato	shallow water of lakes, rivers, ditches	E	T
Salix candida	hoary willow	calcareous wetlands, fens, shores	E	T
Schoenoplectiella smithii	Smith's bulrush	shores, beaches, dune swales, mudflats	E	T
Sisyrinchium montanum	northern blue-eyed-grass	open moist shores, meadows, woods	E	T
Sisyrinchium mucronatum	narrow-leaved blue-eyed-grass	open moist shores, meadows, woods, field, thickets	E	T
Solidago squarrosa	leafy goldenrod	rocky upland woods and thickets	E	T
Symphyotrichum dumosum	bushy aster	open sandy fields and thickets	E	T
Vernonia fasciculata	prairie ironweed	open prairies/marshes with rich soils	E	E
Viola nephrophylla	northern bog violet	open wet neutral to calcareous sites	E	T
Xanthoria elegans	elegant sunburst lichen	calcareous and siliceous rocks	E	E
Xyris torta	twisted yellow-eyed grass	fields, ditches, seepages, pond shores	E	T

Source: ODNR, .2016, 2018b.
[1] S=Seneca, E=Erie, H=Huron
[2] E = Endangered, T = Threatened.

As shown above in Table 08-7, the majority of state-listed plant species recorded in Seneca, Erie, and/or Huron Counties only occur in Erie County. Many of these species are restricted to dune and swale habitats in close proximity to Lake Erie, a habitat type that does not occur in the Project Area, which is located well inland. The remaining state-listed plants predominantly occur in wetland and prairie habitats, which are uncommon within the Project Area and have been avoided during Facility siting to the extent practicable. Furthermore, most of the water features in the Project Area are part of a regional ditch and agricultural drainage system. These wetlands consist of man-made drainages

that have become dominated by emergent wetland vegetation and are unlikely to provide habitat for any threatened or endangered plant species. The modification of a waterbody reduces the likelihood of significant rare, threatened, or endangered species populations developing, since the habitat and/or water chemistry is constantly impacted by land use.

(ii) Aquatic and Terrestrial Animals

Animal resources within 0.25 mile of the Project Area boundary were identified through review and analysis of existing data sources, including the USGS North American Breeding Bird Survey (BBS), Audubon Christmas Bird Count (Audubon CBC), Hawk Migration Association of North America (HMANA), American Society of Mammalogists, Ohio Frog and Toad Calling Survey, Ohio Salamander Monitoring Program, Ohio Aquatic Gap Analysis Program, ODNR field guides, ODNR hunting and trapping regulations, and ODNR's statewide and county-specific compilations of State-listed species. These various sources of information have been synthesized and are presented below for birds, mammals, reptiles/amphibians, aquatic species, commercial species, and recreational species. Each of these discussions identifies the potential presence of species designated as endangered or threatened in accordance with the U.S. and Ohio threatened and endangered species lists. See Section 4906-4-08(B)(1)(d) below for discussion of field surveys completed on-site.

Birds

Breeding Birds: The BBS, overseen by the Patuxent Wildlife Research Center of the USGS, is a long-term, large-scale, international avian monitoring program that tracks the status and trends of North American bird populations. Each survey route is 24.5 miles long, with 3-minute point counts completed at 0.5-mile intervals. During the point counts, every bird seen or heard within a 0.25-mile radius is recorded. The Vickery Survey Route runs north-south just west of the Project Area, then turns east and then south again, passing through the southern Project Area within approximately 700 feet of several proposed turbine sites. Data on breeding birds has been collected on this route every year from 2002 to 2017, during which a total of 94 species have been recorded. The most commonly observed species include European starling (*Sturnus vulgaris*), common grackle (*Quiscalus quiscula*), house sparrow (*Passer domesticus)*, American robin (*Turdus migratorius*), horned lark (*Eremophila alpestris*), red-winged blackbird (*Agelaius phoeniceus*), song sparrow (*Melospiza melodia*), mourning dove (*Zenaida macroura*), American goldfinch (*Spinus tristis*), chipping sparrow (*Spizella passerina*), and killdeer (*Charadrius vociferus*) (Pardieck et al., 2018).

Two state-listed endangered species (northern harrier [*Circus cyaneus*] and cattle egret [*Bubulcus ibis*]), one state-listed threatened species (black-crowned night heron [*Nycticorax nycticorax*]), and eight state-listed species of concern (black-billed cuckoo [*Coccyzus erythropthalmus*], common nighthawk [*Chordeiles minor*], great egret [*Ardea alba*], red-headed woodpecker [*Melanerpes erythrocephalus*], sedge wren [*Cistothorus platensis*], vesper sparrow [*Pooecetes gramineus*], grasshopper sparrow [*Ammodramus savannarum*], and bobolink [*Dolichonyx oryzivorous*]) were observed during these surveys. These state-listed species were generally detected in very low numbers. For example, one cattle egret was observed (in 2004), one black-crowned night heron (in 2002), one sedge wren (in 2015), one common nighthawk (in 2004), etc. No federally-listed endangered or threatened species were observed along the Vickery route (Pardieck et al., 2018; ODNR, 2018c). See Section 4906-4-08(B)(1)(d) below and Exhibit V for description of site-specific surveys that were completed to evaluate breeding birds in the Project Area.

Wintering Birds: Data from the Audubon CBC provides an overview of the birds that inhabit the region during early winter. Counts take place on a single day during a three-week period around Christmas, when birdwatchers comb a 15-mile (24 km) diameter circle in order to count the number of bird species and individuals observed. The Fireland CBC, centered approximately 6 miles east of the nearest proposed turbine, overlaps the northeastern portion of the Project Area. The number of wintering birds observed in this count circle ranged between 57 and 80 species/year between 2008 and 2017, with a total of 117 different species recorded. The most common wintering bird species observed were ring-billed gull (*Larus delawarensis*), red-breasted merganser (*Mergus serrator*), European starling, Bonaparte's gull (*Chroicocephalus philadelphia*), Canada goose (*Branta canadensis*), herring gull (*Larus argentatus*), mallard (*Anas platyrhynchos*), rock pigeon (*Columba livia*), and American robin. The following state-listed avian species were documented over the past 10 years of the Fireland CBC: one state-listed endangered species (northern harrier), one state-listed threatened species (trumpeter swan [*Cygnus buccinator*]), and four state-listed species of concern (great egret, sharp-shinned hawk [*Accipiter striatus*], American coot [*Fulica americana*], and red-headed woodpecker). No federally-listed endangered or threatened species were recorded during the Fireland CBCs (National Audubon Society, 2018; ODNR, 2018c). See Section 4906-4-08(B)(1)(d) for description of site-specific surveys that were completed to evaluate bird use in the Project Area and Exhibits S-1 and S-2 describe avian use surveys conducted throughout the year, including during winter months.

Migratory Birds: The HMANA collects hawk count data from almost two hundred affiliated raptor monitoring sites throughout the United States, Canada, and Mexico. Historically, there have been no hawk watch sites in the state of Ohio; however, a new hawk watch site was established in 2018 in Conneaut, Ohio, along Lake Erie just a few miles from the Pennsylvania state line. This new hawk watch is approximately 115 miles northeast of the Project Area. The closest established hawk watch sites are the Detroit River Hawk Watch in Michigan, approximately 58 miles north of the Project Area, and the Freedom Area Hawk Watch in Pennsylvania, approximately 142 miles southeast of the Project Area (HMANA, 2018). Data from these three hawk watches were reviewed, but due to the distances to the Project Area and the marked differences in landform, these sites were not considered representative of conditions for migrating raptors in the vicinity of the proposed Facility. See Section 4906-4-08(B)(1)(d) below for description of site-specific surveys that were completed to evaluate passerine migration and raptor migration through the Project Area.

Mammals

The occurrence of mammalian species was documented through evaluation of species range and available habitat, including data from the American Society of Mammalogists, NatureServe, and ODNR field guides. This effort suggests that approximately 40 species of mammals could occur in the area, including white-tailed deer (*Odocoileus virginianus*), Eastern cottontail rabbit (*Sylvilagus floridanus*), eastern chipmunk (*Tamias striatus*), coyote (*Canis latrans*), red fox (*Vulpes vulpes*), raccoon (*Procyon lotor*), Virginia opossum (*Didelphis virginiana*), woodchuck (*Marmota monax*), Eastern gray squirrel (*Sciurus carolinensis*), Eastern fox squirrel (*Sciurus niger*), striped skunk (*Mephitis mephitis*), American beaver (*Castor canadensis*), common muskrat (*Ondatra zibethicus*), American mink (*Mustela vison*), long-tailed weasel (*Mustela frenata*), river otter (*Lontra canadensis*), big brown bat (*Eptesicus fuscus*), little brown bat (*Myotis lucifugus*), Indiana bat *(Myotis sodalis*), northern long-eared bat *(Myotis septentrionalis*), eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), silver-haired bat (*Lasionycteris noctivagans*), tri-colored bat (*Perimyotis subflavus*), evening bat (*Nycticeius humeralis*), and a variety of small mammals such as mice (e.g., *Peromyscus leucopus*), moles (e.g., *Scalopus aquaticus*), voles (e.g., *Microtus pennsylvanicus*), and shrews (e.g., *Blarina brevicauda*).

Most of the mammal species likely to occur in the area are common and widely distributed throughout Ohio. However, Indiana bat is both state- and federally-listed as endangered, while northern long-eared bat is both state- and federally-listed as threatened (ODNR, 2018c). Presence of both these bat species has been confirmed in the Project Area, as have little brown bat, big brown bat, tri-colored

bat, hoary bat, silver-haired bat, evening bat, and eastern red bat, all of which are listed as species of concern (ODNR, 2018c). See 4906-4-08(B)(1)(c)(ii) for further discussion of on-site surveys. Several other mammalian species of concern could also occur in the area, including star-nosed mole (*Condylura cristata*), deermouse (*Peromyscus maniculatus*), woodland vole (*Microtus pinetorum*), southern bog lemming (*Synamptomys cooperi*), gray fox (*Urocyon cinereoargenteus*), and badger (*Taxidea taxus*) (ASM, 2018; NatureServe, 2018; ODNR, 2016a, 2016b, 2018c, 2018d).

Amphibians and Reptiles

Reptile and amphibian presence in the vicinity of the Project Area was determined through review of the Ohio Frog and Toad Calling Survey, the Ohio Salamander Monitoring Program, the National Amphibian Atlas, and ODNR data and correspondence. Based on this information, along with documented species ranges, it is estimated that approximately 35 reptile and amphibian species could occur within 0.25 mile of the Project Area boundary. These species include, but are not limited to, small-mouth salamander (*Ambystoma texanum*), red-backed salamander (*Plethodon cinereus*), Eastern American toad (*Bufo americanus*), Fowler's toad (*Bufo fowleri*), Blanchard's cricket frog (*Acris crepitans*), spring peeper (*Pseudacris crucifer*), western chorus frog (*Pseudacris triseriata*), gray treefrog (*Hyla versicolor*), bullfrog (*Rana catesbeiana*), green frog (*Rana clamitans*), snapping turtle (*Clelydra serpentina*), midland painted turtle (*Chrysemys picta*), Eastern garter snake (*Thamnophis sirtalis*), common water snake (*Nerodia sipedon*), and Eastern milksnake (*Lampropeltis triangulum*) (Davis & Lipps, 2018; ODNR, 2008, 2012). Most of the amphibian and reptile species likely to occur in the area are generally common and widely distributed throughout Ohio.

Aquatic Species

The potential occurrence of aquatic species in the vicinity of the Project Area was determined through review of the Ohio Aquatic Gap Analysis Program and ODNR data. Based on this information, it is estimated that approximately 70 fish species, 30 mollusk species, and 10 crayfish species could occur within one-fourth of a mile of the Project Area boundary (Covert et al., 2007). Fish species that could occur include bigeye chub (*Notropis amblops*), black bullhead (*Ameiurus melas*), blacknose dace (*Rhinichthys atratulus*), blackside darter (*Percina maculata*), bluntnose minnow (*Pimephales notatus*), bluegill (*Lepomis macrochirus*), brown bullhead (*Ictalurus nebulosus*), common shiner (*Luxilus cornutus*), central mudminnow (*Umbra limi*), central stoneroller (*Campostoma anomalum*), creek chub (*Semotilus atromaculatus*), fathead minnow (*Pimephales promelas*), fantail darter (*Etheostoma flabellare*), golden shiner (*Notemigonus crysoleucas*), grass pickerel (*Esox americanus*), green sunfish (*Lepomis cyanellus*), greenside darter (*Etheostoma*

blennioides), Johnny darter (*Etheostoma nigrum*), largemouth bass (*Micropterus salmoides*), northern hogsucker (*Hypentelium nigricans*), pumpkinseed (*Lepomis gibbosus*), redfin shiner (*Lythrurus umbratilis*), rock bass (*Ambloplites rupestris*), sand shiner (*Notropis stramineus*), silverjaw minnow (*Notropis buccatus*), spotfin shiner (*Cyprinella spiloptera*), striped shiner (*Luxilus chrysocephalus*), white sucker (*Catostomus commersoni*), and yellow bullhead (*Ameiurus natalis*).

Mollusk species that could occur within one-fourth mile of the Project Area boundary include creeper (*Strophitus undulatus*), creek heelsplitter (*Lasmigona compressa*), cylindrical papershell (*Anodontiodes ferussacianus*), fatmucket (*Lampsilis radiata*), giant floater (*Pyganodon grandis*), lilliput (*Toxolasma parvus*), long fingernailclam (*Musculium transversum*), slippershell mussel (*Alasmidonta viridis*), striated fingernail clam (*Sphaerium striatinum*), threehorn wartyback (*Obliquaria reflexa*), and white heelsplitter (*Lasmigona complanata*). Crayfish species that could occur within one-fourth mile of the Project Area boundary include big water crayfish (*Cambarus robustus*), devil crayfish (*Cambarus diogenes*), digger crayfish (*Fallicambarus fodiens*), Great Lakes crayfish (*Orconectes propinquus*), Ortmann's mudbug (*Cambarus ortmanni*), painted hand mudbug (*Cambarus polychromatus*), papershell crayfish (*Orconectes immunis*), rusty crayfish (*Orconectes rusticus*), Sanborn's crayfish (*Orconectes sanbornii*), and white river crayfish (*Procambarus acutus*).

These aquatic species are generally common and widely distributed throughout Ohio. However, the following state-listed aquatic species are thought to occur in watersheds in the vicinity of the Project Area: the endangered rayed bean (*Villosa fabalis*), white catspaw (*Epioblasma obliquata perobliqua*), northern riffleshell (*Epioblasma torulosa rangiana*), and washboard (*Megalonaias nervosa*); the threatened bigmouth shiner (*Notropis dorsalis*), black sandshell (*Ligumia recta*), and threehorn wartyback; and the following species of concern: purple wartyback (*Cyclonalas tuberculata*), round pigtoe (*Pleurobema sintoxia*), salamander mussel (*Simpsonaias ambigua*), elktoe (*Alasmidonta marginata*), kidneyshell (*Ptychobranchus fasciolaris*), creek heelsplitter, and Great Lakes crayfish (Covert et al., 2007; ODNR, 2018c). Rayed bean mussel, white catspaw, and northern riffleshell are also federally-listed as endangered species (ODNR, 2018c).

The federally-listed mussel species and the majority of the state-listed aquatic species identified above are predicted to have limited ranges within the Project Area. For example, northern riffleshell is restricted to the Honey Creek watershed (below Brokenknife Creek to above Silver Creek; hydrologic unit code [HUC] 04100011008030), which drains portions of Richmond Township in the far southern portion of the Project Area. Rayed bean is predicted to occur in the Honey Creek

watershed, as well as the West Branch Huron River watershed (from near Willard to above Slate Run; HUC 04100012010050), which drains portions of Norwich Township in the southern Project Area. White catspaw, washboard, black sandshell, purple wartyback, round pigtoe, salamander mussel, and elktoe are predicted to occur in the same West Branch Huron River watershed as rayed bean, as well as the adjacent downstream West Branch Huron River watershed (below Slate Run to the Huron River; HUC 04100012020050), which drains portions of Lyme Township in the north-central Project Area. Exceptions consist of bigmouth shiner, threehorn wartyback, creek heelsplitter, and Great Lakes crayfish, which are predicted to occur through the majority of Project Area (Covert et al., 2007).

Risks to listed aquatic species are minimal, because the majority of Facility components are being sited in active agricultural land, meaning soil disturbance/exposure due to Facility construction will generally occur in areas already subject to regular plowing, tilling, harvesting, etc. Also, construction runoff will be managed under an NPDES construction storm water permit, a SWP3, and an erosion and sediment control plan. Specific mitigation measures for protecting surface water resources will include designating no equipment access areas and restricted activity areas and employing low impact stream crossing techniques. These mitigation measures are described below in Section 4906-4-08(B)(2)(b). Furthermore, presence of federally-listed mussel species is "not expected" in any Huron or Erie County streams evaluated in Appendix A of the *Ohio Mussel Survey Protocol* (ODNR & USFWS, 2018).

Earth-moving activities associated with Facility construction have the potential to cause siltation and sedimentation impacts down slope of the area of disturbance. Facility components will be sited away from wetlands and streams to the extent practicable. To prevent adverse effects to water quality and aquatic habitat during construction, runoff will be managed under an NPDES construction storm water permit and the associated SWP3. An erosion and sediment control plan will be developed prior to construction that will use appropriate runoff diversion and collection devices. Also,

Commercial Species

Commercial species consist of those trapped or hunted for fur and/or castoreum (i.e., beaver castor gland secretions; used in perfumes and as a food additive). The ODNR regulates the hunting and trapping of the following furbearers in Seneca, Erie, and/or Huron Counties: common muskrat, raccoon, red fox, gray fox, coyote, American mink, Virginia opossum, striped skunk, long-tailed weasel, American beaver, and river otter (ODNR, 2018e, 2018f). Each of these species is briefly

described below, based on habitat and distribution data published by the ODNR (2016b, 2018d) and the American Society of Mammalogists (ASM, 2018).

- Common muskrat: Muskrat are abundant throughout Ohio, and prefer habitats with slow-moving water, such as creeks and wetlands. This species is likely to occur in the vicinity of the Project Area.
- Raccoon: Raccoon are common statewide, occupying a wide variety of habitats near water, including forests, cropland, and developed land. This species is likely to occur in the vicinity of the Project Area.
- Red fox: Red fox are common statewide, occupying a wide variety of habitats, including forests, cropland, and developed land. This species is likely to occur in the vicinity of the Project Area.
- Gray fox: Less common in Ohio than the red fox, gray fox prefer forested and shrubland habitats, avoiding open areas. Although the Project Area is predominantly open agricultural land, this species could occur in low numbers in area woodlots and shrubland.
- Coyote: Once extirpated in Ohio, coyotes are now common statewide, occupying a wide variety of habitats, including forests, cropland, shrubland, and developed land. This species is likely to occur in the vicinity of the Project Area.
- American mink: This semi-aquatic weasel has a statewide distribution and favors forested wetlands with abundant cover. Although the Project Area is predominantly open agricultural land, this species could occur in low numbers in the area woodlands.
- Virginia Opossum: Opossum are common statewide, occupying a wide variety of habitats, including forests, cropland, and developed land. This species is likely to occur in the vicinity of the Project Area.
- Striped skunk: Skunk are common statewide, occupying a wide variety of habitats, including forests, cropland, and developed lands. This species is likely to occur in the vicinity of the Project Area.
- Long-tailed weasel: Found in a wide variety of habitats (including forests, cropland, and shrubland), this species is Ohio's most common weasel, and is likely to occur in the vicinity of the Project Area.
- American beaver: Beaver are common statewide, inhabiting and modifying permanent sources of water of almost any type, particularly low gradient streams and small lakes/ponds with outlets. This species is likely to occur in the vicinity of the Project Area.
- River otter: Otters live in a variety of aquatic habitats, including rivers, lakes, and marshes. They particularly favor unpolluted tributaries of major drainages where there is minimal human

disturbance. Although aquatic habitats are uncommon in the Project Area and human activity is common throughout the Project Area, it is possible that otters could occur in low numbers in area waterways (albeit unlikely).

Recreational Species

Recreational species consist of those hunted as game. The ODNR regulates the hunting of the following species in Seneca, Erie, and/or Huron Counties: white-tailed deer, gray squirrel, red squirrel, fox squirrel, cottontail rabbit, woodchuck, wild turkey (*Meleagris gallopavo*), ring-necked pheasant (*Phasianus colchicus*), American crow (*Corvus brachyrhynchos*), mourning dove, and various waterfowl (ODNR, 2018e). Each of these species are briefly described below, based on habitat and distribution data published by the ODNR (2013, 2016b, 2018d, 2018e), American Society of Mammalogists (ASM, 2018), USGS BBS (Pardieck et al., 2018), and Audubon CBC (National Audubon Society, 2018).

- White-tailed deer: Deer are common statewide, occupying a wide variety of habitats, including forests, shrubland, cropland, and developed land. This species is likely to occur in the vicinity of the Project Area.
- Gray, red, and fox squirrels: The fox squirrel is primarily an inhabitant of open woodlands, while the gray squirrel and the red squirrel prefer more extensive forested areas. However, all three species have adapted well to landscaped suburban areas and are often found around structures. These tree squirrels occur throughout Ohio and are likely to occur in the vicinity of the Project Area.
- Eastern cottontail: Cottontails are widespread and abundant statewide. The species prefers open areas bordered by brush and open woodlands and have adapted well to developed areas. This species is likely to occur in the vicinity of the Project Area.
- Woodchuck: Woodchuck are common statewide, occupying a wide variety of habitats, including pastures, grasslands, and open woodlands. This species is likely to occur in the vicinity of the Project Area.
- Wild turkey: Once extirpated in Ohio, this species has re-established populations statewide, and is especially common in the southern and eastern parts of the state. Wild turkey is an adaptable species that prefers mature forest habitats but live successfully in areas with as little as 15% forest cover. This species has been documented in the vicinity of the Project Area in the Audubon CBC.

- Ring-necked pheasant: Although not native to North America, the pheasant is naturalized in northern and western Ohio, and occupies open habitats such as agricultural landscapes and old fields. This species has been documented in the vicinity of the Project Area in the USGS BBS and the Audubon CBC.
- American crow: Crow are common statewide, occupying a wide variety of habitats, including forests, cropland, shrubland, and developed land. This species has been documented in the vicinity of the Project Area in the USGS BBS and the Audubon CBC.
- Mourning dove: Mourning doves are common statewide, occupying a wide variety of habitats, including cropland, shrubland, and developed land. This species has been documented in the vicinity of the Project Area in the USGS BBS and the Audubon CBC.
- Waterfowl: The following waterfowl game species have been recorded in the vicinity of the Project Area in the USGS BBS and/or the Audubon CBC: Canada goose, snow goose (*Chen caerulescens*), Ross's goose (*Chen rossii*), red-breasted merganser, common merganser (*Mergus merganser*), hooded merganser (*Lophodytes cucullatus*), mallard, American black duck (*Anas rubripes*), northern pintail (*Anas acuta*), lesser scaup (*Aythya affinis*), redhead (*Aythya americana*), and wood duck (*Aix sponsa*).

(d) *Results of Field Surveys for Plant and Animal Life Identified in Literature Review*

The literature review discussed in Section 4906-4-08(B)(1)(c) identified plant and animals likely to occur in the vicinity of the Project Area, based on previously published data. This review largely identified common species, but also indicated that some endangered, threatened, and Ohio species of concern could occur in the area. A series of site-specific field surveys were subsequently completed to further evaluate the plants and animals found on-site. The site-specific wildlife studies focused on endangered, threatened, and special concern species, as well as birds and bats, which are more vulnerable to operational impacts from wind energy facilities than flightless wildlife species. The site-specific vegetation studies conducted by MSG focused on identifying plant communities/habitats, and on delineating sensitive features such as wetlands and streams. Numerous avian and bat studies were completed throughout the Project Area and surrounding area between 2009 and 2019 by BHE Environmental, Inc. (BHE); Western Ecosystems Technology, Inc. (WEST); Tetra Tech, Inc. (Tetra Tech); Copperhead Environmental Consulting, Inc. (Copperhead); and Arcadis U.S., Inc. (Arcadis). These surveys are outlined in Table 08-8 below and were designed and completed in accordance with ODNR's On-Shore Bird and Bat Pre-and Post-Construction Monitoring Protocol for Commercial Wind Energy Facilities in Ohio, as well as USFWS and ODNR recommendations.

Table 08-8. Summary of Avian and Bat Studies Completed in the Project Area

Survey Type	Dates Completed	ODNR Survey Effort for Current Boundary	Total Survey Effort within Current Boundary
Raptor Nest Survey and Monitoring	2009, 2010, 2011, 2012, 2013, 2014, 2018	1 mile	1-mile buffer and eagle nest searches
Raptor Migration/Use	2010-2011, 2016-2017	2 points	37 Points
Passerine Migration	2010-2011, 2012, 2016-2017	15 points	18 Points
Eagle Use	2010-2011, 2011-2012, 2016-2017, 2018-2019	N/A	94 Points
Breeding Bird	2011, 2012, 2017, 2018	17 points	40 points
Owl Playback	2012-2013	2 points	2 Points
Bat Activity	2010, 2011	MET towers	2 met towers and 2 ground units
Listed Bat Presence/Absence (Mist-Net)	2011, 2012, 2017, 2018	30 sites	41 sites

Raptor Nest Surveys and Monitoring

As outlined in Table 08-8 above, raptor nest surveys and subsequent nest monitoring have occurred throughout the Project Area since 2009. Results of studies completed prior to 2018 can be found in Exhibit R but are not discussed here, as the 2018 studies are most relevant to understanding how nesting raptors are currently using the Project Area. The 2018 surveys are discussed below.

2018 Raptor Nest Survey and Monitoring (North)

WEST completed the most recent raptor nest survey from March 12 to 15, 2018 in the portion of the Project Area in Erie County and in Lyme, Ridgefield, and northern Sherman Townships in Huron County (Exhibit R-1). The purpose of the survey was to document the presence of bald eagle nests within the Project Area and a 2-mile buffer, and of other large raptor nests within the Project Area and a 1-mile buffer. Surveys were completed prior to leaf-out and entailed driving along public roads and surveying all areas containing potentially suitable raptor nest habitat (e.g., riparian forested areas, shelterbelts, woodlots, and artificial nest structures) for the presence of large stick nests.

Five occupied and one unoccupied bald eagle nests were recorded within two miles of the Project Area. Two of the occupied eagle nests were located within the Project Area and the other three occupied nests within the two-mile buffer. The unoccupied nest was located 0.8 mile south of the Project Area, and although occupied in 2017, was confirmed unoccupied in 2018 after two rounds of follow-up surveys, as described in Exhibit R-1. Eleven active red-tailed hawk nests, one active great horned owl nest, and 21

unoccupied stick nests were observed within the Project Area and 1-mile buffer. The unoccupied nests were determined to be non-eagle nests based on their size. In summary, the majority of the nests found in the 2018 survey were unoccupied, and those that were occupied were mostly of red-tailed hawk, which is a common raptor species that breeds in relatively high densities in Ohio (WEST, 2018a).

Additional eagle nest monitoring surveys were completed at the two occupied eagle nests identified within the Project Area to understand how the birds utilized the area around the nests and inform siting of turbines in this area (Exhibit R-2). Eagle nest monitoring consisted of 60-minute point-count surveys completed twice a week at four points per nest, totaling eight fixed-point locations per nest per week. Nest #1 was monitored between April 17 and June 27, 2018, and Nest #2 was monitored from May 2 to June 28, 2018 for a total of 160 point-count surveys (160 survey hours).

A total of 235 eagle observations were recorded, the majority of which were of adults (n=185), followed by sub-adults (n=32) and juveniles (n=18). Of the 235 observations, 160 of the eagles were observed flying and the majority of these (73.8%) were observed flying between 25 and 200 meters (82 and 656 feet) above ground level. Eagle activity was concentrated within 0.5 mile of each nest location. Both eagle nests are located near the northern boundary of the project and nearly half of the eagle flight paths were directed to or from the north and outside of the Project Area (Iskali & LeBeau, 2018a). The current Facility layout, as presented in this Application, does not include any turbines within approximately 1.18 mile of the active eagle nests.

2018 Raptor Nest Survey (South)

WEST completed an additional raptor nest survey from April 9-10, 2018 in the portion of the Project Area in Sherman, Norwich, and Richmond Townships in Huron County (Exhibit R-3). The survey consisted of searching suitable nesting areas prior to leaf out from public roads and leased areas within the Project Area and a 1-mile buffer. In addition, historical eagle nests within a 2-mile buffer were checked to verify presence and status. Two occupied bald eagle nests and one unoccupied bald eagle nest were recorded within two miles of the Project Area. Of the occupied eagle nests, one was previously known and the other was new (i.e., previously undocumented). The unoccupied nest was active in 2017 but was confirmed as unoccupied 2018 through additional nest monitoring, as described in Exhibit R-3. Two of the nests, the newly discovered occupied one and the historic unoccupied one, are located within the Project Area. Six active red-tailed hawk nests, two active great horned owl nests, and 12 unoccupied stick nests were observed within the Project Area and 1-mile buffer. Based on their size, these unoccupied nests were determined to be non-eagle raptor nests (WEST, 2018b).

Raptor Migration/Use Surveys

As outlined in Table 08-8, raptor migration surveys were completed throughout the Project Area between 2010-2017 for a total of 50 survey points and 509 hours of survey. Results of all studies completed to date are summarized below, and the associated reports can be found in Exhibit S.

2016-2017 Diurnal Raptor Survey (North)

Large bird/raptor surveys were completed monthly over the course of a year at 23 points throughout the portion of the Project Area in in Erie County, east of SR 4, and in northwestern Huron County, in Lyme, Ridgefield, and northern Sherman Townships (Exhibit S-1). The surveys evaluated raptor use throughout the year, with a focus on spring (March 15 – May 1) and fall (September 1 – October 31) migration in accordance with ODNR protocols and recommendations. Each survey point was located to maximize viewshed for the observer and to enable evaluation of representative habitats within and near the proposed Facility. Each survey point was surveyed for 20 minutes each month, with all raptors observed within the 800-meter (2,625-foot) survey plot recorded.

A total of six diurnal raptor species (96 observations) were documented over the course of the 20-minute surveys. Diurnal raptor use was similar during the spring (0.35 birds/plot/survey), winter (0.34 birds/plot/survey), and summer (0.33 birds/plot/survey) and lowest during fall (0.09 birds/plot/survey). Diurnal raptor use was primarily attributable to use of the area by red-tailed hawk, which had the highest overall use of any diurnal raptor. Diurnal raptors accounted for 29% of large bird use in summer, 25.3% in winter, 24.6% in spring, and 8.5% in fall. Diurnal raptor use at each observation point ranged from 1 bird/plot/survey to 0.58 birds/plot/survey. Raptor migration during the spring and fall does not appear to be concentrated within the Project Area, as diurnal raptor use was similar among three seasons and lowest during the fall. When compared with annual mean raptor use at 46 other wind-energy projects, use at the Project (0.2-0.5 raptors/plot/survey) is considered low.

The majority of species observed are widespread and abundant. Three species (American kestrel, red-tailed hawk, and bald eagle) were observed in the Project Area during all four seasons and are considered common raptors of the Midwest. No federally listed threatened or endangered large bird species were observed during the surveys, although the following state-listed species were: northern harrier (endangered; n=10), sharp-shinned hawk (species of concern; n=1), and great egret (species of concern; n=7) (Iskali & LeBeau, 2018b; ODNR, 2018c). All of the northern harrier observations were recorded below the rotor swept height, nesting habitat is extremely limited, and the species has not been

documented in post-construction fatality studies in the Midwest. Based on this information, WEST concluded that the proposed Facility poses minimal risk to large birds, including these special status species (Iskali & LeBeau, 2018b).

2016-2017 Diurnal Raptor Survey (South)

Large bird/raptor surveys were completed monthly over the course of a year at 21 points throughout the portion of the Project Area in Norwich, Richmond, and southern Sherman Townships in in Huron County (Exhibit S-2). The surveys evaluated raptor use throughout the year, with a focus on spring (March 15 – May 1) and fall (September 1 – October 31) migration in accordance with ODNR protocols and recommendations. Each survey point was located to maximize viewshed for the observer and to enable evaluation of representative habitats within and near the proposed Facility. Each survey point was surveyed for 20 minutes each month, with all raptors observed within the 800-meter (2,625-foot) survey plot recorded.

A total of five diurnal raptor species (91 observations) were documented over the course of the 20-min surveys. Diurnal use was similar among seasons but relatively higher during fall (0.49 birds/plot/survey), followed by summer (0.42 birds/plot/survey), winter (0.37 birds/plot/survey), and spring (0.30 birds/plot/survey). Diurnal raptor use was primarily attributable to use of the area by red-tailed hawk, a common species in Ohio. Diurnal raptors accounted for 33.8% of large bird use in the fall, 27% in winter, 23.2% in the summer, and 22.2% in spring. Diurnal raptor use at each observation point ranged from 0.08 birds/plot/survey to 0.83 birds/plot/survey. Raptor migration during the spring and fall does not appear to be concentrated within the Project Area, as diurnal raptor use was similar among three seasons and lowest during the spring. When compared with annual mean raptor use at 46 other wind-energy projects, use at the Project (0.33-0.41 raptors/plot/survey) is considered low.

The majority of species observed are widespread and abundant, suggesting low risk of adverse impacts to large bird populations. Three common Midwest raptors were observed in the Project Area during all four seasons (red-tailed hawk, northern harrier, and American kestrel). No federally listed threatened or endangered large bird species were observed during the surveys, although one state-listed endangered species, northern harrier (n=8), and one Ohio-listed species of concern, red-headed woodpecker (n=1), were (Iskali & LeBeau, 2018c; ODNR, 2018c). Red-headed woodpecker occurs in very low numbers and has rarely been documented in post-construction fatality studies in the Midwest. The majority (75%) of the northern harrier observations were recorded below the rotor swept height, nesting habitat is limited, and the species has not been documented in post-construction fatality studies in the Midwest. Based on

this information, WEST concluded that the proposed Facility poses minimal risk to large birds, including these special status species (Iskali & LeBeau, 2018c).

2010-2011 Raptor Migration Survey (North)

WEST completed fall and spring raptor migration surveys to estimate the overall rate of use of the Project Area by diurnal raptors (defined here as kites, accipiters, buteos, harriers, eagles, and falcons) (Exhibit S-3). The surveys were completed for 1.75 hours each survey day at four points in the portion of the Project Area in Lyme, Sherman, and Norwich Townships. Raptor migration surveys were conducted three times per week during the fall (September 1 to October 29, 2010) and spring (March 15 to May 1, 2011) migration periods, for a total of 26 survey days in the fall and 21 in the spring. To the extent practical, each plot was surveyed during various times of day to ensure all parts of the day were surveyed at each point.

A total of 324 raptor observations, representing 11 species, were documented during fall and spring raptor migration surveys. Overall raptor use was relatively higher during the spring (1.15 birds/observer hour) than in the fall (0.72 birds/observer hour). Buteos, primarily red-tailed hawk, had the highest relative use of raptor subtypes during spring and fall (0.78 and 0.43 birds/observer hour). During the fall, raptors made up 4.1% of bird use, but were recorded during 68.9% of all surveys. During the spring, raptor use was slightly lower (2.3%); however, raptors were still observed during 67.9% of all surveys. State-listed species observed during the raptor migration survey included the endangered northern harrier (n=32), the threatened sandhill crane (*Grus canadensis*; n=3), and two Ohio species of concern: sharp-shinned hawk (n=4) and great egret (n=2). No federally-listed threatened or endangered species were observed during the raptor migration surveys (Ritzert et al., 2013; ODNR, 2018c).

2011-2012 Diurnal Raptor and Bird Migration Survey (North)

Tetra Tech completed one year of diurnal raptor/bird migration surveys in the portion of the Project Area in Erie County and in Lyme, Ridgefield, and northern Sherman Townships in Huron County (Exhibit S-4). A single diurnal raptor/bird migration survey point was established in a central location within the portion of the Project Area in Erie County and surveyed three times weekly from March 15 to April 28, 2011. A second sample point location was added In Lyme Township for the fall survey, and both locations were surveyed three times weekly from September 1 to October 28, 2011. Surveys were completed for seven hours each survey day.

