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ROMNEY
wind energy centre

ROMNEY WIND ENERGY CENTRE

Construction Plan Report

Romney Energy Centre Limited Partnership

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D	12 January, 2018	Update to Site Plan maps to remove reference to SODAR	N. O'Neill	F. Gagnon	G Constantin

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Abbreviation	Meaning
APRD	Approval and Permitting Requirements Document
CPR	Construction Plan Report
DNV GL	GL Garrad Hassan Canada Inc.
DVA	Designated Vulnerable Area
EDF EN	Électricité de France Énergies Nouvelles
ERP	Emergency Response Plan
EASR	Environmental Activity and Sector Registry
ESA	Endangered Species Act
ESC	Erosion and Sediment Control
EPA	Ontario *Environmental Protection Act*
Hydro One	Hydro One Networks Inc.
IESO	Independent Electricity System Operator
LRP	Large Renewable Procurement
LTVCA	Lower Thames Valley Conservation Authority
MNRF	Ontario Ministry of Natural Resources and Forestry
MOECC	Ontario Ministry of the Environment and Climate Change
MTO	Ministry of Transportation of Ontario
MW	Megawatt
NHA	Natural Heritage Assessment
NIA	Noise Impact Assessment
O&M	Operations and Maintenance
ON	Ontario
O.Reg.	Ontario Regulation
PCC	Point of Common Coupling
POI	Point of Interconnect
REA	Renewable Energy Approval
SCADA	Supervisory Control and Data Acquisition
SESMP	Stormwater, Erosion and Sediment Management Plan
SPP	Source Protection Area
SWH	Significant Wildlife Habitat
TC	Transport Canada
TMP	Traffic Management Plan
WTG	Wind Turbine Generator
ZOI	Zone of Influence

1 PREAMBLE

Romney Energy Centre Limited Partnership (the "Proponent") is proposing to develop the Romney Wind Energy Centre (the "Project") which is subject to *Ontario Regulation* (*O. Reg.*) *359/09* (Renewable Energy Approvals [1] under Part V.0.1 of the Ontario *Environmental Protection Act* (EPA)), as amended. The Proponent was awarded a contract for this Project in March 2016 from the Independent Electricity System Operator (IESO) under the Large Renewable Procurement (LRP), and is seeking a Renewable Energy Approval (REA) from the Ontario Ministry of the Environment and Climate Change (MOECC). The Project will be owned and operated by Romney Energy Centre Limited Partnership a partnership between Électricité de France Énergies Nouvelles Canada (EDF EN) and Aamjiwnaang First Nation. The Municipality of Chatham-Kent has also been provided with an option to participate in the Project.

This Construction Plan Report (CPR) has been prepared in accordance with Table 1 of *O. Reg 359/09* and the Technical Guide to Renewable Energy Approvals, Chapter 5: Guidance for preparing the Construction Plan Report [2]. Table 1-1 presents the corresponding sections for each CPR requirement.

Table 1-1: Construction Plan Report Requirements and Corresponding Sections

Requirement	Section
Details of any construction or installation activities.	3
The location and timing of any construction or installation activities for the duration of the construction or installation.	2.2, 4.14, Appendix A
Negative environmental effects that may result from construction or installation activities.	5.1
Mitigation measures in respect of negative environmental effects that may occur.	5.1

2 GENERAL INFORMATION

2.1 Project Name and Project Proponent

The name of the project is Romney Wind Energy Centre and Romney Energy Centre Limited Partnership, a partnership between EDF EN Canada and Aamjiwnaang First Nation is the Project Proponent.

2.2 Location of Project

The Romney Wind Energy Centre is located in southwestern Ontario, within the Town of Lakeshore and the Municipality of Chatham Kent, Ontario. More specifically, the Project is located south of Highway 401, extending along Richardson Side Road and Wheatley Road near the community of Wheatley. It has a total Project study area of approximately 5,093 ha.

Project components will be mostly installed on privately-owned agricultural lots within this area. It is anticipated that the electrical collector lines including junction boxes will be partially located within public road allowances. The Project will connect to the existing 230 kV transmission line located within the Town of Lakeshore and close to Richardson Side Road. There is a short section of transmission line (less than 1 km) proposed for the Project to be built by either the Proponent or Hydro One Networks Inc. (Hydro One) from the Point of Common Coupling (PCC) to the Point of Interconnect (POI).

The proposed Project study area is located on private and public lands; the geographic coordinates of the extreme points of the Project study area are provided in Table 2-1. Figure 2-1 presents the location of the Project study area.

Table 2-1: Geographic Coordinates of Project Study Area

Site Location	Easting	Northing
North	378764	4678793
East	386458	4665518
West	376264	4669394
South	379094	4662491

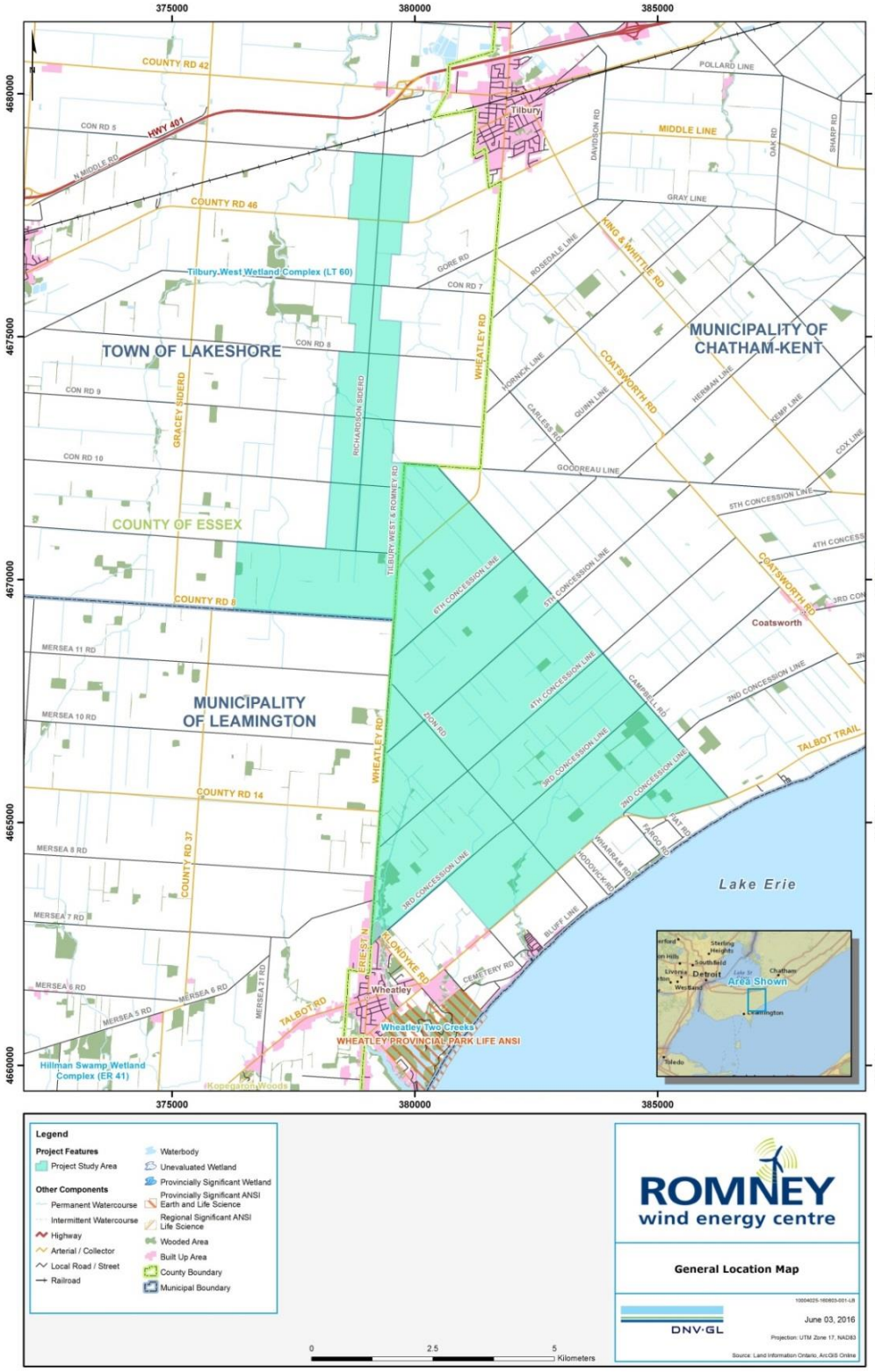

Figure 2-1: General Project Study Area

The location of the study area was defined early in the planning process for the proposed wind energy facility and was based on the availability of wind resources, approximate area required for the proposed Project, and availability of existing infrastructure for connection to the electrical grid. Most of the agricultural fields are planted annually with common crops (e.g. corn, soybeans and winter wheat) or are used as pasture lands. All turbines are to be installed in these agricultural field areas.

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

Disturbance Areas have been identified surrounding various Project components; such areas correspond to the "Project Location" boundaries in the Site Plan Maps included in Appendix A. These areas denote zones where temporary disturbance during the construction phase may occur as a result of: temporary Project component laydown and storage areas, crane pad construction or turbine turnaround areas. With the exception of the Project components described in Section 3.2, no permanent infrastructure is proposed within these areas. Following construction activities, the land will be returned to a condition suitable to the landowner and local authorities.

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

The wind turbine generators (WTGs) of the Project will convert wind energy into electricity to feed into the Ontario IESO transmission system. The Project, with a total nameplate capacity of up to 60 megawatts (MW), is considered to be a Class 4 wind facility. A total of 18 wind turbine locations are being permitted for the Project. The Proponent is currently evaluating different wind turbine technologies for the Project.

2.4 Contact Information

2.4.1 Project Proponent

The Project Proponent is Romney Energy Centre Limited Partnership. The primary contact for this Project is:

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Project website: http://www.edf-en.ca/projects/project_display/romney-wind-energy-centre

2.4.2 Project Consultant

GL Garrad Hassan Canada Inc. (hereafter referred to as "DNV GL"), a member of the DNV GL Group and part of the DNV GL brand, has been retained to lead the REA for the Project. The Environmental and Permitting Services team of DNV GL has completed mandates throughout Canada, the United States and in many other parts of the world. These mandates include permitting management, permit applications, environmental impact assessments, and various environmental studies for more than 15,000 MW of wind and solar-PV projects.

DNV GL's environmental team is composed of over 20 environmental professionals, including environmental impact specialists, planners, GIS technicians and engineers. DNV GL has no equity stake in any Project. This rule of operation is central to its philosophy, distinguishing it from many other players and underscoring its independence.

DNV GL's contact information is as follows:

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3 PROJECT INFORMATION

3.1 Existing Features

3.1.1 Buildings or structures

Buildings within 300 m of the Project location are identified in the Site Plan Maps (see Appendix A) and consist primarily of rural residences that are considered "noise receptors" as per O. Reg. 359/09[1].

3.1.2 Roads

The Project is located south of Highway 401, extending along Richardson Side Road and Wheatley Road near the community of Wheatley, Ontario. Municipal roads are located throughout the Project boundary.

3.1.3 Utilities and Other Infrastructure

The Project will be interconnected to the existing 230 kV transmission line located on Hydro One transmission line C21J, less than 1 km from the Project substation.

Railways, pipelines, phone lines and other buried utilities have also been identified within 300 m of the Project location.

3.2 Facility Components

The Project will be made up of the following main components:

- Wind turbine generators;
- Permanent meteorological tower(s);
- Access roads and crane pads;
- Electrical collector lines, junction boxes substation and grid interconnection;
- Operations and Maintenance (O&M) building; and
- Construction staging and laydown areas (including temporary staging areas).

3.2.1 Wind Turbine Generators

At the time of this report, the final wind turbine technologies have not been selected; however, it is likely that more than one turbine variant rated up to 3.6 MW will be installed. For the purposes of reference, the Vestas V136-3.6 MW turbines will be considered, some of which may need to be de-rated to lower noise modes. Alternatively, another turbine model that is acoustically equivalent and would have the same or lower octave band sound power levels, tonal audibility values, and predicted noise impact levels at receptors may be chosen. The total installed capacity for the Project will be up to 60 MW. The proposed turbine will be a 3-bladed and horizontal-axis turbine.

The total rotor diameter of the V136 is 136 m, resulting in a swept area of 14,526 m^2. The turbine rotors and nacelles are mounted on top of 132 m tubular towers, although other heights are being evaluated, which are manufactured in sections from steel plates. A pad mounted transformer will also be located adjacent to or inside the wind turbine.

The complete technical specifications for the selected technology will be available in the Wind Turbine Specification Report as part of the complete REA package.

The acoustic emissions data, including the sound power level and frequency, will be detailed in the Noise Impact Assessment (NIA) and will be available as part of the complete REA package.

All Project turbines will meet Transport Canada (TC) requirements from an aviation safety and lighting perspective.

3.2.2 Permanent Meteorological Tower(s)

Wind speed, wind direction, temperature and humidity will be measured by means of meteorological tower(s) of up to 132 m in height. The tower(s) will remain on-site for the duration of the Project for wind turbine performance testing; exact location(s) with be determined prior to issuing the final REA reports. The tower(s) will be of lattice or monopole type and will be constructed on small concrete pad(s) and/or and supported by a number of guy wires (lattice tower only).

3.2.3 Access Roads

Transportation of machinery, turbine components, the main transformer and other equipment will take place using existing municipal roads. New access roads will be constructed on private lands to provide access to the turbine sites during construction phase and for maintenance activities during operation, including side clearance. Typically access roads will be constructed to be up to 12 m wide during construction. Areas adjacent to the access road within the larger approximately 20 m disturbance area may be utilized during the construction phase in order to accommodate cranes, transportation equipment and other construction activities. After construction, these roads may be reduced in size to approximately 5-6 m in width, in order to allow access to turbines and associated infrastructure for maintenance and repairs.

3.2.4 Electrical Collector Lines, Substation and Grid Interconnection

Energy generated by the Project will be collected via underground and in some cases, overhead electrical collector lines, that will be directed to the Project's substation.

3.2.4.1 Electrical Collector Lines

The electricity generated at each of the WTGs will be transported through 34.5 kV underground or overhead electrical collector lines to the Project's substation. Electrical collector lines will be sited adjacent to the turbine access roads, where feasible, and will follow public road allowances to reach the Project substation.

Junction boxes will also be installed below or above ground in instances where more than one circuit must be connected together. These will be located on privately-owned agricultural lots or within public road allowances.

3.2.4.2 Substation and Grid Interconnection

Measuring a total footprint of up to 2-3 ha, the electrical substation for the Project will be located on privately held lands through an "option to lease land" agreement. The substation will be comprised of the following main components:

- Disconnect switch(es);
- Circuit breaker (s);
- Main power transformer (s);
- Metering and protection equipment;
- Station service transformer (s);
- Grounding grid (consistent with Ontario Electrical Safety Code standards);
- Containment system;
- Oil / water separator;
- Revenue metering; and
- Control building including supervisory control and data acquisition (SCADA).

A secondary containment system will also be included to prevent soil contamination in the unlikely event of a leak from the main transformer. At the substation, the voltage level will be raised to 230 kV by the main power transformer. The electricity will then be delivered to the PCC. A new high-voltage overhead transmission line is proposed to be built by either Hydro One or the Proponent, between the PCC and POI and located on privately owned lands held under lease options less than 1 km from the Project substation. This line will be owned and operated by Hydro One. At the POI, the Project will connect to the existing 230 kV Hydro One transmission line C21J.

3.2.5 Operations and Maintenance Building

It is anticipated that an Operations and Maintenance (O&M) building will be constructed in the general vicinity of the Project for the purpose of monitoring the day-to-day operations of the Project and supporting maintenance efforts. A small parking lot may be constructed to accommodate staff vehicles.

Potable water will be supplied by a well or through the municipal water system. A septic bed may also be constructed for the disposal of sewage. If deemed to be required, the septic bed will be constructed to the minimum size required for the size of the O&M building. It is the Project owner's responsibility to ensure proper maintenance of the septic system. The O&M building, septic system, and potable water supply will be constructed in accordance with applicable municipal and provincial standards.

3.2.6 Construction Staging and Laydown Areas

A temporary construction staging area will be constructed on privately owned lands for the purpose of staging and storing equipment during the construction phase. Activities on this site will include material storage, equipment refuelling, construction offices, parking lot, temporary toilet facilities, rinsing and water facilities. The temporary staging area will have a total footprint of approximately 8 ha.

In addition, a temporary area of approximately 80 m diameter around each wind turbine will be established for the laydown and assembly of the wind turbine components. This temporary area will be restored following the construction phase to a condition suitable to the landowner and local authorities.

4 CONSTRUCTION AND INSTALLATION ACTIVITIES

4.1 Surveying and Geotechnical Study Activities

Surveys will be required for the micro-siting of the turbines, crane pads, access roads, electrical collector lines, O&M building, meteorological towers(s) and the substation. Crews will drive light trucks to reach sites primarily using existing roads. They will then survey the site on foot and mark the locations using stakes. For the wind farm site, the surveys will typically take one to two days per turbine location.

Existing buried infrastructure located on public property will be identified using the Ontario One Call service and buried infrastructure located on private property will be identified by private contractors prior to construction or geotechnical sampling and updated throughout construction, as required.

Geotechnical sampling is required for turbine foundation locations, and some points along the new access roads or collector lines. Typically, a track-mounted drill rig visits the sampling locations, drills the borehole or pushes a probe into the ground and collects geotechnical information. This operation typically uses two operators and requires one to two hours per turbine location.

Any archaeological sites, as identified during the Archaeological Assessment, will be clearly marked in the field. All personnel working on or entering the construction area will be instructed to avoid these areas, if present.

This activity can be summarized as follows:

- Equipment required: Light trucks and a track-mounted drill rig; excavator (should test pits be required for geotechnical sampling).
- Materials brought on-site: Piezometers will be inserted into select boreholes to measure groundwater elevation. The only chemicals required for this phase are oils, gasoline, and grease used to operate construction equipment. Handling of fuels and other chemicals/substances will be conducted in compliance with the mitigation measures outlined below in Section 5.
- Timing: These activities will take place prior to construction and are not season-dependent. This operation typically uses two operators and requires one to two hours per site.
- Material generated: Some drill cuttings (composed of soil) will be generated and will be disposed of on-site by scattering in the vicinity of the borehole.

4.2 Culvert Installations

To the extent possible, Project infrastructure will be sited to minimize the number of water crossings. The Water Assessment and Water Body Report, describes all water crossings and associated mitigation measures, as part of the complete REA package.

Where instream work is required (i.e. installation of culvert), timing windows and permitting requirements will be discussed with the Lower Thames Valley Conservation Authority (LTVCA) in advance of any work taking place.

This activity can be summarized as follows:

- Equipment required: This construction task would utilize one or more excavator(s), dump truck(s) and compaction equipment.
- Materials brought on-site: Steel or plastic culverts and backfill material where required.
- Timing: These activities will take place during construction and in some cases, will be subject to timing restrictions associated with in-water works.

4.3 Access Roads, Crane Paths and Crane Pads

This activity generally involves the planning of roadway surfacing and road limits, as well as the stabilizing of backfill, excavated material, and stripped soil. Whenever possible, new road construction and upgrades will use existing material on-site, such as excavated material from turbine sites. The required amount and type of gravel will be the responsibility of the general contractor; an effort will be made to obtain gravel locally if feasible.

The Project is located primarily on private agricultural land and as such, will require clearing and grubbing of any vegetation, excavation of the topsoil layer and adding a layer of compacted material. Construction staff will be required to be familiar with the extent of the approved construction area to avoid damage to wildlife habitat beyond the Project location, which could include installing protective fencing, marking trees, or other means to delineate the construction limits. Damaged trees should be pruned through implementation of proper arboricultural techniques. Any required vegetation removal will be conducted in accordance with the mitigation measures proposed by the Natural Heritage Assessment (NHA) and approved by the Ministry of Natural Resources and Forestry (MNRF). The NHA is available as part of the complete REA package.

Access roads during the construction and operation phases of the Project will have the following characteristics:

- During construction, access roads within the larger approximately 20 m disturbance area may be utilized during the construction phase in order to accommodate cranes, transportation equipment and other construction activities. After construction, these roads may be reduced in size to approximately 5-6 m in width, to allow access to turbines and associated infrastructure for maintenance during the operations phase.
- Access roads may either be composed of a) a sub-layer of compacted material to a typical thickness of 300-600 mm; b) cement stabilized soil, plus a top layer of clean granular material (typically "A" or "B" gravel); or c) such other material determined by the Project Proponent to be necessary to implement any mitigation measures required for the Project

Each wind turbine access road will end at a crane pad during construction. The crane pad will be constructed of the same granular material as the access roads and have the following characteristics:

- Crane pads will be constructed at the same time as the access roads and will be located adjacent to the turbine locations. The turbine construction area including the crane pads will typically measure approximately 80 m in diameter (actual size to be finalized). The topsoil at the crane pad will be removed and approximately 600 mm of clean compacted crushed gravel will be imported as needed. The excavated topsoil will be re-used on-site as feasible.

This activity can be summarized as follows:

- Equipment required: At a minimum, trucks, graders, and bulldozers. The trucks and graders will be driven to the site and the bulldozers will be transported via flatbed trailers. Where vegetation removal is allowed in accordance with the NHA, large scale wood chippers and various sizes of wood and tree harvesting machinery could be required. Depending on the size of trees and type of terrain encountered, industrial size chainsaws used by qualified logging professionals could be required as well.
- Materials brought on-site: Granular material for road construction, geotechnical mats, as needed, and steel culverts. The only chemicals required for this phase are oils, gasoline, and grease used to operate construction equipment. Handling of fuels and other chemicals/substances will be conducted in accordance with the mitigation measures outlined below in Section 5.
- Timing: This activity will preferentially be completed in late spring or summer to take advantage of typically drier weather. If necessary, this activity can be completed in the spring or fall, depending on the amount of rainfall.
- Material generated: Any stock piled material generated from excavation will be handled in an approved and appropriate manner. Wood waste generated from vegetation removal will be sorted, mulched and either left on-site or removed by qualified logging professionals.

4.4 Transportation

This section covers the transportation of all items required for the Project, such as Project components, heavy machinery, and concrete.

