Canadian Solar Developers Ltd.

Draft Design and Operations Report

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Project Name
Draft Design and Operations Report
Proposed Groundmount Solar Facility L.P #1
9307 Union Drive, Strathroy, ON
OPA FIT Program: FIT-FEU6UX3I

Project Number
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Canadian Solar Developers Ltd.

Draft Design and Operations Report

Prepared for:

Canadian Solar Developers Ltd.

Ground Mount Solar PV Power Project – L.P #1

August 10, 2012

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Revision History

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1.0	August 10, 2012	Municipality of Strathroy-Caradoc
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Executive Summary

Canadian Solar Developers Ltd. is the proponent for the development of a 100 kilowatt solar power project in the Municipality of Strathroy-Caradoc at 9307 Union Drive. An application has been made for the site L.P#1 and a file opened under the OPA FIT Program (FIT-FE6UX3I). **Exp** Services Inc is completing all REA-related reports and will be representing Canadian Solar Developers Ltd during the application and approval process.

The Design and Operations Report (DOR) has been prepared as part of an application for a Class 3 Solar Facility under O.Reg.359/09 Renewable Energy Approval (REA) under Part V.0.1 of the Ontario Environmental Protection Act as amended by O.Reg. 521/10 and O.Reg. 231/11.

This report follows the protocols and procedures set out for REA projects. A detailed Facility Site Plan, Facility Design Plan, Facility Operational Plan, and Environmental Effects Monitoring Plan has been prepared. In addition, an outline specifying the requirements for an Emergency Response Plan with an Emergency Communications Plan to facilitate the municipal ERP has been presented.

The site plan shows the layout of the solar array field, the associated electrical components, topographical features and other amenities within the study area. This layout has been designed to minimize the footprint and the potential environmental effects, yet maximize the system capability for power generation. The setting is an actively cultivated farm field next to a farmyard.

The DOR is supported by several background studies that have assessed the potential impacts of the proposed works on the environment / natural heritage, as well as other social and cultural aspects of the site. The environmental impacts during the construction, operation and decommissioning phases have been determined to be able to be mitigated and/or manageable. There are no provincial parks, ANSIs or water bodies within 120 metres of the proposed solar array field. There is a natural feature (woodland) which is outside the prescribed limit. The Project will not impact this feature. The acoustical assessment determined that all MOE requirements are met or exceeded. The Stage 1 archaeological property inspection exhibited archaeological potential. A Stage 2 archaeological field inspection has been undertaken and found artefacts of low heritage cultural value. A cultural heritage self assessment was conducted and indicated that there was potential for heritage resources at the project location. A cultural heritage impact assessment has been completed. The solar array development was determined to have no negative impact on the property. Neither the surface water nor groundwater is impacted by the development. There is no requirement to change the Land Use for the Project. Post-decommissioning, the land can revert back to its agricultural usage.

The solar facility relies on sunshine to produce electricity and therefore operates only during daylight hours. It will operate year-round. A schedule of inspection, maintenance and repair has been set out. No security measures are proposed.

An outline for an Emergency Response Plan (ERP) along with an Emergency Communications Plan has been noted. Key contact information for early responders (police, ambulance and fire) will be identified in addition to coordination requirements with the local municipality or other designated agency. An ERP will be prepared and formalized with the local authorities.

Regular contact with stakeholders apprising them of the Project status and a public consultation protocol for all future phases has been identified. This includes mail outs as required, notices in local newspapers, and public information meetings.

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1. Introduction

As part of an application for a Renewable Energy Approval (REA) from the Ontario Ministry of Environment (MOE), any renewal energy projects are required to submit a Design and Operations Report (DOR). The DOR is prepared in accordance with the March 1, 2010 draft of Technical Bulletin Two: Chapter 6, Guidance for preparing the Design and Operations Report as part of an application under O.Reg.359/09 Renewable Energy Approval (REA) under Part V.0.1 of the Ontario Environmental Protection Act as amended by O.Reg. 521/10 and O.Reg. 231/11. This report describes the project activities to be undertaken during the permanent facility construction and their operation, and discusses the potential for environmental effects within 300 metres of the project location. This DOR is to be consistent with information presented in the Project Description Report, and will address and describe the following in relation to the proposed solar power project:

- Detailed Site Plan
- Facility Design Plan
- Facility Operational Plan
- Environmental Effects Mitigation and Monitoring Plan
- Emergency Response Plan and Emergency Communications Plan (from construction to and including decommissioning)

A Project Description Report for the Ground Mount Solar PV Power Project – L.P #1 was prepared on November 16th, 2011, and was available for viewing at the proponent's website (www.futuresolardevelopments.com). An application has been made for the site L.P#1 and a file opened under the OPA FIT Program (FIT-FE6UX3I).

2. General Information

2.1 Project Name, Applicant and Location

The proposed solar power project is named Ground Mount Solar PV Power Project – LP #1 (the Project). It is being initiated by Canadian Solar Developers Ltd., based in Barrie, Ontario. **Exp** Services Inc is completing all REA-related reports and will be representing Canadian Solar Developers Ltd during the application and approval process.

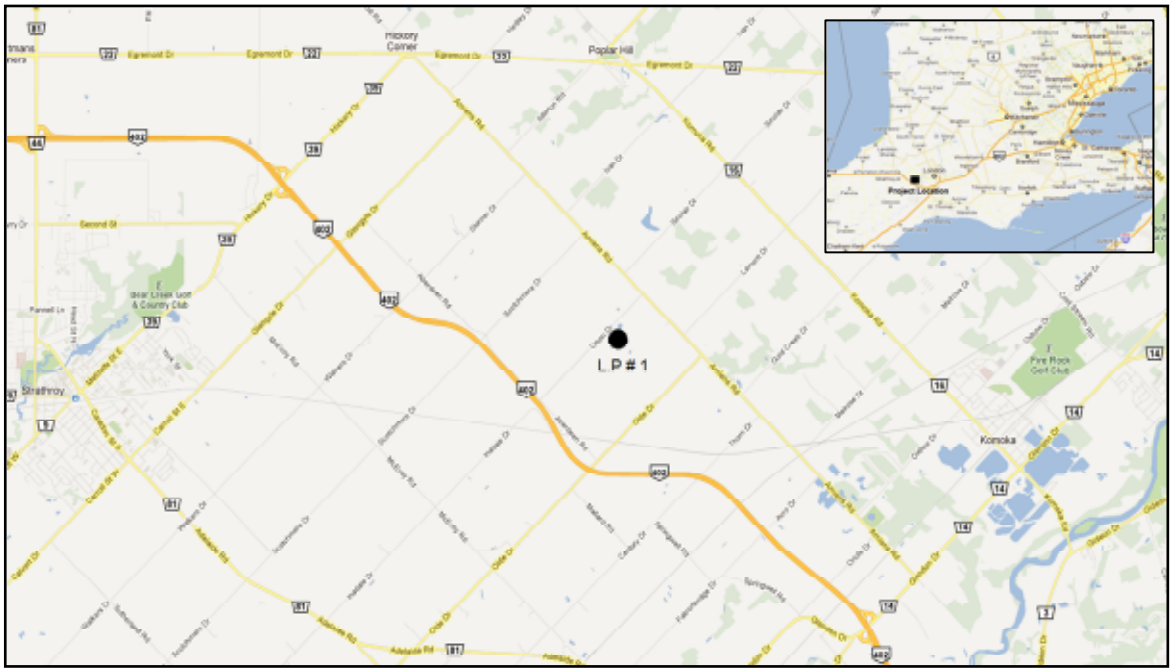
The Project is located in the Municipality of Strathroy-Caradoc, and is approximately 25 km west of the City of London. The project address is L.P #1 9307 Union Drive, Strathroy-Caradoc, Ontario, N0L 1W0. The Project area and local road maps are illustrated in Figures 1 and 2.

The closest arterial road is Highway No. 402. To drive to the site, take the Glendon Drive (Road #14) exit east 1 km to Amiens Road. Go north on Amiens Road 6.5 km to Union Drive. Travel west on Union Drive 0.8 km to the farm entrance on the south side.

The solar array is located in a cultivated field and is situated to the south of and abuts the farmyard. Access can be gained to the site through the farmyard. To the east of the solar array site is Gold Creek, a tributary to the East Sydenham River. The land is gently sloping westward.

Figure 1: Aerial Photo of the Project Location

Figure 2: Project Location Road Map



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The project website and electronic copies of this Design and Operations Report (DOR) and supporting documents are available at: www.futuresolardevelopments.com/projects.

2.2 Energy Source, Nameplate Capacity and Class of Facility

The project will consist of a ground mounted, solar panel array used to convert solar energy into electricity using photovoltaic panels (PV). The maximum name plate capacity will be 100 kW. The facility is classified as a Class 3 solar facility. The electricity generated will be connected to the electrical distribution system of Hydro One Networks Inc.

2.3 Other Approvals and Consultation

The project has received the Feed-In-Tariff (FIT) approval. A contract between Canadian Solar and the Ontario Power Authority (OPA) for the sale of electricity generated by this renewable facility under the FIT program has been received. Permits are being obtained as necessary from the Municipality of Strathroy-Caradoc for temporary and permanent works and any service installation within their road right-of-way. The draft Design and Operations Report is being made available for public review and comment to the requirements of O.Reg. 359/09 prior to final REA submission to the Ontario Ministry of Environment (MOE).

Other consultation that has been or will be undertaken as the project progresses is as follows:

- Complete First Nation and Aboriginal consultation.
- Meet with Ontario Ministry of Natural Resources (MNR) to discuss the natural heritage features and confirm requirements, review results and then obtain a letter confirming their agreement with methodology and results (underway).
- Complete consultation with the Municipality of Strathroy-Caradoc, and any service boards in accordance with the consultation form provided by MOE (pending).
- Determine which natural heritage features are within the setbacks identified in Ontario Regulation 359/09 and complete site investigations, if required (underway).
- Complete a public consultation process including the first and second public information session in the area of the project (pending).

2.3.1 Stakeholder and Public Communications – Design Phase

Public consultation and stakeholder engagement activities will continue through all phases of the Project. The contact list identified during the first public information meeting for the Project Description Report will be updated. The stakeholders including regulatory agencies,

landowners, Aboriginal communities and other interested parties will be notified of upcoming meetings through newspaper advertisements and direct letters where required. In addition, reports and other key documents will be made available on the proponent's website (www.futuresolardevelopments.com). The following communications / consultation is being presently planned:

- Publish second newspaper notice announcing the second public meeting;
- Hold second public meeting;
- Post final copies of REA application (including study reports) on the proponent's website;
- Provide notice of application to MOE and posting this on the EBR;
- Assimilate and respond to communications received from the agencies and public throughout the MOE technical review;
- Formalize the completion of the MOE review and the related Notice to Proceed by placing a notice on the proponent website;
- Identify construction dates on the proponent website; and
- Maintain communications with public through periodic updates of work progress on the proponent website and direct communications as required.

Communications received during the REA process and prior to submission to the MOE will be formally documented (typically electronically) and made part of the submission package for the REA regarding project consultation. Communications received after the MOE submission and prior to application approval will similarly be documented and provided as an addendum. Responses will be formalized and provided in a timely manner.

2.3.2 Public Communications – Construction, Operation and Decommission Phases

Public and stakeholder consultation will continue during the construction, operation and decommission phases. The stakeholder contact will likely be to apprise the parties of the status of the work and emergency issues.

The public may have specific concerns and/or incidents that require a response. A formal approach will be taken to document and address these communications, including:

- Noting name and address of party and other relevant contact information;
- Documenting time and date of contact;
- Identifying nature of issue and whether a formal response is required;
- Responding directly to the party related to the issue or concern and documenting; and
- Following-up further as deemed necessary.

2.4 Supporting Documentation

Supporting documentation of the draft Design and Operations Report includes:

- Project Description Report (PDR);
- Construction Plan Report (CPR);

- Decommissioning Plan Report DPR);
- Acoustic Assessment Report (Noise);
- Natural Heritage Assessment Record Review Report;
- Natural Heritage Site Investigation Report;
- Water Assessment Records Review Report;
- Water Assessment Site Investigation Report;
- Cultural Heritage Impact Assessment; and
- Archaeological Assessment Reports (Stages 1 and 2).

2.5 Land Ownership

Canadian Solar Developers Ltd. has entered into a long term lease agreement with the landowner.

3. Facility Site Plan

The facility is located at 9307 Union Drive in the Municipality of Strathroy-Caradoc, Ontario, west of Amiens Road and south of Union Drive. The solar equipment is to be located to the south of the existing property buildings (see Site Plan, Appendix 1).

3.1 Buildings and Structures

There are no new buildings associated with the facility. Presently, an existing building is used for the farm power supply main switchboard. This building will contain the revenue meter. The transformer that services the farm will be used for the feeder to the power line on Union Drive. Electrical structures will be situated in a small area north of the array panels and consist of an inverter and weatherproof enclosure with station service, disconnect switch and splitter.

3.2 Roads and Access

The farmyard entrance off Union Drive and gravel laneway extending to the back of the yard will be used for the site access for all construction equipment. It is a short distance (10m) from the yard to the limit of the solar array. The existing yard can be used as a staging area. No heavy equipment is envisioned for the solar array assembly. As the site is located in an active farm field, there are no trees or shrubs in the work area. Topsoil will be stripped at the access to and in the area of the electrical system (combiners, inverters, station service disconnect switch and splitter). A small dozer can remove the topsoil and stockpile it in a ridge along the northerly limit of the site. The stockpile will be placed as not to restrict surface drainage. A gravel base approximately 0.25m thick will be placed for the access road (5 metres wide) and at the area for the electrical equipment.