A total of 823 raptor observations, representing nine species, were documented over 147 hours of spring and fall raptor migration surveys. The majority of observations (80.1%) were turkey vultures, with red-tailed hawk comprising the second most abundant raptor species observed (8.9%). Raptor use was greater in spring (2.94 individuals/hour) compared to fall (2.07 individuals/hour). State-listed species observed during the raptor migration survey included the endangered northern harrier (n=27) and common tern (*Sterna hirundo*; n=18); and species of concern sharp-shinned hawk (n=8) and great egret (n=1). No federally-listed threatened or endangered species were observed during the raptor migration surveys (Tetra Tech, 2012b; ODNR, 2018c).

Passerine Migration Surveys

As outlined in Table 08-8, passerine migration surveys were completed throughout the Project Area between 2010-2017 for a total of 43 survey points. Results of all studies completed to date are summarized below, and the associated reports can be found in Exhibits S and T.

2016-2017 Passerine Migration Survey (North)

WEST completed additional spring and fall passerine migration surveys in fall 2016 and spring and fall 2017 in accordance with ODNR guidelines (Exhibit T-1). The surveys were completed in Erie County, east of SR 4, and in northwestern Huron County, in Lyme, Ridgefield, and northern Sherman Townships. Surveys were completed weekly at seven points during the spring (April 1 through May 31, 2017) and fall (September 16 through November 10, 2016 and August 17 through September 13, 2017). Every bird seen or heard during a 10-minute period at each established survey point was identified to species. A total of 23 passerine migration survey visits were completed throughout the survey period for a total of 137 surveys in approximately 23 survey hours.

A total of 3,220 birds of 76 species were identified during the surveys. Small bird richness was greater during the spring season (8.9 species/plot/survey) compared to the fall season (4.3 species/plot/survey). Three species collectively comprised 54.8% of all observations: red-winged blackbird (29.1%), European starling (17.5%), and American robin (8.2%). No other bird species comprised more than 7.2% of the total observations.

Ohio-listed species of concern observed during the surveys include great egret (n=1), vesper sparrow (n=1), and red-headed woodpecker (n=9). No state- or federally-listed endangered or threatened species were observed (Iskali & LeBeau, 2018d; ODNR, 2018c). Based on these results, WEST concluded that development of the proposed Facility is not likely to cause significant impacts to migrating passerine

populations. The majority of the migrating passerines species observed are widespread and abundant, suggesting low risk of adverse impacts to as a result of development and operation of the Project (Iskali & LeBeau, 2018d).

2016-2017 Passerine Migration Survey (South)

WEST completed additional passerine migration surveys in fall 2016 and spring and fall 2017 (Exhibit T-2). The surveys were completed in Huron County, in Sherman, Norwich, and Richmond Townships, using timing and methods based on recommended protocol developed by the ODNR. A total of 17 points were established near forest habitats and surveyed weekly during the fall (September 16 through November 9, 2016 and August 17 through November 2, 2017) and spring (April 7 through May 30, 2017) passerine migration seasons. A total of 205 passerine migration surveys were completed throughout the 2016-17 survey periods for a total of 26.5 survey hours.

A total of 3,395 birds of 83 species were observed. Overall mean small bird use was greater in the fall (22.0 birds/plot/survey) compared to the spring (14.1 birds/plot/survey). Passerines were the most frequently observed bird group, representing 95.2% of birds during fall and 95.4% during spring. Overall bird species richness was greater during the spring season (9.7 species/plot/survey) compared to the fall season (6.2 species/plot/survey). Four species collectively composed 45.5% of all observations: red-winged blackbird (15.2%), European starling (12.4%), American robin (9.4%), and common grackle (8.5%). No other bird species comprised more than 6.9% of the total observations.

Ohio-listed species of concern observed during the surveys include great egret (n=1), American coot (n=1), sharp-shinned hawk (n=1), vesper sparrow (n=6), and red-headed woodpecker (n=4). No state- or federally-listed endangered or threatened species were observed (Iskali & LeBeau, 2018e; ODNR, 2018c). The species of concern were observed with no apparent spatial concentration at any particular location in the Project Area. Based on these results, WEST concluded that the Project presents species composition and seasonal and spatial use patterns for passerines that are similar to many Midwestern wind energy facilities in agricultural landscapes, and therefore, likely presents a low risk of impact to most passerines (Iskali & LeBeau, 2018e).

2012 Passerine Migration Survey (South)

WEST completed spring and fall passerine migration surveys to assess use of the Project Area by migrating passerines (Exhibit T-3). The surveys were completed in the portion of the Project Area in Seneca County, and in Huron County, in Sherman, Norwich, and Richmond Townships. Eleven, 200-

meter (656-foot) survey points were placed on leased lands within forested and shrub habitats. Surveys were completed weekly during spring (April 4 through May 31) and fall (August 14 through November 14) migration periods, and all species of birds observed during each 10-minute survey were recorded.

A total of 6,783 birds of 119 species were identified during the surveys. Overall bird use was higher in the fall (26.94 birds/plot/survey) than in the spring (22.22 birds/plot/survey). Passerines use was also higher in the fall than in the spring (25.16 and 19.9 birds/plot/survey, respectively). Passerines were observed during 100% of spring surveys and 97.2% of fall surveys and comprised over 89% of overall bird use during each season. Cumulatively, four species comprised 39.5% of the individual bird observations: red-winged blackbird (n=1,655), American goldfinch (n=349), American robin (n=347), and European starling (n=327). No other bird species comprised more than 3.9% of the total observations.

No federally-listed endangered or threatened species were observed. One state-listed endangered species (northern harrier [n=6]), and nine state-listed species of concern (black-billed cuckoo [n=1], common nighthawk [n=2], red-headed woodpecker [n=23], vesper sparrow [n=25], grasshopper sparrow [n=1], Henslow's sparrow [n=1], sharp-shinned hawk [n=1], bobolink [n=5], and cerulean warbler [*Dendroica cerulea;* n=2] were observed during these surveys. This data suggests that some passerines may utilize the Project Area as stopover habitat during migration. However, the proposed Facility is located within a landscape largely dominated by tilled agriculture, which is generally recommended by the USFWS as more suitable for wind energy development versus areas containing native habitats (WEST, 2013b).

2010-2011 Passerine Migration Survey (North)

WEST completed spring and fall passerine migration surveys to assess use of Project Area by migrating passerines (Exhibit S-3). The surveys were completed in the portion of the Project Area in Lyme, Sherman, and Norwich Townships in Huron County. Sixteen 200-meter (656-foot) survey plots were placed on leased lands within forested and shrub habitats. Surveys were completed weekly during fall (September 1 through November 15) and spring (April 1 through May 31) migration periods, and all species of birds observed during each 10-minute survey were recorded.

A total of 5,885 birds of 115 species were identified during the surveys. Overall bird use was higher in the fall (17.36 birds/plot/survey) than in the spring (13.45 birds/plot/survey). Passerines use was also higher in the fall than in the spring (14.78 and 11.9 birds/plot/survey, respectively). Passerines were observed during 100% of spring surveys and 97.9% of fall surveys and comprised more than 85% of

overall bird use during each season. Cumulatively, 5 species comprised 33.8% of the individual bird observations: American robin (n=674), European starling (n=465), common grackle (n=345), American goldfinch (n=288), and red-winged blackbird (n=219). No other bird species comprised more than 2.2% of the total observations.

No federally-listed endangered or threatened species were observed. One state-listed endangered species (northern harrier [n=2]), and 5 state-listed species of concern (great egret [n=1], American coot [n=1], sharp-shinned hawk [n=1], vesper sparrow [n=8], and red-headed woodpecker [n=13]) were observed during these surveys. This data suggests that some passerines may utilize the Project Area as stopover habitat during migration. However, the proposed Facility is located within a landscape largely dominated by tilled agriculture, which is generally recommended by the USFWS as more suitable for wind energy development versus areas containing native habitats (Ritzert et al., 2013).

Large Bird and Eagle Use Surveys

As outlined above in Table 08-8, large bird and eagle use surveys were completed throughout the Project Area between 2010-2019. Results of all studies completed to date are summarized below, and the associated reports can be found in Exhibits S and U.

2016-2017 Large Bird and Eagle Use Survey (North)

Large bird and eagle use surveys were completed in accordance with the Eagle Conservation Plan Guidance (ECPG) at 23 points throughout the portion of the Project Area in in Erie County, east of SR 4, and in northwestern Huron County, in Lyme, Ridgefield, and northern Sherman Townships (Exhibit S-1). The surveys were completed monthly from September 30, 2016, to December 18, 2017, with the following objectives: 1) to provide estimates of large bird use throughout the year; 2) to evaluate species composition and seasonal and spatial use by bird, including special status species; and 3) to assess risk to eagles and special status species. Each survey point was located to maximize viewshed for the observer and to enable evaluation of representative habitats within and near the proposed Facility. Each survey point was surveyed for a total of 60 minutes, with all large birds observed within the 800-meter (2,625-foot) survey plot recorded during the first 20 minutes, and all eagles observed recorded for the entire 60 minutes.

A total of 268 large bird and eagle use surveys were completed, resulting in 89 hours of 20-minute large bird use surveys and 268 hours of eagle use surveys. A total of 2,924 individual birds representing 19 species were recorded during the large bird surveys, including 96 individual birds representing six species

of diurnal raptors. Two species of waterfowl composed 83.2% of all large bird observations: Canada goose (75.8%), and tundra swan (*Cygnus columbianus*; 7.9%). The next most frequently recorded large birds were turkey vulture (2.7%), killdeer (2.6%), rock pigeon (2.6%), and mourning dove (2.4%). No other species accounted for more than 2% of the observations. Overall large bird use was highest during the winter (29.17 birds/plot/survey), followed by summer (1.9 birds/plot/survey), fall (1.78 birds/plot/survey), and spring (1.59 birds/plot/ survey). The number of species of large birds recorded was higher in the fall (n=18), but fairly consistent among the other three seasons: spring (n=16), summer (n=12), and winter (n=13). However, large bird species richness per plot per survey was slightly higher in the summer (1.13 species/plot/survey) compared to spring, winter, and fall (0.96, 0.78, and 0.57 species/plot/survey, respectively).

A total of 52 bald eagle observations were recorded in the survey plots during 268 hours of eagle surveys. Bald eagles were observed at 17 of the 23 survey points; however, 49% of the use occurred at three points. Eleven of the 52 observations were recorded at Survey Point 2, which is located 0.3 miles from a known nest; seven observations were recorded at Survey Point 40, which is located 0.9 mi from a second known nest outside of the Project Area; and seven observations were recorded at Survey Point 4, which is not near any known eagle nests. The remainder of the observations were scattered throughout the Project Area at relatively low levels. Overall mean use was 0.19 eagles/plot/survey across the entire study period, and the total number of risk minutes documented was 68. Seasonal mean use varied from 0.04 in the fall to 0.23 in the spring. Eagle flight paths are presented in Figure 4 of Exhibit S-1. Seventy-two percent of all bald eagle risk minutes were observed at Survey Points 1 and 2, which were located within 2.0 miles of the northern nest suggesting the use of the Project Area by eagles is concentrated near active eagle nests. There are no other landscape features within the Project Area that appear to concentrate eagle use (Iskali & LeBeau, 2018d).

Analysis of the data collected during the surveys generally indicates that development of the proposed Facility is not likely to cause significant impacts to large bird populations, including diurnal raptors or listed species. The majority of species observed are widespread and abundant, suggesting low risk of adverse impacts to large bird populations. No federally listed threatened or endangered large bird species were observed during the surveys, although the following state-listed species were documented: northern harrier (endangered; n=10), sharp-shinned hawk (species of concern; n=1) and great egret (species of concern; n=7) (Iskali & LeBeau, 2018d; ODNR, 2018c). All of the northern harrier observations were recorded below the rotor swept height, nesting habitat is extremely limited, and the species has not been documented in post-construction fatality studies in the Midwest. Based on this information, WEST

concluded that the proposed Facility poses minimal risk to large birds, including these special status species (Iskali & LeBeau, 2018d).

2016-2017 Large Bird and Eagle Use Survey (South)

Large bird and eagle use surveys were completed in accordance with the ECPG at 21 points throughout the portion of the Project Area in Norwich, Richmond, and southern Sherman Townships in in Huron County (Exhibit S-2). The surveys were completed monthly from September 16, 2016, to December 18, 2017, with the same objectives and methods described immediately above in the discussion of the Large Bird and Eagle Use Survey that was conducted in the northern portion of the Project Area.

A total of 252 large bird and eagle use surveys were completed, resulting in 84 hours of 20-minute large bird use surveys and 252 hours of eagle use surveys. A total of 793 individual birds representing 17 species were recorded during the large bird surveys, including 91 individual birds representing five species of diurnal raptors. Turkey vultures were the most frequently recorded large birds (38.1%), followed by American crow (15.5%), mourning dove (9.7%), and Canada goose (8.3%). No other species accounted for more than 5% of the observations. Overall large bird use was highest during the summer (3.91 birds/plot/survey), followed by spring (3.89 birds/plot/survey), winter (3.10 birds/plot/survey), and fall (2.26 birds/plot/survey). The number of species of large birds recorded was fairly consistent among season: spring (n=14), summer (n=11), fall (n=11), and winter (n=13). Large bird species richness per plot per survey was highest in the spring (1.51 species/plot/survey) while richness was similar during the summer, fall, and winter (1.07, 1.04, and 1.00 species/plot/survey, respectively).

A total of 17 bald eagle observations were recorded in the survey plots during 252 hours of eagle surveys over the course of the 15-month study. Overall mean use was 0.07 eagles/plot/survey across the entire study period, and the total number of risk minutes documented was 17. Seasonal mean use varied from no use in the spring to 0.12 in the summer and fall. Eagle flight paths are presented in Figure 4 of Exhibit S-2. Seven of the 17 observations were recorded at Survey Point 41, which is located 0.7 miles southeast from a known eagle nest that was active in 2017. The remainder of the observations were scattered throughout the Project Area at relatively low levels. There are no other landscape features within the Project Area that appear to concentrate eagle use. Avoiding siting turbines near the documented nest and point 41 may be appropriate to minimize risk.

No federally listed threatened or endangered large bird species were observed during the surveys, although one state-listed endangered species, northern harrier (n=8), and one Ohio-listed species of

concern, red-headed woodpecker (n=1), were documented (Iskali & LeBeau, 2018c; ODNR, 2018c). Red-headed woodpecker occurs in very low numbers and has rarely been documented in post-construction fatality studies in the Midwest. The majority (75%) of the northern harrier observations were recorded below the rotor swept height, nesting habitat is limited, and the species has not been documented in post-construction fatality studies in the Midwest.

Analysis of the data collected during the surveys generally indicates that development of the proposed Facility is not likely to cause significant impacts to large bird populations, including diurnal raptors or listed species. The majority of species observed are widespread and abundant, suggesting low risk of adverse impacts to large bird populations. Based on this information, WEST concluded that the proposed Facility poses minimal risk to large birds, including these special status species (Iskali & LeBeau, 2018c).

2010-2011 Eagle Use Survey (North)

WEST completed fixed-point surveys to observe bald eagle use of the Project Area within three miles of a documented bald eagle nest site in Sherman Township, Huron County (Exhibit S-3). Ten points were established along three transects, spaced at increasing distances from the nest (approximately every mile). Each survey plot was an 800-meter (2,625-foot) radius circle centered on the point. A total of 374 20-minute bald eagle fixed-point surveys were completed during 38 visits from September 9, 2010 to August 29, 2011. Surveys were broken down to two seasons: the breeding season (March 1 through August 31) and the winter (September 1 through February 15).

A total of 6,464 individual birds representing 79 species were recorded during the eagle use surveys. Twenty-two bald eagles were observed, accounting for 9.8% of all raptor observations. Bald eagles had an observed mean use of 0.07 birds/plot/survey during the breeding season and 0.04 birds/plot/survey during the winter. Bald eagles comprised 1.2% of all birds observed during both seasons and were observed during 2.9% of surveys in the breeding season and 3.6% of surveys in the winter.

State-listed species observed during the eagle use survey included the endangered northern harrier (n=18) and lark sparrow (*Chondestes grammacus*; n=3); and Ohio species of concern great egret (n=6), sharp-shinned hawk (n=2), Henslow's sparrow (n=5), bobolink (n=10), and red-headed woodpecker (n=3). No federally-listed threatened or endangered species were observed during the eagle use surveys (Ritzert et al., 2013; ODNR, 2018c).

2011-2012 Avian Use Surveys (North)

Tetra Tech completed avian use surveys in the portion of the Project Area in Erie County and in Lyme, Ridgefield, and northern Sherman Townships in Huron County (Exhibit U). These surveys included 13 months of 800-meter (2,625-foot) fixed radius point counts at 40 locations within the Project Area. Bald eagle behavior and flight patterns were recorded at each point count for 30 minutes twice a month, from March 2011 and through March 2012. Data recorded during each survey period included the total number of bald eagle in flight during each 1-minute interval, referred as bald eagle minutes.

A total of 508 hours of observation were completed across the 40 sample points. During that time, a total of 226 minutes of bald eagle observations were recorded at 32 of the 40 point count locations. Based on these results, the overall mean bald eagle exposure rate was found to be 0.0074 bald eagles per minute. In other words, on average, one bald eagle was observed during every 135 minutes (2 hours and 15 minutes) of observation. Bald eagle minutes were highest during the spring migration in March and April, and again during the fall migration in November and early December (Tetra Tech, 2012a).

Breeding Bird Surveys

As outlined above in Table 08-8, multiple breeding bird surveys have been completed throughout the Project Area since 2011, for a total of 74 survey points. Results of all studies completed to date are summarized below, and the associated reports can be found in Exhibits S and V.

2018 Breeding Bird Survey (North)

WEST completed breeding bird surveys during the spring and summer of 2018, to provide additional site-specific information on nesting birds in the vicinity of the Project Area (Exhibit V-1). The surveys were completed in the portions of the Project Area in Erie and Seneca Counties, and in northwestern Huron County, in Lyme, Ridgefield, and northern Sherman Townships. Survey timing and methods were based on recommended protocol developed by the ODNR. Sixteen fixed points were surveyed once in May and twice in June, in or near breeding bird habitat as defined by the ODNR. Surveys were completed for 10 minutes within a 200-meter (656-foot) radius plot at each point. All birds observed by sight or sound during fixed-point counts were identified to species.

A total of 959 individual birds representing 64 species were observed during the breeding bird surveys. Bird species observed are typical of the agriculture-dominated landscapes in Ohio and the Midwest. The most commonly observed species included common grackle, American robin, European starling, red-winged blackbird, house sparrow, song sparrow, and mourning dove. Ohio-listed species of concern

observed during the surveys include great egret (n=1), vesper sparrow (n=1), and red-headed woodpecker (n=2). No state- or federally-listed endangered or threatened species were observed (Iskali & LeBeau, 2018f; ODNR, 2018c).

2017 Breeding Bird Survey (South)

WEST completed additional breeding bird surveys during the spring and summer of 2017, to provide site-specific information on nesting birds in the vicinity of the Project Area (Exhibit V-2). The surveys were completed in the portion of the Project Area in Lyme, Ridgefield, and northern Sherman Townships, in Huron County, Ohio. Survey timing and methods were based on recommended protocol developed by the ODNR. Eight fixed points were surveyed once in May and twice in June. Surveys were completed for 10 minutes within a 200-meter (656-foot) radius plot at each point. All birds observed by sight or sound during fixed-point counts were identified to species.

A total of 472 individual birds representing 55 species were observed during the breeding bird surveys. The three most frequently observed species were common grackle (n=58), red-winged blackbird (n=41), and American robin (n=35). These three species collectively comprised 28.4% of all birds observed. Ohio-listed species of concern observed during the surveys included vesper sparrow (n=2) and red-headed woodpecker (n=2). No state- or federally-listed endangered or threatened species were observed (Iskali & Good, 2017; ODNR, 2018c).

2012 Breeding Bird Survey (South)

WEST completed breeding bird surveys in the portion of the Project Area in Seneca County, and in Sherman, Norwich, and Richmond Townships in Huron County to provide site-specific information on nesting birds in the vicinity of the Project Area (Exhibit V-3). Survey timing and methods were based on recommended protocol developed by the ODNR. Forty-five fixed points were surveyed once in May and twice in June, in or near breeding bird habitat as defined by the ODNR. Ten-minute surveys were completed within a 200-meter (656-foot) radius plot at each point. All birds observed by sight or sound during fixed-point counts were identified to species. In addition, a July survey was completed at four point-count locations with potential habitat for sedge wren.

A total of 2,446 individual birds representing 88 species were observed during the breeding bird surveys. The majority of species observed were typical agricultural species. Cumulatively, six species comprised 34.7% of the individual bird observations: American robin (n=162), red-winged blackbird (n=160), European starling (n=151), song sparrow (n=134), indigo bunting (*Passerina cyanea*; n=128), and red-

eyed vireo (*Vireo olivaceus*; n=113). No other bird species comprised more than 4% of the total observations. A variety of woodland birds were also observed, such as the black-and-white and blackpoll (*Dendroica striata*) warblers (*Wilsonia citrina*), American redstart (*Setophaga ruticilla*), and ovenbird (*Seiurus aurocapillus*), but in relatively limited numbers. The ODNR-recommended survey period for breeding birds overlaps with the late migration period for many woodland passerines. Given this, and the relative scarcity of woodland habitats with the Project Area, many of the forest bird observations likely represent late migrants passing through, rather than locally breeding birds.

State-listed species observed during the survey included the endangered northern harrier (n=1), and the threatened sandhill crane (*Grus canadensis*; n=1). The following state-listed species of concern were also documented: bobolink (n=19), grasshopper sparrow (n=4), Henslow's sparrow (*Ammodramus henslowii*; n=1), vesper sparrow (n=7), common nighthawk (n=1), and red-headed woodpecker (n=4) (WEST, 2012; ODNR, 2018c).

2011 Breeding Bird Survey (North)

Tetra Tech completed breeding bird surveys (Exhibit S-4) in the portion of the Project Area in Erie County and in Lyme, Ridgefield, and northern Sherman Townships in Huron County. Three sets of 10-minute point count surveys were completed at 35 point count locations, with one survey occurring in May and two surveys occurring in June. Surveys were not completed on mornings with heavy wind, prolonged periods of rain, or fog.

A total of 2,063 breeding birds were recorded during the surveys, the largest percentage (93.8%) of which were passerines and other landbirds. Gulls and shorebirds had the next highest percentage at 4.22%. The remaining avian groups had lower counts and included waterfowl (0.78%), raptors (0.48%), unknown/unidentified birds (0.44%), and wading birds (0.34%). Blackbirds and corvids were the most abundant passerines/landbirds, comprising 579 (~30%) of the total 2,063 birds observed in the survey. These included birds very common to the region including red-winged blackbird, common grackle, brown-headed cowbird, and American crow. Sparrows, wrens, and swallows collectively made up around 22% (n = 429) of the birds observed. The most abundant species in this group included species common to the region such as song sparrow, house sparrow, chipping sparrow, barn swallow (*Hirundo rustica*), and house wren (*Troglodytes aedon*). The other abundant group included thrushes and thrashers, which comprised approximately 20% of all birds recorded, with American robin and gray catbird most frequently observed. European starling and horned lark were also relatively abundant, making up approximately 10% of all birds observed. All bird groups and species observed are considered to be generally common

to the region and many are often associated with disturbed and/or agricultural conditions. No state- or federally-listed endangered or threatened species were observed (Tetra Tech, 2012b).

Owl Surveys

2012-2013 Owl Surveys (South)

Targeted owl surveys were completed between December 2012 and April 2013 within portions of the Project Area located in Seneca County and in southern Lyme, Sherman, Norwich, and northern Richmond Townships in Huron County (Exhibit W). The objective of the surveys was to determine if three species of owl are present during the winter: great horned owl (*Bubo virginianus*), barred owl (*Strix varia*), and eastern screech owl (*Otus asio*). Two survey points were placed within forested areas in Huron County, and each point was surveyed three times throughout the season: December 18, 2012 (great horned owl), January 28, 2013 (barred owl), and April 29, 2013 (eastern screech owl). Surveys began 0.5 hours after sunset and calls were played using a portable radio. Three replications of one minute of calls, followed by four minutes of listening (15 minutes total per station) were played at each survey point. One eastern screech owl was recorded during the January survey for barred owls (WEST, 2013a).

ODNR confirmed that the 2012-2013 surveys are adequate to inform use of the Project Area by the aforementioned owl species, and that additional owl surveys were not needed.

Bat Acoustic Surveys

As outlined in Table 08-8, multiple bat acoustic surveys were completed within the Project Area in 2010-2011. Results of these studies are summarized below, and the associated reports can be found in Exhibit X. Given the plethora of data currently available on bat activity patterns, ODNR confirmed that the 2010-2011 surveys are adequate to inform use of the Project Area by bats, and that additional acoustic surveys are not needed.

2011 Bat Acoustic Survey (North)

Tetra Tech completed bat acoustic surveys from March 21 to November 16, 2011 to estimate the seasonal and spatial use of the area by bats (Exhibit X-1). The surveys were completed in the portion of the Project Area in Erie County and in Huron County, in Lyme, Ridgefield, and northern Sherman, Townships, using timing and methods based on recommended ODNR protocol. Bat activity was monitored at two meteorological towers and two ground stations within suitable habitat using six ultrasonic acoustic recorders (AnaBat SD-1). Four detectors were deployed at two different heights on two temporary meteorological towers, one detector at 5 meters (16.4 feet) and one at 40 meters (131 feet) at

each tower. The detectors were programmed to begin recording bat calls approximately 30 minutes before sunset, monitor activity all night, and then stop recording 30 minutes after sunrise each night, to ensure that the greatest period of bat activity was monitored, with recording times adjusted over the course of the survey to compensate for seasonal changes in photoperiod.

A total of 19,252 bat call sequences were recorded over 1,287 detector nights, representing eight different species: hoary bat, silver-haired bat, eastern red bat, evening bat, little brown bat, tri-colored bat, northern long-eared bat, and big brown bat. Overall, there was more bat activity by migratory species than non-migratory species in the Project Area. Of the calls that could be classified to species, 49.5% were attributed to typical long-distance migratory bats including hoary bat, silver-haired bat, and eastern red bat. Silver-haired bat was the most active species, followed by big brown bat and little brown bat. There vast majority of bat call sequences (n=16,181; 84%) were recorded at the ground detectors rather than at those in the meteorological towers. This indicates that bat activity within the rotor swept zone of the turbine blades was low compared to bat activity levels below the rotor swept zone; bats flying near ground level have considerably reduced risk of collision mortality. One federally- and state-listed threatened bat species (northern long-eared bat, n=5) and six state-listed species of concern (all of the other species except evening bat) were documented during the survey (Tetra Tech, 2012c; ODNR, 2018c).

Patterns of activity in the Project Area do not suggest the presence of a large bat migration corridor in the vicinity of the meteorological towers. There was an observed increase in activity during the late-summer early fall swarming/migratory staging period. The sporadic and diffused occurrence of long-distance migratory species in the recording indicates that few individuals use the open area near the met towers. Although the observed increase in activity during August and September was apparent, there did not appear to be an episode of dramatic fluctuation in recorded activity that could be definitively attributed to large-scale migration (Tetra Tech, 2012c).

2010 Bat Acoustic Survey (South)

WEST completed bat acoustic surveys from March 11 to November 17, 2010 to estimate the seasonal and spatial use of the area by bats (Exhibit X-2). The surveys were completed in the portion of the Project Area in Seneca County and Huron County, in Lyme, Sherman, and Norwich Townships, using timing and methods based on recommended ODNR protocol. Bat activity was monitored at one meteorological tower using two ultrasonic acoustic recorders (Anabat SD-1) placed at different heights to compare bat activity at varying heights: one at 5 meters (16.4 feet) and one at 50 meters (164 feet) above ground level. Detectors were programmed to begin recording each night 30 minutes before sunset and stop

recording 30 minutes after sunrise. Detectors were visited weekly throughout the study period to download data, exchange batteries and data cards, and to ensure they were functioning properly.

A total of 3,243 bat passes were recorded over the 252-night survey period (457 detector nights). Average bat activity at the 5-meter detector was 7.12 ± 0.76 bat passes per detector-night, and average bat activity for the 50-meter detector was 7.07 ± 0.88 bat passes per detector-night. Bat activity varied among seasons, with the overall bat activity highest during the summer season (14.84 bat passes per detector-night), intermediate bat activity in the fall season (7.58 bat passes per detector-night), and lowest bat activity during the spring season (1.36 bat passes per detector night). Bat activity generally increased from spring into summer, with a period of peak sustained activity occurring shortly before the fall migration period. Higher bat activity in August likely reflects the movement of bats through the Project Area to winter areas or hibernacula. Activity levels declined until reaching very low levels in October. During the fall migration period, bat passes averaged 11.70 ± 1.67 per detector-night at the 5-meter detector, and 10.60 ± 1.74 bat passes per detector-night for the 50-meter detector.

The majority (70.5%) of all recorded bat passes were low frequency calls (e.g., big brown, silver-haired, and hoary bats), while 18.1% were high frequency calls (e.g., little brown, northern long-eared, Indiana, eastern small-footed, and tri-colored bats) and 11.4% were mid-frequency calls (e.g., eastern red bat and evening bats). Activity levels for all bat passes were highest from mid-July through mid-August. The increased level in activity during this period likely represents migratory bats passing through the Project Area in the fall. Bat pass rates recorded during this survey were moderate compared to other wind energy facilities where bat pass rates and bat fatality rates have been measured. Based on the available data, it is expected that bat mortality in the Project Area will be highest from mid-July through mid-August (Ritzert et al., 2011). To minimize risk to bats during this period, a curtailment strategy will be implemented as agreed upon with USFWS and ODNR (Exhibit K).

Listed Bat Presence/Probable Absence Surveys

As outlined in Table 08-8, bat mist net surveys have occurred throughout the Project Area since 2011. Results of all studies completed to date are summarized below, and the associated reports can be found in Exhibit Y.

2017-2018 Bat Mist-Netting (North)

Copperhead completed additional bat mist-netting surveys during the summer of 2017 (Exhibit Y-1). The surveys were completed in Erie County, east of SR 4, and in northwestern Huron County, in Lyme,

Ridgefield, and northern Sherman Townships. Ten mist-net sites were selected to maximize coverage of flight paths used by bats along suitable travel corridors, foraging areas, or drinking areas. Each mist-net site consisted of three to four double-high net sets (two nets stacked; 5.2 meters [17 feet] tall) and one three high net set (three mist-nets stacked; 7.5 meters [24.6 feet] tall). Mist-net sites were surveyed for two nonconsecutive nights between June 19 and July 3, 2017, for a total of nine net nights per site. Nets were deployed at sunset and left open for at least 5 continuous netting hours. The nets were attended continuously and checked at least every 10 minutes.

A total of 53 bats of three species were captured. Big brown bats comprised 72% of total captures (n=42), eastern red bats comprised 21% of total captures (n=12), and the remaining 7% of captures were hoary bats (n=4). No federally- or state-listed endangered or threatened species were captured during this survey (Copperhead, 2017a). Big brown bat, eastern red bat, and hoary bat are all state-listed species of concern (ODNR, 2018c).

Copperhead completed supplemental bat mist-netting surveys between June 25 and 30, 2018, in portions of the Project Area in Seneca and Erie Counties not covered in the 2017 surveys, as well as within the outer-tier of a 5-mile conservation buffer around an Indiana bat acoustic record adjacent to the Project Area (Exhibit Y-2). Each of five net sites was sampled on two non-consecutive nights, for a total of nine net nights per site. A total of 16 bats of two species were captured. Big brown bats comprised 88 percent of total captures (n=14), and eastern red bats comprised the other 12 percent of total captures (n=2). No federally- or state-listed endangered or threatened species were captured during this survey (Copperhead, 2018). Big brown bat and eastern red bat are both state-listed species of concern (ODNR, 2018c).

2017 Bat Mist-Netting (South)

Copperhead completed additional bat mist-netting surveys during the summer of 2017 (Exhibit Y-3) in the portion of the Project Area located in Lyme, Ridgefield, and northern Sherman Townships, in Huron County. Thirty-five mist-net sites were selected to maximize coverage of flight paths used by bats along suitable travel corridors, foraging areas, or drinking areas. Each mist-net site consisted of five net sets, with at least one three-high net set (three mist-nets stacked; 7.5 meters [24.6 feet] tall). Mist-net sites were surveyed for two nonconsecutive nights between June 19 and July 3, 2017, for a total of nine net nights per site. Nets were deployed at sunset and left open for at least 5 continuous netting hours. The nets were attended continuously and checked at least every 10 minutes.

A total of 337 bats of six species were captured. Big brown bats comprised 77% of total captures (n=260), eastern red bats comprised 15% of total captures (n=49), and hoary bat comprised 7% of total captures (n=24). The remaining 1% of captures consisted of silver-haired bat (n=2), Indiana bat (n=1) and evening bat (n=1).

One federally and state endangered bat (Indiana bat, n=1) was captured; all of the other species captured (except evening bat) were state-listed species of concern (ODNR, 2018c). In accordance with the ODNR and USFWS approved study plan, the Indiana bat was radio-tagged and tracked during the day to locate diurnal roost trees. Tracking occurred for eight days (26 June – 3 July), during which time three roost locations were estimated using ground triangulation or aerial telemetry. In addition, foraging data was collected over four nights resulting in a total of 147 foraging points. Although the female Indiana bat was captured within the Project Area, all roost locations (n=3) were outside of the Project Area, as was the majority of its home range.

The results of this study document summer Indiana bat presence in the southeastern portion of the Project Area, and no or very low Indiana bat usage of the remaining portion of the Project Area. The lack of northern long-eared bat captures suggests this species is either absent or is present in such low densities during the summer maternity period that current survey techniques failed to detect them (Copperhead, 2017b).

2012 Bat Mist-Netting (South)

WEST completed bat mist-netting surveys during the summer of 2012 (Exhibit Y-4) to assess the presence/probable absence of listed bats in the portion of the Project Area located in Seneca County, and in Sherman, Norwich, and Richmond Townships in Huron County. A minimum of four net sets were used at each mist-net site, with at least one net set being 7.8 meters (25.6 feet) tall. A total of 50 mist-net sites were surveyed, with each site sampled on two non-consecutive nights between July 2 and July 29, 2012. Mist-netting began at sunset and continued for at least 5 hours, with nets checked approximately every 10 minutes.

Bats were captured at all 50 sites, resulting in a total of 1,121 bats of seven species. Big brown bats were the most common species captured (n=622; 55.5% of total captures), followed by eastern red bats (n=198; 17.7%), northern long-eared bats (n=170; 15.2%), little brown bats (n=87; 7.8%), hoary bats (n= 41; 3.7%), tri-colored bats (n=2; 0.2%), and evening bats (n=1; 0.1%). WEST also completed a radio

telemetry study of a lactating female little brown bat captured in a mist-net to locate the maternity roost (Sichmeller at al., 2012).

Northern long-eared bat is both federally- and state-listed as a threatened species, and all of the other species captured (except evening bat) were state-listed species of concern (ODNR, 2018c). No federally- or state-listed endangered bats were captured during the survey. There are no previous Indiana bat summer capture records in Huron County, and no Indiana bats were captured at any of the 50 sites surveyed in 2012. These results suggest that Indiana bat is not present within the area surveyed (Sichmeller at al., 2012).

2011 Bat Mist-Netting (North)

Tetra Tech EM, Inc. completed a bat mist-netting survey during the summer of 2011 (Exhibit Y-5) to assess the presence/probable absence of listed bats in the Project Area, and to provide data on bat species composition within the Project Area using guidelines recommended by the USFWS and the ODNR. The surveys were completed in the portions of the Project Area in Erie County, and in northwestern Huron County, in Lyme, Ridgefield, and northern Sherman Townships. Nine mist-net sites were located within or adjacent to upland forest woodlots or creek corridors. These locations represent the most suitable areas of Indiana bat summer habitat and the most likely locations to capture Indiana bats throughout the Project Area. Each net site was sampled on two non-consecutive nights between July 19 and 30, 2011.

