

CONSTRUCTION PLAN REPORT

Marsh Hill Solar Farm

EXECUTIVE SUMMARY

Solray Energy Corporation (Solray) proposes to develop a solar facility with a maximum name plate capacity of approximately 10 megawatts (MW) located in the Township of Scugog and Regional Municipality of Durham, Ontario. The renewable energy facility will be known as the Marsh Hill Solar Farm and will be rated as a Class 3 Solar Facility. The project will require approval under *Ontario Regulation 359/09 – Renewable Energy Approval (REA)* under Part V.0.1 of the *Ontario Environmental Protection Act*.

The *Construction Plan Report* provides detailed information on the installation of all project components, potential negative environmental effects within 300 metres of the project location (as they relate to construction activities and temporary facility components¹), and mitigation and/or monitoring measures with respect to those negative environmental effects.

Construction activities are anticipated to take approximately five to eight months and are scheduled to begin in the spring of 2013. Major activities during the construction phase include: surveying and staking of the project location; clearing, ground leveling, compacting and grading; drainage and erosion control; installation of perimeter fence and security lighting; construction of access roads; installation of temporary power; delineation of temporary storage and construction areas and installation of temporary facilities; construction of foundations; installation of supports, racking and PV modules; installation of wiring and inverters/transformers; remediation and clean-up of work areas; site landscaping and vegetation planting; and, testing and commissioning.

The construction phase of any project such as this has the potential for adverse effects on the environment. As part of the construction program, good site practices and procedures will be implemented. These practices will include policies regarding the management of any excavated material, erosion, sediment, noise, dust control, the handling of wastes, on-site safety management and emergency response procedures. To minimize the potential for environmental effects during the construction phase, the contractor will be made aware of, and be responsible for, the environmental management commitments made for the project. After all major construction activities are completed; work areas will be remediated and, with the exception of permanent structures, returned to their pre-construction condition. All construction related waste and excess materials brought to the site will be removed and reused, recycled, or disposed of as applicable by a licensed contractor in accordance with provincial guidelines.

Potential negative environmental effects as a result of construction were determined through fieldwork, data collection, an understanding of site conditions, construction practices and mitigation measures. The

¹ Refer to the *Design and Operations Report* for technical specifications of permanent project components (i.e. those present for the lifetime of the renewable energy facility).

existing conditions, potential effects and proposed mitigation and/or monitoring plans are described in detail and summarized in **Table 4** of this report and in the Environmental Effects Mitigation and Monitoring Plan (EEMMP) of the *Design and Operations Report*.

The Stage 1 and Stage 2 *Archaeological Assessments* did not identify any archaeological resources within the project location and no negative effects are anticipated. The *Cultural Heritage Screening/Self-Assessment* determined that no cultural heritage features or protected properties are located in the vicinity of the project location and that no such resources or properties will be negatively impacted by the proposed project.

Based on the natural environment information collected, the project location was refined to avoid impacts to significant and/or sensitive natural heritage features and waterbodies. The layout of the solar project has been developed to prioritize the protection of and minimize the effects on natural features. Potential effects to natural heritage features and waterbodies are limited but may include alteration of surface water flows to adjacent lands, sedimentation of adjacent habitat, and obstacles to wildlife movement. Mitigation measures include erosion and sediment control, limiting vegetation clearing to outside of the core breeding period, maintaining vegetation buffers near natural features, and re-vegetating land with native grassland species.

Other potential negative effects of construction include: increased dust and noise in the vicinity of construction activities; increased traffic and wear on roads; removal of agricultural land from production; and, health and safety risks related to the use of heavy machinery. Dust levels are not anticipated to be considerably higher than those achieved during current agricultural operations and roads will be watered as needed. Construction will occur during normal working hours or in accordance with local noise By-laws. A Road User's Agreement will be prepared in collaboration with the Township and signage will inform of traffic disruptions. A perimeter fence will protect the public from potential hazards on the construction site and Emergency Response and Communications Plans will be implemented as necessary.

The overall conclusion of the *Construction Plan Report* is that this project can be constructed without any significant adverse residual effects to the natural or social environment.

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1.0 INTRODUCTION

Solray Energy Corporation (Solray) proposes to develop a solar facility with a maximum name plate capacity of approximately 10 megawatts (MW), located in the Township of Scugog and Regional Municipality of Durham, Ontario. The renewable energy facility will be known as the Marsh Hill Solar Farm and will be rated as a Class 3 Solar Facility. Solray has received a contract from the Ontario Power Authority (OPA) for the sale of electricity generated by this renewable facility through the province's Feed-in-Tariff (FIT) program (enabled by the *Green Energy and Green Economy Act, 2009*). The project will require a Renewable Energy Approval (REA) as per *Ontario Regulation 359/09* under Part V.0.1 of the *Ontario Environmental Protection Act*.

This *Construction Plan Report* is being submitted to the Ontario Ministry of the Environment (MOE) as per *Ontario Regulation 359/09* as part of a complete REA application. This report was made available in draft form for public review and comments prior to this final REA submission. Other reports included in the REA submission package include:

- *Project Description Report*
- *Design and Operations Report*
- *Decommissioning Plan Report*
- *Noise Study Report*
- *Natural Heritage Assessment (4 reports)*
- *Water Assessment (2 reports) and Water Body Report (1 report)*
- *Archaeological Assessments*
- *Cultural Heritage Screening/Self Assessment*
- *Consultation Report*
- *Supporting Documents*

The *Construction Plan Report* provides detailed information on the installation of all project components, potential negative environmental effects within 300 metres of the project location (as they relate to construction activities and temporary facility components²), and mitigation and/or monitoring measures with respect to those negative environmental effects.

² Refer to the *Design and Operations Report* for technical specifications of permanent project components (i.e. those present for the lifetime of the renewable energy facility).

2.0 THE PROPONENT

Solray is a developer of utility-scale solar energy projects in Ontario, with two projects moving towards construction and nine projects in early-stage development. Solray endeavours to work closely with all interested stakeholders in their projects including landowners, Aboriginal communities, the general public, municipalities, government agencies and ministries. Solray’s main objective is to design and construct projects that are both environmentally beneficial and financially viable.

Contact information for the proponent is as follows:

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Dillon Consulting Limited (Dillon) is the consultant responsible for the preparation of REA-related reports and for consultation activities for the Marsh Hill Solar Farm. The contacts at Dillon are:

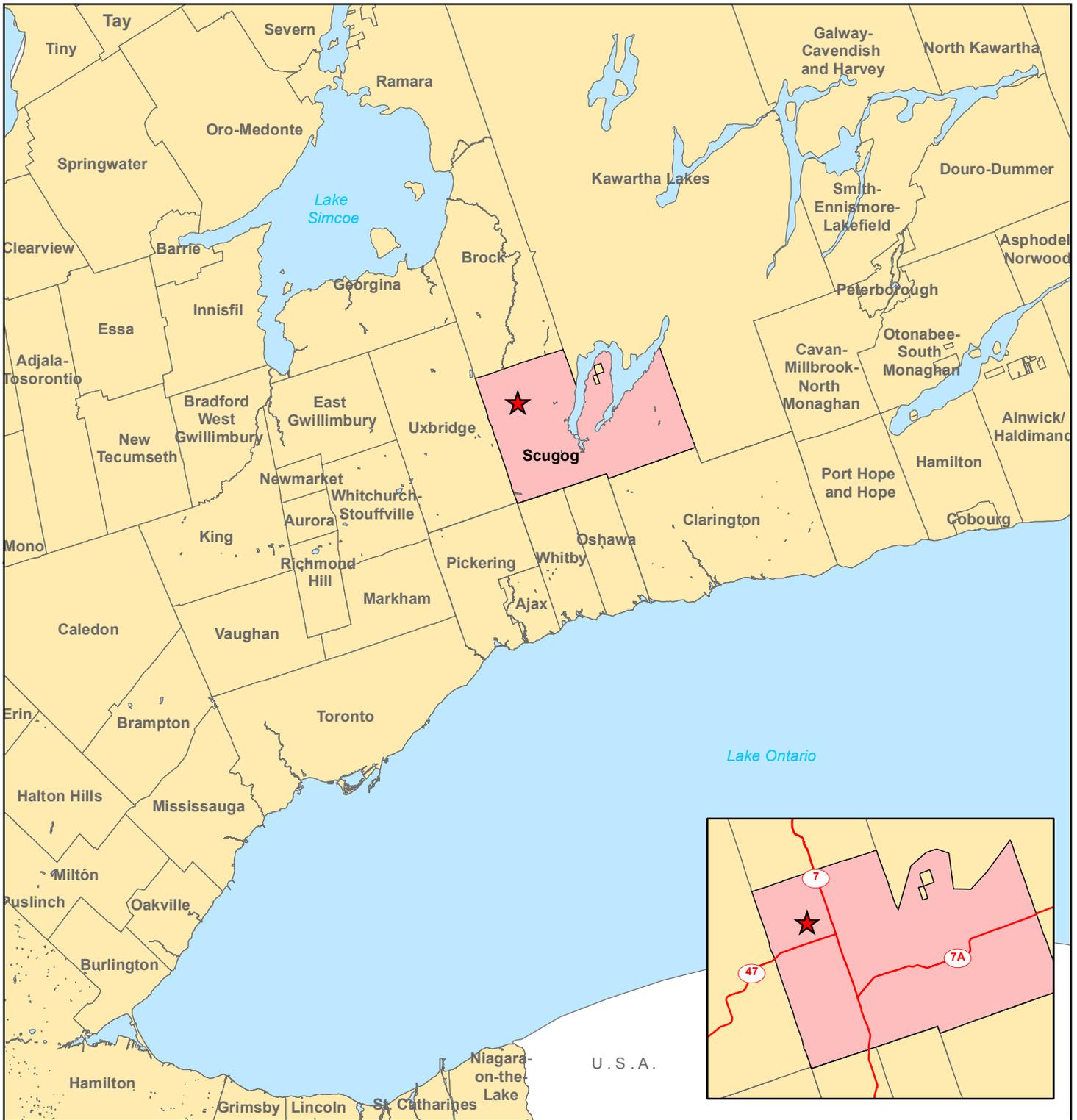
Full Name of Company:	<i>Dillon Consulting Limited</i>	
Prime Contacts:	<i>Mario Buszynski, Project Manager</i>	<i>Katharine Myrans, REA Project Coordinator</i>
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3.0 PROJECT LOCATION

The proposed Class 3 Solar Facility is located at 725 Cragg Road, Uxbridge, Ontario, between Marsh Hill Road and Highway 7 within the Township of Scugog. **Figure 1** shows the general location of the project in Southern Ontario. The project location covers part of Lot 8, Concession 11, and consists of approximately 36.1 hectares of privately owned land (leased by the proponent); with geographic coordinates (centroids) as follows:

- Latitude: 44° 8' 59.78" N
- Longitude: 79° 2' 58.05" W

“Project Location” is defined in *Ontario Regulation 359/09* to be “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”. **Figure 2** shows the proposed layout and location of all project components. Further information on facility components making up the project location is provided in Sections 4 and 5 of the *Design and Operations Report*. **Figure 3** identifies the project location boundary in relation to natural features and water bodies.