Transportation of the turbine parts and sections will be done using trucks. Up to thirteen heavy-load hauling trucks will be required for each turbine installed, i.e. one truck for each tower section (up to seven), one for the nacelle, one for the hub, one for the cone, and one for each blade (three). Trucks or heavy-load hauling trucks will also be used to bring to the site concrete for foundations, cranes, electrical components, and other equipment.

All proposed transportation routes will be discussed with the appropriate municipal engineering departments prior to construction as discussed in Section 4.21.

This activity can be summarized as follows:

- Equipment required: At a minimum, trucks and heavy-load hauling trucks. The trucks and graders will be driven to the site and the bulldozers will be transported via flatbed trailers. Vegetation removal could include large scale wood chippers and various sizes of wood and tree harvesting machinery. These will also be transported via flatbed trailers.
- Materials brought on-site: Packaging materials will be brought on-site with components delivery. The recyclable material will be separated from the non-recyclable material on-site. Both streams of waste will be removed by a licensed sub-contractor. The only chemicals required for this phase are oils, gasoline, and grease used to operate construction equipment. Handling of fuels and other chemicals/substances will be conducted in accordance with the mitigation measures outlined below in Section 5.

- Timing: This activity will preferentially be completed in late spring, summer, fall or early winter to take advantage of typically drier weather and avoid load restrictions.
- Material generated: Some packing material waste will be generated. The recyclable material will be separated from the non-recyclable material on-site. Both streams of waste will be removed by a licensed sub-contractor.

4.5 Wind Turbine Foundations

A spread footing foundation design will be used at each of the proposed turbine locations. Installation of this foundation design activity includes the excavation of soil at each of the turbine sites, preparation of the excavation base which may include the placement and compaction of gravel fill, the installation of reinforcing steel (rebar) and the pouring of concrete foundations. For typical spread footing foundations, the anticipated dimensions of the foundation excavation are approximately 20-25 m in diameter with a depth of approximately 3 m.

Each concrete foundation will cure for approximately seven days prior to the excavation being backfilled. Excavated rock will be spread onto the crane pad and adjacent access roads. Concrete will be sourced from plants in proximity to the Project or from a temporary concrete plant installed on the Project site by the general contractor.

This activity can be described as follows:

- Equipment required (per turbine): Flatbed trucks (four to six) for the delivery of rebar, turbine mounting assembly and forms. Truck mounted crane or rough terrain forklift for unloading and the placement of rebar and forms. Concrete trucks for delivery of concrete (60-80 loads). Construction trucks (three to four vehicles with multiple visits). Dozer, loader, excavator, vibratory compactor, and dump trucks to backfill and compact foundation and remove surplus excavated materials.
- Materials brought on-site: Rebar and concrete. The only chemicals required for this phase are oils, gasoline, and grease used to operate construction equipment. Handling of fuels and other chemicals/substances will be conducted in accordance with the mitigation measures outlined below in Section 5.
- Timing: This activity will preferentially be completed in late spring, summer, fall or early winter to take advantage of typically drier weather and avoid load restrictions.
- Material generated: Any stock piled material generated from excavation will be handled in an approved and appropriate manner. Wood waste generated from vegetation removal will be sorted then mulched and left on-site or removed by qualified logging professionals.

While cleaning the concrete mixers (hopper and unloading chute) and accessories for the pouring of the concrete, the washing water will be poured into a small excavation (cleaning basin) within the turbine pad or in the excavation of the wind turbine foundation. The quantity of water and concrete residue from this operation will be insignificant and not anticipated to have any negative environmental effects on the natural heritage features. The water used for this operation will be transported in a tank directly to the cement mixer. The water contained in the tank generally allows for performing the rough cleaning two or three times (casting). Water will infiltrate by percolation in the soil, which will constitute the walls of the excavation and make it possible to filter and retain residue concrete

particles in the depression. The rinsing of the concrete mixers will be undertaken at least 60 m (could be adapted to the minimum required here) from any lake, stream or wetland.

When backfilling the foundation, concrete residues in the cleaning basin will be recovered and deposited near the foundation. The cleaned basin shall be free from concrete residues and may then be backfilled with granular material from cuttings made in the project. Concrete residues will be used for backfilling associated with foundation construction. During the backfilling, the only source of concrete residues will be from the wash basin present on the turbine pad. The concrete residues will be less than 30 cm in size and will not infiltrate into the groundwater. Complete washing of the cement mixing tank will be carried out at the concrete plant, the operation of which will require separate plant-specific permits that will be trusted to the contractor on-site.

The preparation of a typical concrete tower foundation is depicted in Figure 4-1.

Figure 4-1: Preparation of a Typical Concrete Tower Foundation

4.6 Wind Turbine Assembly

Tower assembly will be decided by the general contractor based on the final wind turbine technology. Blades may be lifted one at a time, or a fully assembled rotor with all three blades may be elevated to the nacelle. The latter case would require a larger footprint area at the base of the tower and this assembly area would consist of the permanent turbine, the crane pad, and any laydown area.

Installation of the turbines consists of lifting and bolting 6-7 tower sections to the base foundation and then to themselves, lifting and securing the nacelle to the top tower section, and lastly, either (i) lifting and securing the assembled blades and rotor to the nacelle as a single unit or (ii) lifting and securing the hub to the nacelle and then lifting the three blades individually and securing them to the hub.

This activity can be summarized as follows:

- Equipment required: At a minimum, service trucks, two cranes, graders, and bulldozers. The trucks and graders will be driven to the site and the cranes and bulldozers will be transported via trailers, crane crawling between turbine locations may also be done.
- Materials brought on-site: Wood, towers, nacelles, blades and hub. The only chemicals required for this phase are oils, gasoline, and grease used to operate construction equipment. Handling of fuels and other chemicals/substances will be conducted in accordance with the mitigation measures outlined below in Section 5.
- Timing: This will preferentially be completed in summer or early fall to take advantage of typically drier weather. If necessary, this activity can be completed in the spring or fall, depending on weather conditions. Total assembly time will be four to five days per turbine depending on the wind.
- Material generated: Any stock piled material generated from excavation will be handled in an approved and appropriate manner. Wood waste generated from vegetation removal will be sorted then mulched and left on-site or removed by qualified professionals.

4.7 Installation of Electrical Collector lines

All electrical installation work will meet or exceed Ontario Electrical Safety Code regulations.

Vegetation removal will be required for some of the electrical collector lines. Construction staff will be required to be familiar with the extent of the approved construction area to avoid damage to wildlife habitat beyond the Project location, which could include installing protective fencing, marking trees or other means to delineate the construction limits.

In the event that vegetation removal is required for the installation of the electrical collector lines, this work will be conducted in accordance with the mitigation measured proposed within the NHA and approved by the MNRF. Damaged trees, if any, will be pruned through implementation of proper arboricultural techniques, as required. The complete NHA is available as part of the complete REA submission.

Underground cabling will be placed underneath the concrete tower foundations and buried, linking the turbines to the Project substation. The construction timeframe is dependent upon the required length of the lines.

While construction or environmental constraints may require that the electrical collector lines to be installed in conduits (via directional drilling) or overhead on wooden poles, it is expected that the electrical collector lines for the Project will be directly buried through either a trench or cable plow installation method:

- Trench: Typically, trenches will be excavated to a depth of approximately 1.2 m below finished grade using backhoes or tracked excavators. The excavated material will be stored on-site. The collector cables will be bedded in sand and the trench will be backfilled with the excavated material using dump trucks and compaction equipment.
- Cable Plow: Alternatively, electrical collector lines could be plowed into the soil directly to their burial depth using a cable plow. Easements will be obtained through municipality, county and landowners for the exact locations of the electrical collector lines where applicable. For installation of junction boxes, construction will require typical equipment for site preparation and grading. There may be some poured-in-place concrete work required. The electrical equipment will be delivered in units, with final assembly on-site.

This activity can be summarized as follows:

- Equipment required: At a minimum, trucks, graders, backhoes, track excavators, cable plow, drill rig. The trucks and graders will be driven to the site and the bulldozers and other equipment will be transported via flatbed trailers. Where vegetation removal is allowed in accordance with the NHA, equipment could include large scale wood chippers and various sizes of wood and tree harvesting machinery. This will depend on size of trees encountered and terrain. Logging professionals with industrial size chainsaws could be used as well.

- Materials brought on-site: Electrical collector lines, conduit and junction boxes and general construction components. Wooden poles may be required for overhead lines but is not anticipated. The only chemicals required for this phase are oils, gasoline, and grease used to operate construction equipment. Handling of fuels and other chemicals/substances will be conducted in accordance with the mitigation measures outlined below in Section 5.

- Timing: This activity will preferentially be completed in late spring or summer to take advantage of typically drier weather. If necessary, this activity can be completed in the spring or fall, depending on the amount of rainfall.

- Material generated: Any stock piled material generated from excavation will be handled in an approved and appropriate manner. Wood waste generated from vegetation removal will be sorted then mulched and left on-site or removed by qualified logging professionals. Some packing material waste may be generated. The recyclable material will be separated from the non-recyclable material onsite. Both streams of waste will be removed by a licensed sub-contractor.

4.8 Substation and Grid Interconnection

Components required for the substation and interconnection are likely to be prefabricated and transported to site. The components will be supported by either cast-in-place concrete foundations/slabs-on-grade or structural steel piers and the entire substation area will be graded and overlaid with a clear stone granular material. The specific make of the associated electrical components will be selected by the Proponent or general contractor during the detailed design phase. The

components of the substation will also provide a SCADA system for protection, control and monitoring of the substation and the facility.

A chain link security fence will be installed around the perimeter of the substation site.

The substation will be accessible from a new permanent access road; a small gravelled permanent parking area will be constructed adjacent to the substation to accommodate staff vehicles. To prepare for construction of the substation and parking area, topsoil will be stripped, stockpiled and reused to the extent possible during site landscaping. Excavations of approximately 1-2 m depth will be required for the equipment and building foundations and for placing underground utilities.

Concrete is necessary for the footings for the control building, component pad and supports. Excavations will be backfilled using granular fill and excavated materials.

Prior to start-up, all systems will be commissioned to verify that they are operating correctly. Acceptance testing will be completed on the components, both at the factory and on-site, to verify that it meets the engineering specifications. Operating staff will be trained on equipment control and operation. The testing and commissioning will be conducted in the presence of the design engineers and technical specialists representing the Proponent, general contractor and major equipment and component suppliers.

This activity can be summarized as follows:

- Equipment required: Earthworks equipment, small trenchers, crane(s), forklifts, and concrete trucks and a bulldozer. The trucks and graders will be driven to the site and the bulldozers will be transported via trailers.
- Materials brought on-site include: gravel, disconnect switches, circuit breakers, a main power transformer), metering/protection equipment, station service transformer, grounding grid, insulators, transformer oil, electrical cabling and concrete for bases. The only chemicals required for this phase are oils, gasoline, and grease used to operate construction equipment and transformer oil. Handling of fuels and other chemicals/substances will be conducted in accordance with the mitigation measures outlined below in Section 5.
- Timing: This will preferentially be completed in late spring or summer to take advantage of typically drier weather. If necessary, this activity can be completed in the spring or fall, depending on weather conditions.
- Material generated: Any stock piled material generated from excavation will be handled in an approved and appropriate manner. Wood waste generated from vegetation removal will be sorted then mulched and left on-site or removed by qualified logging professionals. Some packing material waste may be generated. The recyclable material will be separated from the non-recyclable material on-site. Both streams of waste will be removed by a licensed sub-contractor.

4.9 Construction Staging and Laydown Areas

During construction of the staging and laydown areas, topsoil will be stripped, stockpiled and reused to the extent possible for site landscaping and reclamation. Gravel will be laid and compacted, the depth of gravel will vary dependent upon site conditions/requirements at the time of construction. Once construction is complete, the areas will be restored to a condition acceptable to the landowner. Any topsoil that is removed and/or stockpiled during construction will be redistributed as appropriate,

during site clean-up and restoration. This will enable the land to be returned to its prior use following the construction of the Project.

- Equipment required: Earthworks equipment, small trenchers, a crane, forklifts, compactors and concrete trucks and a bulldozer. The trucks and graders will be driven to the site and the bulldozers will be transported via trailers.
- Materials brought on-site include: Gravel, the only chemicals required for this phase are oils, gasoline, and grease used to operate construction equipment. Handling of fuels and other chemicals/substances will be conducted in accordance with the mitigation measures outlined below in Section 5.
- Timing: This will preferentially be completed in late spring or summer to take advantage of typically drier weather. If necessary, this activity can be completed in the spring or fall, depending on weather conditions.
- Material generated: Any stock piled material generated from excavation will be handled in an approved and appropriate manner.

4.10 Operations and Maintenance Building

If the construction of a new O&M building is determined to be required, it may require a new permanent access road. A small permanent parking area may also be constructed adjacent to the O&M building to accommodate staff vehicles. To prepare for construction of the O&M building and parking area, topsoil will be stripped, stockpiled and reused to the extent possible during site reclamation and landscaping. Excavations of approximately 1-2 m depth will be required for building foundations and for placing underground utilities. Concrete would be necessary for the building foundations. Excavations will be backfilled using granular fill and excavated materials.

The building will likely be constructed of structural steel, contain office space, storage/warehousing, area and personnel spaces.

- Equipment required: Earthworks equipment, small trenchers, crane(s), forklifts, compactors and concrete trucks and a bulldozer. The trucks and graders will be driven to the site and the bulldozers will be transported via trailers.
- Materials brought on-site include: Gravel, the only chemicals required for this phase are oils, gasoline, and grease used to operate construction equipment. Handling of fuels and other chemicals/substances will be conducted in accordance with the mitigation measures outlined below in Section 5.
- Timing: This will preferentially be completed in late spring or summer to take advantage of typically drier weather. If necessary, this activity can be completed in the spring or fall, depending on weather conditions.
- Material generated: Any stock piled material generated from excavation will be handled in an approved and appropriate manner. Wood waste generated from vegetation removal will be sorted then mulched and left on-site or removed by qualified logging professionals. Some packing material waste may be generated. The recyclable material will be separated from the

non-recyclable material on-site. Both streams of waste will be removed by a licensed sub-contractor.

A chain link security fence will be installed around the perimeter of the operation and maintenance building backyard that will be used as a storage area during operation of the Project.

4.11 Permanent Meteorological Tower(s)

The permanent meteorological tower(s) will be installed using cranes and secured to a concrete (monopole) foundation or with guy wires tied off to anchors, depending on the tower type that is selected for the Project. Local geotechnical conditions will be considered in the foundation design. Details on tower location, height and lighting will be submitted to NAV Canada and TC for review and approval prior to installation.

- Equipment required: Small trenchers, crane and concrete trucks and a bulldozer. The trucks and will be driven to the site and the bulldozer, crane and trencher will be transported via trailers.
- Materials brought on-site include: Concrete and gravel (if required). The only chemicals required for this phase are oils, gasoline, and grease used to operate construction equipment. Handling of fuels and other chemicals/substances will be conducted in accordance with the mitigation measures outlined below in Section 5.
- Timing: This will preferentially be completed in late spring or summer to take advantage of typically drier weather. If necessary, this activity can be completed in the spring or fall, depending on weather conditions.
- Material generated: Any stock piled material generated from excavation will be handled in an approved and appropriate manner. Some packing material waste may be generated. The recyclable material will be separated from the non-recyclable material on-site. Both streams of waste will be removed by a licensed sub-contractor.

Access to the tower(s) will be required throughout the construction and operations phases. The access roads will be designed and constructed as described in Section 4.3 of this report but may be of smaller width.

4.12 Clean-up and Reclamation Strategy

Waste and debris generated during the construction activities will be collected and disposed of at an approved facility. All reasonable efforts will be made to minimize waste generated throughout construction.

During construction, industry best practices for spill prevention will be utilized. In the highly unlikely event of a minor spill, it will be cleaned up immediately and any impacted soils will be removed from the site and disposed of at an approved facility in accordance with the applicable regulations. At the conclusion of construction, vehicles and construction equipment will be removed from the site.

High-voltage warning signs will be installed at the substation and elsewhere, as appropriate.

Where it is no longer required, gravel will be removed from crane pads, turbine assembly areas, and access roads. The gravel will likely be placed as a top layer on the new project roads, or in parking areas. Those disturbed areas will then be de-compacted, and returned to their prior use. Any remaining stock piled material generated from excavation will be handled in an approved and appropriate manner.

4.13 Turbine Commissioning

Turbine commissioning will occur once the wind turbines and substation are fully installed and Hydro One is ready to accept grid interconnection. The commissioning activities will consist of testing and inspection of electrical, mechanical, and communications systems.

Temporary portable generator sets may be used to electrically commission the turbines prior to connection to the grid. The generators are required for approximately two days per turbine. The generators are supplied with an Environmental Compliance Approval or Registration to the generator owners, where required. Following the commissioning phase, the portable generators will be removed from the site.

This activity can be summarized as follows:

- Equipment required: Support trucks which will be driven to the construction site and temporary portable generators.
- Materials brought on-site: The only chemicals required for this phase are oils, gasoline, and grease which will be used to operate construction equipment and portable generators, as well as gearbox oil and lubricants. Handling of fuels and other chemicals/substances will be conducted in accordance with the mitigation measures outlined below in Section 5.
- Timing: This will preferentially be completed in late spring or summer to take advantage of typically drier weather. If necessary, this activity can be completed in the spring or fall or winter depending on weather conditions.
- Material generated: Some packing material waste will be generated. The recyclable material will be separated from the non-recyclable material on-site. Both streams of waste will be removed by a licensed sub-contractor.

4.14 Timing and Operational Plans of Proposed Construction and Installation Activities

Commencement of the construction phase is anticipated to occur in the winter or spring of 2018/2019 at the earliest.

A description of the main construction activities is provided in Table 4-1. In any scenario, construction activities leading up to Project operations are anticipated to take approximately 10-12 months and will comply with the *Endangered Species Act*(ESA) requirements. The exact calendar dates of construction activities are yet to be determined and will be based on the timing of the REA approval. Upon award of the construction contract, the selected general contractor will be required to provide an updated schedule.

As discussed in Section 4.7, tree removal may be required to facilitate construction of the electrical collector lines within the municipal road allowances. Should clearing be required during the breeding bird window, best management practices will be implemented to reduce risks to migratory birds and

their habitats as outlined in Section 5.1. If construction falls within this window, pre-construction bird nest surveys will be undertaken by a qualified biologist to identify the presence/absence of nesting birds or breeding habitat. If a nest is located, a designated buffer will be marked off within which no construction activity will be allowed while the nest is active. Additional seasonal timing requirements with respect to natural heritage features such as wildlife and wildlife habitat are provided in the NHA (under separate cover).

Construction activities will commence once all necessary permits have been obtained and weather conditions are conducive to construction. For example, construction may be timed to avoid early spring so that vehicles do not negatively impact the ground through soil rutting, where practical.

Table 4-1 outlines the duration of each activity and approximate order of construction activities for the proposed Project.

Table 4-1: Duration of Construction Activities

Activity	Timing of Activity	Estimated Schedule
Surveying	Prior to construction – not seasonably dependant	2016-2017
Geotechnical Sampling	Prior to construction – preferably in fall or winter	2016-2017
Installation of Culverts	Preferably during drier months or winter to avoid timing constraints	Q4 2108-Q1 2019 (avoid March 15- July 15 for instream water works), to be confirmed in consultation with the local MNRF.
Land Clearing and Construction of Access Roads	Preferably during drier months – winter months for any tree clearing to avoid timing constraints	Q4 2018-Q1 2019 (avoid May 1-July 31 for vegetation removal)
Construction Laydown Areas	Preferably during drier months	Q2 2019
Temporary Crane Paths	Preferably during drier months	Q2-Q3 2019
Turbine Site and Crane Pad Construction	Preferably during drier months	Q2-Q3 2019
Electrical Collector Lines	Preferably during drier months	Q2-Q3 2018
Turbine Foundations	Preferably during drier months	Q2-Q3 2019
Delivery of Equipment	Throughout construction phase as needed, and in compliance with the Traffic Management Plan	Q2-Q3 2019
Substation, including main power transformer	Preferably during drier months	Q2-Q3 2019
Wind Turbine Assembly and Installation	Preferably during drier months	Q3 2019
Turbine Commissioning	Late fall or early winter	Q4 2
Clean-up and Reclamation	Following turbine construction	Q4 2019
Tree planting (if required)	Preferably during spring or fall	Q2 2020

The planned start of construction for the Project is anticipated to occur in the winter of 2018 at the earliest, with testing and commissioning planned for fall/winter 2019. Testing and commissioning will occur over the last few weeks of construction in accordance with the Electrical Safety Authority and Hydro One requirements, under their supervision.

If required, tree planting to replace any trees that were removed throughout construction will occur in 2020 once the main construction activities are complete and the facility is in operation.

4.15 Temporary Uses of Land

Construction of the Project will require temporary crane paths and laydown areas. These areas will be reclaimed for the duration of the operational phase.

The decommissioning phase will also require the same temporary areas. After all Project components are removed, all areas affected by the Project will be reclaimed as described in Section 4.12.

Temporary construction trailers may be required on-site during the construction and decommissioning phases of the Project. See also Section 3.2.6 regarding the use of an on-site temporary staging area during construction.

4.16 Stormwater, Erosion and Sediment Management

The installation and construction of man-made infrastructure, like building a wind farm, will inevitably disturb the natural ground cover and increase stormwater runoff and erosion. A conceptual Stormwater, Erosion and Sediment Management Plan (SESMP) has been developed with the aim of reducing contaminants in stormwater runoff associated with the Project and minimizing the erosion and sedimentation of the natural habitats. This plan is included in Appendix B of this report.

4.17 Temporary Water Takings

Localized temporary drawdown of the groundwater table has the potential to temporarily reduce or eliminate groundwater baseflow contributions to adjacent water bodies that are located within the zone of influence (ZOI). Although dewatering activities would only occur for the duration of the construction of foundation, collection line and access road or until groundwater levels have receded to a suitable depth, it may generate small changes on groundwater flow immediately adjacent to the foundation location.

Groundwater dewatering is expected to occur as a result of excavation for foundation construction. In the event 50,000 L/day is surpassed, the mitigation measures discussed in Section 5 the are expected to mitigate against potential negative impacts associated with dewatering activities. Additionally, if a volume of 50,000 L/day is surpassed but is less than 400,000 L/day, then registration on the MOECC's Environmental Activity and Sector Registry (EASR) for water taking may be required. It is also possible that that the Project encounters conditions that necessitate additional water takings during turbine foundation dewatering beyond 400,000 L/day. Water taking completed during the construction is subject to the REA and does not require a separate PTTW, however, a similar assessment that would be required to obtain a PTTW is provided as part of this REA application. As such, a Hydrogeological

Assessment and Effects Assessment was completed for the Project and is presented in Appendix C to this report.

