CanadianSolar

Glenarm Solar Project

Renewable Energy Approval Application

Design and Operations Report

July 2012

GL Garrad Hassan

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GLENARM SOLAR PROJECT

RENEWABLE ENERGY APPROVAL (REA) APPLICATION

DESIGN AND OPERATIONS REPORT

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Author: D. Boudreau

Approved by: P. Henn

GL Garrad Hassan Canada Inc.
151 Slater Street, Suite 806, Ottawa, Ontario, K1P 5H3, Canada

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1 PREAMBLE

SkyPower Glenarm LP is proposing to develop the Glenarm Solar Project which is subject to *Ontario Regulation 359/09* (Renewable Energy Approval (REA) [1] under Part V.0.1 of the *Ontario Environmental Protection Act* (EPA)) and *Regulation 521/10* [2]. SkyPower Glenarm LP has received a contract from the Ontario Power Authority (OPA) for the purchase of electricity generated by photovoltaic solar panels through the Province's Feed-in Tariff (FIT) Program. Canadian Solar Solutions Inc. is managing and coordinating the approvals process for SkyPower Glenarm LP. The Project is seeking a Renewable Energy Approval from the Ontario Ministry of the Environment (MOE).

This Design and Operation Report has been prepared in accordance with Table 1 of *Ontario Regulation 359/09* and the MOE's "Technical Guide to Renewable Energy Approvals" (July 2011) [3].

2 PROJECT LOCATION AND GENERAL DESCRIPTION

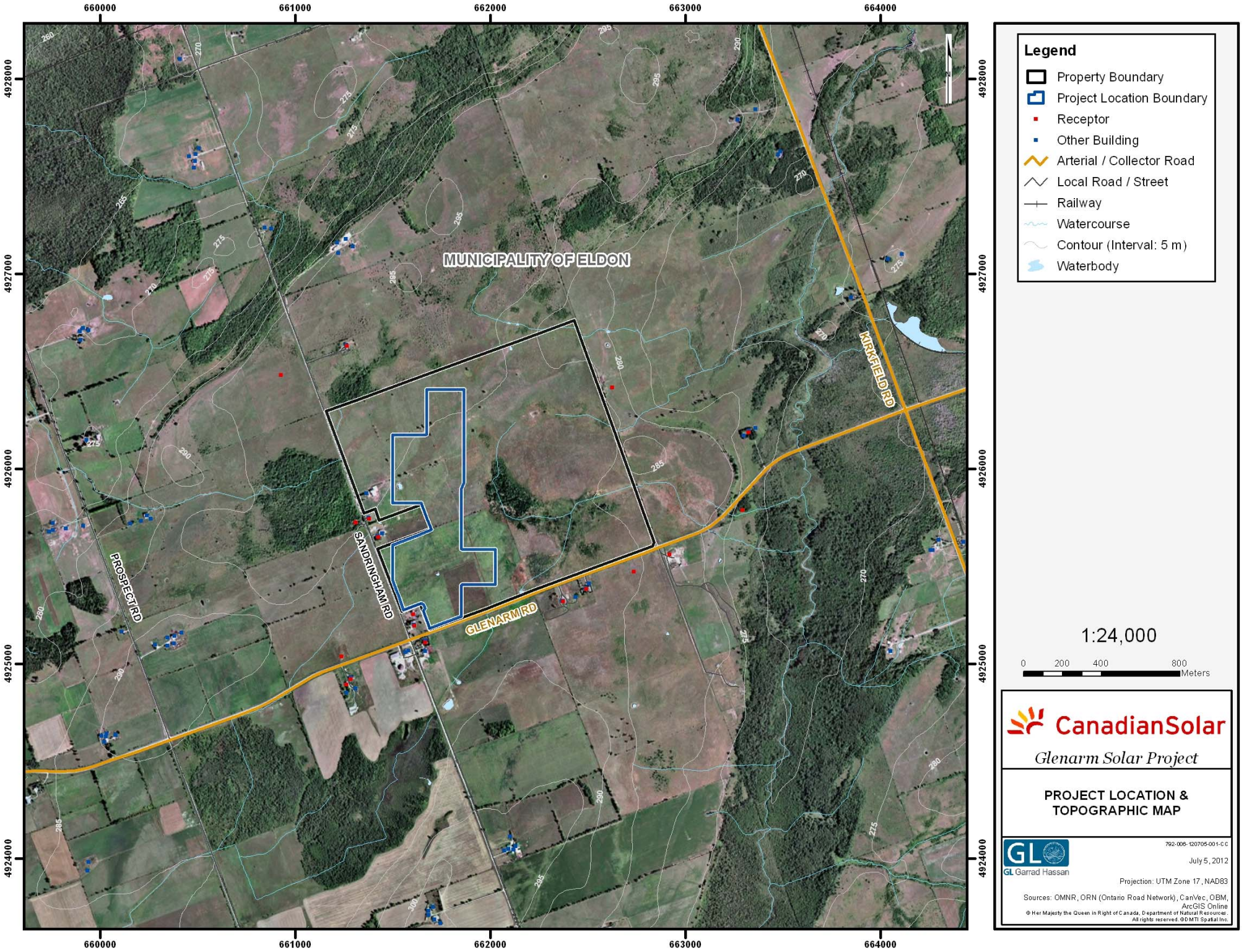
The Project is located on Part Lot 11 and 12, Concessions 6, Eldon Township, City of Kawartha Lakes, approximately 25 km north of Lindsay, Ontario. More specifically, the Project is located on the northeast corner of the intersection of County Road 8 (Glenarm Road) and Sandringham Road (see Figure 2-1). The Project Location occupies an area approximately 93 acres (38 ha) and is located on one parcel approximately 400 acres (162 ha) which is owned by the proponent with general geographic coordinates as follows:

- Latitude: 44°27'36.98" N
- Longitude: 78°57'53.66"W

The landscape within the Study Area is largely dominated by idle agricultural lands. The surrounding land use is characterized as low density rural residential. A mix of agricultural uses was observed and included row crops (corn, soy bean, and winter wheat), pasture/forage, and idle lands. One municipal land use (Township of Eldon's Road Department and depot) is located within the Study Area.

The Glenarm Solar Project will generate renewable power using state-of-the-art solar energy technology and feed this electricity into the Hydro One electrical system. The proposed Project has a maximum total nameplate capacity of 10 MW AC. The Project components will be installed on one proponent owned lot. The Project will connect to the Hydro One distribution system that runs along Linden Drive.

The Project has been configured to optimize the current solar photovoltaic technology to convert sunlight to electricity while taking into consideration a set of biophysical- and human-related setbacks to ensure the Project is developed in a sustainable manner and in compliance with applicable regulations, namely *Ontario Regulation 359/09* setbacks. These constraints stem from regulations, existing land uses, consultations and expert analysis of the site's sensitivity. Field surveys were also conducted by the biophysical and archaeological teams to identify any significant natural or heritage features.



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3 SITE PLAN

A site plan per the format requirements in *Ontario Regulation 359/09* and MOE's guidance document is presented in Appendix A of this Report. The site plan includes the proposed Project components, as well as cultural and natural heritage features, water bodies and noise/odour receptors within 300 m of the Project Location.

The Project Location is defined as per O. Reg. 359/09 as "*...a part of land and all or part of any building or structure in, on or over which a person is engaging in or proposes to engage in the project and any air space in which a person is engaging in or proposes to engage in the project*". As described therein, the Project Location boundary is the outer limit of where site preparation and construction activities will occur (including temporary construction areas if applicable) and where permanent infrastructure is proposed.

3.1 Project Components

The Project will be designed to include the following components, all of which are clearly depicted in Appendix A:

- Buildings and structures – No permanent building are being proposed for this Project. An approximately 2.7 m (9') tall chain link security fence will be erected around the perimeter of the solar facility. Temporary staging areas during construction such as temporary office trailers and associated parking spaces will be used.
- Transportation systems – Two site entrances onto the Project Location have been proposed, both towards the southern end of the Project: One along Sandringham Road approximately 200 m north of the intersection of Sandringham Road and Glenarm Road and the other along Glenarm Road approximately 300 m east of the same intersection. On-site access roads approximately 3.7 m to 5 m wide will be utilized throughout the Project.
- Electrical generation equipment – The Project will include photovoltaic modules, racking systems, inverters and a transformer (see Section 4 for further details).
- Collector System and Distribution – Underground cabling will direct AC electricity from the inverter stations to a transformer to step up the output to the electrical system. Distribution lines will be constructed above ground by Hydro One to connect the facility to the electrical system. The Project will not be constructing distribution lines.
- A switch house with 10 MVA pad mount step-up transformer will connect to the Hydro One distribution system is located in the southern part of the Project Location. Refer to the Noise Impact Study for the exact location of inverters, transformers, and receptors.

3.2 Features of the Project Area

Studies were undertaken to identify features in the area that may be potentially affected by the construction and/or operation of the solar energy facility. Background studies were completed to understand the presence and significance of the features and the extent of the potential impacts. The following sections summarize the results of these studies.

3.2.1 Archaeological and Cultural Heritage Features

Archaeological Features

A Stage 1 Archeological Assessment was completed by Scarlett Janusas with Scarlett Janusas Archaeological and Heritage Consulting and Education in June 2010 [4]. Subsequently, a Stage 2 Archaeological Assessment was completed by Advance Archaeology in December 2011 [5]. Both of these assessments have been submitted to the Ministry of Tourism, Culture and Sport (MTCS)

The Stage 1 Archaeological Assessment determined that approximately two thirds of the area within the property boundary exhibits archaeological potential for the recovery of both prehistoric and historic cultural materials. Subsequently, a Stage 2 Archaeological Assessment was conducted which produced no artifacts, structural remains, or other cultural heritage resources from either the prehistoric or pre-contact time periods. Based on the lack of findings during the Stage 2, a Stage 3 was determined not to be necessary.

A confirmation letter for the Stage 1 Archaeological Assessment was issued by the MTCS on July 14, 2010 and a confirmations letter for the Stage 2 Archaeological Assessment was issued on January 13, 2012. The confirmation letters state the Ministry is satisfied that concerns for archaeological sites have been met for the area of this Project.

The complete Stage 1 and 2 Archaeological Assessments that were submitted to the MTCS and the confirmations letters are provided in Appendix B.

Cultural Heritage Features

A Cultural Heritage Assessment was completed by Scarlett Janusas with Scarlett Janusas Archaeological and Heritage Consulting and Education in June 2010. The report was submitted to the MTCS and updated in October 2011 to reflect their comments [6] and a confirmation letter was issued by the MTCS on November 2011 based on the successful completion and review of the Heritage Assessment. The letter stated that based on the information contained in the assessment the MTCS is satisfied that concerns for heritage features have been appropriately addressed.

By applying the evaluation criteria in Ontario Regulation 9/06 under the Environmental Protection Act, it was determined that two buildings adjacent to the Project Location exhibit some heritage values. Subsequently, a visual simulation of the two buildings was completed to determine if either will be impacted by the Glenarm Solar Project. The simulations determined that one of the buildings (school house identified as BF#4) is currently surrounded by coniferous trees. The other building (log house identified as BF#3) will be impacted if no visual barriers are proposed. As a result, a berm was proposed between the log house and the solar panels to eliminate visual impacts. A confirmation letter from the MTCS determined that there will be no direct impacts to either of the two buildings that exhibited some heritage value.

The complete Heritage Assessment that was submitted to the MTCS and the confirmation letter is provided in Appendix C.

3.2.2 Natural Heritage Features

A Natural Heritage Assessment (NHA) in accordance with Ontario Regulation 359/09 was submitted to the MNR in July 2011. Subsequent to revisions to the site plan the NHA was resubmitted on February 1, 2012 and now includes an Environmental Impact Study (EIS) [7].

No significant natural features, significant woodlands, wetlands, or valley lands are located within 120 m of the Project Location. The Project Location is also not located within 120 m of confirmed significant wildlife habitat. Biologists however, have treated three wildlife habitats within 120 m of the Project Location as being significant open country breeding bird habitat. Prior to construction breeding bird surveys will be completed in accordance with provincially accepted evaluation criteria to confirm (or deny) their significance. If these habitats are confirmed to be significant, two years of post-construction monitoring of the remaining open country habitat will be completed. In addition to post construction monitoring the proponent has committed, if required to compensate for the removal a significant open country breeding bird habitat.

Compensation will include the following:

- A minimum of 32 ha (79 acres) within the same property will be managed as open country breeding bird habitat for the duration of the Glenarm Solar Project.
- Habitat management will include mowing the habitat once per year to ensure that it remains open
    - Mowing or harvesting hay will occur outside of the breeding bird season (May 1st – July 15th)

Although no natural features are present within 120 m of the Project Location except for three wildlife habitats that have been treated as significant, the NHA and EIS have considered general potential negative effects and mitigation measure for features outside of 120 m from the Project Location.

A confirmation letter was provided by the MNR on March 30, 2012. The confirmation letter and the NHA/EIS are provided in Appendix D.

3.2.3 Water Body Report

A Water Body Report was completed in February 2012 in accordance with the Ontario Regulation 359/09. No lakes (300 m for lake trout lakes), permanent or intermittent streams, or seepage area were identified within 120 m of the Project Location [8]. Since no aquatic features were located within 120 of the Project Location, an EIS was not required for the Glenarm Solar Project.

Five unnamed watercourses were identified within the Study Area (300 m from the Project Location). Although no aquatic features are located within 120 of the Project Location, potential remains for adjacent water bodies to be impacted through sediment and contaminants being carried from Project Location via overland flow pathways and ephemeral or “non-water body” drainage features

Mitigation measures to avoid potential impacts have been discussed in the Construction Plan Report and are provided in the Water Body Report presented in Appendix E of this report.

3.2.4 Noise Receptors

The Project area is considered to be Class 3 (rural), defined as a rural area with an ambient noise dominated by natural sounds, with little or no road traffic. Class 3 areas are often the following:

- A small community with a population of less than 1000;
- An agricultural area; and
- A rural recreational area such as a cottage or a resort area, or a wilderness area.

As such, ambient sound levels within the Project area and on adjacent lands are typical of rural agricultural Ontario, with sounds originating from nature, residential activities, agricultural activities (tractors and other machinery), vehicle traffic, and ambient noise induced by wind.

A total of 18 Points of Reception, including dwellings and vacant lot receptors, were identified within 1000 m of the Project Location and were considered for the Noise Impact Assessment. The results of the Noise Impact Assessment indicate that the Project complies with the applicable MOE environmental noise guidelines [9].

The Noise Impact Assessment is provided in Appendix F.

4 FACILITY DESIGN PLAN

The Project includes the following components:

- Photovoltaic modules:
    - The solar panels used for a project of this scale range from 60 to 300 W each. For a 10 MW AC project, it is expected that approximately 30,000 to 100,000 PV panels will be installed. Panels will be aligned in rows approximately 4-10 m apart.
- Racking:
    - Fixed racking systems will be used to attach the solar panels to the galvanized steel support structures.
- Inverters and transformers:
    - Solar panels create DC electricity, which is then converted by an inverter to AC electricity which is suitable for distribution to the Hydro One electrical system. This Project will use up to 11 inverter clusters each comprising 2 inverters and a transformer.
- Collection system and main step-up transformer:
    - Underground cabling will direct AC electricity to a 10 MVA pad mount step-up transformer to connect to the Hydro One distribution system.
- On-site access roads (approximately 3.7 m to 5 m wide).
- Distribution:
    - Distribution lines will be constructed above ground by Hydro One to connect the facility to the electrical system.
- A 2.7 m (9') chain link security fence will be installed around the perimeter of the solar facility for security purposes, or as required by the *Electrical Safety Act* (ESA).

Table 4-1 below summarizes the components proposed for this Project at the time of this report. The details of these components are attached as Appendix G.

Table 4-1: Proposed facility design components

Component	Model No.	Quantity
Solar panels	Canadian Solar CS6P (or similar)	Approximately 48,000
Inverters	SC 500HE-US (or similar)	Up to 22
Main Step-up Transformer	Siemens – Exact Model TBD	1

5 FACILITY OPERATIONS PLAN

The Project's Operations Phase is not resource intensive. Solar panels convert radiation from the sun into electricity. Each solar array is connected to a remote system which monitors a large number of parameters in real time and can detect any condition which exceeds normal operating conditions of the facility (i.e. short circuits). Once a problem is identified, maintenance crews will be dispatched to correct the problem.

It is anticipated that the Operations Phase's activities will mainly be routine maintenance activities with scheduled maintenance tasks. Maintenance may consist of the following activities:

- Inverter preventative maintenance;
- Panel washing (with water), as necessary;
- Diagnostics of electrical connections;
- Padmount transformer periodic maintenance;
- Solar module replacement, as necessary;
- General repair and maintenance work; and
- Ground maintenance, as necessary.

In addition to the above-mentioned scheduled maintenance activities, other isolated maintenance tasks stemming from regular operation are also performed. These unplanned maintenance activities usually involve replacing small components such as breakers and electrical wiring, etc. Events involving the replacement of major components typically do not occur over the lifespan of a solar facility. In the unlikely event that a major component needs to be replaced, associated maintenance activities will be carried out in a timely fashion. These major maintenance activities will entail the mobilization of specific equipment on site and of a greater number of maintenance workers.

The Operations Phase's duration will coincide with the FIT contract and for the purpose of this assessment; it is assumed that the Glenarm Solar Project will be in operation for a minimum of 20 years.

Table 5-1 below summarizes the activities of the Project's Operations Phase.

Table 5-1: Project activities during the operations phase

Activity	Description
Operation of solar arrays	• The Glenarm Solar Project will be controlled via a remote system, software, and communication system enabling the staff to continuously monitor 24 hours a day. • The system can be accessed remotely and allows for remote reset of minor fault conditions and access to data for fault analysis.
Maintenance	• Servicing, inspection and replacement of weathered electrical components. • Clearing of snow as required. • No water taking is proposed. If washing of the panels is deemed to be necessary, water will be brought to the site as required. • As required, vegetation will be controlled mechanically to allow access to all areas of the site and to prevent shading of the panels. No herbicides will be used onsite. • Regular inspections of transformers to check for signs of oil leaks and general maintenance requirements • Maintenance crews will be trained and equipped to respond to accidental spills. All Project vehicles will carry an emergency spill response kit.
Transportation and traffic	• Regular maintenance services or site check-ups will only require minimal use of trucks. Access roads are maintained unless an unplanned event or malfunction requires the immediate intervention of heavy machinery or trucks. Transportation crews will be trained and equipped to respond to accidental spills. All Project vehicles will carry an emergency spill response kit.

6 ENVIRONMENTAL EFFECTS, MITIGATIONS MEASURES AND MONITORING PLAN

This section presents a summary of potential effects, mitigation measures and residual effects associated with project-environment interactions during the operations phase of the Project.

More detailed discussions relating to natural heritage impacts, archaeological and heritage impacts, noise impacts, land use impacts and water body impacts are found in the Natural Heritage Assessment reports, Archaeological Assessment reports, Heritage report, Noise Impact Assessment, and Water Body report, appended to this report.

During the Operations Phase, photovoltaic technology produces no air pollution, little noise, and requires no transportable fuels. The main activity occurring during operations is maintenance and inspections, which are mostly done with light-weight vehicles.

As requested under REA, operational effects on natural features are assessed in more detail within 120 m of the Project Location. If warranted operational effects on some features are also assessed within the 300 m radius area, generally defined as the "Study Area", or beyond, depending on the type of impact and the type of feature. Effects on the following environmental components during the Operations Phase have been analysed in this report:

- Terrain and soils;
- Aquatic Resources;
- Noise; and
- Local interests, land use and infrastructure.

Potential environmental effects of the Project's operational activities and associated mitigation measures and monitoring plans are discussed in detail for each component.

6.1 Environmental Effects – Methodological Approach

As requested under REA, potential effects from the design and operation of the solar facility have to be assessed while considering applicable mitigation and compensation measures. GL GH evaluated the significance of the residual effect, based on Table 6-1 below.

Table 6-1: Levels of residual effects

Residual Effect	Residual Effect Level	Significance
Potential impact could threaten sustainability of the resource and should be considered a management concern. Research, monitoring and/or recovery initiatives should be considered.	High	Significant
Potential impact could result in a decline in resource to lower-than-baseline but stable levels in the study area after Project closure and into the foreseeable future. Regional management actions such as research, monitoring and/or recovery initiatives may be required.	Medium	Significant
Potential impact may result in a slight decline in resource in study area during the life of the Project. Research, monitoring and/or recovery initiatives would not normally be required.	Low	Not Significant
Potential impact may result in a slight decline in resource in study area during Construction Phase, but the resource should return to baseline levels.	Minimal	Not Significant

Depending on the outcome of the effects assessment, follow-up and/or monitoring programs could be proposed in order to further investigate the potential effects, or to verify the significance of the effect.

6.2 Terrain and Soils

6.2.1 Potential Effects

The Project-related effects on these environmental components include the following:

- Terrain and soils contamination.

6.2.2 Performance Objectives

- No contamination of terrain and soils from accidental spills.

6.2.3 Effects Assessment

Due to the small amount of vehicle use during operations, which is mainly for maintenance and the limited volume of materials capable of spilling, the effect of this impact is considered minimal. It is understood that the transformers to be used for this Project will be fluid immersed and housed in a factory provided enclosure.

The potential impact from these components is also considered minimal by implementing the mitigation measures listed below.

6.2.4 Mitigation Strategy

Mitigation measures include:

- Training of the maintenance crews to respond to accidental spills;
- Applying spill control measures including prevention and emergency response;
- An emergency spill response kit will be kept onsite;
- Inspecting trucks and equipment on a regular basis; and
- Ensure transformer stations have secondary containment.

In accordance with the Environmental Management and Emergency Response Plans, should a spill occur, it will be reported to the Ministry of the Environment's Spills Action Centre immediately upon its discovery. Through these plans, the Proponent commits to routinely train and update applicable staff during all phases of the Project's service life on spill reporting, containment, and proper spill clean-up and disposal procedures.

Based on this mitigation strategy, the effect to this environmental component is considered minimal and not significant, as shown in Table 6-2.

Table 6-2: Effects assessment summary – Terrain and soils

Effect	Mitigation Measures	Level of Concern	Significance of Effect
Operation			
Terrain and soil contamination	• Training of the maintenance crews to respond to accidental spills; • Applying spill control measures including prevention and emergency response; • An emergency spill response kit will be kept onsite; • Inspecting trucks and equipment on a regular basis; and • Ensure transformer stations have secondary containment	Minimal	Not significant

6.2.5 Follow-up and Monitoring

Given the small quantities possibly involved and the planned mitigation measures proposed, the adverse effects due to accidental oil or fuel spills is of minimal concern and not significant; a monitoring plan is therefore not required. As discussed above, the emergency response plan will be enacted in the event of an accidental spill.

6.3 Aquatic Resources

6.3.1 Potential Effects

The Project-related effects on these environmental components include the following:

- Surface water and ground water contamination; and
- Increased storm water runoff and decreased water quality.

6.3.2 Performance Objectives

- No contamination of surface water and ground water resources; and
- No negative environmental effects from storm water.

6.3.3 Effects Assessment

There are no water bodies within 120 m of the Project Location. There are however five intermittent tributaries within the Study Area. As discussed in Section 6.2, given the mitigation measures that will be taken to minimize the chances of accidental spills, the potential effects on surface water and ground water is greatly reduced.

During operations the presence of granular access roads and component foundations may change the overall imperviousness of the Project Location. Solar panels themselves are impervious surfaces but runoff onto the ground beneath them will be permitted.

The potential impact from these components is considered minimal by implementing the mitigation measures listed below.

6.3.4 Mitigation Strategy

Mitigation measures include:

- Same as per section on terrain and soils;
- Clear vegetative cover only as necessary;
- Minimize grading resulting in minimized changes to the storm water regime;
- To the extent feasible, the ground beneath solar panels should be allowed to re-vegetate naturally or be planted with native low growing vegetation to replicate pre development hydrologic conditions; and
- Complete a storm water management plan as part of the detailed engineering design.

Based on this mitigation strategies provided, the effect to this environmental component is considered minimal/low and not significant, as shown in Table 6-3.

Table 6-3: Effects assessment summary – Aquatic resources

Effect	Mitigation Measure	Level of Concern	Significance of Effect
Operations			
Surface water and ground water contamination	• Same as per section on terrain and soils; • Clear vegetative cover only as necessary;	Minimal	Not significant
Increased storm water runoff and decreased water quality	• Minimize grading resulting in minimized changes to the storm water regime; • To the extent feasible, the ground beneath solar panels should be allowed to re-vegetate naturally or be planted with native low growing vegetation to replicate pre development hydrologic conditions; and • Complete a storm water management plan as part of the detailed engineering design	Low	Not Significant

6.3.5 Follow-up and Monitoring

The potential for impacts to surface water and ground water will be minimized by implementing the above mitigation measures as well as those identified in Section 6.2. With these measures in place, surface water, ground water, and storm water impacts are of minimal concern and not significant. A monitoring plan is therefore not required.

6.4 Noise

6.4.1 Potential Effects

The Project-related effect on this environmental component includes the following:

- Increased noise levels from inverters and transformers.

6.4.2 Performance Objectives

- Compliance with Ontario Noise Guidelines and no noise complaints for nearby residents.

6.4.3 Effects Assessment

The Noise Impact Assessment (Appendix F) provides a detailed analysis of noise propagation from this solar facility. The study concludes that the Project is compliant with current noise guidelines in Ontario. Given the Project's compliance and the fact that noise from the facility may be perceived only on site or in the immediate vicinity (see the Noise Impact Assessment for description of noise sources and receptors), the level of concern for increased ambient noise due to this solar facility is minimal and not significant.

6.4.4 Mitigation Strategy

Potential effects are minimized by applying the following mitigation measures:

- Conduct noise study indicating compliance of the Project with Ontario Noise Guidelines; and
- Respect setback distance to noise receptors based on compliance with the Ontario Noise Guidelines.

Based on this mitigation strategies provided, the effect to this environmental component is considered minimal and not significant, as shown in Table 6-4.

Table 6-4: Effects assessment summary – Noise

Effect	Mitigation Measures	Level of Concern	Significance of Effect
Operation			
Increased noise levels from inverters and transformers	• Conduct noise study indicating compliance of the Project with Ontario Noise Guidelines; and • Respect setback distance to noise receptors based on compliance with the Ontario Noise Guidelines.	Minimal	Not significant

6.4.5 Follow-up and Monitoring

Considering the minimal adverse residual effects that the Project is expected to have with respect to noise, no follow-up or monitoring program have been proposed or are considered necessary.

6.5 Local Interests, Land Use and Infrastructure

6.5.1 Potential Effects

The Project-related effect on this environmental component includes the following:

- Increased traffic volume on public and site access roads during operations

6.5.2 Performance Objectives

- Minimize public disturbance during operations.

6.5.3 Effect Assessment

The potential effect of increased traffic on public and site access roads as a result of the proposed development is expected to be minimal. Increased traffic volumes on access roads are not expecting to be noticeable to neighbouring residences or businesses.

6.5.4 Mitigation Strategy

Considering the minimal effects, any potential effects will be minimized by applying the following mitigation measures:

- Respecting, as much as possible, the operation and maintenance schedule; and
- Respect posted speed limits;

Based on this mitigation strategies provided, the effect to this environmental component is considered minimal and not significant, as shown in Table 6-5.

Table 6-5: Effects assessment summary – Local interests, land use and infrastructure

Effect	Mitigation Measures	Level of Concern	Significance of Effect
Operation			
Increased volume on public and site access roads during operations	• Respecting, as much as possible, the operation and maintenance schedule; • Respect posted speed limits; and	Minimal	Not significant

6.5.5 Follow-up and Monitoring

Considering the minimal adverse residual effects that the Project is expected to have with respect to increased volume during operations, no follow-up or monitoring program have been proposed or are considered necessary.

Table 6-6 below presents a summary of the potential operational effects of the proposed Project on the local community and environmental features. Appropriate mitigation measures are also described.

Table 6-6: Effects assessment summary

Potential Negative Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures
Accidental spill of fuel or oil can potentially negatively impact: • Terrain and soils	No contamination of terrain and soil from accidental spills	• Training of the maintenance crews to respond to accidental spills • Apply spill control measures including prevention and emergency response • An emergency spill kit will be kept on-site • Regular inspection of trucks and equipment • Ensure transformer stations have secondary containment	• In accordance with the Environmental Management and Emergency Response Plan, spills will be reported to the MOE's Spills Action Center immediately upon discovery. **Contingency Measures** • The Proponent commits to routinely train and update applicable staff on spill response procedures through all phases of the Project's life cycle. • Any spills will be cleaned up in a timely manner
• Surface water and ground water contamination • Increased storm water runoff and decreased water quality	• No contamination of surface water and groundwater resources • No negative effects from storm water	• Same as per section on contamination of terrain and soils • Clear vegetative cover only as necessary; • Minimize grading resulting in minimized changes to the storm water regime; • To the extent feasible, the ground beneath solar panels should be allowed to re-vegetate naturally or be planted with native low growing vegetation to replicate pre development hydrologic conditions; and • Complete a storm water management plan as part of the detailed engineering design.	• In accordance with the Environmental Management and Emergency Response Plan, spills will be reported to the MOE's Spills Action Center immediately upon discovery. **Contingency Measures** • The Proponent commits to routinely train and update applicable staff on spill response procedures through all phases of the Project's life cycle. • If storm water is found to impact the intermittent watercourses,

Potential Negative Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures
			additional mitigation measures will be taken.
• Increased noise levels from inverters and transformers	• Compliance with Ontario Noise Guidelines • No noise complaints from residences	• Conduct noise study indicating compliance of the Project with Ontario Noise Guidelines; and • Respect setback distance to noise receptors based on compliance with the Ontario Noise Guidelines.	• No follow-up monitoring programs are considered necessary **Contingency Measures** • Noise disturbance claims will be investigated and if required additional mitigation measures may be provided (additional acoustic barriers)
• Increased traffic volume on public and site access roads during operations	• Minimize public disturbance during operations	• Respecting, as much as possible, the operation and maintenance schedule; and • Respect posted speed limits;	• Considering the minimal increase in traffic during operations, no monitoring is proposed **Contingency Measures** • Public disturbance claims other than noise will be investigated and if required additional mitigation measures provided.

7 EMERGENCY RESPONSE AND COMMUNICATIONS PLAN

7.1 Emergency Response and Communication Plan

Emergency events associated with the operation of a solar project are unlikely. SkyPower Glenarm LP is committed to addressing and reacting to any emergency that should arise from an accident or a malfunction during the course of the Project's service life, in order to safeguard the health and safety of its staff, the public and the environment. SkyPower Glenarm LP commits to implementing an Emergency and Communications Plan. As previously mentioned, Canadian Solar Solutions Inc. is managing and coordinating the approvals process for SkyPower Glenarm LP

7.1.1 Proponent

The primary Project contact:

Project contact:	Terry Rasmussen
Email:	Terry.Rasmussen@na.canadiansolar.com
Project website:	www.glenarmsolar.com
Company name:	Canadian Solar Solutions Inc.
Company address:	545 Speedvale Avenue West Guelph, ON, N1K 1E6
Telephone:	519-837-1881
Fax:	519-837-2550

7.1.2 Organizational Structure

Prior to starting the construction phase of the Project, the name of a single Engineering, Procurement and Construction (EPC) Manager will be made available for this Plan. Additionally, a representative from Canadian Solar Solutions Inc. will be appointed to the Project. When the Project is in its Operational Phase, the name of the Operational Managers and Project Managers will also be made available in this Plan.

7.2 Accidents and Malfunctions during Operations

7.2.1 Purpose and Scope

The Accidents and Malfunctions Plan is structured around the following four main objectives:

1. Understanding the type and extent of a potential accident or malfunction;
2. Establishing a response plan commensurate with the risk, namely with respect to personnel and equipment required;
3. Ensuring an orderly and timely decisional process; and
4. Providing an incident management organization with clear responsibilities.

The Plan will address all incidents that could potentially arise during the course of the Project's life, from construction to decommissioning. It will cover all incidents that could arise in the general Project area, which is an approximated zone around the solar facility including the access roads and step-up transformer

sites. It is expected that most impacts of an accident or a malfunction during the Project life will occur in close proximity to these infrastructures.

7.3 Pre-Planning

The solar facility benefits from an automatic remote system composed of various sensors that monitor the entire facility, including electrical circuits of different components. In the event that a malfunction should occur, operations and maintenance personnel will be immediately notified of the situation by a communication system that links all the solar arrays to a centralised unit. This unit then informs on-site personnel of the situation, ensuring a prompt response in mobilising the appropriate resources.

Accidents and malfunctions could occur during any of the three Project phases, i.e., construction, operations and decommissioning. The possible accidents or malfunctions and the planned response of solar farm technicians and other community-based resources are listed below.

7.3.1 Worker Accidents

Worker accidents can occur during the Construction and the Decommissioning Phase of the Project as well as during maintenance activities carried out during the Operational Phase. Among potential accidents that can occur are:

- Electrocution due to improper lockout/tagout procedures; and
- Human errors associated with fatigue.

To minimize the risk of accidents, the Proponent will ensure that workers will have adequate training and that construction activities are conducted with rigorously applied safety measures.

7.3.2 Spills of Hazardous Materials

The main hazardous substance that will be handled on site during construction is diesel fuel. Fuel will be hauled to the Project site to supply heavy machinery. It is assumed that no fuel will be stored on site.

Spill occurrence will be minimized by ensuring that all fuel trucks are inspected and compliant with industry standards. All refuelling will occur at designated refuelling sites. As all of these sites will be located at least 120 m from watercourses and will avoid traditional land use sites and sensitive ecosystems, any spills are expected to have minimal effect on the environment.

7.3.3 Vehicle Collisions

Certain construction timeframes will be characterized by a minor increase in traffic on the Project's main access road, Glenarm Road. Excess traffic could increase the possibility of collision with other vehicles, namely service vehicles.

Vehicles on the Project's access roads will have a maximum speed limit of 40 km/h, thus limiting the potential for serious incidents on site and for collisions with wildlife. On public roads and highways, vehicles should abide by the posted speed limits.

7.3.4 Machinery and Truck Failure

Machinery and transportation trucks on site could suffer for mechanical problems. Failure could result in oil or fuel spills on site. Spill occurrence will be minimized by ensuring that all machinery and trucks are inspected for any mechanical weaknesses or failure. Construction staff will be required to systematically inspect construction equipment for leaks and worn hoses or fittings prior to access to site. Faulty parts will be repaired or replaced before accessing the site.

The Proponent has made an effort to avoid water bodies, sensitive ecosystems, and traditional land use sites in accordance with Ontario Regulation 359/09 when siting the Project's infrastructure, thus reducing the risk of impacts to the environment.

7.3.5 Contaminant Spill from Transformers

The transformers on site have protective housing that prevents their internal fluids from leaking and all transformers will have secondary containment. The Proponent has made an effort to avoid watercourses and sensitive ecosystems when siting the Project's infrastructure, thus reducing the risk of impacts to the environment.

7.3.6 Mechanical Failure

Mechanical failure could occur for components of the racking system that support the solar panels due to weathering. Other components such as wiring and the actual solar panels are subject to weather conditions and are therefore also subject to mechanical failure. If mechanical failure of the solar panels were to occur, the control system would detect these failures and communicate the problem via the remote system. Repair crews would be notified to replace the faulty parts as necessary. Additionally, scheduled maintenance will help identify possible weathering of the support racks.

7.3.7 Electrical Failure

Electrical components of the solar facility such as electrical wires, circuit breakers, batteries, and transformers can suffer a failure due to short-circuit in the system. Failures of these components would result in loss of power for the Project, but no environmental damage or injury to the public is expected. Communication with Hydro One will be maintained through the onsite communication tower allowing a remote disconnect of the facility from the Hydro One system.

7.4 Communications: Emergency Organization and Responsibility

The Project's Construction Manager during the construction and decommissioning phases, as well as the Operations Manager during the operations will act as the "Incident Commander" in the event of an emergency. A second-in-command Incident Commander will also be named in case the firstly appointed Incident Commander is not able to perform his/her duties. The incident commanders will be responsible for ensuring that all contractors, employees, and any individual visiting the site are informed and can act according to the Accidents and Malfunctions Plan for the Project.

When notified of an incident or complaint, the Incident Commander will evaluate its severity by considering:

- 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 accident/malfunction.

The Incident Commander will also be responsible for documenting the accident or malfunction and informing the governmental authorities as required.

7.5 Complaint Recording and Tracking

All complaints which are received will be logged and forwarded to the construction manager (if received during construction) or the operations manager (if received after construction is complete). The following information will be documented:

- Name and contact information of the person making the complaint
- Nature of the complaint
- Environmental conditions at the time of the complaint (weather, temperature, wind direction, etc.)
- Follow-up action (if any)
- Responses (if any)

7.6 Internal Alerting

The internal emergency communication network will ensure that personnel will be promptly notified to respond to an emergency. The following procedures will be followed by SkyPower Glenarm LP in the event of an emergency:

- Incident Commander will notify on-site personnel of the emergency via telephone or a two-way radio system.
- Incident Commander will notify first responders and officials who can provide assistance.
- Incident Commander will identify any need for security measures and will designate personnel to implement them.

7.7 External Alerting

The following procedures will be followed by the Incident Commander in the event of an emergency:

- Evaluate the emergency and notify, as required, the fire department, police department and health services; call 911; and
- Spills of a hazardous material in excess of reportable limits will be reported to the Ontario Ministry of Environment.

7.7.1 Resources

The following are identified as resources potentially required in the event of a major accident or malfunction on the Project site:

Police

Policing needs are met by the Ontario Provincial Police (OPP):

- OPP 24 Hour Toll-Free Number (888) 310-1122;
- OPP TDD/TTY (Telephone Device for the Deaf / Teletypewriter) (888) 310-1133; and
- OPP City of Kawartha Lakes Detachment (705)-324-8479.

Ambulance

The City of Kawartha Lakes currently has a fleet of 10 ambulances 4 emergency response units with bases in Lindsay, Fenelon Falls, Bobcaygeon and secondary posts in Oakwood and Coboconk.

- In case of a medical emergency call 911

Other informational contacts are:

- Poison Information – (800) 668-6868
- TELEHEALTH Ontario – (866) 797-0000

Fire

The City of Kawartha Lakes uses multiple fire bases. Call 911 in a fire emergency.

Spills

In case of any large spills, call the Ontario Action Centre.

Environmental Spills – Ontario Action Centre – 24 hours – (800) 268-6060.

8 SUMMARY

This Design and Operations Report has been prepared in accordance with regulatory requirements subject to *Ontario Regulation 359/09* (Renewable Energy Approval (REA) under Part V.0.1 of the *Ontario Environmental Protection Act* (EPA)).

This report provides a detailed site plan for the Glenarm Solar Project and discusses studies that have been undertaken to identify significant features in the area that may be potentially affected by the construction and/or operation of the solar energy facility. Background studies were completed to understand the presence of environmental and social features and the extent of any potential impacts.

This report has specifically addressed potential negative effects associated with the design and operation of the Glenarm Solar Project. It has also provided appropriate mitigation measures to address the potential effects identified as well as monitoring plans and contingency measures

This report has discussed the facility design and operations plan and has provided the Project components and routine tasks and maintenance activities anticipated to be performed during operation of the Project. It has also discussed in detail the Emergency Response and Communications Plan for the Glenarm Solar Project.

The Decommissioning Report will discuss activities and procedures associated after the operational life of the Glenarm Solar Project.

9 REFERENCES

[1] *Ontario Regulation 359/09*, made under the *Environmental Protection Act*, Renewable Energy Approvals under Part 1.0 of the Act.

[2] *Ontario Regulation 521/10*, made under the *Environmental Protection Act*, Renewable Energy Approvals under Part 1.0 of the Act.

[3] Technical Guide to Renewable Energy Approvals, Ontario Ministry of the Environment, July 2011.

[4] Scarlett Janusas, Scarlett Janusas Archaeological and Heritage Consulting and Education. 2010. Stage 1 Archaeological Assessment - Proposed Glenarm Solar Farm – Lots 11 and 12, Concessions 6 – Geographic Township of Eldon, Victoria County, Municipality of Kawartha Lakes, Ontario.

[5] Donna Morrison, Advance Archaeology. December 5, 2011. Stage 2 Archaeological Assessment of the Proposed Glenarm Solar Energy Facility, Part of Lots 11 and 12, Concession 6, Geographic Township of Eldon, (Now in the City of Kawartha Lakes), County of Victoria, Ontario.

[6] Scarlett Janusas, Scarlett Janusas Archaeological and Heritage Consulting and Education. October 24, 2011. Cultural Heritage Assessment, Proposed Glenarm Solar Farm, Lot 11 and 12, Concessions 6, Township of Eldon, Former County of Victoria, City of Kawartha Lakes, Ontario.

[7] Natural Resource Solutions Inc. January 2012. Glenarm Solar Park Natural Heritage Assessment & Environmental Impact Study.

[8] Natural Resource Solutions Inc. February 2012. Glenarm Water Body Report.

[9] GL Garrad Hassan Canada Inc. February 2012. Glenarm Solar Project, Noise Impact Assessment

APPENDIX A SITE PLAN

660700 661200 661700 662200 662700 663200

4927000 4926500 4926000 4925500 4925000

120 m/ 394 ft. Setback from Wetland

MUNICIPALITY OF ELDON

30 m/ 98 ft. Setback from Waterbody

SANDRINGHAM RD

Glenarm

Underground Cable

11 10 9 8 7 6 5 4 3 2 1

Inner Access

BALSAM LAKE 1-WETLAND

Communication Tower

Site Entrance 1

Site Entrance 2

GLENARM RD

Substation

Overhead Line

PCC

Lay Down Area

280 290 270

N

Legend

- Property Boundary
- Project Location Boundary
- Records Review (120 m)
- Records Review (300 m)
- Site Entrance
- PCC
- Communication Tower
- PV Panel
- Substation
- Inverter/ Padmount Transformer
- Fence
- Underground Cable
- Overhead Line
- Inner Access Road
- Lay Down Area
- Building
- Arterial / Collector Road
- Local Road / Street
- Railway
- Contour (Interval: 5 m)
- Watercourse
- Wetland
- Wooded Area
- Waterbody
- Watercourse and Waterbody - 30 m Buffer
- Wetland - 120 m Buffer

0 100 200 400 Meters

CanadianSolar

Glenarm Solar Project

PRELIMINARY SITE PLAN

GL Garrad Hassan

792-003-120705-001-CC

July 5, 2012

Projection: UTM Zone 17, NAD83

Sources: ORN (Ontario Road Network), OBM, CanVec and Google Earth.
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APPENDIX B ARCHAEOLOGICAL ASSESSMENTS

Ministry of Tourism and Culture
Culture Division
Culture Programs Unit
Programs and Services Branch
400 University Avenue, 4th floor
Toronto, ON, M7A 2R9
Telephone: 416/314-7132
Facsimile: 416/314-7175
Email : Jim.Sherratt@ontario.ca

Ministère du Tourisme et de la Culture
Division de culture
Unité des programmes culturels
Direction des programmes et des services
400, avenue University, 4e étage
Toronto, ON, M7A 2R9
Téléphone: 416/314-7132
Télécopieur: 416/314-7175
Email : Jim.Sherratt@ontario.ca

Ontario

July 14, 2010

Ms. Scarlett Janusas
SJAHCE
269 Cameron Lake Road
Tobermory, Ontario
N0H 2R0
jscarlett@amtelecom.net

RE: Review and Acceptance into the Provincial Register of Reports: Archaeological Assessment Report Entitled, *"Stage 1 Archaeological Assessment Proposed Glenarm Solar Farm, Lots 11 and 12, Concession 6, Geographic Township of Eldon, Victoria County, Municipality of Kawartha Lakes, Ontario"* Report Dated June 2010, Report Received June 28, 2010. MCL Project Information Form Number P027-104-2010, MCL RIMS Number HD00469.

Dear Ms. Janusas:

This office has reviewed the above-mentioned report, which has been submitted to this Ministry as a condition of licensing in accordance with Part VI of the Ontario Heritage Act, R.S.O. 1990, c 0.18. This review is to ensure that the licensed professional consultant archaeologist has met the terms and conditions of their archaeological licence, that archaeological sites have been identified and documented according to the 1993 technical guidelines set by the Ministry and that the archaeological fieldwork and report recommendations ensure the conservation, protection and preservation of the cultural heritage of Ontario.

As the result of our review, this Ministry accepts the above titled report into the Provincial register of archaeological reports. The report indicates that portions of the subject property have archaeological potential and, consequently, should be subject to a Stage 2 archaeological assessment. This Ministry concurs with this recommendation.

Should you require any further information regarding this matter, please feel free to contact me.

Sincerely,

Jim Sherratt
Archaeology Review Officer
Eastern Region
c. Archaeological Licensing Office
Ms. Elizabeth Fennell, Garrad Hassan/Helimax

Ministry of Tourism, Culture and Sport

Ministère du Tourisme, de la Culture et du Sport

Culture Programs Unit
Programs and Services Branch
Culture Division
435 S. James St., Suite 334
Thunder Bay, ON, P7E 6S7
Telephone: 807-475-1632
Facsimile: 807-475-1291

Unité des programmes culturels
Direction des programmes et des services
Division de culture
435 rue James sud, Bureau 334
Thunder Bay, ON, P7E 6S7
Téléphone: 807-475-1632
Télécopieur: 807-4751291

Email: andrew.hinshelwood@Ontario .ca

January 13, 2012

SkyPower Ltd.
130 Adelaide St. W., 30th Floor
Toronto, ON M5H 3P5

Attn.: Grace Pasceri

RE: Glenarm Solar Energy Facility

Part of Lots 11&12, Concession 6, Geographic Township of Eldon, City of Kawartha Lakes, County of Victoria

FIT # 631730129

MTC File HD000469

MTC PIFs P027-104-2010, P121-090-2010 & P121-095-2011

Dear Proponent:

This letter constitutes the Ministry of Tourism and Culture's written comments as required by s. 22(3)(a) of O. Reg. 359/09 under the *Environmental Protection Act* regarding archaeological assessments undertaken for the above project.

Based on the information contained in the report(s) you have submitted for this project, the Ministry believes the archaeological assessment complies with the *Ontario Heritage Act's* licensing requirements, including the licence terms and conditions and the Ministry's 1993 Archaeological Assessment Technical Guidelines or the 2011 Standards and Guidelines for Consultant Archaeologists (whichever apply). Please note that the Ministry makes no representation or warranty as to the completeness, accuracy or quality of the report(s).*

Archaeological assessment report entitled, ***Stage 1 Archaeological Assessment Proposed Glenarm Solar Farm Lots 11 and 12, Concession 6 Geographic Township of Eldon Victoria County Municipality of Kawartha Lakes, Ontario***, dated June, 2010, recommends the following:

> Based upon the background research of past and present conditions and the Stage 1 archaeological assessment of the property, the following is recommended:
>
> - A Stage 2 archaeological resource assessment is recommended for those portions of the study area considered to exhibit archaeological potential (Figure 8) and must be conducted prior to any development disturbance;
> - Should previously undocumented archaeological resources be discovered, they may be an archaeological site and therefore 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 archaeological fieldwork, in compliance with sec. 48 (1) of the Ontario Heritage Act;
> - The Cemeteries Act requires that any person discovering human remains must notify the police or coroner and the Registrar of cemeteries, Ministry of Small Business and Consumer Services.

Archaeological assessment report entitled, ***Stage 2 Archaeological Assessment of the proposed Glenarm Solar Energy Facility (FIT# 631730129), Part of Lots 11 and 12, Concession 6, Geographic Township of Eldon, (Now in the City of Kawartha Lakes), County of Victoria, Ontario***, dated December 5, 2011 and received by MTCS Toronto office December 14, 2011, recommends the following:

> Based on the results of this Stage 2 archaeological assessment, we offer the following two recommendations:
>
> - That, since nothing of cultural heritage value or interest was identified during the Stage 2 assessment, the entire subject property should be cleared of the archaeological condition placed upon it, and;
> - The proponent should carefully read the "Advice on Compliance with Legislation" provided in Section 6.0.

The Ministry is satisfied with these recommendations.

This letter does not waive any requirements which you may have under the Ontario *Heritage Act*. A separate letter addressing archaeological licensing obligations under the Act will be sent to the archaeologist who completed the assessment and will be copied to you.

This letter does not constitute approval of the renewable energy project. Approvals of the project may be required under other statutes and regulations. It is your responsibility to obtain any necessary approvals or licences.

Please feel free to contact me if you have questions or require additional information.

Sincerely,

Andrew Hinshelwood
Archaeology Review Officer

cc. S. Janusas
Archaeological and Heritage Consulting and Education
269 Cameron Lake Road
Tobermory, Ontario N0H 2R0

D. Morrison
Advance Archaeology
PO Box 493
Port Hope, ON L1A 3Z4

* In no way will the Ministry be liable for any harm, damages, costs, expenses, losses, claims or actions that may result: (a) if the Report(s) or its recommendations are discovered to be inaccurate, incomplete, misleading or fraudulent; or (b) from the issuance of this letter. Further measures may need to be taken in the event that additional artifacts or archaeological sites are identified or the Report(s) is otherwise found to be inaccurate, incomplete, misleading or fraudulent.

STAGE 1 ARCHAEOLOGICAL ASSESSMENT PROPOSED GLENARM SOLAR FARM LOTS 11 AND 12, CONCESSION 6 GEOGRAPHIC TOWNSHIP OF ELDON VICTORIA COUNTY MUNICIPALITY OF KAWARTHA LAKES, ONTARIO

SCARLETT JANUSAS
ARCHAEOLOGICAL AND HERITAGE CONSULTING AND EDUCATION
269 Cameron Lake Road
Tobermory, Ontario N0H 2R0
phone and fax 519-596-8243 cell 519-374-1119
jscarlett@amtelecom.net

Distribution:
2 copies: Helimax
3 copies: Ministry of Tourism and Culture
1 copy: SJAHCE

Licence # P027, PIF #P027-104-2010
June 2010
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Project Personnel

Project Manager Principal Archaeologist, And Report Preparation	Scarlett Janusas (P027)
Research Assistant	Chelsea Robert
GIS Mapping	This Land Archaeology

Acknowledgments

Scarlett Janusas Archaeological and Heritage Consulting and Education extend our thanks to Mr. Patrick Henn for providing maps, data and permission to access the property, and to Mr. Robert von Bitter, Ontario Ministry of Tourism and Culture regarding registered archaeological site data. In addition, SJAHCE would like to acknowledge the assistance provided by the City of Lindsay's Library staff, Local History Room.

Executive Summary

The proponent retained the services of Scarlett Janusas Archaeological and Heritage Consulting and Education (SJAHCE) to conduct a Stage 1 archaeological resource assessment on property proposed to be a solar farm. This property is located on Lots 11 and 12, Concession 6, in the geographic township of Eldon, Victoria County, Municipality of Kawartha Lakes, Ontario.

The study property is 169 ha in size. A field visit was conducted on June 9th, 2010 under cloudy skies and a high of 16 degrees C. There was sufficient archival and desk top information, in addition to the field visit, to ensure a determination of archaeological potential.

Background research indicated that there are no registered archaeological sites within two kilometres of the study area. However, information from the Annual Archaeological Reports of Ontario suggests there are archaeological sites two concessions distant from the study area.

There are a number of extant structures located on the subject property – #616 and #622 Sandringham Road are modern buildings with associated modern landscaping. Number 668 Sandringham is a 2 storey house with a rear addition and porch. There are a number of outbuildings associated with this property, including a shed, garage and log house. To the north of #668 Sandringham is a barn complex, but with no extant house. Number 679 Sandringham is School House #3, with a date indicated as 1903. There are numerous wire and wooden rail fences surrounding and running through the property.

There are four identified areas of soils. The first consists of the parent material of Otonabee loam, and then there is Otonabee loam – shallow phase; Granby loam, and Emily loam- shallow phase. The bedrock underlying the area is Trenton formation limestone.

The major drainage associated with the property is a number of tributaries of the Staples River, which cross the property several times on an approximate east-west axis. In addition, there is a marshy area to the south and approximate centre of the property.

Topography varies across the property, but the majority of the property exhibits moderately rolling hill topography.

The Stage 1 archaeological assessment of the study property was conducted under licence P027, (Scarlett Janusas, PIF #P027-104-2010) during June 2010.

Based upon the background research of past and present conditions, and a field visit, the following is recommended:

- Stage 2 archaeological assessment must be conducted on those areas identified in Figure 8 as exhibiting archaeological potential;

- Those areas identified as exhibiting low archaeological potential due to development disturbance or lack of archaeological potential variables, should be considered free of archaeological concerns; and
- Should previously undocumented archaeological resources be discovered, they may be an archaeological site and therefore 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 archaeological fieldwork, in compliance with sec. 48 (1) of the Ontario Heritage Act; and
- The Cemeteries Act requires that any person discovering human remains must notify the police or coroner and the Registrar of cemeteries, Ministry of Small Business and Consumer Services.

This archaeological assessment has been conducted under the 1993 Technical Standards and Guidelines (Government of Ontario).

This report is submitted to the Minister 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 report is reviewed to ensure that the licensed consultant archaeologist has met the terms and conditions of their archaeological licence, and that the archaeological fieldwork and report recommendations ensure the conservation, protection and preservation of the cultural heritage of Ontario (Government of Ontario, Ministry of Culture 2009:73).

Stage 1 Archaeological Resource Assessment
Proposed Glenarm Solar Farm
Lots 11 and 12, Concession 6
Geographic Township of Eldon
Victoria County
Municipality of Kawartha Lakes, Ontario

1.0 PURPOSE – Development Context

The proponent retained the services of Scarlett Janusas Archaeological and Heritage Consulting and Education (SJAHCE) to conduct a Stage 1 archaeological resource assessment on property proposed to be a solar energy facility. This property is located on Lots 11 and 12, Concession 6 in the geographic township of Eldon, Victoria County, Municipality of Kawartha Lakes, Ontario (Figures 1 and 2).

The study property is approximately 169 ha in size.

The Stage 1 archaeological assessment of the study property was conducted under licence P027, (Scarlett Janusas, PIF #P027-104-2010) during June 2010. A field visit was conducted on June 9th, 2010 under cloudy skies and a high of 16 degrees C.

This report is submitted to the Minister 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 report is reviewed to ensure that the licensed consultant archaeologist has met the terms and conditions of their archaeological licence, and that the archaeological fieldwork and report recommendations ensure the conservation, protection and preservation of the cultural heritage of Ontario (Government of Ontario, Ministry of Culture 2009:73).

This archaeological assessment has been conducted under the 1993 Technical Standards and Guidelines (Government of Ontario 1993).

Figure 1
Location of Study Area
From atlas.nrcan.gc.ca

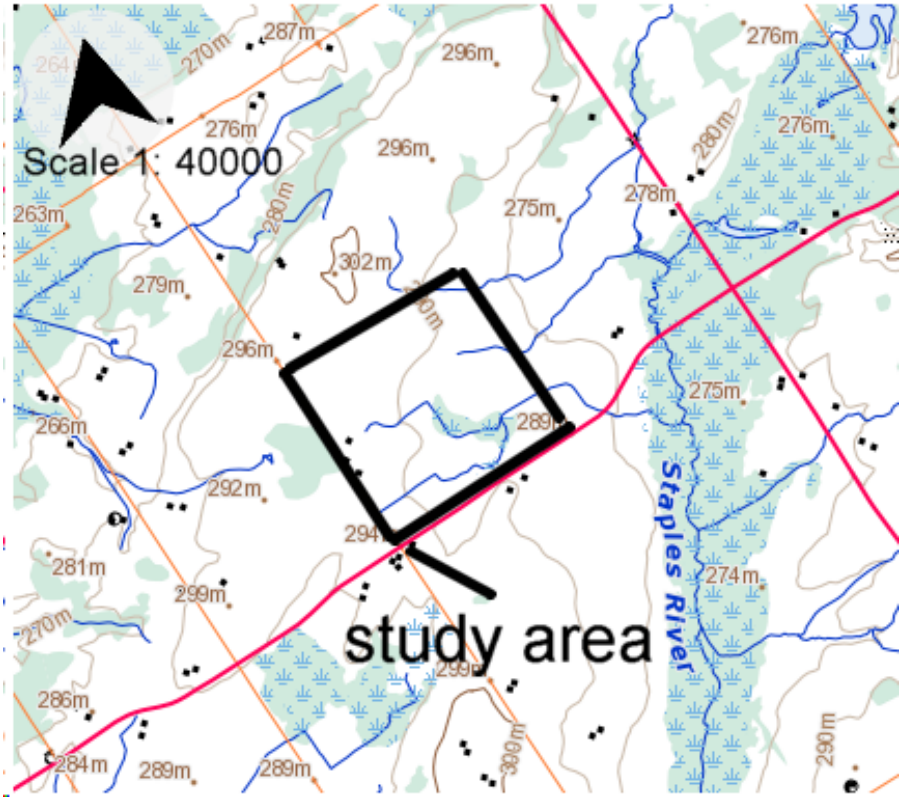


Figure 2
Satellite View of Property
Imagery Date October 21, 2007 Google Earth

2.0 Study Methods

2.1 Stage 1 (Background Research)

As part of the background research, an examination of the following was conducted:

- The National Site Registration Database was examined for the presence of known archaeological sites in and around the project area for a radius of two kilometres by contacting the data coordinator of the Ministry of Tourism and Culture;
- Topographic maps at 1:20 000 (recent and historical) or the most detailed map available;
- A land use history and the present condition of the study area was detailed using topographic maps and historic atlases (where available);
- Commemorative plaques or monuments; and
- Any other avenues that assisted in determining archaeological potential were examined (Government of Ontario 2009:2).

3.0 RESULTS – Historic and Archaeological Context

3.1 Background Research (Stage 1)

3.1.1 Current and Natural Environment

Current Environment and Existing Features

The property is bounded to the east by Moor Road, which is little more than a farm lane; to the south by Glenarm Road (Regional Road 8), to the west by Sandringham Road, and to the north by a property line and fencing. The property is an approximately square shaped parcel of 169 ha.

There are numerous buildings located along Sandringham Road. The following is a description of the properties (and accompanying photographs) of the properties from south to north.

At the southwest corner of the study area, is a modern bungalow and detached garage with a semi-circular driveway. The landscaped area of the property includes a side and backyard (Photographs 1 – 3). The landscaped area is not extensive enough to have obscured archaeological potential. This property is identified as 616 Sandringham Road.

The adjacent property to the north is #622 Sandringham Road, which is a red brick bungalow, of recent construction, made to resemble a patterned brick house. There is a detached garage and manicured lawn (Photographs 4 – 6).

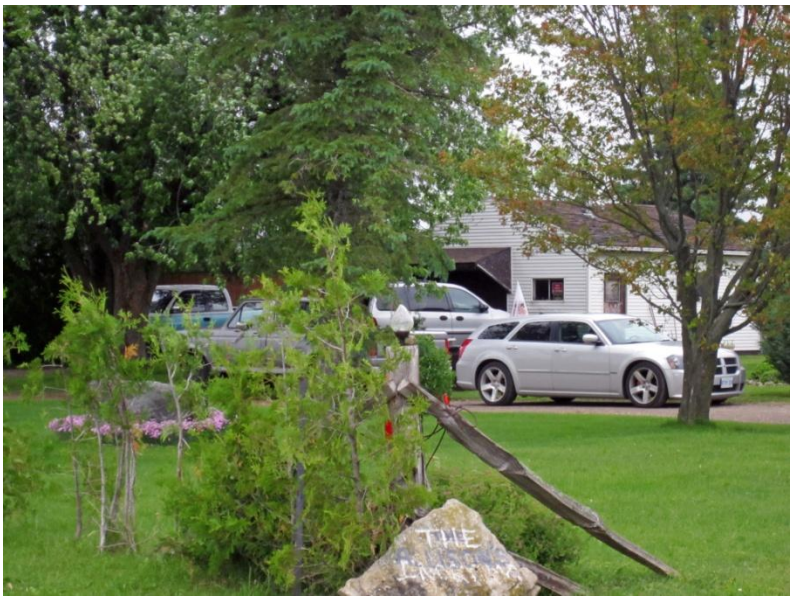
North of the former property is #668 Sandringham Road. This building complex consists of a two storey house with rear addition. The property is clad with modern material, making it difficult to ascertain the original construction details. In addition, the foundation is parged, also limiting identification of the structural aspects of the main building. There is a small shed of recent construction to the northeast of the house, and a recent two storey board and batten construction garage to the north of the house. To the north of the small shed is a log one story building with a poured concrete floor. There is no evidence of a foundation, and it is difficult to assign either a date or an in situ status to the building (Photographs 7-11).

North of #668 Sandringham Road is the 1903 (dated) No. 3 School house. There is an associated yard which has been landscaped associated with this building (Photographs 12-13). The landscaped area is not extensive enough to have obscured archaeological potential.

North of the school house is a complex of barn and associated outbuildings. There is no extant residence associated with this barn complex, although there is a front yard where it is very likely that the original residence would have stood (Photographs 14).

Photograph 1
616 Sandringham Road - Residence

Photograph 2
616 Sandringham Road - Garage



Photograph 3
616 Sandringham Road - Yard

Photograph 4
622 Sandringham Road - Residence

Photograph 5
622 Sandringham Road - Garage

Photograph 6
668 Sandringham Road - Residence

Photograph 7
668 Sandringham Road - Shed

Photograph 8
668 Sandringham Road - Garage

Photograph 9
668 Sandringham Road – Log Building

Photograph 10
668 Sandringham Road – Poured Concrete Floor, Log Building

Photograph 11
School House No. 3

Photograph 12
School House Yard

Photograph 13
Barn Complex

The following photographs (Photographs 14 -18) illustrate the other conditions of the property.

Photograph 14
Northwest Corner of Property facing northeast

Photograph 15
Property facing North from Glenarm Road

Photograph 16
Wetland Area facing North from Glenarm Road

Photograph 17
Study Area facing Northwest from Moor Road

Photograph 18
Facing Westerly from Northeast Corner of Study Area

Natural Environment – Physiography, Bedrock and Soils

The study area lies on the Trenton Formation Limestone. The physiography of the region is identified by Chapman and Putnam (1966: 280-287) as the Peterborough Drumlin Field. The drumlin field is described as an "...area of shallow overburden ...rolling till plain" (ibid: 280). There are no drumlins located directly on the study property itself (field observations) although there is one directly to the east and north of the property.

Natural Environment - Soils

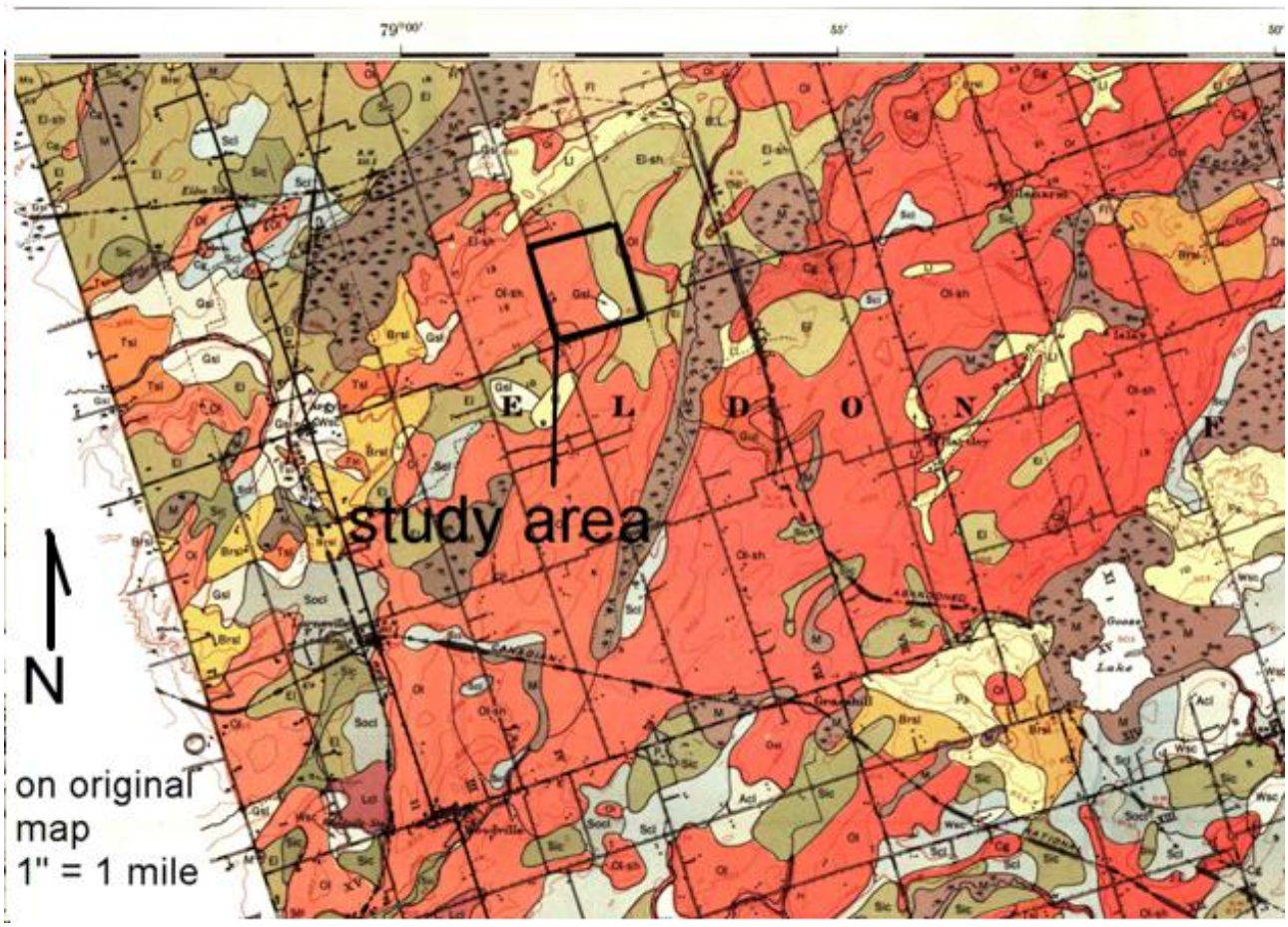
There are four identified areas of soils. The first consists of the parent material of Otonabee loam, and then there is Otonabee loam – shallow phase; Granby loam, and Emily loam- shallow phase. Otonabee sandy loam is textured glacial till containing a moderate amount of stone. The Otonabee loam, shallow phase, has developed on relatively thin deposits of loam over the limestone till, but is still up to two feet in depth. The Otonabee loams are well drained, and located on rolling hill topography.

There is a small area (Figure 3) of Granby Sandy Loam, which is poorly drained, and developed on well sorted calcareous outwash sand. The loam is essentially stone free (ibid: 42-43).

The fourth soil area is represented by a small area on the east side of the property, approximately along at the midpoint. This is Emily loam, and imperfectly drained soil on a gently sloping topography. There is a shallow phase to this loam, and the bedrock comes up to within 60 cms of the surface.

The majority of the property consists of Otonabee loam and Emily loam (Gillespie and Richards 1957: 27).

Figure 3
Soils of the Study Area



Gsl – Granby sandy loam
Ol, and Ol-sh – Otonabee loam and Otonabee shallow phase
El-sh Emily loam, shall0w phase

Natural Environment – Prehistoric Shorelines

There are no prehistoric shorelines in or near the study area (Chapman and Putnam 1966:34).

Natural Environment – Drainage

The major drainage associated with the property is a number of tributaries of the Staples River, which cross the property several times on an approximate east-west axis. In addition, there is a marshy area to the south and approximate centre of the property.

Natural Environment – Vegetation

The study area, aside from the residential areas, is primarily pasture land. There are small mixed hardwood woodlots on the property, and a small marshy area to the south on the property.

During the first survey of Eldon township, hardwoods were recorded as the primary vegetation in the southern portion of the township, and pine occupied those areas north of the escarpment (north of the study area).

3.1.2 Potential for Aboriginal Archaeological Resources

Table 1 provides the general outline of the culture history of southern Ontario. Each region within southern Ontario will have its own variations of the table presented below.

Table 1: General Cultural Chronology for the Southern Ontario

PERIOD	SUBPERIOD	GROUP	DATE RANGE	COMMENTS
Paleo		Fluted Point	9500-8500 BC	big game hunters
		Hi Lo	8500-7500 BC	small nomadic groups, hunting
Archaic	Early		8000-6000 BC	hunters and gatherers
	Middle	Laurentian	6000-2000 BC	territorial divisions
	Late	Lamoka	2500-1700 BC	appearance of ground stone tools
		Broadpoint	1800-1400 BC	
		Crawford Knoll	1500-500BC	
		Glacial Kame	ca. 100 BC	elaborate burial practices, red ochre
Woodland	Early	Meadowood	1000-400BC	introduction of pottery
		Red Ochre	1000-500BC	burials with red ochre
	Middle	Point Peninsula	400BC – 500AD	long distance trade
		Princess Point	500-800 AD	inception of horticulture
	Late	Pickering	800-1300 AD	villages and agriculture
		Uren	1300-1350 AD	villages become larger
		Middleport	1300-1400 AD	
		Huron	1400-1650 AD	large villages, warfare
Historic	Early	Odawa, Ojibway	1700-1875 AD	social displacement, early encounters with Euro-Canadians
	Late	Euro-Canadian	1785 to present	European fur trade, settlement

Potential exists for archaeological sites of the Archaic, Woodland and Historic periods.

