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SunEdison Canada

Project Description Report

Solar Spirit 4 Solar Project

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Project Report

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Table of Contents

1. Introduction 1

1.1 General 1
1.2 Renewable Energy Approval Legislative Requirements 1
1.3 Purpose of Report 2

2. General Information Requirements 3

2.1 General Information 3
2.2 Contacts 3
2.3 Authorizations Required 3
2.4 Federal Involvement 4

3. Project Information 7

3.1 Ownership of the Land 7
3.2 Energy Sources to Generate Electricity 7
3.3 Nameplate Capacity 7
3.4 Class of the Renewable Energy Facility 7
3.5 Project Components 7
3.6 Project Activities 10
3.6.1 Construction 10
3.6.2 Operation and Maintenance 12
3.6.3 Decommissioning 14

4. Description of Environmental Effects 15

4.1 General 15
4.2 Environmental Resource Features and Potential Effects 15
4.2.1 Heritage and Archaeological Resources 15
4.2.2 Natural Heritage Resources 15
4.2.3 Waterbodies 16
4.2.4 Air, Odour and Dust 16
4.2.5 Noise 16
4.2.6 Land Use and Resources 16
4.2.7 Provincial and Local Infrastructure 17
4.2.8 Public Health and Safety 17
4.2.9 Areas Protected Under Provincial Plans and Policies 17
4.2.10 Summary 17

5. References 23

List of Tables

Table 4.1 Summary of Potential Negative Environmental Effects During Construction, Operations and Decommissioning 19

List of Figures

Figure 2.1 Project Location Map 5
Figure 3.1 Generalized Schematic of Electrical Equipment Connectivity 8
Figure 3.2 Photograph of Typical Solar PV Module Installation 9

1. Introduction

1.1 General

SunEdison Canada ("SunEdison") is proposing to develop a 10-megawatt (MW) solar photovoltaic project titled Solar Spirit 4 Solar Project (the "Project"). The Project Location[1] is situated on an approximately 154.1 hectares (ha) on Lot 14 and Lot 15 of Concession 4 in the City of Belleville (single tier municipality).

The Project is proposed to be constructed on privately owned land currently used for agriculture crops. The Project is located east of Highway 37, north of Blessington Road, approximately 4.5 km northeast of the City of Belleville.

The proposed Project is a renewable energy generation facility which will use solar photovoltaic technology to generate electricity. Electricity generated by solar photovoltaic panels will be converted from direct current (DC) to alternating current (AC) by inverters and then stepped-up (via pad-mounted inverter transformers and a main substation transformer) to a voltage of 44 kV prior to being connected to the existing local distribution line. In order to meet the Ontario Power Authority (OPA)'s Feed-In-Tariff (FIT) Program requirements, a specific percentage of equipment will be manufactured in Ontario.

The construction of the Project will begin once the Renewable Energy Approval (REA) has been obtained. The construction period is estimated to be approximately 8 months, with Project commissioning anticipated in early 2014. Operationally, the lifespan of the Project will be at least 20 years, which can be extended with proper maintenance, component replacement and repowering.

1.2 Renewable Energy Approval Legislative Requirements

Ontario Regulation (O. Reg.) 359/09 – *Renewable Energy Approvals Under Part V.0.1 of the Act*, (herein referred to as the REA Regulation), came into force on September 24, 2009 and identifies the Renewable Energy Approval (REA) requirements for renewable energy generation facilities in Ontario. The REA Regulation has since been amended by O. Reg. 521/10, which came in effect as of January 1, 2011. As per the REA Regulation (Part II, Section 4), ground mounted solar facilities with a name plate capacity greater than 12 kilowatts (kW) are classified as Class 3 solar facilities and require an REA.

Section 13 of the REA Regulation requires proponents of Class 3 solar projects to prepare a Project Description Report. As prescribed by Table 1 of O. Reg. 359/09, the Project Description Report shall describe the following:

1. *"Any energy sources to be used to generate electricity at the renewable energy generation facility.*
2. *The facilities, equipment or technology that will be used to convert the renewable energy source or any other energy source to electricity.*

[1] "Project Location means, when used in relation to a renewable energy project, a part of land and all or part of any building or structure in, on or over which a person is engaging in or proposes to engage in the project and any air space in which a person is engaging in or proposed to engage in the project" [O. Reg. 359/09, s. 1 (1)].

3. *If applicable, the class of the renewable energy generation facility.*
4. *The activities that will be engaged in as part of the renewable energy project.*
5. *The name plate capacity of the renewable energy generation facility.*
6. *The ownership of the land on which the Project Location is to be situated.*
7. *Any negative environmental effects that may result from engaging in the project.*
8. *An unbound, well marked, legible and reproducible map that is an appropriate size to fit on a 215 mm by 280 mm page, showing the Project Location and the land within 300 m of the Project Location."*

A draft of the Project Description Report must be made available to the public, the local municipality and identified Aboriginal communities, at least 30 days prior to the first public consultation meeting in accordance with O. Reg. 359/09.

1.3 Purpose of Report

The Project Description Report is one of the first Project documents prepared once the REA process commences and serves several purposes. This initial draft of the Report will be used to provide preliminary information regarding the Project to the public, Aboriginal groups, municipalities and other government agencies. As the REA process progressed, the Report will be updated based on information obtained from various studies and data collection activities as well as preliminary planning and engineering of the Project. As a consequence, the final version of the Report serves as a comprehensive overview document that summarizes all of the important information about the Project.

Section 2 of the Report describes general information about the Project including the Project name, location and contact information. Section 3 describes the Project components, the major construction activities, operational aspects and decommissioning. Section 4 describes the potential environmental effects associated with the Project's construction, operation and decommissioning phases and the proposed mitigation measures to prevent/minimize those effects. Section 5 provides the references.

This Project Description Report has been prepared in accordance with the requirements identified in Table 1 of O. Reg. 359/09, as well as the guidance provided in the Ministry of the Environment's (MOE) Draft Technical Bulletin 1 – Guidance for Preparing the Project Description Report as part of an application under O. Reg. 359/09 (MOE, 2010).

2. General Information Requirements

2.1 General Information

The name of the Project is the Solar Spirit 4 Solar Project (the "Project").

The Project Location, per the definition in the REA Regulation, is shown in Figure 2.1. The Project Location includes the entire footprint of the project, including all temporary and permanent parts of the land that will be utilized for the Project. This includes the following Project features:

- all areas where vegetation will be cleared
- temporary and permanent site access roads
- solar panel arrays
- inverters/pad-mounted transformer in building enclosures
- substation yard, main substation transformer and communication tower
- temporary laydown area for construction
- project fencing
- electrical distribution line from the substation to the interconnection point.