Marsh Hill Solar Farm

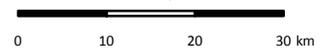
Figure 1: General Location of the Marsh Hill Solar Farm in Southern Ontario

Legend

-  Project Location
-  Highway
-  Township of Scugog
-  Municipalities



1:850,000



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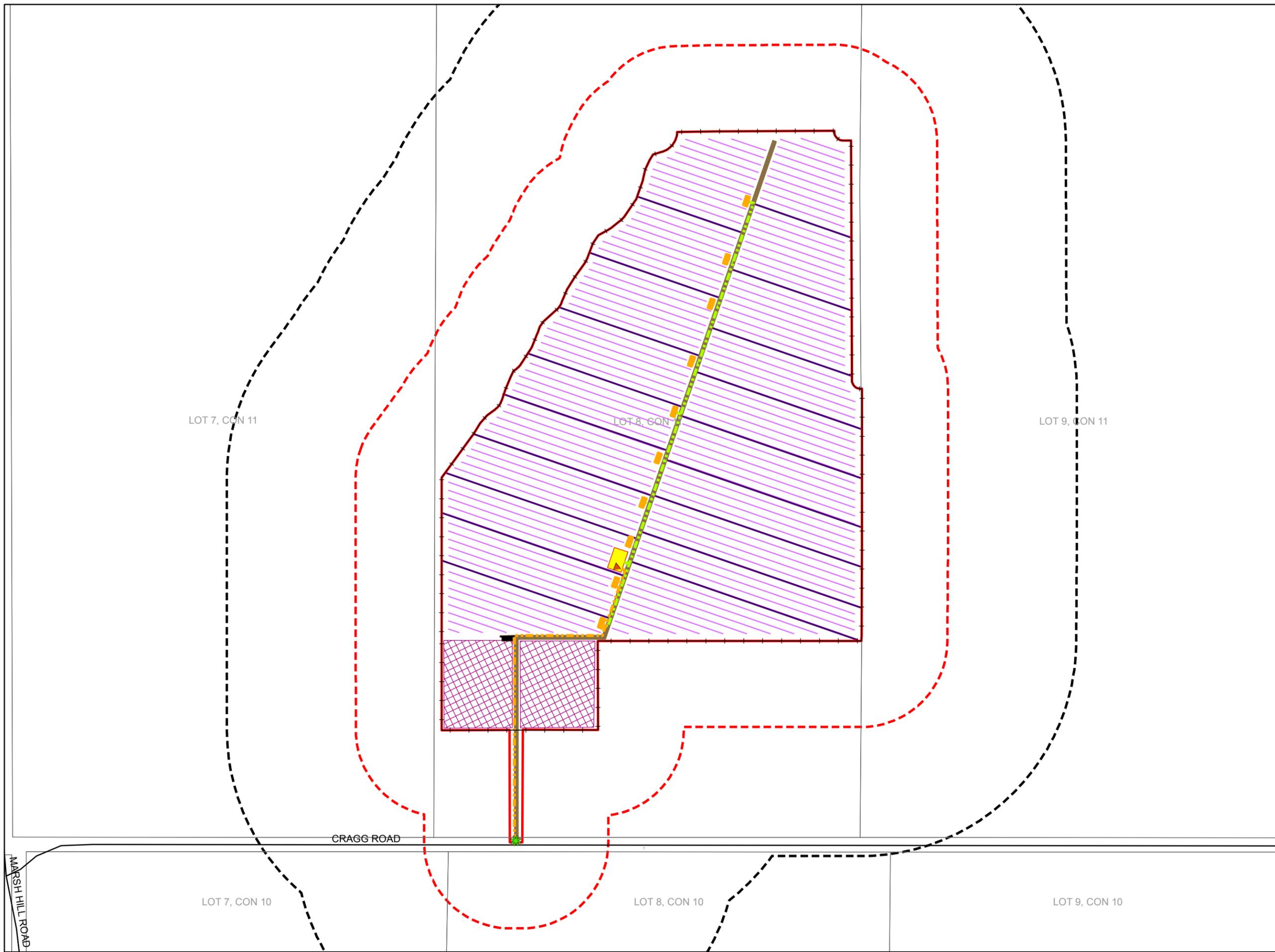
**Figure 2:
Site Plan - Component Layout**

Legend

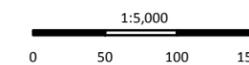
- Local Roads
- ▭ Project Location
- - - 120 m from Project Location
- - - 300 m from Project Location
- Lots/Concessions

Project Components

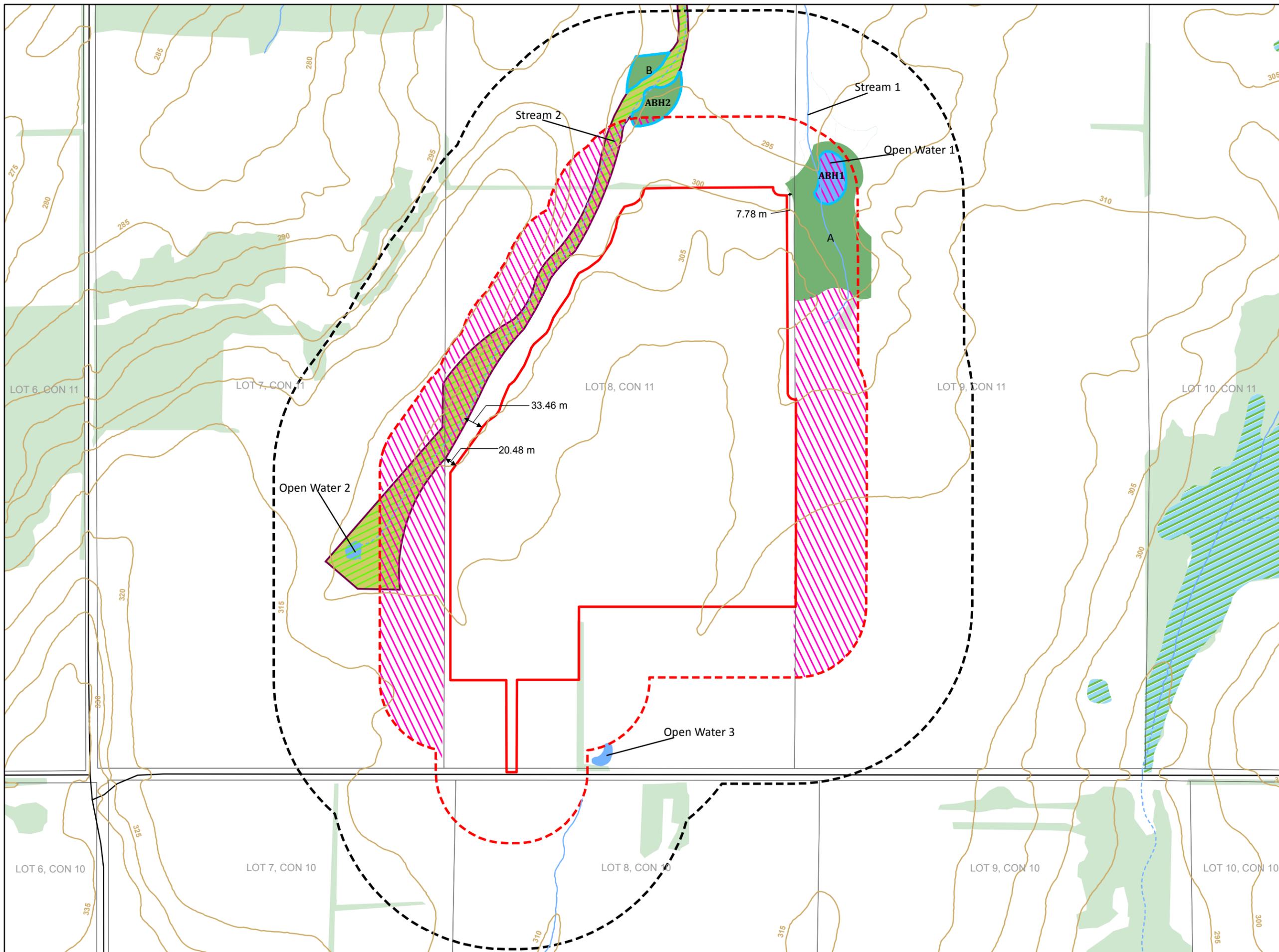
- ▲ Communication Tower
- ✱ Site Entrance
- Fence
- ▭ Solar Panel
- 0.5 MW Boundaries Section
- Underground Cable
- Overhead Line
- Access Roads
- ▭ Laydown Area (Temporary)
- ▭ Inverter
- ▭ Substation Yard
- ▭ Permanent Parking



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**Figure 3:
Site Plan -
Natural Heritage Features**



Legend

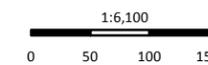
- Watercourse (Intermittent Stream)
- Watercourse (Permanent Stream)
- Local Roads
- 5 m Contours
- Project Location
- 120 m from Project Location
- 300 m from Project Location
- Lots/Concessions
- Undelineated Woodland
- Undelineated Wetlands

Significant Natural Features

- Generalized Candidate Significant Wildlife Habitat
- Candidate Significant Amphibian Breeding Habitat (Habitat for Western Chorus Frog)
- Candidate Significant Amphibian Movement Corridor
- Candidate Significant Bullfrog Concentration Area
- Delineated Woodland
- Delineated Wetlands

An Environmental Impact Study has been submitted to the Ministry of Natural Resources for natural features deemed significant

A Water Bodies Report has been prepared



4.0 PROJECT OVERVIEW

The Marsh Hill Solar Farm is designed to generate a maximum of 10 MW of electricity. Photovoltaic (PV) panels will be the technology used to convert solar energy into electricity. With exposure to sunlight, the solar modules convert solar radiation into direct current (DC) electricity through a PV process. The PV process occurs when the energy from the sunlight is transferred to semiconductors contained in the modules. DC electricity generated from the panels will be collected and converted into AC electricity by inverters. From the inverters, the electricity will be metered and transferred into the local distribution system for regular use after step-up transformers raise the voltage to appropriate distribution levels.

The construction phase of any project has the potential to adversely affect the environment. A construction program will be designed by Solray and the contractor to minimize the potential for adverse environmental effects. These potential effects, the level of magnitude for each effect and mitigation and/or monitoring measures for construction activities, are discussed below and summarized in **Table 4** at the end of **Section 6.0**. For a description of the land prior to construction see the *Site Investigation Report* and *Environmental Impact Study*, provided as part of the *Natural Heritage Assessment*.

As part of the construction program, good site practices and procedures will be implemented. These practices will include policies regarding the management of any excavated material, erosion, sediment, noise, dust, wastes, on-site safety and emergency response procedures. These are discussed in **Section 6.0** as part of the mitigation measures and monitoring activities. They will be expanded upon in the Emergency Response and Communications Plans (ERCPs) prior to construction. Solray's staff and contractors will be made aware of the environmental management commitments contained in these reports to ensure they are implemented. An Environmental Monitor may also be employed to supervise site practices and procedures. All construction related activities will be conducted on-site within the project location as identified in **Figure 2**.

4.1 *General Construction Timing*

Construction activities are anticipated to take approximately 5-8 months with an anticipated start date in the spring of 2013. They will occur in the relative order in which they are presented in **Table 1**. Pre-construction activities that are currently underway at the project location include: topographic survey, geotechnical study, Archaeological and Cultural Heritage Assessments and a Phase I Environmental Site Assessment.

