GRAND VALLEY WIND FARMS – PHASE 3 WIND PROJECT

DESIGN AND OPERATIONS REPORT

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Prepared for:

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1.0 Introduction

1.1 PROJECT OVERVIEW

Grand Valley Wind Farms Inc. (GVWF) is proposing to develop, construct, operate and decommission the 40 megawatt (MW) Grand Valley Wind Farms - Phase 3 Wind Project (the Project) in the Town of Grand Valley and Township of Amaranth, Dufferin County in response to the Government of Ontario's initiative to promote the development of renewable electricity in the province.

The Project Study Area is generally bordered on the north by Highway 89, on the south by County Road 109, on the east by 9th Line and on the west by East West Luther Townline. The proposed Project Location 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 Area are shown in Appendix A.

The basic components of the Project include:

- Between 14 and 17 wind turbine generators (Siemens SWT-2.3-113 and/or SWT 3.0-113 turbine) with a total maximum installed nameplate capacity of 40MW. The turbine models are identical in structure, and would be 'de-rated', generating less electricity per turbine to meet the contract nameplate capacity. Noise Assessment Reports have been completed for both turbine models as part of the Renewable Energy Approval (REA) process;
- A 34.5 kV underground power line collector system that would transport the electricity generated from the Project to the Hydro One Networks Inc. (HONI) transmission system;
- Fibre optic cabling laid with the underground collector lines;
- Turbine access roads;
- Crane pads;
- One connection point to the existing HONI electrical transmission system;
- Existing operations and maintenance facilities to be leased by the Project (joining the current facilities for the operation of the Grand Valley Phase 1 and 2 Wind Projects). The currently municipally-serviced office facility is located at 35A Main Street South, Grand Valley and the currently unserviced warehouse facility is located at 27 Mill Street West, Grand Valley;
- Existing parking (owned) and gravel quarry (leased) sites to be used for employee parking and temporary construction trailer sites (174321 and 173395 County Road 25, Grand Valley);
- A 34.5 kV/230 kV 45 MVA transformer station; and,

- Meteorological equipment, including an approximately 100 m MET tower or a ground mounted SoDAR unit.

Temporary components include:

- Work and storage areas during construction at the turbine locations and along the underground power line collector system; and,
- Office, parking and storage areas during construction for the work crews during the construction phase of the Project.

GVWF retained Stantec Consulting Ltd. (Stantec) to prepare the 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 *Environmental Protection Act* (O. Reg. 359/09), as amended. 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.

1.2 REPORT REQUIREMENTS

The purpose of the Design and Operations 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 operating the Project.

The Design and Operations Report has been prepared in accordance with Item 4, Table 1 of O. Reg. 359/09 and the Ministry of the Environment's (MOE's) *Technical Guide to Renewable Energy Approvals* (MOE 2012). O. Reg. 359/09 sets out specific content requirements for the Design and Operations Report as provided in Table 1.1.

Table 1.1: Design and Operations Report Contents: O. Reg. 359/09

Requirements	Completed	Section Reference
1. Set out a site plan of the Project Location at which the renewable energy Project will be engaged in, including:		
i. one or more maps or diagrams of:		
A. all buildings, structures, roads, utility corridors, road allowances and easements required in respect of the renewable energy generation facility and situated within 300 m of the facility,	✓	2.0, 3.0, Appendix A
B. any ground water and surface water supplies used at the facility,	N/A	N/A
C. any things from which contaminants are discharged into the air,	N/A	N/A
D. any works for the collection, transmission, treatment and disposal of sewage,	N/A	N/A
E. any areas where waste, biomass, source separated organics and farm material are stored, handled, processed or disposed of,	N/A	N/A

Table 1.1: Design and Operations Report Contents: O. Reg. 359/09

Requirements	Completed	Section Reference
F. the Project Location in relation to any of the following within 125 m: properties described in Column 1 of the Table to section 19, heritage resources, archaeological resources, the portion of the Oak Ridges Moraine Conservation Plan Area that is subject to the Oak Ridges Moraine Conservation Plan, the area of the Niagara Escarpment Plan, the Protected Countryside, the Lake Simcoe watershed, and	✓	2.0, Appendix A
G. any noise receptors or odour receptors that may be adversely affected by the use or operation of the facility,	✓	2.0, Appendix A
ii. a description of each item diagrammed under subparagraph i, and	✓	3.0
iii. one or more maps or diagrams of land contours, surface water drainage and any of the following, if they have been identified in complying with this Regulation: properties described in Column 1 of the Table to section 19, heritage resources, archaeological resources, water bodies, significant or provincially significant natural features and any other natural features identified in the Protected Countryside or in the portion of the Oak Ridges Moraine Conservation Plan Area that is subject to the Oak Ridges Moraine Plan.	✓	Appendix A
2. Set out conceptual plans, specifications and descriptions related to the design of the renewable energy generation facility, including a description of:		
i. any works for the collection, transmission, treatment and disposal of sewage, including details of any sediment control features and storm water management facilities,	N/A	N/A
ii. any things from which contaminants are discharged into the air, and	N/A	N/A
iii. any systems, facilities and equipment for receiving, handling, storing and processing any waste, biomass, source separated organics, farm material and biogas.	N/A	N/A
3. Set out conceptual plans, specifications and descriptions related to the operation of the renewable energy generation facility, including,	✓	3.0, 4.0
i. in respect of any water takings,		
A. a description of the time period and duration of water takings expected to be associated with the operation of the facility,	N/A	N/A
B. a description of the expected water takings, including rates, amounts and an assessment of the availability of water to meet the expected demand, and	N/A	N/A
C. an assessment of and documentation showing the potential for the facility to interfere with existing uses of the water expected to be taken,	N/A	N/A
ii. a description of the expected quantity of sewage produced and the expected quality of that sewage at the Project Location and the manner in which it will be disposed of, including details of any sediment control features and storm water management facilities,	N/A	N/A
iii. a description of any expected concentration of air contaminants discharged from the facility,	N/A	N/A
iv. in respect of any biomass, source separated organics and farm material at the facility,		

Table 1.1: Design and Operations Report Contents: O. Reg. 359/09

Requirements	Completed	Section Reference
A. the maximum daily quantity that will be accepted,	N/A	N/A
B. the estimated annual average quantity that will be accepted,	N/A	N/A
C. the estimated average time that it will remain at the facility, and	N/A	N/A
D. the estimated average rate at which it will be used, and	N/A	N/A
v. in respect of any waste generated as a result of processes at the Project Location, the management and disposal of such waste, including:		
A. the expected types of waste to be generated,	N/A	N/A
B. the estimated maximum daily quantity of waste to be generated, by type,	N/A	N/A
C. processes for the storage of waste, and	N/A	N/A
D. processes for final disposal of waste.	N/A	N/A
4. Include an environmental effects monitoring plan in respect of any adverse environmental effects that may result from engaging in the renewable energy Project, setting out:		
i. performance objectives in respect of the adverse environmental effects,	✓	5.0, 6.0
ii. mitigation measures to assist in achieving the performance objectives mentioned in subparagraph i,	✓	5.0, 6.0
iii. a program for monitoring adverse environmental effects for the duration of the time that the Project is engaged in, including a contingency plan to be implemented if any mitigation measures fail.	✓	5.0, 6.0
5. Include a response plan setting out a description of the actions to be taken while engaging in the renewable energy Project to inform the public, aboriginal communities and municipalities, local roads boards and Local Services Boards with respect to the Project, including,		
i. measures to provide information regarding the activities occurring at the Project Location, including emergencies,	✓	8.0
ii. means by which persons responsible for engaging in the Project may be contacted, and	✓	8.0
iii. means by which correspondence directed to the persons responsible for engaging in the Project will be recorded and addressed.	✓	8.0
6. If the Project Location is in the Lake Simcoe watershed, a description of whether the Project requires alteration of the shore of Lake Simcoe, the shore of a fresh water estuary of a stream connected to Lake Simcoe or other lakes or any permanent or intermittent stream and,		
i. how the Project may impact any shoreline, including the ecological functions of the shoreline, and	N/A	N/A
ii. how the Project will be engaged in to,		
A. maintain the natural contour of the shoreline through the implementation of natural shoreline treatments, such as planting of natural vegetation and bioengineering, and	N/A	N/A
B. use a vegetative riparian area, unless the Project Location is used for agricultural purposes and will continue to be used for such purposes.	N/A	N/A

The MOE's *Technical Guide to Renewable Energy Approvals* (MOE 2012) further elaborates on content requirements for the Design and Operations Report, as provided in Table 1.2.

Table 1.2: Design and Operations Report Contents: MOE Technical Guide

Requirements	Completed	Section Reference
1. Report Introduction	✓	1.0
2. Site Plan	✓	2.0
3. Facility Design Plan	✓	3.0
4. Facility Operations Plan	✓	4.0
5. Environmental Effects Monitoring Plan	✓	6.0
6. Emergency Response and Communications Plans	✓	8.0

2.0 Site Plan

The Site Plan (Appendix A) provides the following information:

- Facility components, including: turbine locations, underground collector lines/fibre optic cabling, turbine access roads, the connection point to the existing HONI system, met tower and transformer station.
- Project Location: the outer limit of all components of the Project, including temporary work areas during construction. The Project Location is used for defining setback and site investigation distances.
- Roads, utility corridors, road allowances, and easements within 300 m of the Project Location.
- Location of property lines.
- Location of heritage resources within 125 m of the Project Location.
- Cultural and natural features including topographic contours, surface water drainage, heritage and archaeological resources, and natural features and water bodies.
- Noise receptors (participating, non-participating and vacant lots).
- Visual representation of setback buffer areas from the Project Location to heritage resources, water bodies and significant or provincially significant natural features.

The locations of the permanent and temporary met towers are not provided at this time, but will be identified following detailed design. The location of the operations and maintenance building is also not provided as an existing structure will be used. A detailed description of the Project components and cultural and natural features is provided in Sections 3.0, 4.0 and 5.0.

2.1 SETBACK DISTANCES

O. Reg. 359/09 provides setback distances between the Project Location and:

- Significant and provincially significant natural features;
- Provincial parks and conservation reserves; and
- Water bodies.

O. Reg. 359/09 also provides setback distances between the wind turbine base and:

- Property lines;
- Public road right-of-ways;
- Railway right-of-ways; and
- Noise receptors.

Visual representation of the setback distances are illustrated on the Site Plan (Appendix A) and within the Noise Assessment Report (Appendix C). Where the Project Location is within the setback distances (e.g. to natural features or property lines), additional information is provided within the Natural Heritage Assessment/Environmental Impact Study (NHA/EIS) and the Property Line Setback Assessment (Attachment D to this report).

All turbines are located at a minimum distance of 550 m from the nearest non-participating receptor. In accordance with Section 53 of O. Reg. 359/09, all turbines must be located at least 99.5 m (hub height) from the nearest non-participating property line. When this setback is not achievable, a setback of the blade length plus 10 m can be utilized with the completion of a written assessment of the potential effects and preventative measures associated with the turbine location. Written assessments have been prepared (Appendix D) for turbines that have utilized a minimum setback of blade length plus 10 m (65 m) but are closer than 99.5 m to the nearest non-participating property line. In addition, all turbines have been located at least blade length plus 10 m (65 m) from public roads and railway rights-of-way.

3.0 Facility Design Plan

This section provides a description of the key facility design components identified on the Site Plan (Appendix A).

The key mitigation strategy used to address potential environmental effects from operation of the facility was avoidance of significant natural features and water bodies to the extent possible during siting of the Project.

The basic components of the Project include:

- Between 14 and 17 wind turbine generators (Siemens SWT-2.3-113 and/or SWT 3.0-113 turbine) with a total maximum installed nameplate capacity of 40 MW. The turbine models are identical in structure, and would be 'de-rated', generating less electricity per turbine to meet the contract nameplate capacity. Noise Assessment Reports have been completed for both turbine models as part of the REA process;
- A 34.5 kV underground power line collector system that would transport the electricity generated from the Project to the HONI transmission system;
- Fibre optic cabling laid with the underground collector lines;
- Turbine access roads;
- Crane pads;
- One connection point to the existing HONI electrical transmission system;
- Existing operations and maintenance facilities to be leased by the Project (joining the current facilities for the operation of the Grand Valley Phase 1 and 2 Wind Projects). The currently municipally-serviced office facility is located at 35A Main Street South, Grand Valley and the currently unserviced warehouse facility is located at 27 Mill Street West, Grand Valley;
- Existing parking (owned) and gravel quarry (leased) sites to be used for employee parking and temporary construction trailer sites (174321 and 173395 County Road 25, Grand Valley);
- A 34.5 kV/230 kV 45 MVA transformer station; and,
- Meteorological equipment, including an approximately 100 m MET tower or a surface mounted SoDAR unit.

3.1 WIND TURBINE GENERATORS

If approved, the Project would consist of between 14 and 17 wind turbine generators with a total maximum installed nameplate capacity of 40 MW. Both the Siemens SWT 2.3-113 and SWT 3.0-113 turbine models are being considered as part of the REA process. The turbine models are identical in structure, and would be 'de-rated', generating less electricity per turbine to meet the contracted nameplate capacity. Noise Assessment Reports have been completed for both turbine models as part of the REA process and are provided in the Design and Operations Report. A summary of the basic specifications of a typical turbine model in this class is provided in Table 3.1. Detailed information about both turbine models is provided in the Wind Turbine Specifications Report, and Noise Assessment Reports for both models are provided in Appendix C of this report.

Table 3.1: Basic Wind Turbine Specifications

Manufacturer	Siemens	Siemens
Model	SWT 2.3-113	SWT 3.0-113
Name plate capacity (MW)	2.3 MW	3.0 MW
Hub height above grade	99.5 m	99.5 m
Blade length	55 m	55 m
Full blade diameter	113 m	113 m
Blade sweep area	10,000 m^2	10,000 m^2
Speed range	6-13 rpm	6-16 rpm
Frequency spectrum	60 Hz	60 Hz

Table 3.2: Turbine and Transformer Station Coordinates

Turbine #	UTM Easting	UTM Northing
101	546165	4873538
102	546188	4872997
103	548193	4872750
104	548297	4872271
105	552907	4870024
106	554074	4870311
107	554657	4870312
108	555316	4869921
109	552688	4864238
110	552887	4863599
112	551622	4863426
113	551529	4861903
114	550852	4861687
115	550750	4860447
117	550194	4860468
118	550461	4859993
120	554159	4869801
Transformer Station	553380	4868754

3.2 ELECTRICAL INFRASTRUCTURE

A step-up transformer at the base of each turbine is required to transform the electricity created in the nacelle to the collector system voltage of 34.5 kV. From each step-up transformer, underground collector lines would be constructed parallel to the turbine access roads (where possible), and along municipal road right-of-way (ROW), to the 34.5 kV/230 kV 45 MVA transformer station.

The transformer station would occupy an area approximately 100 m X 150 m m in size on private lands located in the immediate vicinity of the connection point to the HONI electrical transmission system (Appendix A).

All underground collector lines would be constructed on leased lands and within municipal road ROW. Wherever possible, underground collector lines on private lands would be aligned with the access roads to reduce the area required for construction and minimize potential construction impacts. The cables would be installed immediately to one side of the access road, just within 2-3m of off the graveled surface. In the municipal road ROW, the cables would be installed to the satisfaction of the municipalities, acting reasonably. The collector lines would be buried at a minimum of 1.0 m. Overhead lines are not anticipated for the Project.

3.3 ACCESS ROADS AND CRANE PADS

Permanent access laneways will be approximately 6 m wide and would not require resizing for the operation phase. Entrances off municipal roads require wider turning radii during construction (40 m), but will be returned to a 8-10 m entrance for operations. Access roads will be used during maintenance activities.

A gravel area (crane pad) adjacent to each turbine will be approximately 30 m x 20 m to allow for crane redeployment should a major maintenance event occur.

3.4 EXISTING OPERATIONS AND MAINTENANCE BUILDING

The Project would use the existing facilities currently being used for the operation and maintenance of the existing GVWF Phase 1 and 2 projects. The currently municipally-serviced office facility is located at 35A Main Street South, Grand Valley and the currently unserviced warehouse facility is located at 27 Mill Street West, Grand Valley.

3.5 TRANSFORMER STATION

A 34.5 kV/230 kV 45 MVA transformer station would be constructed for connection to the existing HONI transmission system. The transformer station would occupy an area approximately 100 m X 150 mm in size on private lands located in the immediate vicinity of the connection point to the HONI electrical transmission system.

Area drainage from the transformer station would be through swales/ditches adjacent to the proposed access road that would collect and convey runoff from the transformer station area and the associated access road. The total drainage area associated with the transformer station 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 would also provide water quality control, which is a suitable stormwater management practice for such an area according to the MOE guidelines.

Within the transformer station footprint, the transformer would be equipped with an oil containment storage area to capture oil in the event of a leak.

3.6 PERMANENT WATER CROSSINGS

Two permanent culvert installations would be required, and will be maintained as required and inspected regularly. Underground collector lines in the municipal road ROW will be directionally drilled under all watercourses, and will not require permanent water crossings (i.e., culverts).

3.7 MET TOWER

For operational purposes, meteorological equipment would be installed within the Project boundary. To satisfy the Independent Electricity System Operator (IESO) reporting requirements, the Project will either erect a permanent 100 m (equivalent to wind turbine hub height) MET tower or place a ground mounted SoDAR unit. The permanent MET tower or SoDAR unit would be located in the vicinity of the transformer station.

The MET tower lighting requirements would be based on the requirements of Navigation Canada and Transport Canada regulations. The permanent MET tower or SoDAR unit would remain for the duration of the Project's operating life.

4.0 Facility Operations Plan

Operations include daily monitoring of the wind turbines and maintenance activities.

4.1 SITE SUPERVISION AND STAFF TRAINING

GVWF may hire a specialized Operation and Maintenance (O&M) Contractor to carry out various on-going activities, including daily operation and maintenance, associated with the Project. Additional staff will be brought in on an as needed basis to support the maintenance activities required for the Project.

During pre-operational mobilization, GVWF and/or the O&M Contractor will develop an operation and maintenance program to ensure compliance with any applicable municipal, provincial, and/or federal requirements. As appropriate, the program will cover staff training, predictive and preventive maintenance, routine maintenance, unscheduled maintenance (including appropriate environmental mitigation measures), annual overhauling, inspection of equipment and components, procurement of spare parts, and maintenance of optimum inventory levels to reduce inventory carrying costs and working capital costs. No significant inventory will be kept on-site, other than control equipment spares and some consumable materials. It will also include a schedule for regular inspections of the turbines and ancillary facilities.

4.2 PLANNED MAINTENANCE

The maintenance of the turbines would be the responsibility of GVWF and/or the O&M Contractor. Maintenance and inspection related to the electrical collector system would remain the responsibility of GVWF and/or the O&M Contractor.

Through use of a SCADA system that is connected to fibre optic cables installed with the collector lines, the maintenance staff would be able to monitor the performance of all turbines on-line in real time. The SCADA system would identify any potential problems so that pro-active inspection and maintenance can be undertaken. Potentially damaged turbines would be shut down until maintenance staff can perform a site inspection. Regular maintenance of the equipment would be a key method of mitigating these potential effects.

Scheduled maintenance will include:

- Visual inspection;
- Inspection of mechanical components;
- Inspection of electrical components; and
- Greasing and general maintenance.

Planned maintenance will occur more frequently at the start of operations, and will slow to once every six months or more as the Project matures. Maintenance of each wind turbine usually takes approximately five days to complete.

Oil changes would be completed in accordance with oil analysis recommendations. The amount of oil and grease stored on site would depend on availability, transportation schedules, and the service cycle. Used oil would be stored in a designated area within the turbine and picked up by a certified contractor with the appropriate manifests in place.

4.3 UNSCHEDULED MAINTENANCE

GVWF and/or the O&M Contractor would also provide unscheduled maintenance for the turbine units when required. Unscheduled maintenance activities could include replacement of major components such as blades or generators.

4.4 MONITORING METEOROLOGICAL DATA

Each turbine would have sensors to measure wind speed and direction. This data would be used to determine when the turbines are operating, as well as to control the pitch of the blades and the orientation of the nacelle.

The meteorological sensors within the nacelle would be used to monitor meteorological data, and the SCADA system will use this data to:

- Provide additional parameters such as wind direction, air temperature, air pressure and wind shear to better manage the operational performance of the equipment; and,
- Provide a backup source of wind speed data should a turbine's own sensors prove unreliable.

The Independent Electrical System Operator (IESO) is expected to require GVWF to provide real-time weather data from the meteorological sensors, along with real-time generation data to provide input to their central generation forecasting model.

More information on monitoring activities during operation of the facility can be found in Section 6.0.

4.5 OTHER ACTIVITIES

No groundwater or surface water-taking activities are planned as part of the operation of the Project, and there is no potential for the Project to interfere with existing uses of water within or near the Study Area. Project operations will not discharge contaminants into the air, and no stormwater management activities are required as part of the operation of the Project. As such, no sediment control features and no storm water management facilities are required. In addition, there are no areas where waste, biomass, source separated organics and farm material are stored, handled, processed or disposed of during the operation of the Project.

In accordance with Section 8 of O. Reg. 419/05, air emission rate calculations and dispersion modeling do not have to be performed for emissions from negligible sources or for the emission of negligible contaminants from significant sources.

Based on the preliminary facility design, the following sources of air emissions have been identified:

- Fuel combustion from on-site vehicles;
- Maintenance use of solvent-based cleaners;
- Maintenance welding activities;
- One stand-by emergency diesel generator; and,
- Battery chargers.

Based on the guidance given in Table B-3 of *Procedure for Preparing an Emission Summary and Dispersion Modelling (ESDM) Report* (Version 3, February 2009), the following are defined as sources that emit contaminants in negligible amounts:

- Small maintenance and janitorial activities;
- Maintenance welding stations;
- Standby power generators firing liquid or gaseous fuels that are used for standby power only with periodic testing as per the Regulation;
- Exhaust of inert gases; and,
- Battery chargers.

Therefore, as O. Reg. 419/05 does not apply to discharges of contaminants from motor vehicles and all other facility sources can be considered negligible per the information provided above, no further assessment is required.

5.0 Potential Effects and Mitigation Measures

O. Reg. 359/09 requires that any adverse environmental effects that may result from operations 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 operation 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, and Heritage Impact Assessment.

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, 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, 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 environmental effects from operation of the facility was avoidance of significant natural features and water bodies 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 in consideration of 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) to the features throughout the operations phase of the Project. The proposed mitigation measures would assist in achieving this performance objective. Additional information related to specific performance objectives is provided in Table 7.1, and detailed in the Environmental Effects Monitoring Plan provided in Section 6.0.

5.1 CULTURAL HERITAGE AND ARCHAEOLOGICAL RESOURCES

5.1.1 Heritage Resources

In accordance with O. Reg. 359/09, a Heritage Impact Assessment (HIA) was undertaken, and is included as part of the REA application. The HIA report was submitted to the Ministry of Tourism, Culture, and Sport (MTCS), who reviewed and provided confirmation that the methodology, recommendations, and conclusions are to their standards. The confirmation letter from MTCS is included as part of the final REA submission to the MOE.

The Heritage Assessment involved archival research (including records held by the Town of Grand Valley, the Township of Amaranth, and the Ontario Heritage Trust), consultation with relevant groups and authorities, and a visual survey of the Study Area. The visual survey was completed in November and December, 2012, to document the general cultural landscape of the Study Area, to record the context and condition of previously identified resources, and to determine the extent of any previously unidentified built heritage resources or cultural heritage landscapes within and adjacent to the Project Location.

During the course of the assessment 196 potential cultural heritage resources were recorded. Of those, 28 Built Heritage Resources and 37 Cultural Heritage Landscapes were identified as meeting the criteria for determining cultural heritage value or interest (CHVI) under Ontario Regulation 9/06.

No protected properties, as identified in the table in Section 19, O.Reg.359/09 are located within or adjacent to the Project Location.

For each resource and landscape of cultural heritage value or interest, a Heritage Impact Assessment (HIA) was undertaken in order 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 Effects

If heavy machinery or turbine components are required for maintenance activities, the use of roads through cultural heritage landscapes in the communities of Grand Valley, Monticello and Colbeck could impact cultural heritage resources should an accident occur.