3.1.2.1 Prehistory of the Subject Area

The Paleo Indian period, 9500 – 7500 B.C., represents the first human populations in Ontario. These people subsisted largely on caribou and small mammals and fish. They were nomadic in nature, travelling large areas, but generally following glacial strandlines. Sites from this period are represented solely by lithic assemblages. There are no registered early or late Paleo Indian sites located on or in the vicinity of the study area, and the potential for sites from this cultural period are low.

The Archaic period spans a large time period from 8000 to 1000 B.C. Raw materials used by these nomadic people became much more diverse, and they remained hunters and gatherers. There are no registered archaeological sites identified as Early, Middle or Late Archaic periods. Potential for these sites is considered high, given their distance from drainage and wetlands.

The Woodland periods spans from 1000 B.C. to 1650 A.D. The introduction of ceramics marks the differentiation between the Woodland and Archaic periods. There are no registered Woodland sites in or near the study area, and the potential for campsites for this temporal period is considered moderate.

Information from the Annual Archaeological Reports of Ontario suggests there are archaeological sites two concessions distant from the study area (Laidlaw 1896; 1912). This is discussed in more detail in section 3.1.3.

3.1.2.2 Native Historic Period

In 1818, the government purchased a tract of approximately 4000 squares miles (counties of Peterborough and Victoria and some of the 28 adjoining townships) from the Mississauga Indians (Kirkconnell 1967: 2). There were six tribes of Mississauga including the Buckquauet of the Eagles, Pishikinse of the Reindeers, Paudash of the Cranes, Cahgahkishinse of the Pikes, Cahgagewin of the Snakes, and Pininse of the White Oaks (ibid: 165).

It is reported that an "old Indian trail" crosses from Lake Simcoe to Balsam Lake – the northern portion of Eldon Township (ibid: 36). This is located a distance away from the study area to the north.

The two closest First Nations to the study area are the Chippewas of Georgina Island and the Mississauga's of Scugog Island First Nation.

3.1.3 Previously Known Archaeological Resources

The Ministry of Tourism and Culture Archaeological Data Coordinator's office indicated in June 2010 that there are no registered archaeological sites located within two kilometers of the study area.

Although the Ministry of Tourism and Culture did not report sites within two kilometers of the study area, a study of the Annual Archaeological Reports of Ontario, and articles submitted by Geo. Laidlaw (Laidlaw 1896:80); there are several sites that are located in the vicinity of the study area, and suggest that the possibility of discovery of additional sites is high. For example, Laidlaw (1912:62-63) reports sites on Lot 22, Concession 8; Lot 23, Concession 3; Lot 21, Concession 9; Lot 13, Concession 10; Lot 20, Concession 8; and Lot 17, Concession 10. While these are more than two kilometers distant from the study area; it is also important to note that archaeological assessments closer to the study area were not completed by Laird or other researchers, and that there may well be archaeological sites in the area.

3.1.4 Euro-Canadian Historic Period

The Township of Eldon was first surveyed by Henry Ewing from 1826 to 1829. Settlement of Eldon Township was slow to begin, but increased in the 1830s. Over the next fourty years, immigration to the township consisted largely of Irish and Scots (Kirkconnell 1967:1).

The 1877 map of the County of Victoria (Figure 4) is not completely legible but was compiled and drawn by Jas. A. Paterso….e. The southwest half of Lot 11 illustrates a house and an orchard, owned by J. Scurrah (the same owner as in 1881). Interestingly, the 1881 census does not list Scurrah as the owner of this property, and there may well be a transcription error in the historic records. The southeast half of Lot 11 is owned by D.S. McArthur, and the north half of Lot 11, does not indicate any ownership or structures. The southwest half of Lot 12 shows the school house and H. Gillander. The southeast half indicates a house and an illegible name. There is nothing indicated on the north half.

Figure 4
1877 Map of Study Area

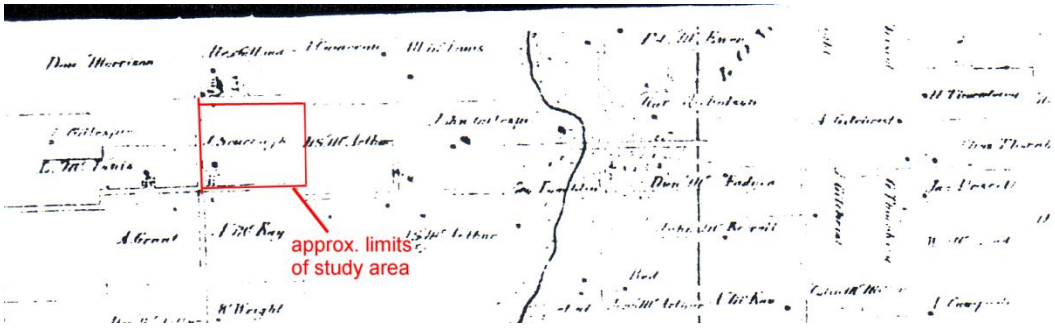


Figure 5 illustrates a hand drawn depiction of "Eldon of Old" (Fleming 1976:22). Although there is no date, it suggests that the early settlement route and Sandringham Community were part of the study area.

The 1881 historical illustrated atlas (Belden 1881) (Figure 6) shows a residence located on Lot 11, Concession 6. The owner is listed as Joseph Scurrah, born in 1840, from England. He was a farmer who settled here in 1873, and owned 80 acres. Again, Scurrah does not appear in the 1881 census and suggests a transcription error in the historical records.

Figure 5
"Eldon of Old"

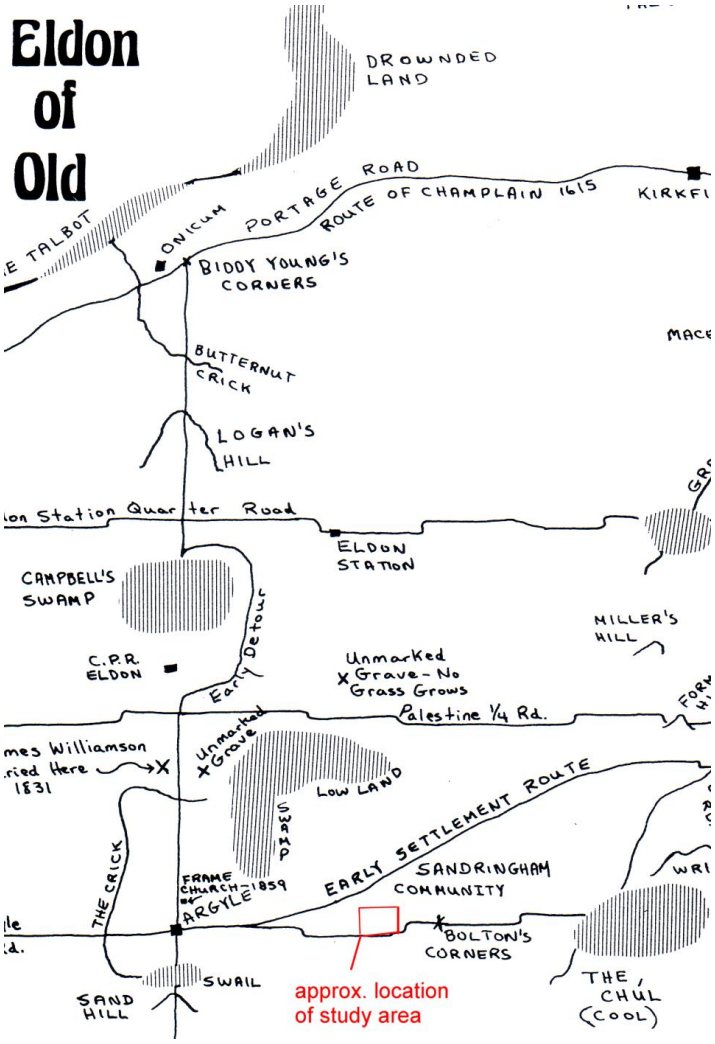
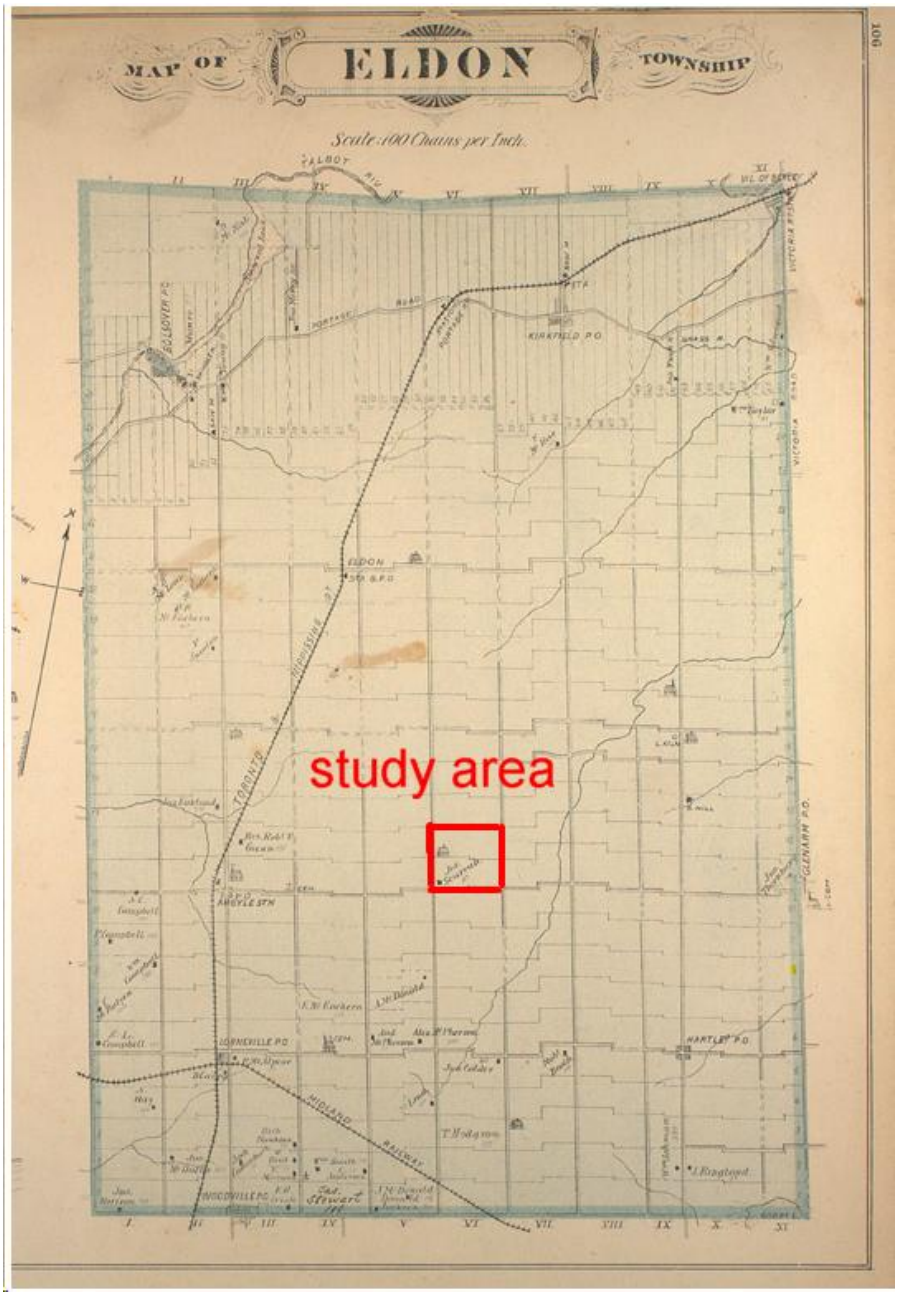
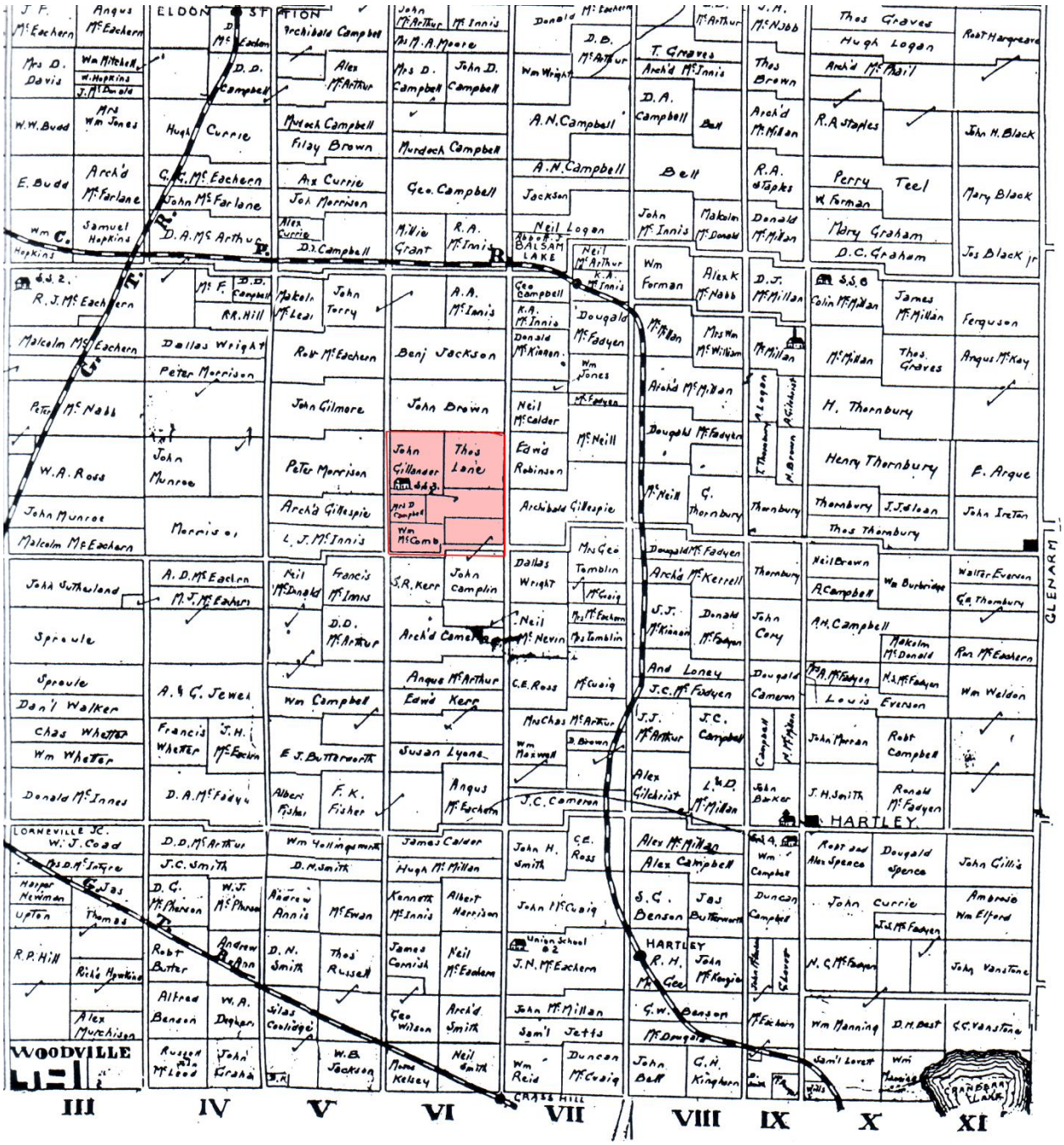


Figure 6
1881 Map of the Study Area



The 1916 map of Eldon township (Figure 7) depicts Wm. McComb on the southwest half of Lot 11, and Mrs. D. Campbell on the northwest half of Lot 11. There is nobody shown for the east half of Lot 11. The west half of Lot 12 is shown as School House No. 3 and John Gillander. The east half is shown as being owned by Thos. Lane.

Figure 7
1916 Map of the Township of Eldon
(A.E. Guidal)



School house No. 3 exhibits a date below the second storey window of 1903 (field observations). However, based on historical maps, it is obvious that the extant building is not the original building. Further, Sandringham School, as it was known, was also known as Gillander's School, the name of the family who lived south of the school in the 1870s (Fleming 1976:244). In fact, it is recorded (ibid) that the one of the children of the Gillanders, Margaret, actually taught at the

school. The name Gillanders is spelled different ways in the historical record, either with an s at the end, or not, or with double l's, or a single l. These are again considered transcription errors in the historical records.

4.0 DETERMINATION OF ARCHAEOLOGIAL POTENTIAL

The following are criteria formulated by the Ministry of Tourism and Culture with their respective buffers for arriving at archaeological potential. Yes and no determinations have been made beside each of the criteria as they pertain to the study area.

- If a known archaeological site is present, the buffer is 250 m around the site - NO
- 300 metres around primary water source (i.e. lakeshore, river, large creek) – NO
- 200 metre buffer around secondary water source (i.e. stream, spring, marsh, swamp) – YES
- Ancient water source (beach ridge, river bed) has a 300 metre buffer - NO
- All areas of elevated topography, e.g. knolls, drumlins, eskers, plateaus – NO
- Pockets of sandy soil in a clay or rocky area – NO
- Unusual land formations (waterfalls, mounds, caves) - NO
- Resource extractive areas (e.g. food or scarce resources) – YES (associated with wetlands)
- Non-Aboriginal settlement (monuments, cemeteries) - NO
- Historic transportation routes (100 m buffer on either side of road) - YES
- Designated properties – NO
- Other historic structures – YES (historic atlas, abstract index, and visual observation)

The above criteria are used to exhibit archaeological potential.

- Areas that have been subject to recent disturbance (extreme and intensive) (agricultural fields are not considered to be disturbed). – NO

The above criteria can remove potential from an area.

(Ministry of Culture 2004:11)

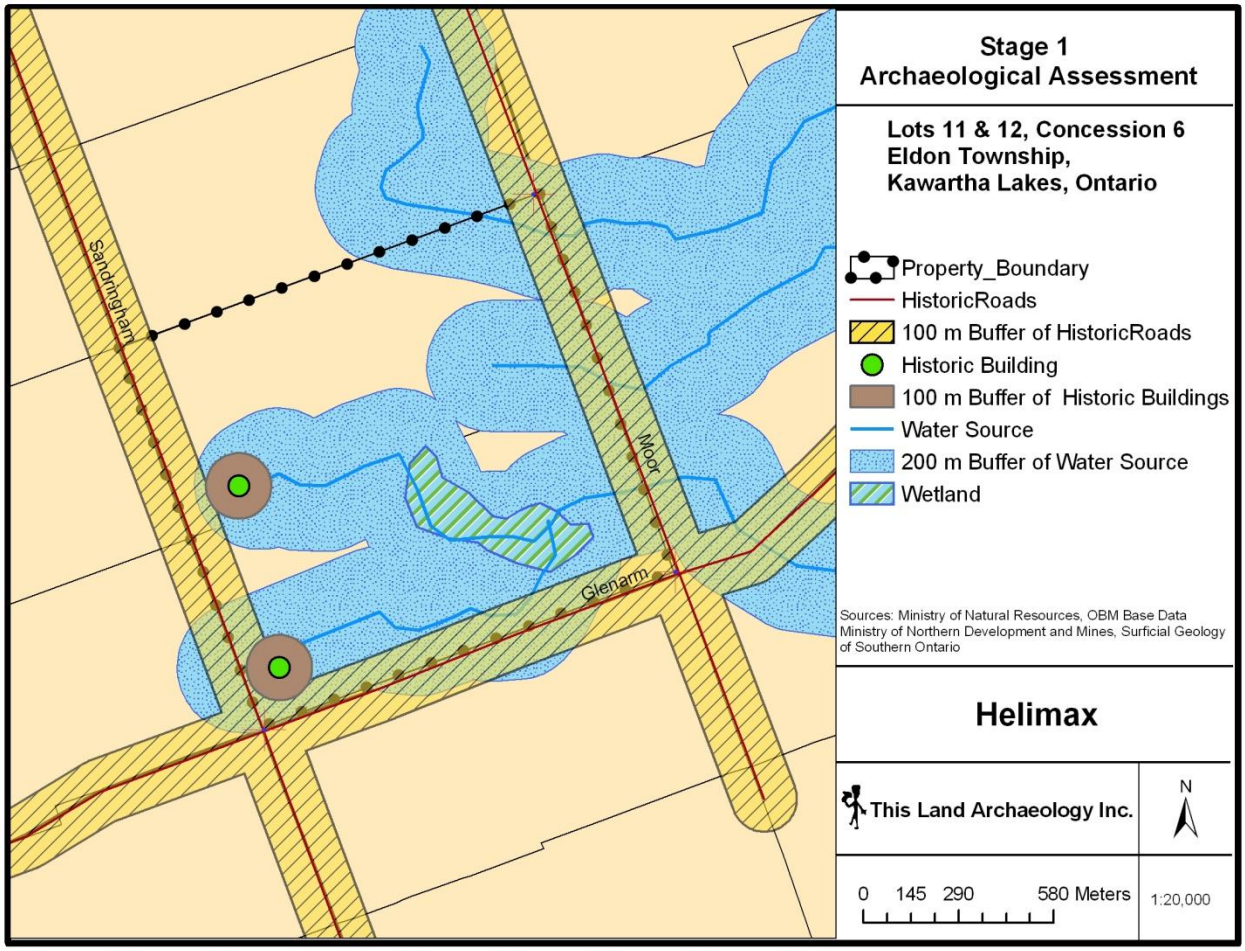
Figure 8 illustrates the archaeological potential for the study area.

Areas of archeological potential include the following:

1. Either extant or former historic buildings and a 100 m buffer
2. 200 m buffer of water sources
3. 100 meter buffer of historic roads.

Approximately two-thirds of the property exhibits archaeological potential for the recovery of both prehistoric and historic cultural materials.

Figure 8
Archaeological Potential of Study Area



5.0 RECOMMENDATIONS

Based upon the background research of past and present conditions and the Stage 1 archaeological assessment of the property, the following is recommended:

- A Stage 2 archaeological resource assessment is recommended for those portions of the study area considered to exhibit archaeological potential (Figure 8) and must be conducted prior to any development disturbance;
- Should previously undocumented archaeological resources be discovered, they may be an archaeological site and therefore 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 archaeological fieldwork, in compliance with sec. 48 (1) of the Ontario Heritage Act;
- The Cemeteries Act requires that any person discovering human remains must notify the police or coroner and the Registrar of cemeteries, Ministry of Small Business and Consumer Services.

The Ministry of Tourism and Culture is asked to review this report and issue a letter concurring with the recommendations laid out herein.

6.0 REFERENCES CITED AND CONSULTED

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Paterson....e, Jas. A.
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STAGE 2 ARCHAEOLOGICAL ASSESSMENT OF THE PROPOSED GLENARM SOLAR ENERGY FACILITY (FIT # 631730129), PART OF LOTS 11 and 12, CONCESSION 6, GEOGRAPHIC TOWNSHIP OF ELDON, (NOW IN THE CITY OF KAWARTHA LAKES), COUNTY OF VICTORIA, ONTARIO

Original Report Prepared By:

Advance Archaeology
P.O. Box 493
Port Hope, ON
L1A 3Z4

Licensed to: Donna Morrison, M.A. (P121)
Original PIF #: P121-090-2010
Continuation PIF#: P121-095-2011

December 5, 2011

EXECUTIVE SUMMARY

In the summer of 2010, Advance Archaeology was contracted to conduct a Stage 2 archaeological assessment of part of Lots 11 and 12 in Concession 6 of geographic Eldon Township, County of Victoria (now in the City of Kawartha Lakes), in compliance with the requirements outlined by the Ministry of Tourism and Culture (MTC). The subject property, which is a proposed solar energy facility (FIT # 631730129), consists of approximately 65.6 hectares (162 acres) of land on the east side of Sandringham Road, north of Glenarm Road near Argyle. The project lands contain long-term pasture fields and large tracts of marsh grass adjacent to wetland zones. Stage 1 research on a large parcel of land containing the subject property was conducted previously by another consultant and had indicated that there were sections with archaeological potential on the subject property, primarily due to its proximity to secondary water sources, historic transportation corridors, and surrounding areas of historic Euro-Canadian settlement.

As a result of the recommendations of the earlier Stage 1 study, a Stage 2 archaeological assessment was conducted on all parts of the subject property with moderate or high archaeological potential. Large sections of the subject property were considered to be of low archaeological potential, due to the presence of permanent standing water or heavily water-saturated soils, and were therefore exempt from Stage 2 testing. The fieldwork methods used on the subject property were a combination of pedestrian survey in the ploughed fields and test-pit survey wherever possible in the unploughable areas. Testing was conducted under appropriate weather and lighting conditions in June of 2010 and November of 2011.

No artifacts, structural remains, or anything of cultural heritage value or interest were discovered during the Stage 2 assessment. Therefore, complete clearance of the archaeological condition is recommended and advice on compliance with legislation is provided.

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PROJECT PERSONNEL

Project Director	Donna Morrison, M.A. *Director and Senior Archaeologist,* *(Archaeological License # P-121)*
Report Preparation	Donna Morrison, M.A.
Graphics Preparation	Dale Bateman
Field Directors	Donna Morrison, M.A. (*Archaeological License # P-121*) Lawrence Jackson, Ph.D. *(Archaeological License # P-025)*
Field Technicians	Eric Porter Myles Allen Nelson Jacobs Jon-Erik Monague Kris Martin Justin Tighe

1.0 DEVELOPMENT CONTEXT

A contract to carry out a Stage 2 archaeological assessment of the proposed Glenarm Solar Energy Facility (FIT # 631730129) was awarded to *Advance Archaeology* on August 10, 2010, in compliance with the requirements of the Ministry of Tourism and Culture (MTC). The subject property is approximately 65.6 hectares (162 acres) in size and is located on part of Lots 11 and 12, Concession 6 of the Geographic Township of Eldon (now in the City of Kawartha Lakes) in Victoria County. It is east of Beaverton, between Argyle and Glenarm, on the northeast corner of the intersection of Glenarm Road and Sandringham Road (see Maps 1 to 4 in Section 8.0).

Project Director for this Stage 2 archaeological assessment is Donna Morrison. This report was written by Donna Morrison, with maps drafted by Dale Bateman. The base map for Maps 2 and 4 was provided by the proponent.

Stage 2 fieldwork was undertaken on June 24 2010 and November 15, 17, 18, and 22, 2011, with Lawrence Jackson as the 2010 field director and Donna Morrison as the 2011 field director. Justin, Tighe, Myles Allen, Kris Martin, Jon-Erik Monague, Eric Porter, and Nelson Jacobs were the field technicians for this assessment.

All fieldwork was carried out under excellent weather and lighting conditions; photos taken during this assessment are found in Section 9.0.

The original Stage 2 PIF number for this project is P121-090-2010 and the Stage 2 Continuation PIF # is P121- 095-2011.

Permission to enter the property for the purpose of conducting a Stage 2 archaeological assessment was granted by the landowner/proponent.

2.0 PROJECT BACKGROUND

2.1 Findings and Recommendations of the Prior Stage 1 Archaeological Assessment

A Stage 1 archaeological assessment of the proposed Glenarm solar energy facility was conducted by Scarlett Janusas Archaeological and Heritage Consulting and Eduction (SJAHCE) in June of 2010. However, the area covered by that assessment is much larger than the current subject property, which has been scaled down by roughly 60% as the project has been redesigned over the last 15 months.

The SJACHE (2010a) Stage 1 assessment determined that there were no registered archaeological sites on or within a 2-km radius of the property, and that there were 4 types of soil present (including 2 loams and 2 shallow-phase loams) above Trenton Formation limestone. It was described as having variable topography, with moderately rolling hills, and containing a number of tributaries of the Staple River as well as marshy areas in the south and central part of the property.

There were four recommendations offered (SJAHCE 2010a):

1. That a Stage 2 archaeological assessment must be conducted on those areas identified as exhibiting archaeological potential;

2. That those areas identified as exhibiting low archaeological potential due to development disturbance or lack of archaeological potential variables, should be considered free of archaeological concerns;

3. That, if archaeological resources are discovered, then all work must cease and a consulting archaeologist must be retained, in compliance with Section 48(1) of the *Ontario Heritage Act*; and

4. That the *Cemeteries Act* requires that any person discovering human remains must notify the police or coroner as well as the Registrar of the Cemeteries Branch of the Ministry of Government Services.

It was in order to fulfil recommendation #1, above, that the current Stage 2 archaeological assessment was undertaken by Advance Archaeology. Recommendations #2, 3, and 4 were taken into consideration during the Stage 2 work.

2.2 Findings and Recommendations of the Prior Cultural Heritage Assessment

A Cultural Heritage Assessment of the proposed Glenarm solar energy facility was conducted by Scarlett Janusas Archaeological and Heritage Consulting and Eduction (SJAHCE) in June of 2010. However, the area covered by that assessment is much larger than the current subject property, which has been scaled down by roughly 60% as the project has been redesigned over the last 15 months.

The SJACHE (2010b) cultural heritage assessment determined that there were 5 built properties in the study area (all of which are located along the east side of Sandringham Road). Only two of the five properties present were considered to have some heritage value, although neither of them have been designated or recognized for heritage or cultural value and none are included on any heritage list.

There were three recommendations offered (SJAHCE 2010b):

1. That Built Heritage Feature #3 (a log house) be investigated further to determine if it is an in situ structure or was brought to its current location. If it is determined to be in situ, then a Cultural Heritage Impact Assessment must be conducted;

2. That Built Heritage Feature #4 (a brick school house) be protected from all proposed development that might impact it and its immediate environs; and

3. That an archaeological investigation be completed to determine the locations of the original buildings in the southwest corner of the property and in the school property.

Since the proposed project has since been redesigned to eliminate any development along the eastern edge of Sandringham Road in the vicinity of the buildings mentioned above, there will be no adverse impact to them and, therefore, no need to fulfil recommendations # 1, 2, or 3, above.

3.0 STAGE 2 ASSESSMENT METHODOLOGY

The subject property has areas of high archaeological potential (such as those sections within 100m of an historic transportation route or within 200m of a secondary water source), as well as areas with no indicators of archaeological potential, which were illustrated in the earlier Stage 1 report (SJAHCE 2010a). During the current Stage 2 assessment, however, some changes were made to the earlier designations of the zones of potential, based on a more detailed examination of the ground conditions, the drainage status of the lands, and the topographic features present. Consequently, the high-potential zones identified during the Stage 1 assessment (SJAHCE 2010a) were generally still valid, but they were expanded to include three isolated high-potential ridges and hilltops that overlooked adjacent wetland zones and which had not been identified previously as having archaeological potential. Conversely, a large percentage of the lands misidentified as having archaeological potential during the Stage 1 assessment (SJAHCE 2010a) were found instead, during the Stage 2 assessment, to be of low archaeological potential due to extremely poor drainage that had created vast areas of permanently saturated soils or standing water, which were untestable. Those areas appeared, from a distance, to be dry fields of grass or pasture land but were found to be completely untestable during Stage 2 fieldwork attempts at various times of the year. Photographs of these special field conditions are provided in Section 9.0 ("Images"). Finally, a section of land with moderate archaeological potential was also identified during the Stage 2 assessment, in relatively dry and slightly elevated areas adjacent to some of the wetlands.

Those sections of the subject property that were able to be ploughed were subsequently assessed by pedestrian survey at 5m intervals in June of 2010. However, as noted above, much of the property was unploughable, due to the presence of vast tracts of permanently standing water or heavily water-saturated soils. In other areas, the heavy clay soil was too shallow and rocky to permit ploughing. According to the experienced operator hired to carry out that work (Mr. Kevin Drake), it was possible to plough two large pasture fields in the central part of the subject property (which is also the driest part), but when he made attempts at ploughing the remaining portions that were grass-covered and appeared, from a distance, to be ploughable, he found that it was impossible and any further attempts would have damaged and/or stranded his machinery. Some of these unploughable areas, as well as isolated elevated ridges or hilltops, were test-pitted by hand at 5m intervals wherever possible. Test-pitting of hillslope sections with moderate archaeological potential (in a zone that was transitional between high and low potential zones at the north end of the property) was conducted at 10m intervals.

All Stage 2 test pits were at least 30cm in diameter and were excavated to at least 5cm into subsoil or to bedrock (if present); all soils from within the test pits were screened using 6mm-mesh portable rocker screens. The Stage 2 test pits were examined for evidence of stratigraphy, cultural features, and foreign fill, and were backfilled after screening of soil was completed.

Stage 2 pedestrian survey was conducted on June 24, 2010 and test-pit survey was conducted on November 15, 17, 18, and 22, 2011 following numerous failed attempts at ploughing made during the spring, summer, and fall months. All Stage 2 fieldwork was carried out under appropriate weather and lighting conditions; there was no frost in the ground for the test-pit survey. Map 4 in Section 8.0 shows the zones of archaeological potential and Stage 2 fieldwork methodology used. Images 1 to 8 in Section 9.0 illustrate the conditions on the subject property and the Stage 2 testing in progress.

4.0 RESULTS AND CONCLUSIONS

Despite the use of high-potential (5m) pedestrian survey intervals on all ploughable lands, as well as the use of high-potential (5m) and moderate-potential (10m) test-pitting intervals on all other unploughable non-wetland areas, no artifacts, structural remains, or other cultural heritage resources from either the historic or the pre-contact time periods were found on the subject property.

Therefore, since nothing of cultural heritage interest or value was discovered during the Stage 2 assessment, no further archaeological assessment of the subject property is necessary or warranted.

5.0 RECOMMENDATIONS

Based on the results of this Stage 2 archaeological assessment, we offer the following two recommendations:

1. That, since nothing of cultural heritage value or interest was identified during the Stage 2 assessment, the entire subject property should be cleared of the archaeological condition placed upon it;

   and

2. The proponent should carefully read the "Advice on Compliance with Legislation" provided in Section 6.0, below.

6.0 ADVICE ON COMPLIANCE WITH LEGISLATION

a. This report is submitted to the Minister of Tourism and Culture as a condition of licencing in accordance with Part VI of the *Ontario Heritage Act*, R.S.O. 1990, c 0.18. The report is reviewed to ensure that it complies with the standards and guidelines that are issued by the Minister, and that the archaeological fieldwork and report recommendations ensure the conservation, protection and preservation of the cultural heritage of Ontario. When all matters relating to archaeological sites within the project area of a development proposal have been addressed to the satisfaction of the Ministry of Tourism and Culture, a letter will be issued by the ministry stating that there are no further concerns with regard to alterations to archaeological sites by the proposed development.

b. It is an offence under Sections 48 and 69 of the *Ontario Heritage Act* for any party other than a licenced archaeologist to make any alteration to a known archaeological site or to remove any artifact or other physical evidence of past human use or activity from the site, until such time as a licensed archaeologist has completed archaeological fieldwork on the site, submitted a report to the Minister stating that the site has no further cultural heritage value or interest, and the report has been filed in the Ontario Public Register of Archaeology Reports referred to in Section 65.1 of the *Ontario Heritage Act*.

c. Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore 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 licenced consultant archaeologist to carry out archaeological fieldwork, in compliance with Section 48 (1) of the *Ontario Heritage Act*.

d. The *Cemeteries Act*, R.S.O. 1990 c. C.4 and the *Funeral, Burial and Cremation Services Act*, 2002, S.O. 2002, c.33 (when proclaimed in force) require that any person discovering human remains must notify the police or coroner and the Registrar of Cemeteries at the Ministry of Consumer Services.

7.0 REFERENCES CITED

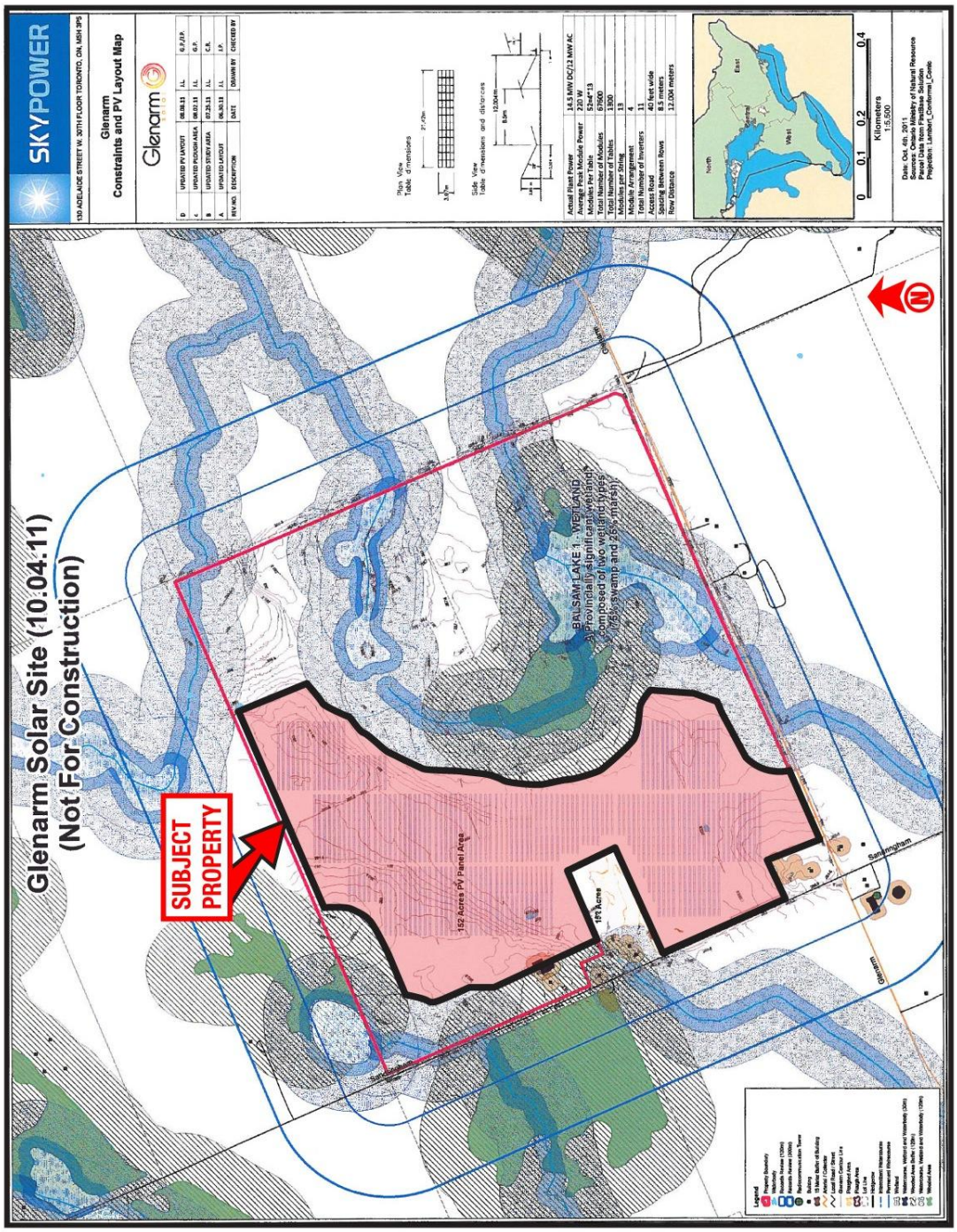
Ontario Ministry of Culture, Tourism, and Recreation
1993 *Archaeological Assessment Technical Guidelines (Stages 1-3 and Reporting Format)*. Prepared by the Cultural Programs Branch, Archaeology and Heritage Planning Unit.

Scarlett Janusas Archaeological and Heritage Consulting and Education (SJAHCE)
2010a *Stage 1 Archaeological Assessment, Proposed Glenarm Solar Farm, Lots 11 and 12, Concession 6, Geographic Township of Eldon, Victoria County, Municipality of Kawartha Lakes, Ontario*. PIF# P-027-104-2010. June 2010. Report submitted to the Ministry of Tourism and Culture.

2010b *Cultural Heritage Assessment, Proposed Glenarm Solar Farm, Lot 11 and 12, Concession 6, Township of Eldon, Former County of Victoria, City of Kawartha Lakes, Ontario*. June 2010. Report submitted to the Ministry of Tourism and Culture.

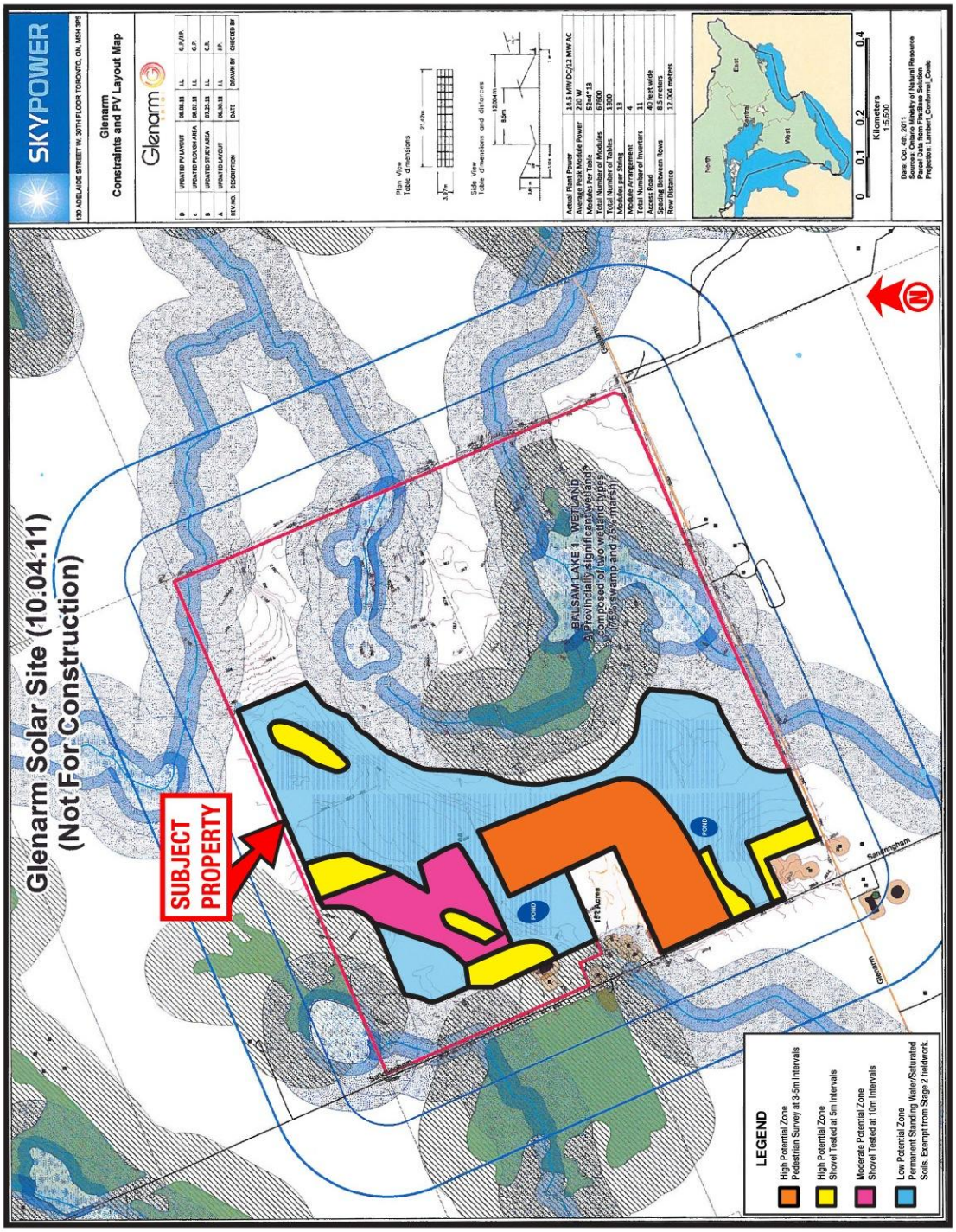
8.0 MAPS

Map 1: Location of Subject Property in the City of Kawartha Lakes, Ontario.



Map 2: Site Layout Map of Subject Property (area highlighted in pink).
The large square outer boundary, outlined in red, is the area assessed during the previous Stage 1 assessment (SJAHCE 2010a) and Cultural Heritage Assessment (SJAHCE 2010b).

Map 3: Aerial View of Subject Property.



Map 4: Zones of Archaeological Potential on the Subject Property and Stage 2 Methodology Used.

9.0 IMAGES

Image 1: View to South of Standing Water in Drainage Ditch in Northeast Subject Property.

Image 2: View to North of Marsh at Northwest Corner of Subject Property.

Image 3: View to South of Marsh Grass in Permanently Saturated Soils at Centre of Subject Property.

Image 4: View to South of Excavated Pond, Exposed Limestone Bedrock, and Marsh East of Barn (Glenarm Road on Horizon).

Image 5: View to Northeast of Stage 2 Shovel Testing in Progress.

Image 6: View to North of Marsh at North End of Subject Property.

Image 7: View to South of Permanent Standing Water and Marsh Grass in Southeast Portion of Subject Property.

Image 8: View to West of Marsh of North Side of Glenarm Road (southernmost edge of subject property; Sandringham Road on horizon).

APPENDIX C CULTURAL HERITAGE ASSESSMENT

Ministry of Tourism and Culture
Culture Division
Culture Services Unit
Programs and Services Branch
401 Bay Street, Suite 1700
Toronto, ON, M7A 0A7
Telephone: 416 314 3108
Facsimile: 416 314 7175
Email : laura.hatcher2@ontario.ca

Ministère du Tourisme et de la Culture
Division de culture
Unité des services culturels
Direction des programmes et des services
401, rue Bay, Bureau 1700
Toronto, ON, M7A 0A7
Téléphone: 416 314 3108
Télécopieur: 416 314 7175
Email : laura.hatcher2@ontario.ca

Ontario

November 2, 2011

Darcy Boudreau
Project Coordinator, Environment and Permitting
GL Garrad Hassan
19 Carmody Lane
Uxbridge, Ontario
L9P 1A5

RE: **Glenarm Solar Farm**

Location: Lot 11 and 12, Concession 6, Township of Eldon, Former County of Victoria

FIT Reference Number: FIT # F-000671-SPV-130-505

MTC DPR file no.: PLAN-22EA007

Dear Mr. Boudreau:

This letter constitutes the Ministry of Tourism and Culture's written comments as required by s. 23(3)(a) of O. Reg. 359/09 under the *Environmental Protection Act* regarding heritage assessments undertaken for the above project.

Based on the information contained in the report you have submitted for this project, the Ministry is satisfied with the heritage assessment. Please note that the Ministry makes no representation or warranty as to the completeness, accuracy or quality of the heritage assessment report. *

The report recommends the following:

10.0 MITIGITATION RECOMMENDATIONS

As per the Environmental Protection Act – O. Reg. 359/09 (Government of Ontario 2009:22), an evaluation of any impact of the renewable energy project on any heritage resources which may exist on or abutting the property and proposed measures to avoid, eliminate or mitigate the impact, are made herein.

Visual simulation of the two identified heritage buildings illustrate that the school house (BF#4) has an existing surrounding vegetation screen of pine trees that obscures the solar panels from view. The visual simulation of the log house (BF #3) does show the solar panels in the background. An additional visual simulation with a berm between the solar panels and the log house illustrate that there is no visual impact to the cultural landscape.

Neither the log house or the school house will be directly impacted by the construction of the solar facility.

It is recommended that the berm be constructed between the solar facility and the log house (BF#3) to ensure no visual impact.

There are no further recommendations regarding the cultural heritage assessment of the Glenarm Solar Facility.

The Ministry is satisfied with these recommendations.

This letter does not waive any requirements which you may have under the *Ontario Heritage Act*. Also, this letter does not constitute approval of the renewable energy project. Approvals of the project may be required under other statutes and regulations. It is your responsibility to obtain any necessary approvals or licences.

Please feel free to contact me if you have questions or require additional information.

Sincerely,

Laura Hatcher
Heritage Planner

cc. Scarlett Janusas
Scarlett Janusas Archaeological and Heritage Consulting and Education

Chris Schiller, Manager, Culture Services Unit
Ministry of Tourism and Culture

[*] In no way will the Ministry be liable for any harm, damages, costs, expenses, losses, claims or actions that may result: (a) if the Report(s) or its recommendations are discovered to be inaccurate, incomplete, misleading or fraudulent; or (b) from the issuance of this letter. Further measures may need to be taken in the event that additional artifacts or archaeological sites are identified or the Report(s) is otherwise found to be inaccurate, incomplete, misleading or fraudulent.

CULTURAL HERITAGE ASSESSMENT
PROPOSED GLENARM SOLAR FARM
LOT 11 AND 12, CONCESSION 6
TOWNSHIP OF ELDON, FORMER COUNTY OF VICTORIA
CITY OF KAWARTHA LAKES, ONTARIO

FIT # F-000671-SPV-130-505

SCARLETT JANUSAS
ARCHAEOLOGICAL AND HERITAGE
CONSULTING AND EDUCATION
269 Cameron Lake Road
Tobermory, Ontario N0H 2R0
phone and fax 519-596-8243 cell 519-374-1119
jscarlett@amtelecom.net

September 30, 2011
©

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Project Personnel

Project Manager Principal Researcher and Report Preparation	Scarlett Janusas, B.A., M.A., CAPH
Research Assistant	Chelsea Robert

Acknowledgments

Scarlett Janusas Archaeological and Heritage Consulting and Education (SJAHCE) extend our thanks to Mr. Patrick Henn for providing maps, data and permission to access the property, and acknowledge the assistance provided by the City of Lindsay's Library staff, Local History Room. Thanks for Mr. Darcy Boudreau for providing visual simulations of the project area.

Executive Summary

Scarlett Janusas Archaeological and Heritage Consulting and Education (SJAHCE) was retained by the proponent to conduct a Cultural Heritage Assessment for the property located on Lots 11 and 12, Concession 6, Eldon Township, former County of Victoria, City of Kawartha Lakes, Ontario.

Background research was conducted to determine the historical significance of the property. The research was complemented by a field visit to the site on June 9th, 2010. The research and field visit were conducted by Scarlett Janusas, B.A, M.A. of **SJAHCE**, with the assistance of research assistant Chelsea Robert.

The original boundaries of the study property included five built properties that are described within this report. The February 2011 concept plan reduces the size of the study area by more than half, and there are no built features located within the boundaries of the new study area. All of these properties are located on the east side of Sandringham Road. The properties include addresses at 616, 622, 668, 679 Sandringham Road and one unnumbered barn complex also found along Sandringham Road. Two of the properties are of modern construction (#'s 616 and 622) and are not considered to be of any heritage significance. The barn complex is not considered to contribute to the heritage significance of the area. The remaining two properties exhibit some heritage values.

The project is seeking a Renewable Energy Approval according to Ontario Regulation 359/09 issued under the Environmental Protection Act. The built features were evaluated using the criteria for determining cultural heritage value or interest, from the Ontario Heritage Act, Ontario Regulation 9/06. The Ontario Heritage Act, its Regulations and the Ontario Heritage Toolkit were consulted for this project, in addition to O. Reg. 359/09 of the Environmental Protection Act.

The property and buildings are not designated as a heritage property, nor currently recognized for their heritage or cultural value. None of the properties are, or have ever been, on any heritage list.

To the north, east, west and south of the large property block are areas of pasture and the occasional residence. The west side is bounded by Sandringham Road, the south side is bounded by Glenarm Road, and the east is bounded by Moor Road (a farm lane way). The area to the north is bounded by a woodlot and pasture. These observations are obtained from the original study area boundaries. The current study area is reduced in area to about half of the original study area size.

Visual simulation of the two identified heritage buildings illustrate that the school house has an existing surrounding vegetation screen of pine trees that obscures the solar panels from view. The visual simulation of the log house does show the solar panels in the background. An additional visual simulation with a berm between the solar panels and the log house illustrate that there is no visual impact to the cultural landscape. Neither

the log house or the school house will be directly impacted by the construction of the solar facility.

It is recommended that a berm be built between the proposed solar facility and the log house (Built Feature #3).

There are no further recommendations with respect to the cultural heritage assessment of the Glenarm Solar Facility.

CULTURAL HERITAGE ASSESSMENT
PROPOSED GLENARM SOLAR FARM
LOTS 11 AND 12, CONCESSION 6
ELDON TOWNSHIP, FORMER VICTORIA COUNTY
CITY OF KAWARTHA LAKES, ONTARIO

1.0 INTRODUCTION

Scarlett Janusas Archaeological and Heritage Consulting and Education (SJAHCE) was retained by Helimax to conduct a Cultural Heritage Assessment for the property located on Lots 11 and 12, Concession 6, Eldon Township, former Victoria County, City of Kawartha Lakes, Ontario (Figures 1 and 2). The concept plan (Figures 3 and 4) illustrates a reduced project area (February 2011), when compared to Figures 1 and 2.

The project is seeking a Renewable Energy Approval according to Ontario Regulation 359/09 issued under the Environmental Protection Act. The built heritage was evaluated using the criteria for determining cultural heritage value or interest, from the Ontario Heritage Act, Ontario Regulation 9/06. The Ontario Heritage Act, its Regulations and the Ontario Heritage Toolkit were consulted for this project, in addition to O. Reg. 359/09 of the Environmental Protection Act.

Background research was conducted to determine the historical significance of the property. The research was complemented by a field visit to the site on June 9th, 2010.

The research and field visit were conducted by Scarlett Janusas, B.A, M.A., CAPH of SJAHCE with the assistance of research assistant, Chelsea Robert.

This report provides a description of the historical context of the area, the built structures, and an evaluation of significance.

Figure 1
Location of Study Area
From atlas.nrcan.gc.ca

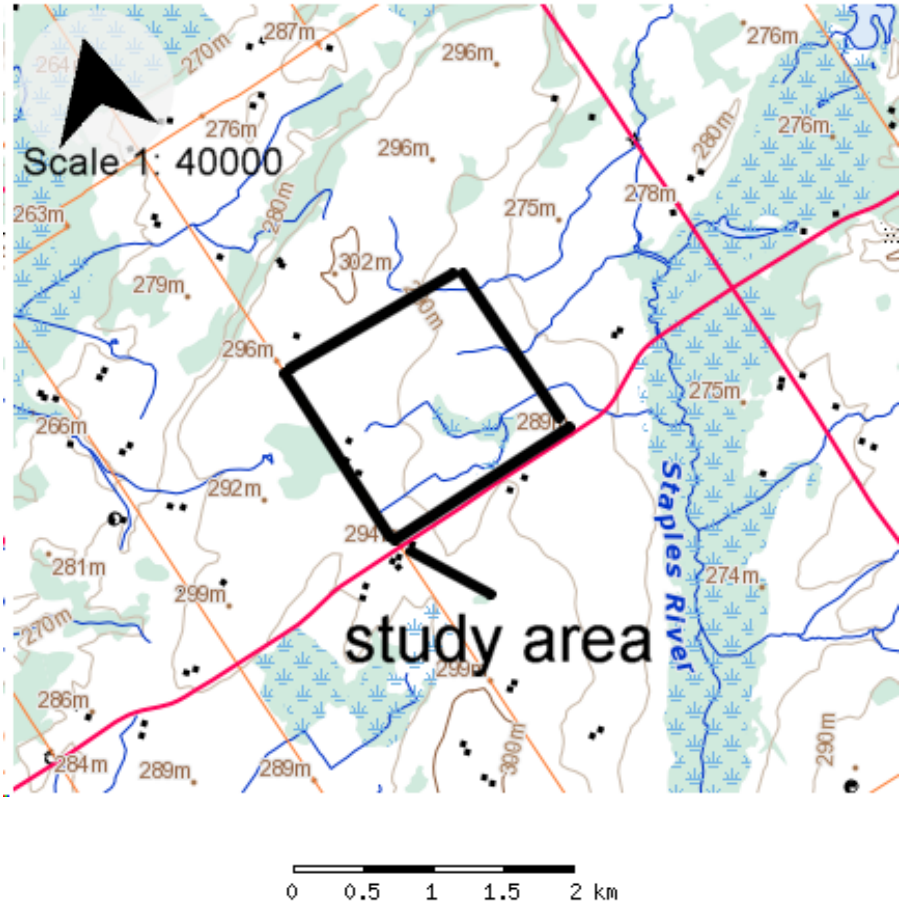
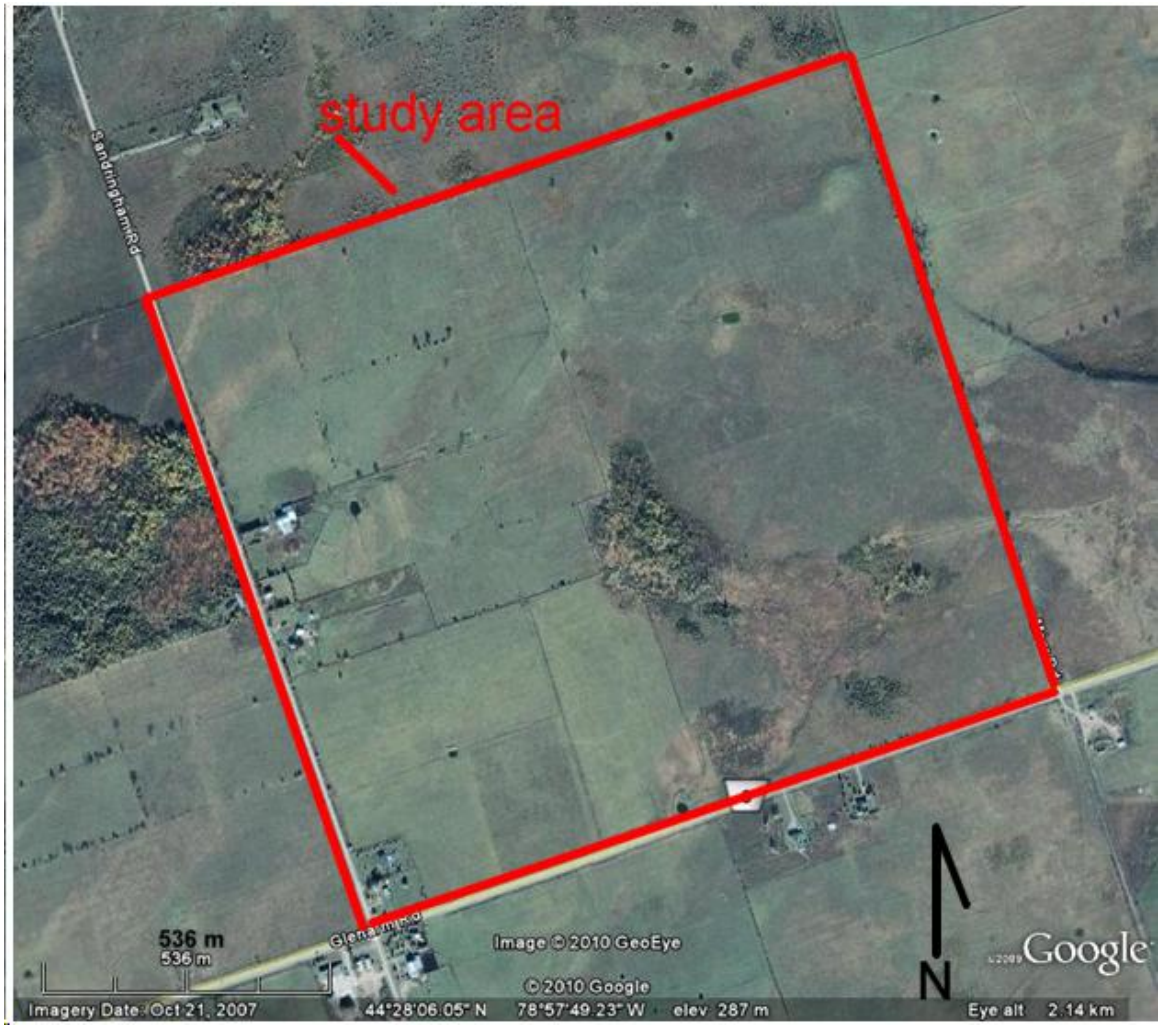


Figure 2
Satellite View of Property
Google Earth Imagery Date October 21 2007



1.1 Project Description

Figure 3 depicts the layout for the solar project. An approximately 80' high communication tower will be located on a two metre square base northeast of the intersection of Glenarm and Sandringham Roads. Access roads will be 6.10 m in width (a typical fire aisle width). The AC and DC cabling will be located underneath the roadways and will be typically be routed along the edge of the roadways. The spacing between the rows of solar panels will typically be 4.87 m.

Figure 3 – Concept Plan (February 2011)

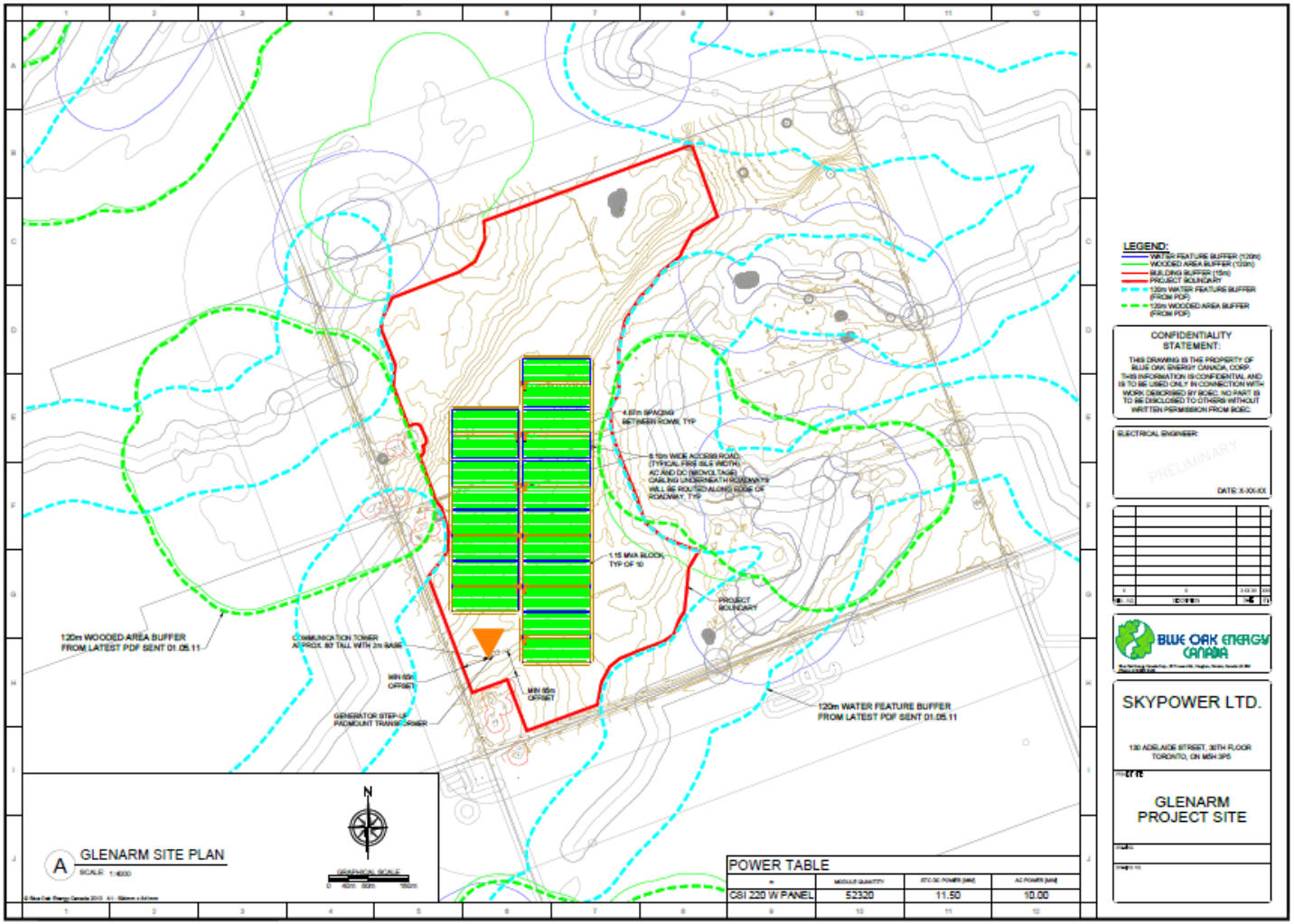
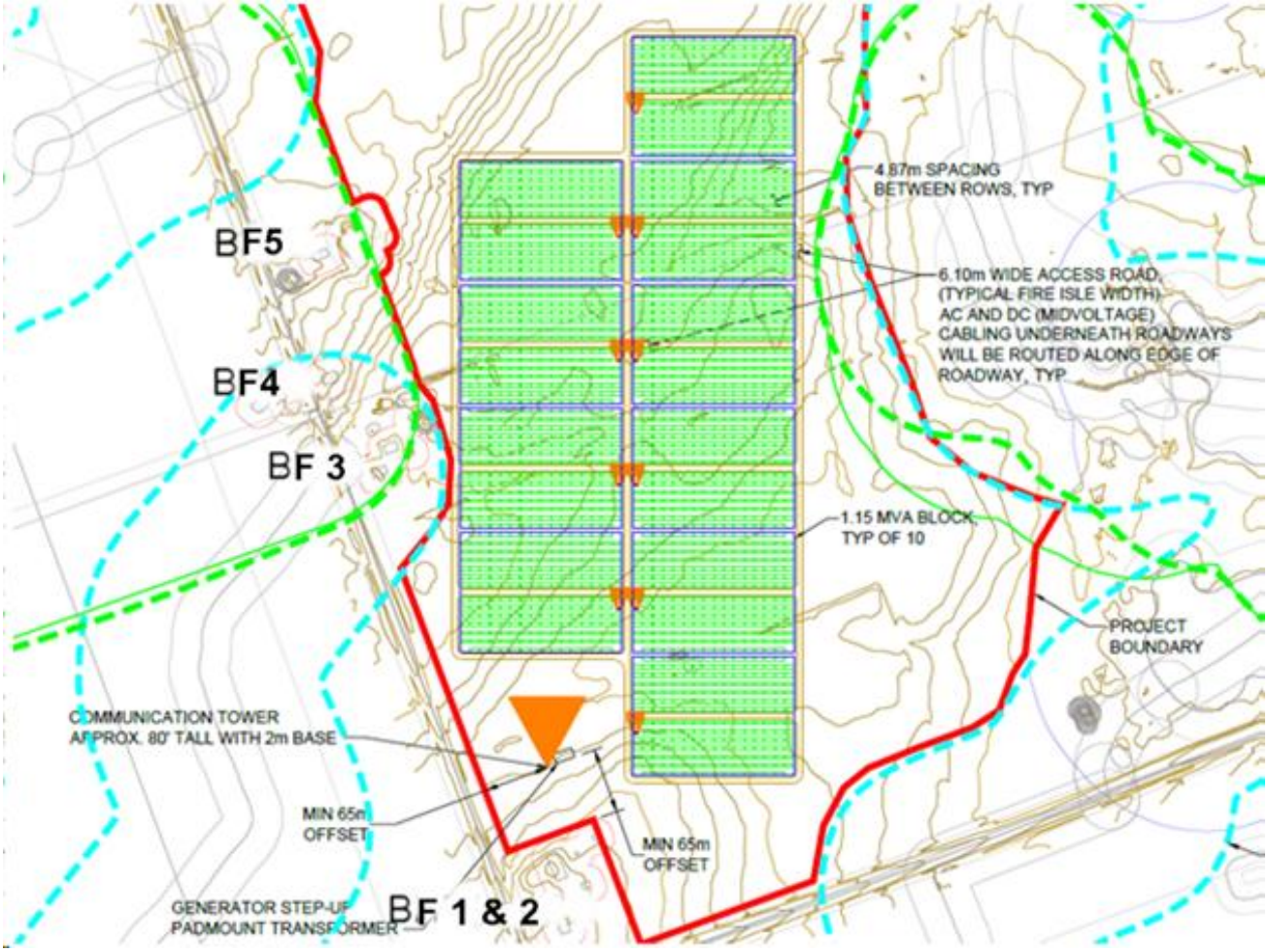


Figure 4
Enlargement of Concept Plan



BF# - BUILT FEATURE

This report provides a description of the historical context of the area, the built structures, and an evaluation of heritage value or interest.

2.0 CURRENT HERITAGE STATUS

2.1 National Heritage Inventory

No structures on the property have been nominated to the Canadian Register of Historic Places.

2.2 Provincial Heritage Inventory

No structures on the property have been listed with the Ministry of Culture's Ontario Heritage Properties Database, and are not a "designated" historic building(s).

2.3 Municipal Heritage Inventory

The Planning Department of the City of Kawartha Lakes referred SJAHCE to the Clerks office where contact was made with Deputy Clerk Mark Gaines. Mark Gaines referred SJAHCE to Tom Mohr of Heritage Victoria. Mr. Mohr (email dated June 10, 2010) indicated only an interest in possible "First Nations sites" in the area. No properties were identified to SJAHCE within the study area as being of any concern to Heritage Victoria.

2.4 Environmental Protection Act – O. Reg. 359/09

Under Section 19 (1) of the Environmental Protection Act – O. Reg. 359/09 (Government of Ontario 2009:19), the following table is to be used with respect to determining if the project location is located on a protected property. Based on this table, it has been determined that the study area is not located on any of the identified types of protected properties.