3.3 Groundwater and Surface Water

The site is situated to the south of the farmyard and is near the crest of a small local topographic high. The predominant drainage pattern is to the west away from the watercourse (Gold Creek) which is situated approximately 120 metres to the east. A borehole was placed at the development site as part of the geotechnical investigation. No monitoring well was installed.

Wet soil conditions were identified at a 4.6 metre depth in a zone of silty sand. The Preliminary Geotechnical Investigation report concluded that there would be no major groundwater problems for construction.

The footprint of the array and associated works is 0.35 ha. The array sheds precipitation to the ground below. The existing topography is not being changed as no grading of the site is planned. A review of existing residential wells in the area was not undertaken. No impact is envisaged to the water balance of infiltration and runoff. Due to the estimated minimal impact on the water balance, a hydrogeotechnical study does not need to be undertaken.

The Natural Heritage report noted that there were several locally significant wetland complexes in the general area of the array field. The development of the site is not anticipated to impact these wetland complexes.

3.4 Stormwater Facilities

The access to the site is at an existing entrance on Union Drive and through a developed farmyard. No constructed works to address surface drainage (ditches and culverts) are required. Precipitation falling on the solar panels is not impacted environmentally. This runoff does not need to be collected for treatment at a stormwater facility. The site is being vegetated with a low maintenance ground cover including any topsoil stockpile. The access to the array will be gravelled. Site erosion will not be an issue.

3.5 Archaeology, Cultural Heritage, Natural Heritage and Water Bodies

A Stage 1 archaeological assessment study has been undertaken by a licensed archaeologist and was conducted in accordance with the Ontario Heritage Act and using the Ministry of Tourism and Sport's Draft Standards and Guidelines for Consultant Archaeologists (2011). The reports are being submitted to the Ministry of Tourism, Culture and Sports. The Stage 1 archaeological property inspection exhibited archaeological potential. A Stage 2 inspection consisting of a combination of pedestrian survey of all ploughable lands and test pits in areas where ploughing is not feasible has been undertaken. The artefacts found were determined to have low cultural heritage value and no further work was recommended. This recommendation is subject to MTCS approval.

A cultural heritage self-assessment was completed for this site, which included correspondence with the local municipality and online heritage-related searches. The self-assessment indicated that, because the site contains a structure more than 40 years old, there is potential for heritage resources at the project location. A cultural heritage impact assessment has been undertaken.. Appendix 3 presents the completed self-assessment form, correspondence with the municipality, and results of online searches. The proposed solar array development was determined to not have any negative impact on the farmhouse, bank barn or any of the cultural heritage attributes associated with the subject property.

The Natural Heritage report, from a review of OMNR Records, noted that natural features were present in the immediate area. A part of the Gold Creek locally significant wetland complex has two (2) wetland communities on the property; one (1) community is located 120 metres away and the other is 220 metres away. A third community is located adjacent the rear of the property approximately 400 metres from the site. These wetland areas are not categorised as ANSIs. Woodlands are present along the watercourse. There are no significant water bodies within the development setback of 120 metres of the array field. A site investigation was undertaken to verify the delineation of the boundary of the woodland natural feature. The layout

for the array field is outside the 120 metre setback requirement of this natural feature. The development of the site is not anticipated to impact these wetland complexes. The Natural Heritage Site Investigation concluded, with the present site disturbance, that no further studies are required.

3.6 Land Use and Land Use Plans

The surrounding land use to the south, north and west is designated as General Agriculture (A1). To the northeast, there are areas of General Agriculture as well as areas of Environmental Protection (EP). A zoning map has been included in Appendix 1. Given the existing Project site land use, and the land use in the surrounding area, the Project is considered to be in a rural environment. The solar facility is situated in an actively farmed field.

3.7 Transformer

The present farm operation relies on the HONI M24 feeder service from Longwood Station. There is an existing 3 phase 16/27.6 kV transformer on a hydro pole at Union Drive with an overhead power line leading to a farm building within the property. This transformer reduces the voltage to 347/600V for farm usage. It will be used for the power feed from the solar array into the power line on Union Drive.

3.8 Noise Receptors

An Acoustic Assessment Report has been prepared for L.P #1. The noise assessment conducted was based on MOE guidance documentation ("Basic Comprehensive Certificates of Approval (Air) – User Guide", MOE, 2004).The study focused on the potential environmental noise producers, being the transformer and the inverter. The critical noise receptors (points of reception – POR) within 1 km of the site were identified as permanent residences. As the area is zoned agriculture, new development and hence future PORs within the environmental zone were not considered. In addition to project L.P #1, a similar project (L.P #7) by Canadian Solar Developers is proposed for 9274 Union Drive which is in the immediate area of this Project and situated north of Union Drive. As these projects have the potential to impact on coincident points of reception the potential noise impact of both projects operating simultaneously has been assessed within the Acoustic Assessment report.

The operating load and hence ambient noise production of the transformer and inverter is at its greatest during daylight hours when the solar panels are receiving maximum sunlight. For the noise evaluation, it was assumed that full power production was being produced continuously (24 hours). As the calculated worst predictable case noise impacts are significantly lower than the applicable MOE exclusionary limits of 45 / 40 / 40 dBA for daytime / evening /nighttime periods respectively, it was concluded that the proposed facility would be in compliance with MOE noise criteria.

4. Facility Design Plan

The components of the solar array facility will be operated and maintained for the life of the project. Manufacturer technical component data sheets are provided in Appendix 2 for the main electrical items of the facility.

As noted in Section 3, Site Plan, the site access makes use of an existing farm entrance off Union Drive. The site does not require any special grading other than for a small length of

access road. No drainage or stormwater management facilities are required. Although the operation of the solar facility will produce some environmental noise, it has been determined that the noise level will not impact residents (PORs) identified within the study area. No noise barriers or other containment will be required. The solar facility will not generate air emissions or sewage, or discharge any air contaminants. No fencing of the electrical works is planned.

4.1 Facility Components

The solar facility will consist of ground mounted solar panels, transformer (existing), and direct buried cable to an existing overhead service which connects this facility to the feeder line at Union Drive (see Site Plan, Appendix 1). Table 1 below summarizes the facility components and their operational details.

Table 1: Facility Specifications and Details

Specification	Details
Generator connection	Three Phase
Connection point type and name	Feeder, M24
Connection point location	Latitude: 42.964 Longitude: -81.515
Connection voltage level	16 kV
Name of transformer station near feeder	Longwood TS
Nearest roads	Union Drive
Distribution lines, poles, support structures	Existing Overhead Connection to Feeder at Union Drive
Solar Array	Panel Type – Canadian Solar CS6P-230 Frame & Mounting – UNIRAC ISYS Ground System with concrete block pedestals
Transformers	Existing 16/27.6 kV three phase
Other electrical conversion, metering and protection equipment	100kW, 600V 3 phase Satcom Inverter; NEMA 3 weatherproof enclosure with station service, disconnect switch, splitter; revenue meter; HV Interrupter & Isolation Switch (existing)

4.1.1 Solar Modules / Array and Mounting System

The solar electric generating facility consists of 507 modules of photovoltaic (PV) panels in strings of 13 modules installed on a fixed racking structure. Solar panels typically produce between 200 and 300 watts of direct current (DC) electricity. It is anticipated that the supplier of the panels will be Canadian Solar and the panel model will be CSP-230, which produces 230 watts (Appendix 2). These panels may come to the site partially pre-assembled.

The panels will be mounted on a rigid racking frame of strings in 5 and 6 rows (to create an array) with the rows facing due south to maximize the sun exposure. The frame is set off the

ground approximately 0.3 to 0.5 metres using concrete blocks. This ensures there is no interference of sunlight reaching the solar panel by the vegetation. These blocks secure the array to the ground to address wind loads. Each racking frame is separated by a distance of 3 metres to aid in assembly and maintenance. A typical manufacturer / supplier of frame and mounting equipment is UNIRAC and their ISYS Ground System (Appendix 2). The design of the frame will be based on the final layout of the panel arrays and foundation support and anchorage. The mounting frame will be designed and produced under the direction of the contractor. The contractor will assemble the frame on site.

The foundation supports are based on a ground mount system and will consist of concrete blocks approximately 0.5m in diameter and 0.3m high with a steel plate mounted to threaded rods cast into the concrete. The plate will be able to be adjusted to provide a level and/or inclined plane as necessary for the frame installation. These blocks will be produced by a concrete manufacturer under the direction of the contractor. There will be approximately 30 supports per assembled unit (13 panels per row / 5 to 6 rows). It is envisaged that the supports will be placed on the grassed surface as the bearing pressure of the concrete block is minimal. The geotechnical report notes that the topsoil should be stripped to the subsoil. Should the design of the foundation supports result in a significantly larger block, the requirements of the geotechnical report will be followed. Similarly, should the contractor prefer an alternate system such as a screw mount anchor, the soil conditions noted and the design parameters set out in the Preliminary Geotechnical Investigation report will be followed.

4.1.2 Inverters, Transformers and Electrical Collection System

Direct current (DC) electricity generated from each panel is transmitted through interconnecting panel wiring in each string to a combiner box. The five Satcom Smart Combiners or equivalent (Appendix 2) will be situated next to the north limit of the solar array.

The DC electricity is directed through an underground cable from each Combiner to an inverter that converts the DC current to 3 phase alternating current (AC). The Satcom Inverter (Appendix 2) will provide 100 kW, 600V three phase electricity, which is the same as the service feed to the farm. The Inverter will be located in the immediate area of the solar array. The electricity is then fed to a weatherproof enclosure (NEMA 3R) housing the station service disconnect switch and splitter. This steel box will be mounted on a concrete pad resting on a gravel base near the Inverter. The underground cable to the existing building that has the farm electrical meter will be installed either using directional drilling or trenched depending on its final layout location. At the point of connection at this farm building, the main switchboard and revenue meter will be mounted and connected to a disconnect switch. The high voltage (HV) interrupter and isolation switch exist presently by the pole mounted transformer at Union Drive.

There is no new transformer required at L.P #1. The Inverter brings the electrical current to the same phase and voltage as that supplied to the farm from the HONI M24 power system.

4.1.3 Temporary Construction Activities

Arrangements will be made with the farmer to take off any crop prior to construction and plough and till the field in preparation for seeding of ground cover (see section 4.3 Landscape Plan). There will be no stripping of topsoil or grading of sub-soils in the area of the solar array.

All landmarks, access roads, transmission cables and construction area boundaries will be identified and marked using surveying equipment and tied to UTM coordinates. Locates for underground utilities will be requested. Buried infrastructure, such as gas lines and electrical

and communication cables within the farmyard will also be located and marked. The work area will be laid out with tall wood stakes set at the corners.

Site preparation will include system component layout, creating access points for installing foundation supports, frames and panels, identifying and preparing the route for the electrical installations and any other features required for construction of the facility. The aboveground electrical components will be installed at the north limit of the solar array. The electrical service connection will be buried within the farmyard and markers placed to identify the cable location. All materials will be trucked to site on flat bed trailers.

The entrance off Union Drive and gravel laneway extending to the back of the farmyard will be used for the site access for all construction equipment. It is a short distance (10m) from the yard to the limit of the array. The site access will be constructed with a gravel base, including at the north end of the array field where the electrical components are situated. The existing farmyard can be used as a temporary staging area. No heavy equipment is envisaged for the solar array assembly. For construction, service and decommissioning, a working area of 5m to 10m will be taken around the perimeter of the array field. This area will be kept grassed. For operation and maintenance, vehicles can use the constructed access.

Once construction has been completed, all construction equipment and vehicles will be removed from the site. Debris and waste will be collected and disposed of at an approved location. Where possible, materials such as gravel will be diverted from landfill and be recycled. Topsoil that has been stockpiled will be stabilized by seeding with a native grass. Any gravel surface will be bladed with a cross fall to not impede surface drainage. Disturbed areas will be seeded by broadcasting as necessary.

4.2 Water Assessment

Section 3.3 described the groundwater and surface water at the Project site and stated that there would be no impact to the water balance of infiltration and runoff. No scheduled cleaning of the solar panel is undertaken nor are there any site water supply and waste facilities planned. The surface drainage / topography of the site is generally not changed. Runoff (sheet flow) is not impeded. The solar panels direct precipitation to the ground surface. The environmental `water' footprint of the solar array field is related to the foundation supports. It is estimated that these supports equate to approximately 2% of the surface area of the array field. The impact on infiltration would not be measurable. Further, the proposed vegetation will capture runoff to a greater degree and enhance infiltration. The access to the array field is gravel which is generally placed to the same depth as the topsoil. The gravel is semi-pervious and could be considered to have the same permeability as the topsoil. The materials identified for the design and the construction methodology will not have a demand on the local water resources, and will not impact the groundwater.

4.3 Landscape Plan

The existing site is an actively farmed field. There is no permanent vegetation (trees) in the area that will be impacted by the temporary and permanent works. A detailed landscaping plan is not considered necessary. The ground at the site will be tilled and be mechanically seeded with a low maintenance short native grass prior to construction and the seed allowed to germinate. Construction activities will take place on this hardy vegetation.

5. Facility Operational Plan

The solar panels are unattended electricity producing units. They operate year round (365 days a year), given adequate sun exposure. Therefore, operational hours depend on the length of day, which varies throughout the year.