Further information on water takings is outlined in the Water Body and Water Assessment Reports, which can be found as part of the complete REA application package.

4.18 Water Wells

The Project will not negatively affect water wells in proximity to the Project as a result of aquifer disturbance from driving piles as none are required for the proposed foundation type.

The majority of dwellings located within the Project study area have been confirmed to be supplied potable water by the local municipality. Appendix B of the report presents the existing water distributions system for the Municipality of Chatham Kent [4] and Town of Lakeshore. This map also presents the local geological formations (Hamilton Group and Dundee Formation) [5].

The Project turbines are confirmed to be located outside of the Designated Vulnerable Areas (DVA) identified in the Source Protection Plan (SPP) [6]. Any construction activities proposed in proximity to surface water will also be permitted through and in consultation with the MNRF and the LTVCA.

A hydrogeological assessment of the turbine locations will be conducted based on geotechnical data to evaluate the potential for construction impact. Any residents that may be supplied by private wells within the vicinity of a proposed turbine that are identified after generating a spatially accurate well database for the Project will be assessed. Based on this assessment, and if required, a qualified firm will prepare a well testing and monitoring plan.

4.19 Emergency Response and Communications Plan

The Project Emergency Response Plan (ERP) is described in Section 7 of the Design and Operations Report [3] as part of the complete REA application package. The ERP will be implemented throughout all phases of the Project and includes a detailed communications plan. The purpose of the ERP is to establish and maintain emergency procedures for the Project in order to effectively respond to accidents and other emergency situations, if any, as well as minimize losses.

For the construction phase of the Project, the general contractor and/or the Proponent will include a plan for the proper handling of material spills, if any, and associated procedures to be undertaken during a spill event. Specific containment and clean-up materials and their storage locations, as well as general spill response procedures for personnel training will be outlined in the plan. As appropriate, information and actions relating to fire preparedness, evacuation procedures, and medical emergencies will be detailed. Consultation will occur with local emergency services personnel to determine the extent of emergency response resources and response actions of those involved. Contact information will be provided for emergency service providers. The plan will also include address information for Project infrastructure locations, a description of the chain of communications and how information would be disseminated between the Proponent and/or the general contractor and other relevant responders.

4.20 Health and Safety Plan

The Proponent and the general contractor will implement and communicate a Health and Safety plan during the construction and decommissioning phases of the Project.

4.21 Traffic Management Plan

A Traffic Management Plan (TMP) for the Project will be developed in coordination with local municipalities and the Ministry of Transportation Ontario (MTO). The overall purpose of the TMP is to ensure that access to the Project study area will be maintained throughout all phases of the Project in a manner that ensures the safety of public users. The TMP will therefore provide the strategies, procedures and mitigation measures necessary to ensure continuous and safe access to the Project study area.

4.22 Waste Management

Waste generated during the construction phase will be removed by a licensed operator and disposed of at an approved facility. Any lubricants or oils resulting from turbine maintenance will be drummed on-site and disposed of in accordance with applicable provincial regulations. All reasonable efforts will be made to minimize waste generated. Materials used throughout decommissioning will be recycled, as practicable. The spill prevention protocols followed during construction will remain in place throughout the facility operations and maintenance activities.

5 ENVIRONMENTAL EFFECTS MONITORING PLAN

This section presents a summary of potential effects, mitigation measures and residual effects associated with project-environment interactions during the construction and decommissioning phases of the Project. For the sake of completeness, decommissioning phase effects are also discussed and presented here, but can also be found in the Decommissioning Plan Report.

More detailed discussions relating to natural heritage impacts, archaeological and heritage impacts, noise impacts, land use impacts and water body impacts are found in the NHA reports, Archaeological Assessment Reports, Heritage Report, Noise Impact Assessment and Water Body Reports, as part of the complete REA application package.

5.1 Construction & Decommissioning

Table 5-1: Potential Negative Effects and Mitigation Measures – Construction & Decommissioning

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
Cultural Heritage (Protected Properties, Archaeological and Heritage Resources)				
Disturbance or displacement of archaeological resources by any ground disturbance activity.	Avoid disturbance/loss of archaeological sites.	Conduct Archaeological Assessment and apply recommended avoidance measures and other measures from licensed archaeologist or MTCS to project design. Details of the Archaeological Assessment can be found in the reports on this subject as part of the complete REA application package.	The Archaeological Assessment was undertaken as per MTCS guidelines and it is anticipated that the Project will received confirmation from the MTCS. The likelihood and magnitude of any residual effect is considered insignificant.	Monitoring: Immediate notification of the Archaeologist and the MTCS In the event archaeological resources are found. Contingency: The magnitude of any residual effect is considered insignificant. Therefore, no contingency is required provided given the implementation of the recommended mitigation measures and best management practices are applied.
Construction vibrations to sensitive cultural heritage buildings	Minimize direct impacts from vibrations.	Apply avoidance and minimization measures recommended in the Cultural Heritage Assessment. Details of the Cultural Heritage Assessment can be found in the reports on this subject as part of the complete REA application package.	The Cultural Heritage Assessment was undertaken as per MTCS guidelines and it is anticipated that the Project will received confirmation from the MTCS. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: No monitoring required. Contingency: If the avoidance and minimization measures cannot be implemented, a more detailed vibration analysis will be undertaken by a qualified engineer.

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
Natural Heritage				
Direct vegetation removal – Significant woodlands, wetlands and generalized Significant Wildlife Habitat (SWH).	Minimize direct impacts on significant vegetation communities.	Clearly delineate work area using erosion fencing or other suitable barriers to correspond to the disturbance area limits to avoid accidental damage or removal of retained species. The environmental monitor may also consider substituting other demarcating types for fencing, such as staking and flagging, where it is determined that there is no apparent risk to significant woodlands, SWHs, or Generalized SWHs. This could include instances where the significant features are at a higher elevation than the occurring construction activity. The environmental monitor will be a contractor with experience providing environmental recommendations on a large-scale construction site. Place the erosion fencing, or other barrier, as far away as possible from the feature or SWH, and no closer than the dripline where applicable. Locate all directional drill entry and exit pits a sufficient distance from the edge of significant natural features, SWHs, and Generalized SWHs, to maintain a vertical depth of at least 1.5 m at all times below the natural feature to protect the critical root zone where applicable. Details of the NHA can be found in the reports on this subject as part of the complete REA	The NHA was undertaken per MNRF guidelines and this Project is anticipated to receive approval from the MNRF. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Undertake regular monitoring of the dripline where applicable to ensure the work area is clearly delineated and dripline boundaries are respected when construction is anticipated to occur within 10-30 m of significant woodlands, SWHs, or Generalized SWHs. This monitoring should occur at a minimum frequency of once per month. Contingency: Prune any tree limbs or roots that are accidentally damaged by construction activities using proper arboricultural techniques. Accidental damage to trees, or unexpected vegetation removal, may require re-planting of similar, native species, depending on the extent of damage incurred.
Disturbance of local wildlife- Bird Species of Conservation Concern, Colonially-Nesting Breeding Bird Habitat and	Avoid direct impacts on breeding birds and their habitats. Minimize impacts on	Avoid construction and decommissioning activities during the breeding bird period (May 1st – July 31st), wherever possible, to minimize potential disturbance to	The NHA was undertaken as per MNRF guidelines and this Project is anticipated to	Monitoring: If construction or decommissioning activities must occur during the breeding bird period (May 1st – July

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
Generalized SWHs.	species that are relatively inactive at night and not accustomed to nighttime disturbances.	breeding birds. Schedule construction and decommissioning activities to occur during daylight hours to avoid excessive noise and/or light disturbances to wildlife, wherever possible. Details of the NHA can be found in the reports on this subject as part of the complete REA application package.	receive approval from the MNRF. The likelihood and magnitude of this residual effect is considered non-significant.	31st), a biologist will conduct nest searches in areas where natural vegetation will be removed. If an active bird nest is identified in the location where natural vegetation clearing is proposed, the area will be protected and no construction activities will occur until the young have fledged or until the nest is no longer active, as confirmed by a qualified biologist. Contingency: If construction or decommissioning activities must occur outside of daylight hours, spotlights will be directed downward and/or away from the features to limit potential light disturbance to breeding birds. The magnitude of the residual effect is considered non-significant therefore no monitoring or contingency is required provided the recommended mitigation/compensation measures and best management practices are applied.
Disturbance of local wildlife- Landbird Migratory Stopover Area.	Avoid direct impacts to migratory landbirds.	Schedule construction and decommissioning activities during the spring and fall landbird migratory stopover period (March 1st – May 31st and August 1st – October 31st) to occur during daylight hours to avoid disruptions to migratory behavior, wherever possible.	The NHA was undertaken as per MNRF guidelines and this Project is anticipated to receive approval from the MNRF. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Environmental supervision during construction as part of a routine inspection program will be implemented to ensure adherence to the prescribed mitigation measures. Contingency: If construction and decommissioning activities must occur outside of daylight hours, spotlights will be directed downwards and/or away from the woodland to minimize potential impacts to migratory landbirds.

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
Disturbance of local wildlife- Bald Eagle Habitat.	Avoid direct impacts to Bald Eagle Habitat.	Project layout has been developed so that the Project Location occurs at least 400 m from the bald eagle nest location, and outside of both the primary and secondary habitat zones. No overhead lines, poles or turbines will be located within the tertiary zone (as determined by site-specific surveys). Project infrastructure will be placed within the Project Location and preferentially located furthest from the eagle nest, wherever possible. Avoid construction and decommissioning activities within the tertiary zone (as determined by site-specific surveys) from March 1st – May 15th.	The NHA was undertaken as per MNRF guidelines and this Project is anticipated to receive approval from the MNRF. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: During construction and decommissioning, monitoring of the eagle nest will follow the methods implemented during the evaluation of significance phase of the Project and will occur for the duration that construction and decommissioning activities occur within the tertiary zone (as determined by site-specific surveys). This will occur during the period of February 15th - August 15th, exclusive of March 1st - May 15th, when no construction will be permitted within the tertiary zone of the active nest. Contingency: If disturbance or avoidance behavior is observed during monitoring, the MNRF will be notified of appropriate contingency measures that will be implemented.
Disturbance of local wildlife- Bat Maternity Colony.	Avoid direct impacts to roosting bats.	Avoid construction and decommissioning activities during the critical roosting period (June 1st – June 30th).	The NHA was undertaken as per MNRF guidelines and this Project is anticipated to receive approval from the MNRF. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Environmental supervision during construction as part of a routine inspection program will be implemented to ensure adherence to the prescribed mitigation measures. Contingency: The magnitude of the residual effect is considered non-significant therefore no contingency is required provided the recommended mitigation measures and best management practices are applied.
Minimization of Erosion and Sedimentation –	Avoid contamination of Significant	The general contractor will develop and implement an Erosion and Sediment	The NHA was undertaken as per	Monitoring:

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
Significant woodlands/wetlands, significant plant habitats, and Generalized SWHs.	woodlands/wetlands, significant plant habitats, and Generalized SWHs.	Control (ESC) plan that will be based off of the conceptual SESMP. Install, monitor, and maintain ESC measures (i.e. erosion fencing) around the Project Location for the duration of the construction or decommissioning activities, as identified within the ESC plan. Erect erosion fencing, or other barrier, to correspond to the construction disturbance area limits. Place the erosion fencing, or other barrier, as far away as possible from the identified feature (s) and no closer than the dripline where applicable. Depending on site-specific conditions, such as steep topography and the presence of direct, or regular, surface water flow, the environmental monitor may consider substituting other styles of fencing, when appropriate. Store any stockpiled material more than 30 m from significant natural features, SWHs, and Generalized SWHs throughout the construction and decommissioning phases. Schedule grading to avoid times of high runoff volumes, wherever possible, and suspend work if an excessive sediment discharge occurs, as determined by an environmental monitor, until mitigation measures have been established. Re-vegetate areas adjacent to the feature(s) as soon as possible after construction activities are complete. Collect directional drill cuttings as they are generated and placed in a soil bin or bag for off-site disposal. Restore and re-vegetate directional drill entry/exit pits to pre-construction	MNRF guidelines and this Project is anticipated to receive approval from the MNRF. The likelihood and magnitude of this residual effect is considered non-significant.	Undertake regular monitoring and routine inspections to ensure proper installation of erosion control measures are in place. Monitor sediment and erosion control measures, such as erosion fencing, and check dams daily in areas where work is taking place and prior to and after any storm events. Monitor sediment and erosion control measures weekly in areas where active construction is not occurring until the construction phase is complete. Contingency: If deficiencies in sediment and erosion control measures are noted, the environmental monitor will notify the general contractor and the Proponent and recommend remedial actions. If sedimentation and erosion control measures fail or/and degradation of the natural feature occurs, appropriate contingency measures will be implemented, which may include re-establishing mitigation measures, habitat remediation, and/or seeding of permanently damaged areas, depending on the extent of degradation incurred.

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		conditions as soon as possible after construction. Details of the NHA can be found in the reports on this subject as part of the complete REA application package.		
Reduced flood attenuation – Significant wetlands and vegetation communities.	Avoid impact on flood attenuation of significant wetlands and vegetation communities.	Clearly delineate work area using erosion fencing, or other barrier, to minimize potential impacts to hydrological connectivity from loss of riparian vegetation. Depending on site-specific conditions, such as steep topography and the presence of direct, or regular, surface water flow, the environmental monitor may consider substituting other styles of fencing for erosion fencing, when appropriate. Where the temporary construction area is proposed to be within 5 m of, but not overlapping by a method other than directional drilling, a wetland (excluding along existing municipal roads), design any permanent infrastructure (i.e., access roads) to be 5 m from the wetland edge. Plant a native vegetation in the 5 m buffer between the infrastructure and wetland edge as soon as reasonably possible after construction. Re-vegetate cleared areas as soon as reasonably possible after construction activities are complete, to be initiated no later than 1 year after construction or decommissioning activities have been completed Details of the NHA can be found in the reports on this subject as part of the complete REA application package.	The NHA was undertaken as per MNRF guidelines and this Project is anticipated to receive approval from the MNRF. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Undertake regular monitoring of the identified feature(s) to ensure the work area is clearly delineated for the duration of the construction and decommissioning phases of the Project. This monitoring will be conducted at a minimum frequency of once per week when activities are occurring within 10 m of a feature. Undertake regular monitoring of the feature to ensure the work area is clearly delineated and respected when construction is anticipated to occur within 10-30 m of the features, at a minimum frequency of once per month. Depending on the season and site-specific conditions, such as topography, surface water flow patterns, and the presence or absence of vegetative buffers, monitoring frequency will be increased at the discretion of the environmental monitor. Contingency: The magnitude of the residual effect is considered non-significant therefore no contingency is required provided the recommended mitigation measures and best management practices are applied.
Minimization of Fugitive and Dust Emissions –	Avoid fugitive dust within significant natural	On-site speed limits will be clearly posted, applied, and followed by	The NHA was undertaken as per	Monitoring:

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
Significant natural features, SWHs and generalized SWHs.	features, SWHs, and Generalized SWHs.	construction staff. Apply dust suppressants to unpaved areas when necessary to suppress dust, as determined by the environmental monitor and general contractor. Application frequency will vary, but will be determined by site specific weather conditions, including recent precipitation, temperatures, and wind speeds. Input from the construction team may also warrant an increased frequency of dust suppression. Re-vegetate cleared areas as soon as reasonably possible after construction activities are complete, and initiated no later than 1 year after construction or decommissioning has been completed. Install wind fences, where determined to be necessary by the on-site environmental monitor. Installation of these fences will depend on site-specific conditions, including wind speeds, topography, land cover, and the extent of surrounding natural wind breaks.	MNRF guidelines and this Project is anticipated to receive approval from the MNRF. The likelihood and magnitude of this residual effect is considered non-significant.	Monitor dust control measures at a minimum frequency of weekly in areas where work is taking place. Monitor dust control measures at a minimum frequency of monthly in areas where active construction is not occurring until the construction phase is complete. Contingency: If fugitive dust is noted, the environmental monitor will notify the general contractor and recommend remedial actions, if necessary. If fugitive dust control measures fail and degradation of the natural feature occurs, appropriate contingency measures will be implemented, which may include re-establishing mitigation measures, habitat remediation, and/or seeding of permanently damaged areas depending on the extent of degradation incurred.
Effects of groundwater discharge- Significant wetlands and Generalized SWHs.	Avoid direct impacts on significant wetlands and Generalized SWHs.	Monitor rate of water pumping and timing to meet requirement of less than 50,000 L per day per turbine location, and contact the local Ministry of the Environment and Climate Change (MOECC) if a total of more than 400,000 L per day situation arises. Restrict taking of groundwater and surface water during extreme low flow time periods. Control quantity and quality of stormwater discharge using best management practices, and avoid direct discharge into wetlands, SWHs, and Generalized SWHs		Monitoring: Undertake regular monitoring of significant wetlands and Generalized SWHs to ensure the work area is clearly delineated within 10 m of construction activities for the duration of the construction and decommissioning phases of the Project. This monitoring will be conducted at a minimum frequency of once per week when construction is anticipated within 10 m of a significant wetland or Generalized SWH. Undertake regular monitoring of significant wetlands and Generalized SWHs to ensure the work area is

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
				clearly delineated and respected when construction is anticipated to occur within 10-30 m of the features, at a minimum frequency of once per month. Depending on the season and site-specific conditions, such as topography, surface water flow patterns, and the presence or absence of vegetative buffers, monitoring frequency will be increased at the discretion of the environmental monitor. Contingency: If impacts to significant wetlands and Generalized SWHs occur as a result of groundwater discharge, the MNRF will be notified of appropriate contingency measures that will be implemented.
Infiltration- Significant wetlands and Generalized SWHs.	Avoid impacts to infiltration.	Minimize the use of impervious surfaces where possible, such as utilizing and contouring permeable surface material (i.e. gravel) to increase infiltration, and reduce surface water runoff.	The NHA was undertaken as per MNRF guidelines and this Project is anticipated to receive approval from the MNRF. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Environmental supervision during construction as part of a routine inspection program will be implemented to ensure adherence to the prescribed mitigation measures. Contingency: The magnitude of the residual effect is considered non-significant therefore no contingency is required provided the recommended mitigation measures and best management practices are applied.
Spills (i.e. oil, gasoline, grease, etc.) - Significant natural features, SWHs, and Generalized SWHs.	Avoid contamination of significant natural features.	The general contractor will develop a spill response plan and train staff on appropriate procedures. The general contractor will develop a 'frac-out' contingency plan and train staff on appropriate procedures during the construction phase.	The NHA was undertaken as per MNRF guidelines and this Project is anticipated to receive approval from the MNRF.	Monitoring: Regular environmental monitoring will occur at least once every two weeks during the construction and decommissioning phase to ensure vehicle refueling and storage of chemicals is occurring more than 30

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		Keep emergency spill kits on-site. Keep contact information for the MOECC Spills Action Centre in a designated area on-site. Dispose of waste material by authorized and approved off-site vendors. Store hazardous materials in designated areas. Locate all vehicle refueling or washing, as well as the storage of chemical and construction equipment more than 30 m from applicable feature(s). Details of the NHA can be found in the reports on this subject as part of the complete REA application package.	The likelihood and magnitude of this residual effect is considered non-significant.	m from the applicable features. An environmental monitor will be present when active directional drilling is occurring within 30 m of significant natural features, SWHs, and Generalized SWHs. Contingency: If 'frac-out' occurs, immediately implement 'frac-out' contingency plan. In the event of a spill, notify the MOECC Spills Action Centre, immediately stop work, and ensure all efforts are made to completely remediate affected areas, especially prior to rain events. If a spill occurs within a significant natural feature, SWH, or Generalized SWH, the environmental monitor will be notified and a follow-up site inspection will be conducted to document extent of degradation of the features, if any. If degradation of significant natural features, SWHs, or Generalized SWHs occurs as a result of the spill, appropriate contingency measures will be implemented. Contingency measures may include re-establishing mitigation measures, habitat remediation, and/or seeding of permanently damaged areas depending on the extent of degradation incurred.
Changes in soil moisture and compaction - significant natural features, SWHs, and Generalized SWHs.	Minimize impact to soil moisture regime and vegetation species composition.	Minimize the use of impervious surfaces where possible, such as utilizing and contouring permeable surface material (i.e. gravel) to increase infiltration, and reduce surface water runoff. Minimize paved surfaces and design	The NHA was undertaken as per MNRF guidelines and this Project is anticipated to receive approval	Monitoring: Environmental supervision during construction as part of a routine inspection program will be implemented to ensure adherence to

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		roads to promote infiltration. Details of the NHA can be found in the reports on this subject as part of the complete REA application package.	from the MNRF. The likelihood and magnitude of this residual effect is considered non-significant.	the prescribed mitigation measures. Contingency: The magnitude of the residual effect is considered non-significant therefore no contingency is required provided the recommended mitigation measures and best management practices are applied.
Impacts to Water Quality - Significant wetlands.	Avoid impacts to water quality (i.e. associated with increased turbidity).	Clearly delineate work area using erosion fencing, or other barrier, to minimize potential impacts to water quality which may result from loss of riparian vegetation. On site speed limits will be clearly posted, applied, and followed by construction staff. Apply dust suppressants to unpaved areas when necessary to suppress dust, as determined by the environmental monitor. Application frequency will vary, and will be determined by site specific weather conditions, including recent precipitation, temperatures, and wind speeds. Input from the general contractor may also warrant an increased frequency of dust suppression. Re-vegetate areas adjacent to significant wetlands as soon as possible after construction activities are complete, to be initiated no later than 1 year after the completion of construction or decommissioning activities. Install wind fences, where determined to be necessary by the on-site environmental monitor. Installation of these fences will depend on site-specific conditions, including wind speeds, topography, land cover, and the extent of surrounding natural wind breaks. No use of herbicides (Project related	The NHA was undertaken as per MNRF guidelines and this Project is anticipated to receive approval from the MNRF. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Undertake regular monitoring of significant wetlands to ensure the work area is clearly delineated within 10 m of construction activities for the duration of the construction and decommissioning phases of the Project. This monitoring will be conducted at a minimum frequency of once per week when construction is anticipated within 10 m of a significant wetland. Undertake regular monitoring of significant wetlands to ensure the work area is clearly delineated and respected when construction is anticipated to occur within 10-30 m of significant wetlands, at a minimum frequency of once per month. Depending on the season and site-specific conditions, such as topography, surface water flow patterns, and the presence or absence of vegetative buffers, monitoring frequency will be increased at the discretion of the environmental monitor. Contingency: If reduced water quality (i.e. increased turbidity) as a result of construction activities is observed, the MNRF will be notified of