2.2 Contacts

SunEdison is the proponent of the Project. The contact information is as follows:

Simon Gill, Business Development
595 Adelaide Street East, Suite 400
Toronto, ON
Canada M5A 1N8
Tel: 647.258.9082
email: sgill@sunedison.com

Hatch Ltd. (Hatch) has been retained to assist SunEdison in meeting the REA requirements. Contact information for Hatch is as follows:

Sean K. Male, M.Sc., Project Manager
Hatch Ltd.
4342 Queen Street, Suite 500
Niagara Falls, ON L2E 7J7
Tel: 905-374-5200
Fax: 905-374-1157
Email: smale@hatch.ca

2.3 Authorizations Required

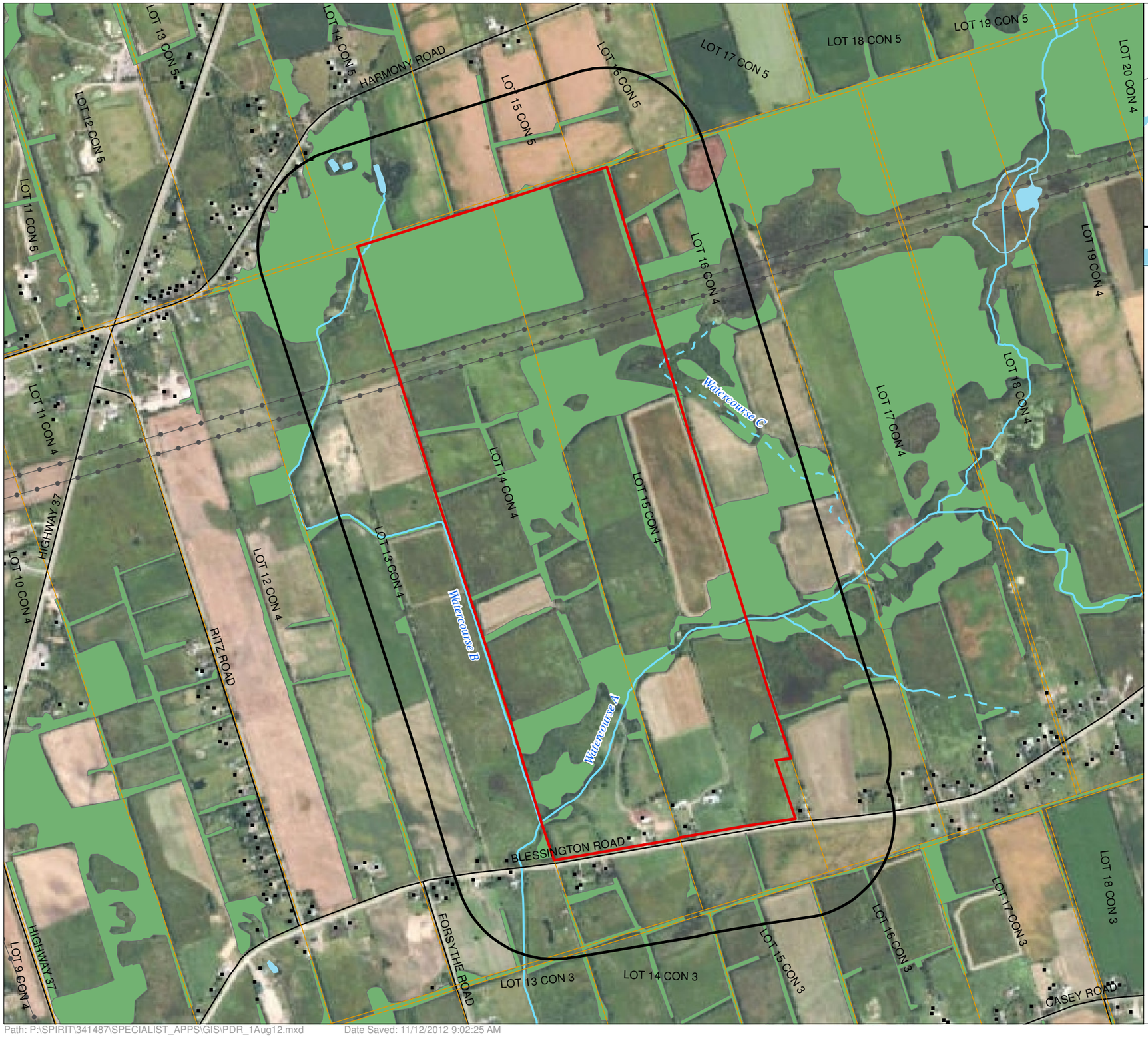
Permits, licenses and authorizations such as those listed below, in addition to the REA may be required for the Project to proceed:

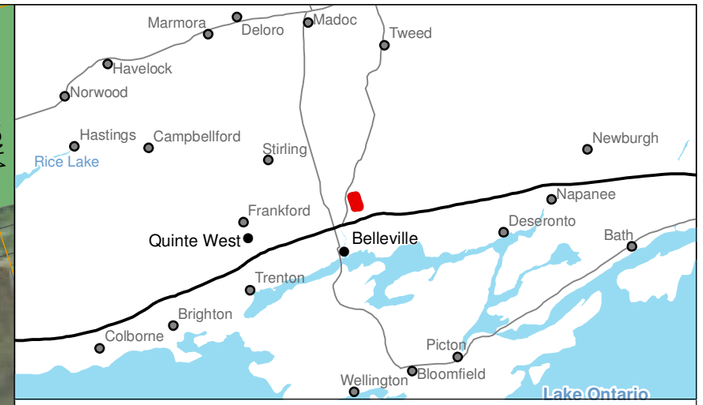
- Entrance Permit – The City of Belleville will likely require an entrance permit for the site access entrance to be constructed from Blessington Road.

- Building Permit – The City of Belleville may require a building permit(s) for construction of the inverter/transformers electrical buildings.

2.4 Federal Involvement

No Federal lands or resources will be utilized for the Project and based on the resources within the Project Location, issues under Federal jurisdiction are not anticipated. Therefore, no Federal involvement (including permits and approvals) is required.





Legend

- Building
- Railway
- Road
- Utility Line
- Watercourse - Intermittent
- Watercourse - Permanent
- Parcel
- Project Site
- 300 m from Project Site
- Waterbody
- Wooded Area

0 100 200 400 600 Metres

NORTH

1:12,000

Notes:
1. Produced by Hatch under licence from Ontario Ministry of Natural Resources, Copyright (c) Queens Printer 2012.
2. Spatial referencing UTM NAD 83.
3. Imagery (2010) provided by Bing Maps services hosted by Microsoft and under licence to ESRI software.

Figure 2.1
SunEdison Canada

Solar Spirit 4 Solar Project
Project Location Map

HATCH™

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3. Project Information

The following sections are intended to satisfy the requirements of Table 1 in O. Reg. 359/09 (Section 10 – Project Description Report) and MOE Draft Technical Bulletin 1 (MOE, 2010). Further details on the Project will be provided in other required reports as per O. Reg. 359/09, including the Construction Plan Report, Design and Operations Report and the Decommissioning Plan Report.

3.1 Ownership of the Land

The Project is located on privately owned lands. The Project Location is situated on approximately 154.6 ha of land on Lots 14 and 15, Concession 2, City of Belleville. The Civic Addresses are 439 Blessington Road, RR 1, Corbyville, ON, K0K 1V0 and 407 Blessington Road, RR 1 Corbyville, ON, K0K 1V0.

