NextEra Energy Canada, ULC

# Final Design and Operations Report – Bluewater Wind Energy Centre

**Prepared by:**

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**Project Number:**

60155032

**Date:**

June, 2012

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## Glossary of Terms

GE.....General Electric
GIS.....Geographical Information Systems
kV.....Kilovolt
LLC .....Limited Liability Company
MNR.....Ontario Ministry of Natural Resources
MOE.....Ontario Ministry of the Environment
MSDS.....Material Safety Data Sheets
MTCS.....Ontario Ministry of Tourism, Culture and Sport
MTO .....Ontario Ministry of Transportation
MW.....Megawatt
O. Reg. 359/09.....Ontario Regulation 359/09
O. Reg. 9/06.....Ontario Regulation 9/06
PDR .....Project Description Report
PSW.....Provincially Significant Wetland
REA.....Renewable Energy Approval
SCADA.....Supervisory Control and Data Acquisition
SGRA.....Significant Groundwater Recharge Area
TC .....Transport Canada
The Project.....Bluewater Wind Energy Centre
ULC.....Unlimited Liability Corporation
UTM .....Universal Transverse Mercator

# 1. Introduction

Varna Wind, Inc., a wholly owned subsidiary of NextEra Energy Canada, ULC (NextEra) is proposing to construct a wind energy centre project in the Municipalities of Bluewater and Huron East in Huron County, Ontario (Figure 1-1). The Project will be referred to as the Bluewater Wind Energy Centre (the "Project") and will be located on private lands east of Highway 21 in the vicinity of the shoreline of Lake Huron. The wind turbine technology proposed for the Project is the 1.6 MW GE model wind turbine. Although NextEra is seeking a Renewable Energy Approval (REA) for 41 wind turbines, up to 37 turbines are proposed to be constructed for the Project.

This *Design and Operations Report* was prepared in accordance with the requirements of the REA process outlined in Ontario Regulation 359/09 (O. Reg. 359/09) and the Technical Guide to Renewable Energy Approvals (Ontario Ministry of the Environment (MOE), 2011).

The following sections outline the site plan, the design of the facility and equipment to be used, how the facility will be operated, and how effects will be monitored and emergencies managed.

## 1.1 Summary of Design and Operations Report Requirements

The requirements for the *Design and Operations Report* defined under *O. Reg. 359/09* are provided in the following table (**Table 1-1**) in addition to the corresponding report section.

**Table 1-1 Adherence to Design and Operations Plan Report Requirements**

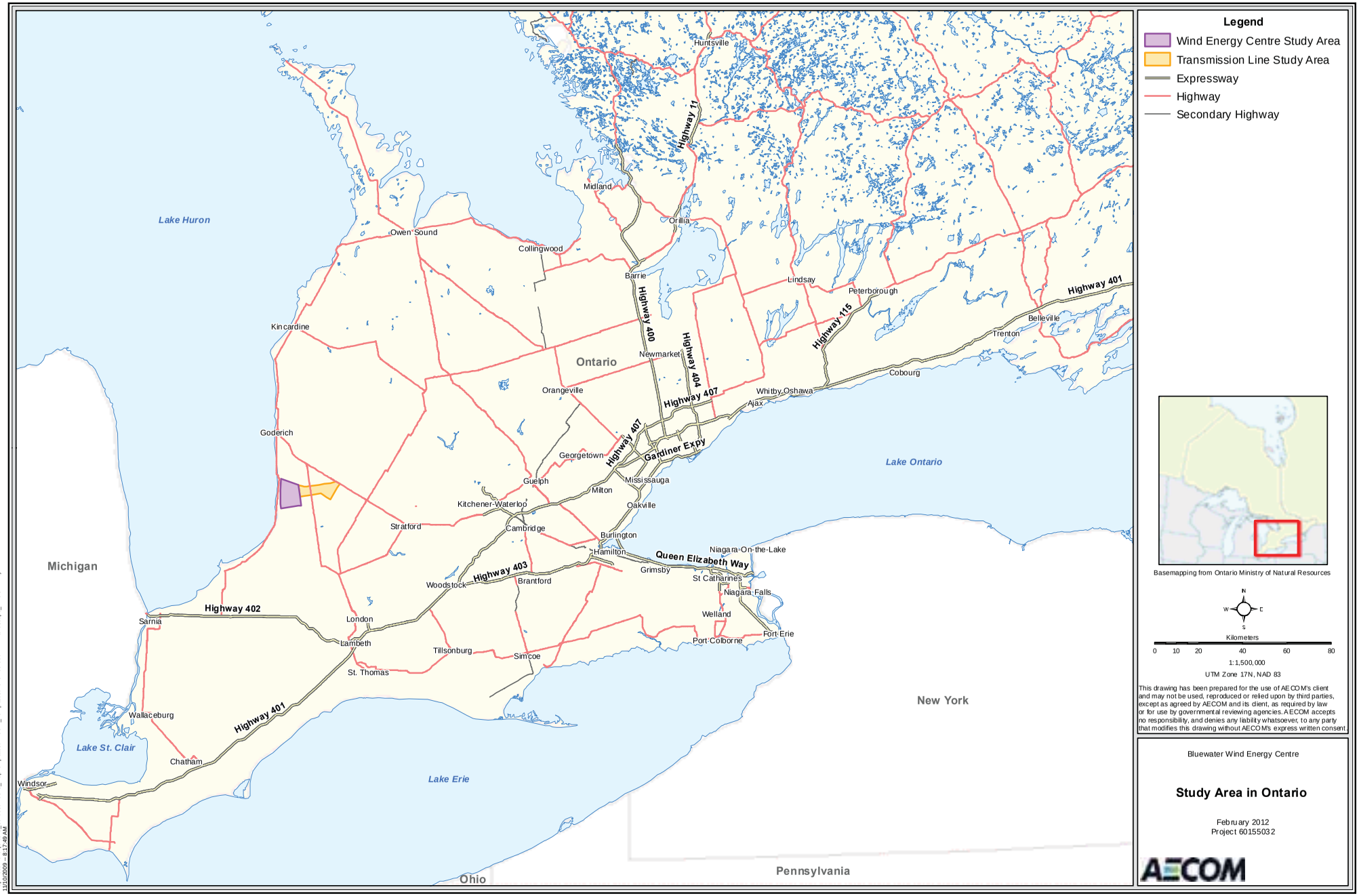
| Requirement | Completed | Corresponding Section |
|---|---|---|
| **Site Plan** | Yes | Section 2, Appendix B |
| **Facility Design Plan** | Yes | Section 3 |
| **Facility Operations Plan** | Yes | Section 4 |
| **Emergency Response and Communications Plan** | Yes | Section 5 |
| **Environmental Effects Monitoring Plan** | Yes | Section 6 |

## 1.2 The Proponent

The Project will be owned and operated by Varna Wind, Inc., a subsidiary of NextEra. NextEra's parent company is NextEra Energy Resources, LLC, a global leader in wind energy generation with a current operating portfolio of over 85 wind energy projects is North America. In Canada, wind energy centres currently owned and operated by NextEra Energy Canada include: Mount Copper and Mount Miller, (both 54 megawatts (MW)) located in Murdochville, Quebec; Pubnico Point, (31 MW) located near Yarmouth, Nova Scotia; and Ghost Pine (82 MW), located in Kneehill County, Alberta.

The primary contacts for the Project are as follows:

| Project Proponent | Project Consultant |
|---|---|
| Nicole Geneau<br>Project Director<br>NextEra Energy Canada, ULC<br>5500 North Service Road, Suite 205<br>Burlington, Ontario, L7L 6W6<br>Phone: 1-877-257-7330<br>Email: Bluewater.Wind@NextEraEnergy.com<br>Website: www.NextEraEnergyCanada.com | Marc Rose<br>Senior Environmental Planner<br>AECOM<br>300-300 Town Centre Blvd.<br>Markham, Ontario, L3R 5Z6<br>Phone: 905-477-8400 x388<br>Email: marc.rose@aecom.com |


Legend
Wind Energy Centre Study Area
Transmission Line Study Area
Expressway
Highway
Secondary Highway
Lake Huron
Lake Ontario
Lake Erie
Lake St. Clair
Ontario
Michigan
New York
Pennsylvania
Ohio
Huntsville
Midland
Orillia
Owen Sound
Collingwood
Barrie
Lindsay
Peterborough
Belleville
Trenton
Cobourg
Kincardine
Newmarket
Orangeville
Whitby-Oshawa
Ajax
Goderich
Georgetown
Mississauga
Guelph
Milton
Kitchener-Waterloo
Oakville
Stratford
Cambridge
Burlington
Hamilton
Niagara-On-the-Lake
Grimsby
St Catharines
Niagara Falls
Welland
Fort Erie
Port Colborne
Woodstock
Brantford
Sarnia
London
Lambeth
Tillsonburg
Simcoe
St. Thomas
Wallaceburg
Chatham
Windsor
Highway 11
Highway 400
Highway 404
Highway 407
Highway 115
Highway 401
Highway 403
Highway 402
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Queen Elizabeth Way
Basemapping from Ontario Ministry of Natural Resources
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Kilometers
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1:1,500,000
UTM Zone 17N, NAD 83
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Bluewater Wind Energy Centre
Study Area in Ontario
February 2012
Project 60155032
AECOM
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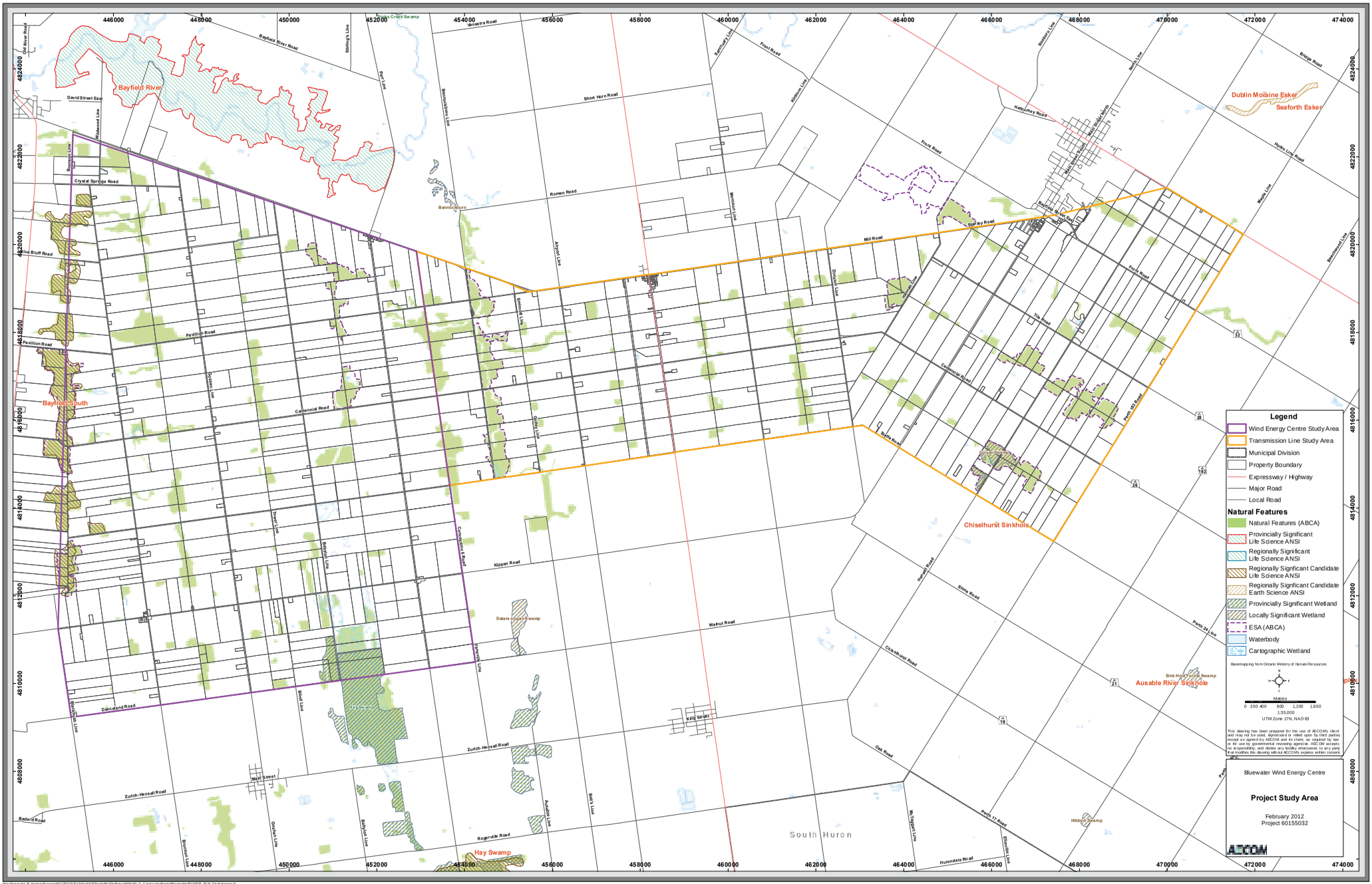
## 1.3 Project Study Area

