Samsung Renewable Energy Inc. and

Pattern Renewable Holdings Canada ULC

1 Project Description Report

For

Armow Wind Project

Summary of Report Revisions

Section of Report	Report Date: August, 2012 (Municipal and County Review)	Report Date: August, 2012 (Public and Aboriginal Review)	Report Date: November, 2012	Report Date: REA Submission November, 2012
Section 1.1		Added: None of the Project Location is situated on Crown Land.		
Section 2.2	Reference to table 9	Revised: Reference to table 10		
Section 2.2.4	Reference to table 8	Revised: Reference to table 9		
Section 2.2.5	Reference to table 9	Revised: Reference to table 10		
Appendix A	Title of Appendix A: Legal Descriptions	Title of Appendix A: Legal Description of Project Location Lands		
Table 2		Project Lifespan (approval to decommissioning)	Revised: Project Lifespan (commercial operation)	
Table 6		Up to three meteorological towers are proposed to be constructed within the Project Study Area (see Figure 1).	Revised/Added: Up to three meteorological towers are proposed to be constructed up to 100m tall within the Project Study Area (see Figure 1). The meteorological towers will be constructed on a concrete foundation or guyed.	
Section 2.1			Added: Microwave tower	
Table 6			Added: Microwave Tower A microwave tower used for communication purposes will be constructed within the substation construction disturbance area. The microwave tower will be up to 100m tall and constructed on a	

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			concrete foundation or guyed.	
Table 6			Added (to collector substation): Communication equipment, SCADA equipment, protection and control equipment, conforming to IESO market rules	
Table 8		Meteorological towers will be installed by a single crane.	Added: Microwave Tower Revised: Meteorological towers and the microwave tower up to 100 m tall will be installed by a single crane.	
Section 2.2.4		If the Project is not extended past its operational life (20 years)	Revised: If the Project is not extended past its commercial operational life (20 years)	
Table 9			Added: Microwave Tower	
General Update			A total of 99 turbines will be permitted to provide contingency positions.	Revised: A total of 98 turbines will be permitted to provide contingency positions.

November 2012

SP ARMOW WIND ONTARIO LP
ARMOW WIND PROJECT

Project Description Report

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2 St. Clair West, Floor 12A
Toronto, Ontario
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REPORT

Golder Associates

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1.0 GENERAL INFORMATION

The Armow Wind Project (the "Project") is an up to 180 megawatt commercial wind energy generation facility located substantially on leased privately owned lands in the Municipality of Kincardine, Bruce County, Ontario. The Project is being developed by SP Armow Wind Ontario LP (the Proponent) by its general partner SP Armow Wind Ontario GP Inc. The Proponent is a joint venture limited partnership owned by affiliates of Pattern Renewable Holdings Canada ULC ("Pattern") and Samsung Renewable Energy Inc. ("Samsung"). The Proponent is proposing to develop, construct, and operate the Project in response to the Government of Ontario's plan to integrate more renewable energy into the province's power grid. The proposed Project was formerly known as the Armow Wind Power Project, (the "Acciona Project") an 80 MW wind facility being developed by Acciona Renewable Energy Canada Holdings Inc. ("Acciona"). In August, 2011, Acciona sold all lease holdings of the former Armow Wind Power Project to the Proponent. The Proponent is proposing to expand the Acciona Project within the same Project Study Area (see Section 1.1) to a nameplate capacity of up to 180 MW. Details regarding the sale of the Acciona Project to the Proponent were communicated by Acciona in an August 2011 letter to landowners that had option agreements with Acciona.

In 2009, the Government of Ontario introduced the *Green Energy and Green Economy Act* and Ontario Regulation (O. Reg.) 359/09. The regulatory amendments to O. Reg. 359/09 came into force on July 1, 2012 as O. Reg 195/12[1]. The Renewable Energy Approval ("REA") integrates previous requirements under the *Environmental Assessment Act* with clear provincial rules and standards in a new regulation under the *Environmental Protection Act*. This Project Description Report has been prepared to provide details of the Project as part of the REA.

Table 1, below, highlights the requirements and how they are addressed in this Project Description.

Table 1: Project Description Requirements and Information Location

Requirement per O. Reg. 359/09, as amended	Project Description Details
Description of any energy sources to be used to generate electricity at the renewable energy generation facility.	Wind energy facility
Description of the facilities, equipment or technology that will be used to convert the renewable energy source or any other energy source to electricity.	See Section 2.1
The class of the renewable energy generation facility.	Class 4 wind facility
Description of the activities that will be engaged in as part of the renewable energy project.	See Section 2.2
The name plate capacity of the renewable energy generation facility.	180 MW
The ownership of the land on which the project location is to be situated.	See Section 2.4
Description of any negative environmental effects that may result from engaging in the project.	See Section 3.0
An unbound, well marked, legible and reproducible map that is an appropriate size to fit on a 215 mm by 280 mm page, showing the project location and the land within 300 m of the project location.	See Project location map

[1] All references to Ontario Regulation 359/09 refer to the Regulation as amended Regulation 195/12 which came into force July 1, 2012

A Draft PDR was provided to the Director of the Environmental Assessment and Approvals Branch ("EAAB") of the Ontario Ministry of the Environment ("MOE") November 8th, 2011. The MOE confirmed on December 15th, 2011 that the list of Aboriginal communities identified for the Acciona Project had not changed and the Proponent could continue to use this list as the basis for their Aboriginal engagement program. The Draft PDR was then provided to Aboriginal communities and the public following the distribution requirements and timing constraints outlined in O. Reg. 359/09, as amended, and the Draft Technical Guide to Renewable Energy Approvals (MOE, 2012).

1.1 The Project Location

The proposed Project is situated in Bruce County, 3 km from Lake Huron, approximately 2 km northeast of Kincardine, Ontario (see Figure 1). The Project location, is defined in O. Reg. 359/09, as amended, in relation to a renewable energy project to mean "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 proposed to engage in the project". The Project location is bounded by Highway 21 to the west, Concession 4 to the north, County Road 1 to the east and the North Line to the south. The area encompassed by these boundaries is referred to in this document as the "Project Study Area".

The proposed Project Study Area, covering approximately 18,800 hectares of land in the Municipality of Kincardine, Ontario, is primarily comprised of agricultural lands with fragmented blocks of forest and riparian areas associated with small creeks and farm drains (see Figure 1). The Project will be located primarily within portions of privately owned lands parcels with collection cables being placed in public road allowances. Portions of privately owned land parcels that contain Project infrastructure will be under lease or easement to the Proponent for the duration of the Project. None of the Project Location is situated on Crown land.

The location of the Project was established based on interest expressed by local landowners, its proximity to high-voltage transmission lines, and its excellent wind resource.

1.2 Description of the Energy Source, Nameplate Capacity, and the Class of Facility

The Project will utilize wind to generate energy. A small amount of electricity will be required to operate the Project's electronic control equipment and facilities. No supplementary fuels sources will be required to generate electricity for the Project.

The Project is a Class 4 wind facility with a nameplate generation capacity of up to 180 MW, which will generate electricity through approximately 90 Siemens SWT-2.3-101 wind turbines rated between 1.8 MW and 2.3 MW. A total of 98 turbines will be permitted to provide contingency positions. A summary of Project vital statistics are presented in Table 2 below.

Table 2: Summary of Project Vital Statistics

General	
Project Name	Armow Wind Project
Project Ownership and Operation	SP Armow Wind Ontario LP
Project Lifespan (commercial operation)	20 Years
Project Nameplate Capacity	Up to 180 MW
Project Area (as shown in Figure 1)	
Location of Project	Privately-owned land and Public Road Allowances Municipality of Kincardine, County of Bruce
Total Project Study Area	18,800 ha
Total Area of Project Location (total disturbance area)	472.9 ha
Wind Turbine Generators	
Model	Siemens SWT-2.3-101
Total Number Permitted	98
Approximate Number Constructed	90
Nominal Power	1.8 to 2.3 MW
Number of Blades	3
Blade Length	49 m
Hub Height	99.5 m
Rotor Diameter	101 m
Cut-in Wind Speed	3 m/s
Cut-out Wind Speed	25 m/s
Rated Wind Speed	12 – 13 m/s
Swept Area	8,000 m^2
Foundation Dimensions	20 m diameter
Access Roads	
Operation Roads (includes shoulder, travel width and ditch)	58 km x 4-8 m
Construction Roads (with shoulder)	58 km x 7-15 m
Temporary Roads / Crane Walks	3 km x 7-15 m
Collector Lines	
34.5 kV Collector Lines in public ROW (total combined length of proposed underground and/or overhead)	132 km x 2-6 m
34.5 kV Collector Lines on private lands (underground)	60 km x 2-6 m
Other Project Structures and Facilities	
Collector Substation	200 m x 150 m
Operations and Maintenance Building	50 m x 30 m

General	
Point of Interconnect	1 acre
Temporary Land Use (Construction Phase)	
Construction Staging Areas	10 acres
Wind Turbine Laydown Area (each turbine)	5000 m^2
Crane Pads	40 m x 20 m

1.3 Contact Information

Applicant

The proponent for the Project is SP Armow Wind Ontario LP, by its general partner SP Armow Wind Ontario GP Inc. The Proponent is a joint venture limited partnership owned by affiliates of Pattern Renewable Holdings Canada ULC and Samsung Renewable Energy Inc. The contacts for the Project are as follows:

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Consultant

The Proponent has retained Golder Associates Ltd. (Golder) to prepare an REA Application under O. Reg. 359/09, as amended. Contact information for the Golder Project Manager is as follows:

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Project

Project email: info@armowwind.com
Project website: www.armowwind.com

1.4 Other Approvals Required

Based on the requirements of the *Green Energy and Green Economy Act*, the Project may require additional provincial authorizations, listed in Table 3. The requirement for additional authorizations and permits will be determined during the REA process and development of the final Project design.

Table 3: **Ontario Authorizations and Permits**

Permit / Authorization	Administering Agency	Rationale
Renewable Energy Approval Application - Ontario Regulation 359/09	Ministry of the Environment (MOE)	Electricity project approval
*Certificate of Approval - Air	MOE	Environmental noise emissions
*Archaeological Clearance	Ministry of Tourism, Culture and Sport (MTCS)	Archaeological & heritage resources
**Public Lands Act* work permit	Ministry of Natural Resources (MNR)	Project may cross watercourses that are considered public lands
Fill, Construction, & Alteration of Waterways Development, Interference with Wetlands and Alterations to Shorelines and Watercourses – Ontario Regulation 169/06	Conservation Authority (Saugeen Valley Conservation Authority) / MNR	Work within floodplains, water crossings, river or stream valleys, hazardous lands and within or adjacent to wetlands.
Permit to Take Water	MOE	Dewatering activities
Encroachment Permit	Ministry of Transportation (MTO)	Crossing of provincial highways
Land-Use Permit	MTO	Project works undertaken within 180m of an MTO controlled intersection
Commercial Access Permit	MTO	Ingress/egress from provincial highway
Change of Access & Heavy / Oversize Load Transportation Permit	MTO	Compliance with provincial highway traffic and road safety regulations
Special Vehicle Configuration Permit	MTO	Use of non-standard vehicles to transport large components
Notice of Project	Ministry of Labour	Notification to the Ministry of Labour before construction begins.
Leave-to-Construct	Ontario Energy Board (OEB)	Development of a high-voltage transmission facility
Generator's Licence	OEB	Generator Operation Permit
Transmitter Licence	OEB	Transmission of electrical power to interconnect with provincial grid
Customer Impact Assessment	Hydro One Networks Inc. (HONI)	Evaluation of potential effects to existing electrical customers

Permit / Authorization	Administering Agency	Rationale
Connection Cost Recovery Agreement (CCRA)	HONI	Recovery of costs to grid operator of changes to allow connection
System Impact Assessment	Independent Electricity Systems Operator (IESO)	Potential effects of integrating the Project within provincial transmission system
Approval of Connection	IESO	Electrical interconnect with IESO regulated network
Connection Assessment	IESO	Integration of project with IESO-controlled transmission system
Certificate of Inspection	Electrical Safety Authority (ESA)	Ensure work complies with the Ontario Electrical Safety Code.