Mitigation Measures

Avoid travel through cultural heritage landscapes in the communities of Grand Valley, Monticello and Colbeck to the greatest extent practicable when transporting heavy machinery and turbine components in order to minimize the potential for accidental or indirect damage to the high concentration of narrowly setback cultural heritage resources and landscapes within those communities.

Net Effects

By following the procedures recommended above, no adverse net effects on significant built heritage resources and cultural heritage landscapes are anticipated during operation of the Project.

5.1.2 Archaeological Resources

In accordance with O. Reg. 359/09, Stage 1 and 2 Archaeological Assessments were undertaken, and are included as part of the REA application. Both reports were submitted to the MTCS, who reviewed and provided confirmation that the methodology, recommendations, and conclusions are to their standards. The confirmation letters from MTCS are included as part of the final REA submission to the MOE.

Based on the results of the Stage 1 Archaeological Assessment, a Stage 2 Assessment was recommended for all areas to be disturbed during construction, operation, and decommissioning of the Project.

A Stage 2 field assessment of proposed Project infrastructure was conducted in December, 2012 and January, 2013. Archaeological monitors from the Saugeen Ojibway Nation, Six Nations of the Grand River, and the Haudenosaunee Development Institute (on behalf of the Haudenosaunee Confederacy Chiefs Council) participated in the field programs. Either pedestrian or test pitting surveys were conducted as appropriate for the field conditions on turbine locations, access roads, collector cables, the transformer station, and all other Project infrastructure. The municipal road ROW where underground cable is proposed were also photo-

documented and assessed; it was determined that, from an archaeological perspective, these areas are disturbed, and do not require any additional fieldwork.

Three archaeological findspots were found during the Stage 2 investigations – two historic Euro-Canadian artifact scatters, and one pre-contact Aboriginal findspot for which a Stage 3 Assessment will be completed outside the REA process, prior to construction.

Potential Effects

There are no areas that would be excavated during the operation phase that have not been previously assessed prior to construction, therefore no potential effects are anticipated to archaeological resources during operation of the Project.

Mitigation Measures

No potential effects are anticipated and therefore no mitigation measures are necessary.

5.2 NATURAL HERITAGE RESOURCES

In accordance with O. Reg. 359/09, an NHA/EIS was undertaken for the Project and is included as part of the REA application. The report was submitted to the Ministry of Natural Resources (MNR), who reviewed and provided confirmation that the methodology, recommendations, and conclusions are to their standards. The confirmation letter from MNR is included as part of the final REA submission to the MOE.

The following provides a summary of the potential effects and 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, Figure 4.

5.2.1 Wetlands

A total of 30 wetlands were identified through the records review and field investigations as occurring within 120m of the Project Location. All were treated as significant for conservative assessment of potential effects.

Potential Effects

Prior to final siting of the Project, previously unevaluated wetlands were assessed and conservatively identified as significant. Substantial effort was allocated to the design of the final layout to ensure that Project components were sited outside of all identified significant wetland boundaries. Separation distances from Project components to significant wetlands were maximized to the extent possible as an impact avoidance strategy.

Turbines are sited more than 50 m (arbitrary distance used for summation purposes only) from wetland features, with the following exceptions:

- Feature 3 is approximately 8 m from the blade sweep of T104.
- Feature 20 is approximately 21 m from the blade sweep of T106.
- Feature 22 is approximately 4 m from the blade sweep of T106.
- Feature 30 is approximately 4 m from the blade sweep of T112.

There will be no direct loss of significant wetland habitat or function outside existing municipal road ROW due to operations and maintenance of the Project. During operation, infrequent day to day use of access roads and maintenance activities associated with the road may result in impacts to wetlands, due to dust, but such impacts are expected to be very minimal. If required, dust suppression during operation of the Project could be considered.

There may be occasional impacts during maintenance of access roads or collector lines. If major maintenance activities are required in proximity to significant wetlands, mitigation measures for construction should be implemented.

Other potential impacts that might occur during operation include spills and contamination to the wetlands. Improper disposal of wastes (e.g. fluids, containers, cleaning materials, etc.) could also have a negative impact on the feature.

Mitigation Measures

The primary mitigation strategy was avoidance of wetlands. Prior to final siting of the Project, significant wetlands were identified applying a conservative approach. Substantial effort was allocated to the design of the final layout to ensure that Project components were sited outside of conservatively identified significant wetland boundaries. Separation distances from Project components to significant wetlands were maximized to the extent possible as an impact avoidance strategy.

If required, dust suppression on access roads during operation of the Project could be considered. Should major maintenance activities be required, mitigation measures as outlined in the Construction Plan Report should be implemented.

Storage of fuel and activities with the potential to cause contamination will occur in properly protected and sealed areas. In the event of an accidental spill, the MOE Spills Action Centre will be contacted and emergency spill procedures implemented immediately.

Net Effects

The setback of more than 50 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.

The percent area converted to hard surfaces is negligible and no effect to the water balance is anticipated.

With the application of mitigation measures identified above, no adverse net effects on wetlands are anticipated during operation of the Project.

5.2.2 Areas of Natural and Scientific Interest

There are no ANSIs within 120 metres of the Project Location.

Potential Effects

No effects to ANSIs are anticipated. Mitigation Measures

As no effects are anticipated, no mitigation measures are required.

Net Effects

No net effects are anticipated.

5.2.3 Significant Woodlands

A review of aerial photos and the Official Plans of the Township of East Luther-Grand Valley (2008) and the Township of Amaranth (2004) indicate the Study Area is predominantly agricultural, with portions of wooded areas.

A total of 33 woodlands were identified within 120m of the Project Location; 25 of these were determined to be significant.

Potential Effects

Turbines are sited more than 50 m (arbitrary distance used for summation purposes only) from significant woodlands, with the following exceptions:

- Feature 18 is approximately 4 m from the blade sweep of T106.
- Feature 25 is approximately 17 m from the blade sweep of T110.
- Feature 30 is approximately 0 m from the blade sweep of T112.
- Feature 31 is approximately 24 m from the blade sweep of T114.

Separation distances from Project components to significant woodlands were maximized to the extent possible as an impact avoidance strategy. All separation distances for significant woodlands are summarized in **Table 4.4** for all project components, including construction zones; also refer to **Figures 5.1-5.2, Appendix A**.

Operation of the Project is anticipated to have very limited impacts to significant woodlands.

During operation, infrequent day to day use of access roads and maintenance activities associated with the road may result in impacts to woodlands, due to dust, but such impacts are expected to be minimal. If required, dust suppression during operation of the Project could be considered.

There may be occasional impacts during maintenance of access roads or collector lines. If major maintenance activities are required in proximity to significant woodlands, mitigation measures for construction should be implemented.

Other potential impacts that might occur during operation include spills and contamination to proximate woodlands; however separation distances are generally sufficient to avoid impacts. Improper disposal of wastes (e.g. fluids, containers, cleaning materials) could also have a negative impact on the feature.

Mitigation Measures

If required, dust suppression on access roads during operation of the Project could be considered. Should major maintenance activities be required, mitigation measures as outlined in the Construction Plan Report should be implemented.

Storage of fuel and activities with the potential to cause contamination will occur in properly protected and sealed areas. In the event of an accidental spill, the MOE Spills Action Centre will be contacted and emergency spill procedures implemented immediately.

Net Effects

With the application of the above mitigation measures, any adverse net effects to woodlands during operation of the Project are anticipated to be short-term in duration and spatially limited.

Accidental spills would be spatially limited and of short duration and protocols to minimize their impact would be provided in the Emergency Response Plan. See Section 8.0 for more information on the Emergency Response Plan.

5.2.4 Provincial Parks and Conservation Reserves

Potential Effects

No Provincial Parks or Conservation Reserves are located within 120 m of the Project in the Study Area.

Mitigation Measures

No potential effects would occur on Provincial Parks or Conservation Reserves and therefore no mitigation measures are necessary.

Net Effects

No adverse net effects on Provincial Parks or Conservation Reserves are anticipated during operation of the Project.

5.2.5 Significant Wildlife Habitat

The Project Location is comprised largely of actively managed agricultural lands. Natural wildlife habitat found within 120 m of the Project Location is primarily provided by the Luther Marsh wetland complex to the west and the Bowling Green Swamp to the east. Wooded areas are located throughout the Study Area.

The nearest Important Bird Area (IBA) is located to the west of the Study Area. Luther Marsh is approximately 10,500 ha, with portions located within the Study Area. Four turbines are inside or immediately adjacent to the Luther Marsh IBA, including turbines 114, 115, 117 and 118.

Luther Marsh IBA was formed by damming one of the Grand River's upper tributaries. Within this site, there are three main areas of interest: the lake, and various islands and bogs therein; a forest with northern characteristics; and Wylde Lake, which is a raised bog of boreal character southeast of the main lake. Luther Marsh provides significant habitat for a variety of wetland bird species, such as Least Bittern, Black Terns, Common Loon, Red-neck Grebe, Wilson's Phalarope, Osprey, Great Egret, and Great Blue Heron. This site is also significant for waterfowl. At least 15 species of ducks nest near Luther Marsh. In addition, Several landbird species of conservation interest also have been recorded to nest at this site: Lincoln's Sparrow, Short-eared Owls, LeConte's Sparrow and Henslow's Sparrow (IBA Canada, 2012).

Based on a review of background information, 247 species of birds, 37 species of mammals, 12 species of amphibians and 13 species of reptiles are known to occur within the range of the Study Area. Exact locations of species occurrences are not available as they are recorded within 10 x 10 km squares. The potential for species to be present within the Project Location would be limited by the habitat suitability and availability. Therefore the identified species recorded from these databases may not occur within the Project Location.

A total of 18 significant wildlife habitats was identified within 120m of the Project Location:

- Amphibian breeding habitat (wetland): ABWE-2
- Amphibian breeding habitat (woodland): ABWO-1 to ABWO-9, and ABWO-13 to ABWO-15
- Bat Maternity Colonies: BMC-1 and BMC-2
- Marsh breeding bird habitat: MBB-1
- Waterfowl nesting area: WNA-3 and WNA-4

None of the 18 candidate significant wildlife habitat features are located in the Project Location

Field investigations planned for 2013 will be used to support the significance evaluation of these features; as per Appendix D of the NHA Guide, all areas of Candidate Significant Wildlife Habitat will be treated as significant and studied as Part of the EIS, prior to development.

The following surveys will be implemented only as required by Appendix D of the NHA Guide:

- Spring and fall waterfowl stopover and staging surveys (March-May and October-December 2013);
- Winter raptor driving and walking transect surveys (complete - January – February 2013);
- Turtle Wintering Areas (March-May 2013)
- Colonial nesting bird sties – ground; Brewer's Blackbird (May–July 2013)
- Spring waterfowl nesting surveys (May–July 2013);
- Summer woodland raptor nesting surveys (mid-March to end-May 2013);
- Amphibian surveys - woodland and wetland (April-June 2013);
- Marsh bird breeding (May-July 2013)
- Woodland area-sensitive bird breeding – woodland (May-July 2013)
- Open country bird breeding (May-July 2013)
- Shrub/early successional bird breeding – shrub/early (May-July 2013)
- Targeted surveys for: Western Chorus Frog, Redhead, Wilson's Phalarope, Black Tern, Short-eared Owl, Common Nighthawk, Red-headed Woodpecker, Canada Warbler, Red-necked Grebe, Louisiana Waterthrush (May-July 2013)

Potential Effects and Mitigation

Amphibian breeding habitat (wetland: ABWE-2) and (woodland: ABWO-1 to ABWO-9, and ABWO-13 to ABWO-15)

Potential impacts to significant amphibian breeding habitat during operation of the Project are anticipated to be minimal. Increased traffic on municipal roads and new access roads might be expected to increase potential for direct mortality of amphibians during operation and maintenance activities, particularly during cool, rainy spring nights as amphibians move to warmer road surfaces. Infrequent day to day uses of the access roads and maintenance activities are unlikely to result in increased vehicle strikes or habitat impacts. If required, dust suppression during operation of the Project could be considered.

There may be occasional impacts during maintenance of collector lines, resulting in habitat degradation by dust, siltation, erosion or accidental spill. If collector line maintenance activities are required in proximity to amphibian breeding features, mitigation measures used during construction should be implemented.

Effects of turbine noise on amphibian populations are relatively unknown and not-well understood; however, individual reproductive success has been directly related to calling effort in frogs (Sun and Narins 2004). Therefore, noise may be a concern because it can interfere with calling rates, which could in turn impact fitness (Sun and Narins 2004, Penna et al. 2005). As well, noise may not allow breeding frogs to properly hear and move toward breeding aggregations (Maxell and Hokit 1999).

Masking of auditory environmental signals, such as mammal warning cries or amphibian calls, may be significant immediately underneath the turbine (Rabin et al. 2006), but the effects rapidly decline with distance from the turbine. A study of low frequency noise and vibration at a modern wind farm determined that vibration is 1/5th to 1/100th of the limit of human perception within 25 m of the turbine base (Legerton et al. 1996).

Considering the setbacks from turbines, masking of auditory signals is not anticipated to have a significant impact on other amphibian breeding features.

During operation of the facility, some materials such as lubricating oils and other fluids associated with turbine maintenance have the potential for discharge on the environment through accidental spills, resulting in a potential impact to amphibian habitat through ground or surface water contamination. In the event of an accidental spill, the MOE Spills Action Centre will be contacted and emergency spill procedures implemented immediately.

Bat Maternity Colonies: BMC-1 to BMC-2

Environment Canada et al. (2011) reported that bat casualties outnumbered birds at almost all wind farm sites in Canada (64% of all carcasses found) and Ontario (66% of all carcasses

found) for post-construction monitoring studies conducted between 2006 and 2009. Bats may be injured or killed through collisions with moving turbine blades and barotrauma (internal haemorrhaging), caused by rapid air pressure reduction near moving turbine blades.

Contributing factors include time of year, species, habitat or landscape features in the area, and weather conditions, including wind speed, with the following key consideration prevalent in the literature:

- Essentially all studies of bats demonstrate that peak fatalities occur during late summer, early fall migrations (NWCC 2011; Environment Canada et al. 2011; MNR, 2007).
- Bats tend to be most active during periods of low wind. Some studies indicate that bat collisions occur primarily on nights with low speed and typically increase immediately before or after passing storm fronts (NWCC 2011).

Based on known bat mortality rates from operational wind projects, MNR has set a threshold for bat mortality (MNR, 2011a). If mortality levels are maintained below the threshold, the Project would not be considered to have significant impacts to bat populations. The Environmental Effects Monitoring Plan describes a response and contingency plan that will be implemented if performance objectives cannot be met.

Indirect impacts to bats, such as avoidance of an area, habitat disruption, reduced population density, habitat abandonment, loss of refugia, habitat unsuitability and behavioural effects have not been demonstrated in North America (NWCC 2010).

Marsh breeding bird habitat: MBB-1

Marsh breeding birds are among the more sensitive bird species with respect to disturbance from wind power development. In their meta-analysis of the effect of wind turbines on bird abundance at 19 globally-distributed wind farms, Stewart et al. (2007) concluded that wading birds were the second-most likely bird taxon to demonstrate declines in abundance. Pearce-Higgins et al. (2012) found construction disturbance was the primary cause of bird population declines at wind farms. For some species, populations rebounded once construction ceased and turbines became operational, however some disturbance-sensitive species such as Snipe and Curlew did not return to their pre-construction abundance (Pearce-Higgins et al 2012).

Differences in avoidance behaviour have been noted at North American wind development projects when compared with European studies. The single wind turbine at Pickering Nuclear Generating Station, adjacent to the Hydro Marsh, has not proved to be a deterrent to local marsh breeding birds. Black-crowned Night Herons and Common Terns were observed flying within 50 m of the active turbine and regularly visited the Hydro Marsh (James 2002). At the Erie Shores Wind Farm, Great Blue Heron were relatively scarce due to limited habitat; however, half of the 19 individuals observed in 2006 and 2007 flew within 100 m of operating turbines (James 2008). Post-construction studies at the Wolfe Island Wind Plant did not find any significant declines in species diversity or abundance in the large coastal wetlands adjacent to

operational wind turbines; no declines were observed in the common marsh species such as Swamp Sparrow, Marsh Wren and Common Yellowthroat. More sensitive species, such as Least Bittern, were also recorded breeding on Wolfe Island in proximity to operational wind turbines (Stantec 2012a).

It is anticipated that similar results would be found at the Grand Valley Phase 3 Project. Post-construction monitoring will be conducted in these features for a period of three years, to confirm disturbance to marsh breeding birds is not higher than expected. The Environmental Effects Monitoring Plan (included in the Project Design and Operations Report) describes a response and contingency plan that will be implemented if performance objectives cannot be met.

Overall, disturbance impacts from operational wind turbines to breeding birds in marsh breeding habitats are expected to be negligible.

Waterfowl nesting area: WNA-3 to WNA-4

Potential indirect impacts to waterfowl nesting areas would include habitat degradation from dust, noise or accidental spill, and infrequent day to day uses of the access roads (access roads are less than 50 m fromWNA-1and 2). Overall, waterfowl nesting areas are not anticipated to be impacted by the operation of the Project. Therefore no post-construction monitoring is proposed.

Generally, breeding waterfowl are not expected to engage in aerial displays or other high risk behaviour at the height of the blade sweep zone.

Net Effects

Overall, the Project has been sited outside of significant waterfowl stopover and staging areas and are relatively well spaced. As such, disturbance to stopover habitat, or potential barrier effects, are not anticipated to be significant. Post-construction monitoring for disturbance will be conducted in these features for a period of three years, to ensure disturbance to marsh breeding birds is not higher than expected. The Environmental Effects Monitoring Plan (Appendix E) describes a response and contingency plan that will be implemented if performance objectives cannot be met.

The Study Area is anticipated to continue to support similar concentrations of wintering raptor during operation of the Project. Post-construction monitoring for disturbance will be conducted in significant raptor wintering areas (SWH16) for a period of three years, to ensure disturbance to wintering raptors is not higher than expected.

No adverse net effects on wildlife and wildlife habitat are anticipated during operation 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. The Environmental Effects Monitoring Plan for Wildlife is provided in Appendix E

5.3 WATER BODIES AND AQUATIC RESOURCES

5.3.1 Groundwater

Potential Effects

It is not anticipated that operation of the Project would adversely affect groundwater quality, quantity, or movement.

In the event of an accidental spill of materials, such as fuel, lubricating oils and other fluids associated with turbine maintenance, there is a potential for discharge to the environment.

Mitigation Measures

Mitigation measures for accidental spills are outlined in Section 5.7.2.

Net Effects

Accidental spills would be spatially limited and of short duration and protocols to minimize their impact would be provided in the Emergency Response Plan. See Section 0 for more information on the Emergency Response Plan.

5.3.2 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 (Appendix A). 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.

The Project Location is situated south of the Grand River headwaters and immediately east of Luther Marsh. The watershed is primarily rural, containing agricultural land and forested areas within the Town of Grand Valley and Township of Amaranth. Within the Project Location the Upper Grand River Watershed is characterized by generally flat topography, with many intermittent, first order watercourses that drain directly into the mainstem of the Grand River (GRCA, 2005). Within the Project Location, watercourses consist predominantly of municipal drains. Site visits were conducted in October, November, and December 2012 to characterize habitat and fish communities within waterbodies within 120m of the Project Location, as defined by O. Reg. 359/09 (Table 5.1).

Table 5.1: Waterbodies within 120m of the Project Location and Associated Infrastructure

Water Body	Crossing Type		Project Component(s) with 120 m		
	Access Road*	Collector Line	Turbine	Access Road**	Collector Line
Galbraith Extension Drainage Works					√
Galbraith Drain		√			
Galbraith Extension Drainage Works		√			
No. 21 Drainage Works	√	√	√		
No. 21 Drainage Works		√		√	
No. 21 Drainage Works		√			
No. 16 Drainage Works		√			
Grand River		√			
Palmer Drain		√			
No. 21 Drainage Works		√			
Bruce Drainage Works		√			
No. 21 Drainage Works		√			
Gajtani Drainage Works		√			
No. 7 Drainage Works		√			
Potter Drain					√
Atkinson Drainage Works					√
No. 1 Drain (Boyne Creek)		√			
No. 2 Drainage Works (Boyne Creek)		√			
No. 2 Drainage Works (Boyne Creek)	√	√	√		

Potential Effects

The potential for effects on watercourses exists from soil erosion resulting from maintenance activities requiring excavation. Erosion can cause downstream sediment transport and a short-term increase in surface water turbidity, including associated impacts to fish and fish habitat. In addition, some materials, such as fuel, lubricating oils and other fluids associated with turbine maintenance have the potential for release to the environment in the event of accidental spills.

Two watercourse crossings will require permanent culverts. The culverts would be designed and installed in a manner that would not impede fish movement or water passage and where possible, habitat enhancement measures would be incorporated into the design. All work in watercourses will be conducted in consultation with the Grand River Conservation Authority.

Maintenance Activities in Proximity to Watercourses

The potential for effects on watercourses exists from soil erosion resulting from unavoidable removal of stabilizing vegetative cover during maintenance activities. Erosion can cause

downstream sediment transport and a short-term increase in surface water turbidity, including associated impacts to fish and fish habitat. 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 turbine maintenance, have the potential for release to the environment in the event of accidental spills.

Mitigation Measures

The following erosion and sediment control measures would be implemented prior to maintenance activities in proximity to watercourses:

- Silt fencing and/or barriers would be used along all maintenance areas adjacent to water bodies;
- No equipment would be permitted to enter any water bodies beyond the silt fencing;
- 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 maintenance site would be stabilized immediately and re-vegetated as soon as conditions allow; and,
- Sediment and erosion control measures would be left in place until all areas of the maintenance site has been stabilized.

If any damage were to occur, as soon as possible following completion of the maintenance activity, stream banks would be restored to their original grade.

Even with properly installed erosion and siltation control measures, extreme runoff events could result in collapse of silt fencing or 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 (Section 8.0) would contain procedures for spill contingency and response plans, 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 O&M Contractor.

Mitigation measures related to accidental spills are outlined in Section 5.7.2.

No additional mitigation measures are required for correctly installed culverts.

Net Effects

Provided that all mitigation measures are implemented, no adverse net effects on surface water are anticipated during operation of the Project. There remains the potential for adverse net effects to fish and fish habitat due to spills, sedimentation and erosion. With the implementation of the mitigation measures listed above, any associated effects would be infrequent, of low probability, of short duration and of limited spatial extent.

5.4 AIR QUALITY AND ENVIRONMENTAL NOISE

5.4.1 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 Guelph, the closest station to the Project Study Area, were chosen to assess the local ambient air quality. During 2012, 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 (MOE, 2012) .

Potential Effects

During operation minor localized air emissions would occur from the periodic use of maintenance equipment and vehicles over the life of the Project.

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;
- Equipment and vehicles would be turned off when not in use unless required for maintenance 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 equipment and vehicles would meet the emissions requirements of the MOE and/or Ministry of Transportation (MTO);
- As appropriate, records of vehicle maintenance would be retained and made available for periodic review by the O&M 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.

Net Effects

The application of the recommended mitigation measures during operation 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 during operation of the Project are anticipated to be short-term in duration and highly localized.

The Project would result in a net reduction of air emissions related to electricity generation, offsetting electricity generated by fossil fuel technologies and therefore, reducing air pollutants and greenhouse gas emissions.

5.4.2 Dust and Odour Emissions

Potential Effects

Operations-related traffic and maintenance activities have the potential to create nuisance dust effects in the immediate vicinity of the Project. Unpaved road surfaces exposed to wind can also be a source of fugitive dust emissions.

No odour emissions are anticipated during operation of the Project. Therefore, no mitigation measures are required.

Mitigation Measures

To protect adjacent receptors from potential off-site dust concerns, GVWF and/or the O&M Contractor would implement good site practices during operation which may include:

- Maintaining equipment in good running condition and in compliance with regulatory requirements;
- Dust suppression (e.g. water) of source areas; and,
- Covering loads of friable materials during transport.