The proposed Project is located in Huron County, within the Municipalities of Bluewater and Huron East. The Project Study Area consists of the areas being studied for the wind farm components (Wind Energy Centre Study Area), as well as for the interconnection route (i.e., the area being studied for transmission lines to connect the Project to the electrical grid) (Transmission Line Study Area) (Figure 1-2). The Wind Energy Centre Study Area is generally bounded by Blackbush Line/Bronson Line to the west, Mill Road to the north, Concession 5 Road to the east, and Danceland Road/Staffa Road to the south, in the Municipality of Bluewater, while the Transmission Line Study Area is located to the east of the Wind Energy Centre Study Area, and is generally bounded by Concession 5 Road to the west, Mill Road to the north, Huron Road and Perth 183 Road to the east, and Staffa Road to the south, extending into the Municipality of Huron East.

The location of the Project Study Area was defined early in the planning process for the proposed wind energy facility, based on the availability of wind resources, approximate area required for the proposed project, and availability of existing infrastructure for connection to the electrical grid. The Project Study Area was used to facilitate information collection.

The following co-ordinates define the external boundaries of the Project Study Area:

| Longitude | Latitude |
|---|---|
| **-81.680043** | 43.553413 |
| **-81.350138** | 43.534437 |
| **-81.402727** | 43.471275 |
| **-81.679229** | 43.433866 |


Bayfield River
Dublin Moraine Esker
Seaforth Esker
Bayfield South
Chiselhurst Sinkhole
Ausable River Sinkhole
Hay Swamp
Hibbert Swamp
South Huron
Bluewater Wind Energy Centre
Project Study Area
February 2012
Project 60155032
Legend
Wind Energy Centre Study Area
Transmission Line Study Area
Municipal Division
Property Boundary
Expressway / Highway
Major Road
Local Road
Natural Features
Natural Features (ABCA)
Provincially Significant Life Science ANSI
Regionally Significant Life Science ANSI
Regionally Signficant Candidate Life Science ANSI
Regionally Signficant Candidate Earth Science ANSI
Provincially Significant Wetland
Locally Significant Wetland
ESA (ABCA)
Waterbody
Cartographic Wetland
Basemapping from Ontario Ministry of Natural Resources
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1:35,000
UTM Zone 17N, NAD 83
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# 2. Site Plan

The Site Plan, presented in this section, details the location of facility components, natural features, noise receptors, required setbacks and lands within 300 m of the Project Location.

The Project Location, situated within the broader Project Study Area, is defined as per O. Reg. 359/09 as "..*a part of land and all or part of any building or structure in, on or over which a person is engaging in or proposes to engage in the project and any air space in which a person is engaging in or proposes to engage in the project*". As described therein, the Project Location boundary is the outer limit of where site preparation and construction activities will occur (i.e., Disturbance Areas described below) and where permanent infrastructure is located, including the air space occupied by turbine blades.

The proposed Project Location is shown on Figure 2-1, 2-2 and 2-3 in Appendix B, and includes the components of the Project listed below:

- Up to 41 1.6 MW GE model wind turbine generator locations and pad mounted step-up transformers are proposed for permitting (a maximum of 37 turbines will ultimately be constructed);
- Laydown and storage areas (including temporary staging areas, crane pads and turnaround areas surrounding each wind turbine);
- Approximately 52 km of 34.5 kV underground electrical collection lines to connect the turbines to the proposed transformer substation;
- Approximately 24 km of 115 kV transmission line proposed along Centennial Road and Hensall Road from the proposed transformer substation to the existing Hydro One Seaforth Transformer Station;
- Approximately 40 km of turbine access roads; and
- An Operations and Maintenance Building.

*Disturbance Areas* have been identified surrounding various Project components; these are depicted on the Project Location figure by the item "Project Location" in the legend. These denote areas where temporary disturbance during the construction phase may occur as a result of: temporary project component laydown and storage areas, crane pad construction and turbine turnaround areas. With the exception of the project components described above, no permanent infrastructure is proposed within these areas. Following construction activities, the land will be returned to pre-construction conditions.

The above mentioned Project components are depicted in the Project Location figures described below:

- Figure 2-1: shows the locations of Project components including: wind turbines, access roads, the electrical collection system, 115 kV transmission line, the Operations and Maintenance Building, the proposed transformer substation, Hydro One Seaforth Transformer Station and temporary laydown/storage areas. This figure also shows topographical land contours and surface water drainage for all land within 120 m of the Project Location.
- Figure 2-2: shows the location of Project components in relation to surrounding natural heritage and water body features such as: wetlands, woodlots, streams, and Areas of Natural and Scientific Interest, in addition to water wells identified in MOE's database. This figure also demonstrates compliance with the 120 m setback distance for natural heritage features, measured from the boundary of the Project Location, the 30 m setback distance for water bodies, measured from the Project Location boundary for turbines, and highlights significant natural heritage features that are within those setback distances.

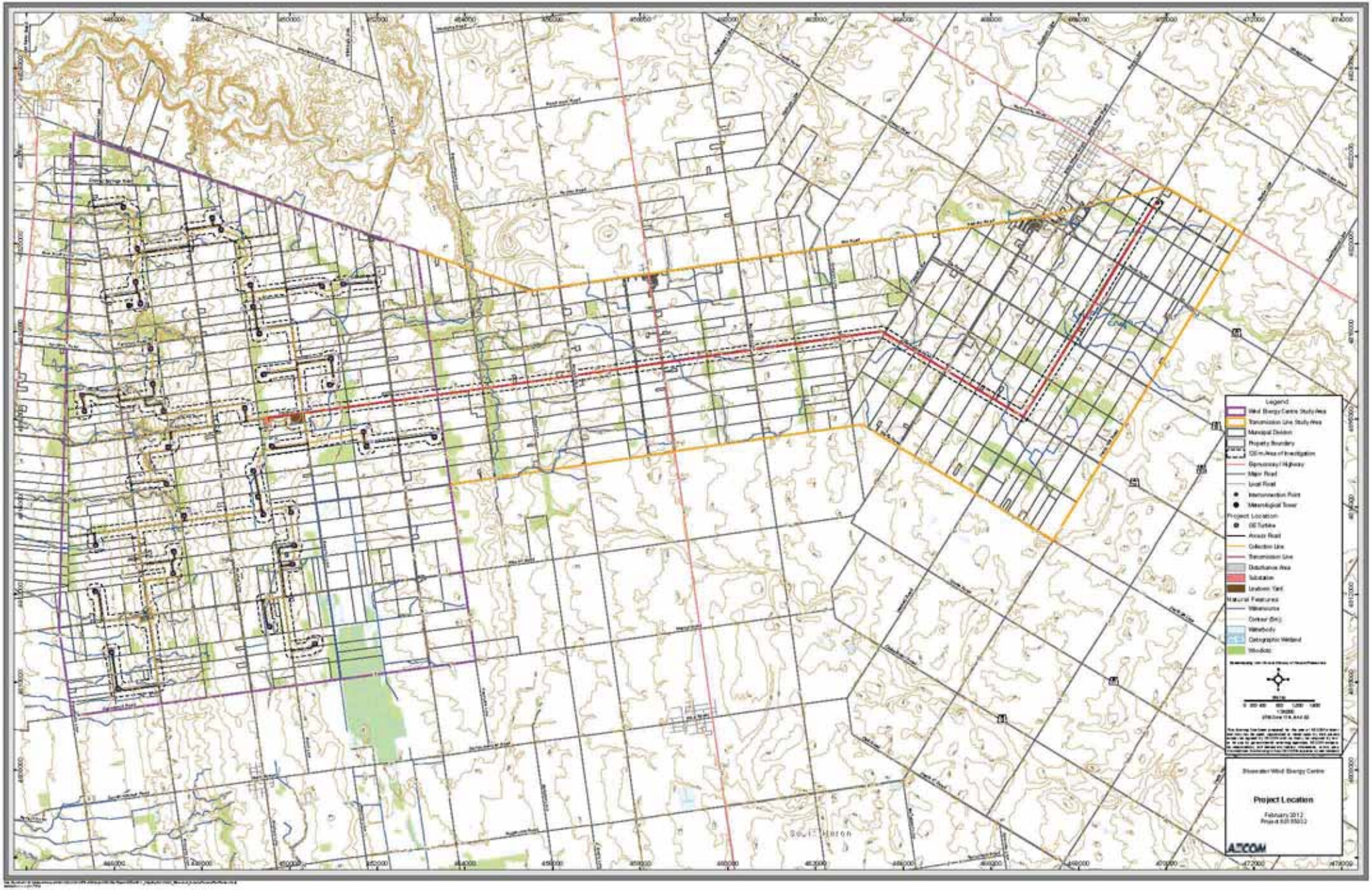
- Figure 2-3: shows the location of Project components in relation to surrounding socio-economic features such as: property boundaries, roads and railway right-of-ways, petroleum resources, and noise receptors. This figure also demonstrates the setback distances between these features and the Project components. Note that noise compliance is demonstrated in **Appendix A** – **Noise Study Report**.