Table 1: Duration of Construction Activities

Construction Activity	Approximate Timeline (2013-2014)	Anticipated Duration
Survey and staking of project location	April 29, 2013 - May 12, 2013	2 weeks
Installation of perimeter fence and security lighting	May 13, 2013 - May 26, 2013	2 weeks
Drainage and erosion control	May 13, 2013 - May 26, 2013	2 weeks
Clearing, ground leveling, compacting and grading	May 13, 2013 - May 26, 2013	2 weeks
Power and communications	May 13, 2013 - May 19, 2013	1 week
Construction of access roads	May 13, 2013 - June 9, 2013	4 weeks
Laydown/construction staging areas and temporary facilities	May 27, 2013 - June 23, 2013	4 weeks
Preparation of substation and inverter unit foundations	June 17, 2013 - July 28, 2013	6 weeks
Installation of support foundations, racks and solar PV modules	June 17, 2013 - September 22, 2013	14 weeks
Installation of electrical collection system, wiring, substation and components	July 29, 2013 - October 6, 2013	10 weeks
Connection to the provincial grid	September 2, 2013 - September 22, 2013	3 weeks
Remediation and clean-up of work areas	September 23, 2013 - October 6, 2013	2 weeks
Site landscaping and vegetation	September 23, 2013 - October 20, 2013	4 weeks
Facility testing	November 1, 2013	1-2 days
Facility operation	February 25, 2014	ongoing

The exact date of construction start-up will be dependent upon the length of the MOE application review, contracts with manufacturers and suppliers, the contractor, and several other variables. The timing of construction activities will take into account potential negative effects that may impact species during their breeding season (see **Section 6.2**).

Table 2: Project Schedule

Activity	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6-8 ³
Survey and staking of project location	•					
Installation of perimeter fence and security lighting	•					
Drainage and erosion control	•					
Clearing, ground leveling, compacting and grading	•					
Power and communications	•					
Construction of access roads	•	•				
Laydown/construction staging areas and temporary facilities	•	•				
Preparation of substation and inverter unit foundations		•	•			
Installation of support foundations, racks and solar PV modules		•	•	•	•	
Installation of electrical collection system, wiring, substation and components			•	•	•	
Connection to the provincial grid					•	
Remediation and clean-up of work areas					•	•
Site landscaping and vegetation					•	As required
Facility testing						•

The following sections provide details on these construction activities, the materials and equipment used, and the location and duration of the activity.

4.2 Overview of Materials and Equipment

In general, construction materials typically include standard building materials such as concrete, wood, aggregate, and metal. To the extent possible, these materials will be procured from local and/or regional sources where they are available in sufficient quality and quantity, and at competitive prices. Beyond the

³ **Table 2** is representative of the shortest potential timeline for construction activities; however, it is possible construction activities could take up to 9 months to complete.

materials required for construction of the facility, resource requirements for ongoing operation of the project include only solar energy and the land-base required for the facility location, and for the maintenance of the facility, access roads and electrical lines.

Hazardous materials used during construction are limited to fuels, lubricants and coolants that are associated with machinery, vehicles and equipment. During construction, no hazardous materials, including fuel, oils or grease will be stored on-site, although equipment may require their use. Disposal of hazardous wastes will only be required in the case of accidental spills and will follow the procedures outlined in the Spills Response Plan (see the *Design and Operations Report*). These materials will be managed according to best management practices and recommendations made as part of an Environmental Effects Mitigation and Monitoring Plan (EEMMP) developed by the contractor that is consistent with the EEMMP provided in the *Design and Operations Report*. The contractor's plan will be outlined in the ERCPs. Decisions on waste disposal or recycling during, and immediately after, construction will be made by the on-site contractor who will follow established Ministry of the Environment protocols for waste disposal.

Table 3 summarizes the construction activities, their duration and the equipment and materials needed during this phase. The information contained in **Table 3** is a compilation of information from the developer and other representative projects. Construction equipment and vehicles, including those that transport materials, will access the site via the entrance off Cragg Road (**Figure 2**). It is expected that dump trucks, flatbed trucks and semi-trailer trucks will transport all materials and equipment to the site. The transportation of materials will occur throughout the construction phase; however, the majority of trips will occur in months 1 and 2 (with the transport of materials for access roads) and in months 3 and 4 (with the transport of solar panels and associated racking/support structures). Any materials requiring on-site storage will be held within the temporary construction area as shown on **Figure 2** during the period of construction. It should be noted that while an attempt has been made to identify all facility and construction equipment, the exact size, weight and technical specifications of the materials and equipment will not be known until a supplier and contractor have been selected. It is anticipated the types and sizes of equipment used will be similar, regardless of which supplier and contractor is selected for the project.

Table 3: Construction Materials and Equipment⁴

Construction Activity	Material and Equipment Brought On-Site ⁵					Material Generated and Taken Off-Site			
	Type of Material (Approximate Quantity)	Number of Truck Loads	Vehicle used to Transport material	Equipment used during activity	Weight (Tonnes)	Type (Quantity)	Stored On-Site?	Number of Truck Loads	Vehicle used to Transport Material Offsite
Survey and staking of project location and delineation of perimeter fence and construction laydown areas	Survey Stakes (TBD)	1	Pickup Truck	Pickup Truck	3	N/A	N/A	N/A	N/A
Equipment used to transport, unload and move materials and equipment	Large equipment	6-10	Flatbed Semi-Trailer Trucks	Semi-Trailer	Empty: 7-16 Loaded: 40-70	N/A	N/A	N/A	N/A
Installation of perimeter fence and security lighting	Fence poles (500) Chain link fence (2700 m) Lights and associated wiring (TBD)	1-2	Pickup Truck Flatbed	Power Auger Skid steer Pickup Truck	9 9 3	N/A	N/A	N/A	N/A
Drainage and erosion control	Silt fence (2700 m) Hay bales (TBD)	1	Pickup Truck	Pickup Truck	N/A	N/A	N/A	N/A	N/A
Clearing, ground leveling, compacting and grading	N/A	N/A	On-site	Bulldozer Scraper Motor Grader Soil Compactor Dump Truck Wheel Loader	44 25 20 25 20 20	Top Soil (TBD) Removed Vegetation (TBD)	Yes* Yes**	N/A TBD	N/A TBD
Power and communications [Note: this will only be undertaken if considered necessary at the time of construction.]	Temporary junction box Conductor	1	Pickup Truck	Telehandler Pickup Truck	13 3	N/A	N/A	N/A	N/A

⁴ The quantities provided in this table are not to be used for estimating construction costs. Estimates are based on typical construction standards/techniques for a typical 10 MW solar project.

⁵ All construction materials and equipment (when not in use) will be temporarily stored in the construction laydown area until they are used.

Construction Activity	Material and Equipment Brought On-Site ⁵					Material Generated and Taken Off-Site			
	Type of Material (Approximate Quantity)	Number of Truck Loads	Vehicle used to Transport material	Equipment used during activity	Weight (Tonnes)	Type (Quantity)	Stored On-Site?	Number of Truck Loads	Vehicle used to Transport Material Offsite
Construction of access roads	Aggregate Granular 'A' and 'B' (3500 - 5000 m ³) 600 mm Culverts (2) Filter fabric underlay (approx. 1150 m) Water	400-500	Dump Truck Semi-trailer	Bulldozer Scraper Motor Grader Soil Compactor Wheel Loader Water Truck	44 25 20 25 20 21	Top Soil (TBD)	Yes*	N/A	N/A
Laydown/construction staging areas, parking and temporary facilities	Aggregate Granular 'A' and 'B' (600 m ³) Filter fabric underlay (150m)	50-80	Dump Truck	Bulldozer Scraper Motor Grader Soil Compactor Wheel Loader Dump Truck	44 25 20 25 20 3	Top Soil	Yes*	N/A	N/A
Preparation of substation, inverter unit and communication tower foundations	Concrete (250 m ³) and wood forms and/or piles	10	Concrete Trucks (TBD) Semi-Trailer	Bulldozer Excavator Backhoe Wheel Loader Motor Grader Dump Trucks	44 26 9 20 13 3	Top Soil	Yes*	N/A	N/A
Installation of support foundations, racks and solar PV modules	Steel Piles (3600-6000) Steel and Aluminum racking (1800-3000) Crystalline Silicon PV panels (up to 50,000)	300-400	Semi-Trailer	Pile Driving Rig Telescopic Handler Crane	20 10 23	N/A	N/A	N/A	N/A
Installation of electrical collection system, wiring, substation and components	Inverter units (10) Transformer (1) Breakers, switchgear, conduit, wooden poles, insulators, cable, connectors, etc. (all TBD)	250	Semi-Trailer	Rough Terrain Crane Telescopic Handler Excavator Backhoe Dump Truck Pickup Truck Trenching Machine	23 10 26 9 20 3 9	N/A	N/A	N/A	N/A

Construction Activity	Material and Equipment Brought On-Site ⁵					Material Generated and Taken Off-Site			
	Type of Material (Approximate Quantity)	Number of Truck Loads	Vehicle used to Transport material	Equipment used during activity	Weight (Tonnes)	Type (Quantity)	Stored On-Site?	Number of Truck Loads	Vehicle used to Transport Material Offsite
Remediation and clean-up of work areas	None	N/A	N/A	Backhoe Pickup Truck Service vehicles	9 3 TBD	Gravel and filter fabric from laydown area (600m ³)	No***	TBD	Dump Truck Semi-Trailer
Site landscaping and vegetation	Native Seed (to cover 36 hectares)	3	Pickup Truck	Pickup Truck Hydroseeding Device	3 TBD	N/A	N/A	N/A	N/A
Facility testing	None	N/A	N/A	Pickup Truck Service vehicles	3 TBD	N/A	N/A	N/A	N/A

* Topsoil will be temporarily stored on-site within the construction laydown area and covered until it can be redistributed within the project location.

** Waste vegetation from site preparation will be temporarily stored along the internal access roads until it can be removed.

*** Construction waste will be removed from the project location by a licensed contractor who will recycle and reuse materials where possible. Material that cannot be recycled or reused will be transported to an appropriate disposal facility.

4.3 Temporary Uses of Land

During the construction phase, there will be several temporary uses of land and associated equipment, including erosion and sediment control (ESC) structures, construction laydown areas, temporary fencing, site trailers, washrooms, first aid station, parking, and temporary access roads.

Temporary sediment, dust and erosion control measures will be in place for the duration of the construction of the facility. These could include the installation of silt fences at appropriate distances from natural features, as well as erosion blankets and/or loosened hay bales.

The construction laydown area (shown on **Figure 2**) marks the location where construction equipment such as excavators, bulldozers and graders, and materials for construction (including panels) will be stored. The laydown area will be approximately 2.42 hectares in size and will be surrounded by temporary construction fencing which will be removed at the end of the construction phase. Site trailers, temporary washrooms, and the first aid station will only be required during construction of the facility and will be located within the laydown area. Once construction is complete, these items will be removed and the temporary laydown area will be rehabilitated.

Temporary access roads may be installed for access to and around the inverter units or panel array rows. It is expected that these roads will be packed dirt during construction, and will allow existing drainage patterns to be unaffected. After construction these roads will be re-vegetated (details on decommissioning of roads is provided in *the Decommissioning Plan Report*).