The legal description of the Project Site lands that the Project is within is: Part Lot 15 Concession 4 Thurlow as in QR559843; S/T PL2162, PL2166; Belleville; County of Hastings and Part Lot 14 Concession 4 Thurlow as in QR105519 lying north of PT 23 21R4709; S/T debts in QR105519; S/T PL2166; Belleville; County of Hastings.

3.2 Energy Sources to Generate Electricity

Solar energy will be used to generate electricity. No supplementary fuel sources are used in the generation of this renewable energy.

3.3 Nameplate Capacity

The nameplate capacity of the Project will be up to 10-MW AC. The project may be up to approximately 12-MW DC.

3.4 Class of the Renewable Energy Facility

The Project will be a Class 3 solar facility. That is, the Project is ground-mounted and greater than 12 kW.

3.5 Project Components

Figure 2.1 provides the Project Location boundaries, existing local roads, topographic contours, existing transmission line, natural features and waterbodies on and within 300 m of the Project Location. The main components of the Project may include the following:

- Solar PV modules, each approximately 300 watts (W), connected to AC inverters that will convert the direct current supplied by the PV modules to alternating current. Pad-mounted transformers will then ‘step up’ the voltage. Each installation will consist of inverters and pad-mounted transformer in building enclosures (E-House) to protect the equipment from the weather and to reduce noise emissions.
- A gravel substation yard that will house a substation transformer that will ‘step up’ the voltage, switchgear, and control and monitoring equipment. A communication tower may also be required within the yard.
- A site entrance road and gravel interior access roads.

- Galvanized chain-link fence around the perimeter of the Project Location and a gated entrance.
- A temporary laydown/staging area to be used for construction trailers, material and equipment storage and vehicle parking during construction of the Project.
- A surface water drainage system comprised of grassed swales, roadside ditches and culverts.

Figure 3.1 depicts a generalized schematic illustrating how electricity will be generated, inverted, transformed and transmitted by the electrical equipment used for the Project.

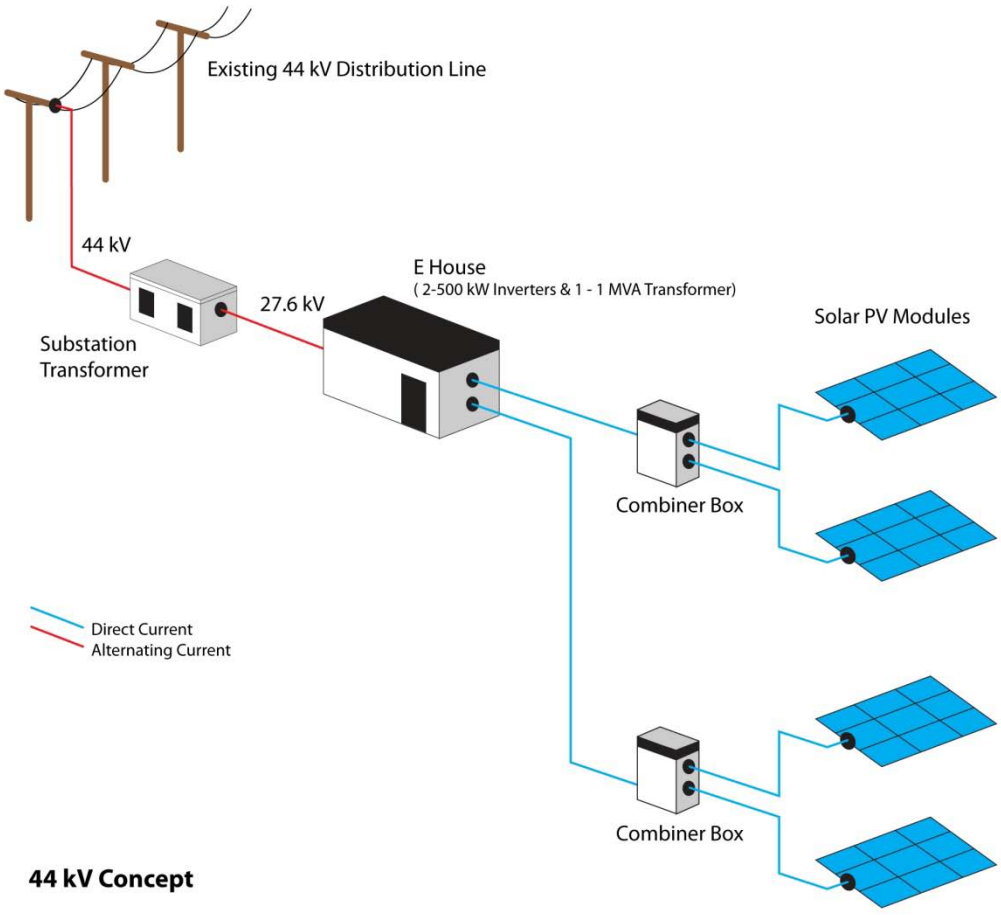

Figure 3.1 Generalized Schematic of Electrical Equipment Connectivity

For the Project, the solar PV modules may be mounted on single-axis tracker units arranged in rows facing north-south. Each tracker row will be able to rotate 180 deg to track the sun as it moves east to west across the sky. Each rack will typically contain modules connected together by electrical wiring. The tracker units will be supported by steel supports that will

extend into the ground. Alternatively, fixed units arranged in rows facing north-south may also be used. Figure 3.2 displays an example of typical solar PV modules.

Figure 3.2 Photograph of Typical Solar PV Module Installation

Upon exposure to sunlight, the solar PV modules convert solar radiation into DC electricity through a process referred to as the photovoltaic effect. This effect occurs when the sunlight energy is transferred to semiconductors in the modules to create a corresponding electric current. The DC electricity from the solar PV modules will be transmitted across the back of the modules by wires, which will connect to combiner boxes. The combiner boxes merge the multiple incoming wires from the racks of modules into a reduced number of outgoing electrical cables.

The DC electrical current from the combiner boxes will be transmitted through underground cables connected to the inverters housed in a building enclosure ('E-House'). Each inverter will convert the DC electrical current to AC and a pad-mounted inverter transformer will step up the voltage. The (AC) current will then will be transmitted through underground cabling to the main transformer situated in the substation yard, which will step up the voltage. Electricity will then flow from the substation yard through overhead electrical lines and connects to the local 44-kV distribution line.

3.6 Project Activities

The preliminary Project activities involved in the construction, operation and decommissioning phases of the Project are outlined in the following sections. More information regarding the construction, operation and decommissioning of these components, will be provided in the Construction Plan Report, the Design and Operations Report, and the Decommissioning Report.

3.6.1 Construction

The construction period is estimated to be approximately 8 months. The initial site preparation activities are anticipated to begin in the summer of 2013 and be completed by the end of 2013. Following testing and commissioning of the facilities, the Project is expected to achieve commercial operation by early 2014.

3.6.1.1 Site Survey and Staking

An Ontario land surveyor may survey and stake the locations of the Project Location perimeter fencing, access roads and foundations as well as any buried utilities, infrastructure and associated easements. Any designated environmental features (e.g., waterbodies, woodlands) and their setbacks may be demarcated and protected by means of staking, flagging, fencing or signage to prevent any intrusion into these areas by construction vehicles.

