ST. COLUMBAN WIND PROJECT
CONSTRUCTION PLAN REPORT

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Prepared for:

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1.0 Introduction

1.1 PROJECT OVERVIEW

St. Columban Energy LP is proposing to develop, construct, and operate the 33 megawatt (MW) St. Columban Wind Project (the Project) in the Municipality of Huron East (Huron East), Municipality of Morris-Turnberry (Morris-Turnberry), and Township of Howick (Howick), County of Huron (Huron County), in response to the Government of Ontario's initiative to promote the development of renewable electricity in the province.

The overall Project Study Area is comprised of two sections – the Wind Project Study Area and the Interconnection Line Study Area. The Wind Project Study Area is bordered on the north by Winthrop Road, on the south by Huron Road/Highway 8, on the east to the west of Perth Road 180 and on the west by Maple Line. In addition, the Interconnection Line Study Area includes the path along which an approximately 43 kilometre (km) underground electrical interconnection line is proposed to extend from the Wind Project to a transformer station and one of two connection points to the existing Hydro One Networks Inc. (HONI) electrical distribution system.

The proposed Project Location for this report includes all parts of the land in, on or over which the Project is proposed (the 'construction area' for the Project). The proposed Project Location and Project Study Areas are shown in Appendix A, Figures 1-3.

St. Columban Energy LP retained Stantec Consulting Ltd. (Stantec) to prepare the Renewable Energy Approval (REA) application with input from Zephyr North Ltd., and Archaeological Services Inc. The REA application is a requirement under Ontario Regulation 359/09 - Renewable Energy Approvals under Part V.0.1 of the Act of the *Environmental Protection Act* (O. Reg. 359/09). According to subsection 6 (3) of O. Reg. 359/09, the Project is classified as a Class 4 Wind Facility and will follow the requirements identified in O. Reg. 359/09 for such a facility.

This Construction Plan Report has been prepared in accordance with O. Reg. 359/09, and is one component of the REA application for the Project. An Environmental Screening Report (ESR) was prepared, and a Notice of Completion was submitted in the fall of 2009 for the Wind Project Study Area. The current REA application used relevant information collected for the ESR, supplemented with new information when necessary, to maintain compliance with the new Regulation.

1.2 REPORT REQUIREMENTS

The purpose of the Construction Plan Report is to provide the public, aboriginal communities, municipalities, and regulatory agencies with an understanding of the Project, including any adverse environmental effects that may result from engaging in the Project.

The Construction Plan Report has been prepared in accordance with Item 1, Table 1 of O. Reg. 359/09 and the Ministry of the Environment's (MOE's) *Technical Guide to Renewable Energy Approvals* (MOE 2011). O.Reg.359/09 sets out specific content requirements for the Construction Plan Report as provided in Table 1.1.

Table 1.1: Construction Plan Report Requirements: O. Reg. 359/09

Requirements	Completed	Section Reference
Set out a description of the following in respect of the renewable energy Project:		
Details of any construction or installation activities.	✓	2.0
The location and timing of any construction or installation activities for the duration of the construction or installation.	✓	2.0 and Appendix A
Any negative environmental effects that may result from construction or installation activities within a 300 m radius of the activities.	✓	3.0
Mitigation measures in respect of any negative environmental effects mentioned in paragraph 3.	✓	3.0

The MOE's *Technical Guide for Renewable Energy Approvals* further elaborates on content requirements for the Construction Plan Report, as provided in the following table (Table 1.2).

Table 1.2: Construction Plan Report Requirements: MOE Draft Technical Bulletin Three

Requirements	Completed	Section Reference
Description of construction and installation activities		
Materials brought on-site	✓	2.3
Construction equipment used	✓	2.3.2
Timing and operational plans	✓	2.7
Temporary uses of land	✓	2.6
Materials generated at, or transported from, the Project Location	✓	2.8
Environmental effects monitoring plan	✓	5.0

2.0 Construction and Installation Activities

2.1 FACILITY COMPONENTS OVERVIEW

The basic components of the Project include:

- 15 Siemens SWT 2.3-101/SWT 2.3-113 wind turbine generators with a maximum installed nameplate capacity of 33 MW. To be conservative, two turbine models were assessed as part of the Renewable Energy Approval (REA) process – the SWT 2.3-113 (113m blade span) and the SWT 2.3-101 (101m blade span). For the noise assessment, the SWT 2.3-101 was assessed, due to its higher noise level. For potential impacts to the natural environment, and property line setback assessments, the SWT 2.3-113 was assessed, due to its longer blade length. This conservative approach ensured the 'worst case scenario' was assessed;
- A 34.5 kV underground power line collector system;
- A 27.6 kV underground power line collector system;
- Fibre optic cabling laid with the underground collector lines;
- Turbine access roads;
- Crane pads;
- Two connection points to the existing electrical system;
- Two unserviced electrical control buildings;
- An existing, currently serviced, operations and maintenance building to be leased from a participating landowner;
- A 34.5kV - approximately 43 km underground electrical interconnection line; and,
- A 44 kV/34.5 kV 15/20 MVA transformer station.

2.1.1 Wind Turbine Generators

The Project has two FIT contracts, and two separate connection points to the HONI system. St. Columban 1 (SC1 - 18 MW) and St. Columban 2 (SC2 - 15 MW) in aggregate combine 15 Siemens SWT 2.3-101/SWT 2.3-113 wind turbine generators with a maximum installed nameplate capacity of 33 MW. A summary of the basic specifications of a typical turbine model in this class is provided in Table 2.1, and coordinates for each turbine are provided in Table 2.2.

Detailed information about both turbine models is provided in the Wind Turbine Specifications Report, and noise assessments for both models are provided in Appendix C of this report
As mentioned previously, to be conservative, both the SWT 2.3-113 (113m blade span) and the SWT 2.3-101 (101m blade span) were assessed as part of the REA process. For the noise assessment, the SWT 2.3-101 was assessed, due to its higher noise level. For potential impacts to the natural environment, and property line setback assessments, the SWT 2.3-113 was assessed, due to its longer blade length. This conservative approach ensured the 'worst case scenario' was assessed.

Table 2.1: Basic Wind Turbine Specifications

Manufacturer	Siemens	Siemens
Model	SWT 2.3-113	SWT 2.3-101
Name plate capacity (MW)	2.3 MW	2.3 MW
Hub height above grade	99.5 m	99.5 m
Blade length	55 m	49 m
Full blade diameter	113 m	101 m
Blade sweep area	10,000 m^2	8,000 m^2
Speed range	6-13 rpm	6-16 rpm
Frequency spectrum	60 Hz	60 Hz

Table 2.2: Turbine Coordinates

Turbine ID	St. Columban 1 (SC1) or 2 (SC2)	Collector System/Connection Voltage	Easting (X)	Northing (Y)
1	SC1	34.5/44kV	475688	4819174
2	SC1	34.5/44kV	475982	4819564
3	SC1	34.5/44kV	476068	4820809
4	SC2	27.6/27.6 kV	476439	4821386
5	SC2	27.6/27.6 kV	477290	4822643
6	SC2	27.6/27.6 kV	474695	4824004
7	SC2	27.6/27.6 kV	475642	4823294
8	SC2	27.6/27.6 kV	476421	4822936
9	SC2	27.6/27.6 kV	476794	4824480
10	SC2	27.6/27.6 kV	476414	4824755
11	SC1	34.5/44kV	473668	4819851
12	SC1	34.5/44kV	473905	4820309
13	SC1	34.5/44kV	474447	4820173
14	SC1	34.5/44kV	474574	4819899
15	SC1	34.5/44kV	478016	4820440

Detailed information about the turbine model is provided in the Wind Turbine Specifications Report.

2.1.1.1 Foundations

The foundations for the turbines are made of poured-in-place reinforced concrete, about 2.5 m thick. The foundation is expected to be octagonal in shape with a diameter of approximately 16 m. Selection of the final foundation design will be based on the site-specific detailed geotechnical assessment to be carried out prior to the design and construction of the tower foundations. An excavator, dozer and truck will perform excavation for the foundation; no blasting is anticipated. Surface material will be stripped and stockpiled (topsoil separate from subsoil). Each excavation will take approximately two to three days.

Concrete requirements for turbine foundations are estimated to be 400 cubic metres (m^3) of 25-30 megapascals (MPa) type concrete per turbine foundation and 30 m^3 of 15 MPa type lean concrete per turbine foundation. The concrete required for foundation construction will be provided via a commercial facility that is located in close proximity to the Project Location. Ready mix trucks will be used to transport the concrete to each turbine siting area; there will be no water required for the mixing of concrete on-site. The contractor will be responsible for ensuring that wash water from the cleaning of concrete truck drums is disposed of in a sewage works designed for that purpose and approved under Section 53.(1) of the *Ontario Water Resources Act*, or under Part 8 of the *Building Code Act*.

The steel tower base is anchored to the concrete foundation using steel foundation mounting pieces and bolts. An excavator, dozer and truck will perform the excavation for the foundation including rock excavation by mechanical means with excavating equipment. Approximately 50 concrete truck trips are required per turbine foundation, for a total of approximately 750 concrete truck trips to the turbine siting areas. Steel requirements for the turbine foundations are estimated to be 40,000 kg per turbine foundation. Geotextile requirements for below gravel are estimated at 72,000 m^2.

Grounding for the turbines will be provided by ground wire installed within the concrete foundation connected to the reinforcing steel of the foundation. A ground wire will be installed below grade around the perimeter of the foundation with periodic connections to the foundation and to a buried copper clad steel ground rod. Connections will be made from the turbine ground wire to the internal tower.

Construction of each foundation (formwork, rebar placement and concrete pour) is expected to be completed within a week. The foundation will then need to cure for approximately 28 days prior to erection of the turbine. The foundation itself will be backfilled and compacted with stockpiled subsoil and/or clean fill. Construction vehicles will stay on-site during foundation construction. Based on preliminary geotechnical investigations, no bedrock is expected to be encountered close to the surface.

2.1.1.2 Turbines

The wind turbines consist of a 99.5 m steel tube tower (four sections), three blades (approximately 49 m to 55 m in length), the nacelle, hub, and step-up transformer. The turbine tower base is approximately 3 m in diameter and will be anchored to the concrete foundation using large diameter anchor bolts.

The turbine towers will be assembled using heavy-lift crawler and mobile cranes. The nacelle will arrive on-site pre-assembled and lifted into place by the heavy-lift crane. The hub and three blades will be fastened together on-site. The blades will be fastened to the hub at grade and the entire assembly lifted and fastened onto the nacelle. The assembly and erection of the turbine will take a few days depending on wind conditions (cranes cannot operate in high winds). It is anticipated that approximately two turbines will be assembled per week. Delivery, assembly and erection of all 15 turbines will take approximately twelve weeks.

2.1.2 Electrical Infrastructure

A step-up transformer at the base of each turbine is required to transform the electricity created in the nacelle to collector system voltages of either 34.5 kV (SC1) or 27.6 kV (SC2). From each step-up transformer underground 34.5 kV (SC1) or 27.6 kV (SC2) collector lines will be constructed parallel to the turbine access roads, along municipal road allowances, to one of two electrical control buildings located near the turbines for each of St. Columban 1 and St. Columban 2.

All underground collector lines will be constructed on leased lands and within municipal road right-of-way (ROW). Wherever possible, underground collector lines on private lands will be aligned with the design of the access roads to reduce the area required for construction and minimize potential construction impacts. The cables will be installed immediately to one side of the access road, just off the graveled surface. In the municipal road ROW the cables are proposed to be installed just off the grass gravel interface at the edge of municipal roads, subject to each municipality's agreement. Typically the collector lines will be buried at a minimum of 1.0 m.

For underground collector line construction, reel trucks dispense the cable, which will be installed by a backhoe or track mounted excavator at a depth of approximately 1.0 m. No blasting will be required for the installation of the underground collector lines. The cables will be bedded in sand and the trench will be backfilled with the excavated material. Warning tape will be installed along the whole length of the underground cables, approximately 300 mm from surface or 700 mm above the cables, and the location of the cables will be provided to the municipalities and Ontario One Call. Where underground collector lines cross watercourses, roads, or other obstacles, the buried lines will be installed using directional drill techniques in suitably sized HDPE conduits at a sufficient depth below the watercourse to prevent any possibility of accidental damage due to dredging or over excavation. Signs indicating the presence and location of the cables will also be placed on either side of the watercourse.

2.1.2.1 St. Columban 1

St. Columban 1 includes 8 Siemens SWT 2.3-101/SWT 2.3-113 wind turbine generators with a maximum installed nameplate capacity of 18 MW, turbine access roads, a 34.5 kV underground collector system with fibre optic cabling, and an unserviced electrical control building. Approximately 11.6 km of 34.5kV underground collection lines will connect the turbines (T1, T2, T3, T11, T12, T13, T14, T15) to the unserviced electrical control building. This structure will measure approximately 6 m X 12 m, and will be located on private property near the entrance from Bridge Road to the turbine access road for T15.

A 34.5 kV - approximately 43 km buried electrical interconnection line will be installed from the electrical control building approximately 43 km to a 44 kV/34.5 kV 15/20 MVA transformer station for connection to the existing distribution system originating from HONI's Wingham Transformer Station (TS). The transformer station will occupy an area approximately 20 m X 30 m in size on private lands located south-east of the intersection of Gough Road and McDonald Road in the Township of Howick (43.847°N, -81.154°W). A 30m overhead line will be constructed on the transformer substation property to connect the station to the HONI system.

St. Columban Energy LP will construct and operate the electrical interconnection line, which will be buried in municipal road allowances. Potential impacts of construction, operation, and decommissioning of this line are assessed in the current REA application.

2.1.2.2 St. Columban 2

St. Columban 2 includes 7 Siemens SWT 2.3-101/SWT 2.3-113 wind turbine generators with a maximum installed nameplate capacity of 15MW, turbine access roads, a 27.6kV underground collector system with fibre optic cabling, and an electrical control building. Approximately 9.5 km of 27.6kV underground collection lines will connect the turbines (T4, T5, T6, T7, T8, T9, and T10) to the unserviced electrical control building for St. Columban 2. This structure will measure approximately 6 m X 12 m, located on private property near the entrance from Beechwood Line to the turbine access road for T8. A 30 m overhead line will be constructed to connect the buried cable eminating from the unserviced electrical control building to the HONI grid at the entrance from Beechwood Line to the turbine access road for T8 (43.560°N, -81.297°W).

HONI will then construct approximately 2.5 km of 27.6 kV overhead electrical interconnection line, beginning at the unserviced electrical control building at the entrance to Turbine 8 on Beechwood Line (500m north of Bridge Road) and running south to the existing HONI line at the intersection of Beechwood Line and Hydro Line Road (43.541°N, -81.315°W), originating from HONI's Seaforth TS.The overhead line is not a part of the renewable energy project being assessed as part of the REA application that is submitted to the MOE. The MOE's 2011 Technical Guide for Renewable Energy Approvals states, "For the purposes of the renewable energy approval, the lines built by the local distribution company in their distribution service area will not be considered part of the facility or project and a REA is not required to be obtained in respect of them". This line will be assessed and constructed by HONI, and will be assessed

under their separate environmental assessment process. The line will also be installed using their preferred techniques (i.e., overhead).

2.1.2.3 Electrical Interconnection Line

The 34.5 kV - approximately 43 km electrical interconnection line to the Township of Howick is proposed to be installed just off the grass gravel interface at the edge of municipal roads, subject to each municipality's agreement. The majority of the cable for the line will be plowed to a depth of at least 1.0 m, significantly reducing the need for open trenching. Warning tape will be installed along the whole length of the underground cables, approximately 300 mm from surface or 700 mm above the cables, and the location of the cables will be provided to the municipalities and Ontario One Call.

Directional drilling, by which conduits and cables are installed along a prescribed bore path using a surface launched drilling rig with minimal impact on the surrounding area, will be used at water and road crossings, through other areas not conducive to 'plowed' installation (at the discretion of the contractor), and through the entire settlement of Cranbrook on McNabb Line. Approximately 1.6 km of underground drilling will be required in Cranbrook; the entrance and exit points for the cable will be spaced approximately 200-400 m apart, with pull and junction pits approximately 10 m long X 2 m wide.

For watercourses, the two required drill pits (entrance and exit points for the conduit/cable) would be approximately 30 - 50 m from either side of the watercourse. For road crossings, the pits would be approximately 10 - 20 m from the outer ends of the ditch on either side of the road. The minimum depth below grade of conduits/cables installed using directional drilling techniques would be 1.0 m, with actual installed depths of typically about 1.2 m and up to 2.0 m under watercourses. Specifications for typical water crossings and directional drilling are provided in Appendix A.

Approximately 8,000 m of buried cable will be required for the collector system on private lands and an additional 56,000 m of buried cable in the road allowance. Exact cable sizes will be determined during the detailed design phase of the Project.

The location of the interconnection line is shown in Appendix A.

2.1.3 Access Roads and Crane Pads

2.1.3.1 Access Roads

Existing provincial and municipal roads will be used to transport project-related components, equipment and personnel to the Study Area. The Project would be situated exclusively on privately owned land and municipal road allowances. Access to these lands will be required for installation and operation of the wind turbines. Agricultural laneways will be utilized and

upgraded where possible. New laneways will be constructed as required and in consultation with landowners, to provide access to the individual turbine sites.

Approximately 8 km of new access roads will be constructed to support construction and transportation vehicles, and for use during the operation and maintenance phase (Appendix A). Access roads have been planned in consultation with the landowners, using existing farm roads where possible to reduce the amount of land required to access the turbine sites. This will result in reduction of potential impacts on the existing environment, as well as avoiding sensitive environmental areas. Every effort has been made to avoid intrusions by access roads into natural areas such as woodlots, and to minimize the number of water crossings required to access turbine sites. Entrance permits will be obtained from Huron East, Howick, and/or Huron County for the access roads.

Access roads will be approximately 6 m in straight sections, but potentially wider where turning of large construction vehicles, such as transport trucks delivering blades, towers, and nacelles, is required. The access roads will not require resizing for the operation phase, with the exception of the entrances off the municipal roads which require a wider turning radius of approximately 26 m. Access road construction will require staging areas and truck turnaround areas, which comprise a portion of the Project Location. The staging areas and truck turnaround areas would be temporary and would be restored to an acceptable condition for its intended use in consultation with the landowners at the end of the construction phase.

To construct the access roads, surface material will be stripped, stockpiled (topsoil separate from subsoil) and reused to the extent possible during the remediation of the truck turnaround areas, access road entrances and access road staging areas. Prior to the placement of aggregate, a geotextile material will be laid down to assist in keeping the aggregate separate from the soil layer. A gravel or stone base will then be installed to facilitate the movement of heavy construction equipment. The road base may be rolled to provide an even driving surface.

The depth of the roadbed will be approximately 0.4 m of Granular B type material. No blasting will be required for the installation of the access roads. The excavation for the roadbed is expected to be above the water table at all times of the year. The road construction for each turbine utilizes one to two excavators, two to three dump trucks and compaction equipment. The access road to each turbine will typically take one to three days of construction time. Noise and dust will be emitted from the equipment used to construct the access roads and other Project infrastructure such as foundations, crane pads, and turbines. The assessment of potential environmental effects from the construction of the Project is discussed below in Section 3.0.

2.1.3.2 Crane Pads

The crane pad area will be approximately 30 m x 20 m. Generally, the process for crane pad construction will be the same as that for access roads; surface material will be stripped and stockpiled (topsoil separate from subsoil) and a gravel or stone base applied. The excavated soil will be re-used on site as feasible. Once the turbine erection is complete, the gravel area

around each turbine and the crane pads will be kept, while the remaining construction area would be rehabilitated to an acceptable condition for its intended use in consultation with the landowners. Perimeter surface hydrology will be maintained during crane pad construction.

The depth of the gravel base will typically be the same throughout the entire turbine erection area including the crane pads (0.4 m of Granular B). The excavated soil will be re-used on site as feasible. If not feasible, the soil will be disposed of at an approved off-site facility. Perimeter surface hydrology will be maintained during crane pad construction.

2.1.4 Water Crossings

Where underground collector and interconnection lines/fibre optic cables cross watercourses and no culvert is required, the buried lines will be installed using directional drilling techniques in suitably sized plastic conduits at a sufficient depth below the watercourse to prevent any possibility of accidental damage due to dredging or over excavation. Signs indicating the presence and location of the cables will also be placed on either side of the watercourse.

Drill pits at either end of the directionally drilled section will be approximately 30 - 50 m from either side of the watercourse. The minimum depth of drilling will be 1 m, with a target depth of 1.2 m and up to 2.0 m under the water crossing (Figure 7, Appendix A). Signs indicating the presence and location of the cables will also be placed on either side of the watercourse.

Four permanent culvert installations will be required for access roads and associated underground electrical collector lines/fibre optic cables in the vicinity of turbines T4, T6, T14 and T15 (Figure 7, Appendix A). Where a culvert is being installed, a trench will be dug, the cables will be installed, and the culvert will be laid. Crossings will be developed in consultation with the Maitland Valley Conservation Authority (MVCA), and Department of Fisheries and Oceans (DFO) Operational Statements will be followed for all works in watercourses. Culverts may be placed on geotextile material and will be countersunk. They will then be backfilled with Granular A and compacted Granular B. Culvert diameter will be determined by the Construction Contractor. All installation activities will conform to *Ontario Provincial Standard Specification 421 (OPSS) – Construction Specification for Pipe Culvert Installation in Open Cut*. All crossings will require permit approval from the MVCA. All temporary crossings will comply with the DFO's Ontario Operation Statement '*Temporary Stream Crossings*' where possible.

2.1.5 Electrical Control Buildings and Operations and Maintenance Building

Two small unserviced electrical control buildings near the entrance to the turbine access roads for T8 and T15 will measure approximately 6 m X 12 m, and are anticipated to be prefabricated engineered structures with a concrete foundation that will extend below the frost line. The buildings will house electrical equipment such as isolation switches and protection and control equipment.

A serviced operations and maintenance facility, located at the access road entrance for T4 at Bridge Road (Figure 2) will be leased from a participating landowner. The building will include office and meeting facilities for maintenance staff, storage for small replacement parts, and the Supervisory Control and Data Acquisition (SCADA) and electrical/mechanical monitoring systems. This building is serviced, and no additional construction is required, with the exception of minor renovations to create office spaces.

2.1.6 Transformer Substation

A 44 kV/34.5 kV 15/20 MVA transformer substation will be constructed for connection to the existing distribution system originating from HONI's Wingham TS. The transformer substation will occupy an area approximately 20 m X 30 m in size on private lands located south-east of the intersection of Gough Road and McDonald Road in the Township of Howick (43.847°N, -81.154°W).

Area drainage from the substation will be accomplished through swales/ditches adjacent to the proposed access road that will collect and convey stormwater runoff from the substation area and the associated access road. The total drainage area associated with the substation and access road "hard" surfaces is less than 2 ha and therefore a "wet" water quality control pond (i.e. one containing a permanent pool) is not required, as per the MOE SWM Planning and Design Guidelines Manual (2003). In addition to the conveyance of runoff, the swales will also provide water quality control, which is a suitable stormwater management practice for such an area according to the MOE guidelines.

Within the substation footprint itself, the transformer will be equipped with oil containment storage area to capture oil in the event of a leak. Additionally, an oil/water separator will be incorporated into the design to treat any effluent before it enters the storm drainage swales.

2.1.7 Met Tower

St. Columban Energy LP has a 60 m tubular guyed met tower which was installed in 2006. This met tower has been used to identify the quality of the wind resource for the proposed Project. The wind data collected will be used to determine the best orientation of the wind turbines such that wind speed reduction from adjacent wind turbines will be minimized. This tower is a prospecting tower and may be removed upon reaching commercial operation. For operational purposes, permanent meteorological tower(s) will be installed within the project boundary. These towers are guyed lattice towers with monitoring sensors at various heights and will be used to complete a power performance study to ensure the performance of the wind turbines installed. The permanent meteorological towers will be installed to a height of at or near hub height. The lighting requirements of these structures will depend on location and requirements of Navigation Canada and Transport Canada regulations. The permanent meteorological towers remain for the duration of the Project's operating life.

2.2 PRE-CONSTRUCTION ACTIVITIES

Preliminary geotechnical work was completed to obtain general subsurface information within the area where the Wind Project is proposed (Golder Associates Ltd., 2006). This information was used in evaluating potential foundation designs for the turbines. It was found that the soil conditions are conducive for the design and construction of the Wind Project.

Prior to construction, a registered Ontario Land Surveyor (or equivalent) will survey all access road, collector line, interconnection line, and turbine locations as appropriate. Any temporary work locations will also be staked to ensure construction vehicles and personnel stay within the demarcated areas.

Additional detailed geotechnical work will be required prior to Project construction to confirm subsurface conditions within the construction area. A geotechnical survey involving bore-hole samples and in-situ testing will be undertaken prior to the design and construction of the tower foundations. The preliminary location of tile drainage has been determined through consultation with the landowners and aerial photographs for the Wind Project Area. Location of tile drainage and any other underground infrastructure in the vicinity of the underground interconnection line will be determined in consultation with the municipalities, landowners, and other stakeholders prior to construction. Further confirmation of the location of tile drainage will be determined through on-site testing as required.