All temporary and disturbed areas will be rehabilitated after the construction of the facility is complete. Temporary fencing, trailers and construction equipment will be removed from the site. Temporary sediment structures will also be removed, as no sediment or dust will be created during the operation of the facility⁶. Areas of compacted soil due to the presence of heavy machinery may be rehabilitated by replacement of top soil throughout the project location, as needed. This material may come from existing stockpiles or nearby soils. The soils will then be re-vegetated and seeded as required.

The construction phase will not require any temporary water takings from a ground or surface water source. Any water required during construction will be trucked to the site.

4.4 Construction Workforce

The work force will include construction supervision, general and skilled labour, equipment operators, technicians for electrical systems and commissioning, plant installation and operation, security and

⁶ While the creation of dust and sediment is not anticipated during operations, there is potential for it to occur during routine maintenance activities at the facility. For more information on maintenance, please see the *Design and Operations Report*. Should operational activities create an unforeseen amount of dust or sediment, sediment structures will be installed to mitigate any potential negative effects to the surrounding environment.

general maintenance. The construction workforce is estimated to be 50 workers on average over the 5 to 8-month construction period. Based on communication with the Township of Scugog, construction activities will take place within the hours of 7:00 am to 7:00 pm, Monday through Friday, and 8:00 am to 3:00 pm on Saturdays (see **Section 6.5**).

5.0 CONSTRUCTION ACTIVITIES

5.1 Survey and Staking of Project Location

At the beginning of the construction phase, the site will be surveyed and staked to delineate the perimeter and areas for fencing, access roads, excavations and foundation locations. The survey will identify the location of any underground utilities and/or infrastructure and the extent of any easements that may be related to the infrastructure. Any significant or provincially significant environmental features and their applicable setbacks (e.g. water bodies, significant wildlife habitat, etc.) will also be clearly demarcated. Areas to be avoided will be fenced and/or flagged.

5.2 Installation of Perimeter Fence and Security Lighting

Permanent fencing will be installed along the perimeter of the project location. The fence will be approximately 2.7 metres in height with 3-strand barbed wire on top (or as required by the *Electrical Safety Authority* (ESA)). A locked, gated entrance will be installed either at the site entrance at Cragg Road or where the internal access road intersects the temporary construction laydown area. The fence posts will typically be spaced 2.5 metres apart and will be placed in augured holes. The installation will require the use of skid steer and auger. The location of the perimeter fence is shown on **Figure 2**.

For security and maintenance purposes, lights may be installed near the entrance of the facility and will be installed at the temporary construction offices, construction staging areas, substation and possibly on or near each inverter unit. The use of lighting will be limited, where possible, and the use of motion sensors and shielding may be implemented where necessary to avoid impacts to neighbouring properties and amphibian breeding.

5.3 Drainage and Erosion Control

A preliminary Stormwater Management Report has been prepared for the Marsh Hill Solar Farm (see Appendix E of the *Design and Operations Report*). The report contains a level of detail suitable to satisfy the requirements set forth within the MOE's *Technical Guide to Renewable Energy Approvals (2011)* and makes recommendations for construction period measures related to stormwater management. To minimize the potential for impairment of the quality of receiving waters during construction, an erosion abatement control plan will be implemented during construction. The plan should include, but not be limited to, the following:

- installing straw bale barriers and/or filter cloth barriers including silt fences, in existing swales, drains, or at critical downstream flow points to intercept suspended solids carried by overland flow and to prevent the runoff from directly entering existing watercourses;
- minimizing the need for topsoil stripping;

- using appropriate grading techniques to prevent increased run-off potential and maintain positive drainage; and,
- planting of grasses on disturbed areas after construction activities have ceased (e.g. construction laydown area).

Prior to construction, a more comprehensive plan will be developed based on the detailed design of the facility and in consultation with the EPC Contractor. Any temporary control measures will remain in place throughout the construction period and will be routinely inspected by the contractor.

5.4 Clearing, Ground Leveling, Compacting and Grading

The project location will be minimally graded to facilitate construction activities based on a grading plan that will be prepared prior to construction, and will implement the Stormwater Management Report to maintain the general drainage patterns of the site as much as possible. Graders, bulldozers, scrapers, soil compactors, dump trucks, wheel loaders and backhoes will be used to prepare the site. Negligible clearing of vegetation will be required based on the results of the *Natural Heritage Assessment*. Selective clearing of trees and vegetation will be required for the installation of panels and racking. Permits for tree removal will be obtained if required by the Township of Scugog.

Major excavation works or fill placement are not required for the project. The primary excavation work is likely to be limited to soil removal for various foundations, access roads and digging trenches to run underground electrical cables. Excavation may also be required for the installation of the communications tower. Topsoil removed from the permanent access road will be distributed across the project area. Any excess topsoil will be spread evenly over graded land. Temporary stockpiled topsoil will be covered in order to minimize erosion from wind and precipitation.

5.5 Power and Communications

During the construction period, any on-site electricity required to power heavy equipment will be obtained from temporary generators supplied by the contractor. Electricity required for temporary construction offices, lighting and other purposes will be arranged for and obtained from the local electricity provider. Communications will be primarily through the use of cellular phones and wireless connections; therefore, no telephone or internet cable line installation will be required.

5.6 Construction of Access Roads

A main access road will be needed for construction vehicles and equipment transport. It will also provide long term access to the site for on-going maintenance requirements. It will allow a service vehicle to access each inverter unit directly. The main access road entrance will be off of Cragg Road, which is a local municipal road. Culverts will be installed across the ditch if necessary to provide increased berm

stability. The main access road will be about 10 metres wide (5 metre gravel road with 2.5 metre vegetated shoulders), with filter fabric beneath a granular 'B' base and finished surface of granular 'A' material. The depth of the roadbed will be constructed as required to transport loads associated with construction and maintenance of the project; however, is expected to be 500 to 600 millimetres. During construction of the access road, the topsoil may be stripped and stored. Some cut and fill may be required; however, it is expected the subgrade material will be comprised of existing native granular deposits. The subgrade will be free of depressions and sloped (at a minimum grade of 2%) to provide effective drainage. The subgrade will be proofrolled with heavy rollers to locate any loose or disturbed areas. Should weak areas or any other incompatible material be detected during proofrolling, further excavation and subsequent backfill with approved native deposits (moisture content within 3% of optimum moisture content) may be required. The replacement granular materials will be compacted to at least 95% standard proctor maximum dry density (SPMDD). No materials will be removed from the site.

In addition to the main access road, several internal roads may be developed to provide access for construction and maintenance purposes. Row to row rack spacing will be large enough such that service vehicles can access modules and wiring for maintenance. The location of any internal access roads and their nature may change but it is expected that the majority will remain as permanent roads to provide access for maintenance during operation. Where roads are deemed necessary only for construction, the area will be rehabilitated prior to facility operation. It is expected that these roads will be packed dirt during construction and vegetated during operations.

Water will be trucked in and sprayed as necessary for dust control during construction. The use of gravel will reduce water use for dust control during construction as compared to dirt roads.

In addition to constructing roads, a small gravel area (approximately 122.9 square metres) will be constructed north of the temporary construction area and east of the main access road. It will be used during operations for permanent parking of maintenance vehicles and for storage of maintenance materials during the operational phase of the facility.

5.7 Laydown/Construction Staging Areas and Temporary Facilities

A temporary laydown and construction staging area, totaling 2.42 hectares has been delineated in the southwest corner of the project location as shown on **Figure 2**. This area will be used for construction office trailers, portable washrooms, first aid stations, vehicle parking, construction equipment parking, storage sheds, truck unloading/loading, waste disposal pick-up areas, and equipment and material lay-down. After site grading (discussed above) a layer of granular material will be installed over filter fabric to provide an adequate base for construction vehicles, heavy equipment and material laydown. This area will be decommissioned, rehabilitated and returned to the landowner when the construction period is finished. The soil will be stabilized and restored (see **Section 5.12**) at the end of construction.

5.8 Preparation of Substation and Inverter Unit Foundations

Based on the geotechnical studies and in consultation with the contractor, the substation area and ten inverter unit areas will be prepared/excavated as needed and foundations for the equipment installed. Foundation types may consist of the following, with a preference for the final option:

- concrete pre-cast pads which are transported to the site by truck and subsequently set into position by a crane;
- concrete cast-in place pads, constructed on site by pouring ready-mix concrete into forms. A mixer truck from a local supplier would deliver ready-mix concrete to the site and pour it into forms. Between 200 - 1000 cubic metres of concrete could be required for the project based on the foundation type; or,
- ground screwed or plate-mounted steel beams (with possible pre-drilling), installed using a mechanical, hydraulic or vibratory pile hammer mounted on a rig, excavator or boom truck. The hydraulic drive motor would rotate the screw pile into the ground. Alternatively, if driven piles are to be used, they would be installed in a similar fashion but would be driven rather than rotated or screwed into the ground.

5.9 Installation of Support Foundations, Racks and Solar PV Modules

The entire project will have approximately 40,000 to 50,000 solar PV modules. Each panel will be 230 W to 280 W and weighs approximately 27 kilograms. The modules will be mounted on steel and/or aluminum racking structures. It is estimated that between 1800 and 3000 racks will be required for the project and will be arranged in rows spaced about 5-7 metres apart.

Depending on soil conditions, it is anticipated that the racks will be supported by steel uprights that will be mounted on either steel driven or helical screw piles. As mentioned above, these would be installed using mechanical, hydraulic or vibratory pile hammer equipment mounted on a specialized rig, excavator or boom truck. In order to support the racking system and modules it is anticipated that the piles would be driven to a design depth of 7 to 9 feet (2.1-2.7 metres) below grade. A total of between 3600 and 6000 piles would be used.

5.10 Installation of Electrical Collection System, Wiring, Substation and Components

The electricity generated by the PV panels will be in the form of direct current (DC). Inverters will be required to convert the DC output of the PV cells into alternating current (AC) suitable for supplying the electrical grid. It is anticipated that the solar modules will be electrically divided into twenty sections of 0.5 MW each. DC wiring mounted to the back side of the racks is connected to a combiner box at the end of each row of racks.

From the combiner box buried electrical collection cables will connect the combiner boxes in each 0.5MW section to an inverter unit. The project will have ten inverter units located along the main access road, each containing two 500kW inverters and one 1000 kVA step-up transformer. Each inverter unit will service two 0.5 MW sections. From the inverters, 27.6 kV underground cables will direct the electricity to the substation. The cables will be installed at a depth of at least 1 metre by a cable trenching machine or dropped in trenches created by an excavator. The material removed from the trench will be used as backfill in the trench. Topsoil and subsoil will be excavated and stored separately. A layer of sand will be located and levelled on the bottom of the excavation to cover the conduits or cables. Equipment used in cable installation may include a backhoe or track mounted excavator, and trenching/boring equipment. Flagging will be placed at the surface as a marker.

The substation transformer will be installed in the substation yard and may be placed in a pre-fabricated building measuring approximately 5 metres x 3.5 metres. Substation components to be installed include the main power transformer, switchgear cells, metering, and service transformer. Disconnect switches will also be installed in the substation area.

After all major construction activities are complete the components will be tested. If any problems or issues arise, remedial corrections and calibration of equipment will be made prior to start-up.

5.11 Connection to the Provincial Grid

From the main substation transformer, an overhead 44 kV distribution line will extend along the access road and will tie into Hydro One's distribution line located on Cragg Road (at the point of common coupling). The line will be mounted on wooden poles equipped with insulators and connectors.