3.6.1.2 Site Preparation

Prior to commencement of construction, sediment and erosion controls (e.g., silt fencing, rock flow check dams) will be installed throughout the Project Location. Trees and large standing vegetation will be cleared from areas where the photovoltaic arrays will be constructed. Meadow vegetation may be left in place to the extent possible. Where practical, merchantable timber, non-merchantable timber (e.g., firewood) and other cleared vegetation, along with any removed topsoil may be stockpiled adjacent to the access roads. Locations of topsoil, timber and vegetation stockpiles will be determined and not within 30 m of any identified waterbodies.

3.6.1.3 Access Road Construction

A new site access road will be constructed from Blessington Road into the Project Location. In addition, smaller gravel roads will be constructed within the interior areas of the Project Location. Road construction will involve vegetation clearing (if necessary) and topsoil removal prior to the placement of a granular base. Ditches and culverts will be constructed, as necessary, to maintain site drainage. Following construction, any access roads that are not required will be removed and restored by replacing the topsoil and seeding the area.

3.6.1.4 Installation of Foundations and Support Structures

Foundations will be installed beneath each inverter/transformer cluster (i.e., building enclosures) and support structures installed to support the PV modules and their mounting racks. Detailed design of the foundations and support structures is yet to be completed. Solar panel racks will be supported by steel uprights mounted on driven steel piles, steel helical screw piles or cast-in-drilled-hole foundations, depending on the soil conditions within

the Project Location. Foundation construction and the installation of support structures will be inspected prior to the installation of PV modules and wiring.

3.6.1.5 *Installation of PV Modules, Single-Axis Trackers and Mounting Racks*

The solar PV modules may either be installed on a single-axis, ground-mounted tracking system or fixed racking system. At this stage, the specific make and model of the tracker system or fixed racking systems has not been finalized. The single-axis, ground-mounted tracking system will be comprised of a steel lattice structure attached to a rotating sleeve on a single horizontal beam supported by steel uprights. The lattice structures will be assembled on site. The modules will be mounted on the mounting racks by installers with the help of a small mobile crane.

3.6.1.6 *Installation of Inverters and Pad-Mounted Transformers*

The Project will have AC inverters and intermediate pad-mounted transformers to convert the DC power collected by the solar PV modules into AC power and this voltage will be stepped up by the pad-mounted transformers to a voltage of 27.6 kV.

3.6.1.7 *Electrical Cable Installation*

Trenches may be excavated for electrical cabling (including DC cables from the modules to the inverters and AC cables from the inverters to the substation yard). Trenches may typically be 1 m deep by 0.5 m wide and may be excavated using a 'ditch-witch' plough, backhoe or similar equipment. Trenches may have a sand base layer below and above the cabling, and once the cabling is laid, the trenches will be backfilled and levelled to match the existing grade. Where necessary, high density polyethylene (HDPE) conduits may be installed beneath road crossings and in areas of shallow bedrock to house and protect the cables.

3.6.1.8 *Substation Yard Construction*

The substation yard location has yet to be determined. In general, construction may include excavation of topsoil, installation of ground grid, foundation construction, covering the area with crushed stone, installation of the substation transformer and other electrical equipment. Switchgear, protection and control equipment may be housed in a prefabricated, weatherproof building enclosure. The building enclosure may be trucked to the site and installed on a precast concrete pad. The substation transformer will step up the voltage prior to connecting to the Hydro One Networks Inc. (HONI) 44-kV local distribution line.

3.6.1.9 *Electrical Distribution Line Installation and Interconnection Point*

The Project will connect to a 2-km 44-kV tap line that will be constructed, owned and operated by HONI. SunEdison will construct the distribution line from the substation yard to the Project property line in accordance with the Ontario Electrical Safety Code. HONI will construct the section of the line from the Proponent's property line to the point of interconnection (POI).

3.6.1.10 *Testing and Commissioning*

Following the installation of all electrical components, testing and commissioning will be performed prior to start up and connection to the power grid. The solar modules, trackers, inverters, transformers and electrical cables will be checked for system continuity, reliability

and performance. If problems or issues are identified, remedial corrections will be made prior to start up.

3.6.1.11 *Site Restoration*

Site restoration will occur during and following the final stages of the Project construction and installation activities. The main objective will be to stabilize and re-instate vegetation within all areas disturbed by the Project construction. Site restoration will include the removal of all construction material, equipment, temporary facilities and waste from the Project Location. Topsoil will be redistributed where required, followed by finished grading and landscaping to achieve proper drainage. Revegetation will include planting of native plants and hydro-seeding where required.

3.6.2 *Operation and Maintenance*

3.6.2.1 *Operation*

The Project will operate year round and generate electricity during daylight hours. The amount of power generated will depend on daily weather conditions and sufficient solar irradiation. The Project will be operated remotely and does not require a permanent on-site operator. Any damage or faults with the PV modules, trackers or ground-mount system and electrical systems will be alerted to staff remotely and repaired (or replaced) by facility staff or qualified professionals. To ensure the safety and integrity of the Project facilities, access to the site will be limited to Project personnel and unauthorized public access to the site will be prevented by fences, gates and security procedures.

Operationally, there are no significant hazards involved in the operation of the Project, nor are hazardous materials stored on the site or created by the Project during its operation. The Project will not generate significant quantities of waste from its operation nor will the Project generate any wastewater (sewage) or discharge any liquid effluent from its operation.

Project operation will not result in the discharge of contaminates or pollutants to the air. The only noise emissions associated with the Project operation will be from the inverters and pad-mounted transformers, which will only operate during daylight hours. A Noise Study Report involving computer modeling simulations of the Project will confirm that the applicable MOE noise level limits will not be exceeded at the locations of the nearest noise receptors. Sound level monitoring, if required by MOE, as a condition in the REA for the Project will be implemented and annual compliance reports submitted to the MOE. In addition, the Proponent will use feedback obtained from nearby noise receptors to confirm that noise emissions are within reasonable levels.

3.6.2.2 *Site Inspection and Maintenance*

The Project solar PV modules, trackers or ground-mount system, inverters and transformers and other electrical equipment as well as wiring and electrical connections will be routinely inspected, typically on a monthly basis. Any broken or malfunctioning PV modules, electrical cabling or components will be repaired or replaced by facility staff. Trash, debris and equipment parts replaced during maintenance and repair activities will be collected and properly stored in waste disposal bins. All waste collected during operation of the Project will be removed from the site in accordance with provincial and municipal requirements.

The Project site grounds including vegetation coverage, drainage systems and trees will be monitored and maintained regularly. Since suitable ground cover will be established under the PV modules, some form of vegetation abatement such as grass cutting may be required several times throughout the summer months. No hazardous chemicals would be used for this vegetation control.

The site, including any constructed drainage features (e.g., grassed swales, culverts) and any sediment and erosion control measures (e.g., riprap protection, rock flow checks) will be visually inspected for any signs of erosion or sedimentation and recorded in a log book. Regular maintenance such as the cleanout of accumulated sediment and/or the removal of any debris blockage would be conducted at that time. If required, remedial works (e.g., stabilizing and/or reseeding of identified erosion areas) and repairs to any drainage features or sediment and erosion control measures will be implemented to prevent environmental impacts.