The exercise of siting infrastructure is an iterative process that involves balancing the wind resource with environmental, socio-economic and engineering constraints, while at the same time adhering to the setback distances prescribed by the Province and outlined in O. Reg. 359/09. Optimum turbine siting on individual properties was also determined in consultation with the landowner. Note that this Site Plan was designed to comply with the setback distances prescribed in O. Reg. 359/09 and outlined in the following table (**Table 2-1**). Universal Transverse Mercator (UTM) co-ordinates of turbines and the transformer substation are provided in **Appendix B**, along with the location of all noise receptors shown in Figure 2-3.

**Table 2-1 Ontario Regulation 359/09 Setback Distances**

| Setback | Distance (metres (m)) | Details |
|---|---|---|
| **Noise Receptors** | 550* | To be measured from the centre of a turbine's base to a noise receptor. |
| **Property Line** | Hub height (80) | Setback can be reduced to blade length plus 10 m (60 m total) measured from the centre of the turbine's base to the nearest property boundary if a Property Line Setback Assessment Report demonstrates that siting turbines closer will not cause adverse effects. |
| **Roads and Railway** | Blade length plus 10 m | Blade length plus 10 m (60 m total) measured from the centre of the turbine's base to the boundary of the right-of-way. |
| **Significant Natural Heritage Features** | 120 | Measured from the project location boundary to the nearest point of the natural features. Project components may be sited closer than the prescribed setback if an Environmental Impact Study is prepared. |
| **Water Bodies** | 120 | Measured from the average annual high water mark of a lake, or permanent / intermittent stream (Project components may be sited closer than 120 m if a Water Body Report is prepared - note that turbines and transformers may not be sited closer than 30 m to these features). |
| Petroleum Resources | 75 | Setback may be reduced with the submission of a Petroleum Engineer's Report to the MNR. |

*Note: * Setback does not apply to noise receptors on land owned by a proponent of a wind energy facility or by a person who has entered into an agreement to permit all or part of the facility on their lands.*


Legend
Wind Energy Centre Study Area
Transmission Line Study Area
Municipal Division
Property Boundary
120 m Area of Investigation
Expressway / Highway
Major Road
Local Road
Interconnection Point
Meteorological Tower
Project Location
Access Road
Collection Line
Transmission Line
Disturbance Area
Substation
Laydown Yard
Natural Features
Watercourse
Contour (5m)
Waterbody
Provincially Significant Wetland
Woodlots
Bluewater Wind Energy Centre
Project Location
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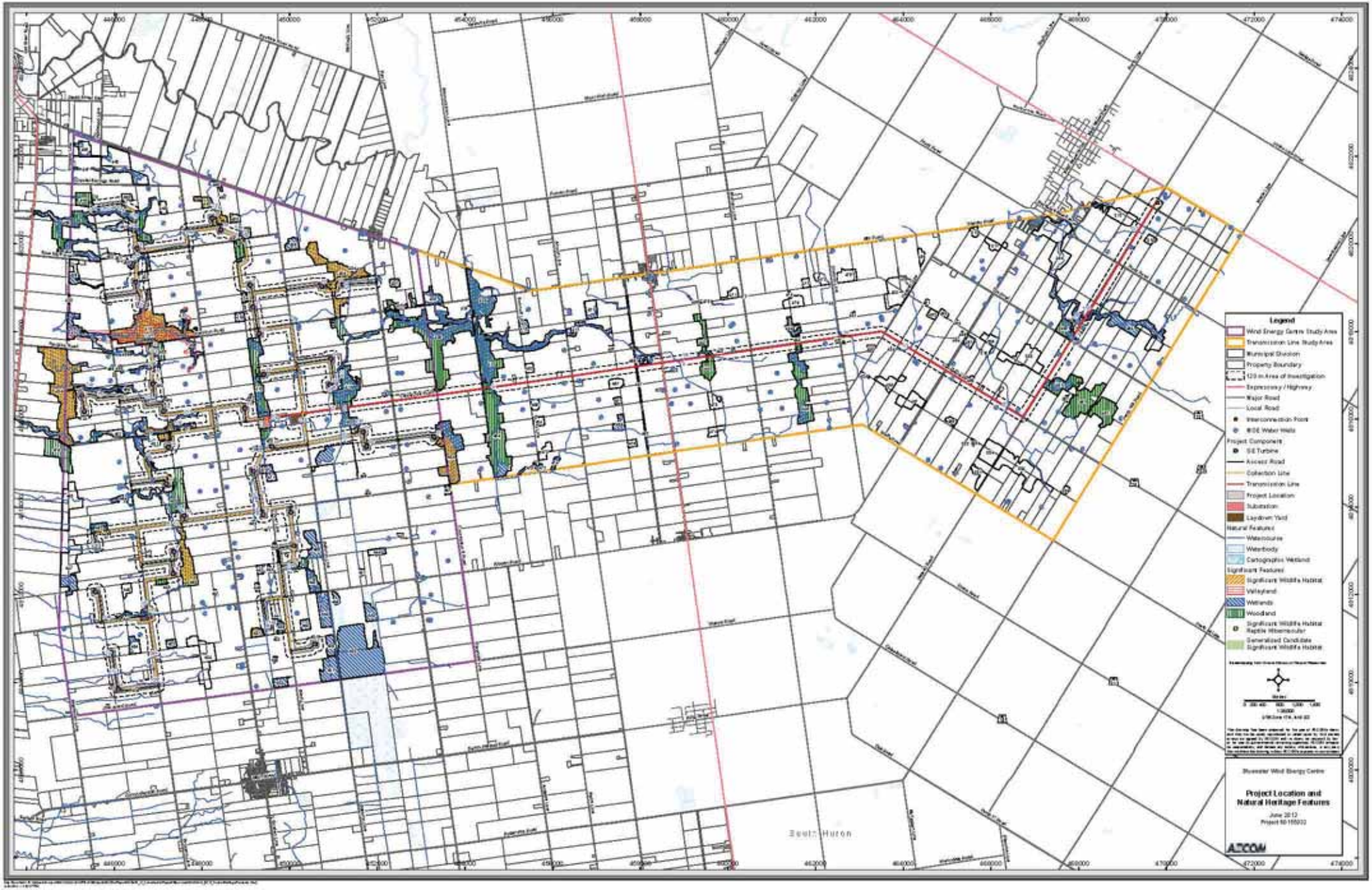
Legend
Wind Energy Centre Study Area
Transmission Line Study Area
Municipal Division
Property Boundary
120 m Area of Investigation
Expressway / Highway
Major Road
Local Road
Interconnection Point
MOE Water Wells
Project Components
Substation
Laydown Yard
Natural Features
Waterbody
Significant Features
Woodland
Bluewater Wind Energy Centre
Project Location and Natural Heritage Features
June 2012
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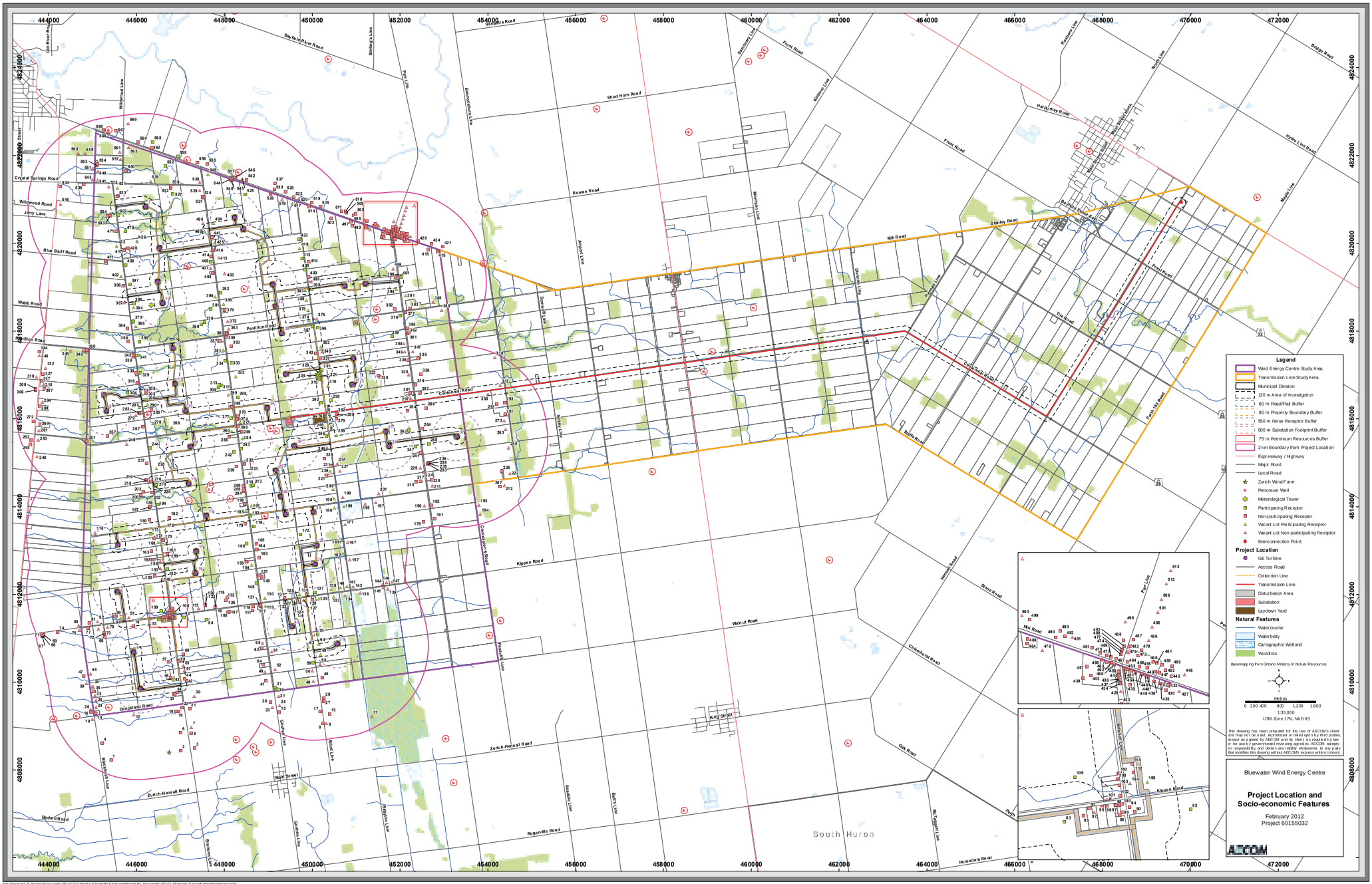
Legend
Wind Energy Centre Study Area
Transmission Line Study Area
Municipal Division
120 m Area of Investigation
60 m Road/Rail Buffer
80 m Property Boundary Buffer
550 m Noise Receptor Buffer
500 m Substation Footprint Buffer
75 m Petroleum Resources Buffer
2 km Boundary from Project Location
Expressway / Highway
Major Road
Local Road
Zurich Wind Farm
Petroleum Well
Meterological Tower
Participating Receptor
Non-participating Receptor
Vacant Lot Participating Receptor
Vacant Lot Non-participating Receptor
Intercconection Point
Project Location
GE Turbine
Access Road
Collection Line
Transmission Line
Disturbance Area
Substation
Laydown Yard
Natural Features
Watercourse
Waterbody
Cartographic Wetland
Woodlots
Basemapping from Ontario Ministry of Natural Resources
Metres
0 200 400 800 1,200 1,600
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UTM Zone 17N, NAD 83
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Bluewater Wind Energy Centre
Project Location and Socio-economic Features
February 2012
Project 60155032
AECOM
South Huron
Zurich-Hensall Road
Klopen Road
Blue Bluff Road
Webb Road
Pavilion Road
Crystal Springs Road
Wildwood Road
Jerry Lane
Bayfield River Road
Ventnor Road
Short Horn Road
Roman Road
Front Road
Henry Hay Road
Stanley Road
Mill Road
Bridge Road
Hydro Line Road
Main Street
Bethesda Line
Bluewater Line
Bosanquet Line
Grosbeak Line
Goshen Line
Blue Line
Zurich Line
Middle Line
Airport Line
Summit Line
Colonsay Line
Concession 3 Road
Concession 4 Road
Dashwood Line
Hensall Road
Stone Road
Oak Road
Rogerville Road
Donnland Road
Bedard Road
Wahkut Road
Chiselhurst Road
Hurondale Road
King Street
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# 3. Facility Design Plan