From the point of common coupling onwards, Hydro One will be responsible for building, owning, and maintaining the 44kV line. They will also be responsible for any permits associated with this distribution line. Given that the distribution line is located within the existing right-of-way along Cragg Road, it is not expected that any natural features would be affected.

A communication tower will be built within the substation yard to transmit data to Hydro One.

5.12 Remediation and Clean-up of Work Areas

After all major construction activities are complete, work areas will be remediated and, with the exception of permanent structures, returned to their pre-construction condition or vegetated (see below). All construction-related waste and excess materials brought to the site will be removed and reused, recycled, or disposed of as applicable by a licensed contractor in accordance with provincial guidelines.

Trucks will be used to remove all non-permanent equipment from the project location, along with any debris. The truck(s) will access the site via the permanent access road located off Cragg Road. Some land

recontouring may be required to complement natural drainage patterns in accordance with the final Stormwater Management Report.

5.13 Site Landscaping and Vegetation

Once construction and site cleanup are complete, the project location will be seeded with low-growing, native and non-invasive vegetation. Native vegetation species could be planted that provide foraging and breeding habitat for various wildlife species. The selected vegetation would be maintained at low heights to prevent shading effects on the solar panels. Seeding would be completed in a seasonally appropriate time period to maximize the success of the plantings.

Landscaping is the final construction activity for the project. It is expected that no heavy machinery or equipment will be required for the planting.

5.14 Facility Testing

The components will be tested prior to start-up and connection to the power grid. If any problems or issues arise, remedial corrections will be made prior to commissioning of the facility.

6.0 POTENTIAL NEGATIVE ENVIRONMENTAL EFFECTS AND PROPOSED MITIGATION MEASURES AND MONITORING ACTIVITIES

Construction of the Marsh Hill Solar Farm has the potential to affect the environment. This section examines the interactions between environmental effects and the project. For each environmental feature/concern, the following is described:

- **Existing Conditions** - describes the existing environmental feature/component;
- **Potential Effects** - describes the potential effects, both positive and negative, to the environmental feature/component that may occur as a result of the project; and,
- **Proposed Mitigation and/or Monitoring Plans** - recommends specific mitigative measures that will be implemented to minimize any potential negative effect of the project on environmental feature/component as well as any recommended monitoring plans.

As part of the construction program, Best Management Practices and procedures will be implemented to further reduce the environmental effects as identified in this *Construction Plan Report*. These practices will dictate the way the following elements are managed:

- excavated material;
- stormwater runoff;
- sediment;
- dust;
- soil compaction;
- natural heritage resources;
- cultural resources;
- agricultural resources; and,
- hazardous materials.

Staff and contractors involved with the Marsh Hill Solar Farm during the construction phase will be made aware of the environmental commitments contained in this report and their requirements for implementation. The contractor will be responsible for creating an EEMMP that is consistent with the EEMMP shown in the *Design and Operations Report*.

6.1 Cultural Heritage and Archaeological Resources

6.1.1 Existing Conditions

D.R. Poulton and Associates Inc., was retained by Solray to conduct Stage 1 and Stage 2 *Archaeological Assessment* for Marsh Hill Solar Farm. The assessment was conducted in the late summer of 2011 and in accordance with the Ministry of Tourism and Culture⁷ (MTC) 2011 *Standards and Guidelines for Consultant Archaeologists*.

A Stage 1 *Archaeological Assessment* is comprised of background research and desktop studies, which did not identify any past archaeological investigations or registered archaeological sites within the project location or within 1000 metres of the project location. However, the assessment determined the project location had a moderate to high potential for as-yet undiscovered First Nations and Euro-Canadian archaeological remains, and resulted in recommending that a Stage 2 *Archaeological Assessment* be undertaken for areas deemed to be of potential archaeological significance.

A Stage 2 *Archaeological Assessment* was undertaken at and around the perimeter of the project location and was comprised of field work involving a pedestrian transect survey at 5 metre intervals. The survey resulted in the discovery of one archaeological site, outside the project location but on the subject property, which was considered to be a First Nations isolated findspot of unknown age and cultural affiliation. An analysis of the recovered cultural remains from this site was conducted and concluded that the site is not considered to show any cultural heritage value or interest. The Stage 2 *Archaeological Assessment* concluded that no further investigation would be required, and there are no outstanding archaeological planning concerns for the proposed Marsh Hill Solar Farm. This was confirmed by MTC.

In addition, a *Cultural Heritage Screening/Self-Assessment* for the proposed project location was conducted in accordance with MTC's 2011 *Protected Properties, Archaeological and Heritage Resources – An Information Bulletin for Applicants Addressing the Cultural Heritage Component of Projects Subject to Ontario Regulation 359/09 Renewable Energy Approvals*. The screening determined that there was no potential for impacts to protected properties or cultural heritage resources and that a full Cultural Heritage Assessment was not required.

6.1.2 Potential Effects

Construction activities at the project location have the potential to cause negative effects on archaeological or cultural heritage resources by altering, disrupting and/or destroying historic materials. The archaeological assessment indicated one find, but determined it was not of significance and that there were no archaeological planning concerns for the project location. Similarly, the *Cultural Heritage Screening/Self-Assessment* determined there were no cultural heritage buildings or features present at

⁷ Since changed to the Ministry of Tourism, Culture and Sport

the project location. No potential negative effects to archaeological resources, cultural heritage resources or protected properties are anticipated.

6.1.3 Proposed Mitigation and/or Monitoring Plans

Based upon the background research of past and present conditions, the Stage 2 *Archaeological Assessment* recommends the following:

- In recognition of the fact that no archaeological survey can be considered to totally negate the potential for deeply buried cultural remains, it is recommended that archaeological staff of the Ontario Ministry of Tourism and Culture be notified immediately if any deeply buried archaeological remains should be discovered during earth moving or construction related to the [Marsh Hill Solar Farm]. A new archaeological site [is subject to] Section 48(1) of the Ontario Heritage Act. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out fieldwork.
- In the event that any human remains should be encountered during earthmoving or construction related to the development of the proposed [Marsh Hill Solar Farm], it is similarly recommended that the proponent immediately contact [MTC] as well as the police, the coroner [and the Registrar of the Cemeteries at the Ministry of Consumer Services] in accordance with the provisions of the *Cemeteries Act* (1990) and the *Funeral, Burial and Cremation Services Act* (2002).
- Based on consultation with Curve Lake First Nation and Alderville First Nation, should excavations unearth bones, remains or other such evidence of a native burial site or any archaeological findings these two Aboriginal communities should be notified immediately. In the case of a burial site, a First Nation's representative is needed before the remains or associated artifacts can be removed.

The Stage 1 and 2 *Archaeological Assessments* were submitted to the Ministry of Tourism and Culture as a condition of licensing in accordance with part VI of the *Ontario Heritage Act*, R.S.O. 1990, c 0.18. The reports have been reviewed to ensure that the licensed consultant archaeologist met the terms and conditions of their license, and that the fieldwork and report recommendations ensured conservation, protection and preservation of the cultural heritage of Ontario. Clearance from MTC was received on March 5, 2012.

The *Cultural Heritage Screening/Self-Assessment*, prepared as per the Regulation, confirmed the project does not have the potential to impact cultural heritage resources or protected properties. This report is being submitted to the MOE as part of the REA application.

6.2 Natural Heritage Resources

Solray has undertaken a *Natural Heritage Assessment* consisting of a *Records Review*, *Site Investigation*, *Evaluation of Significance* and *Environmental Impact Study* (EIS) to identify all natural features within the project location and lands within 120 metres. The following provides a summary of both significant and non-significant features, along with potential environmental effects. **Figure 3** shows the location of natural features within 120 metres and 300 metres of the project location.

6.2.1 Existing Conditions

The *Natural Heritage Assessment* identified the following natural features within 120 metres of the project location:

- An unevaluated southern wetland;
- Woodlands (2 units); and,
- Candidate wildlife habitat including:
 - Amphibian breeding habitat (2 units);
 - Bullfrog concentration area;
 - Habitat for Species of Conservation Concern; and,
 - Amphibian movement corridor.

After these natural features were evaluated for significance using procedures and criteria approved by the Ministry of Natural Resources (MNR), the following determinations were made:

- The unevaluated southern wetland located within the 120 metre setback area is assumed to be provincially significant due to its size (>2 ha);
- One unit of woodland was determined to be significant based on its location in proximity to a watercourse. The other woodland unit was evaluated to be not significant based on its small size and inability to meet any of the criteria for woodland significance; and,
- The amphibian breeding habitat, Bullfrog concentration area, habitat for Species of Conservation Concern, and amphibian movement corridor has all been treated as significant. Targeted field studies are underway to confirm the significance of these habitats (which are currently being treated as significant for the purposes to mitigation and monitoring).

6.2.2 Potential Effects

The proponents for the Marsh Hill Solar Farm undertook a thorough review of constraints to development prior to delineating the final project location. Based on the natural environment information collected, the project location was refined to avoid or minimize potential impacts to significant and/or sensitive natural heritage features, where possible. The layout of the solar project has been developed to minimize its footprint and prioritize the protection of natural features that provide habitat for sensitive species.

All potential negative effects during construction are related to site preparation and trenching and are indirect. They may include the following:

- potential for increased sedimentation and erosion on adjacent lands;
- change in water quality and/or water levels; and,
- obstacles to wildlife movement.

6.2.3 Proposed Mitigation and/or Monitoring Plans

In consideration of these potential environmental effects, mitigation measures have been proposed to avoid, minimize or compensate for these potential effects and maintain the ecological integrity and functionality of significant natural features. Mitigation measures proposed include:

Erosion and Sediment Control (ESC)

- minimizing soil exposure;
- minimizing the removal/disturbance of vegetation adjacent to natural features;
- installing ESC measures prior to grading to prevent mobilization of sediment from the project location into the surrounding landscape; and,
- seeding the project location with low-growing, native vegetation post-construction.

Stormwater Management

- developing and implementing a detailed stormwater management plan to ensure drainage patterns are not significantly altered from existing conditions due to road drainage, reduction in surface permeability, etc.;
- scheduling of grading to avoid times of high runoff volumes where possible (i.e. spring and fall);
- minimizing changes in land contours and maintaining natural drainage patterns where possible to address changes in overland drainage;
- minimizing changes to land contours; any physical land alterations (i.e., cut and fill) required will be designed to remain consistent with pre-existing drainage patterns;
- installing silt fencing in areas where there is potential for run-off to the receiving water bodies (i.e., perimeter of the project location); and,
- designing access roads to promote infiltration (the main roadway within the project location will be gravel).

Open Trenches and Pile Installation

- maintaining effective ESC measures;
- minimizing the duration of time trenches remain excavated; and,
- avoiding excavation of trenches during periods of expected heavy rainfall.

Obstacles to Wildlife

- maximizing the distance of all construction equipment used from the edges of natural features;
- operating machinery in the project location only; and,
- ensuring no wildlife is trapped within the project location prior to construction of the fence

In addition to those listed above, consideration will be given to minimize or avoid construction noise and activities adjacent to amphibian breeding habitat (wetland) during the breeding season (April to June) between sunset and midnight⁸.