The need to clean the solar PV modules will be determined according to local weather conditions, such as the quantity and frequency of rain and snow at the Project Location. At the very most, it is expected that the modules will require cleaning quarterly, but it is possible that cleaning the modules will not be necessary at all. If required, water trucks may bring water to the site to supply the water required. No chemicals will be used for the cleaning of the modules.

The transformers will be visually inspected on a monthly basis and their status recorded in a log book. Any faulty equipment that could result in an oil leak will be repaired and any observed leaks will be cleaned up immediately by maintenance personnel. Spill response equipment will be left on site or in the maintenance trucks should leaks be observed.

During the winter, Project access roads may be ploughed to maintain access of personnel to Project facilities within the site. Under most winter conditions, snow on the modules is expected to either melt off due to the module heating in response to solar radiation or simply fall off as a result of the tracker motion. Under some conditions, manual snow removal may be performed by maintenance personnel who will clear the snow using a brush attached to a long pole.

3.6.2.3 Stormwater Management

Drainage works including grassed swales, ditches and roadside culverts will be designed and constructed as part of the facility civil components. Overall, major alteration to the existing surface drainage patterns is not expected as part of the Project's construction and operation.

3.6.2.4 Water Supply Facilities

The Project does not require any on-site facilities to supply groundwater (wells) or surface water (ponds, watercourses) for operation of the Project. It is anticipated that water from rain and snow will be sufficient for cleaning the solar PV modules; if not, the Proponent will contact local suppliers to provide water in tankers from off-site sources for this purpose.

3.6.2.5 *Wastewater (Sewage) Facilities*

The Project will not generate any wastewater (sewage) or discharge any liquid effluent from its operation nor does the Project require any on-site facilities for the collection, transmission, treatment or disposal of wastewater for operation of the Project. If sanitary facilities are determined to be required, portable toilets, provided and serviced by a local sanitation company, will be used.

3.6.2.6 *Waste Disposal Facilities*

The Project will not generate significant quantities of waste from its operation. A small waste disposal bin(s) may be provided on site to collect any trash, debris or equipment parts replaced during routine maintenance of the Project during its operation. Periodically, when required, the Proponent will arrange for a licensed waste disposal company to empty the bins and haul the waste to an appropriate waste disposal facility off site.

3.6.2.7 *Exhaust Equipment*

The Project has no facilities or equipment that will discharge contaminates or pollutants to the air (e.g., exhaust gases from emergency back-up diesel generators) during operation of the Project.

3.6.3 Decommissioning

It is anticipated that the Project equipment will have a useful lifetime of at least 20 years, which can be extended with proper maintenance, component replacement and repowering. If at the end of the 20-yr power purchase agreement with the OPA the Project owner decides not to continue operation of the Project, the Project will be decommissioned. If so, the Project owner will ensure that the Project Location is restored back to its pre-construction condition agricultural crop land use or as may be appropriate at that time.

The decommissioning process would typically involve the following:

- Removal of the solar modules for reuse in another location if possible. Otherwise, the glass and silicon will be reclaimed and the aluminum frames will be recycled.
- Removal of the scrap metal and cabling. Where possible, these materials will be recycled, with non-recyclables taken to an approved disposal site.
- Removal of support structures and foundations unless the landowner requests otherwise. These materials will be recycled where possible.
- Site restoration and regrading and, if necessary, restoration of surface drainage swales and ditches.
- Planting of leguminous crops and/or other native vegetation as appropriate to provide a rapid return of nutrients and soil structure.

4. Description of Environmental Effects

4.1 General

This section summarizes the potential negative environmental effects that may result from the Project, including its construction, operation and decommissioning. With the exception of transporting construction materials and the workforce to and from the Project Location, all construction and operational activities will occur at the Project Location. However, potential environmental effects have been considered within 300 m of the Project Location.

Figure 2.1 depicts the Project Location and the various natural heritage, water body and other features on and within proximity to the Project Location. Further investigations and documentations have occurred, which provide a greater extent of information regarding the Project. Provided below are generic potential impacts that have been assessed, details with regard to potential impacts of the Project are presented in supplementary reports as noted below.

4.2 Environmental Resource Features and Potential Effects

The following provides a summary discussion of the identified potential impact in regards to the Project and references of the specific REA report(s) where this information is presented.

Table 4.1 summarizes the identified potential negative environmental effects associated with the a generic solar project's construction, operation and decommissioning phases along with the recommended mitigation measures to ensure that no significant residual negative environmental effects will occur as a result of the Project. As these are generic, some of the potential impacts may not occur on this Project.

4.2.1 Heritage and Archaeological Resources

Research has been undertaken to determine whether the Project is located on a protected property (e.g., cultural heritage property designated under the *Ontario Heritage Act*) as defined in Column 1 of the Table in Section 19(1) of O. Reg. 359/09. The Protected Properties Summary Report is provided as an Appendix to the Executive Summary Report.

In addition, a Heritage Impact Assessment and Stage 1 and 2 Archaeological Assessments have been completed and submitted to the Ministry of Tourism, Culture and Sport (MTCS). Clearance Letters from the MTCS are also provided as an Appendix to the Executive Summary Report.

4.2.2 Natural Heritage Resources

Natural heritage resources on and within 300 m of the Project Location are shown in Figure 2.1.

Natural Heritage Assessment Reports, including a records review, site investigation, evaluation of significance and environmental impact study have been completed for the Project. These reports will detail the natural heritage features of the Project. The Ministry of Natural Resources (MNR) has provided comments and confirm the information provided in these reports.

Generic potential adverse effects on these features are discussed in Table 4.1. Additional information on adverse effects and mitigation is provided in the Construction Plan Report and Natural Heritage Assessment Environmental Impact Study.

4.2.3 Waterbodies

Water body features (e.g., permanent and intermittent streams, lakes, seepage areas) on and within 300 m of the Project Location are shown in Figure 2.1 as per LIO data.

Water Body Assessment Reports, including a records review, site investigation, and environmental impact study, have been undertaken to explore the potential impacts of the Project.

Generic potential adverse effects on waterbodies (i.e., surface water features and drainage conditions) and groundwater resources are summarized in Table 4.1. Additional information on potential effects and mitigation are provided in the Construction Plan Report and the Design and Operations Report.

4.2.4 Air, Odour and Dust

Potential adverse effects on air quality due to vehicle emissions and potential fugitive dust emissions during construction, operation and decommissioning are summarized in Table 4.1. Additional information on potential effects and mitigation has been provided in the Construction Plan Report and the Design and Operations Report.

4.2.5 Noise

Potential adverse effects on nearby noise receptors during construction of the Project are summarized in Table 4.1. The only noise emissions associated with the Project operation will be from the inverters and pad-mounted transformers, which will only operate during daylight hours. A Noise Study Report involving computer modeling simulations has confirmed that the applicable MOE noise level limits will not be exceeded at the locations of the nearest noise receptors.