**Permits covered under REA process.*

In addition to the provincial requirements listed in Table 3, the Project will require a number of municipal permits and approvals. Although the list may not be exhaustive, Table 4 shows a number of the permits and approvals that may be required from the Municipality of Kincardine prior to construction.

Table 4: Municipal Authorizations and Permits

Permit / Authorization	Rationale
Entrance Permit	Ingress/egress from Municipal roads
Building Permit	Compliance with Ontario Building Code
Municipal Consent, Work within the R.O.W	Required for work in municipal road allowances
Consent/Severance Application	Required if easements over private lands required
Road Cut Permit	May be required for access roads off of county roads or works to county roads
Pre-condition Survey	Assessment of pre-construction conditions for engineering staff
Transportation Plan	Adherence to road safety and suitability
Supporting Information/Plans for General Engineering, Water, Wastewater, Storm Water, Transportation, and Geotechnical	Supporting information/plans that may be required by the Municipality of Kincardine

1.5 Federal Involvement

It is not anticipated that the Project will require a Federal environmental assessment. Potential triggers under the *Canadian Environmental Assessment Act* include an application for Federal funding or a Harmful Alteration, Disruption or Destruction of fish habitat under the *Fisheries Act*. Required Federal authorizations and permits, listed in Table 5, that are required for the Project will be determined through the REA process and will be obtained, if required.

Table 5: Federal Authorizations and Permits

Permit Authorization	Administering Agency	Rationale
Canadian Environment Assessment	NRCan, DFO, Transport Canada	Issuing Permits & Authorizations
Aeronautical Obstruction Clearance	Transport Canada - Aviation Division	Turbine Marking & Lighting
Land-Use Clearance	NAV Canada	Aeronautical safety mapping and designation
Navigational Clearance	Transport Canada - Marine Division	Crossing a Navigable Watercourse
Fisheries Act	Conservation Authority of behalf of DFO	Harmful alteration, disruption, or destruction of fish or fish habitat

Additional federal acts and regulations that do not require an authorization, but will be considered and adhered to, include the following:

- *Species at Risk Act* (SARA); and
- *Migratory Birds Convention Act*.

2.0 PROJECT INFORMATION

Section 2 provides an overview of all the components and activities required for the proposed Project.

2.1 Project Components

The major components of the Project include wind turbine generators, access roads, collector lines, collector substation, meteorological towers, a microwave tower and an operations building. Table 6 provides descriptions of these major components along with ancillary components required for the operation of the Project. Additional detail regarding the wind turbine generators will be provided in the Wind Turbine Specification Report, which is included as part of the Project's REA Application.

Table 6: Description of Project Components

Component	Description
Wind Turbine Generators	The Project will include large scale commercial wind turbines, namely the Siemens SWT-2.3 model, ranging from 1.8 MW – 2.3 MW. The wind turbine nacelle includes the electric generator, gearbox, wind direction and speed sensors, and auxiliary equipment. These components are located at the top of a supporting tower and are connected to three blades and a hub via a main shaft.
Wind Turbine Foundation	Each turbine tower is anticipated to have a concrete foundation approximately 20 m in diameter and 2.5 m deep. The land base of each turbine foundation will be dependent on subsurface conditions determined during geotechnical investigations. Following geotechnical investigations it may be determined that pile type foundations may be suitable for certain locations.
Pad-mounted Transformers	A pad-mounted transformer will be located immediately adjacent to each wind turbine. This transformer 'steps-up' the electricity generated by the wind turbine (600 V) to a common collector line voltage (34.5 kV).
Wind Turbine Access Roads	During construction and operation of the proposed Project, access roads are required in order to access wind turbine locations. Access roads will be constructed of native materials or engineered fill and will be up to 15 m wide during construction in order to accommodate cranes and transportation equipment used to deliver wind turbine components. Subject to landowner consultation, following construction and installation activities, roads may be reduced to 4-8 m wide, which would allow access to turbines and associated infrastructure for maintenance and repairs.
Meteorological Towers	Assessment of meteorological conditions and wind resources requires permanent meteorological stations to be constructed. Up to three meteorological towers are proposed to be constructed up to 100m tall within the Project Study Area (see Figure 1). The meteorological towers may be constructed on a concrete foundation or guyed.

Component	Description
Microwave Tower	A microwave tower used for communication purposes may be constructed within the substation construction disturbance area. The microwave tower may be up to 100m tall and constructed on a concrete foundation or guyed.
Collector Lines	Collector lines carry the electricity from the pad-mounted transformers to the Project substation (described below). The collector lines will be standard utility 34.5 kV. From the turbine to the municipal and county roads, collector lines will be buried on private land. Collector lines along municipal and county roads will be located within the existing road rights-of-way and, where possible, buried. Underground collector lines will be buried at a depth of approximately 1.0-1.5m. If determined that overhead collector lines are required, they will be constructed on single pole structures that are similar to existing medium voltage distribution lines within the Project Study Area.
Collector Substation	A collector substation is required to bring together all of the collector lines. The collected power will be transformed from the collector line voltage (34.5 kV) to a transmission voltage (230 kV). The collector substation is proposed to be located approximately 400 m from the existing Hydro One transmission line. The collector substation will be connected to the Hydro One line by a single circuit overhead line, supported by 3 to 4 interconnection structures. The collector substation will be constructed within a construction disturbance area of approximately 200 m by 150 m on a raised pad or a prepared base of either engineered fill or native soil to a depth of approximately 2 m. The substation will comply with the requirements of O. Reg. 359/09, as amended, by including a 20 kg/m^2 acoustic barrier that breaks the line of sight with any noise receptors and is located at a distance of at least 500 metres from the nearest noise receptor. Collector substation equipment will include isolation switch(es), circuit breaker(s), step-up power transformer(s), distribution switch-gear(s), capacitor banks, instrument transformers, communication equipment, SCADA equipment, protection and control equipment, grounding transformers, revenue metering (conforming to IESO market rules), substation grounding and a control building. Substation grounding will follow the Canadian Electrical Code (CEC). An oil containment system designed for the main transformer(s) will be installed at the site to prevent soil contamination in the event of a leak.

Component	Description
Operations and Maintenance Facilities	Operations and maintenance facilities with an approximate footprint of 3 acres will be constructed to accommodate offices, mess facilities, control facilities, storage space, maintenance work area, and a parking area. The operations and maintenance facilities will be within the Project Location. The operations and maintenance building will be a structure constructed on a concrete foundation. An access road to the will be constructed to accommodate construction equipment and on-site traffic during the operation of the proposed Project. The operations and maintenance building will be powered by local distribution power company, with an onsite backup power supply. Power will be delivered via underground lines adjacent to the access road.

To facilitate the construction of the proposed Project, a number of temporary construction components are required. These temporary components, described further in Table 7, include crane pads, turbine laydown areas, crane walks, roads, and construction staging areas.

Table 7: Description of Temporary Project Components

Temporary Component	Description
Crane Pads	Crane pads will be constructed in tandem with wind turbine access roads (Table 4). Crane pads will be: ■ Located directly adjacent to wind turbine locations and within the associated construction disturbance area. The crane pad areas will be approximately 40 m by 20 m, and will be constructed with geo-grid/geotextile overlain with a mixture of heavier granular material, native materials, and engineered fill as appropriate. ■ Removed following the construction of each wind turbine. ■ Restored to allow agricultural activities to continue. Reconstructed and removed as required for maintenance and decommissioning activities throughout the life of the Project.
Wind Turbine Laydown Areas	Laydown areas adjacent to wind turbine locations have been incorporated into the disturbance area (part of the Project location) for each turbine. Each wind disturbance area is approximately 5000 m^2 and will allow for temporary turbine component storage during construction. Temporary wind turbine laydown areas will be restored following construction activities to allow agricultural activities to continue.

Temporary Component	Description
Potential Construction Staging Areas	Four potential temporary construction staging areas will be located: 1) On the east side of Bervie Side Road just north of Concession Road 9 (see Figure 1); 2) On the west side of County Road 1, north of Concession Road 2 (see Figure 1); 3) On the south side of County Road 15, west of County Road 1 (see Figure 1); and 4) On the north side of Concession 7, east of Sideroad 20 (see Figure 1) The temporary construction staging areas will be gravelled with compacted surface material suitable for vehicular traffic. The depth of the gravelled areas will vary and will be dependent upon conditions encountered during the time of construction. The four construction staging areas will each be approximately ten acres in size and may serve the following aspects of the Project construction: ■ Laydown areas for Project components; ■ Temporary construction offices; ■ Parking areas for Project staff; ■ Portable generators; ■ Waste disposal containers; ■ Construction equipment storage and maintenance; ■ Self-contained temporary toilet facilities; and ■ Water and rinsing facilities. It is possible that the last three listed aspects could be located at the turbine laydown area during construction. Following Project construction and installation activities, the temporary construction laydown areas will be restored to pre-existing conditions to allow agricultural activities to continue.

The following sections provide a summary of the Project activities throughout the life of the Project. Additional detail regarding Project activities will also be provided in separate reports that will form part of the Project's REA Application:

- Construction Plan Report;
- Design and Operations Report;

- Wind Turbine Specifications Report; and
- Decommissioning Plan Report.

2.2 Project Activities

The development of the proposed Project will include several phases: site preparation and construction, operations and maintenance, as well as decommissioning. Section 2.2.5, Table 10 provides an overview of the projected timing and scheduling for the Project.

2.2.1 Pre-Construction Phase

During the Pre-construction Phase of the Project, the primary activities include the optioning of lands, preliminary engineering, geotechnical assessment and site surveys of the final turbine locations, procurement of turbine and substation equipment, and permitting and detailed design. The Proponent continues to communicate and engage landowners in the development of the site plans for the Project.

The REA process is the primary approval requirement in the Pre-construction Phase of the Project. For the permits and authorizations listed in Section 1.4, the Proponent will work directly with the respective federal, provincial, and municipal authorities to ensure all requirements are met. The Proponent will also continue to work closely with Project engineers, environmental and cultural specialists, as well as local landowners and Aboriginal communities throughout the development of the Project.

2.2.2 Site Preparation and Construction

Construction of the Project is scheduled to begin summer 2013 and be completed by the end of 2014. For detailed information regarding construction and installation activities, please refer to the Construction Plan Report, provided under a separate cover. During site preparation and construction of the proposed Project, the following key activities will be undertaken:

- Delineation of temporary work areas;
- Upgrading of existing access roads and the construction of new access roads;
- Site grading as necessary;
- Preparation and establishment of construction staging areas;
- Preparation of the collector substation laydown area;
- Delivery of construction vehicles and equipment;
- Installation of wind turbine foundations;
- Installation of crane pads and turbine laydown areas;
- Erection of wind turbines;
- Installation of pad-mounted transformers;
- Installation of collector lines on private lands;

- Installation of collector lines in municipal road allowances;
- Construction of collector substation and grid connection;
- Construction of operations and maintenance building; and
- Reclamation of turbine laydown areas, construction staging area, and collector substation laydown area.