The following section provides a summary of the Facility Design Plan.

## 3.1 Wind Turbine Specifications

With a total nameplate capacity of 60 MW, the Project is categorized as a Class 4 facility. Although NextEra is seeking an REA for 41 wind turbines, up to 37 are proposed to be constructed for the Project.

The wind turbine technology proposed for this Project is the 1.6 MW GE model wind turbine. The turbines are 3-bladed, upwind, horizontal-axis wind turbines that are state of the art technology. The turbines have a 100 m rotor diameter with a swept area of 7,854 m; each blade is connected to the main shaft via the hub. The turbine is mounted on an 80 m tubular steel tower which contains an internal ladder provided for maintenance access. The turbine will be constructed on a foundation that is approximately 400 $m^2$. The foundation consists of a wooden frame, poured concrete and steel rebar to provide added strength.

The nacelle houses the main components of the wind turbine such as the rotor shaft, gear box, couplings, control panel, bearing brackets and the generator. The nacelle is equipped with sound-proofing, is ventilated and the interior is illuminated with electric lights. Some of the wind turbines will have external lighting in accordance with the requirements of Transport Canada (TC).

**Table 3-1** below provides a summary of the turbine specifications. Please refer to the Wind Turbine Specifications Report for more detailed information on the wind turbines proposed for the Project.

**Table 3-1 Summary of Technical Specifications**

| Specification | Turbine |
|---|---|
| **Make** | General Electric |
| **Model** | 1.6-100 |
| **Name Plate Capacity** | 1.6 MW |
| **Hub Height** | 80 m |

| Specification | Turbine |
|---|---|
| **Rotor Diameter** | 100 m |
| **Minimum Rotational Speed** | 9.75 rpm |
| **Maximum Rotational Speed** | 16.2 rpm |
| | |

## 3.2 Access Roads

On-site access roads to each turbine will be constructed to provide an access point to the properties for equipment during the construction phase and for maintenance activities during operation. Typically the access roads will be 11 m wide during the construction phase to accommodate the large cranes (with an additional 2 m clearance on each side for travel), and may be reduced in width at the landowner's request following construction.

## 3.3 Collection Lines

The system that connects each turbine to the transformer substation will consist of 34.5 kV electrical collection lines that will be buried on private property adjacent to the turbine access roads, where feasible. The locations of the underground cables and access roads were determined in consultation with the landowners and in accordance the setback requirements defined in O. Reg. 359/09.

## 3.4 Electrical Transmission

The 115 kV electrical transmission line that will be built from the transformer substation to the connection point at the Hydro One Seaforth Transformer Station is proposed to be located within the existing road right-of-ways along Centennial Road and Hensall Road in the Municipalities of Bluewater and Huron East. It is anticipated that the

transmission line will be mounted on new hydro poles. The poles are proposed to be constructed of wood, concrete or steel and will be between 18 and 30 metres tall.

The interconnection plan for any wind energy centre is subject to study, design and engineering by the Integrated Electricity System Operator which manages the province's electricity grid, Hydro One which owns the transmission lines, the local distribution company and the Ontario Energy Board, which regulates the industry through the Transmission System Code and the Distribution System Code.

## 3.5 Transformer Substation

Approximately two to three hectares in size, the transformer substation will either be located on privately held lands through a lease agreement or on land purchased by Varna Wind, Inc. The electricity collected via the 34.5 kV underground collection lines will converge at the transformer substation where the electricity will be "stepped-up" to 115 kV for transmission to the Seaforth Transformer Station via the above-ground transmission line proposed along Centennial and Hensall Road. The substation equipment will include an isolation switch, a circuit breaker, a step-up transformer, transmission switch gear, instrument transformers, grounding and metering equipment. All substation grounding equipment will meet the Ontario Electrical Safety Code.

A secondary containment system will be installed to capture any leaks from the transformer. Water in the containment system will be visually inspected for any evidence of oil (as oil would float to the top). If oil is present, a tank truck will be brought to site to pump the water/oil mix into it. The water/oil mix will then be disposed of off-site at a licensed facility. If no oil is detected in the water, the water will be pumped out to an adjacent swale and then allowed to infiltrate into the ground.

## 3.6 Operations and Maintenance Building

An operations building, approximately 30 m by 15 m in size, will be constructed on privately held lands or an existing suitable structure will be purchased/leased for the purpose of monitoring the day-to-day operations of the wind energy centre and supporting maintenance efforts. A small parking lot will be constructed to accommodate staff vehicles. Prior to the construction phase, a Stormwater Pollution Prevention Study will be conducted to address any potential effects associated with stormwater runoff.

Potable water will be supplied by a well or through the municipal water system and a septic bed will be constructed for the disposal of sewage. The septic bed will be constructed to the minimum size required for the size of the operation and maintenance building. It is the Project owner's responsibility to ensure proper maintenance of the septic system. The Operations and Maintenance Building, septic system and water supply will be constructed in accordance with applicable municipal and provincial standards.

## 3.7 Permanent Meteorological Towers

Permanent meteorological towers are an operational requirement of the Independent Electricity System Operator (IESO) as an electricity market participant (this includes all generators of electricity) and allow the IESO to operate the system reliably and safely.

Two permanent meteorological towers will be installed at the Project. These are typically up to 80 m in height. No significant soil or vegetation disturbance is anticipated. The use of meteorological data are key to the safe and efficient operation of a wind energy centre. Some operational decisions made using meteorological data include:

- Cut-in wind speed;
- Cut-out wind speed;
- Turbine shut down during icing conditions; and
- Turbine shut down during extreme weather events.

# 4. Facility Operations Plan

The following section describes the Facility Operations Plan; including daily operations activities and routine/ unplanned maintenance activities.

## 4.1 Wind Turbine Operation

The wind energy centre will require full time technical and administrative staff to maintain and operate the facility. The primary workers will be wind technicians (i.e., technicians who carry out maintenance on the turbines) along with a site supervisor. The Project will be operated by a staff of five to eight people who will work out of the Operations and Maintenance Building.

The wind turbines will be operating (i.e., in "Run" mode and generating electricity) when the wind speed is within the operating range for the turbine and there are no component malfunctions. Each turbine has a comprehensive control system that monitors the subsystems within the turbine and the local wind conditions to determine whether the conditions are suitable for operation. If an event occurs which is considered to be outside the normal operating range of the turbine (such as low hydraulic pressures, unusual vibrations or high generator temperatures), the wind turbine will immediately take itself out of service and report the condition to the Operations Centre, located in the Operations and Maintenance Building. A communication line connects each turbine to the Operations Centre, which closely monitors and, as required, controls the operation of each turbine. The wind turbine system will be integrated with the electric interconnection Supervisory Control and Data Acquisition (SCADA) to ensure that critical controls, alarms and functions are properly co-ordinated for safe, secure and reliable operation.

## 4.2 Routine Turbine Maintenance

Routine preventative maintenance activities will be scheduled at six month intervals with specific maintenance tasks scheduled for each interval. Maintenance involves removing the turbine from service and having two to three wind technicians climb the tower to spend a full day carrying out maintenance activities.

Consumables such as the various greases used to keep the mechanical components operating and oil filters for gearboxes and hydraulic systems will be used for routine maintenance tasks. Following all maintenance work on the turbine, the area is cleaned up. All surplus lubricants and grease-soaked rags are removed and disposed of as required by applicable regulations. All maintenance activities will adhere to the same spill prevention protocols undertaken during the construction phase.

## 4.3 Unplanned Turbine Maintenance

Modern wind turbines are very reliable and the major components are designed to operate for approximately 30 years. However, there is a possibility that certain component failures may occur despite the high reliability of the turbines fleet-wide. Most commonly, the failure of small components such as switches, fans, or sensors will take the turbine out of service until the faulty component is replaced. These repairs can usually be carried out by a single technician visiting the turbine for several hours.

Events involving the replacement of a major component such as a gearbox or rotor are rare. If they do occur, the use of large equipment, sometimes as large as that used to install the turbines, may be required.

It is possible that an access road, built for construction and returned to farmland when the construction phase is completed, will need to be rebuilt to carry out repairs to a damaged turbine. Typically only a small percentage of turbines will need to be accessed with large equipment during their operating life.

## 4.4 Electrical System Maintenance

The collector lines and substation will require periodic preventative maintenance activities. Routine maintenance will include condition assessment for above-ground infrastructure and protective relay maintenance of the substation, in addition to monitoring of the secondary containment system for traces of oil. Finally, vegetation control will be required around the transmission line to prevent any damage to the line and ensure safe operation.

## 4.5 Waste Management

Waste generated during the operations phase will be removed from the Operations and Maintenance Building by a licensed operator and disposed of at an approved facility. Any lubricants or oils resulting from turbine maintenance will be drummed on site and disposed of in accordance with applicable Provincial regulations. All reasonable efforts will be made to minimize waste generated and to recycle materials including returning packaging material to suppliers for reuse/recycling. The spill prevention protocols followed during construction will continue to be observed throughout the facility's operations and maintenance activities.