2.3 MATERIALS BROUGHT ON SITE AND CONSTRUCTION EQUIPMENT

An estimate of the quantities and types of materials brought on site for the construction and installation of Project components (e.g. access roads, foundations) is provided below. All estimates will be confirmed and additional details provided upon hiring of the Construction Contractor. Additional materials brought on site include project infrastructure described above such as turbines and transformers. Construction vehicles such as excavators, transport trucks and cranes will also be brought on site during construction and installation activities.

To the extent possible these materials will be procured locally when available and in sufficient quality and quantity and at competitive prices. St. Columban Energy LP will follow the Ontario Feed-in Tariff Program requirements for minimum Ontario content, which promotes local procurement of materials.

Raw materials will be delivered to the turbine siting areas for use based on the delivery and construction schedule. If any materials require storage, they will be stored in the turbine staging areas for a short time, dependent on the construction schedule. A detailed delivery and construction schedule will be created during detailed design.

Information on the method of transporting the material is provided in Section 2.4. Information on the timeline and operational plan for transporting materials to the site is provided in Section 2.7.

The site locations where materials will be used are described in Section 2.5, and the mapping provided in Appendix A. Details on temporary storage are provided in Section 2.6.

Hazardous materials to be used during the course of construction are limited to fuels, lubricants and fluids that are required for use in construction equipment. These materials will be stored in appropriate storage units during the construction phase of the Project by the Construction Contractor. Designated storage unit areas and the type of storage units will be confirmed by the Construction Contractor prior to construction. The disposal of waste materials generated at the site or transported from the site is described in Section 3.9.

Subsurface excavations will be required for turbine foundations, crane pads, access roads, underground collector and interconnection lines, fibre optic cable (placed with underground collector lines), electrical control buildings, and the transformer substation. Details of the material requirements for Project infrastructure are provided below along with the types of construction equipment to be used. Backfill is required for the construction of access roads to the turbine sites, construction of crane pads, and for turbine foundation installation and site grading. Backfill required during construction, with the exception of aggregate, will utilize stockpiled material removed during the installation of below ground components – no additional fill from off-site sources is anticipated.

Estimated gravel requirements are provided in Table 2.3.

Table 2.3: Construction Gravel Requirements

Infrastructure	Gravel requirements
Access roads including turnaround areas and road entrances. (Assumes road depth of 0.4m plus 20%)	23,000 m^3 of Granular B type (8,000m x 6m wide x 0.4m deep x1.2 = 23,040)
Turbine crane pads (Assumes 900 square meters 0.5m deep x 15 WTGs x 1.2)	11,500 m^3 of Granular B type

2.3.1 Construction Equipment Used

Heavy construction equipment that is anticipated to be used, and representative model numbers of this type of equipment, includes the following:

- Heavy Lift Crawler Cranes – Liebherr Crane LG1550
- Dump trucks – GMC Tri-axle WG64T, Western Star Tandem
- Water trucks – Ford F600
- Backhoes – John Deere 310 SG, Case 580
- Excavators – Kobelco SK200, Hitachi UH083, Hitachi ZAXIS 270, Case 225
- Loaders – Case 621-D, Case 821

- Rollers – Ingersoll Rand SP-70
- Bulldozers – John Deere 750C, Case 1650 (with 60,000 lb winch)
- Graders – Champion 740
- Plough - Bron 250 (with discharge chute)
- Boom Truck - Western Star (with Hiab 300 Boom)
- Stone Slingers - 3300 Marooka
- Tractor - 250 HP
- Directional Drill - Vermeer 3650
- Hydrovac Truck - Western Star Tridem (with 6700 cfm system)
- Reel Trucks
- Concrete Trucks
- Smaller Cranes
- Drill Heads
- Reamers
- Fusion Equipment

Specifications for equipment, including size and weight, will be confirmed upon hiring of the Construction Contractor and available upon request. The number of trips required is estimated in Section 2.4, and will be confirmed upon hiring of the Construction Contractor. See Section 3.6.2 and 3.6.3 for potential effects from dust and noise, respectively. See Section 3.9 for potential effects and mitigation and management measures for chemicals used during construction. The heavy construction equipment will be brought into and out of the turbine siting areas via the access roads. Further information on transportation is provided in Section 2.4.

2.4 COMPONENT TRANSPORTATION

The Construction Contractor will implement a Traffic Management Plan and coordinate as required with the wind turbine supplier delivering the Project components to site to identify and deal with specific traffic planning issues including the management of traffic and the delivery of materials. The Plan will include details on the size and number of trucks, and the timeline and operational plan for transporting materials to the Project site (including the sequence of events, duration of activities, and timing with respect to season). The Plan may also include the use of signage, road closures, speed restrictions, truck lighting, load restrictions, and equipment inspections. The Traffic Management Plan will be developed, in consultation with the municipalities, during the detailed design phase, once the construction contracts have been awarded. St. Columban Energy LP will provide the Traffic Management Plan to local municipalities.

The potential effects to provincial and municipal roads from the delivery of Project materials are discussed in Section 3.7.7.

2.4.1 Turbines

The turbine manufacturer will be responsible for the transportation of all wind turbine components and related construction equipment to the Project site, and will secure the necessary transportation and safety permits (e.g. Ministry of Transportation Ontario (MTO)). In addition, the MTO will be consulted by the contractor responsible regarding the timing of deliveries in terms of considering any planned road works on provincial highways when developing the turbine delivery plan. The turbine manufacturer will develop a Transportation Plan for delivery of the turbine components to the individual turbine sites.

Along the component transportation route, intersections may require widening to accommodate the turning radius of the trucks carrying the tower, nacelle, and blades, and roads may require structural upgrading/widening. Road widths must be a minimum of 6 m. The clearance required on both sides of the road beyond the minimum 6 m road width is approximately 3 m. Where appropriate, the contractor or firm responsible will pay for any temporary or permanent road widening activities and structural upgrades within Huron East, Morris-Turnberry, Howick, and Huron County for transport of components to the Project Location. Various options are being considered for the transportation route, however it has been confirmed that direct access to the Project Location will be via Huron Road/Highway 8 to Manley Line or Beechwood Line. As a result of the proposed route to the Project Location no roads in close proximity to the Project Location are expected to require upgrading.

Any upgrading of roads that may be required, such as widening turning radii, may include widening and improvement of the granular base to accommodate the intended use and such upgrades are not considered significant. Maintenance and repairs of these roads will be discussed with Huron East, Morris-Turnberry, Howick, and Huron County.

The Project will be responsible for any structural enhancements to roads within Huron East, Morris-Turnberry, Howick, and Huron County. Once the full road requirements have been finalized, detailed plans including maintenance of the roads will be developed with the municipalities, as appropriate. The transport of construction related equipment will likely follow the same route to be used for component transportation to the site. Huron Road/Highway 8 will be the main access point for all Project related components.

Approximately 10 truckloads of turbine components will be transported to each turbine site. For public safety all nonconventional loads will have front and rear escort or “pilot” vehicles to accompany the truck movement on public roads.

Although there are no requirements for formal public notification of the Project component load movements, St. Columban Energy LP may notify the community and the municipalities of non-conventional load movements. This notification would be provided in the interest of public

safety, minimization of disruption of other road users and local businesses, and good community relations. The frequency and type of communications would be determined prior to construction.

2.4.2 Other Project Materials

The crane supplier(s) will be responsible for the transportation of all cranes and related components to the Project Location. The heavy-lift crawler crane will be shipped in pieces, requiring individual transport, and then assembled on-site.

Approximately 50 concrete truck trips are required per turbine foundation, for a total of approximately 750 concrete truck trips to the turbine siting areas.

An estimated 125 conventional truck and trailer units will transport such items as geotextile material, cabling, concrete reinforcement steel, foundation forms, and other miscellaneous materials for the construction of access roads, electrical collection system, interconnection line, wind turbine foundations, electrical control and operations and maintenance buildings, transformer station and other supporting infrastructure.

In addition to the above, an estimated 3,500 dump truck trips are required to transport the required aggregate material to construct the wind turbine access roads.

2.5 TEMPORARY USES OF LAND

Lands to be temporarily used during construction include temporary construction facilities, staging areas for access roads and cable construction, drill pits for directional drilling, delivery truck turnaround areas, staging areas at each turbine, and crane laydown areas. Any temporary structures used during construction will not be serviced, and will be placed within delineated construction work areas.

The existing land use for the wind project is agricultural, and land for temporary components would be restored to an acceptable condition for its intended use in consultation with the landowners following the end of the construction phase. Restoration work will follow installation of each wind turbine and removal of all construction materials (including granular and geotextile material) and equipment from each turbine site. Restoration activities will follow the Site Restoration Plan outlined in Section 2.3 of the Decommissioning Plan Report, and include de-compaction and reseeding as necessary.

2.5.1 Turbine Staging Areas

Turbine components will be delivered directly to the staging areas, and will be temporarily stored until assembled; there will be no central turbine laydown area. Turbine staging areas would be initiated in conjunction with turbine assembly, and would be rehabilitated to an acceptable condition for its intended use in consultation with the landowners following the end of

the construction phase. Turbine staging areas would be actively used to varying degrees during all construction activities at the turbine siting areas.

A 1,600 m^2 temporary work and storage area will be delineated around each turbine tower, which will be used for temporary storage of the turbine components, staging, parking, and foundation soil pile (Figure 4, Appendix A). Prior to construction each turbine and its associated components will be placed in close proximity to the turbine base within the temporary turbine staging areas (approximately 50 m long).

Portions of the staging areas have been reduced on a site-by-site basis to avoid natural features and water bodies, where possible.

These staging areas will be unimproved lands (e.g. no gravel or excavation required) and are shown in the construction site plan (Appendix A) surrounding the crane pad at each turbine site.

Turbine staging areas will be initiated in the 3rd quarter of 2013 in conjunction with turbine assembly. Turbine staging areas will be actively used to varying degrees during all construction activities.

2.5.2 Access Roads

Staging Areas

A staging area will be required for construction of the 6 m wide access road. The timing of the temporary use of land for the access road staging areas will begin with the construction of the access roads (anticipated Summer 2013) and these areas will be rehabilitated at the end of the construction phase. The duration of time that the land will be actively used is expected to be six to eight months.

Delivery Truck Turnaround Areas

All sites require turnaround areas for delivery trucks. These turnaround areas will be the same width as access roads, with turning radii, and will be constructed in the same manner, including the requirement for staging areas.

The timing of the temporary use of land for the delivery truck turnaround areas will begin with the construction of the access roads (anticipated Summer 2013) and these areas would be restored to an acceptable condition for its intended use in consultation with the landowners at the end of the construction phase. The duration of time that the land will be actively used is expected to be six to eight months.

The gravel and fill material that is used for the turning radii (same as the access roads) is to be removed from the temporary turning radii along the access roads. Restoration of the substrate to pre-impact conditions will then be completed once the gravel and fill material has been removed. Pre-impact conditions of the substrate are fully described throughout the NHA/EIS.

Access Road Entrances

Access road entrances require a wider turning radius for construction/delivery vehicles. Entrances will be approximately 25-30 m wide during the construction phase, and reduced to 6 m at the end of the construction phase. All dimensions will be discussed with the municipality during the municipal consultation and permitting process.

2.6 TIMING AND OPERATIONAL PLANS

Construction activities are anticipated to be ongoing throughout the 3rd and 4th quarters of 2013. The majority of construction works are planned for this period, with turbine installation occurring in the 4th quarter of 2013. The timing of key construction activities are provided in Table 2.4 below. Timing requirements with respect to natural heritage features (e.g. tree clearing, in-water works, etc.) are provided in Section 3.0. Preliminary transportation details are outlined in Section 2.4.

Table 2.4: Construction Activities – Projection and Schedule

Construction Phase Details	Schedule	Duration
Turbine Sites		
Delineation and staking of temporary work areas	July 2013	2 weeks
Access road construction	July-August 2013	6 weeks
Component transportation to Project Location	November 2013	4 weeks
Installation of tower foundations	September – October 2013	8 weeks
Installation of substation and construction of electrical control buildings	September – October 2013	8 weeks
Installation of crane pads	October 2013	2 weeks
Installation of underground collector lines parallel to access roads	August - October 2013	8 weeks
Installation of collector and interconnection lines in municipal road allowances	August - November 2013	12 weeks
Turbine delivery, assembly and erection	October – December 2013	12 weeks
Interconnection to point of common coupling on electrical grid	December 2013	1 week
Restoration of temporary work areas (de-compaction, topsoil replacement, reseeding, etc.)	November - December 2013	8 weeks

Note: Construction activities will take place during regular construction hours. When construction is anticipated to be required outside of these hours, the timing will be discussed in advance with Huron East, Morris-Turnberry, Howick and Huron County.

2.7 MATERIALS GENERATED AT, OR TRANSPORTED FROM, THE PROJECT LOCATION

During construction, waste material will be generated at, and transported from, the Project Location. Construction waste produced by the Project is expected to consist of general construction material (e.g. excess fill, soil, brush, scrap lumber and metal, banding, plastic wrap

removed from palletized goods, equipment packaging, grease and oil, steel, etc.), spoil from directional drilling activities (e.g., bentonite (clay) slurry), and a minor amount of domestic waste (i.e. garbage, recycling and organics). Construction waste disposal will be the responsibility of the Construction Contractor. The exact type of trucks and number of truck trips required to dispose of construction waste will be determined and confirmed by the Construction Contractor prior to construction of the Project.

Sanitary waste generated during the construction phase will be collected via portable toilets and wash stations supplied by a licensed third party who will be retained prior to the start of major construction activities. The licensed third party will be responsible for the transportation and disposal of all such waste according to regulatory requirements. The exact type of transportation and number of trips required will be determined and confirmed by the third party prior to construction of the Project.

Domestic waste (i.e. garbage, recycling, and organics) will be generated on-site by construction staff. On-site storage in weather-protected areas for collection and separation of waste materials will be located at a centralized storage area or the operation and maintenance building site. Domestic waste disposal will be the responsibility of the Construction Contractor. The exact type of trucks and number of truck trips required to dispose of domestic waste will be determined and confirmed by the Construction Contractor prior to construction of the Project.

Hazardous materials to be used during the course of construction are limited to fuels, lubricants and fluids that will be on-site for use in construction equipment. These materials will be stored in appropriate storage units during the construction phase of the Project by the Construction Contractor. Designated storage unit areas and the type of storage units will be confirmed by the Construction Contractor prior to construction. The exact type of trucks and number of truck trips required to dispose of hazardous materials will be determined and confirmed by the Construction Contractor prior to construction of the Project.

The gravel and geotextile material that will be removed from the temporary uses of land will require disposal following construction of the Project. Disposal of this material is described in the Decommissioning Plan Report, and may include reuse of the granular material. This will require the use of large dump trucks that are capable of transporting heavy loads of excavated gravel. The exact type of truck and number of truck trips required will be determined and confirmed by the Construction Contractor prior to construction of the Project. The excavated soil removed for installation of infrastructure will be stockpiled and re-used on-site as feasible. If not feasible, the soil will be disposed of at an MOE-approved off-site facility to be determined by the Construction Contractor.

Should contaminated soil be encountered during the course of excavations the contaminated material will be disposed of in accordance with the current appropriate provincial legislation, such as Ontario Regulation 347, the General – Waste Management Regulation.

There will be no on-site disposal of waste during the construction of the Project.

3.0 Potential Effects and Mitigation Measures

O. Reg. 359/09 requires that any adverse environmental effects that may result from construction or installation activities be described within a 300 m radius of those activities (known as the Zone of Investigation). This section describes the potential effects, mitigation measures (if required) and net effects that may result from construction or installation activities within the Zone of Investigation.

Descriptions of the existing natural heritage, water, archaeological and built heritage environments in the Study Area and/or Project Location can be found within the Natural Heritage Assessment & Environmental Impact Study (NHA/EIS), Water Assessment & Water Body Report (WA/WBR), Stage 1 and 2 Archaeological Assessments, the Protected Properties Assessment, and the Heritage Impact Assessment. These reports were completed for the Wind Project Study Area, reviewed by the Ministry of Natural Resources (MNR) and the Ministry of Tourism and Culture and Sport (MTCS), and finalized in 2011. Following addition of the underground electrical interconnection line in the fall of 2011, addendum reports were submitted to MNR and MTC in late 2011 and early 2012, and finalized in the spring of 2012. Final reports are provided in the complete REA application.

Description of potential effects and mitigation measures for specific features located within the setbacks specified by O. Reg. 359/09 are provided in the NHA/EIS, WA/WBR, Protected Properties Assessment, and Heritage Impact Assessment.

For most natural environment and socio-economic features, mitigation measures are anticipated to eliminate all effects.

The need, assessment, and selection of protection and mitigation measures discussed in the following sections have been predicated on the hierarchical principles of:

- avoidance – the elimination of adverse environmental effects by siting, construction scheduling, and design considerations;
- minimization – reduction or control of adverse environmental effects through Project modifications or implementation of protection and mitigation measures; and,
- compensation – enhancement or rehabilitation of affected areas.

The application of these principles has greatly reduced the potential for adverse environmental effects from the Project as demonstrated in the following subsections. The key mitigation strategy used to address potential negative environmental effects from construction of the Project was avoidance of significant natural features and waterbodies to the extent possible during siting of the Project.

Where net effects remain, they are characterized as either positive or adverse. Positive net effects were not assessed. Adverse net effects were assessed utilizing the following nine descriptors, as applicable:

- **Direction**: the degree to which an effect may be positive or adverse;
- **Duration**: the period of time until the element returns to baseline conditions;
- **Ecological/Social Context**: the nature of the area in which the effect may occur;
- **Frequency**: the number of times that an effect may occur;
- **Magnitude**: the degree to which an effect may occur;
- **Permanence**: the degree to which an effect will not return to baseline conditions;
- **Probability**: the likelihood that an effect may occur;
- **Reversibility**: the likelihood that an element will recover from an effect; and,
- **Spatial Extent**: the area within which an effect may occur.

The key performance objective for each of the potentially affected features discussed below is avoiding and/or minimizing potential effects (through the use of appropriate mitigation measures) throughout the construction phase of the Project. The proposed mitigation measures will assist in achieving this performance objective. Additional information related to specific performance objectives is detailed in the Construction Environmental Effects Monitoring Plan provided in Section 5.0.

3.1 HERITAGE AND ARCHAEOLOGICAL RESOURCES

3.1.1 Protected Properties and Heritage Resources

In accordance with O. Reg. 359/09, a Protected Properties Assessment and Heritage Impact Assessment were undertaken for the Wind Project Study Area, and are included under separate cover as part of the REA application. Both reports were completed and submitted to the MTCS, who confirmed that the methodology, recommendations, and conclusions were to their standards for both the Wind Project Study Area and the Interconnection Line Study Area.

The Protected Properties Assessment determined that there is one property designated by a municipal by-law made under section 29 of the Ontario Heritage Act (OHA) within the Project Study Area, the Cameron House at 84354 McNabb Line (adjacent to the Project Location for the underground electrical interconnection line). No protected properties were identified within the Project Location for the Wind Study Area.

A total of 47 resources of significant heritage value and two significant cultural heritage landscapes were identified along the Interconnection Line Study Area and within the Wind Project Area. Six 19th and 20th century windmills were also noted during the site visits. These windmills are considered to be significant in terms of their contribution to the character of the Study Area in general.

For each significant heritage resource and landscape, a Heritage Impact Assessment (HIA) was undertaken to identify potential Project-related negative impacts. Impacts evaluated include: destruction; alteration; shadows; isolation; direct or indirect obstruction of significant views; and changes in land use. Potential negative impacts were identified for 18 of the individual significant built heritage resources.

Potential Effects

Potential negative impacts are possible to the following properties and cultural landscapes within the wind study area:

- Built Heritage Resource (BHR) 12 – 43818 Summerhill Road
- BHR 16 – 43704 Bridge Road
- BHR 17 – 44004 Bridge Road
- BHR 18 – 44272 Bridge Road
- BHR 19 – 44395 Bridge Road
- BHR 21 – 80700 Maple Line
- BHR 22 – 80678 Beechwood Line
- Cultural Heritage Landscape (CHL) 2 – Manley Line Streetscape

Potential negative impacts are possible to the following properties and cultural landscapes within the interconnection line study area:

- BHR 24 – 81628 Manley Line
- BHR 25 – 44411 Sawmill Road
- BHR 26 – 82009 Manley Line
- BHR 33 – 83649 McNabb Line
- BHR 34 – 85869 McNabb Line
- BHR 35 – 84498 McNabb Line
- BHR 43 – 86774 Johnston Line
- BHR 46 – 87142 McDonald Line
- BHR 47 – 88721 McDonald Line

- CHL 3 - Cranbrook

Potential indirect effects to the protected property at 84354 McNabb Line are related to vibration from directional drilling used to install the below-grade electrical interconnection line, as described in the Protected Properties Assessment.

Potential impacts to the significant built heritage resources and significant cultural heritage landscapes are related to destruction, alteration, and direct or indirect obstruction of significant views, as described in the Heritage Impact Assessment.

Mitigation Measures

Project design will avoid damage to and removal of trees along the Manley Line Streetscape, and avoid removal of the early windmills.

The underground electrical interconnection line will be directionally drilled under the road ROW through Cranbrook, in order to avoid direct impacts to the identified protected property. While St. Columban Energy LP does not anticipate vibration to have an potential to impact the property, baseline testing of peak particle velocity (PPV) / level of vibration will be conducted – if no impact is detected the Construction Contractor will determine the need for additional testing, in consultation with a qualified engineer.

Specific mitigation measures for each identified significant built heritage resource and significant cultural heritage landscape are fully described within the Heritage Impact Assessment.

Generally, the mitigation measures to avoid potential impacts to the identified significant built heritage and significant cultural heritage landscape are to:

- Complete a study by a qualified engineer to determine acceptable levels of vibration for subject properties;
- Monitor vibrations during sub-grade construction activities to ensure that they do not exceed pre-determined limits;
- Halt activities if vibration levels exceed maximum thresholds;
- Avoid removal of trees in vicinity of properties and avoid damaging tree roots;
- Install the interconnection line near the centre of the road to ensure that Project activities avoid cultural resources to the greatest extent possible;
- Photographic documentation of views of 44004 Bridge Street prior to commencement of Project construction to be kept on file with the Municipality of Huron East, Huron County Museum Archives, and Huron County Historical Society; and,
- Avoid removal of trees in the vicinity of identified properties and cultural landscapes.

Net Effects

The MTCS has confirmed that the identified potential effects and mitigation measures are appropriate. By following the procedures recommended above, no adverse net effects on protected properties, significant built heritage resources and cultural heritage landscapes are anticipated during construction of the Project.

3.1.2 Archaeological Resources

A Stage I Archaeological Assessment was completed for the Wind Project Study Area in the Environmental Screening completed in 2009. The Assessment meets the criteria under O. Reg. 359/09, and is included as part of the REA submission under separate cover. The Stage I Archaeological Assessment determined that no archaeological sites have been registered within 2 km of the Wind Project Study Area. However, the Wind Project Study Area exhibits archaeological site potential for both Aboriginal and Euro-Canadian archaeological resources. Therefore, archaeological or historical materials or features may be found during construction.

The Wind Project Study Area for the Stage I Archaeological Assessment included the turbine locations proposed in this REA application, with the exception of T11, T12, T13, T14, and T15. St. Columban Energy LP has taken the conservative approach that the results of the Stage I Archaeological Assessment apply to the lands proposed for the new turbines sites and 2 km from the entire Wind Project Study Area used as part of this REA study, and conducted a Stage 2 Assessment on these lands, as well.

All lands proposed for development within the Wind Project Study Area were assessed as part of a Stage 2 Archaeological Assessment completed by Archaeological Services Inc. (ASI). No cultural material was identified during the Stage 2 Archaeological Assessment. The Stage 2 Archaeological Assessment concluded that the proposed facilities can be cleared of further heritage concerns.

Both reports were completed and submitted to MTCS, who confirmed that the methodology, recommendations, and conclusions were to their standards.

Following addition of the approximately 43 km underground electrical interconnection line, an addendum report was completed for the Interconnection Line Study Area, and submitted to MTCS for review and comment in the December, 2011 , with a confirmation letter from MTCS in the spring of 2012. The addenda looked at the underground electrical interconnection line and three small areas for the proposed electrical control buildings and the transformer station. For the interconnection line, 42 km is in disturbed municipal road right-of-way, and archaeological potential was determined to be non-existent. For the remaining 1.6 km of the line, the ROW was not disturbed, and archaeological potential was present; therefore test pitting was conducted along this length. No artifacts of archaeological value were found in test pits along the interconnection line, or on the three private properties where structures are proposed.

Potential Effects

Although there are no areas that would be excavated during construction that have not been assessed during the Stage 2 Archaeological Assessments, archaeological or historical materials or features may be found during construction.

Mitigation Measures

Should previously undocumented archaeological resources or historical materials be discovered during construction, all work within the vicinity of the find will be suspended and a MTCS archaeologist and appropriate Aboriginal communities will be contacted. In the event that human remains are encountered or suspected before or during construction, all work will stop immediately. Notification will then be made to the Ontario Provincial Police or local police who will conduct a site investigation and contact the district coroner. The MTCS, appropriate Aboriginal communities, and the Registrar of Cemeteries, Cemeteries Regulation Unit, Ministry of Consumer Services, will also be notified.

Net Effects

The MTCS has confirmed that the identified potential effects and mitigation measures are appropriate. By following the procedures recommended above no adverse net effects on archaeological resources are anticipated during construction of the Project.