Table 8: Description of Project Components

Project Component	Description of Component Construction
Rotor, generator and tower disassembly, substation, and operations and maintenance building removal	Approximately 11 oversized heavy haul trucks will deliver the wind turbine sections, stored in temporary laydown areas, and assembled on-site. Wind turbine components will be lifted into place by two cranes. Topsoil and subsoil will be removed for construction of the collector substation and stockpiled for use in site reclamation. Excavators will dig an 8 m x 6 m pit, approximately 2 m deep, for the foundation. The collector substation will be constructed on a pad or a prepared base of engineered fill or native soil. Concrete foundations will be poured for all major equipment within the collector substation. Construction of the substation will include an acoustic barrier and a secondary concrete containment system to be installed and buried around the collector substation transformer will be connected to the stormwater drainage system through an oil water separator. Equipment required for the construction and installation of the collector substation will include flatbed trucks, tracked bulldozers, dump trucks, excavators, compaction equipment, concrete trucks, concrete pump trucks, water trucks, and a crane. The operations and maintenance building will be a structure constructed on a concrete foundation. A gravelled vehicle and parts storage area will be located around the perimeter of the operations and maintenance building that will be contained by a chain link fence.
Access roads	Prior to access road construction, soil from the access road footprint will be stripped, stockpiled and reused during construction to reclaim the site. A woven geotextile or cement-stabilized soil will be utilized where necessary. A granular base, overlain by crushed gravel will be deposited and compacted to meet required specifications. Equipment required for access road construction will include light-duty trucks, tracked bulldozers, excavators, loaders, dump trucks, compactors, graders, and water trucks.
Installation of concrete turbine foundation	Topsoil and subsoil will be removed and stored separately followed by the excavation of an approximately 20 m-diameter, 2.5 m pit. Formwork and rebar will be installed to reinforce the wind turbine foundation. Following the assessments, it may be determined that pile type foundations are more suitable for specific locations. An estimated 50 truckloads of concrete will then be poured from concrete trucks. A mounting piece and large bolts will be set into the concrete, which will be used to anchor the wind turbine tower to the foundation. The excavated foundation area will then be backfilled and compacted until only the tower pedestal is left above ground. Equipment required for the construction and installation of wind turbine foundations will include light-duty trucks, tracked bulldozers, excavators, loaders, dump trucks, compactors, graders, concrete trucks, concrete pump trucks, and water trucks.

Project Component	Description of Component Construction
Overhead and Underground Collector Lines	For underground collector lines, 1.0 – 1.5 m-deep trenches will be dug using a trencher or excavator. The collector line will then be placed in the trench and soil replaced. For overhead collectors, auguring trucks or excavators will excavate 5 – 6 m-deep holes. Poles will then be placed in the holes by pole trucks, and the holes filled with fill or native soil. Aluminum conductors will be strung from pole to pole in a manner similar to local electrical distribution circuits, and will be spaced approximately 45-60 m apart. The overhead collector lines will converge at the collector substation. Equipment required for underground collector line installation will include excavators, dozers, dump trucks, direction drilling equipment and compaction equipment. Equipment required for overhead collector line installation will include utility bucket trucks, auguring trucks (or excavators), pole trailers, reel stand vehicles, an excavator, conductor puller vehicles, and tensioner vehicles. Installing the overhead collector lines (including pole installations, tension stringing of the conductor, and commissioning).
Meteorological Towers and Microwave Tower	Meteorological towers and the microwave tower up to 100 m tall will be installed by a single crane. Soil conditions will determine whether the towers will be steel-lattice or guyed.

2.2.3 Operations and Maintenance

Operation of the Project is expected to begin in 2014. The operational lifespan of the Project is approximately 20 years. The operation of the proposed Project will require eight to fourteen trained technical and administrative staff, including turbine maintenance technicians and a site supervisor. During the operation of the proposed Project, on-site activities will be limited primarily to scheduled maintenance of the Project components. For information regarding design and operations activities, refer to the Design and Operations Plan Report, available for review.

During operations and maintenance of the proposed Project, the following key activities will be undertaken:

- Preventative and unplanned maintenance for Project components;
- Proponent Staff Transport: periodic travel of technical staff between the operations and maintenance building and wind turbine locations using light trucks);
- Natural Heritage Field Monitoring: Monitoring of bird and bat mortality will occur at selected wind turbine locations during the operation of the proposed Project. The scope and duration of the monitoring program will be included in the Environmental Effects Monitoring Plan for Birds and Bats and will be agreed to with the MNR
- Meter calibrations;

- Field Monitoring: to evaluate the performance of the Project components and to conduct investigations/field visits to follow-up with any complaints received by the Proponent (see Section 5 and 6 of the Design and Operations Report for information on communication plans);
- Remote operation of the wind turbines;
- Collector line maintenance; and
- Grounds maintenance in the vicinity of Project components.

2.2.4 Decommissioning

If the Project is not extended past its commercial operational life (20 years) the wind turbine structures will be removed to the base of the foundation and the foundations will be excavated and backfilled with subsoil and topsoil to allow agricultural activities to continue. Access road removal will be dependent on the requirements and agreements in place with the individual landowner. Areas of land will be reseeded where appropriate, to restore the area to pre-construction state. Decommissioning procedures will be similar, but in reverse order to those carried out in the construction phase. For further information regarding decommissioning activities, refer to the Decommissioning Plan Report, available for public review. A general description of Project decommissioning activities is located in Table 9.

Key decommissioning activities associated with the proposed Project include:

- Disassembly and removal of wind turbine infrastructure (Hubs, nacelles, blades, and towers);
- Turbine foundations (to be removed, and excavated foundation areas will be backfilled with subsoil and topsoil to match original soil horizons and condition);
- Removal of pad-mounted transformers;
- Reclamation of access roads (dependent upon agreement and at landowners discretion);
- Removal of collector lines on private lands (at the connection points, where the underground collector lines come to the surface, the collector lines will be cut and excavated to a depth of approximately 1 m below grade);
- Overhead cables and transmission poles that are not shared with Hydro One or other utilities, will be removed;
- Removal and disassembly of meteorological towers (unless otherwise requested by Bruce County, the Municipality of Kincardine or local aviation groups, and agreed to by the Proponent):
- Disconnection of the collector substation (unless the lands are rezoned and used for another application acceptable to Bruce County and the Municipality of Kincardine);
- Substation and switchyard area facilities will be dismantled and removed in accordance with Provincial regulatory requirements at the time of decommissioning.; and
- Appropriate use or disposal of the building will be determined at time of decommissioning through consultation with the Municipality of Kincardine and the landowner).

Table 9: General Description of Project Decommissioning Activities

Project Component and Activity	Description
Rotor, generator and tower disassembly, substation, and operations and maintenance building removal	The rotor, generator and towers would be disassembled using a crane and removed from the site for re-use, reconditioning or disposal using a flatbed truck. The collector substation, control building, electrical components and associated infrastructure will be dismantled and decommissioned in accordance with Provincial regulatory standards at the time of decommissioning. The entire area will have the subsoil ripped to alleviate compaction, and topsoil will be replaced with clean fill. Soil management will include soil testing for contaminants in accordance with regulatory requirements at the time of decommissioning. If a concrete foundation is used for the substation, it will be removed to approximately 1 m below grade by excavators mounted with hydraulic hammers and/or hydraulic shears. The concrete will be broken up and crushed using a mobile crushing unit before being loaded in dump trucks for removed from the site. All concrete material will be recycled, where possible, or disposed off-site at an approved and appropriate facility. All disturbed areas will be graded, contoured and will be reseeded with crops or other vegetation, if requested. An appropriate use or disposal of the operations and maintenance building will be determined at time of decommissioning through consultation with the Municipality of Kincardine and the landowner. The entire area will have the subsoil ripped to alleviate compaction, and topsoil will be replaced with clean fill. Soil testing for contaminants will be conducted in accordance with regulatory requirements at the time of decommissioning. The area will be re-graded and restored to pre-facility conditions.
Access roads	The Proponent will either remove roads and restore land to the pre-construction end land use as agreed to with individual landowners, or leave access roads in place if a specific agreement with the landowner has been made.
Removal of concrete turbine foundation	The wind turbine foundations, including any rebar or steel anchor bolts, will be removed to a depth of approximately 1 m below grade, so that agricultural activities can continue following soil restoration. The excavated foundation areas will be backfilled with subsoil and topsoil to match the original soil horizons and elevation, and the area will be graded and contoured
Overhead and Underground Collector Lines	Overhead cables and transmission poles that are not shared with Hydro One or other utilities will be removed. At the connection points, where the underground collector lines come to the surface, the collector lines will be cut and excavated to a depth of approximately 1 m below grade
Meteorological and Microwave Towers	Unless otherwise requested by Bruce County, the Municipality of Kincardine or local aviation groups (and agreed to by the Proponent), the meteorological and microwave towers will be removed, dismantled and components will be reused, recycled or disposed of at the appropriate facilities.

2.2.5 Project Phase Timing and Scheduling

Table 10 provides an overview of the projected timing and scheduling for the Project.

Table 10: Projected Project Timing and Scheduling

Project Task	Projected Date
Distribute Notice of Proposal	November 2011
Environmental Studies and Reporting	September 2011 to March 2012
Open House #1	December 2011
Draft Project Reports and Summaries to Aboriginal Communities	August 2012
Draft Project Reports to Municipality of Kincardine	August 2012
Draft Project Reports to Public	September 2012
Open House #2	November 2012
Submit REA Application	November 2012
Site Preparation and Construction	Summer 2013
Operations and Maintenance Phase	January 2014 – 2034
Decommissioning or Repowering Phase	2034

2.2.6 Waste Generation

Construction and Decommissioning

Wind Projects, by their nature, produce little waste. During construction and decommissioning, waste material would be generated at, and transported from, the Project Location. Waste material produced by the Project is expected to consist of construction material (e.g. excess fill, soil, brush, scrap lumber and metal, banding, plastic wrap removed from palletized goods, equipment packaging, grease and oil, steel, etc.) and a minor amount of domestic waste (i.e. garbage, recycling and organics). Similar waste material may be generated during decommissioning.

Operations

Lubricating and hydraulic oils associated with Operations would be used for the facility, and waste materials such as oil, grease, batteries, and air filters and a minor amount of domestic waste (i.e. garbage, recycling, and organics), would be generated during standard operation and maintenance activities. Although the exact oil and grease requirements for the wind component of the Project are not known at this time, oil changes will be completed in accordance with oil analysis recommendations. The amount of oil and grease stored on site would depend on availability, transportation schedules, and the service cycle. Used oil would be stored in a designated area of the operation and maintenance building, and picked up by certified contractor with the appropriate manifests in place.

During operation, the operation and maintenance building will produce waste materials typical of an office setting, including recyclables and domestic waste.

2.2.7 Air Emissions, Noise Emissions, Odour and Dust Generation

2.2.7.1 Air Emissions

Construction and Decommissioning

The Project activities associated with the site preparation and construction phase and the decommissioning phase will lead to emissions, including but not limited to, greenhouse gases (methane, CO_2), nitrogen dioxide, sulphur dioxide, and suspended particles from vehicles and machinery operation. These emissions will fluctuate through the various construction and decommissioning related activities, with access road construction/ reclamation, site grading, and preparation/reclamation of staging and laydown areas having the highest potential for emissions because of increased construction or decommissioning equipment activities during this time. Additionally, construction and decommissioning-related traffic and various construction activities (e.g. excavation, grading, and exposed areas) have the potential to create short-term nuisance dust effects in the immediate vicinity of the Project. Traffic delays also result in increased emissions from vehicles traveling slowly through construction zones. The delivery of materials to construction sites can also generate emissions, especially for sites that are relatively far from material manufacturers.

The potential effects resulting from air emissions resulting from construction and decommissioning activities are discussed in Section 3.4.1.

Operations

During the operations phase of the Project, maintenance activities will result in emissions from the operation of motorized vehicles. The emissions associated with the operations of the Project will be negligible compared to the normal operation of motorized vehicles in the Project Study Area.

The potential effects resulting from air emissions resulting from operations activities are discussed in Section 3.4.1.

2.2.7.2 Noise

Construction and Decommissioning

During construction and decommissioning, noise will be generated by the operation of heavy construction equipment at each of the work areas and associated vehicular traffic on-site. The audible noise at receptors beyond the construction areas is expected to be a minor, short-term disruption consistent with noise generated by any construction project.

The potential noise effects resulting from construction and decommissioning activities are discussed in Section 3.5.

Operations

Mechanical and aerodynamic sound would be emitted from the wind turbines and their associated transformers. All turbines proposed as part of the Project are located at a distance of at least 550 m from the nearest non-participating noise receptor. In addition, a Noise Assessment Report has been completed for the Project in accordance with the MOE Noise Guidelines for Wind Farms (MOE, 2008), and O. Reg. 359/09, as amended, and is provided as an appendix in the Design and Operations Report.

Additional noise will be generated by the Project's collector substation. During operations of the Project, sound would be generated by the periodic use of maintenance equipment in addition to personnel vehicles and waste

management haulers that would travel to and from the operations and maintenance building during regular business hours.