GVWF would develop and implement a Communications and Complaint Response Protocol to address any concern from the public, such as complaints about dust.

Net Effects

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

5.4.3 Environmental Noise

Potential Effects

During operations, sound would be generated periodically by maintenance equipment. The audible sound at receptors beyond the turbine siting areas is expected to be a minor, short-term disruption.

Mechanical and aerodynamic sound would be emitted from the wind turbines. Mechanical noise will also be emitted from the transformer station. All turbines proposed as part of the Project are located at a distance of at least 550 m from the nearest non-participating noise receptor. In addition, Noise Assessment Reports have been completed for the Project (Appendix C) in accordance with the MOE "*Noise Guidelines for Wind Farms*", dated October 2008 and O. Reg. 359/09.

Based upon the Project design, the analysis carried out in the Noise Assessment Reports indicates that sound produced by the Project is within the acceptable limits established by the MOE at all non-participating noise receptors.

Mitigation Measures

The Project would operate according to the terms and conditions of the REA. In the event the Project does not operate according to the terms and conditions of the REA, the non-compliant turbine(s) may be shut down until the problem is resolved. A regular maintenance program would largely mitigate potential effects related to noise from damaged turbines.

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

Routine facility maintenance will be performed as required to ensure infrastructure is operating properly and efficiently.

To the greatest extent possible, operation activities that could create excessive noise would be restricted to regular business hours and adhere to any local noise by-laws and any requirements of the Occupational Health and Safety Act. If maintenance activities that cause excessive noise must be carried out outside of these time frames, adjacent residents would be notified in advance and by-law conformity would occur, as required.

Net Effects

Application of the recommended mitigation measures during operation would limit noise emissions to the general vicinity of the turbine locations. Given that the noise assessment has

concluded that the environmental noise from the operation of the Project is in compliance with the applicable MOE environmental noise guidelines, no significant net effects are anticipated.

Intermittent noise would increase during regular business hours at the turbine locations. Any adverse net effects due to noise during operation of the Project are anticipated to be short-term in duration and intermittent.

5.5 LAND USE AND SOCIO-ECONOMIC RESOURCES

5.5.1 Areas Protected Under Provincial Plans and Policies

Potential Effects

No areas protected under specified Provincial Plans and Policies are located within the Study Area.

Mitigation Measures

No potential effects will occur on areas protected under provincial plans and policies and therefore no mitigation measures are necessary.

Net Effects

No adverse net effects on areas protected under provincial plans and policies are expected during operation of the Project.

5.5.2 Existing Land Uses

Potential Effects

During the operation phase of the Project, the lands which are occupied by facility components would be removed from their present land-use; however, existing surrounding land uses would remain unchanged.

During operation there would be a short-term and intermittent increase in noise and dust around the work and haul areas used by maintenance equipment and personnel vehicles, resulting in a potential effect to adjacent land uses.

There is potential for a minor increase in traffic during operation on roadways within the Study Area during maintenance activities. Notification of component delivery dates and a traffic management plan are intended to minimize any potential effects in the local area.

Mitigation Measures

Landowners would be compensated by GVWF 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 noise in Section 5.4.3, dust in Section 5.4.2, and traffic in Section 5.5.7.

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.

5.5.3 Recreation Areas and Cultural Features

Potential Effects

Due to the presence of the turbines, disturbance to the viewscape may occur. No additional adverse effects are anticipated to recreation areas and cultural features during operation of the Project.

Mitigation Measures

Mitigation measures have been identified for viewscape in Section 5.5.9.

Net Effects

Net effects have been identified for viewscape in Section 5.5.9.

5.5.4 Agricultural Lands and Operations

Potential Effects

The existing land use within the Project Area includes primarily agricultural lands, specifically Class 1 and 2 lands. During operations, the Project is estimated to take out of agricultural production approximately 105 acres of land, which is equivalent to less than 12% of the total participating properties 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.

Potential effects to the agricultural land used for the turbines, access roads and collector lines are related to the change in use from agricultural to renewable energy development. However, where lands are being used for Project infrastructure, landowners are being financially compensated for the lease of the private lands and thus offset the effect of removing the land from agricultural production.

Impacts to livestock during the operation of the Project are anticipated to be minimal.

Dust emissions from operation activities are associated with vehicular traffic from maintenance equipment and personnel vehicles. Dust emissions are expected to be short-term in duration and highly localized. No potential physical effects are anticipated on agricultural lands and operation from dust during operation of the Project. Therefore, no mitigation measures are required.

Mitigation Measures

Given that agricultural land would be required during the operation of the turbines, access roads and collector lines, landowners are being financially compensated for the lease of the private lands to offset the effect of removing the land from agricultural production. To the greatest extent possible, efforts have been made to site the Project 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.

Operational and maintenance activities would be restricted to the delineated Project areas such as access roads and crane pads. Under O. Reg. 359/09, the centre of the turbine base must be at least hub height (99.5 m) from adjacent non-participating landowners, in order to prevent potential effects on land use and businesses. If this distance cannot be achieved, a Property Line Setback Assessment must be completed for those turbines within a minimum of 65 m of adjacent non-participating properties. This assessment is included in Appendix D to this report.

It is recommended that GVWF and/or the O&M Contractor and property/ livestock owners maintain regular communication in order to ensure a minimum level of impact on livestock during operation.

Net Effects

Disturbances to agricultural lands and operations are expected to be temporary and spatially limited.

5.5.5 Mineral, Aggregate, and Petroleum Resources

Potential Effects

There are no known effects to mineral, aggregate or petroleum resources during operation of the Project.

Mitigation Measures

As no potential effects are anticipated to existing mineral, aggregate or petroleum resources, no mitigation measures are necessary.

Net Effects

No adverse net effects are anticipated to mineral, aggregate or petroleum resources during operation of the Project.

5.5.6 Game and Fishery Resources

Since the Project has been sited largely on agricultural lands, most potential indirect effects to wildlife and their habitats will be temporary until the Project becomes part of the environmental "background". The mammals present on the agricultural lands are common in southwestern Ontario and tend to be well-adapted to human-influenced landscapes and disturbance.

Investigations by the German Institute for Wild Animal Research (Institut für Wildtierforschung) show that no permanent adverse effects from wind turbine operation can be determined for game animals (Austrian Wind Power, 2007). A three-year study by the Institut für Wildtierforschung at the Veterinary University of Hanover showed that no adverse effects by wind turbines could be determined on the occurrence and behaviour of animals such as common hare, deer, red foxes, partridges and carrion crows. A survey conducted in parallel of the owners of hunting shoots in Lower-Saxony showed that the majority of hunters did not view the wind turbines as a source of disturbance for smaller game animals (Austrian Wind Power, 2007). Sixty-six percent of hunters stated that the game did not stay away from the immediate vicinity of the wind plants. Almost 60 percent of the interviewees were of the opinion that all species in their corresponding territories became accustomed to the presence and operation of the turbines, whereby the periods required for this varied from one month to five years. This study demonstrates the tolerance of various wildlife populations to the presence of wind turbines (Austrian Wind Power, 2007).

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

From the few studies that are available, mammals were able to adapt to various noises. Noise and its effects on wildlife appear to be habitat and species specific. If species are able to adapt easily to human-modified habitats, generally they do not seem to be adversely affected by noise.

Improperly installed culverts have the potential to affect fish habitat and may impose barriers to fish passage.

Mitigation Measures

Turbines are generally placed on agricultural land, away from woodlands, and far enough away to meet REA requirements and minimize potential effects. Siting the Project largely on agricultural land has reduced disturbance to local flora, small mammals and amphibians, natural habitat, and corridor functions. No further mitigation measures are required.

Culverts will be designed and installed such that there is no restriction of flows resulting in upstream pooling, erosion at the culvert inlets and outlets and barrier to fish passage to upstream environments.

Net Effects

Once the Project is operating human activity around the facilities will decrease, thus allowing local wildlife movement patterns to quickly re-establish.

Considering the periodic nature of maintenance activities, it is likely that resident game species will adapt to the Project quickly. With the proper installation of culverts, no effects on fish habitat are anticipated. Consequently, no net adverse effects are anticipated from Project operation to game and fishery resources.

5.5.7 Local Traffic

Provincial and other major infrastructure within the Project Study Area include Highway 89, County Roads 10, 15, and 25, and numerous local roads. 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

There is potential for an increase in traffic on municipal roads within the Study Area during operations. A small number of light trucks would be required for typical maintenance activities, and occasionally larger vehicles would be required to transport turbine components, if required. The contractor responsible for collecting used oil would likely be required on a semi-annual basis.

The increase in traffic may result in short-term, localized disturbance to traffic patterns or increases in traffic volume, and/or create potential traffic safety hazards.

Mitigation Measures

There may be instances during maintenance activities where excess loads (e.g. turbine components) would require special traffic planning. In addition, widening turning radii and road widths and the creation of new ingress/egress nodes from the work areas may be required. As appropriate, permits would be obtained to implement these activities to the satisfaction of the municipalities, acting reasonably. As appropriate, for public safety all non-conventional loads would have front and rear escort or “pilot” vehicles accompany the truck movement on public roads.

Although there are no requirements for formal public notification of wind turbine component load movements, GVWF may notify the community and the municipalities of non-conventional load

movements that may interfere with local traffic. This notification would be provided in the interest of public safety, minimization of disruption of other road users, local businesses, and good community relations. The frequency and type of communications would be determined prior to operation.

Net Effects

Road safety is not expected to be an issue during operation; however, the potential for accidents along the haul routes and on-site cannot be totally disqualified. Truck traffic would increase on some roads during maintenance activities, however this traffic would be short-term in duration and intermittent.

The effect of operating the wind farm is anticipated to have a limited, short term effect on traffic.

5.5.8 Local Economy

As of April 2013, there are two business operations within 300m of Project infrastructure (Orica Mining Services, and Custom Countertops).

Potential Effects

Operation of the facility is expected to continue for a minimum of 20 years. GVWF may hire a specialized O&M Contractor for specific maintenance tasks, and to the extent possible, local hiring would be maximized during the operations period to provide work for existing tradespersons and labourers. Trades that could be provided locally may include pipefitters, electricians, ironworkers, millwrights and carpenters. Since it is likely that the majority of the labour force would be supplied through local and neighbouring communities no special housing, healthcare or food facilities would be required as part of operation activities.

Local economic benefits would also include a minimum of 20 years of land lease payments to participating landowners in addition to municipal taxes to be paid by GVWF.

Mitigation Measures

To the extent possible GVWF and/or the O&M Contractor would source required goods and services from qualified local suppliers where these items are available in sufficient quantity and at competitive prices.

Net Effects

A positive net effect is anticipated on the local economy during operation of the Project. The Project provides income, employment, and fiscal benefits to the local area, and participating landowners. The Town of Grand Valley and the Township of Amaranth would receive ongoing property tax income from the Project and participating landowners would receive land lease

payments. A nominal increase in municipal services is also possible. Existing businesses within local communities could benefit from the demands of the Project workforce during operation.

5.5.9 Viewscape

Potential Effects

Siting of turbines would alter the visual landscape. However, visibility of the turbines would vary from receptor to receptor based on the following factors:

- Surficial patterns: landform – largely determined by physiography and tree cover;
- Topography: slope – the greater the slope the greater the visibility of the turbines from more vantage points;
- Observer position: viewing – distance from the turbines reduces scale and the apparent size of a project is directly related to the angle between the viewer's line-of-sight and the slope upon which the project is to take place;
- Atmospheric conditions: clarity – air pollution, natural haze, fogging, snow affect daytime and nighttime visibility; and,
- Turbine marking: lighting – primarily affecting nighttime visibility.

Mitigation Measures

Landscaping at the transformer station may include tree and shrub planting where appropriate, while still maintaining site visibility and building security.

There are limited opportunities for potential mitigation strategies given the height of the wind turbines and the landscape patterns.

Net Effects

Some disturbance to the viewscape is unavoidable due to the height of the turbines. The changed visual landscape would be present during the life of the Project.

5.6 EXISTING INFRASTRUCTURE

5.6.1 Provincial, Municipal and Other Major Infrastructure

Provincial and other major infrastructure within the Project Study Area include Highway 89, County Roads 10, 15, and 25, numerous local roads, and electrical transmission lines.

Potential Effects

No potential effects are anticipated during operation of the Project on Provincial, Municipal or other major infrastructure other than to roadways. Potential effects on Provincial, Municipal or

other major infrastructure from construction of the Project are described in the Construction Plan Report.

There may be instances during maintenance activities where excess loads (e.g. turbine and transformer components) would require special traffic planning.

Potential effects to traffic during the operation of the Project are discussed in Section 5.5.7.

Mitigation Measures

Permits from the MTO may be required to facilitate the transportation of components used for maintenance (e.g. cranes) on provincial highways. As appropriate, for public safety all non-conventional loads would have front and rear escort or "pilot" vehicles accompany the truck movement on public roads.

The additional traffic on the provincial highways is not expected to cause any significant traffic congestion.

Although there are no requirements for formal public notification of wind turbine component load movements, GVWF 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, local businesses, and good community relations. The frequency and type of communications would be determined prior to operation.

Net Effects

No net effects are anticipated to provincial, municipal and other major infrastructure during operation of the Project.

Net effects from traffic during the operation of the Project are discussed in Section 5.5.7.

5.6.2 Telecommunications Network

Potential Effects

Wind turbines have the potential to interfere with telecommunication and radar systems, including:

- Cable distribution off-air (over-the-air, OTA) receiver systems (Head-ends);
- Satellite uplinks and receiver systems (including GPS);
- Direct-to-home receiver systems (DTH - Shaw Direct, Bell TV);
- Radar (weather, defence and air traffic);
- Airport communications and guidance systems;

- Broadcasting – radio (AM, FM) and TV;
- Coast Guard communications and vessel traffic radar systems;
- Point-to-point radio-communication systems;
- Point-to-multipoint radio-communication systems, and,
- Cellular and land mobile networks.

Wind turbines can affect radio-communication and radar signals in a number of ways including shadowing, mirror-type reflections, clutter or signal scattering (RABC, 2010).

No impacts on radar systems employed by the Department of National Defence and NavCanada are anticipated. In addition, no impacts on NavCanada's Air Traffic Control systems are anticipated. Although there is the potential that some portions of the wind farm may be detected by one of Environment Canada's weather radar systems, mitigation measures are available to alleviate the impacts, if any.

Seismoaccoustic station locations in the vicinity of the project were identified on the Canadian National Seismograph Network website as approximately 170 km to the east-southeast (Effingham, EFO) and 100 km to the southwest (Elginfield, EFO2). Given the distances of the seismoacoustic stations from the Project, there are no potential effects.

Mitigation Measures

Although no effects are anticipated, in the unlikely event that signal disruption is experienced, mitigation measures are available to alleviate the impact. This may include replacing the receiving antenna with one that has a better discrimination to the unwanted signals, relocating either the transmitter or receiver, or switching to an alternate means of receiving the information (fibre optic or other means). GVWF would review potential incidents of telecommunications interference on a case by case basis.

In the unlikely case that a cellular provider demonstrates that its coverage has been diminished to the extent that cellular communications are no longer reliable, coverage can be restored by installation of an additional cell tower or possibly installation of one or more additional antennae on the existing cell tower.

Additional information related to potential impacts to telecommunications networks and radar systems will be provided in the Consultation Plan Report, including comments/clearances provided by agencies such as the Ministry of Government Services, , Department of National Defence, and the Royal Canadian Mounted Police.

Net Effects

Telecommunication network signals should not be affected by the operation of the Project. However, a complaint resolution system would be in place to record and investigate complaints

regarding telecommunications interference. Mitigation would be conducted on a case by case basis pending results of the investigation.

With the application of the above mitigation measures, no significant adverse net effects on telecommunications networks are anticipated during operation of the Project.

5.6.3 Aeronautical Systems

Potential Effects

The presence of wind turbines presents a potential hazard to low flying aircraft. Aviation safety lighting and marking of the turbines is required by Transport Canada's Aerodrome Safety Branch as specified in the Canada Aviation Regulations and Standards. Aviation safety lights, which serve to increase night-time visibility of the turbines to aviators, are required at the top of turbines as part of the lighting requirements. These safety lights may also brighten the night sky. Turbine lighting is LED, and is powered by the grid power supply in the turbine. If power is lost, the turbines will stop, and the lights will go out. They will automatically restart as soon as power is reinstated to the turbine and as the lights are controlled by satellite, so will resynchronize with each other. The turbine has a sensor to let the operating systems know the light is working – if it burns out, the system will notify the operator, who will arrange to replace the light.

Transport Canada standards state that wind farms require a red obstruction lighting system consisting of fading on and off aviation red beacons. These are used for night marking of wind turbines between the heights of 90 m and 150 m (including blade length) above ground level and spaced approximately 900 m apart. Final aviation lighting requirements would be in accordance with Transport Canada Regulations and Standards, and Transport Canada has approved the lighting plan for this Project.

There are three private airstrips located within the Project Area. An aeronautical assessment undertaken as part of the consultation process for the Project confirmed that turbines have been sited outside of the zone of approach or departure for an airstrip, in accordance with the requirements for a Code 1 non-instrument runway, as outlined in Transport Canada document *TP 312 Aerodrome Standards and Recommended Practices*, Chapter 4, paragraph 4.2.2 and Table 4.1.

Mitigation Measures

According to Transport Canada's Aerodrome Safety Branch guidelines, a wind turbine more than 900 m from another wind turbine with a light requires its own lighting. Turbine lighting must conform to Transport Canada standards. In order to reduce rural light pollution, lights would be synchronized, with the minimal allowable flash duration, and a narrow beam.

It should be pointed out that turbine marking and lighting are secondary safety measures for aircraft. The turbines, approximately 149 m tall when one blade is upright, are below the minimum flight floor of 500 feet (152.4 m) above ground level. It is illegal for aircraft to fly below

500 feet (152.4 m) unless they have been granted a special clearance for a low level flight. Low-level aircraft such as ultra-lights and crop dusters are to be familiar with the area they are flying over and are prohibited from night-time flights. Nav Canada would be responsible for updating all aeronautical charts with the turbine locations.

Net Effects

With the application of the above mitigation measures, no adverse net effects on aeronautical activities are anticipated during operation of the Project.

5.7 WASTE MANAGEMENT AND CONTAMINATED LANDS

5.7.1 Waste Material Disposal

Potential Effects

Lubricating and hydraulic oils associated with Project maintenance and operation would be used, and waste materials, such as oil, grease, batteries, and air filters and a small amount of domestic waste (i.e. garbage, recycling, and organics), would be generated during standard operation and maintenance activities.

All waste materials will require recycling, and/or disposal at an appropriate off-site facility. Improper disposal of waste material generated during operation may result in contamination to soil, groundwater, and/or surface water resources on and off the Project sites. Litter generated during operation may also become a nuisance to nearby residences if not appropriately contained and allowed to blow off site. There would be no on-site disposal of waste during the operation of the Project. All waste materials would be removed from the Project site and disposed or recycled as required by the municipal and provincial waste management regulations.

Mitigation Measures

During operation, GVWF and/or the O&M Contractor would implement a site-specific waste collection and disposal management plan, which may include good site practices such as:

- Contractors would be required to remove all waste materials from Project sites during maintenance activities;
- 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;
- Labelling and proper storage of 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 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 O&M Contractor;

- As appropriate, spill kits (e.g. containing absorbent cloths and disposal containers) would be provided on-site during maintenance activities and at the operation and maintenance building;
- Dumping or burying wastes within the Project sites would be prohibited;
- 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; and
- Implementation of an on-going waste management program consisting of reduction, reuse, and recycling of materials.

Net Effects

With the application of the mitigation measures outlined above, no net effects from waste material disposal would occur on-site during operation of the Project. However, as with all wastes, it is possible that disposal would have 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.

5.7.2 Spills

Potential Effects

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

Mitigation Measures

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 O&M Contractor.

An Emergency Response Plan would be developed by GVWF and/or the O&M Contractor 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 0 for more information on the Emergency Response Plan.

Net Effects

With the application of the mitigation measures outlined above, no net effects from accidental spills or releases to the environment are anticipated during operation of the Project.

5.8 PUBLIC HEALTH AND SAFETY

5.8.1 Turbine Blade and Structural Failure

Potential Effects

While exceptionally rare, the potential exists for full or partial blade detachment from the turbine structure, resulting in damage to the landing area from the impact. Garrad Hassan Canada undertook a review of publicly-available literature on turbine rotor failures resulting in full or partial blade throws (Garrad Hassan Canada, 2007). Such events were found to be very rare; therefore data describing these events are scarce.

Root causes of blade failure have been continuously addressed through developments in best practice in design, testing, manufacture and operation; much of these developments have been captured in the International Electrotechnical Commission (IEC) standards to which all current large wind turbines comply (Garrad Hassan Canada, 2007). There has been widespread introduction of turbine design certification and approval that certifies compliance with standards and requires a dynamic test that simulates the complete life loading on the blade (Garrad Hassan Canada, 2007). The certification body also performs a quality audit of the blade manufacturing facilities and performs strength testing of construction materials. This approach has effectively eliminated blade design as a root cause of failures (Garrad Hassan Canada, 2007).

The reported main causes of blade failure include:

- Human interference with the control system;
- A lightning strike; and
- A manufacturing defect in the blade.

Turbine control systems are subjected to rigorous specification in the design standards for wind turbines (IEC 61400-1) and exhaustive analysis in the certification process. Turbines with industry certification must have a safety system completely independent of the control system. In the event of a failure of one system, the other is designed to control the rotor speed.

Lightning protection systems for wind turbines have developed significantly over the past decade and best practices have been incorporated into the industry standards to which all

modern turbines must comply. This has led to a significant reduction in events where lightning causes structural damage. A review of available literature, conducted by the Chatham-Kent Public Health Unit (2008), revealed only four documented turbine failure issues in Ontario due to lightning strikes that required the turbine to be shut down for repair.

The occurrence of structural manufacturing defects in rotor blades has also diminished significantly due to experience and improved quality control in the industry. Design practice has evolved to improve structural margins against any manufacturing deficiencies. Even in the rare event of a blade failure in modern turbines, it is much more likely that the damaged structure would remain attached to the turbine rather than separating (Garrad Hassan Canada, 2007). Reviews of available information did not find any recorded evidence of injury to the public as a result of turbine blade or structural failure (Garrad Hassan Canada, 2007; Chatham-Kent Public Health Unit, 2008).

Given that accidents or malfunctions of the turbines are considered to be infrequent events, and turbines would be located at least the minimum regulated setback distance from any residence, the event of a failure of the structure would likely not fall beyond the setback distance and not affect public health and safety.

Mitigation Measures

Modern wind turbines must meet strict international engineering standards. Standards include the ability to withstand the forces of a Level 2 tornado (i.e., wind speeds of approximately 55 m/s), and structures must be built to meet earthquake loads as per the Ontario Building Code. The structural integrity of the turbines is designed to withstand wind speeds of approximately 55 m/s. However, during high wind events (i.e., greater than 24 m/s) the turbines are designed to cease operation. Turbine braking is accomplished by aerodynamic (blade pitch) control and friction brakes. The wind turbines would be designed, installed, operated and maintained according to applicable industry standards/certifications.

GVWF and the O&M Contractor would aim to minimize accidents and malfunctions with proper training and education of staff operating the control system. Municipal emergency response staff would also be familiarized with the project so that they could deal with any potential accidents and malfunctions resulting from the operation of the turbines. In addition, the turbines would be equipped with lightning protection systems and located at least the minimum regulated setback distance from receptors.

Net Effects

As a result of the structural integrity and design features of the turbines, no adverse net effects from structural failure of the turbines are anticipated during operation of the Project.

5.8.2 Ice Fall and Shed

Potential Effects

Another potential public health and safety issue could result from the accumulation of ice on the turbine blades. This can occur when specific conditions of temperature and humidity exist. This condition is not unique to wind turbines and has the potential to occur on any structure that is exposed to the elements. In Ontario, this condition is most likely to occur in the winter months in extreme weather events. Under these conditions the turbines may be subject to ice coating from freezing rain or interception of low clouds containing super-cooled rain. There are two potential hazards associated with ice accumulation on wind turbines:

- The danger of falling ice that may accumulate on the turbine itself as a result of freeze-thaw of snow and ice; and,
- The throwing of ice from the moving turbine blades.