Table 1 – Protected Properties

Item	Column 1	Column 2
	Description of property.	Project location
1.	A property that is the subject of an agreement, covenant or easement entered into under clause 10 (1) (b) of the *Ontario Heritage Act*.	NO
2.	A property in respect of which a notice of intention to designate the property to be of cultural heritage value or interest has been given in accordance with section 29 of the *Ontario Heritage Act*.	NO
3.	A property designated by a municipal by-law made under section 29 of the *Ontario Heritage Act* as a property of cultural heritage value or interest.	NO
4.	A property designated by order of the Minister of Culture made under section 34.5 of the *Ontario Heritage Act* as a property of cultural heritage value or interest of provincial significance.	NO
5.	A property in respect of which a notice of intention to designate the property as property of cultural heritage value or interest of provincial significance has been given in accordance with section 34.6 of the *Ontario Heritage Act*.	NO
6.	A property that is the subject of an easement or a covenant entered into under section 37 of the *Ontario Heritage Act*.	NO
7.	A property that is part of an area designated by a municipal by-law made under section 41 of the *Ontario Heritage Act* as a heritage conservation district.	NO
8.	A property designated as a historic site under Regulation 880 of the Revised Regulations of Ontario, 1990 (Historic Sites) made under the *Ontario Heritage Act*.	NO

3.0 BUILT HERITAGE AND CULTURAL LANDSCAPE CONTEXT

The cultural heritage assessment of the 169 ha parcel of land located on Lots 11 and 12, Concession 6, Township of Eldon, former Victoria County, City of Kawartha Lakes, Ontario included observations on the cultural landscape as well as the built heritage.

The property consists almost entirely of pasture land, in a rolling hill environment. While bordered by three roadways, the cultural landscape on all four sides is similar to the subject property itself, encompassing largely pastoral lands, on a rolling hill environment.

The project is seeking a Renewable Energy Approval according to Ontario Regulation 359/09 issued under the Environmental Protection Act. The built heritage was evaluated using the criteria for determining cultural heritage value or interest, from the Ontario Heritage Act, Ontario Regulation 9/06. The Ontario Heritage Act, its Regulations and the Ontario Heritage Toolkit were consulted for this project, in addition to O. Reg. 359/09 of the Environmental Protection Act.

Under the Environmental Protection Act – O. Reg. 359/09 (2009) a heritage resource means

> *Real property that is of cultural heritage value or interest and may include a building, structure, landscape or other feature of real property.*

Appendix A presents definition of key terms used in cultural heritage assessments.

4.0 GENERAL HISTORIC SUMMARY

In 1818, the government purchased a tract of approximately 4000 squares miles (counties of Peterborough, Victoria and some of the 28 adjoining townships) from the Mississauga Indians (Kirkconnell 1967: 2). There were six tribes of Mississauga including the Buckquauet of the Eagles, Pishikinse of the Reindeers, Paudash of the Cranes, Cahgahkishinse of the Pikes, Cahgagewin of the Snakes, and Pininse of the White Oaks (ibid: 165).

It is reported that an "old Indian trail" crosses from Lake Simcoe to Balsam Lake – the northern portion of Eldon Township (ibid: 36).

The two closest First Nations to the study area are the Chippewas of Georgina Island and the Mississauga's of Scugog Island First Nation.

Eldon Township was first surveyed in 1826 by Henry Ewing over a space of three years. Interestingly, there is a report that the reason the concessions lines were so poorly laid out, were a result of a drinking problem. "Henry Ewing was drunk – that's why all the quarter roads are as crooked as a dog's hind leg (Fleming 1976:6)". It is more probable that the reason behind the "crooked" nature of the quarter roads was a result of starting the survey at one end, then continuing it at the other end, and meeting up in the middle with an irregular length. A preliminary survey of the county was completed by January of 1826, and Ewing continued to work at the survey piecemeal until 1840.

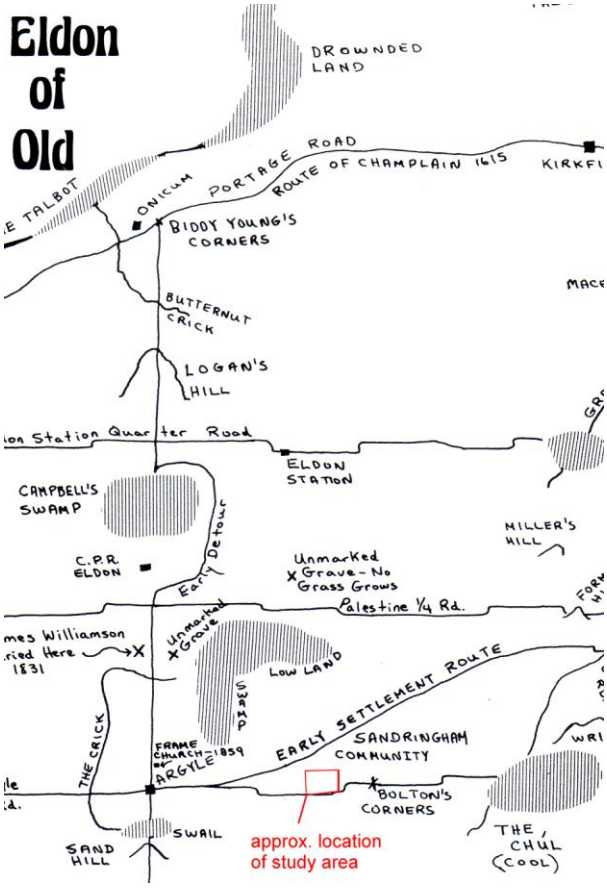
Early roads in the township included the Portage Road (a plaque commemorates the old road/trail), well to the north of the study area, the Third and the Tenth Concession, and the road which followed a ridge of land through the middle of the township, known as the "Old Settlement Road". While this road is close to the study area, it lies north of the property (Figure 5).

There were four ways in which early settlers could acquire land in Eldon Township. The first was to obtain a land grant as a United Empire Loyalist or a discharged soldier. However, there was a condition that made this type of land acquisition generally unpopular. Settlers were required to take immediate and actual settlement (that is, they had to occupy the land). The second method of land acquisition was to purchase a "Location Ticket". The ticket listed a lot and concession assigned to the settler, upon which they were expected to start specific settlement duties (clearing of land, building of a structure). The third method was to be a squatter. And the fourth method was to make a cash purchase of the land.

Settlement duties in 1818 included clearing and fencing five acres for every 100 acres granted, and building a dwelling of minimum dimensions of 16' x 20', and they were also required to clear one half of the road in each lot they owned within a period of two years (ibid:16).

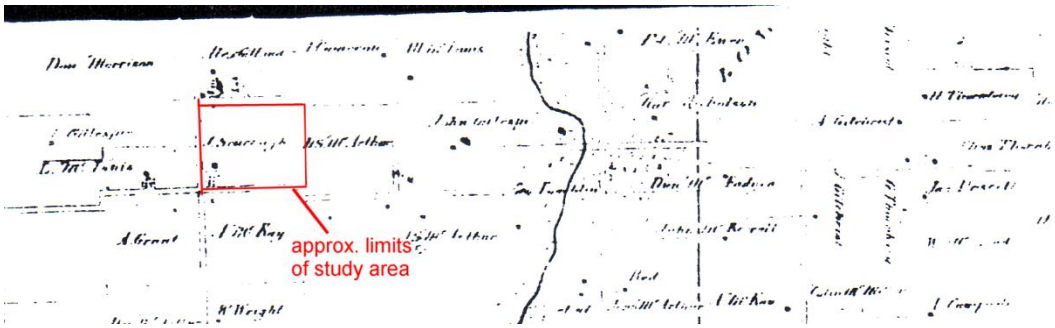
The earliest roads of the area tended to be blazed trails and wagon tracks located at higher elevations. The first railway in Eldon Township came to the area in 1871. All of the current rail lines lie well away from the study area and are not visible.

Figure 5
"Eldon of Old"



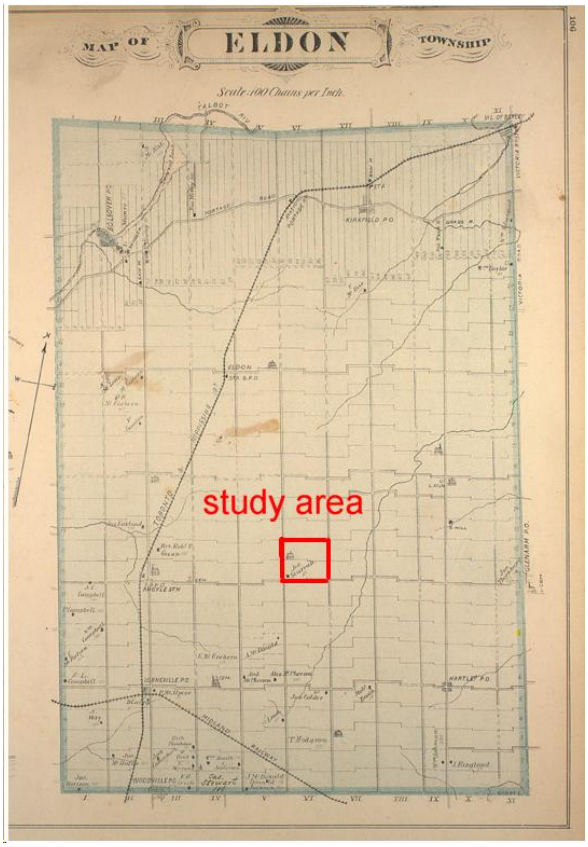
The 1877 map of the County of Victoria (Figure 6) is not completely legible but was compiled and drawn by Jas. A. Paterso….e. The southwest half of Lot 11 illustrates a house and an orchard, owned by J. Scurrah (the same owner as in 1881). It should be noted here that the census records for 1881 (Appendix D) do not list Scurrah on the lot and concession. The southeast half of Lot 11 is owned by D.S. McArthur, and the north half of Lot 11, does not indicate any ownership or structures. The southwest half of Lot 12 shows the school house and H. Gillander. The southeast half indicates a house and an illegible name. There is nothing indicated on the north half.

Figure 6
1877 Map of Study Area



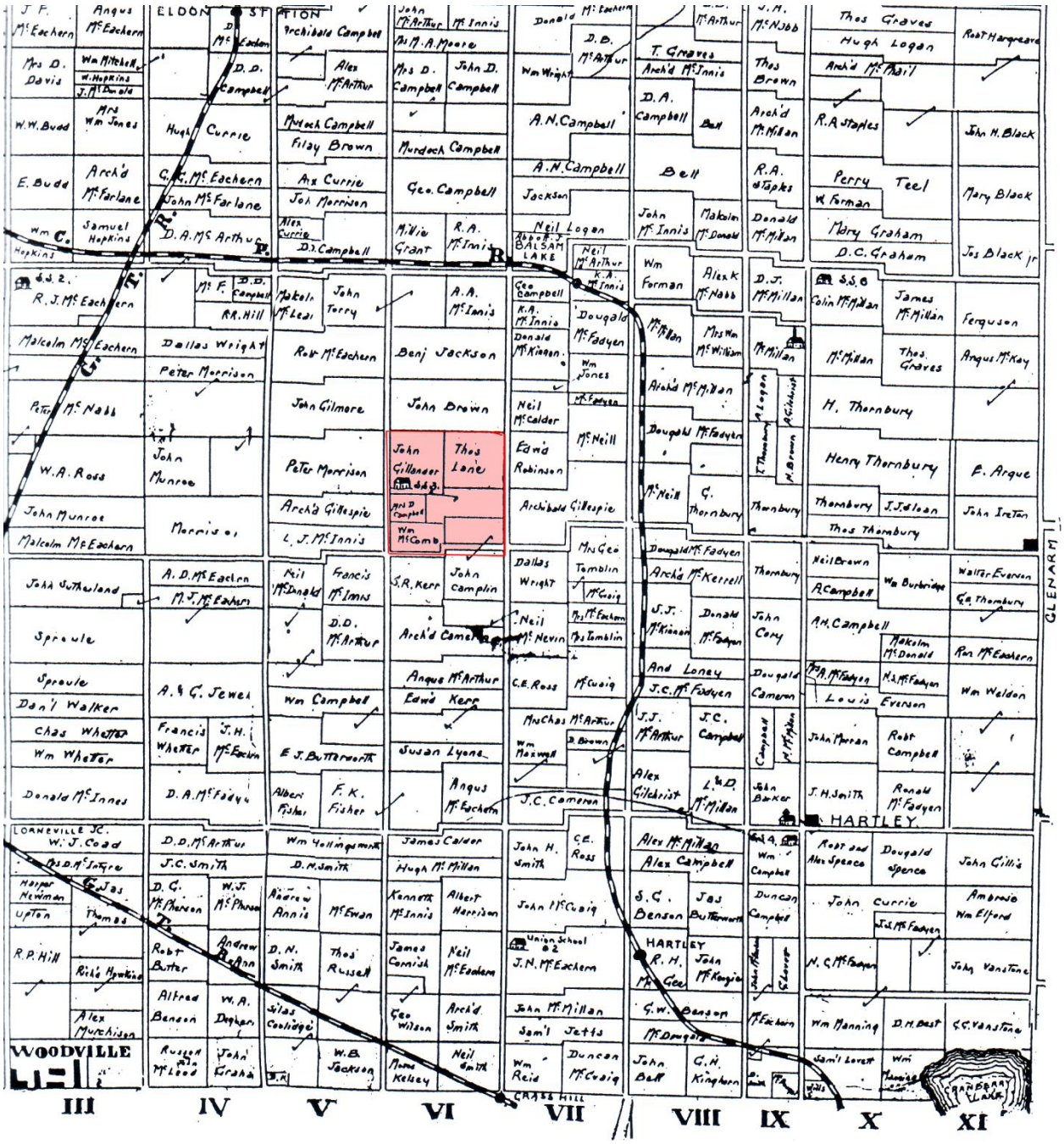
The 1881 historical illustrated atlas (Belden 1881) (Figure 7) shows a residence located on Lot 11, Concession 6. The owner is listed as Joseph Scurrah, born in 1840, from England. He was a farmer who settled here in 1873, and owned 80 acres. It is noted here again that Scurrah is not listed in the 1881 census for this property, and it is unclear where the error lies – either transcription, or actual different location.

Figure 7
1881 Map of the Study Area



The 1916 map of Eldon Township (Figure 8) depicts Wm. McComb on the southwest half of Lot 11, and Mrs. D. Campbell on the northwest half of Lot 11. There is nobody shown for the east half of Lot 11. The west half of Lot 12 is shown as School House No. 3 and John Gillander. The east half is shown as Thos. Lane.

Figure 8
1916 Map of the Township of Eldon
(A.E. Guidal)



School house no. 3, has a date of 1903, as noted from field observations. However, based on historical maps, it is obvious that the extant building is not the original building. Further, Sandringham School, as it was known, was also known as Gillander's School, from the name of the family who lived south of the school in the 1870s (Fleming 1976:244). In fact, it is recorded (ibid) that the one of the children of the Gillanders, Margaret, actually taught at the school.

5.0 CULTURAL HERITAGE LANDSCAPE

5.1 Area Context

The original study property was bounded to the east by Moor Road, which is little more than a farm lane; to the south by Glenarm Road (Regional Road 8), to the west by Sandringham Road, and to the north by a property line and fencing, and is an approximately square shaped parcel of 169 ha. The study area has been reduced from this original project boundary as depicted in Figures 3 and 4, where the study area is now less than half the size and concentrated along the west half, along Sandringham Road.

Photograph 1 illustrates the roadscape facing north along Sandringham Road from the southwest corner of the property. This historic roadscape has retained much of its rural character. Sandringham Road is an unpaved two lane road with narrow shoulders and bordered by shallow ditches, fence lines and some immature trees. The most southern end of the street has been modified by modern residences, and there is some additional modification to the original roadscape further north in front of #668 Sandringham Road (Photograph 2).

Photograph 1
Roadscape – Sandringham Road facing North

Photograph 2
Landscape Modification of Roadscape

Photograph 3 depicts the adjacent cultural landscape as taken from the southwest corner of the study area looking towards the northwest. The neighbouring property is pastoral and also has some small woodlots to the north.

Photograph 3
View from Sandringham Road facing Northwest

Photograph 4 illustrates Glenarm Road, which is also a highway, facing in an easterly direction. The original road has been modified to accommodate the paved highway, wide shoulders, and has been widened. Towards the western end of the study property, there is

modification associated with residences on both the north and south sides of Glenarm Road.

Photograph 4
Glenarm Roadscape facing East

Photograph 5 depicts Moor Road, which borders the eastern end of the property. This road is little more than a car/tractor track, being very rough, and running between two fence lines.

Photograph 5
Moor Road facing North

Photographs 6 - 8 depict the cultural landscape of the study property. The area is currently pasture, in a moderately rolling hill environment, crossed by several tributaries of the Staple River. There are a couple of small woodlots on the property, and at least one wetland area towards the south end of the property. The entire aspect of the study area is pastoral.

Photograph 6
Property facing North from Glenarm Road

Photograph 7
Study Area facing Northwest from Moor Road

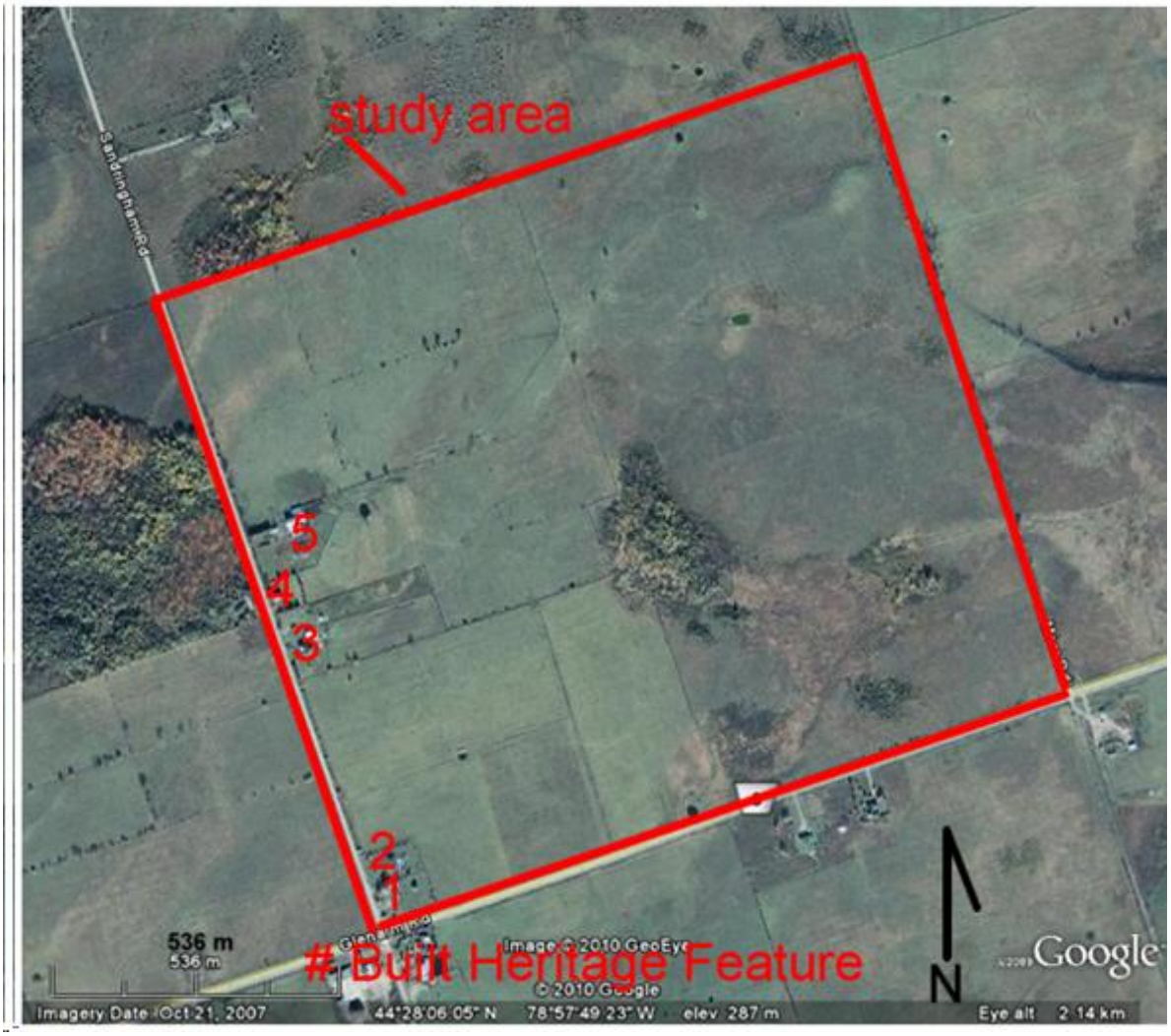
Photograph 8
Facing Westerly from Northeast Corner of Study Area

Fences separate various sections of the property, and are comprised of both wire mesh, with barbed wire, and rail fence line.

6.0 BUILT FEATURES

Photograph 9 illustrates the areas of built features on the study property, and these are identified by numbers for description herein. It should be noted that none of the built features are located directly on the study property, and none will be directly impacted by the development of the solar project.

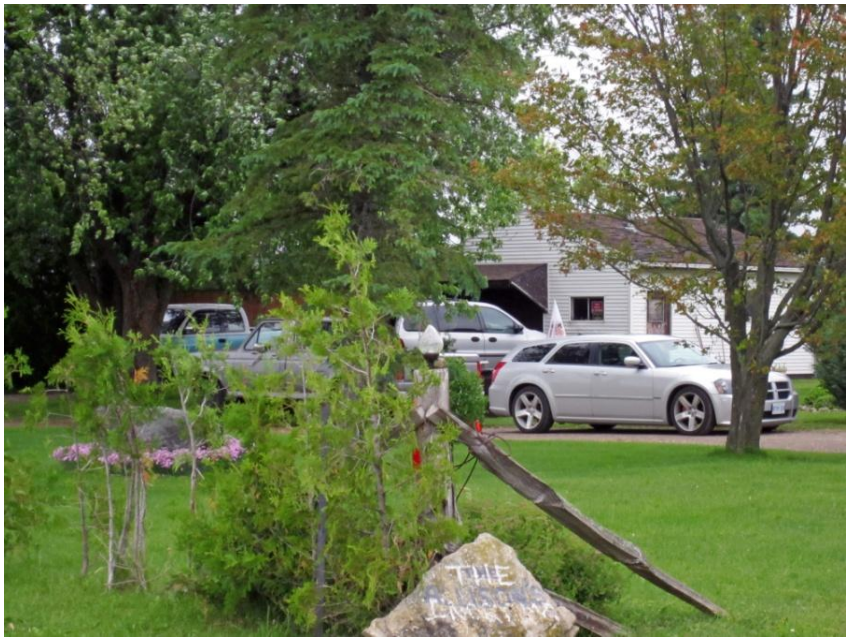
Photograph 9
Satellite View of Property
Imagery Date October 21, 2007 Google Earth



Built Feature #1 (616 Sandringham Road): At the southwest corner of the study area, is a modern bungalow of red brick and frame construction and detached garage with a semi-circular driveway. The landscaped area of the property includes a side and backyard (Photographs 10 – 12).

Photograph 10
616 Sandringham Road - Residence

Photograph 11
616 Sandringham Road - Garage



The side and back yard have been modified, but to such a limited extent that the former historic residence (no longer extant) may still be found through archaeological investigation.

Photograph 12
616 Sandringham Road - Yard

Built Feature #2 (#622 Sandringham Road): This residence is a red brick bungalow, of recent construction, made to resemble a patterned brick house. There is a detached garage and manicured lawn (Photographs 13-14). There is a decorative fence and paved driveway associated with the property.

Photograph 13
622 Sandringham Road - Residence

Photograph 14
622 Sandringham Road - Garage

Built Feature #3 (#668 Sandringham Road): This building complex consists of a two storey house with rear addition and porch. The property is clad with modern material, making it difficult to ascertain the original construction details. In addition, the foundation is parged, also limiting identification of the structural aspects of the main building. There are numerous modifications to the house, and construction details suggests that this was not the original house on the property. There may be remnants of the original house that could be located through archaeological methods. There is a small shed of recent construction to the northeast of the house, and a recent two storey board and batten construction garage to the north of the house. To the north of the small shed is a log one story building with a poured concrete floor. There is no evidence of a foundation, and it is difficult to assign either a date or an in situ status to the building (Photographs 15-19).

Photograph 15
668 Sandringham Road - Residence

Photograph 16
668 Sandringham Road - Shed

Photograph 17
668 Sandringham Road - Garage

Photograph 18
668 Sandringham Road – Log Building

Photograph 19
668 Sandringham Road – Poured Concrete Floor, Log Building

Built Feature #4, No. 3 Schoolhouse: The school house is a two storey brick structure with decorative brick window arches. The foundation is fieldstone, and the front windows have been altered, but are reminiscent of Italianate style. There is a date located below the 2nd storey window of 1903. This is not the original school house, which according to some records dates back to the 1870s. According to Fleming 1976:244), No. 3 School House was known as the Sandringham School, and it was also known as Gillander's School, the name of the family who lived south of the school in the 1870s (Fleming 1976:244). In fact, it is recorded (ibid) that the one of the children of the Gillanders, Margaret, actually taught at the school.

Aside from this reference to the school, there are only passing references to there being a school located along the 6th Concession. There is an associated yard which has been landscaped associated with this building (Photographs 20-21).

Photograph 20
1903 Red Brick School House

Photograph 21
Date of 1903 Below 2nd Storey Window

Built Feature #5, Barn Complex: a complex of barn and associated outbuildings is located north of No. 3 School House. There is no extant residence associated with this barn complex, although there is a front yard where it is very likely that the original residence would have stood (Photographs 22). The barn complex exhibits a main barn typical of the area, and a number of attached, low rise, outbuildings that are of recent vintage. The barn complex is surrounded by split rail fence.

Photograph 22
Barn Complex facing North

7.0 CULTURAL HERITAGE RESOURCE ASSESSMENT

The following criteria were examined to determine if the properties exhibited cultural heritage value or interest as per the Ontario Heritage Act, Ontario Regulation 9/06. It is noted that a property *may* be designated under Section 29 of the Ontario Heritage Act if it meets one or more of the criteria presented in Table 1. It is important to note again, that none of the properties lie directly within the project area, nor will there be any direct impact to these built features.

Table 2
Criteria for Determining Cultural Heritage Value/Interest

Criteria	Question	Property	Yes/No Determination of Cultural Heritage Value or Interest
Design Value or Physical Value`	Is the property a rare, unique, representative or early example of a style, type, expression, material or construction method?	BF#1	NO
		BF#2	NO
		BF#3	NO
		BF#4	YES
		BF#5	NO
	Does the property display a high degree of craftsmanship or artistic merit?	BF#1	NO
		BF#2	NO
		BF#2	NO
		BF#4	NO
		BF#5	NO
	Does the property demonstrate a high degree of technical or scientific achievement?	BF#1	NO
		BF#2	NO
		BF#3	NO
		BF#4	NO
		BF#5	NO
Historical Value or Associates Value	Does the property have direct associations with a theme, event, belief, person, activity, organization or institution that is significant to a community?	BF#1	NO
		BF#2	NO
		BF#3	NO
		BF#4	YES
		BF#5	NO
	Does the property yield, or have the potential to yield, information that	BF#1	NO

Criteria	Question	Property	Yes/No Determination of Cultural Heritage Value or Interest
	contributes to an understanding of a community or culture?		
		BF#2	NO
		BF#3	NO
		BF#4	YES
		BF#5	NO
	Does the property demonstrate or reflect the work or ideas of an architect, artist, builder, designer or theorist who is significant to a community?	BF#1	NO
		BF#2	NO
		BF#3	NO
		BF#4	NO
		BF#5	NO
Contextual Value	Is the property important in defining, maintaining or supporting the character of an area?	BF#1	NO
		BF#2	NO
		BF#3	NO
		BF#4	YES
		BF#5	NO
	Is the property physically, functionally, visually or historically linked to its surroundings?	BF#1	NO
		BF#2	NO
		BF#3	YES
		BF#4	YES
		BF#5	YES
	Is the property a landmark?	BF#1	NO
		BF#2	NO
		BF#3	NO
		BF#4	YES
		BF#5	NO

Built features #1 and #2 are modern construction buildings and not linked with any significant person or event, are not of cultural heritage value or interest.

Built Feature #3 is possibly one of the buildings owned and lived in by the Gillanders, a family long established in the area, and on this specific property. The theme of these built heritage features are associated with rural farming operations. Built Feature #3 is typical of an 1860 to 1890 agricultural era, but in itself, is not unique. The building is not considered to have significance in the development of the community.

Built Feature #4 is a school, dating to 1903. The theme is rural education. Built Heritage Feature #4, the school house has an association with the adjacent built heritage feature #3, and with the Gillanders family. However, this association is clearly with the earlier school and not this extant building. Built Feature #4 is second or third (unknown) rebuild of the school house. It is over 100 years old, and is considered to have contributed to the development of the community.

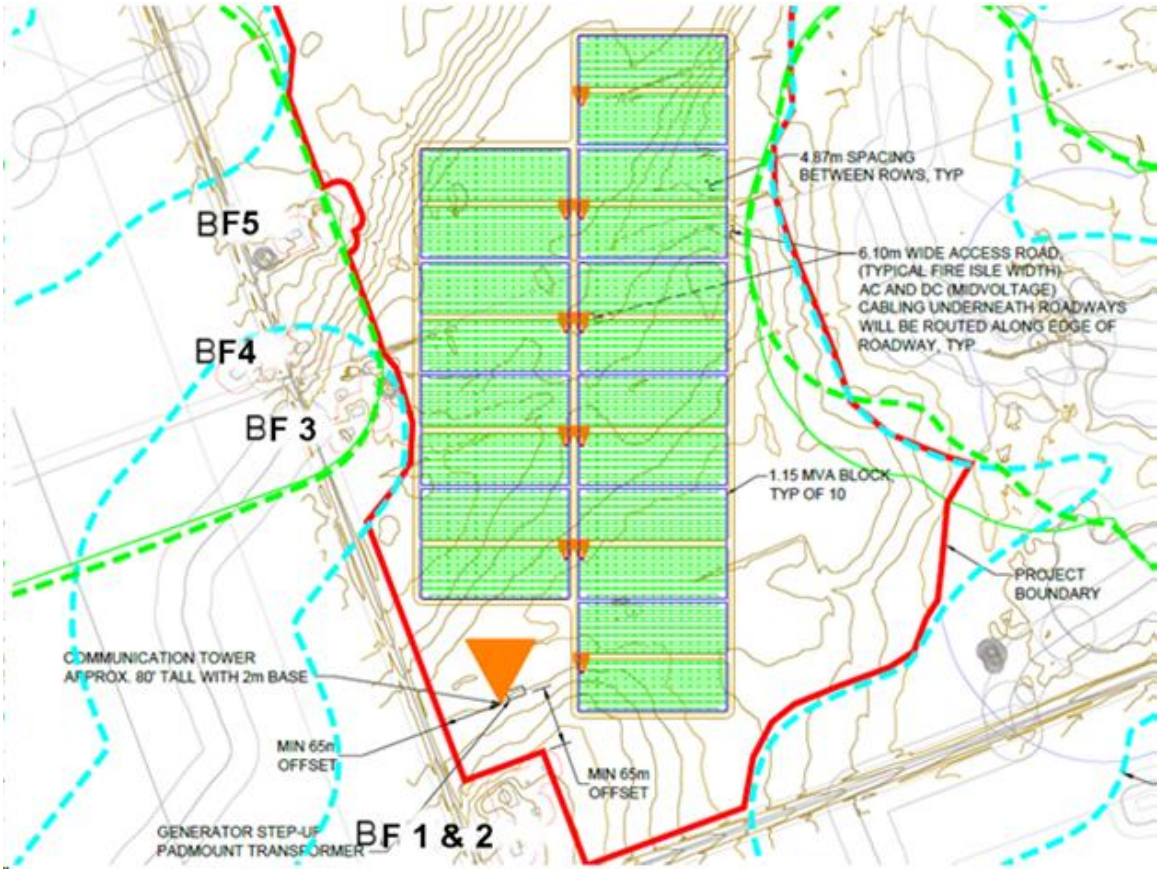
Built Feature #5, a complex of barn and outbuildings is clearly associated with a rural farming theme. Built Feature #5 - The barn is a typical barn of the early pioneer era. While it is not unique to the pioneer era, it is in good condition, large, and representative of a successful farming enterprise. The low rise outbuildings are current and are not considered to have any heritage significance. Built Feature #5 is not considered to be of cultural heritage value or interest.

Only Built Features #3 and #4 are considered to exhibit cultural heritage value or interest.

8.0 ASSESSMENT OF IMPACTS ON BUILT HERITAGE

Figure 9 illustrates the concept plan (February 2011) in relation to the built features.

Figure 9
Concept Plan and Built Features



All five identified built features are outside the project area and there will be no direct impact to any of the features. There may be some indirect impact to Built Features #3 and #4 in terms of sight lines. A visual simulation of the project in relation to these two properties is presented in Figures 10 and 11.

The school house, Built Feature #4, is effectively screened by existing vegetation in the form of pine trees surrounding the property on three sides. There is no visual impact with respect to Built Feature #4.

The log house, Built Feature #3, is in a sight line of the solar panels (Figure 11). The proponent will be building a berm between the log house and the solar panels to remove the solar panels from the sight line (Figure 12).

Figure 10
Visual Simulation for Built Feature #4 (School House)

Figure 11
Visual Simulation for Built Feature #3 (Log House)

Figure 12
Visual Simulation with Proposed Berm – Log House

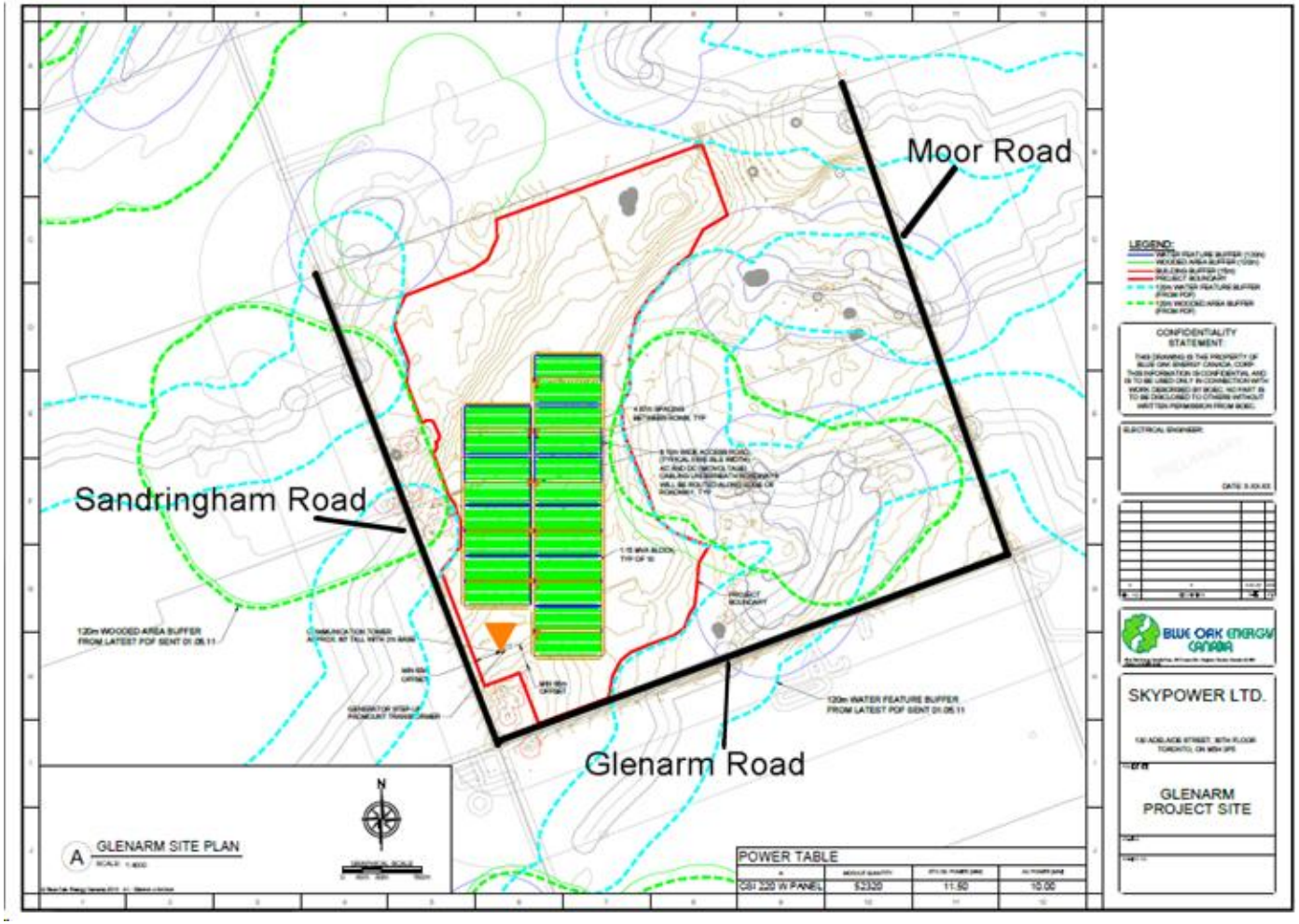
9.0 ASSESSMENT OF IMPACTS TO CULTURAL HERITAGE LANDSCAPE

Figure 13 illustrates the concept plan for the Glenarm Solar Farm and the project area in relation to the roadscapes and vistas. Moor Road, an identified cultural roadscape, is approximately 650 meters east of the proposed solar units. This allows a sufficient buffer to ensure that the roadscape is preserved. There will be no direct or indirect impact to this cultural roadscape.

Glenarm Road is a 2-lane paved roadway, with wide shoulders. The proximity of the proposed solar farm does not detract considerably from its current use. There will be no direct or indirect impact to this cultural roadscape.

Sandringham Road has been modified in the southern section, closest to Glenarm Road. The construction of the solar farm will not severely impact on the roadscape of Sandringham Road.. There will be no direct or indirect impact to this cultural roadscape.

Figure 13 - Concept Plan in Relation to Roadscapes and Vistas



10.0 MITIGITATION RECOMMENDATIONS

As per the Environmental Protection Act – O. Reg. 359/09 (Government of Ontario 2009:22), an evaluation of any impact of the renewable energy project on any heritage resources which may exist on or abutting the property and proposed measures to avoid, eliminate or mitigate the impact, are made herein.

Visual simulation of the two identified heritage buildings illustrate that the school house (BF#4) has an existing surrounding vegetation screen of pine trees that obscures the solar panels from view. The visual simulation of the log house (BF #3) does show the solar panels in the background. An additional visual simulation with a berm between the solar panels and the log house illustrate that there is no visual impact to the cultural landscape. Neither the log house or the school house will be directly impacted by the construction of the solar facility.

It is recommended that the berm be constructed between the solar facility and the log house (BF#3) to ensure no visual impact.

There are no further recommendations regarding the cultural heritage assessment of the Glenarm Solar Facility.

11.0 REFERENCES CITED AND CONSULTED

Belden, H. And Co.
1881 **Victoria County (Ontario Map Ref #24), Victoria Supplement in Illustrated Atlas of the Dominion of Canada.** Toronto.

Fleming, Rae
1976 **Eldon Connections: Portraits of a Township.**

Government of Ontario
1990 **The Heritage Act R.S.O. 1990.** Ontario Regulation 9/06, made under the Ontario Heritage Act. Criteria for Determining Cultural Heritage Value or Interest. Queen's Printer, Toronto.

1997 Conserving a Future for Our Past: Archaeology, Land-Use Planning & Development in Ontario. An Educational Primer and Comprehensive Guide for Non-Specialists. Ministry of Citizenship, Culture and Recreation, Cultural Programs Branch, Archaeology & Heritage Planning Unit.

2005 Mandatory Standards and Guidelines for Provincial Heritage Properties, under Part III, 1 of the Ontario Heritage Act.

2009 **Environmental Protection Act.** O. Reg. 359/09.

Guidal, A.E.
1916 **Township of Eldon.** Scale one inch equals one mile.

Kirkconnell, Watson
1967 **County of Victoria Centennial History.** Victoria County Council, Lindsay, Ontario.

Mikal, Robert
2004 **Ontario House Styles: The Distinctive Architecture of the Province's 18th and 19th Century Homes.** James Lorimer and Company Ltd., Toronto.

Ministry of Culture
2006 **Ontario Heritage Tool Kit: Heritage Property Evaluation – A Guide to Listing, Researching and Evaluating Cultural Heritage Property in Ontario Communities.** Queen's Printer for Ontario.

Ministry of Natural Resources
2006 **A Technical Guideline for Cultural Heritage Resources for Projects Planned under the Class Environmental Assessment for MNR Resource Stewardship and Facility Development Project and the Class Environmental Assessment for Provincial Parks and Conservation Reserves**. On file with the Ministry of Natural Resources and on-line.

No author
n.d. **People of Ontario, 1600 – 1900. Alphabetized Dictionary of the People, Places and Vital Dates.** Noel Montgomery Elliot (ed.), The Genealogical Research Library, London, England.

Parks Canada
2003 Canada's Historic Places. Standards and Guidelines for the Conservation of Historic Places in Canada. Parks Canada.

Paterson....e, Jas. A.
1877 **1877 Map of the County of Victoria, Ontario.** Compiled and drawn by Paterson....e. Scale 8 inches equals 5 miles.

Appendix A

Definition of Key Terms
From Standards and Guidelines for the Conservation of Historic Places in Canada 2003:2).

Character-defining elements: the materials, forms, location, spatial configurations, uses and cultural associations or meanings that contribute to the heritage value of a historic place, which must be retained in order to preserve its heritage value.

Conservation: all actions or processes that are aimed at safeguarding the character-defining elements of a cultural resource so as to retain its heritage value and extend its physical life. This may involve "Preservation," "Rehabilitation," "Restoration," or a combination of these actions or processes.

Guidelines: statements that provide practical guidance in applying the Standards for the Conservation of Historic Places. They are presented herein as recommended and non-recommended actions.

Heritage value: the aesthetic, historic, scientific, cultural, social or spiritual importance or significance for past, present or future generations. The heritage value of a historic place is embodied in its character-defining materials, forms, location, spatial configurations, uses and cultural associations or meaning.

Historic place: a structure, building, group of buildings, district, landscape, archaeological site or other place in Canada that has been formally recognized for its heritage value.

Intervention: any action, other than demolition or destruction, that results in a physical change to an element of a historic place.

Maintenance: routine, cyclical, non-destructive actions necessary to slow the deterioration of a historic place. It entails periodic inspection; routine, cyclical, non-destructive cleaning; minor repair and refinishing operations; replacement of damaged or deteriorated materials that are impractical to save.

Minimal Intervention: the approach which allows functional goals to be met with the least physical intervention.

Standards: Norms for the respectful conservation of historical places.

Appendix B – Land Registry Records

Concession 6, Lot 11 – East Half						
Inst. #	Instrument	Date Inst.	Date Reg.	Grantor	Grantee	Comments
	Notice of Patent	12Apr1865		The Crown	Donald McArthur	E ½ with….??
7962	Mortgage	1Mar1865	2Mar1865	Donald McArthur et ux.	Commercial B&S Society	$700? E ½ & other lands
641	Mortgage	25Oct1872	29Oct1872	Donald McArthur et ux	Jacob Neelands	$500 E ½ 100 acres
645	Dis. Mort	26Oct1872	31Oct1872	Commercial B&S Society	Donald McArthur	E ½ Dis. No7962
1102	Deed	11Jun1874	12Jun1874	Donald McArthur Wife	Susan Hancock	$2000 100 acres
1103	Mortgage	11Jun1874	12Jun1874	Susan Hancock & Husb. Hancock	Donald McArthur	$2000 E ½ 100 acres
1329	Deed	26Apr1875	8May1875	Susan & Richard Hancock	Donald McArthur	$2000 E ½ 100 acres
1383	Agreement	17July1875	3Aug1875	Donald McArthur	John Brown	E ½ agree…? & other lands
1716	Mortgage	19Oct1876	23Oct1876	Donald McArthur & wife	National Investment Coy of Canada ltd.	$1800 E ½
1719	Dis. Of Mortgage 641	30Oct1876	30Oct1876	Jacob Neelands	Donald McArthur	$1800 E ½ 100 acres
2071	Mortgage	14Sep1877	4Oct1877	Wm A. Mason et ux	Donald McArthur	$1800 E ½ 100 acres
2072	Deed	14Sep1877	4Oct1877	Donald McArthur et ux	Wm A Mason	$2000 E ½ 100 acres
2076	Dis. of 2071	4Oct1877	4Oct1877	Donald McArthur	Duncan I. McIntyre	$1000 E ½ 100 acres
28?6	Deed	7Sep1879	3Nov1879	William A. Mason et ux	Duncan I McIntyre	$1500 E ½ 100 acres
3000	Deed	11Apr1881	21Apr1881	Duncan I. McIntyre …?	Angus & Peter Smith	$1000 E ½ 100 acres
3221	Mortgage	11Apr1881	21Apr1881	Angus Smith ..? and Peter Smith	Duncan J. McIntyre	$1000 E ½ 100 acres
3225	Dis. of 1716	11Oct 1877	22Apr1881	??.. Investments ??.. Ltd.	Donald McArthur	E ½ and other lands
3322	Dis. of 3221	11Nov1881	11Nov1881	Duncan J. McIntyre	John Bond	$1039 E ½ 100 acres
5266	Dis. of 3221	8Jan1892	23Jan1892	Eliz. K Broad, John F & W.I Dig exis.	C. Angus & Peter Smith	E ½ 100 acres
7180	B&S	12Apr1904	22Apr1904	Angus Smith & Peter Smith et ux	John L. Gillander	$900 N ½ of E ½ 50 acres
7182	B&S	12Apr1904	22Apr1904	Angus Smith & Peter Smith et ux	Matthew Couplin	$700 S ½ of E ½ 50 acres ??
8574	Probate	25Dec1912	30Apr1913	Matthew Cawplin	John Cawplin & Mary Jane Couplin	As therein SE ¼ with other lands sub. as therein
9192	Grant & Release	21Sep1918	1Oct1918	John L Gillander et ux. Margaret Gillander & L. Gillander	Wellesley Kerr	$6500 NE ¼ & other lands
9287	Grant	22Apr1919	22Apr1919	John Couplin, unmarried, Mary Jane Couplin,	John J. Ruan	$3400 SE ¼ and other land

				spinster		
9292	?C Deed	25Apr1919	2May1919	Wm. K Couplin & Margaret Eliz. Reall	John Couplin & Mary J. Couplin spinster	$2.00 SE ¼ & other lands
9532	Grant	28Feb1921	3Mar1921	John J. Ruan et ux.	James Thomas	$5100 SE ¼
?823	Grant	14Apr1947	17Apr1947	James Thomas et ux.	Leslie James Thomas	$3000 SE ¼
62803	Grant	15May1962	15May1962	Leslie James Thomas et ux	Wesley Kerr & Stanley Kerr	$2000 SE ¼ ….? joint tenants
Q99H	Land Plan #427276	17Jun1968	19July1968	County of Victoria County Roads System		Pl. Parts 23&34 - ….??
96375	Cert. #427273	7Oct1968	15Oct1968	Treasurer of Ontario	R. Wesley Kerr(Samuel Wesley Kerr)	SE ¼ -as desc. In 62803 NE ½ as des. 9192
97065	Grant	4Nov1968	18Nov1968	Margaret Kerr & Stanley Kerr Admins. Of the Est. of Samuel W. Kerr Est. ? Act ? #B1328488, B1328489, B1328491-92-93-94, re the est of Samuel W. Kerr (Wesley Kerr ?)	Stanley Kerr	$2.00 NE ¼ -SE ¼ +- and other lands
A1054	By Law 622		24July1969	Subdivision Control		All
A7100			22May1970	Restraining Order	Director Land Registr't'n	All
A12238			7Jan1971	Withdrawal of A7100	Director Land Registration	All
227558	Dis.		23Oct1987	Beneficial Finance Co. of Canada		Not. Of Security Interest No. 57126 OL
229514	Grant		16Dec1987	Estate of Edward Stanley Kerr	Ross Allan Walker	2) NE ¼ 5) SE ¼ (50ac^2)
248254	Transfer		31Mar1989	R. Allan Walker	Mario Paul Perini	All OL
	57R6351		30Jan1991			Part 1 (248254) OL
277285	Transfer		4Apr1991	Perini, Mario Paul	Chow, Peter Chiu Sang	$360,000 Part 1 57R 6351 OL
	Deposit		4Apr1991	See Deposit No. 277286		Re: Part 1 57R 6351 OL
Concession 6, Lot 11 – West Half						
Inst. #	Instrument	Inst. Date	Reg. Date	Grantor	Grantee	Comments
	Notice of Deed	18Jun1832		The Crown	Eleanor Dunard	W ½ with ? 10-200 acres
3065	B&S	9Mar1833	3July1833	John Dunard & Eleanor Dunard	John Anderson	£100 W ½ and other lands
3395	Certificate of ? Deed	11Aug1847	29Nov1849	Wm. Conger, Sheriff	Darcy E. Boulton	Pr. W ½ 80 acres
3831	B&S	3Apr1861	5Apr1861	Darcy E. Boulton trustee	Allan McQuarrie	£80 Pr. W ½ 80 acres
3832	Mortgage	3Apr1861	5Apr1861	Allan McQuarrie	Darcy E. Boullon	£60 Pr. W ½ 80 acres
5290	B&S	8Sept1862	10Sept1862	Allan McQuarrie et ux	Hugh McQuarrie	$480 W ½ less 20 acres N side 80 acres
7152	Mortgage	1Apr1864	2May1864	Hugh McQuarrie	Samuel Edsall	£25 W ½ S 80 acres less SW corner 10 acres 70 acres

9827	Dis. of Mortgage	4Apr1864	5Sep1866	Darcy E. Brulton, trustee	Allan McQuarrie	Dis. of Mortgage No.3832
10159	Mortgage	18Dec1866	20Dec1866	Hugh McQuarrie	John Craven Chadwick	$250 W ½ less 20 acres W side 80 acres
___16	Tax Deed	6Feb1869	14Aug1869	Neil McDougall, Sheriff	Donald McQuarrie	$20.01 NW corner 13.34x3 ch 4 acres
404	Mortgage	15Dec1871	14Dec1871	Hugh McQuarrie et ux	Neil McIntyre	$300 same as 5290
414	Dis. Mort	8Mar1867	29Dec1871	Samuel Edsall	Hugh McQuarrie	Part W ½ Dis. Mort 7152
416	Dis. Mort	23Dec1871	28Dec1871	J.C Chadwick	Hugh McQuarrie	S ½ less 20 acres … 10 ac Dis. Mort N.10159
422	Deed	30Nov1871	30Dec1871	Donald McQuarrie et ux	Alex Gillander	$42 4 acres part N … E 13.34x3 ….?
684	Dis. Mort	16Dec1872	17Dec1872	Neil McIntyre	Joseph Scurrah	W ½ Dis. of N.404
881	Deed	14Sep1872	11Aug1873	Hugh McQuarrie et ux	Joseph Scurrah	$1000 80 acres …?
1137	Mortgage	21Sep1874	12Oct1874	Joseph Scurrah et ux	Adam Hudspeth, trustee	$500 80 acres …?
1376	Dis. of Mort	21July1875	21July1876	Adam Hudspeth	Henry McCall and James Haftis Trustees	$533 80 acres
1500	Mortgage D	17July1876	21July1876	Joseph Scurrah et ux	Adam Hudspeth	$200 W ½ 80 acres
2008	Mortgage D	15Oct1877	30Oct1877	Joseph Scurrah et ux	Arthur D. Coltins	$1100 Pt W ½ 80 acres ….??
2129	Dis. of 1137	7Nov1877	24Nov1877	Henry McCall & James Haltins … Trustees of McCall Estate	Joseph Scurrah	?? 80 acres
215?	Dis. of 1500	12Nov1877	23Nov1877	Adam Hudspeth	Joseph Scurrah	N Pt 80 acres
2287	Deed	19Mar1878	21Mar1878	Alexander Gillander	Effie Gillander	Love & off $1 NW p 4 acres - ……?
2692	Mortgage	12Apr1879	16Apr1879	Joseph Scurrah et ux	Peterborough R.E.I Coy Ltd	$1500 West 80 acres
2723	Dis. of 2008	10May1879	26May1879	Arthur D Coltins	Joseph Scurrah	PT W ½ 80 acres
4240	Deed	3Nov1885	17Dec1885	Peterboro REI Coy ltd.	Robert Wilson	$1400 S 80 acres of W ½
5246	Deed	2Dec1891	3Dec1891	Robert Wilson et ux	Thomas McComb	$2500 S 80 acres of W ½
6845	Probate	3May1897	2Aug1902	Euphemia Gillanders, widow	Sarah Gilleshir	Pt 4 acres at NW cor S of No.3 Schoolhouse
718?	B&S	12Apr1904	22Apr1904	Angus Smith and Peter Smith et ux	John L. Gillanders	$900 N 20 acres of W ½ ……? and other land
7952	Mortgage	30Nov1909	3Dec1909	Margaret E Campbell, widow	The Acct. of the Supreme Court of Judicature for Ontario	$481 Pt. of N W ½ 45 ac cor. at SW of Gillanders 4 ac of NW Co….?
7954	B&S	30Nov1909	4Dec1909	John Gillanders, unmarried	Margaret E. Campbell, widow	$200 " " " " "
7998	DC Deed	8Mar1910	17Mar1910	Mary Ann Brintnell, Isabella Black, Sarah McCoomb spinster, Jane Black, L. McCoomb	William McCoomb	$1 S 80 acres of W ½
9192	Grant & Release	21Sep1915	1Oct1915	John L Gillander et ux L.D Gillander &	Wellesley Kerr	$6500 N 20 ac of W ½ …. 4 ac of SW cor….?

				Margaret		
9305	Grant	7May1919	27May1919	Margaret E Campbell widow	Squire Simpson	$1400 Pt of NW ¼ 45 acres SW of Gillanders 4 ac ….?
9357	Grant	25Jun1919	12Jan1920	Sarah Gillespir, spinster	Squire Simpson	$310 Pt of NW ¼ -4ac NW E13.34.53 N12.34
9856	Grant	6Mar1924	10Mar1924	N McCombs, unmarried & A.J McCombs widow	N. Morrison	Pt of W ½ N 20 acres in No16 & 7180
51	Plan & Description	14Nov1925	24Nov1925	County of Victories County Road N. 16A	Oliver Smith O.S.S	Pt of W ½ ……..…..?
10319	Grant	1Feb1929	13Mar1929	George Simpson and Edith Contour & Solution under Succession Duty Act	Sarah J Simpson, widow	Prms $1.00 Pt N ¼ - 4 ac. ….? E13.34x5.3chs
7701 GR	Certificate	29Jan1954	1Feb1954	Treasurer of Ontario	Re Ext. of John James MacLachlan	W ½ …20 ac as des in #16x7123
12778	Grant	17Feb1954	24Feb1954	William Morrison, et ux	Anne MacLachlin, widow	$2200 W ½ “ “ “
12782	Grant	4Mar1854	22Mar1954	Annie MacLachlan, widow	Earl W. McKague	$4000 W ½ “ “ “
12783	Grant	20Mar1954	22Mar1954	Earl W McKague et ux	Frederick J. Smith and Margaret Smith	$2400 SW pt of W ½ 2 acres – (joint tenants)
12786	Grant	25Mar1954	26Mar1954	Earl W McKague et ux	Wesley Kerr & Stanley Kerr	$3100 N 20 ac …..?
11846	Grant	14Apr1945	15Oct1947	The Victoria Trust & Savings Company Admins. of Sarah J. Simpson, widow & G. Simpson et ux. & Edith Couture, widow, & Treasurer of Ontario	Hector MacLachlan	$1500.11 Pts NW ¼ -4 acres ….? (2) 4 1/5 acres SW ….?
8370 GR	Certificate	16Aug1956	21Aug1956	Treasurer of Ontario	Re: Est. of Hector MacLachlan	Pt NW ¼ Des in #11846
48173	Certificate	3Nov1958	20Nov1985	Treasurer of Ontario	? of E.J Gorrill	Pt of W ½ Des. In #47071
48205	Certificate	18Nov1958	24Nov1958	Treasurer of Ontario	Re: est of Margaret Elizabeth MacLachlan	Pt of W ½ des in #11896
48382	Certificate	1Dec1958	8Dec1958	Treasurer of Ontario	Re: est of Margaret Anne Smith	Part of W ½ des in #12783 (joint tenants?)
51758	Grant	15Sep1959	13Oct1959	Catherin S. & H. MacLachlan …?	Cyril Murdock & I. Murdock	$1.00 Pt N ¼ …..?
Q99H	Land Plan	17Jun1968	19July1968	County of Victoria County Roads System		$1.00 pt Part 23524 ……?
95072	Grant	28Jun1968	9Aug1968	F. James Smith ….. Succession…?	Alistair Laird and Joan Elizabeth Laird	$1.00 as therein Pt W ½ cor SW N.263 ft E 335…?

96375	Cert. 427277	7Oct1968	15Oct1968	Treasurer of Ontario	Re: Est. Wesley Kerr(Samuel Wesley Kerr)	Pt W ½ as desc. in 9192 and other land
96854	Cert.	4Oct1968	6Nov1968	Treasurer of Ontario	Re: Est. Samuel Wellesley Kerr(Wesley Kerr)	W ½ as desc. in 2786
97065	Grant	4Nov1968	18Nov1968	Margaret Kerr & Stanley Kerr Admins. Of the Est. of Samuel W. Kerr Est. ? Act ? #B1328488, B1328489, B1328491-92-93-94, re the est of Samule W. Kerr (Wesley Kerr ?)	Stanley Kerr	(3) N 20 acres W ½ 4 acres of NW….. Off SW … Margaret Campbell (4) W ½ …. 20 acres……?
A1004	ByLaw 622		24July1969	Subdivision Control		All
A7100			22May1970	Restraining Order	Director Land Registr't'n	All
A12238			7Jan1971	Withdrawal A7100	Director Land Registration	All
A46911	Cert	29Nov1974	10Dec1974	Minister of Revenue of Ontario	Re: est. Cyril Alexander Murdoch	P. being part of lot 11 as in 51758
165840	Grant		4Sep1981	Alistair Laird & Joan E Laird	Cardon S. Banfield	263' fronting on ….. & 335' fronting on ….. cor. SW -2 acres or more; ex part taken for rd widening purpose by 669H
178365	Grant		13May1983	Isabel M Murdock	Louis Murdoch, Dale Murdock	As in 51758 recital
2259449	Grant		15Sep1987	Cardon Seaford Banfield	Edward J Ingram, Patsy A. Ingram	As disc in No.165840
229514	Grant		16Dec1987	Estate of Kerr, Edward Stanley	Ross Allan Walker	3)N20ac of W1/2 Ex. 4 ac at NW cor & 4 ac at SW cor 4) W ½ ex. a) N 20 ac in No.'s 16&7180 & b) Parcel at SWv 263'x335' Com SWv (2ac +-) OL
248254	Transfer		31Mar1989	Ross Allan Walker	Mario Paul Perini	All Ex. Parcel at NW 417.99'x874.65' Com NW in No.178365 & ex. Parcel at SW 263'x335' Com SW in No.165840 & 225949 OL
	57R6351		30Jan1991			Parts 1&2 (248254) OL
277283	Transfer		4Apr1991	Mario Paul Perini	Mario Paul Perini	$2.00 Part 2 57R6351 Planning Act Consent Caution RE: Septic Oil
277285	Transfer		4Apr1991	Mario Paul Perini	Peter Chiu Sang Chow	$360,000 Part 1 57R6351 OL
	Deposit		4Apr1991	See Deposit No. 277286		Re: Part 1 57R6351 OL
	Deposit		12July1996	See Deposit No.		Re: No.178365

				332032		
332033	Transfer		12July1996	Louis & Dale Murdoch	William George & Linda Macisaac, JT	$140,000 Part Com W bdy lot 1599. 18'N from SW as in No.178365 & shown on 57R6351
396517	Transfer		26Aug2002	Edward Jack & Patsy A. Ingram	Wayne Douglas & Marianne Allison	$139,500 As in 225949 "Planning Act Statement"
396518	Charge		26Aug2002	Wayne D.; Marriane & Danny B Allison	Bridgewater Financial Services	$128, 688.75 as in 225949
440509	Transfer		14Oct2005	William G and Linda Macisaac	William G. Macisaac	$2.00 as previously desc in N.332033
	Deposit		6May1994	See deposit No. 312183		Re: Part 2 57R6351 OL
312184	Transfer		6May1994	Mario Paul Perini	Deanne Helen Greig; Edward Bruce Deguerre (joint tenants)	$20,000 Part 2 57R6351 OL
440510	Charge		14Oct2005	William G. Macisaac	The Bank of Nova Scotia	$230,000 as previously desc in No332033
461581	Transfer		15Aug2007	Deanne Helen & Edward Bruce Deguerre	Stephen Michael Charles	$365,000 Part 2 57R6351 as prev. desc in No.312184 Planning Act Statements
461582	Charge		15Aug2007	Stephen M. Charles	Meridian Credit Union Limited	$150,000 Part 257R6351 as prev. desc in No31214
461583	Charge		15Aug2007	Stephen M. Charles	Meridian Credit Union Ltd.	$100,000 Part 2 57R6351 as prev. desc in No31214

Concession 6 , Lot 12 – East Half						
Inst.#	Instrument	Inst. Date	Reg. Date	Grantor	Grantee	Comments
	Notice of Patent	8Sep1868		The Crown	John Cameron	E1/2 100 acres (CR?)
13035	B&S	7Oct1868	10Oct1868	John Cameron et ux	Allan Cameron	E ½ 100 acres
4613	Deed	4Nov1884	24Apr1887	John Cameron et ux	John Cameron Jr.	$1000 E ½ 100 acres
4765	Mortgage	19May1888	19May1888	John Cameron Et ux	Peter H. Clarke	$200 E ½ 100 acres
5609	Dis. of 4765	1May1894	12May1894	Harietta Clarke widow, ex P.H. Clarke	John Cameron	E ½ 100 acres
3943GR	Probate	20Mar1918	13Nov1931	John Cameron	Catherin Cameron, wife	As therein E ½ 100 acres
6748GR	Certificate	15May1950	23May1950	Treasurer of Ontario	Re: Estate of Catherine Cameron	E ½ 100 acres and other lands
12234	Grant	15May1950	23May1950	?? and Treasurer of Ontario Margaret Cameron,	Wesley Kerr & Stanley Kerr	As therein & $1.00 E ½ 100 acres – as joint tenants (entered ….?)