Based upon the Project design, the analysis carried out in the Noise Assessment Report indicates that sound produced by the Project was found to be within the acceptable limits established by the MOE at all noise receptors. The analysis includes the combined impacts of the substation, solar components, wind turbines, and other wind turbines within a three kilometre radius. The Noise Assessment Report has been completed for the Project in accordance with the MOE Noise Guidelines for Wind Farms (MOE, 2008), and O. Reg. 359/09, as amended, and is provided as an appendix in the Design and Operations Report.

The potential noise effects resulting from operations activities are discussed in Section 3.5.

2.2.7.3 Odour

The site preparation and construction, operations, and decommissioning phases of the Project will not involve the management or handling of odorous material. Odour emissions during the site preparation and construction phase and the decommissioning phase will include localized odours from the combustion of diesel fuel associated with the operation of construction equipment.

The potential odour effects resulting from the Project are discussed in Section 3.4.2.

2.2.7.4 Dust

Fugitive dust emissions could potentially increase as a result of Project activities during the site preparation and construction phase and the decommissioning phase due to the increased presence of construction equipment and transport vehicles and through the loss of vegetation. Emissions will be highest during staging and laydown area preparation and other activities that involve significant levels of material handling (e.g., upgrading and construction of new access roads, and installation of conductor lines). Refer to the REA Reports currently available for public review for potentially adverse effects due to fugitive dust emissions and mitigation measures proposed.

The potential odour effects resulting from the Project are discussed in Section 3.4.3.

2.2.8 Toxic/Hazardous Materials

Construction and Decommissioning

There is very little material that could be classified as toxic or hazardous that is used in constructing and operating a wind farm project. Toxic or hazardous materials to be used on-site during the site preparation and construction phase and the operations phase include oils, fuel and lubricants that will be used in construction equipment and for maintenance of the turbine facilities. Only minor amounts of these materials will be generated and the small quantities will be disposed of through conventional waste-oil and hazardous waste disposal streams.

Small quantities of non-hazardous waste, such as plastics, will be generated and disposed of through the local landfill and recycling facilities where appropriate. Wastes will be disposed of locally in accordance with local procedures for management of conventional waste-oil and hazardous waste streams. A licensed contractor will remove special waste such as oily rags and oil from the service of turbines. All non-hazardous waste will be disposed of at the local waste facilities at the local landfill. Materials that are able to be recycled and reused will be stored temporarily on-site prior to reuse and recycling.

Operations

Hazardous materials to be used during Operations are limited to fuels, lubricating oils and other fluids associated with overall Project maintenance. Hazardous materials or wastes will be temporarily stored in an enclosed area within the Operations and Maintenance Facility. Any small quantities of hazardous waste, similar to those generated during Construction and Decommissioning will be disposed of by a licensed contractor. The Proponent and/or the Operation and Maintenance Contractor would be responsible for implementing environmental procedures during the operation phase of the Project for hazardous waste management.

2.2.9 Sewage

Construction and Decommissioning

Portable toilets will be utilized during the site preparation and construction phase and a licensed contractor will be responsible for waste removal. The Project's operations and maintenance building (see Figure 1) will have washroom facilities connected to a self-sufficient septic drain field as deemed appropriate by the local building code. No other component of the Project will generate any sewage or require any specific sewage management processes. Non-potable water will be provided by a well and potable water brought in from offsite (e.g., water coolers, water bottles, etc.).

Operation

No sanitary waste will be generated by the wind and solar components during operations. The operation and maintenance building will have rest rooms which would be serviced by a septic system. The septic system would have capacity for storage only, with its contents being emptied at regular intervals using tankers.

2.2.10 Stormwater

Construction and Decommissioning

To effectively manage runoff during the operation of the Project, drainage channels will be constructed adjacent to access roads as required. The decision of where to construct drainage channels will be made during the detailed design stage of the proposed Project. Potential sources of sedimentation during the operation of the proposed Project will be limited to unpaved access roads. As the access roads will be gravel-based with adjacent and appropriately sized drainage channels, sedimentation from these roads is predicted to be lower than that from agricultural fields where the roads are constructed. Therefore, no additional sedimentation control measures are anticipated to be required.

Operations

A gravelled area around each wind turbine foundation will receive any precipitation runoff from wind turbine towers and allow for infiltration into the ground. Runoff from the tower section of wind turbine generators is expected to be negligible compared to the existing run-off within the Project Study Area, and since this does not represent a measurable difference, no additional Stormwater Management Plans are proposed.

2.2.11 Water-taking Activities

A technical desktop assessment and review of groundwater elevation was conducted to determine if foundation construction associated with the wind turbines will intercept groundwater, and if so, what potential dewatering rates will be required in support of the foundation construction. The assessment concluded that there is a relatively low potential that the depth of the proposed excavations (see Construction Plan Report) will intercept

the water table (or saturated ground) under conditions that will require foundation dewatering for construction purposes other than the management of precipitation catchment.

In the event that the proposed construction intercepts the water table, where groundwater inflow occurs, construction dewatering will be required to remove what groundwater inflow occurs and remove direct precipitation from the excavation. Considering the shallow depth of dewatering and the low permeability soils, dewatering rates are not expected to exceed 50 m^3/day.

At locations where groundwater is encountered or runoff accumulates during excavating for foundations and dewatering of excavations is required, the construction contractors will monitor and record the amount of water withdrawn on a daily basis. Should this amount be less than 50,000 L/day, then no further action is required. If it is expected that greater than 50,000 L/day will be withdrawn, then the following actions will be implemented:

- To control suspended sediment in the water, the inlet pump head will be surrounded with clear stone and filter fabric; and
- The water taker will regulate the discharge at such a rate that there is no flooding in the receiving water body or dissipate the discharge so that no soil erosion is caused that impacts the receiving waterbody

2.3 Map of Project Location

A map of the Project location and the land within 300 m of the Project location that meets the requirements of O. Reg. 359/09, as amended, is provided in Figure 1, which is located in a sleeve at the end of this Report.

2.4 Land Ownership

The Project components will be located primarily within portions of privately-owned land parcels with collector cables being placed in public road easements. The Proponent has currently secured License and Option Agreements for approximately 15,000 hectares of land deemed to be sufficient to construct the Project.

The legal description of Project lands is included in Appendix A.

3.0 DESCRIPTION OF POTENTIAL ENVIRONMENTAL EFFECTS

Following the requirements of O. Reg. 359/09, as amended, this section provides a summary of potential environmental effects that may result from engaging in the construction and operation of the Project. The creation of O. Reg. 359/09, as amended, was envisioned by the Province to result in a streamlined process of assessment for renewable energy projects, including wind projects. This process has resulted in a focussed assessment that concentrates on aspects of renewable energy projects that require management in order to ensure that adverse environmental effects are mitigated to the extent possible.

In accordance with the requirements of O. Reg. 359/09, as amended, the environmental effects outlined in this report address the following environmental considerations:

- Cultural Heritage;
- Natural Heritage;
- Water Bodies;
- Air, Odour, Dust;
- Noise;
- Local Interests, Land Use and Infrastructure; and
- Public Health and Safety.

Setbacks from Environmental Features

The Project was designed to meet the mandatory setbacks within O. Reg. 359/09 in all cases. Within the regulation, there are some environmental setbacks for which studies that identify potential adverse environmental effects and mitigation measures can be conducted in lieu of meeting the setback requirements. The results of the assessments are provided in the Natural Heritage Assessment Environmental Impact Study, Water Body and Water Assessment Report, and the Property Line Setback Assessment (Appendix to the Design and Operations Report), which are provided under a separate cover.

3.1 Cultural Heritage

An overview of the cultural heritage requirements under the REA process is provided below. Project activities during the site preparation and construction phase will avoid archaeological resources, heritage resources, and protected properties where possible.

3.1.1 Archaeological Resources

Under Section 20(1) of O. Reg. 359/09, as amended, proponents of renewable energy projects are required to undertake a self-assessment to identify any known or potential effects to archaeological or heritage resources that could result from the Project. Subsequent to that self-assessment, a Stage 1 archaeological assessment has been conducted, including a desktop review of available archaeological information and a site visit. In areas with identified archaeological potential, a more detailed Stage 2 archaeological assessment was undertaken by qualified archaeologists to investigate the possibility of archaeological resources being present.

A property inspection conducted during the Stage 1 assessment identified that the Study Area consisted primarily of ploughed agricultural fields. The Stage 2 assessment of well-weathered ploughed fields was conducted by the standard pedestrian survey method at transect intervals of five metres. In the event that an artifact was encountered during pedestrian survey, survey intervals were intensified to one metre within a twenty-metre radius of the find. For areas subject to test pit survey the survey was conducted in five metre transects as well. Each test pit was approximately 30 centimetres in diameter and excavated five centimetres into sterile subsoil. All soil matrixes were screened through six millimetre mesh hardware cloth to facilitate the recovery of small artifacts. Approximately 98% of the Study Area was subject to pedestrian survey at five metre intervals, approximately 1% was subject to test pit survey at five metre intervals and approximately 1% of the study was not surveyed due to previous disturbance or being poorly drained. All archaeological work has been conducted according to the 2011 *Standards and Guidelines for Consultant Archaeologists* issued by the Ministry of Tourism, Culture and Sport (MTCS).

A total of 36 archaeological sites were identified during the Stage 2 pedestrian survey and Stage 2 test pitting survey. This inventory includes 16 pre-contact Aboriginal sites, one possible post-contact Aboriginal site, and 19 historic Euro-Canadian sites. Where archaeological resources were discovered, appropriate mitigation measures were assessed, which depending on the resource, included any of the following:

- Preservation *in situ*, requiring changes to Project layout;
- Removal and preservation; and
- Further assessment (i.e., Stage 3 Archaeological Assessment and possibly Stage 4 Archaeological Assessment).

Based on the 2011 *Standards and Guidelines for Consultant Archaeologists*, 12 of the sites were recommended for Stage 3 archaeological assessment, of which three were pre-contact Aboriginal sites and nine were historic Euro-Canadian sites. However, once changes were made to the Project layout, all sites recommended for Stage 3 archaeological assessment were avoided and so no further archaeological assessment was required. All further details of the investigation have been summarized in a Stage 2 Archaeological Assessment Report which was submitted to the MTCS for review and approval.

The undertaking of this type of archaeological program has been an opportunity to learn more about the archaeological resources in this area and has significantly reduced the potential for the Project to result in damage or the loss of archaeological heritage.

3.1.2 Heritage Resources and Protected Properties

In order to determine if the Project Study Area contains heritage resources and protected properties, the Proponent has completed a Heritage Assessment Report. The Heritage Assessment included research on the land use history of the Project Study Area, built heritage resources, cultural heritage landscapes, and protected properties. Based on this research, an inventory of all built heritage resources (dating to greater than 40 years) in the Project Study Area, and an evaluation of the inventory of built heritage resources according to Ontario Regulation 9/06 (Criteria for Determining Cultural Heritage Value or Interest) was conducted to determine their significance. If protected properties and/or cultural heritage resources were to be determined to have cultural heritage value or interest, a comprehensive Heritage Impact Assessment would be done for each individual instance. However, no such properties were identified.

All details of any investigations are presented in the Heritage Assessment Report which was submitted to the MTCS for review. The first Comments Letter was received from the MTCS on March 31, 2012 which provided recommendations. The Heritage Assessment was updated to reflect the recommendations and a final Comments Letter was received June 28, 2012.

3.2 Natural Heritage Resources

The Natural Heritage Assessment, including records review and Project Study Area investigations, is in progress and the following section outlines some of existing conditions in the Project Study Area based on our current knowledge of the Project Study Area from work completed to date.

3.2.1 Existing Conditions

To date, mapped boundaries of known Areas of Natural and Scientific Interest ("ANSIs"), Provincially Significant Wetlands ("PSWs") and other wetlands have been requested and received from Land Information Ontario ("LIO") and the Ontario Ministry of Natural Resources ("MNR"). Additional natural heritage data (e.g., fisheries information, wildlife habitat, rare species records) has been requested from the MNR. The Saugeen Valley Conservation Authority ("SVCA") and Bruce County have already been contacted for Regulation Limit boundaries (hazard lands, floodplains, valley features) and additional fisheries information, and will be contacted again to confirm available information on the current Project Study Area. Through these requests, information relating to valleylands, woodlands, wetlands, and wildlife habitat will be reviewed as they relate to the Project Study Area. Additional data has also been obtained from several online and published resources, including the Ontario Breeding Birds Atlas ("OBBA"), the Ontario Herpetological Society ("OHA"), the Natural Heritage Information Centre ("NHIC"), Biodiversity Explorer, Atlas of the Mammals of Ontario, the Butterfly Atlas, the Odonata Atlas, from the Bruce County Official Plan, from the Important Bird Areas ("IBAs"), and from Bird Studies Canada ("BSC") including Christmas bird and marsh monitoring data.