A total of 175 bats representing six species were captured, with bats netted at all nine net sites. The most common species captured was big brown bat (n=100), which represented 57% of all bats netted. The remaining 43% of captures were distributed among the following species: eastern red bat (n=43), northern long-eared bat (n=20), little brown bat (n=5), hoary bat (n=5), and evening bat (n=2). Northern long-eared bat is both federally- and state-listed as a threatened species, and all of the other species captured (except evening bat) are state-listed species of concern (Tetrat Tech, 2011; ODNR, 2018c). No federally- or state-listed endangered bats were captured during the survey.

(e) *Summary of Additional Ecological Impact Studies*

All of the ecological impacts studies are discussed above in Sections 4906-4-08(B)(1)(b) and (d).

(2) Construction Impacts

(a) *Estimation of Impact of Construction on Undeveloped Areas, Plants, and Animals*

There will be no construction-related impacts to wildlife areas, nature preserves, or other conservation areas. Potential impacts to undeveloped areas, plants, and animals may occur during construction as a result of the installation of turbines, access roads, and electrical interconnects; the upgrade of local public roads or intersections; the development and use of the laydown yards and temporary workspaces around the turbine sites; and the construction of the substations and O&M building. Anticipated impacts to these resources are discussed below.

Impacts to Plants

Construction activities that will result in impacts to vegetation include site preparation, earth-moving, and excavation/backfilling activities associated with construction/installation of the laydown yards, access roads, foundations, and buried electrical interconnect. These activities will result in the cutting and clearing of vegetation, the removal of stumps and root systems, and increased exposure/disturbance of soil. Along with direct loss of (and damage to) vegetation, these impacts can result in a loss of wildlife food and cover, increased soil erosion and sedimentation, increased risk of colonization by non-native invasive species, and disruption of normal nutrient cycling. However, it is not anticipated that any plant species occurring in the Project Area will be extirpated or significantly reduced in abundance as a result of construction activities.

Impacts to Wildlife Species

Construction-related impacts to wildlife are anticipated to be very limited but could include incidental injury and mortality due to vegetation clearing and vehicular movement, potential silt and sedimentation impacts on aquatic organisms, habitat disturbance/loss associated with clearing and earth-moving activities, forest fragmentation, and displacement of wildlife due to increased sound and human activities. Based on the studies completed to date, none of the construction-related impacts will be significant enough to affect local populations of any resident or migratory wildlife species. Each of these potential impacts is described below.

Incidental Injury and Mortality: Incidental injury and mortality should be limited to sedentary/slow-moving species such as small mammals, reptiles, and amphibians that are unable to move out of the area being disturbed by construction. If construction occurs during the nesting season, wildlife subject to mortality could also include the eggs and young offspring of nesting birds, as well as immature mammalian species

that are not yet fully mobile. More mobile species and mature individuals should be able to vacate areas that are being disturbed. Furthermore, because most Facility components are sited in active agricultural land that provides limited wildlife habitat, and which currently (and historically) experiences frequent agricultural-related disturbances, such impacts are anticipated to be very minor.

Siltation and Sedimentation: Earth-moving activities associated with Facility construction have the potential to cause siltation and sedimentation impacts down slope of the area of disturbance. Facility components will be sited away from wetlands and streams to the extent practicable. To prevent adverse effects to water quality and aquatic habitat during construction, runoff will be managed under an NPDES construction storm water permit and the associated SWP3. An erosion and sediment control plan will be developed prior to construction that will use appropriate runoff diversion and collection devices. Also, because the majority of Facility components are being sited in active agricultural land, soil disturbance/exposure due to Facility construction will generally occur in areas already subject to regular plowing, tilling, harvesting, etc.

Habitat Loss: The majority of the Facility will be built in or adjacent to agricultural land, which generally provides habitat for only a limited suite of wildlife species. In addition, most of these areas are already subject to periodic disturbance in the form of mowing, plowing, harvesting, etc. Scrub-shrub and forested communities have largely been avoided and will experience less construction-related disturbance. Based on the current Facility layout, approximately 26.5 acre of forest will be directly impacted by Facility construction. However, most of these impacts will be temporary (see Table 08-9).

Forest Fragmentation: The proposed Facility will result in the conversion of approximately 26 acres of forest to successional communities. However, the forested habitat being impacted by the Facility generally occurs at the edge of relatively small blocks or woodlots. This being the case, it is not anticipated that any forests will be significantly fragmented by construction of the proposed Facility.

Disturbance/Displacement: Some wildlife displacement will also occur due to increased sound and human activity as a result of Facility construction. The significance of this impact will vary by species and the seasonal timing of construction activities. Because most of the Facility occurs in agricultural land, species utilizing those habitats are most likely to be temporarily disturbed/displaced by Facility construction.

Impacts to Upland Habitats

Table 08-9 quantifies impacts to ecological communities, including undeveloped areas, based on the typical area of vegetation clearing column presented in Table 03-1.

Table 08-9. Impacts to Ecological Communities

Community[1]	Total Disturbance (acres)	Temporary Disturbance (acres)	Permanent Loss (acres)
Forestland	26.5	26.0[2]	0.5
Non-Forested Wetlands[3]	4.2[3]	4.0[3]	0.2[3]
Agricultural Lands	1,424.3	1,341.0	83.3
Barren	15.7	15.5	0.2
Urban	3.3	3.0	0.3
TOTAL	1,474.0	1,389.5	84.5

[1] Ecological community types were obtained from Land Use/Land Cover shapefiles for Erie (ODNR, 1994a) and Huron (1994b) Counties, and verified/updated using recent aerial imagery.
[2] The 26.0 acres of temporary impact to forestland includes 19.0 acres of permanent forest conversion (along buried collection line routes), and 7.0 acres that will be allowed to revert to forestland (along the edges of access roads and turbine workspaces).
[3] This value should be treated as an estimate. Impacts to wetlands and surface water habitats have been calculated separately based on the on-site field delineations and are presented below. The field delineation data is more accurate and supersedes this estimate.

Impacts to natural communities have been avoided to the extent possible. Of the 84.5 total acres of permanent disturbance, 83.3 acres will occur within agricultural lands, 0.2 acre in barren lands, 0.3 acre in urban lands, and 0.5 acre will occur within forestland. Native vegetation or agricultural crops will be reestablished during restoration of the 1,341 acres of agricultural land, 26.0 acres of forestland, 15.5 acres of barren lands, and 3.0 acres of urban land temporarily disturbed as a result of construction activities. Please refer to Table 08-21 for a more detailed breakdown of impacts to various types of agricultural lands (i.e., pasture vs. cultivated croplands, etc.).

Impacts to Wetland and Surface Water Habitats

The proposed Facility has been designed to avoid impacting wetlands and surface waters, to the extent practicable, and to minimize such impacts where avoidance is not possible. All large permanent components (i.e., the turbines, substation, O&M Facility, and met towers) have been sited in upland areas, currently or recently used for agricultural production. Therefore, no direct temporary or permanent impacts to wetlands or waterbodies will result from construction of these components, and the potential for indirect impacts to wetlands and surface waters in the vicinity of these components will be negligible as a result of required SWP3 best management practices.

The construction of access roads and the installation of electrical line interconnections among the turbine arrays presents the greatest potential for direct and/or indirect impacts to surface water and wetlands. Facility-wide, only one wetland will be impacted as a result of access road construction. All other impacts will occur as a result of collection line installation, and these impacts will all be temporary in nature. A total of 20 wetlands and one constructed waterbody will be crossed by Facility components, resulting in a cumulative total of 1.983 acre of temporary impact and 0.142 acre of permanent impact, along with 0.001 acre of temporary impact to constructed waterbodies (MSG, 2019a). Anticipated impacts to wetlands and constructed waterbodies are summarized below in Table 08-10. Additional information about each wetland impacted can be found in Exhibit Z.

Table 08-10. Wetland Impacts

Wetland ID	Wetland Type[1]	Figure Number[2]	Facility Component[3]	Crossing Method	Length of Crossing (feet)	Temporary Impact (acres)	Permanent Impact (acres)
W1M-032	PFO	4.26	CL	Trench	305	0.175	0.000
W1M-043	PEM	4.43	CL	Trench	21	0.012	0.000
W1M-045	PFO/PEM	4.43	CL	Trench	131	0.075	0.000
W1M-076	PFO	4.47	CL	Trench/ HDD[4]	300	0.284	0.000
W1M-079/78	PFO	4.47	CL	Trench	89	0.033	0.000
W1M-090	PFO	4.3	CL	Trench	43	0.025	0.000
W1M-091/97	PFO/PSS/PEM	4.3	AR	Fill/ Culvert	391	0.320	0.142
W1M-117	PEM	4.56	CL	Trench	23	0.013	0.000
W1M-124	PFO/PSS/PEM	4.56	CL	Trench	32	0.004	0.000
W1M-133	PFO/PEM	4.52	CL	Trench	82	0.048	0.000
W1M-137	PEM	4.5	CL	Trench	143	0.064	0.000
W1M-140	PSS/PEM	4.3	CL	Trench	146	0.058	0.000
W1M-152	PSS/PEM	4.1	CL	Trench	18	0.008	0.000
W1M-156	PFO	4.6	CL	Trench	82	0.045	0.000
W2M-004	PFO	4.14	CL	Trench	24	0.014	0.000
W2M-028	PFO/PSS/PEM	4.32	CL	Trench	254	0.108	0.000
W2M-052	PFO/PSS/PEM	4.41	CL	Trench/ HDD[4]	222	0.128	0.000
W2M-063	PFO	4.54	CL	Trench/ HDD4	434	0.249	0.000
W2M-066	PFO/PEM/PSS	4.55	CL	Trench/ HDD4	575	0.311	0.000

Wetland ID	Wetland Type[1]	Figure Number[2]	Facility Component[3]	Crossing Method	Length of Crossing (feet)	Temporary Impact (acres)	Permanent Impact (acres)
W2M-072	PFO	4.48	CL	Trench	16	0.009	0.000
WB2M-083	CW	4.51	CL	Trench	36	0.001	0.000
Total						1.983	0.142

[1] PFO = palustrine forested; PEM = palustrine emergent; PSS = palustrine scrub-shrub; POW = palustrine open water; constructed waterbody.
[2] See Figure Set 4 in Appendix C of Exhibit Z.
[3] CL = collection line; AR = access road.
[4] These wetlands will be crossed by trenching through the woods and boring under the streambeds using HDD.

MSG (2019a) reviewed conditions in the study area to determine the probable jurisdictional status of the wetlands and surface waters based on current USACE guidance and policy, and concluded that all wetlands, streams, and other waterbodies would be considered jurisdictional by the USACE. In addition to the wetland impacts presented above in Table 08-10, Facility construction will also result in temporary and permanent impacts to streams. A total of 58 streams will be crossed by Facility components, resulting in a cumulative total 981 linear feet (0.631 acre) of temporary impact and 208 linear feet (0.146 acre) of permanent impact. Of the 58 streams crossed, impacts to 46 will be avoided entirely by using HDD for collection lines installation. One stream will be subject to temporary impacts from installing collection line using trenching, but there are no permanent impacts are associated with collection line installation. A total of 11 streams will be crossed by access roads; of which one will be subject only to temporary impacts, and ten will be subject to both permanent and temporary impacts (MSG, 2019a). Anticipated waterbody impacts are summarized below in Table 08-11. Additional information about each waterbody impact can be found in Appendix A of Exhibit Z.

Table 08-11. Waterbody Impact

Stream ID	HHEI/ QHEI Score	Crossing Method	Access Roads				Collection Lines	
			Temporary Impacts		Permanent Impacts		Temporary Impacts	
			linear feet	acres	linear feet	acres	linear feet	acres
S1M-003-1	35	HDD	0	0.000	0	0.000	0	0.000
S1M-004-1	33	HDD	0	0.014	0	0.000	0	0.000
S1M-006	48	HDD	0	0.000	0	0.000	0	0.000
S1M-011-1	37	Trench	0	0.000	0	0.000	545	0.318
S1M-013-1	22	Culvert/HDD	36	0.081	16	0.036	0	0.000
S1M-014	30	HDD	0	0.000	0	0.000	0	0.000
S1M-025	27	HDD	0	0.000	0	0.000	0	0.000
S1M-026	42	HDD	0	0.000	0	0.000	0	0.000
S1M-036	17	HDD (x2)	0	0.000	0	0.000	0	0.000

Stream ID	HHEI/ QHEI Score	Crossing Method	Access Roads				Collection Lines	
			Temporary Impacts		Permanent Impacts		Temporary Impacts	
			linear feet	acres	linear feet	acres	linear feet	acres
S1M-040	59	HDD	0	0.000	0	0.000	0	0.000
S1M-041	42	HDD	0	0.000	0	0.000	0	0.000
S1M-053	50.5	Culvert/HDD	41	0.023	18	0.010	0	0.000
S1M-055	58	Culvert/HDD	72	0.040	32	0.018	0	0.000
S1M-065	67.5	HDD	0	0.000	0	0.000	0	0.000
S1M-077	52.25	HDD	0	0.000	0	0.000	0	0.000
S1M-083	69	HDD	0	0.000	0	0.000	0	0.000
S1M-089	22	HDD	0	0.000	0	0.000	0	0.000
S1M-101	45	HDD	0	0.000	0	0.000	0	0.000
S1M-105	41	HDD	0	0.000	0	0.000	0	0.000
S1M-106	57.5	HDD	0	0.000	0	0.000	0	0.000
S1M-107	53	HDD	0	0.000	0	0.000	0	0.000
S1M-118	16	HDD	0	0.000	0	0.000	0	0.000
S1M-120	44	HDD	0	0.000	0	0.000	0	0.000
S1M-129	37	HDD	0	0.000	0	0.000	0	0.000
S1M-138	42	HDD	0	0.000	0	0.000	0	0.000
S1M-142	49	HDD	0	0.000	0	0.000	0	0.000
S1M-143	48	Culvert/HDD	39	0.022	17	0.010	0	0.000
S1M-145	57	HDD	0	0.000	0	0.000	0	0.000
S1M-147	62	Culvert/HDD	37	0.021	16	0.009	0	0.000
S1M-149	48	HDD	0	0.000	0	0.000	0	0.000
S1M-159	33	Culvert/HDD	0	0.000	16	0.009	0	0.000
S1M-162	62	HDD	0	0.000	0	0.000	0	0.000
S1M-165	70	HDD	0	0.000	0	0.000	0	0.000
S1M-166	50	HDD	0	0.000	0	0.000	0	0.000
S2M-002	40	HDD	0	0.000	0	0.000	0	0.000
S2M-007	46	Culvert/HDD	36	0.025	16	0.009	0	0.000
S2M-012	21	HDD	0	0.000	0	0.000	0	0.000
S2M-017	50	Culvert	36	0.021	16	0.009	0	0.000
S2M-019	43	HDD	0	0.000	0	0.000	0	0.000
S2M-020	51	HDD	0	0.000	0	0.000	0	0.000
S2M-023	47.5	HDD	0	0.000	0	0.000	0	0.000
S2M-032	54	HDD	0	0.000	0	0.000	0	0.000
S2M-035	35	HDD	0	0.000	0	0.000	0	0.000
S2M-037	83	HDD	0	0.000	0	0.000	0	0.000
S2M-038	39	HDD	0	0.000	0	0.000	0	0.000
S2M-051	75	HDD	0	0.000	0	0.000	0	0.000
S2M-053	67	HDD	0	0.000	0	0.000	0	0.000

Stream ID	HHEI/ QHEI Score	Crossing Method	Access Roads				Collection Lines	
			Temporary Impacts		Permanent Impacts		Temporary Impacts	
			linear feet	acres	linear feet	acres	linear feet	acres
S2M-055	67	HDD	0	0.000	0	0.000	0	0.000
S2M-059	59	Culvert	36	0.021	16	0.009	0	0.000
S2M-062	55	Culvert/HDD	51	0.029	22	0.013	0	0.000
S2M-070	56	HDD	0	0.000	0	0.000	0	0.000
S2M-073	69	Culvert	52	0.030	23	0.013	0	0.000
S2M-082	64	HDD	0	0.000	0	0.000	0	0.000
S2M-092	48	HDD	0	0.000	0	0.000	0	0.000
S2M-093	54	HDD (x2)	0	0.000	0	0.000	0	0.000
S2M-098	49	HDD	0	0.000	0	0.000	0	0.000
S2M-100	59	HDD	0	0.000	0	0.000	0	0.000
S2M-101	52	HDD	0	0.000	0	0.000	0	0.000
Total			436	0.313	208[1]	0.146[1]	545	0.318

[1] Impact numbers do not sum correctly due to rounding issues.

The Facility has been designed and will be constructed so that impacts to waters of the U.S. (WOTUS) meet the requirements for authorization under Nationwide Permit (NWP) 12, Utility Line Activities. Each single and complete linear crossing that would result in the placement of dredged or fill materials into a potential WOTUS would meet the requirements for authorization under NWP 12. NWP 12 requires adherence to both general and regional conditions. With regards to general conditions that require preconstruction notification (PCN), one stream, S1M-011-1, has potential impacts greater than 500 linear feet, thereby requiring a PCN. With regards to regional conditions that require a PCN, nine potential WOTUS, eight wetlands (see Table 08-10) and one stream, S1M-013-1, have combined temporary and permanent impacts greater than 0.1 acre, thereby requiring a PCN (MSG, 2019a).

The impacts presented above in Tables 08-10 and 08-11 were calculated assuming the construction of all 87 proposed turbine sites evaluated in this Application. To minimize impacts and derive the numbers presented herein, the Applicant is currently planning to shift some areas of clearing and soil disturbance associated with the temporary workspaces away from wetlands and streams, to avoid/minimize impacts and ensure impacts to WOTUS can be authorized under NWP 12. However, the actual number of turbines to be constructed will be between 66 and 71, depending on the model of turbine selected (i.e., if a 4.2 MW turbine is selected, it is expected that up to 71 turbines will be constructed; if a 4.5 MW turbine is selected, it is expected that up to 66 turbines will be constructed). Therefore, additional impact reductions are expected when the final turbine model and sites to be constructed are selected during final Facility design, such that impacts to WOTUS will meet the requirements for authorization under NWP 12.

(b) *Description of Short-term and Long-term Mitigation Procedures*

To minimize Facility-related impacts on surface waters and wetlands, preliminary and final Facility designs were guided by the following criteria during the siting of wind turbines and related infrastructure:

- Large built components of the Facility, including wind turbine generators, meteorological towers, and the substation are sited to completely avoid wetlands and surface waters.
- The number and overall impacts due to access road crossings were minimized by routing around wetlands and streams whenever possible, and by utilizing existing crossings and narrow crossing locations to the extent practicable.
- Buried electric interconnect lines will avoid crossing wetlands where possible, will cross streams at existing or previously disturbed locations to the extent practicable, and will utilize installation techniques that minimize construction-related impacts to surface waters.

Other on-site environmental or logistical constraints, (such as stands of mature forest, landowner concerns, and other current land use), may make further avoidance of streams unfeasible. Where crossings of wetlands or surface waters are required, the Applicant will employ applicable best management practices. Specific mitigation procedures for protecting wetlands, surface water resources, vegetation, and major species and their habitats are described below.

(i) Site restoration and stabilization of disturbed soils

Following completion of construction, temporarily impacted areas will be restored to their preconstruction condition. Restoration activities are anticipated to include the following:

- The 300-foot radius turbine workspaces will be reduced to a permanent footprint of 0.03 acre (18-foot diameter turbine pedestal, and a 10-foot wide gravel skirt around the tower base).
- Preconstruction contours and soil/substrate conditions will be established in all disturbed areas, to the extent practicable.
- Disturbed stream banks will be stabilized.
- Buried electrical interconnect routes will be restored to preconstruction contours (as necessary) and allowed to regenerate naturally.

- Restoration of disturbed agricultural fields will be accomplished by de-compacting the soil, removing rocks, and re-spreading stockpiled topsoil.
- Disturbed soils throughout the Project Area will be re-seeded with an annual cover crop to stabilize exposed soils and control sedimentation and erosion. Seeding outside of active agricultural fields will be restricted to native seed mixes, unless otherwise requested by the landowner.

These actions will assure that, as much as possible, the site is returned to its preconstruction condition and that long-term impacts are minimized.

(ii) Frac out contingency plan

Facility construction will include the use of trenchless excavation methods known as HDD. This widely used technique accomplishes the installation of buried utilities with minimal impact, by routing the utility under a sensitive feature (such as a stream, river or wetland). HDD operations have the potential to inadvertently release drilling fluids into the surface environment from pressurization of the drill hole beyond the containment capability of the overburden soil material or through fractured bedrock into the surrounding rock ("frac out"). The HDD procedure uses a bentonite slurry, a fine clay material as a drilling lubricant. Although bentonite is non-toxic and non-hazardous, it has the potential to adversely impact aquatic species if released into waterbodies. Seepage of drilling fluid is most likely to occur near the bore entry and exit points where the drill head is shallow. Frac-outs can occur, however, in any location along a directional bore.

The HDD Frac-Out Contingency Plan, included as Exhibit AA, sets forth procedures to avoid, minimize, and remediate potential environmental impacts resulting from an inadvertent return of drilling fluids during HDD operations. Measures to be deployed as part of the contingency plan include site inspection, proper training of the contractor and construction personnel, development of response procedures, provision of containment materials, and implementation of appropriate clean up procedures. For more information, see Exhibit AA.

(iii) Methods to demarcate surface waters and wetlands during construction

The boundaries of jurisdictional streams and wetlands within and immediately adjacent to the construction limits of disturbance will be demarcated with highly visible flagging, staking, or fencing prior to construction. These sensitive areas will also be depicted on construction drawings. All contractors and subcontractors working on-site will be provided with training to understand the

significance of the types of flagging used, and the importance of staying within defined limits of work areas, especially in and adjacent to marked sensitive resource areas such as wetlands.

(iv) Inspection procedures for erosion control measures

Erosion and sediment control measures will be inspected by a duly qualified individual throughout the period of construction to assure that they are functioning properly until completion of all restoration work. Disturbed areas, and areas used for storage of materials that are exposed to precipitation, shall be inspected for evidence of or the potential for pollutants entering the drainage system. Locations where vehicles enter or exit the site shall be inspected for evidence of off-site vehicle tracking. Inspections will be conducted at least once every seven calendar days, and within 24 hours after any storm event with 0.5 inch or greater of rain, or as required by SWP3 permit. This inspection frequency may be reduced to once every month if the entire site is temporarily stabilized and runoff is unlikely due to weather conditions (e.g., site is covered with snow, ice, or the ground is frozen).

Following each inspection, the qualified inspector will complete and sign a checklist/inspection report. At a minimum, the inspection report shall include:

- the inspection date;
- names, titles, and qualifications of personnel making the inspection;
- weather information for the period since the last inspection (or since commencement of construction activity if the first inspection) including a best estimate of the beginning of each storm event, duration of each storm event, approximate amount of rainfall for each storm event (in inches), and whether any discharges occurred;
- weather information and a description of any discharges occurring at the time of the inspection;
- locations of any best management practices that need to be maintained; and
- any corrective actions recommended.

For three years following the submittal of a notice of termination form, the Applicant will maintain a record summarizing the results of the SWP3 inspections described above, including the names(s) and qualifications of personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of the SWP3, and a signed certification as to whether the facility is in compliance with the SWP3.

(v) Measures to divert stormwater runoff

To avoid and minimize impacts to aquatic resources resulting from construction-related siltation and sedimentation, an approved SWP3 will be implemented. To protect surface waters, wetlands, groundwater, and storm water quality, erosion and sediment control measures will be installed and maintained throughout site development. Such measures could include silt fence, hay bales, and/or temporary siltation basins. The location of these features will be detailed on the construction drawings, approved by the Ohio EPA as part of the NPDES review, and reviewed by the contractor prior to construction. As described above, a duly qualified individual will also inspect these features throughout the period of construction to assure that they are functioning properly until completion of all restoration work (final grading and seeding).

(vi) Measures to protect vegetation

Mitigation measures to avoid or minimize impacts to vegetation will include identifying/delineating sensitive areas (such as wetlands) where no disturbance or vehicular activities will be allowed, limiting areas of disturbance to the smallest size practicable, siting Facility components in previously disturbed areas (e.g., existing farm lanes), educating the construction workforce on respecting and adhering to the physical boundaries of off-limit areas, employing best management practices during construction, and maintaining a clean work area within the designated construction sites. Following construction activities, temporarily disturbed areas will be seeded (and stabilized with mulch and/or straw if necessary) to reestablish vegetative cover in these areas. Native species will be allowed to re-vegetate these areas, except in active agricultural fields or to otherwise meet the desires of the landowner.

Specific mitigation measures for protecting wetlands and surface water resources will include designating no equipment access areas and restricted activity areas and employing low impact stream crossing techniques. Each of these mitigation measures is described below.

No Equipment Access Areas: Except where crossed by permitted access roads, wetlands and surface waters will be designated “No Equipment Access,” thus prohibiting the use of motorized equipment in these areas.

Restricted Activity Areas: A buffer zone of 50 feet, referred to as a “Restricted Activity Area”, will be established wherever Facility construction traverses, or comes in proximity to, wetlands and surface waters. The 50-foot buffer zones will be depicted on construction drawings. Construction vehicles

will be allowed in this zone, if necessary; however, in order to provide further protection to wetlands and surface waters, restricted activities within this buffer zone will include:

- No deposition of slash;
- No accumulation of construction debris;
- No application of herbicide;
- No degradation of stream banks;
- No equipment washing or refueling and;
- No storage of any petroleum or chemical material.

Low Impact Stream Crossing Techniques: Where crossings of surface waters are required, best management practices associated with applicable streamside activities will be implemented. The Applicant will adhere to any permit conditions pertaining to low impact stream crossing techniques, including seasonal restrictions and/or alternative stream crossing methods, such as temporary bridging and installation of crossings "in the dry." Open-bottomed or elliptical culverts may be utilized on certain streams to minimize loss of aquatic habitat and restriction of fish passage. Utilizing these techniques should avoid or minimize any adverse impacts on fish and other aquatic organisms.

(vii) Options for clearing methods and disposing of brush

Facility construction will require clearing or disturbance of approximately 1,474.0 acres of vegetation (see Table 08-9). Although the majority of this disturbance (more than 96%) will occur in agricultural lands, Facility construction will require the clearing of 26.5 acres of forestland. Trees cleared from the work area will be either left for the landowner or cut into logs and removed, while limbs and brush will be buried, chipped, or otherwise disposed of as directed by the landowner and as allowed under federal, state, and local regulations.

(viii) Avoidance measures for state or federally listed and protected species and their habitats

To minimize impacts to wildlife species and their habitats, Facility components have been sited away from sensitive habitats, such as forestland, streams and wetlands, to the extent practicable. As a result, construction-related impacts to wildlife are anticipated to be very limited. The following avoidance measures will further reduce construction impacts to major species and their habitats:

- To avoid impacts to roosting bats, any necessary tree clearing will be completed between November 1 and March 31 within 2.5 miles of the documented Indiana bat roost (or average roost as identified by USFWS where multiple roosts are involved).

- To prevent adverse effects to aquatic species and their habitats during construction, runoff will be managed under an NPDES construction storm water permit and the associated SWP3. An erosion and sediment control plan will be developed prior to construction that will use appropriate runoff diversion and collection devices.

The majority of state-listed plant species recorded in Seneca, Erie, and/or Huron Counties only occur in Erie County. Many of these species are restricted to dune and swale habitats in close proximity to Lake Erie; such habitat does not occur in the Project Area, which is located well inland. The remaining state-listed plants predominantly occur in wetland and prairie habitats, which are uncommon within the Project Area and have been avoided during Facility siting to the extent practicable. The Applicant has made a strenuous effort to avoid federally regulated surface water impacts from discharge of fill material via rerouting access roads, repositioning turbines, and other approaches, and is exploring methods for crossing streams during construction that do not involve any impacts to streams, including using large steel plates as temporary spans. These avoidance efforts notwithstanding, a limited amount of minor permanent and temporary surface water impact from discharge of fill material is unavoidable during construction of the Project.

(3) Operation Impacts

(a) *Estimation of Impact of Operation on Undeveloped Areas, Plants, and Animals*

Aside from minor disturbance associated with routine maintenance and occasional repair activities, no other disturbance to plants, vegetative communities, wetlands, or surface waters are anticipated as a result of Facility operation. As previously indicated, the Facility is located almost entirely on leased land. Therefore, the built Facility will not result in physical disturbance/impacts to wildlife areas, nature preserves, or other conservation areas. However, Facility visibility will extend beyond the boundaries of leased private land. Such impacts are discussed in detail below in Sections 4906-4-08(D)(3) and (4).

Operational impacts to wildlife are expected to be limited to possible displacement of wildlife due to the presence of the wind turbines, and some level of avian and bat mortality as a result of collisions with the wind turbines. Each of these potential impacts is described below.

<u>Displacement of Wildlife</u>

Habitat alteration and disturbance resulting from the operation of turbines and other wind farm infrastructure has the potential to make a site unsuitable or less suitable for some species of wildlife. As

mentioned above, the footprint of turbine pads, roads, and other Facility infrastructure represents a very small percentage of the site following construction. Therefore, overall land use is relatively unchanged by wind power development. However, due to the presence of tall structures and increased human activity, the amount of wildlife habitat indirectly affected by a wind power project can extend beyond the functional Facility footprint. Some wildlife may become habituated to the presence of wind turbines over time; however, the rate and degree of habituation is currently unknown because few studies have evaluated this effect.

Results from the Buffalo Ridge Wind Power Project in Minnesota (Leddy et al., 1999), the Stateline wind energy facility in Oregon and Washington (Erickson et al., 2004), the Combine Hills wind energy facility in Oregon (Young et al., 2006), the Noble Wethersfield Windpark in western New York (Kerlinger & Guarnaccia, 2010), and three wind energy facilities in North and South Dakota (Johnson & Shaffer, 2012; Shaffer & Buhl, 2016) suggest that impacts of wind-energy facilities on grassland nesting passerines vary somewhat between species and sites and are generally minor. For example:

- At the Buffalo Ridge facility, overall bird density was lower within 262 feet (80 meters) of wind turbines, but at distances of 590 feet (180 meters) from the turbines, bird density did not differ from grasslands with no turbines (Leddy et al., 1999).
- At the Stateline facility, horned lark and savannah sparrow showed increased usage post-construction, while grasshopper sparrow and western meadowlark (*Sturnella neglecta*) showed decreased use within 50 meters (164 feet) of turbine strings; areas further away from turbines did not exhibit reduced bird use (Erickson et al., 2004).
- At the facility in New York State, bobolink showed an effect of turbine displacement following construction, with significantly fewer bobolinks within 246 feet (75 meters) of turbines situated in hayfields, but savannah sparrows did not show a significant difference in abundance based on distance from turbines (Kerlinger & Guarnaccia, 2010).
- At the three facilities in the Dakotas, grasshopper sparrow showed displacement effects in the areas adjacent to turbines, but western meadowlarks did not (Johnson & Shaffer, 2012). Most of the nine grassland bird species studied showed some displacement at at least one of the three facilities, although vesper sparrow and killdeer did not (Shaffer & Buhl, 2016).

Leddy at al. (1999) specifically recommended that wind turbines be placed within cropland to reduce displacement impacts to grassland passerines. The Applicant has followed this recommendation, and all 87 of the turbine sites proposed for the Emerson Creek Wind Facility are located within cultivated

croplands as opposed to grasslands. Birds using these areas are generally common and accustomed to disturbance. Therefore, displacement effects to grassland birds are not expected.

The potential impacts of the Facility on waterfowl, including foraging Canada geese and snow geese, should not be significant, even though migrating waterfowl can be expected to forage in the farm fields in the vicinity of the Project Area. This conclusion is based on the results of a study conducted by the Iowa Cooperative Fish and Wildlife Research Unit at the Top of Iowa Wind Farm located in Worth County, Iowa. Due to its proximity to three state-owned Wildlife Management Areas, the Top of Iowa Wind Farm experiences very high use by waterfowl (over 1.5 million duck and goose use-days per year). Observations at that site revealed that the wind turbines did not affect the use of the fields by Canada geese or other species of waterfowl (Koford et al., 2005). At the Buffalo Ridge wind-energy facility in Minnesota, the abundance of several bird types, including shorebirds and waterfowl, were found to be significantly lower at survey plots with turbines than at reference plots without turbines. However, the report concluded that the area of reduced use was limited primarily to within 328 feet (100 meters) of the turbines (Johnson et al., 2000). Based on these study results, and observations at other wind power projects, the proposed Facility is not anticipated to have a significant, long-term displacement effect on resident or migrating waterfowl.

Forest and forest edge birds should not be significantly disturbed because there is so little of this habitat in the vicinity of the Project Area.

Landowners and recreational users are often concerned over the potential displacement effect of wind turbines on game species such as deer and wild turkey. While habituation may not be immediate, species such as deer and wild turkey generally adapt quickly to the presence of man-made features in their habitat, as evidenced by the abundance of these species in suburban settings. Specific to wind turbines, EDR personnel have observed deer and wild turkey foraging at the base of wind turbines that had just been erected a few months before at multiple wind energy facilities, including the Maple Ridge Wind Farm in Lewis County, New York; the Hardscrabble Wind Power Project in Herkimer County, New York; and the Hoosac Wind Power Project in Berkshire County, Massachusetts. Significant displacement of game species from a wind power project has not been reported.

Avian Collision Mortality

Collision with wind turbines is a documented source of avian fatality, with levels varying by bird species, season, and region. A 2013 review compiled data from 68 post-construction avian mortality studies at

modern wind energy facilities (i.e., those using monopole turbines like those proposed for the Facility) to derive an overall annual mortality estimate of 140,000 – 328,000 birds killed annually by wind turbines in the U.S. The study found that 46.4% of total mortality at monopole wind turbines occurs in California, 23.1% occurs in the Great Plains, 18.8% occurs in the East (the region that encompasses the Project Area), and 11.6% occurs in the West. On a per MW basis, California had a mean collision annual rate of 18.76 birds/MW, followed by the East (3.86 birds/MW), the West (2.83 birds/MW), and the Great Plains (1.81 birds/MW) (Loss et al., 2013a).

A similar 2014 study reviewed data from a total of 116 studies at 70 wind energy facilities across the U.S. and Canada, representing over 100,000 turbine searches demonstrated low levels of collision fatality at most projects. Small passerines (i.e., songbirds) were the most common among bird fatalities caused by collision with turbines at wind energy facilities, comprising an estimated 62.5% of all bird fatalities (Erickson et al., 2014). By region, the eastern and prairie avifaunal biomes, which encompass the Project Area, generally have higher fatality rates than northern forests and various western biomes. Erickson et al. (2014) concluded that fatalities from collisions with turbines are fewer than fatalities from other anthropogenic sources, including individual and cumulative effects to listed sensitive species of small passerines. This is substantiated by data from the USFWS (2018b) and other sources, which are summarized below in Table 08-12.

As indicated above, songbirds are most vulnerable to wind turbine mortality. Raptor mortality from collision with turbines has also been low at most operating wind power projects outside of California (Whitfield & Madders, 2006; Chamberlain et al., 2006; Kerns & Kerlinger, 2004; Gruver et al., 2009; Derby et al., 2007; Jain, 2005). As described in Section 4906-4-08(B)(1)(d) of this Application, raptor use of the Project Area was evaluated in a series of studies conducted on-site in 2010, 2011, 2012, 2013, 2014, 2016, 2017, and 2018, all of which illustrated relatively low use of the site by raptors. Even where concentrated hawk migration does occur around wind energy sites, evidence suggests that risk to migrating raptors is not great, and not likely to be biologically significant. Based on post-construction monitoring studies at other operating wind energy facilities, the raptor species most likely to be impacted are resident birds that forage in open country, such as red-tailed hawk and American kestrel, as opposed to migrating raptors that pass through the area. These species are common and widespread throughout their ranges; therefore, the low impacts expected by the Project are not likely to affect local or regional populations.