				Admins. of Catherine Cameron, widow		
96375	Cert 427274	7Oct1968	15Oct1968	Treasurer of Ontario	Re: est. Wesley Kerr(Samuel W. Kerr)	E ½ as desc. in 12234 and other land
97065	Grant	7Nov1968	18Nov1968	Margaret Kerr & Stanley Kerr Admins. Of the Est. of Samuel W. Kerr Est. ? Act ? #B1328488, B1328489, B1328491-92-93-94, re the est of Samule W. Kerr (Wesley Kerr ?)	Stanley Kerr	$2.00 E ½ 106 acres ±
A1004	By Law 622		24July1969	Subdivision Control		All
A7100			22May1970	Restraining Order	Director Land Registr't'n	All
A12238			11Jan1971	Withdrawal A7100	Director Land Registration	All
229514	Grant		16Dec1987	Estate of E Stanley Kerr	Ross Allan Walker	All (106 acres) OL
248254	Transfer		31Mar1989	Ross Allan Walker	Mario Paul Perini	All OL
	57R6351		30Jan1991			Part 1 (248254) OL
277283	Transfer		4Apr1991	Mario Paul Perini	Mario Paul Perini	$2.00 Part 2 57R6351 Planning Act Consent Warning RE; Septic Tank OL
277285	Transfer		4Apr1991	Mario Paul Perini	Peter Chiu Sang Chow	$360,000 Part 1 57R6351 OL
	Deposit		4Apr1991	See Deposit No. 277286		Re: Part 1 57R6351 OL
	Deposit		6May1994	See Deposit No. 312183		Re: Part 2 57R6351 OL
312184	Transfer		6May1994	Mario Paul Perini	Deanne Helen Greig; Edward Bruce Deguerre Joint Tenants	$20,000 Part 2 57R6351 OL

Concession 6, Lot 12 - West Half						
Inst. #	Instrument	Inst. Date	Reg. Date	Grantor	Grantee	Comments
	Notice of Patent	8Jun1868		The Crown	Alexander Gillander	W ½ (less 1ac at SW corner) 99 acres
6826	Mortgage	25Feb1864	25Spet1864	Alexander Gillander et ux	Canada P B&S Society	$400 W ½ 99 acres
7544	Mortgage	11Oct1864	11Oct1864	Alexander Gillander et ux	Canada P B&S Society	$400 W ½ 99 acres
1136	Lease	22Nov1872	9Oct1874	A. Gillander	William Blow	W ½ 99 acres for 10 years
1596	Deed	7Nov1876	4Apr1876	Alex Gillander	Lachlan Gillander	W ½ except 1 acre ….?
2197	Mortgage	9Feb1878	11Feb1878	Lachlan Gillander et ux	G.A Maybec	$400 W ½ 99 acres
2634	Mortgage	5Nov1879	7Nov1879	Lachlan D. Gillander et ux	Thomas R. Adams	$200 W ½ 100 acres
2947	Mortgage	?Feb1880	19Mar1880	Lachlan D. Gillander et ux	George A. Maybec	$200 W ½ 99 acres
3177	Mortgage	28Feb1881	10Mar1881	Lachlan Gillander …?	Geo. A Maybec	$800 W ½ 99 acres
3178	Dis. of 2947	28Feb1881	10Mar1881	George A. Maybec	Lachlan Gillander	W ½ 99 acres
3199	Dis. of 2197	28Feb1881	10Mar1881	George A. Maybec	Lachlan Gillander	W ½ 99 acres
3454	Mortgage	4Mar1882	11Apr1882	Lachlan D. Gillander et ux	George A. Maybec	$1100 W ½ 99 acres
3468	Dis. of 3177	4Apr1882	17Apr1882	Geo. A Maybec	Lachlan Gillander	W ½ 99 acres
3469	Dis. of 6826	10Feb1874	17Apr1882	Canada Permanent B&S Society	Alexander Gillander	W ½ 99 acres
3470	Dis. of 7544	10Feb1874	17Apr1882	Canada Permanent B&S Society	Alexander Gillander	W ½ 99 acres
4683	Dis. of 2634	9Mar1883	7July1888	Thos. R. Adams	L. D. Gillander	W ½ 99 acres
4706	Dis. of 3454	1Mar1888	3Mar1888	George A. Maybec	Lachlan D. Gillander	W ½ 99 acres
8085	B&S	5Dec1910	14Dec1910	Lauchlin D. Gillanders et ux	John L. Gillanders	? $1.00 ? love & affec. therein W ½ 100 acres ??... assumed ….?
8086	? Grant	5Dec1910	14Dec1910	John L. Gillanders, unmarried	Lauchlin D. Gillanders & Margaret Gillanders	$100 …? W ½ 100 acres
9192	? & Release	21Sep1918	1Oct1918	John L. Gillanders et ux & Lachlan Gillanders & Margaret Gillanders	Wellesley Kerr	$6500 W ½ 100 acres & other land
96375	Cert.#427278	7Oct1968	15Oct1968	Treasurer of Ontario	Re: est. Wesley Kerr (Samuel Wesley Kerr)	W ½ - as desc. In 9192 & other lands
97065	Grant	4Nov1968	18Nov1968	Margaret Kerr & Stanley Kerr Admins. Of Est of Samuel Wesley Kerr (known as) Wesley Kerr, Est ?? B1325442; B1328493; B1328488; B1328489; B132549;	Stanley Kerr	$2.00 W ½ " " " & other lands

				B1328484 &B1328495 as the est. of Samuel Wellesley Kerr (Wesley Kerr) attached		
A1004	By Law 622		24July1969	Subdivision Control		All
A3221	Quit Claim (Deed?)	9Oct1969	30Oct1969	Stanley Kerr	The Corporation of the Township of Eldon	Pt. 1 acre in Book B' P.109
A7100			22May1970	Restraining Order	Director Land Registr't'n	All
A12238			7Jan1971	Withdrawal A7100	Director Land Registration	All
229514	Grant		16Dec1987	Estate of Edward Stanley Kerr	Ross Allan Walker	All OL
248254	Transfer		31Mar1989	Ross Allan Walker	Mario Paul Perini	All, Ex Parcel at SW corner 208.71'x208.71' in NO R3233 OL
	57R 6351		30Jan1991			Part 1 (248254) OL
277283	Transfer		4Apr1991	Mario Paul Perini	Mario Paul Perini	$2.00 Part 2 57R6351 Planning Act Consent Warning Re: Septic Tank OL
277285	Transfer		4Apr1991	Mario Paul Perini	Peter Chiu Sang Chow	$360,000 Part 1 57R6351 OL
	Deposit		4Apr1991	See Deposit No.277286		Re: Part 1 57R6351 OL
	Deposit		6May1994	See Deposit No. 312183		Re: Part 2 57R6351 OL
312184	Transfer		6May1994	Mario Paul Perini	Deanne Helen Greig & Edward Bruce Deguerre Joint Tenants	$20,000 Part 2 57R6351 OL
Concession 6, Lot 12 - Southwestern Corner						
Inst. #	Instrument	Inst. Date	Reg. Date	Grantor	Grantee	Comments
	Notice of Patent	27Feb1855		The Crown	John Maceachern & Dugald Baxter	SWestern 1 acre Clergy Reserve
2634	…..??					? $100 W ½ 100 acres
8085	B&S	5Dec1910	14Dec1910	Lauchlin D. Gillanders et ux	John L. Gillanders	?? W ½ 100 acres sub. to …..?
8086	….? Deed	5Dec1910	14Dec1910	John L. Gillanders, unmarried	Lauchlin D. Gillanders & Margaret Gillanders	$100 …? W ½ 100 acres
9192	Grant & Release	21Sep1918	1Oct1918	John L. Gillanders et ux & Lachlan D. Gillanders & Margaret Gillanders	Wellesley Kerr	$6500 W ½ 100 acres & other lands
86102	Grant	16Dec1966	9Jan1967	The Public School Part of the Township of Eldon School Area	The Corporation of the Township of Eldon	$5.00 Pt. 1 sq acre at SW cor as patented in 1855
*90723						
96375	Cert.# 427378	7Oct1968	15Oct1968	Treasurer of Ontario	Re: est Wesley Kerr (Samuel Wesley Kerr)	W ½ as desc. In 9192 - & other lands

97065	Grant	4Nov1968	18Nov1968	Margaret Kerr & Stanley Kerr Admins. Of Est of Samuel Wesley Kerr (known as) Wesley Kerr, Est ?? B1328488; B1328491-92-93-94-95 as the est. of Samuel Wellesley Kerr (Wesley Kerr) attached	Stanley Kerr	W ½ & other lands
A1004	By Law 622		24July1969	Subdivision Control		All
A3221	Quit Claim (Deed?)	9Oct1969	30Oct1969	Stanley Kerr	The Corporation of the Township of Eldon	Pt. 1 acre in
A3233	Grant	1Oct1969	30Oct1969	The Corporation of the Township of Eldon	Martin Turney & Bridget Elizabeth Turney, Joint tenants	As therein & $1.00 Pt 1 sq acre
A7100			22May1970	Restraining Order	Director Land Registr't'n	All
A12238			7Jan1971	Withdrawal A7100	Director Land Registration	All
248173	Crown Patent		31Mar1989	The Crown (Canada)	John MacEachern & Dugald Baxter	SW corner containing 1 sq acre as in A3233

APPENDIX C – VOTER'S LIST FOR SUBJECT PROPERTY

Year	Lot	Conc.	Name	Data	Occupation
1891	Part 12	6	John Cameron Jr.	j MF, owner	
	Part 12	6	L.D. Gillanders	j MF, owner	
	Part 11	6	Robert Wilson	j MF, owner	
	Part 11	6	Peter Smith	j MF, owner	
	Part 11	6	Angus Smith	MF, owner	
1894	Part 12	6	John W. McEachern	j MF, tenant	
	Part 11	6	Thomas McComb	j MF, owner	
	Part 11	6	Angus Smith	MF, owner	
	12	6	Archibald McEachern	MF	
1895	Part 12	6	Alex Gilanders	j MF and FS	
	Part 12	6	LD Gilanders	j MF, owner	
	Part 12	6	John W. McEachern	j MF, tenant	
	Part 11	6	Thomas McComb	j MF, owner	
	Part 11	6	Peter Smith	j MF, owner	
	Part 11	6	Euphemia Gilanders	owner	
1896	Part 12	6	John Gilanders	MF and FS	
	Part 12	6	Alex Gilanders	MF and FS	
	Part 12	6	LD Gilanders	j MF, owner	
	Part 12	6	John W. McEachern	j MF, tenant	
	Part 12	6	Archibald McEachern	MF, tenant	
	Part 11	6	Thomas McComb	MF, owner	
	Part 11	6	Peter Smith	j MF, owner	
	Part 11	6	Angus Smith	MF, owner	
	part 11	6	Euphemia Gilanders	owner	
1897	Part 12	6	LD Gillanders	j MF, owner	farmer
	Part 12	6	Alex Gillanders	MF, FS	farmer
	Part 12	6	John Gillanders	MF, FS	farmer
	Part 12	6	JW McEachern	MF, tenant	farmer
	Part 12	6	Arch. McEachern	MF, tenant	farmer
	Part 12	6	LD McEachern	MF, tenant	farmer
	Part 11	6	Peter Smith	j MF, owner	famer
	Part 11	6	Angus Smith	MF, owner	farmer
	Part 11	6	Eup. Gillanders	owner	W
	12	6	Benjamin Stacey	MF	teacher
1898	Part 12	6	LD Gillanders	j MF, owner	farmer
	Part 12	6	Alex Gillanders	MF, FS	farmer
	Part 12	6	John Gillanders	MF, FS	farmer
	Part 12	6	JW McEachern	MF, tenant	farmer
	Part 12	6	Arch McEachern	MF, tenant	famer
	Part 12	6	LD McEachern	MF, owner	famer
	Part 11	6	Thomas McComb	j MF, owner	farmer
	Part 11	6	Angus Smith	MF, owner	farmer
	part 11	6	Peter Smith	j MF, owner	farmer
	Part 11	6	Eup. Gillanders	owner	W
	12	6	Benjamin Stacey	MF	teacher
1899	Part 12	6	LD Gillanders	j MF, owner	farmer
	Part 12	6	John Gillanders	MF, owner	farmer
	Part 12	6	Don McKinnon	j MF, tenant	farmer
	Part 11	6	Thos. McComb	j MF, owner	farmer
	Part 11	6	Angus Smith	MF, owner	farmer
	Part 11	6	Peter Smith	j MF, owner	farmer
	Part 11	6	Eup. Gillanders	owner	W
1901	part 12	6	LD Gillanders	j MF, owner	farmer
	part 12	6	John L. Gillanders	j Mf, owner	farmer
	part 12	6	Don McKinnon	j MF, tenant	farmer
	Part 11	6	Thos. McComb	j MF, owner	farmer
	Part 11	6	Angus Smith	MF, owner	farmer
	Part 11	6	Peter Smith	j MF, owner	farmer

Year	Lot	Conc.	Name	Data	Occupation
1902	Part 12	6	LD Gillanders	j MF, owner	farmer
	Part 12	6	John L. Gillanders	j MF, owner	farmer
	Part 11	6	James Mitchell	MF, tenant	laborer
	Part 11	6	John Mitchell	MF, tenant	laborer
	part 12	6	Don McKinnon	j MF, tenant	owner
	Part 11	6	Thos. McComb	j MF, owner	farmer
	Part 11	6	Angus Smith	MF, owner	farmer
	Part 11	6	Peter Smith	j MF, owner	farmer

APPENDIX D – CENSUS RECORDS

1871 Census Records

Lot 11, Concession 6

WEST
Donald McQuarrie 76, Scotland, Reformed Baptist, Scottish,

EAST
Donald McArthur
43, Scotland, Church of Scotland/kirk/Scotch Presbyterian, Scottish, Farmer
27, Ontario, */*/*, Scottish, Farmer

WEST
Alex Gillanders
60, Scotland, Wesleyan Methodist, Scottish, Farmer

Lot 12, Concession 6

EAST –
John Cameron
64, Scotland, B, Scottish, Weaver

WEST
Alexander Gillanders

WEST
Dugald Baxter
62, Scotland, Church of Scotland/Kirk/ Scotch Pres., Scottish, Farmer

WEST
McEachearn, John
34, Ontario, Church of Scotland etc., Scotch, Farmer
McEachearn, John
60, Scotland, Church of Scotland etc., Scotch Farmer
McEachearn, John
35, Ontario, Canadian Pres., Scotch, Farmer
McEachearn, John
52 Scotland, Church of Scot etc., Scotch, Farmer
McEachern, John
25, Ontario, Church of Scotland etc., Scottish, Farmer

1881 Census

Lot 12
WEST
Gillanders, Laughlan, 38, Scotland, Scotch, Farmer, married Margaret, 30
Children: Alexander, 11; Margaret Elizabeth, 9; John Laughlin, 6; Effie, 3

EAST
Cameron

Lot 11
EAST
Gillanders, Alexander, 71, Scotland, Scotch, Farmer, married Effie, 45 (wife)

*N.B. No Joseph Scurrah listed in the 1881 census records, although Belden's Historic Illustrated Map puts him on the location.

WEST
Duncan McIntyre, 21, Ontario, Presb. C, Scotch
Angus, 44, Scotland, Church of Scot, Scotch, Farmer, married
Florah, 44
Children: Angus, 24; Peter, 22, Ontario, Church of Scot, Scotch, Farmer; Mariam, 21; Donald, 19; Archibald, 16; Duncan, 12

Smith
Hugh, 60
Peter, 18, Ontario, Church of Scotland, Scotch, Farmer

APPENDIX D NATURAL HERITAGE ASSESSMENT AND EIS

Ministry of
Natural Resources

Peterborough District Office
P.O Box 7000, 300 Water Street
1st Floor, South Tower
Peterborough, Ontario K9J 8M5
Telephone: (705) 755-2001
Facsimile: (705) 755-3125

Ministère des
Richesses naturelles

Le bureau du district de Peterborough
C.P. 7000, 300 rue Water
Peterborough, Ontario K9J 8M5
Telephone: (705) 755-2001
Facsimile: (705) 755-3125

Ontario

March 30, 2012

SkyPower Limited
130 Adelaide Street West
30th Floor
Toronto ON
M5H 3P5

Attention : Grace Pasceri

Dear Ms. Pasceri:

In accordance with the Ministry of the Environment's (MOE's) Renewable Energy Approvals regulation (O.Reg.359/09), applicants are required to prepare a natural heritage assessment and environmental impact study using evaluation criteria or procedures established or accepted by the Ministry of Natural Resources (MNR). The regulation requires MNR to confirm that the natural heritage assessment and environmental impact study, including mitigation measures, were prepared using established procedures acceptable to MNR. The MNR's confirmation letter, along with other required project documentation, must be submitted to MOE as part of an application for a Renewable Energy Approval for consideration by MOE in making their Renewable Energy Approval decision.

The Ministry of Natural Resources (MNR) has reviewed the natural heritage assessment and environmental impact study for the SkyPower Glenarm Solar Park, located at Par Lots 11 and 12 Concession 6, Eldon Township, City of Kawartha Lakes, submitted March 15, 2012.

In accordance with sections 28(2) and 38(2)(b) of the Renewable Energy Approvals regulation, MNR provides the following confirmations following review of the natural heritage assessment reports:

1. The MNR confirms that the determination of the existence of natural features and the boundaries of natural features was made using applicable evaluation criteria or procedures established or accepted by MNR.
2. The MNR confirms that the site investigation and records review were conducted using applicable evaluation criteria or procedures established or accepted by MNR.
3. The MNR confirms that the evaluation of the significance or provincial significance of the natural features was conducted using applicable evaluation criteria or procedures established or accepted by MNR.
4. The MNR confirms that the project location is not in a provincial park or conservation reserve.
5. The MNR confirms that the environmental impact study report has been prepared in accordance with procedures established by the MNR.

In accordance with Section 28(3)(c) and 38(2)(c) of the Renewable Energy Approvals regulation, MNR offers the following comments in respect of the project:

1) The potential for ongoing risk of negative environmental effects has been identified in the natural heritage assessment (NHA). The project and potential effects will be monitored as outlined with the Environmental Impact Study Report to ensure that proposed mitigation strategies are effective and contingency measures have been included for instances where performance objectives are not met.

MNR is providing this confirmation letter based on the review of the information provided in your natural heritage assessment reports. Applicants should be aware of the transition provisions under section 62 of the amended Renewable Energy Approvals regulation and fulfill natural heritage assessment requirements accordingly.

Where specific commitments have been made by the applicant in the natural heritage assessment with respect to project design, construction, rehabilitation, operation, mitigation, or monitoring, MNR expects that these commitments will be considered in MOE's Renewable Energy Approval decision and, if approved, be implemented by the applicant.

This confirmation letter is valid for the project as proposed in the natural heritage assessment and environmental impact study, including those sections describing the environmental effects monitoring plan and construction plan report. Should any changes be made to the proposed project that would alter the natural heritage assessment, MNR may need to undertake additional review of the natural heritage assessment.

In accordance with Appendix D of MNR's NHA Guide, a commitment has been made to complete pre-construction assessment of habitat use for the following candidate significant wildlife habitats Open Country Breeding Bird Habitats. MNR has reviewed and confirmed the assessment methods and the range of mitigative options. Pending completion of the assessments and determination of significance, the appropriate mitigation is expected to be implemented, as committed to in the environmental impact study.

In accordance with section 12(1) of the Renewable Energy Approvals Regulation, this letter must be included as part of your application submitted to the MOE for a Renewable Energy Approval.

If you wish to discuss any part of the confirmation or additional comments provided, please contact Eric R. Prevost, Renewable Energy Planning Ecologist, at (705) 755-3134.

Sincerely,

Karen Bellamy
District Manager
Peterborough District, MNR

cc. Jim Beal, Renewable Energy Provincial Field Program Coordinator, Regional Operations Division, MNR
Narren Santos, Environmental Assessment and Approvals Branch, MOE

GLENARM SOLAR PARK
Natural Heritage Assessment and Environmental Impact Study

Prepared for:
GL Garrad Hassan
151 Slater Street, Suite 806, Ottawa,
Ontario, Canada, K1P 5H3

Project No. 1072 Date: February 2012

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

GLENARM SOLAR PARK
Natural Heritage Assessment and Environmental Impact Study

Project Team:

Staff	Role
Andrew G. Ryckman	Project Manager/Biologist
Christy L. Humphrey	Terrestrial and Wetland Biologist
Kevin S. Dance	Terrestrial and Wetland Biologist
Margaret Martin	Terrestrial and Wetland Biologist
Pamela Tucciarone	Terrestrial and Wetland Biologist
Tara Lessard	Terrestrial and Wetland Biologist
Gerry Schaus	GIS Technician

Report submitted on February 1, 2012

Andrew G. Ryckman

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Appendix I: Field Notes

1.0 Introduction

Natural Resource Solutions Inc. (NRSI) was retained in May 2010 by GL Garrad Hassan, on behalf of SkyPower Limited to conduct a natural environment resource assessment in accordance with the Renewable Energy Approval (REA) Regulation. This assessment includes a records review, site investigation, and evaluation of significance of natural features of any potentially significant natural features at a proposed 10 MW solar energy facility in the City of Kawartha Lakes and the former Township of Eldon, Ontario. The analysis of the natural heritage features and biological factors affecting the proposed site is one issue being considered. Other factors, such as land ownership, social impacts, and cultural impacts are also being assessed by other team members.

This *Natural Heritage Assessment* summarizes the findings of comprehensive records review and detailed site investigations conducted by Natural Resource Solutions Inc. at the proposed Glenarm Solar Park project area in June and August 2010. In addition to terrestrial studies, a detailed records review and site investigation of aquatic resources has also been conducted by NRSI biologists. This information can be found in the *Glenarm Solar Park: Water Report and Environmental Impact Study* report. Other reports pertaining to the development of this proposed solar energy facility have been prepared by other team members.

2.0 Project Details

The Glenarm Solar Park project area is located in the geographic Township of Eldon within the City of Kawartha Lakes, approximately 6km west of the Town of Glenarm, ON. The proposed undertaking includes the installation of solar panel arrays for the development of a 10MW solar energy facility. In addition to the solar panels, associated infrastructure designs, including the placement of access roads, cabling, and inverters, have also been considered for potential impacts on natural features. In accordance with the REA Regulation, NRSI biologists have reviewed the proposed development layout and have examined an area of 120m from this project location for candidate significant natural features.

The 'project location', as defined by the REA Regulation, includes all proposed development activities proposed to occur on land or in air. In order to ensure all areas within 120m of the project location were reviewed for the presence of candidate significant natural features, NRSI biologists have examined natural features within this larger 'project area', which includes all land, water, and air that cover the natural features within 120m of the project location. Identification of natural features through the site investigation guided the layout of the proposed solar facility and assisted GL Garrad Hassan in delineating the actual development footprint.

The Glenarm Solar Park project area is shown on Figure 1 in the context of the surrounding landscape which is characterized by features typical of a southern Ontario landscape. The approximate boundaries of the project area are Glenarm Road to the south, agricultural and wetland areas to the north, Moor Road to the east, and Sandringham Road to the west. The project area is dominated by open pasture. In addition to open pastures, several other habitat types, including woodlands and wetlands, have been noted further than 120m, but within the vicinity of the Glenarm Solar Park project location.

As part of this project, NRSI has considered all aspects relating to provincially Threatened and Endangered species. However, since these species are addressed as part of the *Endangered Species Act* (2007), they have not been discussed within any of these Natural Heritage Assessment reports. These species will be address in full detail,

including a description and results of field assessments, potential impacts, and recommended mitigation measures, as part of a separate *Approval and Permitting Requirements Document* to be submitted to the MNR under a separate cover, where necessary.

Figure 1

Glenarm Solar Park

Project Area

660500 661000 661500 662000 662500 663000

4927000 4926500 4926000 4925500 4925000

SANDRINGHAM RD

GLENARM RD

Tributary 'D'

Tributary 'C'

Tributary 'B'

Tributary 'E'

Tributary 'A'

Legend

- Project Area (120m)
- Project Location
- Primary Road
- Secondary Road
- Watercourse
- Deer Wintering (Stratum 2)
- Wetland Area (OBM)
- Provincially Significant Wetland
- Wooded Area

Path: X:\1072_GlenarmSolarPark\NRSI_1072_Fig1_StudyArea_10K_2012_01_27_ELF.mxd

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Aquatic, Terrestrial and Wetland Biologists

Map Produced by Natural Resource Solutions Inc. This map is proprietary and confidential and must not be duplicated or distributed by any means without express written permission of NRSI. Source: Data provided by MNR.
Copyright: Queen's Printer Ontario

Project: 1072
Date: January 30, 2011

NAD83 - UTM Zone 17
Scale: 1:10,000 (11x17")

0 200 400 600 Metres

N

3.0 REA Requirements

Ontario Regulation (O. Reg.) 359/09 – *Renewable Energy Approvals* under *Part V.0.1 of the Act*, (herein referred to as the REA Regulation) made under the *Environmental Protection Act* identifies the requirements for the development of renewable energy projects in Ontario. In accordance with the REA regulation, the project is classified as a Class 3solar facility, and is required to complete a Natural Heritage Assessment.

3.1 Records Review

Section 25 of the REA Regulation requires proponents of Class 3 solar projects to undertake a natural heritage records review to identify whether the project location is:

1. in a provincial park or conservation reserve
2. within 120m of a provincial park or conservation reserve
3. in a natural feature
4. within 50m of an area of natural and scientific interest (earth science), or
5. within 120m of a natural feature that is not an area of natural and scientific interest (earth science)

Natural Features are defined in Section 1.1 of the REA Regulation to be all or part of

(a) an area of natural and scientific interest (ANSI) (earth science)
(b) an ANSI (life science)
(c) a coastal wetland
(d) a northern wetland
(e) a southern wetland
(f) a valleyland
(g) a wildlife habitat, or
(h) a woodland.

Subsection 3 of Section 25 of the REA Regulation requires the proponent to prepare a report "setting out a summary of the records searched and the results of the analysis" (O. Reg. 359/09). This report has been organized and prepared to satisfy the conditions of these regulations.

3.2 Site Investigation

Section 26 of the REA Regulation requires proponents of Class 3 solar projects to undertake a natural heritage site investigation for the purpose of determining:

1. whether the results of the analysis summarized in the [Natural Heritage Records Review] report prepared under subsection 25 (3) are correct or require correction, and identifying any required corrections.
2. whether any additional natural features exist, other than those that were identified in the [Natural Heritage Records Review] report prepared under subsection 25 (3).
3. the boundaries, located within 120m of the project location, of any natural feature that was identified in the records review or the site investigation.
4. the distance from the project location to the boundaries determined under clause (c).

Natural Features, as defined in Section 1.1 of the REA Regulation, are identified in Section 2.1 above.

Subsection 3 of Section 26 of the REA Regulation requires the proponent to prepare a report setting which includes the following:

1. A summary of any corrections to the report prepared under subsection 25 (3) and the determinations made as a result of conducting the site investigations under subsection (1).
2. Information relating to each natural feature identified in the records review and in the site investigations, including the type, attributes, composition and function of the feature.
3. A map showing
   a) the boundaries mentioned in clause (1) (c)
   b) the location and type of each natural feature identified in relation to the project location, and
   c) the distance mentioned in clause (1) (d).
4. The dates and times of the beginning and completion of the site investigation.
5. The duration of the site investigation.
6. The weather conditions during the site investigation.
7. A summary of methods used to make observations for the purposes of the site investigation.
8. The name and qualifications of any person conducting the site investigation.
9. Field notes kept by the person conducting the site investigation.

This Natural Heritage Assessment report has been organized and prepared to satisfy the conditions of the requirements outlined above.

3.3 Evaluation of Significance

Section 27 of the REA regulation requires that, if any candidate significant natural feature is identified within 120m of the project location, a natural heritage evaluation of significance should be undertaken. This evaluation of significance should utilize evaluation criteria or procedures established or accepted by the Ministry of Natural Resources. In conjunction with the evaluation of significance, Subsection 4 of the REA Regulation requires that a report be prepared that sets out the following:

1. For each natural feature shown on the map mentioned in paragraph 3 of subsection 26 (3), a determination of whether the natural feature is provincially significant, significant, not significant, or not provincially significant.
2. A summary of the evaluation criteria or procedures used to make the determinations mentioned in paragraph 1.
3. The name and qualifications of any person who applied the evaluation criteria or procedures mentioned in paragraph 2.
4. The dates of the beginning and completion of the evaluation

This Natural Heritage Assessment report has been organized and prepared to satisfy the requirements of the evaluation of significance as outlined in the REA Regulation.

3.4 Environmental Impact Study

Section 38 of the REA Regulation specifies that no development activities shall be permitted within 120m of a significant natural feature unless an environmental impact study report is prepared in accordance with any procedures established by the Ministry of Natural Resources. As per Subsection 2, this report should:

1. Identify and assess any negative environmental effects of the project on a natural feature, provincial park or conservation reserve,
2. Identify mitigation measures in respect of any negative environmental effects mentioned in the subclause above,
3. Describe how the environmental effects monitoring plan addresses any negative environmental effects mentioned in subclause 1, and
4. Describe how the construction plan report addresses any negative environmental effects mentioned in subclause 1.

This report has been organized and prepared to satisfy the requirements of the environmental impact study as outlined in the REA Regulation.

4.0 Records Review

In accordance with the Renewable Energy Approval (REA) regulations, an area of at least 120m beyond the proposed development activities was examined for candidate significant natural features, including designated natural areas, vegetation communities, wildlife and wildlife habitat. A preliminary records review has already been completed by another consulting firm, AECOM (2009).In addition to the records compiled by AECOM, NRSI reviewed numerous background review sources. The results of the comprehensive records review is provided in the following sections.

4.1 Resources Consulted

Numerous agencies were contacted by AECOM to compile a comprehensive records review, including the Ministry of Natural Resources (MNR), Peterborough District and the Kawartha Region Conservation Authority. Written information requests were made to both of these agencies by AECOM. In addition, AECOM also examined data from the Natural Heritage Information Centre (NHIC), City of Kawartha Lakes Official Plan. Kawartha Region Conservation Authority website, MNR Natural Resources and Values Information System (NRVIS) Mapping, and Conservation Ontario Aquatic Species at Risk mapping. As of the date of this report, a response letter has been received from the MNR, Peterborough District on May 13, 2010, which outlines MNR's known and available records. The results of these records have been detailed below.

In addition to records compiled by AECOM, NRSI has also completed a review of other available background information, including the MNR's Biodiversity Explorer mapping tool and information database (OMNR 2010a), the Ontario Breeding Bird Atlas (OBBA) (Cadman et al. 2007), Ontario Herpetofauna Atlas (Oldham and Weller 2000), and the Atlas of the Mammals of Ontario (Dobbyn 1994) to record significant wildlife species known from the vicinity, as well as The Physiography of Southern Ontario (Chapman and Putnam 1984) for background information pertaining to terrain, soils, and drainage.In addition, Lake Simcoe Region Conservation Authority regulated lands mapping was also consulted, as a small portion of the project area (consisting primarily of rural residential property) is located within the jurisdiction of this authority. The results of the records review are provided below.

4.2 Provincial Parks and Conservation Reserves

No provincial parks or conservation reserves have been identified within 120m of the Glenarm Solar Park project location (AECOM 2009).

4.3 Areas of Natural and Scientific Interest

No Areas of Natural and Scientific Interest (ANSI), either Life Science (LS) or Earth Science (ES), were identified within 120m of the Glenarm Solar Park project location.

4.4 Wetlands

The records review completed by AECOM (2009) identified the presence of one Provincially Significant Wetland (PSW) located approximately 1.5kmeastof the Glenarm Solar Park project location. This records review noted that although this natural feature was identified as provincially significant on municipal mapping in the City of Kawartha Lakes Draft Official Plan (2009), it was not confirmed through a review of available MNR basemapping. Upon request for confirmation by AECOM to Peterborough District MNR, it was revealed that this natural feature was an unevaluated wetland community, and as such has not been designated as a PSW (E. Prevost 2010, pers. comm.). The City of Kawartha Lakes Draft Official Plan (2010) currently indicates there are two unevaluated wetlands east of the project area. This Official Plan (Section 3.5.5) states that all wetlands within the municipality are to be considered locally significant. As a result, the unevaluated wetlands within the vicinity of the project area should be considered locally significant. Since these wetlands are more than 120m from the project location, they will not be discussed further within this report, and will not be evaluated for provincial wetland significance.

4.5 Valleylands

The City of Kawartha Lakes Draft Official Plan (2010) indicates that significant valleylands in this area of the City are not identified, and assessment through site investigation on a per-development basis is required (Section 3.5.26). Regulated lands mapping is not available online through Kawartha Conservation. Lake Simcoe Region Conservation Authority regulated lands mapping is available online (LSRCA 2010), and indicates that there are no regulated lands within the small portion of the project area within the jurisdiction of this authority. Topographical mapping indicates there are some

rolling hills within the project area, however there do not appear to be any depressions forming a valley. As a result, the project area is not likely to contain any valleylands.

4.6 Woodlands

The records review completed by AECOM (2009) has identified one significant woodland east of the Glenarm Solar Park project area. Based on Schedule 'B' of the Draft Official Plan (City of Kawartha Lakes 2010), one woodland is identified 130meast of the project location. Significant woodlands in rural and agricultural areas of the City of Kawartha Lakes are those greater than 15ha in size, based on an overall wooded cover of 25% in these areas (City of Kawartha Lakes 2010).

The response letter from the MNR, Peterborough District, dated May 13, 2010, has indicated records of "…*wooded areas within and adjacent to the study area*". These candidate significant woodlands will be examined in more detail during the site investigation phase of this project to confirm boundaries and examine the form, function, and attributes of these natural features. No other woodlands have been identified within the Glenarm Solar Park project area.

4.7 Wildlife Habitat

As part of this records review, wildlife habitat within the Glenarm Solar Park project area was reviewed. Background information indicates that the fields at the Glenarm Solar Park are under agricultural use; however, some of these fields may be abandoned (AECOM 2009). This indicates that habitat for grassland or open country bird species may be present within the project area.

The records review completed by AECOM (2009) has identified one significant woodland east of the Glenarm Solar Park project area, and based on Schedule 'B' of the Draft Official Plan (City of Kawartha Lakes 2010), one woodland is identified 130m from the project location. Also, the response letter from the MNR, Peterborough District, dated May 13, 2010, has indicated records of "…*wooded areas within and adjacent to the study area*". These wooded areas, as well as any other wooded areas identified in the project area, have the potential to provide wildlife habitat and should be examined in more detail during the site investigation phase of this project.

A review of the MNR's Biodiversity Explorer (OMNR 2010a) has not identified any seasonal concentration areas, rare vegetation communities, specialized wildlife habitat, or animal movement corridors present within 120m of the Glenarm Solar Park project location. Basemapping available through LIO has identified the presence of a Stratum 2 deer wintering area approximately 1.5km east of the project location. This seasonal concentration area is shown on Figure 1.

No other specific wildlife habitat features, including raptor nests, bat hibernacula, or animal movement corridors have been identified during correspondence with the local MNR office or review of available databases. Despite the absence of records pertaining to other candidate SWH within the project area, NRSI considered the full realm of candidate significant wildlife habitat (SWH) types during the site investigation phase of this project.

The site investigation and evaluation of significance phases of this process will determine the presence of natural features, including wildlife habitats, and document the type, attributes, size, and function of these natural features within 120m of the project location.

4.8 Species of Conservation Concern

Species of conservation concern include all species that have been designated as a species of Special Concern according to the Species At Risk in Ontario (SARO) or have been given a provincial S-Rank of S1-S3, but have not been designated as either Endangered or Threatened within Ontario. This also includes species that have been determined to be significant federally, but not identified as rare within the province of Ontario. Habitat for these species has been considered as part of the review of candidate SWH within the project area.

In addition to a detailed review of natural areas, NRSI biologists conducted a records review of species of conservation concern that may be present within the project area. This review included correspondence with the MNR (E. Prevost 2010, pers. comm.), as well as other available online and published species information sources. Species information collected from the Ontario Mammal Atlas (Dobbyn 1994), Ontario Herpetofaunal Atlas (Oldham and Weller 2000), Biodiversity Explorer (OMNR 2010a),

and Natural Heritage Information Centre (NHIC 2009) were all analyzed for the potential presence of species of conservation concern within the project area.

A review of these sources has revealed the presence of 11 species of conservation concern that have been confirmed within the general vicinity of the project area. These species include 5 birds, 1 turtle, 2 snakes, 2 salamanders and 1 bat. A list of these species is provided in Table 1 below.

Table 1. Species of Conservation Concern Identified within the Glenarm Solar Park Project Area and Vicinity

Scientific Name	Common Name	S-Rank	SARO Status	COSEWIC Status
Birds				
Chlidonias niger	Black Tern	S3B	SC	NAR
Chordeiles minor	Common Nighthawk	S4B	SC	THR
Contopus cooperi	Olive-sided Flycatcher	S4B	SC	THR
Melanerpes erythrocephalus	Red-headed Woodpecker	S4B	SC	THR
Wilsonia canadensis	Canada Warbler	S4B	SC	THR
Herpetofauna				
Chelydra serpentina serpentina	Common Snapping Turtle	S5	SC	SC
Lampropeltis t. triangulum	Eastern Milksnake	S3	SC	SC
Thamnophis sauritus septentrionalis	Northern (Eastern) Ribbonsnake	S3	SC	SC
Ambystoma jeffersonianum-laterale "complex"	Jefferson/Blue Spotted Salamander Complex	S2		
Ambystoma jeffersonianum-laterale polyploids	Jefferson/Blue Spotted Salamander Polyploids	S2		
Mammals				
Myotis septentrionalis	Northern Long-eared Bat	S3?		

Provincial Rank (S-Rank)
SX: Extirpated
S1: Critically Imperiled
S2: Imperiled
S3: Vulnerable
S4: Apparently Secure

SARO and COSEWIC Status
END: Endangered
THR: Threatened
SC: Special Concern
NAR: Not at Risk

Black Tern

Black tern (*Chlidonias niger*) requires wetlands for breeding, and has been recorded within the 10km^{2}OBBA reference square that overlaps with the project area (Cadman et. al 2007). Wetlands may be coastal or inland, and consist of large cattail marshes or wet meadows >20 ha in size, among other wetland types. In addition, shallow and open water areas must both be present near the nests, and foraging habitat consists of adjacent grasslands (OMNR 2000). Wetland habitats are located >120m east of the project location, although there appear to be pastures within the project area which may provide foraging habitat.

Common Nighthawk

Common nighthawk (*Chordeiles minor*) prefers open ground, clearings in dense forests, ploughed fields, gravel beaches, and open woodlands (OMNR 2000). These cleared habitats do not appear to be present within the project area based on aerial photography, but site investigation is needed to confirm the habitat type of the open fields. This species was observed within approximately half of the OBBA atlas squares in the Lindsay Region in both the 1981-1985 and 2001-2005 OBBA atlas period(Cadman et. al 2007). Common nighthawks could potentially occur within the Glenarm Solar Park project area.

Olive-sided Flycatcher

The Olive-sided flycatcher (*Contopus cooperi*) prefers spruce forest near lakes, rivers or ponds and treed wetlands for nesting (OMNR 2000). Forested habitats are not located within 120m of the project location, although treed wetlands may be present beyond 120m. As such, there is no wildlife habitat for this species within the project area.

Red-headed Woodpecker

Red-headed woodpecker can be found in field edges and farmyards with a few large trees (OMNR 2000). Habitat of this type may be available in farmyards adjacent to the project location, and this species was confirmed breeding within the overlapping OBBA reference square during both the 1981-1985 and 2001-2005 atlas periods, although this species appears to be on the decline in the Lindsay Region. It is possible that red-headed woodpecker is presently utilizing trees in farmyards within the Glenarm Solar Park project area and as such these areas should be considered wildlife habitat for this species.

Canada Warbler

Canada warbler (*Wilsonia canadensis*) is an interior forest bird usually requiring at least 30ha of mixed forest or wet cedar or alder bottomland habitat (OMNR 2000). Habitat of this size and type is not available within the Glenarm Solar Park project area.

Common Snapping Turtle

Common snapping turtles (*Chelydra serpentina serpentina*) can inhabit permanent, or semi-permanent, bodies of water, marshes, bogs, or rivers and streams with soft, muddy substrates (OMNR 2000). This species of Special Concern can often be found nesting considerable distances from aquatic habitats. It is possible that this species may be found within the wetlands or watercourses located in the vicinity of the project area, although these natural features are not located within 120m of the project location.

Eastern Milksnake

Eastern milksnake(*Lampropeltis t. triangulum)* is a species of Special Concern which is a habitat generalist, often found in open woodlands, fields, and farm buildings (OMNR 2000). Habitat of this type is abundantly available in the project area. It is possible that the eastern milksnake may be present within 120m of the project location, and as such the field habitats within the project area should be considered wildlife habitat for this species.

Eastern Ribbonsnake

Eastern ribbonsnakes (*Thamnophis sauritus septentrionalis*) are a species of Special Concern which live in open grassy areas with low, dense vegetation near bodies of shallow permanent calm water (OMNR 2000). Habitat of this type appears to be available within the Glenarm Solar Park project area in the fields, and there are watercourses and wetlands in the vicinity (although not within 120m of the project location). As such the field habitats should be considered wildlife habitat for this species.

Jefferson Salamander/Blue-spotted Salamander Complex and Polyploids

Jefferson salamander/blue-spotted salamander complex and polyploids (*Ambystoma jeffersonianum-laterale* "complex" and “polyploids”) are considered species of conservation concern based on a provincial S-Rank of S2, indicating that populations of this species are imperilled within Ontario. This species prefers damp, shady deciduous forest, swamps, moist pasture, and lakeshores, and it requires temporary woodland pools for breeding (OMNR, 2000). Fields are located within 120m of the project location, and may be moist in some areas due to the proximity of wetland habitats. In addition, woodland and wetland habitats found in the vicinity of the project area may provide breeding habitat for this species. Fields within the project area should be considered wildlife habitat for these species complexes and polyploids.

Northern Long-eared Bat

The northern long-eared bat (*Myotis septentrionalis*) has a provincial S-rank of S3?, indicating that populations of this species are likely vulnerable within Ontario. Foraging habitat for this species includes woodlands, with preferential maternity roosts located in hollow trees or under loose bark, and hibernation sites in mines or caves (OMNR 2000). These habitats may be available in nearby woodlands, however, this habitat type is not available within 120m of the project location.

Habitats for each of the species of conservation concern identified within the project area have been discussed above due to the potential for the presence of candidate significant wildlife habitat. Site-specific habitat features within the project area have been characterized during the site investigation phase of this project. The detailed site investigation of this project area has been used to address the potential for suitable habitat for these species (candidate significant wildlife habitat), and is discussed in detail in the evaluation of significance section of this report (Section 8.5).

4.9 Summary of Records Review

In accordance with the REA Regulation, NRSI biologists have conducted a comprehensive records review of the natural features within the Glenarm Solar Park

project area. The natural features examined as part of this records review are summarized in Table 2 below.

Table 2. Summary of Records Review of the Glenarm Solar Park Project Area

Criteria	Result
1. Within 120m of a Provincial Park or Conservation Reserve	The Glenarm Solar Park project location is not within 120m of a Provincial Park or Conservation Reserve.
2. In a Natural Feature	The project area overlaps with agricultural fields, some of which may be abandoned fields. These fields may have the potential to provide habitat for species of conservation concern in the form of Open Country Bird Breeding Habitat. As such, the Glenarm Solar Park project location does overlap with potential wildlife habitat. These potentially significant habitats should be considered candidate SWH and have been evaluated in more detail during the site investigation and evaluation of significance phases of this project.
3. Within 50m of a ANSI-ES	The project location is not within 50m of an Earth Science ANSI.
4. Within 120m of a Natural Feature	
a) ANSI-LS	The project location is not within 120m of a Life Science ANSI.
b) Coastal Wetland	The project location is not within 120m of coastal wetlands.
c) Northern Wetland	The project location is not within 120m of northern wetlands.
d) Southern Wetland	The project location is not within 120m of known southern wetlands.
e) Valleyland	No valleylands have been identified within 120m of the project location.
f) Wildlife Habitat	The fields present throughout the project area have the potential to act as candidate SWH, including habitat for species of conservation concern and open country bird breeding habitat No seasonal concentration areas, rare vegetation types, specialized wildlife habitats, or animal movement corridors have been identified within 120m of the project location.
g) Woodland	The response letter from the MNR, Peterborough District, dated May 13, 2010, has indicated records of "…*wooded areas within and adjacent to the study area*". These wooded areas, as well as any other wooded areas identified in the project area, have the potential to provide wildlife habitat and should be examined in more detail during the site investigation phase of this project.

5.0 Site Investigation Methodology

In accordance with the REA regulations and the requirements of the Ministry of Natural Resources, comprehensive site investigations to document the environmental and biological characteristics of the Glenarm Solar Park were undertaken. These site-specific field investigations focused on vegetation community and wildlife habitat mapping, as well as documentation of any wildlife species observed within the project area. Results of these site investigations have been used to evaluate the potential significance of the natural features within the Glenarm Solar Park project area. A summary of project methodology is found below.

5.1 Staff Roles

The requirements of the REA process indicate that the name and qualifications of all staff participating in the site investigation should be included. As a result, the qualifications and roles of all staff participating in the site investigations at the Glenarm Solar Park have been outlined in the following sections.

Andrew G. Ryckman, B.Sc.
Andrew is a Terrestrial and Wetland Biologist with seven years of environmental experience. He routinely manages the natural heritage aspects of renewable energy projects, with specific expertise relating to bats and herpetofauna. Andrew is certified in Ecological Land Classification (2010), and has successfully completed a Bat Conservation International (BCI) Acoustic Monitoring Workshop (2008).

Andrew's role in the Glenarm Solar Park was to act as the project manager, overseeing all aspects of the Natural Heritage Assessment, including all associated field work and reporting. He was also the main contact point for agency staff. Andrew assisted with the preparation of this report, and worked with other staff to compile the records review and site investigation within the Glenarm Solar Park project area.

Christy L. Humphrey, B.E.S.
Christy has more than 2 years of environmental consulting experience, working on a variety of projects tasks. Her primary areas of expertise are vegetation mapping and floral inventories, but she has experience conducting bird and bat assessments, amphibian studies, and other fauna assessments. Christy is certified in both the Ecological Land Classification (ELC) for Southern Ontario (2010) and Northeastern Ecological Land Classification (2010), and participated in the Ontario MNR Bat Monitoring Workshop for Wind Power Projects (2010).

Christy assisted with Ecological Land Classification within the project area and vicinity for the site investigation. She also assisted in the preparation of this Natural Heritage Assessment report.

Kevin S. Dance, M.E.S. (Candidate 2010)
Kevin is a Terrestrial and Wetland Biologist with 5years' experience working on a variety of environmental projects, including extensive experience in the renewable energy industry. Kevin's primary area of expertise is in avian ecology with specialization in raptor behavior and ecology, and has conducted his master's research on raptor interactions around an operational wind energy facility in Ontario. Kevin is certified in Ecological Land Classification (2009).

Kevin assisted with the Ecological Land Classification within the project area, and he assisted in the preparation of this Natural Heritage Assessment report.

Margaret Martin, M.Sc.
Margaret is a Terrestrial and Wetland Biologist who has over 5 years of experience working on a variety of studies characterizing terrestrial and wetland resources. She has conducted multiple detailed wetland evaluations using the Ontario Wetland Evaluation System, worked with the Forest Ecosystems of Central Ontario and has applied the Ecological Land Classification on many sites in southern Ontario. Margaret routinely conducts natural area inventories, vegetation community mapping and surveys of bats, migrating and breeding birds and terrestrial mammals. Margaret conducted her master's research on paleo-ecology, specifically relating to the effects of climate and anthropogenic causes of ecosystem plasticity.

Margaret's role was to conduct Ecological Land Classification and breeding bird surveys within the project area for the site investigation of wildlife habitats.

Pamela Tucciarone, B.Sc.
Pamela graduated from the University of Toronto in a Biology Specialist program. She has more than 2 years of practical work experience, focusing on urban forestry, insect identification, and insect pest management. During this time period, she specialized in detecting the presence of the emerald ash borer and delineating the extent of its infestation. Pamela is a certified arborist (2011) and has participated in field investigations and reporting for several REA solar and wind power projects in southern and northern Ontario.

Pamela's role was to conduct a site investigation of the wildlife habitat within the project area and assisted in the preparation of this Natural Heritage Assessment report.

Tara Lessard, B.Sc.
Tara is a Terrestrial and Wetland Biologist with more than 4 years of experience working in the environmental field. During her consulting experience, Tara has conducted bird and bat assessments, amphibian studies, and other fauna assessments throughout Ontario. Tara has participated in field investigations and reporting for wind power projects in Ontario and New Brunswick.

Tara's assisted in the preparation of this Natural Heritage Assessment report and EIS.

Gerry C. Schaus, B.A., GIS-AS
Gerry has more than 4 years of experience working on GIS/GS mapping tasks for a variety of environmental projects since graduating from the GIS Application Specialist program from Sir Sandford Fleming College. Gerry assists in all aspects of NRSI's spatial technologies, and has experience with a wide variety of spatial and graphics tools and data, including ArcGIS, WebGIS, GPS, CAD, website and graphic design, and database management systems.

Gerry's role in the Glenarm Solar Park Natural Heritage Assessment was the primary GIS technician. He reviewed and collected all available background and site investigation mapping resources to compile into project mapping for the Glenarm Solar Park.

5.2 Survey Dates

A total of 2site investigation types, occurring over 4 dates, were conducted at the Glenarm Solar Park project area. These investigations were all conducted in good weather conditions with temperatures ranging from 6-21℃. A summary of the survey dates, temperatures, and main purpose of each site visit has been provided in Table 3 below. Although site investigation typically focused on specific tasks, biologists recorded any applicable information, including all wildlife observations, and also conducted surveys specific to the Evaluation of Significance concurrently with both of these visits.

Table 3. Summary of Site Investigations at the Glenarm Solar Park

Survey Date(s)	Temp. (℃)	Purpose(s) of Site Investigation
June 17, 2010	16	Wildlife Habitat Identification Vegetation Mapping and Floral Inventory
July 1, 2010	15	Wildlife Habitat Identification
August 26, 2010	21	Wildlife Habitat Identification Vegetation Mapping and Floral Inventory
May 4, 2011	6	Wildlife Habitat Identification

5.3 Natural Features Identification

NRSI biologists initially reviewed aerial imagery and base mapping as part of the already completed records review to determine the anticipated location of all natural features. Following this preliminary records review, a site investigation was completed to collect site-specific field information of natural features within the project area. A site-specific investigation was completed in all habitats present within 120m of the project location.

Where property access was not granted on adjacent properties, alternative site investigations (i.e. property line/roadside) were conducted instead. During these site-specific investigations, vegetation lists were also compiled for each natural feature examined within 120m of the project location. These detailed vegetation species lists can be found documented on the field notes and field map included in Appendix I(field maps within Appendix I may not be the same as the included Figures 1-2 in this report due to project locations added after preliminary site investigations were completed. The figures included in the body of the report reflect the final project location).

5.4 Areas of Natural and Scientific Interest

The identification of Areas of Natural and Scientific Interest (ANSIs) are the responsibility of the MNR. Since no ANSIs were identified within the project area, no further information pertaining to this natural feature type will be identified during the site investigation beyond the information collected during the records review.

5.5 Wetlands

In order to identify the presence and proximity of wetlands within the Glenarm Solar Park project area, NRSI initially reviewed aerial imagery and base mapping as part of the records review. Wetlands within the vicinity of the project area were initially identified through the use of modified ELC for southern Ontario (Lee et. al. 1998)and ELC code assignment was based on updates made to the system in 2008 (Lee 2008). This vegetation community classification system allows for the assessment of vegetation communities for preliminary delineations of upland, lowland, and wetland habitats among other community types. Vegetation mapping was utilized to identify the site-specific characteristics of natural features, including form, function and attributes within 120m of the Glenarm Solar Park project location. The site investigation also included wetland community mapping and descriptions for any wetland community identified through the vegetation mapping. This included delineating wetland boundaries, surveying wetland vegetation, and assessing wildlife habitat.

ELC information and detailed vegetation species lists can be found documented on the field notes and field map included in Appendix I.

5.6 Valleylands

General topography of the project area and micro-topography of watercourses within the project area were investigated to determine the presence of landform depressions, the size of flooding areas, habitat composition, linkage functions, water regime, distinctiveness, and evidence of hydrogeomorphic processes, according to the Natural Heritage Reference Manual (OMNR 2010b). This information was collected in order to determine the presence of valleylands.

5.7 Woodlands

In order to identify the presence and proximity of any woodlands within the Glenarm Solar Park project area, NRSI initially reviewed aerial imagery and base mapping as part of the records review. Vegetation community classification was conducted within the entire project area, and some habitat features in the vicinity, using a modified Ecological Land Classification (ELC) system for southern Ontario (Lee et al 1998)and ELC code assignment was based on updates made to the system in 2008 (Lee 2008). This vegetation community classification includes descriptions of species composition, character, function, and mapping of woodland boundaries. ELC information and detailed vegetation species lists can be found documented on the field notes and field map included in Appendix I.

For any woodlands identified within the project area, ecological characteristics were compared to the evaluation criteria for significant woodlands, as described in Table 7 of the Natural Heritage Assessment Guide for Renewable Energy Projects (OMNR 2010b) to determine woodland form and function.

These evaluation criteria include three broad categories: woodland size, ecological functions, and uncommon characteristics. The general evaluation criteria for describing woodland form and function have been summarized in Table 4.

Table 4. Woodland Evaluation Criteria for Describing Woodland Form and Function (OMNR 2010a)

Evaluation Criteria for Describing Woodland Form and Function	
Woodland Size Criteria	Woodland Cover
Ecological Functions Criteria	Woodland Interior
	Proximity to Other Woodlands
	Linkages
	Water Protection
	Woodland Diversity
Uncommon Characteristics Criteria	Woodland Characteristics

5.8 Wildlife Habitat

NRSI biologists initially reviewed aerial imagery and base mapping as part of the already completed records review to determine the anticipated location of any wildlife habitats. Following this preliminary records review, a site investigation was completed to collect site-specific field information of wildlife habitats within the project area. Vegetation community mapping using ELC code assignment was also completed in all habitats present within 120m of the project location in order to identify locations of candidate significant wildlife habitat. These observations can be seen in the field notes and field maps included in Appendix I(field maps within Appendix I may not be the same as the included Figures 1-2 in this report due to project locations added after preliminary site investigations were completed. The figures included in the body of the report reflect the final project location). Results of all wildlife habitat found in the project area, including the form and function of each habitat, can be found in Section 6.5 of this report.

In conjunction with the vegetation community mapping work, NRSI biologists made note of incidental wildlife and wildlife habitat observations. This includes recording any wildlife species observed, the number of individuals, their behaviour, and location. As well, other observations such as vernal pools, stick nests, snags, rock piles, and piles of debris or organic material which could provide important habitat for wildlife were noted throughout the Glenarm Solar Park project area by NRSI biologists.

The Significant Wildlife Habitat Technical Guide (SWHTG) (OMNR 2000), including Appendix Q, and the Significant Wildlife Habitat Ecoregion Criteria Schedules Addendum (OMNR 2011a) outline general characteristics that may be used to identify candidate significant wildlife habitats. Each of the four broad categories of candidate

significant wildlife habitat as identified by these documents have been examined and are each discussed in more detail below. These four categories include seasonal concentration areas, specialized wildlife habitat, habitats of species of conservation concern, and animal movement corridors.

5.8.1 Seasonal Concentration Areas

NRSI has reviewed the list of seasonal concentration areas, including avian stopover and staging areas, raptor winter feeding areas, colonial nesting bird habitat, deer yards, reptile hibernacula, etc., as identified in the SWHTG, including Appendix Q, and the SWH Ecoregion Criteria Schedules Addendum (OMNR 2011a) and compared site-specific wildlife inventory in conjunction with vegetation mapping in order to identify candidate significant wildlife habitat.

The general characteristics used to identify candidate seasonal concentration areas are outlined in Table 5.

Table 5. General Characteristics Used to Identify Candidate Seasonal Concentration Areas

Candidate Seasonal Concentration Area	Habitat Characteristics	
	Appendix Q Suggested Criteria	Significant Wildlife Habitat Technical Guide and 2011 Addendum Habitat Criteria
Waterfowl Stopover and Staging Area (Terrestrial)	• Relative importance of the site to local waterfowl populations • Presence of species of conservation concern • Species diversity • Abundance • Quality of habitat • Size of site	Fields with sheet water during Spring (mid-March to May) or annual spring melt water flooding found in any of the following Community Types: Meadow (ME), Thicket (TH)[1]
Waterfowl Stopover and Staging Area (Aquatic)		The following Community Types: Meadow Marsh (MAM), Shallow Marsh (MAS), Shallow Aquatic (SA), Deciduous Swamp (SWD)[1].
Shorebird Migratory Stopover Area	• Relative importance of the site • Presence of species of conservation concern • Species diversity • Abundance • Size of site • Historical use of site • Level of disturbance	Shorelines of lakes, rivers and wetlands, including beach areas, bars and seasonally flooded, muddy and un-vegetated shoreline habitats found in any of the following Community Types: Shoreline (SH), Sand Dune (SB), and Meadow Marsh (MAM). Does not include sewage treatment ponds (CVI_3) and storm water ponds (CVI_3)[1].
Raptor Wintering Area	• Relative importance of the site • Presence of species of conservation concern	Presence of fields and woodlands. I.e. at least one of the following Community Types: Forest (FO), in

	• Species diversity • Abundance • Size of site • Level of disturbance • Location of site • Habitat quality • Historical use of area	addition to one of the following Community Types: Meadow (ME), Thicket (TH), Savannah (SV), Woodland (WO)(<60% cover) that are >20ha and provide roosting, foraging and resting habitats for wintering raptors[1].
Bat Hibernacula	• Relative importance of the site • Presence of species of conservation concern • Species diversity • Abundance • Habitat quality • Location of site • Level of disturbance	Caves, mine shafts, underground foundations, Karsts or one of the following Community Types: Crevice (CCR), Cave (CCA). Does not include buildings[1].
Bat Maternity Colonies	N/A	Any of the following Community Types: Deciduous Forest (FOD), Mixed Forest (FOM) that have >25cm dbh wildlife trees. Maternity colonies can be found in tree cavities, vegetation and often in buildings (buildings are not considered to be SWH). Maternity roosts are not found in caves and mines in Ontario[1].
Bat Migratory Stopover Area	N/A	Location and characteristics of stopover habitats are generally unknown[1].
Turtle Wintering Areas	N/A	Over-wintering areas are permanent water bodies, large wetlands, and bogs or fens with adequate Dissolved Oxygen, and generally utilize the same habitat as their core habitat. These habitats are found in the following Community Types: Swamp (SW), Marsh (MA), Open Water (OA), Shallow Water (SA), Open Fen (FEO), Open Bog (BOO)[1].
Snake Hibernaculum	• Relative importance of the site • Presence of species of conservation concern • Species diversity • Abundance • Habitat quality • Location of site • Level of disturbance	Hibernation occurs in sites located below frost lines in burrows, rock crevices, broken and fissured rock, wetlands such as conifer or shrub swamps and swales, poor fens, or depressions in bedrock terrain with sparse trees or shrubs with sphagnum moss or sedge hummock ground cover. Any Ecosite in central Ontario other than very wet ones, The following Community Types may be directly related to snake hibernacula: Talus (TA), Rock Barren (RB), Crevice (CCR), Cave (CCA), and Alvars (RBOA1, RBSA1,

		RBTA1)[1].
Colonial-Nesting Bird Breeding Habitat (Bank and Cliff)	• Relative importance of the site to local bird populations • Presence of species of conservation concern • Number of nests in the colony • Species diversity • Quality of habitat • Size of site • Level of disturbance • Historical use • Potential concerns of the planning authority	Eroding banks, sandy hills, borrow pits, steep slopes, sand piles, cliff faces, bridge abutments, silos, or barns found in any of the following Community Types: Meadow (ME), Thicket (TH), Savannah (SV), Bluff (BL), Cliff (CL)[1].
Colonial-Nesting Bird Breeding Habitat (Tree/Shrubs)		Any of the following Community Types: Mixed Swamp (SWM), Deciduous Swamp (SWD), Coniferous Treed Fen (FETC1)[1]
Colonial-Nesting Bird Breeding Habitat (Ground)		Any rocky island or peninsula within a lake or large river, close proximity to watercourses in open fields or pastures with scattered trees or shrubs found in any of the following Community Types: Meadow Marsh (MAM), Shallow Marsh (MAS), Meadow (ME), Thicket (TH), Savannah (SV)[1].
Migratory Butterfly Stopover Areas	• Relative importance of the site • Presence of species of conservation concern • Species diversity • Abundance • Size of site • Habitat diversity • Location of site • Level of disturbance • Historical use of area	Minimum 10ha in size, located within 5 km of Lake Ontario, and presence of fields and forests. I.e. at least of the following Community Types: Meadow (ME), Thicket (TH), Savannah (SV), in addition to one of the following Community Types: Forest (FO), Plantation (TAGM1, TAGM2, TAGM3)[1],
Landbird Migratory Stopover Areas	• Relative importance of the site • Presence of species of conservation concern • Species diversity • Abundance • Size of site • Habitat diversity • Location of site • Historical use of area	Any of the following Community Types: Forest (FO), Swamp (SW), that are >10ha in size and within 5 km of Lake Ontario[1].
Winter Deer Yards	Habitats are determined by the OMNR.	
Deer Winter Congregation Areas	N/A	Any of the following Community Types: Coniferous Forest (FOC), Mixed Forest (FOM), Deciduous Forest (FOD), Coniferous Swamp (SWC), Mixed Swamp (SWM), Deciduous Swamp (SWD) >100ha and <1500ha, or coniferous plantations (TAGM1) <<50ha[1]
Bald Eagle Winter Feeding and Roosting	• Relative importance of the site • Abundance • Size of site	N/A

Areas	• Habitat quality • Level of disturbance • Location of roost • Historical use of area	
Wild Turkey Winter Range	• Relative importance of the site • Abundance • Size of site • Habitat quality • Location of habitat • Level of disturbance	Fields/pastures, dense conifer forests, and seeps/open water[2]
Turkey Vulture Summer Roosting Areas	• Relative importance of the site • Abundance • Level of disturbance • Historical use of area	Rocky cliff ledges, large dead/partly dead trees in undisturbed open areas (may be near water) [2]
Bullfrog Concentration Area	• Relative importance of the habitat to local populations • Abundance • Size of site • Historical use of area	Marshes with permanent water or access to permanent water[2]

[1]: OMNR Significant Wildlife Habitat Ecoregion Criteria Schedules: Addendum to SWHTG (Working Draft) (2011)
[2]: OMNR Significant Wildlife Habitat Technical Guide (2000)

NRSI biologists conducted site investigations on all survey dates (listed in Section 5.2 above) that focused on identifying candidate seasonal concentration areas within the Glenarm Solar Park project area. These visits were conducted concurrently with the wildlife habitat evaluation of significance surveys. During each site visit, NRSI biologists conducted area searches throughout the project area to identify candidate seasonal concentration areas as well as habitats for species of conservation concern as outlined in the Significant Wildlife Habitat Technical Guide (SWHTG) (OMNR 2000), including Appendix Q, and the Significant Wildlife Habitat Ecoregion Criteria Schedules Addendum (OMNR 2011a). The methodology used during the evaluation of significance surveys, as well as the results are further discussed in Section 7 and Section 8.

All wildlife (including birds, reptiles, amphibians, and mammals) observed within the project area were documented, along with the number of individuals and their behavior, in order to identify the presence of any species of conservation concern.

5.8.2 Rare Vegetation Communities and Specialized Wildlife Habitat

NRSI has reviewed the list of rare vegetation communities, including alvars, tallgrass prairies, sand barrens, and old-growth forests as identified in the SWHTG and compared

results from the vegetation community mapping using ELC code assignment to identify rare vegetation communities within the Glenarm Solar Park project area.

NRSI has also reviewed the list of specialized wildlife habitats, including turtle nesting habitat, woodland raptor nesting habitat, and osprey nesting, foraging, and perching habitat, etc., as identified in the SWHTG and compared site-specific wildlife inventory in conjunction with vegetation mapping in order to identify candidate significant wildlife habitat.

The general characteristics used to identify candidate specialized wildlife habitat features are outlined in Table 6.

Table 6. General Characteristics Used to Identify Candidate Specialized Wildlife Habitat

Candidate Specialized Wildlife Habitat	Habitat Characteristics	
	Appendix Q Suggested Criteria	Significant Wildlife Habitat Technical Guide and 2011 Addendum Habitat Criteria
Waterfowl Nesting Area	• Relative importance of the site to local waterfowl populations • Presence of species of conservation concern • Species diversity • Abundance • Size of area • Quality of habitat • Location of site • Nest predation • Level of disturbance	Upland habitats of any kind located adjacent to (≤120m) any PSW or the following wetland Community Types: Meadow Marsh (MAM), Shallow Marsh (MAS), Shallow Aquatic (SA), Bedrock Thicket (RBS), Mineral Thicket Swamp (SWT), or Mineral Deciduous Swamp (SWD). Wetland is >0.5ha or cluster of 3 or more smaller wetlands within 120m of each other where waterfowl nesting occurs. Upland areas should be at least 120m wide[1].
Bald Eagle and Osprey Nesting, Foraging and Perching Habitat	• Access to foraging areas • Presence of large, sturdy trees near shoreline • Degree of disturbance • Evidence of use • Current representation of potential sites • Degree of threat	Any of the following Community Types: Forest (FO), or Swamp (SW) that are immediately adjacent to rivers, lakes, ponds, and wetlands. Nests may be located in dead trees over water along forested shorelines, islands or structures. Nests on man-made objects are not SWH[1].
Woodland Raptor Nesting Habitat	N/A	Any of the following Community Types: Forest (FO), Treed Swamp (SW), Coniferous Plantation (TAGM1) that are >30ha with 10ha of interior habitat[1].
Turtle Nesting Habitat	• Size of habitat • Location of site • Substrate	Exposed mineral soil (sand or gravel) areas <100m from or within the following Community Types: Any of the following Community Types: Mineral or

	• Evidence of use • Presence of rare species • Level of predation • Presence of movement corridor • Degree of disturbance • Degree of threat	Organic Meadow Marsh (MAM), Great Lakes Coastal Meadow Marsh (MAMM4), Mineral Fen Meadow Marsh (MAMM5), Tallgrass Meadow Marsh (MAMM6), Bedrock Meadow Marsh (MAMR3), Shallow Marsh (MAS), Shallow Aquatic (SA), Open Bog (BOO), Open Fen (FEO)[1].
Seeps and Springs	• Abundance of seeps/springs • Duration of surface water • Nature of adjacent area • Presence of rare species • Location of seeps/springs	Locations where groundwater comes to surface, often in forested headwater areas. Any forested area (with <25% meadow, field, or pasture) within the headwaters of a stream or river system may have seeps or springs[1].
Amphibian Breeding Habitat (Woodland)	• Provision of significant wildlife habitat • Degree of permanence • Species diversity of pond • Presence of rare species • Size and number of ponds • Diversity of submergent and emergent vegetation • Presence of shrubs, logs at edge of pond • Adjacent forest habitat • Water quality • Level of disturbance	Any of the following Community Types: Forests (FO), Treed Swamps (SW), in addition to wetlands/lakes/ponds found within or adjacent to (<120m) the woodland[1].
Amphibian Breeding Habitat (Wetland)	N/A	Any of the following Community Types: Swamp (SW), Marsh (MA), Fen (FE), Bog (BO), Open Water (OA), Shallow Aquatic (SA), including vernal pools, that are >500m^2 or 25m in diameter, and located >120m from woodlands[1].
Large Weasel Denning Site (Mink, Otter, Marten, Fisher)	• Presence of suitable habitat • Degree of disturbance • Size of local fish population	N/A
Highly Diverse Area	• Current representation of such areas in the planning area • Natural community diversity • Species diversity • Presence of rare species • Size of site	Diversity of vegetation and vertical structure, diversity of ecosystems, presence of biophysical features (e.g. cliffs, seeps, abundant organic debris, pockets of rich soils), little human disturbance[2]
Cliffs	• Current representation of cliffs within planning area • Provision of significant wildlife habitat • Diversity of habitat features associated with cliff • Current or historical use by wildlife species • Species diversity • Presence of rare species	Metamorphic/granitic cliffs, limestone / dolostone / sandstone cliffs[2].

	• Human disturbance • Size and location of cliff	
Caves	• Solution versus physical (e.g. fissured, rock piles, abandoned mine) • Size of opening • Depth of cave • Ambient winter temperature • Ambient relative humidity • Presence of water • Human disturbance	N/A

[1] OMNR Significant Wildlife Habitat Ecoregion Criteria Schedules: Addendum to SWHTG (Working Draft) (2011)
[2] OMNR Significant Wildlife Habitat Technical Guide (2000)

NRSI biologists conducted a site investigation on all survey dates (listed in Section 5.2 above) that focused on identifying candidate specialized wildlife habitat within the Glenarm Solar Park project area. These visits were conducted concurrently with the wildlife habitat evaluation of significance surveys. During each site visit, NRSI biologists conducted area searches throughout the project area to identify candidate specialized wildlife habitats as well as habitats for species of conservation concern as outlined in the Significant Wildlife Habitat Technical Guide (SWHTG) (OMNR 2000) and the Significant Wildlife Habitat Ecoregion Criteria Schedules Addendum (OMNR 2011a). The methodology used during the evaluation of significance surveys, as well as the results are further discussed in Section 7 and Section 8.

All wildlife (including birds, reptiles, amphibians, and mammals) observed within the project area were documented, along with the number of individuals and their behavior, in order to identify the presence of any species of conservation concern.

5.8.3 Habitats of Species of Conservation Concern

Habitats of species of conservation concern include specific observations of species designated as Special Concern within Ontario or those that have been assigned a provincial S-Rank of S1-S3, but can also include habitats for species with declining populations or featured species, as identified by the SWHTG (OMNR 2000). Habitats of species of conservation concern do not include habitats of provincially Endangered or Threatened species, which are addressed in a separate *Approval and Permitting Requirements Document* to satisfy the requirements of the *Endangered Species Act* (2007).

Habitats for species of conservation concern can include specific habitat associations, such as marsh breeding bird habitat or open country breeding bird habitat, but also include preferred habitats for any species (or community) of conservation concern within the project area. Preferred habitats for species of conservation concern have been identified using the SWHTG (OMNR 2000) and were compared to site-specific wildlife inventory in conjunction with vegetation mapping in order to identify habitat for species of conservation concern.

The general characteristics used to identify candidate habitats for species of conservation concern is outlined in Table 7.

Table 7. General Characteristics Used to Identify Candidate Habitats for Species of Conservation Concern

Candidate Habitat for Species of Conservation Concern	Habitat Characteristics	
	Appendix Q Suggested Criteria	Significant Wildlife Habitat Technical Guide and 2011 Addendum Habitat Criteria
Marsh Bird Breeding Habitat	• Degree of rarity of species found at site • Documented significant decline in a species and/or its critical habitat • Species whose range is solely or primarily found in Ontario (i.e., provincial responsibility) • Condition of existing habitat at site • Size of species population at site • Size and location of habitat • Potential for long-term protection of the habitat • Representation of species/habitat within the municipality • Evidence of use of the habitat • Species of particular interest to the planning authority (e.g., the CAC may recommend certain species such as indicator species)	All wetland habitats with shallow water and emergent aquatic vegetation. May include any of the following Community Types: Meadow Marsh (MAM), Shallow Aquatic (SA), Open Bog (BOO), Open Fen (FEO)[1].
Woodland Area-sensitive Bird Breeding Habitat		Habitats where interior forest (at least 100m from the forest edge) breeding birds are breeding. These include any of the following Community Types: Forest (FO), Treed Swamp (SW) that are mature (>60 years old) and >30ha[1].
Open Country Bird Breeding Habitat		Grassland areas > 30ha, not Class 1 or Class 2 agricultural lands, with no row-cropping or intensive hay or livestock pasturing in the last 5 years, in the following Community Type: Meadow (ME)[1].
Shrub/Early Successional Bird Breeding Habitat		Oldfield areas succeeding to shrub and thicket habitats >30ha, not Class 1 or Class 2 agricultural lands, with no row-cropping or intensive hay or livestock pasturing in the last 5 years, in the following Community Types: Thickets (TH), Savannahs (SV)[1].
Terrestrial Crayfish		Meadow and edges of shallow marshes in the following Community Types: Meadow Marsh (MAM),

		Shallow Marsh (MAS)[1]
Special Concern and Rare Wildlife Species		All Species Concern or provincial rare plant and animal species element occurrences within a 1 or 10km grid[1].

NRSI biologists conducted 2 site investigations on June 17th and July 1st, 2010, that focused on identifying breeding bird habitats within the Glenarm Solar Park project area. These two visits were conducted concurrently with the breeding bird evaluation of significance surveys and were conducted during early morning hours with at least 10 days between visits, following recommended monitoring protocol of the OBBA. During each site visit, NRSI biologists conducted area searches throughout the project area to identify candidate significant bird habitats as well as habitats for species of conservation concern as outlined in the Significant Wildlife Habitat Technical Guide (SWHTG) (OMNR 2000) and the Significant Wildlife Habitat Ecoregion Criteria Schedules Addendum (OMNR 2011a). The methodology used during the evaluation of significance surveys, as well as the results are further discussed in Section 7 and Section 8.

All wildlife (including birds, reptiles, amphibians, and mammals) observed within the project area were documented, along with the number of individuals and their behavior, in order to identify the presence of any species of conservation concern.

5.8.4 Animal Movement Corridors

Animal movement corridors are typically considered linear features that connect 2 or more significant, or otherwise ecologically important, habitats. These features are important for several reasons, including promoting genetic flow, protection from predators, and connectivity to habitats required for breeding, foraging, and/or hibernating.

NRSI conducted a site investigation on all survey dates (listed in Section 5.2 above) that included identifying animal movement corridors within 120m of the Glenarm Solar Park project location. NRSI has reviewed the criteria for identifying animal movement corridors, as identified in the SWHTG and its appendices (OMNR 2000), as well as the Significant Wildlife Habitat Ecoregion 6E Criterion Schedule Addendum (OMNR 2011b), and compared site-specific wildlife inventory with vegetation mapping and aerial

photography. The general characteristics used to identify animal movement corridors within 120m of the project location are outlined in Table 8.

Table 8. General Characteristics Used to Identify Animal Movement Corridors

Wildlife Habitat Type	Habitat Characteristics	
	Appendix Q Suggested Criteria	2011 SWH Ecoregion 6E Criterion Schedule Addendum
Deer Movement Corridors	• Importance of areas to be linked by corridor • Importance of corridor to survival of target species • Dimensions • Continuity • Habitat and structure • Species found within or presumed to be using • Risk of mortality • Protection • Other related values	Corridors may be found in all forested Ecosite. They usually follow riparian areas, woodlots, ravines or ridges.
Amphibian Movement Corridors		Corridors may be found in all Ecosite associated with water.

6.0 Natural Features

The majority of the Glenarm Solar Park project area is dominated by open pasture. In addition to this habitat, NRSI biologists have also noted other features that have the potential to represent candidate significant natural features. Each of these candidate significant natural features is described in more detail below.

6.1 Areas of Natural and Scientific Interest

No Areas of Natural and Scientific Interest (ANSI) were identified within the Glenarm Solar Park project area during the site investigation.

6.2 Wetlands

NRSI biologists identified a total of two wetlands within the vicinity of the Glenarm Solar Park project area. These wetlands are located more than 120m from the closest project location, however these natural features have still been considered in this report. The form and function of these wetlands are described in more detail below, and can be seen on Figure 2. The function of these wetlands as it relates to wildlife habitat has been further addressed in Section 6.5 and Section 8.5.