4.2.6 Land Use and Resources

The Project Location is currently primarily used for agriculture field crops, with internal access via grassed or dirt laneways.

Land uses to the south of the Project Location consist of rural residential homes and agricultural fields situated along Blessington Road. The lands to the north, west and east of the Project Location consist of a mix of agricultural fields and natural features (e.g., wetlands and woodlands).

Potential adverse effects on availability of resources and current land uses during construction, operation and decommissioning are discussed in Table 4.1. No potential negative effect on the telecommunications network is anticipated due to the proposed solar project. Additional information on adverse effects and mitigation during construction are provided in the Construction Plan Report and the Design and Operations Report.

4.2.7 Provincial and Local Infrastructure

Local infrastructure within 300 m of the Project Location is depicted in Figure 2.1 and includes the following:

- municipal roads and associated rights-of-ways within 300 m of the Project Location
- a HONI distribution line crosses the northern portion of the Project Location.

Potential adverse effects on provincial and local services and infrastructure (i.e., impacts to local traffic and roads) during construction, operation and decommissioning are summarized in Table 4.1. Additional information on potential effects and mitigation is provided in the Construction Plan Report and the Design and Operations Report.

4.2.8 Public Health and Safety

Potential adverse effects on public health and safety during construction, operation and decommissioning are discussed in Table 4.1. Additional information on adverse effects and mitigation during construction is provided in the Construction Plan Report and the Design and Operations Report.

4.2.9 Areas Protected Under Provincial Plans and Policies

The Project Location is not located within any of the following Provincial Plan areas:

- Protected Countryside or Natural Heritage System of the Greenbelt Plan and *Greenbelt Act*
- Oak Ridges Moraine Conservation Plan Area
- Niagara Escarpment Plan Area
- Lake Simcoe Watershed Plan Area.

4.2.10 Summary

Table 4.1 provides a summary of generalized solar project potential impacts and proposed mitigation measures. Some of the identified impacts may not apply to this specific Project. Further studies have been conducted to provide a greater understanding of the Project's potential impacts and proposed mitigations as discussed in the preceding sections of this report.

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Table 4.1 Summary of Potential Negative Environmental Effects During Construction, Operations and Decommissioning

Environmental Component	Project Phase	Sources of Negative Effect	Potential Negative Effect	Mitigation Measures	Residual Negative Effect
Natural Environment Components					
Soil Quantity	Construction and Decommissioning	Topsoil stripping for access roads, laydown, parking area, substation yard and inverter/transformer building pads.	Loss of the quantity of topsoil resulting in reduced productivity of the soil to support vegetation growth.	Stripped topsoil will be stockpiled on-site for use during site restoration after construction. Following decommissioning, topsoil will be replaced to facilitate revegetation. If necessary, topsoil will be brought in from off-site sources.	No residual effect given effective mitigation.
	Construction, Operations and Decommissioning	Wind and/or water erosion of soils within the Project Location.	Loss of soils from the Project Location, potentially affecting other environmental components (e.g., air quality, vegetation, surface water quality).	Sediment and erosion controls installed and maintained during construction and decommissioning. Dense non-invasive vegetation ground cover planted throughout disturbed areas of the Project Location following construction. Drainage features with erosion protection (e.g., grass lined, rip rap protection) during operations.	No residual effect given effective mitigation.
Soil Quality	Construction and Decommissioning	Soil compaction from heavy equipment, construction vehicles and/or stockpiling of heavy materials.	Soil compaction resulting in changes to soil structure which could cause decreased productivity for plant growth, reduced infiltration and increased runoff.	Project Location will be assessed for compaction following construction and decommission activities. Areas of significant compaction will be restored using mechanical discing or other soil loosening methods.	No residual effect given effective mitigation.
Groundwater	Construction and Decommissioning	Installation (i.e., construction) or removal (i.e., decommissioning) of support foundations (e.g., excavated, driven or screwed steel piles) into the ground to support the modules, trackers or ground-mount system and racks.	No adverse effects on groundwater quantity or quality are expected since the piles will not adversely affect groundwater conditions due to small area of supports relative to Project Location.	None identified.	None.
	Construction	Dewatering of excavations for foundations for inverter/transformers and trenching for electrical cabling to keep the work area dry.	No adverse effect on water table or nearby water wells since significant pumping of groundwater is not required. Some pumping of rainwater out of excavations may occur.	If pumping is required, water will be discharged to a heavily vegetated area or pumped through a filtration bag so that turbid water is not discharged directly to receiving watercourses.	No residual effect given effective mitigation.
	Operation	Decreased groundwater recharge (i.e., infiltration) due to addition of impervious (e.g., inverter buildings) and less pervious areas (e.g., gravel roads).	No adverse effect on groundwater recharge conditions is expected since the amount of impervious and less impervious areas is small.	Dense vegetation cover beneath solar modules and around Project components to promote infiltration and maintain soil moisture conditions will help offset minor reduction in infiltration due to addition of impervious and less impervious areas.	No residual effect given effective mitigation.
Surface Water Quantity	Construction, Operations and Decommissioning	Alteration of existing topography and surface drainage patterns from earth grading and excavation activities. Runoff from impervious (e.g., inverter buildings) and less pervious areas (e.g., gravel roads). Installation of new drainage swales, ditches and culverts.	Minor increase in surface water runoff from Project Location to off-site receiving drainage swales, ditches and/or watercourses resulting in erosion. Potential adverse effects to receiving water quality due to increased turbidity in runoff due to soil erosion.	Maintain existing drainage patterns as much as possible. Retain and/or plant dense vegetation as soon as possible following construction. Sediment and erosion controls installed and maintained during construction. Stormwater management measures installed to control increases in runoff peak flows from the Project Location to pre-construction condition levels.	Minor potential for residual effects until disturbed areas become completely stabilized by vegetative cover and plant growth. No residual post-construction effects.
	Operations	Washing of solar panels during maintenance activities.	Minor increase in surface water runoff from the Project Location if not all wash water infiltrates into the underlying soils.	Amount of water used for cleaning will be limited to the extent possible. Natural infiltration of wash water into underlying soils and storm water management measures will prevent any adverse off-site increase in runoff.	No residual negative effects anticipated. Washing of panels during summer will be positive benefit to vegetation and subsoils beneath the solar panels.
Surface Water Quality	Construction, Operations and Decommissioning	Wind and/or water erosion of soils within the Project Location.	Erosion of soils from the Project Location could result in adverse effects on surface water quality in receiving waterbodies, with associated effects on aquatic biota and habitat.	Sediment and erosion controls installed and maintained during construction and decommissioning. Dense non-invasive vegetation ground cover planted throughout disturbed areas of the Project Location following construction. Drainage features with erosion protection (e.g., grass lined, rip rap protection) during operations.	No residual effect given effective mitigation.
	Operations	Washing of solar panels during maintenance activities.	Adverse effects on the quality of the surface water running off the panels if cleaning agents used.	Rainfall is expected to be sufficient or water will be brought on-site for cleaning purposes. If water from off-site is required, the amount used will be less than that occurring during a normal rainstorm event.	No residual effect given effective mitigation.