Falling ice from an immobile turbine does not differ from other tall structures like telecommunication towers, power lines, and antenna masts. The potential ground area affected by falling ice from wind turbines depends to a large extent on the blade position and the prevailing wind speed and direction. Garrad Hassan Canada (2007) estimated that only very high winds may cause ice fragments of any significant mass to be blown beyond 50 m of the base of a modern, stationary 2 MW turbine. Operating staff and landowners are briefed on this situation; therefore the risk is considered minimal (Garrad Hassan Canada, 2007).

Wind turbines typically operate when the wind speed is within the range of 4 m/s to 25 m/s; when turbines are in operation they can accumulate ice on the rotor blades. Ice fragments which detach from the rotor blades can be thrown from the wind turbine; any fragments would land in the plane of the wind turbine rotor or downwind (Garrad Hassan Canada, 2007). Throwing distance varies depending upon the rotor azimuth, rotor speed, local radius, and wind speed. Also, the geometry of the ice fragments and its mass would affect the flight trajectory.

Observations have shown that the ice fragments do not maintain their shape and immediately break into smaller fragments upon detaching from a blade. This would decrease the ice fragment's drag and potentially allow the ice fragment to be thrown greater distances. For human injury to result from wind turbine ice shed from the Project, several conditions would have to exist simultaneously:

- Sustained weather condition conducive to icing;
- Ice dislodging from the turbine blade;
- Ice pieces large enough to remain intact through the air;
- Ice traveling in a particular direction past setback guidelines; and
- A person in the path of the ice as it lands (Garrad Hassan Canada, 2007).

A risk assessment methodology was developed by Garrad Hassan Canada and Partners, in conjunction with the Finnish Meteorological Institute and Deutsches Windenergie-Institut, as part of a research Project on the implementation of Wind Energy in Cold Climates (WECO). Guidelines produced in the WECO Project were based on a combination of numerical modelling and observations. The WECO database of observed ice fragments determined that recorded ice fragments are typically thrown to distances less than 125 m from the base of the turbine (Seifert et al., 2003).

Garrad Hassan Canada developed an Ontario-specific risk assessment methodology for ice shed based on the findings of the WECO Project. Modeling was undertaken to determine the probability of an ice fragment landing within one square metre of ground area, as a function of distance from the turbine. The model result determined that the critical ice shed distance would be approximately 220 m from a turbine. At distances greater than 220 m, the probability of ice shed reaching ground level at a mass that would cause injury decreases rapidly. The critical distance can effectively be regarded as a “safe” distance, beyond which there is a negligible risk of injury from ice shed (Garrad Hassan Canada, 2007).

Example calculations were presented in the Garrad Hassan Canada (2007) report, using data representative of a typical wind farm Project in rural southern Ontario. These conditions would be considered representative of the Project. Risk to a fixed dwelling, vehicle travelling on a road, and individual person from being struck by an ice fragment thrown from an operating wind turbine were modelled, with the following results:

- Fixed dwelling: equivalent to 1 strike per 500,000 years;
- Vehicle travelling on a road: equivalent to 1 strike per 260,000 years; and
- Individual person: equivalent to 1 strike in 137,500,000 years.

It should be emphasized that these are conservative (high) estimates which will be reduced considerably for lower turbine rotation speeds, especially to zero as in the case of a stationary turbine.

These predictions seem markedly low; however, it is due to the fact that icing events are limited to only a few days per year. For example, Vestas Canada, which maintains turbines across Canada, has experienced no incidents related to falling ice in Canada (Jacques Whitford, 2006).

Mitigation Measures

Unlike telecommunication towers, the wind turbines proposed to be used for this Project would have a solid conical tower. This design reduces the potential for ice buildup on the tower itself since there is no lattice or crevices where ice can accumulate.

In terms of ice shed, several control mitigation strategies are available to wind turbine operators. For example, when the rotor becomes unbalanced due to a change in blade weighting (e.g., caused by ice buildup), the turbine brake is automatically applied to stop the blades from turning

(i.e., it shuts itself off). The blades would not restart their movement until the imbalance is removed (e.g., the majority of ice is removed). This design feature greatly reduces the potential ice shed from the turbines on the few days per year when icing is possible. Established protocols and procedures would make operational staff aware and take appropriate action when weather conditions could likely lead to ice accumulation on the blades.

Net Effects

Considering the design features of the turbines which act to reduce or eliminate the potential for ice accumulation, and that the nearest receptors are located at minimum required setbacks from the turbines no adverse net effects are expected due to ice fall and shed from turbines during operation of the facility. Consequently, no additional mitigation measures have been identified.

5.8.3 Extreme Events

Potential Effects

Extreme events that could occur during operation of the Project include fire, flood, temperature extremes, heavy snow, rain, hail, ice storms, tornadoes, earthquakes, and lightning strikes.

The likelihood of a fire occurring during operation of the Project is low. If a fire were to happen, it would likely occur in the fields at the base of the turbine. Fire could damage the turbine tower paint but it is unlikely that a fire would damage the turbine components within the tower. If a fire event were to happen, the O&M Contractor and GVWF would coordinate with local emergency response.

It is possible that the Grand River, which is located within the Project Location, could flood its banks. As the only Project components in the vicinity of the Grand River are underground collector lines, no potential effects to the Project would occur.

Temperature extremes, to the extent that they are outside the turbine's operating range, are not expected.

No adverse effect is anticipated to the operation of the turbines from heavy snow, except to prevent access to the turbines during an emergency.

In the case of an extreme hail event, the nacelle could suffer cosmetic damage. However, the operation of the turbine would not be effected. It is unlikely that the nacelle cover would suffer structural damage. An extreme hail event may damage the turbine's meteorological sensors.

Climatic fluctuations in temperature and/or humidity are unlikely to have a significant effect on the Project. A change in the annual average air temperature or relative humidity could (slightly) affect the energy production of the Project as higher density air (corresponding to lower temperatures and lower humidity) will result in higher production since the wind power density is a linear function of the air density.

Climatic variations in rainfall or snowfall are unlikely to affect the Project. Variations in freezing precipitation (but not extreme events) could change the overall project energy production through inefficiencies caused by the modification of the aerodynamic profile of the turbine blade. However, such events occur for such a limited fraction of the time that it is very unlikely that there would be a significant impact on energy production.

A change in the wind climate is the likeliest cause for significant impact on the Project's energy production. This results from the very high sensitivity (the cube) of wind power density to the wind speed (i.e., small change in wind speed can result in relatively large changes in kinetic energy available for conversion to electrical energy. It is not unusual for the average wind speed to fluctuate from year to year by, say, up to +/- 10%. This maximum would, typically, translate into Project energy fluctuations of +/- 20 to 25%. While this would not cause any problems for the Project hardware (turbines, electrical infrastructure, etc.), it would result in the same fluctuations in Project income so it is important that the Project financing be structured so that these fluctuations will not result in any cash flow failures.

Mitigation Measures

Project components have been designed to withstand the effects from extreme weather events as follows:

- Rain – surficial drainage patterns would remain intact and continue to convey rain water;
- Hail – the turbine blades, nacelle, and tower are constructed of materials able to withstand damage from the impact of hail. Should the turbine's meteorological sensors be damaged, the turbine control system would sense there are no wind speed and wind direction data available and would initiate a safe shutdown of its operation;
- Ice storms/freezing rain – as noted above, the turbines are designed to automatically shut down when ice load on the blades exceeds a predetermined threshold;
- Tornadoes –the blades would stop moving at wind speeds greater than 25 m/s, and generally, the structural integrity of turbines is designed to withstand gusts of greater than 59 m/s. The turbine would continue to monitor the wind conditions while it is stopped. A direct hit from a tornado may damage certain components on the wind turbine such as the blades and possibly the tower which would require repair or replacement;
- Earthquakes – as noted above, structures would be designed to meet the earthquake loads as per the Ontario Building Code; and
- Lightning – The turbines are equipped with sophisticated lightning protection. Lightning strikes are safely absorbed by lightning conductors and the lightning current is conducted via a spark gap and cables into the ground surrounding the foundation. If a turbine is damaged sufficiently to affect the operation of the turbine, the control system would force an orderly shutdown.

Net Effects

Considering the design features of the turbine which act to reduce or eliminate the potential for damage from extreme events, no adverse net effects from extreme weather events are anticipated during operation of the Project.

5.8.4 Third Party Damage

Potential Effects

The wind turbines are typically located away from roads and are in largely open areas. Nevertheless, the possibility exists for accidental collision from off-road and maintenance vehicles. Although possible, it is highly unlikely that this equipment would significantly damage the towers given their structural integrity (e.g. the rolled steel in the towers is over an inch thick, supporting foundations, and surrounding gravel pad).

Mitigation Measures

Access to the tower structures would be restricted to avoid potential accidents to unqualified persons.

Net Effects

As a result of restricting access of unqualified persons to the turbines, no adverse net effects from third party damage to the turbines are anticipated during operation of the Project.

6.0 Environmental Effects Monitoring Plan

The environmental effects monitoring plan for the Project has been designed to monitor implementation of the proposed protection and mitigation measures and to verify compliance of the Project with O. Reg. 359/09.

Environmental monitoring would provide data on key functions of natural environment and socio-economic features that may be affected during construction or operation of the Project, and on the effectiveness of mitigation measures implemented as part of the Project. The monitoring procedures noted herein are linked to the potential effects and protection and mitigation measures discussed throughout Section 5.0.

6.1 GOALS AND OBJECTIVES

The goals of the monitoring plan are:

- Minimize environmental effects from the Project during the operation phase;
- Minimize conflicts in the communities affected by the execution of the works according to legal terms and to the proponent's policies;
- Avoid accidents and malfunctions;
- Minimize environmental effects on natural habitats, flora and fauna;
- Avoid levies or sanctions from the relevant government agencies for negligent environmental performance;
- Comply with environmental quality standards set by law; and
- Establish measures that enhance occupational health and safety.

6.2 GUIDING PRINCIPLES

The following guiding principles were considered in preparation of the monitoring plan:

- Focus upon environmental, health, and safety risk prevention;
- Conform to relevant standards, codes, and practices considered in the application of safe technologies;
- Perform all activities in a safe and effective manner, by trained personnel;
- Maintain all equipment in good operating condition for protection of worker health and safety, conservation of the environment, and protection of property;
- Implement all necessary precautions to control, remove, or otherwise correct any health and safety hazards; and

- Meet all relevant municipal, provincial, and federal standards that collectively ensure sufficient technical levels of safety during operation of the facility.

Building upon the above methodology, goals and objectives, and guiding principles, the monitoring plan is composed of three components: environmental management systems; programs, plans, and procedures; and monitoring and contingency requirements. Each component is discussed below.

6.3 ENVIRONMENTAL MANAGEMENT SYSTEMS

As part of the environmental monitoring objectives outlined above, several programs, plans, and procedures would be developed by GVWF, the turbine manufacturer, and/or the O&M Contractor (see Section 6.4). They would guide the operation of the Project to optimize its environmental performance. However, for the programs, plans, and procedures to be effective, appropriate management structures and contract documents must be firmly established.

6.3.1 Management Structures

GVWF, the turbine manufacturer, and/or the O&M Contractor would take steps to ensure that they have appropriately skilled personnel to carry out the environmental responsibilities as defined in this document. All organizations associated with Project development and operation would develop responsive reporting systems that clearly assign responsibility and accountability. As appropriate, GVWF and/or the O&M Contractor would review these reporting documents.

6.3.2 Contract Documents

GVWF is committed to operating the Project in an environmentally responsible manner and in compliance with all applicable environmental laws, regulations, and guidelines. All of GVWF's contractors and subcontractors would be accountable for actions that have an adverse effect on the environment. As such, any contract documents executed by GVWF and/or the O&M Contractor would incorporate appropriate provisions from documents prepared for the REA application. Additionally, all contractors, subcontractors, and other associates of the Project would follow the guiding principles of the program, plans and procedures (Section 2), the monitoring and contingency plan (see Section 6.5), and would comply with all applicable municipal, provincial, and federal legislation

During the operation of the facility, changes to operational plans may be required to address unforeseen or unexpected conditions or situations. GVWF and/or the O&M Contractor would be responsible for ensuring environmental and safety issues are addressed for any such changes. GVWF would undertake any significant changes to the Project programs, procedures and plans throughout the operation of the facility with the goal of avoiding or minimizing environmental effects.

6.4 PROGRAMS, PLANS, AND PROCEDURES

As appropriate, GVWF, the turbine manufacturer, and/or the O&M Contractor would implement the programs, plans, and procedures discussed below

6.4.1 Operation and Maintenance Program

The operation and maintenance program, including turbine maintenance, is described in Section 4.0.

6.4.2 Environmental Procedures

GVWF and/or the O&M Contractor would be responsible for implementing environmental procedures during the operation phase of the Project. Individual employee responsibilities would be assigned as necessary to support the full and effective implementation of the environmental procedures. As appropriate the procedures would address the following issues to prevent environmental contamination and injury to personnel:

- *Environmental calendar:* to establish the specific dates and times for environmental inspections of turbine facilities, monitoring events, and emergency notifications;
- *Hazardous waste management:* 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:* 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.

These procedures would ensure internal and external risks are fully evaluated and the information communicated to personnel in advance of any accident or malfunction.

6.4.3 Occupational Health and Safety Procedures

GVWF and/or the O&M Contractor would ensure employee health and safety is maintained throughout their employment term and would also implement the following safety procedures and protocols as appropriate in an effort to ensure employee safety is addressed throughout operation and maintenance activities. Safety measures may include;

- Personal protective equipment, including non-slip footwear, eye protection, clothing, and hardhats, would be worn by operation and maintenance personnel when on duty;
- Elevated platforms, walkways, and ladders would be equipped with handrails, toe boards, and non-slip surfaces; and

- Electrical equipment would be insulated and grounded in compliance with the appropriate electrical code.

Incidents in the work place have the potential to cause personal injury and property damage. As appropriate, GVWF and/or the O&M Contractor would maintain a master Incident Report that documents illnesses and accidents. Incident reporting would follow the requirements of the *Occupational Health and Safety Act*.

6.4.4 Training Program

As appropriate, GVWF and/or the O&M Contractor would develop or have an existing operation training program to ensure personnel receive appropriate training in relation to operation and maintenance programs, environmental, health, and safety procedures, and the Emergency Response Plan. Training may cover the following issues:

Facility Safety

- Accident reporting;
- Chemical and hazardous materials handling;
- Fall and arrest protection;
- Eye, ear, head, hands, feet, and body protective equipment;
- First aid training and equipment;
- Equipment operation and hazards;
- Fire prevention and response;
- Lockout and tag out procedures; and
- Scaffolds and ladders.

Emergency Preparedness

- Fire preparedness and response;
- Natural disasters (i.e. extreme weather events);
- Hazardous materials and spill response;
- Medical emergencies; and
- Rescue procedures.

6.4.5 Emergency Response Plan

GVWF and/or the relevant Contractor would finalize a detailed Emergency Response Plan for each Project phase and coordinate with the applicable municipal agencies.

The Emergency Response Plan 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. The plan would include general procedures for personnel training. As appropriate, the plan may cover response to high winds, fire preparedness, evacuation procedures, and medical emergencies. Developing this plan with local emergency services personnel would allow GVWF to determine the extent of emergency response resources and response actions of those involved.

The plan for each Project phase would include key contact information for emergency service providers, a description of the chain of communications and how information would be disseminated between GVWF and/or the relevant Contractor and the relevant responders. The plan would also indicate how GVWF and/or the relevant Contractor would directly contact (via phone or in-person) Project stakeholders who may be directly impacted by an emergency so that the appropriate actions can be taken to protect stakeholders health and safety.

6.4.6 Measurement of Performance

Once performance standards have been established and personnel have been trained (and are functional in procedural operation), the next step is to monitor the performance of the Project and individuals relative to the performance standards and programs.

Specific internal audits (e.g. management team and/or process team), and external audits against the plans, safety and environmental procedures, and other policies and procedures are all part of establishing performance standards necessary to minimize risks on a continuing basis.

As appropriate a formal audit program for the Project, with regard to loss control programs (i.e. health, safety, environment, and security) would be performed regularly.

6.5 MONITORING REQUIREMENTS AND CONTINGENCY PLANS

Building upon the environmental management measures recommended to minimize adverse effects, while enhancing the positive effects associated with the operation of the facility, the following operation monitoring and contingency planning program has been developed. The monitoring program is designed to allow GVWF and/or the O&M Contractor to monitor and assess the effectiveness of the proposed management and mitigation measures and to verify compliance of the Project with O. Reg. 359/09.

GVWF and/or the O&M Contractor would be the primary organization responsible for the implementation of the operational monitoring and contingency planning measures.

Implementation of the measures would be undertaken consistent with GVWF's and/or the O&M Contractor standard environmental and engineering practices.

6.5.1 Terrestrial Habitats and Significant Natural Features

A detailed Environmental Effects Monitoring Plan is provided in Appendix E.

Operational activities that have the potential to affect terrestrial flora and fauna include equipment operation and accidental spills and/or leaks. Stringent monitoring of these activities is necessary to ensure terrestrial flora and fauna are protected.

As appropriate, records of vehicle maintenance would be retained and made available for periodic review by GVWF and/or the O&M Contractor. All vehicles involved in maintenance activities must be maintained in good operating condition; 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.

Monitoring would be required following the unlikely event of contamination from an accidental spill or leak (method for monitoring may be developed in consultation with the Spills Action Centre of the MOE). Contaminated soils would be removed and replaced as appropriate.

Recommendations for post-construction monitoring during operations include up to two years of monitoring of planted restoration or compensation works in order to recommend supplemental works or replacement plantings, if required.

6.5.2 Wildlife

A post-construction monitoring program has been developed for birds and bats that is consistent with guidelines provided by regulatory agencies at the time of writing (MNR 2011a and b). The plan should give consideration to adaptive management and operational control options. Elements of the post-construction monitoring program will include:

- Bird mortality monitoring at all wind turbines twice-weekly between May 1 and October 31 for a period of three years following start of operations. A weekly mortality survey will be conducted at all turbines in November to assess raptor mortality.
- Bat mortality monitoring at all turbines twice-weekly between May 1 and September 30 for a three-year period following start of operations in accordance with MNR guidelines.
- Searcher efficiency trials seasonally and carcass removal trials monthly between May 1 and September 30. Searcher efficiency and carcass removal rates are known to be more variable for bats than for birds throughout the year and depending on habitat (in part due to the relative size of the species).
- Regular reporting that includes analysis and submission of results to the MNR and Environment Canada (EC).

Potential operational controls are specified by current provincial guidance (at the time of writing, thresholds are: 10 bats/turbine/year, 14 birds/ turbine/year, or 10 or more birds at any one turbine, or 33 or more birds at multiple turbines on any one visit, or 0.2 raptors/turbine/year [0.1 raptors of provincial conservation concern]). Mitigation may include operational controls, such as periodic shut-down on select turbines or blade feathering at specific times of the year, depending on the species affected.

6.5.3 Surface Water Features and Aquatic Habitat

Operation activities that have the potential to affect aquatic habitat includes accidental spills and/or leaks. Proper storage of materials (e.g. maintenance fluids) at off-site storage containers would greatly reduce the potential for accidental spills and/or leaks.

Appropriate remedial measures may be completed as necessary and additional follow-up monitoring conducted as appropriate in the event of an accidental spill and/or leak. The level of monitoring and reporting would be based on the severity of the spill/leak and may be discussed with the MOE Spills Action Centre and MNR.

If *Fisheries Act* approvals are required from DFO, some monitoring may be required, and would be stated in the DFO Authorization. Monitoring typically includes photographic records during construction and for two years after the completion of construction to ensure survival of plantings and overall function of the installation. If significant habitat enhancement or compensation measures are required, monitoring may also include assessments of the fish community and habitat use.

6.5.4 Environmental Noise and Public Health and Safety

The *Environmental Protection Act* requires that noise emissions for any new Project must not have adverse effects on the natural environment. The REA process is the mechanism through which the controls are administered under the *Environmental Protection Act*. Noise monitoring (if required), would be conducted in accordance with the REA for the Project. In the event of a malfunctioning turbine which is resulting in noise emissions that are above MOE requirements, the problematic turbine(s) would be shut down until corrective measures are taken. Routine turbine maintenance and monitoring would also help minimize the likelihood of malfunctioning turbines resulting in excessive noise emissions.

Turbines will be monitored electronically twenty-four hours a day, seven-days a week, to allow operational changes to be noted and assessed quickly. Any performance characteristic that falls outside of normal operation (including excessive noise) will be considered and assessed to determine if further action is required. The MOE requires that if a noise complaint is received, GVWF must act on the complaint to determine if further action is required. The MOE compliance measurement protocol (http://www.ene.gov.on.ca/stdprodconsume/groups/lr/@ene/@resources/documents/resource/stdprod_088931.pdf) will be followed in the case of noise complaints received.

Turbine shut down will occur automatically upon detection of extreme weather. Inspections of turbines will occur after extreme weather events.

6.5.5 Local Expenditures

As was the case during the construction phase, to the extent possible GVWF would continue to encourage the use and procurement of local goods and services where they are available in sufficient quantities and qualities and at competitive pricing.

6.5.6 Community Relations

A Communications and Complaint Response Protocol (Section 8.2) has been developed to address any stakeholder concerns during operation of the Project.

7.0 Summary of Environmental Effects, Mitigation Strategies, and the Environmental Effects Monitoring Plan

Table 7.1 summarizes the potential adverse effects, performance objectives, mitigation strategies and the monitoring/contingency plan measures of the operational phase of the Project.