3.2 NATURAL HERITAGE RESOURCES

In accordance with O. Reg. 359/09, an NHA/EIS was undertaken for the Project and is included under separate cover as part of the REA application. The reports (one for the Wind Study Area and one for the Interconnection Line Study Area) were completed and submitted to the MNR, who confirmed that the methodology, recommendations, and conclusions were to their standards. The following provides a summary of the potential effects and the associated mitigation measures as described in that report. In addition, potential effects and mitigation measures are identified for regulated features outside the setbacks, and unregulated natural features, which are not considered in the NHA/EIS. Natural heritage resources are shown in Appendix A.

Construction activities will occur in active agricultural cropland, or cleared municipal right-of-ways. Therefore, no significant natural features are found in the Project Location.

3.2.1 Wetlands

There are no provincially or locally significant wetlands identified in the Wind Project Location (construction area). No wetlands were identified within 120 m of the Wind Project Location during the records review; however, six wetlands were identified during site investigations by AECOM in 2007 (4) and Stantec in 2010 (2). As four wetlands were assessed by AECOM, and the report was approved by the MNR, the two wetlands identified by Stantec were assessed under the current process.

The records review identified one provincially significant wetland (PSW) and six locally significant wetlands (LSW) within 120 m of the Interconnection Line Project Location. An additional 14 unevaluated wetland units were identified during site visits in the fall of 2011. A total of 17 wetlands required an evaluation of significance.

All wetlands were conservatively evaluated as significant using provincial guidance. This allows for greater protection of the wetlands through mitigation. Potential impacts and mitigation measures are detailed in the NHA/EIS.

Potential Effects

As all components of the Project are sited outside wetland boundaries, there will be no direct loss of wetland habitat or function as a result of the Project. All Project components (except blade sweep) are greater than 120 m from wetlands. There will be no vegetation clearing or construction activities within any natural feature.

Indirect impacts resulting from construction activities, such as dust generation, sedimentation, and erosion are expected to be short term, temporary in duration and mitigable through the use of standard site control measures. During construction, there will be increased traffic and the potential for accidental spills.

Construction activities are proposed at 80 m at their closest point to the wetland features within the Wind Project Area. This distance is considered sufficient to attenuate potential negative effects. The majority of the wetland unit occurs more than 120 m from the Project Location. Research indicates that impacts from development activities do not generally extend to distances beyond 120 m (NHRM, 2010). Changes in surface water drainage can affect wetlands. No underground collector lines are proposed within 120 m of the wetland, and the turbine foundations are located 137.06 m and 151.43 m from the wetlands. Access roads are outside of 120 m from either wetland. When the distances of the Project components to features 3 and 4 (i.e. over 120 m) are considered together with the size and magnitude of the closest component (i.e. turbine blade tip), no changes to groundwater flow are anticipated.

Though construction activities are proposed adjacent to some natural features along the Interconnection Line Study Area, there will be no vegetation clearing or construction within any natural feature; no section of the Project Location is located in the natural feature. The majority of each individual wetland unit occurs more than 120 m from the Project Location, with a relatively small portion closest to the Project Location. Research indicates that impacts from development activities do not generally extend to distances beyond 120 m (NHRM, 2010), and burying an electrical interconnection line underground, outside of a natural feature is not anticipated to have any negative impacts if standard mitigation measures are applied (discussed below).

There will be no clearing of trees in or near the wetland features that could result in desiccation or drying.

All construction is greater than 120 m from the features. No known microhabitat changes have been identified as a result of wind turbines and ancillary infrastructure.

During construction of the turbines, the access roads will experience some traffic, which will vary in intensity as the construction phase progresses. Amphibians are at an increased risk from vehicle collisions in spring, particularly on cool rainy nights as they move towards warmer road surfaces (SWHTGDSS, Index #40). Given the temporary (i.e., one breeding season or less) nature of the increased traffic activity, the restriction of construction activities primarily to daytime hours and the design of access roads (unpaved, gravel) the risk of increased mortality during construction is considered low. Some limited mortality is possible; however, the potential long-term effects to wildlife populations from this mortality and from barrier effects are anticipated to be minimal.

Effects to significant woodland and wildlife habitat supported by the features are discussed in Sections 3.4.4 and 3.4.6, respectively.

Mitigation Measures

Avoidance was the main strategy used to minimize impacts to wetland habitat within 120 m of the Project Location. All components of the Project are sited outside the feature boundaries. Two turbines are located within 120 m of wetland features – T14 is 80.56 m from turbine blade tip to the wetland boundary (feature 3), and T2 is 94.93 m from turbine blade tip to the wetland boundary (feature 4). Turbine bases are sited more than 120 m from each feature (137 m and 151 m).

All other project components are located outside of 120m from each feature. Standard best management practices should be applied to all construction activities, as provided in the NHA/EIS, including:

- No development is permitted within wetland boundaries.
- Directional drilling where heavily vegetated (i.e. trees and shrubs) wetlands are immediately adjacent to the road ROW to avoid damage to treed vegetation for identified features.
- Directional boring will occur in areas where heavy or substantial vegetation (i.e., large trees and shrubs) is immediately adjacent to the road ROW to avoid damage to root systems.
- Inspectors will ensure that no construction disturbance occurs beyond the construction area and that edges of sensitive areas adjacent to the work areas are not disturbed.
- Inspectors will ensure construction vehicles and personnel stay within the construction envelope, thereby limiting the disturbance of natural vegetation.
- Where necessary, standard construction mitigation measures will be implemented to minimize dust, soil erosion and sedimentation.
- All equipment refueling will occur well away from wetlands. In the event of an accidental spill, the MOE Spills Action Centre will be contacted as appropriate and emergency spill

procedures implemented immediately by the Construction Contractor. Any fuel storage (within certified storage tanks) and activities with the potential for contamination will occur in properly protected and sealed areas well removed from wetlands.

Mitigation measures related to dust are outlined in Section 3.6.2. Mitigation measures for erosion and sediment control are outlined in Section 3.5.2. Mitigation measures for traffic are outlined in Section 3.7.7.

Net Effects

The setback of more than 137 m of turbine bases from wetlands will ensure that there is no disruption of wetland function and no net loss of wetland area. These separation distances will reduce disturbance effects due to construction activities.

Limiting construction activities for the interconnection line to within the municipal road ROW will also ensure that there is no disruption to wetland function and no net loss of wetland area. With the application of the above mitigation measures, no adverse net effects on wetlands are anticipated during construction of the Project.

3.2.2 Areas of Natural and Scientific Interest

One regionally significant Life Science Area of Natural and Scientific Interest (ANSI) is located within 120 m of the Interconnection Line Project Location; none were identified within the Wind Project Location. There are no Earth Science ANSIs in the Study Area for either the Wind or Interconnection Line components.

Potential Effects

Potential effects on the ANSI are similar to those for wetlands, above.

Mitigation Measures

Mitigation measures would be similar to those used for wetlands, above.

Net Effects

Limiting construction activities for the interconnection line to within the municipal road ROW will ensure that there is no disruption to the ANSI. With the application of the above mitigation measures, no adverse net effects on ANSIs are anticipated during construction of the Project.

3.2.3 Valley Lands and Hazard Lands

No valley lands or hazard lands are located within the Wind or Interconnection Line Study Areas.

Potential Effects

No potential effects on valley lands or hazard lands are anticipated during construction of the Project.

Mitigation Measures

No potential effects will occur and therefore no mitigation measures are necessary.

Net Effects

No adverse net effects on valley lands and hazard lands are anticipated during construction of the Project.

3.2.4 Woodlands

The dominant land use in the Study Area is agriculture. The woodlands are small, fragmented, and typically represent deciduous forest and deciduous swamp. According to the Municipality of Huron East (County of Huron Planning and Development Department, 2003), all woodlands within the Project Study Area are considered significant.

Though most wooded areas are located outside of the Zone of Investigation, there is some overlapping of the 120 m Zone of Investigation and woodland features. Six significant woodland features (including two swamps discussed in Section 3.4.1) were identified within 120 m of the Wind Project Location. Nineteen significant woodland features were identified within 120 m of the Interconnection Line Project Location (18 during the records review, and one additional during the site investigation). No woodland features are located within the Interconnection Line Project Location.

Potential impacts and mitigation measures are detailed in the NHA/EIS.

Potential Effects

No direct loss of woodland habitat is proposed for the Project, and no new edge will be created. For the Wind Project, all components (except blade sweep) are greater than 120 m from woodlots. Distance between blade tip and the closest woodland edge ranges from 80.56 m to 93.46 m.

The Interconnection Line components are sited outside the woodland boundaries, and there will be no direct loss of woodland habitat or function as a result of the construction of the underground interconnection line. Setbacks from the interconnection line range from adjacent to 94 m to the closest edge.

Clearing activities during construction will result in the removal of vascular plants and portions of plant communities. A botanical survey of the area found that most plant species were common in Ontario. No rare species of vegetation are to be removed as part of the Project. Alteration or removal of vegetation for access roads and turbine installation could have the potential to affect both flora and fauna through loss of species diversity, by reducing or fragmenting available

habitat (especially for species with low mobility), from the introduction or spread of invasive species, and from the temporary disruption to movement of wildlife. Due to the currently fragmented nature of the Project Study Area and the amount of habitat that will remain in the Project Study Area, no loss of species diversity is anticipated from the construction of the Project.

Indirect impacts resulting from construction activities, such as dust generation, sedimentation and erosion are expected to be short term, temporary in duration and mitigable through the use of standard site control measures.

During construction, there would be increased traffic and the potential for accidental spills.

In addition, disturbance from construction has the potential to affect habitat use of woodlands by birds, and vehicle movements within the Project Study Area may disturb local wildlife. However, with the temporary duration of construction (4 weeks) between August and November, 2013, it is anticipated that there will be no long-term negative effects.

Effects to significant wildlife habitat supported by the features are discussed in Section 3.4.6.

Mitigation Measures

Avoidance was the main strategy used to minimize impacts to woodland habitat within 120 m of the Project Location. All components of the Project are sited outside the woodland boundaries. Standard best management practices should be applied to all construction activities:

- Inspectors would ensure construction vehicles and personnel stay within the construction area, thereby limiting the disturbance of natural vegetation.
- All equipment refueling would occur well away from woodlands. In the event of an accidental spill, the MOE Spills Action Centre would be contacted as appropriate and emergency spill procedures implemented immediately by the Construction Contractor.
- Any fuel storage (within certified storage tanks) and activities with the potential for contamination would occur in properly protected and sealed areas well removed from woodlands.
- Efforts have been made to site the Project infrastructure along existing roadways to limit clearing of natural areas.
- As appropriate and prior to construction, the limits of vegetation clearing would be staked in the field. The Construction Contractor would ensure that no construction disturbance occurs beyond the construction envelope and that edges of sensitive areas adjacent to the work areas are not disturbed.

- In order to minimize the spread of existing invasive species, all disturbed areas would be re-vegetated as soon as conditions allow.
- Where necessary, standard construction mitigation measures would be implemented to minimize dust, soil erosion and sedimentation.
- Vehicle movements within construction areas and access roads would be minimized to avoid disruption to wildlife.

Mitigation measures related to dust are outlined in Section 3.6.2. Mitigation measures for erosion and sediment control are outlined in Section 3.5.2. Mitigation measures for traffic are outlined in Section 3.7.7.

Net Effects

Limiting construction to the Project Location as currently marked, and within the municipal road ROW would limit potential effects on woodlands. Indirect impacts resulting from construction activities, such as dust generation, sedimentation, and erosion are expected to be minimal to none, and mitigable through the use of standard site control measures.

3.2.5 Provincial Parks and Conservation Reserves

No Provincial Parks or Conservation Reserves are located within the Study Area.

Potential Effects

No potential effects on Provincial Parks or Conservation Reserves are anticipated during construction of the Project.

Mitigation Measures

No potential effects would occur and therefore no mitigation measures are necessary.

Net Effects

No adverse net effects on other designated natural features are anticipated during construction of the Project.

3.2.6 Significant Wildlife and Wildlife Habitat

Two features containing significant wildlife habitat (amphibian breeding ponds) were identified within 120 m of the Wind Project Location.

One feature containing significant wildlife habitat (winter deer yard) was identified within 120 m of the Interconnection Line Project Location.

Generalized candidate significant wildlife habitat within 120 m of the Interconnection line Project Location is assumed to be present, and was treated as significant.

No species of conservation concern were identified in or within 120 m of the Project Location.

Potential Effects

No potential effects on significant wildlife and wildlife habitat are anticipated during construction of the Project.

All Project components are sited outside the habitat, so no direct loss of amphibian breeding habitat or winter deer yard habitat is proposed for the Project. Turbine blade tips are found within 120 m of the amphibian breeding habitat.

Construction activities are proposed at 80 m at the closest point to amphibian habitat at T3, and the majority of the deer yard occurs more than 120 m from the Project Location. This is considered to be sufficient to reduce or eliminate potential negative effects. During construction, traffic would increase on access roads, increasing risk to amphibians from vehicle collisions in spring, particularly on cool rainy nights as they move toward warmer road surfaces.

Noise during construction can interfere with frog calling rates, which could impact fitness. As well, noise may not allow breeding frogs to properly hear and move toward breeding aggregations (Sun and Narins, 2004, Penna et al., 2005, Maxell and Hokit, 1999).

Indirect impacts resulting from construction activities, such as dust generation, sedimentation and erosion are expected to be short term, temporary in duration and mitigable through the use of standard site control measures. During construction, there would be the increased potential for accidental spills.

Given construction activities from August to November only, and the temporary disturbance of increased traffic activity, the potential short-term and long-term effects to winter deer and amphibian populations are anticipated to be minimal to non-existent.

Mitigation Measures

Avoidance was the main mitigation strategy used to minimize impacts to amphibian breeding habitat and deer winter yard habitat within 120 m of the Project Location. Standard best management practices should be applied to all construction activities:

- Inspectors would ensure construction vehicles and personnel stay within the construction envelope, thereby limiting disturbance of natural vegetation;
- Where necessary, standard construction mitigation measures would be implemented to minimize dust, soil erosion and sedimentation.
- All equipment refueling would occur well away from amphibian habitat and deer winter yard habitat. In the event of an accidental spill, the MOE Spills Action Centre would be

contacted as appropriate and emergency spill procedures implemented immediately by the Construction Contractor.

- Any fuel storage (within certified storage tanks) and activities with the potential for contamination would occur in properly protected and sealed areas well removed from amphibian habitat and winter deer yard habitat.

Consultation is on-going with the Ministry of Natural Resources (MNR) regarding threatened and endangered species. Prior to construction, all applicable permits and approvals would be obtained, and all conditions contained within permits and approvals would be implemented.

Net Effects

Given the temporary (i.e., one breeding season or less) nature of the increased activity, the mitigation measures proposed above should result in low risk of amphibian mortality during construction. Some limited amphibian mortality is possible; however, the potential long-term effects to wildlife populations from this mortality and from barrier effects are anticipated to be minimal. Masking of frog calls may be significant immediately underneath a turbine, but effects rapidly decrease with distance from the turbine. The closest turbine base is 137 m from the amphibian breeding habitat, and is not considered to have an effect on calls.

The setback distance from the features with amphibian habitat to construction activities and turbine bases is considered to be sufficient to mitigate any potential noise and disruption effects.

The temporary disturbance and anticipated construction date would ensure that there is no disturbance to deer, disruption of habitat function and no net loss of habitat area. The mitigation measures described above would ensure no adverse effects to the winter deer yard during construction of the Project.

No adverse net effects on significant wildlife and wildlife habitat are anticipated during construction of the Project.

Post-construction disturbance and mortality monitoring would be conducted to verify effects predictions and additional operational mitigation would be implemented if unanticipated effects occur.

3.2.7 Other Wildlife and Wildlife Habitat

The majority of species found within the Wind Project Location are ranked S5 (i.e., secure - common widespread and abundant) or S4 (apparently secure - uncommon but not rare) in Ontario.

Generalized candidate significant wildlife habitat within 120 m of the Interconnection Line Project Location is assumed to be present and must be treated as significant.

Potential Effects

Clearing activities during construction would result in the removal of vascular plants and portions of plant communities in the Wind Project Location. Alteration or removal of vegetation for access roads and turbine installation could have the potential to affect both flora and fauna through loss of species diversity, by reducing or fragmenting available habitat (especially for species with low mobility), from the introduction or spread of invasive species, and from the temporary disruption to movement of wildlife. Due to the currently fragmented nature of the Wind Project Location and the amount of habitat that would remain in the Wind Study Area, no loss of species diversity is anticipated from the construction of the Project.

As all components for the interconnection line are sited outside the habitat in municipal road ROW, there will be no direct loss of habitat or function as a result of the Project. There would be no clearing of trees in or near features that could result in desiccation or drying. Indirect impacts resulting from construction activities, such as dust generation, sedimentation and erosion are expected to be short-term, temporary in duration, and mitigable through the use of standard site control measures.

During construction, there will be increased traffic and the potential for accidental spills. Sensory disturbance of wildlife may also occur as a result of increased on-site human activities and vehicular traffic. However, a certain level of sensory disturbance to wildlife in the Study Area already exists from ongoing agricultural activities.

Indirect disturbance to birds, particularly breeding birds, and their habitats, may occur as a result of increased on-site human activities, traffic, dust, or noise during construction.

No direct effects to bats are anticipated as a result of construction of the Project.

Given the temporary nature of increased traffic activity and anticipated construction window for the interconnection line of August to November 2013 and the erection of barrier fencing (i.e. silt fencing), the risk of increased mortality to wildlife during construction is considered low. Some limited mortality is possible; however, the potential long-term effects to wildlife populations from this mortality and from barrier effects are anticipated to be minimal.

Mitigation Measures

Avoidance was the main mitigation strategy used to minimize impacts to wildlife habitat within 120 m of the Project Location. Standard best management practices should be applied to all construction activities:

- Inspectors would ensure that no construction disturbance occurs beyond the construction area.
- Where necessary, standard construction mitigation measures would be implemented to minimize dust, soil erosion and sedimentation.

- All refueling would occur well away from generalized significant wildlife habitat. In the event of an accidental spill, the MOE Spills Action Centre would be contacted as appropriate and emergency spill procedures implemented immediately by the Construction Contractor.

- Any fuel storage (within certified storage tanks) and activities with the potential for contamination would occur in properly protected and sealed areas well removed from generalized significant wildlife habitat.

- Silt barriers to be erected along feature edges that occur within 30 m of construction work for the interconnection line to ensure prevention of wildlife access and work zone should be walked through prior to fencing installation to flush out any wildlife.

- Construction machinery should be checked daily prior to operation.

- Any snakes or turtles encountered within the work zone should not be handled prior to contacting MNR.

- Efforts have been made to site the interconnection line along existing roadways to limit clearing of natural areas.

- As appropriate and prior to construction, the limits of vegetation clearing would be staked in the field. The Construction Contractor would ensure that no construction disturbance occurs beyond the construction envelope and that edges of sensitive areas adjacent to the work areas are not disturbed.

- In order to minimize the spread of existing invasive species, all disturbed areas would be re-vegetated as soon as conditions allow.

- Vehicle movements within construction areas and access roads would be minimized to avoid disruption to wildlife.

Mitigation measures have been identified for traffic, dust and noise in Sections 3.7.7 and 3.6.2, and 3.6.3, respectively.

Net Effects

There is some potential for disturbance to wildlife during construction of the Project through limited vegetation removal and increased human activity and traffic. Some limited mortality is possible, however potential long-term effects to wildlife populations from this mortality and from barrier effects is anticipated to be minimal because of the temporary nature of the activity.

The temporary construction activities of the interconnection line, and the fact that no construction would occur within any generalized significant wildlife habitat features, would ensure that there is no disruption of habitat function and no net loss of habitat area. The

mitigation measures described above would ensure no adverse effects to wildlife habitat during construction of the Project.

3.2.8 Significant Flora and Vegetation Communities

Potential Effects

No significant flora or vegetation communities have been identified in or within the Project Location.

Mitigation Measures

Consultation is on-going with the Ministry of Natural Resources (MNR) regarding threatened and endangered species. Prior to construction, all applicable permits and approvals would be obtained, and all conditions contained within permits and approvals would be implemented.

Net Effects

With the application of the above mitigation measures, no adverse net effects to significant flora and vegetation communities are anticipated during construction of the Project.

3.2.9 Other Flora and Vegetation Communities

Potential Effects

Clearing activities during construction would result in the removal of vascular plants and portions of plant communities. Alteration or removal of vegetation for access roads and turbine installation could have the potential to affect both flora and fauna through loss of species diversity, by reducing or fragmenting available habitat (especially for species with low mobility), from the introduction or spread of invasive species, and from the temporary disruption to movement of wildlife. Due to the currently fragmented nature of the Project Study Area and the amount of habitat that would remain in the Study Area, no loss of species diversity is anticipated from the construction of the Project.

Mitigation Measures

Site-specific mitigation measures for other flora and vegetation communities are provided in the NHA/EIS, including:

- Efforts have been made to site the Project infrastructure along existing roadways to limit clearing of natural areas.
- A site visit with staff from Huron East, Morris-Turnberry, Howick and/or Huron County would be conducted to identify areas requiring clearing or pruning.
- Revegetation of the municipal road ROW would be in consideration of the requirements of Huron East, Morris-Turnberry, Howick and/or Huron County.

- As appropriate and prior to construction, the limits of vegetation clearing would be staked in the field. The Construction Contractor would ensure that no construction disturbance occurs beyond the construction envelope and that edges of sensitive areas adjacent to the work areas are not disturbed.

In order to minimize the spread of existing invasive species, all disturbed areas would be re-vegetated as soon as conditions allow.

Net Effects

Though the effects are anticipated to be minimal, there is some potential for disturbance to flora and vegetation communities as a result of the limited removal of vegetation and increased human activity. However, these effects are expected to be short-term in duration and spatially limited to the work areas and their immediate vicinity.

3.3 WATER BODIES AND AQUATIC RESOURCES

3.3.1 Groundwater

Potential Effects

Preliminary geotechnical work was completed by Golder Associates Ltd. to obtain general subsurface information within the Project Study Area. No groundwater is expected to be encountered during construction of the Project. However, if groundwater is encountered, seepage would be controlled during grubbing and stripping and during subsequent excavation and fill placement. As such, it is possible that some dewatering activities may be required when installing the tower foundations and/or, underground collector lines. Review of the preliminary geotechnical investigations and borehole information indicated that water withdrawn would be minimal and would not exceed 50,000 litres (L) per day.

It is not anticipated that the construction of the turbines would adversely affect groundwater quality, quantity, or movement. Existing water wells are not located near the turbine foundation excavation areas. As a result, it is anticipated that private wells would not be affected by construction activities for the wind turbines. There are water wells within 120 m of the Project Location for the interconnection line, and there is the potential for impact to these wells during construction of the underground line.

There also is potential for discharge to the environment due to spills of materials such as fuel, lubricating oils and other fluids associated with construction.

Mitigation Measures

If groundwater is encountered during excavations, good construction practices would be used, such as minimizing the length of time that the excavation is open and monitoring seepage into the excavation. Should pumping be required to dewater excavated areas, water would be directed into the nearest drain or spread across the Project Location and appropriate energy

dissipation techniques would be utilized to reduce the potential for erosion and sourcing. Discharge piping would be free of leaks and would be properly anchored to prevent bouncing and snaking during surging. The rate of discharge would be monitored to ensure no erosion or flooding occurs. If energy dissipation measures are found to be inadequate, the rate of dewatering would be reduced or ceased until satisfactory mitigation measures are in place.

Project infrastructure is not sited within 120 m of residential wells within the Wind Project Area. For the interconnection line, approximately 70 residential wells, as identified by the MOE, are located within 120 m of the proposed location within the municipal road allowance. Consultation with the community has identified more wells not found in the MOE's database that could be within 120 m of the construction area for the interconnection line. In the event that wells are encountered during construction, the Construction Contractor may, at the landowner's request, test pre-and post-construction water quality to ensure there is no impact to well water quality. In the event that well water quality is impacted as a result of construction, St. Columban Energy LP will provide a temporary potable water supply until corrective measures are taken and will comply with MOE's *Guideline B-9: Resolution of Groundwater Interference Problems*. The interconnection line will be buried no deeper than 2.0 m in the vicinity of existing residential wells; therefore, we do not anticipate any impacts.

In terms of accidental spills or releases to the environment, undesirable materials on-site are limited to fuel, lubricating oils, and other fluids associated with turbine construction. Large quantities of these materials would not be stored at the construction sites and do not represent a significant potential adverse effect on the groundwater in the event of an accidental spill. As per S.13 of the *Environmental Protection Act*, all spills that could potentially have an adverse environmental effect, are outside the normal course of events, or are in excess of the prescribed regulatory levels would be reported to the MOE's Spills Action Centre by the Construction Contractor.

A Construction Emergency Response Plan would be developed by the Construction Contractor and/or St. Columban Energy LP and would include protocols for the proper handling of material spills and associated procedures to be undertaken in the event of a spill. See Section 4.0 for more information on the Emergency Response Plan.

Net Effects

Some localized and temporary disturbance to groundwater may be possible during the excavation of the turbine foundations or other Project components. However, it is anticipated any potential effects would be short term in nature and have little to no effect on groundwater flow conditions or adjacent private water wells.