5.1 Equipment Operation and Maintenance

The site will require periodic inspection possibly monthly by a trained technician. This will be undertaken in daylight hours. The system will have remote monitoring capabiity to indicate loss of performance (power production). Periodic maintenance will likely take place quarterly. This will require repairs to or replacement of electrical components, confirming electrical connections are sound, and replacing photovoltaic panels as necessary. The transformer will be checked for leaks and repaired immediately. Adjustments to the elevation of the support frame may need to be made as a result of soil movement (settlement). Cleaning of the panel is generally not required. The system self monitors and identifies any issues with the solar panels as a result of lost electrical production. There will be no cutting of the vegetation although higher vegetation such as weeds will be removed. Any erosion points will be addressed by placing topsoil and seed. Should the potential for more severe erosion be present, bio-filter socks (organic media in a bio-degradable filter tube) with seed can be installed at areas of concentrated flow.

The system is self-contained. There will be no hazardous materials stored on site. Pull sheets of the various electrical components will be stored on site at the meter location along with a data log record of inspection and maintenance. The local utility and other governing bodies will be apprised of the status of the site.

5.2 Post - Installation Activities

All decommissioning and restoration activities will adhere to provincial, federal and municipal requirements and permits. The decommissioning and restoration process will comprise the following:

- Removal of ground structures including all gravel;
- Removal of below ground structures;
- Replacement of topsoil to bring the site back to pre-construction condition.

Materials will be salvaged and recycled to the greatest extent possible.

6. Environmental Effects Monitoring Plan (EEMP)

The Ministry of Environment has released a draft Technical Bulletin for Preparing the Design and Operations Report which sets out the requirement that the environmental effects monitoring plan show how the negative environmental effects will be mitigated and monitored to comply with O. Reg. 359/09.

The Technical Bulletin notes that:

- A summary of all potential negative environmental effects caused by the project as given in the description of negative environmental effects in the Project Description Report be provided.

- For each potential negative effect, performance objectives are to be stated where possible such that in achieving the objective the negative environmental effect will be mitigated.
- A description of all mitigation strategies planned to achieve performance objectives be identified.
- If there is an on-going risk of potential negative environmental effects, a description be included as to how the project will be monitored to ensure that mitigation strategies are meeting performance objectives.
- Contingency measures are to be provided should monitoring reveal that negative effects are continuing to occur.

The EEMP is to:

- Provide instruction regarding measures to protect the environment and minimize the potential negative environmental effects;
- Document environmental concerns along with protection / mitigation measures and strategies;
- Identify monitoring activities; and
- Be kept current and be updated through all phases of the work.

Given the nature of solar power generation, few if any effects are expected during the operations period. The associated Project reports for the L.P #1 solar array facility have documented and studied the potential environmental effects of construction activities and system operations within their respective geographical area. The construction of the proposed Project could impact the environment relating to: topography, soils, surface water, groundwater, aquatic habitats/biota, vegetation, terrestrial wildlife and air quality. In addition to this, certain social environments and cultural features could be affected, and are not limited to: local traffic, municipal roadways, public safety, sound levels, land use, archaeological resources and cultural heritage resources.

The potential negative environmental effects for each component are further summarized in Table 2, along with performance objectives, mitigation strategies, residual and long term effects that may occur, and a monitoring plan for each environmental component.

Table 2: Environmental and Social Effects Summary

Component		Potential Negative Effect	Performance Objectives	Mitigation Strategy/ Measures	Residual Effects	Monitoring Plan/ Contingency Measures
Natural Environment	Topography	During construction, grading and minor alteration to topography could occur	Minimize change to site topography	Disturbed areas will be re-graded to match surrounding topography as closely as possible	Minor long term topographical changes may occur as a result of construction	No monitoring plan required / No contingency measures required.
	Soils	Soil compaction, erosion, loss of quality as a result of accidental spills during construction	Minimize soil disturbance; no long-term increase in erosion beyond existing conditions; no long-term environmental effects due to toxic spills	Use construction best management practices & mitigation measures.	No residual effects if proper mitigation is implemented.	Daily equipment inspection during construction; Report spills to MOE Spills Action Centre; containment; Monthly site inspection of site conditions / Undertake repairs immediately
	Surface Water	As a result of construction, water turbidity could increase, along with contamination from spills	No long-term increase in runoff turbidity; no long-term environmental effect due to toxic spills	The solar array will be minimum 120m from any surface water. Sediment filtration measures will be used during construction. Soil erosion will be repaired.	No residual effects if proper mitigation is implemented.	Check condition of vegetation monthly during growing season; look for soil erosion / Undertake repairs immediately.
	Groundwater	May be contaminated by accidental spills during construction.	No long-term environmental effect due to toxic spills; minimize infiltration loss	Spill prevention and response measures will be implemented through the life of the Project.	No residual effects if proper mitigation is implemented.	Daily equipment inspection during construction / Reporting spills to MOE Spills Action Centre; containment.
	Aquatic Habitat/Biota	Potential negative effects due to construction and site alteration	No long-term environmental effect due to construction and site alteration	The solar panel will be at least120m from any aquatic feature or habitat	No residual effects if proper mitigation is implemented.	Check condition of vegetation monthly during growing season; look for soil erosion / Undertake repairs immediately.
	Vegetation	While the project area is already cleared, some vegetation clearing could occur.	Minimize impact to existing vegetation during construction; site restoration to be compatible with existing land usage and vegetation	Clearing will be kept at a minimum and not extend beyond the construction perimeter. Replanting native species after construction.	No residual effects if proper mitigation is implemented.	Check condition of vegetation monthly during growing season; look for soil erosion / Undertake repairs immediately.

Component		Potential Negative Effect	Performance Objectives	Mitigation Strategy/ Measures	Residual Effects	Monitoring Plan/ Contingency Measures
	Terrestrial Wildlife	Loss of wildlife and wildlife habitat could occur during construction.	No long-term environmental effect due to construction and site alteration	Wildlife habitat clearing will be kept at a minimum. Best management practices with respect to work during breeding seasons will be implemented.	Some disturbance of wildlife will occur during construction and operation.	Check for nesting activities during maintenance; avoid disturbance / No contingency plan required.
	Air Quality	Construction vehicles will cause reductions in air quality. Dust and emissions will increase during construction.	No long-term environmental effect due to construction and site alteration	The use of standard construction best management practices and mitigation measures will be implemented to reduce dust.	No residual effects if proper construction standards are followed.	No monitoring plan required / Discuss operational mitigation strategies during construction meetings.
Social Environment	Local Traffic	May increase due to construction vehicles. Temporary distributions in traffic routes and delays will occur during construction.	Elimination of risk to public	Effects will be minimized by designating and preparing transportation routes and facilitating traffic flows when necessary.	No residual effects if proper mitigation is implemented.	No monitoring plan required / Respond to any complaints and modify construction traffic where possible.
	Municipal Roadways	Damage to roads near the construction site could occur.	Elimination of risk to public	Any damage will be remediated to the satisfaction of the municipality.	No residual effects if proper mitigation is implemented.	Monitor haul roads daily / Notify municipality immediately.
	Public Safety	Construction will pose risk to the community and workforce.	Elimination of risk to public	Proper provincial and federal safety procedures will be adhered to during all phases of the project.	No residual effects if proper mitigation is implemented.	No monitoring plan required / Record any accidents and notify MOL.
	Waste Management and Disposal Sites	Construction will generate construction waste, hazardous waste and sanitary waste.	Maximize recycling potential of construction materials; hazardous and sanitary waste to be dealt with under existing regulations	Proper storage and disposal of wastes will be implemented.	Low potential for heritage resources on property. No residual effects if proper management of waste is implemented.	No long-term monitoring plan required / Discuss waste management strategies during construction meetings and implement.

Component		Potential Negative Effect	Performance Objectives	Mitigation Strategy/ Measures	Residual Effects	Monitoring Plan/ Contingency Measures
	Visual Landscape	Installation of panels will be a permanent fixture and result in a change to the local landscape.	Elimination / reduction in visual disturbance	Aesthetic visual barriers may be considered if necessary.	Visual landscape will change for the duration of the Project.	No monitoring plan required / Repair erosion areas quickly.
	Sound Levels	During construction, disturbance to neighbouring residents will occur. Transformers and inverters may increase ambient sound levels.	Minimize noise emissions at nearby noise receptors to provincial guidelines; minimize environmental impact	A noise study will be conducted to ensure noise levels are within provincial standards.	No residual effects.	No monitoring plan required / Respond to noise complaints quickly.
	Land Use	Land use designation will change for the duration of the Project.	Maintain present land use to the greatest extent possible	The land use designation will remain unchanged.	A reduction in agricultural land for the duration of the Project.	No monitoring plan required / At decommissioning return site to original usage.
	Archaeological Resources	During construction, archaeological finds may be discovered.	Undertake assessment to regulatory requirements; mitigate impact to greatest extent possible	An Archaeological Assessment will be completed to determine potential resources and mitigation requirements.	Construction will cease in the event archaeological evidence is found and the Ministry of Culture will be notified immediately.	No monitoring plan post-construction required / During construction be aware of potential artefacts; Notify regulatory agency and stop work.
	Cultural Heritage Resources	Construction could negatively affect cultural heritage landscapes.	Undertake assessment to regulatory requirements; mitigate impact to greatest extent possible	As required by the Ministry of Tourism and Culture, potential heritage resources will be determined and assessed.	Low potential for impact on heritage resources on property. No residual effects if proper mitigation is implemented.	No monitoring plan post-construction required / At decommissioning return site to original usage.

7. Emergency Response Plan and Emergency Communication Plan

The operation of a solar facility is generally passive and consists of monitoring of the site and undertaking maintenance repairs occasionally. Emergency events are generally unlikely and are typically associated with construction activities during installation and decommissioning. The proponent will develop an emergency response plan and a communications plan to cover the entire life of the project including during the construction, operation and decommissioning phases. These plans will be provided to the local authorities and implemented prior to construction commencement. Plans will be kept current during the various phases and any updates will be circulated.

7.1 Emergency Response Plan (ERP)

The proponent will prepare an Emergency Response Plan (ERP) to the requirements of the local authorities including the Municipality of Strathroy-Caradoc, Middlesex County and St. Clair Region Conservation Authority if requested. The Municipality of Strathroy-Caradoc has prepared an Emergency Response Plan in October 2008 (By-law No. 92-07). The Chief Administrative Office located at 52 Frank Street Strathroy N7G 2R4 (519-245-1105 X225) administers this plan.

The proponent will request a meeting with the Fire Services management (23 Zimmerman Street Strathroy ON N7G 2G8) and the Strathroy-Caradoc CAO prior to construction to discuss the details of the various phases of the work including any potential emergency scenarios that might arise. A draft Project ERP document will be prepared and circulated to the various authorities for review and comment. A final version of the Project ERP will be posted on the Project website and copies provided to MOE and other agencies as requested. The ERP will include:

- Communication procedures including the identification of a primary and secondary crisis manager to serve as the company spokesperson in the event of an emergency;
- Listing of site personnel designated and trained in first aid/ CPR including the contractor safety officer;
- Emergency and evacuation procedures for each type of emergency (fire personal injury, spill);
- Emergency phone numbers; and
- Name and direction to nearest hospital or medical aid facility.

The contractor will be provided a copy of this document with instructions to keep a copy on site at all times during the construction work, and to advise their safety officer and staff of the procedures and contact information.

7.2 Emergency Communications Plan (ECP)

As part of the Emergency Response Plan (ERP), an Emergency Communications Plan (ECP) will be included, identifying contact information for relevant responders, regulators, landowners and other stakeholders. The communications protocol between the proponent and the Municipality's ERP coordinator for emergency scenarios at the Project will be set out. Emergency issues could include personal injury, fire and environmental spill. The contact information will be clearly posted at the construction site and with other key parties. In the event of an emergency at the Project site, contact ((typically phone) will be made with key parties according to the communications protocol.

During the construction and decommissioning phases, the Contractor's Health and Safety officer or designate will take the lead and be the contact with the outside agencies. During the operation phase, the proponent or their designate will take this role. These trained staff will consider:

- The nature of the emergency;
- Potential risk of human injury;
- Potential risk to the environment;
- Potential risk to property; and
- Need for additional resources to respond to the incident.

This knowledgeable staff can identify potential action plans and assist with other communications / notifications to the public, stakeholders and first responders (fire department, medical - ambulance and police). Where the incident involves an environmental spill, the Ministry of Environment Spills Action Centre will be notified immediately (1-800-268-6060).

8. Conclusions

The Design and Operations Report (DOR) has been prepared as part of an application for a Class 3 Solar Facility under O.Reg.359/09 Renewable Energy Approval (REA) under Part V.0.1 of the Ontario Environmental Protection Act as amended by O.Reg. 521/10 and O.Reg. 231/11.

A site plan has been prepared showing the layout of the solar array field, the associated electrical components, topographical features and other amenities within the study area.

The environmental impacts during the construction, operation and decommissioning phases have been determined to be able to be mitigated and/or manageable.

There are no provincial parks, ANSIs or water bodies within 120 metres of the proposed solar array field. Natural features (wetlands and woodlands) were studied. They are outside the prescribed limit. The Project will not impact these features.

The acoustical assessment determined that all MOE requirements are met or exceeded.

The Phase 1 archaeological assessment indicated the site exhibited archaeological potential. A Stage 2 field study determined that the artefacts had low heritage cultural value and no further investigations are required.

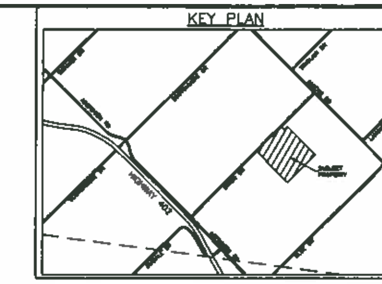
The cultural heritage impact assessment determined the proposed solar array development would not have any negative impact on the farmhouse, bank barn or any of the cultural heritage attributes associated with the subject property.

Neither the surface water nor groundwater is impacted by the development.