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		activities only) within significant wetlands. Details of the NHA can be found in the reports on this subject as part of the complete REA application.		appropriate contingency measures that will be implemented.
Invasive Seed Transfer-Rare vegetation communities and plant species of conservation concern habitat.	To maintain vegetated buffers, including riparian zones. To avoid impacts of rare vegetation communities and plant species of conservation concern habitat.	Clearly delineate work area using erosion fencing, or other barrier, to minimize seed transfer into suitable habitat. Regularly clean vehicles and equipment. Vehicle use will occur primarily on access roads and in agricultural habitats, where invasive and non-native vegetation species are less likely to be concentrated. Details of the NHA can be found in the reports on this subject as part of the complete REA application.	The NHA was undertaken as per MNRF guidelines and this Project is anticipated to receive approval from the MNRF. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Environmental supervision during construction as part of a routine inspection program will be implemented to ensure adherence to the prescribed mitigation measures. Contingency: The magnitude of the residual effect is considered non-significant therefore no contingency is required provided the recommended mitigation measures and best management practices are applied.
Soil compaction-Significant natural features, SHWs, and Generalized SWHs.	Avoid soil compaction.	Minimize vehicle traffic on exposed soils during site clearing, grubbing, grading and topsoil removal. Clearly delineate the dripline and root zone of all trees within 10 m of construction activities with erosion fencing or other barrier.	The NHA was undertaken as per MNRF guidelines and this Project is anticipated to receive approval from the MNRF. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Environmental supervision during construction as part of a routine inspection program will be implemented to ensure adherence to the prescribed mitigation measures. Contingency: The magnitude of the residual effect is considered non-significant therefore no contingency is required provided the recommended mitigation measures and best management practices are applied.
Direct mortalities from traffic on access road.	Avoid direct mortalities due to traffic on access roads.	On-site speed limits will be clearly posted, applied, and followed by construction staff throughout the construction and decommissioning phases Details of the NHA can be found in the	The NHA was undertaken as per MNRF guidelines and this Project is anticipated to receive approval	The magnitude of the residual effect is considered non-significant therefore no monitoring or contingency is required provided the recommended mitigation measures and best management practices are

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		reports on this subject as part of the complete REA application.	from the MNRF. The likelihood and magnitude of this residual effect is considered non-significant.	applied.
Impacts to Species at Risk.	Avoid any impacts to Species at Risk.	The Project may require a permit under the ESA, upon completion of an Approval and Permitting Requirements Document (APRD). This report will be submitted to the local district MNRF to be reviewed under the authority of the *Ministry of Natural Resources Act*, and will not be submitted as part of this completed REA application.	None	Compliance with the requirements of the ESA, as applicable.
Water Bodies				
Dewatering resulting in 1) Changes to surface water levels, or 2) Increased water temperature	Minimize impacts on stream flow water temperature. Minimize alteration of water level.	If water takings are required: Control rate and timing of water pumping so as not to result in erosion and sedimentation to receiving water bodies (see erosion and sedimentation, and water quality impairment).Pump from deep wells to infiltration galleries adjacent to water bodies or wetlands at a rate that reduces the potential for erosion (see erosion and sedimentation). Restrict taking of water during periods of extreme low flow and to avoid in-water work timing windows (generally March 15th to July 15th) as determined in consultation with the local MNRF Adequately treat any discharge water prior to discharge as to meet MOECC policy 2 standards (i.e. filer bags). Prior to groundwater dewatering, evaluate anticipated discharge rates and estimated ZOI in relation to the	The Water Body Assessment was undertaken as per MOECC guidelines and this Project is expected to receive confirmation from the MOECC. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Water level monitoring within water bodies will be conducted prior to the onset of construction at a frequency adequate to characterize baseline levels. During active dewatering, monitor water levels of water bodies within the ZOI for groundwater dewatering to determine if dewatering activities are resulting in alteration of water levels within the water body. Staff gauge readings are to be taken daily and water levels will be monitored by continuous level loggers (logged in 1 hour increments and downloaded weekly). Monitoring will be conducted post-construction until water levels return to baseline conditions. Environmental supervision during construction as part of a routine

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		associated water bodies to ensure the volumes will not impact water body hydrologic function. Where a water body is located within a groundwater dewatering ZOI, develop appropriate strategies for dewatering in consultation with regulatory agencies during the detailed design phase of the project. Monitor water levels of water bodies within the ZOI to determine if dewatering activities are resulting in alteration of water levels within the water body. Details of the Water Body Assessment can be found in the reports on this subject as part of the complete REA application.		inspection program will be implemented to ensure adherence to the prescribed mitigation measures. Contingency: The magnitude of the residual effect is considered non-significant therefore no contingency is required provided the recommended mitigation measures and best management practices are applied.
Erosion and sedimentation.	Minimize impacts of erosion and sedimentation on water bodies.	Minimize potential for soil compaction (see Soil Compaction). Controlled vehicle and machinery access routes, keep away from water bodies where possible. Schedule clearing, grubbing and grading activities to avoid times of high runoff volumes e.g. snow melt or heavy rain events), wherever possible. Suspend work if an excessive sediment discharge occurs, as determined by an environmental monitor, until mitigation measures have been established. Implement Flood Response Plan if on-site flooding occurs. Implement Erosion and Sediment Control Plan (ESC). Avoid construction during high volume rain events (>20 mm in 24 hours) and significant snow melts/thaws where possible and resume once soils have	The Water Body Assessment was undertaken as per MOECC guidelines and this Project is expected to receive confirmation from the MOECC. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: ESC measures, such as silt fence, check dams, and dust control measures, will be checked weekly during active construction periods, daily during extended rain or snowmelt periods, and prior to, during and after forecasted rain events (>20 mm in 24 hours) or significant snowmelt events. An environmental monitor will be present, as required, when active directional drilling is occurring. Environmental supervision during construction as part of a routine inspection program will be implemented to ensure adherence to the prescribed mitigation measures. Contingency: The magnitude of the residual effect is considered non-significant

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		stabilized to avoid risk of erosion, soil compaction or the potential for sediment release into nearby watercourses. Stabilize banks and cleared areas as soon as possible after construction disturbance (i.e. plantings, rock etc.) If insufficient time is available in the growing season to establish vegetative cover, an overwintering treatment such as erosion control blankets, fiber matting etc. could be applied to contain the site over the winter period. Maintain vegetation buffers around water bodies, where possible. Remove construction debris from the site and stabilize it (i.e. tarps) a minimum of 30 m away from water bodies to prevent it from entering the nearby water bodies. Refuse and other material should be appropriately' disposed of off-site. Minimize vehicle traffic on exposed soils during site clearing, grubbing, grading, and top soil removal. Operate construction equipment (i.e. cranes, back hoes, etc.) in a manner that minimizes disturbance to the banks of water bodies and stays outside of the water bodies and bank area. Store any stockpiled material more than 30 m from water bodies. Work in dry conditions (i.e. low flow period) or isolate in-water work area using good engineering practices and dewatering techniques. Install silt fencing in-water downstream of dewatering activities. Dewatering discharge rates should be evaluated as to not result in erosion and		therefore no contingency is required provided the recommended mitigation measures and best management practices are applied.

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		sedimentation to receiving water body. Dewatering discharge should be dissipated (i.e. sand bags, hay bales, etc.) and may require to be split to more than one location. Implement the Stormwater Management Plan. Implement fugitive dust suppression techniques when necessary to suppress dust, as determined by the general contractor and/or the environmental monitor. Details of the Water Body Assessment can be found in the reports on this subject as part of the complete REA application.		
Water Quality Impairment.	Minimize any negative impacts to water quality.	The general contractor will develop a spill response plan and train staff on appropriate procedures. The general contractor will develop a 'frac-out' contingency plan and train staff on appropriate procedures during the construction phase. Locate all entry and exit pits for directional drilling at a sufficient distance to meet minimum depths as established by geotechnical studies to prevent 'frac-out'. Locate drilling entry/exit shafts at least 3m from riparian vegetation or top of bank, whichever is greater, or at a distance otherwise agreed upon with regulatory agencies. Keep emergency spill kits on-site. Keep contact information for the MOECC Spills Action Centre in a designated area on-site. Dispose of waste material by authorized	The Water Body Assessment was undertaken as per MOECC guidelines and this Project is expected to receive confirmation from the MOECC. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Water quality monitoring will be conducted prior to discharging from dewatering to obtain baseline conditions, and then once per week during discharge at the end point of dewatering or as described by agencies to ensure water quality meets provincial standards. Surface water quality sampling will be conducted prior to the onset of construction and should meet agency requirements as to adequately establish baseline conditions. During construction, frequent measurements of in-situ parameters and turbidity, as well as any other general water quality parameters as required by agencies, should be obtained. Environmental supervision during construction as part of a routine inspection program will be

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		and approved off-site vendors. Store hazardous materials in designated areas. Locate all vehicle refueling or washing, as well as the storage of chemical and construction equipment more than 30 m from applicable feature(s). Any discharges to a water body must meet MOECC Policy 2 standards (at or better water quality that than of the receiving water body). Adequately treat any discharge water prior to discharge as to meet MOECC Policy 2 standards (at or better water quality than that of the receiving water body) (i.e. filer bags). Implement fugitive dust suppression techniques to avoid impacting water quality when necessary to suppress dust, as determined by the general contractor and/or the environmental monitor. Details of the Water Body Assessment can be found in the reports on this subject as part of the complete REA application.		implemented to ensure adherence to the prescribed mitigation measures. Contingency: The magnitude of the residual effect is considered non-significant therefore no contingency is required provided the recommended mitigation measures and best management practices are applied.
In-water work.	Minimize sedimentation and disturbance to water body structure and function.	Perform in-water work (if required) in the dry (i.e. low flow period) where possible. If this is not possible, short-term isolated dewatering will be required. Prior to dewatering, isolate the work area with the installation of a temporary water containment structure (i.e., cofferdams). The structure should form an impermeable enclosure, which also prevents escape of debris and sediment to the exterior water body. Construct a by-pass channel to maintain flow through the watercourse and prevent water from back flooding and	The Water Body Assessment was undertaken as per MOECC guidelines and this Project is expected to receive confirmation from the MOECC. The likelihood and magnitude of this residual effect is considered non-	Monitoring: Monitor by-pass channels, if applicable, daily to ensure it is functioning appropriately and water is flowing through as designed. Monitoring will be conducted once prior to the onset of construction to document existing conditions. During in-water work, as well as work within 30 m of a water body, monitoring will be conducted daily to identify any changes in aquatic

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		ultimately overtopping the water containment structure. Install silt fencing in-water downstream of water containment structures. When using a water containment structure, a qualified fisheries biologist will remove any fish prior to dewatering work area and after any flooding or inundation of the work area. Machinery should be operated in a manner that minimizes disturbance to the banks and bed of the watercourse. Stabilize banks as soon as possible after construction disturbance (i.e. plantings, rock etc.). Any in-water work must also adhere to in-water work restriction windows , as determined through consultation with the local MNRF. Details of the Water Body Assessment can be found in the reports on this subject as part of the complete REA application.	significant.	habitat from baseline conditions. When work is occurring >30-120 m from a water body, monitoring will be conducted weekly to identify any changes in aquatic habitat from baseline conditions. Environmental supervision during construction as part of a routine inspection program will be implemented to ensure adherence to the prescribed mitigation measures. Contingency: The magnitude of the residual effect is considered non-significant therefore no contingency is required provided the recommended mitigation measures and best management practices are applied.
Soil Compaction.	Maintain soil infiltration capacity.	Restrict construction equipment to designated controlled vehicle access routes to minimize the potential for soil compaction. Staging areas should be located away from water bodies (i.e. 30 m). Avoid construction during high volume rain events (20 mm in 24 hours) and significant snow melts/thaws where possible and resume once soils have stabilized to avoid risk of erosion, soil compaction or the potential for sediment release into nearby watercourses Details of the Water Body Assessment can be found in the reports on this subject as part of the complete REA	The Water Body Assessment was undertaken as per MOECC guidelines and this Project is expected to receive confirmation from the MOECC. The likelihood and magnitude of this residual effect is considered non-significant.	Environmental supervision during construction as part of a routine inspection program will be implemented to ensure adherence to the prescribed mitigation measures. Contingency: The magnitude of the residual effect is considered non-significant therefore no contingency is required provided the recommended mitigation measures and best management practices are applied.

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		application.		
Emissions to Air, including Odour and Dust				
Reduction in air quality due to CAC emissions and dust.	Minimise deterioration of air quality.	Ensure proper operation and maintenance of vehicles and machinery to limit noise, CAC emissions and leaks. Use water or water-based dust suppressant to control dust on unpaved roads. Implement speed limits on unpaved roads. Minimize vehicular traffic on exposed soils and stabilize high traffic areas with clean gravel surface layer or other suitable cover material. Minimize mud tracking by construction vehicles along access routes and areas outside of the immediate work site, and ensuring timely cleanup of any tracked mud, dirt and debris. Cover or otherwise contain loose construction materials that have potential to release airborne particulates during transport, installation or removal. Restore temporary construction road areas as soon as possible to minimize the duration of soil exposure.	The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Track all complaints and conduct follow-up monitoring (see Complaints Resolution Process in emergency Response and Communications Plan Section 7 of the Design and Operations Report (DOR)) Contingency: The magnitude of the residual effect is considered non-significant therefore no contingency is required provided the recommended mitigation/compensation measures and best management practices are applied.
Noise				
Increase in noise levels in Project study area.	Minimise noise increases for inhabited areas.	Ensure proper operation and maintenance of vehicles and machinery to limit noise, CAC emissions and leaks. Implement speed limits on unpaved roads. Construction equipment will be kept in good condition and will not exceed the noise emissions as specified in MOECC publication NPC-115 and any applicable municipal by-laws	The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Track all complaints and conduct follow-up monitoring (see Complaints Resolution Process in emergency Response and Communications Plan Section 7 of the DOR) Contingency: Faulty equipment resulting in increased noise levels are to be

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
				repaired in a timely fashion.
Local and Provincial Interests, Land, Use and Infrastructure				
Increased congestion due to increase in truck traffic and short-term lane closures on local roads during delivery of Project components.	Minimise disturbance to local community and achieve zero human safety incident.	Notify the community in advance of construction delivery schedules and installing signage to notify road users of construction activity. If required by municipal authorities develop a traffic management plan for the construction phase and submit to the Municipalities prior to construction and communicate truck routes.	The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Track all complaints and conduct follow-up monitoring (see Complaints Resolution Process in Emergency Response and Communications Plan Section 7 of the DOR) Contingency: The magnitude of the residual effect is considered non-significant therefore no contingency is required provided the recommended mitigation/compensation measures and best management practices are applied.
Damage to local infrastructure.	Minimise damage to local infrastructure.	Adhere to the best practices regarding the operation of construction equipment and delivery of construction materials. If required by municipal authorities, undertake roads condition survey prior to construction and post-construction.	The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Track all complaints and conduct follow-up monitoring (see Complaints Resolution Process in Emergency Response and Communications Plan Section 7 of the DOR) Contingency: If required by local authorities, return damaged infrastructure to original condition (or better) where appropriate.
Areas Protected under Provincial Plans and Policies				

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
N/A				
Public Health and Safety				
Effects on public health and safety during construction have been described above under Emissions to air, including Odour and Dust, Noise and Local and Provincial Interests Land Use and Infrastructure.	-	-	-	-
Other Resources				
Potential impacts to petroleum wells or facilities (APRD)	No negative effects on petroleum resources or the renewable energy project	As part of the APRD and as per the MNR "Template for Renewable Energy Projects: Setbacks from Petroleum Operations" a search was conducted using the OGSR database to identify any petroleum wells or facilities within 75 m of project infrastructure. The search concluded that there are three active petroleum wells or facilities existing within 75 m of the Project location. Notice of the findings will be reported to the local District MNR office.	The likelihood and magnitude of this residual effect is considered non-significant.	The magnitude of the residual effect is considered non-significant therefore no monitoring or contingency is required provided the recommended mitigation measures and best management practices are applied.

6 REFERENCES

[1] Ontario Regulation 359/09, made under the Environmental Protection Act, Renewable Energy Approvals under Part 1.0 of the Act.

[2] Technical Guide to Renewable Energy Approvals, Ontario Ministry of the Environment, 2013.

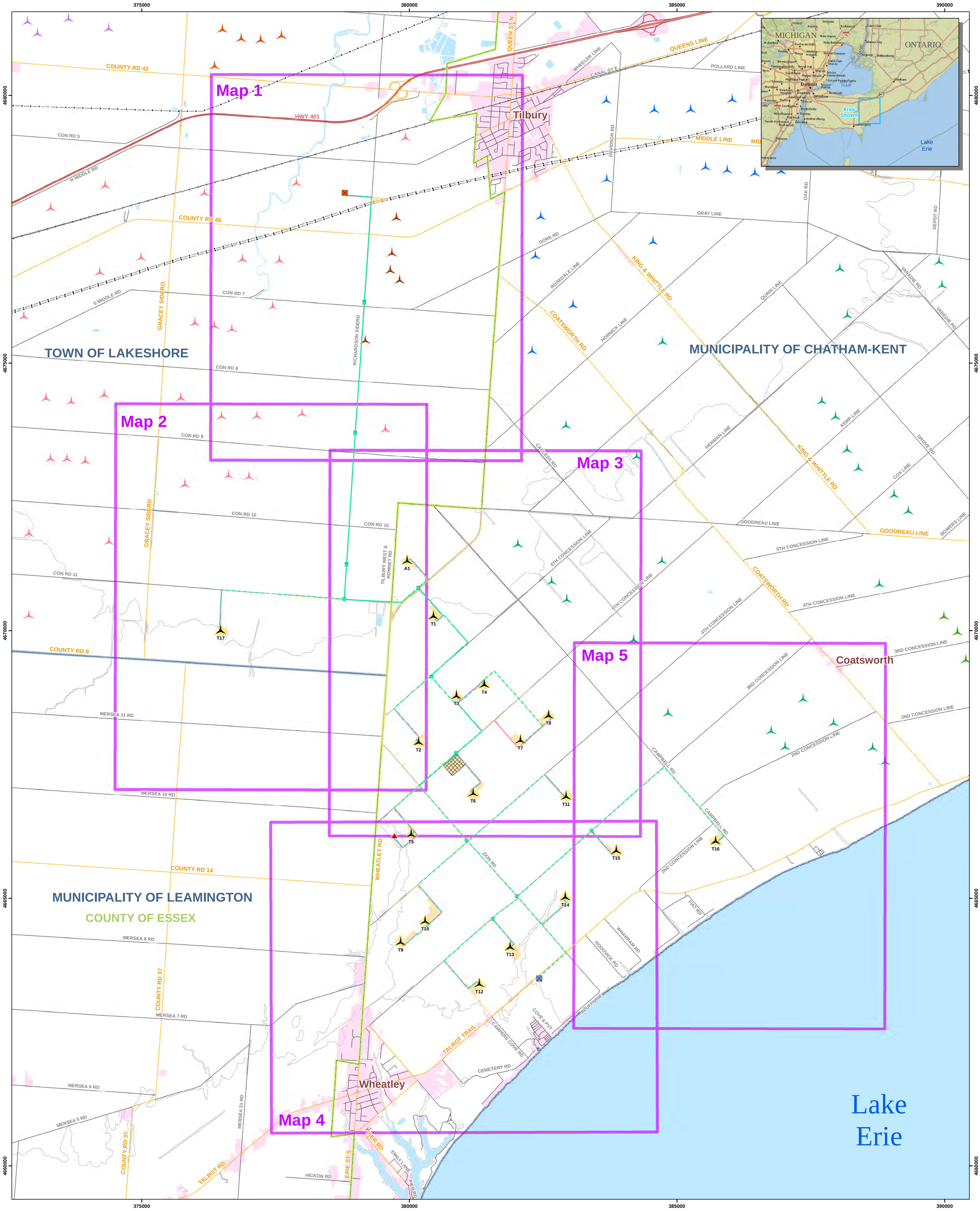
[3] DNV GL,Design and Operations Report, Romney Wind Energy Centre, 27 July 2017

[4] Municipality of Chatham-Kent 2012. Chatham-Kent Water and Wastewater Master Plan, Figure 3-1, Existing Water Distribution Systems. http://www.chatham-kent.ca/SiteCollectionDocuments/Water_Wastewater_Services/Master%20Plan%20Page/Final%20Master%20Plan%20Report%20-%20Figures.pdf.

[5] Ontario Geological Survey 2011. 1:250 000 scale bedrock geology of Ontario; Ontario Geological Survey, Miscellaneous Release---Data 126-Revision 1. ISBN 978-1-4435-5704-7 (CD) ISBN 978-1-4435-5705-4 [zip file].

[6] Thames-Sydenham and Region Source Protection Committee 2015. Source Protection Plan. http://www.sourcewaterprotection.on.ca/approved-source-protection-plan/.