# 5. Emergency Response and Communication Plan

This Emergency Response and Communication Plan (the Plan) for the Bluewater Wind Energy Centre was prepared in accordance with the requirements of O. Reg. 359/09. The purpose of the Plan is to define an avenue for ongoing communication throughout the construction, operation and decommissioning phases of the Project. This will ensure that members of the community, Aboriginal communities, local municipalities and government Ministries are kept apprised of pertinent Project activities, in addition to any emergencies in the unlikely event that one should occur. The Emergency Response and Communication Plan will also be filed with the Ministry of the Environment, the Municipalities of Bluewater and Huron East, and Huron County.

The following sections outline NextEra's communication commitments in relation to emergency responses, ongoing communication and complaint management.

## 5.1 Emergency Response

NextEra Energy Resources, the parent company of NextEra, maintains standard Emergency Action Plans for all of its operating facilities. Throughout the construction, operation and decommissioning phases of the Project, an up-to-date Emergency Action Plan will be maintained in the Project office at the Operations and Maintenance Building. The Emergency Action Plan will contain current contact information for emergency responders, including local police and fire departments, and will outline the chain of communication between on-site employees, NextEra, emergency contacts, the local community and other pertinent stakeholders in the event that an emergency situation should arise. NextEra's Emergency Action Plans typically include the following information:

- Designation of facility emergency co-ordinators
- Process description for responding to emergencies
- Objectives for emergency response and communication
- Local emergency response contact phone numbers
- Regulatory references
- Required health and safety training for employees
- Facility information, including exact location
- Facility emergency procedures
- Immediate site evacuation procedures and routes
- Delayed site evacuation procedures
- Process for documenting personnel injuries/serious health conditions
- Fire response plan
- Process for documenting chemical/oil spills and releases
- Material Safety Data Sheets (MSDS) for all chemicals used in construction and maintenance
- Weather-related emergency procedures

The Emergency Action Plan's communication protocol will be finalized in consultation with the local municipalities and will include the following steps:

- The person observing the emergency will contact first responders immediately via a 911 operator, as required by the site Emergency Action Plan.
- A NextEra representative will then contact the Ministry of the Environment, including the Spills Action Centre, if required, in accordance with Section 92 of the Environmental Protection Act and the local municipalities.

Depending on the level of risk associated with the incident, local community members will be notified at the discretion of NextEra. Employees will be trained on the Emergency Action Plan's procedures and the Plan will be

maintained on-site and updated when required to ensure it contains current information throughout the construction, operation and decommissioning phases of the Project.

## 5.2 Ongoing (Non-Emergency) Communication

NextEra will maintain communication with the local municipalities, members of the community and Aboriginal communities, where appropriate, throughout the construction, operation and decommissioning phases of the Project.

Broad community relations activities are seen as essential to the implementation of a successful project. To this end, the following activities will be undertaken:

a) on-site tours with community leaders, local media and other interested parties during construction and periodically during operations; and
b) installation of construction signage notifying community members of construction activity.

In addition, letters will be mailed to pertinent stakeholders to inform them of:

- the commencement of construction activities;
- the commencement of decommissioning activities; and
- any other activities that NextEra would like to share with the local community.

A project email address and phone number will be maintained and monitored by the operations manager and will be used to respond to stakeholder questions and/or complaints. Contact information for the operations manager will be provided on all notifications.

## 5.3 Complaints Resolution Process

NextEra acknowledges that some members of the community may have concerns regarding construction activities and long-term wind farm operations. To resolve disputes in a collaborative manner NextEra will follow the complaints resolution process described below.

- Should any complaints arise throughout the course of the construction, operation and decommissioning phases, a NextEra representative will contact the complainant within 24 hours of receiving the complaint to understand and seek a resolution. NextEra will notify the local MOE district office of the complaint and prepare / file an initial Complaint Record and include the following:
  a) name, address and phone number of the complainant;
  b) date and time of the complaint;
  c) details of the complaint;
  d) follow-up action to be taken; and
  e) steps taken to prevent the situation from occurring in the future, where applicable;
- If the complaint cannot be resolved through a phone call, a face-to-face meeting may be scheduled with the complainant;
- An updated Complaint Record will be maintained to describe the proposed resolution of the complaint, where applicable; and
- Complaint Records will be maintained at the Project office in the Operations and Maintenance Building and will be made available to MOE field inspection staff should a request be made.

The Construction Manager will be responsible for the implementation of the complaints resolution process during the construction phase and the Operations Manager will take on this responsibility during the operations phase.

# 6. Environmental Effects Monitoring Plan

This section describes potential effects associated with the daily function of the Project in addition to mitigation measures and monitoring commitments that will be made to minimize these potential effects. The potential effects described below are also presented in Section 3 of the PDR.

For each potential negative effect, performance objectives were developed to describe a desired outcome of mitigation. Next, mitigation measures were proposed to achieve the performance objectives.

Residual effects, which are those effects that remain following the application of mitigation measures and monitoring commitments, were then assessed based on professional judgment as well as previous Project experience. Where possible, the significance of residual adverse effects has been described based on the following:

**Magnitude** .... the size or degree of the effect compared against baseline conditions; and
**Likelihood** .... the probability that the effect will occur.

Finally, where monitoring commitments were identified, they are intended to verify that the mitigation measures achieve performance objectives. Should the monitoring reveal that the mitigation measures are not achieving the intended result, the identified contingency measures would then be implemented.

## 6.1 Cultural Heritage

Stage 1 and 2 Archaeological Assessments were conducted and factored into the overall Project layout. The Stage 1 Archaeological Assessment, consisting of an initial desktop archaeological study, was carried out in the fall of 2010 and determined that there are known archaeological resources within the Study Area, in addition to properties with the potential to contain archaeological resources.

In 2011 and 2012, Stage 2 pedestrian surveys were conducted within the Bluewater Wind Energy Centre Project Study Area, according to the 2011 *Standards and Guidelines for Consultant Archaeologists* issued by the Ontario Ministry of Tourism, Culture and Sport (MTCS). A total of 25 archaeological sites were identified as of the January 2012 and include 18 pre-contact Aboriginal sites and seven historic Euro-Canadian sites. Four historic Euro-Canadian sites have been recommended for further Stage 3 archaeological assessment, which is currently underway. None of the pre-contact Aboriginal sites have been recommended for further Stage 3 archaeological assessment at this time.

Both the Stage 1 and Stage 2 Archaeological Assessment Reports were submitted to the MTCS for review and acceptance into the Ontario Public Register of Archaeological Reports by the MTCS. Sign-off from the MTCS was received on April 5, 2012 and confirmed that: (1) the ministry was satisfied with the recommendations in the report; and, (2) the fieldwork and reporting for the archaeological assessment is consistent with the ministry's standards and the terms and conditions for archaeological licences.

A Cultural Heritage Assessment was also completed to address built heritage and cultural heritage landscape resources related to the Euro-Canadian land use in the area dating prior to 1970. All work was carried out in accordance with the Ontario Heritage Act, the Provincial Policy Statement, and the Environmental Assessment Act. The report identified 76 structures (45 houses and 31 barns) as greater than 40 years old within the Project Study Area and as having general historical interest as they contribute to the character of the vernacular rural landscape. When applying the criteria set out in Ontario Regulation 9/06, none of these structures were determined to have cultural heritage value or interest. This report was submitted to the MTCS for review and comment. Sign-off from the Ministry confirming that the report is satisfactory was received on March 22, 2012.

### 6.1.1 Potential Effects

No effects to protected properties, archaeological resources or heritage resources are anticipated as a result of the operational phase of the Project. Therefore, no mitigation measures or monitoring are proposed.

## 6.2 Natural Heritage

Effects to natural heritage features, including significant wetlands, woodlands, wildlife habitat, and valleylands, are identified in the Natural Heritage Assessment Report which was prepared based on the *Natural Heritage Assessment Guide for Renewable Energy Projects*. The potential effects, mitigation measures, net effects and monitoring commitments regarding natural features are evaluated in the Natural Heritage Assessment Report, which was submitted to the Ontario Ministry of Natural Resources (MNR) for review and sign-off. Sign-off from the MNR confirming that the report is satisfactory was received on March 28, 2012.

Following the completion of the Records Review and Site Investigation for all natural heritage features located within 120 m of the Project Location, an Evaluation of Significance was conducted to identify any features that required an Environmental Impact Study. Below is a description of the significant natural heritage features located within 120 m of the Project Location for which an EIS was conducted.

**Table 6-1 Summary of Natural Features Carried Forward to the Environmental Impact Study**

| Feature | Results of Site Investigation |
|---|---|
| **Wetlands** | The following ten wetland units or wetland complexes were treated as significant and carried forward to the EIS:<br>• WET-01, WET-03, WET-04, WET-05, WET-06, WET-07, WET-08, WET-10, WET-12 and WET-13. |
| **Woodlands** | The following 32 woodlands were determined to be significant or treated as significant and therefore carried forward to the EIS:<br>• D, E, F, G, H, K, L, M, N, O, P, Q, R, S, T, U, V, X, Y, AA, AE, AF, AH, AJ, AK, AL, AM, AO, AP, AQ, AR and AS. |
| **Valleylands** | The following valleyland feature was determined to be significant and therefore carried forward to the EIS:<br>• VAL-01 |
| **Significant Wildlife Habitat** | The following candidate significant wildlife habitats were confirmed within the 120 m Area of Investigation and within 120 m of qualifying project infrastructure, and were therefore carried forward to the EIS.<br>Features evaluated and determined to be significant:<br>• Bat maternity colonies (BMC-01, BMC-07, BMC-08 and BMC-13);<br>• Amphibian woodland breeding habitat (AWO-11); and<br>• Rare vegetation communities (RVC-01).<br>Features treated as significant for the purpose of this submission (a determination as to whether the mitigation measures described in the EIS will be applied will be made based on the outcome of evaluation of significance studies to be completed prior to construction):<br>• Reptile hibernacula (RH-01 and RH-02);<br>• Bat maternity colonies (BMC-02, BMC-03, BMC-10, BMC-12 and BMC-14);<br>• Amphibian woodland breeding habitat (AWO-03, AWO-04, AWO-05, AWO-06 and AWO-08); and<br>• Amphibian wetland breeding habitat (AWE-01). |
| | The following candidate significant wildlife habitats were identified within the 120 m Area of Investigation however not within 120 m of qualifying project infrastructure, and were therefore carried forward to the EIS as *Generalized Candidate Significant Wildlife Habitat*:<br>• Waterfowl nesting areas (Natural Area 537);<br>• Reptile hibernacula (Natural Area 541);<br>• Bat maternity roosts (Natural Areas 426, 439, 456, 475, 487, 488, 494, 512, 514, 520, 537, 539, 545, 551, 552, 555, 556 and 561);<br>• Amphibian woodland breeding habitat (Natural Areas 450, 463, 483, 510, 534, 537 and 541);<br>• Amphibian wetland breeding habitat (Natural Areas 494, 564 and 565);<br>• Old growth and mature forest stands (Natural Areas 456, 483, 487, 510, 514, 537, 541 and 542);<br>• Woodland raptor nesting habitat (Woodland Unit N);<br>• Seeps and springs (Natural Areas 437, 439, 463, 510, 518, 532, 534, 537 and 539);<br>• Marsh bird breeding habitat (Natural Area 495); and<br>• Habitats of species of conservation concern (numerous). |