There is no requirement to change the Land Use for the Project. Post-decommissioning, the land can revert back to its agricultural usage.

An outline for an Emergency Response Plan (ERP) along with an Emergency Communications Plan has been noted. An ERP needs to be prepared and formalized with the local authorities.

Appendix 1 – Project Site Plan & Land Use Zoning



LEGEND

⊗	POINT OF CONNECTION
———	PROPERTY LIMIT

HAMMERSCHLAG + JOFFE INC.

STATISTICS: SOLAR ARRAY

NUMBER OF MODULES: 507
NUMBER OF MODULES PER STRING: 13
NUMBER OF STRINGS: 39
PANEL TYPE: CANADIAN SOLAR CS6P-230
FEEDER NAME: M24
CONNECTION VOLTAGE: 16Kv

CONTRACT IDENTIFICATION #F-001360-SPV-130-505

FIT REFERENCE #FIT-FE6UX31

NOTES

THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

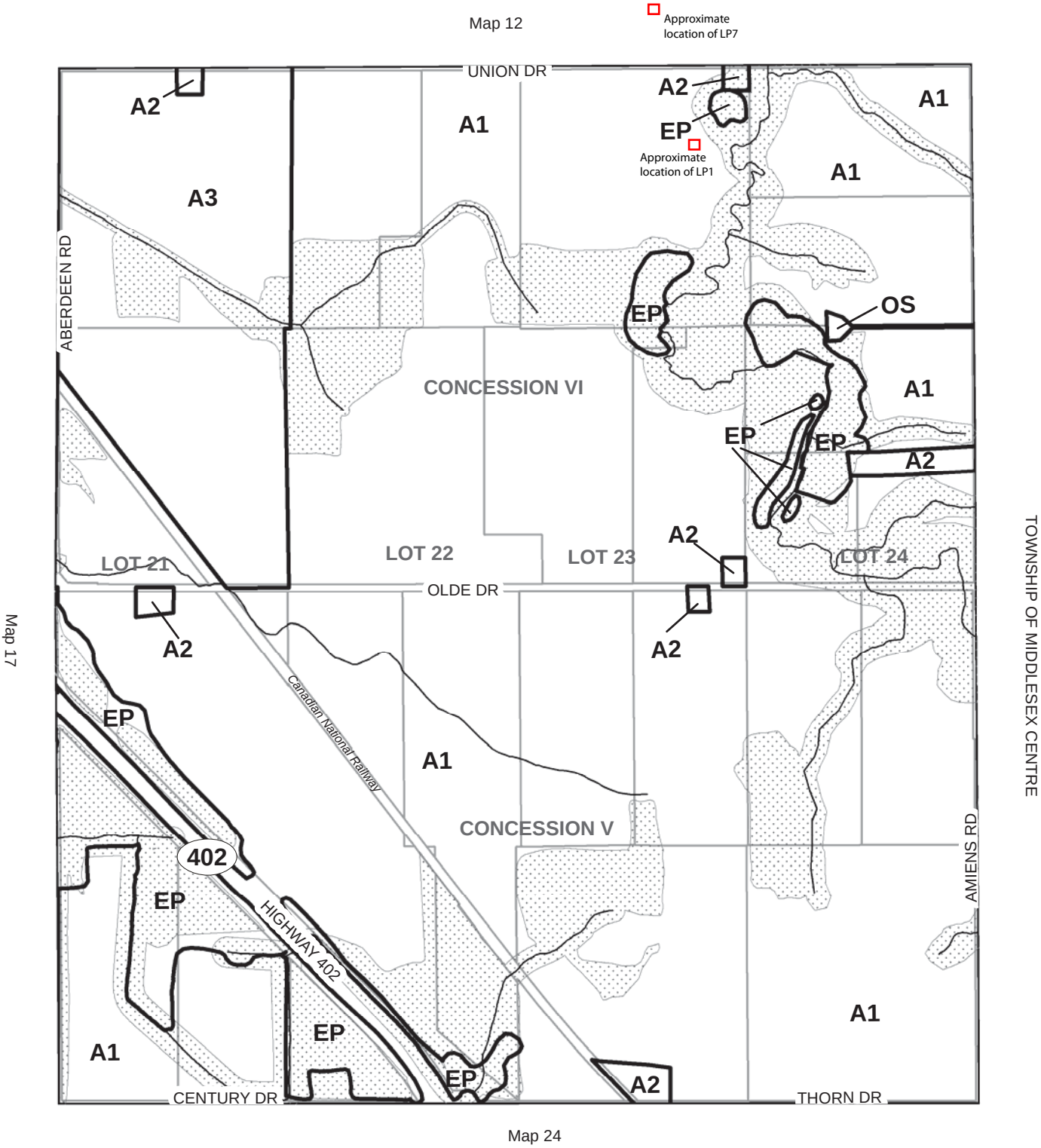
NO.	REVISION DESCRIPTION	DATE	BY	APPD
1	ISSUED FOR DOR REPORT	10/08/12	TB	MHN

SCALE 1:750

CLIENT	FUTURE SOLAR DEVELOPMENTS INC. 3400 PHARMACY AVE, SCARBOROUGH, ON
	K.H. / K.H. / G.B. / K.H. / G.B. / G.B.
PROJECT	FUTURE SOLAR 9307 UNION OR, STRATHROY, ON
TITLE	SITE PLAN LP1
PROJ NO	WSL-2250
SURVEY	FBS
DATE	OCT 7, 2011
DRAWING NO.	SP 1

exp. exp Services Inc.

• BUILDINGS • EARTH & ENVIRONMENT • ENERGY • INDUSTRIAL • INFRASTRUCTURE • SUSTAINABILITY •



STRATHROY-CARADOC
URBAN OPPORTUNITY – RURAL HOSPITALITY

MUNICIPALITY OF STRATHROY-CARADOC BY-LAW No. 43-08

LEGEND

Natural Environment Overlay

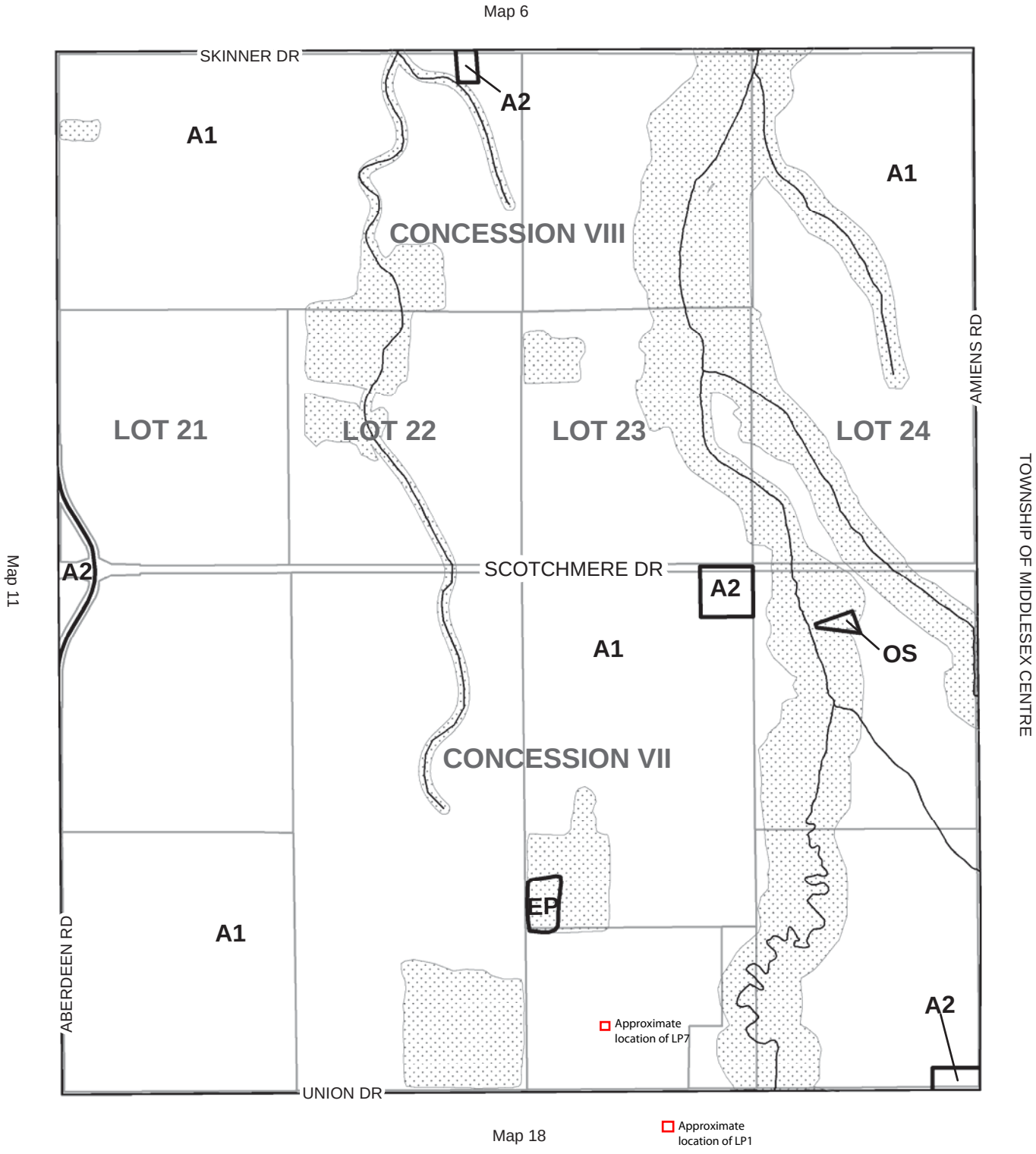
1:15,000

0 150 300 600

Metres

SCHEDULE 'A'

MAP #18



STRATHROY-CARADOC
URBAN OPPORTUNITY – RURAL HOSPITALITY

MUNICIPALITY OF STRATHROY-CARADOC BY-LAW No. 43-08

LEGEND

Natural Environment Overlay

1:15,000

0 145 290 580

Metres

SCHEDULE 'A'

MAP #12

Appendix 2 – Manufacturer Technical Components

CanadianSolar

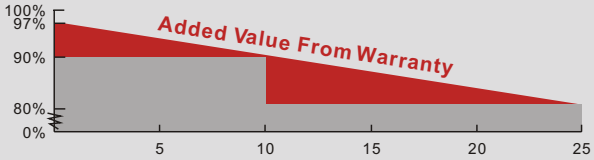
CS6P

235/240/245/250/255M

CS6P is a robust solar module with 60 solar cells. These modules can be used for on-grid solar applications. Our meticulous design and production techniques ensure a high-yield, long-term performance for every module produced. Our rigorous quality control and in-house testing facilities guarantee Canadian Solar's modules meet the highest quality standards possible.

Key Features

- High module efficiency up to 15.85%
- Positive power tolerance: 0 ~ +5W
- Robust frame to up to 5400 Pa load
- Anti-reflective with self-cleaning surface
- Outstanding performance at low irradiance
- High energy yield at Low NOCT
- **Backed By Our New 10/25 Linear Power Warranty Plus our added 25 year insurance coverage**



- 10 year product warranty on materials and workmanship
- 25 year linear power output warranty

Best Quality

- 235 quality control points in module production
- EL screening to eliminate product defects
- Current binning to improve system performance
- Accredited Salt mist/Ammonia resistant

Best Warranty Insurance

- 25 years worldwide coverage
- 100% warranty term coverage
- Providing third party bankruptcy rights
- Non-cancellable
- Immediate coverage
- Insured by 3 world top insurance companies

Comprehensive Certificates

- IEC 61215, IEC 61730, IEC61701ED2, UL1703, KEMCO, CEC Listed, CE, JET and MCS
- ISO9001: 2008: Quality Management System
- ISO/TS16949:2009: The automotive quality management system
- ISO14001:2004: Standards for Environmental management system
- QC080000 HSPM: The Certification for Hazardous Substances Regulations
- OHSAS 18001:2007 International standards for occupational health and safety
- Reach Compliance

www.canadiansolar.com

CS6P-235/240/245/250/255M

Electrical Data

STC	CS6P-235M	CS6P-240M	CS6P-245M	CS6P-250M	CS6P-255M
Nominal Maximum Power (Pmax)	235W	240W	245W	250W	255W
Optimum Operating Voltage (Vmp)	30.1V	30.2V	30.3V	30.4V	30.5V
Optimum Operating Current (Imp)	7.82A	7.95A	8.09A	8.22A	8.35A
Open Circuit Voltage (Voc)	37.2V	37.3V	37.4V	37.5V	37.7V
Short Circuit Current (Isc)	8.34A	8.46A	8.61A	8.74A	8.74A
Module Efficiency	14.61%	14.92%	15.23%	15.54%	15.85%
Operating Temperature	-40℃~+85℃				
Maximum System Voltage	1000V (IEC) /600V (UL)				
Maximum Series Fuse Rating	15A				
Application Classification	Class A				
Power Tolerance	0 ~ +5W				

Under Standard Test Conditions (STC) of irradiance of 1000W/m², spectrum AM 1.5 and cell temperature of 25℃