APPENDIX A – SITE PLAN MAPS



Legend

Project Features

- Wind Turbine (18)
- Substation
- O&M building
- Meteorological mast
- Junction Box
- Collection system
- Access road
- Laydown area
- Project location

Other Components

- Railroad
- Existing HONI Transmission Line
- Highway
- Arterial / Collector
- Local Road / Street
- Contour (Interval : 5 m)
- Permanent watercourse
- Intermittent watercourse
- Waterbody
- Built-up area
- County Boundary
- Municipal Boundary

Neighbouring wind farm

- Chatham-Kent Wind Farm
- Comber Wind Farm
- Gracey Wind Farm
- Pointe-aux-Roches Wind Farm
- Port Alma Wind Farm
- Richardson Wind Farm
- South Kent Wind

0 1 2 Kilometers

ROMNEY wind energy centre

SITE PLAN: MAP INDEX

10021083-180111-001-LB

January 11, 2018

Layout version 68

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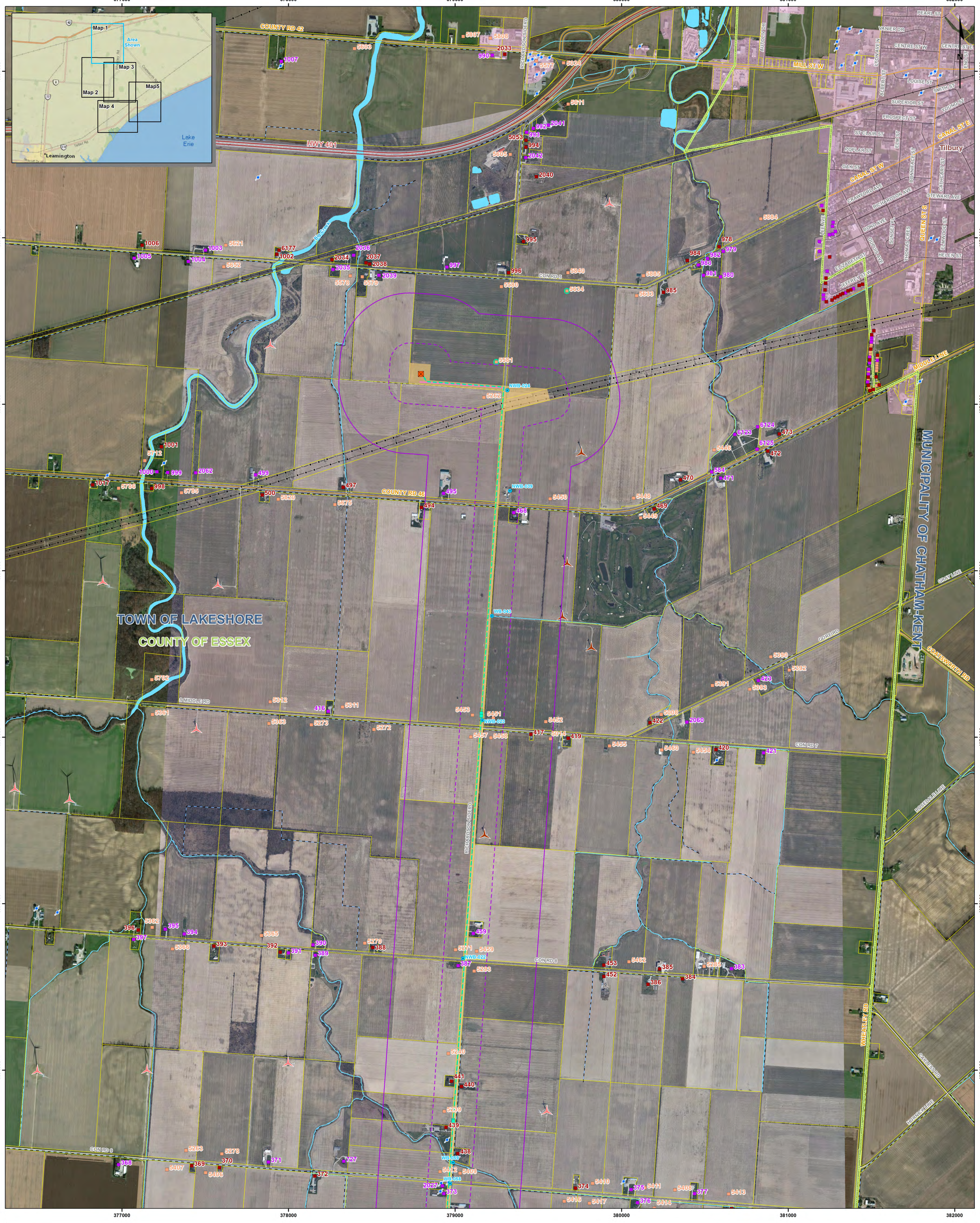
Projection: UTM Zone 17, NAD83

Source: Land Information Ontario, ArcGIS Online



Legend

Project Features

- Wind Turbine (18)
- Substation
- O&M building
- Meteorological mast
- Junction Box
- Collection system
- Access road
- Laydown area
- Project location
- Road and Railway Setback (78m)
- Property Boundary Setback (132m)
- Noise Receptor Setback (550m)
- Project location (120m)
- Project location (300m)

Significant Natural Heritage Features

- Wetland
- Woodland
- Significant Specialized Wildlife Habitats
- Significant Habitats for Species of Conservation Concern
- Generalized Significant Wildlife Habitat

Waterbody Assessment

- Waterbody Assessment Point

Other Components

- Water Well (WWIS)
- Railroad
- Existing HONI Transmission Line
- Highway
- Arterial / Collector
- Local Road / Street
- Contour (Interval : 5 m)
- Municipal Drain
- Permanent watercourse
- Intermittent watercourse
- Waterbody
- Built-up area
- Property Boundary
- County Boundary
- Municipal Boundary
- 3 Storey Receptor
- 2 Storey Receptor
- 1 Storey Receptor
- Vacant Lot Receptor
- POR on Participating Lot

Neighbouring wind farm

- Chatham-Kent Wind Farm
- Comber Wind Farm
- Gracey Wind Farm
- Pointe-aux-Roches Wind Farm
- Port Alma Wind Farm
- Richardson Wind Farm
- South Kent Wind

0 250 500 Meters

ROMNEY wind energy centre

SITE PLAN: MAP 1

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January 11, 2018

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Projection: UTM Zone 17, NAD83

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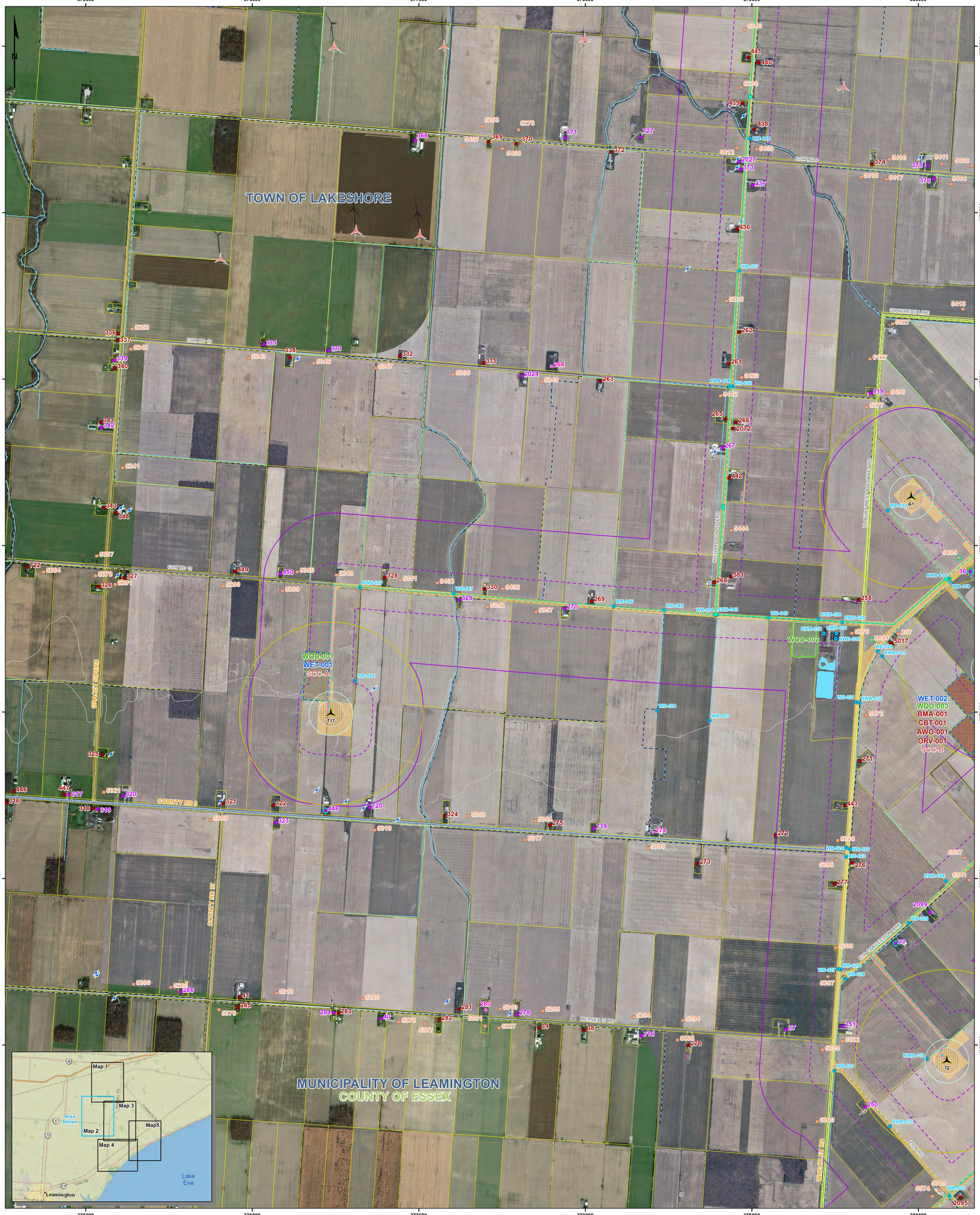

Legend

Project Features

- Wind Turbine (18)
- Substation
- O&M building
- Meteorological mast
- Junction Box
- Collection system
- Access road
- Laydown area
- Project location
- Road and Railway Setback (78m)
- Property Boundary Setback (132m)
- Noise Receptor Setback (550m)
- Project location (120m)
- Project location (300m)

Significant Natural Heritage Features

- Wetland
- Woodland
- Significant Specialized Wildlife Habitats
- Significant Habitats for Species of Conservation Concern
- Generalized Significant Wildlife Habitat

Waterbody Assessment

- Waterbody Assessment Point

Other Components

- Water Well (WWIS)
- Railroad
- Existing HONI Transmission Line
- Highway
- Arterial / Collector
- Local Road / Street
- Contour (Interval : 5 m)
- Municipal Drain
- Permanent watercourse
- Intermittent watercourse
- Waterbody
- Built-up area
- Property Boundary
- County Boundary
- Municipal Boundary
- 3 Storey Receptor
- 2 Storey Receptor
- 1 Storey Receptor
- Vacant Lot Receptor
- POR on Participating Lot

Neighbouring wind farm

- Chatham-Kent Wind Farm
- Comber Wind Farm
- Gracey Wind Farm
- Pointe-aux-Roches Wind Farm
- Port Alma Wind Farm
- Richardson Wind Farm
- South Kent Wind

0 250 500 Meters

ROMNEY wind energy centre

SITE PLAN: MAP 2

10021083-180111-001-LB

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Projection: UTM Zone 17, NAD83

Source: Land Information Ontario, ArcGIS Online, Municipality of Chatham Kent, Airborne Imaging (April 2016), Teranet, WWIS, NRSI, Callon Dietz

Legend

Project Features

- Wind Turbine (18)
- Substation
- O&M building
- Meteorological mast
- Junction Box
- Collection system
- Access road
- Laydown area
- Project location
- Road and Railway Setback (78m)
- Property Boundary Setback (132m)
- Noise Receptor Setback (550m)
- Project location (120m)
- Project location (300m)

Significant Natural Heritage Features

- Wetland
- Woodland
- Significant Specialized Wildlife Habitats
- Significant Habitats for Species of Conservation Concern
- Generalized Significant Wildlife Habitat

Waterbody Assessment

- Waterbody Assessment Point

Other Components

- Water Well (WWIS)
- Railroad
- Existing HONI Transmission Line
- Highway
- Arterial / Collector
- Local Road / Street
- Contour (Interval : 5 m)
- Municipal Drain
- Permanent watercourse
- Intermittent watercourse
- Waterbody
- Built-up area
- Property Boundary
- County Boundary
- Municipal Boundary
- 3 Storey Receptor
- 2 Storey Receptor
- 1 Storey Receptor
- Vacant Lot Receptor
- POR on Participating Lot

Neighbouring wind farm

- Chatham-Kent Wind Farm
- Comber Wind Farm
- Gracey Wind Farm
- Pointe-aux-Roches Wind Farm
- Port Alma Wind Farm
- Richardson Wind Farm
- South Kent Wind

0 250 500 Meters

ROMNEY wind energy centre

SITE PLAN: MAP 3

10021083-180111-001-LB

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Projection: UTM Zone 17, NAD83

Source: Land Information Ontario, ArcGIS Online, Municipality of Chatham Kent, Airborne Imaging (April 2016), Teranet, WWIS, NRSI, Callon Dietz

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Legend

Project Features

- Wind Turbine (18)
- Substation
- O&M building
- Meteorological mast
- Junction Box
- Collection system
- Access road
- Laydown area
- Project location
- Road and Railway Setback (78m)
- Property Boundary Setback (132m)
- Noise Receptor Setback (550m)
- Project location (120m)
- Project location (300m)

Significant Natural Heritage Features

- Wetland
- Woodland
- Significant Specialized Wildlife Habitats
- Significant Habitats for Species of Conservation Concern
- Generalized Significant Wildlife Habitat

Waterbody Assessment

- Waterbody Assessment Point

Other Components

- Water Well (WWIS)
- Railroad
- Existing HONI Transmission Line
- 3 Storey Receptor
- 2 Storey Receptor
- 1 Storey Receptor
- Vacant Lot Receptor
- POR on Participating Lot
- Highway
- Arterial / Collector
- Local Road / Street
- Contour (Interval : 5 m)
- Municipal Drain
- Permanent watercourse
- Intermittent watercourse
- Waterbody
- Built-up area
- Property Boundary
- County Boundary
- Municipal Boundary

Neighbouring wind farm

- Chatham-Kent Wind Farm
- Comber Wind Farm
- Gracey Wind Farm
- Pointe-aux-Roches Wind Farm
- Port Alma Wind Farm
- Richardson Wind Farm
- South Kent Wind

0 250 500 Meters

ROMNEY wind energy centre

SITE PLAN: MAP 4

10021083-180111-001-LB

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Layout version 68

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Projection: UTM Zone 17, NAD83

Source: Land Information Ontario, ArcGIS Online, Municipality of Chatham Kent, Airborne Imaging (April 2016), Teranet, WWIS, NRSI, Callon Dietz

MUNICIPALITY OF CHATHAM-KENT

Lake Erie

384000 385000 386000 387000 388000

4669000 4668000 4667000 4666000 4665000 4664000 4663000

3RD CONCESSION LINE
COATSWORTH RD
Coatsworth
4TH CONCESSION LINE
2ND CONCESSION LINE
CAMPBELL RD
TALBOT TRAIL
CEDAR RD
ELLERBECK RD
FARGO RD
OCEAN BLVD
RATZ RD
WHARRAM RD
HODOVICK RD
ZION RD
CLARKE LINE
TILSON LINE
BLUFF LINE

WET-008
WOD-011
WET-009
WOD-014

T15 T16

Map 1 Map 2 Map 3 Map 4 Map5 Area Shown Lake Erie Leamington

Legend

Project Features

- Wind Turbine (18)
- Substation
- O&M building
- Meteorological mast
- Junction Box
- Collection system
- Access road
- Laydown area
- Project location
- Road and Railway Setback (78m)
- Property Boundary Setback (132m)
- Noise Receptor Setback (550m)
- Project location (120m)
- Project location (300m)

Significant Natural Heritage Features

- Wetland
- Woodland
- Significant Specialized Wildlife Habitats
- Significant Habitats for Species of Conservation Concern
- Generalized Significant Wildlife Habitat

Waterbody Assessment

- Waterbody Assessment Point

Other Components

- Water Well (WWIS)
- Railroad
- Existing HONI Transmission Line
- Highway
- Arterial / Collector
- Local Road / Street
- Contour (Interval : 5 m)
- Municipal Drain
- Permanent watercourse
- Intermittent watercourse
- Waterbody
- Built-up area
- Property Boundary
- County Boundary
- Municipal Boundary
- 3 Storey Receptor
- 2 Storey Receptor
- 1 Storey Receptor
- Vacant Lot Receptor
- POR on Participating Lot

Neighbouring wind farm

- Chatham-Kent Wind Farm
- Comber Wind Farm
- Gracey Wind Farm
- Pointe-aux-Roches Wind Farm
- Port Alma Wind Farm
- Richardson Wind Farm
- South Kent Wind

0 250 500 Meters

ROMNEY wind energy centre

SITE PLAN: MAP 5

10021083-180111-001-LB

January 11, 2018

Layout version 68

Projection: UTM Zone 17, NAD83

Source: Land Information Ontario, ArcGIS Online, Municipality of Chatham Kent, Airborne Imaging (April 2016), Teranet, WWIS, NRSI, Callon Dietz

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APPENDIX B – EXISTING WATER DISTRIBUTION SYSTEM AND GEOLOGICAL FORMATION OF PROJECT STUDY AREA

375000 380000 385000

4680000 4675000 4670000 4665000

N

401

Tilbury

CON RD 5

N MIDDLE RD

DAVIDSON RD

MIDDLE LINE

GRAY LINE

GORE RD

ROSEDALE LINE

KING & WHITTLE RD

QUINN LINE

HORNICK LINE

HERMAN LINE

CON RD 7

DUNDEE FORMATION

RICHARDSON SIDERD

CON RD 8

TOWN OF LAKESHORE

CON RD 9

GRACEY SIDERD

CARLESS RD

MUNICIPALITY OF CHATHAM-KENT

CON RD 10

GOODREAU LINE

KEMP LINE

COATSWORTH RD

6TH CONCESSION LINE

5TH CONCESSION LINE

4TH CONCESSION LINE

3RD CONCESSION LINE

HAMILTON GROUP

A1

T1

T17

COUNTY RD 8

Coatsworth

T3

T4

T8

T2

T7

MERSEA 11 RD

COUNTY OF ESSEX

CAMPBELL RD

COUNTY RD 37

WHEATLEY RD

MERSEA 10 RD

T6

T11

T5

T16

2ND CONCESSION LINE

ZION RD

T15

COUNTY RD 14

T14

TALBOT TRAIL

T10

MERSEA 8 RD

MUNICIPALITY OF LEAMINGTON

T9

T13

T12

BLUFF LINE

Lakeside Village Motel and Campground

Campers Cove Campground

MERSEA 7 RD

Lake Erie

Wheatley

MERSEA 21 RD

TALBOT RD

375000 380000 385000

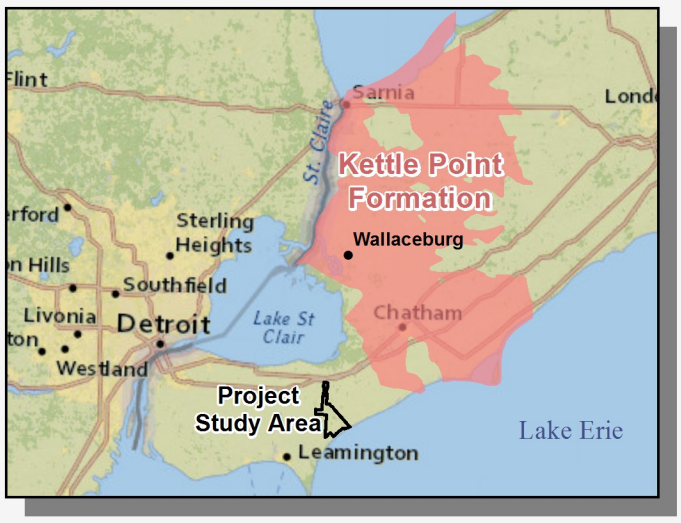
Legend

Project Features

- Romney Wind Turbine (18)
- Project Study Area

Other Components

- Dwelling
- Municipal Water Supply
- Water Supply to be Confirmed
- Project location (2 km)
- Permanent Watercourse
- Intermittent Watercourse
- Highway
- Arterial / Collector
- Local Road / Street
- Railroad
- Waterbody
- County Boundary
- Municipal Boundary
- Geologic Formation



0 2.5 5 Kilometers

ROMNEY wind energy centre

Water Distribution System

10021083-170301-001-LB

March 01, 2017

DNV·GL

Projection: UTM Zone 17, NAD83

Source: Land Information Ontario, ArcGIS Online, Municipality of Chatham-Kent, Ministry of Northern Development and Mines

APPENDIX C – CONCEPTUAL STORMWATER, EROSION AND SEDIMENT MANAGEMENT PLAN

DNV·GL

ROMNEY
wind energy centre

ROMNEY WIND ENERGY CENTRE

Conceptual Stormwater, Erosion and Sediment Management Plan

Romney Energy Centre Limited Partnership

Document No.: 10021083-CAMO-R-07
Date: 27 July 2017

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Project name:	Romney Wind Energy Centre	DNV GL - Energy Renewables Advisory 4100 Rue Molson, Suite 100, Montreal, QC, H1Y 3N1 CANADA
Report title:	Conceptual Stormwater, Erosion and Sediment Management Plan	
Customer:	Romney Energy Centre Limited Partnership, 53 Jarvis St Suite 300 Toronto, ON, M5C 2H2	
Contact person:	Mark Gallagher	
Date of issue:	27 July 2017	
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Prepared by:	Verified by:	Approved by:
Anna Danaitis GIS Analyst	Nancy O'Neill Project Manager	Gabriel Constantin Team Leader

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Issue	Date	Reason for Issue	Prepared by	Verified by	Approved by
A	25 February 2017	Initial issue for review	Anna Danaitis	Nancy O'Neill	Gabriel Constantin
B	27 July 2017	Updated for final REA submission	Anna Danaitis	Nancy O'Neill	Gabriel Constantin

Table of contents

List of tables

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List of abbreviations

Abbreviation	Meaning
ANSI	Life Science Area of Natural and Scientific Interest
CEAA	*Canadian Environmental Assessment Act*
DFO	Department of Fisheries and Ocean Canada
DNV GL	Garrad Hassan Canada, Inc.
EDF EN	Électricité de France Énergies Nouvelles
ESA	Endangered Species Act
EPA	Ontario *Environmental Protection Act*
Hydro One	Hydro One Network Inc.
IBAs	Important Bird Areas
MW	Megawatt
NIA	Noise Impact Assessment
O&M	Operations and Maintenance
O. Reg	Ontario Regulation
REA	Renewable Energy Approval
SARA	*Species at Risk Act*
WB	Waterbody
WTG	Wind Turbine Generator

1 INTRODUCTION

Romney Energy Centre Limited Partnership has requested Garrad Hassan Canada, Inc. (hereafter referred to as "DNV GL"), to provide environmental and permitting services including a conceptual Stormwater, Erosion and Sediment Management Plan (SESMP) for the Romney Wind Energy Centre (hereafter referred to as the "Project") that is located within the Town of Lakeshore and the Municipality of Chatham Kent, Ontario. More specifically, the Project is located south of Highway 401 extending along Richardson Side Road and Wheatley Road near the community of Wheatley. The Project with a total nameplate capacity of up to 60 megawatts (MW) is considered to be a Class 4 wind facility. A total of 18 wind turbine locations are being permitted for the Project.