Environmental Component	Project Phase	Sources of Negative Effect	Potential Negative Effect	Mitigation Measures	Residual Negative Effect
		Runoff of herbicide residue if used to control vegetation.	Adverse effects on surface water quality due to potential use of herbicides to control vegetation communities.	Vegetation will be properly managed and maintained using mechanical methods (grass mowing, tree branch trimming); no chemical herbicides will be used for vegetation control. Some very limited herbicide use may be required to control weeds around electrical equipment and if so, in accordance with all local and provincial procedures.	No residual negative effects on surface water runoff quality due to vegetation maintenance and proper implementation of control/management procedures.
Aquatic Habitat and Biota	Construction, Operations and Decommissioning	Erosion, increases in surface water runoff, accidental spills on Project Location.	Indirect effects to aquatic habitat and biota in receiving watercourses due to increased turbidity in runoff, sedimentation or accidental spills.	Mitigation measures for Soils, Surface Water and Spills will mitigate any potential adverse impacts to aquatic features located on or off site.	No residual effect given effective mitigation.
Vegetation	Construction	Clearing of agricultural crop land and hedgerows within the Project Location.	No adverse impacts since vegetation are non-significant. Some minor potential for damage to adjacent trees/shrubs and/or disturbance to the rooting zone through soil compaction. Increased surface water and soil erosion, and potential indirect effects to receiving water quality due to vegetation removal.	Work areas will be demarcated in order to ensure that the Contractor does not work beyond those bounds. Soil loosening methods for compacted soils. Dense non-invasive vegetation ground cover planted throughout disturbed areas of the Project Location. Mitigation measures for: Soils and Surface Water will minimize potential for increased runoff and erosion.	No residual effect given effective mitigation.
		Generation of airborne dust from construction activities.	Indirect effects to adjacent off-site significant woodlands north and east of Project Location could include deposition of dust on leaves.	Mitigation measures for: Air Quality and Soils will minimize generation of airborne dust to adjacent off-site vegetation communities.	Minor potential for residual effect associated with generation of airborne dust from exposed soils during construction activities that occur on extremely windy days.
Wildlife Habitat	Construction and Operations	Clearing of agricultural crop land and hedgerows within the Project Location. Presence of Project components and long-term alterations in habitat conditions on Project Location.	Some minor loss of non-significant wildlife habitat associated with agricultural fields and hedgerows. No adverse effects to off-site wildlife habitats in significant woodlands north and east of the Project Location. Altered wildlife habitat use within the Project Location.	Tree and vegetation removal will be conducted outside the breeding period for birds (May through July). Work areas will be demarcated in order to ensure that the Contractor does not work beyond those bounds. Retain and/or plant dense vegetation ground cover beneath solar panels to provide wildlife habitat for bird, reptile and small mammal species. Sediment and erosion controls and storm water management mitigation measures implemented during construction will prevent adverse effects off site effects to wildlife habitats.	Long-term wildlife use of the Project Location will be altered, but no overall change in local composition or population is anticipated to occur. No residual negative effects to off-site wildlife habitats.
Wildlife	Construction and Decommissioning	Clearing and/or alteration of vegetation within the Project Location. Use of heavy equipment and presence of workforce. Construction vehicles travelling on access roads within Project Location.	Avoidance of Project Location by wildlife due to equipment, noise and human presence. Possible noise disturbance to breeding birds in woodland north and east of Project Location. Incidental take of wildlife due to construction vehicles within Project Location.	Construction scheduling to avoid breeding bird period (generally May through July) and outside the peak hours of breeding bird singing (approximately one half hour before sunset to approximately 8:30 a.m.). Daily visual monitoring of construction work areas prior to start or work. Speeds on Project access roads will be restricted. Construction workforce will be alerted to the potential for wildlife and that measures should be taken to avoid wildlife wherever possible.	Minor periodic disturbance of local wildlife. No long-term effects on species composition or local populations anticipated. Mitigation will effectively reduce risk of incidental take of wildlife, but not completely eliminate.
	Construction	Installation of perimeter fencing around the Project Location.	Trapping of wildlife within the Project fence.	Prior to fence completion, a visual search of the area within the fence will be completed. If species are observed, they will be directed off the Project site or collected by a designated employee using approved handling protocols and transported to the nearest available location off-site and released.	No long-term residual effect on wildlife.
	Operations	Maintenance vehicles and activities (e.g., grass cutting) and installation of the fence around the Project Location.	Disturbance of wildlife due to maintenance equipment noise and human presence resulting in wildlife avoidance of Project Location. Restricted wildlife movement across Project Location due to fence. Incidental take of wildlife due to maintenance vehicles or activities (e.g., grass cutting).	Vehicle speeds on Project access roads will be restricted. Maintenance workforce will be alerted to the potential for wildlife and that measures should be taken to avoid wildlife wherever possible. If wildlife are observed on the Project Location, they will be either directed off of the site or collected by a designated employee using approved handling procedures released off-site. If possible, maintenance activities (e.g., grass cutting) to avoid breeding bird season of ground nesting birds May through early July).	Overall, disturbance to wildlife due to maintenance activities is expected to be less than existing disturbance due to agricultural activities. Minor potential for incidental take of wildlife due to maintenance vehicles or vegetation mowing.