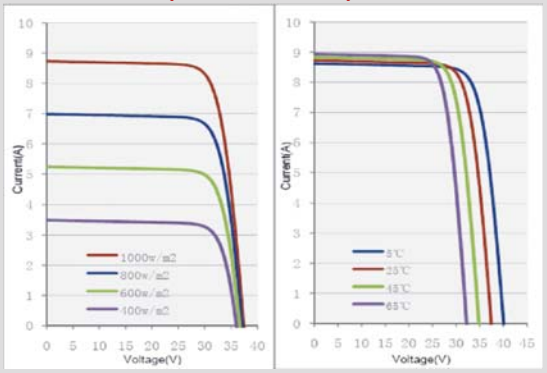
NOCT	CS6P-235M	CS6P-240M	CS6P-245M	CS6P-250M	CS6P-255M
Nominal Maximum Power (Pmax)	170W	173W	177W	180W	184W
Optimum Operating Voltage (Vmp)	27.5V	27.5V	27.6V	27.7V	27.8V
Optimum Operating Current (Imp)	6.18A	6.29A	6.40A	6.51A	6.62A
Open Circuit Voltage (Voc)	34.1V	34.2V	34.3V	34.4V	34.6V
Short Circuit Current (Isc)	6.75A	6.85A	6.97A	7.08A	7.18A

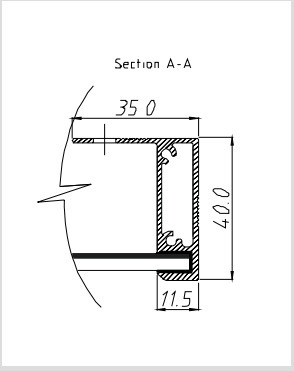
Under Normal Operating Cell Temperature, Irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20℃, wind speed 1 m/s

Mechanical Data

Cell Type	Mono-crystalline 156 x 156mm, 2 or 3 Busbars
Cell Arrangement	60 (6 x 10)
Dimensions	1638 x 982 x 40mm (64.5 x 38.7 x 1.57in)
Weight	19kg (41.9 lbs)
Front Cover	3.2mm Tempered glass
Frame Material	Anodized aluminium alloy
J-BOX	IP65, 3 diodes
Cable	4mm²(IEC)/12AWG(UL), 1000mm
Connectors	MC4 or MC4 Comparable
Standard Packaging (Modules per Pallet)	24pcs
Module Pieces per container (40 ft. Container)	672pcs (40'HQ)

I-V Curves (CS6P-250M)





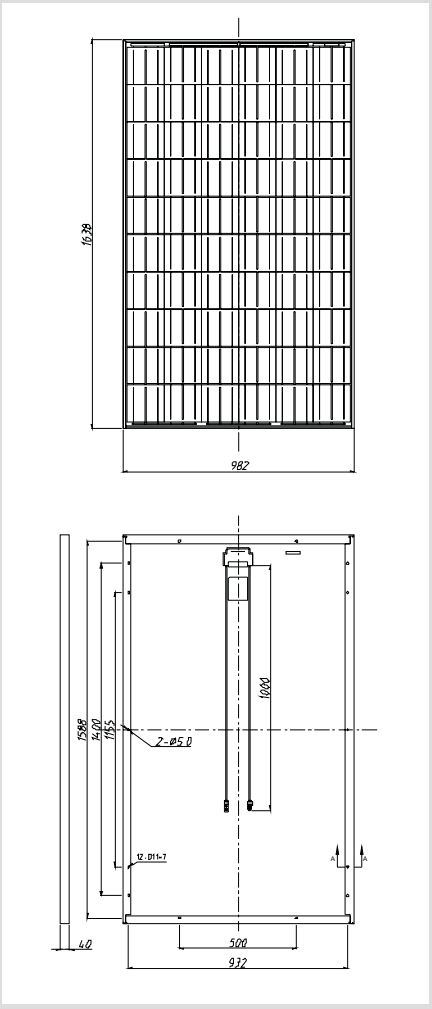
Temperature Characteristics

Temperature Coefficient	Pmax	-0.45%/℃
	Voc	-0.35 %/℃
	Isc	0.060 %/℃
Normal Operating Cell Temperature		45±2℃

Performance at Low Irradiance

Industry leading performance at low irradiation environment, +95.5% module efficiency from an irradiance of 1000w/m² to 200w/m² (AM 1.5, 25 ℃)

Engineering Drawings



*Specifications included in this datasheet are subject to change without prior notice.

About Canadian Solar

Canadian Solar Inc. is one of the world's largest solar companies. As a leading vertically-integrated manufacturer of ingots, wafers, cells, solar modules and solar systems, Canadian Solar delivers solar power products of uncompromising quality to worldwide customers. Canadian Solar's world class team of professionals works closely with our customers to provide them with solutions for all their solar needs.

Canadian Solar was founded in Canada in 2001 and was successfully listed on NASDAQ Exchange (symbol: CSIQ) in November 2006. Canadian Solar has module manufacturing capacity of 2.05GW and cell manufacturing capacity of 1.3GW.

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Guelph | Ontario N1K 1E6 | Canada
Tel: +1 519 837 1881
Fax: +1 519 837 2550
inquire.ca@canadiansolar.com
www.canadiansolar.com

SSC-12-10-ULN/ULP/CE

Intelligent String Management

The Satcon® Smart Subcombiner improves solar array management by sensing current at the string level. Its comprehensive diagnostic capabilities identify string-level connection and performance issues with remarkable speed and accuracy.

Comprehensive String-Level Sensing

- Accommodates up to 12 PV strings
- Features a 16A fuse to handle up to 10 amps per string
- Identifies array connection and performance issues rapidly
- Features multisensor temperature monitoring
- Transmits data to the PV inverter using an RS-485 Modbus connection

Finger-Safe Fuse Holders

- Positive for grounded systems (UL)
- Positive and negative for floating systems (CE)

Efficient Operation

- Receives power from the PV array—no external power supply is required
- Consumes very little power (<20W)
- Operates over a broad range of temperatures (-20º C to +55º C)

Compatibility

- All PowerGate® Plus PV inverters
- Any RS-485-compatible PV inverter

sales@satcon.com

Satcon Corporate
Boston, MA
P: 617.897.2400

Satcon Canada
Burlington, ON
P: 905.639.4692

Satcon West
Fremont, CA
P: 510.226.3800

Satcon Greece
Gerakas, Greece
P: 30 210 6654424

Satcon Czech Republic
Czech Republic
P: 420 255 729 610

Satcon China
Shenzhen, China
P: +86 755 61682588

Shanghai, China
P: 139.1811.2818

Satcon Smart Subcombiner		UL/CSA	CE
Input Parameters			
Maximum DC Voltage	600 VDC	•	
Voltage	900 VDC		•
Output Parameters			
Maximum Output Current	120A	•	•
String Parameters			
Maximum Number of Strings	12	•	•
Maximum Current Per Channel	10A	•	•
Maximum Fuse Size	16A	•	•
External Connections to Bus Bar (DC main)	6 mm bolt connection	•	•
String Connection (Wire Diameter Range)	6.5 mm to 8.9 mm)	•	•
Signal Cable (Gland Diameter Range)	11.4 mm to 18 mm	•	•
Communications and Monitoring			
Interface and Baud Rate	RS-485 (9600 baud)	•	•
String Current Monitoring	0-10A (+/- 2%)	•	•
External temperature Monitoring	Two thermal sensor inputs	•	•
Temperature			
Operating Ambient Temperature Range	-20˚ C to +50˚ C	•	•
Storage Temperature Range	-40˚ C to +85˚ C	•	•
Enclosure			
Enclosure Rating (Outdoors)	NEMA 4, UV Resistant	•	
	IP66		•
Enclosure Finish	Nonmetallic Composite	•	•
Color (Light Grey)	RAL7035	•	•
Dimensions (Height x Weight x Depth)	22" x 17.3" x 11.2" (55 cm x 45 cm x 29 cm)		
Testing and Certification			
EMC	EN61000-6.2		•
	EN61000-6-4		•
UL1741		•	
CE Certification			•
Warranty			
Five Years		•	•

PVS-100 (208 V)
PVS-100 (240 V)
PVS-100 (480 V)
PVS-100 (600 V)
AE-100 (400V)

Peak Efficiency 96.7%

Power Efficiency

Power Level	Output Power[1]	Efficiency[2]
10%	10 kW	93.2%
20%	20 kW	96.1%
30%	30 kW	96.5%
50%	50 kW	96.7%
75%	75 kW	96.5%
100%	100 kW	96.1%

[1] 315V minimum [2] 480V model

Unparalleled Performance

With their advanced system intelligence, next-generation Edge™ MPPT technology, and industrial-grade engineering, PowerGate® Plus inverters maximize system uptime and power production, even in cloudy conditions.

Edge MPPT

Provides rapid and accurate control that boosts PV plant kilowatt yield

Provides a wide range of operation across all photovoltaic cell technologies

Printed Circuit Board Durability

Wide thermal operating range: -40° C (-40° F) to 85° C (185° F)

Conformal coated to withstand extreme humidity and air-pollution levels

Proven Reliability

Rugged and reliable, PowerGate Plus PV inverters are engineered from the ground up to meet the demands of large-scale installations.

Low Maintenance

Modular components make service efficient

Safety

UBC Seismic Zone 4 compliant

Built-in DC and AC disconnect switches

Integrated DC two-pole disconnect switch isolates the inverter (with the exception of the GFDI circuit) from the photovoltaic power system to allow inspection and maintenance

PV Inverters | PowerGate Plus 100 kW

PowerGate Plus 100 kW Specifications			UL/CSA	CE
Input Parameters				
Maximum Array Input Voltage	600 VDC		●	
	900 VDC			●
PV Array Configuration	Positive Ground		○	○
	Negative Ground		●	○
	Floating			●
Input Voltage Range (MPPT; Full Power)	315–600 VDC		●	
	420–850 VDC			●
Maximum Input Current	331 ADC		●	
	248 ADC			●
Output Parameters				
Output Voltage Range (L-L)	183–229 VAC	208 VAC	●	
	211–264 VAC	240 VAC	●	
	352–440 VAC	400 VAC		●
	422–528 VAC	480 VAC	●	
	528–660 VAC	600 VAC	●	
Nominal Output Voltage	208 VAC		●	
	240 VAC		●	
	400 VAC			●
	480 VAC		●	
	600 VAC		●	
Output Frequency Range	59.3–60.5 Hz		●	
	49.3–50.5 Hz			●
AC Voltage Range (Standard)	-12%/+10%		●	●
Nominal Output Frequency	60 Hz		●	
	50 Hz			●
Number of Phases	3		●	●
Maximum Output Current per Phase	278 A	208 VAC	●	
	241 A	240 VAC	●	
	145 A	400 VAC		●
	121 A	480 VAC	●	
	96 A	600 VAC	●	
Peak Efficiency	**96.7%**			
CEC-Weighted Efficiency	96%		●	●
Maximum Continuous Output Power	100 kW (100 kVA)		●	●

PowerGate Plus 100 kW

Built-in isolation transformer

Protective covers over exposed power connections

Output Options

PowerGate Plus 100 kW

UL/CSA	208 VAC Output
	240 VAC Output
	480 VAC Output
	600 VAC Output
CE	400 VAC Output

Streamlined Design

With all components encased in a single, space-saving enclosure, PowerGate Plus PV inverters are easy to install, operate, and maintain.

Single Cabinet with Small Footprint

Convenient access to all components

Large in-floor cable glands make access to DC and AC cables easy

Rugged Construction

Engineered for outdoor environments

Output Transformer

Provides galvanic isolation

Matches the output voltage of the PV inverter to the grid

PG100210.1

PowerGate Plus 100 kW Specifications			UL/CSA	CE
Tare Losses	62.3 W	208 VAC	•	
	61.6 W	240 VAC	•	
	64.5 W	400 VAC		•
	66.1 W	480 VAC	•	
	68.0 W	600 VAC	•	
Power Factor at Full Load	>0.99		•	•
Harmonic Distortion	<3% THD		•	•
Temperature				
Operating Ambient Temperature Range (Full Power)	-20° C to +50° C		•	•
Storage Temperature Range	-30° C to +70° C		•	•
Cooling	Forced Air		•	•
Noise				
Noise Level	<65 dB(A)		•	•
Combiner				
Number of Inputs and Fuse Rating (2 fuses/input for floating)	5 (110 ADC)		o	
	6 (100 ADC)		o	
	5 (125 ADC)			o
Inverter Cabinet				
Enclosure Rating	NEMA 3R		•	
	IP54			•
Enclosure Finish (14-Gauge, Powder-Coated G90 Steel)	RAL-7032		•	•
Cabinet Dimensions (Height x Width x Depth)	80" x 57" x 30.84" (203.2 cm x 144.78 cm x 78.33 cm)			
Cabinet Weight			2,350 lbs.	1,066 kg
Transformer				
Integrated Internal Transformer			•	•
Low Tap Voltage[1]	20%		•	•
Testing and Certification				
UL1741, CSA 107.1-01, IEEE 1547, IEEE C62.41.2, IEEE C62.45, IEEE C37.90.1, IEEE C37.90.2			•	
CE Certification (EN 50178, EN 61000-6-2, EN 61000-6-4)				•
UBC Zone 4 Seismic Rating			•	•
Warranty				
Five Years			•	•
Extended Warranty (up to 10, 15, or 20 years)			o	o
Extended Service Agreement			o	o
Intelligent Monitoring				
Satcon PV View® Plus			o	o
Satcon PV Zone®			o	o
Third-Party Compatibility			•	•

• Standard
o Optional

[1] The 20% boost tap on the isolation transformer increases the AC voltage output range for applications where the solar array DC operating voltage is at or near the lower end of the DC input range. This boost allows for continued inverter operation at lower DC voltage input levels.

Note: Specifications are subject to change.