Table 7.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan during Operation

Environmental Feature	Potential Adverse Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Section Reference
Heritage and Archaeological Resources					
Protected Properties and Heritage Resources	• None	• N/A	• N/A	• N/A.	5.1.1
Archaeological Resources	• None	• N/A	• N/A	• N/A	5.1.2
Natural Heritage Resources					
Wetlands	• Contamination through accidental spills. • Disturbance due to increased traffic, noise or dust during operations and maintenance.	• No spills.	• See 'Accidental Spills, ''Local Traffic', 'Environmental Noise', and 'Dust and Odour Emissions',	• See 'Monitoring Requirements and Contingency Plans'	5.2.1; 5.6.2; 5.4.7; 5.3.5; 5.3.4; 6.0; 6.5
Areas of Natural and Scientific Interest	• None	• N/A	• N/A	• N/A	5.2.2
Valleylands and Hazard Lands	• None	• N/A	• N/A	• N/A	5.2.3
Significant Woodlands	• Contamination through accidental spills. • Dust emissions during operations and maintenance.	• Minimize duration and magnitude of emissions.	• See 'Accidental Spills, ''Local Traffic', 'Environmental Noise', and 'Dust and Odour Emissions',	• See 'Monitoring Requirements and Contingency Plans'	5.2.4; 5.6.2; 5.4.7; 5.3.5; 5.3.4; 6.0; 6.5
Provincial Parks and Conservation Reserves	• None	• N/A	• N/A	• N/A	5.2.5
Significant Wildlife and Wildlife Habitat	• Contamination through accidental spills. • Disturbance due to increased traffic, noise or dust during	• No spills. •	• See 'Accidental Spills, ''Local Traffic', 'Environmental Noise', and 'Dust and Odour Emissions',	• Post-construction disturbance and mortality monitoring would be conducted to verify effects predictions and additional operational mitigation would be	5.2.6; 5.6.2; 5.4.7; 5.3.5; 5.3.4; 6.0

Table 7.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan during Operation

Environmental Feature	Potential Adverse Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Section Reference
	operations and maintenance.			implemented if unanticipated effects occur. • See 'Monitoring Requirements and Contingency Plans'	
Other Wildlife and Wildlife Habitat	• Disturbance and direct mortality to forest and grassland breeding species. • Potential for noise, disturbance and limited mortality due to potential bird and bat collisions with turbines.	• Minimize disturbance to wildlife and wildlife habitat.	• See 'Accidental Spills, ''Local Traffic', 'Environmental Noise', and 'Dust and Odour Emissions',	• See 'Local Traffic'. • See 'Environmental Noise'. • Post-construction disturbance and mortality monitoring would be conducted to verify effects predictions and additional operational mitigation would be implemented if unanticipated effects occur. • See 'Monitoring Requirements and Contingency Plans'	5.2.7; 5.6.2; 5.4.7; 5.3.5; 5.3.4; 6.0; 6.5
Significant Flora and Vegetation Communities	• None	• N/A	• N/A	• See 'Monitoring Requirements and Contingency Plans'	5.2.8; 6.5
Other Flora and Vegetation Communities	• Disturbance to other flora and vegetation from dust emissions.	• Minimize disturbance to other flora and vegetation communities.	• See 'Dust and Odour Emissions'.	• See 'Dust and Odour Emissions'. • See 'Monitoring Requirements and Contingency Plans'	5.2.9; 5.3.4 6.5
Birds	• Direct mortality	• Minimize disturbance to birds	• See 'Other Wildlife and Wildlife Habitat'	• See 'Other Wildlife and Wildlife Habitat' • See 'Monitoring Requirements and Contingency Plans'	5.2.7 6.5
Bats	• Direct mortality	• Minimize disturbance to	• See 'Other Wildlife and Wildlife Habitat'	• See 'Other Wildlife and Wildlife Habitat'	5.2.7 6.5

Table 7.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan during Operation

Environmental Feature	Potential Adverse Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Section Reference
		bats		• See 'Monitoring Requirements and Contingency Plans'	
Water Bodies and Aquatic Resources					
Groundwater	• Potential contamination from accidental spills.	• No spills.	• See 'Accidental Spills'.	• See 'Accidental Spills'. • See 'Monitoring Requirements and Contingency Plans'	5.3.1; 5.6.2 6.5
Surface Water, Fish, and Fish Habitat	• Potential contamination from accidental spills. • Erosion and, sedimentation	• No spills. • No erosion or sedimentation	• See 'Accidental Spills'. • Following completion of the maintenance activity, stream banks would be restored to original grade and seeding would be completed during favourable climatic conditions. • Seeding completed where possible. • If siltation to a watercourse occurs, activities would cease immediately until the situation is rectified.	• See 'Accidental Spills'. • See 'Monitoring Requirements and Contingency Plans'	5.3.2; 5.6.2 6.5
Air Quality and Environmental Noise					
Air Quality	• Emissions from operation and maintenance activities, including equipment and vehicles.	• Minimize duration and magnitude of emissions.	• Operation staff would operate vehicles in a manner that reduces air emissions to the extent practical, including: o Using multi-passenger vehicles to the extent practical o Avoid idling vehicles • Equipment and vehicles would be maintained in a manner that reduces air emissions, including: o Using mufflers and emission control systems as available; o Using catalytic converters as required o Meet the emissions requirements of the MOE and/or MTO;	• Adherence to Complaint Response Protocol. • See 'Monitoring Requirements and Contingency Plans'	5.3.3; 6.5; 8.0

Table 7.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan during Operation

Environmental Feature	Potential Adverse Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Section Reference
			o As appropriate, records of vehicle maintenance would be retained and made available for periodic review by GVWF and/or the O&M Contractor; and, o 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.		
Dust & Odour Emissions	• Dust emissions from operation and maintenance vehicles.	• Minimize duration and magnitude of emissions. • Minimize disturbance to existing land uses.	• Maintaining equipment in good running condition and in compliance with regulatory requirements. • Dust suppression (e.g. water and/or calcium chloride) of source areas as necessary. • Covering loads of friable materials during transport.	• Adherence to Complaint Response Protocol. • See 'Monitoring Requirements and Contingency Plans'	5.3.4; 6.5; 8.0
Environmental Noise	• Noise emitted from a turbine and/or transformer. • Noise emitted from traffic and/or vehicles.	• Noise at all non-participating to meet MOE Guidelines.	• Adherence to all noise setback requirements. • All engines associated with maintenance equipment would be equipped with mufflers and/or silencers in accordance with MOE and/or MTO guidelines and regulations. • Noise levels arising from maintenance equipment would also be compliant with sound levels established by the MOE. • Routine Project maintenance to ensure infrastructure is operating properly and efficiently. • To the greatest extent possible, operation activities that could create excessive noise would be restricted to regular business hours, when residents	• Noise monitoring (if required), would be conducted in accordance with the REA for the Project. • Turbine shutdown in the event of a malfunctioning turbine or extreme weather event. • Turbine maintenance to ensure turbines are running properly and efficiently. • Adherence to Complaint Response Protocol. • See 'Monitoring Requirements and Contingency Plans'	5.3.5; 6.5.4; 8:0

Table 7.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan during Operation

Environmental Feature	Potential Adverse Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Section Reference
			are less sensitive to noise, and adhere to any local noise by-laws and any requirements of the Occupational Health and Safety Act.		
Areas Protected Under Provincial Plans and Policies	• None	• N/A	• N/A	• N/A	5.4.1
Existing Land Uses	• Lands which are occupied by facility components would be removed from their present land-use. • Temporary increase in noise and dust levels. • Potential for minor increase in traffic during maintenance activities.	• Minimize disturbance to existing land uses, including local businesses.	• Landowners would be compensated by GVWF for agricultural land that would be taken out of production during the lifespan of the Project through the land lease agreements. • See 'Environmental Noise', 'Dust and Odour Emissions', and 'Local Traffic'	• See 'Environmental Noise'. • See 'Dust and Odour Emissions'. • See 'Local Traffic'	5.3.5; 5.3.4; 5.4.7
Recreation Areas and Features	• Temporary increase in noise and dust levels. • disturbance to the viewscape • Potential for minor increase in traffic during maintenance activities.	• Minimize disturbance to recreational areas and features	• See 'Environmental Noise', 'Viewscape', 'Dust and Odour Emissions', and 'Local Traffic'	• See 'Environmental Noise'. • See 'Viewscape' • See 'Dust and Odour Emissions'. • See 'Local Traffic' • Adherence to Complaint Response Protocol. • See 'Monitoring Requirements and Contingency Plans'	5.3.5; 5.4.9; 5.3.4; 5.4.7; 6.5; 8.0
Agricultural Lands and Operations	• Inconvenience to operations from traffic and dust. • Minimal impacts to livestock are anticipated.	• Minimize disturbance to agricultural lands and operations.	• Activities would be restricted to the delineated Project areas such as access roads and crane pads • Communication with livestock owners. • See 'Dust and Odour Emissions', and 'Local Traffic'	• Adherence to Complaint Response Protocol. • See 'Monitoring Requirements and Contingency Plans'	5.3.4; 5.4.7; 6.5; 8.0

Table 7.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan during Operation

Environmental Feature	Potential Adverse Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Section Reference
Mineral, Aggregate, and Petroleum Resources	• None.	• N/A	• N/A	• N/A	5.4.5
Game And Fishery Resources	• Disturbance to game species from noise. • Improperly installed culverts have potential to affect fish habitat and may impose barriers to fish passage.	• Minimize disturbance to game and fishery resources.	• See 'Environmental Noise'. • Turbines would be placed in agricultural lands away from woodlands, and within the REA setback requirements. • Culverts would be designed and installed such that there is no restriction of flows through the culvert.	• See 'Environmental Noise'. • None required.	5.4.6; 5.3.5
Local Traffic	• Short-term, localized disturbance to traffic patterns, increases in traffic volume, and/or creation of potential traffic safety hazards.	• Minimize disturbance to local traffic.	• There may be instances where excess loads (e.g. turbine and transformer components) would require special traffic planning, widening turning radiuses and road widths and the creation of new ingress/egress nodes. • GVWF may provide notification of non-conventional load movements that may interfere with local traffic.	• Adherence to Complaint Response Protocol.	5.4.7; 8.0
Viewscape	• Disruption to viewscape from siting of project infrastructure.	• Minimize potential for visual disturbance.	• Turbines would be painted light grey and spread over the Project Study Area.	• Adherence to Complaint Response Protocol.	5.4.9; 8.0
Local Economy	• Increase in direct, indirect and induced employment over the operations period. • Local economic benefits from land lease payments, municipal taxes, etc.	• Create positive effects on local economy.	• To the extent possible local hiring would be maximized.	• See 'Monitoring Requirements and Contingency Plans'	5.4.8; 6.5

Table 7.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan during Operation

Environmental Feature	Potential Adverse Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Section Reference
Existing Infrastructure					
Provincial, municipal, and other major infrastructure	• May be instances during maintenance activities where excess loads would require special traffic planning. Permits from the MTO may be required.	• Minimize disturbance to Provincial, municipal, and other major infrastructure.	• Necessary permits would be obtained. • As appropriate, "pilot" vehicles would accompany non-conventional loads. • Public notification of unconventional load movements may occur. • Consultation with municipalities reading excess loads with potential to damage roads.	• See 'Local Traffic'	5.4.7
Telecommunications Networks	• Potential to interfere with radio, TV, or internet signals. • Potential to interfere with cellular telephone networks. • Potential that some portions of the wind farm may be detected by weather radar systems	• Minimize interference with radio, TV, or internet signals. • Minimize interference with cellular telephone networks.	• GVWF has consulted with relevant agencies and licensed providers to identify any likely effects to telecommunication and radar systems. • Exclusion zones of 100 m were designated along the point-to-point paths and no turbines were placed within the area defined by the exclusion zone. • In the unlikely event that signal disruption is experienced, mitigation measures may include: o Replacing the receiving antenna with one that has a better discrimination to the unwanted signals o Relocating either the transmitter or receiver, or o Switching to an alternate means of receiving the information. • Cellular coverage could be restored by installation of an additional cell tower or of one or more additional antennae on the existing cell tower.	• Adherence to Complaint Response Protocol. • GVWF would review potential incidents of telecommunications interference on a case by case basis.	5.5.2; 8.0
Aeronautical Systems	• Aeronautical obstruction.	• Minimize potential hazard to low flying aircraft.	• Turbine lighting must conform to Transport Canada standards. In order to reduce rural light pollution, lights would be selected with the minimal allowable flash duration, narrow beam, and would	• Routine maintenance of the turbines and replacement of safety lighting in the event of malfunction.	5.5.3; 8.0

Table 7.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan during Operation

Environmental Feature	Potential Adverse Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Section Reference
			be synchronized. • Nav Canada would be responsible for updating all aeronautical charts with the turbine locations promptly after Project approval.		
Waste Management and Contaminated Lands					
Waste Generation	• Improper disposal of waste material may result in contamination to soil, groundwater, and/or surface water resources on and off the Project sites. • Litter generated may become a nuisance to nearby residences if not appropriately contained and allowed to blow off the site.	• Ensure proper disposal of waste.	• Implementation of a site-specific waste collection and disposal management plan, which may include good site practices such as: o Contractors would be required to remove all waste materials from the Project sites during maintenance activities. o 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. o Labeling and proper storage of liquid waste. o As appropriate, spill kits would be provided on-site. o Dumping or burying wastes within the Project sites would be prohibited. o Disposal of non-hazardous waste at a registered waste disposal site(s). o 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. o Implementation of an on-going	• See 'Spills'. • See 'Emergency Response Plan'	5.6.2; 6.4.5

Table 7.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan during Operation

Environmental Feature	Potential Adverse Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Section Reference
			waste management program consisting of reduction, reuse, and recycling of materials. • See 'Accidental Spills'		
Accidental Spills	• Some materials, such as fuel, lubricating oils and other fluids, have the potential for discharge to the on-site environment through accidental spills.	• No spills.	• 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. • Spills would be reported immediately by the Construction Contractor to the MOE Spills Action Centre, as applicable • Development of Emergency Response Plan.	• Monitoring would be required following the unlikely event of contamination from an accidental spill or leak (method for monitoring may be developed in consultation with the Spills Action Centre of the MOE). • Contaminated soils would be removed and replaced as appropriate. • See 'Spills'. • See 'Emergency Response Plan'	5.6.2; 6.4.5
Public Health and Safety					
Turbine Blade and Structural Failure	• Public Health and Safety.	• No structural failure of the turbines or ancillary equipment.	• Adherence to required setbacks. • Design, install, operate, and maintain turbines according to applicable industry standards/certifications. • Use of lightning protection systems. • Training and education of staff operating the control system. • Familiarizing Town of Grand Valley, Township of Amaranth and Dufferin County emergency response staff with Project facilities.	• Inspections of turbines would occur after extreme events and contingency measures such as turbine shutdown would be implemented in the event of structural damage. • Turbine maintenance to ensure turbines are running properly and efficiently. • See 'Emergency Response Plan' • See 'Environmental Noise and Public Health and Safety' • See Emergency Response	5.7.1; 6.4.5; 6.5.4; 8.0

Table 7.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan during Operation

Environmental Feature	Potential Adverse Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Section Reference
				and Communications Plan'	
Ice fall and shed	• Public Health and Safety.	• Limit potential for ice throw/shed to impact pedestrians.	• Adherence to required setbacks. • Design of turbine tower reduces ice accumulation. • Automatic turbine shutdown due to weight imbalances.	• Inspections of turbines would occur after extreme events and contingency measures such as turbine shutdown would be implemented in the event of structural damage and/or icing to a turbine(s). • Turbine maintenance to ensure turbines are running properly and efficiently. • See 'Emergency Response Plan' • See 'Environmental Noise and Public Health and Safety' • See Emergency Response and Communications Plan'	5.7.2; 6.4.5; 6.5.4; 8.0
Extreme Weather Events	• Potential damage to project infrastructure from extreme weather events.	• No structural failure of the turbines or Project equipment.	• Project components have been designed to withstand the effects from extreme events. • Design, install, operate, and maintain turbines according to applicable industry standards/certifications. • Failsafe devices are capable of shutting down the turbine blades in the event of excessive wind conditions, imbalance, or malfunction of other turbine components. • Adherence to setbacks from receptors.	• See 'Extreme Events'. • See 'Emergency Response Plan' • See 'Environmental Noise and Public Health and Safety' • See Emergency Response and Communications Plan'	5.7.3; 6.4.5; 6.5.4; 8.0

Table 7.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan during Operation

Environmental Feature	Potential Adverse Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Section Reference
Third Party Damage	• Potential damage to towers from accidental collision from off-road and maintenance vehicles.	• No structural failure of the turbines or Project equipment.	• Access to the towers would be restricted to avoid potential accidents to unqualified persons.	• See 'Third Party Damage'. • See 'Emergency Response Plan' • See 'Environmental Noise and Public Health and Safety' • See Emergency Response and Communications Plan'	5.7.1; 6.4.5; 6.5.4; 8.0

8.0 Emergency Response and Communications Plan

The following sets out a description of the actions to be taken during all Project phases to inform the public, Aboriginal communities, Dufferin County, the Town of Grand Valley, the Township of Amaranth, leaseholders and relevant Ministries of the Ontario Government regarding activities occurring at the Project site (including emergencies), means by which stakeholders can contact GVWF and/or the relevant Contractor, and means by which correspondence sent to GVWF and/or the Contractor would be recorded and addressed.

As appropriate, GVWF and/or the Contractor would review the Emergency Response and Communications Plan prior to and during each phase of the Project. Notification of any changes to the Emergency Response and Communications Plan would be provided to stakeholders through the Project website (http://www.vereseninc.com/our-businesses/power/wind.html).

8.1 EMERGENCY RESPONSE PLAN

In the event of an emergency, GVWF and/or the relevant Contractor will initiate the Emergency Response Plan. The plan would include key contact information for emergency service providers, a description of the chain of communications and how information would be disseminated between GVWF and/or the relevant Contractor and the relevant responders. The plan would also indicate how GVWF and/or the relevant Contractor would directly contact (via phone or in-person) Project stakeholders who may be directly impacted by an emergency so that the appropriate actions can be taken to protect stakeholders health and safety. The communication plan for emergencies would be developed in collaboration with local emergency responders, and would be prepared following consultations with Dufferin County, the Town of Grand Valley, the Township of Amaranth, and Orica. GVWF also intends to participate with County and Municipal staff in familiarization sessions specific to the Project prior to Project construction.

8.2 COMMUNICATIONS AND COMPLAINT RESPONSE PROTOCOL

8.2.1 Communication Objectives

GVWF has committed to undertaking public communication early in the development of the Project and will continue to communicate throughout the construction and operation phases of the Project. The main objectives of the communications protocol are to:

- Involve the local community and keep them informed of the Project;
- Work with the local community to address concerns, where possible; and,
- Provide the community and Project personnel with an opportunity for direct communication.

8.2.2 Communication Methods

An email address (gvwf@vereseninc.com) and telephone number for contacting GVWF and/or the O&M Contractor will be posted on the Project website (http://www.vereseninc.com/our-businesses/power/wind.html) and provided directly to Dufferin County, the Town of Grand Valley, the Township of Amaranth and the MOE. These will be the direct contact points for GVWF and/or the O&M Contractor during all phases of the Project. The Plan will also will include key contact information for emergency service providers, a description of the chain of communications and how information will be disseminated between GVWF and/or the O&M Contractor and the relevant responders. This information will be obtained during consultations with Dufferin County, the Town of Grand Valley and the Township of Amaranth.

The telephone number and email provided for reporting concerns and/or complaints would be equipped with a voice message system. All messages would be recorded in an on-site Complaint Response Document to maintain a record of all complaints. GVWF and/or the O&M Contractor would endeavor to respond to messages within 48 hours. All reasonable commercial efforts would be made to take appropriate action as a result of concerns as soon as practicable. The actions taken to remediate the cause of the complaint and the proposed actions to be taken to prevent reoccurrences of the same complaint in the future would also be recorded within the Complaint Response Document. If appropriate, the MOE Spills Action Centre would be contacted to notify them of the complaint. Correspondence would be shared with other stakeholders, such as the MOE, as required and/or as deemed appropriate.

GVWF and/or the relevant Contractor will engage with Project stakeholders (public, Aboriginal communities, Dufferin County, the Town of Grand Valley, the Township of Amaranth) during all phases of the Project including providing updates on the Project website (noted above). As a long-term presence in the local municipalities, GVWF will continue to develop contacts and to develop local relationships and channels of communication. Ongoing stakeholder communication will allow GVWF and/or the O&M Contractor to receive and respond to community issues on an ongoing basis.

Additional updates may be provided to stakeholders via letters/newsletters, newspaper notices, or direct contact. Any updates to the Project, including updates to the communications and complaint protocol, will be placed in local newspapers, mailed to landowners in the Project study area, and provided on the Project website (noted above).

8.3 PUBLIC SAFETY PLAN

In addition to the Public Safety Plan that would be developed by the Construction Contractor for the protection of public safety during the construction and decommissioning phases, GVWF and/or the O&M Contractor would prepare and implement a Public Safety Plan for operation of the Project. As previously noted and as appropriate, GVWF and/or the O&M Contractor would develop or have an existing operation training program to ensure personnel receive appropriate training in relation to operation and maintenance programs, environmental, health and safety

procedures, and an Emergency Response and Communications Plan. Proper training would ensure operational safety for Project personnel.

Operational safety to minimize potential risks to the public would include:

- Site access restrictions (with the exception of maintenance and emergency personnel);
- Development of an Emergency Response and Communications Plan; and
- Turbine design and adherence to construction standards.

Signage may include, but would not be limited to signs associated with potential risks at the Project. Signs may be posted in the vicinity of buried cables, high voltage equipment, and warning of the presence of maintenance vehicles along the access roads.

Access restrictions would include “No Trespassing” signs on the turbine access roads and turbine tower site. Access roads would have restricted access (e.g. gates that are open when contractors and staff are on site, and shut but not locked during all other times), thus allowing emergency vehicles to access the transformer station property and all turbine locations in the event of an emergency.

As previously noted, during pre-operational mobilization GVWF and/or the O&M Contractor would finalize an Emergency Response and Communications Plan for the operational activities in collaboration with local emergency responders. The development of and proper execution of the Emergency Response and Communications Plan would help ensure public safety is maintained throughout the operation of the facility.

Potential risk to public safety as a result of extreme events such as fire, lightning, and tornadoes were addressed in Section 5.8.3. The turbines have been designed with various protective measures to address extreme events to reduce the potential risk to public safety. The turbines would adhere to marking and lighting requirements of the Aerodrome Safety Branch of Transport Canada. In addition, construction of the turbines would be completed according to stringent national and international codes.

9.0 Closure

The Design and Operations Report for the Grand Valley Wind Farms - Phase 3 Wind Project has been prepared by Stantec for GVWF in accordance with Ontario Regulation 359/09 and the *Technical Guide to Renewable Energy Approvals* (MOE 2012).

This report has been prepared by Stantec for the sole benefit of GVWF, and may not be used by any third party without the express written consent of GVWF. 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.