Similarly, collision risk to resident waterbirds (waterfowl, long-legged waders, shorebirds, rails, etc.) in the Project Area is likely to be minimal. There are a few small wetlands in the vicinity of the Project Area, so some waterbirds may be present; however, research has demonstrated that very few waterfowl, waterbirds, or shorebirds collide with wind turbines or other tall structures. Shorebirds are extremely rare on the lists of birds killed at wind power projects (Erickson et al., 2001). Risk of collision to waterfowl and other waterbirds during migration is also likely to be minimal, because these birds typically migrate at high altitudes, and because this group of birds has not demonstrated a propensity to collide with wind turbines or communication towers. The Canada geese and snow geese that forage on nearby agricultural fields may experience a slightly higher level of risk due to abundance; however, Canada geese do not demonstrate susceptibility to colliding with turbines. A study at the Top of Iowa Wind Power Project site revealed no fatalities to waterfowl despite documented use in proximity to turbines (Koford et al., 2005). Therefore, waterbirds are not likely to be at significant risk of colliding with Facility turbines.

Table 08-12 summarizes estimated annual avian mortality in the U.S. from anthropogenic causes, including wind turbines. The cumulative level of avian fatalities from wind turbines is quite minor when compared to other anthropogenic sources of mortality such as collision with buildings, collision with power lines, predation by domestic cats, collision with vehicles, use of agricultural pesticides, collision with communication towers, and poisoning in oil pits (Erickson et al., 2014; USFWS, 2018b).

Table 08-12. Estimated Annual Avian Mortality from Anthropogenic Causes

Mortality Source	Estimated Annual Mortality	Citation
Collisions with Buildings	365 – 988 million	Loss et al., 2014a
Collisions with Power Lines	8 – 57 million	Loss et al., 2014b
Electrocution from Power Lines	1 – 12 million	Loss et al., 2014b
Predation by Domestic Cats	1,400 – 3,700 million	Loss et al., 2013b
Automobiles	89 – 340 million	Loss et al., 2014c
Pesticides/Poisons	72 million	USFWS, 2018b
Communication Towers	6.6 million	Longcore et al., 2012
Oil Pits	0.5 – 1 million	USFWS, 2009
Land-based Wind Turbines	0.14 – 0.33 million	Loss et al, 2013a

In general, the documented level of avian fatalities from wind energy facilities has not been large in comparison with the source populations of these species and has been minor when compared to other potential sources of avian mortality (see Table 08-12). Avian risk assessments are based on preconstruction indices and indicators of risk (e.g., avian use surveys), along with empirical data from

operating facilities (e.g., mortality surveys). Because preconstruction surveys revealed no indicators of elevated risk (e.g., unusually high numbers of birds, habitat that would act as an ecological magnet, or abundance of rare species), collision risk to birds in the Project Area is likely to be in line with mortality rates at other wind sites in the Mid-Western U.S. When scavenging and observer efficiency are factored in, recent estimates of avian mortality rates in the Eastern region or biome (where the Facility is located) are very similar, with Loss et al. (2013a) reporting fatality rates of 3.86 birds/MW/year and Erickson et al. (2014) reporting fatality rates of 3.83 birds/MW/year; averaging these studies yield a predicted regional mortality rate of 3.845 birds/MW/year for the proposed Facility.

Using the average regional mortality rate of 3.845 birds killed per MW per year (Loss et al.; 2013a; Erickson et al., 2014), the 297.66 MW proposed for the Facility would result in a total of 1,145 bird deaths per year. Although this number may appear large, it is distributed across many species and the individuals affected represent a fraction of a percent of the populations that migrate through the area. Consequently, the avian mortality from the proposed Facility would not reasonably be considered a biologically significant impact. Furthermore, these impacts would be comparable to the impacts associated with previous OPSB-approved wind generating facilities.

Bat Collision Mortality

As with avian risk, bat risk assessments must be based on preconstruction indices and indicators of risk (e.g., acoustic surveys), along with empirical mortality data from operating facilities. Because the Project Area reveals no indicators of elevated risk (e.g., landscape position), collision risk to bats in the Project Area is likely to be consistent with other wind energy projects in agricultural landscapes in the mid-west. In an overview of post-construction mortality studies conducted in the U.S. and Canada from 2000 to 2011, Arnett and Baerwald (2013) found that annual bat fatality rates in the Midwestern deciduous forest-agricultural region, where the proposed Facility is located, ranged from 4.9 to 11.0 bats/MW, averaging 7.9 bats/MW and generally occurring in greater frequency during the fall migration period.

Using the range of 4.9 to 11.0 bat fatalities/MW, the 297.66 MW Facility is anticipated to result in a total of 1,459 to 3,275 bat deaths per year. Using the average of 7.9 bat fatalities/MW, the 297.66 MW Facility would result in a total of 2,352 bat deaths per year. However, many of the wind energy facilities at which the post-construction studies were conducted operate without any feathering or curtailment designed to minimize bat mortality. Most bat fatalities occur during relatively low-wind conditions during bat migration periods (Arnett et al., 2008). Studies have shown that altering blade angles to either stop or slow rotor movement in low wind speeds (i.e., feathering) below the manufacturer's cut-in speed ($\geq$3.5 m/s [7.8 mph)

is expected to reduce overall bat mortality by a minimum of 35 percent (Good et al., 2012; Young et al., 2011; Baerwald et al., 2009). Arnett et al. (2011) found that nightly reductions in bat fatality ranged from 44 to 93% when turbine cut-in speed was raised from 3.5 m/s to either 5.0 m/s (11.2 mph) or 6.5 m/s (14.5 mph). Similarly, Good et al. (2011) reported an approximate 50% reduction in overall bat fatalities when turbine cut-in speed was raised from 3.5 m/s to 5.0 m/s and approximately 78% fewer fatalities when cut-in speed was raised from 3.5 m/s to 6.5 m/s.

As summarized below in Section 4906-4-08(B)(3)(b), the proposed Facility will operate under a strict curtailment regime developed in consultation with the USFWS and ODNR that will significantly reduce bat fatalities. Consequently, actual mortality at the proposed Facility is expected to be much lower than the above predictions based on average mortality across the Midwestern deciduous forest-agricultural region.

(b) *Procedures to Avoid/Minimize/Mitigate Short-term and Long-term Operational Impacts*

Aside from minor disturbance associated with routine maintenance and occasional repair activities, no other disturbance to plants, vegetative communities, wetlands, or streams are anticipated as a result of Facility operation. Since no significant operational impacts to these resources are anticipated, no mitigation measures are proposed.

The anticipated short-term and long-term operational impacts of the Facility on wildlife are expected to be minor. The Facility has been designed to minimize bird and bat collision mortality. The following measures will avoid take of state and federally protected bats (as per recommendations of the USFWS; Exhibit K), and will minimize and/or mitigate operational impacts to other wildlife species:

- The turbines will be placed much further apart than in older wind farms where high rates of avian mortality have been documented, such as those in California.
- Turbines have been sited to avoid bald eagle nests and areas of concentrated eagle use.
- Towers will be tubular structures (rather than lattice), which prevent perching and nesting by birds.
- Lighting of turbines and other infrastructure will be minimized to the extent allowed by the FAA and will follow specific design guidelines to reduce collision risk (e.g., using flashing lights with the longest permissible off cycle).
- Turbines will be placed in agricultural fields to the extent practicable, avoiding wooded areas that provide habitat for bats.

- Turbines will be set back a minimum of 1,000 feet from suitable Indiana bat habitat within 2.5 miles of the documented Indiana bat roost (or average of the identified roosts).
- Unless otherwise authorized by ODNR or USFWS, turbine blades will be feathered below windspeeds of 6.9 m/s from 30 minutes before sunset to 30 minutes after sunrise during spring (March 15 to May 15) and fall (August 1 to October 31) migration throughout the Project Area.
- Unless otherwise authorized by ODNR or USFWS, the blades of turbines within 2.5 miles of a documented Indiana bat roost (or the average of the identified roosts) will be feathered below 6.9 m/s from 30 minutes before sunset to 30 minutes after sunrise during summer (May 16 to July 31).

(c) *Post-Construction Monitoring Plans*

A post-construction avian and bat fatality monitoring study plan will be developed and implemented in accordance with ODNR and USFWS recommendations. Results of these studies will be discussed with ODNR and USFWS to evaluate impacts and determine if additional monitoring or changes in operational protocols is appropriate to ensure regulatory compliance.

(C) LAND USE AND COMMUNITY DEVELOPMENT

(1) Land Use

(a) *Land Use Map*

Land uses within the one-mile study area of the Facility are shown on Figure 08-5. The land use mapping was developed land use data associated with parcel data. Among other information, Figure 08-5 shows the following features:

(i) The proposed Facility
(ii) Land use
(iii) Structures
(iv) Incorporated areas and population centers

(b) *Structures and Property Line Tables*

(i) Distance between structures/property lines and the nearest turbine

There are 39 structures within 1,500 feet of a proposed turbine site. For each of these structures, Table 08-13 presents the distance to the nearest turbine and the lease status of the underlying parcel (i.e., whether the structure is located on a participating or non-participating parcel).

Table 08-13. Structures Within 1,500 Feet of a Wind Turbine

Structure Type	Distance to Closest Wind Turbine	Closest Wind Turbine	Lease Status of Underlying Parcel
House	1245 feet	T63	Participating
House	1257 feet	T49	Participating
House	1258 feet	T49	Participating
House	1258 feet	T54	Participating
House	1270 feet	T87	Participating
House	1276 feet	T61	Participating
House	1279 feet	T69	Participating
House	1282 feet	T69	Participating
House	1293 feet	T49	Participating
House	1299 feet	T83	Participating
House	1302 feet	T12	Participating
House	1319 feet	T18	Participating
House	1321 feet	T26	Participating
House	1351 feet	T18	Participating
House	1361 feet	T23	Participating
House	1373 feet	T21	Participating
House	1380 feet	T20	Participating
House	1397 feet	T69	Participating
House	1403 feet	T3	Participating
House	1412 feet	T23	Participating
House	1415 feet	T79	Participating
House	1418 feet	T3	Participating
House	1420 feet	T3	Participating
House	1428 feet	T29	Participating
House	1429 feet	T86	Participating
House	1436 feet	T83	Participating
House	1447 feet	T84	Participating
House	1451 feet	T9	Participating
House	1458 feet	T43	Participating
House	1459 feet	T54	Participating
House	1462 feet	T56	Participating
House	1467 feet	T43	Participating

Structure Type	Distance to Closest Wind Turbine	Closest Wind Turbine	Lease Status of Underlying Parcel
House	1468 feet	T86	Non-Participating
House	1471 feet	T25	Participating
House	1478 feet	T4	Participating
House	1485 feet	T29	Non-Participating
House	1488 feet	T61	Participating
House	1490 feet	T43	Participating
House	1497 feet	T69	Non-Participating

There are 415 property lines within 1,500 feet of a proposed turbine site. For each of these properties, Table 08-14 presents the distance to the nearest turbine and the lease status of the parcel (i.e., whether the parcel is participating or non-participating).

Table 08-14. Parcels Within 1,500 Feet of a Wind Turbine

Parcel ID	Distance to Closest Wind Turbine	Closest Wind Turbine	Anticipated Lease Status
35-0030-02-021-0000	252 feet	T59	Participating
20-0040-01-039-0000	257 feet	T39	Participating
47-0040-01-052-0000	257 feet	T48	Participating
36-0040-01-032-0100	259 feet	T63	Participating
36-0020-02-027-0000	260 feet	T62	Participating
20-0010-02-047-0000	262 feet	T30	Participating
20-0020-01-025-0000	263 feet	T23	Participating
40-0030-03-027-0100	263 feet	T83	Participating
26-00113.000	264 feet	T13	Participating
25-00047.000	265 feet	T3	Participating
47-0040-01-030-0000	266 feet	T50	Participating
35-0020-01-006-0000	267 feet	T55	Participating
23-00045.000	267 feet	T16	Participating
36-0020-02-032-0000	267 feet	T62	Participating
36-0040-01-040-0000	268 feet	T69	Participating
20-0040-03-015-0000	270 feet	T34	Participating
36-0010-01-011-0000	270 feet	T71	Participating
45-0020-01-062-0000	274 feet	T42	Participating
24-00119.000	275 feet	T20	Participating
35-0040-01-006-0000	275 feet	T64	Participating
24-00218.000	275 feet	T19	Participating
20-0010-01-001-0000	276 feet	T28	Participating
36-0020-02-024-0000	276 feet	T60	Participating

Parcel ID	Distance to Closest Wind Turbine	Closest Wind Turbine	Anticipated Lease Status
36-0020-02-035-0000	276 feet	T60	Participating
20-0040-03-013-0000	276 feet	T37	Participating
36-0020-02-033-0000	276 feet	T79	Participating
40-0030-03-014-0000	281 feet	T80	Participating
01-0310-A1-012-0000	282 feet	T75	Participating
47-0040-01-050-0000	284 feet	T51	Participating
47-0020-01-064-0000	285 feet	T42	Participating
01-0310-01-016-0000	287 feet	T75	Participating
20-0010-01-027-0000	288 feet	T33	Participating
20-0030-01-017-0000	290 feet	T24	Participating
36-0010-01-008-0000	292 feet	T68	Participating
20-0040-01-030-0100	292 feet	T29	Participating
25-00146.000	294 feet	T84	Participating
35-0030-02-024-0000	298 feet	T78	Participating
26-00065.000	299 feet	T6	Participating
28-00001.000	301 feet	T17	Participating
40-0030-03-025-0000	309 feet	T81	Participating
35-0020-01-073-0000	313 feet	T54	Participating
47-0020-01-100-0000	315 feet	T42	Participating
20-0020-03-014-0000	317 feet	T21	Participating
20-0030-01-025-0000	319 feet	T25	Participating
26-00150.000	326 feet	T74	Participating
47-0010-01-053-0000	328 feet	T49	Participating
46-0020-01-058-0000	329 feet	T45	Participating
26-00122.000	331 feet	T7	Participating
40-0030-03-021-0000	331 feet	T80	Participating
35-0040-01-020-0000	335 feet	T65	Participating
26-00046.000	342 feet	T11	Participating
35-0030-02-025-0000	348 feet	T57	Participating
20-0020-03-004-0000	351 feet	T21	Participating
26-00208.000	357 feet	T6	Participating
36-0020-02-031-0000	363 feet	T62	Participating
20-0010-01-003-0000	363 feet	T28	Participating
36-0040-01-029-0000	365 feet	T65	Participating
20-0040-03-013-0100	366 feet	T38	Participating
47-0040-01-047-0000	379 feet	T50	Participating
36-0020-02-026-0000	380 feet	T60	Participating
20-0010-01-011-0100	385 feet	T36	Participating
36-0010-01-048-0000	385 feet	T66	Participating

Parcel ID	Distance to Closest Wind Turbine	Closest Wind Turbine	Anticipated Lease Status
25-00178.000	387 feet	T86	Participating
47-0020-01-106-0000	388 feet	T46	Participating
47-0020-01-097-0000	388 feet	T40	Participating
20-0040-01-041-0000	391 feet	T39	Participating
36-0010-A1-035-0000	398 feet	T71	Participating
20-0040-01-035-0200	405 feet	T39	Participating
47-0020-01-063-0000	406 feet	T42	Participating
23-00002.001	412 feet	T4	Participating
20-0010-02-053-0000	413 feet	T27	Participating
21-0010-01-022-0000	415 feet	T36	Participating
40-0030-03-026-0000	418 feet	T81	Participating
35-0030-02-027-0000	427 feet	T57	Participating
36-0010-01-046-0000	429 feet	T66	Participating
47-0040-01-002-0000	433 feet	T47	Participating
26-00223.000	436 feet	T74	Participating
35-0040-01-019-0200	447 feet	T63	Participating
36-0010-01-036-0100	450 feet	T68	Participating
24-00121.000	450 feet	T16	Participating
25-00076.000	454 feet	T3	Participating
35-0020-01-004-0000	456 feet	T54	Participating
24-00184.000	458 feet	T15	Participating
20-0040-01-036-0300	460 feet	T39	Participating
20-0010-01-007-0000	461 feet	T31	Participating
20-0040-03-021-0800	463 feet	T34	Participating
26-00057.000	465 feet	T7	Participating
46-0020-01-054-0000	472 feet	T45	Participating
20-0040-03-014-0400	474 feet	T34	Participating
01-0310-01-011-0000	482 feet	T75	Participating
35-0040-01-021-0000	485 feet	T65	Participating
46-0020-01-057-0000	489 feet	T45	Participating
47-0040-01-054-0000	501 feet	T48	Participating
26-00254.000	514 feet	T21	Participating
29-00089.000	517 feet	T84	Participating
35-0030-01-005-0000	520 feet	T56	Participating
23-00028.000	520 feet	T3	Participating
20-0040-01-031-0100	530 feet	T32	Participating
20-0030-01-020-0000	535 feet	T24	Participating
20-0010-02-057-0000	540 feet	T30	Participating
35-0040-01-005-0000	542 feet	T64	Participating

Parcel ID	Distance to Closest Wind Turbine	Closest Wind Turbine	Anticipated Lease Status
29-00183.000	544 feet	T2	Participating
20-0030-01-018-0000	551 feet	T24	Participating
47-0020-01-102-0400	562 feet	T77	Participating
47-0010-01-051-0000	563 feet	T49	Participating
29-00109.000	564 feet	T85	Participating
20-0030-01-014-0000	570 feet	T26	Participating
29-00214.002	571 feet	T85	Participating
36-0020-02-037-0000	572 feet	T60	Participating
35-0030-02-021-0200	573 feet	T59	Participating
46-0020-01-080-0000	579 feet	T76	Participating
20-0040-02-028-0000	590 feet	T37	Participating
35-0040-01-020-0400	594 feet	T65	Participating
24-00009.003	597 feet	T14	Participating
24-00035.000	598 feet	T14	Participating
26-00117.000	606 feet	T10	Participating
26-00176.000	607 feet	T72	Participating
29-00091.000	609 feet	T84	Participating
26-00221.000	609 feet	T8	Participating
35-0030-02-020-0000	630 feet	T59	Participating
20-0040-01-043-0000	637 feet	T39	Participating
24-00165.000	647 feet	T14	Participating
40-0030-03-015-0000	648 feet	T80	Participating
40-0030-03-017-0000	657 feet	T80	Participating
45-0020-01-077-0000	664 feet	T76	Participating
46-0020-01-025-0000	675 feet	T76	Participating
47-0040-01-091-0000	678 feet	T47	Participating
24-00165.000	679 feet	T14	Participating
26-00158.000	690 feet	T17	Participating
36-0010-01-005-0000	695 feet	T68	Participating
35-0030-01-006-0000	704 feet	T56	Participating
46-0020-01-025-0100	709 feet	T76	Participating
20-0040-03-014-0300	709 feet	T87	Participating
35-0040-01-022-0000	712 feet	T70	Participating
35-0030-01-056-0000	716 feet	T63	Participating
35-0040-01-013-0000	721 feet	T70	Participating
20-0010-01-008-0000	721 feet	T31	Participating
23-00045.001	724 feet	T16	Participating
26-00131.000	726 feet	T13	Participating
K40000624960000	737 feet	T53	Participating

Parcel ID	Distance to Closest Wind Turbine	Closest Wind Turbine	Anticipated Lease Status
K40000624640000	739 feet	T53	Participating
35-0030-02-034-0000	742 feet	T53	Participating
35-0040-01-003-0000	745 feet	T64	Participating
47-0020-01-096-0000	750 feet	T40	Participating
35-0030-01-057-0000	755 feet	T63	Participating
47-0040-01-032-0000	757 feet	T52	Participating
47-0020-01-104-0000	757 feet	T45	Participating
36-0040-01-038-0000	769 feet	T69	Participating
36-0010-01-009-0000	771 feet	T71	Participating
26-00220.000	772 feet	T10	Participating
20-0020-01-018-0500	772 feet	T23	Participating
25-00192.000	778 feet	T86	Participating
45-0020-01-095-0000	783 feet	T40	Participating
24-00121.001	801 feet	T16	Participating
36-0040-01-035-0000	802 feet	T69	Participating
27-00238.000	816 feet	T1	Participating
20-0040-03-011-0000	819 feet	T38	Participating
36-0010-02-005-0000	824 feet	T66	Participating
46-0020-01-056-0000	827 feet	T45	Participating
47-0040-01-051-0000	828 feet	T51	Participating
20-0020-03-013-0100	830 feet	T21	Participating
47-0020-01-099-0000	840 feet	T41	Participating
47-0020-01-098-0000	841 feet	T41	Participating
46-0020-01-055-0000	845 feet	T46	Participating
35-0030-01-046-0200	850 feet	T61	Participating
35-0030-01-046-0000	850 feet	T61	Participating
36-0010-01-033-0000	857 feet	T71	Participating
20-0040-01-015-0000	858 feet	T29	Participating
35-0040-01-007-0000	863 feet	T64	Participating
21-0010-01-025-0100	863 feet	T33	Participating
35-0040-01-020-0500	863 feet	T65	Participating
40-0030-03-023-0000	867 feet	T81	Participating
20-0040-01-032-0000	869 feet	T32	Participating
21-0010-01-023-0000	872 feet	T33	Participating
23-00042.000	875 feet	T16	Participating
20-0040-03-010-0100	881 feet	T38	Participating
46-0020-01-078-0000	883 feet	T76	Participating
25-00049.000	883 feet	T3	Participating
25-00032.000	895 feet	T86	Participating

Parcel ID	Distance to Closest Wind Turbine	Closest Wind Turbine	Anticipated Lease Status
20-0010-01-006-0000	901 feet	T28	Participating
47-0040-01-034-0000	914 feet	T52	Participating
45-0030-01-059-0000	915 feet	T43	Participating
45-0020-01-094-0000	918 feet	T40	Participating
20-0010-02-048-0100	919 feet	T30	Participating
24-00120.000	920 feet	T17	Participating
24-00034.000	922 feet	T14	Participating
20-0040-01-040-0000	929 feet	T39	Participating
25-00048.000	948 feet	T3	Participating
40-0030-02-018-0000	948 feet	T83	Participating
47-0010-01-082-0000	949 feet	T46	Participating
46-0020-01-075-0000	951 feet	T76	Participating
29-00119.000	956 feet	T84	Participating
40-0030-03-013-0000	965 feet	T80	Participating
20-0020-03-037-0000	968 feet	T23	Participating
36-0010-01-038-0000	975 feet	T67	Participating
47-0020-01-100-0200	977 feet	T41	Participating
20-0040-02-026-0200	981 feet	T87	Participating
20-0010-02-045-0100	984 feet	T35	Participating
20-0040-02-027-0000	994 feet	T37	Participating
26-00181.000	1001 feet	T21	Participating
20-0020-03-036-0000	1005 feet	T23	Participating
36-0010-01-049-0000	1006 feet	T67	Participating
35-0020-01-079-0000	1013 feet	T58	Participating
27-00150.000	1022 feet	T1	Participating
47-0020-01-103-0000	1025 feet	T44	Participating
20-0010-01-011-0000	1033 feet	T36	Participating
46-0020-01-076-0000	1034 feet	T76	Participating
20-0040-02-021-0100	1041 feet	T26	Participating
26-00182.000	1045 feet	T18	Participating
35-0020-01-080-0000	1049 feet	T58	Participating
20-0010-02-044-0100	1055 feet	T35	Participating
20-0020-01-024-0100	1074 feet	T23	Participating
36-0040-01-036-0000	1076 feet	T69	Participating
35-0040-01-014-0000	1088 feet	T64	Participating
47-0010-01-054-0000	1121 feet	T49	Participating
47-0030-01-057-0000	1123 feet	T43	Participating
36-0010-01-034-0000	1123 feet	T71	Participating
47-0040-01-035-0000	1130 feet	T50	Participating

Parcel ID	Distance to Closest Wind Turbine	Closest Wind Turbine	Anticipated Lease Status
20-0030-01-013-0100	1131 feet	T26	Participating
41-0040-05-004-0000	1138 feet	T33	Participating
35-0030-01-001-0000	1141 feet	T56	Participating
35-0030-01-003-0000	1144 feet	T56	Participating
39-0030-03-029-0000	1153 feet	T82	Participating
O49000804320100	1153 feet	T82	Participating
35-0030-02-029-0000	1153 feet	T57	Participating
27-00266.000	1165 feet	T1	Participating
K40000635760000	1184 feet	T52	Participating
20-0010-02-046-0000	1184 feet	T35	Participating
20-0040-02-022-0000	1195 feet	T26	Participating
20-0010-01-010-0000	1195 feet	T36	Participating
01-0310-01-010-0000	1210 feet	T75	Participating
36-0040-01-039-0100	1211 feet	T69	Participating
36-0040-01-030-0000	1212 feet	T65	Participating
40-0030-03-019-0000	1225 feet	T80	Participating
47-0040-01-010-0000	1226 feet	T48	Participating
25-00047.001	1230 feet	T3	Participating
20-0020-01-019-0000	1236 feet	T23	Participating
26-00134.004	1241 feet	T13	Participating
20-0010-01-002-0000	1245 feet	T28	Participating
26-00253.000	1249 feet	T18	Participating
25-00045.000	1256 feet	T4	Participating
20-0040-03-009-0100	1256 feet	T37	Participating
20-0010-01-012-0200	1257 feet	T36	Participating
25-00178.001	1257 feet	T86	Participating
47-0040-01-011-0000	1261 feet	T48	Participating
27-00061.000	1264 feet	T1	Participating
20-0020-01-017-0000	1268 feet	T23	Participating
46-0020-01-074-0200	1268 feet	T76	Participating
24-00077.000	1269 feet	T20	Participating
20-0010-01-018-0000	1275 feet	T36	Participating
35-0030-01-004-0000	1279 feet	T56	Participating
20-0020-03-040-0000	1284 feet	T23	Participating
36-0010-01-032-0000	1287 feet	T71	Participating
20-0040-02-026-0100	1297 feet	T87	Participating
20-0020-03-007-0000	1300 feet	T21	Participating
24-00204.000	1301 feet	T14	Participating
20-0040-03-025-0000	1305 feet	T87	Participating

Parcel ID	Distance to Closest Wind Turbine	Closest Wind Turbine	Anticipated Lease Status
41-0560-01-010-0000	1306 feet	T22	Participating
36-0040-01-041-0200	1307 feet	T69	Participating
36-0040-01-032-0000	1307 feet	T63	Participating
41-0560-01-020-0000	1310 feet	T22	Participating
35-0030-02-005-0101	1314 feet	T61	Participating
47-0040-01-003-0000	1319 feet	T47	Participating
35-0030-02-005-0100	1320 feet	T61	Participating
35-0030-02-007-0000	1322 feet	T61	Participating
23-00030.000	1328 feet	T3	Participating
20-0010-02-058-0000	1330 feet	T27	Participating
35-0020-A1-068-0000	1331 feet	T58	Participating
O49000804360000	1332 feet	T82	Participating
35-0030-01-054-0000	1336 feet	T61	Participating
26-00042.001	1340 feet	T72	Participating
47-0010-01-047-0000	1344 feet	T54	Participating
20-0040-01-030-0000	1355 feet	T29	Participating
20-0040-01-026-0000	1363 feet	T29	Participating
36-0010-01-031-0000	1364 feet	T71	Participating
20-0030-01-021-0000	1367 feet	T24	Participating
41-0040-05-006-0000	1371 feet	T33	Participating
27-00164.000	1372 feet	T1	Non-Participating
35-0030-02-019-0000	1372 feet	T57	Non-Participating
47-0040-01-092-0100	1373 feet	T47	Non-Participating
47-0030-01-001-0000	1376 feet	T47	Non-Participating
47-0040-01-029-0000	1377 feet	T48	Non-Participating
20-0040-03-010-0101	1379 feet	T38	Non-Participating
24-00220.000	1381 feet	T20	Participating
01-0310-01-004-0600	1381 feet	T75	Non-Participating
20-0020-03-016-0000	1382 feet	T21	Participating
20-0040-01-031-0000	1382 feet	T29	Non-Participating
47-0040-01-076-0000	1385 feet	T49	Non-Participating
35-0040-01-062-0000	1386 feet	T70	Participating
26-00044.000	1386 feet	T73	Non-Participating
26-00043.000	1386 feet	T73	Non-Participating
36-0010-01-039-0000	1386 feet	T67	Non-Participating
45-0020-01-090-0000	1387 feet	T40	Non-Participating
20-0020-03-006-0000	1387 feet	T21	Non-Participating
47-0010-01-048-0000	1387 feet	T54	Participating
45-0020-01-091-0000	1387 feet	T40	Non-Participating

Parcel ID	Distance to Closest Wind Turbine	Closest Wind Turbine	Anticipated Lease Status
20-0040-01-025-0000	1387 feet	T29	Non-Participating
36-0020-02-038-0000	1388 feet	T60	Non-Participating
47-0040-01-077-0000	1388 feet	T49	Participating
47-0010-01-063-0000	1389 feet	T49	Non-Participating
26-00134.000	1389 feet	T12	Non-Participating
27-90007.000	1389 feet	T1	Non-Participating
26-00187.000	1391 feet	T2	Participating
n/a[1]	1391 feet	T17	Non-Participating
36-0010-01-050-0000	1392 feet	T67	Participating
25-00379.002	1393 feet	T86	Non-Participating
01-0310-A1-012-0100	1394 feet	T75	Non-Participating
25-00379.003	1395 feet	T86	Non-Participating
25-00379.008	1395 feet	T86	Non-Participating
26-00049.000	1396 feet	T73	Non-Participating
20-0010-01-013-0600	1396 feet	T35	Participating
45-0030-01-095-0000	1397 feet	T43	Non-Participating
25-00379.004	1397 feet	T86	Non-Participating
24-00167.000	1398 feet	T14	Non-Participating
35-0020-01-009-0000	1400 feet	T55	Non-Participating
47-0040-01-034-0100	1400 feet	T50	Non-Participating
45-0030-01-097-0000	1401 feet	T43	Non-Participating
20-0040-03-019-0000	1401 feet	T34	Non-Participating
41-0030-03-019-0000	1402 feet	T22	Non-Participating
24-00151.000	1402 feet	T14	Non-Participating
20-0010-02-048-0000	1402 feet	T30	Non-Participating
26-00223.001	1403 feet	T74	Non-Participating
14-0030-01-002-0000	1404 feet	T79	Participating
40-0030-02-016-0000	1404 feet	T81	Participating
20-0040-02-029-0300	1404 feet	T37	Non-Participating
36-0040-01-028-0000	1404 feet	T65	Non-Participating
45-0020-01-093-0000	1404 feet	T40	Participating
35-0030-01-057-0100	1405 feet	T63	Participating
20-0020-03-018-0000	1405 feet	T22	Non-Participating
20-0020-03-018-0200	1405 feet	T22	Non-Participating
20-0040-01-012-0000	1406 feet	T32	Non-Participating
14-0030-01-002-0100	1407 feet	T79	Non-Participating
24-00024.000	1407 feet	T19	Non-Participating
47-0010-01-047-0100	1408 feet	T54	Non-Participating
20-0040-02-030-0000	1408 feet	T37	Non-Participating

Parcel ID	Distance to Closest Wind Turbine	Closest Wind Turbine	Anticipated Lease Status
20-0040-03-025-0100	1410 feet	T87	Non-Participating
35-0030-01-046-0100	1410 feet	T61	Non-Participating
25-00379.007	1411 feet	T86	Non-Participating
26-00121.001	1411 feet	T72	Participating
20-0040-03-024-0100	1412 feet	T87	Participating
46-0020-01-029-0000	1413 feet	T76	Non-Participating
47-0010-01-051-0100	1415 feet	T49	Non-Participating
n/a[1]	1415 feet	T18	Non-Participating
47-0040-01-049-0000	1416 feet	T51	Non-Participating
01-0310-01-004-0101	1416 feet	T75	Non-Participating
25-00379.006	1417 feet	T86	Non-Participating
36-0010-01-007-0100	1417 feet	T68	Non-Participating
36-0010-01-007-0000	1417 feet	T68	Participating
01-0310-01-004-0700	1418 feet	T75	Non-Participating
46-0020-01-074-0300	1419 feet	T76	Non-Participating
20-0020-01-024-0200	1419 feet	T23	Participating
35-0020-01-072-0200	1420 feet	T58	Non-Participating
35-0020-01-072-0101	1420 feet	T58	Non-Participating
29-00213.000	1421 feet	T85	Non-Participating
40-0030-03-034-0000	1422 feet	T81	Non-Participating
20-0040-01-011-0000	1422 feet	T32	Non-Participating
23-00126.000	1423 feet	T5	Non-Participating
20-0040-03-014-0200	1424 feet	T34	Non-Participating
35-0020-01-075-0100	1425 feet	T58	Non-Participating
20-0010-02-052-0000	1426 feet	T27	Non-Participating
35-0020-01-002-0000	1426 feet	T54	Non-Participating
20-0040-02-029-0200	1428 feet	T37	Non-Participating
36-0010-01-005-0200	1429 feet	T68	Non-Participating
n/a[1]	1430 feet	T17	Non-Participating
36-0020-02-023-0000	1431 feet	T60	Non-Participating
26-00010.000	1431 feet	T74	Participating
20-0020-03-027-0000	1433 feet	T23	Participating
23-00062.000	1438 feet	T16	Non-Participating
26-00161.000	1440 feet	T8	Non-Participating
36-0020-02-029-0100	1440 feet	T62	Participating
20-0040-03-014-0100	1441 feet	T87	Non-Participating
20-0040-01-024-0000	1442 feet	T29	Non-Participating
35-0040-01-062-0100	1442 feet	T70	Participating
40-0030-03-012-0000	1443 feet	T80	Participating

Parcel ID	Distance to Closest Wind Turbine	Closest Wind Turbine	Anticipated Lease Status
26-00162.000	1448 feet	T13	Non-Participating
14-0030-01-003-0000	1449 feet	T79	Non-Participating
36-0010-01-013-0300	1450 feet	T71	Non-Participating
26-00093.000	1451 feet	T73	Non-Participating
25-00379.005	1451 feet	T86	Non-Participating
25-00194.000	1452 feet	T86	Non-Participating
40-0030-02-017-0100	1454 feet	T83	Non-Participating
47-0040-01-052-0100	1454 feet	T48	Participating
26-00008.000	1455 feet	T74	Participating
24-00022.000	1457 feet	T20	Participating
47-0040-01-054-0100	1459 feet	T48	Non-Participating
40-0030-03-034-0100	1459 feet	T81	Non-Participating
39-0030-01-026-0000	1460 feet	T83	Participating
20-0040-01-038-0100	1461 feet	T39	Non-Participating
36-0010-01-008-0100	1462 feet	T69	Non-Participating
47-0030-01-058-0000	1465 feet	T43	Participating
35-0040-01-020-0300	1466 feet	T65	Non-Participating
23-00124.000	1469 feet	T5	Participating
36-0010-02-004-0000	1469 feet	T66	Participating
47-0040-01-075-0000	1471 feet	T49	Non-Participating
47-0040-01-078-0000	1472 feet	T49	Participating
46-0020-01-059-0200	1475 feet	T45	Non-Participating
40-0030-03-022-0000	1476 feet	T80	Participating
45-0030-01-046-0000	1476 feet	T43	Non-Participating
45-0030-01-094-0000	1477 feet	T43	Non-Participating
35-0030-02-031-0000	1479 feet	T57	Participating
01-0310-01-100-1902	1480 feet	T75	Non-Participating
20-0020-03-002-0000	1482 feet	T21	Participating
20-0030-01-003-0000	1485 feet	T26	Participating
35-0020-01-077-0000	1486 feet	T58	Non-Participating
26-00089.000	1486 feet	T74	Non-Participating
20-0040-01-023-0000	1492 feet	T29	Non-Participating
35-0040-01-012-0100	1492 feet	T70	Non-Participating
26-00209.003	1493 feet	T11	Non-Participating
26-00209.002	1493 feet	T11	Non-Participating
35-0020-01-007-0200	1493 feet	T55	Participating
N46000762760100	1495 feet	T38	Non-Participating
35-0040-01-021-0200	1495 feet	T70	Participating
K40000635760100	1497 feet	T52	Non-Participating

Parcel ID	Distance to Closest Wind Turbine	Closest Wind Turbine	Anticipated Lease Status
26-00065.000	1499 feet	T6	Non-Participating
20-0010-01-019-0000	1499 feet	T36	Participating

[1] The parcel shapefile obtained from Erie County lacks data for these parcels. All three are located in the Town of Groton, along the railroad tracks east of the Bellevue Rail Yard, immediately west of the Oxford town line. The Erie County Auditor's website lists "unavailable" for the Parcel ID, owner, address, etc.