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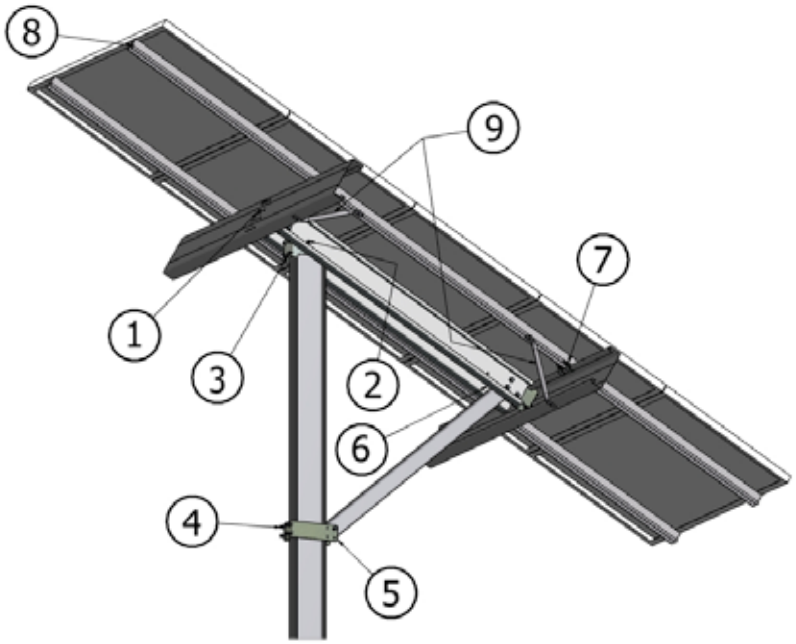
ISYS Ground 2.0 Technical Datasheet

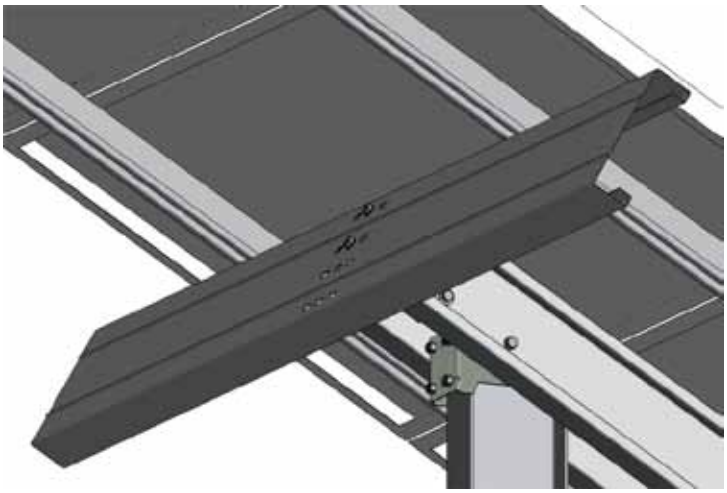
Pub 111206-1td • Rev. 1.1 • December 2011

ISYS Ground Connections

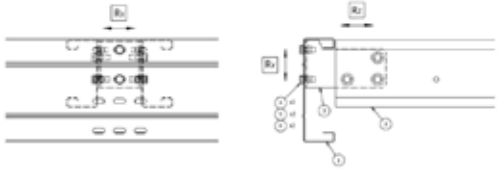


CONNECTION	DESCRIPTION
1	East West Beam to Top-Chord Assembly
2	Top-Chord Assembly to Top U-Clamp
3	Top U-Clamp to Vertical Column
4	Bottom U-Clamp to Vertical Column
5	Diagonal Brace to Bottom U-Clamp
6	Diagonal Brace to Top Chord Assembly
7	East West Beam to North South Rail
8	North South Rail to Module
9	Lateral Brace to East West Beam and North South Rail

East West Beam to Top-Chord Assembly



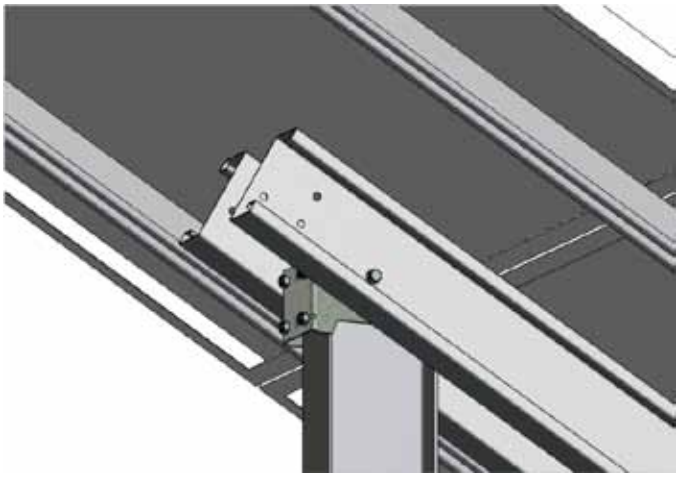
	DESCRIPTION	MATERIAL
1	EAST WEST C-CHANNEL	ASTM A653 GRADE 50, MIN TENSILE 60 KSI, 14GA
2	TOP CHORD CHANNELS	ASTM A653 GRADE 50, MIN TENSILE 60 KSI, 14GA
3	8.5” U-CLAMP	ASTM A653 GRADE 50, MIN TENSILE 60 KSI, 0.1875” THK.
4	1/2 “ BOLT	SAE J429-GRADE 5
5	1/2 FLAT WASHER	ANSI, B, N
6	1/2 “ FLANGE NUT	SAE J995-GRADE 5



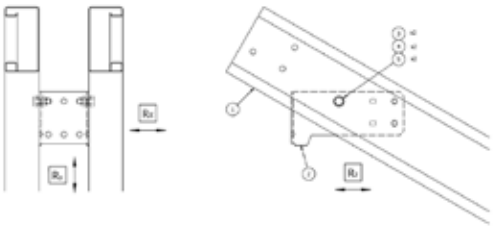
APPLIED LOAD DIRECTION	NOMINAL LOAD lbs (N)	ALLOWABLE LOAD, ASD, (Ω) lbs (N)	DESIGN LOAD, LRFD, (Φ) lbs (N)	DESIGN LOAD, LSD, (Φ) lbs(N)
R_X	5374 (23,904)	1930 (8585)	2960 (13,166)	2765 (12,299)
R_Y	9660 (42,970)	4830 (21,484)	6762 (30078)	4830 (21,484)
R_Z	9660 (42,970)	4830 (21,484)	6762 (30078)	4830 (21,484)

Note: Load values based on two (2) bolts at single East West Beam to Top-Chord connection

Top-Chord Assembly to Top U-Clamp



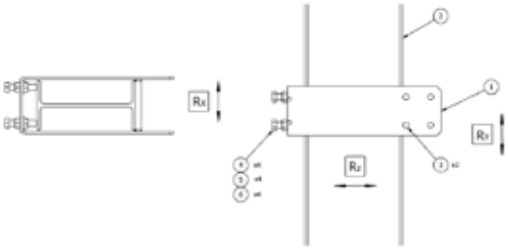
	DESCRIPTION	MATERIAL
1	TOP CHORD CHANNELS	ASTM A653 GRADE 50, MIN TENSILE 60 KSI, 14GA
2	10.5” U-CLAMP	ASTM A653 GRADE 50, MIN TENSILE 60 KSI, 0.1875” THK.
3	1/2 “ BOLT	SAE J429-GRADE 5
4	1/2 FLAT WASHER	ANSI, B, N
5	1/2 “ FLANGE NUT	SAE J995-GRADE 5



APPLIED LOAD DIRECTION	NOMINAL LOAD lbs (N)	ALLOWABLE LOAD, ASD, (Ω) lbs (N)	DESIGN LOAD, LRFD, (Φ) lbs (N)	DESIGN LOAD, LSD, (Φ) lbs(N)
R_X	12,600 (56,047)	5040 (22,419)	7560 (33,628)	6,300 (28,023)
R_Y	12,600 (56,047)	5040 (22,419)	7560 (33,628)	6,300 (28,023)
R_Z	12,600 (56,047)	5040 (22,419)	7560 (33,628)	6,300 (28,023)

Top U-Clamp to Vertical Column

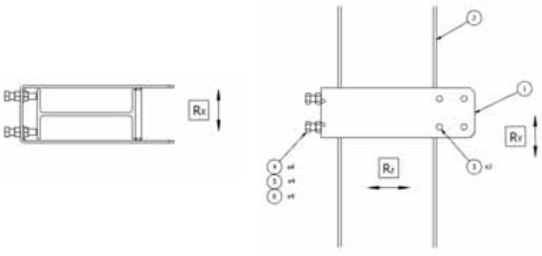
	DESCRIPTION	MATERIAL
1	10.5" U-CLAMP	ASTM A653 GRADE 50, MIN TENSILE 60 KSI, 0.1875" THK.
2	VERTICAL COLUMN	A572 GRADE 50
3	U-CLAMP PIN	AISI 1018 STEEL
4	1/2 " X 2 ½ HEX SOC,SET SCREW,CONE POINT	ALLOY STEEL, ASTM F912-04, ASME 18.3
5	1/2 " FLANGE NUT	SAE J995-GRADE 5
6	1/2 " HEX NUT	SAE J995-GRADE 5



APPLIED LOAD DIRECTION	NOMINAL LOAD lbs (N)	ALLOWABLE LOAD, ASD, (Ω) lbs (N)	DESIGN LOAD, LRFD, (Φ) lbs (N)	DESIGN LOAD, LSD, (Φ) lbs(N)
R_X	8,365 (37,209)	3452 (15,355)	5,293 (23,544)	4182(18,023)
R_Y	8,365 (37,209)	3452 (15,355)	5,293 (23,544)	4182(18,023)
R_Z	8,365 (37,209)	3452 (15,355)	5,293 (23,544)	4182(18,023)

Bottom U-Clamp to Vertical Column

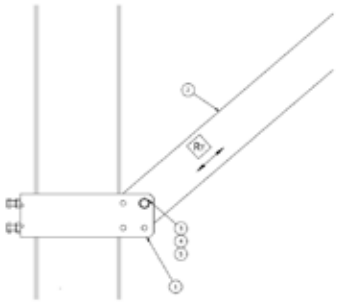
	DESCRIPTION	MATERIAL
1	12.5" U-CLAMP	ASTM A653 GRADE 50, MIN TENSILE 60 KSI, 0.1875" THK.
2	VERTICAL COLUMN	A572 GRADE 50
3	U-CLAMP PIN	AISI 1018 STEEL
4	1/2 " X 2 1/4 HEX BOLT	SAE J429-GRADE 5
5	1/2 " FLANGE NUT	SAE J995-GRADE 5
6	1/2 " HEX NUT	SAE J995-GRADE 5



APPLIED LOAD DIRECTION	NOMINAL LOAD lbs (N)	ALLOWABLE LOAD, ASD, (Ω) lbs (N)	DESIGN LOAD, LRFD, (Φ) lbs (N)	DESIGN LOAD, LSD, (Φ) lbs(N)
R_Y	8,365 (37,209)	3452 (15,355)	5,293 (23,544)	4182(18,023)

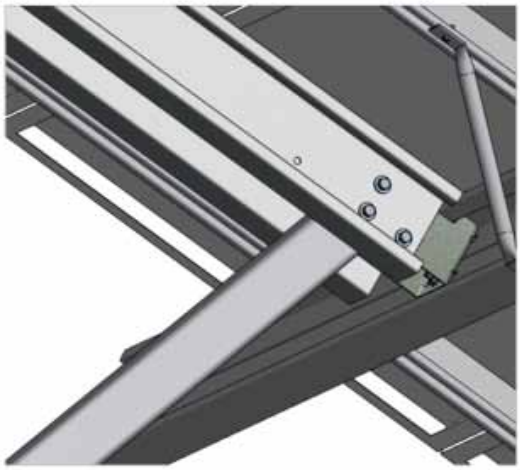
Diagonal Brace to Bottom U-Clamp at Column

	DESCRIPTION	MATERIAL
1	12.5” U-CLAMP	ASTM A653 GRADE 50, MIN TENSILE 60 KSI, 0.1875” THK.
2	DIAGONAL BRACE	4x4 SQUARE TUBE, A572 GRADE 50/ ROLL-FORMED CHANNEL, ASTM A653 GRADE 50
3	1/2 “BOLT	SAE J429-GRADE 5
4	1/2 “ FLAT WASHER	ANSI, B, N
5	1/2 ” HEX NUT	SAE J995-GRADE 5
6	1/2 ” HEX NUT	SAE J995-GRADE 5

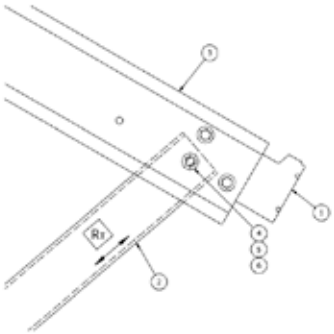


APPLIED LOAD DIRECTION	NOMINAL LOAD lbs (N)	ALLOWABLE LOAD, ASD, (Ω) lbs (N)	DESIGN LOAD, LRFD, (Φ) lbs (N)	DESIGN LOAD, LSD, (Φ) lbs(N)
R_T	21,168 (94,159)	8,820 (39,233)	13,750 (61,163)	8820 (94,159)