Environmental Component	Project Phase	Sources of Negative Effect	Potential Negative Effect	Mitigation Measures	Residual Negative Effect
Socio-Economic Environmental Components					
Air Quality	Construction and Decommissioning	Generation of airborne dust from land clearing and excavation activities, vehicle travel on dirt roads and exhaust emissions from construction vehicles and equipment.	Reductions in local air quality from airborne dust and exhaust emissions from construction vehicles and equipment.	Construction practices to suppress dust (e.g., limit soil exposure, road watering, stabilize and cover stockpiles) and restrict soil working activities during windy conditions. Contractor to ensure that all construction vehicles and equipment have properly functioning emission controls (e.g., mufflers and no excessive vehicle idling).	Some short term minor effects on local air quality due to fugitive dust generation and vehicle emissions.
	Operations	Emissions from Project operations and maintenance vehicles.	Project operation will not discharge any pollutants into the air and emissions from maintenance vehicles or equipment (e.g., grass mowers) will be negligible.	None required.	None.
Noise	Construction and Decommissioning	Noise emissions from construction vehicles and equipment use.	Disturbances to nearby sensitive receptors (i.e., houses and institutions) due to noise emissions.	Contractor to comply with municipal Noise Control By-Laws for construction working times and ensure that vehicles and equipment have proper functioning sound baffling equipment (e.g., mufflers). Notification to adjacent noise receptors to report noise complaints.	Possibly, some short-term, temporary 'nuisance' disturbance to sensitive nearby noise receptors during certain construction activities.
	Operations	Noise emissions from transformers and inverters and/or from maintenance vehicles or equipment (e.g., grass movers).	Disturbances to nearby sensitive receptors (i.e., houses and institutions) due to noise emissions.	Inverters and transformers will be housed in a building enclosure that will provide mitigation of noise emissions from this equipment. Proponent will conduct auditory monitoring and obtain feedback from nearby noise receptors to confirm that noise emissions are within reasonable levels. Facility personnel to ensure maintenance vehicles and equipment have proper sound baffling equipment (e.g., mufflers) and work is done in compliance with any applicable municipal Noise Control By-Law.	Noise emissions will meet Ministry of Environment's requirements for rural area sound levels of 45 dBA for day time and 40 dBA for night time at the nearest noise receptors.
Public and Facility Safety	Construction, Operations and Decommissioning	Construction or facility equipment malfunction, fire or accidents resulting in injury to public, construction workers or facility maintenance personnel.	Personal injury to the public if trespassing on-site or to construction workers or facility maintenance personnel due to accidents, fire or equipment malfunction.	Public access to the facility will be prevented through the use of fences, gates, and any other necessary security procedures. Proper health and safety procedures for construction workers and facility maintenance personnel will be implemented as per provincial and federal regulations.	No risk to public safety unless trespassers obtain access to the site. Health and safety procedures will reduce risk of personal injury to construction workers and facility maintenance personnel, but some risk from accidents will remain.
Traffic and Municipal Roadways	Construction and Decommissioning	Construction vehicles and workforce commuters travelling to and from the Project.	No significant traffic-related impacts identified. Heavy construction vehicles may damage local roadways.	Prepare transportation route and implement construction scheduling as required to avoid bottlenecks of equipment deliveries to site. Construction flag-person to direct vehicles into and out of the site. Municipal 'half-load' requirements for roads will be adhered to. Any damage to local roadways will be repaired by the Contractor.	None.
	Operations	Facility operation and maintenance personnel travelling to and from the Project.	None. The number and frequency of facility personnel travelling to the Project is negligible.	None required.	None.
Archaeological Resources	Construction	Excavations for foundation construction and trenching for underground electrical cables.	Potential adverse effects to any archaeological resources.	Completion of Archaeological Assessment reports for the Project and implementation of any recommendation.	None. Mitigation will be effective in preventing residual negative effects to human remains or archaeological resources if discovered during construction.
Protected Properties, Built Heritages and Cultural Heritage Landscapes	Construction	Construction and installation of Project facilities resulting in the loss (e.g., demolition of existing built structures) and/or alteration to significant cultural heritage features or landscapes.	Potential adverse effects to any protected properties or heritage resources	Protected properties and heritage resources, as defined in Section 19(1) of O. Reg. 359/09, will be investigated and mitigation will be employed as required and recommended by the MTCS.	None. Mitigation will be effective in preventing residual negative effects to any protected properties and heritage resources.

Environmental Component	Project Phase	Sources of Negative Effect	Potential Negative Effect	Mitigation Measures	Residual Negative Effect
Change in Visual Landscape	Construction and Decommissioning	Presence of construction site equipment, activities and personnel.	Portions of the facility will be visible from Black Road and from adjacent properties. This may be perceived as a negative environmental effect.	Existing vegetation along Blessington Road will be maintained to the extent possible during construction to provide some visual screening.	Short term change in local visual landscape during construction. Visual disturbance reduced with retention of existing vegetation.
	Operations	Presence of facility.	Portions of the facility will be visible from Blessington Road and from adjacent properties. This may be perceived as a negative environmental effect.	Retain trees and vegetation along Project Location to extent possible to provide natural screening. If necessary, plant trees or shrubs or construct landscaping berms or fences to provide a visual barrier based on viability and effectiveness.	Long-term change in local visual landscape. Visual disturbance reduced with implementation of visual barriers.
Reflectivity	Operations	Reflection from solar PV modules during early morning and late day when sun is low.	Potential visual disturbance to adjacent observers for short periods of time under site-specific conditions and viewing angles between March and September.	If complaints from adjacent landowners are received, areas of potential human impact will be assessed and the area screened with vegetation.	None.
Property Values	Operations	Presence of the Project within the local rural community and changes due to visual aesthetics and noise emissions from the site.	Installation of the facility has the potential, though unproven, to result in a change in the value of nearby properties based on aesthetic preference of potential landowners. Though subjective, the potential reduction in property values for the purpose of this assessment is considered a potential negative effect.	Mitigation measures to minimize visual disturbance to neighbouring properties and noise emissions that could potentially be audible will minimize the impact of the facility on neighbours, which will in turn, reduce impacts on property values.	Potential reduction in property values if buyers subjectively feel that the Project poses a potential impact to them.
Availability of Resources	Operations	Presence of the Project within an area identified as a potential aggregate, petroleum or mineral resource area.	None expected since these resources are not known to be present on the Project Location. If present, the impact would be a potential loss of access to these resources during the life of the Project. The future availability of the resources would not be changed.	None required.	Loss of access to potential aggregate, petroleum or mineral resources within the Project Location during the life of the Project. Actual potential to develop those resources during that time period is unknown.
Recreational Land Use	Construction, Operations and Decommissioning	Presence of the Project and associated fencing.	None expected since no recreational resources (e.g., trails) are present on the Project Location.	None required.	None.
Effects Due to Accidental Spills					
Groundwater, Surface Water, Soils, Vegetation, Aquatic Habitat and Biota	Construction and Decommissioning	Accidental spills or leakage of fuel, oil or hydraulic fluid from construction vehicles or equipment, on-site refuelling or storage of toxic liquids on-site.	Impairment of groundwater, soil and/or surface water quality due to contamination. Potential adverse effects to aquatic habitats and vegetation.	Proper storage and handling of toxic liquids (if used) in designated areas. Routine inspections of vehicles, equipment and storage containers. Spill control kits will be available on-site and spill response procedures implemented in the event of a spill. Contractor's personnel will be trained in spill response and reporting procedures. No construction vehicle refuelling or storage of toxic liquids on-site or within 30 m of a watercourse.	No residual effect given effective mitigation and spill response and clean-up measures if a spill occurs.
	Operations	Accidental spills or leakage of fuel, oil, hydraulic fluid, etc, from maintenance vehicles or equipment, on-site refuelling or storage of toxic liquids on-site. Accidental spills of transformer oil from inverter transformer.	Impairment of groundwater, soil and/or surface water quality due to contamination. Potential adverse effects to aquatic habitats and vegetation.	Facility personnel will be trained in spill response procedures. Spill control kits will be stored on-site and spill response/cleanup procedures implemented if a spill or oil leak is detected and MOE notified if required. No refuelling or storage of toxic liquids on-site within 30 m of a watercourse. Inverter transformers will sit on a concrete pad with no hydraulic connection (e.g., piping, drains) to surface or groundwater. Substation transformer will have secondary spill containment around the transformer. All transformers will be inspected by facility maintenance personnel for signs of oil leakage.	None. Mitigation and procedures for transformer equipment inspection, monitoring and spill response/cleanup are anticipated to be effective in preventing residual negative effects.

5. References

Ministry of Environment (MOE). 2010. Renewable Energy Approvals Technical Bulletin One Guidance for Preparing the Project Description Report as Part of an Application under O. Reg. 359/09. Draft. March 1, 2010. Queen's Printer for Ontario. PIBS 7436e.

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