The main objective of the conceptual SESMP is to present the prevention and mitigation measures that will be taken to avoid or minimize the Project impacts from potential stormwater runoff or soil erosion.

This technical note includes an overview of the Project components, existing conditions and the stormwater, erosion and sediment management and mitigation measures.

2 PROJECT COMPONENTS

The Project will include the following components:

- Wind turbine generators (WTG) – Up to 18 turbines will be constructed. The final wind turbine technology has not yet been selected but for reference purposes the Vestas V136-3.45 MW turbine is being considered.
- Permanent Meteorological Tower – Wind speed, wind direction, temperature and humidity will be measured by means of meteorological tower(s) of up to 132 m in height. The tower(s) will remain on site for the duration of the Project for wind turbine performance testing; exact location(s) will be determined prior to issuing the final REA reports. The tower(s) will be of lattice or monopole design.
- Access roads and crane pads – Access roads to each wind turbine will lead to a crane pad constructed adjacent to the access road and turbine location.
- Electrical collector lines, substation and interconnection – The electricity generated at each of the WTGs will be transported through 34.5 kV underground or overhead electrical collector lines to the Project's substation. Electrical collector lines will be sited adjacent to the turbine access roads, where feasible, and will follow public road allowances to reach the Project substation. Junction boxes will also be installed below or above ground where more than one circuit must be connected together and will be located on either privately-owned agricultural lots or within public road allowances. Measuring a total footprint of up to 2-3 ha, the electrical substation for the Project will be located on privately held lands through an "option to lease land" agreement. A secondary containment system will be included to prevent soil contamination in the event of a leak from the main transformer.
- Operations and Maintenance Building – It is anticipated that an Operations and Maintenance (O&M) building will be constructed in the general vicinity of the Project for the purposes of monitoring the day-to-day operations of the Project and supporting maintenance efforts. A small parking lot may be constructed to accommodate staff vehicles.
- Construction staging and laydown areas (including temporary staging areas) – A temporary construction staging area will be constructed on privately owned lands for the purposes of staging and storing equipment during the construction phase. In addition, a temporary area of approximately 80 m radius around each wind turbine will be established for the laydown and assembly of the wind turbine components. This temporary area will be returned to its prior use following the construction of the Project.

3 EXISTING CONDITIONS

The Romney Wind Energy Centre is located in southwestern Ontario, in the Town of Lakeshore and the Municipality of Chatham Kent, Ontario. More specifically, the Project is located south of Highway 401 extending along Richardson Side Road and Wheatley Road near the community of Wheatley. It has a total project study area of approximately 5,093 ha.

Project components will be mostly installed on privately-owned agricultural lots within this area. It is anticipated that the electrical collector lines including junction boxes will be partially located within public road allowances. The Project will connect to the existing 230 kV transmission line located within the Town of Lakeshore close to Richardson Side Road. There is a short section of transmission line (less than 1 km) proposed for the Project to be built by either the Proponent or Hydro One Networks Inc. (Hydro One) from the Point of Common Coupling (PCC) to the Point of Interconnect (POI).

The majority of habitat within the Project study area is composed of agricultural lots, deciduous, mixed, and coniferous woodlots, watercourses and occasional wetlands. The presence of several water features were confirmed within the Project study area. NRSI biologists have confirmed that a total of 32 permanent or intermittent water bodies have been confirmed to be located within the Project study area, 23 of which have been identified as overlapping the Project Location in one or more locations. The additional 9 confirmed permanent or intermittent water bodies come within 120 m of the Project Location at least once along their length, ranging in distance from >0.1-110m, without any direct overlap with Project components. A total of 49 Non-Water Body (WB) stations were assessed during the WB evaluation.

There are no known Provincially Significant Wetlands (PSWs), Provincially Significant Life Science Areas of Natural and Scientific Interest (ANSIs), Important Bird Areas (IBAs), Bird Sanctuaries or National Wildlife Refuges within the Project area, and no lakes, Lake Trout lakes or seepage areas were identified.

The Project is located partially within the Northern Lake Erie Secondary watershed and more specifically between the Cedar tertiary and Lower Thames tertiary watersheds as presented in Figure 3-1. The Project is characterized predominantly by poorly draining Brookston soil and Brookston clay. The bed rock geology consists of Limestone, dolostone, and shale. Since the majority of the Project study area is represented by agricultural land, the runoff coefficient value is approximately 0.55 [1]. According to the Ontario Soil Survey Complex, the average slope within the Project is Level (Between 0.3º – 1.3º).

Table 3-1: Waterbody Assessment Observations

Watercourse Name	Report ID	Water Body (Y/N)
Coatsworth-Robinson Drain	WB-001	Y
Albert E. Metcalf Drain	WB-002	Y
Albert E. Metcalf Drain	WB-003	Y
Yellow Creek	WB-004	Y
Yellow Creek	WB-005	Y
Yellow Creek	WB-006	Y
Derbyshire Drain	WB-007	Y
Stobbs Drain	WB-008	Y

Stobbs Drain	WB-009	Y
Stobbs Drain	WB-010	Y
Coatsworth-Robinson Drain	WB-011	Y
Nevills Drain	WB-012	Y
Yellow Creek	WB-013	Y
Wright Drain	WB-014	Y
Yellow Creek	WB-015	Y
East Two Creeks	WB-016	Y
Charles Simpson Drain	WB-017	Y
Drain to Jacobs Drain	WB-018	Y
Cottingham Drain A	WB-019	Y
Cottingham Drain A	WB-020	Y
Cottingham Drain A	WB-021	Y
Cottingham Drain A	WB-022	Y
Scott Drain	WB-023	Y
Scott Drain Beattie Bridge	WB-024	Y
Cottingham Drain A	WB-025	Y
Travis Drain	WB-026	Y
Travis Drain	WB-027	Y
Travis Drain	WB-028	Y
Travis Drain	WB-029	Y
Travis Drain	WB-030	Y
Gahan Drain	WB-031	Y
Gahan Drain	WB-032	Y
Cottingham Relief Drain	WB-033	Y
Jacobs Drain	WB-034	Y
Jacobs Drain	WB-035	Y
Gahan Drain	WB-036	Y
Holland Drain	WB-037	Y
Holland Drain	WB-038	Y
Charles Simpson Drain	WB-039	Y
Charles Simpson Drain	WB-040	Y
Lowe Drain	WB-041	Y
Jacobs Drain	WB-042	Y
Drain To Tilbury Creek	WB-043	Y
Hyatt Drain	WB-044	Y
Hyatt Drain	WB-045	Y
Unnamed Drain G	WB-046	Y
Big Creek	WB-047	Y
Unnamed Drain E	WB-048	Y
Hill Drain	WB-049	Y
Scott Drain	WB-050	Y
Unnamed Drain J	WB-051	Y

Unnamed Drain Z	WB-052	Y
18-19 Side Road Drain	WB-053	Y
Drain to Hyatt Drain	WB-054	Y
Unnamed Drain F	WB-055	Y
18-19 Side Road & Hill Drain	WB-056	Y
18-19 Side Road & Hill Drain	WB-057	Y
19 Side Road & Hill Drain	WB-058	Y
East Branch Of Big Creek Drain	WB-059	Y
Lowe Drain	WB-060	Y
Unnamed Drain O	WB-061	Y
Unnamed Drain P	WB-062	Y
Unnamed Drain Q	WB-063	Y
Travis Drain	WB-064	Y
East Two Creeks	WB-065	Y
East Two Creeks	WB-066	Y
East Two Creeks	WB-067	Y
Unnamed Drain U	WB-068	Y
Non-Water Bodies		
Auxiliary Robinson Drain	NWB-001	N
Albert E. Metcalf Drain	NWB-002	N
Nevills Drain	NWB-004	N
Ditches Along Talbot Trail	NWB-005	N
Auxiliary Robinson Drain	NWB-006	N
Drain to Two Creeks Drain	NWB-007	N
Unnamed Drain K	NWB-008	N
Drain to Two Creeks Drain	NWB-009	N
Unnamed Drain C	NWB-010	N
Cottingham Drain A	NWB-011	N
Cottingham Drain - B (this location is on west side of Wheatley Rd.)	NWB-012	N
Drummel Smith Drain	NWB-013	N
Drain to Cottingham Drain	NWB-014	N
Travis Drain Extension	NWB-015	N
Drummel Smith Drain Extension	NWB-016	N
Drummel Smith Drain Extension	NWB-018	N
Jacobs Drain Extension	NWB-019	N
Holland Drain Extension	NWB-020	N
Holland Drain Extension	NWB-021	N
Unnamed Drain C	NWB-022	N
Unnamed Drain B	NWB-023	N
Unnamed Drain A	NWB-024	N
Hill Drain	NWB-025	N
Dbw Drain	NWB-026	N

Unnamed Drain A	NWB-027	N
Brosseau Drain & Buchanan D&W Drain	NWB-028	N
Unnamed Drain H	NWB-025	N
DBW Drain	NWB-026	N
Unnamed Drain D	NWB-027	N
Brosseau Drain	NWB-028	N
Unnamed Drain L	NWB-029	N
Pond B	NWB-030	N
Pond C	NWB-031	N
Pond D	NWB-032	N
Unnamed Drain M	NWB-033	N
Auxiliary Robinson Drain	NWB-034	N
Stobbs Drain	NWB-035	N
Two Creeks Drain	NWB-036	N
Two Creeks Drain	NWB-037	N
Liddle Drain	NWB-038	N
Pond A	NWB-039	N
18-19 Side Road & Hill Drain	NWB-040	N
Wright Drain	NWB-041	N
Unnamed Drain N	NWB-042	N
Unnamed Drain R	NWB-043	N
Drain to Travis Drain	NWB-044	N
Pond E	NWB-045	N
Drain To Two Creeks Drain	NWB-046	N
Unnamed Drain S	NWB-047	N
Liddle Drain	NWB-048	N
Unnamed Drain T	NWB-049	N
Pond F	NWB-050	N
Pond G	NWB-051	N

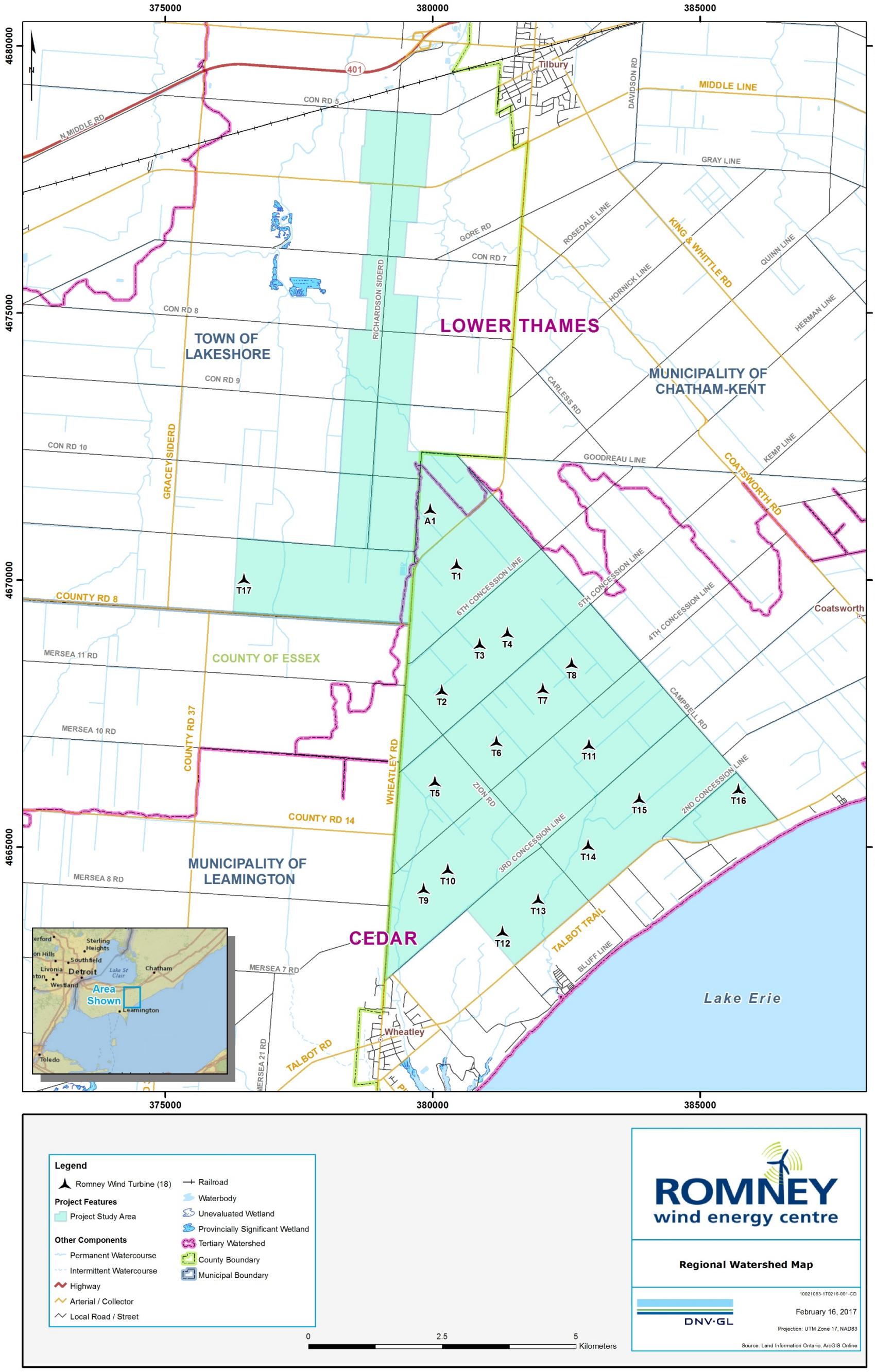

Figure 3-1 Regional Watershed Map

To evaluate the potential hydrologic impact associated with increased impervious coverage, the catchment areas for all draining features within 300 m from the Project location have been delineated and the total coverage areas have been calculated for each of the catchment areas. An example of a delineated catchment area is presented in Figure 3-2. The Project location would represent the maximum theoretical addition in impervious coverage within the catchment area, although in practice only a very small percentage of the Project location will have impervious coverage. The assumption that the whole Project location consists of 100% impervious coverage is very conservative. The summary of delineated catchment area and the conservative estimate of the percent increase of the impervious coverage is presented in Table 3-2.

The existing draining pattern will be maintained to the extent possible by using limited grading, maintaining surrounding agricultural land use and with the installation of conveyance infrastructure such as culverts. Therefore, the change in impervious surface represents the primary factor associated with potential impacts to the hydrology within the Project study area. Percent increase in impervious areas per catchment resulting from the Project will be low by very conservative estimates. Thus, the potential hydrologic impact associated with the Project would be very limited.

Table 3-2: Existing Conditions Impervious Coverage

Catchment Area / Discharge Point	Catchment Area (ha)	Additional Impervious Coverage (ha)	Additional Impervious Coverage (%)
Catchment Area 1	594	5	0.8%
Catchment Area 2	1402	60	4.3%
Catchment Area 3	486	5	1.1%
Catchment Area 4	375	12	3.2%
Catchment Area 5	585	16	2.7%
Catchment Area 6	1278	31	2.4%
Catchment Area 7	279	9	3.1%

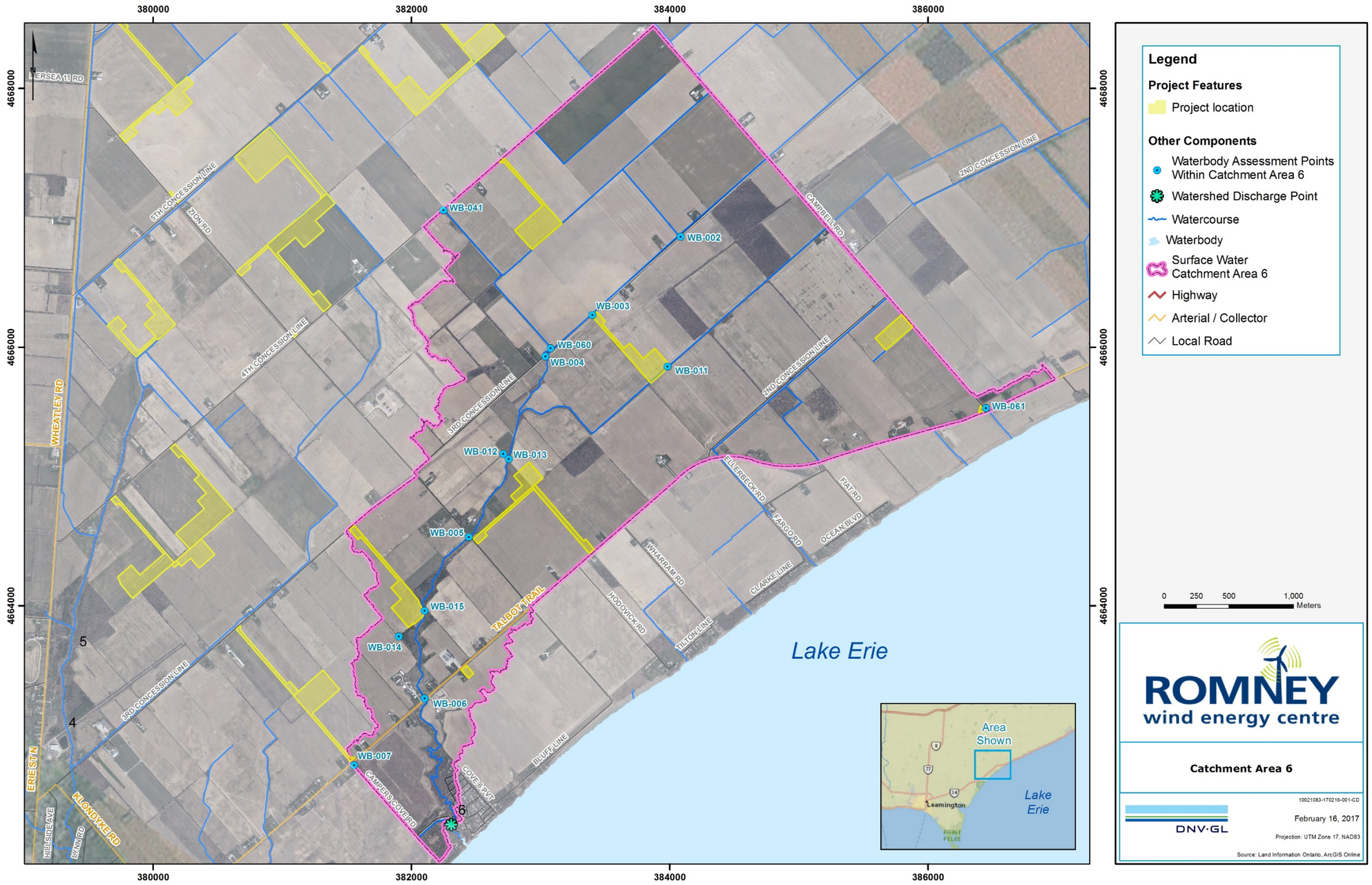

Figure 3-2 Example of Delineated Catchment Area

4 STORMWATER, EROSION AND SEDIMENT MANAGEMENT AND MITIGATION MEASURES

The installation and construction of required manmade infrastructures will inevitably disturb the natural ground cover and increase stormwater runoff and erosion. The SESMP aims to reduce contaminants in stormwater runoff generated from the Project and to minimize the erosion and sedimentation of the natural habitats throughout all phases of the Project. The following sub-sections present the stormwater, erosion and sedimentation mitigation measures that will be implemented during Project activities.

4.1 Erosion and Sediment Control

Erosion and sedimentation are natural processes that consist of soil surface detachment and transportation and deposition of soil particles. Erosion prevention is defined as any practice that protects the soil surface and prevents the soil particles from being detached by rainfall or wind, while sediment control is any practice that traps the soil particles after they have been detached and moved by wind or water. The Project construction and decommissioning activities, such as intensified traffic, topsoil stripping, grading activities involving cutting or filling, will modify the land features while impairing these natural processes. The goal of the erosion and sediment control measures is to prevent the transportation of sediment overland and deposition into surrounding natural areas, including watercourses, woodlands and wetlands.

The following stormwater, erosion and sediment control measures will be implemented to minimize the potential for erosion and off-site transfer of sediment of the Project:

Construction and Decommissioning Phase

- Where soil has lost its structure from grading or compacting, it must be managed to prevent its migration from the site. Land and water uses upstream and downstream must be protected from works generating sediment [3];
- Minimize grading activities to maintain existing drainage patterns where possible;
- Limit changes in land contours and maintain streams and timing and quantity of flow;
- Schedule clearing, grubbing and grading activities to avoid times of very high runoff volumes, wherever possible;
- Clearly delineate work area using erosion fencing, or similar barrier, to avoid accidental damage to retained wetland vegetation and to avoid impacting hydrological connectivity;
- Crossing structure should be properly sized and positioned appropriately (angle and embedded) as to minimize erosion issues and creation of potential fish barriers;
- Dewatering discharge rates should be evaluated as to not result in erosion and sedimentation to receiving water body;
- Dewatering discharge should be dissipated (i.e. sand bags, hay bales, etc.) and may require to be split to more than one location;

- Erect silt fence before grading activities on the downstream side of the area to be graded to protect the downstream lands from potential sediment transport that could be transported overland;
- Redirect stormwater runoff via swales and erosion control berms, where appropriate, to ensure that no untreated runoff is discharged from the site;
- Install temporary rock check dams in swales where appropriate or necessary to attenuate flows, reduce erosive velocities, and encourage sediment deposition;
- Install, monitor, and maintain erosion and sediment control measures (i.e. silt fences) around the construction areas within 30 m of a significant natural feature or wildlife habitat; and
- Drainage system may be incorporated under turbine foundations to allow for drainage of perched water.