Diagonal Brace to Top-Chord Assembly

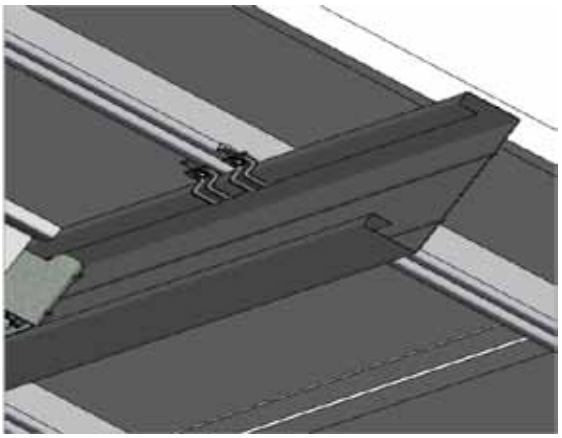


	DESCRIPTION	MATERIAL
1	8.5” U-CLAMP	ASTM A653 GRADE 50, MIN TENSILE 60 KSI, 0.1875” THK.
2	DIAGONAL BRACE	4x4 SQUARE TUBE, A572 GRADE 50/ ROLL-FORMED CHANNEL, ASTM A653 GRADE 50
3	1/2 “BOLT	SAE J429-GRADE 5
4	Top Chord Channels	ASTM A653 GRADE 50, MIN TENSILE 60 KSI, 14 GA
5	1/2 “ FLAT WASHER	ANSI, B, N
6	1/2 ” HEX NUT	SAE J995-GRADE 5

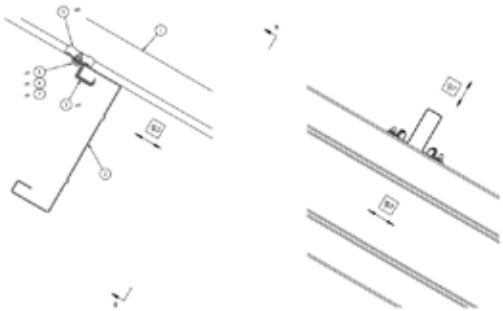


APPLIED LOAD DIRECTION	NOMINAL LOAD lbs (N)	ALLOWABLE LOAD, ASD, (Ω) lbs (N)	DESIGN LOAD, LRFD, (Φ) lbs (N)	DESIGN LOAD, LSD, (Φ) lbs(N)
R_T	21,168 (94,159)	8,820 (39,233)	13,750 (61,163)	8820 (94,159)

East West Beam to North South Rail



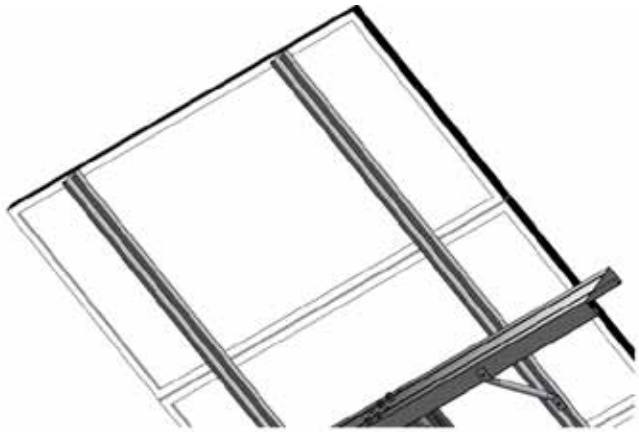
	DESCRIPTION	MATERIAL
1	NORTH SOUTH RAIL	ASTM A653 GRADE 50, MIN TENSILE 60 KSI, 18 GA
2	EAST WEST BEAM	ASTM A653 GRADE 50, MIN TENSILE 60 KSI, 14 GA
3	LARGE BEAM CLIP	ASTM A653 GRADE 50, MIN TENSILE 60 KSI, 14 GA
4	SMALL BEAM CLIP	ASTM A653 GRADE 50, MIN TENSILE 60 KSI, 14 GA
5	1/4 “ BOLT	SAE J429-GRADE 5
6	1/4 ” FLANGE NUT	SAE J995-GRADE 5
7	1/4 “ FLAT WASHER	SAE J995-GRADE 5



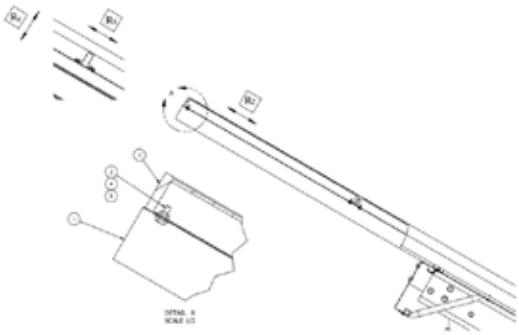
APPLIED LOAD DIRECTION	NOMINAL LOAD lbs (N)	ALLOWABLE LOAD, ASD, (Ω) lbs (N)	DESIGN LOAD, LRFD, (Φ) lbs (N)	DESIGN LOAD, LSD, (Φ) lbs(N)
R_X	549 (2,442)	205 (911)	321 (1,427)	258(1,147)
R_Y	1,559 (6,934)	629 (2,798)	986 (4,386)	795(3,536)
R_Z	2323 (10,333)	937 (4,167)	1469 (6,534)	1,195 (5,315)

Note: Load values based on two (2) clamps at single East West Beam to North South Rail connection

North South Rail to Framed Module



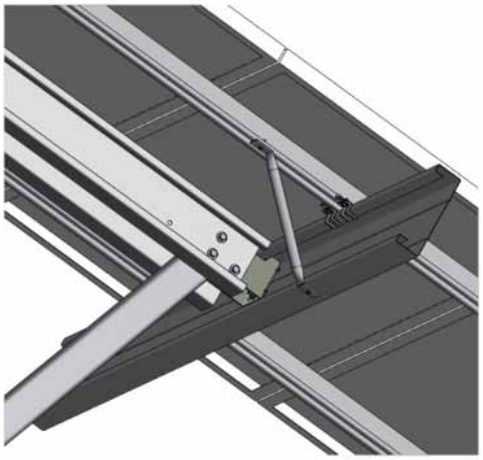
	DESCRIPTION	MATERIAL
1	NORTH SOUTH RAIL	ASTM A653 GRADE 50, MIN TENSILE 60 KSI, MIN G90 GALV, 18 GA
2	MODULE FRAME	ALUMINUM (PER MODULE MFG. SPEC.)
3	1/4 “ BOLT	SAE J429-GRADE 5
4	1/4 ” FLANGE NUT	SAE J995-GRADE 5
5	1/4 “ FLAT WASHER	SAE J995-GRADE 5



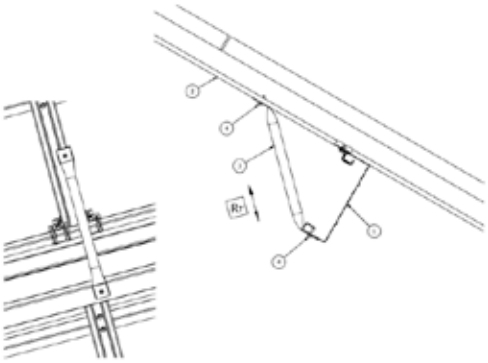
APPLIED LOAD DIRECTION	NOMINAL LOAD lbs (N)	ALLOWABLE LOAD, ASD, (Ω) lbs (N)	DESIGN LOAD, LRFD, (Φ) lbs (N)	DESIGN LOAD, LSD, (Φ) lbs(N)
R_X	1,687 (7,504)	843 (3,750)	1,180 (5,248)	860(3,825)
R_Y	1,687 (7,504)	843 (3,750)	1,180 (5,248)	860(3,825)
R_Z	634 (2,820)	269 (1,196)	381 (1,695)	300 (1,334)

Note: Load values based on one (1) bolt.

Lateral Brace to East West Beam and North South Rail



	DESCRIPTION	MATERIAL
1	EAST WEST BEAM	ASTM A653 GRADE 50, MIN TENSILE 60 KSI, MIN G90 GALV, 14 GA
2	NORTH SOUTH RAIL	ASTM A653 GRADE 50, MIN TENSILE 60 KSI, MIN G90 GALV, 18 GA
3	LATERAL BRACE	1” GALVANIZED ELECTRICAL METAL-LIC TUBING, YIELD 30 KSI, ULTIMATE TENSILE 75 KSI
4	1/4-14 X 1” HEX TEK SCREW SELF-DRILLING	SAE J78, 1/4 -14 X 1”, #3 POINT



APPLIED LOAD DIRECTION	NOMINAL LOAD lbs (N)	ALLOWABLE LOAD, ASD, (Ω) lbs (N)	DESIGN LOAD, LRFD, (Φ) lbs (N)	DESIGN LOAD, LSD, (Φ) lbs(N)
R_T	1500 (6,672)	500 (2,224)	750 (3,336)	600 (2,668)

Appendix 3 – Cultural Heritage Self Assessment

Ontario

Ministry of Tourism, Culture and Sport

Programs and Services Branch
401 Bay Street, Suite 1700
Toronto ON M7A 0A7

REA Checklist: Consideration of Potential for Heritage Resources

Applies to: Applicants for a renewable energy approval (REA) under the *Environmental Protection Act* who opt to consider the potential for heritage resources under subsection 23(2) of O. Reg. 359/09.

Screening Question

Is the project location situated on a parcel of land that:	**Yes**	**No**
1. Abuts any protected property as described in Column 1 of the Table in section 19?*	☐	☑
2. Is included on the Ministry of Tourism, Culture and Sport's list of provincial heritage properties?	☐	☑
3. Is listed on a register or inventory of heritage properties maintained by the municipality?	☐	☑
4. Is the subject of a municipality, provincial or federal plaque?	☐	☑
5. Is on or abutting a National Historic Site?	☐	☑
6. Is on or abutting a known burial site and/or cemetery?	☐	☑
7. Contains structures over forty years old? (Residential structures, farm buildings and outbuildings, industrial, commercial, institutional buildings and/or engineering works, etc.)	☑	☐

Is there Aboriginal or local knowledge or accessible documentation suggesting that the project location is situated on a parcel of land that:	**Yes**	**No**
8. Contains or is part of a cultural heritage landscape? (Aboriginal trail, park, relationship to a Canadian Heritage River, designed garden, historic road or rail corridor, etc.)	☐	☑
9. Is considered a landmark in the local community or contains any structures or sites that are important to defining the character of the area?	☐	☑
10. Has special association with a community, person or historical event? (Aboriginal sacred site, traditional-use areas, battlefield, birthplace of an individual of importance to the community, etc.)	☐	☑

If **YES** to one or more of the above questions, there is potential for heritage resources at the project location.

If **uncertain** about the answer to one or more of the above questions, a heritage assessment is advised as additional research is required to determine whether there is potential for heritage resources in the project location.

if **NO** to all of the above questions, there is low potential for heritage resources at the project location. A summary of the information supporting the consideration of potential for heritage resources must be included in the design and operations report.

LP 1
9307 Union Dr.

*If the project is located on a protected property, written authorization must be obtained from the appropriate body and submitted to MOE as part of complete REA application under section 19 of O. Reg. 359/09.

STRATHROY-CARADOC
URBAN OPPORTUNITY - RURAL HOSPITALITY

The Corporation of the Municipality of Strathroy-Caradoc
52 Frank Street, Strathroy, ON N7G 2R4
Phone: 519-245-1070 • Fax: 519-245-6353
www.strathroy-caradoc.ca

August 15, 2012

Mr. Jean-Louis Gaudet
Exp.
1595 Clark Boulevard
Brampton, ON L6T 4V1

Re: Your Project No. V00002250-00
Request for Information – Renewable Engery Approval – Canadian Solar Developers (LP 1, 5 and 6, 7)

Dear Mr. Gaudet

Further to your email inquiry regarding the above-noted matter, staff have reviewed the subject property files and have the following information to offer:

9307 Union Drive

Relating to Section 19(1) of *O. Reg. 359/09*:

Has the property or abutting property been municipally designated as a heritage or protected property and/or is listed on the municipal heritage register or provincial register/list? **No**

Has a notice of intention to designate has been issued for the property or abutting property? **No**

Is the property or abutting property subject to a municipal easement agreement? **No**

Is the property or abutting property located within a designated Heritage Conservation District? **No**

Relating to Appendix D of the new MTC guidance document (*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)*:

Is a municipal, provincial or federal plaque on or related to the property? **No**

Is there is a known burial site and/or cemetery on the property or abutting the property? **No**

Is the property is within a Canadian Heritage River watershed? **No**

Is the property or an abutting property is associated with a known architect, planner or builder? **No**

Is the property or an abutting property is associated with a historic road or railroad? **Union Drive is an original township concession (VII Concession) surveyed in 1822**

Does the property or an abutting property contain a park or planned/designated recreational or community space? **No**

Is there documentation to indicate built heritage or cultural heritage landscape potential? **Our records indicate that the dwelling located on the property was constructed circa 1870**

Is the property or an abutting property is associated with a person or event of historic interest? **No**

8338 Scotchmere Drive

Relating to Section 19(1) of *O. Reg. 359/09*:

Has the property or abutting property been municipally designated as a heritage or protected property and/or is listed on the municipal heritage register or provincial register/list? **No**

Has a notice of intention to designate has been issued for the property or abutting property? **No**

Is the property or abutting property subject to a municipal easement agreement? **No**

Is the property or abutting property located within a designated Heritage Conservation District? **No**

Relating to Appendix D of the new MTC guidance document (*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)*:

Is a municipal, provincial or federal plaque on or related to the property? **No**

Is there is a known burial site and/or cemetery on the property or abutting the property? **No**

Is the property is within a Canadian Heritage River watershed? **No**

Is the property or an abutting property is associated with a known architect, planner or builder? **No**

Is the property or an abutting property is associated with a historic road or railroad? **Scotchmere Drive is an original township concession (VIII Concession) surveyed in 1822**

Does the property or an abutting property contain a park or planned/designated recreational or community space? **No**

Is there documentation to indicate built heritage or cultural heritage landscape potential? **Our records indicate that the dwelling located on the property was constructed circa 1890**

Is the property or an abutting property is associated with a person or event of historic interest? **No**