### 6.2.1 Potential Effects

Potential effects from operational and maintenance activities on Significant Wildlife Habitat, Significant Woodlands, Significant Valleylands, and Provincially Significant Wetlands include:

- Bats may be disturbed by noise from operations (Features BMC-01, BMC-07, BMC-08, BMC-13 BMC-02, BMC-03, BMC-10, BMC-12 and BMC-14);
- Barrier effect caused by access roads to amphibian movement between breeding pools and home range if a significant amphibian movement corridor is identified during pre-construction surveys
- Introduction of invasive species within rare vegetation community (RVC-01) as a result of proximity to access road
- No anticipated operational effects to reptile hibernacula habitat (Features RH-01 and RH-02) although potential exists for snake mortality due to vehicular collisions along nearby access road during operations
- No anticipated operational effects to amphibian woodland breeding habitat (Features AWO-03, AWO-04, AWO-05, AWO-06, AWO-08, AWO-11) although potential exists for amphibian mortality due to vehicular collisions along nearby access roads during operations
- No anticipated operational effects to amphibian wetland breeding habitat (AWE-01) although potential exists for amphibian mortality due to vehicular collisions along nearby access road during operations.

In addition to effects on significant bird or bat habitats identified during the Natural Heritage Assessment, direct bird or bat mortality may occur at all proposed turbine locations.

The performance objectives, mitigation measures, residual effects, and the monitoring plan associated with potential effects to natural heritage features are described in **Table 6-2** below.

## Table 6-2 Mitigation Measures, Residual Effects and Monitoring Plan: Natural Heritage Resources

| Potential Effect | Performance Objective | Mitigation Strategy | Residual Effects | Monitoring Plan and Contingency Measures |
|---|---|---|---|---|
| **Significant Wildlife Habitat** | | | | |
| **Risk of bird collisions with turbines (Project-wide).** | • No disturbance and/or mortality to wildlife. | • Operational mitigation techniques for birds, which would be applied at times of the year when mortality risks to the affected bird species are particularly high (e.g., migration) may include:<br>▪ Periodic shut-down of select turbines<br>▪ Blade feathering<br>• Mitigation techniques for bats may include:<br>▪ Changing the wind turbine cut-in speed to 5.5 m/s<br>▪ Feathering of blades when wind speeds are below 5.5 m/s<br>▪ Co-ordinating turbine shut-down for maintenance with periods of high bat activity (specifically in June during the breeding season when bat maternity colony habitats are occupied) and/or mortality.<br>• Utilize a lighting scheme that will minimize risk to bird or bat collisions, while fulfilling Transport Canada requirements. | • Significance of residual effects will be determined based on the results of monitoring.<br>• Risk of bird collisions with turbine minimized through mitigation.<br>• Significance of residual effects will be determined based on the results of monitoring. | • Develop and implement a monitoring program for bird and bat mortality consistent with *Birds and Bird Habitats:* Guidelines *for Wind Power Projects* (MNR, 2010) and *Bats and Bat Habitats: Guidelines for Wind Power Projects*" (MNR, 2011) including:<br>▪ Mortality surveys<br>▪ Carcass removal trials<br>▪ Searcher efficiency trials.<br>• Conduct monitoring during the core season for bird activity and bat activity (May 1-October 31) for the first three years of operation. Mortality surveys should be conducted at each monitored turbine twice per week (at least 30% of turbines) and raptor mortality surveys should be continued once per week in November.<br>• Monitor all turbines within the Project Location once during the survey period for evidence of raptor mortalities.<br>• Conduct subsequent monitoring for two years at individual turbines (and unmonitored turbines in close proximity) where significant bird or raptor annual mortality is identified.<br>• Conduct effectiveness monitoring at individual turbines for three years where mitigation has been implemented.<br>• Contingency Measures<br>▪ Institute changes to turbine operation if necessary (see mitigation strategy in this table).<br>• The findings of the bird and bat mortality monitoring programs will be reported back to MNR on an annual basis for the first 3 years of operation. |
| **Risk of bat collisions with turbine (Project-wide).** | | | • Risk of bat collisions with turbine minimized through mitigation<br>• Significance of residual effects will be determined based on the results of monitoring. | |
| **Bats may be disturbed by noise from operation (**BMC-01, BMC-07, BMC-08, BMC-13 BMC-02, BMC-03, BMC-10, BMC-12 and BMC-14**).** | • No displacement from habitat. | • Implement mitigation when disturbance effects are detected through post-construction monitoring (refer to above). | • Bats may be displaced from their habitat because of operational noise.<br>• Significance of residual effects will be determined based on the results of post-construction monitoring | • Conduct 3 years of post-construction acoustic monitoring for Features BMC-01, BMC-07, BMC-08 and BMC-13 where located within 30 m of construction activities according to protocol described for pre-construction survey (as described in March 2010 version of *Bats and Bat Habitats: Guidelines for Wind Power Projects*) including:<br>▪ Conduct through-the-night acoustic bat monitoring in June, beginning at dusk and continuing for 5 hours.<br>▪ Conduct active visual and acoustic monitoring between sunset and midnight in June, consisting of ten minute surveys at each point count location.<br>• Conduct 3 years of post-construction acoustic monitoring for Features BMC-03, BMC-02, BMC-10, BMC-12, BMC 15 where located within 30 m of |

## Table 6-2 Mitigation Measures, Residual Effects and Monitoring Plan: Natural Heritage Resources

| Potential Effect | Performance Objective | Mitigation Strategy | Residual Effects | Monitoring Plan and Contingency Measures |
|---|---|---|---|---|
| | | | | construction activities according to protocol described for pre-construction survey (as described in July 2011 version of *Bats and Bat Habitats: Guidelines for Wind Power Projects*) including:<br>▪ Conduct monitoring of roost trees through exit surveys through June.<br>▪ Conduct active visual and acoustic monitoring at the cavity opening or crevice from 30 minutes before dusk until 60 minutes after dusk in June, consisting of ten minute surveys at each point count location.<br>• The findings of the acoustic monitoring will be reported back to MNR on an annual basis for the first 3 years of operation..<br>• Contingency Measures<br>▪ Institute changes to turbine operation if necessary (see mitigation strategy in this table).<br>▪ Consultation with MNR to determine additional contingency measures if necessary. |
| **Risk of mortality to amphibians moving between breeding pools and home range on access roads.**<br>Note: only applies if significant amphibian movement corridor identified during pre-construction surveys. | No amphibian mortality | • Advise operations staff to go slowly while driving roads in proximity to these features at nights between April 1 and June 30 and any rainy nights from spring to early autumn, where possible.<br>• Maintain wildlife crossing signs and limit speed of vehicles near crossings. | • Risk of amphibian mortality reduced through mitigation measures.<br>• Low likelihood of occurring and limited magnitude due to limited volume of maintenance vehicles. | • Conduct 3 years post-construction amphibian call surveys (frogs and toads) and egg mass or adult surveys (salamanders) to assess any potential changes in amphibian breeding populations or species distribution. |
| **Risk of amphibian mortality on access roads.** | No amphibian mortality along access roads | | | |
| **Possible snake mortality from vehicles using access road near** Features RH-01 and RH-02**.** | No snake mortality along access road | • Erect long term drift fence between edge of habitat and road if hibernaculum determined to be large (>25 snakes). | • Risk of snake mortality minimized through the application of mitigation measures.<br>• Low likelihood of occurring and limited magnitude due to limited volume of maintenance vehicles. | • Conduct reptile hibernacula survey for 2 years post-construction to assess any potential changes in snake populations or species composition. Protocol described for pre-construction survey includes:<br>▪ Examination of rock piles and vicinity between mid-April and mid-May.<br>▪ Identifying species and counting individuals.<br>▪ Preparing a field sheet to record weather, habitat conditions, location of cover objects, UTMs and details of snakes encountered.<br>• The findings of the reptile hibernacula monitoring programs will be reported back to MNR on an annual basis for the first 2 years of operation.<br>• Contingency Measures<br>▪ Advise operations staff to take extra care while driving near Features RH-01 and RH-02. |

## Table 6-2 Mitigation Measures, Residual Effects and Monitoring Plan: Natural Heritage Resources

| Potential Effect | Performance Objective | Mitigation Strategy | Residual Effects | Monitoring Plan and Contingency Measures |
|---|---|---|---|---|
| **Degradation of Rare Vegetation (RVC-01) by physical intrusion or increase of invasive plant species** | • No increase in disturbance or invasive plant species as a result of access road | • Make construction crew aware of RVC-01 and that it should be avoided.<br>• Following construction of access road, determine if any physical disturbance to RVC-01. | • Accidental disturbance prevented. | • Generally no plant monitoring required because existing road lies between RVC-01 and access road and is more a likely source of invasives.<br>• Corrective restoration and plant species monitoring required only if accidental physical intrusion occurs during construction or operations. |
| **Soil / water contamination by oils, gasoline, grease and other materials (e.g., turbine lubricant and maintenance personnel)** | • No off-site contamination of soil or no contamination of groundwater or surface water | • Control soil / water contamination through best management practices.<br>• Ensure machinery arrives on site in a clean, washed condition and is to be maintained free of fluid leaks.<br>• Develop a spill response plan and train staff on associated procedures and maintain emergency spill kits on site.<br>• Site maintenance, vehicle washing and refuelling stations where contaminants are handled at least 30 m away from natural features including water bodies and significant woodlands, wetlands, and wildlife habitat.<br>• Implement vehicle and equipment cleaning procedures and practices to minimize or eliminate the discharge of pollutants from vehicle/ equipment cleaning operations to watercourses or natural areas.<br>• Store any stockpiled materials away from natural features to prevent deleterious substances from inadvertently discharging to the environment.<br>• Dispose of any waste material from maintenance activities by authorized and approved off-site vendors.<br>• Only apply herbicides (if required) when wind speeds are low and no significant precipitation is expected (does not apply to agricultural practices).<br>• Only use herbicides (if required) approved for use adjacent to water bodies, riparian buffers, or woodland edges (does not apply to agricultural practices). | • Soil / water contamination will be minimized through the application of mitigation measures.<br>• Low likelihood and limited magnitude of effects on surface water and groundwater as a result. | • Conduct regular site inspections and monitoring of turbines by a designated on-site Environmental Monitor(s).<br>• Contingency Measures<br>▪ Notify MOE's Spills Action Centre of any spills<br>▪ Assess and remediate affected soils and water<br>• In the event that a spill occurs, the details of the spill will be reported back to MOE, including a description of any assessment and remediation undertaken. |
| **Changes in surface water drainage patterns resulting in effects to soil moisture and species composition of vegetation** | • No effects to soil moisture and species composition of vegetation | • Adhere to all setback requirements from watercourses.<br>• Implement infiltration techniques to the maximum extent possible.<br>• Minimize paved surfaces and design roads to promote infiltration. | • Effects to soil moisture and species composition of vegetation minimized due to setback requirements.<br>• Low likelihood and limited magnitude of effects as a result. | • No monitoring or contingency measures required. |

## 6.3 Surface Water and Groundwater

Potential effects to surface water and groundwater resulting from locating a Project component within the prescribed setbacks to water bodies are evaluated in the Water Assessment and Water Body Report and described below.