3.3.2 Surface Water, Fish and Fish Habitat

The following provides an assessment of potential effects and mitigation measures for all surface water features within 300 m of the Project Location (see Appendix A, Figure 1). In accordance with O. Reg. 359/09, a WA/WBR was undertaken for the Project (included under

separate cover as part of the REA application) to determine the presence of water bodies as defined by O. Reg. 359/09 and associated setbacks.

Watercourses in the Project Study Area are within the Maitland River watershed, and drain into the South Maitland River before it converges with Lake Huron to the west.

Seven watercourses are present within 120 m of the Wind Project Location, all of which were determined to contain fish habitat. Fish were found in all but one watercourse during 2010 and 2011 field investigations. None of the fish species captured are considered indicator species. Three watercourses were determined to be within 120 m of a turbine – T7 (Ryan Drain), T3 (Woods Drain), and T1 (Carpenter Drain).

Twenty-three watercourses are present within 120 m of the Interconnection Line Project Location, all of which contain fish habitat. DFO mapping and correspondence with MNR have identified the presence of Rainbow (a freshwater mussel) in the Little Maitland River at one of the proposed interconnection line crossing locations. Field investigations conducted in October 2011 revealed the presence of fish species within the Maitland River at two proposed crossings for the underground electrical interconnection line; however, none of the fish species observed are considered indicator species.

No Lake Trout lakes were identified within 300 m of the Project Location.

Potential Effects

Watercourse crossings are required for T4, T6, T14, and T15 for underground collector lines and access roads. Watercourse crossings for T14 and T15 would require resizing of an existing culvert. Where underground collector and interconnection lines/fibre optic cables cross watercourses and no culvert is required, the buried lines will be installed using directional drilling techniques in suitably sized plastic conduits at a sufficient depth below the watercourse to prevent any possibility of accidental damage due to dredging or over excavation. Where a culvert is being installed, a trench will be dug, the cables will be installed, and the culvert will be laid. DFO Operational Statements will be followed for all works in watercourses.

Drill pits at either end of the directionally drilled section would be approximately 30 - 50 m from either side of the watercourse. The minimum depth of drilling would be 1 m, with a target depth of 1.2 m and up to 2.0 m under the water crossing. (Figure 7, Appendix A). Signs indicating the presence and location of the cables will also be placed on either side of the watercourse.

All crossings will require permit approval from the MVCA. All temporary crossings would comply with the DFO's Ontario Operation Statement '*Temporary Stream Crossings*' where possible.

Construction Activities in Proximity to Watercourses

Construction activities could impact watercourses, including vegetation removal, removal and reinstallation of existing culverts, installation of new culverts, placement of underground

collector lines, and installation of the interconnection line. All activities could result in sediment release into the watercourse and erosion of the streambank, causing degradation of fish habitat. Additional effects may result from excavation, stockpiling, spreading and soil relocation activities. Erosion can cause downstream sediment transport and a short-term increase in surface water turbidity, including associated impacts to fish and fish habitat.

Due to the Project Location's rural and agricultural land uses, the watercourses are not highly sensitive to temporary disturbances. However, the magnitude and duration of potential effects to watercourses depend on the specific characteristics of each watercourse (e.g. flow regime, water velocity, bed substrates, bank conditions, local soils and the extent and duration of exposure). In addition, some materials, such as fuel, lubricating oils and other fluids associated with construction, have the potential for release to the environment in the event of accidental spills.

Watercourse Crossings

Culvert and underground collector and interconnection line installation can potentially affect surface water quality through downstream sediment transport, resulting in increased turbidity and disturbance to fish and fish habitat. Culvert installation may also enclose portions of a watercourse, cause the loss of bed material within the length of the culvert, and cause changes to riparian vegetation within the road allowance.

Installation of underground collector lines may also cause the collapse of the punch or bore hole under a stream, and disturb riparian vegetation as well as bottom and bank substrates resulting in disturbance to fish and fish habitat.

Mitigation Measures

General mitigation measures for fish habitat impacts include the following:

- All in-water work would be completed within MNR timing windows to protect local fish populations during their spawning and egg incubation periods. A typical construction timing window for warmwater streams in Guelph District (Clinton Area) is July 1 to March 15.
- All materials and equipment used for site preparation and Project construction would be operated and stored in a manner that prevents any deleterious substance (e.g., petroleum products, silt, etc.) from entering the water:
  - Any stockpiled materials would be stored and stabilized away from the water;
  - Refuelling and maintenance of construction equipment would occur a minimum of 100 m from a water body;
  - As appropriate, spills would be reported to the MOE Spills Action Centre by the Construction Contractor;

- Any part of equipment entering the water would be free of fluid leaks and externally cleaned/degreased to prevent any deleterious substance from entering the water; and
- Only clean material, free of fine particulate matter would be placed in the water.

The following erosion and sediment control measures would be implemented prior to construction and maintained during the construction phase to prevent entry of sediment into the water:

- Silt fencing and/or barriers would be used along all construction areas adjacent to water bodies;
- No equipment would be permitted to enter any water bodies beyond the silt fencing during construction;
- All sediment and erosion control measures would be inspected at least weekly and during and immediately following rainfall events to ensure that they are functioning properly and are maintained and/or upgraded as required;
- Topsoil stockpiles would be sufficiently distant from watercourses to preclude sediment inputs due to erosion of stored soil materials;
- If the sediment and erosion control measures are not functioning properly, no further work would occur until the sediment and/or erosion problem is addressed;
- All disturbed areas of the construction site would be stabilized immediately and re-vegetated as soon as conditions allow;
- Sediment and erosion control measures would be left in place until all areas of the construction site have been stabilized, as determined by the Construction Contractor; and,
- Work areas, including areas used for soil excavation, stockpiling, spreading and relocation, would be sufficiently distant from watercourses to preclude sediment inputs due to erosion of stored soil materials.

Vegetation removal on the slopes of watercourses would be minimized to the extent possible, to minimize the risk of slope failure and siltation. Stream banks (i.e. the area between erosion control fences) would not be disturbed until necessary for construction activities.

As soon as possible following completion of the construction activity, stream banks would be restored to their original grade. Seeding would be completed during favourable climatic conditions. Once sown, seed would be protected with a layer of erosion control matting that would assist in stabilizing the slope and propagation of the seed mixture. In the event that broadcast seeding is not feasible due to seasonal restrictions, hydroseeding would be considered.

Even with properly installed erosion and siltation control measures, extreme runoff events could result in collapse of silt fencing, slope or trench failures and other problems which could lead to

siltation of watercourses. If siltation to a watercourse occurs, activities would cease immediately until the situation is rectified. The Emergency Response Plan would contain procedures for spill contingency and response, spill response training, notification procedures, and necessary cleanup materials and equipment. As per s.13 of the *Environmental Protection Act*, all spills that could potentially have an adverse environmental effect, are outside the normal course of events, or are in excess of prescribed regulatory levels would be reported to the MOE's Spills Action Centre by the Construction Contractor.

Additional erosion and sediment control measures may be installed at the discretion of the Construction Contractor.

The following mitigation measures would be implemented when installing new culvert crossings:

- Culverts would be sized according to hydrologic requirements to be determined during the detailed design / permit application stage. Other technical requirements may influence culvert size and materials.
- Where fish habitat is present, culverts would be installed such that fish passage is maintained. Where a watercourse provides indirect habitat, the culvert would continue to convey flow to downstream areas.
- Culverts would be designed and installed such that there is no restriction of flows through the culvert resulting in upstream pooling, no erosion at the culvert inlets and outlets, and no barriers to fish passage to upstream environments.

Specific methods for culvert installation would be dependent on culvert type, size and construction seasons. If a temporary access road is required, the DFO Operational Statement for Temporary Stream Crossings can be used if the specific conditions can be met. This Operational Statement includes details of mitigation measures. The DFO Operational Statement for Temporary Stream Crossings can be found in Appendix D of the WA/WBR.

Under flowing water conditions, water would be pumped around the work area in order to install a culvert. Steps for how a site can be isolated for culvert construction are provided in the WA/WBR.

As appropriate, the Construction Contractor (or designate) would be on-site during installation of watercourse crossings to ensure compliance with specifications and site plans. In particular, the Construction Contractor would ensure that pre-construction preparation is completed prior to commencement of in-stream work and that bank, bed, and floodplains are restored to pre-existing conditions, as possible, following completion of the construction activities.

Where required, the Construction Contractor would ensure that detailed pre-construction profiles of the slopes, banks, and bed are determined prior to installation of the collector lines, interconnection line and/or roads. The Construction Contractor would monitor weather forecasts prior to the installation of the crossings, particularly before crossings of watercourses with year-round flow.

Underground collector and interconnection lines may be installed by directional drilling. Where applicable, DFO Operational Statements would be followed to protect fish and fish habitat. Additional mitigation measures for new culvert crossings, and underground collector and interconnection lines are provided in Sections 5.2 and 5.3 of the WA/WBR.

Net Effects

The application of the above mitigation measures during construction would ensure that effects to surface water, fish and fish habitat due to construction activities are minimized, and that any potential net effects are spatially and temporally limited.

With the implementation of the above mitigation measures, it is expected that there would be no negative effects to aquatic species at risk as a result of constructing the Project.

3.4 AIR QUALITY AND ENVIRONMENTAL NOISE

3.4.1 Air Emissions

The MOE collects ambient air data at almost 40 monitoring sites across the province to determine the state of air quality. Monitoring stations record concentration levels of some or all of the six most common air pollutants: sulphur dioxide, ozone, nitrogen dioxide, total reduced sulphur compounds, carbon monoxide and fine particulate matter. Monitoring results from the Grand Bend, the closest station to the Project Study Area, were chosen to assess the local ambient air quality. During 2011, air quality within the local airshed was rated as Moderate to Good, with less than 5 Poor air quality days in the summer months, primarily due to elevated ozone readings. To May 28, 2012, there have been 3 Poor air quality days in 2012 (Air Quality Ontario - http://www.airqualityontario.com/reports/aqisearch.cfm?stationid=15020&startmonth=all)

Potential Effects

Construction activities rely on using a wide range of mobile equipment, such as bulldozers, dump trucks, and cranes. The engine exhaust from these vehicles, especially from those operating on diesel fuel, represents a source of particulate and other emissions (e.g. sulphur dioxide, nitrogen oxide, volatile organic compounds, polycyclic aromatic hydrocarbons, and carbon dioxide) from the construction site. Traffic delays also result in increased emissions from vehicles traveling slowly through construction zones. The delivery of materials such as concrete to construction sites can also generate emissions, especially for sites that are relatively far from material manufacturers.

Mitigation Measures

To reduce emissions from equipment and vehicles, several mitigation measures would be employed:

- Multi-passenger vehicles would be utilized to the extent practical;

- Company and construction personnel would avoid idling of vehicles when not necessary for construction activities;
- Equipment and vehicles would be turned off when not in use unless required for construction activities and/or effective operation;
- Equipment and vehicles would be maintained in good working order with functioning mufflers and emission control systems as available;
- All vehicles would be fitted with catalytic converters as required by applicable regulation;
- All construction equipment and vehicles would meet the emissions requirements of the MOE and/or MTO;
- As appropriate, records of vehicle maintenance would be retained and made available for periodic review by the Construction Contractor; and
- All vehicles identified through the monitoring program that fail to meet the minimum emission standards would be repaired immediately or replaced as soon as practicable.

A Construction Traffic Management Plan would be developed by the Construction Contractor and would include protocols for the management of traffic and for the delivery of materials to the construction site. The Communications and Complaint Response Protocol would also identify a mechanism for neighbours to notify St. Columban Energy LP and the Construction Contractor if emissions become a concern.

Net Effects

The application of the recommended mitigation measures during construction would limit air emissions to the work areas and limit the magnitude of combustion emissions. As a result, any adverse net effects to air quality from air emissions are anticipated to be short-term in duration and highly localized.

3.4.2 Dust and Odour Emissions

Potential Effects

Construction related traffic and activities (e.g. excavation, grading, soil stripping and exposed areas) have the potential to create nuisance dust effects in the immediate vicinity of the Project. High winds during dry weather may erode and disperse loose soil material away from the construction area, which may be a nuisance to residential properties located in close proximity to the construction sites. Storage piles exposed to wind can also be a source of fugitive dust emissions, as can various road surfaces such as unpaved roads. No odour emissions are anticipated during construction of the Project.

Mitigation Measures

To protect adjacent receptors from potential off-site dust concerns, the Construction Contractor would implement good site practices during construction, which may include:

- Maintaining equipment in good running condition and in compliance with regulatory requirements;
- Protecting stockpiles of friable material with a barrier or windscreen and in the event of dry conditions and excessive dust;
- Dust suppression (e.g. water) of source areas; and,
- Covering loads of friable materials during transport.

An Environmental Management Plan (see Section 4.0) would be developed by the Construction Contractor and would include protocols for dust emission control.

As mentioned above, St. Columban Energy LP would develop and implement a Communications and Complaint Response Protocol for the construction phase to address any reasonable concern from the public such as complaints about dust.

Net Effects

The application of the recommended mitigation measures during construction would limit fugitive dust emissions to the work areas. As a result, any adverse net effects to air quality from dust emissions are anticipated to be short-term in duration and highly localized.

3.4.3 Environmental Noise

Potential Effects

During construction of the Project, noise would be generated by the operation of heavy equipment at the work areas and associated vehicular traffic on-site and on haul routes. The audible noise at receptors beyond the construction areas is expected to be a minor, short-term disruption.

Mitigation Measures

To minimize inconvenience brought on by noise during the construction phase, all engines associated with construction equipment would be equipped with mufflers and/or silencers in accordance with MOE and/or MTO guidelines and regulations. Noise levels arising from equipment would also be compliant with sound levels established by the MOE.

To the greatest extent possible, construction activities that could create excessive noise would adhere to any local noise by-laws and any requirements of the Occupational Health and Safety Act. Sources of continuous noise, such as portable generator sets, would be shielded as appropriate or located so as to minimize disturbance to local residents.

Net Effects

Application of the recommended mitigation measures during construction should limit noise emissions to the general vicinity of the work areas. Intermittent noise would increase during

construction at the work areas and/or along the haul route. Any adverse net effects due to noise are anticipated to be short-term in duration and intermittent.

3.5 LAND USE AND SOCIO-ECONOMIC RESOURCES

3.5.1 Areas Protected Under Provincial Plans and Policies

Potential Effects

No areas protected under specified Provincial Plans and Policies are located within the Study Area. No adverse effects are anticipated to areas protected under Provincial Plans and Policies during construction of the Project.

Mitigation Measures

No potential effects would occur and therefore no mitigation measures are necessary.

Net Effects

No adverse net effects are expected as a result of the Project.

3.5.2 Existing Land Uses

Potential Effects

The lands in and within the Project Location are mostly designated as agricultural land and zoned for agricultural use (AG1), and allow very limited development. Therefore, it is unlikely that the area would be developed in the near future. No planned developments or proposed land use changes which may be impacted by the Project have been identified in consultation with Huron County, and Huron East. The municipal consultation process will confirm that interconnection line construction will have no effect on planned developments or proposed land use changes in these municipalities.

The development of the Project is estimated to take out of agricultural production approximately 12.5 acres of land, which is equivalent to less than 1% of the total land options for the Project. Most of this land will be used to provide road access to the wind turbines, and these roads have been designed in such a manner as to reduce their overall length, and in consultation with the landowners, to assist with and improve the current and future cultivation of the agricultural lands. Residential, commercial and institutional land uses would not be removed as a result of this Project.

It should be noted that the development of wind turbines is a permitted use in the AG1 zoning designation in Huron East. There are no Official Plan or Zoning By-Law amendments required for the Project in accordance with Schedule K of Bill 150. Agricultural lands where Project infrastructure is located would be changed from present land use for the duration of the Project. During construction there would be a temporary increase in noise and dust levels around the work and haul areas resulting in a potential effects to adjacent land uses.

Mitigation Measures

Landowners would be compensated by St. Columban Energy LP for agricultural land that would be taken out of production during the lifespan of the Project through the land lease agreements. Mitigation measures have been identified for dust and noise in Sections 3.6.2 and 3.6.3, respectively.

Net Effects

Although some disturbance to adjacent land uses is unavoidable, it is expected to be short-term in duration, temporary, and minimized through the implementation of good site practices, transportation planning, and communication with the community.

3.5.3 Recreation Areas and Cultural Features

The St. Columban teams of the Western Ontario Soccer League use two soccer fields adjacent to St. Columban Catholic School within the Wind Study Area. The season lasts from the end of May to the end of September, and games are scheduled throughout the week on weekend afternoons and weekday evenings.

St. Columban Catholic Elementary School, part of the Huron-Perth Catholic District School Board is within the Wind Study Area. There is an enrollment of approximately 153 students from Grades 3 to 8. This school is closely tied with St. Patrick's Church in Dublin and the surrounding community.

Knox Presbyterian Church, a Knights of Columbus Hall and the Cranbrook Community Hall are located within the Interconnection Line Study Area. St. Columban Cemetery and one un-marked cemetery (located on Winthrop Rd) are also located within the Study Area.

Project infrastructure is sited on privately and municipal owned lands, and does not include or border local hiking or cycling routes, fishing or conversation areas or parks.

Potential Effects

During construction, noise and dust are potential nuisance effects on cultural and recreational features within the Study Area. Increased traffic during construction may also be a nuisance.

Mitigation Measures

Mitigation measures have been identified for dust and noise in Sections 3.6.2 and 3.6.3, respectively, and mitigation for traffic would be discussed and finalized with the municipalities prior to construction.

Net Effects

Although some disturbance is unavoidable, it is expected to be short-term in duration, temporary, and minimized through the implementation of good site practices, transportation planning, and communication with the community.

3.5.4 Agricultural Lands and Operations

Potential Effects

Agricultural land-use in the Project Study Area is dominated by crop production including corn, hay, wheat, barley, oats and soybeans. There is the potential to affect agricultural lands and operations due to Project construction activities, which may create a temporary inconvenience to site-specific cropping patterns and livestock on leased properties. The turbine towers and access roads would displace approximately 12.5 acres of prime agricultural land. No specialty crop or locally significant agricultural lands have been identified in the Project Study Area.

During Project construction, additional land in excess of the final Project footprint would be required to accommodate the construction and assembly of the individual turbines. There would be no impact on prime agricultural lands, specialty crops or locally significant agricultural lands on the properties of non-participating landowners.

Soils

Agricultural soils would be disturbed as a result of construction. Activities during wet months or extended periods of heavy rainfall could have adverse impacts on agricultural lands. The movement of heavy machinery on wet soil may cause rutting, compaction, and mixing of topsoil and subsoil, which may break down soil structure and affect soil fertility, thereby reducing soil productivity. When exposed, soils are more prone to erosion. The degree of erosion is affected by the intensity and duration of rainfall and/or wind events, soil moisture, surface soil cover, slope, soil texture, structure, and organic matter content. Improperly salvaged topsoil can result in topsoil and subsoil mixing, compaction, rutting, and erosion. This can affect re-vegetation of the construction area and potentially decrease crop yields.

Artificial Drainage

Construction could result in adverse effects to artificial drainage, including tiles being crushed or cut by machinery. Temporary or permanent disruption to water flow could result in soil erosion or crop loss on adjacent lands due to flooding.

Livestock

Impacts to livestock during the construction phase of the Project are anticipated to be minimal. It is advised that the construction team and property/livestock owners maintain regular communication in order to ensure a minimum level of impact on livestock.

Mitigation Measures

To the greatest extent possible, efforts have been made to site the turbines, access roads, collector lines and the interconnection line in such a way as to minimize disturbances to existing agricultural lands and operations. In particular, siting of turbines and access roads are completed with the approval of the participating landowner. Construction activities would be

restricted to the delineated construction areas. Construction of the interconnection line would occur entirely with the municipal ROW.

Soils

Where agriculturally productive lands are impacted by heavy rainfall events and wet soil conditions, St. Columban Energy LP would implement a wet soil shutdown practice; if conditions deteriorate to a situation where ruts under vehicles become deep enough to cause topsoil/subsoil mixing or create excessive compaction or make topsoil/subsoil separation too difficult, those activities would cease. Construction activities would continue when conditions improve and those soil qualities are protected.

In areas where activity on agricultural land would be for the duration of the construction only, the Construction Contractor would monitor topsoil stripping to ensure that the correct depth of topsoil is removed and stockpiled in a manner that avoids mixing with subsoil material. Stone picking would occur before and after topsoil replacement and during cleanup.

Following the completion of construction, as appropriate, temporary workspaces would be graded and de-compacted (if required), the topsoil replaced, and the area restored to an acceptable condition for its intended use in consultation with the landowners. The option of de-compacting soil with an agricultural subsoiler, followed by discing, chisel ploughing or cultivating, to smooth the surface, may be considered on a site-specific basis. Soil density and/or penetrometer measurements may be used as a means of assessing the relative degree of soil compaction and to determine if additional compaction relief is required.

Where there is potential for erosion or where erosion has already developed, silt fence and straw bales (or appropriate substitutes) would be installed to reduce soil transport. The location of such protection measures would be determined by the Construction Contractor. Topsoil salvage and/or replacement would be avoided during heavy precipitation or extremely windy conditions. Silt control fencing would be installed and maintained throughout construction and restoration until lands are fully stabilized.

If Soybean Cyst Nematode (SCN) is identified in agricultural fields, the pre-construction program would include soil analysis for each agricultural row crop field to determine the extent of the SCN infestation. Any field identified to contain SCN would be recorded and the location provided to the Construction Contractor. Additionally, any imported topsoil would have a composite sample analyzed for SCN before it is used in construction. If SCN fields are identified, appropriate mitigation measures would be developed, such as washing stations for equipment, and/or restricted access to fields.

Artificial Drainage

The location of artificial tile drainage and associated drains would be confirmed with each landowner on a site-specific basis prior to construction activities on leased properties.

Avoidance of all tile drains may not be possible. Some artificial tile drains may be severed or may require re-alignment due to the installation of the underground power lines and/or wind turbine tower foundation excavations. Should tile drains be severed or crushed during construction activities, locations would be recorded and flagged.

If a main drain, header tile, or large diameter tile is severed, a temporary repair would be made to maintain field drainage and prevent flooding of the work area and adjacent lands. Information and mapping from the landowner will be used to best address any problems. Severed tile drains that are not immediately repaired would be capped to prevent the entry of soil, debris, or rodents. After the repair of each severed tile, and prior to backfilling, the landowner would be invited to inspect and approve the repair. If flooding of adjacent agricultural land occurs as a result of a severed tile and subsequent soils are damaged or crops are lost, the impacted area would be rehabilitated as soon as possible.

Where there is potential for damage during construction, the operation of the drains would be monitored during the construction phase, immediately after final clean up, and after the spring thaw the following year.

Where necessary, a qualified drainage specialist would be retained to identify reasonable drainage solutions. An agricultural tile drainage contractor would carry out any re-alignment works as well as repair tiles and/or drains that may experience construction related damage. To ensure the success of measures recommended by the drainage specialist all persistent drainage problem sites would be monitored quarterly for a one year period after repair.

All drain works would be conducted in consultation with the local Drainage Superintendent to ensure drainage is not impeded. Disruption to drainage ditches, culverts, field entrances, and fences would be repaired appropriately.

Livestock

The construction team and property/livestock owners would maintain regular communication in order to ensure a minimum level of impact on livestock during construction. In areas where agricultural land may be utilized by livestock, it would be necessary to erect temporary fencing around the workspaces, install gates to accommodate access through pasturelands, and/or move the livestock to different fields for short periods of time. This requirement would be determined in consultation with the landowner prior to the commencement of construction and St. Columban Energy LP would bear the cost of any such requirements.

Net Effects

Disturbances to agricultural lands and operations are expected to be temporary and spatially limited. However, as appropriate, temporary construction areas would be rehabilitated following construction and restored to agricultural use.

3.5.5 Mineral, Aggregate, and Petroleum Resources

Based on field studies conducted in November 2011, aggregate resources appear to be actively utilized near or within the Project Study Area, including for example, Handy Aggregates on Hensall Road. There are potential aggregate extraction areas in the vicinity of Johnston Line and Centre Line Road in the Township of Howick.

Potential Effects

Lands designated as Potential Aggregate Resources according to Huron County's Official Plan are situated in the Wind Project Study Area and along the interconnection line, particularly in the area of Johnston Line and Centre Line Road. While lands designated for resource extraction are present, construction of the Project is not anticipated to have any effect on mineral and aggregate resources in the wind study area, as the lands required for the Project have been granted for renewable energy development instead of mineral and aggregate extraction by each participating landowner. Along the interconnection line, further discussions with the municipalities will identify the locations of deposits, and the details of any known plans to develop these resources.

The Project Study Area lies within a region of southern Ontario with known oil and gas resources, and there are no oil and gas pipelines within 300 m of the Project Location. There is one abandoned petroleum well within 300 m of the Interconnection Line Project Location – near the intersection of McNabb line and Brandon Road. No adverse effects are anticipated to petroleum resources during operation of the Project.

Mitigation Measures

As no potential effects are anticipated to existing mineral or aggregate resources, no mitigation measures are necessary. St. Columban Energy LP will work with the Township of Howick to address any potential issues surrounding aggregate operations proposed for the area of the interconnection line.

Project components are sited more than 75 m from a mapped petroleum well location, however, underground locates would be conducted prior to construction given the known potential for unrecorded, improperly decommissioned wells.

Net Effects

No adverse net effects are anticipated to petroleum resources during construction of the Project.