(ii) Distance between structures/property lines and associated facility

There are 90 structures within 250 feet of an associated facility (i.e., a collection line, access road, or collection substation). Of these, two structures are within 250 feet of multiple associated facilities. For each of the 92 occurrences of an associated facility within 250 feet of a structure, Table 08-15 presents the structure type, the distance to the nearest component by type, and the lease status of the underlying parcel (i.e., whether the structure is located on a participating or non-participating parcel). There are no structures within 250 feet of a meteorological tower, laydown yard, or O&M facility.

Table 08-15. Structures Within 250 Feet of an Associated Facility

Structure Type	Distance to Closest Associated Facility	Associated Facility	Lease Status of Underlying Parcel
House	39 feet	Access Road	Participating
House	95 feet	Access Road	Non-Participating
House	96 feet	Collection Line	Non-Participating
House	97 feet	Access Road	Participating
House	109 feet	Collection Line	Participating
House	109 feet	Access Road	Non-Participating
House	109 feet	Collection Line	Non-Participating
House	109 feet	Collection Substation	Participating
House	118 feet	Collection Line	Participating
House	119 feet	Collection Line	Participating
House	122 feet	Access Road	Participating
House	123 feet	Collection Line	Participating
House	123 feet	Collection Line	Participating
House	123 feet	Collection Line	Participating
House	129 feet	Access Road	Non-Participating
House	132 feet	Access Road	Non-Participating
House	135 feet	Collection Line	Participating
House	136 feet	Collection Line	Non-Participating
House	137 feet	Access Road	Participating
House	137 feet	Collection Line	Non-Participating

Structure Type	Distance to Closest Associated Facility	Associated Facility	Lease Status of Underlying Parcel
House	137 feet	Access Road	Participating
House	138 feet	Collection Line	Participating
House	140 feet	Collection Line	Non-Participating
House	143 feet	Access Road	Participating
House	144 feet	Access Road	Participating
House	147 feet	Collection Line	Participating
House	147 feet	Collection Line	Non-Participating
House	149 feet	Collection Line	Non-Participating
House	150 feet	Access Road	Participating
House	153 feet	Access Road	Participating
House	154 feet	Access Road	Non-Participating
House	155 feet	Collection Line	Non-Participating
House	156 feet	Access Road	Non-Participating
House	156 feet	Access Road	Non-Participating
House	159 feet	Access Road	Non-Participating
House	159 feet	Collection Line	Participating
House	161 feet	Collection Line	Non-Participating
House	162 feet	Access Road	Participating
House	162 feet	Access Road	Participating
House	163 feet	Access Road	Non-Participating
House	169 feet	Collection Line	Non-Participating
House	172 feet	Collection Line	Participating
House	173 feet	Collection Line	Participating
House	174 feet	Collection Line	Non-Participating
House	174 feet	Collection Line	Participating
House	175 feet	Collection Line	Participating
House	178 feet	Access Road	Participating
House	182 feet	Collection Line	Participating
House	184 feet	Collection Line	Participating
House	189 feet	Access Road	Participating
House	190 feet	Collection Line	Participating
House	190 feet	Access Road	Participating
House	192 feet	Access Road	Non-Participating
House	192 feet	Access Road	Non-Participating
House	194 feet	Collection Line	Non-Participating
House	194 feet	Collection Line	Non-Participating
House	197 feet	Collection Line	Participating
House	198 feet	Access Road	Non-Participating
House	199 feet	Collection Line	Non-Participating
House	200 feet	Collection Line	Non-Participating

Structure Type	Distance to Closest Associated Facility	Associated Facility	Lease Status of Underlying Parcel
House	200 feet	Collection Line	Non-Participating
House	200 feet	Access Road	Non-Participating
House	208 feet	Collection Line	Non-Participating
House	208 feet	Collection Line	Non-Participating
House	213 feet	Collection Line	Non-Participating
House	213 feet	Collection Line	Non-Participating
House	215 feet	Access Road	Non-Participating
House	215 feet	Collection Line	Participating
House	218 feet	Access Road	Participating
House	219 feet	Access Road	Participating
House	220 feet	Collection Line	Participating
House	220 feet	Collection Line	Non-Participating
House	222 feet	Collection Line	Participating
House	226 feet	Access Road	Non-Participating
House	226 feet	Collection Line	Non-Participating
House	232 feet	Collection Line	Non-Participating
House	232 feet	Collection Line	Participating
House	233 feet	Access Road	Non-Participating
House	234 feet	Access Road	Participating
House	234 feet	Access Road	Non-Participating
House	235 feet	Access Road	Non-Participating
House	235 feet	Collection Line	Non-Participating
House	239 feet	Collection Line	Participating
House	242 feet	Access Road	Participating
House	242 feet	Collection Line	Non-Participating
House	244 feet	Collection Line	Participating
House	244 feet	Collection Line	Non-Participating
House	245 feet	Access Road	Participating
House	246 feet	Collection Line	Participating
House	249 feet	Collection Line	Non-Participating
House	249 feet	Access Road	Participating
House	249 feet	Collection Line	Non-Participating

There are 418 property lines within 250 feet of an associated facility (i.e., a collection line, access road, O&M facility, meteorological tower, laydown yard, or collection substation). This total includes 37 parcels that are within 250 feet of multiple associated facilities. For each occurrence of an associated facility within 250 feet of a property line, Table 08-16 presents the distance to the parcel boundary and the lease status of the parcel (i.e., whether the parcel is participating or non-participating).

Table 08-16. Parcels Within 250 Feet of an Associated Facility

Parcel ID	Distance	Associated Facility	Anticipated Lease Status
20-0010-02-056-0100	1 foot	Access Road	Non-Participating
26-00223.000	2 feet	Access Road	Participating
20-0040-01-038-0100	3 feet	Access Road	Non-Participating
K40000633600000	3 feet	Access Road	Non-Participating
20-0010-01-001-0000	3 feet	Access Road	Participating
K40000624960000	3 feet	Access Road	Participating
24-00121.000	4 feet	Access Road	Participating
36-0040-01-029-0000	7 feet	Access Road	Participating
23-00045.000	7 feet	Access Road	Participating
35-0030-02-005-0100	8 feet	Collection Line	Participating
35-0030-02-005-0101	8 feet	Collection Line	Participating
45-0020-01-060-0100	9 feet	Access Road	Participating
26-00253.000	10 feet	Access Road	Participating
26-00065.000	11 feet	Access Road	Participating
20-0020-03-041-0000	11 feet	Access Road	Participating
20-0010-01-003-0000	11 feet	Access Road	Participating
20-0020-03-014-0000	13 feet	Access Road	Participating
01-0310-A1-012-0100	13 feet	Access Road	Non-Participating
N46000762760100	13 feet	Access Road	Non-Participating
36-0010-01-009-0000	14 feet	Meteorological Tower	Participating
35-0030-02-007-0100	14 feet	Collection Line	Non-Participating
36-0040-01-034-0000	15 feet	Collection Line	Non-Participating
24-00077.000	16 feet	Access Road	Participating
20-0020-01-013-0100	17 feet	Collection Line	Non-Participating
36-0020-02-027-0100	17 feet	Collection Line	Participating
46-0020-01-085-0100	17 feet	Access Road	Non-Participating
23-00036.000	18 feet	Collection Line	Non-Participating
20-0010-01-027-0000	18 feet	Access Road	Participating
45-0030-01-072-0000	18 feet	Collection Line	Non-Participating
20-0020-01-014-0000	19 feet	Collection Line	Non-Participating
20-0040-01-001-0000	19 feet	Collection Line	Non-Participating
45-0030-01-080-0100	19 feet	Collection Line	Non-Participating
47-0020-01-097-0100	20 feet	Collection Line	Participating

Parcel ID	Distance	Associated Facility	Anticipated Lease Status
47-0020-01-097-0200	20 feet	Collection Line	Participating
35-0040-01-019-0400	21 feet	Collection Line	Non-Participating
46-0020-01-057-0100	21 feet	Access Road	Non-Participating
35-0040-01-019-0300	21 feet	Collection Line	Non-Participating
20-0040-01-005-0000	21 feet	Collection Line	Non-Participating
26-00223.001	21 feet	Access Road	Non-Participating
20-0040-01-028-0000	21 feet	Collection Line	Participating
40-0030-02-016-0000	22 feet	Access Road	Participating
47-0010-01-079-0100	22 feet	Collection Line	Non-Participating
36-0020-01-064-0000	22 feet	Access Road	Non-Participating
36-0040-01-065-0300	22 feet	Collection Line	Non-Participating
20-0040-01-003-0500	22 feet	Collection Line	Participating
47-0040-01-041-0000	22 feet	Access Road	Participating
20-0020-01-016-0000	22 feet	Collection Line	Participating
45-0030-01-061-0000	22 feet	Collection Line	Participating
20-0010-01-009-0000	23 feet	Collection Line	Participating
24-00184.001	24 feet	Collection Line	Non-Participating
20-0040-01-036-0000	24 feet	Collection Line	Non-Participating
20-0020-01-035-0000	24 feet	Collection Line	Non-Participating
47-0020-01-064-0000	25 feet	Collection Line	Participating
20-0010-02-035-0000	25 feet	Access Road	Participating
20-0010-02-035-0100	25 feet	Access Road	Participating
20-0040-02-016-0100	25 feet	Access Road	Non-Participating
36-0010-01-048-0000	25 feet	Access Road	Participating
25-00051.000	25 feet	Access Road	Participating
24-00077.000	25 feet	Collection Line	Participating
21-0010-01-023-0000	25 feet	Access Road	Participating
47-0020-01-001-0000	26 feet	Access Road	Non-Participating
25-00076.000	26 feet	Access Road	Participating
21-0010-01-025-0100	26 feet	Access Road	Participating
20-0040-02-015-0000	26 feet	Access Road	Non-Participating
47-0020-01-104-0000	26 feet	Collection Line	Participating
20-0040-02-016-0000	26 feet	Collection Line	Non-Participating
40-0030-03-034-0000	26 feet	Access Road	Non-Participating
20-0040-02-016-0000	27 feet	Access Road	Non-Participating

Parcel ID	Distance	Associated Facility	Anticipated Lease Status
20-0040-02-011-0000	27 feet	Collection Line	Participating
20-0020-01-016-0100	27 feet	Collection Line	Non-Participating
20-0020-03-026-0000	27 feet	Collection Line	Non-Participating
35-0040-01-019-0100	27 feet	Collection Line	Non-Participating
26-00212.000	27 feet	Access Road	Non-Participating
20-0010-01-005-0000	27 feet	Collection Line	Non-Participating
40-0030-02-013-0100	27 feet	Collection Line	Non-Participating
36-0010-02-036-0000	27 feet	Access Road	Non-Participating
20-0040-02-029-0400	28 feet	Collection Line	Non-Participating
35-0020-01-072-0101	28 feet	Access Road	Non-Participating
29-00215.000	28 feet	Access Road	Non-Participating
20-0020-03-013-0000	28 feet	Collection Line	Participating
20-0040-02-011-0000	28 feet	Access Road	Participating
40-0030-02-012-0100	28 feet	Collection Line	Non-Participating
36-0010-02-008-0101	28 feet	Collection Line	Non-Participating
36-0040-01-037-0000	29 feet	Access Road	Non-Participating
35-0030-02-021-0000	29 feet	Access Road	Participating
20-0010-01-006-0000	29 feet	Access Road	Participating
26-00161.000	29 feet	Collection Line	Non-Participating
46-0020-01-086-0000	29 feet	Access Road	Participating
47-0030-01-001-0000	29 feet	Access Road	Non-Participating
20-0010-02-057-0100	30 feet	Access Road	Participating
36-0040-01-040-0000	30 feet	Access Road	Participating
47-0030-01-022-0000	30 feet	Access Road	Non-Participating
35-0040-01-022-0000	30 feet	Access Road	Participating
26-00051.000	30 feet	Collection Line	Non-Participating
40-0030-03-012-0000	30 feet	Access Road	Participating
20-0020-02-024-0200	30 feet	Collection Substation	Participating
20-0020-03-027-0000	30 feet	Collection Line	Participating
20-0010-01-005-0000	30 feet	Access Road	Non-Participating
35-0030-01-012-0000	31 feet	Access Road	Participating
20-0040-01-013-0100	31 feet	Collection Line	Non-Participating
14-0030-01-001-0000	31 feet	Access Road	Participating
20-0040-03-025-0000	31 feet	Access Road	Participating
36-0020-02-026-0000	31 feet	Access Road	Participating

Parcel ID	Distance	Associated Facility	Anticipated Lease Status
23-00080.000	31 feet	Access Road	Non-Participating
36-0040-01-034-0000	32 feet	Access Road	Non-Participating
24-00009.003	32 feet	Collection Line	Participating
24-00165.000	32 feet	Collection Line	Participating
47-0040-01-034-0000	32 feet	Access Road	Participating
36-0020-02-025-0000	33 feet	Collection Line	Non-Participating
26-00161.000	33 feet	Access Road	Non-Participating
47-0040-01-075-0000	33 feet	Access Road	Non-Participating
47-0040-01-049-0000	33 feet	Collection Line	Non-Participating
29-00214.000	33 feet	Access Road	Participating
47-0010-01-047-0000	33 feet	Access Road	Participating
14-0030-01-002-0100	33 feet	Access Road	Non-Participating
47-0040-01-001-0200	33 feet	Access Road	Non-Participating
35-0030-02-005-0100	34 feet	Access Road	Participating
36-0010-02-034-0000	34 feet	Access Road	Non-Participating
25-00379.002	34 feet	Access Road	Non-Participating
20-0030-01-018-0000	34 feet	Access Road	Participating
20-0020-01-026-0000	34 feet	Access Road	Participating
36-0020-01-050-0000	34 feet	Access Road	Participating
24-00034.000	34 feet	Access Road	Participating
35-0030-01-056-0000	34 feet	Access Road	Participating
46-0020-01-087-0000	34 feet	Access Road	Participating
35-0020-01-008-0000	35 feet	Access Road	Non-Participating
20-0010-02-042-0000	35 feet	Collection Line	Participating
36-0020-01-063-0000	35 feet	Collection Line	Non-Participating
35-0030-01-046-0200	35 feet	Access Road	Participating
35-0030-01-046-0000	35 feet	Access Road	Participating
26-00211.000	35 feet	Access Road	Non-Participating
25-00379.008	35 feet	Access Road	Non-Participating
45-0030-01-046-0000	36 feet	Access Road	Non-Participating
29-00166.000	36 feet	Collection Line	Participating
26-00176.000	36 feet	Access Road	Participating
47-0040-01-034-0100	37 feet	Collection Line	Non-Participating
20-0030-01-003-0000	37 feet	Access Road	Participating
27-00150.000	37 feet	Access Road	Participating

Parcel ID	Distance	Associated Facility	Anticipated Lease Status
39-0030-01-025-0000	37 feet	Access Road	Non-Participating
20-0040-02-021-0000	37 feet	Access Road	Participating
47-0010-01-049-0000	37 feet	Access Road	Participating
20-0010-02-027-0100	38 feet	Collection Line	Non-Participating
36-0040-01-041-0200	38 feet	Collection Line	Participating
47-0040-01-009-0200	38 feet	Collection Line	Non-Participating
35-0040-01-020-0300	38 feet	Collection Line	Non-Participating
24-00218.000	38 feet	Collection Line	Participating
47-0030-01-016-0000	38 feet	Access Road	Participating
20-0040-03-024-0000	39 feet	Access Road	Participating
36-0040-01-039-0100	39 feet	Collection Line	Participating
36-0020-02-025-0000	39 feet	Access Road	Non-Participating
46-0020-01-054-0000	39 feet	Access Road	Participating
26-00208.001	40 feet	Collection Line	Non-Participating
35-0030-02-005-0101	40 feet	Access Road	Participating
14-0030-01-002-0000	40 feet	Access Road	Participating
20-0010-01-001-0100	40 feet	Access Road	Participating
36-0020-02-025-0100	41 feet	Access Road	Non-Participating
47-0040-01-076-0000	41 feet	Access Road	Non-Participating
35-0040-01-018-0000	42 feet	Collection Line	Non-Participating
29-00214.001	42 feet	Access Road	Participating
36-0020-01-048-0100	43 feet	Collection Line	Participating
35-0030-02-017-0000	43 feet	Access Road	Participating
47-0020-01-102-0400	43 feet	Collection Line	Participating
35-0030-01-012-0000	43 feet	Collection Line	Participating
36-0020-01-056-0000	43 feet	Collection Line	Participating
29-00213.000	43 feet	Collection Line	Non-Participating
35-0030-02-016-0000	43 feet	Collection Line	Non-Participating
47-0040-01-032-0000	44 feet	Access Road	Participating
23-00098.001	45 feet	Access Road	Participating
36-0020-02-032-0100	45 feet	Access Road	Non-Participating
29-00214.000	45 feet	Collection Line	Participating
36-0020-01-062-0000	45 feet	Collection Line	Non-Participating
24-00197.000	45 feet	Collection Line	Non-Participating
26-00042.001	46 feet	Access Road	Participating

Parcel ID	Distance	Associated Facility	Anticipated Lease Status
45-0570-02-012-0000	46 feet	Collection Line	Participating
45-0030-01-085-0000	47 feet	Collection Line	Non-Participating
20-0030-01-002-0000	47 feet	Collection Line	Non-Participating
40-0030-02-009-0000	48 feet	Collection Line	Non-Participating
24-00022.000	48 feet	Access Road	Participating
25-00080.000	48 feet	Collection Line	Non-Participating
35-0040-01-018-0100	49 feet	Collection Line	Participating
35-0030-02-007-0000	49 feet	Access Road	Participating
35-0030-01-008-0000	49 feet	Collection Line	Non-Participating
24-00151.000	50 feet	Collection Line	Non-Participating
36-0020-02-024-0100	50 feet	Collection Line	Participating
20-0020-03-016-0100	52 feet	Collection Line	Participating
35-0030-02-030-0200	52 feet	Collection Line	Participating
20-0040-01-052-0100	52 feet	Collection Line	Non-Participating
20-0040-02-024-0000	52 feet	Collection Line	Participating
29-00204.000	53 feet	Access Road	Non-Participating
36-0010-01-005-0200	53 feet	Collection Line	Non-Participating
25-00379.004	53 feet	Access Road	Non-Participating
20-0040-03-014-0200	54 feet	Access Road	Non-Participating
24-00218.000	55 feet	Access Road	Participating
35-0030-01-010-0100	55 feet	Collection Line	Non-Participating
47-0020-01-103-0000	55 feet	Collection Line	Participating
47-0010-01-048-0100	57 feet	Access Road	Participating
20-0040-01-011-0000	57 feet	Collection Line	Non-Participating
20-0040-01-029-0000	57 feet	Laydown Yard	Participating
24-00022.001	58 feet	Access Road	Non-Participating
47-0010-01-080-0200	59 feet	Collection Line	Non-Participating
26-00086.001	59 feet	Access Road	Participating
20-0010-02-028-0100	59 feet	Collection Line	Non-Participating
35-0030-02-016-0000	59 feet	Access Road	Non-Participating
35-0030-01-003-0000	59 feet	Collection Line	Participating
35-0020-01-004-0000	59 feet	Access Road	Participating
36-0020-02-035-0000	59 feet	Access Road	Participating
20-0040-01-029-0000	59 feet	O&M Facility	Participating
36-0040-01-038-0100	59 feet	Access Road	Non-Participating

Parcel ID	Distance	Associated Facility	Anticipated Lease Status
36-0020-01-046-0000	59 feet	Collection Line	Non-Participating
47-0040-01-054-0100	60 feet	Collection Line	Non-Participating
23-00035.000	61 feet	Collection Line	Non-Participating
20-0020-02-024-0000	61 feet	Collection Substation	Participating
36-0040-A1-066-0000	62 feet	Collection Line	Non-Participating
20-0020-01-034-0000	63 feet	Collection Line	Non-Participating
20-0020-03-011-0000	64 feet	Collection Line	Participating
35-0030-02-025-0000	64 feet	Access Road	Participating
47-0010-01-054-0000	64 feet	Collection Line	Participating
45-0570-02-011-0000	65 feet	Collection Line	Participating
20-0010-02-056-0100	65 feet	Collection Line	Non-Participating
24-00202.004	65 feet	Collection Line	Non-Participating
29-00165.000	66 feet	Collection Line	Non-Participating
20-0020-01-011-0000	66 feet	Collection Line	Participating
35-0020-01-072-0200	67 feet	Access Road	Non-Participating
35-0020-01-073-0000	67 feet	Access Road	Participating
45-0030-01-093-0000	69 feet	Collection Line	Non-Participating
35-0020-01-007-0100	69 feet	Collection Line	Participating
20-0040-01-049-0100	70 feet	Collection Line	Participating
n/a[1]	71 feet	Collection Line	Non-Participating
35-0030-01-052-0000	71 feet	Collection Line	Participating
36-0040-01-038-0000	73 feet	Collection Line	Participating
36-0020-01-049-0000	73 feet	Access Road	Participating
36-0010-02-031-0000	75 feet	Access Road	Non-Participating
20-0030-02-016-0000	77 feet	Access Road	Participating
47-0010-01-048-0100	77 feet	Collection Line	Participating
47-0020-01-099-0100	77 feet	Access Road	Participating
24-00086.000	79 feet	Collection Line	Non-Participating
24-00091.000	79 feet	Collection Line	Non-Participating
20-0030-01-001-0000	80 feet	Collection Line	Non-Participating
24-00050.000	80 feet	Collection Line	Non-Participating
24-00086.002	81 feet	Collection Line	Non-Participating
47-0040-01-038-0000	81 feet	Collection Line	Participating
20-0040-01-033-0000	83 feet	Access Road	Non-Participating
45-0570-02-010-0000	83 feet	Collection Line	Participating

Parcel ID	Distance	Associated Facility	Anticipated Lease Status
35-0020-01-008-0200	85 feet	Collection Line	Participating
39-0030-01-026-0000	86 feet	Access Road	Participating
46-0020-01-059-0100	86 feet	Access Road	Non-Participating
27-00150.000	87 feet	Collection Line	Participating
45-0030-01-073-0000	87 feet	Collection Line	Non-Participating
35-0030-01-046-0100	87 feet	Collection Line	Non-Participating
35-0030-01-057-0000	88 feet	Collection Line	Participating
20-0010-01-011-0100	90 feet	Access Road	Participating
29-00185.001	90 feet	Collection Line	Non-Participating
29-00185.000	91 feet	Collection Line	Participating
29-00185.002	91 feet	Collection Line	Non-Participating
20-0010-02-057-0300	93 feet	Access Road	Participating
29-00117.000	93 feet	Collection Line	Participating
35-0030-01-057-0100	93 feet	Collection Line	Participating
47-0040-01-001-0000	94 feet	Access Road	Non-Participating
40-0030-02-015-0200	96 feet	Collection Line	Non-Participating
29-00121.000	98 feet	Collection Line	Non-Participating
N46000762960000	98 feet	Access Road	Non-Participating
35-0030-02-030-0100	99 feet	Collection Line	Participating
45-0030-01-021-0000	99 feet	Collection Line	Non-Participating
36-0020-01-050-0000	100 feet	Collection Line	Participating
20-0040-02-012-0000	100 feet	Access Road	Non-Participating
45-0570-02-009-0000	102 feet	Collection Line	Participating
35-0030-01-006-0000	102 feet	Collection Line	Participating
45-0030-01-020-0300	105 feet	Collection Line	Non-Participating
20-0040-02-009-0000	106 feet	Access Road	Non-Participating
20-0030-01-003-0000	108 feet	O&M Facility	Participating
47-0040-01-002-0000	108 feet	Collection Line	Participating
35-0030-01-058-0000	109 feet	Collection Line	Participating
36-0010-01-048-0000	111 feet	Collection Line	Participating
24-00220.000	112 feet	Collection Line	Participating
24-00057.000	112 feet	Collection Line	Non-Participating
20-0030-01-021-0000	112 feet	Access Road	Participating
20-0040-01-028-0000	112 feet	O&M Facility	Participating
20-0040-02-012-0000	113 feet	Collection Line	Non-Participating

Parcel ID	Distance	Associated Facility	Anticipated Lease Status
01-0310-01-016-0000	114 feet	Collection Line	Participating
27-90007.000	115 feet	Collection Line	Non-Participating
24-00211.000	115 feet	Collection Line	Participating
20-0010-02-058-0000	116 feet	Access Road	Participating
21-0010-01-023-0000	117 feet	Collection Line	Participating
45-0030-01-020-0200	117 feet	Collection Line	Non-Participating
47-0040-01-077-0100	119 feet	Collection Line	Participating
20-0020-03-040-0000	119 feet	Collection Line	Participating
45-0570-02-008-0000	120 feet	Collection Line	Participating
20-0020-01-018-0400	120 feet	Collection Line	Participating
40-0030-03-040-0000	122 feet	Collection Line	Participating
20-0020-01-009-0000	122 feet	Collection Line	Participating
47-0010-01-081-0000	123 feet	Collection Line	Participating
25-00047.001	123 feet	Access Road	Participating
35-0020-01-008-0200	125 feet	Access Road	Participating
20-0010-02-057-0000	130 feet	Collection Line	Participating
40-0030-02-015-0100	130 feet	Collection Line	Non-Participating
40-0030-03-034-0000	131 feet	Collection Line	Non-Participating
20-0040-01-012-0000	133 feet	Collection Line	Non-Participating
20-0020-02-024-0200	134 feet	Collection Line	Participating
20-0020-03-041-0000	134 feet	Collection Line	Participating
24-00018.000	135 feet	Collection Line	Non-Participating
45-0030-01-077-0000	137 feet	Collection Line	Participating
45-0030-01-076-0000	137 feet	Collection Line	Participating
47-0010-01-048-0000	137 feet	Access Road	Participating
39-0030-01-024-0100	137 feet	Access Road	Non-Participating
35-0020-01-007-0200	138 feet	Collection Line	Participating
20-0040-01-039-0000	138 feet	Collection Line	Participating
20-0040-03-015-0000	138 feet	Collection Line	Participating
45-0570-02-007-0000	139 feet	Collection Line	Participating
29-00206.000	140 feet	Collection Line	Non-Participating
45-0030-01-020-0100	142 feet	Collection Line	Non-Participating
35-0030-01-059-0500	143 feet	Collection Line	Participating
25-00379.003	143 feet	Access Road	Non-Participating
47-0040-01-032-0000	144 feet	Collection Line	Participating

Parcel ID	Distance	Associated Facility	Anticipated Lease Status
45-0030-01-076-0100	145 feet	Collection Line	Participating
45-0570-02-002-0000	147 feet	Collection Line	Non-Participating
47-0040-01-025-0000	148 feet	Collection Line	Non-Participating
47-0040-01-001-0400	149 feet	Access Road	Non-Participating
20-0020-03-018-0000	149 feet	Collection Line	Non-Participating
35-0020-01-008-0000	150 feet	Collection Line	Non-Participating
46-0020-01-078-0200	151 feet	Access Road	Participating
26-00263.000	151 feet	Collection Line	Non-Participating
35-0040-01-015-0000	152 feet	Collection Line	Non-Participating
40-0030-03-019-0000	152 feet	Access Road	Participating
35-0030-02-015-0000	153 feet	Collection Line	Participating
24-00049.000	153 feet	Collection Line	Non-Participating
20-0040-01-036-0200	154 feet	Collection Line	Non-Participating
46-0020-01-088-0000	155 feet	Access Road	Non-Participating
35-0030-02-002-0000	156 feet	Collection Line	Participating
20-0010-02-058-0000	156 feet	Collection Line	Participating
26-00176.000	157 feet	Collection Line	Participating
24-00024.000	157 feet	Access Road	Non-Participating
20-0010-02-052-0000	157 feet	Collection Line	Non-Participating
20-0040-02-008-0000	158 feet	Access Road	Non-Participating
26-00042.001	158 feet	Collection Line	Participating
35-0030-01-046-0000	159 feet	Collection Line	Participating
20-0020-01-012-0100	164 feet	Collection Line	Non-Participating
14-0030-01-003-0000	165 feet	Access Road	Non-Participating
46-0020-01-086-0100	165 feet	Access Road	Participating
24-00202.005	165 feet	Collection Line	Non-Participating
47-0040-01-090-0000	165 feet	Collection Line	Non-Participating
20-0040-01-001-0100	166 feet	Collection Line	Non-Participating
40-0030-02-007-0000	172 feet	Collection Line	Participating
20-0040-01-015-0200	172 feet	Collection Line	Non-Participating
20-0040-01-004-0000	172 feet	Collection Line	Non-Participating
20-0010-02-058-0100	172 feet	Collection Line	Participating
47-0040-01-089-0000	172 feet	Collection Line	Non-Participating
20-0010-01-003-0000	173 feet	Collection Line	Participating
20-0010-02-051-0000	174 feet	Collection Line	Non-Participating

Parcel ID	Distance	Associated Facility	Anticipated Lease Status
47-0040-01-064-0000	174 feet	Collection Line	Non-Participating
36-0040-01-054-0000	175 feet	Collection Line	Participating
24-00040.000	176 feet	Collection Line	Non-Participating
45-0020-01-090-0000	177 feet	Collection Line	Non-Participating
24-00202.003	179 feet	Collection Line	Non-Participating
23-00059.000	180 feet	Access Road	Non-Participating
35-0030-01-059-0100	180 feet	Collection Line	Non-Participating
35-0030-01-062-0000	181 feet	Collection Line	Non-Participating
45-0570-02-006-0000	181 feet	Collection Line	Non-Participating
N46000762760000	182 feet	Access Road	Non-Participating
20-0020-01-027-0000	182 feet	Collection Line	Participating
20-0020-02-003-0000	182 feet	Collection Line	Participating
35-0040-01-020-0200	182 feet	Collection Line	Participating
45-0020-01-077-0100	183 feet	Collection Line	Non-Participating
35-0030-01-061-0000	187 feet	Collection Line	Non-Participating
24-00053.000	188 feet	Collection Line	Non-Participating
36-0040-01-039-0100	190 feet	Access Road	Participating
36-0020-02-031-0000	192 feet	Access Road	Participating
45-0570-02-005-0000	192 feet	Collection Line	Participating
25-00379.006	194 feet	Access Road	Non-Participating
35-0030-02-028-0000	194 feet	Collection Line	Non-Participating
36-0040-01-035-0000	195 feet	Access Road	Participating
20-0040-02-021-0200	196 feet	Access Road	Non-Participating
36-0010-01-007-0100	196 feet	Collection Line	Non-Participating
45-0020-01-077-0100	197 feet	Access Road	Non-Participating
35-0030-02-021-0200	200 feet	Collection Line	Participating
40-0030-03-006-0000	202 feet	Collection Line	Non-Participating
47-0010-01-049-0100	202 feet	Collection Line	Non-Participating
20-0010-02-057-0200	205 feet	Access Road	Non-Participating
36-0020-01-037-0000	210 feet	Collection Line	Participating
36-0010-01-036-0100	210 feet	Collection Line	Participating
36-0010-01-007-0000	210 feet	Collection Line	Participating
45-0030-01-020-0400	213 feet	Collection Line	Participating
24-00042.000	213 feet	Collection Line	Non-Participating
20-0040-01-030-0000	215 feet	Collection Line	Participating

Parcel ID	Distance	Associated Facility	Anticipated Lease Status
46-0020-01-078-0000	218 feet	Access Road	Participating
35-0040-01-021-0200	219 feet	Collection Line	Participating
26-00043.000	219 feet	Collection Line	Non-Participating
23-00098.000	219 feet	Access Road	Non-Participating
25-00137.000	223 feet	Collection Line	Non-Participating
36-0040-01-065-0500	223 feet	Collection Line	Non-Participating
36-0040-01-064-0000	225 feet	Collection Line	Non-Participating
24-00184.000	225 feet	Access Road	Participating
47-0040-01-011-0100	226 feet	Collection Line	Non-Participating
24-00019.000	226 feet	Collection Line	Non-Participating
20-0040-01-010-0000	226 feet	Collection Line	Participating
35-0040-01-020-0100	226 feet	Collection Line	Participating
20-0020-02-025-0000	227 feet	Collection Substation	Non-Participating
24-00220.000	229 feet	Access Road	Participating
35-0040-01-063-0100	229 feet	Collection Line	Non-Participating
35-0040-01-021-0100	231 feet	Collection Line	Participating
29-00214.002	231 feet	Access Road	Participating
45-0570-02-013-0000	231 feet	Collection Line	Non-Participating
47-0040-01-065-0000	235 feet	Collection Line	Non-Participating
24-00202.002	236 feet	Collection Line	Non-Participating
35-0020-01-075-0100	237 feet	Collection Line	Non-Participating
35-0020-01-077-0000	237 feet	Collection Line	Non-Participating
47-0010-01-080-0100	238 feet	Collection Line	Non-Participating
47-0040-01-052-0000	238 feet	Access Road	Participating
36-0010-01-043-0100	240 feet	Collection Line	Non-Participating
45-0570-02-004-0000	241 feet	Collection Line	Participating
23-00028.000	242 feet	Collection Line	Participating
35-0030-01-059-0400	242 feet	Collection Line	Non-Participating
35-0030-02-007-0200	242 feet	Collection Line	Non-Participating
20-0020-01-018-0200	244 feet	Collection Line	Participating
20-0040-01-009-0000	245 feet	Collection Line	Non-Participating
20-0040-01-026-0000	246 feet	Collection Line	Participating
40-0030-03-022-0000	248 feet	Access Road	Participating
20-0040-03-014-0300	249 feet	Access Road	Participating
45-0570-02-003-0000	249 feet	Collection Line	Participating

[1] The parcel shapefile obtained from Erie County lacks data for this parcel. It is located in the Town of Groton, along the railroad tracks east of the Bellevue Rail Yard, immediately west of the Oxford town line. The Erie County Auditor's website lists "unavailable" for the Parcel ID, owner, address, etc.

(iii) Land/lease status of the property for each structure

The lease status for each structure and parcel within 1,500 feet of a turbine and each structure and parcel within 250 feet of an associated facility is presented above in Table 08-15 and Table 08-16, respectively.

(c) *Land Use Impacts*

Table 08-17 presents the total, temporary, and permanent land use impacts on the land uses illustrated in Figure 08-5, in total for each land use type, and by project component. Facility-related impacts to land use were calculated based on the impact assumptions provided in Table 03-1 of this Application and the land use codes for each parcel, found in parcel shapefiles for Seneca, Huron, and Erie Counties. In ArcGIS, Facility components were intersected with the parcel shapefiles, resulting in shapefiles of impacts to each land use associated with the respective Facility component, and then the impact areas or lengths for all Facility components were entered into a spreadsheet. For example, wind turbines were buffered by 300 feet (to generate a shapefile representing the area of total disturbance) and the parcel shapefiles were clipped to the buffer, resulting in the total land use that will be impacted by wind turbines. To determine the temporary impacts to each land use associated with wind turbines, 0.03 acres per turbine (area of the 20-foot radius permanent impacts) were subtracted from the total land use impacts associated with wind turbines that were calculated in ArcGIS. For linear components (access roads and collection lines), the appropriate impact widths were multiplied by the lengths to create an area of impact. Finally, using the spreadsheet, the separate areas of impact for each Facility component were added together, resulting in the temporary, permanent, and total areas of impact associated with each component and for each land use type.