A preliminary examination of the natural features within the Project Study Area and screening for significant habitat is ongoing using aerial imagery and through conducting site level Ecological Land Classification (ELC) for Southern Ontario. This desktop analysis is being verified through site-specific ELC mapping and vegetation inventories that are currently being conducted within the Project Study Area.

Avian field programs, including winter bird surveys, fall migration surveys, breeding bird surveys and spring migration surveys, as well as bat migration surveys were completed by Acciona prior to the development of the REA Regulation. Additional field investigations and analysis of the environmental features have been ongoing to fulfil the requirements of the O. Reg. 359/09 and the Ministry of Natural Resources' (MNR) Approval and Permitting Requirements Document (APRD) for Renewable Energy Projects. These surveys will provide baseline information on existing behavioural patterns, species associations, and local wildlife populations as they relate to potential wildlife habitat within the Project Study Area. If required, an environmental impact study ("EIS") will be completed to ensure there are no net impacts to the significant features or habitats located within 120 m of the Project location. Field activities may be required to inventory and determine potential effects on other natural features such as woodlots, wetlands, valleylands, and watercourse crossings that are within 120 m of a project component or are within 120 m of an area of construction disturbance. Field work plans will be developed to determine the composition, function, attributes and significance of natural features using provincial

guidelines. A summary of the natural heritage existing conditions information collected to date is provided in the following sections.

3.2.1.1 Wetlands

The MNR has indicated that there are two PSWs in the general Project Study Area. The Glammis Bog, located in the northwest corner of the Project Study Area, is a provincially significant Life Science ANSI composed of five individual wetlands with a total of three wetland types (30% bog, 60% swamp and 10% marsh) and with an area of 79.3 hectares (ha). The ANSI description for Glammis Bog describes the wetland portion of the feature as a bog, which has resulted from plant succession filling in a lake. Plant communities are dominated by heath (*Ericaceae*) and sedge (*Cyperaceae*) families. In the swamps, white cedar (*Thuja occidentalis*), red maple (*Acer rubrum*), yellow birch (*Betula allegeniensis*), and tamarack (*Larix laricina*) are the dominant trees, and ferns are present in quantity. Beaver activity has drowned large sections of forested area creating swampland and streams flow through depressions and valleys between moraines within the PSW and ANSI (MNR, 2010).

Greenock Swamp is a PSW with the majority of its area located along the eastern boundary of the Project Study Area. This feature is a PSW complex, made up of 41 individual wetlands, composed of four wetland types (0.02% bog, 0.08% fen, 96.30% swamp and 3.60% marsh) with an area of 8,947.6 ha. Greenock Swamp is also a provincially significant life science ANSI with an area of 8,300 ha, and is described as one of the largest wetlands within southern Ontario. A more detailed description of the ANSI can be found in the following section.

3.2.1.2 ANSIs and Vegetation Communities

As discussed above, two ANSIs have been identified within the general vicinity of the Project Study Area. The Glammis Bog provincially significant Life Science ANSI includes both upland and wetland habitats. Moraines (largely if not entirely kame moraines) occur over almost half of this ANSI and are largely covered by deciduous forest dominated by sugar maple (*Acer saccharum*), with several clearings. Depressions among the moraines are occupied by wooded swamps and an open acid kettle bog (MNR, 2010). The bog is described in more detail above.

In addition to silver maple (*Acer saccharinum*) swamp, cedar swamp, thicket swamp and marsh, the Greenock Swamps offers good representation of fen and bog communities, and limited representation of upland coniferous and deciduous forest. The ANSI consists of a main body, three south lobes, and a northeast portion, which begins 3 to 4 km northwest of Chepstow, less than 1 km from County Road # 20. This ANSI contains 10 lakes and the wetlands occupy a large majority of the total area, particularly in the main body. There are a large number of upland areas, partly on moraines. A very high proportion of the ANSI supports natural forests in both the wetland and upland habitats. The main continuous wetland area of the ANSI is the largest forested wetland, or swamp, in Southern Ontario (MNR, 2010).

Most of the Greenock Swamp ANSI can be classified as wetland with muck soil which supports swamp or lowland deciduous forest and swamp forest. These vegetation communities are dominated by silver maple/red maple and to a lesser extent red/green ash (*Fraxinus pensylvanica*). Yellow birch is subdominant overall. Mixed swamp is dominated overall by Eastern-white cedar and red maple with yellow birch as a subdominant species (MNR, 2010).

There are a number of wooded habitats within the general Project Study Area, ranging from small hedgerow features to larger woodlands communities. Many of these forested areas are located adjacent to watercourse

and valleyland features and in low, poorly drained areas not suitable for agricultural practices. Site specific studies are underway to classify the baseline conditions and map out vegetation communities within the site as part of the Project.

3.2.1.3 Species at Risk

As part of the Project, all aspects relating to provincially Threatened and Endangered species have been considered. However, since these species are addressed as part of the *Endangered Species Act* (2007), they are not discussed within any of the REA, Natural Heritage Assessment ("NHA"), or Water Assessment and Water Body ("WB") Reports. These species will be addressed in full detail, including a description and results of field assessments, potential impacts, and recommended mitigation measures, as part of a separate *Approval and Permitting Requirements Document ("APRD"),* to be submitted to the MNR under a separate cover, where necessary.

3.2.2 Potential Effects

The Project layout is currently being developed and includes consideration of the natural features and wildlife habitats identified within the area of influence (i.e., 50/120 m) as determined through the records review, with a desire to minimize impacts to significant natural heritage features, functions and attributes. The following sections identify typical natural environment effect scenarios that could be encountered during the site preparation and construction, operations and decommissioning phases of a wind energy project. As the site specific effects cannot be determined until the layout is finalized, a generalized and preliminary effects screening was deemed appropriate and is provided below.

During site preparation and construction of the Project, typical activities include land clearing, access road construction, foundation construction, and the installation of collector lines between wind turbines and the collector substation. Collectively these activities have the potential to affect natural features including terrestrial habitats, individual species or specific life stages or activities (e.g., nesting birds.

The noise associated with heavy machinery and construction activities could result in sensory disturbance and, under exceptional circumstances, habitat alienation, displacement, or desertion. This concern is particularly relevant for local wildlife, including breeding birds (desertion of nests, eggs, or young). However, the level of activity and noise will not be dissimilar from seasonal noise conditions at the site (e.g., agricultural machinery) and the timing of construction is therefore relevant in the effects assessment.

The creation of dust can coat vegetation in the Project Study Area. These effects will be minimized by employing mitigation measures and best management practices such as limiting vehicle speed and watering gravel roads, as necessary.

Mitigation by design, which is the preferred approach for this Project, recommends that Project infrastructure should be located at an appropriate distance from significant natural heritage features to reduce residual impacts, as may be determined through an EIS. Other mitigation techniques commonly employed when components are within, or in proximity to natural heritage features include tree protection fencing, equipment laydown exclusion fencing, silt fencing adjacent to watercourses/wetlands, nesting surveys prior to vegetation clearing, timing construction to avoid sensitive wildlife windows, and adherence to the Department of Fisheries and Oceans Canada ("DFO's") Operational Statements for crossing techniques. A multitude of other guidance documents exist which may be used to further reduce the magnitude, extent or duration of effects.

In general, turbine operations have the potential to displace some wildlife individuals as a result of sensory disturbance (visual and/or aural). If turbines are situated in close proximity, or within their habitats, turbine operations have the potential to displace birds, cause nest abandonment and stress, impart hazards along avian flight paths, and could result in reduced breeding success within the specific adjacent habitats present, when these habitats are being utilized. The hazard that wind turbines pose to birds varies substantially by season and by species, with spring and fall migration typically being the periods of highest risk for many species.

Bat mortality has been documented at operational wind development projects in southwestern Ontario and elsewhere and the mortalities have often been attributed to in-flight collisions with wind turbine blades or the tower structures and, more recently, to barotrauma (James and Coady, 2003). The risk that wind turbines pose to bats varies by season and species, with fall migration typically representing the greatest potential for adverse effects.

Typical activities of decommissioning such as the removal of Project components, waste and site remediation typically have a low likelihood of occurrence and negligible effects on natural features, wildlife habitat or wildlife species richness or abundance. It is anticipated that no lands, other than those originally cleared during site preparation and construction, will be disturbed during decommissioning and where these lands are disturbed they can be rehabilitated to functional conditions using conventional techniques.

3.3 Water Bodies

The Project is situated in portions of the Little Sauble River, Willow Creek, Andrew's Creek, Tiverton Creek, Lorne Creek, Kincardine Creek and North Pentagore River drainages within the jurisdictional area of the SVCA. Many of the watercourses in the Project Study Area are influenced by historic and present agricultural activities as evidenced by straightened watercourses and presence of field swales. Preliminary mapping obtained through SVCA from DFO indicates that none of the watercourses within the Project Study Area have been classified as habitat for aquatic species at risk. Element occurrences obtained from the Natural Heritage Information Centre (NHIC) does not contain any records of rare, threatened or endangered species within the Project Study Area.

Site specific field surveys of the aquatic resources within the Project Study Area have been completed along all potential water bodies within 120m of the Project location. These surveys included collection of a wide range of site characteristics, including water temperature, substrate, flow conditions, bank width, vegetation characteristics, etc. The purpose of these field surveys was to determine if the features meet the definition of a water body as per the REA Regulation. Any features that are consistent with the definition of a water body will require the completion of an Environmental Impact Study to ensure any potentially negative or permanent impacts to these features will be mitigated appropriately.

The western edge of the Project Study Area runs approximately parallel to the Lake Huron shoreline, at a distance ranging from 5-10 km. The Project may interact with Lake Huron through potential watercourse crossings (required for Project Study Area access or for underground cables) for watercourses that drain into Lake Huron; however, the exact location and number of watercourse crossings (if required) are not yet known. The construction of watercourse crossings has the potential to negatively affect surface water quality, quantity and flow patterns and natural hazard risks (e.g., flooding, erosion). The extent and magnitude of the potential effects is largely dependent on the characteristics of the watercourse, sensitivity of the fish community and the crossing and mitigation techniques employed. If the watercourse is determined to be fish habitat, the crossing

technique first considered will be from a DFO Operational Statement such that a fish and fish habitat review will not be required. Any other technique used in fish habitat that does not conform to a DFO Operational Statement will require a fish and fish habitat review.

Where possible, and in consideration of other constraints, the Proponent will maintain a 120 metre setback from watercourses or will conduct an water assessment report that demonstrates that significant residual impacts to aquatic resources will not occur. Land clearing and site grading near watercourses has the potential to increase sediment runoff, decrease bank stability, and alter riparian vegetation conditions affecting aquatic habitats. Some vegetation removal may be required if watercourse crossings are required where riparian vegetation is present, however the design will attempt to avoid watercourse crossings. As appropriate silt fencing will be placed to prevent siltation of adjacent watercourses and wetlands.

Dewatering for turbine foundation construction has the potential to temporarily alter the quantity or the flow of groundwater to a natural feature (i.e., watercourses, wetlands, other features with seasonal inundation). In addition, pumping of groundwater from the foundation excavation and subsequent release to a watercourse has the potential to introduce sediment to the watercourse and change watercourse hydrology and water temperature. In these cases, dewatering and discharge of groundwater may require a Permit to Take Water from the Ministry of Environment, which will be evaluated as part of this REA application.

During the site preparation and construction phase of a wind energy project, negative effects to surface or groundwater sources could occur through accidental spills or releases of substances which may contain contaminants. Implementation of mitigation measures and best management practices associated with the use of construction equipment in the Project Study Area (i.e., contained re-fuelling areas) will reduce the chances of accidental spills of contaminants.