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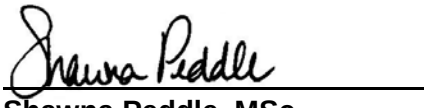
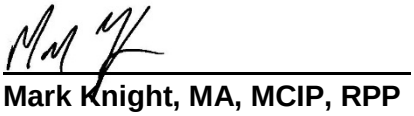


Shawna Peddle, MSc
Senior Project Manager



Mark Knight, MA, MCIP, RPP
Project Manager

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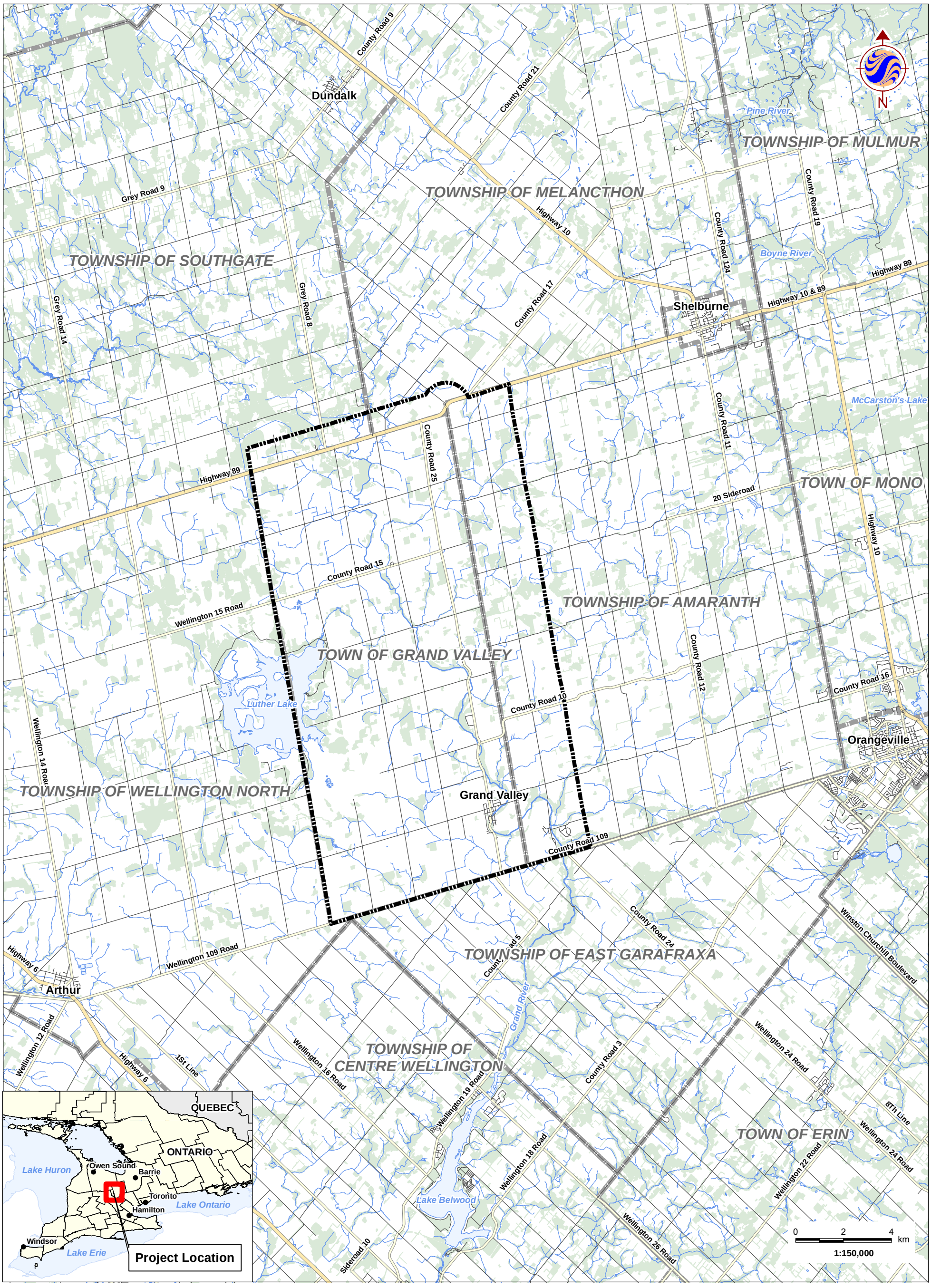
Appendix A

Site Plan



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Revised: 2012-12-19 By: dharvey

December, 2012
160960698

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Legend

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

Notes

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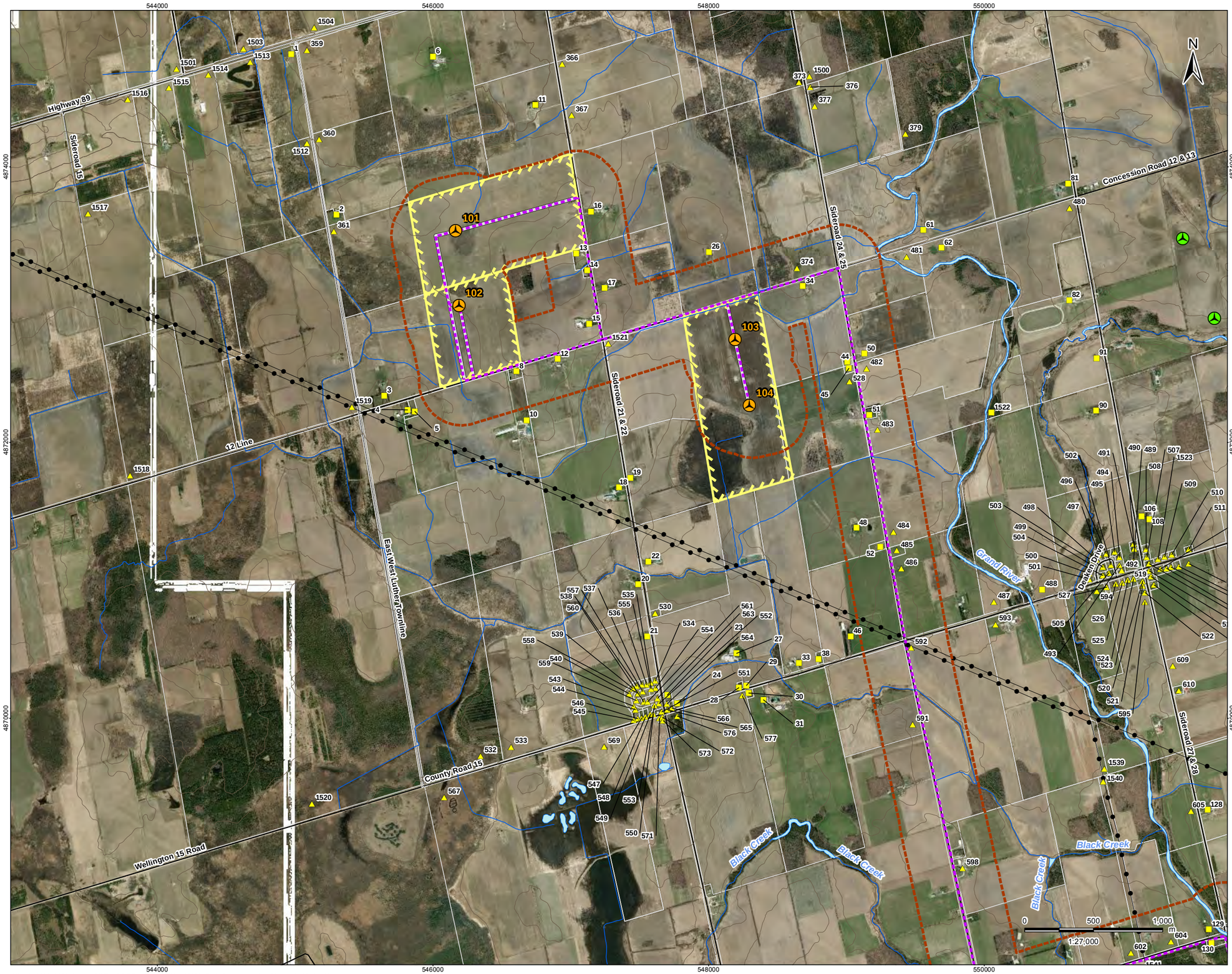
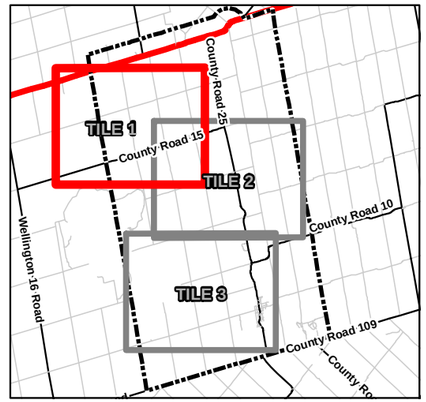
Client/Project
Grand Valley Phase 3
Veresen Inc.

Figure No.
1

Title
Project Study Area





Legend

- 300m Zone of Investigation

Proposed Project Components

- Turbine
- Construction Trailer/ Parking Area (Previously Disturbed)
- Access Roads
- Collector Lines
- Transformer Location/ HONI Connection Point/ Met Tower/ Construction Laydown
- Participating Property

Other Crystallized/ Existing Turbines

- Grand Valley Phase 1 & 2
- Melancthon Phase 1 & 2

Existing Features

- Hydro Line
- Contours (5 Metre Interval)
- Road
- Watercourse (as per MNR base mapping)
- Property Parcel
- Waterbody (as per MNR base mapping)

Noise Receptors

- Participating
- Non- Participating Occupied
- Non- Participating Vacant
- 483 Receptor ID

Notes

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Client/Project
Grand Valley Phase 3
Veresen Inc.

Figure No.
2

Title
Project Location Mapbook
TILE 1

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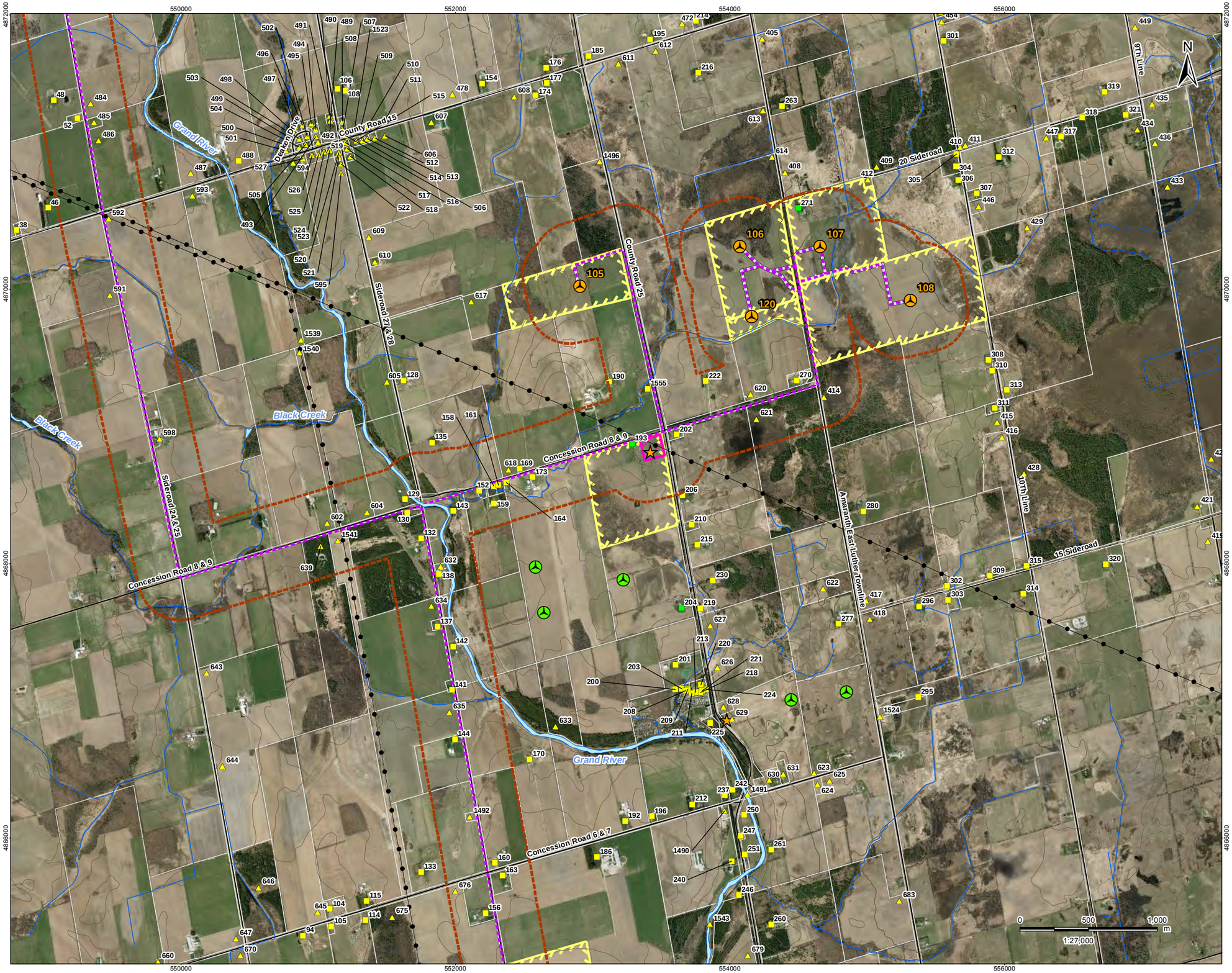
Revised: 2013-04-24 By: dharvey



Legend

- 300m Zone of Investigation

Proposed Project Components

- Turbine
- Construction Trailer/ Parking Area (Previously Disturbed)
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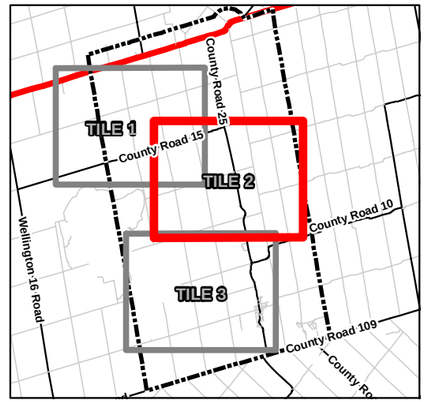
- Property Parcel
- Waterbody (as per MNR base mapping)

Noise Receptors

- Participating
- Non- Participating Occupied
- Non- Participating Vacant
- 483 Receptor ID



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Notes

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Client/Project
Grand Valley Phase 3
Veresen Inc.

Figure No.
2

Title
Project Location Mapbook
TILE 2

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Revised: 2013-04-24 By: dharvey

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4864000 4862000 4860000

East Bay
Luther Lake
Concession Road 6 & 7
Sideroad 21 & 22
Sideroad 27 & 28
County Road 10
Sideroad 24 & 25
Sideroad 28 & 29
Sideroad 21 & 22
East West Luther Townline
Concession Road 2 & 3
2 Line
Fife Road
Spruyt Avenue
Main Street North
Crozier Street
Scott Street
Emma Street South
Leeson Street South
Main Street South
Cooper Street
Water Street
Wellington 16 Road
Boyne Creek
Grand River
County Road 25
County Road 15
County Road 109

109 110 112 113 114 115 117 118

N

0 500 1,000 m
1:27,000

Legend

300m Zone of Investigation

Proposed Project Components

- Turbine
- Construction Trailer/ Parking Area (Previously Disturbed)
- Access Roads
- Collector Lines
- Transformer Location/ HONI Connection Point/ Met Tower/ Construction Laydown
- Participating Property

Other Crystallized/ Existing Turbines

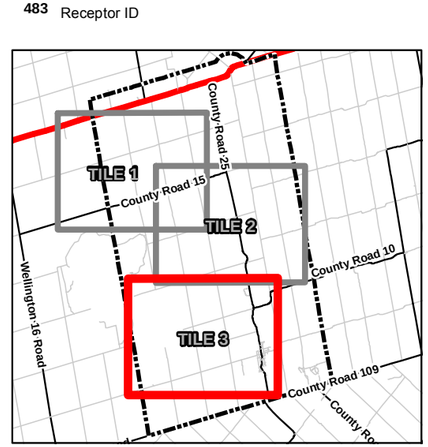
- Grand Valley Phase 1 & 2
- Melancthon Phase 1 & 2

Existing Features

- Hydro Line
- Contours (5 Metre Interval)
- Road
- Watercourse (as per MNR base mapping)
- Property Parcel
- Waterbody (as per MNR base mapping)

Noise Receptors

- Participating
- Non- Participating Occupied
- Non- Participating Vacant
- 483 Receptor ID



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Client/Project
Grand Valley Phase 3
Veresen Inc.

Figure No.
2

Title
Project Location Mapbook
TILE 3

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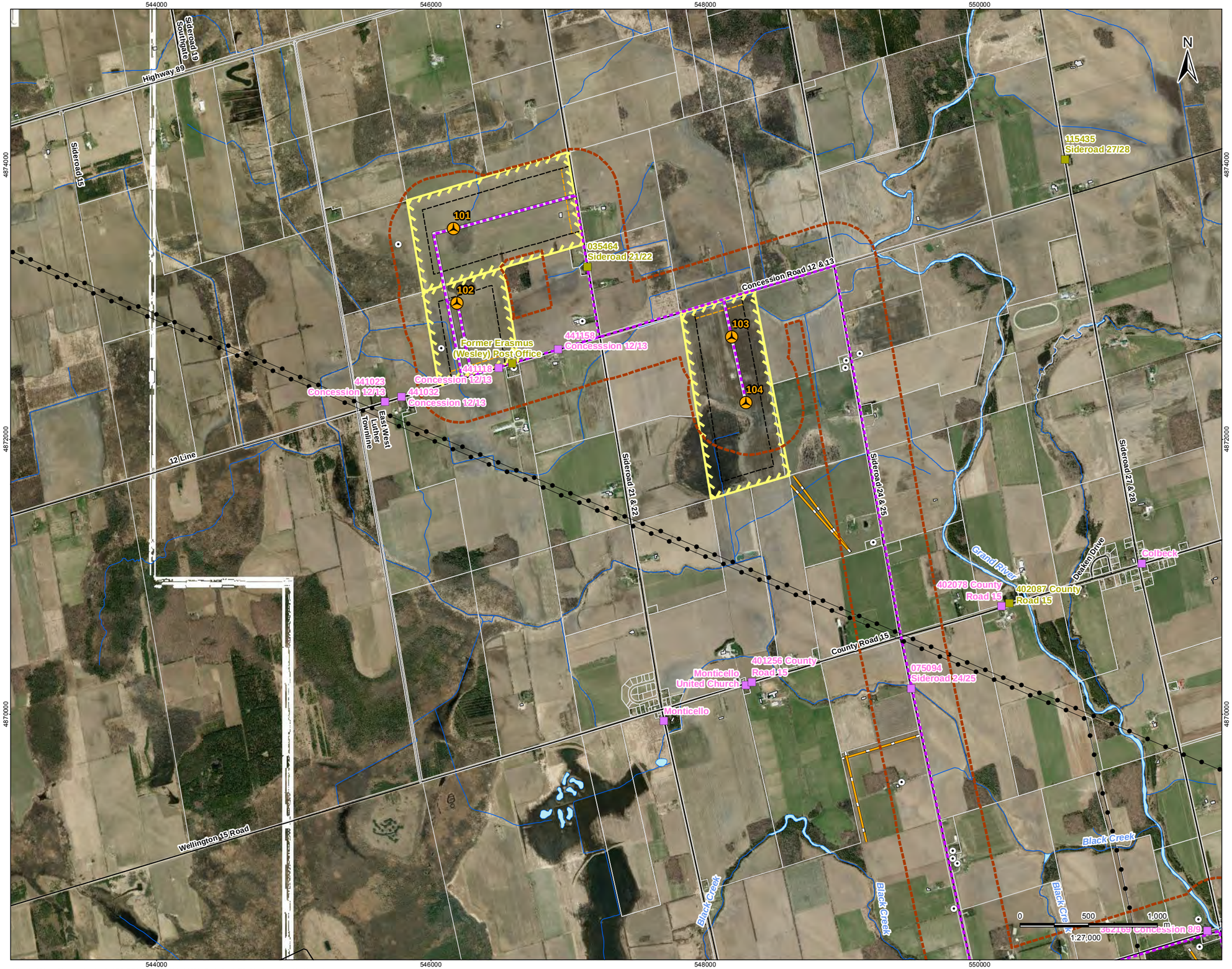

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Revised: 2013-04-24 By: dharvey

Legend

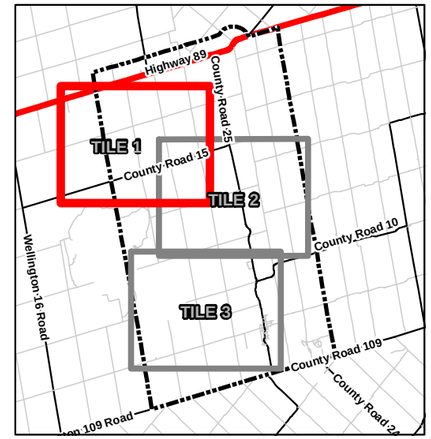
- 300m Zone of Investigation

Proposed Project Components

- Turbine
- Construction Trailer/ Parking Area (Previously Disturbed)
- Access Roads
- Collector Lines
- Transformer Location/ HONI Connection Point/ Met Tower/ Construction Laydown
- Participating Property

Existing Features

- Hydro Line
- Air Strip
- Road
- Watercourse (as per MNR base mapping)
- Buildings (as per MNR base mapping)
- Property Parcel
- Property Line - 100m Setback
- Public Road - 65.5m Setback
- Waterbody (as per MNR base mapping)
- Built Heritage Resource
- Cultural Heritage Landscape
- Landfill (MOE)
- Water Well Record (MOE)



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Client/Project
Grand Valley Phase 3
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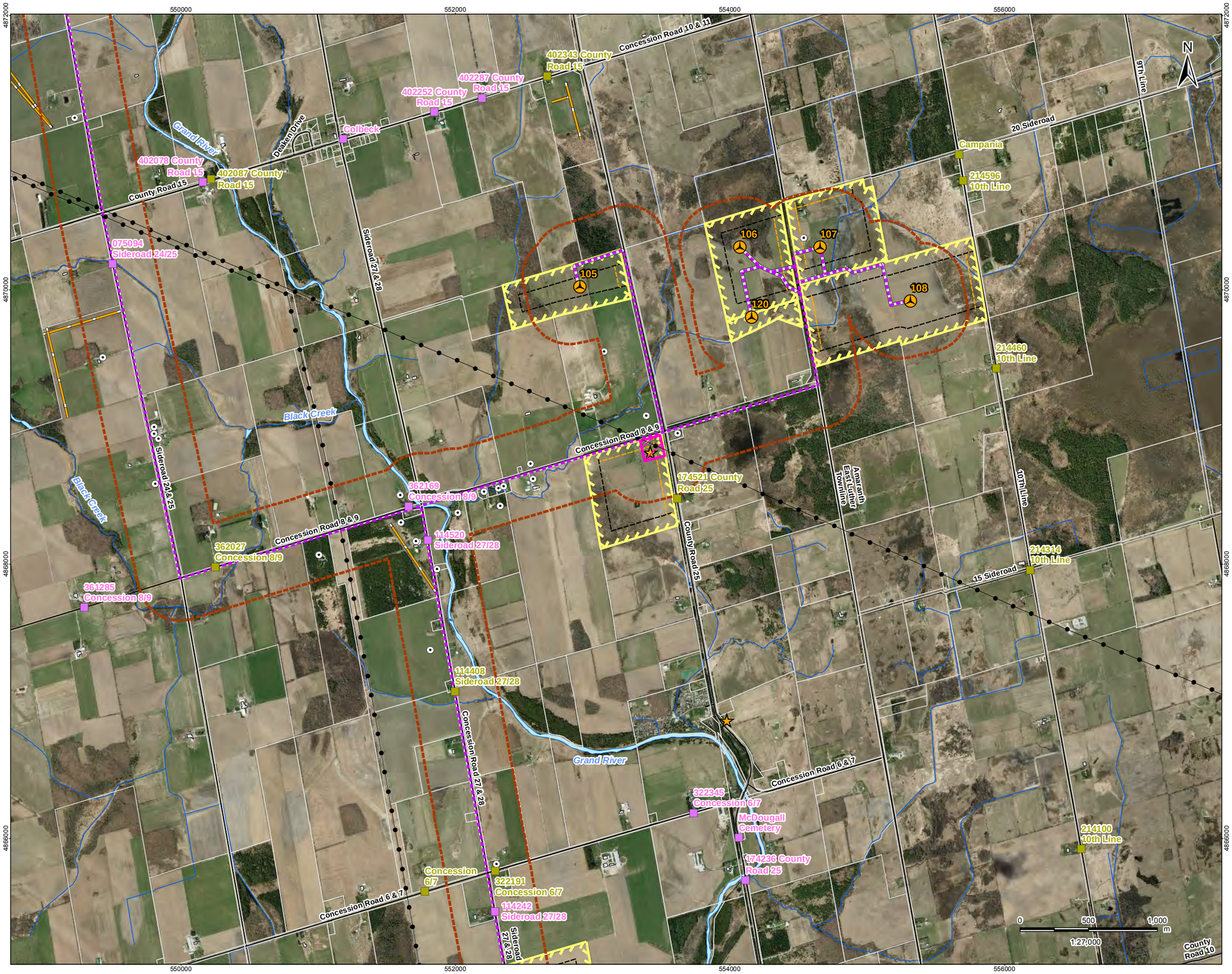
Figure No.
3

Title
Socio-Economic Features Mapbook TILE 1



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Revised: 2013-04-24 By: dharvey

Legend

- 300m Zone of Investigation

Proposed Project Components

- Turbine
- Construction Trailer/ Parking Area (Previously Disturbed)
- Access Roads
- Collector Lines
- Transformer Location/ HONI Connection Point/ Met Tower/ Construction Laydown
- Participating Property

Existing Features

- Hydro Line
- Air Strip
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- Buildings (as per MNR base mapping)
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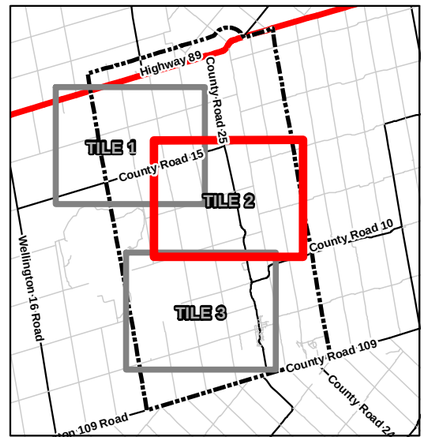
- Property Line - 100m Setback
- Public Road - 65.5m Setback
- Waterbody (as per MNR base mapping)
- Built Heritage Resource
- Cultural Heritage Landscape
- Landfill (MOE)
- Water Well Record (MOE)



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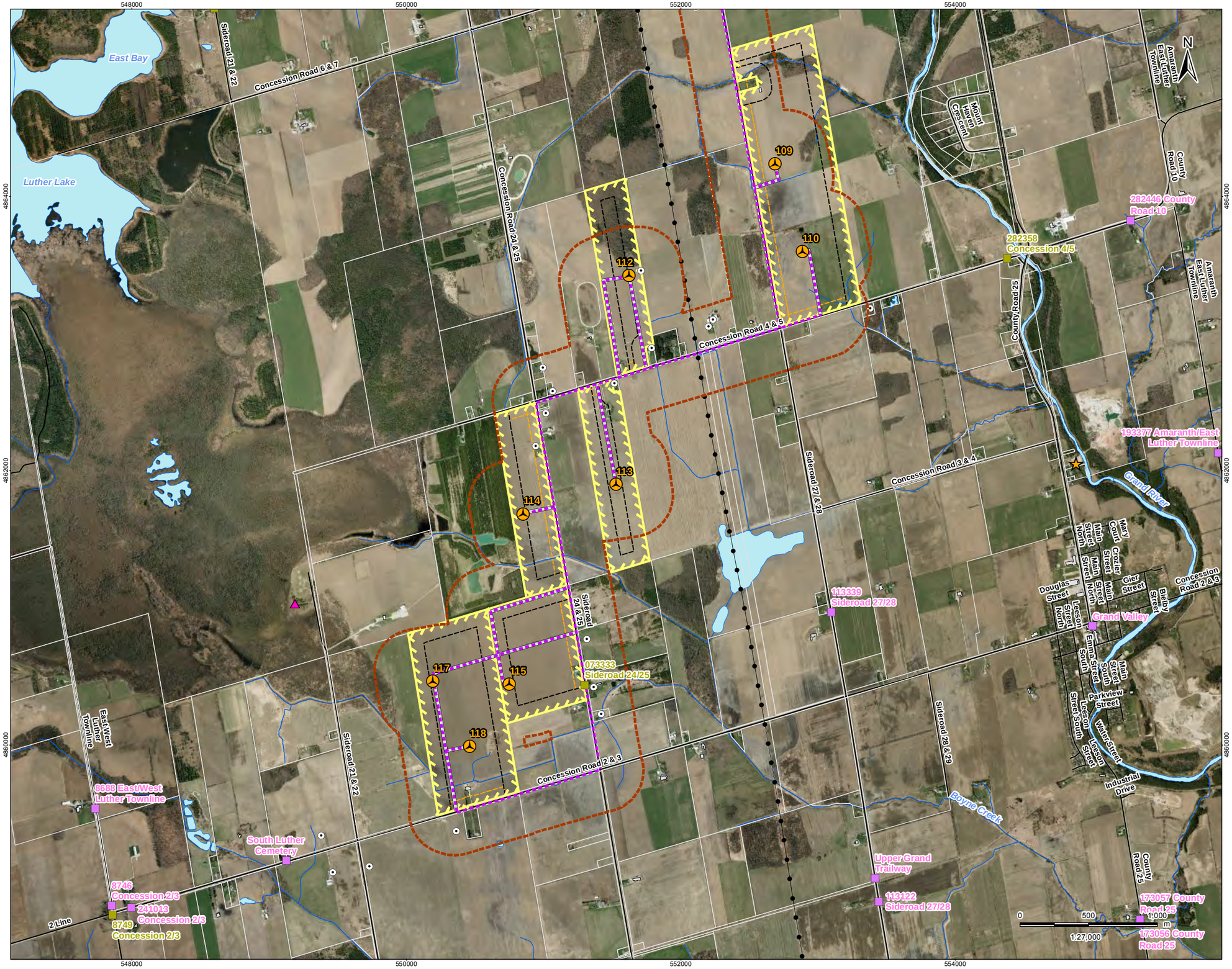
Client/Project
Grand Valley Phase 3
Veresen Inc.