Table 08-17. Land Use Impacts

Land Use[1]	Total Disturbance (acres)	Temporary Disturbance (acres)	Permanent Loss (acres)
Agricultural (100)	1,439.5[2]	1,357.0	82.5
Wind Turbines and Workspaces	*551.1*	*548.6*	*2.6*
Access Roads	*154.6*	*85.9*	*68.6*
Buried Electrical Collection Cable	*706.9*	*706.9*	*0.0*
O&M Buildings	*5.0*	*0.0*	*5.0*
Laydown Yards	*12.7*	*12.7*	*0.0*

Land Use[1]	Total Disturbance (acres)	Temporary Disturbance (acres)	Permanent Loss (acres)
Substation	*6.1*	*0.0*	*6.1*
Meteorological Towers	*3.0*	*2.8*	*0.2*
Commercial (400)	0.1[2]	0.1	0.0
Wind Turbines and Workspaces	*0.0*	*0.0*	*0.0*
Access Roads	*0.0*	*0.0*	*0.0*
Buried Electrical Collection Cable	*0.1*	*0.1*	*0.0*
O&M Buildings	*0.0*	*0.0*	*0.0*
Laydown Yards	*0.0*	*0.0*	*0.0*
Substation	*0.0*	*0.0*	*0.0*
Meteorological Towers	*0.0*	*0.0*	*0.0*
Residential (500)	1.5[2]	1.5	0.0
Wind Turbines and Workspaces	*0.0*	*0.0*	*0.0*
Access Roads	*0.0*	*0.0*	*0.0*
Buried Electrical Collection Cable	*1.5*	*1.5*	*0.0*
O&M Buildings	*0.0*	*0.0*	*0.0*
Laydown Yards	*0.0*	*0.0*	*0.0*
Substation	*0.0*	*0.0*	*0.0*
Meteorological Towers	*0.0*	*0.0*	*0.0*
Industrial (300)	19.0[2]	18.0	0.1
Wind Turbines and Workspaces	*13.0*	*12.9*	*0.1*
Access Roads	*2.2*	*1.3*	*0.9*
Buried Electrical Collection Cable	*3.8*	*3.8*	*0.0*
O&M Buildings	*0.0*	*0.0*	*0.0*
Laydown Yards	*0.0*	*0.0*	*0.0*
Substation	*0.0*	*0.0*	*0.0*
Meteorological Towers	*0.0*	*0.0*	*0.0*
Exempt (600)	0.1[2]	0.1	0.0
Wind Turbines and Workspaces	*0.0*	*0.0*	*0.0*
Access Roads	*0.0*	*0.0*	*0.0*
Buried Electrical Collection Cable	*0.1*	*0.1*	*0.0*
O&M Buildings	*0.0*	*0.0*	*0.0*
Laydown Yards	*0.0*	*0.0*	*0.0*
Substation	*0.0*	*0.0*	*0.0*
Meteorological Towers	*0.0*	*0.0*	*0.0*
Unknown (no code assigned)	13.8[2]	12.8	1.0
Wind Turbines and Workspaces	*0.0*	*0.0*	*0.0*
Access Roads	*2.1*	*1.1*	*1.0*
Buried Electrical Collection Cable	*11.7*	*11.7*	*0.0*
O&M Buildings	*0.0*	*0.0*	*0.0*
Laydown Yards	*0.0*	*0.0*	*0.0*

Land Use[1]	Total Disturbance (acres)	Temporary Disturbance (acres)	Permanent Loss (acres)
Substation	*0.0*	*0.0*	*0.0*
Meteorological Towers	*0.0*	*0.0*	*0.0*
Total	1,474.0	1,389.5	84.5

[1] From land use codes in Huron and Erie County parcel shapefiles.
[2] This breakdown of impact acreages differs slightly from those presented in Table 08-9, because the data were derived from different sources. Land uses were derived from property tax codes, which are assigned by parcel, while ecological communities were derived from ODNR data, which are assigned by cover type, which does not follow parcel boundaries. For example, the 0.1 acre of commercial impact presented here is not reflected in the ecological community impacts, because it is vacant commercial land that is farmed; in Table 08-9, this same 0.1-acre impact is reported as an impact to agricultural land. Please note that total impact acreages are consistent regardless of data source (i.e., 1,474.0 acres total impact, 1,389.5 acres temporary impact, and 84.5 acres permanent impact).
[3] Permanent impacts from meteorological towers will be 0.06 acre per tower, or a total of 0.18 acre. For purposes of this table, that value rounds to 0.2 acre.

Only very minor changes in land use are anticipated within the Project Area as a result of Facility operation, and no changes are predicted outside the Project Area. The presence of the turbines bases, the collection substation, and other ancillary structures will result in the cumulative conversion of approximately 84.5 acres of land from its current use to built facilities (less than 0.3% of the 32,000 acres of leased land). During Facility operation, additional impacts over the years on land use should be infrequent and minimal. Aside from occasional maintenance and repair activities, Facility operation will not interfere with on-going land use (i.e., farming activities).

More than 97% of the total impacts from Facility construction and operation will occur in land used for agriculture. While both temporary impacts and permanent impacts to land use could occur, these changes will affect a tiny percentage of leased lands, and the Facility will be compatible with the agricultural land uses that dominate the Project Area. The transportation and use of construction equipment and material could impact growing crops, fences and gates, subsurface drainage systems (tile lines), and/or temporarily block farmers' access to agricultural fields. However, construction impacts will be temporary in nature, and confined to the properties of participating landowners. As described in Section 4906-4-08(E)(2)(c), the Applicant has developed construction specifications for construction activities occurring partially or wholly on privately owned agricultural land. These specifications, along with special siting considerations will minimize impacts to agricultural land uses in the Project Area.

(d) *Structures That Will Be Removed or Relocated*

The Applicant does not anticipate the removal or relocation of any existing structure as a result of construction or operation of the proposed Facility.

(2) Parcel Status Map

Figure 08-6 illustrates the proposed facility, habitable residences, and parcel boundaries of all parcels within a half-mile of the Project Area. This map also shows the lease status for each parcel, along with setbacks from property lines, pipelines, and major roads.

(a) *Setback to Wind Farm Property Line*

As per OAC Rule 4906-4-08(C)(2)(a), the distance from a wind turbine base to the property line of the wind farm property must be at least one and one-tenth times the total height of the turbine structure as measured from its tower's base (excluding the subsurface foundation) to the tip of a blade at its highest point. As shown in Table 03-2, the maximum total height of the tallest turbine model under consideration for the Facility is 655 feet. Therefore, the turbine setback to the wind farm property line for the proposed Facility is 720.5 feet (655 feet x 1.1). All 87 proposed turbine locations meet this requirement.

(b) *Setback to Property Line of Nearest Adjacent Property, including State or Federal Highway*

As per OAC Rule 4906-4-08(C)(2)(b), the wind turbine must be at least 1,125 feet in horizontal distance from the tip of the turbine's nearest blade at ninety degrees to the property line of the nearest adjacent property at the time of the certification application. As shown in Table 03-2, the maximum rotor diameter for the turbine models under consideration for the Facility is 492 feet. Therefore, the turbine setback to the property line of the nearest adjacent property is 1,371 feet [(492 feet ÷ 2) + 1,125 feet = 246 feet + 1,125 feet]. Based on anticipated lease agreements, all 87 turbine locations meet this requirement.

(c) *Setback to Electric Transmission Line, Gas Pipeline, Gas Distribution Line, Hazardous Liquid Pipeline*

As per OAC Rule 4906-4-08(C)(2)(c), the distance from a wind turbine base to any electric transmission line, gas pipeline, gas distribution line, hazardous liquid(s) pipeline, or public road shall be at least one and one-tenth times the total height of the turbine structure as measured from its tower's base (excluding the subsurface foundation) to the tip of a blade at its highest point. As shown in Table 03-2, multiple turbine models of various heights are under consideration for the proposed Facility. For the purposes of this setback analysis, each of these possible turbine heights is presented separately.

- The maximum total height of the tallest turbine model under consideration for the Facility is 655 feet, for the Nordex N149 with a 125-meter hub height. Should this model be selected, the turbine setback to public roads and electric/gas transmission and distribution lines for the proposed Facility would be 720.5 feet (655 feet x 1.1). Of the total 87 proposed turbine locations,

84 meet this requirement. Turbine sites T67, T70, and T82 potentially have setback conflicts with this turbine model.

- Two proposed turbine sites, T67 and T70, are potentially located within the setback to public roads. Specifically, T67 is 668 feet from the mapped location for Town Highway 71 and T70 is 660 feet from the mapped location for Town Highway 69, based on ODOT roads data. If the tallest turbine model under consideration (i.e., the Nordex N149 with a 125-meter hub height) is selected for the Facility, T67 and T70 will not be constructed, assuming the preconstruction survey confirms the mapped location of these roadways.
- One proposed turbine site, T82, is potentially located within the setback for electric transmission lines. Specifically, T82 is approximately 680 feet from an unknown power line. Although this power line was observed in the field and is visible on aerial imagery, it is not included in the Department of Homeland Security Homeland Infrastructure dataset nor in the U.S. Energy Information Administration U.S. Energy Mapping System. Because the Applicant was unable to obtain shapefiles mapping this power line, or information identifying it voltage, this unknown power line was not mapped in Figure 08-6. However, in order to fully account for the potential applicability of the setback to electric transmission lines, the Applicant has assumed the unknown power line is of sufficient capacity to trigger the setback. If the tallest turbine model under consideration (i.e., the Nordex N149 with a 125-meter hub height) is selected for the Facility, T82 will not be constructed, assuming the preconstruction survey confirms the location of this power line and its capacity is confirmed to be greater than 125 kV.

- The maximum total height for the second tallest turbine model under consideration for the Facility is 602 feet, for the Nordex N149 with a 109-meter hub height. Should this model be selected, the turbine setback to public roads and electric/gas transmission and distribution lines for the proposed Facility would be 662.2 feet (602 feet x 1.1). Of the total 87 proposed turbine locations, 86 would meet this requirement; only T70 could not be constructed, assuming the preconstruction survey confirms the mapped location of these roadways, since it is 660 feet from the mapped location for Town Highway 69.

- The other two turbine models under consideration (i.e., the Vestas V150 or Gamesa SG145) both have a maximum total height of 591 feet. Should either of these models be selected, the turbine setback to public roads and electric/gas transmission and distribution lines for the

proposed Facility would be 650.1 feet (591 feet x 1.1). All 87 proposed turbine locations would meet this requirement.

This discussion has focused on public roads and electric transmission lines because all proposed turbine locations currently meet the setback to known gas pipelines, gas distribution lines, and hazardous liquid pipelines for all turbine models under consideration.

As referenced above, a preconstruction survey will be conducted within turbine setbacks to inform the final Facility design. This survey will verify the precise location of electric transmission lines, gas pipelines, gas distribution lines, hazardous liquid pipelines, and public roads within turbine setbacks. In addition, the exact turbine locations may be subject to unsubstantial and minor engineering revisions (micro-siting) prior to construction. For example, if the Nordex N149 turbine model at the 109-meter hub height is selected, and the preconstruction survey verifies the location of Town Highway 69 as 660 feet from the proposed site for T70, that turbine site could be subject to micro-siting to comply with the public roads setback. Please note that any such micro-siting will comply with state laws and regulations (including all applicable setbacks), be compatible with landowner preferences, and be presented at the preconstruction meeting with OPSB with proof of all necessary participation agreement.

All turbine locations selected for construction will ultimately comply with setbacks to electric transmission lines, gas pipelines, gas distribution lines, hazardous liquid pipelines, and public roads.

(d) *Setback Waivers*

The Applicant understands that minimum setbacks from property lines and residences may be waived pursuant to ORC Section 4906.20 and the procedures set forth in OAC Rule 4906-4-08(C)(3). The Applicant is in the process of working with property owners to obtain the necessary waivers and understands that it will only be able to construct turbines that either meet the statutory setback requirement or have the requisite setback waivers.

(3) Setback Waiver

While not all waivers have been obtained, as stated previously, the Applicant understands that the setbacks described above will apply in all cases except those in which all owner(s) of property adjacent to the wind farm property waive application of the setback to that property. The requirements of the waivers are described below.

(a) *Content of Waiver*

The waivers entered into by the Applicant will meet the following requirements set forth in OAC Rule 4906-4-08(C)(3)(a):

(i) Be in writing
(ii) Provide a brief description of the Facility
(iii) Notify the applicable property owners of the statutory minimum setback requirements
(iv) Describe the adjacent property subject to the waiver through a legal description
(v) Describe how the adjacent property is subject to the statutory minimum setback requirements
(vi) Advise all subsequent purchasers of the adjacent property subject to the waiver that the waiver of the minimum setback requirements shall run with the land

(b) *Required Signature*

All setback waivers entered into by the Applicant will be signed by the Applicant and the applicable property owner(s), indicating consent to construction activities without compliance with the minimum setback requirements.

(c) *Recordation of Waiver*

All setback waivers entered into by the Applicant will be recorded in the county recorder's office where the property that is the subject of the waiver is located.

(4) Land Use Plans

(a) *Formally Adopted Plans for Future Use of Site and Surrounding Lands*

Several of the municipalities within the 5-mile study area have adopted comprehensive land use plans and/or economic development plans. Each of these are summarized below:

- City of Bellevue Vision 2025 Comprehensive Master Plan: This plan, adopted in 2005 by the Bellevue City Council, identifies the need for a 20-year vision, in which the issues, concerns, goals, and priorities of the community are addressed through civic engagement. High-paying job creation in the manufacturing sector, as well as the retention of existing jobs and the preservation of existing farming operations are goals and issues presented in the plan (City of Bellevue, 2005).

- 2006 City of Norwalk Comprehensive Plan: This plan serves as an updated blueprint for the future through its vision to preserve natural resources and strong neighborhoods while promoting business growth and intergenerational opportunities and responding to both local and global challenges. To achieve this vision, the plan outlines goals relating to community character, community facilities, economic and business development, education, government, housing, land use, natural environment and resources, population growth and demographics, quality of life, services, transportation, and utilities and infrastructure (City of Norfolk, 2006).

- 1995 Erie County Comprehensive Development Plan: This plan "determines the immediate and future needs of the community and provides ways to allow the County to guide appropriate land uses to the most suited areas for that kind of development" (Erie County, 1995). By analyzing the existing conditions and growth trends of the County, along with issues facing the region, the plan identifies goals for future land use and policy making.

- 2017 Huron County Comprehensive Land Use Plan: Originally developed in 2007 and last revised in 2017, the Huron County Commissioners, the Huron County Comprehensive plan aims to manage future growth within the County to cohesively guide development patterns over the next thirty years. A key goal is to promote Huron County as a development destination and to retain and expand existing businesses (Huron County, 2017). In March 2018, Huron County approved a resolution to support Emerson Creek Wind Facility in the county as a Qualified Energy Project, making it eligible for state tax incentives.

- 2013 Sandusky County Comprehensive Plan: This plan is an update to the 2003 Comprehensive Plan and is intended to be long-range plan used to guide growth and development using current existing condition, along with updated trends and priority project. A major goal of the plan is to facilitate the economic health and growth of the County and its municipalities by expanding on the tax and employment base. Furthermore, the plan "promotes and facilitates the proper placement and provision of energy infrastructure components throughout the County, including but not limited to wind farms and solar arrays" (Sandusky County, 2013).

- 2011 Seneca County Comprehensive Economic Development Strategy (EDA): The plan is intended to position Seneca County as a "redevelopment area," as defined by the EDA, and thus to make its political subdivisions eligible to apply from the EDA Public Works and other

programs. As specified by the plan, "the assumptions, goals, and strategies laid out in the plan create a blueprint for the County's overall economic development and a summary of what is considered the most effective and proactive, targeted strategy to improve the economic position and climate of Seneca County" (Seneca County, 2011).

- 2005 Perkins Township Comprehensive Development Plan: This plan presents a vision for the community through a series of issues and action steps for various components of the community: economic/industrial development, commercial enhancement, land use, housing, infrastructure and utilities, parks and recreation, and transportation. Regarding economic and industrial development, the plan aims to retain existing and attract new industry and business to the Perkins Township area in order to add to the tax base, provide high paying jobs for the residents and enhance the financial stability of the region (Erie Regional Planning Commission, 2005).

(b) *Applicant's Plans for Concurrent or Secondary Uses of the Site*

The Applicant has no plans for concurrent or secondary uses of the site. Facility components will be located on portions of leased land with existing rural residential or agricultural uses. Wind power projects are compatible with agricultural practices, and because this Facility has been sited and designed to maximize such compatibility, existing land uses will continue concurrently with Facility operation.

(c) *Impact on Regional Development*

The regional economy surrounding the Facility is shaped in large part by the agricultural industries of Crawford, Erie, Huron, Sandusky, and Seneca Counties. While the 5-mile study area is predominantly rural, the City of Toledo (west of the study area) and the City of Cleveland (east of the study area), both significant metropolitan regions, are each in relative proximity to the study area. The regional context for the development of this Facility is discussed in further detail below, concentrating on five primary components: housing, commercial and industrial development, schools, transportation, and other public services and facilities.

Housing

As with all sectors of the economy, the housing market throughout the region and within the Study Area has felt the impact of population loss. Owner-occupied vacancy rates in Erie and Seneca Counties, at 3.0% and 1.8%, are slightly higher than the statewide average of 1.7%, while the owner-occupied vacancy rate for Sandusky County (1.6%) is slightly lower than the statewide average. Owner-occupied vacancy

rates in Crawford and Huron Counties, 1.4%, are both noticeably lower than the statewide average. The rental vacancy rates in Sandusky County (9.3. %), Seneca County (8.9%), Huron County (7.9%), and Erie County (7.1%) are substantially higher than the statewide average of 5.8%, while the rental vacancy rate in Crawford County is lower than the statewide average at only 4.0%.

Crawford, Erie, Huron, Sandusky, and Seneca Counties feature a median monthly gross rent level of $637, $716, $650, $507 and $672, respectively, all of which is below the statewide average of $764/month. Each county has a lower than statewide percentage of households whose rent accounts for more than 35% of their household income. In addition, Crawford, Erie, Huron, Sandusky, and Seneca Counties features a median housing values of $85,600, $132,400, $118,900, $111,300, and $98,600, respectively, all of which are below the statewide average of $135,100.

It is estimated that 16,093 housing units within Crawford, Erie, Huron, Sandusky, and Seneca Counties are currently vacant. Given these figures, in addition to the population projections discussed in Section 4906-4-08(C)(3)(e) below, it is not expected that the development of the Facility will have a significant impact on the regional housing market. While Facility development may not represent a widespread boom for rental property owners, it is worth noting that the availability of vacant rental housing also indicates that the Facility should not have a destabilizing effect on current renters (EDR, 2019a).

Commercial and Industrial Development

The diversification of Ohio's energy portfolio will have significant and positive economic impacts beyond a reduced dependence on coal imported from outside of the state. The Environment Ohio Research & Policy Center estimated that if the State of Ohio increased wind power production to 20% of the state's total energy portfolio by 2020, such development would create 3,100 permanent, full-time positions within the state, and result in cumulative wages totaling $3.7 billion. This same analysis estimated that such a commitment would result in an increase in gross state product of approximately $8.2 billion by 2020 (Environment Ohio, 2007).

These impacts are principally due to the impact of wind energy development on the manufacturing sector. The State of Ohio is uniquely positioned to take advantage of advanced manufacturing opportunities for the development and distribution of wind power technology, according to the Renewable Energy Policy Project's (2004) report, "Wind Turbine Development: Location of Manufacturing Activity." This analysis estimates that if the United States were to invest $50 billion into 50,000 MW of new wind power production, Ohio manufacturers could stand to create 11,688 jobs in wind turbine and related

manufacturing, accounting for 1.95% of the total investment. The AWEA estimates that the State of Ohio alone has enough wind resources to generate nearly 359 MW at 80-meter hub height and 110,439 MW at 110-meter hub height of onshore wind energy (AWEA, 2015).

The Environmental Law & Policy Center (ELPC) estimated that the State of Ohio is currently home to 106 wind power supply chain businesses, providing 1,000 to 2,000 jobs throughout the state (ELPC, 2011). Wind energy technology manufacturing opportunities include rotors, controls, drive trains, generators, and towers. Several of these manufacturers and other wind power-related businesses are in the Greater Cleveland Region (AWEA, 2015).

Specific short- and long-term economic impacts of this Facility on commercial and industrial development throughout the region are described in further detail in Section 4906-4-06(E)(4) of this Application.

Schools

The proposed Facility will have a significant positive impact on the local tax base, including local school districts that serve the area where the wind farm is to be located. However, aside from increased tax revenue for the local school districts, no significant impact on schools or school facilities is anticipated. The revenue impact from the proposed Facility is expected to be in the range of $1,785,960 to $2,678,940 per year, to be distributed amongst the taxing jurisdictions, including local school districts. The Facility is not expected to have significant growth-inducing effects on the surrounding locales. Local employees would be hired to the extent possible. In the event that non-resident workers are hired during construction, it is expected that they would commute or stay in regional transient housing or motels and would not bring families that might require additional school facilities.

Transportation System Development

The region surrounding the Project Area features numerous Interstates, U.S, and State highways, as well as county and local roadway networks, in addition to freight rail lines and small airports. The main transportation route to the Facility is I-80/90 (Ohio Turnpike), which runs along the northern edge of the Project Area. U.S. Route 250 (north-south; east of the Facility), SR 2 and U.S. Route 6 (east-west; north of the Facility), U.S. Route 224 (east-west; south of the Facility), and SRs 18 and 269 (north-south; west of the Facility) also provide access to the region. U.S. Route 20 (east-west) and SR 4 (north-south) provide direct access into the Project Area. These and other primary routes facilitate transportation between the Facility and the surrounding metropolitan areas.

Workers coming to and from the site will most likely enter via SR 4 or 20 from I-80/90, and then traveling along other State and county roads (e.g., SRs 547, 99, 113, and 162). The proposed Facility is not expected to cause any substantial disruption to major transportation corridors serving the Project Area.

Freight rail lines connect several of the municipalities throughout the 5-mile study area. CSX and Norfolk Southern operate the majority of Ohio's freight rail system. Municipalities within the 5-mile study area that are connected to freight rail lines include the Cities of Bellevue Norwalk and Willard; the Townships of Groton, Huron, Lyme, Margaretta, Perkins, Milan, Norwalk, Oxford, Perkins, Reed, Ridgefield, Thompson, Townsend, and York; and the Villages of Attica, Milan, and Monroeville. The rail system may be used for the transportation of a very small number of turbine component and equipment suppliers, but the Applicant does not anticipate making any modifications to the system.

The Project Area is also in proximity to the Port-Bucyrus-Crawford County Airport, Huron County Airport, the Sandusky County Regional Airport, the Seneca County Airport, the Bandit Field Airport, the Carl R. Keller Field Airport, the Fremont Airport, the Griffing-Sandusky Airport, the Hinde Airport, the Wakeman Airport, the Weiker Airport, and the Willard Airport. Construction and operation of the Facility will be designed according to FAA standards and are not expected to result in any adverse impacts to the regional air transportation network. The Applicant has filed Form 7460-1 with the FAA for each proposed turbine sites[12] (see Exhibit J) to confirm that the Facility will not cause any adverse impacts to the existing air travel network.

Other Public Services and Facilities

The Facility is not expected to have significant growth-inducing effects on the surrounding locales. Therefore, no significant impact on local public services and facilities is expected. Workers will commute to the work site on a daily basis. Local employees will be hired to the extent possible. Hiring of non-resident workers would occur only when local residents with the required skills were not available or competitive. It is expected that non-resident workers would commute or stay in regional transient housing or motels, and not require new housing, and would not bring families that might require family healthcare or additional school facilities. The principal impact on public services in the site locale would be a temporary increase in traffic on roads leading to the Project Area, due to deliveries of equipment and materials during construction.

[12] One turbine location has shifted since the December 2018 FAA submittal, but due to the federal government shutdown, a revised filing cannot currently be submitted. The Notice of Proposed Construction for T20 will be submitted to the FAA once the government resumes normal operations, and appropriate documentation provided to Staff as a supplemental filing.

(d) *Regional Plan Compatibility*

As discussed in Section 4906-4-08(C)(3)(a), several of the municipalities within the 5-mile study area have adopted comprehensive land use plans and/or economic development plans. Compatibility with each of these plans is discussed below:

- City of Bellevue Vision 2025 Comprehensive Master Plan: In terms of economic development, the Facility offers an opportunity for the use of local goods and services, including but not limited to labor, equipment, and maintenance. In addition, the payments associated with land leases provide additional income for landowners, including agricultural producers, and in doing so, improves the economic conditions for existing farming practices.

- 2006 City of Norwalk Comprehensive Plan: This plan outlines goals in a range of categories that are compatible with the construction of the proposed Facility: retaining and attracting new industry, reflecting good stewardship of the environment, and preserving a balance between emerging residential uses and commercial needs. An additional goal, however, is the protection of existing scenery and vista points, specifically in proximity to views of Norwalk Creek and its surrounding vegetation, as well as views of other attractive natural areas. Whether or not a wind energy facility negatively impacts local character is subjective, to some extent. Some people may feel the Facility will impact local character if visible from Norwalk Creek and other natural areas, which would represent an inconsistency with the Norfolk Comprehensive Plan. However, according to the Emerson Creek Wind Visual Impact Assessment (VIA), views of the proposed Facility along the highly vegetated Norwalk Creek will be limited due to the highly vegetated creek bank. There are limited areas along Norwalk Creek that are free of vegetation and may allow limited views of the Facility. The Facility is also expected to be visible from Memorial Lake Park (EDR, 2019b). A simulation showing the view from Memorial Lake Park is included in the VIA.

- 1995 Erie County Comprehensive Development Plan: The Facility is compatible with the Plan's goal to "promote community development through the improvement of infrastructure that meets development demands".

- 2017 Huron County Comprehensive Land Use Plan: A key goal is to promote Huron County as a development destination and to retain and expand existing businesses. The Facility is compatible with this goal due to the positive impacts it will create for the local economy. Furthermore, the recent County approval of a resolution to support Emerson Creek Wind Facility in the county as a Qualified Energy Project shows that Huron County views the project as compatible with land use plans.

- 2013 Sandusky County Comprehensive Plan: A major goal of the plan is to facilitate the economic health and growth of the County and its municipalities by expanding on the tax and employment base. Furthermore, the plan "promotes and facilitates the proper placement and provision of energy infrastructure components throughout the County, including but not limited to wind farms and solar arrays" (Sandusky County, 2013). The Facility is compatible with these goals, specifically the placement and provision of alternative energy infrastructure.

- 2011 Seneca County Comprehensive Economic Development Strategy: The Facility is compatible with the plan's priority action to improve the local economy and implement alternative energy. Recently, the County approved a resolution to make Seneca County an "Alternative Energy Zone," making it eligible for state tax incentives.

- 2005 Perkins Township Comprehensive Development Plan: To the extent that this project adds to the tax base, provides high-paying jobs, and facilitates additional revenues for operational agriculturalists, the proposed Facility is compatible with both the economic and land use goals of the Perkins Township Comprehensive Plan.

The Facility is located in an area that is largely rural in nature with a majority of impacts from construction and operation occurring on land used for agriculture. The economic benefits of the turbines for local agriculturalists, as well as their overall compatibility with farming practices, will support and aid in the preservation of local farming operations. Furthermore, the jobs and economic development created by Facility may help to create and retain existing local employment opportunities. The revenue impact from the proposed Facility is expected to be in the range of $1,785,960 to $2,678,940 per year, to be distributed amongst the local taxing jurisdictions. In summary, the development of this Facility is compatible with the goals and strategies of existing local and regional plans.

(e) *Current and Projected Population Data*

U.S. Census Bureau data reveals that communities within 5 miles of the Project Area have experienced histories of small population growth and decline over the past two decades. The 2017 population for the State of Ohio and for Crawford, Erie, Huron, Sandusky, and Seneca Counties is shown in Table 08-18 below. Ohio showed an overall increase in population between 2000 and 2017. However, the counties in the 5-mile study area each experienced an overall decrease of equal or higher magnitude over the same time period. Huron County experienced the smallest annual rate of population decrease, while Crawford County experienced the greatest overall decrease in population (EDR, 2019a).

Table 08-18. County and State Population Trends and Densities

County	2000 Population	2010 Population	2017 Population	% Annual Change 2000-2017	Est. 2030 Population	% Change 2017-2030	2017 Population Density (people per square mile)
Crawford County	46,966	43,784	41,746	-0.7%	38,334	-8.2%	105.7
Erie County	79,551	77,079	74,817	-0.4%	71,483	-4.5%	297.5
Huron County	59,487	59.626	58,494	-0.1%	57,752	-1.3%	119.4
Sandusky County	61,792	60,944	59,195	-0.2%	57,320	-3.2%	251.5
Seneca County	58,683	56,745	55,243	-0.3%	52,817	-4.4%	101.1
State of Ohio	11.353.140	11,536,504	11,658,609	0.2%	11,900,779	2.1%	282.3

Source: EDR, 2019a.

Population within the cities, townships, and village also generally decreased from 2000 to 2017, as shown below in Table 08-19. Of the 30 municipalities within a 5-mile radius of the proposed turbines, Auburn Township has experienced the greatest decline in population (-0.9%) from 2000-2017. The Village of Attica and Oxford Township were two areas of notable growth, with each experiencing an annual rate of population increase at 0.5% over the same time span (EDR, 2019a).

Table 08-19. Municipal Population Trends and Densities

Municipality	2000 Population	2010 Population	2017 Population	% Change 2000-2017	Est. 2030 Population	% Change 2017-2030	Population Density (people per square mile)
City of Bellevue	8,193	8,202	7,966	-0.2%	7,799	-2.1%	1,335.3
City of Norwalk	16,238	17,012	16,824	0.2%	17,294	2.8%	1,902.5
City of Willard	6,806	6,382	6,047	-0.7%	5551	-8.2%	1,705.1
Auburn Township	897	795	757	-0.9%	671	-11.3%	215.4
Cranberry Township	1,674	1,579	1,503	-0.6%	1,390	-7.5%	52.5
Chatfield Township	776	724	687	-0.7%	629	-8.4%	21.5
Greenfield Township	1,442	1,374	1,438	0.0%	1,435	-0.2%	49.9
Groton Township	1,384	1,427	1,344	-0.2%	1,315	-2.2%	51.1
Huron Township	10,530	10,697	10,517	0.0%	10,507	-0.1%	459.5
Lyme Township	968	853	842	-0.8%	762	-9.5%	35.6
Margaretta Township	6,289	5,981	5,843	-0.4%	5,534	-5.3%	180.5
Milan Township	3,686	3,606	3,538	-0.2%	3,431	-3.0%	139
New Haven Township	2,860	2,670	2,556	-0.6%	2,356	-7.8%	110.5
Norwalk Township	3,685	3,591	3,490	-0.3%	3,351	-4.0%	199.0
Norwich Township	1,072	1,070	1,055	-0.1%	1,042	-1.2%	35.8
Oxford Township	1,096	1,201	1,182	0.5%	1,255	6.2%	47.8
Perkins Township	12,578	12,202	11,746	-0.4%	11,166	-4.9%	461.6
Peru Township	1,043	1,105	1,067	0.1%	1,086	1.8%	50.7
Reed Township	949	848	814	-0.8%	730	-10.3%	20.7
Richmond Township	501	510	501	0.0%	501	0.0%	41.8
Ridgefield Township	2,390	2,329	2,298	-0.2%	2,231	-2.9%	88
Sherman Township	501	510	501	0.0%	501	0.0%	13.9
Thompson Township	1,422	1,443	1,390	-0.1%	1,366	-1.7%	37.2
Townsend Township	1,670	1,623	1,559	-0.4%	1,482	-5.0%	40.8
Venice Township	1,871	1,716	1,688	-0.6%	1,566	-7.2%	43.6
York Township	955	899	1,033	-0.2%	2,353	-2.8%	76.2
Village of Attica	935	852	808	0.5%	1,099	6.4%	1,526.4
Village of Castalia	1,670	1,623	1,559	-0.8%	728	-9.9%	816.8
Village of Milan	1,445	1,367	1,317	-0.5%	1,231	-6.6%	925.9
Village of Monroeville	1,433	1,400	1,382	-0.2%	1,345	-2.7%	93
Total	97,801	96,500	94,113	-0.2%	91,435	-2.8%	N/A

Note: Totals calculated by formula; may reflect rounding errors.
Source: EDR, 2019a.

For the purposes of this report, the trends experienced by each community from 2000 to 2017 are expected to continue regardless of whether the proposed Facility is built. Over the next decade, the total population within the 5-mile study area is projected to decrease by -2.4% from 2017 to 2030, compared to the projected statewide increase of 2.1% during the same time span. Meanwhile, county population projections are expected to decline between the same time span. Crawford County is projected to experience the greatest decrease in population (-0.7%) from 2010-2017, while Huron County is projected to experience only a -0.1% decline in population during the same time span (see Table 08-18).

Although construction employment related to the construction of the Facility will be substantial, this employment is relatively short term and is not expected to result in the permanent relocation of construction workers to the area. Therefore, the Facility is not anticipated to generate significant population growth within the 5-mile study area. The number of potential short- and long-term employment opportunities associated with the construction and operation of the Facility is discussed in further detail below.

(D) CULTURAL AND ARCHAEOLOGICAL RESOURCES

(1) Landmarks of Cultural Significance Map

Figure 08-7 depicts formally adopted land and water recreation areas, recreation trails, scenic rivers, scenic routes or byways, and registered landmarks of historic, religious, archaeological, scenic, natural, or other cultural significant within ten miles of the Project Area.

EDR completed a cultural resources records review using online resources from the Ohio Historic Preservation Office (OHPO) (Exhibit I). The purpose of this review was to identify known cultural resources in the vicinity of the Facility so that impacts to these resources can be minimized. Cultural resources include archaeological and historical sites, such as cemeteries, buildings, structures, objects, and districts. The literature review included the following records from OHPO:

- OHPO previous Phase I, II, and III cultural resources surveys
- National Register of Historic Places (NRHP)
- NRHP Determination of Eligibility (DOE) properties
- National Historic Landmarks (NHL) List
- Ohio Historic Inventory (OHI)
- ODOT Historic Bridge Inventory
- Ohio Archaeological Inventory (OAI)

- Ohio Genealogical Society (OGS) cemetery files
- Mills *Archaeological Atlas of Ohio* (1914)

The records review for the 10-mile study area identified 148 historic resources listed on the NRHP (one within the Project Area); 43 properties previously determined eligible for listing in the NRHP (none within the Project Area); 2,776 previously identified historic structures recorded in the OHI (78 within the Project Area); six historic bridges listed on the ODOT Historic Bridge Inventory (none within the Project Area); 1,355 archaeological sites recorded in the OAI (109 within the Project Area); and 219 cemeteries recorded by the OGS (six within the Project Area). Appendix A in Exhibit I contains a complete list of NRHP-listed properties within 10 miles of the Project Area. A list of properties previously determined eligible for listing on the NRHP within 10 miles of the Project Area can be found in Appendix B in Exhibit I. Additional information on all cultural resources can be found in Exhibit I.

(2) Impact to Landmarks and Mitigation Plans

As a result of EDR's records review, the Applicant identified nine locations where proposed Project facilities may impact previously recorded archaeological sites that have not been formally assessed for NRHP eligibility: 33HU0025, 33HU0038, 33HU0043, 33HU0046, 33HU0211, 33HU0232, 33HU0233, 33HU0239, and 33HU0424. To further assess the significance of these resources, MSG (2019b) completed a reconnaissance-level survey of the nine locations sufficient to allow for a preliminary determination of potential NRHP eligibility for each site.