3.4 Air Emissions, Odour, Dust

3.4.1 Air Emissions

The Project activities associated with the site preparation and construction phase and the decommissioning phase will lead to emission products, including but not limited to, greenhouse gases (e.g., methane, CO_2), nitrogen dioxide, sulphur dioxide, and suspended particles from vehicles and machinery operation. These emissions will fluctuate through the various construction and decommissioning related activities, with access road construction/reclamation, site grading, and preparation/reclamation of staging and laydown areas having the highest potential for emissions because of increased construction or decommissioning equipment activities during this time. In general these emissions will be local, temporary, and minor.

During the operation of the Project, maintenance activities have the potential to cause infrequent and short-term emissions typical to the operation of motorized vehicles. These emissions are expected to be considerably lower in magnitude than during the site preparation and construction phase and the decommissioning phase.

Emissions products will be managed to the extent possible by implementing specific measures, including:

- Ensure proper maintenance of all vehicles, to reduce the potential for abnormal operation and increases in emissions;
- Implementation of a speed limit; and

- Implementation of rules regarding idling of engines, to limit idling of vehicles as much as possible.

3.4.2 Odour

The site preparation and construction, operation, and decommissioning of the Project will not involve the management or handling of odorous material. Odour emissions during site preparation and construction and decommissioning will include localized odours from the combustion of diesel fuel associated with the operation of construction equipment. As this is a short-term localized effect and consistent with odours associated with the current operation of farm equipment, this is not deemed to be a significant adverse effect.

3.4.3 Dust

Fugitive dust emissions could potentially increase as a result of Project activities during construction and decommissioning related activities due to the increased presence of construction equipment and transport vehicles and ground excavation. Emissions will be highest during staging and laydown area preparation and other activities that involve significant levels of material handling (e.g., upgrading and construction of new access roads, and installation of electrical conductor lines). Fugitive dust emissions will be managed by the implementation of Best Management Practices (BMPs), which will help reduce the potential for dust generation and off-site movement. The main items included in the BMP plan are as follows:

- Implementation of a speed limit, which will lead to reduced disturbance of dust on paved and unpaved surfaces;
- Application of dust suppressants to unpaved areas (i.e., unpaved roads, storage piles), which may include the use of water. The frequency of application will be determined based on site conditions during the construction process, and will be adjusted based on climatic factors;
- Land clearing and heavy construction activities will be staged to reduce the opportunity of simultaneous operation of large dust generating equipment;
- Re-vegetation of cleared areas, as soon as possible, and maintenance of the vegetation to ensure growth;
- If possible, the installation of wind fences in areas where they may be required; and
- Implementation of a complaint response program, whereby complaints received from the public are recorded and investigated. The investigations should be focused on determining the cause of the complaint and, if necessary, mitigation measures should be implemented.

3.5 Noise

Activities occurring during construction and decommissioning have the potential to affect noise levels due to the operation of heavy equipment. All construction and decommissioning equipment will be kept in good repair and will not exceed the noise emissions as specified in MOE publication NPC-115. Through adherence to MOE noise guidelines, construction and decommissioning-related noise may be perceptible to nearby residents but will not represent a significant adverse effect.

The operation of wind turbines, collector substation and the operations and maintenance building will generate noise. All turbines will respect the minimum setback requirement of 550 m from a Point of Reception in accordance with O. Reg. 359/09, as amended, and will comply with the MOE's permissible sound limits at all

identified Points of Reception. All setback requirements as well as noise levels at all Points of Receptions have been provided in the Noise Impact Assessment (GL GH, 2012). The Noise Impact Assessment supports that the proposed Armow Wind Farm will comply with all relevant noise regulations.

3.6 Local Interests, Land Use, Infrastructure and Resources

This section describes past and current local interests, land use and infrastructure resources and the potential for negative effects on resources located within 300 m of the Project Study Area. This description includes information about local business and facilities, natural resources, recreation areas, telecommunications, and stray voltage.

3.6.1 Past Land Uses

A Stage 1 Archaeological Assessment was conducted to determine pre-contact and historic land uses of the Project Study Area. The Project Study Area is located within the traditional territory of the Saugeen Ojibway First Nations, which will be the focus of Aboriginal engagement efforts for this Project. The Assessment suggests that land uses have been predominantly agricultural since early European settlement in this area. Some areas within 300 m of the Project Study Area have also been used for residential (e.g., Tiverton) land uses for many years. Some logging of the Project Study Area has also occurred as a past land use. Refer to the Stage 1 Archaeological Assessment Report for more information.

Potential Contamination from Past Land Use

A Record of Site Condition will be requested to determine if there have been any recorded incidences of contamination. It is unlikely that contamination issues exist in the Project Study Area due to the predominantly agricultural nature of past land uses.

3.6.2 Current Land Uses

The Project is located substantially on leased privately owned lands in the Municipality of Kincardine, Bruce County, Ontario. The Project Study Area is primarily comprised of agricultural lands. The Project location map (Figure 1) displays Canadian Land Inventory ("CLI") land use data that demonstrate the predominance of pasture and forage crops in the Project Study Area. Woodlands, grazing and rangelands and some minor built-up areas (Tiverton) are also located across the Project Study Area. A portion of land owned by the Saugeen Valley Conservation Authority is located near the north-eastern corner of the Project Study Area. Current land uses are reflected in the Bruce County Official Plan and the Municipality of Kincardine Comprehensive Zoning By-law.

The Bruce County Official Plan identifies the Project Study Area as being predominantly Rural-Agricultural with hamlet areas identified at Tiverton and Armow. Hazard lands (Environmental Protection zone) associated with areas of existing or potential natural hazards, and areas of provincial natural significance are also identified throughout the Project Study Area. Two pits or quarries are identified in the Official Plan, as well as on the Project location map.

The loss of agricultural lands as a result of the Project represents a potential interaction between the Project and land use. There will be a temporary loss of agricultural land during construction and installation activities as a

result of temporary Project components, including crane pads, turbine laydown areas, and the construction staging areas (see Figure 1). The loss of agricultural land during the lifespan of the project due to turbine footprints and access roads will represent less than 0.5% of all lands within the Project Study Area. All Project infrastructure will be dismantled and removed following the decommissioning of the Project and the lands will be restored to allow agricultural activities to continue. The objective of the Proponent, following decommissioning, is to restore the lands affected by the proposed facility to pre-disturbance conditions. Refer to the Decommissioning Plan Report for more information. This Project's effect on current land use is not considered significant. No further assessment on land use is deemed to be required.

3.6.3 Provincial and Local Infrastructure

The Project location map (Figure 1) displays existing local and provincial roads in proximity to the Project Study Area. The road capacity and local traffic could be affected during construction and decommissioning related activities. The delivery of construction equipment and Project infrastructure, and construction of new turbine access roads could result in a temporary increase in slower moving traffic volume on local roads. Construction and/or decommissioning related activities next to or in road easements could also result in temporary disruptions to the flow of traffic on some local roads. The changes in traffic volume are expected to be minimal and no appreciable change to traffic flow is anticipated as a result of the Project.

The implementation of transportation planning during Project activities will minimize potential effects related to road damage and traffic congestion. If a traffic management plan is required by local governments (Municipality or County), such a plan will be prepared by the Proponent in consultation with local governments. The construction contractor and/or turbine manufacturer would oversee the implementation of the traffic management plan during the detailed Project design phase, which may include measures such as signage, road closures, speed restrictions, truck lighting, load restrictions and equipment inspections.

The construction of new turbine access roads and upgrading of existing local/rural roads (e.g., widening, installation of new culverts, and widening of turn radii between existing County roads and new turbine access roads) will require separate permit approvals outside of the REA process. Appropriate permits will be obtained from provincial and municipal agencies, including (but not limited to) the Ministry of Transportation (MTO) and Bruce County and/or the Municipality of Kincardine.

3.6.4 Local Businesses and Facilities

Employment in the Kincardine area is dominated by the presence of the one the largest nuclear generating stations in Canada, the Bruce Nuclear Power Development (BNPD). The BNPD is located on the shore of Lake Huron near Inverhuron. Since the 1960s, Kincardine has the been the location of a commercial nuclear power reactor, which now employs approximately 4,000 workers, through Bruce Power and Ontario Power Generation. Agriculture is by far the most important labour force sector in Kincardine, employing about 33% of the experienced labour force 15 years and over (StatsCan, 2006). The Project design has taken into consideration local businesses and facilities, by adhering to MOE setback requirements. As such, no adverse effects are anticipated.

3.6.5 Natural Resources

The Project study area contains two minor pits or quarries located along Concession Road 9 and Side Road 10, as shown on Figure 1.

The locations of historic and existing oil and gas wells within 200 m of Project location has been mapped using the 2012 Ontario Oil, Gas and Salt Resources (OGSR) Library. Four wells have been identified to be located within 200 m of the Project Study Area. In accordance with the Ministry of Natural Resources' (MNR) Approval and Permitting Requirements Document (APRD) for renewable energy projects in meeting petroleum resource setback requirements, the Proponent will provide written notification to the MNR that the required petroleum resource assessment has been completed.

The locations of woodland resources in the Project Study Area are shown on Figure 1. The Natural Heritage Assessment, available for public review, has identified and assessed significant woodlands within the Project Study Area. Refer to the Natural Heritage Assessment for further information regarding significant woodlands and mitigation measure proposed.

Land used for agriculture is also considered a significant natural resource supporting Bruce County's economic base within the Project Study Area. The agricultural community in the County involves over 3,750 farm operators (Bruce County, 2012).

The Glammis Bog and Greenock Swamp, which are evaluated Provincially Significant Wetlands are located in the easterly portion of the Project Study Area. The Greenock Swamp is also a Provincial Area of Natural and Scientific Interest (ANSI). The Kingarf Complex, which is an evaluated wetland, is located in the south easterly portion of the Project Study Area. The wetland and ANSI areas were assessed and mitigation measures have been proposed as part of the Natural Heritage Assessment, which will be submitted to the MNR for review and approval.

Interactions exist between the Project and these natural resources; however, the Project is not likely to have significant adverse effects on the current or future use of natural resources in the Project Study Area, based on the Project design and effects assessments completed. For more information regarding the natural resources located within the Project Study Area, refer to the Natural Heritage Assessment available for public review.

3.6.6 Recreation Areas

The Saugeen Valley Conservation Authority (SVCA) owns a portion of land identified near the eastern portions of the Project Study Area. The lands are associated with upstream tributaries and wetlands of various creeks and rivers in the region, and do not represent a major recreational resource in the Project Study Area.

A potential interaction exists between the Project and the conservation of these lands. However, by meeting MOE required setback distances and through constraint considerations, no adverse effects of the Project on recreation areas are anticipated.

3.6.7 Telecommunications

Locations of existing telecommunications infrastructure and transmission paths will be considered in the Project design. The Proponent will follow the recommended consultation process outlined in the Radio Advisory Board of Canada ("RABC") and Canadian Wind Energy Association (CanWEA) "Technical Information and Coordination Process Between Wind Turbines and Radiocommunication and Radar Systems" document (RABC and CanWEA, 2012). Through consultation with interested stakeholders, consideration will be given to the potential for electromagnetic interference in an attempt to minimize any effects. This consultation will ensure that service providers and government agencies have received appropriate contact and Project related details.

Electromagnetic interference represents a potential effect of the Project on telecommunications infrastructure near the Project Study Area. All existing telecommunications services will be considered in the Project design to limit the adverse effects. Furthermore, communication plans have been developed by the Proponent to receive communication or complaints. Please refer to the Design and Operations Report for further information on telecommunications and communication plans.,

3.6.8 Stray Voltage

Stray voltage describes the occurrence of electrical potential between two objects that ideally should not have any voltage difference between them. Most cases of stray voltage occur when there is either improper grounding of on-site equipment or a change in current patterns on the distribution line, from generation or load that exposes a pre-existing condition. The potential for stray voltage is not unique to wind power facilities, as it can be produced by a wide variety of off-farm (e.g., ground conductors) and on-farm sources (e.g., poor or faulty wiring).