Operations Phase

- Crossing structure for access road should be properly sized and positioned appropriately (angle and embedded) as to minimize erosion issues and creation of potential fish barriers;
- Drainage system may be incorporated under turbine foundations to allow for drainage of perched water;
- To manage stormwater runoff during operation, drainage channels will be constructed adjacent to access roads when required; and
- Precipitation runoff from wind turbine tower will be percolate through the gravelled area around each turbine foundation, ensuring infiltration into the ground.

4.2 Vegetation and Habitat Conservation

The protection of graded surfaces from erosion can be achieved through vegetation that limits erosion during stormwater event. Vegetation helps to minimize the impacts of stormwater because vegetation roots hold soil together, leaves and stems breaks up rainfall impact, groundcover slows down runoff and filters sediment out of water and plants evapotranspire moisture from soil [2]. Therefore, the removal of vegetation and other construction activities may degrade soil, leading to a higher potential for erosion. Vegetation may be removed to allow the construction and safe operation of the Project, but the following mitigation measures related to vegetation and natural habitats will be implemented:

- Removal of vegetation and other construction activities degrades soil, leading to a higher potential for erosion [3]; therefore, vegetation removal will be done only when necessary and where natural heritage assessments have been completed as part of the REA;
- Slash, logs, roots and stumps and other cleared/grubbed material may result in a fire hazard, disrupt other standing vegetation and/or watercourses, disrupt/block surface drainage and disturb ground surface potentially leading to increased erosion and sedimentation in watercourses. Therefore, the construction and decommissioning site will be cleaned up on a regular basis of all waste debris [3]; and
- Stabilize banks as soon as possible after construction disturbance (i.e. plantings, rock etc.). If insufficient time is available in the growing season to establish vegetative cover, an overwintering

treatment such as erosion control blankets and fiber matting could be applied to contain the site over the winter period.

4.3 Contaminant Prevention and Vehicle Maintenance

Small quantities of hazardous material are used in compliance with applicable laws in certain situations during the Project life-cycle and can be spread by stormwater events if proper mitigation measures are not enforced. Vehicles travelling on Project access roads during the construction, operation and decommissioning phases can generate limited fugitive dust emissions, especially in dry or windy conditions. While sustainable source of water should be utilized to maximize reuse of the resource, proper wet cleaning methods should be enforced so that no contaminants are present in dust suppression liquids and that stormwater episodes do not propagate hazardous material in the surrounding environment. Spill prevention measures for machinery and vehicles should also be implemented to prevent soil contamination and potential propagation of contaminant during stormwater events. The following contaminant prevention measures and vehicles maintenance policy will be implemented:

Construction and Decommissioning Phase

- All vehicles must be in good condition and must not have fuel and/or oil leaks;
- All maintenance activities, vehicle refueling or washing, and chemical storage will be located more than 30 m from any significant natural feature or significant wildlife habitat;
- To address any risk that the movement of sediment from the construction site poses to surrounding aquatic and terrestrial habitats, machinery and trucks will be cleaned regularly and refuelled away from any water body at designated locations (>30 m) [3];
- The general contractor will develop a site-specific spill response plan and train staff on appropriate procedures;
- Wash public roads to minimize the carriage of sediment off site;
- Minimize vehicular traffic on exposed soils and stabilize high traffic areas with clean gravel surface layer or other suitable cover material;
- For dust suppression of unpaved surface, only products that are safe for the environment and human health and safety will be used (water or water-based dust suppressant); and
- Implement speed limits on unpaved roads by clearly posting construction speed limits.

Operations Phase

- All vehicles must be in good condition and must not have fuel and/or oil leaks;
- All maintenance activities, vehicle refueling or washing, and chemical storage will be located more than 30 m from any significant natural feature or significant wildlife habitat;
- Develop a site-specific spill response plan and train staff on appropriate procedures; and
- Implement speed limits on unpaved roads by clearly post operation speed limits on Project access roads.

4.4 Monitoring

To ensure that the stormwater, erosion and sedimentation mitigation measures are adequate, a monitoring program will be implemented during the construction and decommissioning phases of the Project to inspect the erosion and sediment control measures in place after each significant rainfall and at least once a week when construction and decommissioning activities are underway. These inspections would include examination of silt fences, rock-check dams, swales and erosion control berms, as applicable. An Environmental Monitor will be hired to ensure that vegetation will be removed in designated areas only and that revegetation is successfully completed.

5 CONCLUSION

This conceptual SESMP provides an overview of the current site conditions and multiple mitigation measures to avoid or minimize the impacts of stormwater events on the natural environment by increasing erosion and sedimentation or by transportation of contaminant. Preventive control measures to limit erosion and sedimentation processes, removal of vegetation and modification of habitat as well as the maintenance of vehicle and proper dust suppression techniques will be implemented. A monitoring program will be executed during both construction and decommissioning to evaluate the effectiveness of the mitigation measures proposed within the SESMP and ensure that the best efforts are being made to minimize the impacts of stormwater events. Given the mitigation measures proposed, DNV GL considers that the proposed conceptual SESMP is adequate for the nature and size of the Project.

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[4] Greater Golden Horseshoe Area Conservation Authorities, Erosion and Sediment Control Guideline for Urban Construction, December 2006

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APPENDIX D – HYDROGEOLOGICAL ASSESSMENT AND EFFECTS ASSESSMENT

DNV·GL

ROMNEY WIND ENERGY CENTRE

Hydrogeological Assessment and Effects Assessment

Romney Energy Centre Limited Partnership

Document No.: 10021083-CAMO-R-1
Date: 18 October 2017

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1 INTRODUCTION

Romney Energy Centre Limited Partnership has requested GL Garrad Hassan Canada, Inc. (hereafter DNV GL) to provide environmental and permitting services including a Draft Hydrogeological and Water Resource Protection Information for the Romney Wind Energy Centre ("Project") located in southwestern Ontario, within the Town of Lakeshore and the Municipality of Chatham Kent, Ontario. More specifically, the Project is located south of Highway 401, extending along Richardson Side Road and Wheatley Road near the community of Wheatley. This Project with a total nameplate capacity of up to 60 megawatts (MW) is considered a Class 4 wind facility. A total of 18 wind turbine locations are being permitted for the Project.

The objective of this Hydrogeological and Water Resource Protection Information report was to conduct a preliminary review of existing hydrogeological conditions and elaborate a strategy to assess potential effects of the construction and installation of the Project on the local and regional hydrogeology.

DNV GL reviewed all readily available data related to hydrogeology of the region. The following databases have been consulted:

- Bedrock Geological Mapping from Ontario Geological Survey (OGS) [1];
- Physiographic Units of Southern Ontario from OGS [2];
- Drift thickness Map from OGS [3];
- Surficial Geological Mapping from OGS [4];
- Ministry of the Environment and Climate Change (MOECC) Water Well Information System (WWIS) [5]; and
- MOECC Permit to Take Water Records (PTTW) [6].

2 PROJECT COMPONENTS

The Project will include the following components:

- **Wind turbines –** Up to 18 turbine locations will be permitted. The final wind turbine technology has not been selected yet, but for reference purposes the Vestas V136-3.6 MW turbine is being considered.
- **Permanent Meteorological Tower(s) –** Wind speed, wind direction, temperature and humidity will be measured by means of meteorological tower(s) of up to 132 m in height. The tower(s) will remain on site for the duration of the Project for wind turbine performance testing. The tower(s) will be of lattice or monopole type and will be constructed on a small concrete pad(s) and/or and supported by a number of guy wires (lattice tower only).
- **Access roads and crane pads** – Transportation of machinery, turbine components, main transformer and other equipment will use existing municipal roads. New access roads will be constructed on private lands to provide access to the turbine sites during the construction phase and for maintenance activities during operation, including side clearance. Typically access roads will be constructed to be up to 12 m wide during construction. Areas adjacent to the access road within the larger 20 m disturbance area may be utilized during the construction phase in order to accommodate cranes, transportation equipment and other construction activities. After construction, these roads may be reduced in size to approximately 5-6 m in width, to allow access to turbines and associated infrastructure for maintenance and repairs.
- **Electrical collector lines, substation and switchyard** – The electricity generated at each of the WTGs will be transported through 34.5 kV underground or overhead electrical collector lines to the Project's substation. Electrical collector lines will be sited adjacent to the turbine access roads, where feasible, and will follow public road allowances to reach the Project substation. Junction boxes will also be installed below or above ground where more than one circuit must be connected and will be located on either privately-owned agricultural lots or within public road allowances. Measuring a total footprint of up to 2-3 ha, the electrical substation for the Project will be located on privately held lands through an "option to lease land" agreement. At the substation, the voltage level will be raised to 230 kV by the main power transformer. The electricity will then be delivered to the PCC. A new high-voltage overhead transmission line is proposed to be built by either Hydro One or the Proponent, between the PCC and POI located on privately owned lands held under lease options less than 1 km from the Project substation. This line will be owned and operated by Hydro One. At the POI, the Project will connect to the existing 230 kV Hydro One transmission line C21J.
- **Operations and Maintenance Building-** It is anticipated that an Operations and Maintenance (O&M) building will constructed in the general vicinity of the Project substation or closer to the wind turbines for the purposes of monitoring the day-to-day operations of the Project and supporting maintenance efforts. The exact location will be determined prior to issuance of the final REA reports. A small parking lot will be constructed to accommodate staff vehicles. Potable water will be supplied by a well or through the municipal water system and a septic bed will be constructed for the disposal of sewage. A septic bed will be constructed to the minimum size required for the size of the O&M building. It is the Project owner's responsibility to ensure proper maintenance of the septic system.

The O&M building, septic system, and water supply solution will be constructed in accordance with applicable municipal and provincial standards.

- **Construction staging and laydown areas (including temporary staging areas) –** A temporary construction staging area will be constructed on privately owned lands for the purposes of staging and storing equipment during the construction phase. Activities on this site will include material storage, equipment refuelling, construction offices, parking lot, temporary toilet facilities, rinsing and water facilities. The temporary staging area will have a total footprint of approximately 2 ha. In addition, a temporary area of approximately 1 ha around each wind turbine will be established for the laydown and assembly of the wind turbine components. This temporary area will be restored following the construction phase to a condition suitable to the landowner and local authorities.

3 BASELINE CONDITIONS

3.1 Physical characterization

3.1.1 Topography

The topography of the area is characterized by low relief, varying between 175 and 190 meters above sea level (asl). The elevation within the Project Study Area decreases gradually approaching Lake Erie and Tilbury.

3.1.2 Physiographic units

The Project Study Area is overlays the Physiographic Region of St. Clair Clay Plains [2].

The Project Study Area is in a sub region of the St. Clair Clay Plain, the Essex Clay Plain [7]. The physiography of this region is a till plain with low relief caused by smoothing from glacial lakes which covered the area following glacial retreat. The soils are of a fine texture which results in poor natural drainage, leading to the extensive use of tile drainage and drainage ditches in the area [7].

3.2 Geology

3.2.1 Bedrock geology

The two bedrock formations overlay the study area, the Hamilton Group and Dundeee Formation (Figure 1), both of the Middle Devonian Epoch [1]. The Hamilton Group is largely consisted of grey shale with interbeds of crystalline cherty limestone whereas the Dundee formation is composed of light brown, medium grained limestone with some chert [8].

According to the bedrock topography mapping from OGS [3], the bedrock depth varied from 30 to 57 m within the Project Study Area.

3.2.2 Overburden geology

The surficial geology of the Project Study Area is similar to the surrounding region and mostly consists of Clay to silt-textured till, derived from glaciolacustrine deposits or shale [4]. According to the available OGS drift thickness map, overburden thickness varies from 30 to 57 m [3].

Surficial geology within the Project Study Area is shown in Figure 2 and the major units are briefly described below [4]:

- Glaciolacustrine-derived silty to clayey till: clayey silt, overlain by glaciolacustrine silty clay to silt (Late Wisconsinan);
- Massive-well laminated: Stratified to massive silty clay to silt (Late Wisconsinan);
- Littoral-foreshore deposits: Beach, bar and nearshore deposits, sand and sandy gravel (Late Wisconsinan); and
- Modern alluvial deposits: Young stream deposits; clay, silt, sand, and muck (recent).

3.3 Hydrogeological setting

The hydrogeology setting of the Project Study Area was developed based on previous studies and available data.

3.3.1 Hydrostratigraphy

Defining the hydrostratigraphy of an area requires a detailed understanding of the soil characteristics through a sufficient number of borehole logs. Hydrostratigraphic layers can be classified as aquifer or aquitard. An aquifer corresponds to a geologic formation of water bearing permeable rocks, rock fractures and unconsolidated materials that can provide significant supply of water to a well. Contrastingly, an aquitard corresponds to a geologic formation of mainly fine grained consolidated materials or hard rocks that prevent the flow of water. Based on the geotechnical investigation report [9], the Project Study Area consists of the following surficial sedimentary units:

- Stiff to very stiff Clayey Silt (Silt, Clay) – Aquitard;
- Glaciolacustrine Deposits (Clay, Silt) – Aquitard;
- Sand or Silt Lens (Sand, Silt) – Discontinuous perched materials;

The upper clayey silt layer forms a stiff to very stiff soil crust with a thickness ranging approximately between 1 and 5 m. The glaciolacustrine deposits consist of silt and clay to silty clay deposits with poor water bearing capacity. This layer extends down to the bedrock with a thickness of up to 40 m. Some sand and silt lenses were encountered in the glaciolacustrine deposits. The upper part of the fractured bedrock is the only aquifer within the study area [9].

3.3.1.1 Groundwater flow

In order to assess the groundwater flow, regional water level data, collected from water well records from Ontario Ministry of Environment and Climate Change (MOECC), was krigged. The krigging surface shows that the regional direction of groundwater flow is to the southeast towards Lake Erie.

3.3.2 Groundwater resource

3.3.2.1 Wells

Most of the Project Study Area has municipal water utility coverage served via surface water intake from either Lake St. Clair or Lake Erie [10] (Figure 3).

Even in the presence of municipal water utility, wells are found in the Project Study Area (Figure 3). Table 3-1 summarizes well records within 1 km of the Project Study Area, which were available from the MOECC database [6]. MOECC records include 61 wells within 1 km of the Project Study Area, of which 40 are active water supply wells. Livestock and Irrigation wells account for 48 % of the MOECC well records, followed by Domestic wells (30 %).

The presence of groundwater resources can be gathered from the location and depth of water in the MOECC records within the Project Study Area. Forty percent of the MOECC records showed wells located within overburden deposits whereas 52 % of the wells are located within bedrock aquifer.

Table 3-1 Summary of wells located within 1 km of the Project Study Area.

Primary Water Use	Number of Well	Well Depth (m)	Primary Well Type
Domestic	12	9.1 – 61	Bedrock: 5 Overburden: 7
Commercial and Industrial	1	40.2	Bedrock: 1
Irrigation and Livestock	19	34.7 – 65.8	Bedrock: 11 Overburden: 8
Public	2	42.4 - 43	Bedrock: 2
Not used	1	47.9	Overburden: 1
Unknown	5	Unknown to 48.2	Bedrock: 2 Unknown: 3

Figure 3 shows the approximate location of water supply wells (Abandoned Wells, Observation Wells, Monitoring and Test Hole were excluded from these figures). According to the MOECC, location accuracy of wells ranges from 10 m to 3 km. A complete listing of MOECC water well records is present in Appendix B.

3.3.2.2 Permit to take water records

Ontario enhanced the PTTW program to ensure water takings in Ontario are managed to the standards of the Great Lakes-St. Lawrence River Basin Sustainable Water Resources Agreement. According to the PTTW, a permit is required if the Project plans to take 50,000+ litres of water in a day from the environment [6].

Based on the review of MOECC database, there is no active PTTW within the Project Study Area and only one is found within a 1 km buffer. This PTTW record is used for commercial purposes (Figure 3) [6].

3.3.2.3 Depth to water table

According to the MOECC water level data, the regional ground water level falls 10 to 50 m below the ground surface. However, average static groundwater levels measured in standpipe piezometers at selected WTG locations varies from 0.4 m below ground surface in February to 4.5 m in December [9].

3.3.3 Drinking Water Source Vulnerability Assessment

The Project study area is located completely within the Lower Thames Valley Source Protection Area. It is in an area with low potential for stress for surface water and ground water, and an area of low aquifer vulnerability [10]. There are no Well Head Protection Areas (WHPAs) or Highly Vulnerable Aquifers (HVAs) within the Project Study area [10].

3.3.4 Intake Protection Zones

An Intake Protection Zone (IPZ) is an area of vulnerability delineated around a surface water intake point. A Zone 1 IPZ (IPZ-1) is determined by distance to an intake point whereas a zone 2 IPZ (IPZ-2) is delineated based on flow travel time and storm sewer shed drainage. The Project Study area is located north of the primary and emergency intake point for the town of Wheatley which serves a population of 10,700. The Project Study area does not overlap the IPZ-1 or IPZ-2 for the Wheatley surface water intake point or that for any other surface water intake point (Figure 4)[10].

Intake Protection Zone 3 (IPZ-3) is a third type of intake protection zone which delineates areas where drinking water is vulnerable to a release of a chemical parameter or pathogen during an extreme event [10]. IPZ-3s buffer several watercourses within the Project Study area. Mitigation measures presented in the Project Water Body Report [11] will be implemented to address potential impacts to surface water.

3.3.5 Significant Groundwater Recharge Areas

Significant Groundwater Recharge Areas (SGRAs) are areas where ground water research is more than 1.15 times the average recharge in the area and/or 55% or more of the volume for the related groundwater recharge area is derived from annual precipitation minus evapotranspiration. One significant ground water recharge area with a vulnerability score of low vulnerability intersects the Project Area near its southern border (Figure 4)[10].

4 WATER TAKING

Water takings during the construction phase can impact local and regional water resources. Proper hydrogeological assessment is important to identify any adverse impact that may result from Project activities.

4.1 Predicted short-term water takings during construction phase

The construction phase of this Project will require short term dewatering. For example, dewatering is required to maintain dry working conditions during the construction of turbine foundations or borrow pits.

In order to estimate the dewatering required for keeping the foundation dry, a “big well” approach has been used. In this approach, the radius of influence for a pumping well at the centre of the foundation has been estimated by replacing the group of dewatering wells around the foundation with a single equivalent well.

For an unconfined aquifer, groundwater flow to the assumed big well can be written based on Dupuit’s formula:

$$Q = \frac{\pi K(H^2 - h^2)}{\ln(\frac{R_0}{r_s})} \qquad \text{----------(1)}$$

Where,

K = Hydraulic conductivity of the aquifer

H = Pre-construction saturated aquifer thickness (m)

h = Post construction saturated aquifer thickness (m)

R_0 =Radius of influence

r_s = Radius of the assumed big well

The radius of the assumed big well, r_s is:

$$r_s = \sqrt{\frac{BL}{\pi}} \qquad \text{----------(2)}$$

Where,

b = Width of foundation

l= Length of foundation

d= Distance of dewatering wells from the edge of foundation

B= Width of excavation = (b + 2d)

L = Length of excavation = (l + 2d)

For a typical 25 m x 25 m foundation with the dewatering wells at 5 m away from the edge of the foundation:

$$r_s = \sqrt{\frac{(b+2d)*(l+2d)}{\pi}}\sqrt{\frac{(b+10.0m)*(l+10.0m)}{\pi}} = \sqrt{\frac{35.0m * 35.0m}{\pi}} = 19.75m$$

The radius of influence, R_0, is the distance up to which drawdown occurs. R_0 is a function of hydraulic conductivity of the soil, K, and drawdown, h, and can be expressed by using an empirical relationship developed by Sichart and Kryieleis:

$$R_0 = Ch\sqrt{K} \quad \text{---------- (3)}$$

Where, C is a factor equal to 3,000 for radial flow to pumping wells.

Using equations (1), (2) and (3), the dewatering requirement for a wind turbine has been estimated after applying a safety factor of 3 (as a best practice) to be around 5,125,000 L per day. In this estimate, it was assumed that dewatering will be required to lower the water level from 0.4 m down to a depth of 3.5 m below ground surface at each turbine location. It was also assumed that the turbine foundations will be dug in the lacustrine deposits with an average water bearing thickness of 35m. It should be noted that the water table varies seasonally. Therefore, dewatering might not be necessary if the water level stays below the excavation depth at the time of construction.

Water is sometimes needed to suppress dust and used as a directional drilling fluid. Maximum daily demand for this purpose is expected to be less than 50,000 L/d.

4.2 Predicted long-term water takings during operations phase

It is anticipated that an O&M building will be constructed in the general vicinity of the Project for the purpose of monitoring the day-to-day operations of the Project and supporting maintenance efforts. Potable water will be supplied by a well or through the municipal water system and a septic bed may be constructed for the disposal of sewage. If a water well is constructed, water taking will not exceed 50,000L/day for the O&M building.

5 IMPACT ASSESSMENT AND MONITORING RECOMMENDATIONS

The Project Study Area is a low-density area for wells with significant coverage from municipal utilities. Table 5-1 presents the mitigation strategy for any potential effects to groundwater. Additional mitigation strategy for potential impacts to groundwater is detailed in the Water Body Report [11].

Table 5-1 Potential Effects Mitigation and Monitoring for Wells

Potential Effect	Project phase	Mitigation Strategy and Monitoring Plan	Performance Objective
Temporary reduction of water quality and quantity in private wells	Construction Phase (Dewatering)	• If any change in well conditions is reported or observed during dewatering period through the complaints procedure, actions will be taking: - Supply water will be provided; - Reduction of the rate and amount of water taking (during dewatering) to prevent negative effect on wells. • Limit duration of dewatering to minimal possible; • Dewatering discharge rates should be evaluated as to not result in erosion and sedimentation to receiving water body; and • Implement groundwater cut-offs, as applicable, to limit groundwater taking.	Minimize any temporary reduction of water quality and quantity on private wells.
Permanent reduction of water quality and quantity in private wells	Operation Phase	If any change in well conditions is reported or observed after the construction period through the complaints procedure, action will be taken to restore water supply, such as drilling a new well, etc.	Avoid any permanent reduction of water quality and quantity on private wells.
Contamination of groundwater due to accidental spills	Construction / Operation / Decommissioning Phase	• All vehicles must be in good condition and have proper operation and maintenance to limit leaks. • Oil trays should be placed under equipment that could present oil or fuel leaks, as applicable. • Develop a site-specific Spill Response Plan and train staff on appropriate procedures.	Avoid any contamination of groundwater.