WET-001

This wetland is 4.17ha in size, located adjacent to Moor Road, and is located approximately 125m northeast of the closest portion of the project location. Two vegetation communities have been identified within this wetland. The majority of this wetland has been identified as a Rush Graminoid Mineral Meadow Marsh Type (MAMM1-13), dominated by dark-green bulrush (*Scirpus atrovirens)* and awl-fruited sedge (*Carex stipata).* Groundcover is dominated by calico aster (*Symphyotrichum lateriflorum* var. *lateriflorum*) and grass-leaved goldenrod (*Euthamia graminifolia*). The southeast and northeast portion of this wetland has been identified as a Mixed Willow Mineral Deciduous Thicket Swamp Type (SWTM3-6), dominated by slender willow (*Salix petiolaris*) and heartleaf willow (*Salix eriocephala*). Groundcover is dominated by mad-dog skullcap (*Scutellaria lateriflora)* and northern bugleweed (*Lycopus uniflorus*). Tributary C of Staples River appears to originate in this wetland.

WET-002

This wetland is 17.54ha, located north of Glenarm Road and west of Moor Road, and is located approximately 125m east of the closest portion of the project location. Two tributaries to Staples River are found within this wetland and five vegetation communities have been identified. The majority of this wetland has been identified as a Cattail Graminoid Mineral Meadow Marsh Type (MAMM1-2), dominated by broad-leaved cattail (*Typha latifolia*) and rushes (*Juncus* spp.).

Groundcover is dominated by calico aster and grass-leaved goldenrod. A small Mixed Willow Mineral Deciduous Thicket Swamp Type (SWTM3-6) inclusion has been identified in the southern end of this community, dominated by slender willow and heartleaf willow.

The next community found within WET-002 is located southwest of the cattail marsh identified above, and has been identified as a small Reed-canary Grass Graminoid Mineral Meadow Marsh Type (MAMM1-3). This community is almost completely dominated by reed canary grass (*Phalaris arundinacea)* with dark-green bulrush present in smaller amounts. Groundcover is rare in this community, with calico aster as the only species present in small amounts. A small pond is also found in the southwest corner of this community.

A Mixed Willow Mineral Deciduous Thicket Swamp Type (SWTM3-6) has also been identified within WET-002 and is located northeast of the large cattail marsh. This community is dominated by slender willow and heartleaf willow, and the groundcover is dominated by mad-dog skullcap and northern bugleweed.

The next community within WET-002 is located east of the willow swamp identified above, and has been identified as a Rush Graminoid Mineral Meadow Marsh Type (MAMM1-13). This community is dominated by dark-green bulrush and awl-fruited sedge and the groundcover is dominated by calico aster and grass-leaved goldenrod. This community is located east and west of Moor Road.

The final community within WET-002 is located northwest of the cattail marsh, and has been identified as a Poplar Mineral Deciduous Swamp Type (SWDM4-5). This community is dominated by green ash (*Fraxinus pennsylvanica)* and balsam poplar (*Populus balsamifera* ssp. *balsamifera*) in the canopy as well as some occasional narrow emergents including hop sedge (*Carex lupulina*) and fowl meadow grass (*Poa palustris*). Groundcover is dominated by creeping buttercup (*Ranunculus repens*) and spotted jewelweed (*Impatiens capensis*). Water marks were observed on the trees within this community, indicating that the water level is approximately 1-2 feet higher in the spring.

6.3 Valleylands

The terrain within the Glenarm Solar Park project area consists of gently rolling uplands. No candidate significant valleylands were identified within the project area during the site investigation.

6.4 Woodlands

NRSI biologists identified a total of 4 woodlands within the vicinity of the Glenarm Solar Park project area. These woodlands are all located more than 120m from the closest project location; however, these natural features have still been considered in this report. The composition, attributes, and function of these woodlands are described in more

detail below and can be seen on Figure 2. The function of these woodlands as it relates to wildlife habitat has been further addressed in Section 6.5 and Section 8.5.

WOD-001

This woodland is 1.26ha in size, located east of and adjacent to WET-002, and is located approximately 500m east of the closest portion of the project location. This woodland has been identified as a Fresh-Moist Poplar Deciduous Forest Type (FODM8-1), dominated completely by trembling aspen (*Populus tremuloides*) in the canopy. Speckled alder (*Alnusincana* spp. *rugosa*) and red-osier dogwood (*Cornus stolonifera*) is abundant in the subcanopy, and the relatively dense groundcover is dominated by sedge species (*Carex* sp.), cow vetch (*Vicia cracca*) and ox-eye daisy (*Leucanthemum vulgare*).

This woodland is located adjacent to a large (17.54ha) wetland (WET-002), as well as an open pasture which has been considered as candidate open country bird breeding habitat (OCB-003), which is discussed further in Section 6.5. This woodland is located approximately 125m from the closest woodland (WOD-004), provides water protection, does not provide woodland interior, and does not exhibit woodland diversity or any uncommon characteristics.

WOD-002

This woodland is 6.47ha in size, is found 125m east of the closest portion of the project location, and has been identified as a Poplar Mineral Deciduous Swamp Type (SWDM4-5). This community is dominated by trembling aspen, balsam poplar and green ash in the canopy, with the subcanopy comprised of green ash, eastern white cedar (*Thuja occidentalis)* and balsam poplar. The understory is dominated by green ash, with small numbers of speckled alder and red-osier dogwood. The groundcover is dominated by sedge species, creeping buttercup and spotted jewelweed.

This woodland also functions as a wetland, and has been included as part of the larger (17.54ha) wetland (WET-002). This woodland is located within an open pasture that has been considered as candidate open country bird breeding habitat (OCB-001), which is discussed further in Section 6.5. This woodland is located approximately 200m from the closest woodland (WOD-004), provides water protection, provides approximately 0.10ha of woodland interior, and does not exhibit woodland diversity or any uncommon characteristics.

WOD-003

This large (18.64ha) woodland is located on the west side of Sandringham Road, 135m west of the closest portion of the project location. Tributary D to White's Creek flows along the northern half of this woodland. This community has been identified as a Fresh-Moist White Cedar-Hardwood Mixed Forest Type (FOMM7-2), dominated by trembling aspen, green ash and white elm (*Ulmus americana)* in the canopy. Eastern white cedar is abundant in the subcanopy with smaller numbers of white birch (*Betula papyrifera),* green ash, and trembling aspen. The understory is comprised of green ash, trembling aspen and common buckthorn (*Rhamnus cathartica*) and groundcover is dominated by large-leaved avens

(*Geumma crophyllum*), agrimony (*Agrimonia gryposepala*), and woodland strawberry (*Fragaria vesca* ssp. *americana*).

This woodland is located adjacent to an open pasture that has been considered as candidate open country bird breeding habitat (OCB-002), which is discussed further in Section 6.5. This woodland is located approximately 300m from the closest woodland (not in the project area), provides water protection, provides approximately 4.73ha of woodland interior, and does not exhibit woodland diversity or any uncommon characteristics.

WOD-004

This woodland is 0.86ha in size, is located approximately 300m east of the closest portion of the project location, and has been identified as a Fresh-Moist White Cedar Coniferous Thicket Type (THCM2-1). This community is entirely dominated by eastern white cedar in the canopy, subcanopy and understory. Heavy cow grazing has resulted in the regeneration of this species throughout this woodland. The groundcover is dominated by bird's-foot trefoil (*Lotus corniculatus*), with smaller numbers of cow vetch, red clover (*Trifolium pratense*) and timothy (*Phleum pratense*).

This woodland is located within an open pasture that has been considered as candidate open country bird breeding habitat (OCB-003), which is discussed further in Section 6.5. This woodland is located approximately 125m from the closest woodland (WOD-001), and does not provide water protection or woodland interior, and does not exhibit woodland diversity or any uncommon characteristics.

6.5 Wildlife Habitat

NRSI has reviewed the 4 broad categories of significant wildlife habitat, as identified by the Significant Wildlife Habitat Technical Guide (SWHTG) (OMNR 2000). The habitat characteristics and ELC codes identified in the SWHTG, and other supporting documents, were compared to the site specific characteristics identified at the Glenarm Solar Park. These 4 categories, including seasonal concentration areas, specialized wildlife habitat, habitats of species of conservation concern, and animal movement corridors, have each been addressed independently in the sections below.

6.5.1 Seasonal Concentration Areas

Seasonal concentration areas, which include waterfowl stopover areas, raptor wintering areas, snake hibernaculum, amphibian breeding habitat, etc., have all been considered during the records review and site investigation phase of this project. As a result of available background information and site specific field investigations, NRSI has reviewed site-specific habitat characteristics and identified the presence of 4 candidate

significant seasonal concentration areas within the vicinity of the Glenarm Solar Park project area.

SNH-001 (Snake Hibernaculum)
According to the 2011 Addendum to the SWHTG, the existence of rock piles or slopes, stone fences, and crumbling foundations assist in identifying candidate significant snake hibernacula (OMNR 2011a).NRSI biologists noted the presence of a large rock pile and an old wooden fence piece, dumped along the fence on the north side of Glenarm Road, and have considered this feature as a candidate snake hibernaculum, due to its potential to support hibernating snakes. Due to the size and characteristics of this feature, it is unlikely to support a large population of snakes, but may provide hibernation habitat for a small group of snake species. This candidate snake hibernaculum is located within the open pasture, which has been considered as candidate open country bird breeding habitat (discussed further in Section 6.5.3). No snake species were observed at this candidate snake hibernaculum.

This candidate significant snake hibernaculum is located approximately 220m from the closest portion of the project location. As this feature is located more than 120m from the nearest project location, it is not discussed further in this report.

SNH-002 (Snake Hibernaculum)
NRSI biologists noted the presence of a rock pile along the eastern edge of WET-002, between WOD-001 and WOD-004, and have considered this feature as a candidate snake hibernaculum, due to its potential to support hibernating snakes. Due to the size and characteristics of this feature, it is unlikely to support a large population of snakes, but may provide hibernation habitat for a small group of snake species. This candidate snake hibernaculum is located within the open pasture, which has been considered as candidate open country bird breeding habitat (discussed further in Section 6.5.3).

This candidate significant snake hibernaculum is located approximately 350m from the closest portion of the project location. As this feature is located more than 120m from the nearest project location, it is not discussed further in this report.

SNH-003 (Snake Hibernaculum)
NRSI biologists noted the presence of a rock pile, just north of WET-002, and have considered this feature as a candidate snake hibernaculum, due to its potential to support hibernating snakes. Due to the size and characteristics of this feature, it is unlikely to support a large population of snakes, but may provide hibernation habitat for a small group of snake species. This candidate snake hibernaculum is located within the open pasture, which has been considered as candidate open country bird breeding habitat (discussed further in Section 6.5.3).

This candidate significant snake hibernaculum is located approximately 450m from the closest portion of the project location. As this feature is located more

than 120m from the nearest project location, it is not discussed further in this report.

SNH-004 (Snake Hibernaculum)
NRSI biologists noted the presence of an additional rock pile just north of WET-002, and have considered this feature as a candidate snake hibernaculum, due to its potential to support hibernating snakes. Due to the size and characteristics of this feature, it is unlikely to support a large population of snakes, but may provide hibernation habitat for a small group of snake species. This candidate snake hibernaculum is located within the open pasture, which has been considered as candidate open country bird breeding habitat (discussed further in Section 6.5.3).

This candidate significant snake hibernaculum is located approximately 400m from the closest portion of the project location. As this feature is located more than 120m from the nearest project location, it is not discussed further in this report.

No other candidate significant seasonal concentration areas were identified within 120m of the project location.

Table 9 below summarizes all candidate seasonal concentration areas considered for the Glenarm Solar Park project area, including habitat characteristics as identified in the SWHTG (OMNR 2000), including Appendix Q, as well as the SWH Ecoregion Criteria Schedules Addendum (OMNR 2011b). This table also includes habitat presence within the project area, site investigation observations, and whether any candidate seasonal concentration areas will be carried forward to the Evaluation of Significance.

Table 9. Summary of Candidate Seasonal Concentration Areas Considered for the Glenarm Solar Park Project Area

Candidate Seasonal Concentration Area	Habitat Characteristics		Present Within 120m of Project Location	Details	EOS Required (Yes/No)
	Appendix Q Suggested Criteria	Significant Wildlife Habitat Technical Guide and 2011 Addendum Habitat Criteria			
Waterfowl Stopover and Staging Area (Terrestrial)	• Relative importance of the site to local waterfowl populations • Presence of species of conservation concern • Species diversity • Abundance • Quality of habitat • Size of site	Fields with sheet water during Spring (mid-March to May) or annual spring melt water flooding found in any of the following Community Types: Meadow (ME), Thicket (TH)[1]	No	There are no Meadow (ME) or Thicket (TH) community types within the project area.	No
Waterfowl Stopover and Staging Area (Aquatic)		The following Community Types: Meadow Marsh (MAM), Shallow Marsh (MAS), Shallow Aquatic (SA), Deciduous Swamp (SWD)[1].	No	No Meadow Marsh (MAM), Shallow Marsh (MAS), Shallow Aquatic (SA), and/or Deciduous Swamp (SWD)community types have been identified within the project area.	No
Shorebird Migratory Stopover Area	• Relative importance of the site • Presence of species of conservation concern • Species diversity • Abundance • Size of site • Historical use of site • Level of disturbance	Shorelines of lakes, rivers and wetlands, including beach areas, bars and seasonally flooded, muddy and un-vegetated shoreline habitats found in any of the following Community Types: Shoreline (SH), Sand Dune (SB), and Meadow Marsh (MAM). Does not include sewage treatment ponds (CVI_3) and storm water ponds (CVI_3)[1].	No	No Shoreline (SH), Sand Dune (SB), and/or Meadow Marsh (MAM) community types have been identified within the project area.	No
Raptor Wintering Area	• Relative importance of the site • Presence of species of conservation concern • Species diversity • Abundance • Size of site • Level of disturbance	Presence of fields and woodlands. I.e. at least one of the following Community Types: Forest (FO), in addition to one of the following Community Types: Meadow (ME), Thicket (TH), Savannah (SV), Woodland (WO) (<60% cover) that are >20ha and provide roosting, foraging and resting habitats for	No	There are no Forest (FO), Meadow (ME), Thicket (TH), Savannah (SV), and/or Woodland (WO) community types present within the project area.	No

	• Location of site • Habitat quality • Historical use of area	wintering raptors[1].			
Bat Hibernacula	• Relative importance of the site • Presence of species of conservation concern • Species diversity • Abundance • Habitat quality • Location of site • Level of disturbance	Caves, mine shafts, underground foundations, Karsts or one of the following Community Types: Crevice (CCR), Cave (CCA). Does not include buildings[1].	No	There are no Crevice (CCR) or Cave (CCA) community types, or mine shafts, underground foundations, or karsts within the project area.	No
Bat Maternity Colonies	N/A	Any of the following Community Types: Deciduous Forest (FOD), Mixed Forest (FOM) that have >25cm dbh wildlife trees. Maternity colonies can be found in tree cavities, vegetation and often in buildings (buildings are not considered to be SWH). Maternity roosts are not found in caves and mines in Ontario[1].	No	There are no Deciduous Forest (FOD) or Mixed Forest (FOM)community types within the project area.	No
Bat Migratory Stopover Area	N/A	Location and characteristics of stopover habitats are generally unknown[1].	No	No bat migratory stopover areas are known from within the project area.	No
Turtle Wintering Areas	N/A	Over-wintering areas are permanent water bodies, large wetlands, and bogs or fens with adequate Dissolved Oxygen, and generally utilize the same habitat as their core habitat. These habitats are found in the following Community Types: Swamp (SW), Marsh (MA), Open Water (OA), Shallow Water (SA), Open Fen (FEO), Open Bog (BOO)[1].	No	There are no Marsh (MA), Swamp (SW), Open Water (OA), Shallow Water (SA), Open Fen (FEO), or Open Bog (BOO)community types within the project area.	No

Snake Hibernaculum	• Relative importance of the site • Presence of species of conservation concern • Species diversity • Abundance • Habitat quality • Location of site • Level of disturbance	Hibernation occurs in sites located below frost lines in burrows, rock crevices, broken and fissured rock, wetlands such as conifer or shrub swamps and swales, poor fens, or depressions in bedrock terrain with sparse trees or shrubs with sphagnum moss or sedge hummock ground cover. Any Ecosite in central Ontario other than very wet ones, The following Community Types may be directly related to snake hibernacula: Talus (TA), Rock Barren (RB), Crevice (CCR), Cave (CCA), and Alvars (RBOA1, RBSA1, RBTA1)[1].	No	Four candidate snake hibernacula were identified during site investigations. Due to the size and characteristics of these features, it is unlikely that they support a large population of snakes, but may provide hibernation habitat for a small group of snake species. These features are located between 220m and 450m from the closest portion of the project location, and have therefore not been discussed further in this report.	No
Colonial-Nesting Bird Breeding Habitat (Bank and Cliff)	• Relative importance of the site to local bird populations • Presence of species of conservation concern • Number of nests in the colony • Species diversity • Quality of habitat • Size of site • Level of disturbance • Historical use • Potential concerns of the planning authority	Eroding banks, sandy hills, borrow pits, steep slopes, sand piles, cliff faces, bridge abutments, silos, or barns found in any of the following Community Types: Meadow (ME), Thicket (TH), Savannah (SV), Bluff (BL), Cliff (CL)[1].	No	There are no eroding banks, sandy hills, borrow pits, steep slopes, sand piles, cliff faces, bridge abutments, silos, or barns within the project area.	No
Colonial-Nesting Bird Breeding Habitat (Tree/Shrubs)		Any of the following Community Types: Mixed Swamp (SWM), Deciduous Swamp (SWD), Coniferous Treed Fen (FETC1)[1]	No	There are no Mixed Swamp (SWM), Deciduous Swamp (SWD), or Coniferous Treed Fen (FETC1) community types within the project area.	No
Colonial-Nesting Bird Breeding Habitat (Ground)		Any rocky island or peninsula within a lake or large river, close proximity to watercourses in open fields or pastures with scattered trees or shrubs found in any of the following Community Types: Meadow Marsh (MAM), Shallow Marsh (MAS), Meadow (ME), Thicket (TH), Savannah (SV)[1].	No	There are no rocky islands or peninsulas within a lake or large river in close proximity to watercourses in open fields or pastures with scattered trees or shrubs within the project area.	No
Migratory	• Relative importance of	Minimum 10ha in size, located	No	The project area is not within 5km of Lake	No

Butterfly Stopover Areas	the site • Presence of species of conservation concern • Species diversity • Abundance • Size of site • Habitat diversity • Location of site • Level of disturbance • Historical use of area	within 5 km of Lake Ontario, and presence of fields and forests. I.e. at least of the following Community Types: Meadow (ME), Thicket (TH), Savannah (SV), in addition to one of the following Community Types: Forest (FO), Plantation (TAGM1, TAGM2, TAGM3)[1],		Ontario.	
Landbird Migratory Stopover Areas	• Relative importance of the site • Presence of species of conservation concern • Species diversity • Abundance • Size of site • Habitat diversity • Location of site • Historical use of area	Any of the following Community Types: Forest (FO), Swamp (SW), that are >10ha in size and within 5 km of Lake Ontario[1].	No	The project area is not within 5km of Lake Ontario.	No
Winter Deer Yards	Habitats are determined by the OMNR.		No	No winter deer yards have been identified within the project area.	No
Deer Winter Congregation Areas	N/A	Any of the following Community Types: Coniferous Forest (FOC), Mixed Forest (FOM), Deciduous Forest (FOD), Coniferous Swamp (SWC), Mixed Swamp (SWM), Deciduous Swamp (SWD) >100ha and <1500ha, or coniferous plantations (TAGM1)<<50ha[1]	No	There are no Coniferous Forest (FOC), Mixed Forest (FOM), Deciduous Forest (FOD), Coniferous Swamp (SWC), Mixed Swamp (SWM) and/or Deciduous Swamp (SWD) community types within the project area.	No
Bald Eagle Winter Feeding and Roosting Areas	• Relative importance of the site • Abundance • Size of site • Habitat quality	N/A	No	No bald eagle roosts were identified in the project area. The project area is not known to be historically used as bald eagle winter feeding and roosting areas.	No

	• Level of disturbance • Location of roost • Historical use of area				
Wild Turkey Winter Range	• Relative importance of the site • Abundance • Size of site • Habitat quality • Location of habitat • Level of disturbance	Fields/pastures, dense conifer forests, and seeps/open water[2]	No	Although there are agricultural fields within the project area (OAGM2 and OAGM4), there is limited importance of the project area on the winter range of wild turkeys.	No
Turkey Vulture Summer Roosting Areas	• Relative importance of the site • Abundance • Level of disturbance • Historical use of area	Rocky cliff ledges, large dead/partly dead trees in undisturbed open areas (may be near water) [2]	No	There are no rocky cliff ledges, or large dead/partly dead trees in undisturbed open areas within the project area.	No
Bullfrog Concentration Area	• Relative importance of the habitat to local populations • Abundance • Size of site • Historical use of area	Marshes with permanent water or access to permanent water[2]	No	There are no marshes with permanent water or access to permanent water within the project area.	No

[1]: OMNR Significant Wildlife Habitat Ecoregion Criteria Schedules: Addendum to SWHTG (Working Draft) (2011b)
[2]: OMNR Significant Wildlife Habitat Technical Guide (2000)

6.5.2 Rare Vegetation Communities and Specialized Wildlife Habitat

Rare vegetation communities, including savannah and tallgrass prairie, have all been considered during the records review and site investigation phase of this project. The results of the records review and site investigation indicate that no rare vegetation communities have been identified within the Glenarm Solar Park project area.

Specialized wildlife habitat, which includes waterfowl nesting areas, woodland raptor nesting habitat, turtle nesting habitat and over wintering areas, etc., have all been considered during the records review and site investigation phase of this project. No candidate significant specialized wildlife habitats were identified within the Glenarm Solar Park project area.

Table 10 below summarizes all candidate specialized wildlife habitats considered for the Glenarm Solar Park project area, including habitat characteristics as identified in the SWHTG (OMNR 2000), including Appendix Q, as well as the SWH Ecoregion Criteria Schedules Addendum (OMNR 2011b). This table also includes habitat presence within the project area, site investigation observations, and whether any candidate specialized wildlife habitats will be carried forward to the Evaluation of Significance.

Table 10. Summary of Candidate Specialized Wildlife Habitats Considered for the Glenarm Solar Park Project Area

Candidate Specialized Wildlife Habitat	Habitat Characteristics		Present Within 120m of Project Location	Details	Carried Forward to Summary and EOS
	Appendix Q Suggested Criteria	Significant Wildlife Habitat Technical Guide and 2011 Addendum Habitat Criteria			
Waterfowl Nesting Area	• Relative importance of the site to local waterfowl populations • Presence of species of conservation concern • Species diversity • Abundance • Size of area • Quality of habitat • Location of site • Nest predation • Level of disturbance	Upland habitats of any kind located adjacent to (≤ 120m) any PSW or the following wetland Community Types: Meadow Marsh (MAM), Shallow Marsh (MAS), Shallow Aquatic (SA), Bedrock Thicket (RBS), Mineral Thicket Swamp (SWT), or Mineral Deciduous Swamp (SWD). Wetland is >0.5ha or cluster of 3 or more smaller wetlands within 120m of each other where waterfowl nesting occurs. Upland areas should be at least 120m wide[1].	No	There are no upland habitats within the project area that are ≤120m from any PSW or the following community types: Meadow Marsh (MAM), Shallow Marsh (MAS), Shallow Aquatic (SA), Bedrock Thicket (RBS), Mineral Thicket Swamp (SWT), or Mineral Deciduous Swamp (SWD), that are >0.5ha in size.	No
Bald Eagle and Osprey Nesting, Foraging and Perching Habitat	• Access to foraging areas • Presence of large, sturdy trees near shoreline • Degree of disturbance • Evidence of use • Current representation of potential sites • Degree of threat	Any of the following Community Types: Forest (FO), or Swamp (SW) that are immediately adjacent to rivers, lakes, ponds, and wetlands. Nests may be located in dead trees over water along forested shorelines, islands or structures. Nests on man-	No	There are no Forest (FO), or Swamp (SW) community types within the project area.	No

		made objects are not SWH[1].			
Woodland Raptor Nesting Habitat	N/A	Any of the following Community Types: Forest (FO), Treed Swamp (SW), Coniferous Plantation (TAGM1) that are >30ha with 10ha of interior habitat[1].	No	There are no Forest (FO), Treed Swamp (SW), or Coniferous Plantation (TAGM1) community types >30ha within the project area.	No
Turtle Nesting Habitat	• Size of habitat • Location of site • Substrate • Evidence of use • Presence of rare species • Level of predation • Presence of movement corridor • Degree of disturbance • Degree of threat	Exposed mineral soil (sand or gravel) areas <100m from or within the following Community Types: Any of the following Community Types: Mineral or Organic Meadow Marsh (MAM), Great Lakes Coastal Meadow Marsh (MAMM4), Mineral Fen Meadow Marsh (MAMM5), Tallgrass Meadow Marsh (MAMM6), Bedrock Meadow Marsh (MAMR3), Shallow Marsh (MAS), Shallow Aquatic (SA), Open Bog (BOO), Open Fen (FEO)[1].	No	Exposed mineral soil (sand or gravel) within 100m of any Marsh (MA), Shallow Aquatic (SA), Open Bog (BOO) or Open Fen (FEO) community types were not observed within the project area.	No
Seeps and Springs	• Abundance of seeps/springs • Duration of surface water • Nature of adjacent area • Presence of rare species • Location of seeps/springs	Locations where groundwater comes to surface, often in forested headwater areas. Any forested area (with <25% meadow, field, or pasture) within the headwaters of a stream	No	No seeps or springs were observed in the project area.	No

		or river system may have seeps or springs[1].			
Amphibian Breeding Habitat (Woodland)	• Provision of significant wildlife habitat • Degree of permanence • Species diversity of pond • Presence of rare species • Size and number of ponds • Diversity of submergent and emergent vegetation • Presence of shrubs, logs at edge of pond • Adjacent forest habitat • Water quality • Level of disturbance	Any of the following Community Types: Forests (FO), Treed Swamps (SW), in addition to wetlands/lakes/ponds found within or adjacent to (<120m) the woodland[1].	No	There are no wetlands, lakes, or ponds within or adjacent to (<120m) a Forest (FO) or Treed Swamp (SW) community types within the project area.	No
Amphibian Breeding Habitat (Wetland)	N/A	Any of the following Community Types: Swamp (SW), Marsh (MA), Fen (FE), Bog (BO), Open Water (OA), Shallow Aquatic (SA), including vernal pools, that are >500m^2 or 25m in diameter, and located >120m from woodlands[1].	No	No Marsh (MA), Swamp (SW), Fen (FE), Bog (BO), Open Water (OA), or Shallow Aquatic (SA) community types, or vernal pools, were identified within the project area.	No
Large Weasel Denning Site (Mink, Otter, Marten, Fisher)	• Presence of suitable habitat • Degree of disturbance • Size of local fish population	N/A	No	No denning sites were observed in the project area.	No
Highly Diverse Area	• Current representation of such areas in the planning area • Natural community diversity	Diversity of vegetation and vertical structure, diversity of ecosystems, presence of biophysical features (e.g. cliffs, seeps,	No	No highly diverse vegetation, structures, ecosystems, biophysical features, abundant organic debris, or pockets of rich soils were observed in the project area.	No

	• Species diversity • Presence of rare species • Size of site	abundant organic debris, pockets of rich soils), little human disturbance[2]			
Cliffs	• Current representation of cliffs within planning area • Provision of significant wildlife habitat • Diversity of habitat features associated with cliff • Current or historical use by wildlife species • Species diversity • Presence of rare species • Human disturbance • Size and location of cliff	Metamorphic/granitic cliffs, limestone / dolostone / sandstone cliffs[2].	No	There are no metamorphic / granitic cliffs, or limestone / dolostone / sandstone cliffs within the project area.	No
Caves	• Solution versus physical (e.g. fissured, rock piles, abandoned mine) • Size of opening • Depth of cave • Ambient winter temperature • Ambient relative humidity • Presence of water • Human disturbance	N/A	No	There are no caves within the project area.	No

[1]: OMNR Significant Wildlife Habitat Ecoregion Criteria Schedules: Addendum to SWHTG (Working Draft) (2011b)
[2]: OMNR Significant Wildlife Habitat Technical Guide (2000)

6.5.3 Habitats of Species of Conservation Concern

Habitat for species of conservation concern include breeding habitats for bird groups, such as marsh bird breeding habitat and open country bird breeding habitat, as well as specific habitats for species of conservation concern that may be present within the project area. NRSI biologists have identified the presence of 4 candidate significant habitat types and candidate significant habitat for 6 species of conservation concern.

OCB-001 (Open Country Bird Breeding Habitat)

According to Appendix Q of the SWHTG, size and location must be considered to determine if candidate open country bird breeding habitat is present (OMNR 2000). Also, according to the 2011 Addendum to the SWHTG, large grassland areas greater than 30ha are considered examples of open country bird breeding habitat (OMNR 2011a).A candidate significant open country bird breeding habitat has been identified within the Glenarm Solar Park project area. This large (263ha) habitat includes the pasture fields that cover most of the project area. These pasture fields have been classified as Open Pasture (OAGM4). This community represents established pastures, in use as such for at least the past 5 years. This community is dominated by vetch species (*Vicia* sp.), red clover, Kentucky bluegrass (*Poapratensis* ssp. *pratensis*), and yarrow (*Achillea millefolium*).

This habitat provides approximately 175ha of interior habitat for open country breeding birds. This habitat has been considered candidate SWH based on the habitat characteristics noted during the site investigation. This area spans a majority of the project area and overlaps with the project location.

As this habitat has been considered candidate significant open country bird breeding habitat, and is found within 120m of the project location, this habitat will be carried forward to the Evaluation of Significance section (Section 7.0) of the report.

OCB-002 (Open Country Bird Breeding Habitat)

A second candidate significant open country bird breeding habitat has been identified within the Glenarm Solar Park project area. This large (43ha) habitat includes the pasture fields that cover a small portion of the project area in the southwest end. These pasture fields have been classified as Open Pasture (OAGM4). This community represents established pastures, in use as such for at least the past 5 years. This community is dominated by vetch species, red clover, Kentucky bluegrass, and yarrow.

This habitat provides approximately 20ha of interior habitat for open country breeding birds. This habitat has been considered candidate SWH based on the habitat characteristics noted during the site investigation.

This area spans the southwest corner of the project area and is located approximately 35m from the closest portion of the project location.

As this habitat has been considered candidate significant open country bird breeding habitat, and is found within 120m of the project location, this habitat will be carried forward to the Evaluation of Significance section (Section 7.0) of the report.

OCB-003 (Open Country Bird Breeding Habitat)

A third candidate significant open country bird breeding habitat has been identified within the Glenarm Solar Park project area. This 78ha habitat includes the active agricultural hayfield located south of Glenarm Road, east of Sandringham Road and west of Moor Road. This field has been classified as a Perennial Cover Crop (OAGM2) field. This community is dominated entirely by hay, with no other species.

This habitat provides approximately 40ha of interior habitat for open country breeding birds. This habitat has been considered candidate SWH based on the habitat characteristics noted during the site investigation.

This area spans the south end of the project area and is located approximately 40m from the closest portion of the project location.

As this habitat has been considered candidate significant open country bird breeding habitat, and is found within 120m of the project location, this habitat will be carried forward to the Evaluation of Significance section (Section 7.0) of the report.

In addition to the candidate SWH described above, NRSI biologists have also noted the potential presence of 11 species of conservation concern within the vicinity of the project area, based on a detailed records review. The habitat requirements for each of these species have been examined in detail (Section 4.8), and have been compared with site-specific characteristics documented during the site investigation. Candidate significant habitats of 6 species of conservation concern may be present within the project area. These species and their habitat requirements, and the habitat observed during the site investigations, are described in more detail below.

Black Tern

Black tern requires wetlands for breeding, and has been recorded within the 10km^{2}OBBA reference square that overlaps with the project area (Cadman et. al 2007). Wetlands may be coastal or inland, and consist of large cattail marshes or wet meadows >20 ha in size, among other wetland types. In addition, shallow and open water areas must both be present near the nests, and foraging habitat consists of adjacent grasslands (OMNR 2000). Wetland habitats are located >120m east of the project location and do not meet the minimum habitat size requirement for this species. Since habitat for this species does not exist within the project area, this species as well as its habitat is not further discussed in this report.

Common Nighthawk

Common nighthawk prefers open ground, clearings in dense forests, ploughed fields, gravel beaches, and open woodlands (OMNR 2000). The groundcover within the open pastures in the project area (OCB-001 and OCB-002) were densely vegetated (>60%) with vetch species, red clover, Kentucky bluegrass, and yarrow.

This species was observed within approximately half of the OBBA atlas squares in the Lindsay Region in both the 1981-1985 and 2001-2005 OBBA atlas periods (Cadman et. al 2007). A total of 200 common nighthawk individuals were observed in the Carden Plain, a large (37,177ha) Important Bird Area, located north of the project area, with probable evidence of breeding (Bird Studies Canada 2004). According to Appendix Q of the SWHTG, sites capable of producing a large number of individuals of a single species of conservation concern, highly diverse sites that support one or more species of conservation concern, larger sites, and those that are large enough to ensure long-term support, viability and protection of species of conservation concern are considered most significant (OMNR 2000), As the Carden Plain exhibits all of these characteristics, the open pastures within the Glenarm Solar Park project area would not be the most significant habitat for this species within the general area. As such, NRSI recommends that candidate significant habitat for the common nighthawk does not exist within the project area.

Red-headed Woodpecker

Red-headed woodpecker can be found in field edges and farmyards with a few large trees (OMNR 2000). Habitat of this type may be available in farmyards adjacent to the project location, and this species was confirmed breeding within the overlapping OBBA reference square during both the 1981-1985 and 2001-2005 atlas periods, although this species appears to be on the decline in the Lindsay Region. Occasional snags between 25-50cm dbh were found within WOD-002, located further than 120m from the project location. No large snags were recorded within the project area. Since the preferred habitat for this species does not exist with the project area, this species as well as its habitat is not further discussed in this report.

Eastern Milksnake

Eastern milksnake is a species of Special Concern which is a habitat generalist, often found in open woodlands, fields, and farm buildings (OMNR 2000). These habitat types, including open pastures, provide foraging habitat for this species within 120m of the project location.

This species has been identified within the vicinity of the project area through a review of the Ontario Herpetofauna Atlas (Oldham and Weller 2002). According to the 2011 Addendum to the SWHTG, snake hibernation takes place in sites located below the frost line within burrows, rock crevices and other natural locations, and candidate significant habitat includes rock piles, slopes, stone fences or crumbling foundations (OMNR 2011a). Also, according to Appendix Q of the SWHTG, significant snake hibernacula support two or more species of concern, may support more than one species, those that support the greatest number of species, those with the highest number of individuals, and those that

are least disturbed are the most significant. Sites that are located in areas with good movement corridors are also the most significant (OMNR 2000).

A total of 4 candidate snake hibernacula were identified outside of the project area, with the closest candidate snake hibernacula located 220m from closest project location. Despite potential foraging habitat being present within the project location, critical habitat for this species is not present within 120m of the project location. As such, NRSI recommends that candidate habitat for this species is not present within 120m of the project location.

Eastern Ribbonsnake

Eastern ribbonsnakes are a species of Special Concern which live in open grassy areas with low, dense vegetation near bodies of shallow permanent calm water (OMNR 2000). Habitat of this type is not available within 120m of the Glenarm Solar Park project location, and as such, this species as well as its habitat not further discussed in this report.

Jefferson Salamander/Blue-spotted Salamander Complex and Polyploids

Jefferson salamander/blue-spotted salamander complex and polyploids are considered species of conservation concern based on a provincial S-Rank of S2, indicating that populations of this species are imperilled within Ontario. This species prefers damp, shady deciduous forest, swamps, moist pasture, and lakeshores, and it requires temporary woodland pools for breeding (OMNR, 2000). Preferred habitat for this species is not available within 120m of the Glenarm Solar Park project location, and as such, this species as well as its habitat not further discussed in this report.

In addition to the species of conservation concern identified in the records review, an additional 2 species of conservation concern have been identified during the site investigations. These species represent 1 butterfly and 1 frog, and have been identified below:

Monarch

The monarch (*Danaus plexippus*) is a federal and provincial species of Special Concern (COSEWIC 2011; OMNR 2009). This species utilizes milkweeds as a host plant, and relies on the presence of other common field species, including goldenrods and asters (Government of Canada 2007). Two monarchs were observed in the meadow marsh, adjacent to Moor Road, located within WET-002 during the vegetation mapping and floral inventory survey on August 26, 2010.

According to the Wildlife Habitat Decision Support Tool for the SWHTG (OMNR 2000), for a field or meadow to function as breeding habitat for monarch butterflies, it must contain relatively large populations of milkweed plants. No milkweed was found within the project area, and only occasional amounts of swamp milkweed was observed further than 120m from the project location, within WOD-002. As no milkweed species were identified within the project area, and only spare amounts of swamp milkweed were identified within the vicinity of the project area, NRSI recommends that candidate habitat for the monarch does

not exist within the project area. As such, habitat for this species is no longer discussed in this report.

Western Chorus Frog

The western chorus frog is a federally Threatened species and is considered Not at Risk in Ontario (COSEWIC 2010; OMNR 2009). One individual was heard calling from a drainage ditch, located in the north end of the project area, during the wildlife habitat identification site investigation. This drainage ditch is approximately 1.1km in length, and is located approximately 50m north of the closest portion of the project location.

This species prefers roadside ditches or temporary ponds in fields, as well as swamps, wet meadows, woodland or open country with cover and moisture or small ponds and temporary pools (OMNR 2000). Although this species was heard calling from a drainage ditch in the project area, this feature does not provide critical habitat for the western chorus frog in order to carry out its life processes. In addition, several large wetlands are present within the general vicinity of the project area, including the Provincially Significant Balsam Lake 1 Wetland (located approximately 1.5km east of the project area). The Balsam Lake 1 PSW provides emergent and floating aquatic vegetation, which is required for breeding habitat for this species, as well as providing foraging habitat within the wetland for adults. NRSI recommends that although a western chorus frog was heard calling within 120m of the project location, this feature does not provide suitable habitat for this species. As a result, NRSI recommends that no candidate significant habitat for the western chorus frog is present within 120m of the project location.

No other candidate SWH for species of conservation concern have been identified within the Glenarm Solar Park project area.

Table 11 below summarizes all candidate habitats for species of conservation concern considered for the Glenarm Solar Park project area, including habitat characteristics as identified in the SWHTG (OMNR 2000), including Appendix Q, as well as the SWH Ecoregion Criteria Schedules Addendum (OMNR 2011b). This table also includes habitat presence within the project area, site investigation observations, and whether any candidate seasonal concentration areas will be carried forward to the Evaluation of Significance.

Table 11. Summary of Candidate Habitats for Species of Conservation Concern Considered for the Glenarm Solar Park Project Area

Candidate Habitat for Species of Conservation Concern	Habitat Characteristics Appendix Q Suggested Criteria Significant Wildlife Habitat Technical Guide and 2011 Addendum Habitat Criteria		Present Within 120m of Project Location	Details	Carried Forward to Summary and EOS
Marsh Bird Breeding Habitat	• Degree of rarity of species found at site • Documented significant decline in a species and/or its critical habitat • Species whose range is solely or primarily found in Ontario (i.e., provincial responsibility) • Condition of existing habitat at site • Size of species population at site • Size and location of habitat • Potential for long-term protection of the habitat • Representation of species/habitat within the municipality • Evidence of use of the habitat • Species of particular interest to the planning authority	All wetland habitats with shallow water and emergent aquatic vegetation. May include any of the following Community Types: Meadow Marsh (MAM), Shallow Aquatic (SA), Open Bog (BOO), Open Fen (FEO)[1].	No	No wetland habitats with shallow water and emergent aquatic vegetation are present within the project area.	No
Woodland Area-sensitive Bird Breeding Habitat		Habitats where interior forest (at least 100m from the forest edge) breeding birds are breeding. These include any of the following Community Types: Forest (FO), Treed Swamp (SW) that are mature (>60 years old) and >30ha[1].	No	No Forest (FO) and/or Treed Swamp (SW) community types have been identified within the project area.	No
Open Country Bird Breeding Habitat		Grassland areas > 30ha, not Class 1 or Class 2 agricultural lands, with no row-cropping or intensive hay or livestock pasturing in the last 5 years, in the following Community Type: Meadow (ME)[1].	Yes	Three candidate open country bird breeding habitats have been identified within the project area. OCB-001 is a large (263ha) Open Pasture (OAGM4) that covers most of the project area. OCB-002 is a large (43ha) Open Pasture (OAGM4) that covers a small portion of the project area in the southwest end.	Yes

	(e.g., the CAC may recommend certain species such as indicator species)			OCB-003 is a large (78ha) habitat that has been classified as a Perennial Cover Crop (OAGM2) field.	
Shrub/Early Successional Bird Breeding Habitat		Oldfield areas succeeding to shrub and thicket habitats >30ha, not Class 1 or Class 2 agricultural lands, with no row-cropping or intensive hay or livestock pasturing in the last 5 years, in the following Community Types: Thickets (TH), Savannahs (SV)[1].	No	There are no old field areas succeeding to shrub and thicket habitats (Savannah (SW) and Thicket (TH) community types)>30ha within the project area.	No
Terrestrial Crayfish		Meadow and edges of shallow marshes in the following Community Types: Meadow Marsh (MAM), Shallow Marsh (MAS)[1]	No	There are no Meadow Marsh (MAM) and/or Shallow Marsh (MAS) community types present within the project area.	No
Special Concern and Rare Wildlife Species		All Species Concern or provincial rare plant and animal species element occurrences within a 1 or 10km grid[1].	No	Based on a detailed records review, NRSI biologists noted the potential presence of 11 species of Species Concern or provincial rare plant and animal species within the vicinity of the project area. Three other species of conservation concern were identified within the project area during site investigations. Based on the habitat requirements for each of these species , compared with site-specific characteristics documented during the site investigation, no candidate significant habitat for special concern and rare wildlife species is present within the project area.	No

[1]: OMNR Significant Wildlife Habitat Ecoregion Criteria Schedules: Addendum to SWHTG (Working Draft) (2011b)
[2]: OMNR Significant Wildlife Habitat Technical Guide (2000)

6.5.4 Animal Movement Corridors

No candidate significant deer or amphibian movement corridors were identified within the Glenarm Solar Park project area during the site investigation.

6.6 Summary of Corrections to Records Obtained During Records Review

Following the completion of the site investigation, no corrections are to be made from the information collected during the records review phase of this project.

6.7 Site Investigation Summary

A total of 3 natural features, all identified as candidate significant wildlife habitats, have been determined through site investigations to be within the Glenarm Solar Park project area. These 3 candidate significant wildlife habitats represent open country bird breeding habitat and are listed in Table 12, including distance to the proposed project location. These habitats are depicted in Figure 2. The significance of each of these features has also been addressed in detail in Section 8.0 of this report.

Table 12. Summary of Candidate Significant Natural Features and Proximity to Project Location for the Glenarm Solar Park

Natural Feature Type	Natural Feature ID	Distance to Closest Project Location
Open Country Bird Breeding Habitat	OCB-001	Overlapping
	OCB-002	35m
	OCB-003	40m

Figure 2

Glenarm Solar Park

Natural Features

660000 660500 661000 661500 662000 662500 663000 663500 664000

4928000 4927500 4927000 4926500 4926000 4925500 4925000 4924500

PALESTINE RD
SANDRINGHAM RD
KIRKFIELD RD
PROSPECT RD
GLENARM RD

OAGM4
OCB-001
MAMM1-13
WET-001
SWTM3-6
FOMM7-2
WOD-003
SWDM4-5
WOD-002
MAMM1-2
WET-002
FODM8-1
WOD-001
CVR_4
MAMM1-3
THCM2-1
OAGM4
OCB-002
OAGM2
OCB-003

Path: X:\1072_GlenarmSolarPark\NRSI_1072_Fig2_NaturalFeatures_15K_2012_01_27_ELF.mxd

Legend

- Project Area (120m)
- Project Location
- Primary Road
- Secondary Road
- Watercourse
- Wetland Area (OBM)
- Wooded Area (OBM)
- Wetland Habitat (NRSI)
- Woodland Habitat (NRSI)
- **Ecological Land Classification**

(CVR_4) Rural Property
(FODM8-1) Fresh – Moist Poplar Deciduous Forest Type
(FOMM7-2) Fresh – Moist White Cedar – Hardwood Mixed Forest Type
(MAMM1-13) Rush Graminoid Mineral Meadow Marsh Type
(MAMM1-2) Cattail Graminoid Mineral Meadow Marsh Type
(MAMM1-3) Reed-canary Grass Graminoid Mineral Meadow Marsh Type
(OAGM2) Perennial Cover Crop
(OAGM4) Open Pasture
(SWDM4-5) Poplar Mineral Deciduous Swamp Type
(SWTM3-6) Mixed Willow Mineral Deciduous Thicket Swamp Type
(THCM2-1) Fresh - Moist White Cedar Coniferous Thicket Type

Candidate Significant Natural Features

- Open Country Bird Breeding Habitat

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Project: 1072
Date: January 31, 2012

NAD83 - UTM Zone 17
Scale: 1:15,000 (11x17")

N

0 200 400 600 800 Metres

7.0 Evaluation of Significance Methodology

In accordance with the REA regulation, NRSI biologists have completed a comprehensive records review and site investigations to confirm site-specific ecological functions of the habitats within the Glenarm Solar Park project area. The results of these tasks have provided the information required to evaluate the significance of 3 identified natural features within 120m of the project location. NRSI has reviewed all natural features within the project area and compared the site-specific conditions and results of field investigations to available evaluation criteria to determine their significance. The methodology and evaluation criteria used to determine significance is outlined in the following sections.

7.1 Staff Roles

The requirements of the REA process indicate that the name and qualifications of all staff participating in the evaluation of significance should be included. As a result, the qualifications and roles of all staff participating in the evaluation of significance at the Glenarm Solar Park have been outlined in the following sections.

Andrew G. Ryckman, B.Sc.
Andrew is a Terrestrial and Wetland Biologist with seven years of environmental experience. He routinely manages the natural heritage aspects of renewable energy projects, with specific expertise relating to bats and herpetofauna. Andrew is certified in Ecological Land Classification (2010), and has successfully completed a Bat Conservation International (BCI) Acoustic Monitoring Workshop (2008).

Andrew's role in the Glenarm Solar Park was to act as the project manager, overseeing all aspects of the Natural Heritage Assessment, including all associated field work and reporting. He was also the main contact point for agency staff. Andrew assisted with the preparation of this report, and worked with other staff to evaluate the significance of several of the natural features within the Glenarm Solar Park project area.

Christy L. Humphrey, B.E.S.
Christy has more than 2 years of environmental consulting experience, working on a variety of projects tasks. Her primary areas of expertise are vegetation mapping and floral inventories, but she has experience conducting bird and bat assessments, amphibian studies, and other fauna assessments. Christy is certified in both the Ecological Land Classification (ELC) for Southern Ontario (2010) and Northeastern Ecological Land Classification (2010), and participated in the Ontario MNR Bat Monitoring Workshop for Wind Power Projects (2010).

Christy assisted with Ecological Land Classification within the project area and vicinity for the evaluation of significance. She also assisted in the preparation of this Natural Heritage Assessment report.

Kevin S. Dance, M.E.S.
Kevin is a Terrestrial and Wetland Biologist with 5 years of experience working on a variety of environmental projects, including extensive experience in the renewable energy industry. Kevin's primary area of expertise is in avian ecology with specialization in raptor behavior and ecology, and has conducted his master's research on raptor interactions around an operational wind energy facility in Ontario. Kevin is certified in Ecological Land Classification (2009).

Kevin assisted with the Ecological Land Classification within the project area and vicinity for the evaluation of significance. He also assisted in the preparation of this Natural Heritage Assessment report.

Margaret Martin, M.Sc.
Margaret is a Terrestrial and Wetland Biologist who has over 5 years of experience working on a variety of studies characterizing terrestrial and wetland resources. She has conducted multiple detailed wetland evaluations using the Ontario Wetland Evaluation System, worked with the Forest Ecosystems of Central Ontario and has applied the Ecological Land Classification on many sites in southern Ontario. Margaret routinely conducts natural area inventories, vegetation community mapping and surveys of bats, migrating and breeding birds and terrestrial mammals. Margaret conducted her master's research on paleo-ecology, specifically relating to the effects of climate and anthropogenic causes of ecosystem plasticity.

Margaret's role was to conduct Ecological Land Classification and breeding bird surveys within the project area for the evaluation of significance of wildlife habitats.

Pamela Tucciarone, B.Sc.
Pamela graduated from the University of Toronto in a Biology Specialist program. She has more than 2 years of practical work experience, focusing on urban forestry, insect identification, and insect pest management. During this time period, she specialized in detecting the presence of the emerald ash borer and delineating the extent of its infestation. Pamela is a certified arborist (2011) and has participated in field investigations and reporting for several REA solar and wind power projects in southern and northern Ontario.

Pamela's role was to conduct wildlife habitat surveys within the project area for the evaluation of significance. She also assisted in the preparation of this Natural Heritage Assessment report.

Tara Lessard, B.Sc.
Tara is a Terrestrial and Wetland Biologist with more than 4 years of experience working in the environmental field. During her consulting experience, Tara has conducted bird and bat assessments, amphibian studies, and other fauna

assessments throughout Ontario. Tara has participated in field investigations and reporting for wind power projects in Ontario and New Brunswick.

Tara assisted in the preparation of this Natural Heritage Assessment report and EIS.

7.2 Evaluation Dates

A total of 2 survey types were conducted for the Glenarm Solar Park project in order to evaluate the significance of the 3 candidate significant natural features identified through the site investigations. The evaluation of natural feature significance occurred over 2 dates, and were all conducted in good weather conditions with temperatures consistently around 15-16℃. A summary of the survey dates, tem peratures, and the surveys that were conducted in order to evaluate the significance of candidate significant natural features has been provided in Table 13 below. Although the evaluation of significance typically focused on specific tasks, biologists recorded any applicable information, including all wildlife observations.

Table 13. Summary of Survey Types Evaluated for Significance at the Glenarm Solar Park

Survey Date(s)	Temp. (℃)	Surveys Conducted to Evaluate the Significance of Candidate Significant Natural Features
June 17, 2010	16	Breeding Bird Survey (Visit 1) Vegetation Mapping and Floral Inventory
July 1, 2010	15	Breeding Bird Survey (Visit 2)

In addition to the site-specific natural feature significance surveys conducted at the Glenarm Solar Park project area, an office-based evaluation of significance was also conducted on May 16, 2011 to compare the field results with evaluation criteria outlined in the Natural Heritage Assessment Guide for Renewable Energy Projects (OMNR 2010c). This office-based evaluation of significance was completed to ensure that all evaluated natural features were within the requirements of the REA regulation.

7.3 Areas of Natural and Scientific Interest

No Areas of Natural and Scientific Interest (ANSI) have been confirmed within 120m of the project location, based on the records review. ANSIs are designated based on site

investigations by MNR and their designation is warranted as a result of their level of significance, either provincially or regionally.

7.4 Wetlands

Wetlands within the vicinity of the project area were initially identified through the use of modified ELC for southern Ontario (Lee et al. 1998) and ELC code assignment was based on updates made to the system in 2008 (Lee 2008). This vegetation community classification system allows for the assessment of vegetation communities for preliminary delineations of upland, lowland, and wetland habitats among other community types.

All these features are located further than 120m from the project location. As a result, NRSI biologists did not have to conduct a specific evaluation of significance of these natural features.

7.5 Valleylands

Site-specific field investigations, in conjunction with records review and agency consultation, have been used to identify any potential candidate significant valleylands within the project area.

Site investigations at the Glenarm Solar Park have not identified any candidate significant valleylands within 120m of the project location.

7.6 Woodlands

NRSI biologists used modified Ecological Land Classification (ELC) for southern Ontario to identify woodlands within the project area (Lee et. al. 1998)and ELC code assignment was based on updates made to the system in 2008 (Lee 2008). Through this vegetation mapping technique, three woodland communities were identified within the vicinity of the project area. No woodlands were identified within the Glenarm Solar Park project area. Therefore, NRSI biologists did not have to implement evaluation of significance criteria for this type of feature.

7.7 Wildlife Habitat

For the review of candidate significant wildlife habitat, NRSI biologists have consulted the Significant Wildlife Habitat Technical Guide (SWHTG) (OMNR 2000), including Appendix Q, and the subsequent Significant Wildlife Habitat Ecoregion Criteria Schedules for Ecoregion 6E addendum (OMNR 2011a). These documents identify a wide variety of candidate significant wildlife habitat and criteria used to evaluate their respective significance. Evaluation criteria have been separated into the four broad groups of significant wildlife habitat: seasonal concentration areas, rare vegetation communities and specialized wildlife habitat, habitats of species of conservation concern, and animal movement corridors. Each of these categories of wildlife habitat is described in more detail in the sub-sections below.

7.7.1 Seasonal Concentration Areas

NRSI has reviewed the list of seasonal concentration areas, including avian stopover and staging areas, raptor winter feeding areas, colonial nesting bird habitat, deer yards, reptile hibernacula, etc., as identified in the documents mentioned above and compared site-specific wildlife inventory in conjunction with vegetation mapping to each evaluation criteria. No candidate seasonal concentration areas were identified within the Glenarm Solar Park project area. Therefore, NRSI biologists did not have to implement evaluation of significance criteria for this type of wildlife habitat.

7.7.2 Rare Vegetation Communities and Specialized Wildlife Habitat

Rare vegetation communities, as identified by the SWHTG, include alvars, tallgrass prairies, sand barrens, and old-growth forests (OMNR 2000). No rare vegetation communities were identified within the Glenarm Solar Park project area. Therefore, NRSI biologists did not have to implement evaluation of significance criteria for these rare vegetation communities.

The evaluation criteria for specialized wildlife habitat, including turtle nesting habitat, woodland raptor nesting habitat, and osprey nesting, foraging, and perching habitat, has been reviewed and compared with the results of the records review and site investigation. No specialized wildlife habitats were identified within the Glenarm Solar Park project area. Therefore, NRSI biologists did not have to implement evaluation of significance criteria for specialized wildlife habitats.

7.7.3 Habitats of Species of Conservation Concern

Species of conservation concern include any species that has been designated a provincial species of Special Concern or any species assigned a provincial S-Rank of S1, S2, or S3 (Critically Imperiled, Imperiled, and Vulnerable, respectively). Habitats of species of conservation concern do not include habitats of provincially Endangered or Threatened species, which are addressed in a separate *Approval and Permitting Requirements Document* to satisfy the requirements of the *Endangered Species Act* (2007).

Habitats for species of conservation concern can include specific habitat associations, such as marsh breeding bird habitat or open country breeding bird habitat, but also include preferred habitats for any species (or community) of conservation concern within the project area. Preferred habitats for species of conservation concern identified within the project have been used to evaluate any wildlife habitat within Section 8.0 of this report.

Three candidate significant habitats of species of conservation concern associated with open country bird breeding habitat have been identified within the Glenarm Solar Park project area. NRSI has used the criteria outlined in Appendix Q of the Significant Wildlife Habitat Technical Guide (SWHTG) (2000) as well as the Ecoregion Criteria Schedules Addendum to the Significant Wildlife Habitat Technical Guide, for Ecoregion 6E (OMNR 2011a) to evaluate these features. The general evaluation criteria for these open country bird breeding habitats are outlined in Table 14.

Table 14. Habitats of Species of Conservation Concern Evaluation of Significance Criteria

Habitat of Species of Conservation Concern	Appendix Q Suggested Guidelines for Evaluation of Significance	2011 Addendum to the SWHTG Defining Criteria for the Evaluation of Significance
Open Country Bird Breeding Habitat	- Habitats of the rarest species are most significant - Habitat for species in greatest decline is most significant - Habitat for species within the poorest representation within the planning area is most significant - Sites that provide the best survival requirements for species are most	- Presence of breeding individuals of 2 or more indicator species (grasshopper sparrow (*Ammodramus savannarum)*, vesper sparrow (*Pooecetes gramineus)*, or upland sandpiper (*Bartramia*

	significant - Habitats supporting large populations of several species or of a single species is most significant - Large sites, including those that support large populations of several species of conservation concern are most significant - Sites large enough to ensure long-term support and viability of species of conservation concern are significant - Sites with large areas of suitable habitat, connected to other suitable habitat are most significant - Habitats that provide the best opportunity for long-term protection are most significant - Poorly represented habitats for species of conservation concern are significant - Sites with documented traditional use by species are most significant - Sites providing the best examples of habitat that will ensure the long-term sustainability of the species are significant.	*longicauda*), in addition to at least 1 common species (eastern kingbird (*Tyrannus tyrannus*), northern harrier (*Circus cyaneus)*, American kestrel (*Falco sparverius*), savannah sparrow (*Passerculus sandwichensis*). - Confirmation of short-eared owl (*Asio flammeus*) breeding within any field

NRSI biologists conducted 2 evaluation of significance surveys on June 17th and July 1st, 2010, that focused on identifying breeding bird species and habitats within the Glenarm Solar Park project area. These two visits were conducted during early morning hours with at least 10 days between visits, following recommended monitoring protocol of the OBBA. During each site visit, NRSI biologists conducted area searches throughout the project area, and recorded all bird species observed within each general habitat type. Breeding evidence for each species was recorded, using standard breeding codes recognized by the OBBA. A list of all bird species identified during the breeding bird survey is provided in Appendix I.

7.7.4 Animal Movement Corridors

Animal movement corridors are typically considered linear features that connect two or more significant, or otherwise ecologically important, habitats. These features are important for several reasons, including promoting genetic flow, protection from predators, and connectivity to habitats required for breeding, foraging, and/or hibernating. No animal movement corridors have been confirmed within 120m of the project location, based on the records review.

8.0 Evaluation of Natural Feature Significance

In accordance with the REA Regulation, the presence of candidate significant natural features within the project area has been reviewed by NRSI biologists. NRSI has used the results of the records review and site investigation to evaluate the environmental significance of the natural features identified within the project area. This evaluation of significance has been conducted using evaluation criteria outlined in applicable guidance documents, including the Natural Heritage Assessment Guide for Renewable Energy Projects (OMNR 2010c) and Significant Wildlife Habitat Technical Guide (SWHTG) (OMNR 2000) and as outlined in Section 7.0.

8.1 Areas of Natural and Scientific Interest

No ANSIs have been identified within the Glenarm Solar Park project area.

8.2 Wetlands

No wetlands have been identified within the Glenarm Solar Park project area.

8.3 Woodlands

No woodlands have been identified within the Glenarm Solar Park project area.

8.4 Valleylands

No valleylands have been identified within the Glenarm Solar Park project area.

8.5 Wildlife Habitat

NRSI has reviewed the 4 broad categories of significant wildlife habitat, as identified by the Significant Wildlife Habitat Technical Guide (SWHTG) (OMNR 2000), which include seasonal concentration areas, specialized wildlife habitat, habitats of species of conservation concern, and animal movement corridors. NRSI has identified a total of 3candidate significant wildlife habitat areas within the Glenarm Solar Park project area. Each of these candidate natural features has been addressed in more detail below, using the SWHTG and DRAFT Significant Wildlife Habitat Ecoregion Criteria Schedules for Ecoregion 6E (OMNR 2011a), which encompasses the entire project area.

8.5.1 Seasonal Concentration Areas

No candidate seasonal concentration areas have been identified within the Glenarm Solar Park project area.

8.5.2 Rare Vegetation Communities and Specialized Wildlife Habitat

No candidate significant rare vegetation communities or candidate specialized wildlife habitats were identified within the Glenarm Solar Park project area.

8.5.3 Habitats of Species of Conservation Concern

NRSI biologists have identified the presence of 3candidate significant habitats of species of conservation concern associated with open country bird breeding habitat. The evaluation of the significance of these natural features is outlined below.

OCB-001 (Open Country Bird Breeding Habitat)

According to Appendix Q of the SWHTG, size and location must be considered to determine if candidate open country bird breeding habitat is present (OMNR 2000). Also, according to the 2011 Addendum to the SWHTG, large grassland areas greater than 30ha are considered examples of open country bird breeding habitat (OMNR 2011a). A candidate significant open country bird breeding habitat has been identified within the Glenarm Solar Park project area. This habitat includes the open pasture that makes up most of the project area (263ha), and provides approximately 175ha of interior habitat for open country breeding bird species. This habitat overlaps the proposed project location.

According to the 2011 Addendum to the SWHTG, in order to be considered significant, the presence of nesting or breeding of 2 or more indicator species and at least 1 common species must be identified within the project area (OMNR 2011a). The results of the breeding bird surveys identified the presence of one common field species, eastern kingbird, displaying possible evidence of breeding. The eastern kingbird was observed further than 120m from the project location withinWET-001. No indicator species were observed during the breeding bird surveys.

Although these area searches that have been completed by NRSI provide results that suggest this feature is not significant, the MNR has recommended that additional surveys may be required following a combination of standardized transect and point counts to address the potential significance of this area. These recommended surveys are proposed to generally follow the methods outlined in the *Birds and Bird Habitat* provincial guidelines (OMNR 2010) or *Bobolink Survey Methodology* (OMNR 2011), both of which were released after the completion of the breeding surveys completed by NRSI in 2010. As such, OCB-001 has been assumed significant for the purposes of this report, and pre-construction breeding bird surveys (i.e. point counts) have been committed to in the Environmental Impact Study (Section 10).

OCB-002 (Open Country Bird Breeding Habitat)

A second candidate significant open country bird breeding habitat has been identified within the Glenarm Solar Park project area. This habitat includes the open pasture that makes up a portion (43ha) of the southwestern project area, and provides approximately 20ha of interior habitat for open country breeding bird species. This habitat is located approximately 35m from the closest portion of the project location.

According to the 2011 Addendum to the SWHTG, in order to be considered significant, the presence of nesting or breeding of 2 or more indicator species and at least 1 common species must be identified within the project area (OMNR 2011a). The results of the breeding bird surveys identified the presence of one common field species, eastern kingbird, displaying possible evidence of breeding. The eastern kingbird was observed further than 120m from the project location within WET-001. No indicator species were observed during the breeding bird surveys.

Although these area searches that have been completed by NRSI provide results that suggest this feature is not significant, the MNR has recommended that additional surveys may be required following a combination of standardized transect and point counts to address the potential significance of this area. These recommended surveys are proposed to generally follow the methods outlined in the *Birds and Bird Habitat* provincial guidelines (OMNR 2010) or *Bobolink Survey Methodology* (OMNR 2011), both of which were released after the completion of the breeding surveys completed by NRSI in 2010. As such, OCB-001 has been assumed significant for the purposes of this report, and pre-construction breeding bird surveys (i.e. point counts) have been committed to in the Environmental Impact Study (Section 10).

OCB-003 (Open Country Bird Breeding Habitat)

A third candidate significant open country bird breeding habitat has been identified within the Glenarm Solar Park project area. This habitat includes the 78ha hay field that makes up a small portion of the project area in the south, and provides approximately 40ha of interior habitat for open country breeding bird species. This habitat is located approximately 40m from the closest portion of the project location.

According to the 2011 Addendum to the SWHTG, in order to be considered significant, the presence of nesting or breeding of 2 or more indicator species and at least 1 common species must be identified within the project area (OMNR 2011a). No indicator or common species were observed during the breeding bird surveys.

Although these area searches that have been completed by NRSI provide results that suggest this feature is not significant, the MNR has recommended that additional surveys may be required following a combination of standardized transect and point counts to address the potential significance of this area. These recommended surveys are proposed to generally follow the methods outlined in the *Birds and Bird Habitat* provincial guidelines (OMNR 2010) or *Bobolink Survey Methodology* (OMNR 2011), both of which were released after the completion of

the breeding surveys completed by NRSI in 2010. As such, OCB-001 has been assumed significant for the purposes of this report, and pre-construction breeding bird surveys (i.e. point counts) have been committed to in the Environmental Impact Study (Section 10).

No other candidate significant habitats of species of conservation concern were identified within the Glenarm Solar Park project area.

8.5.4 Animal Movement Corridors

No candidate significant animal movement corridors have been identified within the Glenarm Solar Park project area.

8.6 Evaluation of Significance Summary

A comprehensive analysis of natural features found within 120m of the Glenarm Solar Park project location was conducted by NRSI biologists to determine their significance. This analysis combined the information collected during the records review, site investigation, and evaluation of significance phases of this project. The evaluation of significance was conducted following the criteria identified in the Natural Heritage Assessment Guide for Renewable Energy Projects (OMNR 2010c) and the SWHTG (OMNR 2000).

The results of the site investigation phase of this project identified 3 candidate significant natural features within 120m of the Glenarm Solar Park project location, and were all identified as habitats of species of conservation concern. An evaluation of significance was completed for each of these 3 natural features, and it was assumed that all 3 of these features are significant for the purposes of this report. A summary of these 3 natural features, including distance to project location, can be seen in Table 15 below. These habitats are depicted in Figure 3.

Table 15. Summary of Significant Natural Features and Proximity to Project Location for the Glenarm Solar Park Project Area

Natural Feature ID	Distance to Nearest Project Location	Significance	EIS Required
OCB-001	Overlapping	Presumed	**Yes**
OCB-002	35m	Presumed	**Yes**
OCB-003	40m	Presumed	**Yes**

The REA Regulation requires that an Environmental Impact Study (EIS) be completed to identify and mitigate for any impacts to significant natural features found within 120m of the project location. Three significant natural features were identified within 120m of the project location. As a result, an EIS is required for the Glenarm Solar Park.

Figure 3

Glenarm Solar Park

Significant Natural Features

660000 660500 661000 661500 662000 662500 663000 663500 664000

4928000 4927500 4927000 4926500 4926000 4925500 4925000 4924500

PALESTINE RD

PROSPECT RD

GLENARM RD

SANDRINGHAM RD

KIRKFIELD RD

OCB-001
OAGM4

OCB-001

OCB-001

OCB-001

OCB-001

OCB-001

OCB-002
OAGM4

OCB-003
OAGM2

MAMM1-13

SWTM3-6

MAMM1-13

SWTM3-6

FODM8-1

FOMM7-2

SWDM4-5

CVR_4

MAMM1-2

MAMM1-2

OAGM4

THCM2-1

CVR_4

MAMM1-3

CVR_4

CVR_4

Legend

- Project Area (120m)
- Project Location
- Primary Road
- Secondary Road
- Watercourse
- Wetland Area (OBM)
- Wooded Area (OBM)
- Wetland Habitat (NRSI)
- Woodland Habitat (NRSI)
- **Ecological Land Classification**

(CVR_4) Rural Property
(FODM8-1) Fresh – Moist Poplar Deciduous Forest Type
(FOMM7-2) Fresh – Moist White Cedar – Hardwood Mixed Forest Type
(MAMM1-13) Rush Graminoid Mineral Meadow Marsh Type
(MAMM1-2) Cattail Graminoid Mineral Meadow Marsh Type
(MAMM1-3) Reed-canary Grass Graminoid Mineral Meadow Marsh Type
(OAGM2) Perennial Cover Crop
(OAGM4) Open Pasture
(SWDM4-5) Poplar Mineral Deciduous Swamp Type
(SWTM3-6) Mixed Willow Mineral Deciduous Thicket Swamp Type
(THCM2-1) Fresh - Moist White Cedar Coniferous Thicket Type

Significant Natural Features

- Open Country Bird Breeding Habitat

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

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Copyright: Queen's Printer Ontario

Project: 1072
Date: February 29, 2012

NAD83 - UTM Zone 17
Scale: 1:15,000 (11x17")

0 200 400 600 800 Metres

N

Path: X:\1072_GlenarmSolarPark\NRSI_1072_Fig3_SigFeatures_15K_2012_01_27_ELF.mxd

9.0 Description of the Proposed Undertaking

In accordance with the Renewable Energy Approval (REA), the presence of significant natural features within the Glenarm Solar Park project area has been reviewed by NRSI biologists. Based on natural features, vegetation communities, and wildlife habitat present within the project area, summarized in previous sections, NRSI biologists have examined the potential for this project impact the surrounding features. NRSI has used the detailed records review, site investigation, and evaluation of significance to determine the environmental significance of each of these potentially significant features, using provincially accepted evaluation criteria outlined in the Natural Heritage Reference Manual (OMNR 2011a), Significant Wildlife Habitat Technical Guide (SWHTG) (OMNR 2000)and Significant Wildlife Habitat Ecoregion 6E Criteria Schedule (OMNR 2011b).

The construction of this project is expected to occur over a six or seven month period. The approximate project schedule is outlined in Table 16 below.

Table 16. Project Schedule for the Glenarm Solar Park Project

Project Activity	Month 1	Month 2	Month 3	Month 4	Month 5	Months 6-7
Clearing of areas	●					
New access road construction and upgrades	●	●				
Foundation construction			●	●		
PV panel installation			●	●	●	
Substation construction			●	●	●	
Cabling construction			●	●	●	
Site reclamation					●	If appropriate
Testing					●	●
Commissioning						●

9.1 Site Preparation and Servicing

NRSI has reviewed the list of site preparation and servicing activities that may be required for the Glenarm Solar Park, including grading and installation of services and utilities. A specific project layout has not been prepared as part of this report, however a project outline has been considered. Within this project boundary, NRSI has assumed that any project component (solar panel, inverter, access road, etc.) may be placed

anywhere within the provided project boundary. A summary of the site preparation and servicing activities for this project, including timing and duration of each activity, are outlined in Table 17.