The Proponents will ensure that all electrical design conforms and complies with relevant electrical safety standards. Further, the Project collector lines will not share poles with existing distribution lines, thereby reducing the instances of potential stray voltage generation.

Hydro One has established procedures in place to address stray voltage for a number of off-farm and on-farm stray voltage sources. Prior to commencing construction and installation activities, the Proponent will make copies of a detailed communication plans available to the appropriate regulatory agencies, Bruce County, Municipality of Kincardine, local residents and Aboriginal communities to be utilized in events such as stray voltage complaints. The purpose of the communications plans are to establish and maintain procedures required for effectively responding to complaints, emergencies or accidents. Refer to Section 6.0 of the Design and Operations Report for more information regarding the emergency response and communications plan.

3.7 Public Health and Safety

Electricity generation through a wind turbine facility is a clean renewable energy source that does not emit environmental contaminants (e.g., CO_2, NO_X) or produce harmful waste products. Through the implementation of the *Green Energy Act*, the Province is looking to increase the amount of electricity generated by renewable energy sources, including wind. Potential effects on public health and safety during the site preparation and construction, operation, and decommissioning of the Project are discussed below.

3.7.1 Construction and Decommissioning

Public safety hazards are present on any construction or decommissioning site and require the implementation of appropriate safety measures to prevent incidents from occurring. One such hazard that exists during construction or decommissioning of the Project is the operation of heavy machinery. Typical equipment to be used for construction and decommissioning related activities includes tracked bulldozers, excavators, tippers and dumpers, mobile cranes for general use and a large tracked crane for tower section, turbine and blade erection or disassembly. Various large truck and trailer combinations will be used to transport the large Project components to the Project Study Area. Additional vehicles will be used for personnel and small equipment transport to and at the site.

During turbine erection and disassembly, Project workers will be required to work at high elevations on the turbine sections of the tower, nacelle, and rotor and blade assembly. Installation of underground collector lines could pose a risk of injury to both the public and construction workers during the excavation of trenches.

In order to ensure public safety for the duration of the site preparation and construction, the turbine manufacturer or the construction contractor will ensure that the following safety measures are implemented as appropriate:

- Properly trained staff;
- Appropriate warning signage;
- Speed restrictions;
- Road closures;
- Vehicle lighting;
- Safety fencing surrounding trenches, or work space, as necessary; and
- Traffic direction.

Through consultation with Bruce County and the Municipality of Kincardine, the Proponent will ensure that emergency response services are prepared to respond to any unique, albeit unlikely, emergencies related to construction or decommissioning of the Project (e.g., high elevation rescue). Refer to the Design and Operations Report for further information regarding emergency and communication plans.

3.7.2 Operations

Potential effects of the operation of wind turbines on public health and safety were assessed in a report by the Chief Medical Officer of Health for Ontario (CMOH, 2010). Identified effects include sound and noise, low frequency sound, infrasound and vibration, electric and magnetic fields (EMF), shadow flicker, ice throw and ice shed, and structural hazards. Definitions of these terms (where available) from the Potential Heath Impacts of Wind Turbines report (CMOH, 2010) and description of the potential project effects are provided in the following sections. The report notes that “provincial setbacks were established to protect Ontarians from potential health and safety hazards of wind turbines, including noise and structural hazards” (CMOH, 2010).

Potential effects of sound and noise for this project are described in section 3.5 above.

3.7.2.1 Low Frequency Sound, Infrasound and Vibration

Low frequency sound refers to sound at frequencies between 20 and 200 Hz; infrasound commonly refers to sound at frequencies below 20 Hz (i.e., below the threshold of human perception). Although generally considered inaudible, infrasound at high-enough sound pressure can be audible to some people (CMOH, 2010).

Low frequency sound and infrasound are present in wind turbines, just like they are present in most household appliances, but many studies have shown that they are not present at levels high enough to cause human discomfort.

Several sources of literature that support these claims include:

- The Potential Heath Impacts of Wind Turbines report (CMOH, 2010) identified that infrasound and low frequency sound from modern wind turbines were found to be well below the level where known health effects occur (50 to 70 dB) in studies of wind turbine noise.
- In 2009, a scientific advisory panel was commissioned by the American and Canadian Wind Energy Associations to review currently available literature on perceived health effects of wind turbines. Top findings include: Sub audible, low frequency sound and infrasound from wind turbines do not present a risk to human health.
- In 2005, Dr. Geoff Leventhal provided literature at the First International Meeting on Wind Turbine Noise: Perspectives for Control in Berlin, Germany. The document states that, "…infrasound intensity levels more than 1000 times greater would be necessary simply to be audible, and still 1000 times greater than that to cause the minor and short-lived vestibular reactions (fatigue, headaches, nausea) sometimes observed experimentally. The concern of wind turbine-produced infrasound is therefore unfounded."
- In April 2012, C. Turnbull et al. (2012) had their literature titled, Measurement and Level of Infrasound from Wind Farm and Other Sources published in the Acoustics Australia Journal. The measurement of infrasound is affected by even a light surface breeze and as such, methodology was developed for measurement below the ground surface in a test chamber. In addition to two Australian wind farms, infrasound was measured in the vicinity of a beach, a coastal cliff, the city of Adelaide, and a power station. The study concluded that infrasound is prevalent in urban and coastal environments at similar levels to the level of infrasound measured close to a wind farm.

3.7.2.2 Electric and Magnetic Fields

Electromagnetic fields are a combination of invisible electric and magnetic fields. They occur both naturally (e.g., light is a natural form of EMF) and as a result of human activity. Nearly all electrical and electronic devices emit some type of EMF (CMOH, 2010).

The generation of electrical fields from underground collector lines from the Project will be shielded by line insulation and the surrounding ground, but will still generate magnetic fields. Associated magnetic fields will be similar to other buried distribution lines in Ontario. The Potential Heath Impacts of Wind Turbines report (CMOH, 2010) indicates that "wind turbines are not considered a significant source of EMF exposure".

3.7.2.3 Shadow Flicker

Shadow flicker a result of the sun casting intermittent shadows from the rotating blades of a wind turbine onto a sensitive receptor such as a window in a building. The flicker is due to alternating light intensity between the direct beam of sunlight and the shadow from the turbine blade (CMOH, 2010).

The Potential Heath Impacts of Wind Turbines report (CMOH, 2010) indicates that most industrial turbines rotate at a speed well below the flicker frequencies (generally flicker frequencies between 5-30 Hz) that may result in a response from the small percentage of the population with epilepsy who are also photosensitive. The Siemens wind turbine rotates at a frequency below 1.0 Hz.

3.7.2.4 Ice Throw

Ice throw and ice shed refer to situations where during specific weather conditions, ice may form on wind turbines and may be thrown or break loose and fall to the ground (CMOH, 2010).

Wind turbines for the proposed Project will be located on private property, and meet (at a minimum) the setback distances from non-participating receptors (550 m) and roads (blade length plus 10 m) outlined in O. Reg. 359/09, as amended. The setbacks are defined by the province to be protective of human health and safety. During the operation of the Project, sensors located on the turbines will be able to detect ice build-up and turbines will be shut down during unsafe operating conditions.

3.7.2.5 Structural Hazards

In the unlikely event of structural collapse or failure, equipment will fall within a very small diameter due to the weight of the wind turbine components. All of the proposed wind turbines for the proposed Project meet (at a minimum) the setback distances from roads (blade length plus 10 m) and non-participating residences (550 m) outlined in O. Reg. 359/09, as amended. These setback distances were designed to minimize the risk of injury from structural failure of wind turbines (CMOH, 2010). A Property Line Setback Assessment Report was conducted in accordance with O. Reg 359/09, as amended, to identify the proposed turbines located within the hub height (99.5 m) of an adjacent property line. The Report concluded that given the low likelihood of such events occurring and the mitigation measure proposed by the Proponent, no adverse impacts are anticipated as a result of the setback reductions. Refer to the Design and Operations Report for further information.

3.8 Areas Protected Under Provincial Plans and Policies

The Project is not located in an area where the following plans or policies are applicable:

- Greenbelt Plan and *Greenbelt Act*;
- Oak Ridges Moraine Conservation Plan;
- Niagara Escarpment Plan; and
- Lake Simcoe Watershed Plan.

4.0 REFERENCES

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Report Signature Page

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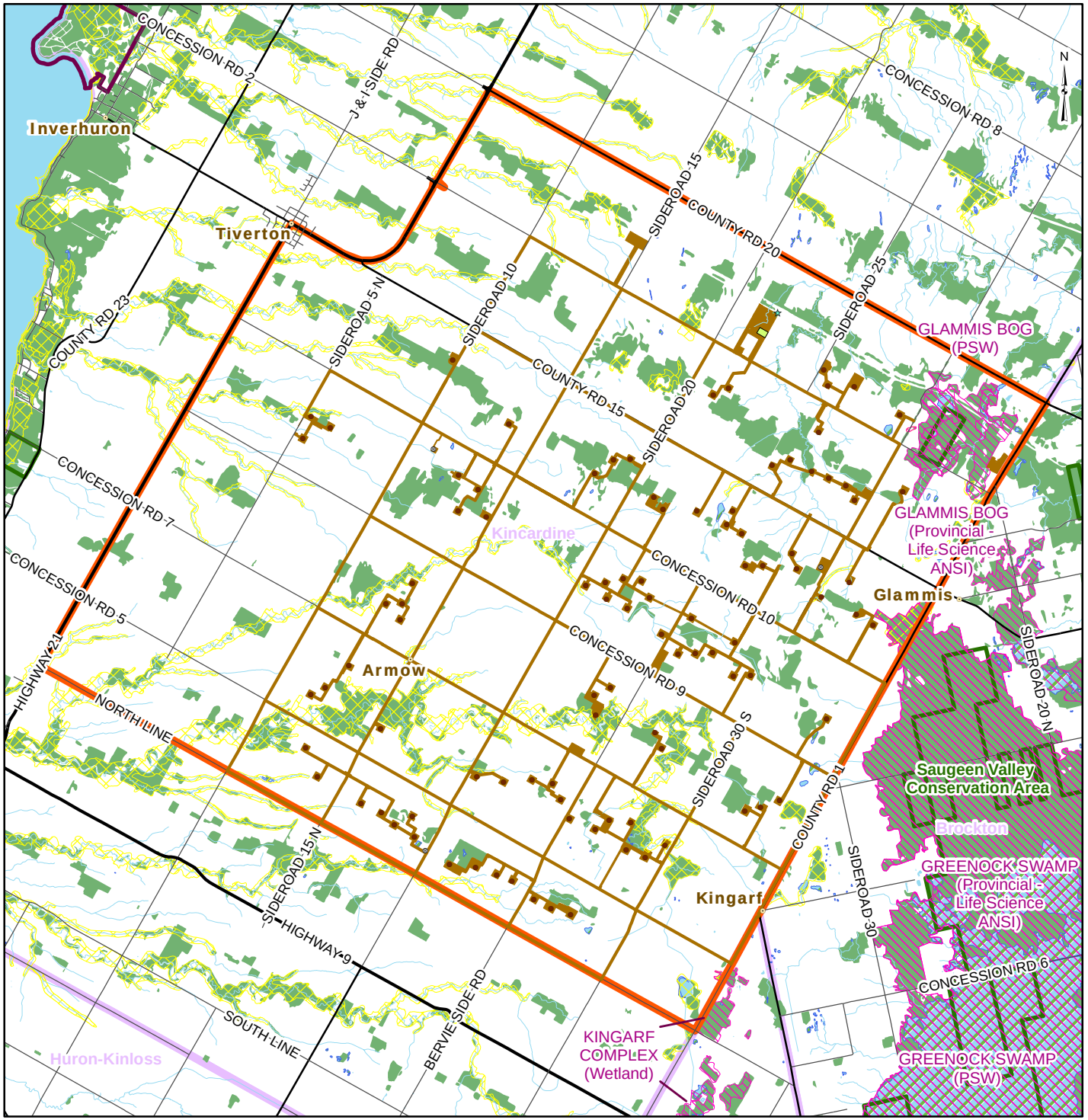
FIGURE 1

Project Location

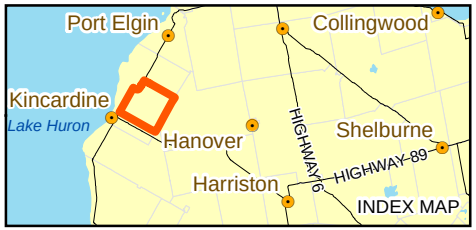


LEGEND

- Turbine
- MET Tower
- Point Of Interconnect (POI)
- Community
- Railway
- Highway
- Major Road
- Local Road
- Watercourse
- Project Study Area
- Project Location
- Substation
- Provincial Park
- Conservation Area
- Natural Feature
- Kincardine Hazard Land
- Wetland
- Waterbody
- Wooded Area
- Municipal Boundary

NOTES:

All potential project collector routes are shown on this figure, final design will likely reduce overall footprint.