3.5.6 Game and Fishery Resources

Potential Effects

The area is largely cleared for agriculture and there are no game or fishery resources that could be deemed inaccessible, therefore there is no potential for creating access to previously inaccessible areas.

Sensory disturbance to game species may occur during the construction phase due to noise and increased traffic and human activity. A certain level of sensory disturbance to wildlife in the Project Study Area already exists from ongoing agricultural, rural, and domestic activities.

Mitigation Measures

It is anticipated that those who participate in outdoor recreation on Project lands would choose an alternate location for their recreation during construction. Mitigation measures related to noise are identified in Section 3.6.3.

Net Effects

Construction noise effects on games species are anticipated to be temporary and intermittent.

3.5.7 Local Traffic

Provincial and other major infrastructure within the Project Study Area includes Huron Road/Highway 8, Winthrop Road/Highway 17, Blyth Road/Highway 25, Newry Road/Highway 16, and Amberly Road/Highway 86. Characteristic of low density rural agricultural areas, very low traffic levels are supported by the municipal rural concession roads surrounding the Project. Local traffic and area residents comprise the majority of traffic on these roads which do not typically facilitate through traffic or access to major traffic arteries.

Potential Effects

Traffic on municipal roads will increase during construction due to a commuting workforce, the transport of Project components, construction machinery, equipment and supplies, and to remove excess materials and waste from the Project Study Area. In addition, transport of Project equipment and supplies would include carrying excess loads and large turbine components. Truck trips would be noticeably reduced after the access roads and foundations have been installed and the turbine components are on-site. The increase in traffic, including excess load traffic, may result in short-term, localized disturbance to traffic patterns, increase in traffic volume, and create potential traffic safety hazards.

Installation of the underground electrical interconnection line in the municipal road ROW could cause temporary disturbance to traffic during equipment mobilization. The line is proposed to be installed just off the grass gravel interface at the edge of municipal roads, subject to each municipality's agreement, to reduce impacts to infrastructure and traffic, and will be directionally bored under all road crossings. This will eliminate the need to close roads during installation.

Mitigation Measures

No permanent access roads would be built with access onto Huron Road/Highway 8 or Amberley Road/Highway 86 to reduce the impact on traffic flows in the Project Study Area.

High traffic volume periods would be considered to reduce potential delays. The Construction Contractor would implement a Traffic Management Plan to identify and deal with specific traffic

planning issues including the management of traffic and the delivery of materials (see Sections 3.7.7 and 3.8.1).

Detailed plans or agreements regarding maintenance and/or repairs of local roads damaged during construction would be developed with Huron East, Morris-Turnberry, Howick and Huron County. The municipalities may identify the need for pre and post construction road surveys, and St. Columban Energy LP would conduct as necessary.

Net Effects

Truck traffic would increase on some roads during turbine and other component deliveries, but would be restricted to predetermined routes and times to the greatest extent possible. Road safety is not expected to be an issue during the construction phase, however, the potential for accidents along the haul routes and on-site cannot be totally avoided.

Effects of construction on traffic are anticipated to be limited, and short term.

3.5.8 Local Economy

As of November 2011, three businesses are located within or near the Interconnection Line Study Area, and 12 businesses are located within the Wind Project Study Area. These businesses include farms, a general store, a hardware store, trucking businesses, a pottery store, a welding and repair shop, wood products, and electrician services.

Potential Effects

Construction of the Project is expected to begin in July 2013 with a commercial operation date of December 2013/Early 2014. During construction, the actual number employed and the make-up of those employed would vary over time as the Project goes through the various construction phases. It is estimated that up to 10 person years (one person year is equivalent to a full-time position for one year) of direct employment would be generated over the construction period.

The construction of the Project would also result in indirect and induced employment, the majority of which is anticipated to be filled by local businesses. Indirect employment is jobs and income in other businesses/industries in the community that supply inputs to the Project and Project employees. Induced employment includes jobs and income changes occurring in other businesses/industries in the community from spending activities of directly and indirectly employed individuals.

To the extent possible, local hiring would be maximized during the construction period providing work for existing qualified tradespersons and labourers. Trades that could be provided locally may include pipefitters, electricians, ironworkers, drivers, millwrights and carpenters.

Since it is likely that the labour force would be supplied through local and neighbouring communities no special housing, healthcare or food facilities would be required as part of the Project construction activities.

While the increased number of personnel present in the area during the 6-month construction period would increase the demand for some goods and services from the local area (e.g. lodging, food, and banking), the demand is expected to be nominal and short-term. This demand would also generate local benefits to business and services from Project spending.

Potential disruption to use and enjoyment of businesses may occur within the Project Study Area during construction. Potential disruptions could be caused by physical effects from dust (Section 3.6.2) and traffic noise (Section 3.6.3).

Potential effects to agricultural lands and operations due to Project construction activities are discussed in Section 3.7.4.

Mitigation Measures

To the extent possible St. Columban Energy LP and/or the Construction Contractor would source required goods and services from local qualified suppliers where these items are available in sufficient quantity and at competitive prices.

The Construction Contractor would implement a Traffic Management Plan, as described in Section 4.0, to identify and deal with specific traffic planning issues including the management of traffic and the delivery of materials. The program may include the use of signage, road closures, speed restrictions, truck lighting, load restrictions, and equipment inspections.

Disruptions in the vicinity of local businesses would be largely due to an increase in traffic, and would be short term and are not expected to affect use of these businesses.

Section 3.6.4 describes the mitigation measures for reducing the impact of construction activities on agricultural lands and operations.

Net Effects

A positive net effect is anticipated on the local economy during construction of the Project. The Project provides income, employment, and fiscal benefits to the local area, and participating landowners. Both Huron East and Huron County would receive ongoing property tax income from the Project and participating landowners would receive land lease payments. A nominal increase in municipal services is possible for Huron East, Morris-Turnberry, Howick and Huron County. Existing businesses within local communities could benefit from the demands of the Project workforce during construction.

Traffic effects would be temporary, of short duration, and cease upon completion of the construction of the Project.

3.6 EXISTING LOCAL INFRASTRUCTURE

3.6.1 Provincial and Other Infrastructure

Provincial and other major infrastructure within the Project Study Area includes Huron Road/Highway 8, Winthrop Road/ Highway 17, Blyth Road/Highway 25, Newry Road/Highway 16, and Amberley Road/Highway 86. Municipal infrastructure in the vicinity of the Project Location includes municipal road allowances and municipal drains.

Potential Effects

During construction there is potential to interfere with local utilities and transportation of excess loads and large turbine components may produce abnormal wear on the municipal roads.

St. Columban Energy LP will consult with the owners of any potentially impacted provincial or major infrastructure, and will continue discussions with Huron East, Morris-Turnberry, Howick, and Huron County regarding any potential effects to municipal interests. St. Columban Energy LP is committed to working with the Huron East, Morris-Turnberry, Howick and Huron County to obtain all necessary permits, approvals, and agreements related to the Project.

St. Columban Energy LP will also continue to consult with local utility providers, to ensure the location of all utilities is known and no potential effects will occur. Municipal road allowances will be used for the siting of collector lines and the interconnection line in consultation with the Huron East, Morris-Turnberry, Howick, and Huron County. There is potential for increased traffic during construction on provincial roads due to commuting workforce, the transport of Project components, equipment and supplies, and removal of excess materials and waste from the Project Study Area. In addition, transport of Project equipment and supplies would include carrying excess loads and large tower components (e.g. turbine components). Truck trips would be noticeably reduced after the access roads and foundations have been installed and the turbine components are on-site. Truck traffic during the winter is anticipated to be minimal. The increase in traffic, including excess load traffic, may result in short-term, localized disturbance to traffic patterns, increase in traffic volume, create potential traffic safety hazards, and/or produce abnormal wear on the roads.

Permits from the MTO may be required to facilitate the component transportation on provincial highways. It is not anticipated that the additional traffic on the provincial highways would cause any significant traffic congestion.

Potential effects to these municipal drains are discussed in the Water Assessment and Water Body Report, and in Section 3.5.2.

Mitigation Measures

The Construction Contractor would implement a Traffic Management Plan as described in Section 4.0. St. Columban Energy LP would develop a Municipal Roads Agreement in consultation with the municipalities, and undertake consultation with the MTO regarding any

necessary agreements related to wear on roads from transportation of Project materials in addition to obtaining the required permits for use of provincial highways. To the extent that any roads are damaged as a result of the construction activities, the roads would be repaired to their original condition.

Project infrastructure has not been sited in proximity to other local utilities. In the event that any unidentified utilities are damaged during the construction of the Project, St. Columban Energy LP will pay for repairs. Any agreements between St. Columban Energy LP and the municipalities will be discussed during the consultation process.

Plans or agreements regarding maintenance and/or repairs of the local roads damaged during construction will be developed with the respective municipality. Pre and post construction road surveys are expected to form part of these plans or agreements.

Mitigation measures are discussed in Section 3.5.2. The respective municipality will be consulted to determine that no permits are required for work within municipal drains.

Net Effects

Truck traffic would increase on some roads during turbine and other component deliveries, however this traffic would be restricted to predetermined routes and times to the greatest extent possible. Road safety is not expected to be an issue during the construction phase, however the potential for accidents along the haul routes and on-site cannot be totally avoided. Abnormal wear on roads is also possible, though unlikely on provincial highways.

The effect of constructing the various Project components is anticipated to have a limited, short term effect on traffic during construction.

3.6.2 Navigable Waters

Potential Effects

Project infrastructure and/or construction activities would not require the crossing of navigable waters.

Mitigation Measures

No potential effects would occur and therefore no mitigation measures are necessary.

Net Effects

As construction activities would not require the crossing of navigable waters, no adverse net effects on navigable waters are anticipated during construction of the Project.

3.7 WASTE MANAGEMENT AND CONTAMINATED LANDS

Potential Effects

Landfill Sites

The location and classification of landfills sites in the Project Study Area was determined through a review of the MOE Waste Disposal Inventory (1991), and review of municipal Official Plans. No landfill sites were found within the Project Study Area.

Contaminated Lands

The land within the Project Study Area is predominately rural and agricultural in nature, dominated by agricultural fields. There is potential for finding contaminated sites and improperly decommissioned oil and gas wells or pipelines during construction, therefore the possibility of encountering such lands and infrastructure cannot be completely ruled out.

All of the turbines and ancillary facilities are located on land currently used for agricultural production, and the interconnection line is located within the municipal ROW, and thus given the present and historical land-uses the potential for encountering contaminated material or soils is minimal.

Waste Generation

Waste materials expected to be generated during construction are described in Section 2.8 and would be temporarily stored on-site and would require reuse, recycling, and/or disposal at an appropriate MOE-approved off-site facility. Improper disposal of waste material generated during construction may result in contamination to soil, groundwater, and/or surface water resources on and off the Project sites. Litter generated during construction may also become a nuisance to nearby residences if not appropriately contained and allowed to blow off the construction-site.

Spills

Some materials, such as fuel, lubricating oils and other fluids associated with construction, have the potential for discharge to the on-site environment through accidental spills.

Mitigation Measures

In the event that previously unknown contaminated soils, such as buried tanks, drums, oil residue or gaseous odour, are uncovered or suspected of being uncovered, construction would cease in that location until the source of the contamination is further investigated. In such an instance, St. Columban Energy LP would retain expert advice on assessing and developing a soil sampling, handling and remediation plan. All contaminated material would be managed in accordance with the applicable sections of the *Environmental Protection Act* and Regulation 347.

During construction, the Construction Contractor would implement a site-specific waste collection and disposal management plan, which may include site practices such as:

- systematic collection and separation of waste materials within on-site storage areas in weather-protected areas located at either a central storage area or the operation and maintenance building;
- all waste materials and recycling would be transported off-site by private waste material collection contractors licensed with a Certificate of Approval – Waste Management System;
- contractors would be required to remove their excess materials from the site (e.g. extra cable, formwork, scrap metals, pallets, etc.);
- excess materials generated during the course of construction excavations of soil would be handled in accordance with the MOE's Protocol for the Management of Excess Materials in Road Construction and Maintenance;
- excess excavated soils may be reused elsewhere on the property with landowner permission;
- labelling and proper storage of hazardous and liquid wastes (e.g. used oil, drained hydraulic fluid, and used solvents) in a secure area that would ensure containment of the material in the event of a spill. As per s.13 of the *Environmental Protect Act*, all spills that could potentially have an adverse environmental effect, are outside the normal course of events, or are in excess of the prescribed regulatory levels would be reported to the MOE's Spills Action Centre by the Construction Contractor;
- dumping or burying wastes within the Project sites would be prohibited;
- should contaminated soil be encountered during the course of excavations the contaminated material would be disposed of in accordance with the current appropriate provincial legislation, such as Ontario Regulation 347, the General – Waste Management Regulation;
- disposal of non-hazardous waste at a registered waste disposal site(s);
- if waste is classified as waste other than solid non-hazardous, a Generator Registration Number is required from the MOE and the generator would have obligations regarding manifesting of waste. Compliance with Schedule 4 of Regulation 347 is mandatory when determining waste category;
- implementation of an on-going waste management program consisting of reduction, reuse, and recycling of materials;
- disposal of sanitary wastes would be the responsibility of the contracted third party and they would ensure disposal in accordance with appropriate legislation, standards and policies; and,

- the cement provider would be responsible for ensuring that wash water from the cleaning of cement truck drums is disposed of in a sewage works designed for that purpose and approved under Section 53.(1) of the *Ontario Water Resources Act*, or under Part 8 of the *Building Code Act*.

In terms of accidental spills or releases to the environment, standard containment facilities and emergency response materials would be maintained on-site as required. Refuelling, equipment maintenance, and other potentially contaminating activities would occur in designated areas, and as appropriate spills would be reported immediately to the MOE Spills Action Centre by the Construction Contractor.

Construction Waste Management Plans would be developed by the Construction Contractor and would include protocols for the reuse, recycling and/or disposal of solid, hazardous and sanitary waste. See Section 4.0 for more information on the Construction Waste Management Plans.

Net Effects

With the application of the mitigation measures outlined above, no net effects are anticipated on-site during construction. In terms of waste disposal, it is possible that there would be a minor incremental effect on soil, groundwater, and surface water at the waste disposal site(s) depending on municipal on-site containment practices and quality of the landfill protection mechanisms (e.g. use of geotextiles to contain leachate). It is assumed that licensed waste disposal sites are legally compliant.

3.8 PUBLIC HEALTH AND SAFETY

Potential Effects

Potential effects to public health and safety are largely in the form of increased construction related traffic (Sections 3.7.7 and 3.8.1), dust emissions (Section 3.6.2), construction noise (Section 3.6.3) and unauthorized access of the public to the work sites.

Mitigation Measures

Implementing transportation planning and safety measures during construction would minimize the potential for traffic related safety concerns. A detailed Traffic Management Plan and a detailed Health and Safety Plan (Section 4.0) would be prepared and implemented by the Construction Contractor.

An Emergency Response Plan would be developed in detail for the Project, including the construction phase, and is outlined in greater detail in the Design and Operations Report.

Mitigation measures for dust emissions and construction noise are provided in Sections 3.6.2 and 3.6.3**,** respectively.

Access to the construction-site would be controlled through signage and restricted to authorized personnel only. The Construction Contractor would also employ good site safety practices during the construction phase. The detailed Health and Safety Plan will consider both public and occupational health and safety issues. This may include protecting the public from equipment and construction areas by posting warning signs, use of personal protective equipment, accident reporting, equipment operation, and confined space entry. Discussions would be undertaken with local emergency services personnel to familiarize them with the new facilities.

Net Effects

With proper protection and mitigation measures, and adherence to St. Columban Energy LP's safety policies and procedures, there is minimal increased or new risk to public health and safety from construction of the Project.

4.0 Construction Environmental Management Plan

St. Columban Energy LP, in consultation with the Construction Contractor, would prepare a Construction Environmental Management Plan (CEMP) prior to the initiation of any substantive on-site works. The CEMP would be the controlling plan for all construction activities, and would be designed to minimize potential adverse environmental effects, while enhancing the Project's benefits. The CEMP would be based on the environmental effects and mitigation measures identified in this report, and related reports to be submitted as part of the REA application.

As part of the construction program, site practices and procedures would be implemented to further reduce the environmental effects identified in this report and supporting studies. These practices may include specifications regarding disposal of excavated material, sediment control, dust control, and soil compaction control. In addition, St. Columban Energy LP staff and contractors would be made aware of the environmental commitments contained in this report and supporting studies to ensure the commitments are implemented.

The Project CEMP would include procedures and plans based on regulatory requirements and accepted site practices and as appropriate would include the following plans:

- *Traffic Management Plan*: the Construction Contractor and/or the turbine manufacturer would assist in the development and would implementation of this plan, including strategies governing movement of materials and personnel to, from, and within the workspace areas; management of connection points between access roads and public roads; transport of abnormal loads; road/lane closure strategies, control of any upgrading/modification roadworks; and/or dust and vehicle emission controls;

- *Hazardous Waste Management Plan:* to outline the procedures for proper identification, storage, handling, transport, and disposal of hazardous waste. In addition, the procedures would outline specific requirements for personnel training, emergency response, product review and approval, and record keeping;

- *Non-Hazardous Waste Management Plan:* to establish alternative procedures for the management and disposal of non-hazardous waste such as used lubricants, used drums, and general waste with specific provisions for reuse and recycling of waste materials;

- *Health and Safety Plan*: the Construction Contractor would prepare this plan considering both public and occupational health and safety issues. This may include protecting the public from equipment and construction areas by posting warning signs, use of personal protective equipment, accident reporting, equipment operation, and confined space entry;

- *Construction Plan*: St. Columban Energy LP would develop construction specifications that would form part of the construction contract. These specifications would detail the specific techniques and procedures to be followed to implement the mitigation recommendations contained in this report and supporting reports and studies;

- *Emergency Response Plan* the Construction Contractor and/or St. Columban Energy LP would include a plan for the proper handling of material spills and associated procedures to be undertaken during a spill event. The plan would also specify containment and clean-up materials and their storage locations, and general procedures for personnel training. As appropriate, the plan may cover response actions to high winds, fire preparedness, evacuation procedures, and medical emergencies. This plan would be developed in consultation with local emergency services personnel to determine the extent of emergency response resources and response actions of those involved. The plan would include key contact information for emergency service providers, address information for Project infrastructure locations, a description of the chain of communications and how information would be disseminated between St. Columban Energy LP and/or the Construction Contractor and the relevant responders;

- *Training Plan*: as appropriate, this would involve the training/informing of construction personnel on the unique features of the above plans prior to construction; and

- *Communications and Complaint Response Protocol*: St. Columban Energy LP will continue its pre-construction contact with Project stakeholders during construction and operations. The Communications and Complaint Response Protocol is detailed in the Design and Operations Report. This protocol will provide a telephone number and email for St. Columban Energy LP. Where possible, staff will respond immediately to calls, and if a message is received, it will be responded to in a timely fashion. All reasonable commercial efforts should be made to take appropriate action as a result of actual concerns as soon as practicable. The Protocol will be posted on the Project website (http://www.vereseninc.com/our-businesses/power/wind.html) and/or provided directly to the municipalities and the MOE.

St. Columban Energy LP would provide overall direction and assume responsibility for the development and implementation of these plans.

5.0 Construction Environmental Effects Monitoring Plan

The Construction Contractor would be the primary party responsible for the implementation of Construction Environmental Effects Monitoring Plan (CEMP) measures. Implementation will be in a manner consistent with St. Columban Energy LP's standard environmental and engineering practices and in compliance with applicable municipal, provincial, and federal standards and guidelines. The following subsections outline the key monitoring activities to be implemented based on the potential effects and mitigation measures identified in the previous sections and supporting studies.

5.1 TERRESTRIAL HABITATS

Methodologies/Sampling Protocols

The majority of monitoring for terrestrial habitat impacts would occur post-construction, during operations of the Project. Construction activities that have the potential to affect terrestrial flora and fauna include vegetation clearing, disturbance, accidental spills and/or leaks, and waste disposal. Monitoring of construction activities is necessary to ensure terrestrial flora and fauna are protected.

Vegetation clearing activities would be conducted under constant observation and monitoring of the Construction Contractor to ensure that vegetation is cleared only from designated areas (within identified 'construction areas'). Areas outside the designated construction-sites shall not be disturbed.

Monitoring would be required following the unlikely event of contamination from an accidental spill or leak. Contaminated soils would be removed and replaced as appropriate. All such activities would follow procedures outlined in the Emergency Response Plan for the CEMP.

As appropriate, records of waste generation and hauling would be maintained. Where a third party's activities are identified as non-compliant or insufficient, the Construction Contractor would seek out an alternative recycling or disposal solution.

Performance Objectives/Additional Actions

Provided mitigation measures outlined in Section 3.0 are implemented, and monitoring as outlined above occurs, it is anticipated that environmental disturbance would have been contained and that no additional monitoring actions would be required.

5.2 GROUNDWATER

Methodologies/Sampling Protocols

While we do not anticipate effects on water wells, the presence of recently drilled or non-documented water wells would be investigated. In the event that wells are encountered during construction, the Construction Contractor may, at the landowner's request, monitor water quality and quantity in these wells over the course of construction to ensure there is no interruption or impact. In the event that well water quality or quantity is disturbed as a result of construction, St. Columban Energy LP would provide a temporary potable water supply until corrective measures are taken and would comply with MOE's *Guideline B-9: Resolution of Groundwater Interference Problems*.

Performance Objectives/Additional Actions

In the event that well water quality or quantity is disturbed as a result of construction, St. Columban Energy LP would provide a temporary potable water supply until corrective measures are taken and would comply with MOE's *Guideline B-9: Resolution of Groundwater Interference Problems*.

5.3 AQUATIC HABITATS

Methodologies/Sampling Protocols

As appropriate, a Construction Contractor representative would be on-site during installation of Project components that could potentially affect aquatic habitats to ensure compliance with specifications, site plans and permits. In particular, the Construction Contractor would ensure that pre-construction preparation is completed prior to commencement of in-stream work (if required). Where required and if applicable, the Construction Contractor would ensure that detailed pre-construction profiles of the slopes, banks, and bed are determined prior to installation of the Project components. The Construction Contractor would monitor weather forecasts prior to the installation of Project components, particularly prior to work near aquatic habitats.

Performance Objectives/Additional Actions

The Construction Contractor would ensure that bank, bed, and floodplain conditions are restored to pre-construction conditions, as possible, following completion of the construction activities.

Environmental monitoring following spring run-off the year after construction (first year of operations) may also be considered to review the effectiveness of the bank and slope re-vegetation (if required), to check bank and slope stability, and to ensure surface drainage has been maintained. In the event that adverse effects are noted, appropriate remedial measures would be completed as necessary (i.e. site rehabilitation and revegetation) and additional follow-up monitoring conducted as appropriate, under the direction of an environmental advisor.

Additionally, compensation strategies and/or permits from DFO and/or the MVCA, as applicable, would likely include conditions of approval such as construction and post-construction monitoring. All such strategies and/or permits would be obtained prior to construction, and all such conditions and requirements would be implemented as appropriate.

5.4 PUBLIC ROADS

Methodologies/Sampling Protocols

County roads would be restored to their pre-construction conditions to the satisfaction of local authorities as applicable to the agreements with Huron East, Morris-Turnberry, Howick, and Huron County. Some municipal roads requiring structural enhancement/upgrades may be left in their upgraded form if requested. For a period of one year after construction (first year of operations), roads would be monitored following a heavy rain event and following spring runoff, as defined by applicable agreements, to ensure no erosion, bank slumpage, road subsidence or major rutting has occurred as a result of construction activities. As appropriate, affected roadside ditches and drains would be repaired if required and monitored to ensure that they are functioning properly.

Performance Objectives/Additional Actions

If adverse impacts are noted during the above post-construction monitoring, appropriate remediation measures would be developed as per applicable agreements. As appropriate, affected road substrate would be repaired and roadside ditches and drains would be revegetated. Additional follow-up monitoring would be conducted, as per applicable agreements, until adverse impacts are no longer evident.

5.5 AIR QUALITY, DUST & ODOUR, AND ENVIRONMENTAL NOISE

Methodologies/Sampling Protocols

As appropriate, records of vehicle maintenance would be retained and made available for periodic review by the Construction Contractor. Monitoring and maintenance of noise abatement devices on construction and support equipment would also take place to keep noise levels within acceptable construction noise standards.

The Construction Contractor would monitor to ensure that temporary topsoil storage piles are stabilized with appropriate means.

Performance Objectives/Additional Actions

All vehicles identified through the monitoring program that fail to meet the minimum emission and noise standards would be repaired immediately or replaced as soon as practicable from the construction area. Provided mitigation measures outlined in Section 3.0 are implemented, and monitoring as outlined above occurs, it is anticipated that environmental disturbance would have been contained and that no additional monitoring actions would be required.

6.0 Closure

The Construction Plan Report for the St. Columban Wind Project has been prepared by Stantec for St. Columban Energy LP in accordance with Item 1, Table 1 of Ontario Regulation 359/09, and the *Technical Guide to Renewable Energy Approvals* (MOE 2011).

This report has been prepared by Stantec for the sole benefit of St. Columban Energy LP, and may not be used by any third party without the express written consent of St. Columban Energy LP. The data presented in this report are in accordance with Stantec's understanding of the Project as it was presented at the time of reporting.

STANTEC CONSULTING LTD.