Table 17. Summary of Site Preparation and Servicing Activities within 120m of the Glenarm Solar Park Project Location

Project Activity	Timing	Duration	Description
Vegetation Removal (Clear and Grub All Areas for Project Components - Shoreline/Riparian Habitat)	N/A	N/A	None expected
Vegetation Removal (Clear and Grub All Areas for Project Components - Wetland Habitat)	N/A	N/A	None Expected
Vegetation Removal (Clear and Grub All Areas for Project Components - Upland Habitat)	Month 1	4 weeks (concurrent with access road construction)	The project location is approximately 60ha in size. Up to 32ha of open pasture habitat will be removed to accommodate project components including solar panels, foundations, access roads, and transmission lines.
Install Site Fencing	Month 1	3 weeks	A 2.7 m (9') chain link security fence will be installed around the perimeter of the solar facility.
Site Grading	Months 1 and 2	4 weeks	Minimal grading is expected to occur within the project area.

9.2 Construction

NRSI has reviewed the list of construction activities that may be required for the Glenarm Solar Park, including solar panel installation, road construction, etc. A specific project layout has not been prepared as part of this report, however a project outline has been considered. Within this project boundary, NRSI has assumed that any project component (solar panel, inverter, access road, etc.) may be placed anywhere within the provided project boundary. A summary of the construction activities for this project, including timing and duration of each activity, are outlined in Table 18.

Table 18. Summary of Construction Activities within 120m of the Glenarm Solar Park Project Location

Project Activity	Timing	Duration	Description
Access Road Construction	Month 1	4 weeks (concurrent with clearing and grubbing activities)	No water crossings by access roads are anticipated for this project. A series of access roads will be installed as part of the Glenarm Solar Park. These access roads are anticipated to be topped with gravel, or similar semi-porous material, and will be approximately 3.7 to 5m in width.
Foundation Construction	Months 3 and 4	6 weeks	The type of foundation will be determined based on subsurface conditions that were evaluated during the geotechnical assessment. Typically, this step will require the installation of ground screws or plate-pounded steel beams with possible pre-drilling. Excavated top soil and sub-soil will be salvaged for rehabilitation following project completion. The foundations for the inverter station(s) and transformer(s) will be made of concrete. The concrete may be prepared off-site and delivered by truck.
Building Construction	Months 3, 4 and 5	4 weeks (concurrent with electrical collector system construction)	Twelve 'buildings' may be associated with the Glenarm Solar Park, including a tower and up to 11 inverter huts.
Solar Panel Assembly and Installation	Months 3, 4 and 5	8 weeks (concurrent with foundation construction)	The proposed undertaking includes the installation of solar panel arrays for the development of a 10MW solar energy facility. Typically for a project of this size, panels are mounted on a racking system and are aligned in approximately 80 m and approximately 7 m apart.
Underground Cabling – Open Cut	Months 3, 4 and 5	4 weeks (concurrent with foundation	Open cut underground cabling may be required as part of the Glenarm Solar Park.

		construction and solar panel assembly and installation)	Underground cables will be buried in trenches approximately 1 m deep and varying from 0.5 m to 1 m in width. The trenched corridors will be restored with backfill to conform to the surrounding surface contours with appropriate materials for grounding.
Underground Cabling – Horizontal Direction Drilling	N/A	N/A	None expected
Installation of Electrical Collector System	Months 3, 4 and 5	4 weeks (concurrent with foundation construction and solar panel assembly and installation)	Overhead cabling may be installed as part of the Glenarm Solar Park.
Clean-up and Site Reclamation	Month 5 (and 6 and 7, if appropriate)	2 weeks	The disturbed areas will be stabilized to minimize potential for soil movement through mass wasting or surface erosion. This will be achieved through the application of various re-vegetation strategies and techniques specific to the characteristics of each site. Generally, salvaged subsoil will be replaced and capped with topsoil and salvaged organic material. The area around the solar panel installations will be seeded with a low-growing species, such as clover, as necessary. If required, an erosion control seed mix, consisting of fast-growing species can be used in areas of erosion risk.

9.3 Operation

NRSI has reviewed the list of operational activities that are required for the Glenarm Solar Park, including solar panel operation, maintenance, etc. A specific project layout has not been prepared as part of this report, however a project outline has been considered. Within this project boundary, NRSI has assumed that any project

component (solar panel, inverter, access road, etc.) may be placed anywhere within the provided project location. The duration of the operational phase of this project will coincide with the FIT contract, and for the purpose of this assessment it is assumed that the Glenarm Solar Park will be in operation for a minimum of 20 years. A summary of the operational activities for this project are outlined in Table 19.

Table 19. Summary of Operational Activities within 120m of the Glenarm Solar Park Project Location

Project Activity	Description
Groundwater and Surfacewater Taking	None Expected
Application of Herbicides	None Expected
Operation of solar arrays	The Glenarm Solar Project will be controlled via a remote system, software, and communication system to link each solar array to the inverter, enabling the staff to continuously monitor 24 hours a day. The system can be accessed remotely and allows for remote reset of minor fault conditions and access to data for fault analysis.
Solar Panel Maintenance	Regular maintenance will occur at all of the operational solar panels at the Glenarm Solar Park, and may include: • Servicing, inspection and replacement of weathered electrical components. • Clearing of snow, as required. • Panel washing, as required. No water taking is proposed to wash the panels. If panel washing is deemed necessary, water will be brought to the site, as required. • Vegetation control, as required. Vegetation will be controlled to allow access to all areas of the site and to maintain aesthetics • Monthly inspections of transformers to check for signs of oil leaks and general maintenance requirements In addition to regularly scheduled maintenance, occasional unscheduled maintenance activities may also be required.
Transportation and traffic	Regular maintenance services or site check-ups will only require minimal use of trucks. Access roads are maintained unless an unplanned event or malfunction requires the immediate intervention of heavy machinery or trucks.

9.4 Decommissioning

NRSI has reviewed the list of decommissioning activities that are required for the Glenarm Solar Park, including building removal, solar panel removal, etc. A specific project layout has not been prepared as part of this report, however a project outline has been considered. Within this project boundary, NRSI has assumed that any project component (solar panel, inverter, access road, etc.) may be placed anywhere within the provided project boundary. A summary of the decommissioning activities for this project are outlined in Table 20.

Table 20. Summary of Decommissioning Activities within 120m of the Glenarm Solar Park Project Location

Project Activity	Description
Above-Ground Structure Decommissioning	Decommissioning of the above-ground structures can be summarized as follows: • The solar energy facility shall be disconnected from the utility power grid; • Photovoltaic modules shall be disconnected from the site electrical network and removed from the support racks; PV modules shall be returned to the manufacturer, re-used, recycled, or safely disposed offsite; • The racking systems shall be dismantled and re-used, recycled or safely disposed of offsite; • Above-ground lines and poles that are not owned by Hydro One will be removed and will be filled with clean fill; • Components from the communication tower shall be removed and re-used, recycled, or safely disposed offsite; • Inverter, generators and transformers shall be disconnected and removed; these components shall be sent back to the manufacturer, re-used, recycled, or safely disposed offsite; and • The transformer shall be decommissioned in an appropriate manner and in accordance with current standards and best practices, and demolished.
Below-ground Structure Decommissioning	The below-ground decommissioning of the project can be summarized as follows: • Underground electrical lines shall be cut and the ends buried to approximately 1 m below grade, and left in place. These lines are inert and will have no negative impacts on the environment, soil or arboreal practices; and • Underground infrastructure and protective electrical structures involving concrete – such as concrete electrical shelters and

	concrete pad foundations for inverters and transformers – shall be removed and the area which is affected shall be backfilled as necessary. Waste concrete shall be recycled offsite by a concrete recycler or crushed onsite and used as fill material.
Equipment Dismantling and Removal	This Decommissioning Plan assumes that the area will be re-converted to vacant land, and thus the plan provides for the complete restoration of the areas used for the solar energy facility to return to their pre-Project conditions or to a state that is similar to its previous use. The decommissioning will also weigh the different options and proceed with dismantling in a way that is safe, beneficial to the environment, and beneficial to the landowners. If the facility is to be decommissioned and the solar energy facility is to be removed, the impacts will be similar to the Construction Phase, but in reverse sequence. For a detailed understanding of the construction activities, refer to the Construction Plan Report provided in this REA Application. The components of the solar energy facility will be dismantled and removed by licensed subcontractors using similar techniques as those employed during the construction of the Project. Conventional construction equipment will be used to dismantle the components and the materials will be recycled or re-used, where possible, or disposed of offsite at an approved and appropriate facility in accordance with provincial waste management regulations. Any wastes generated will be disposed of according to provincial waste management regulations.
Site Restoration	After the decommissioning process is completed, the land will be returned to the pre-Project conditions or to a state that is similar to its previous state. Restoration of lands is planned for the areas impacted by the location of photovoltaic modules, inverters, transformers, access roads, and laydown areas. It is expected that some soil disturbance will occur during decommissioning of the solar facility. This is likely to occur during removal and transportation of above and below-ground infrastructure and components. Disturbance may include mixing of soil profiles (topsoil and subsoil), compaction, rutting, erosion, and decrease of soil fertility. It is expected that stockpiled topsoil and subsoil from the Construction Phase will be available when required during site restoration. Once all infrastructure and components have been removed from the site, protection from erosion, improving soil fertility and soil structure will become the primary concern. It is recommended that the rehabilitated lands be seeded with a legume-grass mixture to help stabilize soil conditions, enhances soil structure, and increase soil fertility. Once this has been established, over time, the area will re-vegetate naturally to restore the site to pre-constructions conditions.

9.5 Approach to Impact Assessment

For the purposes of this report, the analysis of potential impacts has been divided into the different classifications of significant natural features, as identified by the evaluation of significance section of this report, with significant wildlife habitat further subdivided based on the distance to project location, type of wildlife habitat, and methods of determining significance, as follows:

- Provincial Parks or Conservation Reserves
- Areas of Natural or Scientific Interest
- Significant Woodlands
- Significant Wetlands
- Significant Valleylands
- Significant Wildlife Habitat (SWH)
    - Project Location within Confirmed SWH
    - Project Location within 120m of Confirmed SWH
    - Project Location within 120m of SWH Treated as Significant
    - Generalized Impacts to Wildlife Habitat

Potential impacts on each of the significant features or wildlife habitats within the Glenarm project area have been discussed collectively based on their respective distance to the closest project location that has the potential to have an operational impact. Given the potential impacts at various distances to project location, NRSI has grouped groups of features or wildlife habitats into 2 broad distance categories, overlapping, and 0-120m from the project location. The impacts within each of these distance categories are expected to be relatively consistent within the given distance, with slightly different impacts (and related mitigation measures) associated with each distance category.

10.0 Environmental Impact Study

In accordance with the Renewable Energy Approval (REA), the presence of significant natural features within the Glenarm Solar Park project area has been reviewed by NRSI biologists. Based on natural features, vegetation communities, and wildlife species present within the project area, summarized in previous sections, NRSI biologists have evaluated the project area for potentially significant natural areas and habitats. NRSI has used the detailed records review to evaluate the environmental significance of each of these potentially significant features, using evaluation criteria outlined in the Natural Heritage Reference Manual (OMNR 2010) and Significant Wildlife Habitat Technical Guide (SWHTG) (OMNR 2000).

Each of these significant natural features are discussed in more detail below, including potential impacts and proposed mitigation measures.

10.1 Provincial Parks or Conservation Reserves

No provincial parks or conservation reserves are present within 120m of the Glenarm Solar Park project location.

10.2 Areas of Natural and Scientific Interest (ANSIs)

No ANSIs (Life Science or Earth Science) are present within 120m of the Glenarm Solar Park project location.

10.3 Significant Woodlands, Wetlands, and Valleylands

No significant woodlands, wetlands or valleylands are present within 120m of the Glenarm Solar Park project location. No potentially negative impacts on these natural features are anticipated.

10.4 Significant Wildlife Habitat

NRSI biologists have completed comprehensive site investigations and evaluations of significance of all potential wildlife habitats within 120m of the Glenarm Solar Park project area. These studies have determined that 3 wildlife habitats that are presumed significant are present within 120m of the project location. In accordance with the REA Regulation, each of these features within 120m of a project component expected to have

an operational impact, as per Appendix D of the Natural Heritage Assessment Guide (OMNR 2011a), has been specifically addressed below.

10.4.1 Project Location within Confirmed Significant Wildlife Habitat

No significant wildlife habitat was confirmed within the Glenarm Solar Park project location.

10.4.2 Project Location within 120m of Confirmed Significant Wildlife Habitat

No significant wildlife habitat was confirmed within 120m of the Glenarm Solar Park project location.

10.4.3 Project Location within 120m of Wildlife Habitat Treated as Significant

NRSI biologists have identified wildlife habitats that could be considered significant, but require additional studies. For the purpose of this report, these habitats have been treated as significant with a commitment for additional pre-construction surveys to be undertaken during the appropriate season prior to any construction activities.

Wildlife habitats that have been treated as significant for the purposes of this EIS include 3 open country breeding bird habitats. Following the completion of the additional pre-construction surveys (described below), any feature determined to be significant, based on a comparison of data to provincial standards, will require the mitigation measures and contingency plans described below (Table 21) to be applied to that specific feature.

10.4.4 Project Location within 120m of Generalized Candidate Significant Wildlife Habitat

No generalized wildlife habitats have been assumed to be present within 120m of the project location where components will not have operational effects. As such, no potentially negative impacts on generalized candidate significant wildlife habitats are anticipated.

Table 21. Potential Impacts, Mitigation Measures, and Monitoring Plans during the Site Preparation, Construction, Operation and Decommissioning Phases of the Glenarm Solar Park for Wildlife Habitats that have been Presumed Significant.

Wildlife Habitat	Distance to Project Location	Project Activity	Potential Negative Effects	Pre-construction Surveys	Mitigation Measures and Objectives (if significant)	Monitoring and Objectives (if significant)
Site Preparation and Servicing						
OCB-001 Open Country Bird Breeding Habitat	Overlapping	Vegetation removal (i.e. clearing and grubbing of upland habitats)	Direct removal of nesting habitat for open country breeding birds	Surveys will be in accordance with Birds and Bird Habitats (OMNR 2011b). Point counts will be conducted, and will be focused on identifying breeding birds in open country habitats. Surveys will be conducted in the early morning, between a half hour before sunrise and about 4 hours after sunrise. Each point count will be ten minutes in length, and will be conducted on 3 visits between June 1st and July 15th, with at least 10 days between surveys. Survey stations will be 250m apart, ideally with the center point at least 100m from habitat edge. Standardized transect surveys will occur while walking between stations.	• The project location is approximately 60ha (148 acres) in size. Up to 32ha (79 acres) of open country bird breeding habitat will be removed within the project location, in order to accommodate all project components. Approximately 142ha (351 acres) of open country habitat exists within the property proposed for development. Of this 142ha (351 acres), approximately 110ha (272 acres) of open country habitat will remain on the property once the 32ha (79 acres) of habitat has been removed. In addition, approximately 242ha (598 acres) of open country habitat (i.e. the remainder of OCB-001, all of OCB-002 and OCB-003) exist adjacent to the proposed project location, and approximately 164ha (405 acres) of interior open country bird breeding habitat will remain in the vicinity of the project area once development has occurred. As such, the removal of 32ha (79 acres) of open country breeding bird habitat is insignificant considering the large amount of habitat that will still be available for open country breeding birds in the vicinity of the project area after the development has occurred and considering that open country bird species require only 30ha of suitable habitat for breeding. • In order to compensate for the removal of 32ha (79 acres) of open country habitat from the project location, up to 110ha (272 acres) (the remainder of the open country habitat on the property), but a minimum of 32ha (79	• Conduct post-construction point counts of habitats for 2 years after construction, following pre-construction methods <u>Objectives:</u> • Determine if breeding birds are still using adjacent habitats in similar numbers to pre-construction results

					acres) of open country bird breeding habitat within the property, will be maintained and managed for open country breeding birds. • Habitat management will include: mowing the habitat once per year to ensure that it remains open. Mowing will only occur outside of the breeding bird season (May 1st – July 15th). If hay is planted in this area, it will not be tilled or harvested during the breeding bird season. <u>Objectives:</u> • To compensate for the loss of open country bird breeding habitat as a result of this project.	
			Direct mortality of breeding birds and/or their eggs/young	Same as above	• Construction activities should occur outside of the breeding bird season (May 1st – July 15th), or retain a biologist to confirm no nests are present in areas proposed for vegetation removal. • Clearly delineate work area using erosion fencing, or similar barrier • Create a vegetated buffer between the proposed development and the adjacent open country bird breeding habitats <u>Objectives:</u> • Protect open country breeding birds and their nests/young	• Same as above
			Disturbance of local wildlife (i.e. noise)	N/A	• Construction activities should occur outside of the breeding bird season (May 1st – July 15th), or retain a biologist to confirm no nests are present in areas proposed for vegetation removal. • Clearly delineate work area using erosion fencing, or similar barrier • Create a vegetated buffer between the proposed development and the adjacent open country bird breeding habitats • Construction activities should occur during daylight hours to avoid excessive noise	N/A

					and/or light at night. • Construction speed limits should be clearly posted and followed by on-site staff. <u>Objectives:</u> • Protect open country breeding birds and their nests/young • Minimize impacts on species that are relatively inactive at night and are not accustomed to nighttime disturbances.	
OCB-001 OCB-002 OCB-003 Open Country Bird Breeding Habitat	0-120m	Vegetation removal (i.e. clearing and grubbing of upland habitats)	Disturbance of local wildlife (i.e. noise)	N/A	• Construction activities should occur outside of the breeding bird season (May 1st – July 15th), or retain a biologist to confirm no nests are present in areas proposed for vegetation removal. • Clearly delineate work area using erosion fencing, or similar barrier • Create a vegetated buffer between the proposed development and the adjacent open country bird breeding habitats • Construction activities should occur during daylight hours to avoid excessive noise and/or light at night. • Construction speed limits should be clearly posted and followed by on-site staff. <u>Objectives:</u> • Protect open country breeding birds and their nests/young • Minimize impacts on species that are relatively inactive at night and are not accustomed to nighttime disturbances.	N/A
OCB-001 OCB-002 OCB-003 Open Country Bird Breeding Habitat	All distances	Installation of site fencing	Disturbance of local wildlife (i.e. noise)	N/A	• Construction activities should occur outside of the breeding bird season (May 1st – July 15th), or retain a biologist to confirm no nests are present in areas where fencing will be installed • Construction activities should occur during daylight hours to avoid excessive noise and/or light at night.	N/A

					Objectives: • Protect open country breeding birds and their nests/young • Minimize impacts on species that are relatively inactive at night and are not accustomed to nighttime disturbances.	
OCB-001 Open Country Bird Breeding Habitat	Overlapping	Site grading	Disturbance of local wildlife (i.e. noise)	N/A	• Construction activities should occur outside of the breeding bird season (May 1st – July 15th), or retain a biologist to confirm no nests are present in areas proposed for grading. • Clearly delineate work area using erosion fencing, or similar barrier • Create a vegetated buffer between the proposed development and the adjacent open country bird breeding habitats • Construction activities should occur during daylight hours to avoid excessive noise and/or light at night. Objectives: • Protect open country breeding birds and their nests/young • Minimize impacts on species that are relatively inactive at night and are not accustomed to nighttime disturbances.	N/A
			Sedimentation and erosion	N/A	• Develop and implement an erosion and sediment control plan, • Install erosion and sediment control measures (i.e. silt fences) around the construction area, • Schedule grading to avoid times of high runoff volumes (spring and fall), wherever possible • Suspend work if high runoff volume is noted or excessive sediment discharge occurs, • Minimize vehicle traffic on exposed soils Objectives: • Minimize impacts to wildlife habitats	• Monitor, and maintain erosion and sediment control measures (i.e. silt fences) around the construction area • Retain an Environmental Monitor throughout the site preparation, construction and decommissioning stages of this

						project Objectives: • Minimize impacts to wildlife habitats
			Spills (i.e. oil, gasoline, grease, etc.)	N/A	• All vehicle refueling or washing, and chemical storage will be located more than 30m from any significant natural feature. • Implement best management practices. • Develop a spill response plan and train staff on appropriate procedures. • Keep emergency spill kits on site. • Dispose of waste material by authorized and approved offsite vendors. Objectives: • Minimize impacts to wildlife habitats	• Retain an Environmental Monitor throughout the sit e preparation, construction and decommissioning stages of this project Objectives: • Minimize impacts to wildlife habitats
			Changes in soil moisture and compaction	N/A	• Implement best management practices, • Implement infiltration techniques to the maximum extent possible, • Minimize paved surfaces and design roads to promote infiltration, Objectives: • Minimize impact to soil moisture regime and vegetation species composition	• Retain an Environmental Monitor throughout the site preparation, construction and decommissioning stages of this project Objectives: • Minimize impact to soil moisture regime and vegetation species composition
OCB-001 OCB-002 OCB-003 Open Country Bird Breeding Habitat	0-120m	Site grading	Disturbance of local wildlife (i.e. noise)	N/A	• Construction activities should occur outside of the breeding bird season (May 1st – July 15th), or retain a biologist to confirm no nests are present in areas proposed for grading. • Clearly delineate work area using erosion fencing, or similar barrier • Create a vegetated buffer between the proposed development and the adjacent open	N/A

					country bird breeding habitats • Construction activities should occur during daylight hours to avoid excessive noise and/or light at night. <u>Objectives:</u> • Protect open country breeding birds and their nests/young • Minimize impacts on species that are relatively inactive at night and are not accustomed to nighttime disturbances.	
Construction						
OCB-001 Open Country Bird Breeding Habitat	Overlapping	Access Road Construction Foundation Construction Building Construction Solar Panel Assembly and Installation Underground Cabling (Open Cut) Installation Installation of Electrical Collector System Clean-up and Site Reclamation	Direct mortality of breeding birds and/or their eggs/young	Surveys will be in accordance with Birds and Bird Habitats (OMNR 2011b). Point counts will be conducted, and will be focused on identifying breeding birds in open country habitats. Surveys will be conducted in the early morning, between a half hour before sunrise and about 4 hours after sunrise. Each point count will be ten minutes in length, and will be conducted on 3 visits between June 1st and July 15th, with at least 10 days between surveys. Survey stations will be 250m apart, ideally with the center point at least	• Construction activities should occur outside of the breeding bird season (May 1st – July 15th), or retain a biologist to confirm no nests are present in areas proposed for vegetation removal. • Clearly delineate work area using erosion fencing, or similar barrier • Create a vegetated buffer between the proposed development and the adjacent open country bird breeding habitats <u>Objectives:</u> • Protect open country breeding birds and their nests/young	• Conduct post-construction point counts of habitats for 2 years after construction, following pre-construction methods <u>Objectives:</u> • Determine if breeding birds are still using adjacent habitats in similar numbers to pre-construction results

				100m from habitat edge. Standardized transect surveys will occur while walking between stations.		
			Disturbance of local wildlife (i.e. noise)	N/A	• Construction activities should occur outside of the breeding bird season (May 1st – July 15th), or retain a biologist to confirm no nests are present in areas proposed for vegetation removal. • Clearly delineate work area using erosion fencing, or similar barrier • Create a vegetated buffer between the proposed development and the adjacent open country bird breeding habitats • Construction activities should occur during daylight hours to avoid excessive noise and/or light at night. • Construction speed limits should be clearly posted and followed by on-site staff. <u>Objectives:</u> • Protect open country breeding birds and their nests/young • Minimize impacts on species that are relatively inactive at night and are not accustomed to nighttime disturbances.	N/A
			Sedimentation and erosion	N/A	• Develop and implement an erosion and sediment control plan, • Install erosion and sediment control measures (i.e. silt fences) around the construction area, • Suspend work if high runoff volume is noted or excessive sediment discharge occurs,	• Monitor, and maintain erosion and sediment control measures (i.e. silt fences) around the

					• Minimize vehicle traffic on exposed soils Objectives: • Minimize impacts to wildlife habitats	construction area • Retain an Environmental Monitor throughout the site preparation, construction and decommissioning stages of this project Objectives: • Minimize impacts to wildlife habitats
			Spills (i.e. oil, gasoline, grease, etc.)	N/A	• All vehicle refueling or washing, and chemical storage will be located more than 30m from any significant natural feature. • Implement best management practices. • Develop a spill response plan and train staff on appropriate procedures. • Keep emergency spill kits on site. • Dispose of waste material by authorized and approved offsite vendors. Objectives: • Minimize impacts to wildlife habitats	• Retain an Environmental Monitor throughout the sit e preparation, construction and decommissioning stages of this project Objectives: • Minimize impacts to wildlife habitats
			Changes in soil moisture and compaction	N/A	• Implement best management practices, • Implement infiltration techniques to the maximum extent possible, • Minimize paved surfaces and design roads to promote infiltration, Objectives: • Minimize impact to soil moisture regime and vegetation species composition	• Retain an Environmental Monitor throughout the site preparation, construction and decommissioning stages of this project Objectives: • Minimize impact to soil moisture regime and

						vegetation species composition
OCB-001 OCB-002 OCB-003 Open Country Bird Breeding Habitat	0-120m	Access Road Construction Foundation Construction Building Construction Solar Panel Assembly and Installation Underground Cabling (Open Cut) Installation Installation of Electrical Collector System Clean-up and Site Reclamation	Disturbance of local wildlife (i.e. noise)	N/A	• Construction activities should occur outside of the breeding bird season (May 1st – July 15th), or retain a biologist to confirm no nests are present in areas proposed for vegetation removal. • Clearly delineate work area using erosion fencing, or similar barrier • Create a vegetated buffer between the proposed development and the adjacent open country bird breeding habitats • Construction activities should occur during daylight hours to avoid excessive noise and/or light at night. • Construction speed limits should be clearly posted and followed by on-site staff. <u>Objectives:</u> • Protect open country breeding birds and their nests/young • Minimize impacts on species that are relatively inactive at night and are not accustomed to nighttime disturbances.	N/A
Operation						
OCB-001 OCB-002 OCB-003 Open Country Bird Breeding Habitat	All distances	Operation of solar arrays Solar panel maintenance Transportation and traffic	Disturbance of local wildlife (i.e. noise)	N/A	• Maintenance activities should occur during daylight hours to avoid excessive noise and/or light at night. • Speed limits should be clearly posted and followed by on-site staff. <u>Objectives:</u> • Protect open country breeding birds and their nests/young • Minimize impacts on species that are relatively inactive at night and are not accustomed to nighttime disturbances.	N/A
Decommissioning						

OCB-001 Open Country Bird Breeding Habitat	Overlapping	Above-Ground Structure Decommissioning Below-ground Structure Decommissioning Equipment Dismantling and Removal Site Restoration	Direct mortality of breeding birds and/or their eggs/young	N/A	• Decommissioning activities should occur outside of the breeding bird season (May 1st – July 15th), or retain a biologist to confirm no nests are present in areas proposed for vegetation removal. • Clearly delineate work area using erosion fencing, or similar barrier <u>Objectives:</u> • Protect open country breeding birds and their nests/young	N/A
			Disturbance of local wildlife (i.e. noise)	N/A	• Decommissioning activities should occur outside of the breeding bird season (May 1st – July 15th), or retain a biologist to confirm no nests are present in areas proposed for vegetation removal. • Clearly delineate work area using erosion fencing, or similar barrier • Decommissioning activities should occur during daylight hours to avoid excessive noise and/or light at night. • Speed limits should be clearly posted and followed by on-site staff. <u>Objectives:</u> • Protect open country breeding birds and their nests/young • Minimize impacts on species that are relatively inactive at night and are not accustomed to nighttime disturbances.	N/A

			Sedimentation and erosion	N/A	• Develop and implement an erosion and sediment control plan, • Install erosion and sediment control measures (i.e. silt fences) around the construction area, • Suspend work if high runoff volume is noted or excessive sediment discharge occurs, • Minimize vehicle traffic on exposed soils <u>Objectives:</u> • Minimize impacts to wildlife habitats	• Monitor, and maintain erosion and sediment control measures (i.e. silt fences) around the construction area • Retain an Environmental Monitor throughout the site preparation, construction and decommissioning stages of this project <u>Objectives:</u> • Minimize impacts to wildlife habitats
			Spills (i.e. oil, gasoline, grease, etc.)	N/A	• All vehicle refueling or washing, and chemical storage will be located more than 30m from any significant natural feature. • Implement best management practices. • Develop a spill response plan and train staff on appropriate procedures. • Keep emergency spill kits on site. • Dispose of waste material by authorized and approved offsite vendors. <u>Objectives:</u> • Minimize impacts to wildlife habitats	• Retain an Environmental Monitor throughout the sit e preparation, construction and decommissioning stages of this project <u>Objectives:</u> • Minimize impacts to wildlife habitats

			Changes in soil moisture and compaction	N/A	• Implement best management practices, • Implement infiltration techniques to the maximum extent possible, • Minimize paved surfaces and design roads to promote infiltration, <u>Objectives:</u> • Minimize impact to soil moisture regime and vegetation species composition	• Retain an Environmental Monitor throughout the site preparation, construction and decommissioning stages of this project <u>Objectives:</u> • Minimize impact to soil moisture regime and vegetation species composition
OCB-001 OCB-002 OCB-003 Open Country Bird Breeding Habitat	0-120m	Above-Ground Structure Decommissioning Below-ground Structure Decommissioning Equipment Dismantling and Removal Site Restoration	Disturbance of local wildlife (i.e. noise)	N/A	• Decommissioning activities should occur outside of the breeding bird season (May 1st – July 15th), or retain a biologist to confirm no nests are present in areas proposed for vegetation removal. • Clearly delineate work area using erosion fencing, or similar barrier • Decommissioning activities should occur during daylight hours to avoid excessive noise and/or light at night. • Speed limits should be clearly posted and followed by on-site staff. <u>Objectives:</u> • Protect open country breeding birds and their nests/young • Minimize impacts on species that are relatively inactive at night and are not accustomed to nighttime disturbances.	N/A

11.0 Summary of Commitments

For each wildlife habitat that has been presumed significant, NRSI biologists have identified potential negative impacts and mitigation measures associated with the construction, operation, and decommissioning phases of this project.

To assist in the summary of the potential impacts and mitigation measures associated with the Glenarm Solar Park, NRSI has summarized the full extent of pre-construction and post-construction monitoring commitments in the following sections.

11.1 Pre-Construction Monitoring Commitments

In accordance with the Natural Heritage Assessment process, NRSI biologists have identified natural features that have been treated as significant for the purposes of this report. These features have been treated as significant until additional pre-construction surveys can be completed to confirm (or deny) the significance based on provincially accepted evaluation criteria. The pre-construction surveys that will be conducted as part of the commitments made in this EIS are summarized in Table 22 below.

The survey methods described below have assumed that site access will be granted. In the event that specific site access is not available for all, or part, of a specific feature, a potential alternative survey method will be discussed with appropriate MNR staff.

Table 22. Summary of Pre-construction Monitoring Commitments for the Glenarm Solar Park

Wildlife Habitat Type	Generalized Methods	Location/Feature(s)
Open Country Breeding Bird Habitat	Surveys will be in accordance with Birds and Bird Habitats (OMNR 2011b). Point counts will be conducted, and will be focused on identifying breeding birds in open country habitats. Surveys will be conducted in the early morning, between one half hour before sunrise and about 4 hours after sunrise. Each point count will be ten minutes in length, and will be conducted on 3 visits between June 1st and July 15th, with at least 10 days between surveys. Survey stations will be 250m apart, ideally with the center point at least 100m from habitat edge. The site-specific surveys associated with the above program are dependent on receiving site access. Although site access is confirmed for at least one of these habitats, if access is not granted for some or all of the others, an alternative site	OCB-001 OCB-002 OCB-003

	investigation methodology will be discussed with the MNR. The appropriate number of point count locations for this project will be determined in consultation with MNR.	

11.2 Construction Mitigation Measures

Mitigation measures that are recommended to limit potential impacts to significant wildlife habitats for the development of the Glenarm Solar Park have been identified above. To assist in fully identifying all mitigation measures that are recommended for this development, a summary table of construction related mitigation measures has been provided below, including the mitigation objective and specific location where each mitigation measure should be applied. The only mitigation measures that may be required at the Glenarm Solar Park are dependent on the results of pre-construction breeding bird surveys that will be conducted with the candidate open country bird habitats. Mitigation measures, if some (or all) of these habitats are determined to be significant, are outlined in Table 23 below.

Table 23. Summary of Construction Phase Mitigation Measures Recommended for the Glenarm Solar Park

Mitigation Measure	Objective(s)	Location(s)
• Construction activities should occur outside of the breeding bird season (May 1st – July 15st), or retain a biologist to confirm no nests are present in areas proposed for vegetation removal.	• Protect open country breeding birds and their nests/young	Within or within 120m of significant wildlife habitat, which may include: OCB-001* OCB-002* OCB-003*
• Clearly delineate work area using erosion fencing, or similar barrier		
• Create a vegetated buffer between the proposed development and the adjacent open country bird breeding habitats		
• Construction speed limits should be clearly posted and followed by on-site staff.		
• Construction activities should occur during daylight hours to avoid excessive noise and/or light at night.	• Minimize impacts on species that are relatively inactive at night and are not accustomed to nighttime disturbances.	
• Develop and implement an erosion and sediment control plan	• Minimize impacts to wildlife habitats	
• Install erosion and sediment control measures (i.e. silt fences) around the construction area		
• Suspend work if high runoff volume is noted or excessive sediment discharge occurs		
• Minimize vehicle traffic on exposed soils		
• All vehicle refueling or washing, and		

chemical storage will be located more than 30m from any significant natural feature		
• Implement best management practices		
• Develop a spill response plan and train staff on appropriate procedures		
• Keep emergency spill kits on site		
• Dispose of waste material by authorized and approved offsite vendors		
• Implement best management practices	• Minimize impact to soil moisture regime and vegetation species composition	
• Implement infiltration techniques to the maximum extent possible		
• Minimize paved surfaces and design roads to promote infiltration		

** Only if these habitats are determined to be significant through pre-construction surveys described in Section 11.1*

11.3 Post-Construction Monitoring Commitments

In accordance with appropriate provincial guidance and the results of pre-construction surveys, a series of post-construction surveys may be required at the Glenarm Solar Park. These surveys will only be required depending on the results of additional pre-construction surveys that have been committed to in Section 11.1 above.

Table 24. Summary of Post-construction Monitoring Commitments at the Glenarm Solar Park

Survey Type	Location(s)	Generalized Methods	Purpose
Breeding Bird Surveys (Point Counts)	OCB-001* OCB-002* OCB-003*	Surveys will follow pre-construction surveys, and will be in accordance with Birds and Bird Habitats (OMNR 2011b). Point counts will be conducted, and will be focused on identifying breeding birds in open country habitats. Surveys will be conducted in the early morning, between one half hour before sunrise and about 4 hours after sunrise. Each point count will be ten minutes in length, and will be conducted on 3 visits between June 1st and July 15th, with at least 10 days between surveys. Survey stations will be 250m apart, ideally with the center point at least 100m from habitat edge. The appropriate number of point count locations for this project will be determined in consultation with MNR.	To determine if breeding birds are still using these habitats in similar numbers to pre-construction results

** Only if these habitats are determined to be significant through pre-construction surveys described in Section 11.1*

12.0 Summary and Conclusions

Natural Resource Solutions Inc. (NRSI) was retained in May 2010 by GL Garrad Hassan, on behalf of SkyPower Limited to conduct a natural environment resource assessment in accordance with the Renewable Energy Approval (REA) Regulation. This assessment includes a records review, site investigation, evaluation of significance, and environmental impact study of any potentially significant natural features at a proposed solar energy facility of approximately 10MW, in the former geographic Township of Eldon within the City of Kawartha Lakes, approximately 6km west of the Town of Glenarm, ON.

Recommendations have been provided to assist in limiting potential impacts natural features wherever possible. The analysis of the natural heritage features and biological factors affecting the proposed site is one issue being considered. Other factors, such as land ownership, social impacts, and cultural impacts are also being assessed by other team members.

The records review yielded limited information pertaining to the candidate significant natural features and wildlife habitat present within the project area. Eleven species of conservation concern were identified as occurring within the vicinity of the project area, and habitat requirements were assessed for review during the site investigation.

Based on the proposed undertaking of the Glenarm Solar Park project, NRSI biologists conducted site investigations to identify candidate significant natural features and evaluate their potential significance. This site investigation was used to build upon information collected during the records review, and confirm natural feature boundaries, function, and characteristics. NRSI biologists expanded upon the records review to identify a total of 3 candidate significant wildlife habitats within 120m of the Glenarm Solar Park project location. These 3 wildlife habitats were all open country bird breeding habitats.

Using the data collected during the site investigations, NRSI biologists evaluated the 3 candidate significant wildlife habitats, comparing characteristics to provincial evaluation standards. NRSI determined that the site-specific characteristics of the 3 candidate

significant natural features may meet the provincial evaluation criteria, and as such, these 3 wildlife habitats were treated as significant pending confirmation through pre-construction surveys. Due to the presence of significant natural features within the project area, an environmental impact study was required.

Through the environmental impact study, NRSI biologists have recommended mitigation measures, as well as pre-construction and post-construction surveys that should be implemented during the construction phase of this project.

Providing mitigation measures are implemented during the development of this facility, NRSI anticipates minimal disturbance to local flora and fauna populations at the Glenarm Solar Park.

13.0 References

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Personal Communication

Prevost, E.R. Planning Ecologist, Ministry of Natural Resources (Peterborough District). May 13, 2010.

Appendix I
Field Notes

NATURAL RESOURCE SOLUTIONS INC

Modified ELC Community Description

Site:	1072 Glenarm
Polygon:	1 open pasture OAGM4
UTM:	17T 662702 x 4925637
Date:	17 June 2010 Time: 0715
Surveyor(s):	MM, KSJ
Weather:	16°C, wind 5 from N, precip none, cloud 60%

Community Classification

Vegetation Type:		OAGM4 open Pasture
	Inclusion:	
X	Complex:	

Polygon Description

System		Substrate		Topo Feature			Community		
X	Terrestrial		Organic		Lacustrine	Talus		Lake	Barren
	Wetland	X	Mineral Soil		Riverine	Crevice/Cave		Pond	X Meadow
	Aquatic		Parent Min.		Bottomland	Alvar		River	Prairie
			Acidic Bedrock		Terrace	Rockland		Stream	Thicket
History			Basic Bedrock		Valley Slope	Beach/Bar		Marsh	Savannah
	Natural		Carb. Bedrock	X	Tableland	Sand Dune		Swamp	Woodland
X	Cultural				Roll. Upland	Bluff		Fen	Forest
		Site			Cliff			Bog	Plantation

Cover		Open Water	Plant Form		
X	Open	Shallow Water	Plankton	Forb	Coniferous
	Shrub	X Surficial Dep	Submerged	Lichen	Mixed
	Treed	Bedrock	Floating-Lvd.	Bryophyte	
			X Graminoid	Deciduous	

Stand Description

	Layer	HT	Cover	Species
*	Super-canopy			
1	Canopy			
2	Sub-canopy			
3	Understorey	4 5	1	Dark Green Rush > Woolgrass
4	Groundcover	6 7	4	Vetch > Red clover > Ken. bluegrass > yarrow

HT Codes: 1: >25m 2: 25 - 10m 3: 10 - 2m 4: 2 - 1m 5: 1 - 0.5m 6: 0.5 - 0.2m 7: <0.2m

Cover Codes: 0:none 1: 0 - 10% 2: 10 - 25 3: 25 - 60% 4: >60%

Size Class Analysis	N	< 10	N	10 - 24	N	25 - 50	N	> 50
Snags	N	< 10	N	10 - 24	N	25 - 50	N	> 50
Deadfall/Logs	N	< 10	N	10 - 24	N	25 - 50	N	> 50

Abundance Codes: N: None R: Rare O: Occasional A: Abundant

Community Age	X	Pioneer		Young		Mid-age		Mature	Old Growth

PLANT SPECIES LIST

Site:	1072 Glenarm
Polygon:	1
UTM:	
Date:	17 June 2010 Time: 0715
Surveyor(s):	MM, KSJ
Weather:	16°C, wind 5 from N, no precip, CC 60%

Layers: 1=canopy 2=sub-canopy 3=understorey 4=ground layer

Abundance Codes: R=rare O=occasional A=abundant D=dominant

Species	Layer 1	2	3	4	Sample	Species	Layer 1	2	3	4	Sample
Red clover				A							
orange hawkweed				O							
Kentucky bluegrass				O							
Juniper Shrub				R							
wild carrot				O							
Eelgrass				O							
bird's foot trefoil				O							
ENG. plantain				A							
oxeye daisy				A							
Norway maple seedling				O							
Yarrow				A							
Ranunculus sp.				A							
grass sp.				A							
Vetch				A							
goldenrod sp.				O							
Dark green Rush			O								
Woolgrass			O								

Wildlife and Other Notes

NATURAL RESOURCE SOLUTIONS INC

Modified ELC Community Description

Site:	1072 Glen Arm
Polygon:	2B Fresh moist Pedor forest FODM8-1 (Woodland 1)
UTM:	17T 662575 x 4925798
Date:	17 June 2010 Time: 0845
Surveyor(s):	MM
Weather:	16°C, Wind 5 from N, no precip, cloud 60%

Community Classification

Vegetation Type:	FODM 8-1
Inclusion:	
Complex:	

Polygon Description

System	Substrate	Topo Feature		Community	
X Terrestrial	Organic	Lacustrine	Talus	Lake	Barren
Wetland	X Mineral Soil	Riverine	Crevice/Cave	Pond	Meadow
Aquatic	Parent Min.	Bottomland	Alvar	River	Prairie
	Acidic Bedrock	Terrace	Rockland	Stream	Thicket
History	Basic Bedrock	Valley Slope	Beach/Bar	Marsh	Savannah
X Natural	Carb. Bedrock	X Tableland	Sand Dune	Swamp	Woodland
Cultural		Roll. Upland	Bluff	Fen	X Forest
	Site	Cliff		Bog	Plantation

Cover		Plant Form		
Open	Open Water	Plankton	Forb	Coniferous
Shrub	Shallow Water	Submerged	Lichen	Mixed
X Treed	X Surficial Dep.	Floating-Lvd.	Bryophyte	
	Bedrock	Graminoid	X Deciduous	

Stand Description

	Layer	HT	Cover	Species
*	Super-canopy			
1	Canopy	2	4	Trembling Aspen
2	Sub-canopy	3	1	Speckled Alder > red osier dogwood
3	Understorey			
4	Groundcover	4	4	Carex sp > Vetch > Oxeye daisy > common strawberry

HT Codes: 1: >25m 2: 25 - 10m 3: 10 - 2m 4: 2 - 1m 5: 1 - 0.5m 6: 0.5 - 0.2m 7: <0.2m

Cover Codes: 0:none 1: 0 - 10% 2: 10 - 25 3: 25 - 60% 4: >60%

Size Class Analysis	A	< 10	O	10 - 24	N	25 - 50	N	> 50
Snags	N	< 10	N	10 - 24	N	25 - 50	N	> 50
Deadfall/Logs	N	< 10	N	10 - 24	N	25 - 50	N	> 50

Abundance Codes: N: None R: Rare O: Occasional A: Abundant

Community Age		Pioneer	X	Young		Mid-age		Mature		Old Growth

NATURAL RESOURCE SOLUTIONS INC

Modified ELC Community Description

PLANT SPECIES LIST

Site:	1072 Glen Arm
Polygon:	2B
UTM:	
Date:	17 June 2010 Time: 0845
Surveyor(s):	MM
Weather:	16°C, Wind S from N, no precip, CC 60%

Layers: 1=canopy 2=sub-canopy 3=understorey 4=ground layer

Abundance Codes: R=rare O=occasional A=abundant D=dominant

Species	Layer 1	2	3	4	Sample	Species	Layer 1	2	3	4	Sample
T. Aspen	D										
Cow vetch				A							
Salix sp.			O								
red O. dogwood		A									
Speckled Alder			O								
oxeye daisy				O							
Strawberry				O							
Sensit. fern				O							
Bullrush sp.			O								
common red			O								
red clover				A							
orange hawkweed				O							
ribg. plantain				O							
Sedge sp.				O							

Wildlife and Other Notes

NATURAL RESOURCE SOLUTIONS INC

Modified ELC Community Description

Site:	1072 Glenarm
Polygon:	2C Mixed willow swamp SWTM3-6
UTM:	17T 662390 X 4925707
Date:	17 June 2010 Time: 0910
Surveyor(s):	MM, KSJ
Weather:	16°C, wind S from N, no precip, CC 60%

Community Classification

Vegetation Type:	Mixed willow Mineral Deciduous Thicket Swamp Type
Inclusion:	
Complex:	

Polygon Description

System	Substrate	Topo Feature		Community	
Terrestrial	Organic	Lacustrine	Talus	Lake	Barren
X Wetland	X Mineral Soil	Riverine	Crevice/Cave	Pond	Meadow
Aquatic	Parent Min.	Bottomland	Alvar	River	Prairie
	Acidic Bedrock	Terrace	Rockland	Stream	X Thicket
History	Basic Bedrock	Valley Slope	Beach/Bar	Marsh	Savannah
X Natural	Carb. Bedrock	X Tableland	Sand Dune	Swamp	Woodland
Cultural		Roll. Upland	Bluff	Fen	Forest
	Site	Cliff		Bog	Plantation

Cover		Open Water	Plant Form		
Open		Shallow Water	Plankton	Forb	Coniferous
X Shrub	X	Surficial Dep.	Submerged	Lichen	Mixed
Treed		Bedrock	Floating-Lvd.	Bryophyte	
			Graminoid	X Deciduous	

Stand Description

	Layer	HT	Cover	Species
*	Super-canopy			
1	Canopy	3	4	Slender willow > S. pedicellaris > Willow sp.
2	Sub-canopy	4/5	2	rattail > Com. Reed > Sensitive fern
3	Understorey	1		
4	Groundcover	4/3	4	Cover sp.

HT Codes: 1: >25m 2: 25 - 10m 3: 10 - 2m 4: 2 - 1m 5: 1 - 0.5m 6: 0.5 - 0.2m 7: <0.2m

Cover Codes: 0:none 1: 0 - 10% 2: 10 - 25 3: 25 - 60% 4: >60%

Size Class Analysis	< 10	10 - 24	25 - 50	> 50
Snags	< 10	10 - 24	25 - 50	> 50
Deadfall/Logs	< 10	10 - 24	25 - 50	> 50

Abundance Codes: N: None R: Rare O: Occasional A: Abundant

Community Age	Pioneer	Young	Mid-age	Mature	Old Growth

NATURAL RESOURCE SOLUTIONS INC

Modified ELC Community Description

PLANT SPECIES LIST

Site:	1072 Glenarm
Polygon:	2C SWTM3-6
UTM:	
Date:	17 June 2010 Time: 0910
Surveyor(s):	MM, KSJ
Weather:	16°C, wind S from N, no precip, CC 60%.

Layers: 1=canopy 2=sub-canopy 3=understorey 4=ground layer

Abundance Codes: R=rare O=occasional A=abundant D=dominant

Species	Layer 1	2	3	4	Sample	Species	Layer 1	2	3	4	Sample
Slenderwillow											
bog willow											
Salix sp.											
Speck. Alder											
R.O. Dogwood											
typha latifolia											
Com. Reed											
Reed Canary											
Marsh timothy											
Carex sp.											
Woolgrass											
St Johnswort											
Inverleaved Aster											
Com. Strawberry											

Wildlife and Other Notes

NATURAL RESOURCE SOLUTIONS INC

Modified ELC Community Description

Site:	1072 Glenarm
Polygon:	3 (Woodland 2)
UTM:	17T 662076 x 4925891
Date:	17 JUNE 2010 Time: 10:40AM
Surveyor(s):	MM KSJ
Weather:	16°C, wind S from N, no precip, CC 60%

Community Classification

	Vegetation Type:	SWDM4-5 Poplar Min. Deciduous Swamp
X	Inclusion:	FOCM4-1 Fresh-moist White Cedar Coniferous Forest Type / Type
	Complex:	

Polygon Description

System	Substrate	Topo Feature		Community	
Terrestrial	Organic	Lacustrine	Talus	Lake	Barren
X Wetland	X Mineral Soil	Riverine	Crevice/Cave	Pond	Meadow
Aquatic	Parent Min.	Bottomland	Alvar	River	Prairie
	Acidic Bedrock	Terrace	Rockland	Stream	Thicket
History	Basic Bedrock	Valley Slope	Beach/Bar	Marsh	Savannah
X Natural	Carb. Bedrock	X Tableland	Sand Dune	X Swamp	Woodland
Cultural		Roll. Upland	Bluff	Fen	Forest
	Site	Cliff		Bog	Plantation

Cover		Open Water	Plant Form		
Open		Shallow Water	Plankton	Forb	Coniferous
Shrub	X	Surficial Dep.	Submerged	Lichen	Mixed
X Treed		Bedrock	Floating-Lvd	Bryophyte	
			Graminoid	X Deciduous	

Stand Description

	Layer	HT	Cover	Species
*	Super-canopy			
1	Canopy	2	4	T. Aspen > Balsam Poplar = green ash > white elm
2	Sub-canopy	3	3	green ash > white cedar > Balsam Poplar
3	Understorey	4/5	1	green ash > speckled alder > red osier.
4	Groundcover	4	4	Jewelweed > Carex spp. > creeping buttercup

HT Codes: 1: >25m 2: 25 - 10m 3: 10 - 2m 4: 2 - 1m 5: 1 - 0.5m 6: 0.5 - 0.2m 7: <0.2m

Cover Codes: 0:none 1: 0 - 10% 2: 10 - 25 3: 25 - 60% 4: >60%

Size Class Analysis	O	< 10	A	10 - 24	O	25 - 50	N	> 50
Snags	O	< 10	O	10 - 24	R	25 - 50	N	> 50
Deadfall/Logs	O	< 10	O	10 - 24	R	25 - 50	N	> 50

Abundance Codes: N: None R: Rare O: Occasional A: Abundant

Community Age		Pioneer		Young	X	Mid-age		Mature		Old Growth

NATURAL RESOURCE SOLUTIONS INC

Modified ELC Community Description

PLANT SPECIES LIST

Site:	1072 Glenarm
Polygon:	3
UTM:	
Date:	17 July 2010 Time: 1040 AM
Surveyor(s):	MM KSJ
Weather:	16°C, wind S from N, no precip, CC 60%

Layers: 1=canopy 2=sub-canopy 3=understorey 4=ground layer

Abundance Codes: R=rare O=occasional A=abundant D=dominant

Species	Layer 1	2	3	4	Sample	Species	Layer 1	2	3	4	Sample
Am. Elm	O										
White ash	R										
green ash	A										
T. Aspen	A										
Chil. flagrans				R							
Fragaria virginiana				O							
Raspberry				O							
ench. nightshade				O							
spr. dioicum				O							
Caricaceae				O							
Caricaceae				O							
Cryptogramma				R							
bird's foot trefoil				R							
Red clover				R							
virg. Creeper				O							
Viola riparia				R							
Rubus occidentalis				O							
Swamp milkweed				O							
woodgrass			O								
Sedge sp.				O							
Creeping buttercup				O							

Wildlife and Other Notes

NATURAL RESOURCE SOLUTIONS INC

Modified ELC Community Description

Site:	Glenarm Solar Park 1077
Polygon:	4
UTM:	
Date:	Aug 26, 2010
Time:	1230
Surveyor(s):	CLH, KSD
Weather:	21°C, no precip, CC 60%, wind 3 from NE

Community Classification

Vegetation Type:	THCM 2-1 Fresh-moist white cedar coniferous Thicket Type
Inclusion:	
Complex:	

Polygon Description

System	Substrate	Topo Feature		Community	
X Terrestrial	Organic	Lacustrine	Talus	Lake	Barren
Wetland	X Mineral Soil	Riverine	Crevice/Cave	Pond	Meadow
Aquatic	Parent Min.	Bottomland	Alvar	River	Prairie
	Acidic Bedrock	Terrace	Rockland	Stream	X Thicket
History	Basic Bedrock	Valley Slope	Beach/Bar	Marsh	Savannah
X Natural	Carb. Bedrock	X Tableland	Sand Dune	Swamp	Woodland
Cultural		Roll. Upland	Bluff	Fen	Forest
	Site	Cliff		Bog	Plantation

Cover		Plant Form		
Open	Open Water	Plankton	Forb	X Coniferous
Shrub	Shallow Water	Submerged	Lichen	Mixed
X Treed low	X Surficial Dep.	Floating-Lvd	Bryophyte	
	Bedrock	Graminoid	Deciduous	

Stand Description

	Layer	HT	Cover	Species
*	Super-canopy	1	0	—
1	Canopy	2	1	white cedar (one tall tree).
2	Sub-canopy	3	4	White Cedar
3	Understorey	4/5	2	White Cedar
4	Groundcover	6/7	3	bird's-foot trefoil > cow vetch > red clover > timothy.

HT Codes: 1: >25m 2: 25 - 10m 3: 10 - 2m 4: 2 - 1m 5: 1 - 0.5m 6: 0.5 - 0.2m 7: <0.2m

Cover Codes: 0:none 1: 0 - 10% 2: 10 - 25 3: 25 - 60% 4: >60%

Size Class Analysis	A	< 10	N	10 - 24	N	25 - 50	N	> 50
Snags	N	< 10	N	10 - 24	N	25 - 50	N	> 50
Deadfall/Logs	N	< 10	N	10 - 24	N	25 - 50	N	> 50

Abundance Codes: N: None R: Rare O: Occasional A: Abundant

Community Age	Pioneer	Young	Mid-age	Mature	Old Growth

NATURAL RESOURCE SOLUTIONS INC

Modified ELC Community Description

PLANT SPECIES LIST

Site:	Glenarm
Polygon:	4
UTM:	
Date:	Aug 26, 2010
Time:	1230
Surveyor(s):	CLH, KSD
Weather:	21°C, no precip, CC 60%, wind 3 from NE

Layers: 1,2 3 4,5 6,7 — 1=canopy 2=sub-canopy 3=understorey 4=ground layer

Abundance Codes: R=rare O=occasional A=abundant D=dominant

Species	Layer 1	2	3	4	Sample
White Cedar		D	O		
Bird's foot trefoil				A	
red clover				O	
cow vetch				O	
dandelion				O	
fox sedge				O	
bebb's sedge				O	
green wood orchis				R	
timothy				O	
fowl meadow grass				O	

Species	Layer 1	2	3	4	Sample

Wildlife and Other Notes

White cedar regeneration arising from heavy cow grazing

NATURAL RESOURCE SOLUTIONS INC

Modified ELC Community Description

Site:	1072 Glenarm
Polygon:	5 Cattail Marsh MAMM1-2
UTM:	
Date:	17 June 2010 Time: 0955
Surveyor(s):	MM, KSJ
Weather:	16°C, wind S from N, no precip, CC 60%

Community Classification

Vegetation Type:	MAMM1-2
Inclusion:	
Complex:	

Polygon Description

System	Substrate	Topo Feature		Community	
Terrestrial	Organic	Lacustrine	Talus	Lake	Barren
X Wetland	X Mineral Soil	Riverine	Crevice/Cave	Pond	Meadow
Aquatic	Parent Min.	Bottomland	Alvar	River	Prairie
	Acidic Bedrock	Terrace	Rockland	Stream	Thicket
History	Basic Bedrock	Valley Slope	Beach/Bar	X Marsh	Savannah
X Natural	Carb. Bedrock	X Tableland	Sand Dune	Swamp	Woodland
Cultural		Roll. Upland	Bluff	Fen	Forest
	Site	Cliff		Bog	Plantation

Cover		Plant Form		
X Open	Open Water	Plankton	Forb	Coniferous
Shrub	X Shallow Water	Submerged	Lichen	Mixed
Treed	X Surficial Dep.	Floating-Lvd.	Bryophyte	
	Bedrock	X Graminoid	Deciduous	

Stand Description

	Layer	HT	Cover	Species
*	Super-canopy	1	0	—
1	Canopy	2	0	—
2	Sub-canopy	3	1	Balsam poplar > dead white elm
3	Understorey	4/5	4	Typha latifolia > reed canary
4	Groundcover	6/7	4	Carex spp. > Juncus spp.

HT Codes: 1: >25m 2: 25 - 10m 3: 10 - 2m 4: 2 - 1m 5: 1 - 0.5m 6: 0.5 - 0.2m 7: <0.2m

Cover Codes: 0:none 1: 0 - 10% 2: 10 - 25 3: 25 - 60% 4: >60%

Size Class Analysis	N	< 10	N	10 - 24	N	25 - 50	N	> 50
Snags	N	< 10	O	10 - 24	N	25 - 50	N	> 50
Deadfall/Logs	N	< 10	O	10 - 24	N	25 - 50	N	> 50

Abundance Codes: N: None R: Rare O: Occasional A: Abundant

Community Age		Pioneer		Young	X	Mid-age		Mature		Old Growth

NATURAL RESOURCE SOLUTIONS INC

Modified ELC Community Description

PLANT SPECIES LIST

Site:	Glenarm 1072
Polygon:	5 MAMM1-2
UTM:	
Date:	June 17, 2010 Time: 0955
Surveyor(s):	MM, KSJ
Weather:	16°C, wind S from N, no precip, CC 60%

Layers: 1=canopy 2=sub-canopy 3=understorey 4=ground layer

Abundance Codes: R=rare O=occasional A=abundant D=dominant

Species	Layer 1	2	3	4	Sample
Typha latifolia			D		
Red canary			O		
Carex sp				A	
Juncus sp.				A	
Balsam poplar		R			

Species	Layer 1	2	3	4	Sample

Wildlife and Other Notes

NATURAL RESOURCE SOLUTIONS INC

Modified ELC Community Description Page 1 of 2

Site:	1072 Glenarm
Polygon:	6 Reed canary grass Marsh MAMM1-3
UTM:	17T 662184 X 4925431
Date:	17 June 2010 **Time:** 0945
Surveyor(s):	MM KS
Weather:	16°C, wind 5 from N, no precip, 60% cc

Community Classification

Vegetation Type:	MAMM1-3
Inclusion:	
Complex:	

Polygon Description

System	Substrate	Topo Feature		Community	
Terrestrial	Organic	Lacustrine	Talus	Lake	Barren
X Wetland	X Mineral Soil	Riverine	Crevice/Cave	Pond	Meadow
Aquatic	Parent Min.	Bottomland	Alvar	River	Prairie
	Acidic Bedrock	Terrace	Rockland	Stream	Thicket
History	Basic Bedrock	Valley Slope	Beach/Bar	X Marsh	Savannah
X Natural	Carb. Bedrock	X Tableland	Sand Dune	Swamp	Woodland
Cultural		Roll. Upland	Bluff	Fen	Forest
	Site	Cliff		Bog	Plantation

Cover		Plant Form		
X Open	Open Water	Plankton	Forb	Coniferous
Shrub	X Surficial Dep.	Submerged	Lichen	Mixed
Treed	Bedrock	Floating-Lvd.	Bryophyte	
		X Graminoid	Deciduous	

Stand Description

	Layer	HT	Cover	Species
*	Super-canopy	1	0	—
1	Canopy	2	0	—
2	Sub-canopy	3	0	—
3	Understorey	4 5	4	Reed Canary >> Cattail = Woolgrass
4	Groundcover	4 5	2	Carex spp.

HT Codes: 1: >25m 2: 25 - 10m 3: 10 - 2m 4: 2 - 1m 5: 1 - 0.5m 6: 0.5 - 0.2m 7: <0.2m

Cover Codes: 0:none 1: 0 - 10% 2: 10 - 25 3: 25 - 60% 4: >60%

Size Class Analysis	C	< 10	N	10 - 24	N	25 - 50	N	> 50
Snags	R	< 10	N	10 - 24	N	25 - 50	N	> 50
Deadfall/Logs	R	< 10	N	10 - 24	N	25 - 50	N	> 50

Abundance Codes: N: None R: Rare O: Occasional A: Abundant

Community Age	Pioneer	X Young	Mid-age	Mature	Old Growth

NATURAL RESOURCE SOLUTIONS INC

Modified ELC Community Description Page 2 of 2

PLANT SPECIES LIST

Site:	1072 Glenarm
Polygon:	6 MAMM1-3
UTM:	
Date:	June 17, 2010 **Time:** 0945
Surveyor(s):	
Weather:	16°C, no precip, wind 5 from N, CCCeC2

Layers: 1=canopy 2=sub-canopy 3=understorey 4=ground layer

Abundance Codes: R=rare O=occasional A=abundant D=dominant

Species	Layer 1	2	3	4	Sample
Reed Canarygr.			D		
Typha latifolia			O		
Can. bluegrass			D		
Carex sp.				O	
Woolgrass			O		
Forbs/Herbs				O	

Species	Layer 1	2	3	4	Sample

Wildlife and Other Notes

NATURAL RESOURCE SOLUTIONS INC

Modified ELC Community Description

Site:	1072 Glenarm
Polygon:	7 Rush Graminoid Mineral Meadow Marsh MAMM3-13
UTM:	See →
Date:	17 July 2010 Time: 0815
Surveyor(s):	MM, KSJ
Weather:	16°C, wind S from N, no precip, CC 60%.