REFERENCE

1. Base Data - MNR LIO, obtained 2009
2. Natural Features compiled by Golder from NRVIS base data, NHIC Natural Areas and MNR Wetland and ANSI data, obtained 2010
3. Hazard Lands - Bruce County, obtained 2010

Produced by Golder Associates Ltd under licence from Ontario Ministry of Natural Resources, © Queens Printer 2010
Projection: UTM Datum: NAD 83 Coordinate System: UTM Zone 17

0 0.75 1.5 3 4.5 6

SCALE 1:110,000 KILOMETRES

PROJECT

ARMOW WIND PROJECT

TITLE

PROJECT LOCATION

Golder Associates
Mississauga, Ontario

PROJECT NO. 11-1151-0247			SCALE AS SHOWN	REV.
DESIGN	ME	23 Jul. 2012		
GIS	ME	15 Nov. 2012		
CHECK	KM	15 Nov. 2012		
REVIEW	IC	15 Nov. 2012		

FIGURE: 1

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APPENDIX A

Legal Description of Project Location Lands

PT LT 33-34 CON 9 KINCARDINE AS IN R301740; S/T KN16398, R246735; KINCARDINE
PT LT 13-14 CON 8 KINCARDINE AS IN R143142 EXCEPT PT 17, 18 3R1008 MUNICIPALITY OF KINCARDINE
PT LT 23 CON 9 KINCARDINE AS IN R333743; KINCARDINE
PT LT 30 CON 3 BRUCE AS IN R244667 EXCEPT PT 5, 6, 3R4324, LYING W OF PUBLIC RD; S/T R246759, R246760; KINCARDINE
PT LT 27-28 CON 1 BRUCE AS IN R244667; S/T INTEREST IN R71328; KINCARDINE
LT 14 CON 11 KINCARDINE EXCEPT PT 7, 3R2440; S/T INTEREST IN R243421; KINCARDINE
LT 14 CON 10 KINCARDINE; PT LT 14 CON 9 KINCARDINE AS IN R185050 EXCEPT PT 4, 3R2440 & PT 22 & 24, 3R1008; S/T KN16390; KINCARDINE
LT 28 CON 3 NDR KINCARDINE EXCEPT PT 4 3R4245; KINCARDINE
PT LT 22 CON 5 KINCARDINE AS IN R294868; KINCARDINE
PT LT 21 CON 5 KINCARDINE; PT LT 21 CON 6 KINCARDINE AS IN R356823; KINCARDINE
PT LT 25 CON 9 KINCARDINE AS IN R202978; KINCARDINE
PT LT 26 CON 1 BRUCE AS IN R298245; KINCARDINE
LT 13 CON 10 KINCARDINE; KINCARDINE
PT LT 29 CON 12 KINCARDINE AS IN R271357 EXCEPT PT 1 3R7973; KINCARDINE
PT LT 26 CON 10 KINCARDINE AS IN R322314; KINCARDINE
LT 27 CON 8 KINCARDINE EXCEPT N 10 FT; KINCARDINE
PT LT 26-28 CON 9 KINCARDINE AS IN R300455; KINCARDINE
LT 26 CON 3 BRUCE; KINCARDINE
PT LT 27 CON 3 BRUCE AS IN R309116 MUNICIPALITY OF KINCARDINE
PT LT 26 CON 2 BRUCE AS IN R324915 MUNICIPALITY OF KINCARDINE
PT LT 27 CON 2 BRUCE AS IN R332656 EXCEPT THE EASEMENT THEREIN; KINCARDINE
PT LT 29-30 CON 9 KINCARDINE AS IN R289182, S/T INTEREST IN R289182; KINCARDINE
PT LT 28 CON 6 KINCARDINE AS IN R117419; KINCARDINE
LT 19 CON 11 KINCARDINE; E 1/2 LT 18 CON 11 KINCARDINE EXCEPT PT 14 & 15, 3R2098; KINCARDINE
PT LT 30 CON 1 BRUCE AS IN R254904; KINCARDINE
PT LT 30 CON 12 KINCARDINE AS IN R141473; KINCARDINE
PT LT 26 CON 12 KINCARDINE AS IN R56066; KINCARDINE
LT 22 CON 3 BRUCE, EXCEPT PTS 2, 3 & 4, 3R4074 & PT 1, 3R5128 MUNICIPALITY OF KINCARDINE
PT LT 32 CON 2 BRUCE; PT LT 32 CON 1 BRUCE AS IN R351915 EXCEPT THE EASEMENT THEREIN RE: PT 9, 3R4599; S/T R246756, R295515E; KINCARDINE
PT LT 31 CON 11 KINCARDINE AS IN R268584 MUNICIPALITY OF KINCARDINE
PT LT 25 CON 12 KINCARDINE AS IN R290065; KINCARDINE
PT LT 29 CON 1 BRUCE AS IN R343977; KINCARDINE
PT LT 37-40 CON 3 NDR KINCARDINE; PT LT 19 CON 4 KINCARDINE AS IN R352390; KINCARDINE
PT LT 35 CON 3 BRUCE AS IN R327118; KINCARDINE

PT LT 33-34 CON 9 KINCARDINE AS IN R301740; S/T KN16398, R246735; KINCARDINE
LT 6 CON 10 KINCARDINE; W 1/2 LT 7 CON 10 KINCARDINE EXCEPT PT 1, 2 & 14, 3R2439; KINCARDINE
PT LT 11-13 CON 6 KINCARDINE; PT LT 11-13 CON 5 KINCARDINE AS IN R292978; S/T KN16173, KN16295; S/T EASEMENT IN GROSS OVER PT LT 11, CON 6 KINCARDINE, PT 1 3R8705 AS IN BR25836; KINCARDINE
PT LT 11-14 CON 7 KINCARDINE AS IN R382032; KINCARDINE
LT 27 CON 6 KINCARDINE EXCEPT N 17 FT; KINCARDINE
PT LT 48-50 CON 3 NDR KINCARDINE AS IN R150562; KINCARDINE
PT LT 27 CON 5 KINCARDINE AS IN R306502; KINCARDINE
PT LT 26 CON 5 KINCARDINE AS IN R148360 EXCEPT PT 2 3R2964 & R100510; KINCARDINE
LT 29 CON 5 KINCARDINE EXCEPT PT 5 3R2964; KINCARDINE
LT 53-55 CON 3 NDR KINCARDINE EXCEPT PT 1-2 3R1247; KINCARDINE
PT LT 26 CON 4 KINCARDINE; PT LT 51-52 CON 3 NDR KINCARDINE AS IN R345370 MUNICIPALITY OF KINCARDINE
LT 30 CON 5 KINCARDINE EXCEPT PT 1 3R2968 & PT 6 3R2964; PT LT 30 CON 6 KINCARDINE AS IN R51082; KINCARDINE
PT LT 23 CON 6 KINCARDINE AS IN R334171; KINCARDINE
PT LT 36-38 CON 3 NDR KINCARDINE AS IN R141673; KINCARDINE
PT LT 28 CON 11 KINCARDINE AS IN R240457; KINCARDINE
LT 24-25 CON 7 KINCARDINE; KINCARDINE
PT LT 25 CON 6 KINCARDINE AS IN R273392 EXCEPT R100507 & PT 1, 3R5295; KINCARDINE
LT 28 CON 7 KINCARDINE EXCEPT S 17 FT; KINCARDINE
PT LT 24 CON 6 KINCARDINE AS IN R273469; KINCARDINE
LT 20 CON 12 KINCARDINE EXCEPT PT 1, PL920 & PT 1, 3R6787; S/T RIGHTS IN R301676; KINCARDINE
LT 12 CON 4 KINCARDINE; PT LT 13-15 CON 4 KINCARDINE AS IN R201429, EXCEPT PT 2 & 4 3R4056; KINCARDINE
PT LT 16 CON 5 KINCARDINE AS IN R366239; KINCARDINE
LT 22 CON 2 BRUCE EXCEPT PT 1, 3R535 & PT 12 & 14, 3R4074; KINCARDINE
PT LT 27 CON 11 KINCARDINE AS IN R78345, S/T INTEREST IN R55720 & R55439; KINCARDINE
LT 6 CON 9 KINCARDINE EXCEPT PT 35, 3R1008; KINCARDINE
PT LT 3-5 CON 9 KINCARDINE AS IN R370540 EXCEPT PT 1, 3R7761; PT LT 4-5 CON 10 KINCARDINE AS IN R345487 EXCEPT PT 1, 3R7276; KINCARDINE
PT LT 10 CON 12 KINCARDINE AS IN R167065 EXCEPT PT 1, PL920; KINCARDINE
PT LT 14-15 CON 2 BRUCE AS IN R307498 & R162926 EXCEPT PT 9 3R3756; S/T & T/W R307498 MUNICIPALITY OF KINCARDINE
PT LT 32 CON 12 KINCARDINE AS IN R310378 MUNICIPALITY OF KINCARDINE
PT LT 34 CON 11 KINCARDINE AS IN R364541, EXCEPT PT 1 3R7688 & LANDS AS IN R79240; S/T R246731 MUNICIPALITY OF KINCARDINE
LT 19 CON 12 KINCARDINE EXCEPT PT 1, PL920; KINCARDINE

PT LT 33-34 CON 9 KINCARDINE AS IN R301740; S/T KN16398, R246735; KINCARDINE
LT 12 CON 10 KINCARDINE EXCEPT PT 2, 3R2440; KINCARDINE
LT 43-46 CON 3 NDR KINCARDINE; KINCARDINE
PT LT 21-25 CON 4 BRUCE PT 1 & 2, 3R328, PT 3 & 4, PL880, PT 1 & 3, 3R1348, PT 3, PL878 & PT 1, PL879; KINCARDINE
PT LT 28-29 CON 10 KINCARDINE AS IN R334905 MUNICIPALITY OF KINCARDINE
PT LT 47 CON 3 NDR KINCARDINE AS IN R355006, S/T DEBTS IN R76124; KINCARDINE
PT LT 32 CON 11 KINCARDINE AS IN KN17642 EXCEPT R79247 & LT 33 CON 11 KINCARDINE AS IN KN17642 EXCEPT R79247 & EXCEPT PT 1 3R8961 MUNICIPALITY OF KINCARDINE
PT LT 22 CON 11 KINCARDINE AS IN R365169; KINCARDINE
PT LT 24 CON 12 KINCARDINE AS IN R365393; KINCARDINE
PT LT 23-25 CON 10 KINCARDINE AS IN R335253; KINCARDINE
PT LT 22 CON 10 KINCARDINE AS IN R343165; KINCARDINE
PT LT 21-22 CON 9 KINCARDINE AS IN R335252; KINCARDINE
PT LT 16 CON 4 KINCARDINE AS IN R364169; KINCARDINE
PT LT 33-34 CON 3 NDR KINCARDINE AS IN R353828 EXCEPT PTS 1 TO 3 3R7555, PTS 2 TO 6 3R8585; S/T KN16199; T/W EASEMENT OVER PTS 3, 4 & 5 3R8585 AS IN BR11384; KINCARDINE
PT LT 35 CON 3 NDR KINCARDINE AS IN R354717; KINCARDINE
LT 15 CON 10 KINCARDINE EXCEPT PT 5 & 14, 3R2440; KINCARDINE
PT LT 24-25 CON 8 KINCARDINE AS IN R337710; KINCARDINE
PT LT 33 CON 7 KINCARDINE PT 2 3R6760; KINCARDINE

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