6 CONCLUSIONS AND RECOMMENDATIONS

This high level hydrogeological assessment was conducted as a desktop study to review the existing hydrogeological conditions within the Project Study Area, describe potential groundwater taking during the construction and operation phase, and identify mitigation measures for potential effects of the Project on groundwater.

This desktop review shows that the Project Study Area is within municipal water supply zones, but wells for domestic and other uses still exist within the Project Study Area. The Project Study Area does not intercept any WHPAs, HVAs, or Zone 1 or Zone 2 IPAs. One SGRA intercepts the southeast corner of the Project Study Area.

Forty percent of active well records are located within overburden deposits whereas 52 % of the wells are located within bedrock aquifer. Average overburden thickness is approximately 40 m, mostly composed of silt and clay to silty clay deposits. As a result, proposed mitigation measures, including a site-specific Spill Response Plan, will mitigate potential impacts to water quality and quantity. No permanent or otherwise significant negative potential effects are anticipated, including in the vicinity of wind turbines and other Project components.

There is a potential for groundwater dewatering to exceed 50,000 L/day or 400,000 L/day at turbine foundations during the construction phase. Mitigation measures presented in Table 5-1 and in the Project Water Body Report [11] will be implemented to minimize potential impacts to groundwater resources.

7 REFERENCES

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APPENDIX A : MAPS

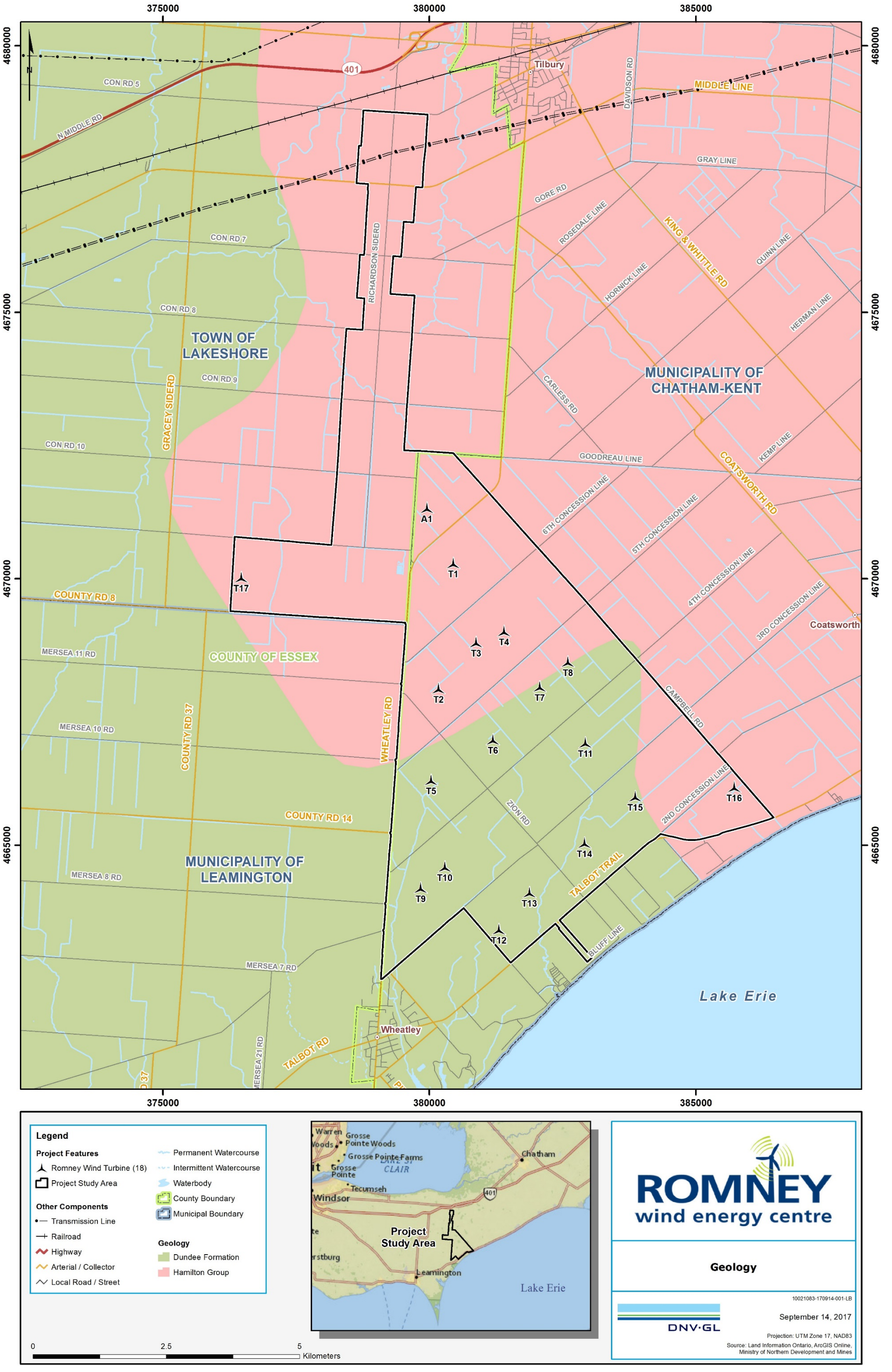

Figure 1: Geology

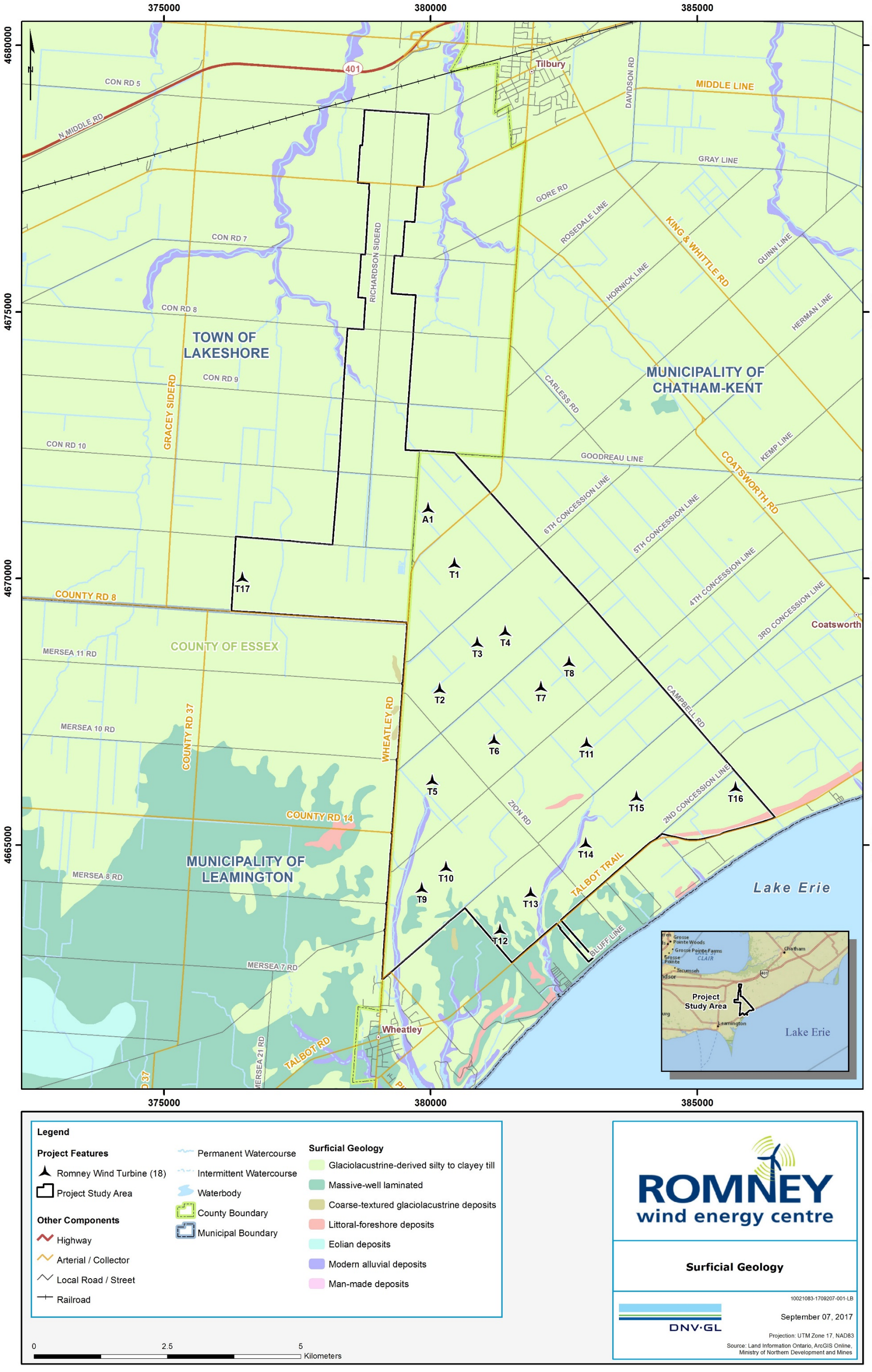

Figure 2: Surficial Geology

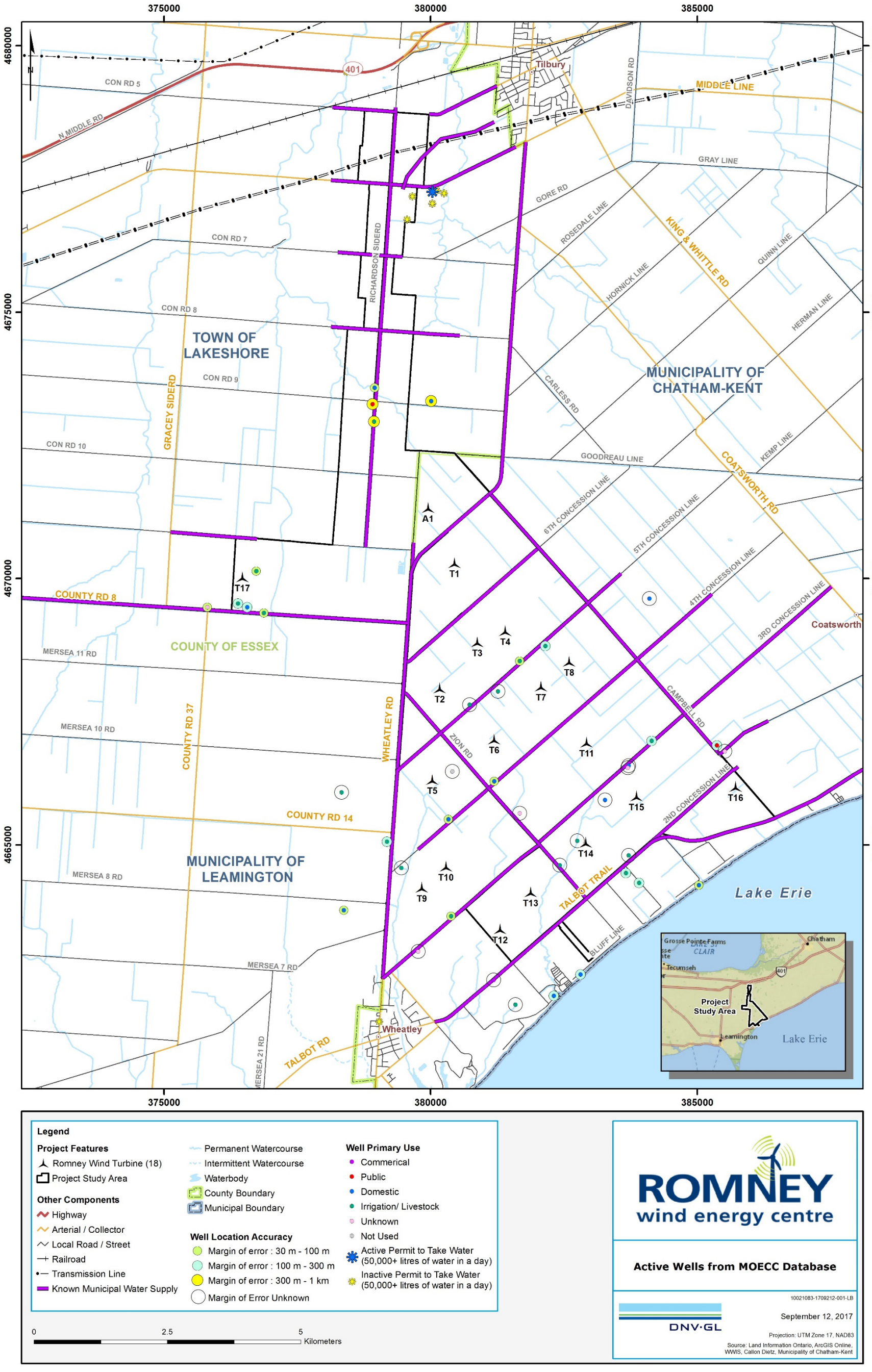

Figure 3: Wells Within 1 km of Project Study Area (MOECC)

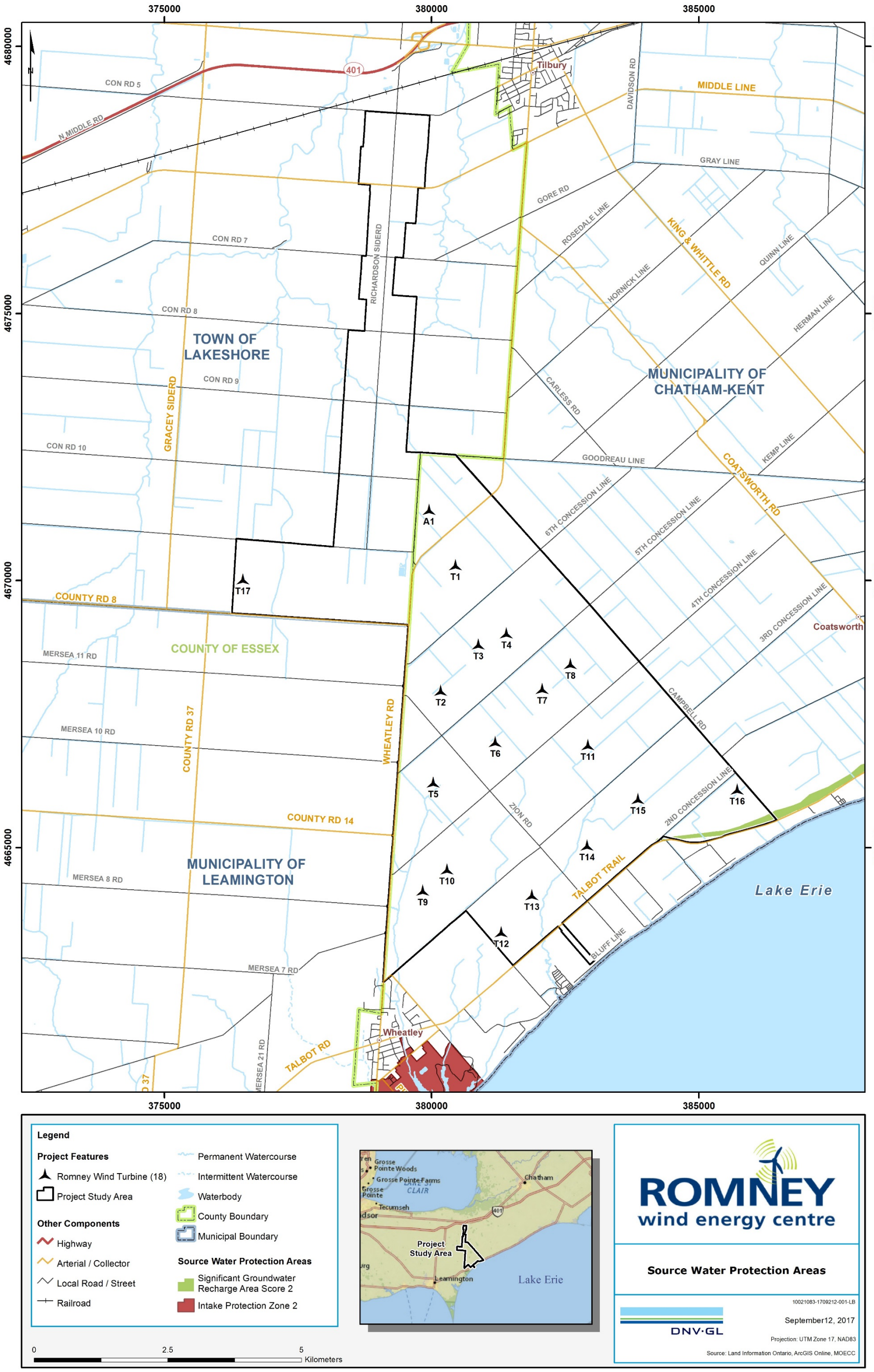

Figure 4: Source Water Protection Areas

APPENDIX B: MOECC WATER WELLS RECORDS

BOREHOLE ID	WELL ID	DEPTH (m)	BEDROCK DEPTH (m)	STATIC LEVEL (m)	Latitude (NAD83)	Longitude (NAD83)	PRIMARY USE	MATERIAL	WELL TYPE	CLOSEST WIND TURBINE	DISTANCE (m)
10188566	3304411	46.9	0	12.2	42.151737	-82.443534	Livestock	CLAY	Overburden	T2	623.1
10188931	3304776	61	48.8	2.1	42.138842	-82.437675	Domestic	TOPSOIL	Bedrock	T6	755.1
10191401	3307279	18.3	0	0	42.132318	-82.447933	Domestic	CLAY	Overburden	T5	764.9
10192897	3308951	47.9	0	0	42.140415	-82.447222	Not Used	CLAY	Overburden	T5	421.1
10530825	2105648	41.5	36	0	42.13653	-82.472238	Irrigation	SAND	Bedrock	T5	1713.0
10188546	3304391	42.4	42.1	4.3	42.145542	-82.38724	Public	CLAY	Bedrock	T16	884.5
10191453	3307331	9.1	0	0	42.121857	-82.390836	Domestic	CLAY	Overburden	T16	1937.8
10539223	3309872	42.1	0	4.6	42.144564	-82.385441		Unknown type	Unknown type	T16	730.5
10188565	3304410	36.3	36	3.4	42.161856	-82.426575	Livestock	CLAY	Bedrock	T8	554.6
10192908	3308962	39	0	3	42.17016	-82.403154	Domestic	CLAY	Overburden	T8	1933.6
10091515	2102506	42.7	0	6.1	42.12836	-82.461756	Livestock	CLAY	Overburden	T9	1110.1
10092705	2103707	35.4	35.1	6.1	42.11662	-82.471284	Domestic	CLAY	Bedrock	T9	1514.6
10188557	3304402	46.3	45.7	11.6	42.123945	-82.458388	Livestock	CLAY	Bedrock	T9	555.8
10189840	3305699	40.2	30.2	10.1	42.115939	-82.446955	Livestock	TOPSOIL	Bedrock	T9	742.6
1003751750	7179220				42.109867	-82.454257				T9	1168.2
10189752	3305611	46	44.2	4.9	42.159262	-82.432327	Livestock	CLAY	Bedrock	T4	595.7
10188541	3304386	64.9	64.3	8.2	42.123726	-82.407451	Livestock	CLAY	Bedrock	T14	921.2
10188542	3304387	65.8	65.2	10.7	42.122097	-82.404391	Livestock	CLAY	Bedrock	T14	1232.2
10188554	3304399	51.2	0	12.2	42.126704	-82.406912	Livestock	CLAY	Overburden	T14	825.6
10188555	3304400	48.8	0	10.7	42.124846	-82.422478	Livestock	CLAY	Overburden	T14	627.1
10188556	3304401	48.2	0	11.6	42.129037	-82.418579	Livestock	CLAY	Overburden	T14	174.8
1003751744	7179218				42.13353	-82.431772				T14	1374.0
10188553	3304398	17.1	0	5.5	42.136003	-82.412442	Domestic	TOPSOIL	Overburden	T15	593.6
10188558	3304403	40.8	40.5	4.9	42.146127	-82.402078	Livestock	CLAY	Bedrock	T15	1110.4
10192176	3308152	41.5	41.1	4.9	42.141876	-82.407248	Domestic	FILL	Bedrock	T15	627.7
10192177	3308153	48.2	41.5	0	42.141513	-82.407422		FILL	Bedrock	T15	593.0

BOREHOLE ID	WELL ID	DEPTH (m)	BEDROCK DEPTH (m)	STATIC LEVEL (m)	Latitude (NAD83)	Longitude (NAD83)	PRIMARY USE	MATERIAL	WELL TYPE	CLOSEST WIND TURBINE	DISTANCE (m)
10092039	2103030	44.2	0	5.2	42.167567	-82.494378	Domestic	TOPSOIL	Overburden	T17	536.1
10092040	2103031	47.2	46.9	5.5	42.16817	-82.496511	Livestock	CLAY	Bedrock	T17	466.3
10092966	2103970	48.8	44.5	3.7	42.166643	-82.490591	Livestock	CLAY	Bedrock	T17	752.4
10093201	2104214	42.1	0	3.7	42.173716	-82.492464	Livestock	CLAY	Overburden	T17	300.9
10092579	2103580	46.3	44.8	0	42.167448	-82.503455		CLAY	Bedrock	T17	845.6
10188562	3304407	34.7	0	11.9	42.154068	-82.437172	Livestock	CLAY	Overburden	T7	813.1
10188537	3304382	40.2	39.6	4.9	42.105256	-82.437037	Commerical	CLAY	Bedrock	T12	929.8
10188538	3304383	43.3	42.1	3.7	42.101177	-82.431986	Livestock	CLAY	Bedrock	T12	1411.1
10188539	3304384	42.7	42.1	9.1	42.102771	-82.423314	Domestic	CLAY	Bedrock	T12	1579.3
10188540	3304385	47.2	45.7	8.2	42.106447	-82.417349	Domestic	CLAY	Bedrock	T12	1714.1
10092002	2102993	43.3	0	3.7	42.202947	-82.453422	Domestic	CLAY	Overburden	A1	2041.6
10092003	2102994	43	42.1	4.6	42.202237	-82.46673	Public	CLAY	Bedrock	A1	2239.5
10092004	2102995	43.3	0	2.7	42.199315	-82.466359	Livestock	CLAY	Overburden	A1	1944.7
10093373	2104386	26.2	0	0	42.205034	-82.46631	Domestic	CLAY	Overburden	A1	2501.5

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