The Marsh Hill Solar Farm has been developed to retain the significance of all natural features identified and mitigate any effects that will occur. Of the natural features evaluated to be significant, the layout of the project will allow for the persistence of all these natural features after this project is constructed and operational.

6.3 Water Bodies

6.3.1 Existing Conditions

As outlined in Sections 30 and 31 in *Ontario Regulation 359/09*, a records review and site investigation were undertaken to fulfill the requirements of the *Water Assessment Report*. As outlined in the *Records Review*, one watercourse was mapped on Lake Simcoe Region Conservation Authority (LSRCA) Regulation mapping within the south-eastern portion of the project location and extending into the 120 metre setback area north of the project location. Site investigations revealed this stream no longer exists within the project location, and this was confirmed by LSRCA staff. Due to land restrictions, the extent of Stream 1, beyond what could be seen from the project location and within the 120 and 300 metre setback areas could not be assessed.

As shown on **Figure 3**, within 120 metres of the project location a mapped stream (Stream 2), located to the west of the project location and identified during the records review, was determined to be an intermittent stream through site investigation and therefore meets the definition of a water body under *Ontario Regulation 359/09*. This stream conveys flow from a cattail marsh west of the project location to a headwater channel of Beaver River within the northern setback. Two crossings were observed along Stream 2 for agricultural use. Several obstructions and low to no flow conditions throughout the year prevent this stream from containing fish habitat.

Three open water areas were identified within 120 metres and 300 metres of the project location through the site investigation (**Figure 4**). Within 120 metres of the project location, Open Water 1 was identified northeast of the project location. The surrounding vegetation community consists of Fresh – Moist White

⁸ Amphibian breeding occurs during evening hours when construction activities will not be occurring.

Cedar – Hardwood Mixed Woodland which prevented visual observation during site investigations. Within 300 metres of the project location, Open Water 2 and Open Water 3 were identified west and south of the project location. These features are located outside of the 120 metre setback of the project location and therefore do not require further study under *Ontario Regulation 359/09*.

For a detailed description of the water bodies within 120 metres of the project location, where access was permitted, please refer to the *Water Assessment Report*. For those features determined to meet the definition of a water body under *Ontario Regulation 359/09*, mitigation measures to minimize potential environmental effects will be implemented in accordance with Sections 39 and 40 of the Regulation.

6.3.2 Potential Effects

All potential negative effects during construction are related to site preparation and trenching and are indirect. They may include the following:

- potential for soil mobilization and erosion resulting in increased sedimentation and turbidity after site clearing;
- increased sedimentation and turbidity may affect fish habitat downstream (e.g., spawning areas, food sources; benthic composition); and,
- decreased site permeability has potential to increase amount of surface runoff.

6.3.3 Proposed Mitigation and/or Monitoring Plans

No solar panels or transformer substation will be constructed within 30 metres of a water body. Therefore, all potential negative environmental effects of the project (outlined in **Table 4**) are considered to be indirect effects associated with the drainage area for each water body. None of the project activities are expected to have any direct or indirect effect on a water body provided the appropriate mitigation measures are implemented.

To minimize the potential for impairment of the quality of receiving waters during construction, an erosion and sediment control plan will be implemented during construction. The elements of this plan, as well as other proposed mitigation measures, are as follows:

Erosion and Sediment Control (ESC)

- limiting the amount of time that bare soils are exposed;
- minimizing the removal/disturbance to vegetation adjacent to natural features;
- installing ESC measures prior to grading to prevent mobilization of sediment from the project location into the surrounding landscape;
- seeding the project location with low-growing, native vegetation post-construction;
- minimizing changes to land contours (any physical land alterations such as cut and fill that are required will be designed to remain consistent with pre-existing drainage patterns);

- installing silt fencing in areas where there is potential for run-off to the receiving water bodies (i.e. perimeter of the project location); and,
- designing access roads to promote infiltration (the roadways within the project location will be gravel).

Stormwater Management

- developing and implementing a stormwater management plan to ensure drainage patterns are not significantly altered from existing conditions due to road drainage, reduction in surface permeability, etc.; and,
- scheduling of grading to avoid times of high runoff volumes where possible (i.e. spring and fall), minimizing changes in land contours and maintaining natural drainage patterns, where possible, to address changes in overland drainage.

Open Trenches and Pile Installation

- maintaining effective ESC measures;
- minimizing duration of times trenches remain excavated;
- avoiding excavation of trenches during periods of expected heavy rainfall;
- if dewatering of trenches is necessary, directing all discharged water away from the wetland; and
- control the rate and timing of water pumping (pump water onto vegetated surfaces if possible or into temporary retention basin and, if possible, restrict groundwater taking to low flow time periods.

In addition to those listed above, consideration will be given to minimize or avoid construction noise and activities adjacent to amphibian breeding habitat (wetland) during the breeding season (April – June) between sunset and midnight.

6.4 Air, Odour and Dust

6.4.1 Existing Conditions

Based on the *Site Investigation* and Ecological Land Classification, lands within the project location for Marsh Hill Solar Farm have historically been under active agricultural production. Farming equipment such as tillage and harvesting equipment have the potential to create odour and dust during the planting and harvesting seasons. Odour may also be present if crops are sprayed with pesticides and herbicides. These activities would span over several days during the season.

6.4.2 Potential Effects

During construction, increases in particulate matter (dust) may be experienced in the immediate vicinity of the project. These adjacent lands are predominantly used for agricultural production and contain a

few residential dwellings. Activities that could produce higher levels of dust include, but are not limited to: construction of access roads; travel of construction vehicles and equipment over gravel access roads; clearing and grubbing; and grading and levelling. The majority of these dust-producing activities are expected to occur during the first two months of the construction phase. Additionally, there will be emissions (e.g. CO₂, NO_x, SO₂ and VOCs) from the diesel engines of construction machinery and equipment which will cause temporary, negative impacts to local air quality and may cause an odour nuisance in the immediate vicinity of their use. The emissions will not have an impact on regional air quality or climate change. Appropriate air quality mitigation measures will be implemented during construction to ensure limited impacts to neighbouring properties. Once operational, the renewable energy facility will not create dust, odour or emissions to air with the exception of limited vehicular travel on gravel access roads during periodic maintenance.

6.4.3 Proposed Mitigation and/or Monitoring Plans

The following air quality mitigation measures will be implemented during construction where appropriate:

- vehicle idling will be prohibited where possible;
- equipment will be maintained in good working order;
- vehicular traffic will be minimized in areas of exposed soils;
- dust-producing activities will be limited on windy days (where possible) to reduce dust deposition on neighbouring properties and natural features; and,
- gravel roads will be watered down as required during construction to reduce dust.

6.5 Noise

6.5.1 Existing Conditions

As mentioned above in **Section 6.4.1**, Marsh Hill Solar Farm is currently under agricultural production. The farming equipment used to seed and harvest the crops has the potential to create excess noise. It is estimated that tilling and/or harvesting activities occur several days over the course of the season.

6.5.2 Potential Effects

During the construction period, activities will lead to elevated levels of noise in the area. Activities that could produce higher levels of noise include, but are not limited to: clearing and grubbing of trees; compacting and grading; and driving of foundation posts for solar panel supports (if applicable). These activities are expected to occur during months 1 to 4.

6.5.3 Proposed Mitigation and/or Monitoring Plans

All efforts will be made to minimize noise during construction. The following mitigation measures will reduce the impact of noise on surrounding land uses:

- vehicle idling will be restricted, where possible;
- construction activities resulting in noise emissions will typically take place as stipulated by the Township (Monday through Friday from 7:00 A.M. until 7:00 P.M., and 8:00 A.M. to 3:00 P.M. on Saturdays), or in accordance with local municipal By-laws;
- where work may need to be conducted after the normal hours or on weekends, this will be done in accordance with local municipal requirements in order to minimize any impacts to the surrounding community;
- all equipment will be maintained in good working order with effective muffling devices where appropriate; and,
- any noise complaints will be investigated using the procedures outlined in the communications plan (see the *Design and Operations* report).

6.6 Land Use and Resources

6.6.1 Existing Conditions

The planned solar facility will occur within lands designated by the Township of Scugog as 'Rural' and has been under agricultural production of hay or row crops. Surrounding lands are also zoned as 'Rural' and are under agricultural production and contain residential dwellings. **Figure 4** depicts the land uses in the project location and within 300 metres based on information from multiple sources including Canada Land Inventory mapping and Zoning By-laws and Ecological Land Classification (ELC) surveys.

6.6.2 Potential Effects

The solar facility will temporarily alter the agricultural land use and remove approximately 36 hectares from production (the temporary construction/laydown area will be rehabilitated after construction activities have ceased and will be returned to the landowners for agricultural use). However, the entire project location will be returned to its original condition or future anticipated land use after decommissioning. The proposed project is low-profile and non-obtrusive and does not interfere with other nearby land uses. Potential environmental effects resulting from a change in land use include visual impacts to neighbouring landowners. The temporary use of the land for the solar facility will not impact future agricultural uses of the land.

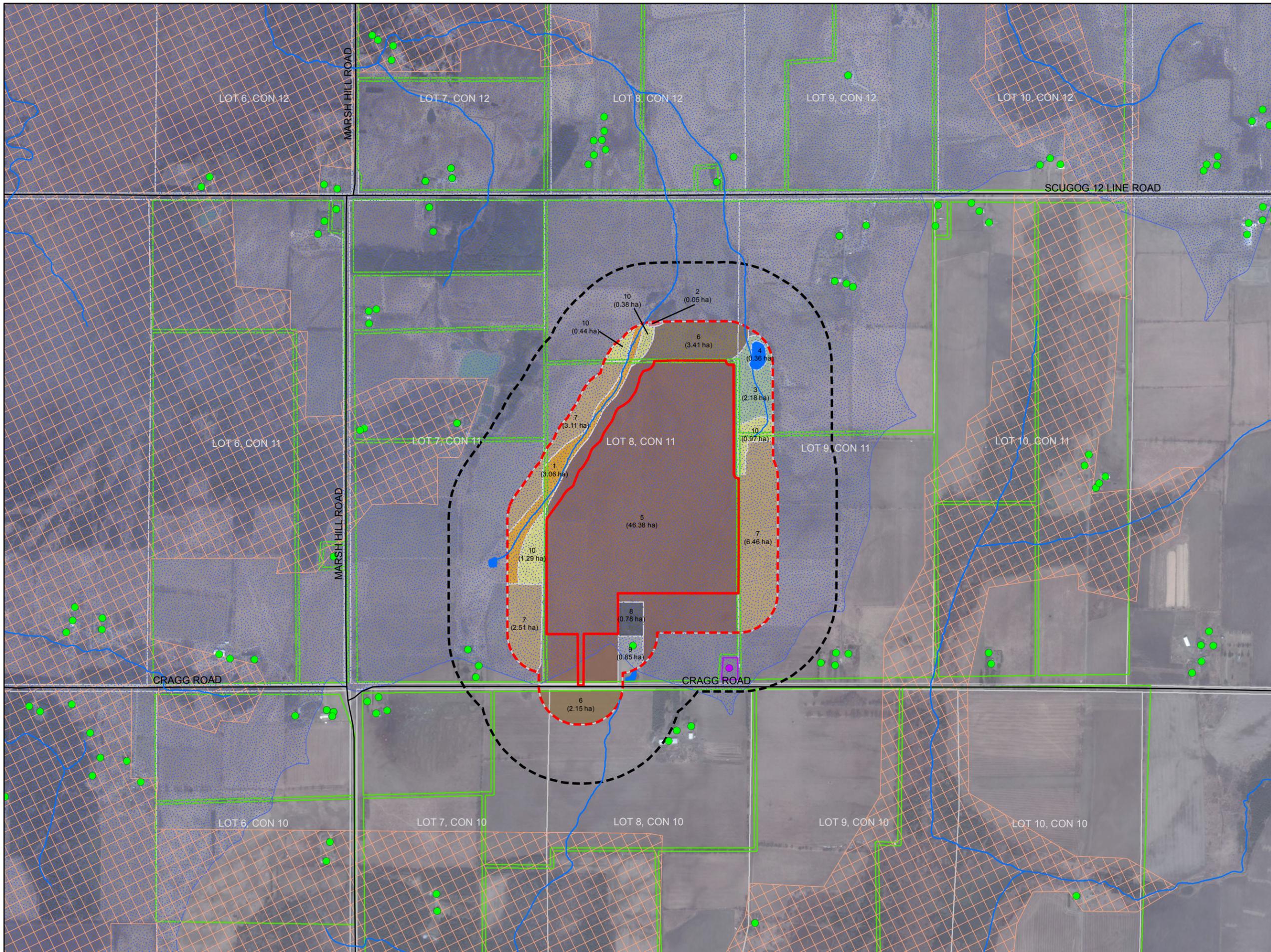
6.6.3 Proposed Mitigation and/or Monitoring Plans