### 6.3.1 Surface Water

Following the Records Review and Site Investigation, the Project was found to be within the prescribed setback distance for 49 water bodies. To aid in the assessment of water bodies and to focus mitigation measures, information was collected during site investigations that incorporated water quality, flow, aquatic habitat and riparian features in order to provide some understanding on the system's resiliency. Based on a sensitivity ranking, 2 watercourses were classified as high sensitivity (*i.e*., not very resilient to environmental change); 33 as moderate sensitivity; and 14 as low sensitivity. This assessment demonstrates that the majority of the watercourses are fairly resilient to environmental perturbations. In general, water quality throughout the Study Area was heavily influenced by agriculture, as evidenced by tile drain runoffs, high suspended solids and turbidity of the water, as well as algae growth in some of the channels.

In compliance with O. Reg. 359/09, a Water Body Report was prepared to assess negative environmental effects, identify mitigation measures and describe monitoring commitments to address any effects. For a detailed account of this assessment, please refer to the Water Assessment and Water Body Report.

#### *6.3.1.1 Potential Effects*

Potential effects from operational and maintenance activities include:

- Water contamination by oils, gasoline, grease and other materials (e.g., turbine lubricant and maintenance activities, use of access roads) at the following watercourses due to their proximity to the project:
  - **High** Sensitivity:
    C35 (Project Component: Turbine).
  - **Moderate** Sensitivity:
    C41, C30, C51, C36, C18, C22, C26, C28, C114 (Project Component: Turbine)
    C46, C30, C22, C28, C113 (Project Component: Road Crossing)
    C25 (Project Component: Substation and Laydown Areas)
    T1, T2, T3, T4, T5, T6, T7, T8, T9, T10, T17 (Project Component: Transmission Line).
  - **Low** Sensitivity:
    C32, C71, C99, C33, C40, C3 (Project Component: Turbine)
    C13, C22 (Project Component: Road Crossing).
- Increase in impervious surfaces from the presence of turbine foundation and access roads, resulting in increased water temperatures, increased surface runoff and stream peak flows.
- Obstruction of lateral flows in watercourses and other waterbodies from water crossings.

### 6.3.2 Groundwater

A desktop study was conducted to identify potential effects to the groundwater from the proposed turbine layout. Materials used included MOE Water Well Records, geological descriptions from the Ontario Geological Survey (OGS), air photos and GIS, as well as the turbine layout for the Project site and turbine construction details.

The predominant overburden material throughout the Project Site is the St. Joseph Till, which is characterized by glaciolacustrine-derived silty to clayey till (OGS, 2003). The St. Joseph Till has a high clay content which likely restricts infiltration and groundwater movement. Therefore shallow groundwater transport is likely through the weathered overburden flowing west toward Lake Huron or is vertical along fractures until it reaches a flow path at depth. Groundwater recharge areas within the Project Study Area are restricted to the small patches of high permeable soils of beach ridge and glacial outwash deposits found running north-south in the centre of the Project Study Area (OGS, 2003). The surface topography is influenced by the Wyoming Moraine, producing the typical hummocky/rolling topography of this area. The largest north-south glaciolacustrine deposit has been designated as a Significant Groundwater Recharge Area (SGRA) by the Government of Ontario and also houses the Hay Swamp Provincially Significant Wetland (PSW), the only PSW within the Project Study Area.

#### *6.3.2.1 Potential Effects*

Potential effects from operational and maintenance activities include:

- Increase in impervious surfaces from presence of turbine foundations overlaying high permeability surficial materials (such as: sands, gravels and silty sands) and access roads, resulting in reduced infiltration to groundwater.
- Groundwater contamination by oil, gasoline, grease or other material from construction activities.

The mitigation measures, residual effects, and the monitoring plan associated with these effects to surface water and groundwater are described in **Table 6-3** below.

## Table 6-3 Mitigation Measures, Residual Effects and Monitoring Plan: Surface Water and Groundwater

| Potential Effect | Performance Objective | Mitigation Strategy | Residual Effects | Monitoring Plan and Contingency Measures |
|---|---|---|---|---|
| **Increase in impervious surfaces from presence of turbine foundation and access roads, resulting in increased water temperatures, increased surface runoff and stream peak flows, and reduced infiltration, base flows and upwelling.** | • No changes to surface water quality or quantity. | • Adhere to all setback requirements from watercourses.<br>• Control quantity and quality of stormwater discharge using best management practices, and implement infiltration techniques to the extent possible (e.g., use of a permeable surface for access roads). | • Increase in impervious surfaces and subsequent changes to surface water quality or quantity minimized due to setback requirements and through application of mitigation measures.<br>• Low likelihood and limited magnitude of effect due to small increase in impervious surfaces within entire Project Study Area. | • No monitoring or contingency measures required. |
| **Soil / water contamination by oils, gasoline, grease and other materials (e.g., turbine lubricant and maintenance activities, use of access roads).** | • No off-site contamination of soil and no contamination of groundwater or surface water | • Control soil / water contamination through best management practices.<br>• Ensure machinery arrives on site in a clean, washed condition and is to be maintained free of fluid leaks.<br>• Develop a spill response plan and train staff on associated procedures and maintain emergency spill kits on site.<br>• Site maintenance, vehicle washing and refuelling stations where contaminants are handled at least 30 m away from natural features including water bodies and significant woodlands, wetlands, and wildlife habitat.<br>• Implement vehicle and equipment cleaning procedures and practices to minimize or eliminate the discharge of pollutants from vehicle/ equipment cleaning operations to watercourses or natural areas.<br>• Store any stockpiled materials away from natural features to prevent deleterious substances from inadvertently discharging to the environment.<br>• Dispose of any waste material from maintenance activities by authorized and approved off-site vendors. | • Soil / water contamination will be minimized through application of mitigation measures.<br>• Low likelihood and limited magnitude of effects on surface water and groundwater as a result. | • Conduct regular site inspections and monitoring of turbines by a designated on-site Environmental Monitor(s).<br>• Contingency Measures<br>▪ Notify MOE's Spills Action Centre of any spills.<br>▪ Assess and remediate affected soils and water<br>• In the event that a spill occurs, the details of the spill will be reported back to MOE, including a description of any assessment and remediation undertaken. |
| **Obstruction of lateral flows in watercourses and other waterbodies due to design of culverts and debris build-up at water crossings.** | • No obstructions of lateral flows. | • Design culverts to accommodate high flows of the watercourse.<br>• Inspect culverts during routine maintenance activities. | • Obstruction of lateral flows in watercourses and other waterbodies will be avoided through culvert design and maintenance activities.<br>• No likelihood of effect occurring. | • No monitoring or contingency measures required. |

## 6.4 Emissions to Air

Emissions to air are more likely to be effects experienced during construction activities rather than during the operation of the Project. Wind turbines do not generate any emissions and instead such environmental effects are likely to be limited to emissions from maintenance vehicles.

### 6.4.1 Potential Effects

Potential effects from operational and maintenance activities include:

- Emissions of contaminants from maintenance vehicles, including but not limited to, nitrogen dioxide, sulphur dioxide, suspended particulates, emission of greenhouses gases (CO2, methane).
- Dust as a result of vehicle traffic over gravel roads and/or cleared areas.

No effects from the emission of odour are anticipated.

The mitigation measures, residual effects, and the monitoring plan associated with air emissions are described in **Table 6-4** below.

**Table 6-4 Mitigation Measures, Residual Effects and Monitoring Plan: Emissions to Air**

| Potential Effect | Performance Objective | Mitigation Strategy | Residual Effects | Monitoring Plan and Contingency Measures |
|---|---|---|---|---|
| **Emissions of contaminants from maintenance vehicles.** | • Limit impact of maintenance vehicles on local air quality. | • Ensure all engines (vehicles and generators) meet emission requirements specified by the MOE and MTO. | • Emissions of contaminants from maintenance vehicles minimized through application of mitigation measures.<br>• Low likelihood of occurring and limited magnitude due to limited volume of maintenance vehicles. | • Track all complaints and conduct follow-up monitoring (see Complaints Resolution Process in Emergency Response and Communications Plan).<br>• No contingency measures required. |
| **Dust as a result of vehicle traffic over gravel roads and/or cleared areas.** | • Limit dust production from maintenance vehicles. | • Limit speed of maintenance vehicles to minimize dust generation. | • Dust from vehicular traffic minimized through application of mitigation measures.<br>• Low likelihood of occurring and limited magnitude due to limited volume of maintenance vehicles. | • Track all complaints and conduct follow-up monitoring (see Complaints Resolution Process in Emergency Response and Communications Plan).<br>• No contingency measures required. |

## 6.5 Noise

Wind energy projects have the potential to generate environmental noise which under certain circumstances may represent an annoyance to some surrounding residents. A Noise Study Report was conducted to identify these effects; the study and its results are presented in **Appendix A** of this Report.

Noise modelling conducted for the Noise Study Report determined that the Project layout is in compliance with all of the requirements outlined in *O. Reg. 359/09*, and the MOE "Noise Guidelines for Wind Farms (2008)". These regulations set out a minimum 550 m setback from non-participating noise receptors (i.e., residents, hospitals, schools, daycares, places of worship, etc.). MOE has based the regulatory approach to noise on a 40dBA outdoor night time noise limit. This setback also applies to the future use of vacant land, where that land is zoned to allow for the construction of potential receptors (e.g., residential). Participating land owners (i.e., someone who has entered

into an agreement to permit all or part of the facility on their land) are not considered noise receptors for the purposes of determining noise setbacks.

As part of the Noise Study Report the cumulative noise effects of the Project and other existing wind farm projects within 5 km were modelled. This assessment also addressed any wind farms which have not yet been constructed but have a crystallized site plan. Following consultation with MOE and area municipalities, it was determined that one existing wind farm is located within 5 km of the Project; the Zurich Wind Farm operated by Magnum Wind Energy. This is a single 0.8 MW turbine located to the west of Zurich near Bronson Line and Zurich-Hensall Road (see Figure 2-3). In addition, the Goshen Wind Energy Centre being developed by NextEra was also considered in the cumulative noise assessment.