Community Classification

Vegetation Type:	MAMM1-13 Rush Graminoid Min meadow marsh Type
Inclusion:	
Complex:	

Polygon Description

System	Substrate	Topo Feature		Community	
Terrestrial	Organic	Lacustrine	Talus	Lake	Barren
X Wetland	X Mineral Soil	Riverine	Crevice/Cave	Pond	Meadow
Aquatic	Parent Min.	Bottomland	Alvar	River	Prairie
	Acidic Bedrock	Terrace	Rockland	Stream	Thicket
History	Basic Bedrock	Valley Slope	Beach/Bar	X Marsh	Savannah
X Natural	Carb. Bedrock	X Tableland	Sand Dune	Swamp	Woodland
X Cultural		Roll. Upland	Bluff	Fen	Forest
	Site	Cliff		Bog	Plantation

Cover		Plant Form		
X Open	Open Water	Plankton	Forb	Coniferous
Shrub	Shallow Water	Submerged	Lichen	Mixed
Treed	X Surficial Dep.	Floating-Lvd.	Bryophyte	
	Bedrock	X Graminoid	Deciduous	

Stand Description

	Layer	HT	Cover	Species
*	Super-canopy	1	0	—
1	Canopy	2	0	—
2	Sub-canopy	3	0	—
3	Understorey	4/5	4	Dark Green Bulrush >> Slender willow > Woolgrass = Softstem Bulrush
4	Groundcover	4/5	4	Carex stipata >> fan. bluejoint > marsh timothy

HT Codes: 1: >25m 2: 25 - 10m 3: 10 - 2m 4: 2 - 1m 5: 1 - 0.5m 6: 0.5 - 0.2m 7: <0.2m

Cover Codes: 0:none 1: 0 - 10% 2: 10 - 25 3: 25 - 60% 4: >60%

Size Class Analysis	N	< 10	N	10 - 24	N	25 - 50	N	> 50
Snags	N	< 10	N	10 - 24	N	25 - 50	N	> 50
Deadfall/Logs	N	< 10	N	10 - 24	N	25 - 50	N	> 50

Abundance Codes: N: None R: Rare O: Occasional A: Abundant

Community Age		Pioneer	X	Young		Mid-age		Mature		Old Growth

PLANT SPECIES LIST

Site:	1072 Glenarm
Polygon:	7 MAMM3-1
UTM:	17T 662683 x 4925897
Date:	17 July 2010 Time: 0815
Surveyor(s):	MM, KSJ
Weather:	16°C, wind S from N, no precip, CC 60%

Layers: 1=canopy 2=sub-canopy 3=understorey 4=ground layer

Abundance Codes: R=rare O=occasional A=abundant D=dominant

Species	Layer 1	2	3	4	Sample
typha latifolia			R		
fox. Sedge				O	
Dark green bulrush			D		
woolgrass			O		
Carex stipata				D	
Carex aligna				O	
fan. bluejoint			O		
Marsh timothy			O		
Slender willow			O		
Softstem bulrush			O		

Species	Layer 1	2	3	4	Sample

Wildlife and Other Notes

NATURAL RESOURCE SOLUTIONS INC

Modified ELC Community Description

Site:	Glenarm Solar Park 1072
Polygon:	8 (Woodland 3)
UTM:	
Date:	Aug 26, 2010 Time: 16:51
Surveyor(s):	CLH, KSD
Weather:	Sunny, 21°C, CC 60%, wind 5

Community Classification

Vegetation Type:	FOMM7-2	Fresh-moist white cedar-hardwood mixed forest type
Inclusion:		
Complex:		

Polygon Description

System	Substrate	Topo Feature		Community	
✓ Terrestrial	Organic	Lacustrine	Talus	Lake	Barren
Wetland	✓ Mineral Soil	Riverine	Crevice/Cave	Pond	Meadow
Aquatic	Parent Min	Bottomland	Alvar	River	Prairie
	Acidic Bedrock	Terrace	Rockland	Stream	Thicket
History	Basic Bedrock	Valley Slope	Beach/Bar	Marsh	Savannah
✓ Natural	Carb. Bedrock	X Tableland	Sand Dune	Swamp	Woodland
Cultural		Roll. Upland	Bluff	Fen	X Forest
	Site	Cliff		Bog	Plantation

Cover		Plant Form		
Open	Open Water	Plankton	Forb	Coniferous
Shrub	Shallow Water	Submerged	Lichen	X Mixed
✓ Treed	✓ Surficial Dep	Floating-Lvd	Bryophyte	
	Bedrock	Graminoid	Deciduous	

Stand Description

	Layer	HT	Cover	Species
*	Super-canopy			
1	Canopy	2	2	Trembling Aspen > Green Ash > White Elm
2	Sub-canopy	3	4	White Cedar > White Birch > Green Ash > Trembling Aspen
3	Understorey	4 5	2	Green Ash > Trembling Aspen > Common Buckthorn
4	Groundcover	6 7	2	Large-leaved Asters > Agrimony > Woodland Strawberry

HT Codes: 1: >25m 2: 25 - 10m 3: 10 - 2m 4: 2 - 1m 5: 1 - 0.5m 6: 0.5 - 0.2m 7: <0.2m

Cover Codes: 0:none 1: 0 - 10% 2: 10 - 25 3: 25 - 60% 4: >60%

Size Class Analysis	A	< 10	O	10 - 24	R	25 - 50	N	> 50
Snags	R	< 10	R	10 - 24	N	25 - 50	N	> 50
Deadfall/Logs	O	< 10	O	10 - 24	N	25 - 50	N	> 50

Abundance Codes: N: None R: Rare O: Occasional A: Abundant

Community Age	Pioneer	✓ Young	Mid-age	Mature	Old Growth

NATURAL RESOURCE SOLUTIONS INC

Modified ELC Community Description

PLANT SPECIES LIST

Site:	Glenarm Solar Park
Polygon:	8
UTM:	
Date:	Aug 26, 2010 Time: 16:51
Surveyor(s):	CLH, KSD
Weather:	Sunny, CC 60%, wind 3, 21°

Layers: 1=canopy 2=sub-canopy 3=understorey 4=ground layer

Abundance Codes: R=rare O=occasional A=abundant D=dominant

Species	Layer 1	2	3	4	Sample
White Cedar		A	O	O	
Trembling Aspen	O	O	O	R	
White Elm	O	O	R	R	
Juniper (edges)			R		
Common Buckthorn			O	O	
Green Ash	O	O	O	O	
N. England Aster				O	
Agrimony				O	
Basswood			R	R	
White Birch		O	O	O	
Calico Aster				O	
Large-toothed Aspen				O	
Woodland Strawberry				O	

Species	Layer 1	2	3	4	Sample

Wildlife and Other Notes

EAWP

1072 Glenarm SP
ELC June 17, 2010

& August 26, 2010

Breeding Bird Monitoring

10 Minute Point Count Project Name: Glenarm Project # 1072

Wind speed: 5
Cloud cover: 5 %
Air Temp. 15 °C
Precip. none
UTM

Station: 1
Date: June 17, 2010
Visit #: (1) 2 (circle)
Start Time: 7:40am
Observers: KSJ, MM

Area Searches by ELC polygon # for Station

Species Name	First 5 Minutes			Second 5 Minutes			Breeding Evidence
	<50m	50-100m	>100m*	<50m	50-100m	>100m*	
WISN (Wilson's Snipe)							S
EAME (Eastern Meadowlark)							P, A
RWBL (Red-Wing Blackbird)							P
SAVS (Savannah Sparrow)							S, P
TRES (Tree Swallow)							X, H
SOSP (Song Sparrow)							S, FY
BOBO (Bobolink)							P, A
YWAR (Yellow Warbler)							S
MODO (Mourning Dove)							X
AMGO (American Goldfinch)							P
CHSP (Chipping Sparrow)							S
CDGR (Common Grackle)							X
~~COLE~~ Pigeons							X
AMRO (Robin)							S
BLJA (Blue Jay)							S
BAOR (B. Oriole)							FY
BNPS							S

Wind Scale
0 Calm
1 Smoke drifts
2 Wind felt on face
3 Leaves in motion
4 Sm branches move
5 Sm trees sway
6 Lrg branches move
7 Whole trees in motion
8 Twigs break off, hard to walk
9 Light structural damage
10 Trees uprooted

Breeding Evidence Codes
Observed
X - No evidence of breeding
Possible
H - Suitable nesting habitat
S - Singing male
Probable
P - Pair
T - Permanent territory
D - Courtship or display
V - Visiting prob. nest site
A - Agitated behaviour or anxiety calls
B - Brood patch/cloacal protuberance
N - Nest building or excavation
Confirmed
DD - Distraction display
NU - Used nest or egg shell
FY - Fledged young
AE - Adults at occupied nest
FS - Faecal sac
CF - Carrying food
NE - Nest containing eggs
NY - Nest with young

Comments:

* Note: this column gets entered in as incidental species (Point Count radius is 100m)

Breeding Bird Monitoring

10 Minute Point Count Project Name: Glenarm Project # 1072

Wind speed: 4
Cloud cover: 0 %
Air Temp. 20 °C
Precip. —
UTM

Station: 2, 5, 6, 7
Date: June 17, 2010
Visit #: (1) 2 (circle)
Start Time:
Observers: KSJ, MM

Species Name	First 5 Minutes			Second 5 Minutes			Breeding Evidence
	<50m	50-100m	>100m*	<50m	50-100m	>100m*	
ALFL (Alder Flycatcher)							S
LEFL (Least Flycatcher)							S
AMAR							S CF
SOSP							S
SAVS							S
CEDW (Cedar Waxwing)							X
RWBL							FY
EAKI (E Kingbird)							X S
COYE (Co. Yellowthroat)							S
YRWA (Yellow rumped W)							S
AMCR (Crow)							X
SWSP (Swamp Sp)							S
COGR							S
BRTH (Brown Thrasher)							X
Mallard							X

Wind Scale
0 Calm
1 Smoke drifts
2 Wind felt on face
3 Leaves in motion
4 Sm branches move
5 Sm trees sway
6 Lrg branches move
7 Whole trees in motion
8 Twigs break off, hard to walk
9 Light structural damage
10 Trees uprooted

Breeding Evidence Codes
Observed
X - No evidence of breeding
Possible
H - Suitable nesting habitat
S - Singing male
Probable
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V - Visiting prob. nest site
A - Agitated behaviour or anxiety calls
B - Brood patch/cloacal protuberance
N - Nest building or excavation
Confirmed
DD - Distraction display
NU - Used nest or egg shell
FY - Fledged young
AE - Adults at occupied nest
FS - Faecal sac
CF - Carrying food
NE - Nest containing eggs
NY - Nest with young

Comments:

* Note: this column gets entered in as incidental species (Point Count radius is 100m)

Breeding Bird Monitoring

10 Minute Point Count Project Name: Glenarm Project # 1072

Wind speed: 4
Cloud cover: 0 %
Air Temp. 18 °C
Precip.
UTM

Station: 3
Date: June 17, 2010
Visit #: (1) 2 (circle)
Start Time:
Observers: KSJ, mn

Species Name	First 5 Minutes			Second 5 Minutes			Breeding Evidence
	<50m	50-100m	>100m*	<50m	50-100m	>100m*	
SOSP							S, FY
AMGO							P
SWSP							S
RWBL							P, A
LEFL							S

Wind Scale
0 Calm
1 Smoke drifts
2 Wind felt on face
3 Leaves in motion
4 Sm branches move
5 Sm trees sway
6 Lrg branches move
7 Whole trees in motion
8 Twigs break off, hard to walk
9 Light structural damage
10 Trees uprooted

Breeding Evidence Codes
Observed
X - No evidence of breeding
Possible
H - Suitable nesting habitat
S - Singing male
Probable
P - Pair
T - Permanent territory
D - Courtship or display
V - Visiting prob. nest site
A - Agitated behaviour or anxiety calls
B - Brood patch/cloacal protuberance
N - Nest building or excavation
Confirmed
DD - Distraction display
NU - Used nest or egg shell
FY - Fledged young
AE - Adults at occupied nest
FS - Faecal sac
CF - Carrying food
NE - Nest containing eggs
NY - Nest with young

Comments:

* Note: this column gets entered in as incidental species (Point Count radius is 100m)

Breeding Bird Monitoring

10 Minute Point Count Project Name: Glenarm Project # 1072

Station: 4

Wind speed: 4

Date: June 17, 2010

Cloud cover: 0 %

Visit #: (1) 2 (circle)

Air Temp. 20 °C

Start Time:

Precip. —

Observers: KSJ, MM

UTM

Species Name	First 5 Minutes			Second 5 Minutes			Breeding Evidence
	<50m	50-100m	>100m*	<50m	50-100m	>100m*	
REVI (Red-eyed Vireo)							S
RWBL							S, A
LEFL							S, N
COYE							S
SOSP							S
AMGO							S
DOWO (Downy)							S

Wind Scale
0 Calm
1 Smoke drifts
2 Wind felt on face
3 Leaves in motion
4 Sm branches move
5 Sm trees sway
6 Lrg branches move
7 Whole trees in motion
8 Twigs break off, hard to walk
9 Light structural damage
10 Trees uprooted

Breeding Evidence Codes
Observed
X - No evidence of breeding
Possible
H - Suitable nesting habitat
S - Singing male
Probable
P - Pair
T - Permanent territory
D - Courtship or display
V - Visiting prob. nest site
A - Agitated behaviour or anxiety calls
B - Brood patch/cloacal protuberance
N - Nest building or excavation
Confirmed
DD - Distraction display
NU - Used nest or egg shell
FY - Fledged young
AE - Adults at occupied nest
FS - Faecal sac
CF - Carrying food
NE - Nest containing eggs
NY - Nest with young

Comments:

* Note: this column gets entered in as incidental species (Point Count radius is 100m)

Breeding Bird Monitoring

10 Minute Point Count

Project Name: Glen Arm

Project #: 1072

Wind speed: 4, NE

Cloud cover: 0 %

Air temperature: 15 °C

Precipitation: none

Station: 1

Date: July 1, 2010

Visit #: 1 (2) (circle)

Start Time: 0715

Observers: MM

Species Name	Number			Breeding Evidence			
	<50m	50-100m	>100m*	Obs.	PO	PR	CO
American Crow				X			
Common Grackle	III			X			
barn Swallow					S		
Northern Cardinal	II				S		
Amer. Robin	IIII I			X	S		
Bobolink	II I			X		P	
Killdeer	III			X	S	P	

Comments:

* Note: this column gets entered in as incidental species (Point Count radius is 100m)

Wind Scale
0 Calm
1 Smoke drifts
2 Wind felt on face
3 Leaves in motion
4 Sm branches move
5 Sm trees sway
6 Lrg branches move
7 Whole trees in motion
8 Twigs break off, hard to walk
9 Light structural damage
10 Trees uprooted

Breeding Evidence Codes
Observed
X - No evidence of breeding
Possible
H - Suitable nesting habitat
S - Singing male
Probable
P - Pair
T - Permanent territory
D - Courtship or display
V - Visiting prob. nest site
A - Agitated behaviour or anxiety calls
B - Brood patch/cloacal protuberance
N - Nest building or excavation
Confirmed
DD - Distraction display
NU - Used nest or egg shell
FY - Fledged young
AE - Adults at occupied nest
FS - Faecal sac
CF - Carrying food
NE - Nest containing eggs
NY - Nest with young

Breeding Bird Monitoring

10 Minute Point Count

Project Name: Glen Arm

Project #: 10-12

Station: 2,5,6,7 (wetlands)

Wind speed: 4

Date: 1 July 2010

Cloud cover: 0 %

Visit #: 1 (2) (circle)

Air temperature: 15 °C

Start Time: 0730

Precipitation: none

Observers: MM

Species Name	Number			Breeding Evidence			
	<50m	50-100m	>100m*	Obs.	PO	PR	CO
Redwing blackbird	HHT IIII			X	S		
Com. grackle	III			X			
Barn Swallow	IIII			X	S		
Mourning dove	I			X	S		
Cedar waxwing	II			X	S		
Am. goldfinch	I			X			
Yellow Warbler	I			X	S		
Eastern Kingbird	I			X			
Willow flycatcher	I			X			
Am. woodcock	1 pair II			X		P	

Wind Scale
0 Calm
1 Smoke drifts
2 Wind felt on face
3 Leaves in motion
4 Sm branches move
5 Sm trees sway
6 Lrg branches move
7 Whole trees in motion
8 Twigs break off, hard to walk
9 Light structural damage
10 Trees uprooted

Breeding Evidence Codes
Observed
X - No evidence of breeding
Possible
H - Suitable nesting habitat
S - Singing male
Probable
P - Pair
T - Permanent territory
D - Courtship or display
V - Visiting prob. nest site
A - Agitated behaviour or anxiety calls
B - Brood patch/cloacal protuberance
N - Nest building or excavation
Confirmed
DD - Distraction display
NU - Used nest or egg shell
FY - Fledged young
AE - Adults at occupied nest
FS - Faecal sac
CF - Carrying food
NE - Nest containing eggs
NY - Nest with young

Comments:

* Note: this column gets entered in as incidental species (Point Count radius is 100m)

Breeding Bird Monitoring

10 Minute Point Count Project Name: Glen Arm Project #: 1072

Wind speed: 4, NE
Cloud cover: 0 %
Air temperature: 18 °C
Precipitation: none

Station: 3
Date: 1 July 2010
Visit #: 1 (2) (circle)
Start Time: 0750
Observers: MM

Wind Scale
0 Calm
1 Smoke drifts
2 Wind felt on face
3 Leaves in motion
4 Sm branches move
5 Sm trees sway
6 Lrg branches move
7 Whole trees in motion
8 Twigs break off, hard to walk
9 Light structural damage
10 Trees uprooted

Species Name	Number			Breeding Evidence			
	<50m	50-100m	>100m*	Obs.	PO	PR	CO
Com. yellowthroat	I				S		
R.W. blackbird	IIII I			X	S		
yellow warbler	I			X	S		
Am. crow	II			X			
Eastern kingbird	III			X	S		
barn swallow	IIII III				S		
Song Sparrow	II				S		
b.-cap. chickadee	I				S		
Am. Tree Sparrow	I				S		
Eu. Starling	II				S		
R. eyed vireo	I				S		
Am. Robin	II			X	S		
Com. grackle	III			X	S		
br.-headed cowbird	I						

Breeding Evidence Codes
Observed
X - No evidence of breeding
Possible
H - Suitable nesting habitat
S - Singing male
Probable
P - Pair
T - Permanent territory
D - Courtship or display
V - Visiting prob. nest site
A - Agitated behaviour or anxiety calls
B - Brood patch/cloacal protuberance
N - Nest building or excavation
Confirmed
DD - Distraction display
NU - Used nest or egg shell
FY - Fledged young
AE - Adults at occupied nest
FS - Faecal sac
CF - Carrying food
NE - Nest containing eggs
NY - Nest with young

Comments:

* Note: this column gets entered in as incidental species (Point Count radius is 100m)

Breeding Bird Monitoring

10 Minute Point Count

Project Name: Glenburn Project #: 1072

Wind speed: 4, NE

Cloud cover: 0 %

Air temperature: 18 °C

Precipitation: none

Station: 4

Date: 1 July 2010

Visit #: 1 (2) (circle)

Start Time: 08:15

Observers: MM

Wind Scale
0 Calm
1 Smoke drifts
2 Wind felt on face
3 Leaves in motion
4 Sm branches move
5 Sm trees sway
6 Lrg branches move
7 Whole trees in motion
8 Twigs break off, hard to walk
9 Light structural damage
10 Trees uprooted

Species Name	Number			Breeding Evidence			
	<50m	50-100m	>100m*	Obs.	PO	PR	CO
Common grackle	I			X			
Northern Cardinal	I			X			
American Robin	I			X	S		
Song sparrow	II			X	S		
Cedar waxwing	IIII			X	S		
Eastern kingbird	II			X	S		
Com. yellowthroat	I				S		
Yellow warbler	I				S		
barn Swallow	IIII			X			
Rose breasted grosbeak	III			X	S		

Breeding Evidence Codes

Observed
X - No evidence of breeding

Possible
H - Suitable nesting habitat
S - Singing male

Probable
P - Pair
T - Permanent territory
D - Courtship or display
V - Visiting prob. nest site
A - Agitated behaviour or anxiety calls
B - Brood patch/cloacal protuberance
N - Nest building or excavation

Confirmed
DD - Distraction display
NU - Used nest or egg shell
FY - Fledged young
AE - Adults at occupied nest
FS - Faecal sac
CF - Carrying food
NE - Nest containing eggs
NY - Nest with young

Comments:

* Note: this column gets entered in as incidental species (Point Count radius is 100m)

Bird and Wildlife Area Search Observation Form	Project: Glenarm SP
	Project #: 1072
Date: May 4, 2011	Cloud Cover (%): 75%
Time: 9:33 AM	Temperature (°C): 6°C
Observer(s): PNT, JRW	Wind: 140°
Survey: Herp & Bird Habitat Searches	Precipitation: None (rained steady yesterday)

Species (**note: no codes)	POLYGON NUMBERS - Record evidence by polygon												
	WET-002	OCB-003	WET-001	WOD-001	OCB-001	WOD-002	WOD 003						
Red-winged Blackbird	50			::		::							
Sharp-Shinned Hawk	•												
Canada Goose	3												
Song Sparrow	2												
Eastern Meadowlark	••	•		••	••								
American Robin	::					•	::						
Sparrow sp.	•												
American Crow		::				•							
Savannah Sparrow	•												
Tree Swallow	::												
Coyote (scat)	::				•								
* Sandpiper sp.					::								
Western Chorus Frog	::												
Raccoon (tracks)						•							
Sandhill Crane	::												
Beaver (old evidence of chewed trees)						•							
Woodpecker sp.						•							
American Goldfinch						::							
Water Striders						::							
Downy Woodpecker							:						
Mallard							•						
Praying Mantis (Ootheca)	•												

* Shorebird

may 4, 2011 - Herp + Bird Habitat Searches MNRA
OBS: PNT, JRW

660500 661000 661500 662000 662500 663000

4927000 4926500 4926000 4925500 4925000

OC1
OAGM4
Inverter
MAMM1-13-WET1
SWTM3-6
FOMM7-2
WOOD3
WOOD2
SWDM4-5
MAMM1-13
SWTM3-6
FODM8-1
WOOD1
WET2
MAMM1-2
THCM2-1
OAGM4
OC3
MAMM1-2
CVR_4
CVR_4
Communication Tower
OAGM4
OC2
CVR_4
Transformer
MAMM1-3
Access Road
Solar Panel Array
GLENARM RD
SANDRINGHAM RD

X:\1072_GlenarmSolarPark\NRSI_1072_Fig2_NaturalFeatures_10K_2011_02_03_SWM.mxd

Figure 2

Glenarm Solar Park

Candidate Significant Natural Features

Legend

- Watercourse
- Primary Road
- Secondary Road
- Wetland Area (OBM)
- Project Area (120m)
- **Ecological Land Classification**
  - (CVR_4) Rural Property
  - (FODM8-1) Fresh – Moist Poplar Deciduous Forest Type
  - (FOMM7-2) Fresh – Moist White Cedar – Hardwood Mixed Forest Type
  - (MAMM1-13) Rush Graminoid Mineral Meadow Marsh Type
  - (MAMM1-2) Cattail Graminoid Mineral Meadow Marsh Type
  - (MAMM1-3) Reed-canary Grass Graminoid Mineral Meadow Marsh Type
  - (OAGM4) Open Pasture
  - (SWDM4-5) Poplar Mineral Deciduous Swamp Type
  - (SWTM3-6) Mixed Willow Mineral Deciduous Thicket Swamp Type
  - (THCM2-1) Fresh - Moist White Cedar Coniferous Thicket Type
- **Candidate Significant Natural Features**
  - Open Country Bird Breeding Habitat
  - Wetland
  - Woodland

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

Map Produced by Natural Resource Solutions Inc. This map is proprietary and confidential and must not be duplicated or distributed by any means without express written permission of NRSI. Source: Data provided by MNR.
Copyright: Queen's Printer Ontario

Project: 1072
Date: January 31, 2011

NAD83 - UTM Zone 17
Scale: 1:10,000 (11x17")

0 200 400 600 Metres

N

APPENDIX E WATER BODY REPORT

GLENARM SOLAR PARK
Water Body Report

Prepared for:
GL Garrad Hassan
151 Slater Street, Suite 806, Ottawa,
Ontario, Canada, K1P 5H3

Project No. 1072 Date: March 2012

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

GLENARM SOLAR PARK
Water Body Report

Project Team:

Staff	Role
Andrew G. Ryckman	Project Advisor/Biologist
Tara Lessard	Project Manager/Biologist
Gina K. MacVeigh	Aquatic Biologist
Shawn W. MacDonald	GIS Technician

Report submitted on March 23rd, 2012

Andrew G. Ryckman

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Appendix II: Site Investigation Field Notes

1.0 Introduction

Natural Resource Solutions Inc. (NRSI) was retained in May 2010 by GL Garrad, on behalf of SkyPower Limited to conduct a water body assessment in accordance with the Renewable Energy Approval (REA) Regulation (O.Reg. 359/09 of the *Environmental Protection Act)*. This assessment includes a records review, site investigation, and impact assessment of any water bodies within 120m (or 300m) of the proposed 10MW solar energy facility in the City of Kawartha Lakes and the former Township of Eldon, Ontario. The analysis of the water bodies and aquatic resources within the project area is one issue being considered. Other factors, such as land ownership, social impacts, and cultural heritage features are also being assessed by other team members.

The Glenarm Solar Park project area is located in the former geographic Township of Eldon within the City of Kawartha Lakes, approximately 6km west of the community of Glenarm, ON. The Glenarm Solar Project includes the proposed installation of solar panel arrays and associated infrastructure, including access roads, cabling, inverters, etc. In accordance with the REA Regulation, NRSI biologists have reviewed the proposed development layouts and have examined an area of 120m from the project location for water bodies, and within 300m for lake trout (*Salvelinus namaycush*) lakes.

This *Water Report* summarizes the findings of a comprehensive records review and detailed site investigations conducted by Natural Resource Solutions Inc. at the proposed Glenarm Solar Project area in July 2010. In addition to an aquatic assessment, a detailed records review and site investigation of terrestrial resources has also been conducted by NRSI biologists. This information has been summarized under a separate Natural Heritage Assessment and Environmental Impact Study cover, prepared by NRSI (NRSI 2012). Other reports pertaining to the development of this proposed solar energy facility have been prepared by other team members.

For the purposes of this report, ‘project location’ refers to the all proposed project components and ‘project area’ refers to the 120m (or 300m for lake trout) area surrounding the project location that was reviewed by NRSI biologists for the completion of this report. Since certain natural features may have an area of influence of up to 1km, NRSI reviewed an extended area around the project location, wherever possible. This

extended area was reviewed as part of the queries of Biodiversity Explorer and NHIC, as well as other online and published resources, such as fish collection records.

As part of this project, NRSI has considered all aspects relating to provincially Threatened and Endangered species. However, since these species are addressed as part of the *Endangered Species Act* (2007), they have not been discussed in great detail within this Water Body report. If present, these species will be addressed in full detail, including a description and results of field assessments, potential impacts, and recommended mitigation measures, as part of a separate *Approval and Permitting Requirements Document* to be submitted to the Ministry of Natural Resources (MNR) under a separate cover.

Figure 1

Glenarm Solar Park

Project Area and Aquatic Features

660500 661000 661500 662000 662500 663000

4927000 4926500 4926000 4925500 4925000

SANDRINGHAM RD

GLENARM RD

Tributary 'D'

Tributary 'C'

Tributary 'B'

Tributary 'A'

Tributary 'E'

Legend

- Project Area (120m)
- Project Location
- Primary Road
- Secondary Road
- Watercourse
- Wetland Area (OBM)
- Provincially Significant Wetland
- Wooded Area
- Elevation Contour (0.5m Interval)

Path: X:\1072_GlenarmSolarPark\NRSI_1072_Fig1_StudyArea_10K_2012_02_16_ELF.mxd

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

Map Produced by Natural Resource Solutions Inc. This map is proprietary and confidential and must not be duplicated or distributed by any means without express written permission of NRSI. Source: Data provided by MNR. Copyright: Queen's Printer Ontario

Project: 1072
Date: February-16-12

NAD83 - UTM Zone 17
Scale: 1:10,000 (11x17")

N

0 200 400 600 Metres

2.0 REA Requirements

Ontario Regulation (O. Reg.) 359/09 – Renewable Energy Approvals under Part V.0.1 of the Act, (herein referred to as the REA Regulation) made under the Environmental Protection Act (EPA) identifies the requirements for the development of renewable energy projects in Ontario. In accordance with REA Regulation, the Glenarm Solar Park, classified as a Class 3 solar facility, is required to complete a REA submission.

2.1 Records Review

Section 29 of the REA Regulation requires proponents of Class 3 solar projects to undertake a water assessment which involves a records review in order to identify whether the project location is:

1. in a water body;
2. within 120 meters of the average annual high water mark of a lake, other than a Lake Trout lake that is at or above development capacity;
3. within 300 meters of the average annual high water mark of a Lake Trout lake that is at or above development capacity;
4. within 120 meters of the average annual high water mark of a permanent or intermittent stream; or
5. within 120 meters of a seepage area.

Section 1.1 of the REA Regulation defines a "water body" as a lake, a permanent stream, an intermittent stream and a seepage area but does not include,

a) grassed waterways;
b) temporary channels for surface drainage, such as furrows or shallow channels that can be tilled and driven through;
c) rock chutes and spillways;
d) roadside ditches that do not contain a permanent or intermittent stream;
e) temporary ponded areas that are normally farmed;
f) dugout ponds; and
g) artificial bodies of water intended for storage, treatment or recirculation of runoff from animal yards, manure storage facilities and sites and outdoor confinement areas.

Subsection 2 of Section 30 of the REA Regulation requires the proponent to prepare a report "setting out a summary of the records searched and the results of the analysis" (O. Reg. 359/09). Section 4.0 of this report has been prepared for the Glenarm Solar Park to meet these requirements.

2.2 Site Investigation

Section 31 (1) subject to subsection (2) of the REA Regulation requires proponents of Class 3 solar projects to undertake a water site investigation for the purpose of determining:

(a) whether the results of the analysis summarized in the report prepared under subsection 30(2) are correct or require correction, and identifying any required corrections;
(b) whether any additional water bodies exist, other than those identified in the records review;
(c) the boundaries, located within 120 m of the project location, of any water body that was identified in the records review or the site investigation; and
(d) the distance from the project location to the boundaries determined under clause (c).

The REA Regulation has specific requirements if designated Lake Trout lakes are present within 300m of the project location. These requirements were not deemed applicable to the Project as no such lakes were found during the Records Review (AECOM 2009).

Subsection (3) of Section 31 of the REA Regulation requires the proponent to prepare a report setting out the following:

1. A summary of any corrections to the report prepared under subsection 30 (2) and the determinations made as a result of conducting the site investigation under subsection (1).
2. Information relating to each water body identified in the records review and in the site investigation, including the type of water body, plant and animal composition and the ecosystem of the land and water investigated.
3. A map showing
   i. The boundaries mentioned in clause (1) (c) or (2) (c) and (d),
   ii. The location and type of each water body identified in relation to the project location, and
   iii. The distances mentioned in clause (1) (d) or (2) (e).
4. The dates and times of the beginning and completion of the site investigation.
5. The duration of the site investigation.
6. The weather conditions during the site investigation.
7. A summary of methods used to make observations for the purpose of the site investigation.
8. The name and qualifications of any person conducting the site investigation.
9. Field notes kept by the person conducting the site investigation.

Sections 5.0 and 6.0 of this report have been prepared for the Glenarm Solar Park to meet these requirements.

2.3 Environmental Impact Study (EIS)

Section 40 of the REA Regulation state that “no person shall construct, install or expand a renewable energy generation facility as part of a renewable energy project at a project location that is in any of the following locations”:

1. within 120 meters of the average annual high water mark of a lake, other than a Lake Trout lake that is at or above development capacity;
2. within 300 meters of the average annual high water mark of a Lake Trout lake that is at or above development capacity;
3. within 120 meters of the average annual high water mark of a permanent or intermittent stream; or
4. within 120 meters of a seepage area.

This however does not apply if the applicant submits a report that:

i. identifies and assesses any negative environmental effects of the project on a water body referred to in paragraphs 1 to 4 (above) and on land within 30m of the water body;
ii. identifies mitigation measures in respect of any negative environmental effects mentioned in clause (i);
iii. describes how the environmental effects monitoring plan addresses any negative environmental effects mentioned in clause (i); and
iv. describes how the construction plan report prepared in accordance with Table 1 of the REA addresses any negative environmental effects mentioned in clause (i).

3.0 Staff Roles

The requirements of the REA Regulation indicate that the name and qualifications of all staff participating in the site investigation and/or evaluation of significance. As a result, the qualifications and roles of all staff participating in the completion of the project have been outlined in the following sections.

Andrew G. Ryckman, B.Sc

Andrew is a Terrestrial and Wetland Biologist with 7 years of environmental experience. He routinely manages the natural heritage aspects of renewable energy projects, with specific expertise relating to bats and herpetofauna. Andrew is certified in Ecological Land Classification (2010), and has successfully completed a Bat Conservation International (BCI) Acoustic Monitoring Workshop (2008).

Andrew's role in the Glenarm Solar Park was to act as the project advisor, overseeing all aspects of the Natural Heritage and Water Body Assessments, including all associated field work and reporting.

Tara Lessard, B.Sc.

Tara is a Terrestrial and Wetland Biologist with more than 4 years of experience working in the environmental field. During her consulting experience, Tara has conducted bird and bat assessments, amphibian studies, and other fauna assessments throughout Ontario. Tara has participated in field investigations and reporting for wind power projects in Ontario and New Brunswick.

Tara's role in this project was to act as the project manager, overseeing and reviewing the reporting for this project.

Gina K. MacVeigh, F.W.T.

Gina is an Aquatic Biologist with more than 5 years of work experience in the environmental field. Her areas of expertise are fish habitat surveys, habitat mapping, and fish community assessments, but she also has extensive knowledge and experience with benthic invertebrate surveys and species identification. Gina has been certified to the level two fish identification (2010) under the Ontario Stream Assessment protocol, and has also obtained her Ontario Benthic Biomonitoring Network Certificate (2009). She has also completed the Fish and Species at Risk Identification courses through the Royal Ontario Museum (2009). Her experience on wind, solar and hydroelectric projects includes background reviews, aquatic habitat assessments and report generation.

Gina's role was to conduct the field investigations of the aquatic features with the project area. Gina also prepared portions of this report.

Shawn W. MacDonald, B.A., GIS-AS

Shawn has more than 3 years of experience working on GIS mapping tasks for a variety of environmental projects since graduating from the Geomatics Technician program from Sir Sandford Fleming College. Shawn's primary focus is the creation and organization of spatial data for renewable energy project clients. This role requires the management of several project areas and the organization of multiple datasets within set data standards.

Shawn's role in the Glenarm Solar Park project was as the primary GIS technician. He reviewed and collected all available background and site investigation mapping resources to compile into project mapping for the Glenarm Solar Park.

4.0 Records Review

In accordance with the Renewable Energy Approval (REA) Regulation, an area of at least 300m beyond the proposed development activities was examined for any water body (lakes (including lake trout lakes), permanent or intermittent streams, and seepage areas).

This preliminary records review has already been completed by another consulting firm, AECOM (2009). As part of this records review, AECOM examined records from the Natural Heritage Information Centre (NHIC), the City of Kawartha Lakes Official Plan (2009), the Ministry of Natural Resources and Values Information System (NRVIS) Mapping, Conservation Ontario/Department of Fisheries and Oceans (DFO) Aquatic Species at Risk Distribution Mapping (2009) for information pertaining to the water bodies or species records within the project area (AECOM 2009). Direct correspondence has also occurred between AECOM with the Ministry of Natural Resources (MNR) Peterborough District, and the Kawartha Conservation Authority (KCA) for information pertaining to the aquatic features or species records within the project area (AECOM 2009).

As of the date of this report, no information from the MNR or the KCA has been provided to NRSI.

In addition to the records already examined by AECOM, NRSI has completed a secondary records review of other available background information, specifically the MNR's Biodiversity Explorer mapping tool and information database (MNR 2010a), Land Information Ontario mapping, and the current Conservation Ontario/DFO Aquatic Species at Risk Distribution Mapping (2010). In addition, the Lake Simcoe Region Conservation Authority regulated lands mapping was also consulted, as a small portion of the project area (consisting primarily of rural residential property) is located within the jurisdiction of this authority. The results of these queries and reviews are provided in Table 1 and in the sections below.

Table 1. Summary of Records Reviewed for the Glenarm Solar Park

Information Source	Consultation Details	Records Received
AECOM Records Review		
Conservation Ontario/DFO Aquatic Species at Risk Distribution Mapping	Species at Risk distribution mapping consulted.	No water bodies within the vicinity of the project area have been identified in SAR mapping as containing suitable habitat for an extirpated, endangered or threatened aquatic species protected under the Species at Risk Act (SARA).
Ministry of Natural Resources, Land Information Ontario	Land Information Ontario mapping consulted.	A permanent watercourse was identified within the center portion of the project area. Warmwater watercourses were also identified along the northeast and northwest corners of the project area. However, upon subsequent changes to the project layout, these watercourses are now located more than 120m from the project location. No lakes were identified within 300m of the project area.
Ministry of Natural Resources Peterborough District Office	A written request for information was made.	No information has been received to date.
Kawartha Conservation Authority	A written request for information was made.	No information has been received to date.
NRSI Records Review		
Conservation Ontario/DFO Aquatic Species at Risk Distribution Mapping	Species at Risk distribution mapping consulted on February 7, 2012.	No water bodies within the vicinity of the project area have been identified in SAR mapping as containing suitable habitat for an extirpated, endangered or threatened aquatic species protected under the Species at Risk Act (SARA).
Ministry of Natural Resources, Land Information Ontario	Information consulted on February 7, 2012.	No water bodies were identified within the project area.
NHIC Biodiversity Explorer	Website consulted on February 7, 2012.	No aquatic information was identified through the Biodiversity Explorer website.

4.1 Lakes

A comprehensive review of available background information has revealed that no lakes exist within the Glenarm Solar Park project area.

4.2 Lake Trout Lakes

The Records Review Desktop Study and Analysis for Glenarm Site by AECOM (2009) indicates that no Lake Trout lakes are present within 300m of the project location. NRSI biologists have also reviewed the Inland Ontario Lakes Designated for Lake Trout Management (OMNR 2006), and have confirmed that no Lake Trout lakes (natural or put-grow-take) are present within the Glenarm Solar Park project area.

4.3 Permanent or Intermittent Streams

During the records review conducted by AECOM in 2009, a permanent watercourse was identified within the center portion of the Glenarm Solar Park project area. Warmwater watercourses were also identified along the northeast and northwest corners of the project area. However, upon subsequent changes to the project layout, these watercourses are now located more than 120m from the project location, and as such, they will not be discussed further in this report.

Current LIO mapping also indicates that no permanent or intermittent streams are located within 120m of the proposed Glenarm Solar Park project location, although watercourses do exist just outside of the project area. The locations of these watercourses are depicted in Figure 1.

4.4 Fisheries Information

Since no lakes, permanent or intermittent streams exist within the project area, no fisheries information was available for this project.

The Conservation Ontario/DFO Species at Risk Distribution Mapping (2010) confirmed there are no water bodies within the vicinity of the project area that contain suitable habitat for an extirpated, endangered or threatened aquatic species protected under the Species at Risk Act (SARA).

4.5 Seepage Areas

A review of available records did not identify any seepage areas within the project area. Site investigations will be conducted by NRSI biologists to obtain additional information pertaining to seepage areas within the project area.

4.6 Species of Conservation Concern

Species of conservation concern include all species that have been designated as a species of Special Concern according to the Species at Risk in Ontario (SARO) or have been given a provincial S-Rank of S1-S3, but have not been designated as either Endangered or Threatened within Ontario. Habitats for these species have been considered as part of the records review for the proposed Glenarm Solar Park.

A review of all relevant background sources, including Biodiversity Explorer and Conservation Ontario/DFO Species at Risk Distribution Mapping currently indicates that there are no fish or mussel species of conservation concern known to occur within the project area.

4.7 Records Review Summary

In accordance with REA Regulation, AECOM (2009) have conducted a records review of the water bodies within the Glenarm Solar Park project area. The summary of specific criteria related to key water features and the proposed development examined as part of this report are summarized in Table 2 below.

Table 2. Summary of Water Body Records for the Glenarm Solar Park

Criteria	Yes/No	Result
1. In a water body	No	No project components are found within a water body.
2. Within 120m of the average annual high water mark of a lake, other than a Lake Trout lake that is at or above development capacity	No	No project components are found within 120m of the average annual high water mark of a lake, other than a Lake Trout lake that is at or above development capacity.
3. Within 300m of the average annual high water mark of a Lake Trout lake that is at or above development capacity	No	No project components are found within 300m of the average annual high water mark of a Lake Trout lake that is at or above development capacity.
4. Within 120m of the average annual high water mark of a permanent or intermittent stream	No	No project components are found within 120m of the average annual high water mark of any permanent or intermittent streams.
5. Within 120m of a seepage area	No	No project components are found within 120m of any known seepage areas.

5.0 Site Investigation Methodology

In accordance with the REA Regulation and the requirements of the Ministry of Environment, a comprehensive site investigation to document the habitat characteristics of the water bodies within the Glenarm Solar Park project area were undertaken. This site-specific field investigation focused on characterizing, and identifying the boundaries of water bodies that were not identified during the records review phase of this project. NRSI biologists specifically looked for fish habitat, substrate conditions, aquatic and riparian vegetation, and seepage areas. A summary of project methodology is found below.

5.1 Survey Dates

The details pertaining to the site investigation conducted by NRSI, including staff, date and weather conditions are available below. Refer to Section 3.0 for NRSI Biologist qualifications.

Table 3. Site Investigation Survey Details Summary

Staff Name(s)	Date	Duration (hrs)	Weather Conditions		
			Temp. (°C)	Beaufort Wind	Cloud Cover (%)
Gina MacVeigh	July 1, 2010	3	12	2	0

5.2 Aquatic Habitat Mapping

In order to identify the presence and proximity of aquatic features within the Glenarm Solar Park project area, NRSI initially reviewed aerial imagery and base mapping as part of the already completed records review. Site-specific investigations were completed by biologists on foot for all areas within, and within 120m of, the project location. When conducting the site investigation information regarding substrates, vegetation, condition of channels, and whether the watercourse was permanent or intermittent were noted. Photos and field notes were recorded and are included in Appendix I and II.

6.0 Aquatic Resources

NRSI biologists completed a comprehensive site investigation of the aquatic resources within the Glenarm Solar Park project area. These surveys have been completed in accordance with REA Regulation and the results have been summarized below.

6.1 Lakes

A review of available background information and detailed site investigation has confirmed that no lakes are present within 120m of the Glenarm Solar Park project location.

Several small dugout ponds, created for agricultural purposes (i.e. cattle watering), were identified throughout the project area. Since these features are not considered water bodies, as defined in Section 1.1 of the REA Regulation, they have not been considered further in this report.

6.2 Permanent or Intermittent Streams

A review of available background information and detailed site investigation has confirmed that no permanent or intermittent streams are present within 120m of the Glenarm Solar Park project location.

Five unnamed watercourses were confirmed just outside of the project area. Three unnamed tributaries of the Staples River (i.e. tributaries A, B, and C) are located to the east and south of the project area, and two unnamed tributaries of White's Creek (i.e. tributaries D and E) are located to the west and south of the project area. Of these five tributaries, four of them (i.e. tributaries A, B, D, and E) are located immediately adjacent to the project area, whereas tributary C is located approximately 20m from the project area boundary. These five tributaries are depicted on Figure 1. Since these water bodies have been confirmed beyond 120m from the project location, they have not been discussed in any more detail within this report.

6.3 Seepage Areas

Seepage areas are defined with the REA Regulation as "a site of emergence of groundwater where the water table is present at the ground surface, including a spring"

(O. Reg. 359/09). No groundwater indicator vegetation, seepages or upwellings were identified within the project area or vicinity by NRSI biologists during site investigations.

6.4 Summary of Aquatic Resources

An assessment of the water bodies within, and adjacent to, the proposed Glenarm Solar Park project location has occurred through a detailed Records Review and Site Investigations conducted by NRSI biologists.

Through the completion of these studies, NRSI has confirmed that no lakes, lake trout lakes, permanent or intermittent streams are present within 120m (300m for lake trout lakes) of the Glenarm Solar Park project location. Since no aquatic features are present within 120m of the project location, no environmental impact study is required for the Glenarm Solar Park.

7.0 Summary and Conclusions

Natural Resource Solutions Inc. (NRSI) was retained by GL Garrad Hassan, on behalf of SkyPower Limited, to conduct an aquatic resource assessment in accordance with the Renewable Energy Approval (REA) Regulation. This Water Report includes a records review and site investigation of any potentially significant aquatic features at the proposed 10MW Glenarm Solar Park in the City of Kawartha Lakes and the former Township of Eldon, Ontario.

Based on the results of these evaluations, no aquatic features are present within 120m of the project location; therefore, no Environmental Impact Study is required. No significant impacts are anticipated on the identified water body features as a result of the development of the Glenarm Solar Park.

8.0 References

Publications

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Appendix I
Site Photographs

Photo 1: Tributary ‘B’ at culvert crossing under Moor Road (outside project area)

Photo 2: Tributary ‘B’ facing west from Moor Road (outside project area)

Photo 3: Tributary ‘B’ facing downstream, to the east of Moor Road (outside of the project area)

Photo 4: Tributary ‘B’ facing upstream towards wetland area, which is east of the project area (outside project area)

Photo 5: Western side of pond associated with Tributary ‘C’ (outside project area)

Photo 6: Eastern side of pond associated with tributary ‘C’ (outside project area)

Photo 7: Large amount of standing water at Moor Road crossing of Tributary ‘C’ (outside project area)

Photo 8: Tributary ‘D’ facing north along Sandringham Road (north of the project area)

Photo 9: Roadside ditch (tributary ‘D’) along Sandringham Road (north of project area)

Photo 10: Tributary ‘E’ facing east along Sandringham Road (manmade pond and grassed waterway within project area)

Photo 11: Pond within tributary ‘A’ to the north of Glenarm Road (outside project area)

Photo 24: Tributary ‘A’ facing north towards forested area (outside project area)

Appendix II
Site Investigation Field Notes

1 July 2010 Glenarm Solar Park
GVW, MM. 1072.

air: 12°C precip: —
wind: 2 cloud: 0%
water: 22°C

Watercourse 1

crosses through Eastern side of property near glenarm road + an unassumed road (Moor rd.)
- ~~intermittent~~ permanent watercourse throughout cattle field
- channel is defined in a few locations and in others has been destroyed by cattle

Description of map 4 of 4 (google map) [section 1]
walked in over fence on moor rd
- there is a defined channel where it goes under road / culvert (photo 1+2)
- as you continue towards the wetland area, channel is less defined + heavily vegetated (photo 3-5)

photo 23 - 24 of crossing order rd

- as you get towards wetland the main channel is divided + difficult to see through cattails + other veg. (photo's 6 - 11)
- there is no defined channel through the entire woods as it has been trampled by cattle (photo's 12 - 13)

photo 14 - cattle skull
photo 15 - forest
photo 16 - view N of forest

Map 3 description (section 2)
- no defined channel
- intermittent
- ~~rain~~ swath through field (photo 17 - 18)
- pond in field approx 15x 30m filled in algae, banks trampled
- frogs observed.
- (photo's 19 - 20)
- very wet but no channel where it crosses road again (photo's 21 - 22)

photo 23 -

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Section 3

- dry
- no channel observed
- cattle field
- no photos's taken

Section 4

photo 25 - looking NE toward woodlot

photo 26 - ditch along road

→ drainage ditch through field

- intermittent (dry currently)
- cattails near road and grasses as it continues toward N (woodlot)

Sect 5

- manmade pond on E side of Sandringham rd
- connects under road through a grassed waterway
- did not see if any water flowing into pond
- photos 27-28.

Sect. 6

- manmade pond at southern side of study area
- intermittent undefined channel (swale) on North side
- pond not releasing any water to intermittent undefined channel that flows under glenarm rd.
- photo's 29-33

- Whole study site was intermittent with mostly undefined channels (swales).
- Cows + livestock has greatly interferred with channels.

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1072 Glenarm

map 1 of 4
SW corner

1072 Glenarm

map 2 of 4
NW corner

1072 Glenarm

map 3 of 4
NE corner

1072 Glenarm

map 4 of 4
SE corner

660000 660500 661000 661500 662000 662500 663000 663500 664000

4927000 4926500 4926000 4925500 4925000 4924500 4924000

ELDON

Glenarm
(1072)

Section 1

Section 2

Section 3

Section 4

Section 5

Section 6

Sandringham

KIRKFIELD RD

GLENARM RD

SANDRINGHAM RD

PROSPECT RD

Legend

Project Area

Records Review
- Records Review (120 m)
- Records Review (300 m)

Human Features
- Building
- Radiocommunication Tower
- Arterial / Collector
- Local Road / Street
- Railway
- Lot Line

Natural Features
- Watercourse
- Hedgerow
- Wetland
- Wooded Area
- Waterbody

Constraints
- Watercourse, Wetland and Waterbody (30 m)

Consultation Zones
- Watercourse, Wetland and Waterbody (120 m)
- Wooded Area (120 m)

0 0.15 0.3 0.6 kilometres

SKYPOWER

Glenarm Solar Site

PRELIMINARY CONSTRAINTS ANALYSIS - RECORDS REVIEW -

helimax
Member of Group

752-002 100810-01 CLA

June 10, 2010

Projection: UTM Zone 17, NAD83

Sources: ORN (Ontario Road Network), OBM and Google Earth.

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1072
Glenarm
Solar
Park

N
8
Sandringham R
Image © 2010 GeoEye
© 2010 Google
©2009 Google
Imagery Date: Oct 21, 2007
17 T 662078.58 m E 4925995.15 m N elev 944 ft
Eye alt 10517 ft

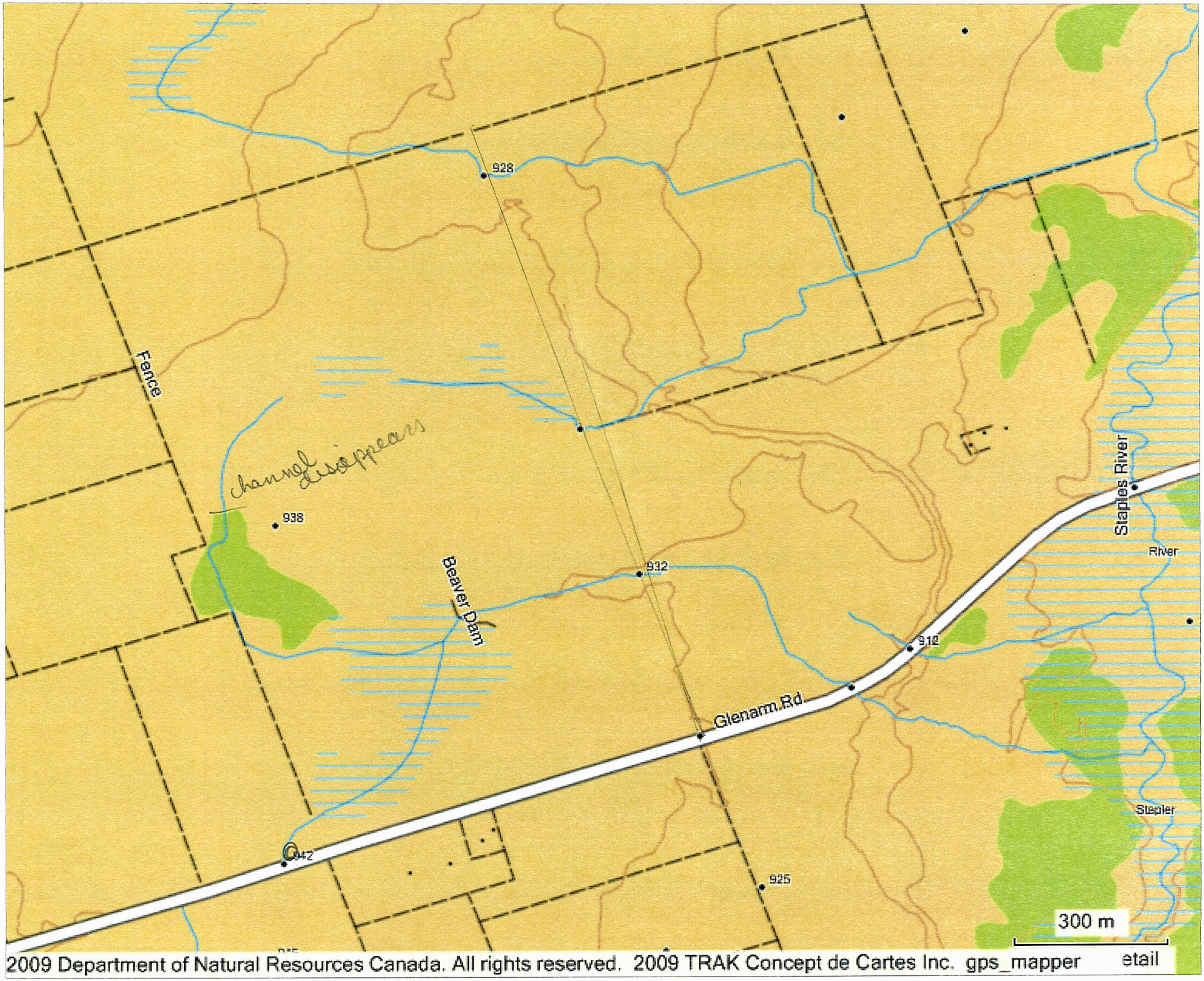
928
Fence
channel disappears
938
Beaver Dam
932
Staples River
River
912
Glenarm Rd
Stapler
942
925
300 m
2009 Department of Natural Resources Canada. All rights reserved. 2009 TRAK Concept de Cartes Inc. gps_mapper etail

Figure 1

Glenarm Solar Park

Project Area and ~~Natural~~ Aquatic Features

660500 661000 661500 662000 662500 663000

4927000 4926500 4926000 4925500 4925000

'A' 'B' 'C' 'D' 'E'

Inverter

Communication Tower

Transformer

Access Road

Solar Panel Array

GLENARM RD

SANDRINGHAM RD

Legend

- Watercourse
- Primary Road
- Secondary Road
- Elevation Contour (0.5m Interval)
- Project Area (120m)
- Deer Wintering (Stratum 2)
- Provincially Significant Wetland
- Wetland Area (OBM)
- Wooded Area

X:\1072_GlenarmSolarPark\NRSI_1072_Fig1_StudyArea_10K_2011_02_03_SWM.mxd

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Aquatic, Terrestrial and Wetland Biologists

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Copyright: Queen's Printer Ontario

Project: 1072
Date: January 31, 2011

NAD83 - UTM Zone 17
Scale: 1:12,000 (11x17")

N

0 200 400 600 Metres

660500 661000 661500 662000 662500 663000

4927000 4926500 4926000 4925500 4925000

Tributary 'D'

Tributary 'C'

Tributary 'B'

269

163m

121 m

Tributary 'E'

Tributary 'A'

Inverter

GLENARM RD

Communication Tower

Transformer

163m

Access Road

SANDRINGHAM RD

Solar Panel Array

X:\1072_GlenarmSolarPark\NRSI_1072_Fig1_StudyArea_10K_2011_02_03_SWM.mxd

Figure 1

Glenarm Solar Park

Project Area and ~~Natural~~ Aquatic Features

Legend

- Watercourse
- Primary Road
- Secondary Road
- Elevation Contour (0.5m Interval)
- Project Area (120m)
- ~~Deer Wintering (Stratum 2)~~
- Provincially Significant Wetland
- Wetland Area (OBM)
- Wooded Area

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Project: 1072
Date: January 31, 2011

NAD83 - UTM Zone 17
Scale: 1:12,000 (11x17")

N

0 200 400 600 Metres

APPENDIX F NOISE IMPACT ASSESSMENT

CanadianSolar

Glenarm Solar Project

Renewable Energy Approval Application

Noise Impact Assessment

July 2012

GL Garrad Hassan

GL Garrad Hassan

GLENARM SOLAR PROJECT - NOISE IMPACT STUDY

Client	Canadian Solar Solutions Inc.
Contact	Terry Rasmussen
Document No	792-CAMO-R-01
Issue	C
Status	Final
Classification	Client's Discretion
Date	05 July 2012

Author:

A. Nercessian

Checked by:

D. Boudreau, S. Dokouzian

Approved by:

P. Henn

GL Garrad Hassan Canada Inc.

151 Slater Street, Suite 806, Ottawa, Ontario CANADA
Phone: (613) 230-3787 | Fax: (613) 230-1742

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REVISION HISTORY

Issue	Date	Summary
A	15 February 2012	Original Version (electronic only)
B	12 March 2012	Revisions as per new MOE requirements and update to inverter cluster configurations
C	05 July 2012	Re-branding to Canadian Solar (electronic version only)

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1 INTRODUCTION

SkyPower Glenarm LP is proposing to develop the Glenarm Solar Project ("Project"), which is subject to Ontario Regulation 359/09 (Renewable Energy Approvals (REA) under Part V.0.1 of the Ontario Environmental Protection Act (EPA)) [1]. SkyPower is seeking a Renewable Energy Approval from the Ontario Ministry of the Environment (MOE). Canadian Solar Solutions Inc. is managing and coordinating the approvals process for SkyPower Glenarm LP

At the request of SkyPower, GL Garrad Hassan Canada, Inc., (GL GH), prepared a Noise Impact Assessment per the requirements of the REA, Technical Guide to Renewable Energy Approvals and in accordance with Appendix A of the Ministry of the Environment's publication entitled, "Basic Comprehensive Certificates of Approval (Air) – User Guide", dated April 2011 [2], as amended periodically and available from the Ministry, as well as the MOE's Solar Facilities Noise Requirements document dated October 2011 [3]. Publications NPC-232 and NPC-233 have also been used as references [4].

The purpose of this study is to verify compliance of the Project to current Ontario noise guidelines by calculating the noise levels generated by the Project at all sensitive Points of Reception in the vicinity of the solar facility.

This study comprises 3 main sections: (i) a general description of the project area, noise sources and noise receptors, (ii) a description of the Project's components including noise sources, and (iii) noise impact assessment results.

2 GENERAL DESCRIPTION OF PROJECT AREA

2.1 Project Location

The Project is located in the community of Glenarm, which is part of the Township of Eldon and the City of Kawartha Lakes. The Project is located west of the community of Glenarm, and approximately 25 km north of Lindsay. More specifically, the Project is located on the northeast corner of the intersection of County Road 8 (Glenarm Road) and Sandringham Road. The proposed site is an area of approximately 255 ha located on private property with general geographic coordinates as follows:

- Latitude: 44°27’37.0” N
- Longitude: 78°57’53.7”W

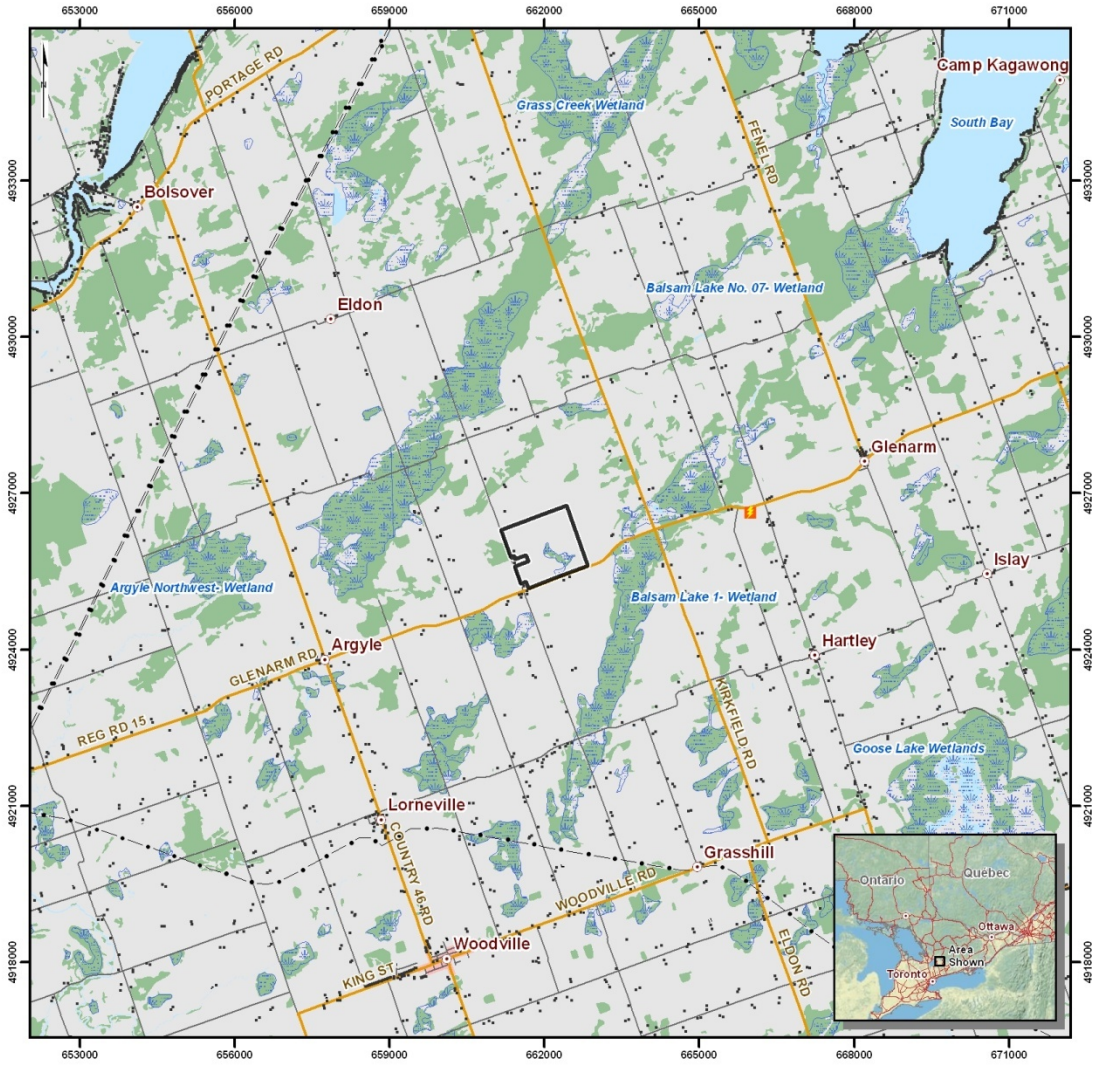


Figure 2-1: Glenarm solar project - project area

2.2 Land Use Description

According to the City of Kawartha Lakes Official Plan, the Project lies within - and is mostly surrounded by - zones designated as Agricultural [5]. The Project site also contains a small area designated as Community Facility, and is bordered by a zone designated as Environmental Protection.

The land inside and surrounding the Project Area is relatively flat. Three-quarters of the area consists of pasture lands (Figure 2-1). The remaining area consists of woodlands and wetlands. The woodlots tend to be isolated stands surrounded by fields. The lands surrounding the property have a low residential density but a few houses as well as a number of vacant lots are found in the vicinity.

The land use map for the Township of Eldon is presented in Appendix A.

Figure 2-2: Glenarm project area as seen from Glenarm Road

2.3 Baseline Ambient Noise Conditions

The MOE categorizes Points of Reception into three classes: 1, 2, and 3. Class 1 refers to an acoustic environment typical of a major population centre where the background noise is dominated by the urban hum. These areas are highly urbanized and have moderate to high noise levels throughout the day and night. Class 2 areas have an acoustic environment characterized by low ambient sound levels between 19:00 and 07:00, whereby the evening and night-time levels are defined by natural sounds, infrequent human activity and no clearly audible sounds from stationary sources (e.g. industrial and commercial facilities). Class 3 areas are typical of rural and/or small communities (i.e. with populations of less than 1000) and an acoustic environment that is dominated by natural sounds with little or no road traffic.

Within the study area, the main sources of ambient sound that currently exist include:

- Vehicular traffic noise from nearby roads;
- Vehicular traffic on the local concession and side roads, some of which are gravel roads;
- Occasional sounds stemming from agricultural activities;
- Occasional sounds due to anthropogenic domestic activities; and
- Natural sounds.

Based on these conditions, all Points of Reception are considered as having a Class 3 acoustical environment, which requires that the permissible sound level not exceed the following values at the PoR:

Table 2-1: Permissible sound levels for a Class 3 area

Time of Day	One Hour L_{eq} [dBA]
07:00 – 19:00	45
19:00 – 23:00	40
23:00 – 07:00	40

2.4 Points of Reception

GL GH used available Ontario base mapping, satellite imagery and parcel fabric data to determine the nature and types of Points of Reception found within 1000 m of the Glenarm Solar Project, as per [3], and conducted an on-site validation of the PoR. A total of 13 buildings were identified; all buildings identified were considered Points of Reception for this NIA. No other Points of Reception, such as schools, camping grounds, or churches were found within the 1000 m perimeter.

Five (5) vacant lots with a zoning designation that considers houses as a permitted use were also found. In accordance with the REA requirements, “vacant lot receptors” (VLR) were placed on these vacant lots, in a location consistent with the building pattern of the area, which is typically alongside the road frontage. For the sake of consistency and given the unknown location of any future houses on these lots, VLRs were placed half-way on the front yard lot line abutting the road.

Table 2-2 below provides all PoR locations that were analyzed in this study. GL GH used a conservative assumption for PoR height, i.e. 4.5 m thus implying all PoRs are two-storey houses.

Table 2-2: List of identified points of reception

POR ID#	Type	Coordinates (NAD83 UTM17)		Receptor Height [m]
		X	Y	
1	Building	661263	4924895	4.5
2	Building	661285	4924923	4.5
3	VLR	661238	4925037	4.5
4	Building	661667	4925111	4.5
5	Building	661611	4925194	4.5
6	Building	661605	4925253	4.5
7	Building	661426	4925650	4.5
8	Building	661379	4925744	4.5
9	Building	661309	4925726	4.5
10	VLR	660926	4926481	4.5
11	Building	661265	4926632	4.5
12	Building	662372	4925321	4.5
13	Building	662493	4925384	4.5
14	VLR	662736	4925474	4.5
15	VLR	662627	4926418	4.5
16	Building	662921	4925563	4.5
17	VLR	663293	4925788	4.5
18	Building	663325	4926187	4.5

3 PROJECT DESCRIPTION

The Glenarm Solar Project will derive power from the sun and generate electricity to supply energy to the Ontario energy system using state-of-the-art solar energy technology. The Project has been awarded a FIT contract by the Ontario Power Authority (OPA).

Based on the classification system outlined in Part II of O. Reg. 359/09, the Glenarm Solar Project is a Class 3 renewable energy generation facility due to the ground mounted nature of the facility as well as its nameplate capacity of 10 MW (AC).

Photovoltaic panels (PV panels) will convert solar radiation into electricity, which will create Direct Current (DC) electricity. The DC electricity will be collected and converted into Alternating Current (AC) electricity by inverters, which will then transfer this electricity to step-up transformers that will elevate the voltage to 25 kV. The power will then be directed to a main transformer on site that will elevate the voltage to 44 kV, i.e. the local distribution voltage level. The Project will be made up of the following key facilities, equipment and technologies:

- Photovoltaic modules (approximately 50,000);
- Racking;
- Inverters and step-up transformers: The Project will include up to 11 inverter/transformer "clusters" each comprising two (2) 500-kVA inverters placed in a corrugated steel shed and one (1) 1.29-MVA step-up transformer located outside the shed;
- Collector system and main 10 MVA transformer at the substation; and
- Access roads and maintenance building.

For the purposes of this NIA a conservative approach was used and the cumulative noise impact of all 11 inverter clusters and the main step-up transformer was calculated.

A scaled location map, indicating the topography, nature of the neighborhood surrounding the facility, location of adjacent buildings, structures and receptors has been attached as Appendix B.

3.1 Life of the Project

The expected life of the Project will be a minimum of 20 years (the length of the power purchase agreement), but may continue to operate or be repowered once the power purchase agreement expires. At the end of the Project life the Project will be decommissioned in accordance with the Decommissioning Plan Report.

3.2 Operating Hours

Solar PV facilities produce electricity during periods with direct sunlight, which generally coincides with the MOE's day-time period of 07:00 to 19:00. This is the period in which the Project produces most of its electricity. Some energy may be produced beyond 19:00 in the summertime when daylight periods are extended, however it is important to note that the inverters operate well below 100% during these periods. After sunset the solar facility does not receive solar radiation and does not generate electricity. During that

time only the transformers are energized and thus produce some noise, as the inverters are not operational. However, for the purpose of this study, all equipment is assumed to be functioning at full power for the entire day and night, thus adding conservatism in the analysis.

3.3 Noise Sources

3.3.1 Study Approach

The sound pressure level at each Point of Reception for the aggregate of all noise sources associated with the Glenarm Solar Project was calculated based on the ISO 9613-2 method [6]. This is a widely used and generally accepted standard for the evaluation of noise impact in environmental assessments. The sound specifications of the proposed inverter units were obtained from the Client, while the transformers' sound power levels (PWL) were estimated on the basis of generic technical specifications and dimensions, and by using data from CAN/CSA-C88-M90:1990 and NEMA TR-1 1993 (R2000) [7][8]. The software package CadnaA, which implements ISO 9613-2, was used to predict the sound pressure levels at the PoRs.

As per the MOE's Solar Facilities Noise Requirements document dated October 2011 [3], the predicted noise levels were calculated on a basis of a worst-case scenario, i.e. all inverters and transformers in function and the permissible sound limit was set at 40 dBA for all Points of Reception.

3.3.2 Noise Sources Summary

The noise sources of this Project are the 22 inverters, the 11 step-up transformers at each of the inverter clusters and the main transformer located in the southern portion of the Project area. The Project's electrical layout design was provided by the Client. Details on each noise source are presented in Table 3-1 below. This study assumes that the 1.29-MVA step-up transformers at the inverter clusters are fluid-immersed self-cooling devices, and that the 10-MVA main transformer at the substation is a fluid-immersed device with forced air cooling. It should be noted that this proposed equipment list was prepared for the purposes of this noise study and is considered representative of noise sources for such a solar facility.

All noise sources were modeled as non-directional point sources. All sources have a 5 dBA penalty for tonality, as per Publication NPC-104 (Sound Level Adjustments).

All noise sources are shown on the noise iso-contour map in Appendix C.

3.3.3 Inverters

At the time of this report, the specific make and model of the inverters have not been finalized. The Client anticipates using SC 500HE-US inverters (see Figure 3-1), or a similar make, in the final design of the Project. The main sources of noise are the inverters located in a corrugated steel shed. As indicated by the client, the shed will not be equipped with additional noise sources (such as fans or cooling units installed on the shed's walls). Each 1MW solar array will have two (2) 500 kVA inverters. Each inverter pair is modeled as a point source. The specifications for the model that has been used for this report and associated sound power level (PWL) are attached as Appendix D. Coordinates of all inverters are also listed in Appendix D.

Figure 3-1: SC 500HE-US Inverter

3.3.4 Inverter-Transformers – 1.29 MVA

For every 1 MW of solar modules, one 1.29 MVA step-up transformer will be installed at the inverter cluster. It is assumed that the transformer will be mounted on a concrete slab. The worst-case scenario broadband sound pressure level (SPL) value originates from CAN/CSA-C88-M90:1990 (NEMA TR-1 1993 (R2000)) for the given transformer rating (1.29 MVA). The SPL was then converted to PWL using ISO3744:1994 [9] and IEEE C57.12.90-2006 [10]. A generic transformer octave band PWL spectrum was used and fitted to match the broadband value of 81.0 dB(A) [11].

Coordinates of the transformers and a table with the derived octave band spectra are listed in Appendix D

3.3.5 Main Transformer

This Project uses one (1) main step-up transformer located at the Project's substation. The worst-case scenario broadband SPL value originates from CAN/CSA-C88-M90:1990 (NEMA TR-1 1993 (R2000)) for the given transformer rating (10 MVA). The SPL was then converted to PWL using ISO3744:1994 and IEEE C57.12.90-2006. A generic transformer octave band PWL spectrum was used and fitted to match the broadband value of 92.0 dB(A) [11].

Coordinates of the main transformer and a table with the derived octave band spectra are listed in Appendix D.

3.3.6 Noise Control Description

It is conservatively assumed that all noise generated from the inverters exit through the shed's vents (louvers). Through iterative testing, it was deemed necessary to add acoustical louvers to 5 of the 11 inverter clusters sheds. The free field noise reduction values were subtracted from the noise power level octave band spectrum of the 1000-MV inverter pairs that are modeled as point sources. The general specifications of the louvers that were used in this analysis and the noise reduction values of the louvers, per octave band frequency, are presented in Appendix E.

3.3.7 Summary Tables

Table 3-1: Noise source summary table

Source ID	Source Description	Sound Power Level [dBA][1]	Source Location[2]	Sound Characteristics[3]	Noise Control Measures[4]
Inv1	2 × SC 500 HE US (shed)	95.4	O	S-T	U
Inv2	2 × SC 500 HE US (shed)	95.4	O	S-T	U
Inv3	2 × SC 500 HE US (shed)	95.4	O	S-T	U
Inv4	2 × SC 500 HE US (shed)	95.4	O	S-T	S
Inv5	2 × SC 500 HE US (shed)	95.4	O	S-T	S
Inv6	2 × SC 500 HE US (shed)	95.4	O	S-T	S
Inv7	2 × SC 500 HE US (shed)	95.4	O	S-T	U
Inv8	2 × SC 500 HE US (shed)	95.4	O	S-T	S
Inv9	2 × SC 500 HE US (shed)	95.4	O	S-T	S
Inv10	2 × SC 500 HE US (shed)	95.4	O	S-T	U
Inv11	2 × SC 500 HE US (shed)	95.4	O	S-T	U
T01	1.29 MVA transformer	81.0	O	S-T	U
T02	1.29 MVA transformer	81.0	O	S-T	U
T03	1.29 MVA transformer	81.0	O	S-T	U
T04	1.29 MVA transformer	81.0	O	S-T	U
T05	1.29 MVA transformer	81.0	O	S-T	U
T06	1.29 MVA transformer	81.0	O	S-T	U
T07	1.29 MVA transformer	81.0	O	S-T	U
T08	1.29 MVA transformer	81.0	O	S-T	U
T09	1.29 MVA transformer	81.0	O	S-T	U
T10	1.29 MVA transformer	81.0	O	S-T	U
T11	1.29 MVA transformer	81.0	O	S-T	U
Substation	Main 10 MVA 44kV	92.0	O	S-T	U

1. 5 dBA tonal penalty applied, Effect of Noise Control measures not applied.
2. (O): Outside building
3. (S): Steady; (T): Tonal
4. (S): Silencer, Acoustic Louver, Muffler ; (U): Uncontrolled

3.3.8 Adjacent Solar Farm

Invenergy's Sandringham Solar Project is located within 5000 m of the Project. The cumulative noise effect of this solar farm has been included in the current analysis as required in the new Solar Facilities Noise Requirements of the MOE [3]. The noise source positions and sound power levels were taken directly from the publicly available Noise Study Report for this project, dated November 2011 [12]. The pages of the report that show the coordinates, heights, and octave band sound power levels of the Sandringham Solar Farm noise sources are shown in Appendix F. They were used as presented in the report, without any modifications performed by GL GH.

4 NOISE IMPACT ASSESSMENT

As stated in MOE's publication NPC 232, the sound level limit at a point of reception must be established based on the principle of "predictable worst case" noise impact.

The sound pressure level at each Point of Reception for the aggregate of all noise sources associated with the Glenarm Solar Project was calculated based on the ISO 9613-2 method.

The ISO 9613 standard provides a prediction of the equivalent continuous A-weighted sound pressure levels at a distance from one or more point sources under meteorological conditions favourable to propagation of sound emissions.

The method consists of octave-band algorithms (i.e. with nominal mid-band frequencies from 63 Hz to 8 kHz) for calculating the attenuation of the emitted sound. The algorithm takes into account the following physical effects:

- Geometrical divergence – attenuation due to spherical spreading from the sound source;
- Atmospheric absorption – attenuation due to absorption by the atmosphere; and
- Ground effect – attenuation due to the acoustic properties of the ground.

ISO 9613-2 parameters were set as follows:

- Ambient air temperature: 10ºC;
- Ambient barometric pressure: 101.32 kPa;
- Humidity: 70%;
- Ground factor: 0.7 (soft ground);
- Inverter (shed) unit height: 1.8 m;
- Substation transformer height: 1.6 m;
- Inverter-transformer height: 1.4 m;
- PoR height: 4.5 m

Additional calculations concerning attenuation from foliage or the solar panels were not performed in this report, implying that the values calculated for sound attenuation are likely to be conservative in areas where there is foliage or solar panels present in the line of sight between any noise source and a Point of Reception. The estimated accuracy of the ISO 9613 method, as stated in ISO 9613-2, is ± 3 dB.

A flat terrain has been assumed in the noise model. No barrier attenuation due to topography and obstacles is present in the calculations.