Figure No.
3

Title
Socio-Economic Features Mapbook TILE 2



Legend

300m Zone of Investigation

Proposed Project Components

- Turbine
- Construction Trailer/ Parking Area (Previously Disturbed)
- Access Roads
- Collector Lines
- Transformer Location/ HONI Connection Point/ Met Tower/ Construction Laydown
- Participating Property

Existing Features

- Hydro Line
- Air Strip
- Road
- Watercourse (as per MNR base mapping)
- Buildings (as per MNR base mapping)
- Property Parcel
- Property Line - 100m Setback
- Public Road - 65.5m Setback
- Waterbody (as per MNR base mapping)
- Built Heritage Resource
- Cultural Heritage Landscape
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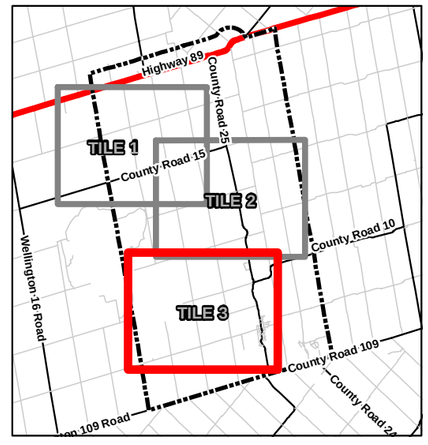
- Water Well Record (MOE)



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Client/Project
Grand Valley Phase 3
Veresen Inc.

Figure No.
3

Title
Socio-Economic Features Mapbook TILE 3

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Revised: 2013-04-24 By: dharvey

Legend

- 120m Zone of Investigation
- 300m Zone of Investigation

Proposed Project Components

- Turbines
- Access Roads
- Collector Lines
- Collector Line ROW
- Transformer Location/ HONI Connection Point/ Met Tower/ Construction Laydown
- Turbine Blade Reach (56.5m)
- Turbine Construction Area
- Turning Area
- Optioned Property

Existing Features

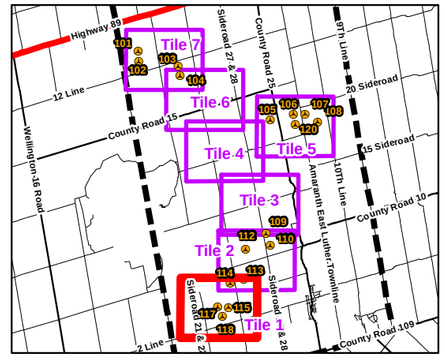
- Road
- Constructed Drain
- Watercourse
- Waterbody

Natural Features

- Candidate Significant Woodland
- Wildlife Habitat
- Wetland Feature

Water Body Status

- REA Water Body/ Fish Habitat
- Not REA Water Body



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Client/Project
Grand Valley Phase 3
Veresen Inc.

Figure No.
4.1

Title
Aquatic & Natural Heritage Features - Field Review
Tile 1 of 7

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Revised: 2013-04-23 By: dharvey

Legend

- 120m Zone of Investigation
- 300m Zone of Investigation

Proposed Project Components

- Turbines
- Access Roads
- Collector Lines
- Collector Line ROW
- Transformer Location/ HONI Connection Point/ Met Tower/ Construction Laydown
- Turbine Blade Reach (56.5m)
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- Constructed Drain
- Watercourse
- Waterbody

Natural Features

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- Wildlife Habitat
- Wetland Feature

Water Body Status

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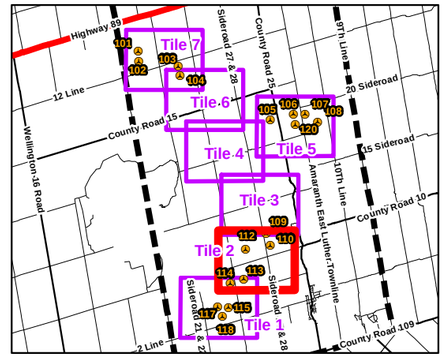
- Not REA Water Body



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Client/Project
Grand Valley Phase 3
Veresen Inc.

Figure No.
4.1

Title
Aquatic & Natural Heritage Features - Field Review
Tile 2 of 7

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Revised: 2013-04-23 By: dharvey

Legend

- 120m Zone of Investigation
- 300m Zone of Investigation

Proposed Project Components

- Turbines
- Access Roads
- Collector Lines
- Collector Line ROW
- Transformer Location/ HONI Connection Point/ Met Tower/ Construction Laydown
- Turbine Blade Reach (56.5m)
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- Turning Area
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- Watercourse
- Waterbody

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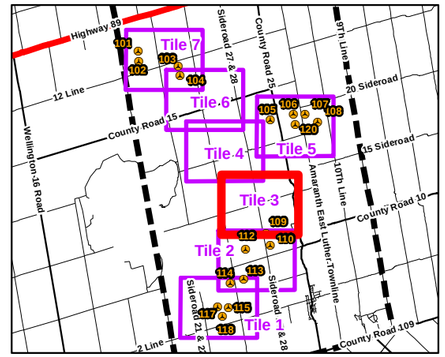
- REA Water Body/ Fish Habitat
- Not REA Water Body



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April 2013
160960698

Client/Project
Grand Valley Phase 3
Veresen Inc.

Figure No.
4.1

Title
Aquatic & Natural Heritage Features - Field Review
Tile 3 of 7

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Revised: 2013-04-23 By: dharvey

Legend

- 120m Zone of Investigation
- 300m Zone of Investigation

Proposed Project Components

- Turbines
- Access Roads
- Collector Lines
- Collector Line ROW
- Transformer Location/ HONI Connection Point/ Met Tower/ Construction Laydown
- Turbine Blade Reach (56.5m)
- Turbine Construction Area
- Turning Area
- Optioned Property

Existing Features

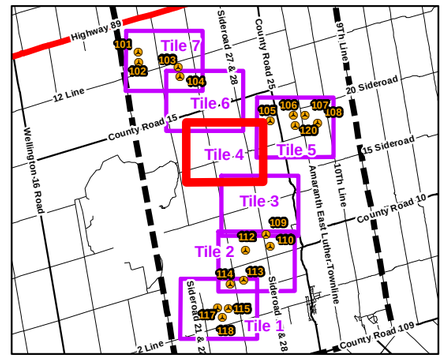
- Road
- Constructed Drain
- Watercourse
- Waterbody

Natural Features

- Candidate Significant Woodland
- Wildlife Habitat
- Wetland Feature

Water Body Status

- REA Water Body/ Fish Habitat
- Not REA Water Body



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Veresen Inc.

Figure No.
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Aquatic & Natural Heritage Features - Field Review
Tile 4 of 7

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Revised: 2013-04-23 By: dharvey

Legend

- 120m Zone of Investigation
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Proposed Project Components

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Existing Features

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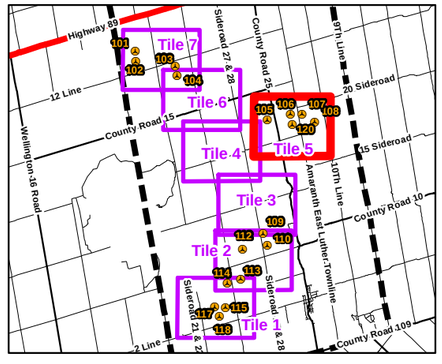
- Watercourse
- Waterbody

Natural Features

- Candidate Significant Woodland
- Wildlife Habitat
- Wetland Feature

Water Body Status

- REA Water Body/ Fish Habitat
- Not REA Water Body



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Veresen Inc.

Figure No.
4.1

Title
Aquatic & Natural Heritage Features - Field Review
Tile 5 of 7

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Revised: 2013-04-23 By: dharvey

Legend

- 120m Zone of Investigation
- 300m Zone of Investigation

Proposed Project Components

- Turbines
- Access Roads
- Collector Lines
- Collector Line ROW
- Transformer Location/ HONI Connection Point/ Met Tower/ Construction Laydown
- Turbine Blade Reach (56.5m)
- Turbine Construction Area
- Turning Area
- Optioned Property

Existing Features

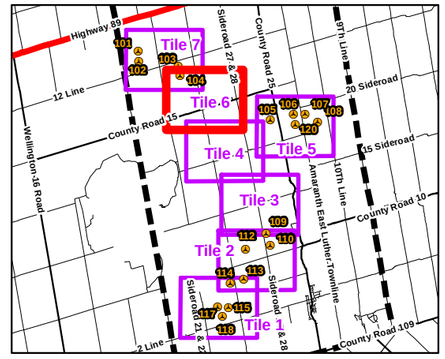
- Road
- Constructed Drain
- Watercourse
- Waterbody

Natural Features

- Candidate Significant Woodland
- Wildlife Habitat
- Wetland Feature

Water Body Status

- REA Water Body/ Fish Habitat
- Not REA Water Body



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April 2013
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Client/Project
Grand Valley Phase 3
Veresen Inc.

Figure No.
4.1

Title
Aquatic & Natural Heritage Features - Field Review
Tile 6 of 7

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Revised: 2013-04-23 By: dharvey

Legend

- 120m Zone of Investigation
- 300m Zone of Investigation

Proposed Project Components

- Turbines
- Access Roads
- Collector Lines
- Collector Line ROW
- Transformer Location/ HONI Connection Point/ Met Tower/ Construction Laydown
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Existing Features

- Road
- Constructed Drain
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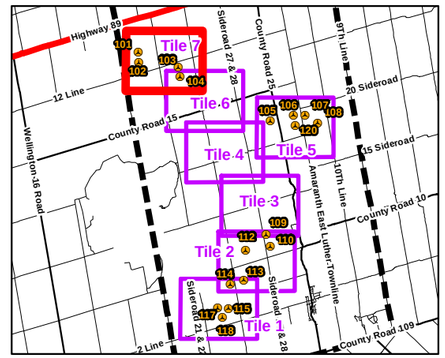
- Waterbody

Natural Features

- Candidate Significant Woodland
- Wildlife Habitat
- Wetland Feature

Water Body Status

- REA Water Body/ Fish Habitat
- Not REA Water Body



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April 2013
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Client/Project
Grand Valley Phase 3
Veresen Inc.

Figure No.
4.1

Title
Aquatic & Natural Heritage Features - Field Review
Tile 7 of 7

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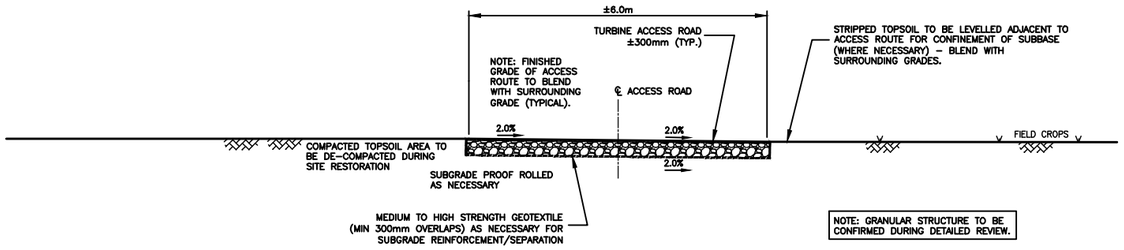
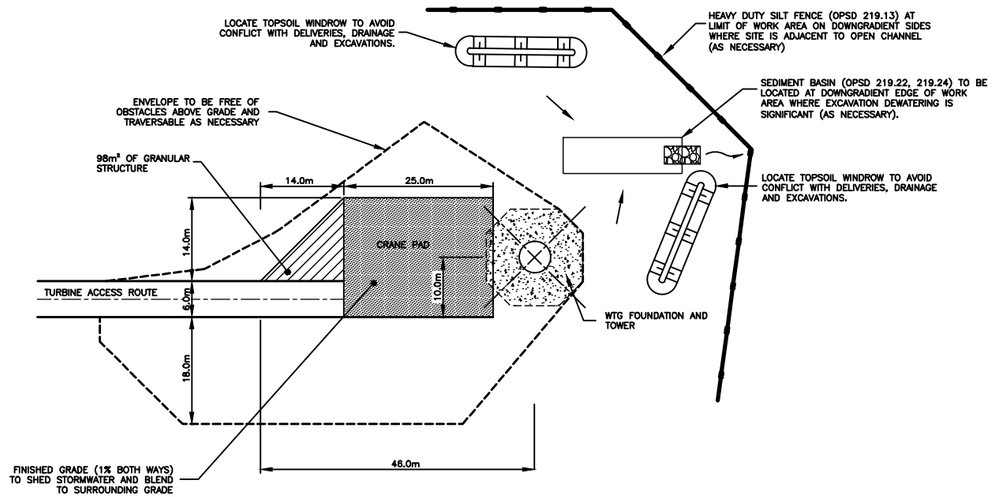
Revised: 2013-04-23 By: dharvey

Appendix B

Conceptual Plans and Specifications



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.

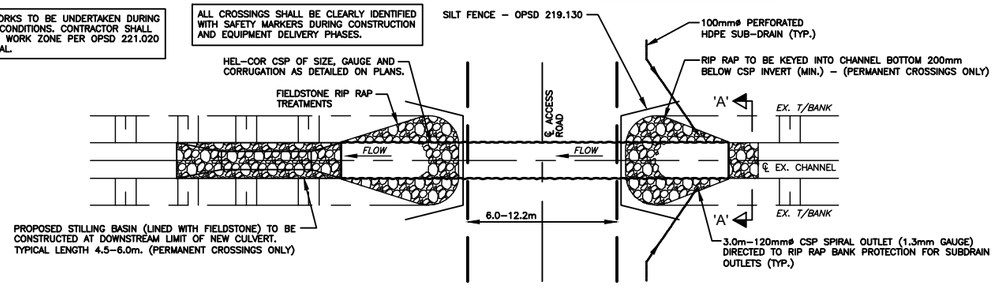
NOTE: FUELING OPERATIONS SHALL NOT BE CONDUCTED WITHIN 15.0m OF A DITCH OR FIELD TILE INLET.

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

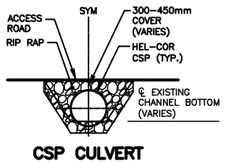
ALL CROSSINGS SHALL BE CLEARLY IDENTIFIED WITH SAFETY MARKERS DURING CONSTRUCTION AND EQUIPMENT DELIVERY PHASES.

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.

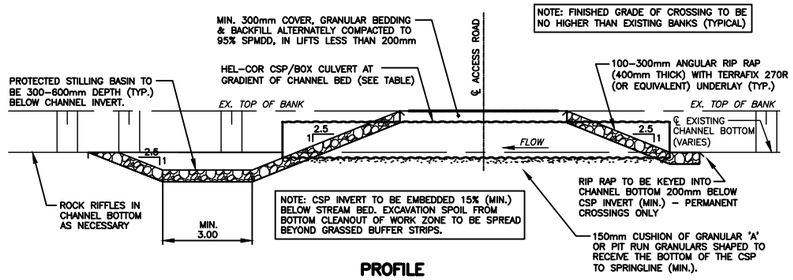
NOTE: EXISTING CHANNEL VEGETATION TO BE PROTECTED WHERE POSSIBLE.



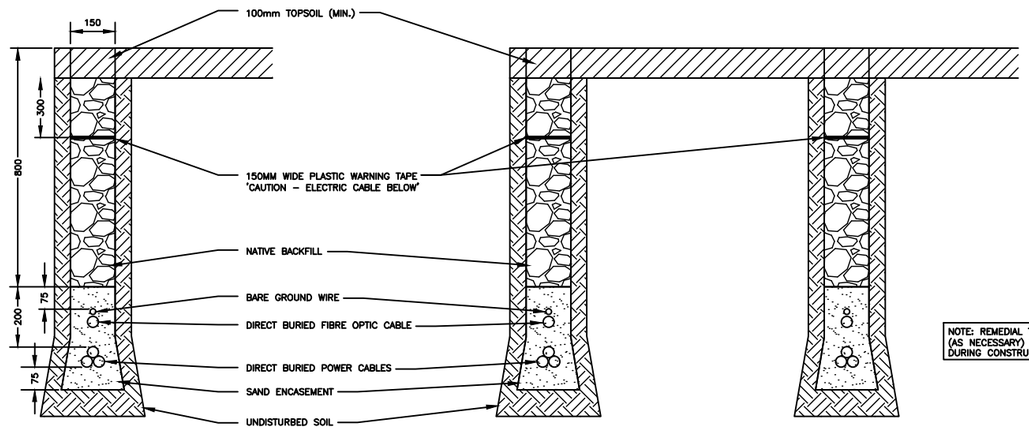
TYPICAL CULVERT CROSSING DETAIL
NTS



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.K.				
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.

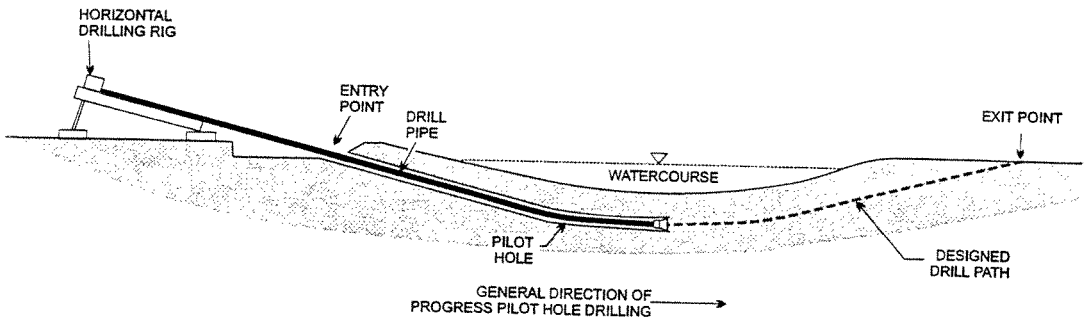
SCALE: AS NOTED

TITLE: ST. COLUMBAN WIND FARM
TYPICAL DETAILS

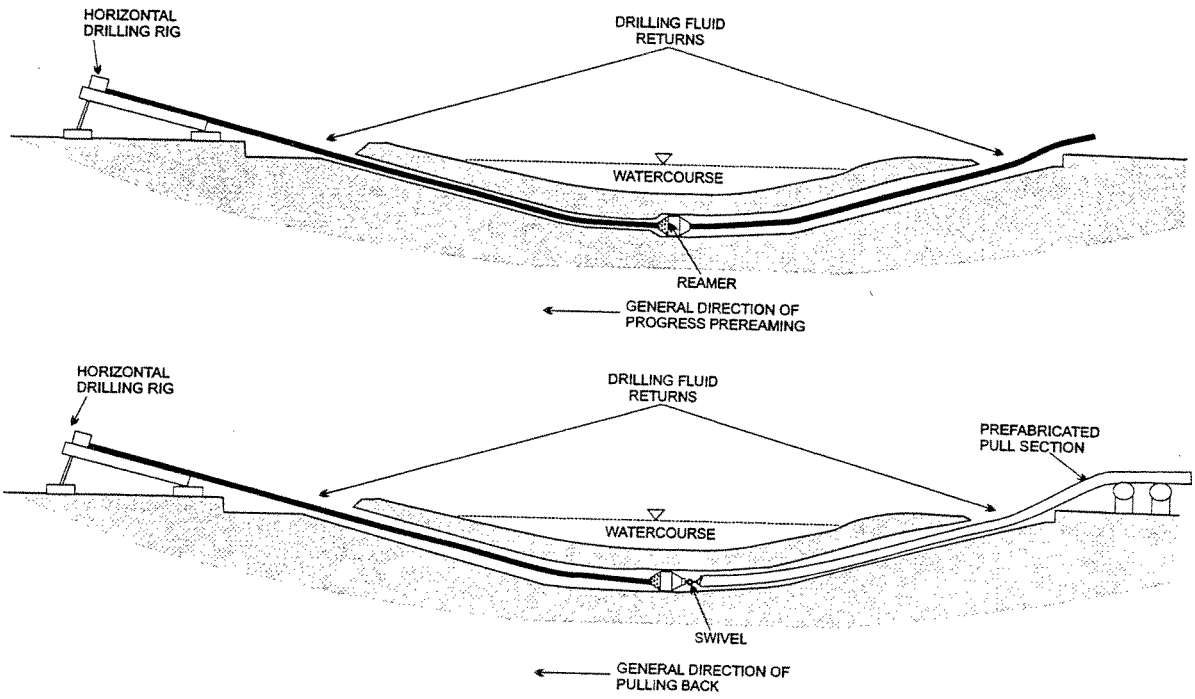
PROJECT No. DEL11-054
SHEET No. 1
PLAN FILE No.

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.