### 6.5.1 Potential Effects

Potential effects from operational and maintenance activities include:

- An increase in noise levels due to the aerodynamic noise generated from wind turbine blades, and mechanical noise associated with each turbine and from the transformer located at the substation. Specifically, the noise modelling results show that the noise levels for all receptors are below 40 dBA.

The mitigation measures, residual effects, and the monitoring plan associated with noise are described in **Table 6-5** below.

**Table 6-5 Mitigation Measures, Residual Effects and Monitoring Plan: Noise**

| Potential Effect | Performance Objective | Mitigation Strategy | Residual Effects | Monitoring Plan and Contingency Measures |
|---|---|---|---|---|
| **Increased noise levels experienced by receptors (residents located on non-leased properties) due to turbine operation.** | • Limit noise levels to <40 dBA at non-participating receptors. | • Adhere to noise setbacks.<br>• Repair equipment in a timely manner. | • Noise levels experienced by receptors (residents located on non-leased properties) due to turbine operation will be below 40 dBA . | • Track all complaints and conduct follow-up monitoring (see Complaints Resolution Process in Emergency Response and Communications Plan).<br>• Contingency Measures<br>▪ Repair damaged turbine component.<br>▪ Operate turbines that are out of compliance in noise-reduced mode. |
| **Increased noise levels experienced by receptors (residents located on non-leased properties) due to substation operation.** | • Limit noise level to < 40 dBA at non-participating receptors. | • Adhere to noise setbacks (greater than 1,000 m).<br>• Repair equipment in a timely manner.<br>• Install a 5 m high noise barrier around the transformer substation to comply with MOE noise limits. | • Noise levels experienced by receptors near the substation will be below 40 dBA due to setback requirements and application of mitigation measures.<br>• High likelihood but limited magnitude of effects as a result. | • Track all complaints and conduct follow-up monitoring (see Complaints Resolution Process in Emergency Response and Communications Plan).<br>• No contingency measures required. |

## 6.6 Local Interests, Land Use and Infrastructure

Land uses within 300 metres of the Study Area were identified through the REA planning process and in consultation with the local municipalities, Ontario Ministry of Transportation (MTO) and local landowners. The following section describes the results of the effects assessment for the operations phase of the Project.

### 6.6.1 Existing Land Uses and Infrastructure

Common agricultural land uses in northern Lambton County and southern Huron County are cash crops (e.g., soybeans, corn and wheat) and livestock farming. Other land uses include non-farm residential uses on separate lots created through severances for farm retirement lots, surplus farm dwelling lots and older estate lots, which are scattered throughout the Study Area in limited numbers.

Recreational land uses within the Project Study Area include the 95-acre Linfield Wildlife Area, which is situated to the west of the Goshen Line and Pavilion Road intersection, to the southwest of Varna and north of Zurich. This area contains trails used for hiking, bird watching, snow-shoeing, cross-country skiing and fishing and is managed by the Ausable Bayfield Conservation Authority. A number of other recreational trails exist just beyond the Project Study Area boundary, such as the Sawmill, Heritage and Woodland Trails in Bayfield and the Bannockburn Conservation Area to the northeast of Varna.

The Project will provide an increased municipal tax base for the Municipalities of Bluewater and Huron East, increased number of employment opportunities (especially during the construction stage) and the generation of clean, renewable electricity from wind power. The operation of the wind energy centre will also provide annual economic benefits through royalties to landowners and an initial and continuing need for supplies and services in the local and regional rural economies.

#### *6.6.1.1 Potential Effects*

Potential effects from operational and maintenance activities include:

- A minor reduction in usable farmland as a single turbine, together with its access road, will take up on average only 1.0 to 1.5% of a typical 40 hectare farm parcel.
- Reduction in aesthetic quality of landscape which may affect the use and enjoyment of private property and recreational amenities.
- Damage to crops or trees due to turbine malfunction or failure associated with 9 turbines that are located within 80 metres of neighbouring property lines (refer to **Appendix C** - **Property Line Setback Assessment Report**).

### 6.6.2 Stray Voltage and Effects to Livestock

NextEra has designed the Project to minimize the risk of stray voltage to consumers and to ensure the Project is built and maintained within acceptable levels as prescribed by the Distribution System Code and the Electrical Safety Authority.

Most cases of stray voltage occur when there is either:

- Improper grounding of on-site equipment (in which case it is an issue with on-site wiring).
- A change in current patterns on the distribution line, from generation or load, which exposes a pre-existing condition (in which case it is an issue with the distribution utility, not with the generator or load).

The turbines are therefore not the root of the problem, but like any change to the system, may expose faults in that system. All types of generation (wind generation using wind turbines included) must fully comply with utility requirements to ensure that the electricity they supply is compliant with grid standards.

### *6.6.2.1 Potential Effects*

Potential effects from operational and maintenance activities include:

- Mild electric shocks to livestock, which may cause behavioural changes, and changes in production performance.

At a voltage difference above about 10 volts, people may detect a tingle. This is not a health hazard to humans.

The mitigation measures, residual effects, and the monitoring plan associated with potential land use impacts are described in **Table 6-6** below.

**Table 6-6 Mitigation Measures, Residual Effects and Monitoring Plan Local Interests, Land Use and Infrastructure**

| Potential Effect | Performance Objective | Mitigation Strategy | Residual Effects | Monitoring Plan and Contingency Measures |
|---|---|---|---|---|
| **Minor reduction in usable agricultural land.** | • Minimize reduction of farmland. | • Minimize length of access roads where possible.<br>• Compensate landowners on Project Location as per land lease agreement.<br>• Limit road width during operations to 6 m. | • Minor reduction in usable agricultural land.<br>• High likelihood of effect, however limited magnitude due to size of overall footprint within the entire Project Study Area. | • No monitoring or contingency measures required. |
| **Reduction in aesthetic quality of landscape which may affect the use and enjoyment of private property and recreational amenities.** | • Limit aesthetic impact of turbines where possible. | • Adhere to setback requirements to limit likelihood of any impacts. | • Reduction in aesthetic quality of landscape which may affect the use and enjoyment of private property and recreational amenities.<br>• Likelihood and magnitude dependent on perception of residents and visitors to presence of turbines. | • No monitoring or contingency measures required. |
| **Stray voltage effects to livestock.** | • Minimize effects of stray voltage on livestock. | • Build and maintain Project as prescribed by the Distribution System Code and the Electrical Safety Authority to minimize the risk of stray voltage.<br>• Maintain point of interconnection with the transmission system, not the distribution system thus reducing potential to impact any customers. | • Stray voltage effects to livestock.<br>• Low likelihood and limited magnitude expected based on existing wind farm operations. | • Track all complaints and conduct follow-up monitoring (see Complaints Resolution Process in Emergency Response and Communications Plan.<br>• No contingency measures required. |
| **Damage to crops or trees due to turbine malfunction or failure associated with 12 turbines located within 80 metres of neighbouring property lines** | • Minimize damage to crops or trees due to turbine malfunction or failure. | • Ensure ongoing regular maintenance and monitoring of turbines.<br>• Implement shutdown mechanisms and protocols in extreme weather instances to prevent damage to wind turbines. | • Damage to crops or trees minimized through mitigation measures<br>• No likelihood of effect as a result of mitigation strategy. | • No monitoring or contingency measures required. |

## 6.7 Other Resources

There are three authorized aggregate resources located within the Project Study Area. The first aggregate resource is a 36 ha site owned by Huron County and has a Class A Licence for over 20,000 tonnes. This is located 1,510 m from the nearest Project infrastructure (access road to Turbine 33). The second aggregate resource is a 19 ha site owned by G. Heard Construction Limited and has a Class B Licence for 20,000 tonnes or less. This is located 402 m from the nearest Project infrastructure (access road to Turbine 7). The third aggregate resource is a 4 ha Class B site licensed to Donald G. Heard, but has since been surrendered. This is located 242 m from the nearest Project infrastructure (transmission line).

There are no landfills or forest resources located within the Project Study Area.

There are two locations where Project infrastructure is located within 75 m of a petroleum resource:

- The collection line between Turbines 16 and 26 is approximately 62 m from a petroleum resource.
- The turnaround box for Turbine 9 is approximately 35 m from a petroleum resource.

### 6.7.1 Potential Effects

No effects on aggregate resources or petroleum resources are anticipated as a result of the operation of the Project due to the distance between Project components and these resources. An Engineer's Report will be submitted to the MNR prior to construction to confirm that there are no effects on petroleum resources.

In addition, there are no effects on landfills or forest resources as none are present.

## 6.8 Public Health and Safety

To minimize or avoid effects on public health and safety, the turbines are sited according to setback distances outlined in *O.Reg.359/09* and as described above. Effects relating to noise are described in Section 6.5.

### 6.8.1 Potential Effects

Potential effects from operational and maintenance activities include:

- Ice formation on turbine blades resulting in ice shed.
- Shadow flicker causing disturbance at nearby residences and businesses. Shadow flicker occurs when – at precise latitude, wind direction, and height of the sun – rotating wind turbine blades cast shadows upon stationary objects.

The mitigation measures, residual effects, and the monitoring plan associated with public health and safety are described in **Table 6-7** below.

**Table 6-7 Mitigation Measures, Residual Effects and Monitoring Plan: Public Health and Safety**

| Potential Effect | Performance Objective | Mitigation Strategy | Residual Effects | Monitoring Plan and Contingency Measures |
|---|---|---|---|---|
| **Impacts on public health and safety from ice shed and/or shadow flicker.** | • No public health and safety incidents. | • Adhere to setback requirements to limit likelihood of any impacts. | • No impacts on public health and safety from ice shed and/or shadow flicker due to setback requirements.<br>• Low likelihood and limited magnitude expected based on existing wind farm operations. | • Track all complaints and conduct follow-up monitoring (see Complaints Resolution Process in Emergency Response and Communications Plan).<br>• Contingency Measures<br>• Suspend operations during icing conditions to minimize the risk of ice shed. |

## 6.9 Areas Protected Under Provincial Plans and Policies

The REA regulation requires a determination as to whether the Project is being proposed in any of the following protected or plan areas:

- Protected Countryside or Natural Heritage Systems in the Greenbelt Plan;
- Oak Ridges Moraine Conservation Plan Areas;
- Niagara Escarpment Plan Area; or
- Lake Simcoe Watershed Plan Area.

The proposed Bluewater Wind Energy Centre is not proposed in any of these protected or plan areas. As such, there will be no effects on these areas as a result of the Project.

# 7. Summary and Conclusions

Significant adverse effects have been avoided through careful site selection, facility layout planning and strict adherence to all regulatory requirements. All turbines, access roads and ancillary facilities have been sited with landowner consultation to minimize the impact to current agricultural operations.

**The overall conclusion of this *Design and Operations Report* is that this Project can be operated without any significant adverse residual effects. Post-construction monitoring related to effects on wildlife, including birds and bats, will be undertaken to confirm this conclusion.**

# 8. References

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