9274 Union Drive

Relating to Section 19(1) of *O. Reg. 359/09*:

Has the property or abutting property been municipally designated as a heritage or protected property and/or is listed on the municipal heritage register or provincial register/list? **No**

Has a notice of intention to designate has been issued for the property or abutting property? **No**

Is the property or abutting property subject to a municipal easement agreement? **No**

Is the property or abutting property located within a designated Heritage Conservation District? **No**

Relating to Appendix D of the new MTC guidance document (*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)*:

Is a municipal, provincial or federal plaque on or related to the property? **No**

Is there is a known burial site and/or cemetery on the property or abutting the property? **No**

Is the property is within a Canadian Heritage River watershed? **No**

Is the property or an abutting property is associated with a known architect, planner or builder? **No**

Is the property or an abutting property is associated with a historic road or railroad? **Union Drive is an original township concession (VII Concession) surveyed in 1822**

Does the property or an abutting property contain a park or planned/designated recreational or community space? **No**

Is there documentation to indicate built heritage or cultural heritage landscape potential? **Our records indicate that the dwelling located on the property was constructed circa 1975**

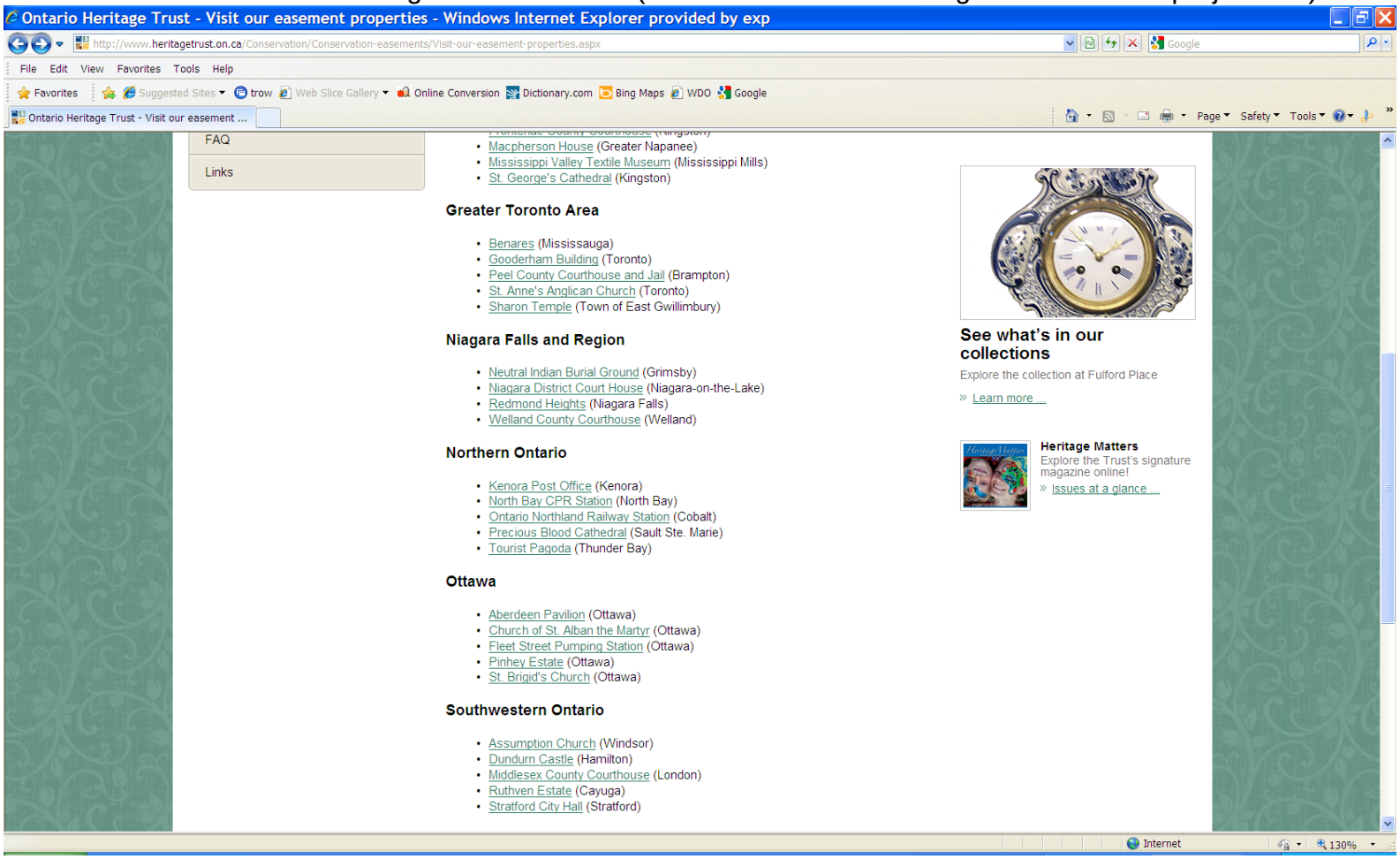
Is the property or an abutting property is associated with a person or event of historic interest? **No**

I trust the above will be satisfactory for your purposes. Should you require additional information or clarification on what had been provided, please do not hesitate to contact me by telephone at: 519-245-1105 (ext 250) or by email at: phicks@strathroy-caradoc.ca.

Sincerely

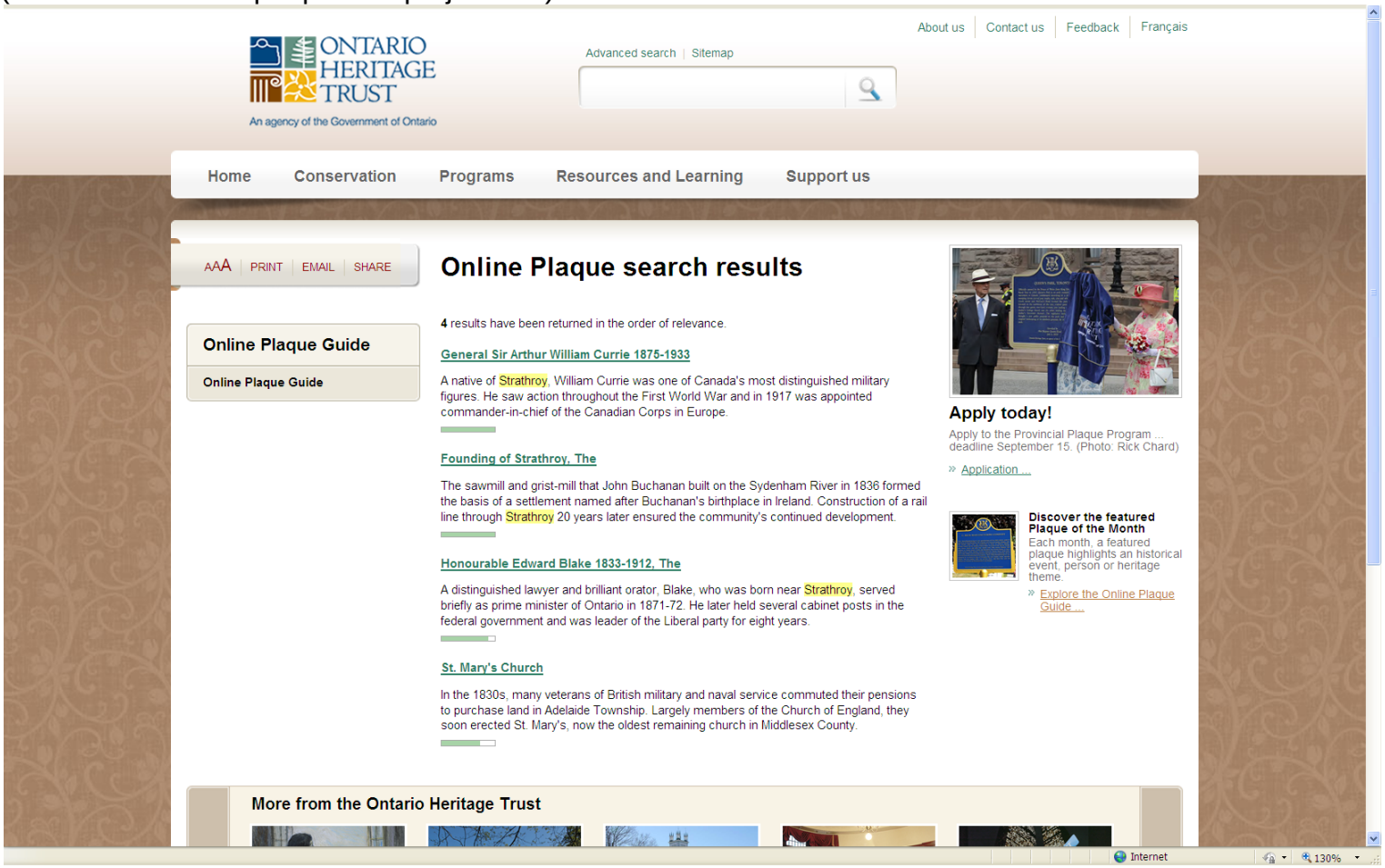
Paul Hicks
Planner

Search Results of Ontario Heritage Trust Website (result - no Ontario Heritage Trust sites on project site)



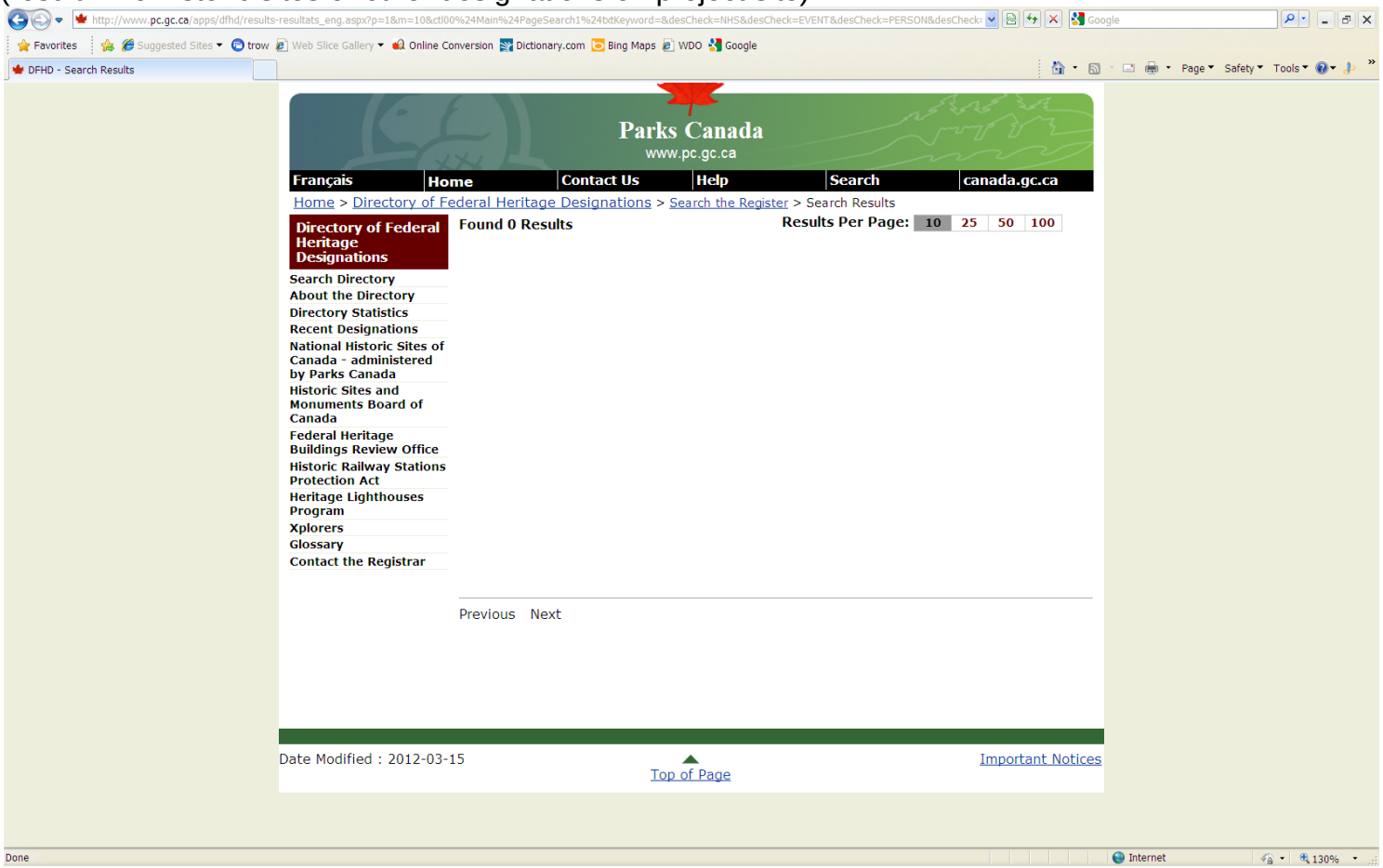
Online Plaque search results on Ontario Heritage Trust website. http://www.heritagetrust.on.ca/Resources-and-Learning/Online-Plaque-Guide/Online-Plaque-search-results.aspx?searchtext=

(result – no historic plaques on project site)



Search results on Parks Canada website. http://www.pc.gc.ca/apps/dfhd/default_eng.aspx

(result – no historic sites or other designations on project site)



Location of LP's #1, 5, 6 and 7 in watershed

http://maps.camaps.ca/SilverlightViewer1_4/Viewer.html?ViewerConfig=http://maps.camaps.ca/Geocortex/Essentials/REST/sites/scrca/viewers/SCRCA_SL/virtualdirectory/Config/Viewer.xml

(result – project site not in historic river watershed)