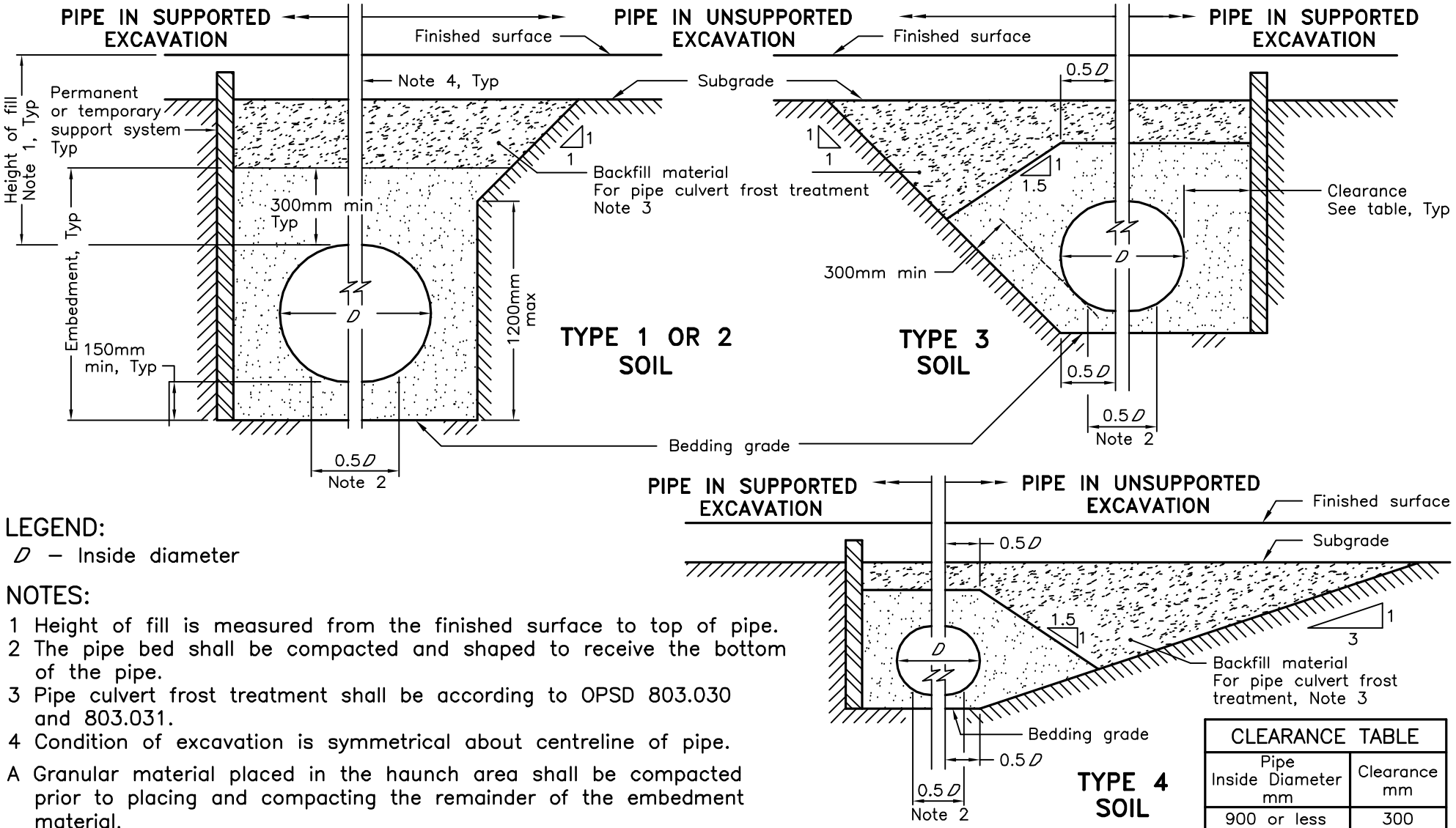
Source: Adapted from ASCE 1996, TERA 1998

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 · OPS

OPSD 802.010

Appendix D

Property Line Setback Assessment

GRAND VALLEY WIND FARMS – PHASE 3 WIND PROJECT

PROPERTY LINE SETBACK ASSESSMENT REPORT

File Number: 160960698
April 2013

Prepared for:

Grand Valley Wind Farms Inc.
Suite 502, 216 Chrislea Road
Woodbridge, ON, L4L 8S5

Prepared by:

Stantec Consulting Ltd.
Suite 1 - 70 Southgate Drive
Guelph ON N1G 4P5

Table of Contents

List of Attachments

1.0 Introduction

1.1 PROJECT OVERVIEW

Grand Valley Wind Farms Inc. (GVWF) is proposing to develop, construct, operate and decommission the 40 megawatt (MW) Grand Valley Wind Farms - Phase 3 Wind Project (the Project) in the Town of Grand Valley and Township of Amaranth, Dufferin County in response to the Government of Ontario's initiative to promote the development of renewable electricity in the province.

The Project Study Area is generally bordered on the north by Highway 89, on the south by County Road 109, on the east by 9th Line and on the west by East West Luther Townline. The proposed Project Location 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 Area are shown in Figures 1 and 2, Appendix A.

The basic components of the Project include:

- Between 14 and 17 wind turbine generators (Siemens SWT-2.3-113 and/or SWT 3.0-113 turbine) with a total maximum installed nameplate capacity of 40MW. The turbine models are identical in structure, and would be 'de-rated', generating less electricity per turbine to meet the contract nameplate capacity. Noise Assessment Reports have been completed for both turbine models as part of the Renewable Energy Approval (REA) process;
- A 34.5 kV underground power line collector system that would transport the electricity generated from the Project to the Hydro One Networks Inc. (HONI) transmission system;
- Fibre optic cabling laid with the underground collector lines;
- Turbine access roads;
- Crane pads;
- One connection point to the existing HONI electrical transmission system;
- Existing operations and maintenance facilities to be leased by the Project (joining the current facilities for the operation of the Grand Valley Phase 1 and 2 Wind Projects). The currently municipally-serviced office facility is located at 35A Main Street South, Grand Valley and the currently unserviced warehouse facility is located at 27 Mill Street West, Grand Valley;
- Existing parking (owned) and gravel quarry (leased) sites to be used for employee parking and temporary construction trailer sites (174321 and 173395 County Road 25, Grand Valley);
- A 34.5 kV/230 kV 45 MVA transformer station; and,

- Meteorological equipment, including an approximately 100 m MET tower or a surface mounted SoDAR unit.

Temporary components include:

- Work and storage areas during construction at the turbine locations and along the underground power line collector system;
- Office, parking and storage areas during construction for the work crews during the construction phase of the Project; and,
- An approximately 100 m anemometer tower, for equipment performance testing.

GVWF 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 *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 Property Line Setback Assessment Report has been prepared in accordance with O. Reg. 359/09, and is one component of the REA application for the Project.

1.2 REPORT REQUIREMENTS

Of the 17 potential turbine sites being assessed for the Project, three (3) are located closer to a property line than the height of the turbine (99.5 metres). None of the potential turbine sites are located less than the length of the turbine blades plus 10 metres (i.e., 66.5 metres) from a property line or the boundary of a municipal road right-of-way. All of the potential turbine sites meet the minimum setback requirement of at least 550 metres from the nearest non-participating noise receptor.

The purpose of the Property Line Setback Assessment Report is to provide a review of potential adverse impacts and preventative measures for wind turbines located within the prescribed setback from non-participating parcels of land (i.e. where there is no agreement with the land owner specifically permitting a closer setback).

The Property Line Setback Assessment Report has been prepared in accordance with s.53 of O. Reg. 359/09, which sets out specific content requirements:

- Demonstrate that the proposed location of the wind turbine would not result in adverse impacts on nearby business, infrastructure, properties or land use activities, and
- Describe any preventative measures that are required to be implemented to address the possibility of any adverse impacts.

2.0 Summary of Property Line Setback Analysis

This section summarizes the features over which Project turbine locations overlap the 99.5 metre setback, potential adverse impacts on those features, and preventative measures to address potential adverse impacts. Mapping of each potential turbine location analyzed is provided in Appendix A.

The detailed analysis for each turbine, including the distance of each potential turbine site from the non-participating property line, and the distance of overlap, is provided in Appendix B.

2.1 AGRICULTURAL LAND

Description of Features within Overlap

The setback for Turbines T112 and T120 overlap with agricultural cash crop land. Details are provided in Appendix B.

Potential Adverse Impacts

Adverse impacts to agricultural land, including crop damage and soil compaction, may occur in the unlikely event of turbine collapse.

Preventative Measures

The turbines would be constructed and designed by professional engineers, undergo regular maintenance and monitoring by operational staff, and contain automatic shutdown mechanisms in instances such as extreme weather. All of these measures are standard best practices detailed in the REA reports. In the unlikely event of damage to agricultural land due to turbine collapse, landowners would be compensated by GVWF for any crop damage, and measures are outlined in the REA reports to mitigate soil compaction. Given the above measures, no additional preventative measures are required for the changes in setback.

2.2 WOODLOTS

Description of Features within Overlap

The setback for Turbine T114 overlaps with a White Spruce/White Pine plantation. Details are provided in Appendix B.

Potential Adverse Impacts

Information on potential adverse impacts for natural heritage features are outlined in the Natural Heritage Assessment/Environmental Impact Study provided under separate cover as a component of the REA application.

Preventative Measures

Information on preventative measures for natural heritage features are outlined in the Natural Heritage Assessment/Environmental Impact Study provided under separate cover as a component of the REA application. Given these measures, no additional preventative measures are required for the changes in setback.

2.3 WATERCOURSES

Description of Features within Overlap

The setback for Turbine 120 overlaps with a watercourse, No. 21 Drainage Works, which has been classified as a water body. Details are provided in Appendix B.

Potential Adverse Impacts

Information on potential adverse impacts for aquatic features are outlined in the Water Assessment and Water Body Report provided under separate cover as a component of the REA application.

Preventative Measures

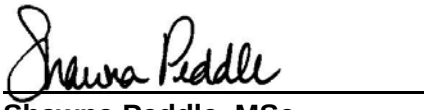
Information on preventative measures for aquatic features are outlined in the Water Assessment and Water Body Report provided under separate cover as a component of the REA application. Given these measures, no additional preventative measures are required for the changes in setback.

3.0 Closure

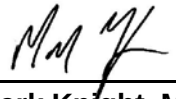
This Property Line Setback Assessment Report for the Grand Valley Wind Farms - Phase 3 Wind Project has been prepared by Stantec for GVWF in accordance with Ontario Regulation 359/09.

This report has been prepared by Stantec for the sole benefit of GVWF, and may not be used by any third party without the express written consent of GVWF. 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.



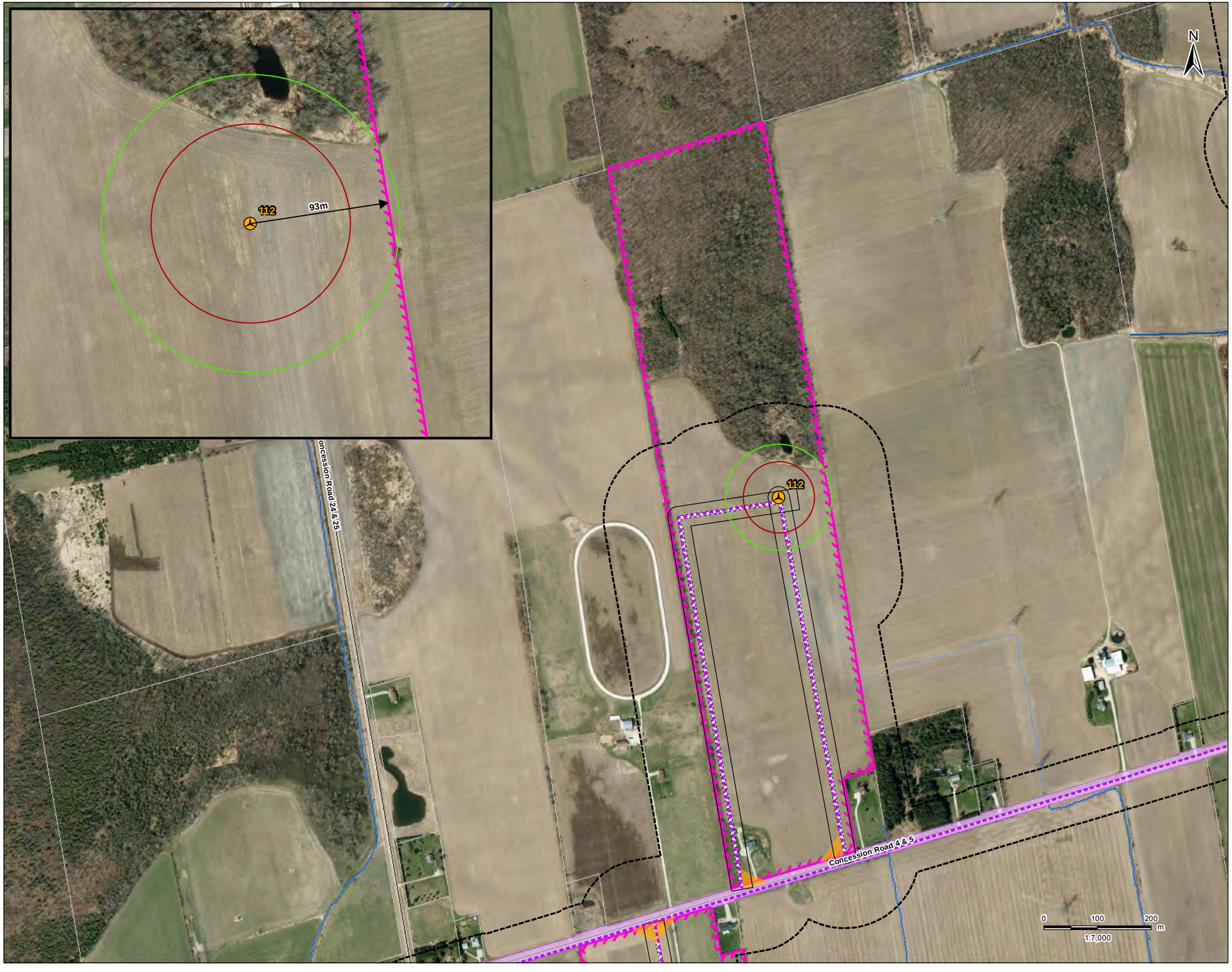
Shawna Peddle, MSc
Senior Project Manager



Mark Knight, MA, MCIP, RPP
Project Manager

Attachment A

Figures: Individual Turbine Locations and Property Line Setbacks



Legend

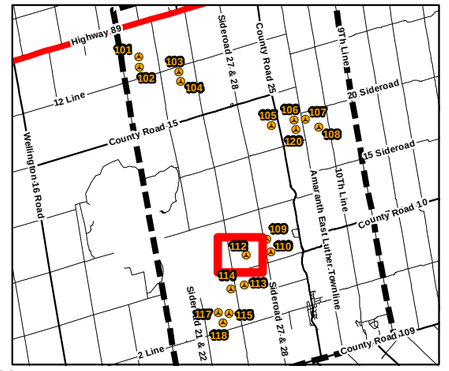
- 120m Zone of Investigation

Proposed Project Components

- Turbines
- Access Roads
- Collector Lines
- Collector Line ROW
- Turbine 66.5m Buffer (Blade + 10m)
- Turbine 99.5m Buffer (Hub Height)
- Transformer Location/ HONI Connection Point/ Met Tower/ Construction Laydown
- Turning Area
- Optioned Property

Existing Features

- Road
- Constructed Drain
- Watercourse
- Waterbody
- Property Parcel



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160960698

Client/Project
Grand Valley Phase 3
Veresen Inc.

Figure No.
1

Title
Property Line Assessment - T112

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Revised: 2013-04-22 By: dharvey

Legend

120m Zone of Investigation

Proposed Project Components

- Turbines
- Access Roads
- Collector Lines
- Collector Line ROW
- Turbine 66.5m Buffer (Blade + 10m)
- Turbine 99.5m Buffer (Hub Height)
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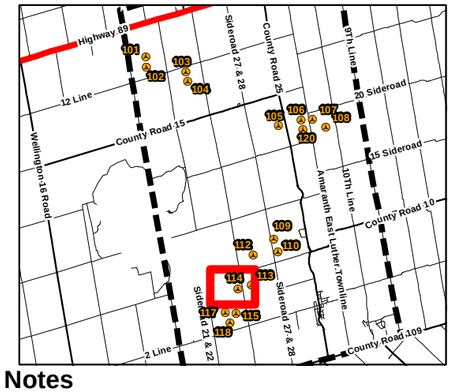

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Client/Project
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Veresen Inc.

Figure No.
2

Title
Property Line Assessment - T114

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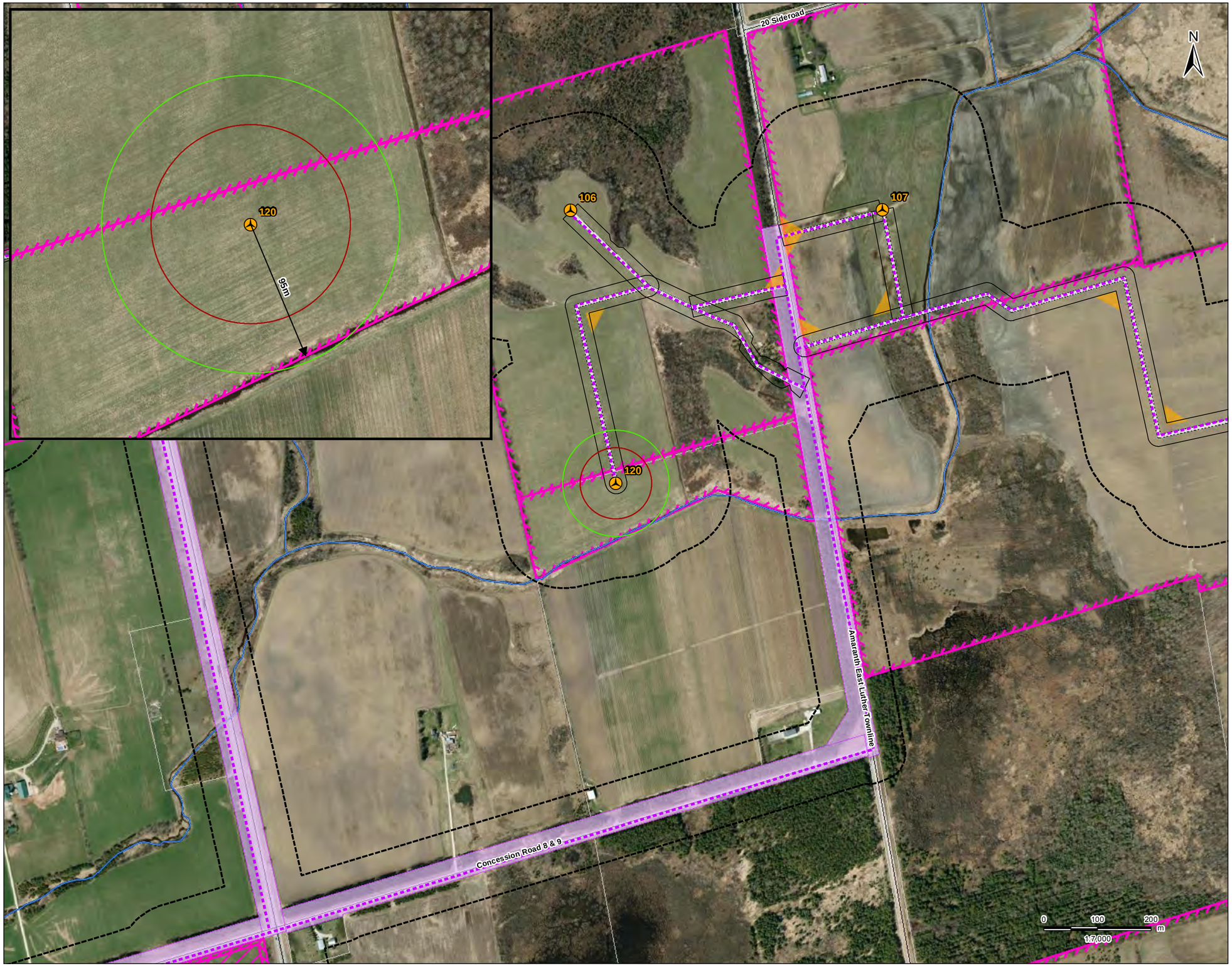
Revised: 2013-04-22 By: dharvey



Legend

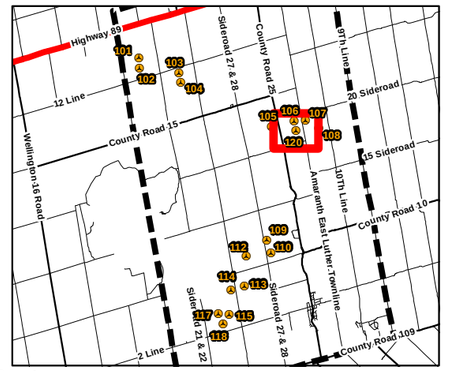
- 120m Zone of Investigation

Proposed Project Components

- Turbines
- Access Roads
- Collector Lines
- Collector Line ROW
- Turbine 66.5m Buffer (Blade + 10m)
- Turbine 99.5m Buffer (Hub Height)
- Transformer Location/ HONI Connection Point/ Met Tower/ Construction Laydown
- Turning Area
- Optioned Property

Existing Features

- Road
- Constructed Drain
- Watercourse
- Waterbody
- Property Parcel



Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2011.
3. Orthographic imagery provided by Grand River Conservation Authority © First Base Solutions, 2011. Imagery taken in Spring 2010.

Stantec

April 2013
160960698

Client/Project
Grand Valley Phase 3
Veresen Inc.

Figure No.
3

Title
Property Line Assessment - T120

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Revised: 2013-04-22 By: dharvey

Attachment B

Individual Property Line Setback Assessments

Appendix B: Property Line Assessment Summary

Turbine ID	Distance to Property Line (m)	Distance of Overlap (m)	Greater than Blade + 10m (66.50m)?	Features Within Overlap	Potential Adverse Impacts	Preventative Measures
T112	93.00m	6.50m	Yes	Infrastructure: ☐ Agricultural Land: ☒ Hedgerows: ☐ Woodlots: ☐ Watercourses: ☐	Adverse impacts to agricultural land, including crop damage and soil compaction, may occur in the unlikely event of turbine collapse.	• The turbines would be constructed and designed by professional engineers, undergo regular maintenance and monitoring by operational staff, and contain shutdown mechanisms in instances such as extreme weather. • In the unlikely event of damage to agricultural land due to turbine collapse, landowners would be compensated by GVWF for any crop damage, and measures are outlined in the REA reports to mitigate soil compaction.
T114	82.00m	17.50m	Yes	Infrastructure: ☐ Agricultural Land: ☐ Hedgerows: ☐ Woodlots: ☒ Watercourses: ☐	Information on potential adverse impacts for natural heritage features are outlined in the Natural Heritage Assessment/ Environmental Impact Study provided under separate cover as a component of the Renewable Energy Approval application.	• Information on preventative measures for natural heritage features are outlined in the Natural Heritage Assessment/Environmental Impact Study provided under separate cover as a component of the REA application.
T120	95.00m	4.50m	Yes	Infrastructure: ☐ Agricultural Land: ☒ Hedgerows: ☐ Woodlots: ☐ Watercourses: ☒	Adverse impacts to agricultural land, including crop damage and soil compaction, may occur in the unlikely event of turbine	• The turbines would be constructed and designed by professional engineers, undergo regular maintenance and monitoring by operational

Appendix B: Property Line Assessment Summary

Turbine ID	Distance to Property Line (m)	Distance of Overlap (m)	Greater than Blade + 10m (66.50m)?	Features Within Overlap	Potential Adverse Impacts	Preventative Measures
					collapse. Information on potential adverse impacts for aquatic features are outlined in the Water Assessment and Watery Body Report provided under separate cover as a component of the Renewable Energy Approval application.	staff, and contain shutdown mechanisms in instances such as extreme weather. • In the unlikely event of damage to agricultural land due to turbine collapse, landowners would be compensated by GVWF for any crop damage, and measures are outlined in the REA reports to mitigate soil compaction. • Information on preventative measures for aquatic features are outlined in the Water Assessment and Water Body Report provided under separate cover as a component of the REA application.

Appendix E

Environmental Effects Monitoring Plan for Wildlife