Shawna Peddle
Senior Project Manager

Kerrie Skillen
Project Manager

rpt_60649_ppsc_consplan_20120611_fnl

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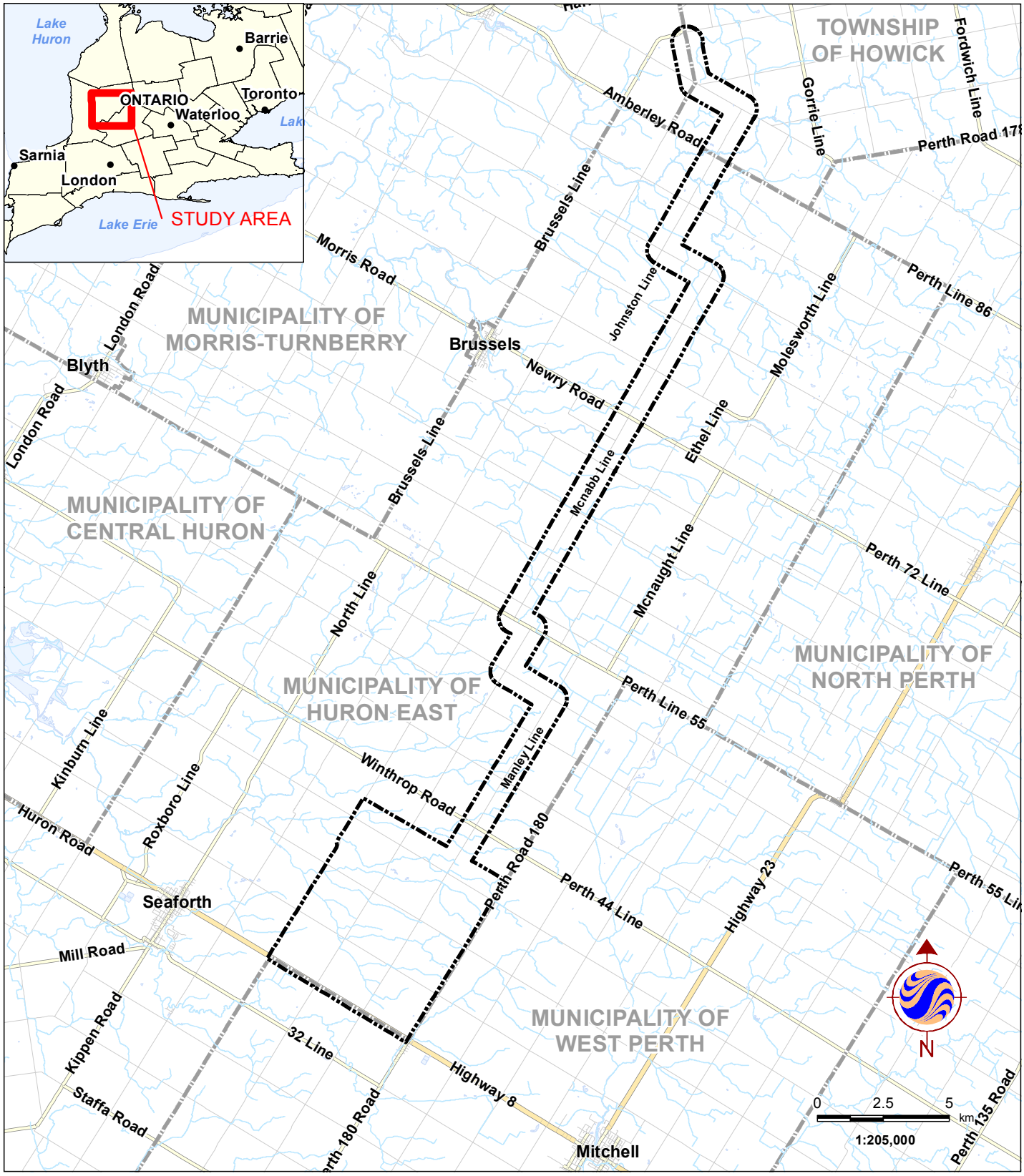
Appendix A

Figures



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Revised: 2012-06-07 By: dharvey

June, 2012
160960649

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Legend

- Study Area
- Highway
- Major Road
- Local Road
- Municipal Boundary
- Watercourse
- Waterbody

Notes

1. Coordinate System: UTM Zone 17 Northern Hemisphere
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2011.

Client/Project

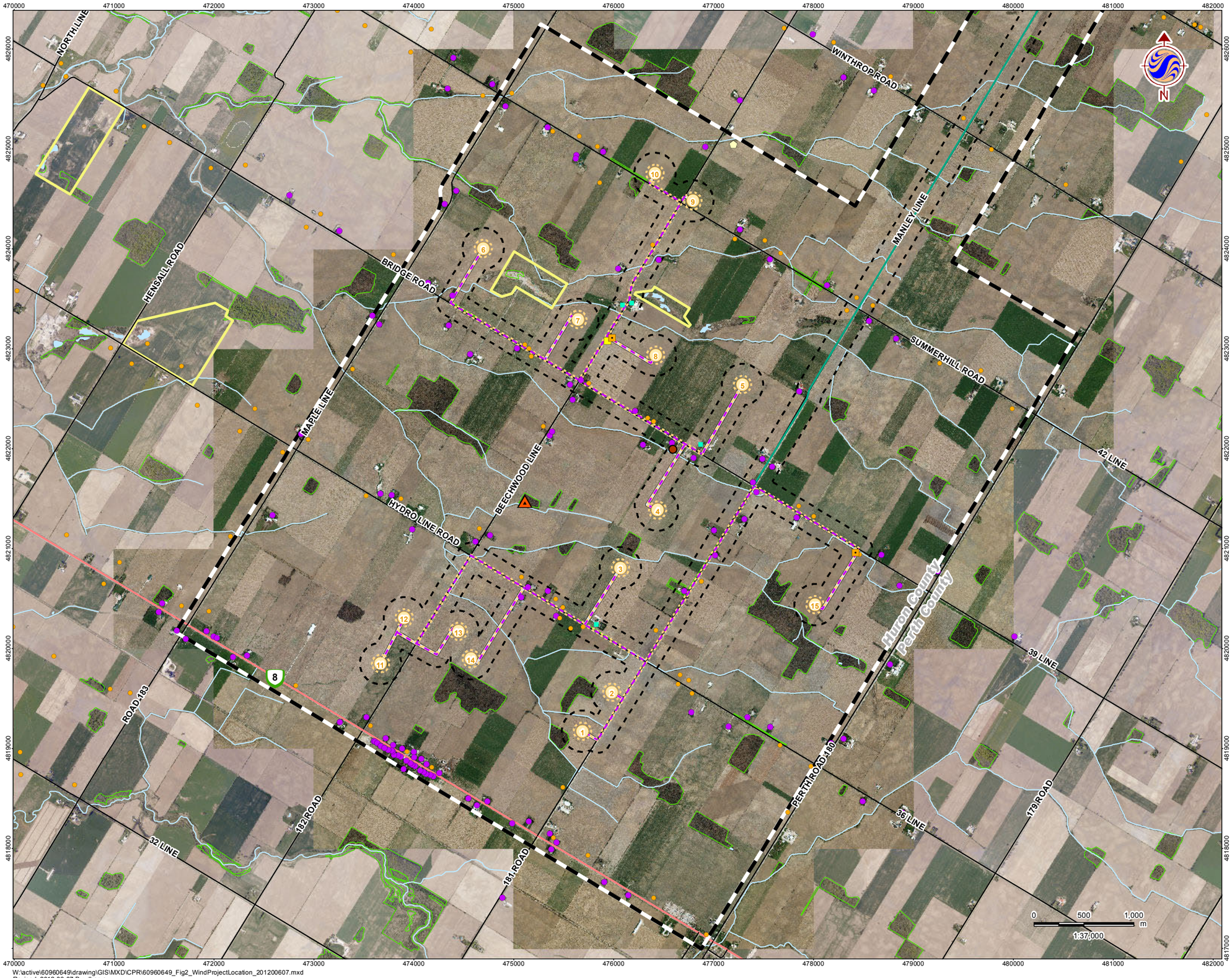
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.

1

Title

PROJECT LOCATION



Legend

- Study Area
- 120m Zone of Investigation

Project Components

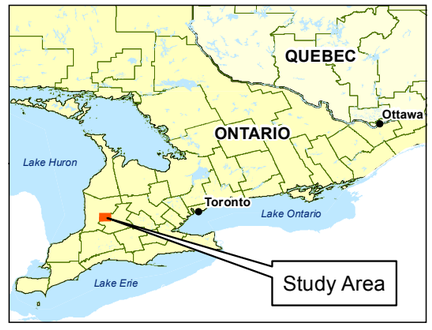
- Turbine Location
- Construction Area
- Access Road
- Proposed Underground Electrical Interconnection Line Route
- Underground Collector
- Operations and Maintenance Building
- Point of Connection to HONI Network
- Met Tower
- Unserviced Electrical Control Building

Existing Features

- Bell Communication Tower
- Highway
- Road
- Watercourse
- Waterbody
- Aggregate Site
- Wooded Area

Noise Receptors (As defined under 0.Reg 359109)

- Participating
- Non-Participating
- Vacant Lot



Notes

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Client/Project
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.
2.0

Title
WIND PROJECT LOCATION

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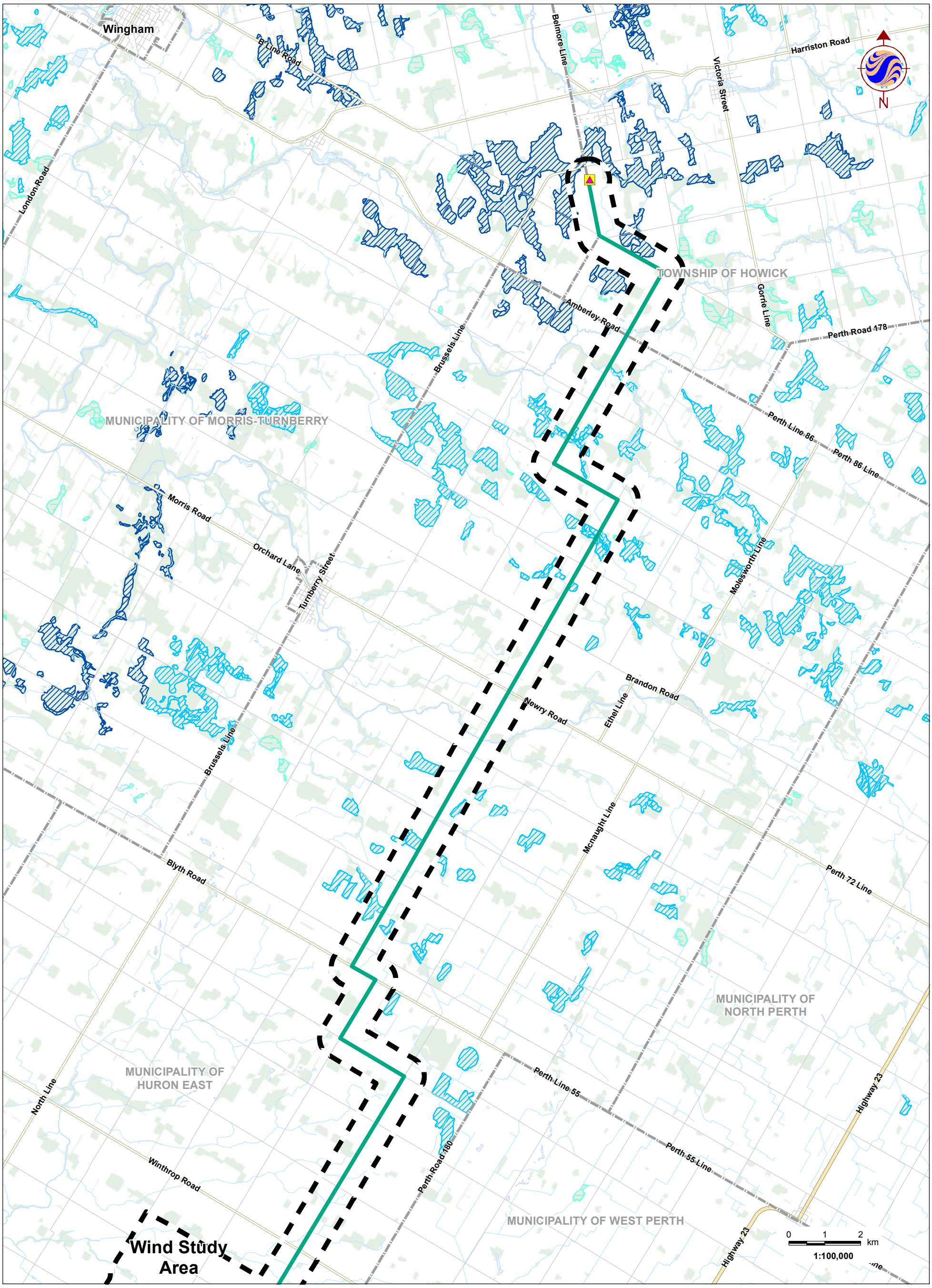
Revised: 2012-06-07 By: dharvey



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Revised: 2012-06-07 By: dharvey

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Legend

- Study Area
- **Project Components**
  - Proposed Interconnection Line
  - Transformer Substation
  - Point of Connection to HONI Network
- **Existing Features**
  - Highway
  - Major Road
  - Local Road
  - Municipal Boundary
  - Wooded Area
  - Watercourse
  - Waterbody
  - Provincially Significant Wetland
  - Locally Significant Wetland
  - Other Wetland

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
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Client/Project

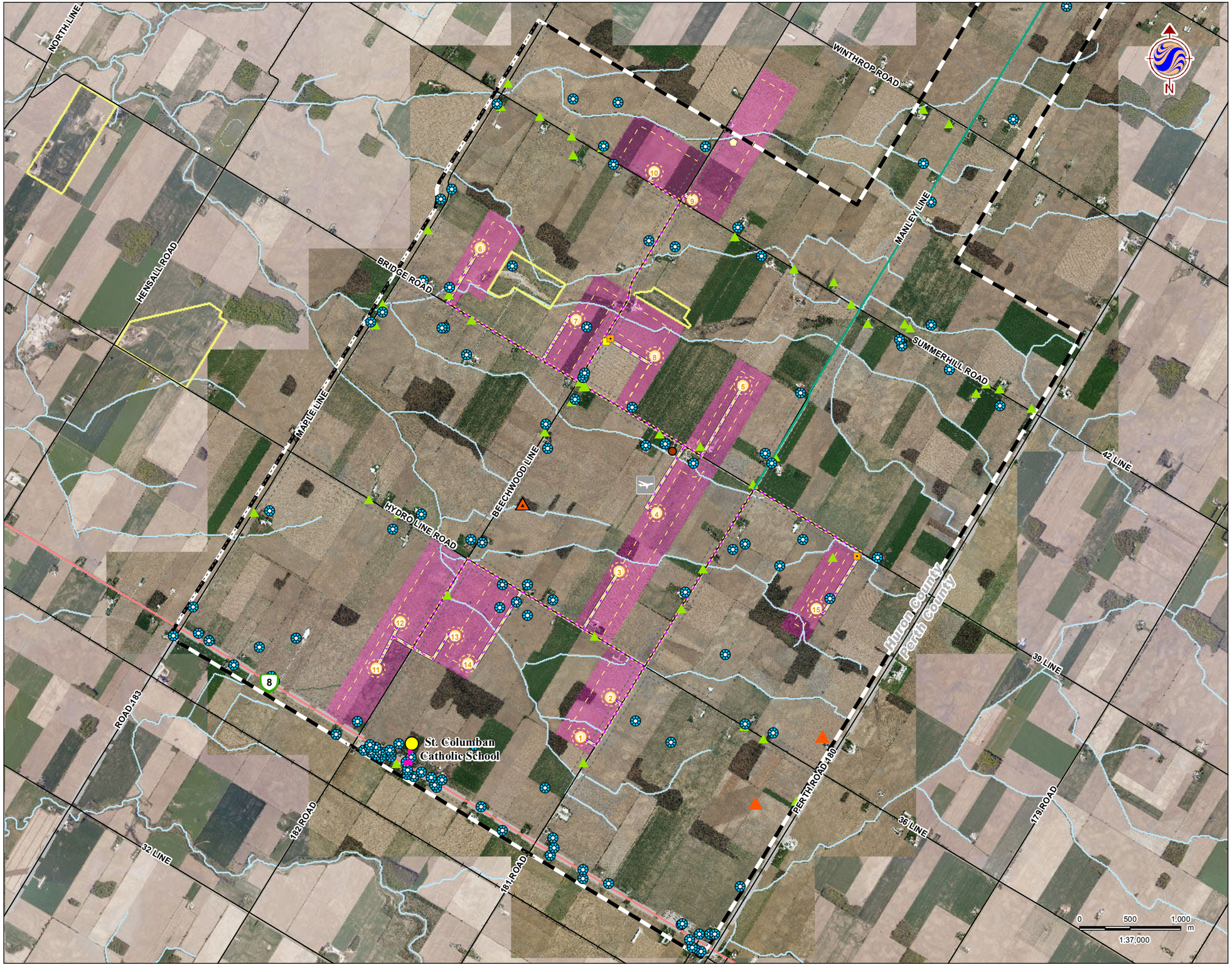
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.

3.0

Title

UNDERGROUND ELECTRICAL INTERCONNECTION LINE PROJECT LOCATION



Legend

- Study Area

Project Components

- Turbine Location
- Construction Area
- Access Road
- Proposed Underground Electrical Interconnection Line Route
- Underground Collector
- Operations and Maintenance Building
- Point of Connection to HONI Network
- Met Tower
- Unserviced Electrical Control Building

Existing Features

- Bell Communication Tower
- Highway
- Road
- Abandoned Petroleum Well
- Heritage Resources
- Airstrip
- School
- Soccer Field
- Water Well
- Railway
- Aggregate Site
- Watercourse
- Optioned Property

Setback

- Road Setback (65m)
- Property Line Setback (99.5m)

Notes

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Client/Project
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.
4.0

Title
SOCIO-ECONOMIC FEATURES WIND PROJECT LOCATION

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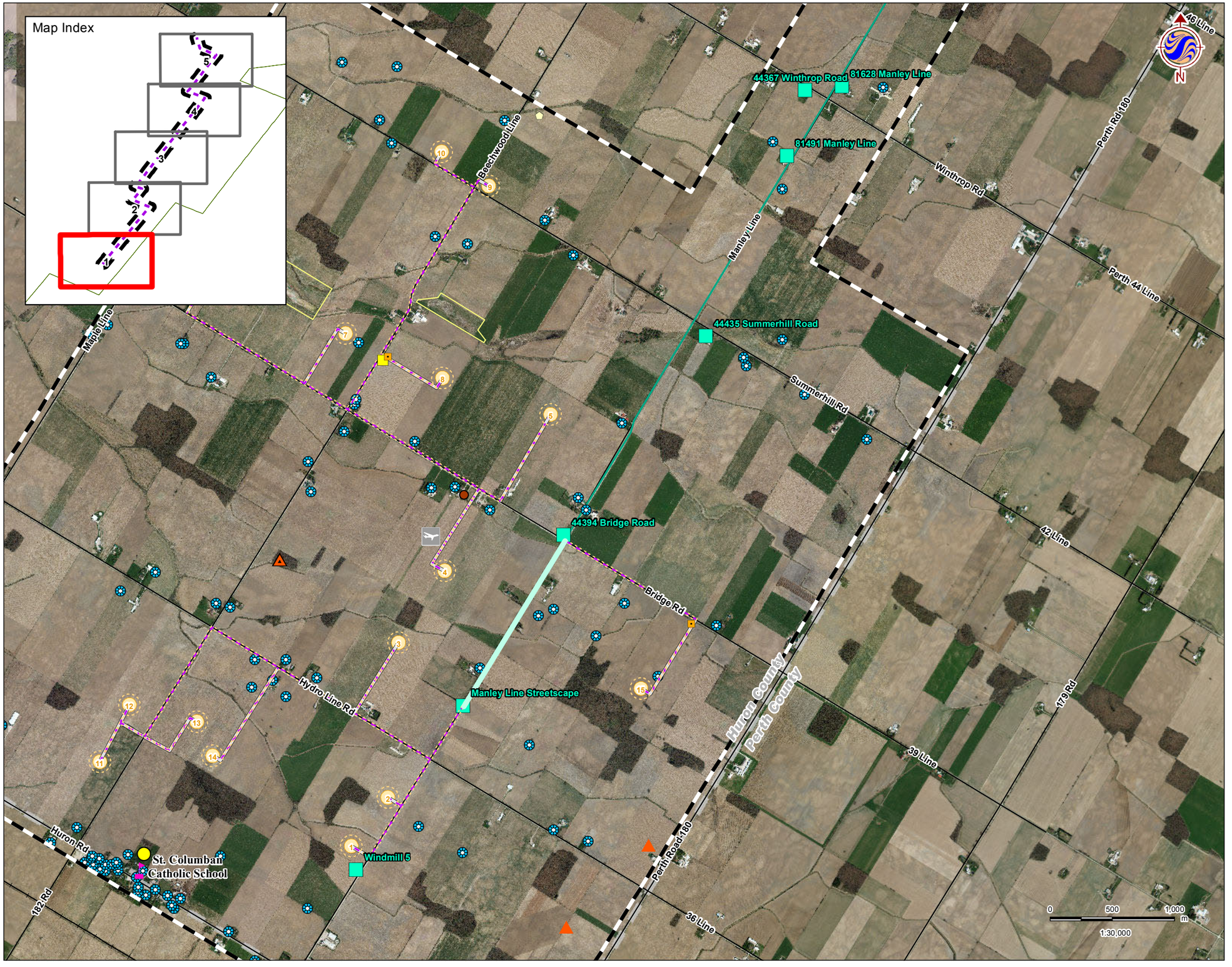
Revised: 2012-06-07 By: dharvey



Legend

- Study Area

Project Components

- Turbine Location
- Construction Area
- Access Road
- Proposed Underground Electrical Interconnection Line Route
- Underground Collector
- Transformer Substation
- Operations and Maintenance Building
- Point of Connection to HONI Network
- Unserviced Electrical Control Building
- Met Tower

Existing Features

- Bell Communication Tower
- Road
- Railway
- Aggregate Site
- Heritage Resources
- Cultural Heritage Landscape
- Abandoned Petroleum Well
- Water well (Identified by member of public not in MOE Water Well Records)
- Airstrip
- School
- Soccer Field
- Water Well (MOE)

Notes

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Client/Project
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.
5.0

Title
SOCIO- ECONOMIC FEATURES UNDERGROUND ELECTRICAL INTERCONNECTION LINE PROJECT LOCATION (Tile 1 of 5)

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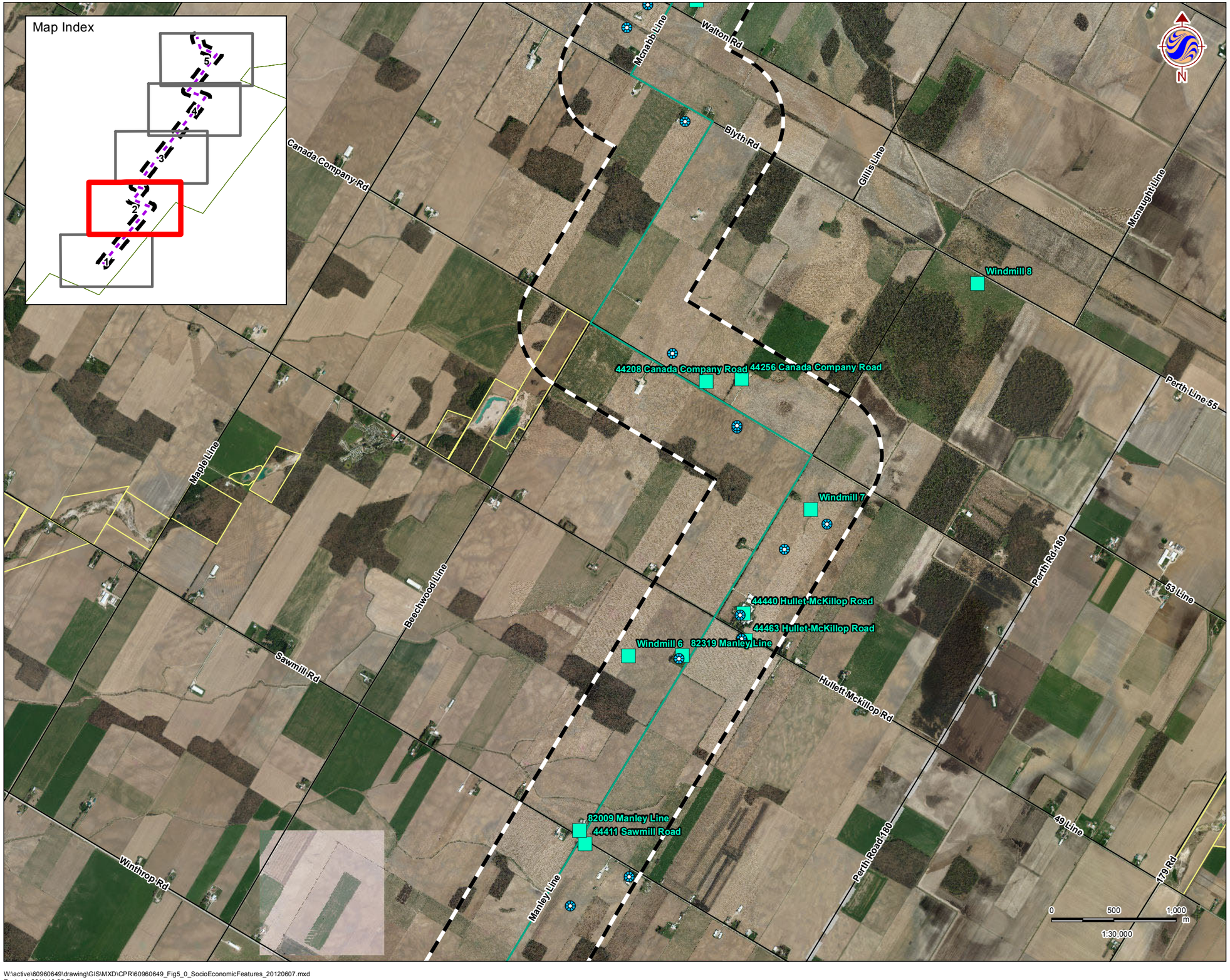
Revised: 2011-10-02 By: pworsell