Mitigation measures to address temporary changes in land use include:

- Maintaining soil nutrients through planting of a low growing native vegetation and preserving of top soil; and
- Landscaping as required to minimize view of the project location.

Marsh Hill Solar Farm

**Figure 4:
Site Plan - Land Uses**



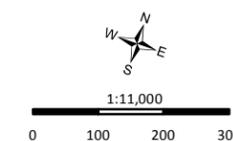
Legend

- Assumed Future Noise Receptor
- Potential Noise Receptor
- Watercourse
- Local Roads
- Project Location
- 120 m from Project Location
- 300 m from Project Location
- Vacant Parcel
- Occupied Parcel
- Lots/Concessions
- Lake Simcoe Protection Act Watershed Boundary
- Greenbelt Natural Heritage System

Ecological Land Classification

- 1) MAMM1-3: Reed Canary Grass Graminoid Mineral Meadow Marsh Type
- 2) SWM: Mixed Swamp
- 3) WOMM4-1: Fresh - Moist White Cedar - Hardwood Mixed Woodland Type
- 4) Open Aquatic
- 5) Ploughed Field
- 6) OAGM1: Annual Row Crops
- 7) OAGM2: Perennial Cover Crops
- 8) IAGM1: Agricultural Buildings
- 9) CVR_4: Rural Property
- 10) MEFM4: Fresh-Moist Forb Meadow Ecosite

Project falls within the Greenbelt Protected Countryside and is zoned as rural by the Township of Scugog



6.7 Provincial and Local Infrastructure

6.7.1 Existing Conditions

Based on information obtained from Land Information Ontario, there are no pits, quarries, petroleum tanks, water tanks, transmission lines, distribution lines, pumping, or hydro or transmission stations in the vicinity of the project location. The road network consists of local roads (Cragg Road and Marsh Hill Road) and arterial roads (Highway 7/12). The local roads are gravel roads and the arterial roads are paved with two lanes.

6.7.2 Potential Effects

Periodic traffic disruptions may occur along Cragg Road, Marsh Hill Road or Highway 7/12 during the construction phase of the project. Wear on roads may occur due to heavy and frequent construction vehicles and equipment travel. Should roads need to be upgraded to support the weight and number of construction vehicles, Solray may pay to improve the local roads, as a benefit to the community. This would be determined through preparation of a road condition report prior to construction and anything outside of normal road use will be determined between Solray and the Township.

While unlikely, the connection of the solar facility with Hydro One's existing distribution line may result in some temporary power outages of short duration to local customers. Connection to the grid has been considered under the Feed-in-Tariff (FIT) program and no negative effects are anticipated during the operational phase of the project. It may ultimately increase the reliability of electrical supply in the area.

6.7.3 Proposed Mitigation and/or Monitoring Plans

Solray will work with the municipality to develop a Road User's Agreement and which will identify how it will repair and/or compensate the municipality should wear occur to local municipal roads. A survey of existing road conditions would be undertaken prior to construction. This would serve as a benchmark for repair and/or rehabilitation after decommissioning of the facility, should it be required. Construction signage will be implemented to warn travelers of possible traffic disruption.

6.8 Public Health and Safety

6.8.1 Existing Conditions

Currently the project location for Marsh Hill Solar Farm is used for agricultural production and poses minimal risk to public health and safety. The use of heavy machinery such as tractors has a potential risk of injury or death to the operator or public, should the machinery be used on municipal roads. Additionally, any pesticides, herbicides or insecticides that may currently be used on the land have the potential to migrate into waterways and have been shown to cause illness in humans.

6.8.2 Potential Effects

Potential impacts to public health and safety are minimal but include those generally related to construction. The following potential impacts are unlikely but possible:

- Injury or death of construction workers or members of the public due to accidents involving heavy equipment and construction vehicles; and,
- fires (electrical, wildfires) at the project location causing a risk to firefighters and neighbouring properties.

It should be noted that there is limited potential for wildfires or electrical fires at the project location. The solar PV panels and related equipment represent a negligible increase in fire potential. Risk for vegetative fuel build-up is minimal (a discussion of how vegetation will be managed is provided in the *Design and Operations Report*) and will be no greater than when the land was used for agricultural purposes.

A beneficial impact of the project may be improved water quality and human health due to reduced use of pesticides, herbicides, insecticides or other chemicals that may have historically been used.

6.8.3 Proposed Mitigation and/or Monitoring Plans

Safety is a primary objective and the goal of Solray is to maintain a safe work environment for workers and the public at all times during construction. The following mitigation and monitoring activities will be implemented, as necessary, during the construction phase:

- A traffic management plan will be developed with the municipality prior to construction;
- Reduced speed limits on local roads;
- Special care will be taken with regard to school buses, pedestrians and the blind entrance to the cemetery;
- Flag person as required;
- The proponent and/or contractor will work with the local fire department to create a fire-prevention and response plan to all types of fires (this will be outlined in the ERCPs);
- Regular landscaping will ensure that there is no vegetative fuel build-up; and,
- The ERCPs will outline key contact information for emergency responders, landowners, contractors and stakeholders.

6.9 Areas Protected under Provincial Plans and Policies

6.9.1 Existing Conditions

A search and analysis of available records identified that the project location is in and adjacent to areas subject to Land Use Plans. Specifically, the project location falls within the Lake Simcoe Watershed and

Greenbelt Protected Countryside. The project location does not fall within the Niagara Escarpment or the Oak Ridges Moraine.

6.9.2 Potential Effects

No impact is expected to areas protected under provincial plans and policies. Additional environmental studies, as stipulated by *Ontario Regulation 359/09* for project locations within Plan Areas will be conducted and will consider the full intent of the Lake Simcoe Protection Plan and *Greenbelt Act* when evaluating the potential negative environmental effects as a result of the proposed project.

6.9.3 Proposed Mitigation and/or Monitoring Plans

No mitigation or monitoring plans are proposed.

6.10 Summary of Potential Environmental Effects

Table 4 outlines how any potential negative environmental effects of project construction will be mitigated and how monitoring will occur to meet the requirements set out in *Ontario Regulation 359/09*. Overall, the potential environmental effects during construction are anticipated to be short-term and indirect. For a summary of potential negative effects during the operation and decommissioning phases see Appendix D of the *Design and Operations Report*.

Table 4: Summary of Potential Environmental Effects During Construction¹

Potential Effect	Affected Feature(s) / Environmental Components	Likelihood	Magnitude	Performance Objective	Mitigation Measures	Monitoring Locations	Frequency & Duration	Contingency Measures
Cultural Heritage and Archaeological Resources								
Disruption or destruction of cultural or archaeological materials	Cultural heritage resources Archaeological resources	Low	Low	N/A	N/A	N/A	N/A	Should a previously undocumented cultural or archaeological resource be discovered, alteration of the site will immediately cease, and additional fieldwork will be undertaken by a licensed archaeologist in accordance with Section 48(1) of the <i>Ontario Heritage Act</i> . Should human remains be found, the police or regional coroner's office and the Registrar of Cemeteries will be contacted in accordance with the <i>Cemeteries Act</i> . Contact Curve Lake First Nation and Alderville First Nation immediately of any archaeological findings or burial sites.
Natural Heritage Features								
There are no direct effects on significant or non-significant natural features within 120 metres of the project location. Potential indirect effects relate to site preparation and electrical cable trenching: <ul style="list-style-type: none"> Potential for increased sedimentation and erosion on adjacent lands. Change in water quality and/or water levels. Obstacle to wildlife movement. 	Wetland 2 (assumed provincially significant) Candidate Significant Amphibian Breeding Habitat 1 & 2 Candidate Significant Bullfrog Concentration Area Candidate Significant Amphibian Movement Corridor	Low	Low	No erosion or sedimentation on adjacent lands and maintain surface water quality of wetlands and streams.	Erosion and Sediment Control (ESC) <ul style="list-style-type: none"> Minimize soil exposure Minimize the removal/disturbance to vegetation adjacent to natural features Install ESC measures prior to grading to prevent mobilization of sediment from the project location into the surrounding landscape Project location will be seeded with low-growing, native vegetation post-construction Consideration will be given to minimize or avoid construction activities adjacent to amphibian habitats between sunset and midnight during the amphibian 	Monitor ESC measures regularly during site preparation and construction. Monitor around the perimeter of the project location where ESC measures are implemented. Monitor effectiveness of stormwater management	Monitor ESC measures regularly during site preparation and construction Post-construction ESC monitoring to occur monthly or after rain events 10 mm or greater until vegetation is re-established	Repair deficiencies in ESC structures as soon as possible upon notification of breach in ESC structure or buffer fencing Appropriate restoration of wetland vegetation if a high degree of sedimentation occurs or excessive (more than 50%) vegetation mortality is observed

³ This table provides an overview of potential effects, proposed mitigation measures and monitoring. Individual reports (e.g., *Environmental Impact Study*, *Water Bodies Report*) contain additional mitigation and monitoring requirements.

Potential Effect	Affected Feature(s) / Environmental Components	Likelihood	Magnitude	Performance Objective	Mitigation Measures	Monitoring Locations	Frequency & Duration	Contingency Measures
	Woodland A Woodland B (sig.) Generalized Significant Wildlife Habitat Mixed Meadow Stream 1 Stream 2 Open Water Area 1				breeding season (April – June) <u>Stormwater Management</u> <ul style="list-style-type: none"> ▪ Develop and implement a stormwater management plan to ensure drainage patterns are not significantly altered from existing conditions due to road drainage, reduction in surface permeability, etc. ▪ Changes in overland drainage can be addressed via scheduling of grading to avoid times of high runoff volumes where possible (i.e. spring and fall), minimizing changes in land contours and maintain natural drainage patterns, where possible. Additional considerations will also be given to the following: <ul style="list-style-type: none"> ▪ Changes to land contours will be minimized; any physical land alterations (i.e., cut and fill) required will be designed to remain consistent with pre-existing drainage patterns. ▪ Silt fencing will be installed in areas where there is potential for run-off to the receiving water bodies (i.e., perimeter of the project location). ▪ Access roads have been designed to promote infiltration; the roadways within the project location will be gravel. <u>Open Trenches and Pile Installation</u> <ul style="list-style-type: none"> ▪ Maintain effective ESC measures ▪ Minimize duration of times trenches remain excavated ▪ Avoid excavation of trenches during periods of expected heavy rainfall ▪ Consideration will be given to minimize or avoid construction activities adjacent to amphibian 	measures; ensure flow is free of sedimentation. Monitor for surface water run-off flow and evidence of erosion to the features.		