MSG completed field surveys in December 2018 within areas where previously recorded site boundaries overlap with proposed construction limits for the Facility. Since none of the nine sites had previously been shovel tested, MSG began by completing pedestrian surface surveys at each site, followed by limited, selective shovel testing in order to determine whether any of the sites might have intact, sub-plow zone artifact deposits or cultural features. Based on the results of MSG's survey efforts, as well the examination of private artifact collections, MSG determined that sites 33HU0025, 33HU0211, 33HU0233, and 33HU0424 are not eligible for listing on the NRHP. Furthermore, while portions of sites 33HU0038, 33HU0046, 33HU0232 and 33HU0239 that fall outside of the proposed construction for the wind farm were not surveyed, and therefore cannot be fully evaluated for NRHP eligibility, MSG determined that no NRHP-eligible components of these sites are present within the construction boundaries. In contrast, MSG determined that site 33HU0043 may have the potential to yield significant cultural data, and therefore may be eligible for listing on the NRHP under Criterion D (MSG, 2019b).

Based on results of the field surveys, the Applicant revised the Facility layout so that there will be no direct impacts to known cultural resources (i.e., cemeteries or historic structures) from construction of the Project. The Applicant will seek to avoid any potentially significant (i.e., NRHP-eligible or -unevaluated) archaeological sites located within the Project Area. For site 33HU0043, the Applicant included an alternative collection line route around this site in the layout presented in this Application and plans on using this route to avoid impacts to this potentially NHRP-eligible site.

The Project has the potential to cause indirect (visual) impacts to aboveground historic resources within the Cultural Resource Study Area. A complete VIA will be prepared in support of the Certificate Application for the Project, in accordance with OAC Chapter 4906-04-08(D)(4). The VIA includes viewshed analyses and photographic simulations and assesses the potential visual impacts of the Project.

(3) Impact to Recreational and Scenic Areas and Mitigation Plans

Existing recreational areas within a 10-mile radius of the proposed Facility are depicted on Figure 08-7 and listed in Table 08-20 below. Recreational areas were identified through ODNR Lands and Facilities online mapping (2018g), ESRI StreetMap North America, and ESRI ArcGIS Online map services.

Table 08-20. Recreational Areas Within a 10-Mile Radius of the Facility

Recreational Area	Location	Distance from Nearest Turbine
Buckeye Trail/ North County National Scenic Trail	▪ Towns of Adams, Thompson, and Reed; Seneca County ▪ Towns of Norwich, Greenfield, and Fairfield; Huron County	0.1 mile
North Coast Inland Trail	▪ Towns of York and Green Creek; Sandusky County ▪ Towns of Lyme, Ridgefield, Norwalk, and Townsend; Huron County	0.3 mile
Erie Sand Barrens State Nature Preserve	▪ Town of Oxford, Erie County	1.9 miles
West Branch Huron River	▪ Towns of Ridgefield, Peru, Greenfield, and New Haven; Huron County	2.0 miles
Dupont Marsh State Nature Preserve	▪ Town of Huron; Erie County	6.6 miles
Lake Erie Coastal Ohio Trail Scenic Byway	▪ Towns of Margaretta Annex, Perkins, Huron, and Berlin Annex; Erie County	6.7 miles
Sheldon Marsh State Nature Preserve	▪ Town of Huron; Erie County	6.9 miles
Old Woman Creek National Estuarine Research Reserve	▪ Towns of Huron and Berlin Annex; Erie County	8.8 miles

As listed in Table 08-20 above, eight state-designated recreation areas occur within 10 miles of the proposed Facility. Each of these recreational sites is described below, along with an assessment of potential impacts from the proposed Facility.

The Buckeye Trail, which is located 0.1 mile at its nearest point from a proposed turbine, was first proposed by Merrill Gilfillan in 1958. The trail was originally planned to be a 500-mile path from the Ohio River to Lake Erie, but evolved into the nation's longest loop trail, winding 1,444 miles around Ohio. The trail extends from the farmland of the northwest, to the hills of Appalachia, the Blackhand sandstone cliffs of the Hocking Hills regions, the Bluegrass region of southwest, scenic wetlands and forests across the state, and many historic towns, canal towpaths, and abandoned rail grades. There are 26 sections of the trail, each named for a town or feature within that section. Portions of the Norwalk section passes through the central/southern portion of the 10-mile visual study area, following public roadways (Buckeye Trail Association, 2017). Foreground, midground, and background views of the turbines will likely be visible along portions of the Buckeye Trail. In general, areas of screened views increase in size with distance from the Facility. Facility sound levels along the Buckeye Trail may exceed 49 dBA Leq for a limited distance along Town Highway 67 (RSG, 2019). Shadow flicker may be experienced along approximately 2.3 miles of the trail; however, it will be less than 30 hours/year along the entire route (EDR, 2019c).

The North Coast Inland Trail is a bike route that traverses the northern portion of the Project Area, and at its closest point, comes within approximately 0.3 miles of the nearest proposed turbine. The trail is currently 71.8 miles, but when completed the bike trail will extend approximately 105 miles, from Lorain, Ohio to Toledo, Ohio (Ohio Bikeways, 2019). Foreground, midground, and background views of the turbines will likely be visible along various portions of the North Coast Inland Trail. In general, areas of screened views increase in size with distance from the Facility. Facility sound levels along the North Coast Inland Trail will not exceed 49 dBA Leq, even under high winds and anomalous meteorological conditions (RSG, 2019). Shadow flicker may be experienced along approximately 4.4 miles of the North Coast Inland Trail. However, the flicker will mostly occur at low levels, exceeding 30 hours/year for only approximately 750 feet of the 4.4 miles. Adverse shadow flicker impacts are not anticipated along the Buckeye Trail, since trail users are typically transient, and consequently, are not present in any particular location long enough to experience 30 hours/year of shadow flicker. Furthermore, shadow flicker impacts are conservative and do not take into account the screening effects associated with existing, site-specific conditions and obstacles such as trees (EDR, 2018c).

Erie Sand Barrens State Nature Preserve is situated in the sandy beach ridges of glacial Lake Warren, a predecessor to modern Lake Erie. Recreational facilities include a 1-mile loop trail. Viewshed analysis indicates partial visibility within the nature reserve, which is characterized by meadows and prairies. In other words, turbines will be visible from some portions of the site but screened from others. Facility sound levels will not exceed 49 dBA Leq, even under high winds and anomalous meteorological conditions (RSG, 2019). There will be no shadow flicker at the Erie Sand Barrens State Nature Preserve (EDR, 2019c).

Located approximately 2.0 miles from the nearest proposed turbine site, the West Branch of the Huron River was added to the Nationwide Rivers Inventory (NRI) in 1982. The NRI is a listing of more than 3,200 free-flowing river segments in the United States that are believed to possess one or more "outstandingly remarkable" natural or cultural values judged to be at least regionally significant. Hence, NRI river segments are potential candidates for inclusion in the National Wild and Scenic River System. A 29-miles segment of the West Branch of the Huron River was listed because of its recreational opportunities, including fishing and canoeing. Viewshed analysis indicates that the West Branch of the Huron River will be entirely screened from views of the Facility turbines. Facility sound levels will not exceed 49 dBA Leq, even under high winds and anomalous meteorological conditions (RSG, 2019). There will be no shadow flicker along the West Branch of the Huron River (EDR, 2019c).

Much of the Dupont Marsh State Nature Preserve consists of a marsh situated along the edge of the Huron River. The higher ground adjacent to the marsh was formerly agricultural land and is now occupied by typical old-field vegetation. Recreational facilities include a trail system and restrooms. Viewshed analysis indicates that views of the Facility turbines are mostly screened by intervening vegetation and topography, and only extremely limited views will be available from the nature preserve. Facility sound levels will not exceed 49 dBA Leq, even under high winds and anomalous meteorological conditions (RSG, 2019). There will be no shadow flicker at the Dupont Marsh State Nature Preserve (EDR, 2019c).

The 293-mile Lake Erie Coastal Ohio Scenic Byway is a National Scenic Byway that features beaches, state parks, preserves, lighthouses, vacation islands, quaint villages, and big cities. This byway offers travelers shopping, fishing, birding, biking, boating, camping, touring, and exploring. Viewshed analysis indicates that views of the Facility turbines from the scenic byway are mostly screened by intervening vegetation and topography, with only short intermittent stretches of turbine visibility far in the distance. The scenic resources and focus of this scenic byway is the Lake Erie coast, which is located on the north side of the route; the brief views of the turbines will be off to the distant south. Facility sound levels will not exceed 49 dBA Leq, even

under high winds and anomalous meteorological conditions (RSG, 2019). There will be no shadow flicker at the Lake Erie Coastal Ohio Scenic Byway (EDR, 2019c).

Sheldon Marsh State Nature Preserve and contiguous wetlands comprise some of the last remaining undeveloped stretches of shoreline in the Sandusky Bay region. The preserve offers excellent bird-watching opportunities in spring and fall. Recreational facilities include accessible parking, trails, and restrooms. Viewshed analysis indicates that views of the Facility turbines are mostly screened by intervening vegetation and topography, and views will be available from small portions of the nature preserve. Facility sound levels will not exceed 49 dBA Leq, even under high winds and anomalous meteorological conditions (RSG, 2019). There will be no shadow flicker at the Dupont Marsh State Nature Preserve (EDR, 2019c).

Located in Huron on the south-central shore of Lake Erie, Old Woman Creek National Estuarine Research Reserve is one of Ohio's few remaining examples of a natural estuary. As a transition zone between land and water, the site contains a variety of habitats including marshes and swamps, upland forest, open water, tributary streams, barrier beach, and near-shore Lake Erie. Old Woman Creek Reserve is managed as a cooperative partnership between NOAA and ODNR and is also a dedicated Ohio State Nature Preserve. Recreational facilities include a visitor's center, trail system, and observation decks. Viewshed analysis indicates that views of the Facility turbines are mostly screened by intervening vegetation and topography, and only extremely limited views will be available from the nature preserve. Facility sound levels will not exceed 49 dBA Leq, even under high winds and anomalous meteorological conditions (RSG, 2019). There will be no shadow flicker at Old Woman Creek (EDR, 2019c).

(4) Visual Impact

EDR prepared a VIA for the proposed Facility. The VIA will be submitted as a supplemental filing to this Application in early February 2019. The purpose of the VIA is to:

- Describe the appearance of the visible components of the proposed Facility.
- Define the visual character of the project study area.
- Inventory and evaluate existing visual resources and viewer groups.
- Evaluate potential project visibility within the study area.
- Identify key views for visual assessment.
- Assess the visual impacts associated with the proposed Facility.

The VIA was prepared by, and with oversight from, a professional with experience in developing visual impact assessments. It is also consistent with the policies, procedures, and guidelines contained in established visual impact assessment methodologies.

The visual study area for the Facility was defined as the area within a 10-mile radius of the Project Area (Study Area). The 10-mile study area encompasses approximately 946 square miles, and includes portions of Crawford, Erie, Huron, Richland, Sandusky, and Seneca Counties. Municipalities that occur within ten miles of the proposed Facility include six cities (Norwalk and Willard in Huron County; Sandusky and Huron in Erie County; Bellevue in Sandusky, Erie, and Huron Counties; and Clyde in Sandusky County); 13 villages (Bloomville, Attica, and Republic in Seneca County; Berlin Heights, Bay View, and Castalia in Erie County; Milan in Erie and Huron Counties; Monroeville and North Fairfield in Huron County; Plymouth in Huron and Richland Counties; and Chatfield, Tiro, and New Washington in Crawford County); and 42 Townships (Auburn, Chatfield, Cranberry, Liberty, Sandusky, Vernon, and Lykens in Crawford County; Berlin, Berlin Annex, Groton, Huron, Margaretta, Margaretta Annex, Milan, Oxford, and Perkins in Erie County; Bronson, Fairfield, Greenfield, Hartland, Lyme, New Haven, Norwalk, Norwich, Peru, Richmond, Ridgefield, Ripley, Sherman, and Townsend in Huron County; Cass and Plymouth in Richland County; Green Creek, Riley, Townsend, and York in Sandusky County; and Adams, Bloom, Reed, Scipio, Thompson, and Venice in Seneca County).

(a) *Project Visibility and Viewshed Analysis*

An analysis of Facility visibility was undertaken to identify those locations within the visual Study Area where there is potential for the proposed wind turbines to be seen from ground-level vantage points. This analysis included identifying potentially visible areas on viewshed maps and verifying visibility in the field. The methodology employed for each of these assessment techniques is described in the VIA, to be submitted as a supplemental filing. Results are summarized below, with additional detail to be found in the VIA.

Viewshed Analyses

The bare-earth Digital Elevation Model (DEM) blade-tip viewshed analysis indicates that areas where there is no possibility of seeing the Facility are extremely limited, consisting of a few topographic depressions, such as quarries and portions of river/stream valleys. Based on the screening effect of topography alone, one or more Facility turbines will be visible from approximately 98% of the Study Area.

Factoring vegetation and structures into the viewshed analysis, through use of the lidar/NLCD-derived Digital Surface Model (DSM), provides a more accurate reflection of what the actual extent of Facility

visibility is likely to be. The blade tip viewshed analysis indicates that approximately 57.5% of the Study Area will have potential views of some portion of a wind turbine. Visibility will be eliminated in small areas throughout the Study Area where blocks of forest vegetation occur, along forested stream corridors, and is drastically reduced or eliminated in cities and villages due to screening provided by trees and structures. In general, areas of screened views increase in size with distance from the Facility. Based on the DSM viewshed, sizable areas of no or limited turbine visibility include the Cities of Clyde, Bellevue, Norwalk, Willard, Huron, and Sandusky; the Villages of Attica, Republic, Bloomville, Castalia, Bay View, Berlin Heights, Milan, Monroeville, North Fairfield, Plymouth, New Washington, Chatfield, Tiro, and Plymouth; the West Branch Huron River, East Branch Huron River, Huron River, Honey Creek, Sycamore Creek, and Silver Creek corridors; and the northeastern portion of the Study Area.

The results of the FAA warning light viewshed analysis are very similar to those of the blade tip analysis, except that it illustrates that the Facility's potential nighttime visibility covers a somewhat smaller geographic area. Considering the screening of topography, vegetation, and structures, potential nighttime turbine visibility is indicated within 48.1% of the visual Study Area.

Field Verification

The field review suggested that portions of the Facility will be visible throughout most of the Study Area due to the flat topography and the abundance of open agricultural land. The field review confirmed a general lack of open views toward the Facility from developed areas with an abundance of structures and street/yard trees, particularly in the Cities of Clyde, Bellevue, Norwalk, Willard, Huron, and Sandusky; and the various villages within the study area (including Attica, Republic, Bloomville, Castalia, Bay View, Berlin Heights, Milan, Monroeville, North Fairfield, Plymouth, New Washington, Chatfield, Tiro, and Plymouth). Consequently, views of the Facility from the majority of residences and historic sites within these residential areas are anticipated to be fully or partially screened. In general, only on the outskirts of these developed areas, where open fields adjoined residential areas, were open views available in the direction of the Facility. Views of Project turbines were most available from the more rural/agricultural portions of the Study Area. Some screening will be provided by wood lots, hedgerows, farm buildings, rural residences and yard trees. Long distance views are likely to be unavailable where homes and roads are surrounded by vegetation, as the lack of topography allows the foreground and midground vegetation to screen the view. Field review also confirmed that the Facility will be visible from most of the transportation corridors in the Study Area.

The largest concentration of sensitive sites is found within the cities and villages in the Study Area. Field review of these confirmed that visibility from the majority will be partially to fully screened, because of the surrounding built environment. More discussion of Facility visibility from sensitive sites is presented in the VIA (to be submitted as a supplemental filing), which also includes, in Appendix B, a comprehensive summary of potential visibility from land and water recreation areas, recreational trails, scenic rivers, scenic routes or byways, and registered landmarks of historic, religious, archaeological, scenic, natural, or other cultural significance within 10 miles of a proposed turbine site.

(b) *Description of Scenic Quality of Existing Landscape*

As previously discussed, land use within the visual Study Area is dominated by agricultural land, farms, and rural and suburban style residences. Rural residential development occurs at a very low density throughout the agricultural portions of the Study Area. Hamlets are relatively small pockets of development within a primarily rural/agricultural landscape. Higher density residential and commercial development is concentrated in the Cities of Clyde, Bellevue, Norwalk, Willard, Huron, and Sandusky, and the Villages of Monroeville, Attica, Castalia, Milan, and Republic. The city and villages are generally characterized by a main street business district, surrounded by traditional residential neighborhoods, with some commercial frontage development along the outskirts. Some suburban residential and commercial development occurs around the periphery of the city and villages in the Study Area. Commercial/industrial uses within the Study Area also occur on the outskirts of the city and villages, and along certain portions of state and county highways in the area.

Vegetation in the Study Area is dominated by active agricultural land (crop fields), followed by developed/open space (residences/yards), and some deciduous forest areas (woodlots). Many of the fields and roadsides have man-made or modified ditches that help maintain drainage for proper growing conditions. Forestland is limited to isolated woodlots between crop areas and along roads. Water features within the Study Area include the Huron River (including east and west branches), Slate Run, Mills Creek, Honey Creek, Frink Run, Lake Erie, and Sandusky Bay, along with various reservoirs, small ponds, and tributary streams. The West Branch Huron River is a dominant feature within the Study Area and is characterized by a meandering stream following through a moderately wooded corridor. The river experiences moderate fishing use and is seasonally canoeable. The northern portion of the visual Study Area also contains Lake Erie and Sandusky Bay, two of the principal water bodies of northern Ohio. Both offer recreational activities such as boating, swimming, bird watching, water sports, and hunting. Reservoirs represent some of the larger water bodies within the Study Area and may experience some recreational use. However, the majority of the water features within the visual Study Area are small ponds

and streams that occur primarily in residential communities. As such, these areas may receive limited use by the general public and are not major visual components of the landscape.

The definition of landscape types found in the Study Area provides a useful framework for the analysis of available visual resources and viewer circumstances. These landscape types, referred to in the VIA as Landscape Similarity Zones (LSZs), are defined based on the similarity of landscape features such as landform, vegetation, water, and land use patterns, as well as characteristics that affect visual sensitivity, such as the availability of open views, scenic quality, and user activity. Within the visual Study Area, four major LSZs were defined:

- Rural Residential/Agricultural Zone,
- City/Village Zone,
- Suburban Residential Zone,
- Transportation Corridor Zone.

The Rural Residential/Agricultural LSZ is the dominant landscape type that occurs throughout the Study Area and is visually recognizable by its working landscape characteristics. The landscape in this zone is characterized by uniformly level topography with a mix of farms and associated crop fields, rural residences, hedgerows, small woodlots, and occasional water features. The dominant land use is crop farming (primarily soybeans and corn), along with small amounts of pasture. Due the prevalence of open agricultural fields, open views are generally available within this LSZ. These views generally feature an agricultural field in the foreground and middle ground that is backed by distant forest vegetation or farming structures in the background. Often, manmade elements such as working farm equipment, barns, silos, fencing, and widely scattered residences can be seen at varying distances throughout the view. In some areas of this LSZ, water features are present in the form of creeks, small ponds, and reservoirs. The elevated earthen embankments of the reservoirs and the larger expanse of open water provide additional opportunities for long distance views towards the Facility. Due to the siting of the turbines almost exclusively within this zone and the abundance of open fields, viewers will be afforded foreground (0-0.5 mile), midground (0.5-4.0 miles), and background (>4.0 miles) views of the proposed Facility from many areas within the Rural Residential/Agricultural LSZ.

The City/Village LSZ includes the downtown portion of the Cities of Norwalk, Willard, Bellevue, Huron, Sandusky, and Clyde and the Villages of Chatfield, New Washington, Tiro, Monroeville, North Fairfield, Plymouth, Attica, Bloomville, Republic, Bay View, Berlin Heights, Castalia, and Milan. The majority of

this zone is characterized by an array of high to moderate-density commercial development concentrated along a main street that transitions to residential development outside of the central business district. In some instances, such as in the Cities of Huron and Norwalk and the Village of Milan, riparian vegetation and landform associated with the Huron River become more dominant and contribute to the visual character of the City/Village zone. In these areas, tracts of mature forest vegetation and water bodies become dominant features within the city or village limits. The shoreline of Lake Erie is also a prominent feature in the City/Village LSZ in waterfront cities such as Sandusky and Huron. Elsewhere in this zone, vegetation and landform contribute to visual character in city and village areas, but buildings (typically 2-3 stories tall) and other man-made features dominate the landscape. These features are highly variable in their size, architectural style, and arrangement, but are typically dominated by masonry or wood-sided buildings fronting on an organized grid of local streets. Scenic quality is generally moderate and influenced largely by the arrangement and condition of built structures in the view. Views within this zone are typically focused on the roadways and adjacent structures, although outward views across yards, adjacent fields, and water bodies are available at the outskirts of these areas, where structures and vegetation density decrease and therefore screening is reduced. Views of the Facility turbines will generally be screened by structures but could occasionally be available from open road corridors oriented toward the project site.

The Suburban Residential LSZ is dominated by low to medium-density residential neighborhood development that typically occurs on the outskirts of the City/Village LSZ. Buildings (typically 1-2 stories tall) and other man-made elements dominate this LSZ, with vegetation primarily limited to ornamental trees and shrubs within a manicured lawn. Topography is generally level throughout the majority of this zone but becomes slightly more rolling in communities around the Huron River valley. Residential neighborhoods in this region are also surrounded by tracts of mature forest vegetation, and mature trees are relatively common within these neighborhoods in addition to the ornamental plantings prevalent throughout the majority of this zone. Scenic quality is unremarkable, although homes and yards generally appear neat and well maintained, and residences are more spread out than in a village setting. Open views to the surrounding landscape are generally more restricted than in open agricultural areas, but more available than in the cities and villages due to the wider spacing of the homes and yards. The effect of vegetation on visibility is highly variable in this LSZ, with adjacent agricultural fields offering open views in some areas, and hedgerows, woodlots, and yard trees significantly blocking views in others, especially in riparian areas around the Huron River. Land use in this zone is almost exclusively residential.

The Transportation Corridor LSZ includes divided multi-lane highways with limited access and heavily-traveled U.S. highways. These include Interstate 80/90 and U.S. Routes 20 and 250. Views along these transportation corridors are dominated by automobiles, pavement, guard rails, and signs in the foreground. Surrounding land use is predominantly open agricultural land and forest vegetation but may include high density commercial development where the corridors pass through cities. Scenic quality is largely defined by the surrounding landscape but is generally compromised by the abundance of transportation infrastructure in the view.

Scenic quality in the Study Area generally ranges from low to moderate, depending on the variety and arrangement of landscape features in the view. Additional information about the LSZs, including representative photos of each LSZ, can be found in the VIA (to be submitted as a supplemental filing).

(c) *Landscape Alterations and Impact on Scenic Quality of the Landscape*

Construction and operation of the proposed Facility will result in an alteration to the existing landscape through the introduction of tall, lit, moving structures where currently there are none. The VIA indicates that the proposed Facility's overall contrast with the visual/aesthetic character of the Study Area will also be variable. Insignificant to moderate contrast was noted for viewpoints where one or more of the following occurs: existing turbines are present, existing vegetation provides at least partial screening, or distance reduces the turbines' perceived line and scale contrast with the landscape. More substantial contrast was noted where unscreened foreground and near midground views of turbines are available where currently no turbines are visible, or where the proposed Facility increases perceived turbine density and visual clutter increases perceived turbine density and visual clutter. In most settings, addition of the proposed Facility will not alter the landscape character, scenic quality, or activities of various user groups. However, the visibility and visual impact of the wind turbines will be variable, based on landscape setting, the extent of natural screening, and distance of the viewer from the Facility.

Based upon the nighttime photos/observations of existing wind power projects, the red flashing lights on the turbines could result in a potential nighttime visual impact (i.e., a landscape alteration). The actual significance of this impact from a given viewpoint will depend on how many lighted turbines are visible, what other sources of lighting are present in the view, the extent of screening provided by structures and trees, and nighttime viewer activity/sensitivity. It should be noted that nighttime visibility/visual impact will be limited in cities, villages, hamlets, and along highways where existing lights already compromise dark skies and compete for viewer attention. However, night lighting could be somewhat distracting and have an adverse effect on rural residents that currently experience dark nighttime skies.

The low to moderate scenic quality within the working agricultural landscape that makes up the majority of the visual Study Area serves to limit the Facility's visual impact. There are no National Parks, National Forests, National Wildlife Refuges, National Natural Landmarks, federally designated scenic rivers, State Parks, or State Forests within the visual Study Area.

(d) *Visual Impacts to Landmarks of Cultural Significance*

The DSM viewshed analysis indicates that views of the Facility will be fully screened from 263 of the inventoried visually sensitive resources. These include 147 NRHP-listed resources, 28 NRHP-eligible resources, and 88 other locally significant resources (see Appendix B of the VIA). Only one of the inventoried visually sensitive resources (an NRHP-eligible bridge that carries TR 80 over Royer Ditch, in Thompson Township) is indicated as having fully unobstructed views of the Facility, while the remaining 259 identified resources are indicated as having a combination of open and screened views, depending on the exact location of the viewer within the resources mapped boundary.

(e) *Photographic Simulations*

To illustrate anticipated visual changes associated with the proposed Facility, photographic simulations of the completed Facility from nine selected viewpoints were used to evaluate Project visibility, appearance, and contrast with the existing landscape. The visual simulations are included as Appendix D of the VIA (to be submitted as a supplemental filing). Review of these images, along with photos of the existing view, allowed for comparison of the aesthetic character of each view with and without the proposed Facility in place. The VIA includes a detailed discussion of each simulation. Evaluation by an aesthetics expert indicates that the Facility's overall contrast with the visual/aesthetic character of the area will range from insignificant to appreciable.

Insignificant to moderate contrast was noted for viewpoints located more than 1.5 miles from the Facility, particularly where existing vegetation provides at least partial screening, or where existing vertical elements (such as trees and utility poles) in the foreground or mid-ground reduces the turbines' perceived line and scale contrast with the landscape. Moderate to appreciable contrast was noted where foreground and near mid-ground views of turbines (i.e., under 1.3 miles) are available, especially from open agricultural areas. Under these circumstances, the Facility's strong scale and line contrast with existing landscape features, and with viewer activity was noted. However, contrast was substantially reduced when views of the turbines were more distant or screened.

Based on experience with currently operating wind power projects elsewhere, public reaction to the Facility is likely to be generally positive, but highly variable based on proximity to the turbines, the affected landscape, and personal attitude of the viewer regarding wind power. As Stanton (1996) notes, although a wind power project is a man-made facility, what it represents "may be seen as a positive addition" to the landscape.

(f) *Impact Minimization Measures*

Mitigation options are limited, given the nature of the Facility and its siting criteria (i.e., tall structures typically located in open fields). The VIA evaluates various impact minimization measures, as summarized below:

Project Area Location

As described in Section 4906-4-04, the selection of possible sites for development of wind power facilities is constrained. Projects must be located in areas with adequate wind resource proximate to electric transmission lines with unused capacity sufficient to accept energy from the facility, and situated in locations that can accommodate setback, land use, and environmental restrictions imposed by local, state, and federal laws. The Emerson Creek Wind Farm area was selected because it meets these criteria and has willing land lease participants and host communities. Furthermore, since wind turbines are tall, lit, moving structures, they generally remain somewhat visible regardless of Project location. Therefore, changing the Project location to a different windy agricultural area would not be effective in mitigating the Facility's visual impacts.

Lighting

Turbine lighting will adhere to FAA regulations. Medium intensity red strobes will be used at night, rather than white strobes or steady burning red lights. Lighting at the proposed substation will adhere to utility standards and be kept to a minimum and turned on only as needed by switch or motion detector.

Turbine Layout

Again, because of the extent of the Facility, the number of individual turbines, and the variety of viewpoints from which the Facility can be seen, turbine relocation within the Project Area will generally not significantly alter visual impact. Where visible from sensitive resources within the Study Area (e.g., local parks, historic locations, and heavily used roadways) numerous turbines are likely to be visible, and relocation of individual turbines would have little effect on overall visual impact. Throughout the Study

Area, available views of the Facility include different turbines at different distances from the viewer. Therefore, turbine relocation would generally not be effective in mitigating visual impacts.

Visual Screening

Views of the proposed turbines from cities and villages, where the majority of the residents and sensitive historic sites are located, are typically well screened by intervening structures and trees. Midground and background views in the more rural portions of the Study Area, including views from sensitive sites, are generally at least partially screened by hedgerows and woodlots. Due to the height of individual turbines and the geographic extent of the proposed Facility, screening of individual turbines with earthen berms, fences, or planted vegetation will generally not be effective in reducing Facility visibility or visual impact. These visual impacts are comparable to previous OPSB-approved wind generating facilities.

Facility Coloration

The white color of wind turbines (as mandated by the FAA to eliminate the need for day time lighting) minimizes contrast with the sky under most conditions, especially when viewed at distance against the horizon. The size and movement of the wind turbine blades prevents more extensive camouflage from being a viable mitigation alternative (i.e., they cannot be made to look like anything else).

Maintenance

The turbines and turbine sites will be maintained to ensure that they are operating efficiently. Research and anecdotal reports indicate that viewers find wind turbines more appealing when the rotors are turning (Stanton, 1996; Pasqualetti et al., 2002).

In addition to the mitigation measures described above, other measures that will reduce or mitigate visual impact have been incorporated into the Project design. These include the following:

- All turbines will have uniform design, speed, color, height and rotor diameter.
- The Project operations and maintenance building (although not yet designed) will reflect the vernacular architecture of the area (i.e., resemble an agricultural structure), or, preferably, will reuse an existing structure within the community that is currently vacant.
- New road construction will be minimized by utilizing existing farm lanes whenever possible.
- The placement of any advertising devices on the turbines will be prohibited.

(E) AGRICULTURAL DISTRICT IMPACTS

(1) Agricultural Land and Agricultural District Land Map

Agriculture is the dominant land use in the Project Area. Figure 08-8 depicts agricultural land, agricultural district land, and land eligible for Current Agricultural Use Value (CAUV) program within the Project Area.

(2) Potential Impacts and Proposed Mitigation

Significant impacts to agricultural land have been avoided through careful Facility design, which deliberatively sited Facility components along field edges/hedgerows to the extent practicable. Each wind turbine location, along with the locations for associated infrastructure, was individually inspected during field efforts by the Applicant and/or its consultants.

(a) *Acreage Impacted*

Table 08-21 quantifies impacts to agricultural land uses, based on the typical area of vegetation clearing column presented in Table 03-1.

Table 08-21. Impacts to Agricultural Land Uses

Agricultural Land Use[1]	Total Disturbance (acres)	Temporary Disturbance (acres)	Permanent Loss (acres)
Agricultural Vacant (100 or 110)	853.5	800.0	53.5
Wind Turbines and Workspaces	*305.4*	*304.0*	*1.4*
Access Roads	*92.3*	*51.4*	*40.9*
Buried Electrical Collection Cable	*430.0*	*430.0*	*0.0*
O&M Buildings	*5.0*	*0.0*	*5.0*
Laydown Yards	*12.7*	*12.7*	*0.0*
Substation	*6.1*	*0.0*	*6.1*
Meteorological Towers	*2.0*	*1.9*	*0.1[2]*
Cash Grain or General Farm (101 or 111)	378.5	358.0	20.5
Wind Turbines and Workspaces	*168.3*	*167.5*	*0.8*
Access Roads	*44.6*	*25.0*	*19.6*
Buried Electrical Collection Cable	*164.6*	*164.6*	*0.0*
O&M Buildings	*0.0*	*0.0*	*0.0*
Laydown Yards	*0.0*	*0.0*	*0.0*
Substation	*0.0*	*0.0*	*0.0*
Meteorological Towers	*0.0*	*0.0*	*0.1[2]*
Other Agricultural Use (199)	207.5	199.0	8.5
Wind Turbines and Workspaces	*77.5*	*77.0*	*0.5*

Agricultural Land Use[1]	Total Disturbance (acres)	Temporary Disturbance (acres)	Permanent Loss (acres)
Access Roads	*18.0*	*10.0*	*8.0*
Buried Electrical Collection Cable	*112.0*	*112.0*	*0.0*
O&M Buildings	*0.0*	*0.0*	*0.0*
Laydown Yards	*0.0*	*0.0*	*0.0*
Substation	*0.0*	*0.0*	*0.0*
Meteorological Towers	*0.0*	*0.0*	*0.0*
Total[3]	1,439.5[3]	1,357.0[3]	82.5[3]

[1] From land use codes in Huron and Erie County parcel shapefiles.

[2] Permanent impacts from meteorological towers will be 0.06 acre per tower. Two of the proposed meteorological tower sites are located in Agricultural Vacant land use (0.12 acre), while the third proposed site is located in Cash Grain or General Farm land use. For purposes of this table, both those values round to 0.1 acre. The total permanent impact from meteorological towers will be 0.18 acre.

[3] This breakdown of impact acreages differs somewhat from those presented in Table 08-9 and Table 08-15. The ecological community impacts presented in Table 08-9 were derived from ODNR data, which are different in two significant ways: (1) they include non-agricultural communities, such as forestland and urban lands, that are not included here; and (2) the data source contains polygons defined by community boundaries, not by parcel boundaries. The land use impacts in Table 08-15 and the agricultural land impacts presented here were both derived from parcel data, which assigns a single land use code to each parcel in entirety. However, this table only presents impacts that occur within agricultural land uses, so total impacts differ because other lands are not included (e.g., residential, industrial, etc.). As reflected both above and in Table 08-15, total impacts to agricultural lands will be 1,439.5 acres; temporary impacts to agricultural land will be 1,357.0 acres; and permanent impacts to agricultural land will be 82.5 acres.

Table 08-22 quantifies impacts to agricultural district land, based on the typical area of vegetation clearing column presented in Table 03-1.

Table 08-22. Impacts to Agricultural District Land

Agricultural District Land[1]	Total Disturbance (acres)	Temporary Disturbance (acres)	Permanent Loss (acres)
Huron County			
Wind Turbines and Workspaces	84.5	84.0	0.5
Access Roads	31.2	17.2	14.0
Buried Electrical Collection Cable	112.6	112.6	0.0
O&M Buildings	5.0	0.0	5.0
Laydown Yards	12.7	12.7	0.0
Substation	0.0	0.0	0.0
Meteorological Towers	0.0	0.0	0.0
Total[4]	246.0[2]	226.5[2]	19.5[2]

[1] Agricultural district data requested from Huron and Erie County Auditors. Erie County does not have designated agricultural districts.

[2] This breakdown of impact acreages differs from those presented elsewhere in this Application, because this table only includes impacts from Facility components located within designated Agricultural Districts.

For property tax purposes, farmland devoted exclusively to commercial agriculture may be valued according to its current use rather than at its "highest and best" potential use. This provision of Ohio law

is known as the CAUV program. By permitting values to be set well below true market values, the CAUV normally results in a substantially lower tax bill for working farmers. To qualify for the CAUV, land must meet one of the following requirements during the three years preceding an application for the CAUV: ten or more acres must be devoted exclusively to commercial agricultural use; or if under ten acres are devoted exclusively to commercial agricultural use, the farm must produce an average yearly gross income of at least $2,500. Table 08-23 quantifies impacts to CAUV-eligible land, based on the typical area of vegetation clearing column presented in Table 03-1.

Table 08-23. Impacts to CAUV Land

Current Agricultural Use Value Lands[1]	Total Disturbance (acres)	Temporary Disturbance (acres)	Permanent Loss (acres)
Wind Turbines and Workspaces	486.1	483.8	2.3
Access Roads	129.1	71.6	57.5
Buried Electrical Collection Cable	634.0	634.0	0.0
O&M Buildings	5.0	0.0	5.0
Laydown Yards	12.7	12.7	0.0
Substation	6.1	0.0	6.1
Meteorological Towers	2.0	1.9	0.1[2]
Total[3]	1,275.0[3]	1,204[3]	71.0[3]

[1] From land use codes in Huron and Erie County parcel shapefiles.

[2] Permanent impacts from meteorological towers will be 0.06 acre per tower. Two of the proposed meteorological towers are located within CAUV lands, for a total of 0.12 acre. For purposes of this table, that value rounds to 0.1 acre.

[3] This breakdown of impact acreages differs from those presented elsewhere in this Application, because this table only includes impacts from Facility components located within designated CAUV lands.