Legend

- Study Area

Project Components

- Turbine Location
- Construction Area
- Access Road
- Proposed Underground Electrical Interconnection Line Route
- Underground Collector
- Transformer Substation
- Operations and Maintenance Building
- Point of Connection to HONI Network
- Unserviced Electrical Control Building
- Met Tower

Existing Features

- Bell Communication Tower
- Road
- Railway
- Aggregate Site
- Heritage Resources
- Cultural Heritage Landscape
- Abandoned Petroleum Well
- Water well (Identified by member of public not in MOE Water Well Records)
- Airstrip
- School
- Soccer Field
- Water Well (MOE)

Notes

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Client/Project
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.
5.0

Title
SOCIO- ECONOMIC FEATURES UNDERGROUND ELECTRICAL INTERCONNECTION LINE PROJECT LOCATION (Tile 2 of 5)

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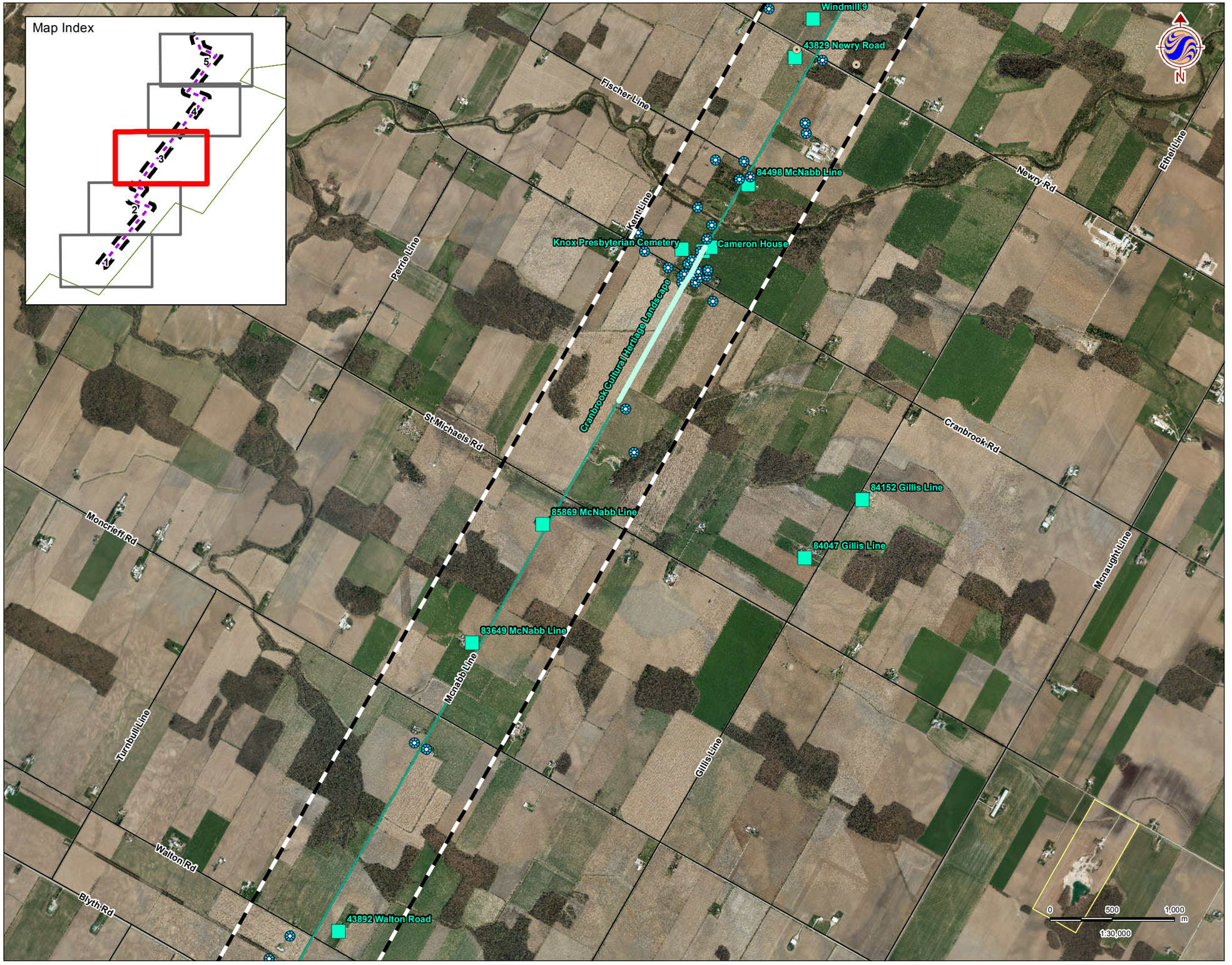

Legend

- Study Area

Project Components

- Turbine Location
- Construction Area
- Access Road
- Proposed Underground Electrical Interconnection Line Route
- Underground Collector
- Transformer Substation
- Operations and Maintenance Building
- Point of Connection to HONI Network
- Unserviced Electrical Control Building
- Met Tower

Existing Features

- Bell Communication Tower
- Road
- Railway
- Aggregate Site
- Heritage Resources
- Cultural Heritage Landscape
- Abandoned Petroleum Well
- Water well (Identified by member of public not in MOE Water Well Records)
- Airstrip
- School
- Soccer Field
- Water Well (MOE)

Notes

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ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.
5.0

Title
SOCIO- ECONOMIC FEATURES UNDERGROUND ELECTRICAL INTERCONNECTION LINE PROJECT LOCATION (Tile 3 of 5)

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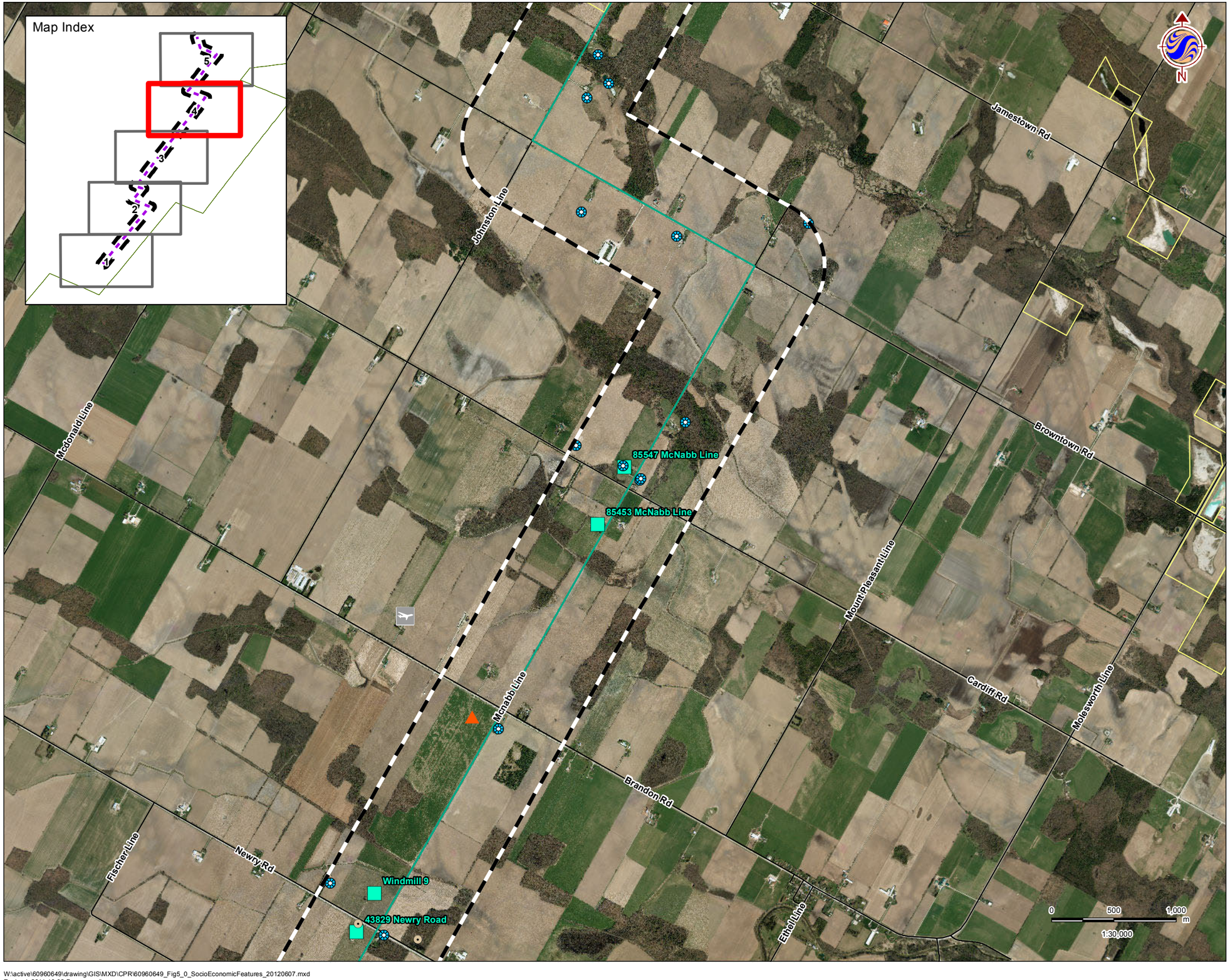

Legend

- Study Area

Project Components

- Turbine Location
- Construction Area
- Access Road
- Proposed Underground Electrical Interconnection Line Route
- Underground Collector
- Transformer Substation
- Operations and Maintenance Building
- Point of Connection to HONI Network
- Unserviced Electrical Control Building
- Met Tower

Existing Features

- Bell Communication Tower
- Road
- Railway
- Aggregate Site
- Heritage Resources
- Cultural Heritage Landscape
- Abandoned Petroleum Well
- Water well (Identified by member of public not in MOE Water Well Records)
- Airstrip
- School
- Soccer Field
- Water Well (MOE)

Notes

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ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.
5.0

Title
SOCIO- ECONOMIC FEATURES UNDERGROUND ELECTRICAL INTERCONNECTION LINE PROJECT LOCATION (Tile 4 of 5)

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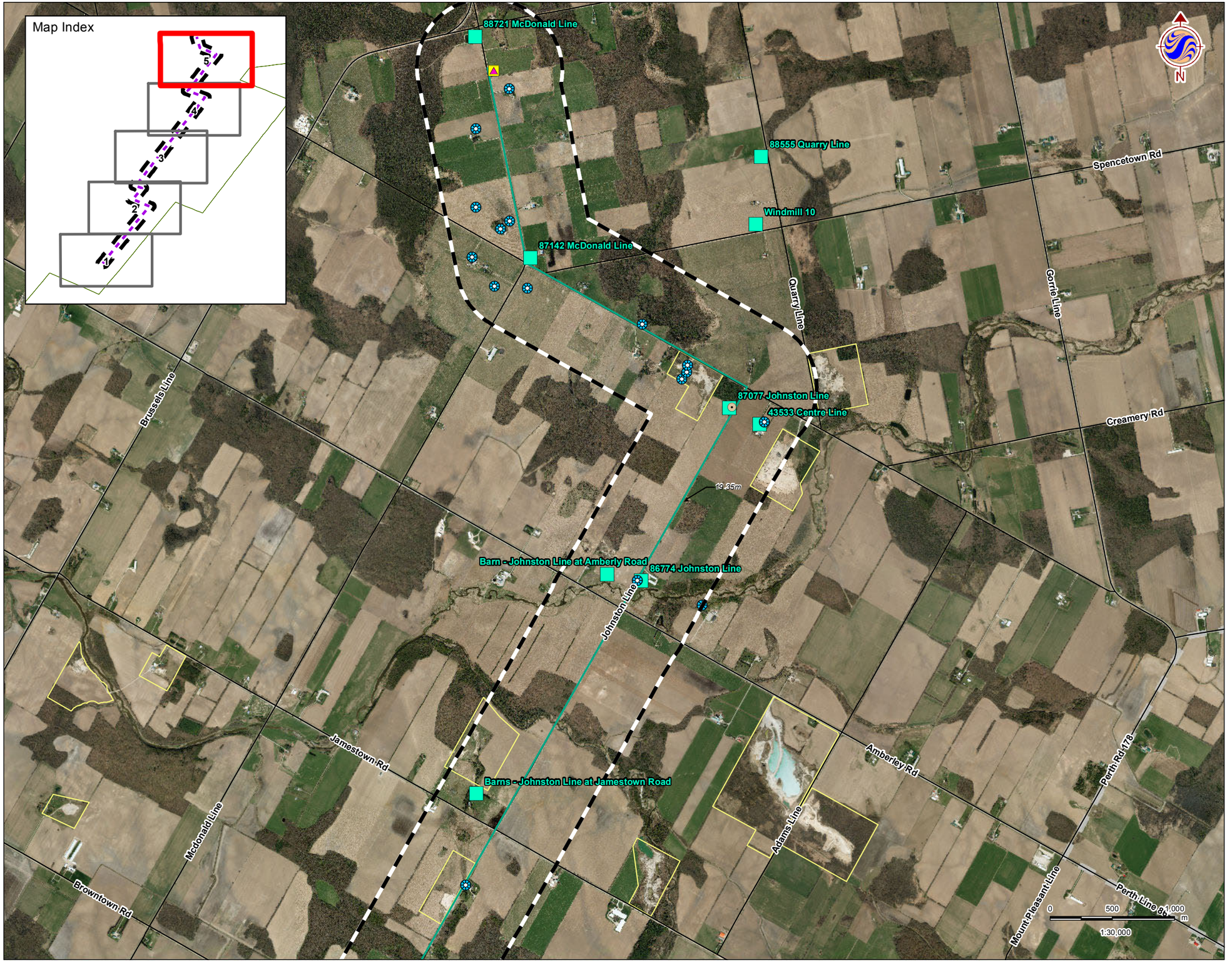

Legend

- Study Area

Project Components

- Turbine Location
- Construction Area
- Access Road
- Proposed Underground Electrical Interconnection Line Route
- Underground Collector
- Transformer Substation
- Operations and Maintenance Building
- Point of Connection to HONI Network
- Unserviced Electrical Control Building
- Met Tower

Existing Features

- Bell Communication Tower
- Road
- Railway
- Aggregate Site
- Heritage Resources
- Cultural Heritage Landscape
- Abandoned Petroleum Well
- Water well (Identified by member of public not in MOE Water Well Records)
- Airstrip
- School
- Soccer Field
- Water Well (MOE)

Notes

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Client/Project
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.
5.0

Title
SOCIO- ECONOMIC FEATURES UNDERGROUND ELECTRICAL INTERCONNECTION LINE PROJECT LOCATION (Tile 5 of 5)

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Revised: 2011-10-02 By: pworsell

Legend

Study Area

Project Components

- Turbine Location
- Construction Area
- Access Road
- Proposed Underground Electrical Interconnection Line Route
- Underground Collector
- Operations and Maintenance Building
- Point of Connection to HONI Network
- Met Tower
- Unserviced Electrical Control Building

Existing Features

- Highway
- Road
- Railway
- Optioned Property

Noise Receptors (As defined under 0.Reg 359109)

- Participating
- Non-Participating
- Vacant Lot

Notes

1. Coordinate System: UTM NAD 83 - Zone 17 (N).
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Client/Project
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.
6.0

Title
NOISE RECEPTORS
WIND PROJECT LOCATION

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Revised: 2012-05-28 By: dharvey

Legend

- Study Area
- 120m Zone of Investigation

Project Components

- Turbine Location
- Operations and Maintenance Building
- Point of Connection to HONI Network
- Unserviced Electrical Control Building
- Met Tower
- Construction Area
- Proposed Underground Electrical Interconnection Line Route
- Underground Collector
- Access Road

Existing Features

- Highway
- Road
- Railway
- Regionally Significant Earth Science ANSI
- Aggregate Site
- Watercourse
- REA Waterbody (as defined in O.Reg 359/09)
- Waterbody
- Wooded Area
- Significant Natural Features
- Contour Line (Metres)

Notes

1. Coordinate System: UTM NAD 83 - Zone 17 (N).
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Client/Project
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.
7.0

Title
NATURAL HERITAGE FEATURES WIND PROJECT LOCATION

0 500 1,000 m
1:37,000

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Revised: 2012-06-07 By: dharvey

Legend

- Study Area
- 120m Zone of Investigation

Project Components

- Turbine Location
- Transformer Substation
- Operations and Maintenance Building
- Point of Connection to HONI Network
- Unserviced Electrical Control Building
- Met Tower
- Proposed Underground Electrical Interconnection Line Route
- Wind Construction Area

Existing Features

- Road
- Railway
- Contour Line (Metres)
- Regionally Significant Life Science ANSI (MNR, 2011)
- Provincially Significant Wetland (MNR, 2011)
- Locally Significant Wetland (MNR, 2011)
- Other Wetland (MNR, 2011)
- Winter Deer Yard (MNR, 2011)
- Wooded Area (MNR, 2011)
- Water Body (as defined in O.Reg 359/09)
- Not Water Body (as defined in O.Reg 359/09)

Significant Natural Features

- Significant Woodlands and Generalized Candidate Significant Wildlife Habitat (Stantec, 2011)
- Significant Wetlands and Generalized Candidate Significant Wildlife Habitat (Stantec, 2011)
- Winter Deer Yards and Generalized Candidate Significant Wildlife Habitat (Stantec, 2011)
- 29 Natural Feature Number

Notes

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Client/Project
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.
8.0

Title
NATURAL HERITAGE FEATURES UNDERGROUND ELECTRICAL INTERCONNECTION LINE PROJECT LOCATION (Tile 1 of 5)

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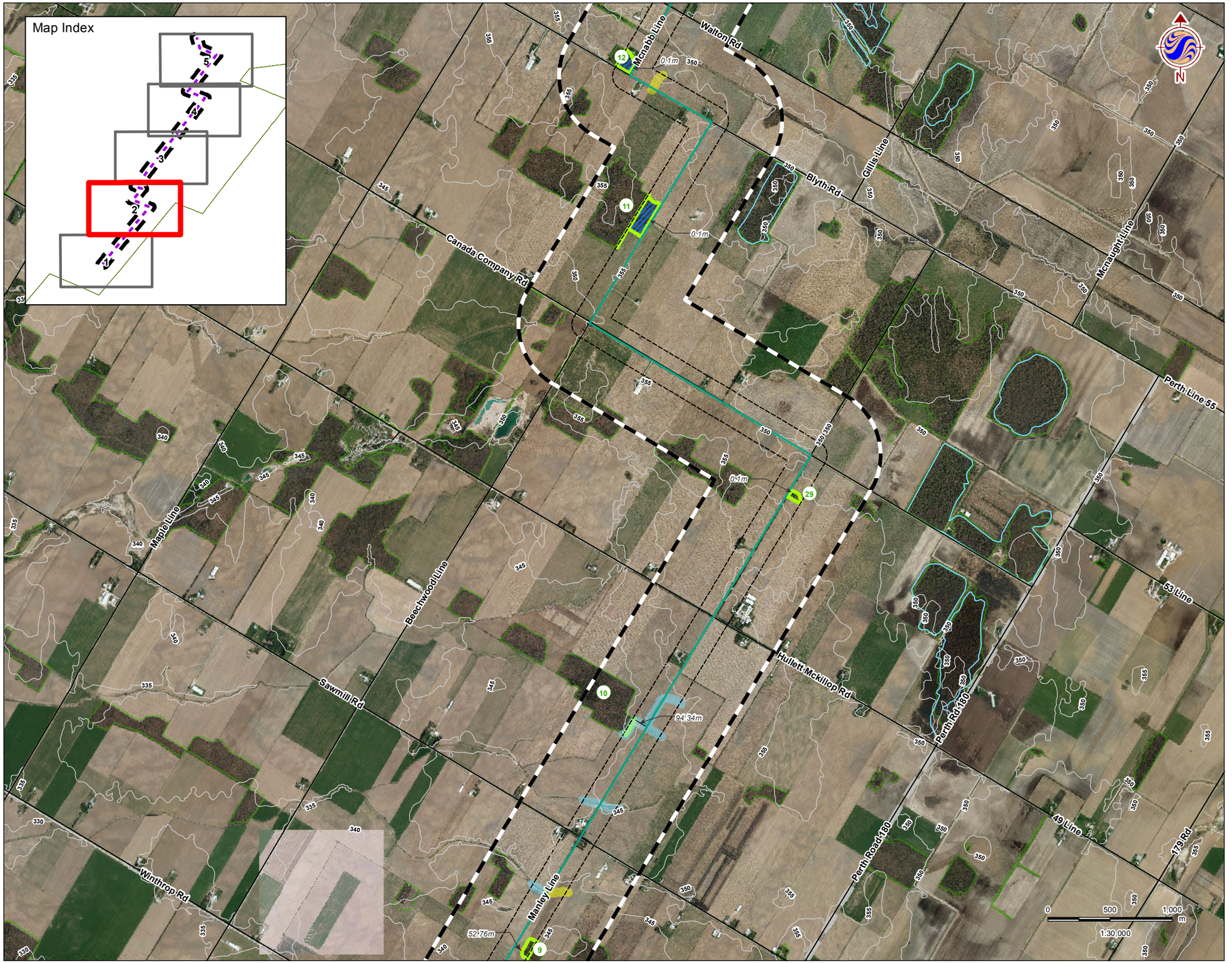
Revised: 2012-06-07 By: dharvey



Legend

- Study Area
- 120m Zone of Investigation

Project Components

- Turbine Location
- Transformer Substation
- Operations and Maintenance Building
- Point of Connection to HONI Network
- Unserviced Electrical Control Building
- Met Tower
- Proposed Underground Electrical Interconnection Line Route
- Wind Construction Area

Existing Features

- Road
- Railway
- Contour Line (Metres)
- Regionally Significant Life Science ANSI (MNR, 2011)
- Provincially Significant Wetland (MNR, 2011)
- Locally Significant Wetland (MNR, 2011)
- Other Wetland (MNR, 2011)
- Winter Deer Yard (MNR, 2011)
- Wooded Area (MNR, 2011)
- Water Body (as defined in O.Reg 359/09)
- Not Water Body (as defined in O.Reg 359/09)

Significant Natural Features

- Significant Woodlands and Generalized Candidate Significant Wildlife Habitat (Stantec, 2011)
- Significant Wetlands and Generalized Candidate Significant Wildlife Habitat (Stantec, 2011)
- Winter Deer Yards and Generalized Candidate Significant Wildlife Habitat (Stantec, 2011)
- 29 Natural Feature Number

Notes

1. Coordinate System: UTM NAD 83 - Zone 17 (N).
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3. Orthographic Imagery: © Huron County, First Base Solutions
   Imagery Date: 2010 & 2006.