Potential Effect	Affected Feature(s) / Environmental Components	Likelihood	Magnitude	Performance Objective	Mitigation Measures	Monitoring Locations	Frequency & Duration	Contingency Measures
					habitats between sunset and midnight during the amphibian breeding season (April – June) <u>Obstacles to Wildlife</u> <ul style="list-style-type: none"> Maximize the distance of all construction equipment used from the edges of natural features Operate machinery in the project location only Ensure no wildlife are trapped within the project location prior to construction of the fence Consideration will be given to minimize or avoid construction noise and activities adjacent to the wetland between sunset and midnight during the amphibian breeding season (April – June). 			
Waterbodies								
There are no direct effects on waterbodies in the study area. Potential indirect effects relate to site preparation and electrical cable trenching: <ul style="list-style-type: none"> Potential for soil mobilization and erosion resulting in increased sedimentation and turbidity after site clearing. Increased sedimentation and turbidity may affect fish habitat (e.g., spawning areas, food sources, benthic composition). Decreased site permeability has potential to increase amount of surface runoff. 	Stream 1 Stream 2 Open Water 1	Low	Low	Appropriate ESC measures are implemented prior to and during construction. All ESC controls are maintained during the construction phase.	<u>Erosion and Sediment Control (ESC)</u> <ul style="list-style-type: none"> Limit the amount of time that bare soils are exposed Minimize the removal/disturbance to vegetation adjacent to natural features Install ESC measures prior to grading to prevent mobilization of sediment from the project location into the surrounding landscape Project location will be seeded with low-growing, native vegetation post-construction Consideration will be given to minimize or avoid construction activities adjacent to amphibian habitats between sunset and midnight during the amphibian breeding season (April – June) Additional considerations will also be given to the following: <ul style="list-style-type: none"> Changes to land contours will be minimized; any physical land alterations (i.e., cut and fill) required 	At all areas where ESC controls are constructed.	Monitor ESC measures regularly during site preparation and construction. Post-construction ESC monitoring to occur monthly or after rain events 10 mm or greater until vegetation is re-established.	Repair deficiencies in ESC structures as soon as possible upon notification of breach in ESC structure and buffer fencing.

Potential Effect	Affected Feature(s) / Environmental Components	Likelihood	Magnitude	Performance Objective	Mitigation Measures	Monitoring Locations	Frequency & Duration	Contingency Measures
					<p>will be designed to remain consistent with pre-existing drainage patterns.</p> <ul style="list-style-type: none"> Silt fencing will be installed in areas where there is potential for run-off to the receiving water bodies (i.e., perimeter of the project location). Access roads have been designed to promote infiltration; the roadways within the project location will be gravel. <p>Stormwater Management</p> <ul style="list-style-type: none"> Develop and implement a stormwater management plan to ensure drainage patterns are not significantly altered from existing conditions due to road drainage, reduction in surface permeability, etc. Changes in overland drainage can be addressed via scheduling of grading to avoid times of high runoff volumes where possible (i.e. spring and fall), minimizing changes in land contours and maintain natural drainage patterns, where possible. <p>Open Trenches and Pile Installation</p> <ul style="list-style-type: none"> Maintain effective ESC measures Minimize duration of times trenches remain excavated Avoid excavation of trenches during periods of expected heavy rainfall If dewatering of trenches is necessary, direct all discharged water away from the wetland Control the rate and timing of water pumping. Pump water onto vegetated surfaces if possible or into a temporary retention basin. If possible, restrict groundwater taking to low flow time periods. 			

Potential Effect	Affected Feature(s) / Environmental Components	Likelihood	Magnitude	Performance Objective	Mitigation Measures	Monitoring Locations	Frequency & Duration	Contingency Measures
					<ul style="list-style-type: none"> Consideration will be given to minimize or avoid construction activities adjacent to amphibian habitats between sunset and midnight during the amphibian breeding season (April – June). 			
Air, Odour and Dust								
Deposition of dust on agricultural crops, sensitive natural features and adjacent properties from construction activities such as clearing, grubbing, grading and levelling.	Neighbouring land uses	Low	Low	N/A	<p>Vehicle idling will be restricted where possible. Equipment will be maintained in good working order.</p> <p>Vehicular traffic will be minimized in areas of exposed soils.</p>	N/A	N/A	N/A
Health related impacts from the release of emissions related to construction activities, such as CO, NO _x , SO ₂ and Volatile Organic Compounds (VOCs) from machinery	Construction workers Project staff Neighbouring landowners	High	Low	N/A	<p>Dust-producing activities will be limited on windy days, where possible, to reduce dust deposition on neighbouring properties.</p> <p>Gravel roads will be watered down during construction as needed to reduce dust.</p>	N/A	N/A	N/A
Odour nuisance from the operation of diesel-fuelled machinery during construction activities.	Neighbouring landowners	Low	Low	N/A		N/A	N/A	N/A
Noise								
Increased noise disturbance due to construction activities such as compacting and grading, and driving of foundation piles for solar panel supports.	Neighbouring landowners	Moderate	Low	N/A	<p>Vehicle idling will be restricted, where possible.</p> <p>Construction activities resulting in noise emissions will take place as stipulated by the Township (Monday through Friday from 7:00 am until 7:00 pm and 8:00 am to 3:00 pm on Saturdays) or in accordance with local By-laws.</p> <p>Should work need to be conducted on weekends, this work will be done in accordance with local regulations and policies to minimize disturbance to the surrounding community.</p>	N/A	N/A	N/A

Potential Effect	Affected Feature(s) / Environmental Components	Likelihood	Magnitude	Performance Objective	Mitigation Measures	Monitoring Locations	Frequency & Duration	Contingency Measures
					<p>All equipment will be maintained in good working order, with muffler devices, where appropriate.</p> <p>Any noise complaints will be investigated as discussed in the Communications Plan (see the <i>Design and Operations Report</i>).</p>			
Land Use and Resources								
Temporary removal of land from agricultural production	36 hectares of project location lands	High	Low	N/A	Soil nutrient contents will be maintained through planting of a low-growing species such as clover.	N/A	N/A	Lands will be restored to their original or future anticipated land use at the time of decommissioning.
Visual impact	Neighbouring landowners	Low	Low	N/A	Landscaping as required to minimize view of project location.	N/A	N/A	Visual impact studies will be undertaken, as required.
Provincial and Local Infrastructure								
Periodic traffic disruption during the delivery of project components	Cragg Road, Marsh Hill Road and/or Highway 7/12	Moderate	Low	Limit traffic flow disruption	Construction signage will be implemented to warn travelers of possible traffic disruption.	N/A	N/A	N/A
Damage to local roads	Cragg Road, Marsh Hill Road and/or Highway 7/12	Moderate	Low	N/A	A survey of existing road conditions would be undertaken prior to construction. This would serve as a benchmark for repair and/or rehabilitation after decommissioning of the facility, should it be required.	N/A	N/A	Solray will work with the municipality to create a Road User's Agreement, which will dictate how infrastructure will be repaired, or how the municipality will be compensated should damage occur.
Temporary power outages to local customers during commissioning of the facility	Neighbouring landowners and local community	Low	Moderate	N/A	To be undertaken by Hydro One.	N/A	N/A	N/A
Public Health and Safety								
Risks of injury or death from transport of materials on public roads	<p>Construction workers</p> <p>Neighbouring landowners and other members of the community</p>	Low	High	No injuries or deaths	<p>A traffic management plan will be developed with the municipality prior to construction</p> <p>Reduced speed limits on local roads</p> <p>Special care will be taken with regard to school buses, pedestrians and the blind entrance to the cemetery</p> <p>Flag person as required</p>	N/A	N/A	Implementation of Emergency Response and Communications Plans

Potential Effect	Affected Feature(s) / Environmental Components	Likelihood	Magnitude	Performance Objective	Mitigation Measures	Monitoring Locations	Frequency & Duration	Contingency Measures
Fires (electrical, wildfire) at the project location during construction	Construction workers	Low	Low	Minimize fire potential at project location	Solray will work with the local fire department to develop a fire prevention plan for the project location that includes the construction phase. This plan will be outlined in the Emergency Response and Communications Plans. (See the <i>Design and Operations Report</i>). The Emergency Response and Communications Plans will outline key contact information for emergency responders, landowners, contractors and stakeholders.	N/A	N/A	Implementation of Emergency Response and Communications Plans.
	Neighbouring landowners and other members of the community	Low	Low					
	Municipal firefighters	Low	Moderate					

Areas Protected Under Provincial Plans and Policies

No potential negative effects are anticipated to the Greenbelt Protected Countryside or Lake Simcoe Watershed. Additional natural environment studies, as stipulated by *Ontario Regulation 359/09* for project locations within Plan Areas will be conducted and will consider the full intent of the *Greenbelt Act* and Lake Simcoe Watershed Protection Plan.

(Sig.) – Indicates a natural heritage species that has been deemed either significant or provincially significant based on criteria from the Ministry of Natural Resources and the *Evaluation of Significance Report* as part of the *Natural Heritage Assessment*.

N/A – Not Applicable

“Assumed Provincially Significant” Applicants proposing to develop a renewable energy project within 120 metres of an unevaluated wetland can assume the wetland is provincially significant and can do a rapid assessment of the wetland in the *Natural Heritage Assessment Evaluation of Significance Report*. Mitigation measures to protect the wetland from negative environmental effects associated within development are outlined in the *Natural Heritage Assessment Environmental Impact Study*.

“Candidate Significant” – Wildlife habitat can be treated as significant in the *Natural Heritage Assessment Evaluation of Significance Report* if targeted field studies have not yet occurred (due to seasonality). Targeted wildlife habitat studies will be done prior to the start of construction, as committed to in the *Natural Heritage Assessment Environmental Impact Study Report*, and the habitats will then be evaluated for significance.

7.0 SUMMARY AND CONCLUSIONS

This *Construction Plan Report* has been completed to fulfill regulatory requirements as mandated by the provincial government for the development of the Marsh Hill Solar Farm. This report is consistent with the provisions of *Ontario Regulation 359/09* for a Class 3 Solar Facility as set out by the *Green Energy and Green Economy Act (2009)*.

Fieldwork and data collection were performed at the project location to assist in the determination of potential construction effects to environmental and social features. Various mitigation measures to manage these potential effects have been identified. Significant adverse effects from construction activities to the natural and social environment will be avoided through careful facility layout planning, the application of appropriate mitigation measures, and adherence to all regulatory requirements.

The overall conclusion of this *Construction Plan Report* is that Marsh Hill Solar Farm can be constructed without any significant adverse residual effects to the natural or social environments.