(b) *Impacts on Agricultural Facilities and Practices*

(i) Field operations

As shown above in Table 08-21, construction of Facility access roads, buried interconnects, wind turbines, and other accessory structures will collectively disturb a total of 1,439.5 acres of agricultural lands. Although most of these impacts will be temporary, approximately 82.5 acres of agricultural lands will be converted to built facilities. Access road construction through agricultural fields will include stripping a 36-foot width of topsoil and placing it in windrows along the access road to prevent construction vehicles from driving over undisturbed soil and adjacent fields. Following turbine construction, access road widths will be reduced to 16 feet or less. In locations where buried cable or crosses agricultural fields, construction equipment may disturb soil in a corridor up to an average of 25 feet wide. However, this will represent a temporary disturbance only, and as the cable will be

buried at a minimum depth of 36 inches, will not have a long-term impact on farming practices (e.g., plowing). Crane paths across active agricultural land will be improved to the extent necessary to protect agricultural soils. If conditions allow (i.e., soils are hard and dry) the crane may drive across the ground without stripping of topsoil. If significant rutting or soil disturbance could occur, temporary roads will be developed to accommodate crane passage. Topsoil within a 300-foot radius of each tower will first be stripped and stockpiled. A backhoe will then be used to excavate a foundation hole. Excavated subsoil and rock will be segregated from topsoil during this process. Following construction, the footprint of each turbine will be reduced to approximately 0.03 acre, which includes the turbine pedestal and a gravel skirt around the turbine base. The remaining work area will be restored to agricultural use.

Along with these direct impacts to agricultural land, movement of equipment and material during Facility construction could result in damage to growing crops, damage to fences and gates, and/or temporary blockage of farmers' access to agricultural fields. However, as described in the following section, wind turbines and associated facilities have been located so as to minimize loss of active agricultural land and interference with agricultural operations. Such impacts are not anticipated during Facility operation and maintenance, but landowners will be compensated for any impacts that do occur.

(ii) Irrigation

Irrigation systems are not in widespread use in the Project Area. Potential interference to irrigation operations is very limited and coordination with affected landowners will alleviate potential for significant long-term disruption.

(iii) Field drainage systems

Facility construction could result in damage to subsurface drainage systems (tile lines). Avoidance of damage to drainage systems will be incorporated in Facility design, and mitigation measures will be implemented as outlined below.

(iv) Structures used for agricultural operations

The Facility will not physically impact any agriculturally related structures.

(v) Viability as agricultural district land

The presence of wind turbines will help preserve agricultural land and avoid conversion of that land to other developmental land uses, such as seasonal or permanent high-density residences. Aside from temporary disturbance during construction activities, the Facility is largely compatible with farming practices. Furthermore, the Facility will not result in a change in land use and will promote the long-term economic viability of the affected farms by supplementing the income of participating farmers.

(c) *Proposed Mitigation Procedures*

(i) Avoidance/minimization of damage to field tile drainage systems

Where Facility components are proposed to cross active agricultural fields, an attempt will be made to determine the location of any subsurface drainage tiles through consultation with the landowner and/or review of public records.

(ii) Timely repair of damaged field tile systems

Any drainage tiles damaged during construction will immediately be identified, documented, and repaired. It is anticipated that a local drain tile contractor or the farmer tending the land will be involved in repair activities.

(iii) Topsoil segregation, decompaction, and restoration

Mitigation measures to protect and restore agricultural soils have been incorporated into the siting of Facility components. For example, wind turbines and other structures have been located along field edges, so as to minimize adverse impacts on agricultural land and farming operations. Permanent access road width is limited to 16 feet or less. Where possible, access roads follow hedgerows and field edges to minimize loss of agricultural land. To the extent practicable, existing fields have been kept intact, rather than broken up into smaller, irregularly shaped fields that are more difficult to farm. Parking areas, the laydown yards, and other temporary and permanent support facilities have been located outside of active agricultural fields where possible. Known surface and subsurface drainage features (i.e., ditches, diversions, tile lines) have been avoided.

Additional measures to reduce impacts to agricultural land will be undertaken during Facility construction, operation, and maintenance. These mitigation measures include:

Access Roads Specifications

- Vehicular access to the tower sites will be minimized until permanent access roads have been constructed.
- Roads will be constructed only in locations shown on the construction drawings.
- The boundaries of all work areas will be identified with snow fence, stockpiled topsoil, or other temporary barrier. No vehicles or equipment will be allowed outside the work areas.
- All permanent access roads across agricultural fields will be the minimum width necessary to accommodate construction traffic (i.e., no wider than 16 feet).
- Project schedule permitting, roads across agricultural fields will not be constructed during saturated conditions when their development would damage agricultural soils.
- When constructing access roads on active agricultural land, all topsoil will be stripped from the entire work area and stockpiled in windrows along the road, or in designated temporary storage areas. Temporarily stockpiled topsoil shall be segregated from other excavated material (rock and/or subsoil).
- When stockpiling topsoil in windrows along roads, surface water drainage from the road or adjacent agricultural fields will not be blocked.
- When constructing access roads through active agricultural land, the final road surface will be leveled with the adjacent field surface. During restoration, topsoil will be used to create a smooth transition between the road surface and surrounding agricultural land, so as not to impede crossing by farm equipment.
- Where necessary, culverts or water bars will be installed to assure uninterrupted natural surface water drainage patterns. Such culverts or water bars will be installed in a manner that prevents concentration of water runoff and soil erosion.
- Access roads will be maintained throughout construction so as to allow continued use/crossing by farm machinery. Maintenance will be performed to repair rutting so as to avoid interrupting natural cross drainage of the area or preventing use or crossing of the road by the landowner.
- To prevent damage to adjacent agricultural land, all vehicle traffic and parking will be confined to the access roads, designated work areas at the tower sites, and/or designated parking and material laydown yards. Any necessary pull-offs and parking areas will be developed outside of active agricultural fields. If this is not possible, all topsoil shall be stripped from agricultural areas used for vehicle and equipment traffic and parking, and such areas will be restored at the end of construction.

Laydown Yard Specifications

- Temporary construction parking, laydown, and storage areas on active agricultural land will be developed by removing all topsoil from areas that will receive vehicular traffic. Topsoil will be stockpiled adjacent to the laydown yards in windrows or piles on the same property from which it was removed.
- Storage of construction materials on undisturbed ground will only be permitted if their placement and removal can be accomplished without driving over the undisturbed areas.
- Upon completion of construction, any gravel and/or geotextile mats will be removed, and the soils will be de-compacted and restored as described below in the restoration specifications.

Excavation/Backfill Specifications

- The boundaries of all ROWs and work areas will be identified with snow fence or other temporary barrier. No vehicles or equipment shall be allowed outside the work area.
- All agricultural areas to be disturbed by excavation shall first be stripped of topsoil. Topsoil stripping must be undertaken on the full area to be disturbed by excavation, grading, or piling of excavated subsoil/rock.
- Stripped topsoil will be segregated from subsoil and stockpiled in temporary storage areas on the property from which it was removed.
- All areas to be disturbed by excavation and backfilling will be enclosed within silt fencing or other temporary barrier to define the allowable limits of disturbance. No vehicular activity will be allowed outside the defined work area.
- Excavated subsoil and rock shall not be stockpiled or spoiled on active agricultural land outside the work area.
- Excess excavated subsoil and rock that is not suitable for backfill will be removed from the site. On-site disposal will only occur outside of active agricultural land with permission from the landowner.
- Open excavation areas in active pastureland will be temporarily fenced to protect livestock. All existing fences and gates will be maintained or relocated as necessary to prevent livestock access to the work area and/or escape from fenced enclosures. Following construction, any relocated fencing will be restored to “like new” condition in its original location (or as otherwise agreed upon with the landowner).
- Any water pumped from open excavations shall be directed into temporary sediment traps prior to discharge. Pumping will be done in a manner that minimizes adverse effects on agricultural crops and operations.

- Buried electric lines in active agricultural fields will be at least three feet deep, unless bedrock is encountered prior to reaching this depth. If bedrock is encountered, the buried lines will be placed completely below the bedrock surface.
- Backfill will utilize excavated subsoil and rock whenever possible. If this material is determined to be unsuitable as backfill, select granular fill (e.g., bank run gravel) will be utilized in its place. No rock backfill will be used in the top 24 inches in active agricultural fields.

Foundation Specifications

- Concrete trucks will be restricted to designated access roads and crane pads at all times.
- Excess concrete shall be disposed of off-site, unless otherwise approved by the landowner. Under no circumstances shall it be buried or left on the surface in active agricultural areas.
- Concrete trucks will be washed in foundation holes, or outside of active agricultural areas in locations approved by the landowner.
- In active pasture areas, foundations treated with concrete curing compound or sealer shall be temporarily fenced to prevent access by livestock.

Turbine Erection Specifications

- Any grading to accommodate crane pads and material laydown at the turbine sites will be confined to the designated work area around each foundation.
- Topsoil will be stripped from crane pad locations and work areas around foundations and stockpiled in areas designated on the construction drawings.
- Erection cranes will be restricted to designated access roads and work pads at the structure sites. Crane set-up and break-down activities will not occur outside these areas in active agricultural land.
- Crane paths across active agricultural land will be improved to the extent necessary to protect agricultural soils. If conditions allow (i.e., soils are hard and dry) the crane may drive across the ground without stripping of topsoil. If leveling of the ground is required, such leveling will be kept to a minimum, and topsoil will not be mixed with subsoil. If significant rutting or soil disturbance could occur, temporary roads will be developed to accommodate crane passage.
- Development of temporary roads, if necessary, across agricultural land will involve stripping and stockpiling of topsoil and may involve placement of gravel over a geotextile mat. Following use by the crane, any gravel and matting will be removed, and soils restored in accordance with the restoration specifications described below.

- The contractor will immediately pick up and dispose of any pieces of wire, bolts, staples, or other small metallic objects that fall to the ground in active pastureland.

Restoration Specifications

- Following completion of construction, excess gravel/fill will be removed from along access roads and crane paths, crane pads, around towers, and the laydown yards.
- Exposed subsoils will be de-compacted with a deep ripper or heavy-duty chisel plow to a minimum depth of 18 inches. Soil de-compaction shall be paid for by the Applicant.
- Following de-compaction of the subsoil, the surface of the subsoil will be picked over to remove all rocks four inches in size or larger. Following rock picking, stockpiled topsoil will be returned to all disturbed agricultural areas. The topsoil will be re-graded to match original depth and contours to the extent possible.
- The surface of the re-graded topsoil will be disked, and any rocks over four inches in size will be removed from the soil surface. Restored topsoil will be stabilized with seeding and/or mulching, unless other arrangements have been made with the landowner.
- De-compaction of crane paths over otherwise undisturbed agricultural land will be accomplished using a deep ripper or heavy chisel plow as needed.
- All access roads will be re-graded as necessary to create a smooth travel surface, allow crossing by farm equipment, and prevent interruption of surface drainage. Temporary water bars and culverts shall be removed if they are no longer necessary.
- Restored agricultural areas will be stabilized with seed and/or mulch. In areas to remain in hay production, an appropriate seed mix will be selected in consultation with the landowner. If future crop type is undetermined at the time of restoration, the site shall be seeded with annual rye or similar cover crop, or as agreed to with the landowner. If restoration occurs outside of the growing season, restored areas will be stabilized by mulching with hay or straw.
- Any surface or subsurface drainage features, fences, or gates damaged during construction shall be repaired or replaced as necessary.
- All construction debris will be removed and disposed of off-site at the completion of restoration.
- The Applicant will review restored agricultural land with the landowner during the following growing season to identify and correct any Facility-related problems that may not have been apparent immediately following restoration.

4906-4-09 REGULATIONS ASSOCIATED WITH WIND FARMS

The Applicant commits to comply with the regulations established by the OPSB as set forth below.

(A) CONSTRUCTION, LOCATION, USE, MAINTENANCE, AND CHANGE

(1) Adherence to Other Regulations

The Applicant will construct and operate the Facility consistent with all applicable federal and state requirements including all applicable safety, construction, environmental, electrical, communications, and FAA requirements.

(2) Construction, Operations, and Maintenance Safety

The Applicant will ensure utilization of equipment and construction practices align with those set forth in this Application.

(a) *Equipment Safety*

(i) Manufacturer's Safety Manual

The Applicant will comply with the manufacturer's most current safety manuals, unless such safety manual conflicts with OAC Rule 4906-4-08(C)(2).

(ii) Displaying Manufacturer's Safety Manual

The Applicant will maintain a copy of the manufacturer's safety manual in the Facility's O&M building, depicted on Figure 03-2.

(b) *Geologic Features*

(i) Geotechnical exploration

At least 60 days prior to the preconstruction conference, the Applicant will provide a fully detailed geotechnical exploration and evaluation to confirm that there are no issues to preclude development of the Facility.

(ii) Boring results

The geotechnical report will include borings at each turbine location to provide subsurface soil properties, static water level, rock quality description, percent recovery, and depth and description of the bedrock contact. Recommendations for final design and construction of each wind turbine foundation, as well as the final location of the collection substation will be included in the geotechnical report.

(iii) Borehole closures

The Applicant will fill all boreholes. Abandoned boreholes will comply with state and local regulations.

(iv) Copies of boring logs

The Applicant will provide copies of all geotechnical boring logs to OPSB staff and ODNR Division of Geological Survey staff prior to construction.

(c) *Blasting*

As indicated in Section 4906-4-08(A)(5)(a) and Exhibit E of this Application, blasting is not anticipated. In the unlikely event that site-specific conditions necessitate blasting, it would be conducted in accordance with all applicable laws and regulations and the Applicant would provide OPSB staff with a blasting plan at least 30 days prior.

(i) Blasting plan

If site-specific conditions warrant blasting, the Applicant will submit the following information as part of its blasting plan:

a. Blasting company contact information

The name, address, and telephone number of the drilling and blasting company.

b. Blasting plan

A detailed blasting plan for dry and/or wet holes for a typical shot. The blasting plan will address blasting times, blasting signs, warnings, access control, control of adverse effects, and blast records.

c. Liability plan

A plan for liability protection and complaint resolution.

(ii) Required licenses and permits

The Applicant does not anticipate requiring the use of explosives. However, should it be determined necessary based on data obtained from the detailed geotechnical exploration, the Applicant or explosive contractor will obtain all required licenses and permits prior to the use of explosives. The Applicant will submit a copy of the license or permit to OPSB staff within seven days of obtaining it from local authority.

(iii) Seismographs

If blasting is needed, the blasting contractor will use two blasting seismographs that measure ground vibration and air blast for each blast. One seismograph will be placed beside the nearest dwelling, or at least at the nearest accessible property line to the dwelling, and the other placed at the discretion of the blasting contractor.

(iv) Notification

If blasting is needed, at least 30 days prior to the initiation of blasting operations, the Applicant will notify, in writing, all residents or owners of dwellings or other structures within 1,000 feet of the blasting site. The Applicant or explosive contractor will offer and conduct a pre-blast survey of each dwelling or structure within 1,000 feet of each blasting site, unless waived by the resident or property owner. The survey will be completed and submitted to OPSB at least 10 days before blasting begins.

(3) Location

The Facility will be installed at the Applicant's proposed Emerson Creek site as presented in this Application. The Facility will comply with requirements outlined in OAC Rule 4906-4-08(C)(2). Please refer to Section 4906-4-08 of this Application for additional details.

(4) Maintenance and Use

(a) *Maintenance*

The Applicant will maintain the Facility equipment in good condition. Maintenance activities will include, but will not be limited to, painting, structural repairs, and security measures.

(b) *Construction and Maintenance Access Plan*

Prior to commencement of construction, the Applicant will provide OPSB with a construction and maintenance access plan based on the final plans for the Facility, access roads, and types of equipment to be used. The plan will:

- Consider the location of sensitive resources, as identified by ODNR, and explain how impacts to all sensitive resources will be avoided or minimized during construction, operation, and maintenance.
- Include locations of erosion control measures.
- Provide specific details on all wetland, streams, and/or ditches to be impacted by the Facility, including those where construction or maintenance vehicles and/or Facility components such as access roads cannot avoid crossing the waterbody. If crossing a waterbody cannot be avoided, the plan will specifically discuss the proposed crossing methodology for each wetland and stream crossing, as well as post-construction site restoration.
- Include the measures to be used for restoring the area around all temporary access points, and a description of any long-term stabilization required along permanent access routes.

(c) *Vegetation Management Plan*

The Applicant will submit a vegetation management plan to OPSB prior to the commencement of construction. The plan will:

- Identify all areas of proposed vegetation clearing for the project, specifying the extent of the clearing, and describing how such clearing work will be done so as to minimize removal of woody vegetation.
- Describe how trees and shrubs around structures, along access routes, at construction staging areas, during maintenance operations, and in proximity to any other project facilities will be protected from damage. Priority will be given to protecting mature trees throughout the Project Area, and all woody vegetation in wetlands and riparian areas, both during construction and during subsequent operation and maintenance of all facilities; low-growing trees and shrubs in particular will be protected wherever possible within the proposed ROWs.
- Explore various options for the disposal of downed trees, brush, and other vegetation during initial clearing activities for the Facility and recommend methods that minimize the movement of heavy equipment and other vehicles within the ROW that would otherwise be required for removing all trees and other woody debris off site.

(d) *Herbicide Use*

For both construction and future ROW maintenance, the Applicant will limit, to the greatest extent possible, the use of herbicide in proximity to surface waters, including wetlands along the ROW. Individual treatment of tall-growing woody plant species is preferred, while general, widespread use of herbicides during initial clearing or future ROW maintenance should only be used where no other options exist, and with prior approval from the Ohio EPA. Prior to commencement of construction, the Applicant will provide to OPSB a description the planned herbicide use for all areas in or near any surface waters during initial Facility construction and future ROW maintenance.

(e) *Post-construction Site Restoration*

The Applicant's post-construction site restoration plan and stabilization of disturbed soils, will include the following:

(i) Temporary Project component

The Applicant will remove all temporary gravel and other construction staging area and access road materials after the completion of construction activities, as weather permits, unless otherwise directed by the landowner.

(ii) Construction material disposal

The Applicant will not dispose of gravel or any other construction material during or following construction of the Facility by spreading such material on agricultural land. All construction debris and all contaminated soils will be promptly removed and properly disposed of in accordance with Ohio EPA regulations.

(5) Change, Reconstruction, Alteration, or Enlargement

(a) *Amendments*

If necessary, any amendment to the Facility's Certificate will be provided to OPSB as an amendment application.

(b) *Modifications*

The Applicant understands that, unless otherwise ordered by the OPSB or administrative law judge, modification(s) shall not be considered amendments under this rule if such modification(s) would be minimal in nature and would be adequately addressed by the conditions of the Certificate.

(c) *Modification Review*

The Applicant understands that:

- The Applicant may seek review of a proposed modification(s) sought under OAC Rule 4906-4-09(A)(5)(b) by filing the proposed modification(s) in this case and providing written notification of such filing to OPSB staff and all landowners immediately adjacent to the site of the proposed modification(s).
- The notification shall reference, and include a copy of, OAC Rule 4906-4-09(A)(5).
- In the filing, the Applicant is to present its rationale as to why it is seeking the proposed modification(s) and must demonstrate that the proposed modification(s) satisfies OAC Rule 4906-4-09(A)(5)(b).
- OPSB staff or any interested person may file objections to the Applicant's proposal within 21 days. If no objections are filed within the 21-day period, the Applicant may proceed with the proposed modification(s). If objections are filed within the 21-day period, OPSB staff may subsequently docket its recommendation on the matter.
- The OPSB will process proposed modification(s) under the suspension process set forth for accelerated applications as outlined in OAC Rule 4906-6-09.

(B) EROSION CONTROL

Within its procedures for inspection and repair of erosion control measures, the Applicant will employ the following erosion and sedimentation control measures, construction methods, and best management practices when working near environmentally-sensitive areas or when in close proximity to any watercourse:

(1) Seeding Disturbed Areas

During construction, the Applicant will seed all disturbed soil, except within actively cultivated agricultural fields, within seven days of final grading. Denuded areas, including spoils piles, will be seeded and stabilized in accordance with the Facility's approved SWP3, if such areas will be undisturbed for more than 21 days. Re-seeding will be conducted in accordance with the Facility's approved SWP3 as necessary until sufficient vegetation in all areas has been established.

(2) Inspection of Erosion Control Measures

The Applicant will inspect and repair all erosion control measures after each rainfall event where one-half inch, or greater, of rain falls over a 24-hour period. Such efforts will continue until permanent vegetative cover is established on disturbed areas.

(3) Marking Watercourses

The Applicant will delineate all watercourses, including wetlands, within and immediately adjacent to the construction limits of disturbance, by fencing, flagging, or other prominent means prior to construction. These sensitive areas will also be depicted on construction drawings.

(4) Watercourse Avoidance

The Applicant will avoid the entry of construction equipment into watercourses, including wetlands, except at specific locations where construction has been approved.

(5) Protection of Sensitive Areas

The Applicant will not store, stockpile, or dispose of equipment or material in the watercourses or wetlands.

(6) Location of Structures

The Applicant will locate structures outside of identified watercourses, including wetlands, except at specific locations where construction has been approved.

(7) Storm Water Runoff

The Applicant will direct storm water from fill slopes and other exposed surfaces to the greatest extent possible, and direct instead to appropriate catchment structures, sediment ponds etc., using diversion berms, temporary ditches, check dams, or similar measures.

(C) AESTHETICS AND RECREATIONAL LAND USE

(1) Vandalism

In the event of vandalism on the Facility, the Applicant will immediately remove or abate the damage to preserve the aesthetics of the project to pre-vandalism condition.

(2) Signage

No commercial signage or advertisements will be placed on any turbine, tower, or related infrastructure, except for reasonable identification of the manufacturer component or the operator of the Facility.

(3) FAA Lighting

The structures that require lighting by the FAA, including construction equipment, will be lit with the minimum lighting required by the FAA. Lighting of other parts of the wind farm, such as associated structures and access roads, will be limited to that required for safety and operational purposes, and shall be reasonably shielded from adjacent properties.

(4) Structure Surfaces

The visible surfaces of wind farm structures will be a non-reflective, matte finished, non-obtrusive, and neutral color such as white, off-white, gray, or beige.

(5) Impact Avoidance Plan

The Applicant will provide a plan to avoid adverse impacts of the Facility on landmarks in the surrounding area. Landmarks consist of those districts, sites, buildings, structures, and objects that are recognized by, registered with, or identified as eligible for registration by the national registry of natural landmarks, the state historic preservation office, or ODNR. If avoidance measures are not feasible, the Applicant will describe why impacts cannot be avoided and provide an evaluation of the impact of the Facility on the preservation and continued meaningfulness of registered or potentially eligible landmarks of historic, religious, archaeological, scenic, natural, or other cultural significance and describe plans to mitigate any adverse impact. The mitigation plan will contain measures to be taken should previously-unidentified archaeological deposits or artifacts be discovered during construction.

(6) Photographic Simulations

The Applicant's VIA, to be submitted as a supplemental filing to this Application, provides photographic simulations or artist's pictorial sketches of the Facility from at least one vantage point in each area of three square miles within the Project Area, showing views to the north, south, east, and west. The photographic simulations and pictorial sketches incorporate the environmental and atmospheric conditions under which the Facility would be most visible.

(D) WILDLIFE PROTECTION

(1) Coordination with USFWS, ODNR, and OPSB

The Applicant will continue to coordinate with the USFWS, ODNR, and OPSB staff to determine if additional actions are necessary to avoid or minimize impacts to state- or federally-listed and protected species or other species which may be impacted. Copies of coordination letters received from the USFWS and ODNR to date

are included as Exhibit K. If USFWS, ODNR, or OPSB staff identify any recommendations for avoidance or minimization of impacts to specific species, the Applicant will describe how it will address such recommendations.

(2) Presence of Threatened or Endangered Species

The Applicant will contact OPSB staff within 24 hours if a state- or federally-listed species are encountered during construction activities. Construction activities that could adversely impact the identified plants or animals will be halted until appropriate action is agreed upon by the Applicant, OPSB staff, and applicable administrative agencies.

(3) Habitat Avoidance

The Applicant will avoid construction in federal- or state-listed and protected species' habitats during seasonally-restricted dates, or at restricted habitat types, as provided by ODNR and USFWS, unless coordination efforts with ODNR and USFWS allows a different course of action.

(4) Post-Construction Avian and Bat Monitoring Plan

The Applicant will submit a post-construction monitoring plan for avian and bat species to OPSB, to be developed in accordance with ODNR Guidelines and USFWS recommendations. Though not anticipated, if significant mortality occurs to birds or bats during operation of the Facility, the Applicant will work with ODNR and USFWS to develop a mitigation plan.

(5) Turbine Curtailment

At least 60 days prior to the first turbine becoming operational, the Applicant will provide OPSB with a description of its plans for maintaining the turbine blades in a stationary, or nearly stationary, stance during low wind speed conditions at night during bird and bat migratory seasons.

(6) Adverse Impact to Listed Species

Construction activities are not anticipated to negatively impact state- or federally-listed species. However, if construction activities result in unanticipated significant adverse impact to state- or federally-listed and protected species, the Applicant will develop a mitigation plan or adaptive management strategy.

(E) ICE THROW

(1) Ice Throw Analysis

An ice throw analysis has been prepared for the Facility (see Exhibit L). The analysis includes the probability of ice throw impacts at the nearest property boundary and public road.

(2) Impact Minimization

The Applicant's plans to minimize the potential impacts of ice throw include:

(a) *Restricting public access to the Facility with appropriately placed signs and other necessary measures,*

(b) *Instructing workers on the potential hazards of ice conditions on wind turbines, and*

(c) *Installing and utilizing an ice warning system to include an ice detector installed on the roof of the nacelle, ice detection software, warranted by the manufacturer to detect ice, for the wind turbine controller, or an ice sensor alarm that triggers an automatic shutdown.*

(3) Ice Throw Safety

The Applicant understands that, in addition to the use of the safety measures enumerated in Section 4906-4-09(E)(2) of this Application, the potential impact from ice throw shall be presumptively deemed to satisfy safety considerations if the probability of one kilogram of ice landing beyond the statutory property line setback for each turbine location is less than one percent per year.

(F) SOUND

(1) Construction Hours

General construction activities will take place between 7:00 a.m. and 7:00 p.m., or until dusk during times when the sun sets later than 7:00 p.m. Impact pile driving, hoe ramming, and blasting operations will only occur between 10:00 a.m. and 5:00 p.m. Monday through Friday. The Applicant understands that construction activities that do not involve sound increases above ambient levels at sensitive receptors (i.e., occupied buildings) are permitted outside of daylight hours, when necessary. The Applicant will notify property owners and affected tenants within the meaning of OAC Rule 4906-3-03(B)(2) of upcoming construction activities including potential for nighttime construction activities.

(2) Operation Sound Limits

The Facility will be operated so that it does not result in sound levels at any non-participating[13] sensitive receptor (i.e., occupied building) within 1 mile of the Project Boundary that exceed the Project Area ambient nighttime average sound level (Leq) by five A-weighted decibels (dBA). The Applicant understands that, during daytime operation only (7:00 a.m. to 10:00 p.m.), the Facility may operate at the greater of: the Project Area ambient nighttime Leq plus 5 dBA; or the validly measured ambient Leq plus 5 dBA at the location of the sensitive receptor. After commencement of commercial operation, the Applicant will conduct further review of the impact and possible mitigation of all project-related sound complaints through its complaint resolution process (see Exhibit M).

(G) BLADE SHEAR

The Applicant will provide plans to minimize potential impacts from blade shear, including restricting public access to the Facility with properly placed warning signs or other necessary measures, and instructing workers on the potential hazards.

(1) Turbine Equipment

To minimize the possibility of blade shear, all wind turbine generators considered by the Applicant for use in the Project will be equipped with the following:

(a) *Braking system*

Two independent braking systems, which may include aerodynamic overspeed controls and mechanical brakes operated in a fail-safe mode but shall not include stall regulation.

(b) *Pitch control system*

(c) *Lightning protection system*

(d) *Turbine shutoffs*

Turbine shutoffs in the event of excessive wind speeds, uncontrolled rotation, excessive blade vibration, stress, or pressure on the tower structures, rotor blades, and turbine components.

[13] As used in this context, "non-participating" refers to a property for which the owner has not signed a waiver or otherwise agreed to be subject to a higher sound level.

(2) Safety Feature Bypass

Bypass or override of wind turbine safety features or equipment will be prohibited.

(3) Industry Standards

Design of the wind turbine generators will conform to industry standards, as effective at the time of this Application, including: the IEC, the American National Standards Institute (ANSI), or other equivalent industry standard. The Applicant will submit certificates of design and compliance obtained by the equipment manufacturers from underwriter laboratories, det Norske veritas, Germanischer Lloyd wind energies, or other similar certifying organization.

(H) SHADOW FLICKER

(1) Avoidance

The Facility will be designed to avoid unreasonable adverse shadow flicker effect at any non-participating[14] sensitive receptor (i.e., occupied building) within 1,000 meters of any turbine. At a minimum, the Facility will be operated so that shadow flicker levels do not exceed 30 hours per year at any such receptor.

(2) Shadow Flicker Complaints

Following the commencement of Facility operation, the Applicant will conduct further review of the impact and possible mitigation of all project-related shadow flicker complaints through its complaint resolution process (see Exhibit M).

(I) DECOMMISSIONING AND REMOVAL

(1) Decommissioning Plan

The Applicant will provide the final decommissioning plan to the OPSB and the County Engineers at least 30 days prior to the preconstruction conference. The decommissioning plan will:

(a) *Indicate the Intended Future Land Use*

The decommissioning plan will describe the intended land use for the Facility site following decommissioning and reclamation.

[14] As used in this context, "non-participating" refers to a property for which the owner has not signed a waiver or otherwise agreed to be subject to a higher shadow flicker level.

(b) *Describe Engineering Techniques & Equipment, Surface Water Drainage Plan, and Soil Restoration Plan*

The decommissioning plan will describe the engineering techniques and main equipment to be used in decommissioning and reclamation; a surface water drainage plan and any proposed impacts that would occur to surface and ground water resources and wetlands; and a plan for backfilling, soil stabilization, compacting, and grading.

(c) *Provide a Detailed Timetable*

The decommissioning plan will provide a detailed timetable for the accomplishment of each major step in the decommissioning process, including the steps to be taken to comply with applicable air, water, and solid waste laws and regulations and any applicable health and safety standards in effect as of the date of submittal.

(2) Revised Decommissioning Plan

The Applicant will file a revised decommissioning plan to the OPSB and County Engineers every five years following the commencement of construction. The revised plan will include advancements in engineering techniques and reclamation equipment and standards. The revised plan will be applied to each five-year decommissioning cost estimate.

(3) Completion of Decommissioning

The Applicant will, at its expense, complete decommissioning of the Facility, or individual wind turbines, within the 12-month period following the end of the useful life of the Facility or individual wind turbines. The Applicant understands that: if no electricity is generated for a continuous period of 12 months, or if the OPSB deems the Facility or turbine to be in a state of disrepair warranting decommissioning, the wind farm or individual wind turbines will be presumed to have reached the end of its useful life; the OPSB may extend the useful life period for the wind farm or individual turbines for good cause as shown by the Applicant; and the OPSB may require decommissioning of individual wind turbines due to health, safety, wildlife impact, or other concerns that prevent the turbine from operating within the terms of the certificate.

(4) Structure Removal

Decommissioning activities will include: the removal and transportation of wind turbines and towers off site; the removal of buildings, cabling, electrical components, access roads, and other associated facilities, unless otherwise mutually agreed upon between the Facility owner and/or Facility operator, and the landowner; all physical material pertaining to the Facility and associated equipment will be removed to a depth of at least 36 inches below soil surface and transported off site; the disturbed area will be restored to the same physical its

condition that existed before construction of the Facility; and damaged field tile systems shall be repaired as soon as practicable using a qualified field tile repair contractor approved by the property owner in advance, at the Applicant's expense, after receiving the landowner's approval.

(5) Recyclable Materials

During decommissioning, all recyclable material, salvaged and non-salvaged, shall be recycled to the furthest extent practicable. Non-recyclable waste material will be disposed of in accordance with state and federal laws.

(6) Electrical Infrastructure

The Facility owner and/or Facility operator will not remove any improvements made to the electrical infrastructure if doing so would disrupt the electric grid, unless otherwise approved by the applicable regional transmission organization and interconnection utility.

(7) Cost of Decommissioning

At least 7 days prior to the preconstruction conference, the Applicant will retain an independent, Ohio state-licensed engineer to estimate the total cost of decommissioning, in current dollars, without regard to the salvage value of equipment. The estimate will be converted into a per-turbine basis calculated as the total cost of decommissioning of all facilities divided by the number of turbines in the most recent Facility engineering drawings. This estimate will be conducted every 5 years and will include:

(a) *Analysis of the Necessary Activities*

The estimate will include identification and analysis of the activities necessary to implement the most recently approved decommissioning plan, including, but not limited to, physical construction and demolition costs assuming good industry practice and based on publication or guidelines approved by OPSB staff.

(b) *Cost*

The estimate will include the itemized cost to perform each activity.

(c) *Contingency Costs*

The estimate will include an amount to cover contingency costs, not to exceed 10% of the estimated reclamation cost.

(8) Decommissioning Bond

The Applicant, Facility owner, and/or Facility operator will post and maintain a performance bond equal to the per-turbine decommissioning cost multiplied by the sum of the number of turbines constructed and under construction (a turbine is considered to be under construction at the commencement of excavation for the turbine foundation). The form of the performance bond will be mutually agreed upon by OPSB and the Applicant, Facility owner, and/or the Facility operator. The performance bond will ensure the faithful performance of all requirements and reclamation conditions of the most recently filed and approved decommissioning and reclamation plan. At least 30 days prior to the preconstruction conference, the Applicant, Facility owner, and/or the Facility operator will provide an estimated timeline for the posting of decommissioning funds based on the construction schedule for each turbine. Prior to commencement of construction, the Applicant, Facility owner, and/or the Facility operator will provide a statement from the holder of the performance bond demonstrating that adequate funds have been posted for the scheduled construction. Once the performance bond is provided, the Applicant, the Facility owner and/or Facility operator will maintain such funds or assurance throughout the remainder of the applicable term. The Applicant, Facility owner, and/or the Facility operator will obtain new performance bond every 5 years with an updated decommissioning cost estimate from its engineer and revised decommissioning plan.

(9) Damage to Public Roads

The Applicant will repair damages to government-maintained (public) roads and bridges caused by decommissioning activity. Damages will be repaired promptly to their pre-decommissioning state by the Facility owner and/or Facility operator under the guidance of the appropriate regulatory agency. Additionally, the Applicant will provide financial assurance to the County that it will restore the public roads and bridges it uses to their pre-decommissioning condition. These terms will be defined in a RUMA between the Applicant and the Erie and Huron County Engineers prior to construction. RUMAs will include the following:

(a) *Pre-Decommissioning Survey of Public Roads and Bridges*

The RUMAs will include a pre-decommissioning survey of the condition of public roads and bridges conducted within a reasonable time prior to decommissioning activities.

(b) *Post-Decommissioning Survey of Public Roads and Bridges*

The RUMAs will include a post-decommissioning survey of the condition of public roads and bridges conducted within a reasonable time after decommissioning activities.

(c) *An Objective Standard of Repair*

The RUMAs will include an objective standard of repair that obligates the Facility owner and/or Facility operator to restore public roads and bridges to the same condition, or better than they were prior to decommissioning.

(d) *Bond Timetable*

The RUMAs will include a timetable for posting the decommissioning road and bridge bond prior to the use or transport of heavy equipment on public roads and bridges.

(10) Release of the Performance Bond

The Applicant understands that the performance bond will be released by the holder of the bond when the Facility owner and/or Facility operator has demonstrated, and the OPSB concurs, that decommissioning has been satisfactorily completed, or upon written approval of the OPSB, to implement the decommissioning plan.

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Summary: Application - Part 1 of 17 electronically filed by Christine M.T. Pirik on behalf of Firelands Wind, LLC