Stantec

June 2012
160960649

Client/Project
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.
8.0

Title
NATURAL HERITAGE FEATURES UNDERGROUND ELECTRICAL INTERCONNECTION LINE PROJECT LOCATION (Tile 2 of 5)

W:\active\60960649\drawing\GIS\MXD\CPR\60960649_Fig8_0_NaturalFeaturesTline_20120607.mxd
Revised: 2012-06-07 By: dharvey

Legend

- Study Area
- 120m Zone of Investigation

Project Components

- Turbine Location
- Transformer Substation
- Operations and Maintenance Building
- Point of Connection to HONI Network
- Unserviced Electrical Control Building
- Met Tower
- Proposed Underground Electrical Interconnection Line Route
- Wind Construction Area

Existing Features

- Road
- Railway
- Contour Line (Metres)
- Regionally Significant Life Science ANSI (MNR, 2011)
- Provincially Significant Wetland (MNR, 2011)
- Locally Significant Wetland (MNR, 2011)
- Other Wetland (MNR, 2011)
- Winter Deer Yard (MNR, 2011)
- Wooded Area (MNR, 2011)
- Water Body (as defined in O.Reg 359/09)
- Not Water Body (as defined in O.Reg 359/09)

Significant Natural Features

- Significant Woodlands and Generalized Candidate Significant Wildlife Habitat (Stantec, 2011)
- Significant Wetlands and Generalized Candidate Significant Wildlife Habitat (Stantec, 2011)
- Winter Deer Yards and Generalized Candidate Significant Wildlife Habitat (Stantec, 2011)
- 29 Natural Feature Number

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Client/Project
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.
8.0

Title
NATURAL HERITAGE FEATURES UNDERGROUND ELECTRICAL INTERCONNECTION LINE PROJECT LOCATION (Tile 3 of 5)

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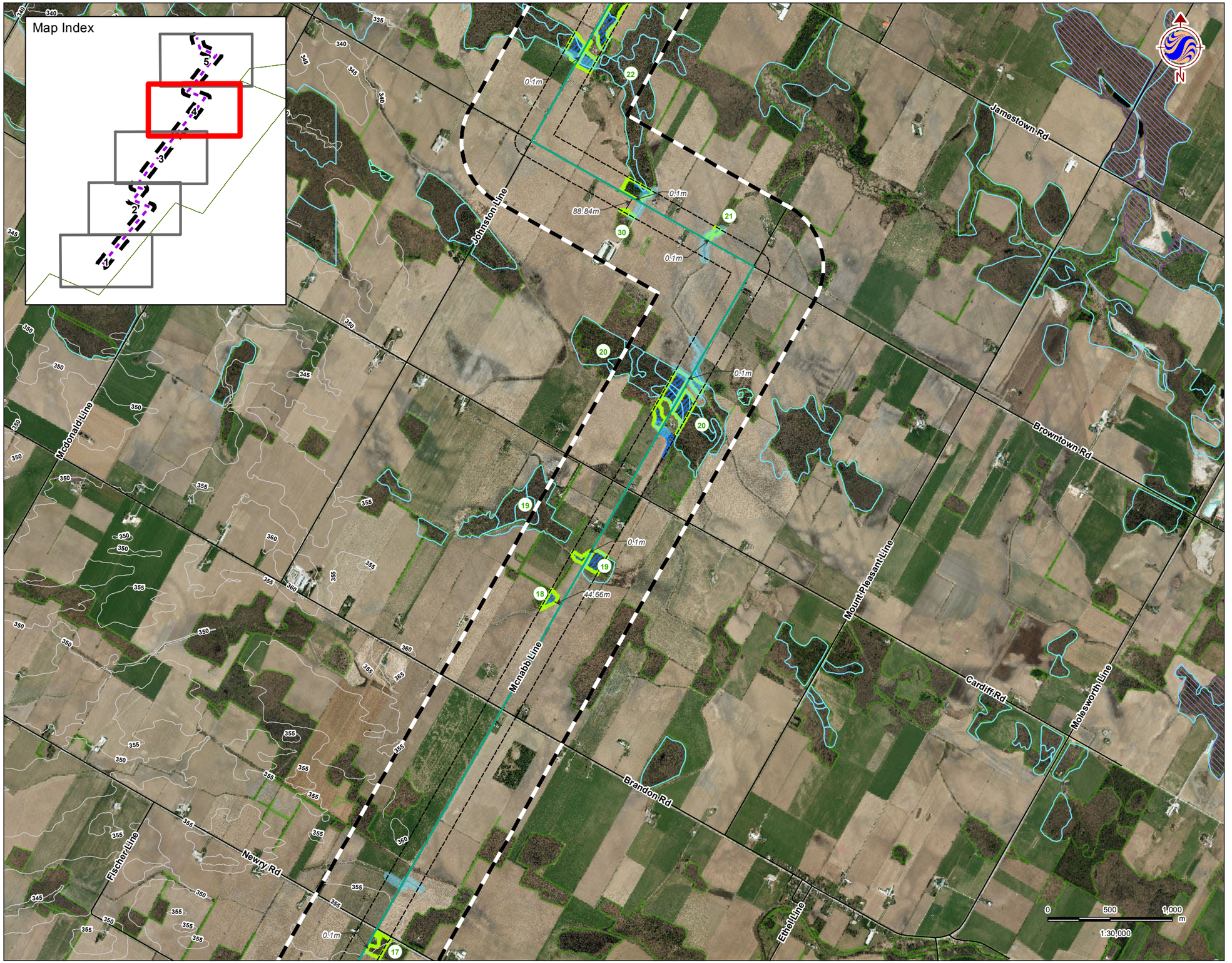
Revised: 2012-06-07 By: dharvey



Legend

- Study Area
- 120m Zone of Investigation

Project Components

- Turbine Location
- Transformer Substation
- Operations and Maintenance Building
- Point of Connection to HONI Network
- Unserviced Electrical Control Building
- Met Tower
- Proposed Underground Electrical Interconnection Line Route
- Wind Construction Area

Existing Features

- Road
- Railway
- Contour Line (Metres)
- Regionally Significant Life Science ANSI (MNR, 2011)
- Provincially Significant Wetland (MNR, 2011)
- Locally Significant Wetland (MNR, 2011)
- Other Wetland (MNR, 2011)
- Winter Deer Yard (MNR, 2011)
- Wooded Area (MNR, 2011)
- Water Body (as defined in O.Reg 359/09)
- Not Water Body (as defined in O.Reg 359/09)

Significant Natural Features

- Significant Woodlands and Generalized Candidate Significant Wildlife Habitat (Stantec, 2011)
- Significant Wetlands and Generalized Candidate Significant Wildlife Habitat (Stantec, 2011)
- Winter Deer Yards and Generalized Candidate Significant Wildlife Habitat (Stantec, 2011)
- 29 Natural Feature Number

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   Imagery Date: 2010 & 2006.

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June 2012
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Client/Project
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.
8.0

Title
NATURAL HERITAGE FEATURES UNDERGROUND ELECTRICAL INTERCONNECTION LINE PROJECT LOCATION (Tile 4 of 5)

W:\active\60960649\drawing\GIS\MXD\CPR\60960649_Fig8_0_NaturalFeaturesTline_20120607.mxd
Revised: 2012-06-07 By: dharvey

Legend

- Study Area
- 120m Zone of Investigation

Project Components

- Turbine Location
- Transformer Substation
- Operations and Maintenance Building
- Point of Connection to HONI Network
- Unserviced Electrical Control Building
- Met Tower
- Proposed Underground Electrical Interconnection Line Route
- Wind Construction Area

Existing Features

- Road
- Railway
- Contour Line (Metres)
- Regionally Significant Life Science ANSI (MNR, 2011)
- Provincially Significant Wetland (MNR, 2011)
- Locally Significant Wetland (MNR, 2011)
- Other Wetland (MNR, 2011)
- Winter Deer Yard (MNR, 2011)
- Wooded Area (MNR, 2011)
- Water Body (as defined in O.Reg 359/09)
- Not Water Body (as defined in O.Reg 359/09)

Significant Natural Features

- Significant Woodlands and Generalized Candidate Significant Wildlife Habitat (Stantec, 2011)
- Significant Wetlands and Generalized Candidate Significant Wildlife Habitat (Stantec, 2011)
- Winter Deer Yards and Generalized Candidate Significant Wildlife Habitat (Stantec, 2011)
- 29 Natural Feature Number

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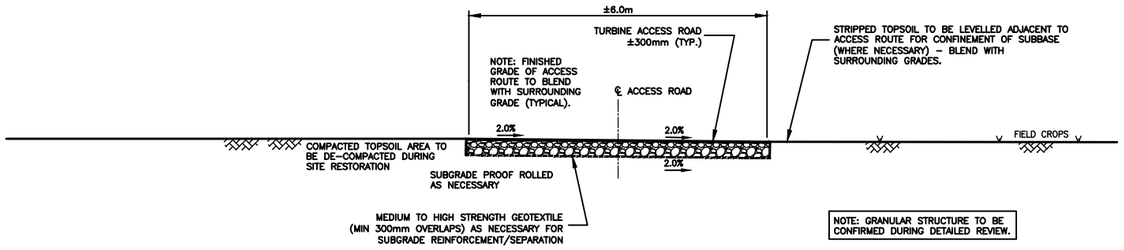
June 2012
160960649

Client/Project
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

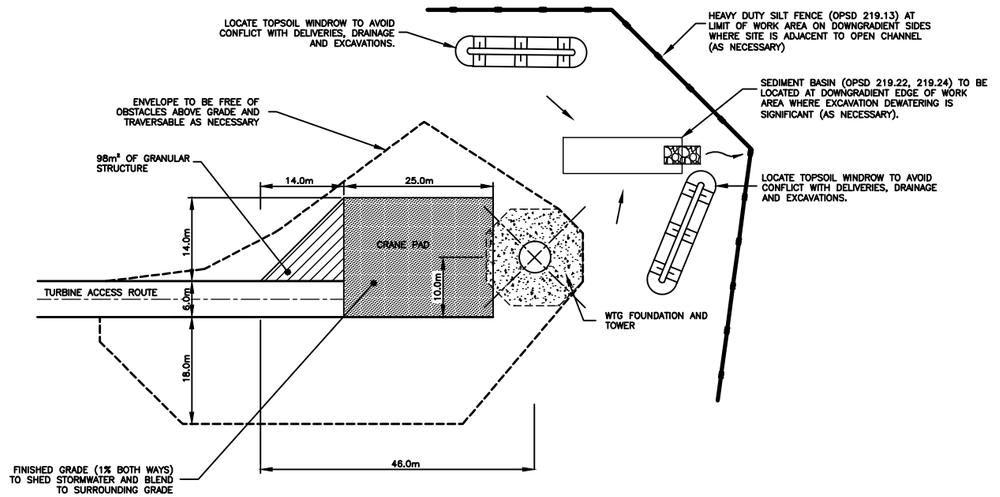
Figure No.
8.0

Title
NATURAL HERITAGE FEATURES UNDERGROUND ELECTRICAL INTERCONNECTION LINE PROJECT LOCATION (Tile 5 of 5)

W:\active\60960649\drawing\GIS\MXD\CPR\60960649_Fig8_0_NaturalFeaturesTline_20120607.mxd
Revised: 2012-06-07 By: dharvey



TYPICAL ACCESS ROAD CROSS SECTION
NTS



TURBINE ERECTION ZONE
DEAD END LAYOUT (TYPICAL)
NTS

SILT CONTROLS SHALL BE IMPLEMENTED AT CROSSING SITES PER DETAIL DRAWINGS.

ALL REASONABLE EFFORTS SHALL BE TAKEN TO PREVENT DISCHARGE OF DELETERIOUS SUBSTANCES TO THE CHANNEL AND TO MINIMIZE IMPACTS TO FISH HABITAT.

NOTE: IN WATER WORKS TO BE UNDERTAKEN DURING NO TO LOW FLOW CONDITIONS. CONTRACTOR SHALL CONTROL WATER IN WORK ZONE PER OPSD 221.020 OR APPROVED EQUAL.

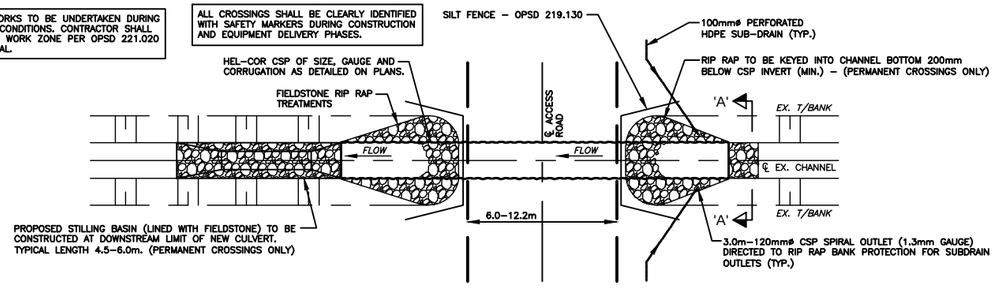
NOTE: FUELING OPERATIONS SHALL NOT BE CONDUCTED WITHIN 15.0m OF A DITCH OR FIELD TILE INLET.

NOTE: ALL DISTURBED BANKS TO BE SEEDED IMMEDIATELY AFTER CONSTRUCTION. STABILIZE WITH EROSION CONTROL MATTING (S150 BY NORTH AMERICAN GREEN, OR EQUIVALENT)

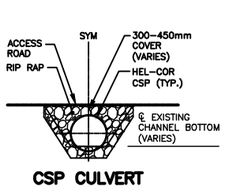
ALL CROSSINGS SHALL BE CLEARLY IDENTIFIED WITH SAFETY MARKERS DURING CONSTRUCTION AND EQUIPMENT DELIVERY PHASES.

NOTE: WINDROWS OF TOPSOIL SHALL NOT BE LOCATED WITHIN 10.0m OF ANY OPEN CHANNEL. DISPOSAL OF EXCESS FILL MATERIAL WITHIN 15m OF A RIPARIAN ZONE MAY BE SUBJECT TO CONSERVATION AUTHORITY APPROVAL.

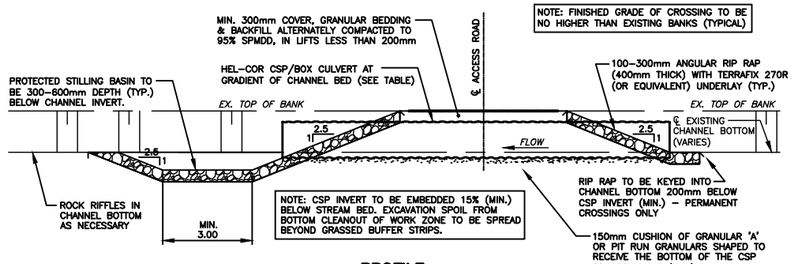
NOTE: EXISTING CHANNEL VEGETATION TO BE PROTECTED WHERE POSSIBLE.



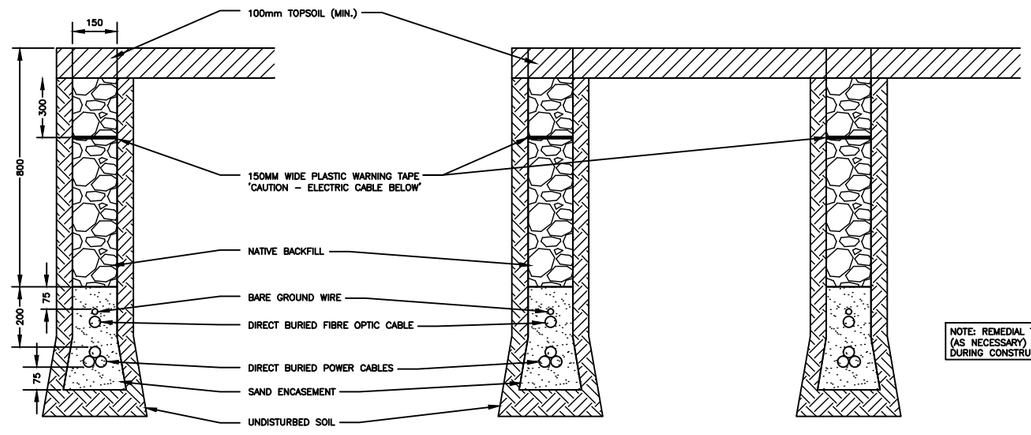
TYPICAL CULVERT CROSSING DETAIL
NTS



CSP CULVERT SECTION 'A'–'A'



PROFILE



PLOW DETAIL FOR 1 CIRCUIT

PLOW DETAIL FOR 2 CIRCUITS

UNDERGROUND POWER CABLES
TYPICAL PLOW DETAIL
NTS

PRELIMINARY
NOT APPROVED FOR CONSTRUCTION

DETAILS	No.	REVISIONS	DATE	CONSULTANT
DESIGN	1	FOR REVIEW	MAY 11/11	DE(L)L
DRAWN BY JS				
CHECKED RAH				
APPROVED				
DATE MAY 2011				
F.B#.				
LDD FILENAME:				
FILENAME:				

CONSULTANT OR DIVISION
Consulting Civil Engineers
41 Adelaide St. N., Unit 71
London, Ontario N6B 3P4
Phone (519) 672-8310
Fax (519) 672-4182
e-mail: deveng@deveng.net
development engineering (London) Limited

ENGINEER'S STAMP

VERESEN INC.

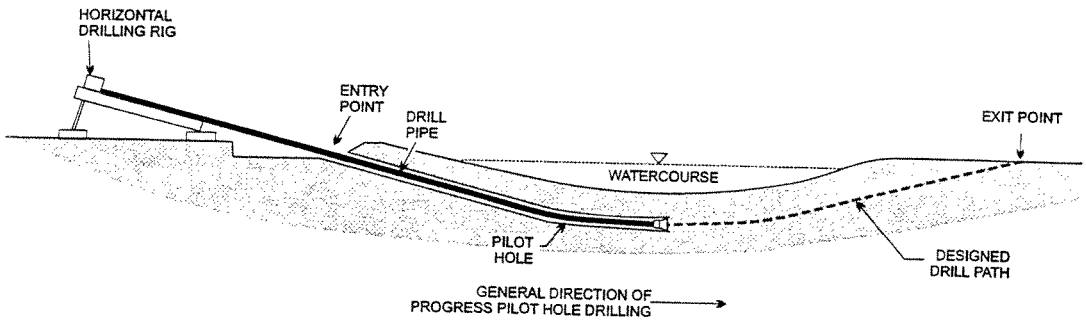
SCALE: AS NOTED

TITLE: ST. COLUMBAN WIND FARM
TYPICAL DETAILS

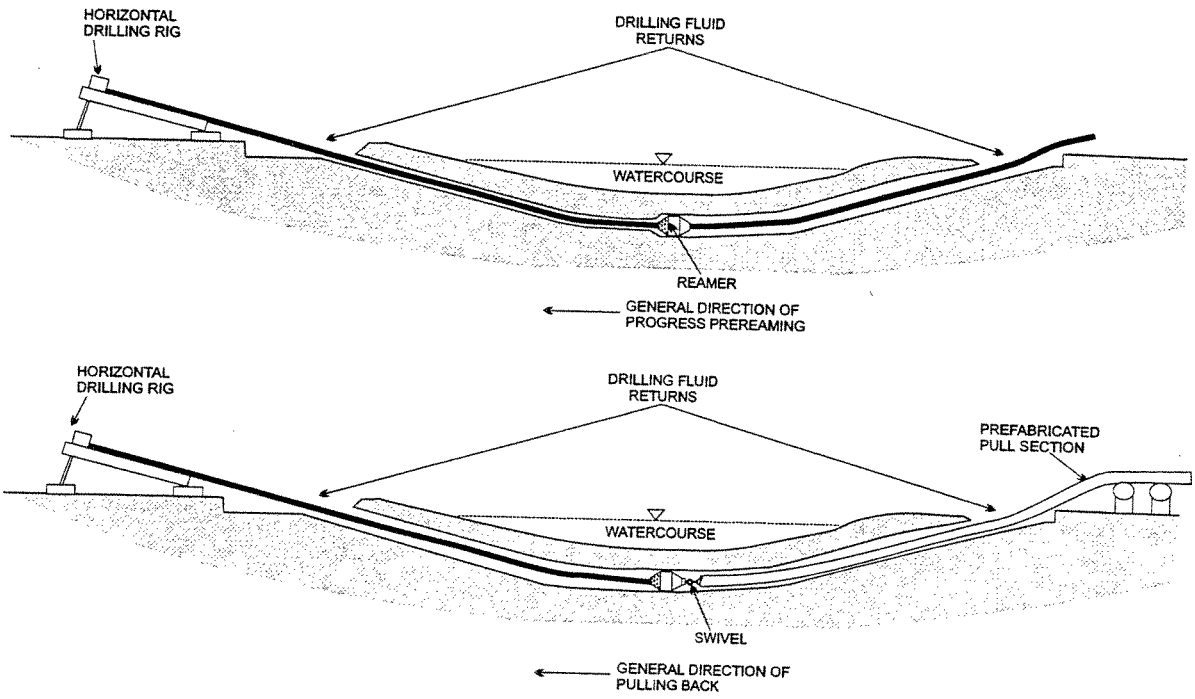
PROJECT No. DEL11-054
SHEET No. 1
PLAN FILE No.

jsmith May/11/11–1:19pm DEL11-054-typical details.dwg

STAGE 1: PILOT HOLE DIRECTIONAL DRILLING



STAGE 2: REAMING AND PULLING BACK



PROFILE
(Not to Scale)

Notes:

1. Obtain geotechnical data prior to initiating drilling. Drilling may not be feasible in some materials such as unconsolidated gravels.
2. Prepare a drilling mud release contingency plan.
3. Set up drilling equipment a minimum of 10 m from the edge of the watercourse; do not clear or grade within 10 m zone.
4. Employ full time inspectors to observe for an inadvertent mud release into the watercourse.
5. Ensure that only bentonite based drilling mud is used. Do not allow the use of any additives to the drilling mud without the approval of appropriate regulatory authorities.
6. Install suitable drilling mud tanks or sumps to prevent contamination of watercourse.
7. Install berms downslope from the drill entry and anticipated exit points to contain any release of drilling mud.
8. Dispose of drilling mud in accordance with the appropriate regulatory authority requirements.

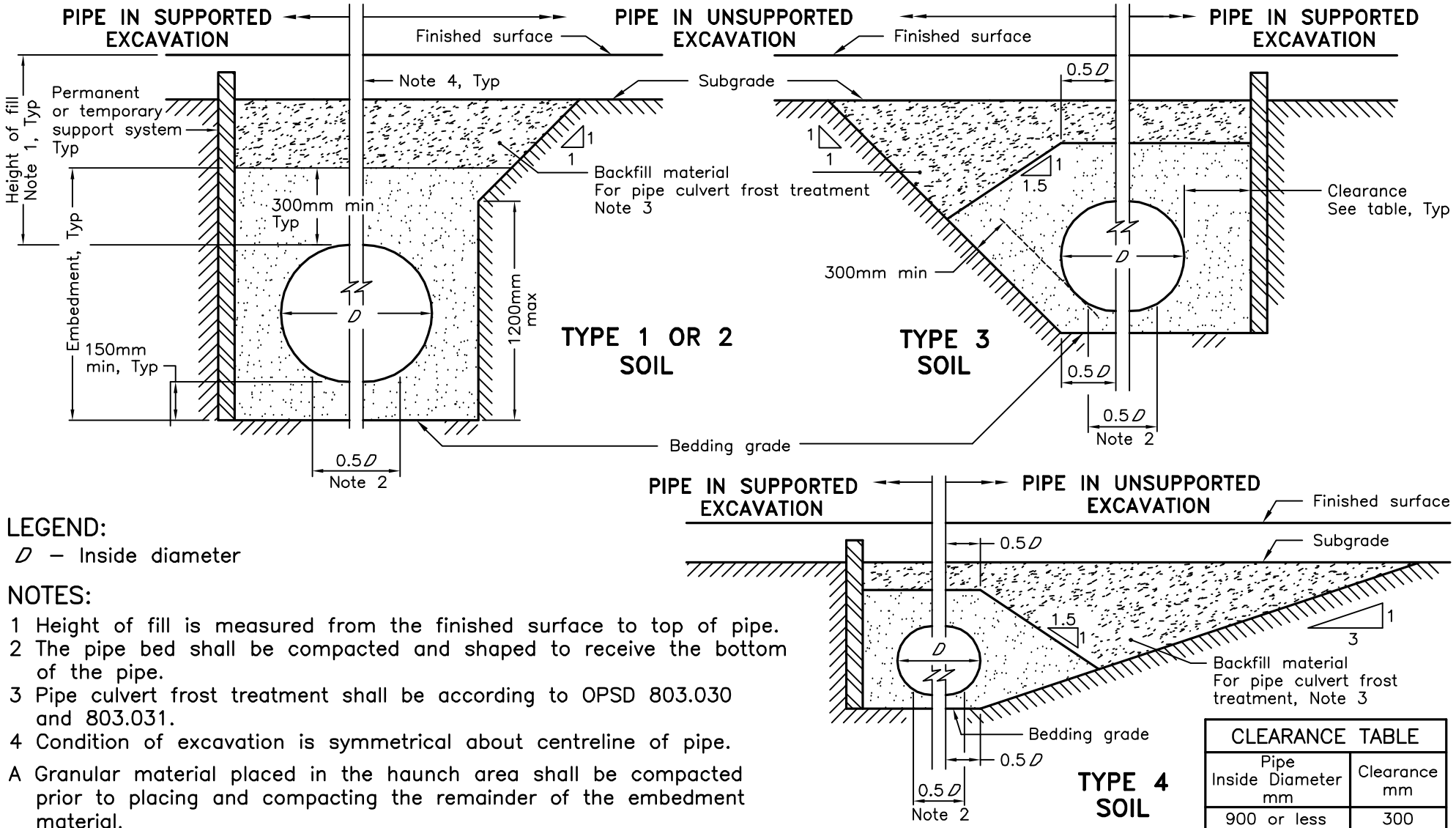
Source: Adapted from ASCE 1996, TERA 1998

CPWCC WATERCOURSE CROSSINGS

CONSTRUCTION TECHNIQUE – TYPICAL HORIZONTAL DIRECTIONAL DRILL

Second Edition

DWG. NO. 11(a)



LEGEND:

D – Inside diameter

NOTES:

1 Height of fill is measured from the finished surface to top of pipe.
2 The pipe bed shall be compacted and shaped to receive the bottom of the pipe.
3 Pipe culvert frost treatment shall be according to OPSD 803.030 and 803.031.
4 Condition of excavation is symmetrical about centreline of pipe.

A Granular material placed in the haunch area shall be compacted prior to placing and compacting the remainder of the embedment material.

B Soil types as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.

C All dimensions are in metres unless otherwise shown.

CLEARANCE TABLE	
Pipe Inside Diameter mm	Clearance mm
900 or less	300
Over 900	500

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2010 | Rev 2

FLEXIBLE PIPE EMBEDMENT AND BACKFILL EARTH EXCAVATION

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

OPSD 802.010