The inverter and transformer noise emission ratings used for each octave band were those specified in Table 3-1. The noise impact was calculated for each Point of Reception located within 1000 m of a source of sound from the Project, and the calculated noise level was then compared with the applicable permissible sound levels for each receptor for day-time and night-time values, as presented in Table 4-1.

Sample Calculations are provided in Appendix G.

4.1 Results

Table 4-1 presents the sound pressure level at each point of reception within 1000 m of any noise source of the Glenarm Solar Project, and all are found to be compliant with daytime and night-time permissible sound levels per the MOE guidelines.

The shortest distance between a noise source at the Glenarm Solar Project and a house is 185 m (PoR #6), while the shortest distance between a noise source and a vacant lot receptor is 582 m (PoR #3).

The 40 dBA noise iso-contour line is shown in Appendix C. Individual contributions from each noise source on the most impacted dwelling and vacant lot receptor are shown in Appendix H [2].

Table 4-1: Acoustic assessment summary

Point of Reception ID	Description	Sound Level at PoR Level Lr [dBA]	Verified by Acoustic Audit	Performance Limit Night/Day [dBA]	Compliance with Performance Limit
1	Building	31.5	NO	40/45	YES
2	Building	31.9	NO	40/45	YES
3	VLR	32.6	NO	40/45	YES
4	Building	37.4	NO	40/45	YES
5	Building	38.5	NO	40/45	YES
6	Building	39.6	NO	40/45	YES
7	Building	39.6	NO	40/45	YES
8	Building	38.8	NO	40/45	YES
9	Building	37.7	NO	40/45	YES
10	VLR	32.1	NO	40/45	YES
11	Building	34.7	NO	40/45	YES
12	Building	33.5	NO	40/45	YES
13	Building	32.4	NO	40/45	YES
14	VLR	30.4	NO	40/45	YES
15	VLR	31.5	NO	40/45	YES
16	Building	29.1	NO	40/45	YES
17	VLR	26.8	NO	40/45	YES
18	Building	26.6	NO	40/45	YES

4.2 Mitigation Measures

The overall predicted noise levels for all identified Points of Reception, based on site operations, comply with performance limits for daytime and night-time operations. As a result, no mitigation is deemed required to ensure compliance with MOE guidelines.

5 CONCLUSION

GL GH calculated the predicted noise levels generated by the Glenarm Solar Project based on the ISO-9613-2 model using CadnaA software. Based on the approach presented in this study and a set of assumptions related to noise sources of the Project and noise receptors, the Project is considered to be compliant with the daytime and night-time MOE permissible sound limits for Class 3 areas.

6 REFERENCES

[1] Ontario Regulation 359/09 (Renewable Energy Approvals (REA) under Part V.0.1 of the Ontario Environmental Protection Act (EPA)).

[2] Ministry of the Environment (MOE). 2011. Basic Comprehensive Certificates of Approval (Air) – User Guide (Appendix A). Environmental Assessment and Approval Branch.

[3] Solar Facilities Noise Requirements, MOE, 25 October 2011. Sent by John Kowalewski, MOE, on 24 February 2012 via email.

[4] Sound Level Limits for Stationary Sources in Class 3 Areas (Rural), Publication NPC-232, MOE, October 1995, and Information to be Submitted for Approval of Stationary Sources of Sound, Publication NPC-233, MOE, October 1995.

[5] City of Kawartha Lakes Official Plan – 2010. September, 2010.

[6] ISO 9613-2 (1996), Acoustics – Attenuation of sound during propagation outdoors.

[7] CAN/CSA-C88-M90 (1990), Power transformers and reactors.

[8] NEMA TR1-1993 (2000), Transformers, regulators and Reactors, Natural Electrical Manufacturers Association.

[9] ISO3744 (1994), Acoustics – Determination of sound power levels of noise sources using sound pressure – Engineering method in an essentially free field over a reflecting plane.

[10] C57.12.90-2006 IEEE Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers.

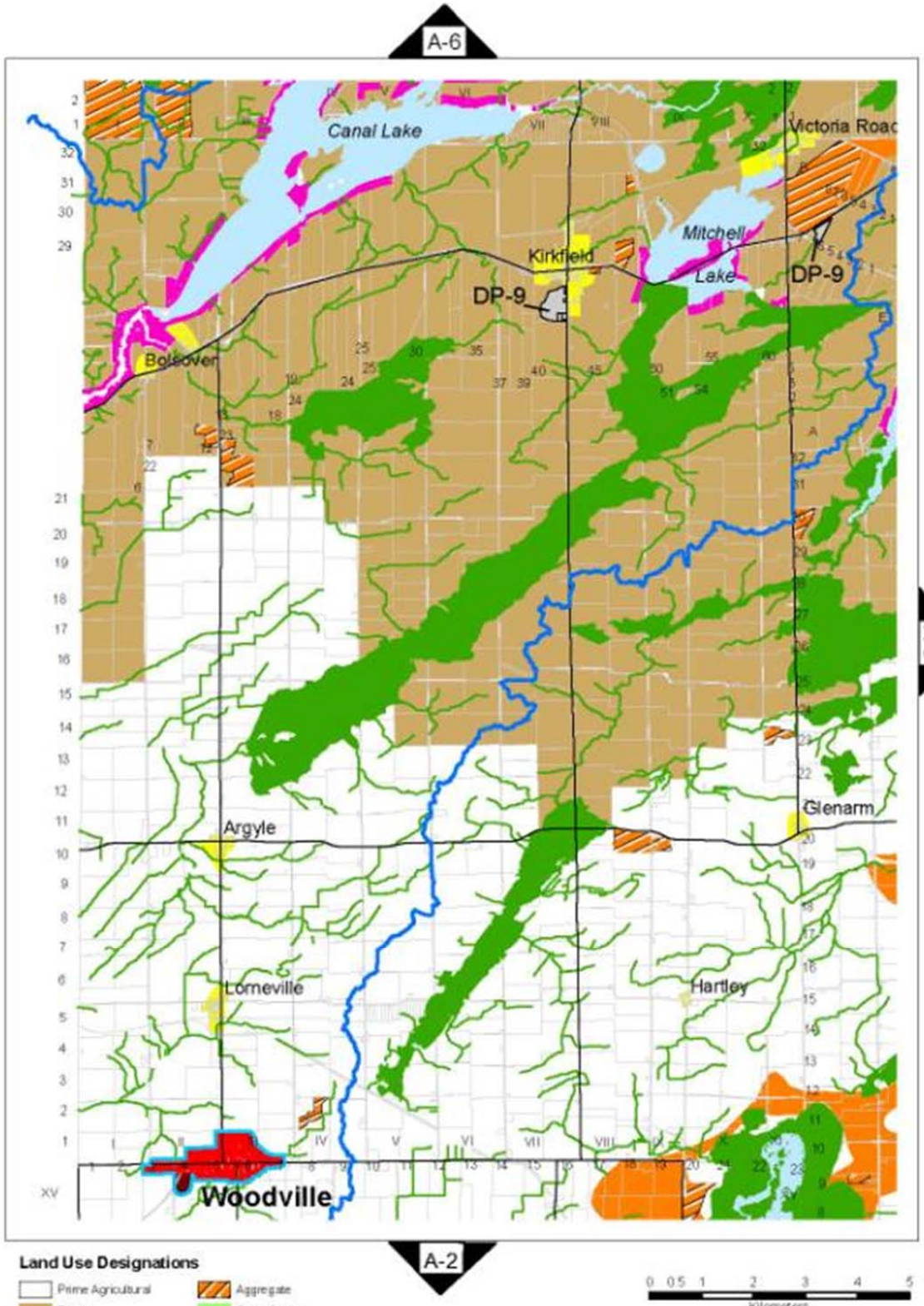
[11] Handbook of Acoustics, Edited by Malcolm J. Crocker, 1998

[12] “Design and Operations Report, Sandringham Wind Farm”, Dillon Consulting, November 2011.

[13] Test Report, SC500HE-US, Acoustic Environment Test, Revision 1.1, Document SC500HE-US-91:LD1211, Dated 2011-04-01.

APPENDIX A CITY OF KAWARTHA – TOWNSHIP OF ELDON LAND USE MAP

City of Kawartha Lakes Official Plan
Schedule A-4
(Geographic Township of Eldon)



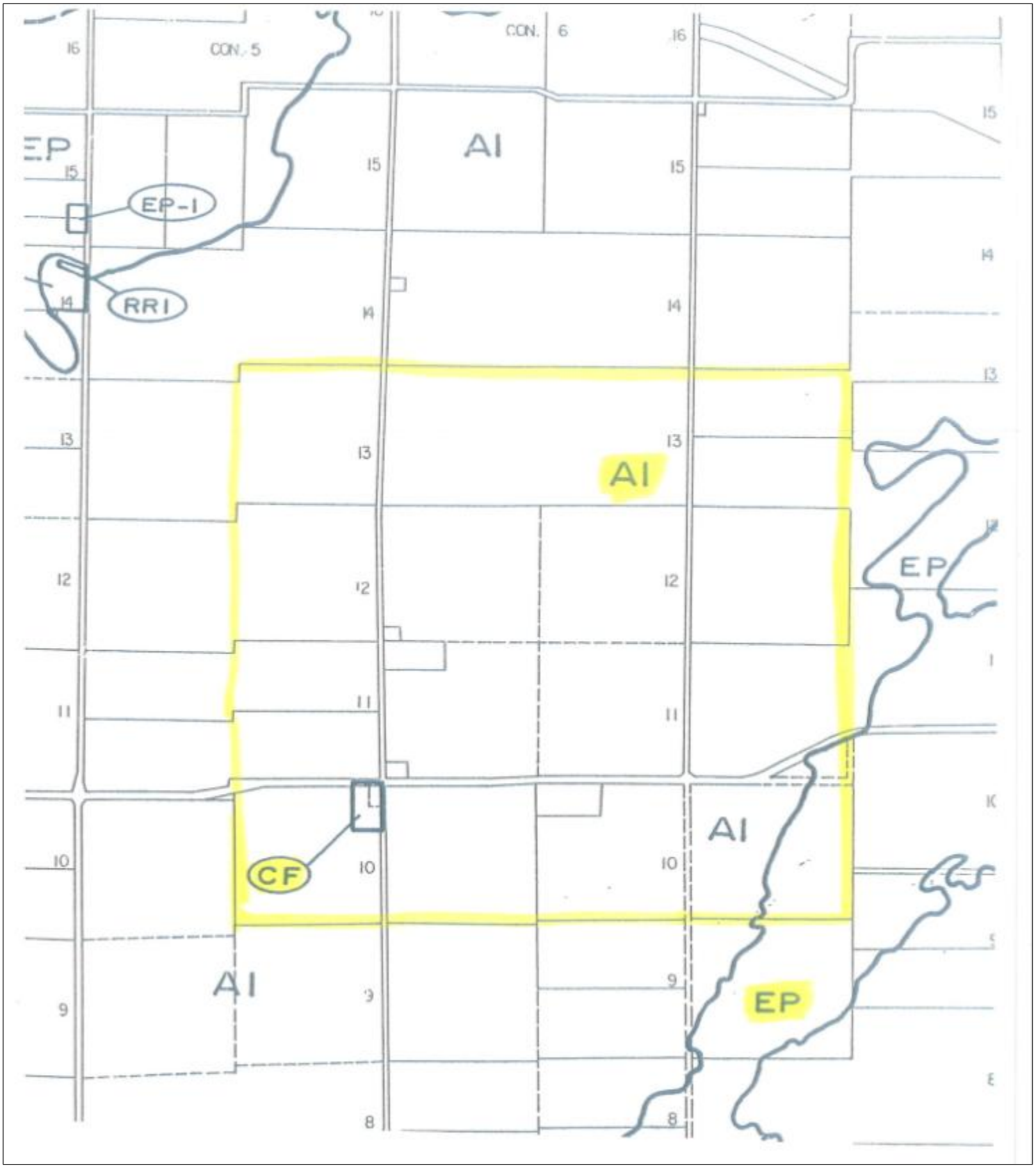
Land Use Designations

- Prime Agricultural
- Rural
- Environmental Protection
- Urban Settlement Area
- Hamlet Settlement Area
- Waterfront
- Highway Commercial
- Tourist Commercial
- Industrial
- Aggregate
- Open Space
- Aggregate Resource
- Development Plan Area
- Abandoned Mine Constraint
- Urban Settlement Boundary
- Lake Simcoe Source Water Protection Boundary
- SP-1 (Specific Lake Policy Area)

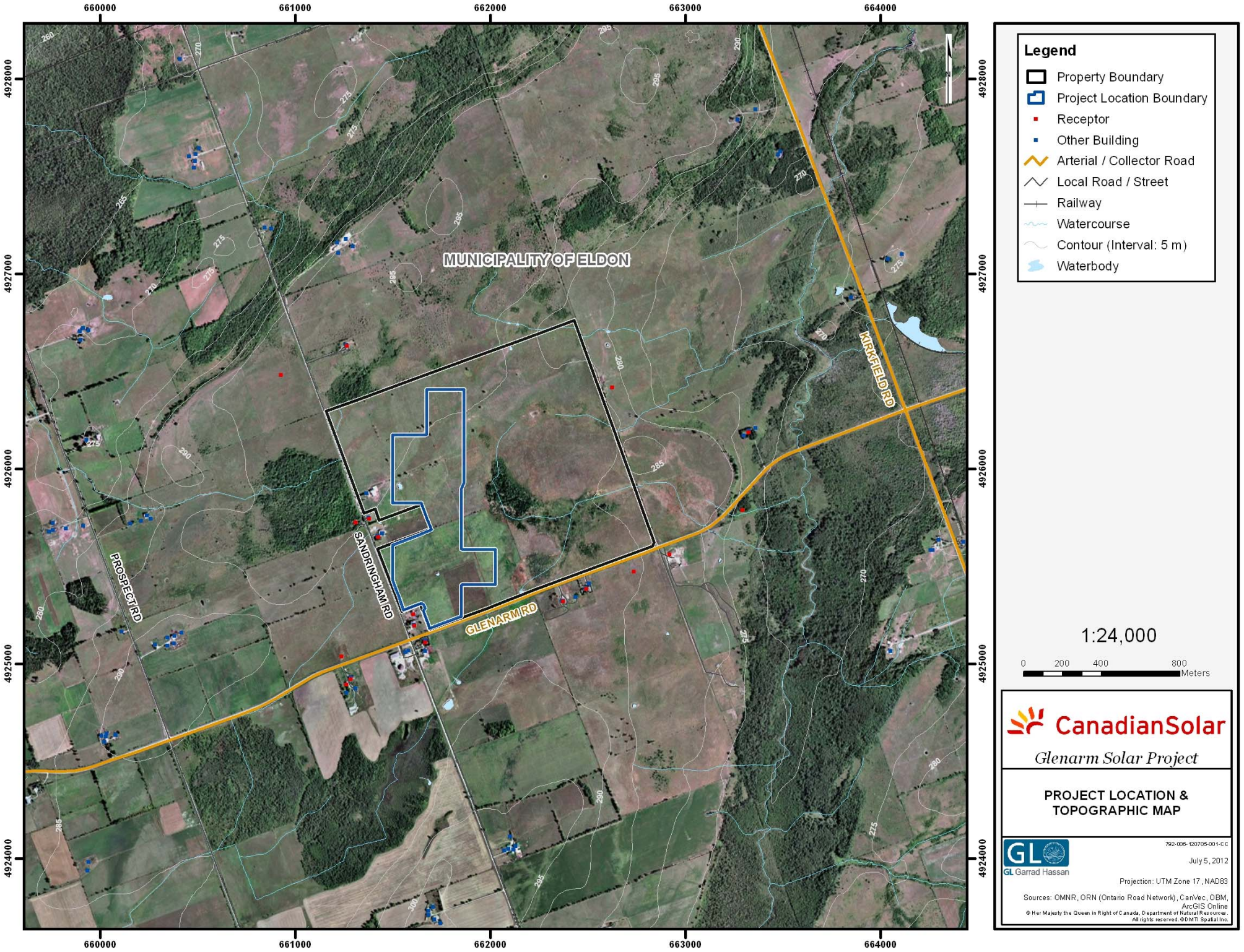
0 0.5 1 2 3 4 5
Kilometers

City of Kawartha Lakes

Township of Eldon - Land Use designations around the Project area.



APPENDIX B PROPOSED LOCATION AND TOPOGRAPHIC MAP



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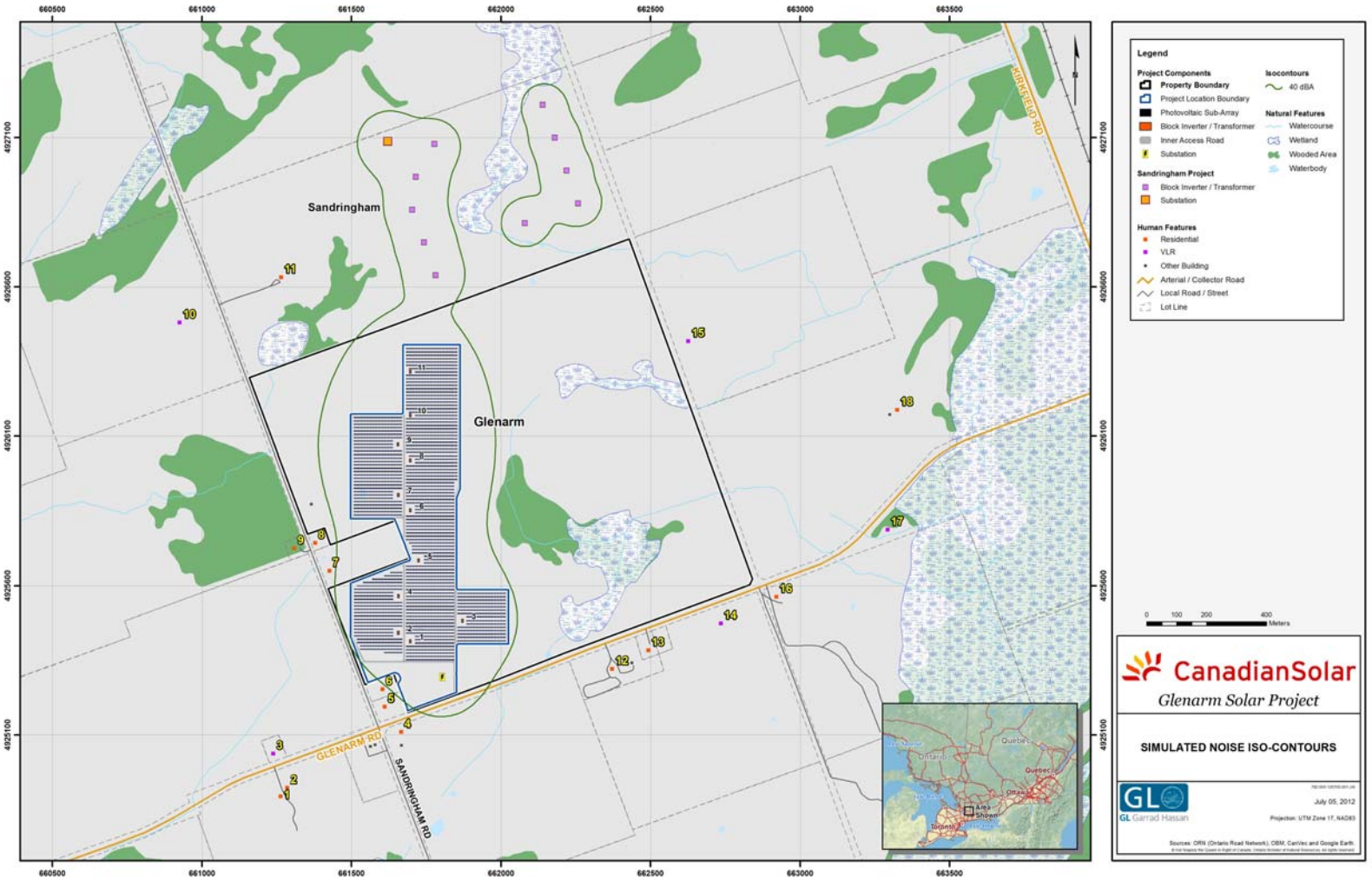
APPENDIX C SIMULATED NOISE ISO-CONTOURS



GL Garrad Hassan

APPENDIX D NOISE SOURCES

Point sources used – 1000-MV inverter units and transformers

Source ID	Description	Sound Power Level[1] [dBA]	X	Y
Inv1	2 × SC 500 HE US (shed)	95.4	661696	4926170
Inv2	2 × SC 500 HE US (shed)	95.4	661654	4926073
Inv3	2 × SC 500 HE US (shed)	95.4	661696	4926020
Inv4	2 × SC 500 HE US (shed)	95.4	661656	4925905
Inv5	2 × SC 500 HE US (shed)	95.4	661696	4925853
Inv6	2 × SC 500 HE US (shed)	95.4	661723	4925685
Inv7	2 × SC 500 HE US (shed)	95.4	661656	4925566
Inv8	2 × SC 500 HE US (shed)	95.4	661656	4925443
Inv9	2 × SC 500 HE US (shed)	95.4	661696	4925414
Inv10	2 × SC 500 HE US (shed)	95.4	661870	4925483
Inv11	2 × SC 500 HE US (shed)	95.4	661696	4926316
T1	1.29MVA Transformer	81.0	661696	4926175
T2	1.29MVA Transformer	81.0	661654	4926078
T3	1.29MVA Transformer	81.0	661696	4926025
T4	1.29MVA Transformer	81.0	661656	4925910
T5	1.29MVA Transformer	81.0	661696	4925858
T6	1.29MVA Transformer	81.0	661723	4925690
T7	1.29MVA Transformer	81.0	661656	4925571
T8	1.29MVA Transformer	81.0	661656	4925448
T9	1.29MVA Transformer	81.0	661696	4925419
T10	1.29MVA Transformer	81.0	661870	4925488
T11	1.29MVA Transformer	81.0	661696	4926321
Substation	10 MVA Transformer	92.0	661803	4925294
1. 5 dBA tonal penalty included				

SC 500HE-US inverter pair octave band spectrum in dBA, without louver[1]

63	125	250	500	1000	2000	4000	8000	Overall Sound Power Level [dB(A)]
81.9	83.3	91.1	91.1	85.7	78.2	68.5	78.1	**95.4**

1. Provided by Client in the form of measured third octave band sound power levels. 5 dB penalty included and scaled to 95.4 dB(A), which represents the overall sound power level of 2 inverters. [13]

Greenheck J-blade 6in acoustical louver free field noise reduction (dB)

63	125	250	500	1000	2000	4000	8000
0	10	10	12	16	23	18	0

SC 500HE-US Inveter pair octave band spectrum in dBA with louver[1]

63	125	250	500	1000	2000	4000	8000	Overall Sound Power Level [dB(A)]
81.9	73.3	81.1	79.1	69.7	55.2	50.5	78.1	**86.6**

1. Regular spectrum shown above minus the louver's free field noise reduction

10 MVA substation transformer octave band spectrum (including 5 dB penalty) [1]

63	125	250	500	1000	2000	4000	8000	Overall Sound Power Level [dB(A)]
68.4	80.5	83.0	88.4	85.6	81.8	76.6	67.5	**92.0**

1. Generic octave band spectrum from [11] Scaled to 92.0 dB(A)

Audible Sound Level: 70 dB(A), as per CAN/CSA-C88-M90
Fluid immersed
< 72.5 kV
Class FA forced air
Estimated Surface area (S) for generic transformer of this size: 50 m^2
Estimated Sound Power Level (without penalty): 87.0 dB(A)

1.29 MVA inverter-transformer octave band spectrum (including 5 dB penalty) [1]

63	125	250	500	1000	2000	4000	8000	Overall Sound Power Level [dB(A)]
57.4	69.5	72	77.4	74.6	70.8	65.6	56.5	**81.0**

1. Generic octave band spectrum from [11] Scaled to 81.0 dB(A)

Audible Sound Level: 60 dB(A), as per CAN/CSA-C88-M90
Fluid immersed
< 72.5 kV
Class OA self cooling air
Estimated Surface area (S) for generic transformer of this size: 40 m^2
Estimated Sound Power Level (without penalty): 76.0 dB(A)

SUNNY CENTRAL 500HE-US

High Yields
- 98% CEC efficiency
- Suitable for ambient temperatures of up to 60 °C (140 °F)
- OptiCool™ intelligent temperature management

Low System Costs
- Outdoor-rated enclosure
- Couples to medium-voltage external transformer
- Available as integrated solution

Strong Peripherals
- Optional DC & AC disconnects
- Optional combiner boxes with string monitoring
- Sunny WebBox, Modbus® & OPC compatible

UL Certified
- UL 1741 / IEEE-1547 compliant

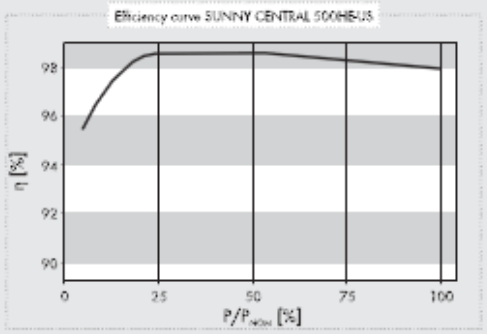
SUNNY CENTRAL 500HE-US

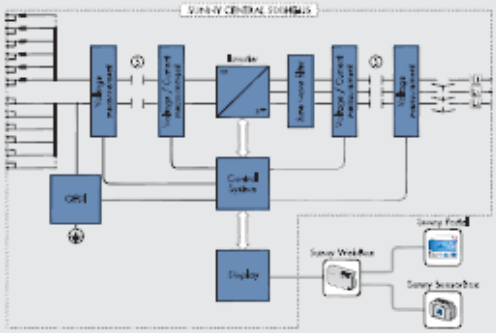
The ideal solution for large-scale North American solar power plants

The Sunny Central 500HE-US couples to an external medium-voltage transformer to accommodate long distance power feeds to distribution substations and delivers the highest efficiency available for large PV inverters. An updated user interface features a large LCD that provides a graphical view of the daily plant production as well as the status of the inverter and the utility grid. Flexible plant monitoring is available through various communications solutions such as Ethernet, Modbus, RS485 and OPC. Designed for easy installation, operation and performance monitoring, the UL-certified Sunny Central 500HE-US is the ideal choice for large-scale PV projects.

Technical data	Sunny Central 500HE-US
Input data	
Max. DC power	565 kWp [1]
MPP voltage range	330 V – 600 V
Max. DC voltage	600 V
Feed starting at [U] / [P]	380 V / 5000 W
Max. DC current	1600 A
Number of DC inputs	6 – 9
Output data	
Nominal AC power	500 kVA @ 45 °C (113 °F)
Max. AC current	1470 A @ 200 V
AC grid frequency	60 Hz
AC voltage range	180 V – 220 V
AC voltage range, full active power	196 V – 210 V
Power factor (cos φ)	> 0.99
Max. THD	< 5%
Efficiency [2]	
Max. efficiency	98.6%
CEC efficiency	98.0%
Euro-eta	97.9%
Ambient conditions	
Operating temperature range	-25 °C ... +60 °C (-13 °F ... +140 °F)
Max. temperature for nominal conditions	+45 °C (+113 °F)
Protection rating	NEMA 3R
Installation indoors / outdoors	●/●
Rel. humidity	15% ... 95%
Fresh air consumption	3000 m³/h
Internal consumption at nominal power	< 1600 W
Standby consumption (P_{night})	< 110 W
Dimensions and weight	
Height	2277 mm (90 in)
Width	2562 mm (101 in)
Depth	956 mm (38 in)
Weight	< 1800 kg (3970 lb)
Certificates / listings	
Certificates	UL 1741, UL 1998, IEEE 1547
EMC conformity	FCC, Part 15, Class A
Interfaces	
RS485 / Ethernet / analog	o/o/o
Display: text line / graphic	–/●
Communication protocols	Modbus / TCP
SSM-US connection	RS485
Plant monitoring	Sunny Portal
● Standard features o Optional features – Not available	
Type designation	SC 500HE-US

1) Specifications apply to irradiation values below STC
2) Measured without an internal power supply at U_{DC} = 330 V





5.3 Soundpower at third-octave band frequency

Terz-frequency [kHz]	Soundpower-level L_{pA} [dB_A]500kW
0,05	62,50
0,063	60,20
0,08	63,90
0,1	64,60
0,125	61,20
0,16	64,90
0,2	65,00
0,25	68,90
0,315	75,20
0,4	74,60
0,5	68,20
0,63	69,20
0,8	67,30
1	61,10
1,25	67,70
1,6	60,00
2	59,80
2,5	54,20
3,15	52,10
4,0	47,00
5,0	44,30
6,3	58,60

APPENDIX E NOISE CONTROL MEASURES

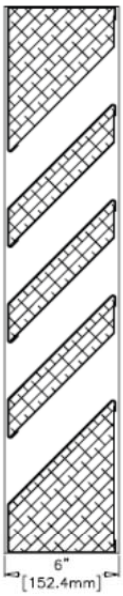
GREENHECK

AFJ-601

Acoustical Louver
J Blade

Application and Design

AFJ-601 is an acoustical weather louver designed to protect air intake and exhaust openings in building exterior walls. Design incorporates J style insulated acoustical blades and high free area to provide maximum resistance to sound transmission, rain and weather while providing minimum resistance to airflow. The AFJ-601 is an extremely efficient louver with **AMCA LICENSED PERFORMANCE DATA** enabling designers to select and apply with confidence.



Standard Construction

Frame . . . . . Heavy gauge formed aluminum, 6 in. x 0.080 in. nominal wall thickness

Blades . . . . . J style, heavy gauge formed aluminum, 0.080 in. nominal wall thickness, positioned at 45° on approximately 5 in. centers

Construction . . . Mechanically fastened

Acoustical Insulation . . . . . Fiberglass Insulation

Birdscreen. . . . . 3/4 in. x 0.051 flattened expanded aluminum in removable frame, inside mount (rear)

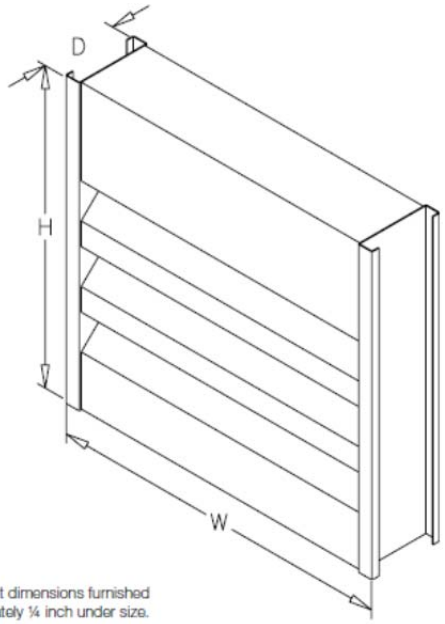
Finish. . . . . . Mill

Minimum Size . . 12 in. W x 15 in. H

Maximum Single Section Size . . . 60 in. W x 120 in. H

Options *(at additional cost)*

- A variety of bird and insect screens
- Blank off panels
- Clip angles
- Extended sill
- Filter racks
- Flanged frame
- Galvanized steel frame and blade
- Security bars
- Welded construction
- A variety of architectural finishes including:
  - Clear anodize
  - Integral color anodize
  - Baked enamel paint
  - Kynar paint



*Width and height dimensions furnished approximately ¼ inch under size.

PERFORMANCE DATA

AFJ-601

J Blade Acoustical Louver
Formed Aluminum

Free Area Chart (Sq. ft.)

Louver Height Inches	Louver Width Inches								
	12	18	24	30	36	42	**48**	54	60
15	0.12	0.21	0.29	0.37	0.45	0.53	0.61	0.69	0.77
18	0.25	0.41	0.57	0.74	0.90	1.06	1.22	1.38	1.55
24	0.37	0.62	0.86	1.10	1.35	1.59	1.83	2.08	2.32
30	0.50	0.82	1.15	1.47	1.80	2.12	2.44	2.77	3.09
36	0.62	1.03	1.43	1.84	2.24	2.65	3.05	3.46	3.86
42	0.75	1.24	1.72	2.21	2.69	3.18	3.67	4.15	4.64
48	1.00	1.65	2.30	2.94	3.59	4.24	**4.89**	5.54	6.18
54	1.12	1.85	2.58	3.31	4.04	4.77	5.50	6.23	6.96
60	1.25	2.06	2.87	3.68	4.49	5.30	6.11	6.92	7.73
66	1.37	2.26	3.16	4.05	4.94	5.83	6.72	7.61	8.50
72	1.50	2.47	3.44	4.41	5.39	6.36	7.33	8.30	9.27
78	1.75	2.88	4.02	5.15	6.28	7.42	8.55	9.69	10.82
84	1.87	3.09	4.30	5.52	6.73	7.95	9.16	10.38	11.59
90	2.00	3.29	4.59	5.89	7.18	8.48	9.77	11.07	12.37
96	2.12	3.50	4.88	6.25	7.63	9.01	10.38	11.76	13.14
102	2.25	3.71	5.16	6.62	8.08	9.54	11.00	12.45	13.91
108	2.50	4.12	5.74	7.36	8.98	10.60	12.22	13.84	15.46
114	2.62	4.32	6.02	7.73	9.43	11.13	12.83	14.53	16.23
120	2.75	4.53	6.31	8.09	9.88	11.66	13.44	15.22	17.00

Greenheck Fan Corporation certifies that the AFJ-601 louvers shown herein are licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 511 and comply with the requirements of the AMCA Certified Ratings Program. The AMCA Certified Ratings Seal applies to water penetration, air performance and sound ratings.

Sound Transmission Class

The Sound Transmission Class (STC) is a rating of the effectiveness of an assembly in isolating or reducing airborne sound transmission. STC is a single number that summarizes airborne sound transmission loss data. Assemblies with higher STC ratings are more efficient at reducing sound transmission. STC is determined in accordance with ASTM E413-04.

Transmission Loss

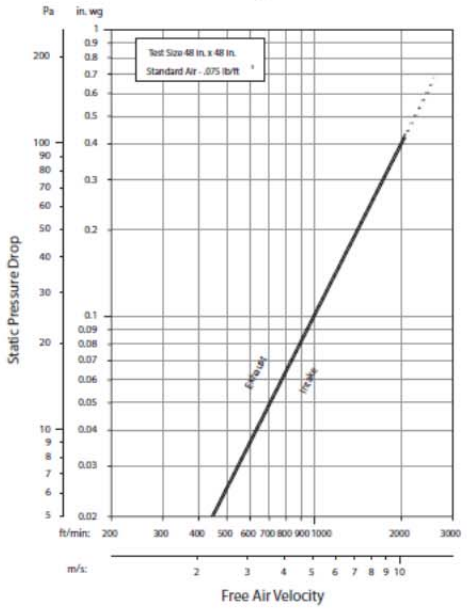
Transmission loss (TL) is a measurement of the reduction of sound power transmission (dB) through an assembly at a given frequency. The more sound power that is reduced, the greater the TL. TL is tested in accordance with ASTM E90-04.

Free Field Noise Reduction in Decibels

Free Field Noise Reduction is determined by adding 6 dB to the Transmission Loss.

Octave Band	2	3	4	5	6	7	STC
Frequency (Hz)	125	250	500	1000	2000	4000	
Transmission Loss (dB)	4	4	6	10	17	12	10
Free Field Noise Reduction (dB)	10	10	12	16	23	18	

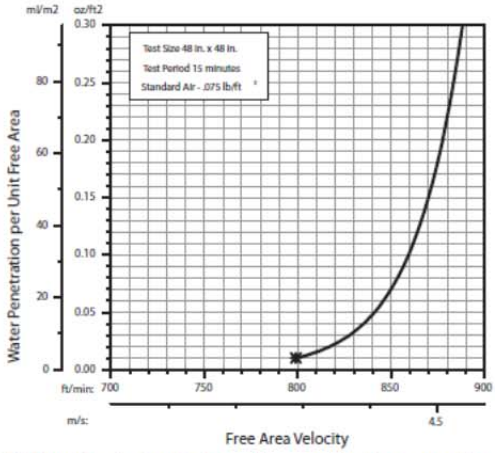
Airflow Resistance (Standard Air - .075 lb/ft³)



Model AFJ-601 resistance to airflow (pressure drop) varies depending on louver application (air intake or air exhaust). Free area velocities (shown) are higher than average velocity through the overall louver size. See louver selection information.

Water Penetration (Standard Air - .075 lb/ft³)

Test size 48 in. x 48 in. Test duration of 15 min.



The AMCA Water Penetration Test provides a method for comparing various louver models and designs as to their efficiency in resisting the penetration of rainfall under specific laboratory test conditions. The beginning point of water penetration is defined as that velocity where the water penetration curve projects through .01 oz. of water (penetration) per sq. ft. of louver free area.

- **The beginning point of water penetration for Model AFJ-601 is 799 fpm free area velocity.** These performance ratings do not guarantee a louver to be weatherproof or stormproof and should be used in combination with other factors including good engineering judgement in selecting louvers.

GREENHECK

APPENDIX F SANDRINGHAM SOLAR PROJECT NOISE SOURCES

Acoustic Assessment Report
Renewable Energy Approval
Sandringham Solar Farm

3.0 NOISE SOURCE SUMMARY

3.1 Noise Source Summary Table

The significant noise sources identified during the acoustic assessment are listed in **Table 2a** – Noise Source Summary Table. This table contains a listing of source sound power levels, source location, sound characteristics, and a summary of any noise abatement measures that may have been implemented. The sound power levels in octave spectrum are provided in **Table 2b** – Noise Source Sound Power Spectra. The UTM coordinates, ground elevation and source height above grade for all onsite noise sources are provided in **Table 2c**.

Table 2a- Noise Source Summary Table

SOURCE ID	SOURCE DESCRIPTION	PWL (dBA)	Source Location1 (I or O)	Sound Characteristics2 (S,Q,I,B,T,C)	Noise Control Measures3 (S,A,B,L,E,O,U)
INV	Inverter	86.7*	I	S	E
TR	Transformer	78.4**	O	T	E
TRS	Substation Transformer	90.4**	O	T	U

Noise Source Summary Table Notes:

[1] Source Locations
O – located/installed outside building, including on rooftop
I – located/installed inside building

[2] Sound Characteristics
S – Steady
Q – Quasi Steady
Impulsive
I – Impulsive
B – Buzzing
T – Tonal
C – Cyclic
Int – Intermittent

[3] Noise Control Measures
S – silencer, acoustic louver, muffler
A – acoustic lining, plenum
B – barrier, berm, screening
L – lagging
E – acoustic enclosure
O – other
U – uncontrolled

* Additional 3 dB added to account for 2nd inverter located inside the enclosure.

** Includes 5 dB tonal penalty.

Table 2b – Noise Source Sound Power Spectra

Noise Source		Octave Spectrum (dB)									Overall		Data Source
Name	ID	31.5	63	125	250	500	1000	2000	4000	8000	A	lin	
Transformer 2 MVA	TR1 - TR10	70	76	78	73	73	67	62	57	50	73.4	82	MFG - Appendix A
Transformer 12 MVA	TRS	82	88	90	85	85	79	74	69	62	85.4	94	MFG - Appendix A
AEI Solaron 500	INV1 - INV10		83.4	89.6	81.8	81	78	73.1	70.3	75.2	83.7	91.9	Vibro-acoustic Report Table 1 - Configuration 2 Appendix A

Table 2c – Noise Source Coordinates

Noise Source		UTM Coordinates		Ground Elev. (m)	Source Height (m)
Name	ID	X (m)	Y (m)		
INVERTER 1	INV1	661780	4927079	298	2
INVERTER 2	INV2	661718	4926969	299	2
INVERTER 3	INV3	661705	4926858	298	2
INVERTER 4	INV4	661746	4926749	295	2
INVERTER 5	INV5	661783	4926639	294	2
INVERTER 6	INV6	662144	4927210	295	2
INVERTER 7	INV7	662182	4927100	294	2
INVERTER 8	INV8	662222	4926990	293	2
INVERTER 9	INV9	662261	4926880	289	2
INVERTER 10	INV10	662083	4926814	292	2
TRANSFORMER 1	TR1	661777	4927079	299	2
TRANSFORMER 2	TR2	661714	4926969	299	2
TRANSFORMER 3	TR3	661702	4926859	298	2
TRANSFORMER 4	TR4	661742	4926749	295	2
TRANSFORMER 5	TR5	661780	4926639	294	2
TRANSFORMER 6	TR6	662139	4927210	295	2
TRANSFORMER 7	TR7	662179	4927100	295	2
TRANSFORMER 8	TR8	662218	4926990	293	2
TRANSFORMER 9	TR9	662257	4926880	289	2
TRANSFORMER 10	TR10	662079	4926814	292	2
Substation Transformer	TRS	661621	4927087	299	2

APPENDIX G CADNA-A SAMPLE CALCULATIONS

Receiver:	VLR
ID:	7
X:	661426
Y:	4925650
Z:	4.5

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
7	661656	4925566	1.8	0	32	14.7	244.48	3.15	58.76	0	-3.68	0	0	0.01	-40.39
7	661656	4925566	1.8	0	63	81.9	244.48	3.15	58.76	0	-3.68	0	0	0.03	26.79
7	661656	4925566	1.8	0	125	83.3	244.48	3.15	58.76	0	2.09	0	0	0.1	22.35
7	661656	4925566	1.8	0	250	91.1	244.48	3.15	58.76	0	4.32	0	0	0.26	27.75
7	661656	4925566	1.8	0	500	91.1	244.48	3.15	58.76	0	1.09	0	0	0.47	30.78
7	661656	4925566	1.8	0	1000	85.7	244.48	3.15	58.76	0	-0.92	0	0	0.89	26.96
7	661656	4925566	1.8	0	2000	78.2	244.48	3.15	58.76	0	-1.1	0	0	2.36	18.18
7	661656	4925566	1.8	0	4000	68.5	244.48	3.15	58.76	0	-1.1	0	0	8.01	2.83
7	661656	4925566	1.8	0	8000	78.1	244.48	3.15	58.76	0	-1.1	0	0	28.58	-8.14

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
3	661696	4926020	1.8	0	32	14.7	457.73	3.15	64.21	0	-4.76	0	0	0.01	-44.77
3	661696	4926020	1.8	0	63	81.9	457.73	3.15	64.21	0	-4.76	0	0	0.06	22.39
3	661696	4926020	1.8	0	125	83.3	457.73	3.15	64.21	0	2.83	0	0	0.19	16.07
3	661696	4926020	1.8	0	250	91.1	457.73	3.15	64.21	0	4.04	0	0	0.48	22.37
3	661696	4926020	1.8	0	500	91.1	457.73	3.15	64.21	0	0.78	0	0	0.88	25.23
3	661696	4926020	1.8	0	1000	85.7	457.73	3.15	64.21	0	-1.24	0	0	1.67	21.05
3	661696	4926020	1.8	0	2000	78.2	457.73	3.15	64.21	0	-1.43	0	0	4.42	10.99
3	661696	4926020	1.8	0	4000	68.5	457.73	3.15	64.21	0	-1.43	0	0	15	-9.28
3	661696	4926020	1.8	0	8000	78.1	457.73	3.15	64.21	0	-1.43	0	0	53.5	-38.18

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
10	661870	4925483	1.8	0	32	14.7	473.99	3.15	64.52	0	-4.8	0	0	0.02	-45.03
10	661870	4925483	1.8	0	63	81.9	473.99	3.15	64.52	0	-4.8	0	0	0.06	22.13
10	661870	4925483	1.8	0	125	83.3	473.99	3.15	64.52	0	2.9	0	0	0.19	15.69
10	661870	4925483	1.8	0	250	91.1	473.99	3.15	64.52	0	4.03	0	0	0.49	22.06
10	661870	4925483	1.8	0	500	91.1	473.99	3.15	64.52	0	0.77	0	0	0.91	24.9
10	661870	4925483	1.8	0	1000	85.7	473.99	3.15	64.52	0	-1.25	0	0	1.73	20.7
10	661870	4925483	1.8	0	2000	78.2	473.99	3.15	64.52	0	-1.44	0	0	4.58	10.55
10	661870	4925483	1.8	0	4000	68.5	473.99	3.15	64.52	0	-1.44	0	0	15.53	-10.11
10	661870	4925483	1.8	0	8000	78.1	473.99	3.15	64.52	0	-1.44	0	0	55.4	-40.37

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
2	661654	4926073	1.8	0	32	14.7	480.27	3.15	64.63	0	-4.82	0	0	0.02	-45.13
2	661654	4926073	1.8	0	63	81.9	480.27	3.15	64.63	0	-4.82	0	0	0.06	22.03
2	661654	4926073	1.8	0	125	83.3	480.27	3.15	64.63	0	2.93	0	0	0.2	15.54
2	661654	4926073	1.8	0	250	91.1	480.27	3.15	64.63	0	4.02	0	0	0.5	21.95
2	661654	4926073	1.8	0	500	91.1	480.27	3.15	64.63	0	0.76	0	0	0.93	24.78
2	661654	4926073	1.8	0	1000	85.7	480.27	3.15	64.63	0	-1.26	0	0	1.76	20.57
2	661654	4926073	1.8	0	2000	78.2	480.27	3.15	64.63	0	-1.45	0	0	4.64	10.37
2	661654	4926073	1.8	0	4000	68.5	480.27	3.15	64.63	0	-1.45	0	0	15.74	-10.42
2	661654	4926073	1.8	0	8000	78.1	480.27	3.15	64.63	0	-1.45	0	0	56.13	-41.22

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
1	661696	4926170	1.8	0	32	14.7	585.66	3.15	66.35	0	-5.03	0	0	0.02	-46.64
1	661696	4926170	1.8	0	63	81.9	585.66	3.15	66.35	0	-5.03	0	0	0.07	20.51
1	661696	4926170	1.8	0	125	83.3	585.66	3.15	66.35	0	3.38	0	0	0.24	13.33
1	661696	4926170	1.8	0	250	91.1	585.66	3.15	66.35	0	3.96	0	0	0.61	20.18
1	661696	4926170	1.8	0	500	91.1	585.66	3.15	66.35	0	0.7	0	0	1.13	22.92
1	661696	4926170	1.8	0	1000	85.7	585.66	3.15	66.35	0	-1.32	0	0	2.14	18.53
1	661696	4926170	1.8	0	2000	78.2	585.66	3.15	66.35	0	-1.51	0	0	5.66	7.7
1	661696	4926170	1.8	0	4000	68.5	585.66	3.15	66.35	0	-1.51	0	0	19.19	-15.54
1	661696	4926170	1.8	0	8000	78.1	585.66	3.15	66.35	0	-1.51	0	0	68.45	-55.2

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
11	661696	4926316	1.8	0	32	14.7	718.42	3.15	68.13	0	-5.21	0	0	0.02	-48.24
11	661696	4926316	1.8	0	63	81.9	718.42	3.15	68.13	0	-5.21	0	0	0.09	18.9
11	661696	4926316	1.8	0	125	83.3	718.42	3.15	68.13	0	3.86	0	0	0.3	11.02
11	661696	4926316	1.8	0	250	91.1	718.42	3.15	68.13	0	3.91	0	0	0.75	18.32
11	661696	4926316	1.8	0	500	91.1	718.42	3.15	68.13	0	0.65	0	0	1.39	20.94
11	661696	4926316	1.8	0	1000	85.7	718.42	3.15	68.13	0	-1.37	0	0	2.63	16.32
11	661696	4926316	1.8	0	2000	78.2	718.42	3.15	68.13	0	-1.56	0	0	6.94	4.69
11	661696	4926316	1.8	0	4000	68.5	718.42	3.15	68.13	0	-1.56	0	0	23.54	-21.61
11	661696	4926316	1.8	0	8000	78.1	718.42	3.15	68.13	0	-1.56	0	0	83.97	-72.43

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
T12	661803	4925294	1.6	0	32	49.2	518.26	3.05	65.29	0	-4.94	0	0	0.02	-11.17
T12	661803	4925294	1.6	0	63	68.4	518.26	3.05	65.29	0	-4.94	0	0	0.06	7.99
T12	661803	4925294	1.6	0	125	80.5	518.26	3.05	65.29	0	3.1	0	0	0.21	11.9
T12	661803	4925294	1.6	0	250	83	518.26	3.05	65.29	0	4.27	0	0	0.54	12.9
T12	661803	4925294	1.6	0	500	88.4	518.26	3.05	65.29	0	1.54	0	0	1	20.57
T12	661803	4925294	1.6	0	1000	85.6	518.26	3.05	65.29	0	-1.13	0	0	1.9	19.55
T12	661803	4925294	1.6	0	2000	81.8	518.26	3.05	65.29	0	-1.48	0	0	5.01	12.98
T12	661803	4925294	1.6	0	4000	76.6	518.26	3.05	65.29	0	-1.48	0	0	16.98	-4.19
T12	661803	4925294	1.6	0	8000	67.5	518.26	3.05	65.29	0	-1.48	0	0	60.58	-56.88

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
6	661723	4925685	1.8	0	32	14.7	298.62	3.15	60.5	0	-4.1	0	0	0.01	-41.71
6	661723	4925685	1.8	0	63	81.9	298.62	3.15	60.5	0	-4.1	0	0	0.04	25.46
6	661723	4925685	1.8	0	125	73.3	298.62	3.15	60.5	0	2.22	0	0	0.12	10.46
6	661723	4925685	1.8	0	250	81.1	298.62	3.15	60.5	0	4.23	0	0	0.31	16.06
6	661723	4925685	1.8	0	500	79.1	298.62	3.15	60.5	0	0.97	0	0	0.58	17.05
6	661723	4925685	1.8	0	1000	69.7	298.62	3.15	60.5	0	-1.04	0	0	1.09	9.15
6	661723	4925685	1.8	0	2000	55.2	298.62	3.15	60.5	0	-1.23	0	0	2.89	-6.96
6	661723	4925685	1.8	0	4000	50.5	298.62	3.15	60.5	0	-1.23	0	0	9.79	-18.56
6	661723	4925685	1.8	0	8000	78.1	298.62	3.15	60.5	0	-1.23	0	0	34.9	-16.08

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
8	661656	4925443	1.8	0	32	14.7	309.16	3.15	60.8	0	-4.17	0	0	0.01	-41.95
8	661656	4925443	1.8	0	63	81.9	309.16	3.15	60.8	0	-4.17	0	0	0.04	25.22
8	661656	4925443	1.8	0	125	73.3	309.16	3.15	60.8	0	2.25	0	0	0.13	10.12
8	661656	4925443	1.8	0	250	81.1	309.16	3.15	60.8	0	4.21	0	0	0.32	15.76
8	661656	4925443	1.8	0	500	79.1	309.16	3.15	60.8	0	0.95	0	0	0.6	16.75
8	661656	4925443	1.8	0	1000	69.7	309.16	3.15	60.8	0	-1.06	0	0	1.13	8.83
8	661656	4925443	1.8	0	2000	55.2	309.16	3.15	60.8	0	-1.25	0	0	2.99	-7.34
8	661656	4925443	1.8	0	4000	50.5	309.16	3.15	60.8	0	-1.25	0	0	10.13	-19.19
8	661656	4925443	1.8	0	8000	78.1	309.16	3.15	60.8	0	-1.25	0	0	36.14	-17.59

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
5	661696	4925853	1.8	0	32	14.7	337.42	3.15	61.56	0	-4.32	0	0	0.01	-42.55
5	661696	4925853	1.8	0	63	81.9	337.42	3.15	61.56	0	-4.32	0	0	0.04	24.62
5	661696	4925853	1.8	0	125	73.3	337.42	3.15	61.56	0	2.34	0	0	0.14	9.25
5	661696	4925853	1.8	0	250	81.1	337.42	3.15	61.56	0	4.17	0	0	0.35	15.02
5	661696	4925853	1.8	0	500	79.1	337.42	3.15	61.56	0	0.91	0	0	0.65	15.98
5	661696	4925853	1.8	0	1000	69.7	337.42	3.15	61.56	0	-1.11	0	0	1.23	8.01
5	661696	4925853	1.8	0	2000	55.2	337.42	3.15	61.56	0	-1.3	0	0	3.26	-8.33
5	661696	4925853	1.8	0	4000	50.5	337.42	3.15	61.56	0	-1.3	0	0	11.06	-20.82
5	661696	4925853	1.8	0	8000	78.1	337.42	3.15	61.56	0	-1.3	0	0	39.44	-21.61

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
4	661656	4925905	1.8	0	32	14.7	343.06	3.15	61.71	0	-4.35	0	0	0.01	-42.67
4	661656	4925905	1.8	0	63	81.9	343.06	3.15	61.71	0	-4.35	0	0	0.04	24.5
4	661656	4925905	1.8	0	125	73.3	343.06	3.15	61.71	0	2.36	0	0	0.14	9.09
4	661656	4925905	1.8	0	250	81.1	343.06	3.15	61.71	0	4.16	0	0	0.36	14.87
4	661656	4925905	1.8	0	500	79.1	343.06	3.15	61.71	0	0.9	0	0	0.66	15.83
4	661656	4925905	1.8	0	1000	69.7	343.06	3.15	61.71	0	-1.11	0	0	1.25	7.85
4	661656	4925905	1.8	0	2000	55.2	343.06	3.15	61.71	0	-1.3	0	0	3.32	-8.52
4	661656	4925905	1.8	0	4000	50.5	343.06	3.15	61.71	0	-1.3	0	0	11.24	-21.15
4	661656	4925905	1.8	0	8000	78.1	343.06	3.15	61.71	0	-1.3	0	0	40.1	-22.4

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
9	661696	4925414	1.8	0	32	14.7	358.33	3.15	62.09	0	-4.42	0	0	0.01	-42.98
9	661696	4925414	1.8	0	63	81.9	358.33	3.15	62.09	0	-4.42	0	0	0.04	24.19
9	661696	4925414	1.8	0	125	73.3	358.33	3.15	62.09	0	2.42	0	0	0.15	8.65
9	661696	4925414	1.8	0	250	81.1	358.33	3.15	62.09	0	4.14	0	0	0.37	14.5
9	661696	4925414	1.8	0	500	79.1	358.33	3.15	62.09	0	0.88	0	0	0.69	15.44
9	661696	4925414	1.8	0	1000	69.7	358.33	3.15	62.09	0	-1.14	0	0	1.31	7.44
9	661696	4925414	1.8	0	2000	55.2	358.33	3.15	62.09	0	-1.33	0	0	3.46	-9.02
9	661696	4925414	1.8	0	4000	50.5	358.33	3.15	62.09	0	-1.33	0	0	11.74	-22
9	661696	4925414	1.8	0	8000	78.1	358.33	3.15	62.09	0	-1.33	0	0	41.88	-24.54

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
T7	661656	4925571	1.4	0	32	38.2	242.81	2.95	58.71	0	-3.81	0	0	0.01	-16.7
T7	661656	4925571	1.4	0	63	57.4	242.81	2.95	58.71	0	-3.81	0	0	0.03	2.48
T7	661656	4925571	1.4	0	125	69.5	242.81	2.95	58.71	0	1.93	0	0	0.1	8.77
T7	661656	4925571	1.4	0	250	72	242.81	2.95	58.71	0	4.83	0	0	0.25	8.21
T7	661656	4925571	1.4	0	500	77.4	242.81	2.95	58.71	0	2.8	0	0	0.47	15.42
T7	661656	4925571	1.4	0	1000	74.6	242.81	2.95	58.71	0	-0.55	0	0	0.89	15.56
T7	661656	4925571	1.4	0	2000	70.8	242.81	2.95	58.71	0	-1.14	0	0	2.35	10.89
T7	661656	4925571	1.4	0	4000	65.6	242.81	2.95	58.71	0	-1.14	0	0	7.96	0.08
T7	661656	4925571	1.4	0	8000	56.5	242.81	2.95	58.71	0	-1.14	0	0	28.38	-29.44

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
T6	661723	4925690	1.4	0	32	38.2	299.25	2.95	60.52	0	-4.23	0	0	0.01	-18.1
T6	661723	4925690	1.4	0	63	57.4	299.25	2.95	60.52	0	-4.23	0	0	0.04	1.07
T6	661723	4925690	1.4	0	125	69.5	299.25	2.95	60.52	0	2.09	0	0	0.12	6.76
T6	661723	4925690	1.4	0	250	72	299.25	2.95	60.52	0	4.74	0	0	0.31	6.43
T6	661723	4925690	1.4	0	500	77.4	299.25	2.95	60.52	0	2.7	0	0	0.58	13.6
T6	661723	4925690	1.4	0	1000	74.6	299.25	2.95	60.52	0	-0.67	0	0	1.09	13.65
T6	661723	4925690	1.4	0	2000	70.8	299.25	2.95	60.52	0	-1.27	0	0	2.89	8.66
T6	661723	4925690	1.4	0	4000	65.6	299.25	2.95	60.52	0	-1.27	0	0	9.81	-3.46
T6	661723	4925690	1.4	0	8000	56.5	299.25	2.95	60.52	0	-1.27	0	0	34.98	-37.73

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
T8	661656	4925448	1.4	0	32	38.2	305.84	2.95	60.71	0	-4.26	0	0	0.01	-18.26
T8	661656	4925448	1.4	0	63	57.4	305.84	2.95	60.71	0	-4.26	0	0	0.04	0.92
T8	661656	4925448	1.4	0	125	69.5	305.84	2.95	60.71	0	2.12	0	0	0.13	6.55
T8	661656	4925448	1.4	0	250	72	305.84	2.95	60.71	0	4.73	0	0	0.32	6.24
T8	661656	4925448	1.4	0	500	77.4	305.84	2.95	60.71	0	2.69	0	0	0.59	13.41
T8	661656	4925448	1.4	0	1000	74.6	305.84	2.95	60.71	0	-0.68	0	0	1.12	13.45
T8	661656	4925448	1.4	0	2000	70.8	305.84	2.95	60.71	0	-1.28	0	0	2.96	8.41
T8	661656	4925448	1.4	0	4000	65.6	305.84	2.95	60.71	0	-1.28	0	0	10.02	-3.85
T8	661656	4925448	1.4	0	8000	56.5	305.84	2.95	60.71	0	-1.28	0	0	35.75	-38.68

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
T5	661696	4925858	1.4	0	32	38.2	340.45	2.95	61.64	0	-4.44	0	0	0.01	-19.01
T5	661696	4925858	1.4	0	63	57.4	340.45	2.95	61.64	0	-4.44	0	0	0.04	0.16
T5	661696	4925858	1.4	0	125	69.5	340.45	2.95	61.64	0	2.25	0	0	0.14	5.47
T5	661696	4925858	1.4	0	250	72	340.45	2.95	61.64	0	4.68	0	0	0.36	5.32
T5	661696	4925858	1.4	0	500	77.4	340.45	2.95	61.64	0	2.64	0	0	0.66	12.46
T5	661696	4925858	1.4	0	1000	74.6	340.45	2.95	61.64	0	-0.73	0	0	1.25	12.45
T5	661696	4925858	1.4	0	2000	70.8	340.45	2.95	61.64	0	-1.33	0	0	3.29	7.2
T5	661696	4925858	1.4	0	4000	65.6	340.45	2.95	61.64	0	-1.33	0	0	11.16	-5.87
T5	661696	4925858	1.4	0	8000	56.5	340.45	2.95	61.64	0	-1.33	0	0	39.79	-43.6

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
T4	661656	4925910	1.4	0	32	38.2	346.8	2.95	61.8	0	-4.47	0	0	0.01	-19.14
T4	661656	4925910	1.4	0	63	57.4	346.8	2.95	61.8	0	-4.47	0	0	0.04	0.03
T4	661656	4925910	1.4	0	125	69.5	346.8	2.95	61.8	0	2.28	0	0	0.14	5.28
T4	661656	4925910	1.4	0	250	72	346.8	2.95	61.8	0	4.67	0	0	0.36	5.16
T4	661656	4925910	1.4	0	500	77.4	346.8	2.95	61.8	0	2.63	0	0	0.67	12.3
T4	661656	4925910	1.4	0	1000	74.6	346.8	2.95	61.8	0	-0.74	0	0	1.27	12.27
T4	661656	4925910	1.4	0	2000	70.8	346.8	2.95	61.8	0	-1.34	0	0	3.35	6.99
T4	661656	4925910	1.4	0	4000	65.6	346.8	2.95	61.8	0	-1.34	0	0	11.36	-6.23
T4	661656	4925910	1.4	0	8000	56.5	346.8	2.95	61.8	0	-1.34	0	0	40.53	-44.5

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
T9	661696	4925419	1.4	0	32	38.2	355.06	2.95	62.01	0	-4.5	0	0	0.01	-19.31
T9	661696	4925419	1.4	0	63	57.4	355.06	2.95	62.01	0	-4.5	0	0	0.04	-0.14
T9	661696	4925419	1.4	0	125	69.5	355.06	2.95	62.01	0	2.31	0	0	0.15	5.03
T9	661696	4925419	1.4	0	250	72	355.06	2.95	62.01	0	4.66	0	0	0.37	4.96
T9	661696	4925419	1.4	0	500	77.4	355.06	2.95	62.01	0	2.62	0	0	0.68	12.09
T9	661696	4925419	1.4	0	1000	74.6	355.06	2.95	62.01	0	-0.75	0	0	1.3	12.05
T9	661696	4925419	1.4	0	2000	70.8	355.06	2.95	62.01	0	-1.35	0	0	3.43	6.71
T9	661696	4925419	1.4	0	4000	65.6	355.06	2.95	62.01	0	-1.35	0	0	11.64	-6.69
T9	661696	4925419	1.4	0	8000	56.5	355.06	2.95	62.01	0	-1.35	0	0	41.5	-45.65

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
T3	661696	4926025	1.4	0	32	38.2	461.78	2.95	64.29	0	-4.85	0	0	0.01	-21.25
T3	661696	4926025	1.4	0	63	57.4	461.78	2.95	64.29	0	-4.85	0	0	0.06	-2.09
T3	661696	4926025	1.4	0	125	69.5	461.78	2.95	64.29	0	2.82	0	0	0.19	2.2
T3	661696	4926025	1.4	0	250	72	461.78	2.95	64.29	0	4.56	0	0	0.48	2.67
T3	661696	4926025	1.4	0	500	77.4	461.78	2.95	64.29	0	2.52	0	0	0.89	9.7
T3	661696	4926025	1.4	0	1000	74.6	461.78	2.95	64.29	0	-0.86	0	0	1.69	9.48
T3	661696	4926025	1.4	0	2000	70.8	461.78	2.95	64.29	0	-1.46	0	0	4.46	3.5
T3	661696	4926025	1.4	0	4000	65.6	461.78	2.95	64.29	0	-1.46	0	0	15.13	-12.37
T3	661696	4926025	1.4	0	8000	56.5	461.78	2.95	64.29	0	-1.46	0	0	53.97	-60.31

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
T10	661870	4925488	1.4	0	32	38.2	472.25	2.95	64.48	0	-4.88	0	0	0.02	-21.42
T10	661870	4925488	1.4	0	63	57.4	472.25	2.95	64.48	0	-4.88	0	0	0.06	-2.27
T10	661870	4925488	1.4	0	125	69.5	472.25	2.95	64.48	0	2.87	0	0	0.19	1.95
T10	661870	4925488	1.4	0	250	72	472.25	2.95	64.48	0	4.56	0	0	0.49	2.47
T10	661870	4925488	1.4	0	500	77.4	472.25	2.95	64.48	0	2.52	0	0	0.91	9.49
T10	661870	4925488	1.4	0	1000	74.6	472.25	2.95	64.48	0	-0.86	0	0	1.73	9.25
T10	661870	4925488	1.4	0	2000	70.8	472.25	2.95	64.48	0	-1.46	0	0	4.56	3.22
T10	661870	4925488	1.4	0	4000	65.6	472.25	2.95	64.48	0	-1.46	0	0	15.48	-12.9
T10	661870	4925488	1.4	0	8000	56.5	472.25	2.95	64.48	0	-1.46	0	0	55.2	-61.72

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
T2	661654	4926078	1.4	0	32	38.2	484.68	2.95	64.71	0	-4.9	0	0	0.02	-21.62
T2	661654	4926078	1.4	0	63	57.4	484.68	2.95	64.71	0	-4.9	0	0	0.06	-2.46
T2	661654	4926078	1.4	0	125	69.5	484.68	2.95	64.71	0	2.93	0	0	0.2	1.66
T2	661654	4926078	1.4	0	250	72	484.68	2.95	64.71	0	4.55	0	0	0.51	2.24
T2	661654	4926078	1.4	0	500	77.4	484.68	2.95	64.71	0	2.51	0	0	0.93	9.25
T2	661654	4926078	1.4	0	1000	74.6	484.68	2.95	64.71	0	-0.87	0	0	1.77	8.99
T2	661654	4926078	1.4	0	2000	70.8	484.68	2.95	64.71	0	-1.47	0	0	4.68	2.88
T2	661654	4926078	1.4	0	4000	65.6	484.68	2.95	64.71	0	-1.47	0	0	15.88	-13.52
T2	661654	4926078	1.4	0	8000	56.5	484.68	2.95	64.71	0	-1.47	0	0	56.65	-63.39

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
TRS	661621	4927087	2	0	32	47.6	1450.04	3.25	74.23	0	-5.6	0	0	0.05	-21.08
TRS	661621	4927087	2	0	63	66.8	1450.04	3.25	74.23	0	-5.6	0	0	0.18	-2.01
TRS	661621	4927087	2	0	125	78.9	1450.04	3.25	74.23	0	4.49	0	0	0.6	-0.41
TRS	661621	4927087	2	0	250	81.4	1450.04	3.25	74.23	0	3.49	0	0	1.51	2.17
TRS	661621	4927087	2	0	500	86.8	1450.04	3.25	74.23	0	-0.12	0	0	2.8	9.9
TRS	661621	4927087	2	0	1000	84	1450.04	3.25	74.23	0	-1.58	0	0	5.3	6.05
TRS	661621	4927087	2	0	2000	80.2	1450.04	3.25	74.23	0	-1.68	0	0	14.01	-6.36
TRS	661621	4927087	2	0	4000	75	1450.04	3.25	74.23	0	-1.68	0	0	47.52	-45.07
TRS	661621	4927087	2	0	8000	65.9	1450.04	3.25	74.23	0	-1.68	0	0	169.48	-176.13

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
INV5	661783	4926639	2	0	32	-39.4	1051.25	3.25	71.43	0	-5.44	0	0	0.03	-105.42
INV5	661783	4926639	2	0	63	60.2	1051.25	3.25	71.43	0	-5.44	0	0	0.13	-5.92
INV5	661783	4926639	2	0	125	76.5	1051.25	3.25	71.43	0	4.39	0	0	0.43	0.24
INV5	661783	4926639	2	0	250	76.2	1051.25	3.25	71.43	0	3.54	0	0	1.1	0.13
INV5	661783	4926639	2	0	500	80.8	1051.25	3.25	71.43	0	-0.08	0	0	2.03	7.42
INV5	661783	4926639	2	0	1000	81	1051.25	3.25	71.43	0	-1.54	0	0	3.85	7.26
INV5	661783	4926639	2	0	2000	77.3	1051.25	3.25	71.43	0	-1.63	0	0	10.16	-2.66
INV5	661783	4926639	2	0	4000	74.3	1051.25	3.25	71.43	0	-1.63	0	0	34.45	-29.95
INV5	661783	4926639	2	0	8000	77.1	1051.25	3.25	71.43	0	-1.63	0	0	122.87	-115.57

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
T1	661696	4926175	1.4	0	32	38.2	590.1	2.95	66.42	0	-5.1	0	0	0.02	-23.14
T1	661696	4926175	1.4	0	63	57.4	590.1	2.95	66.42	0	-5.1	0	0	0.07	-3.99
T1	661696	4926175	1.4	0	125	69.5	590.1	2.95	66.42	0	3.44	0	0	0.24	-0.6
T1	661696	4926175	1.4	0	250	72	590.1	2.95	66.42	0	4.49	0	0	0.62	0.48
T1	661696	4926175	1.4	0	500	77.4	590.1	2.95	66.42	0	2.45	0	0	1.14	7.39
T1	661696	4926175	1.4	0	1000	74.6	590.1	2.95	66.42	0	-0.93	0	0	2.16	6.95
T1	661696	4926175	1.4	0	2000	70.8	590.1	2.95	66.42	0	-1.53	0	0	5.7	0.21
T1	661696	4926175	1.4	0	4000	65.6	590.1	2.95	66.42	0	-1.53	0	0	19.34	-18.63
T1	661696	4926175	1.4	0	8000	56.5	590.1	2.95	66.42	0	-1.53	0	0	68.97	-77.36

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
INV4	661746	4926749	2	0	32	-39.4	1144.45	3.25	72.17	0	-5.49	0	0	0.04	-106.12
INV4	661746	4926749	2	0	63	60.2	1144.45	3.25	72.17	0	-5.49	0	0	0.14	-6.62
INV4	661746	4926749	2	0	125	76.5	1144.45	3.25	72.17	0	4.45	0	0	0.47	-0.59
INV4	661746	4926749	2	0	250	76.2	1144.45	3.25	72.17	0	3.53	0	0	1.19	-0.69
INV4	661746	4926749	2	0	500	80.8	1144.45	3.25	72.17	0	-0.09	0	0	2.21	6.51
INV4	661746	4926749	2	0	1000	81	1144.45	3.25	72.17	0	-1.55	0	0	4.19	6.19
INV4	661746	4926749	2	0	2000	77.3	1144.45	3.25	72.17	0	-1.65	0	0	11.06	-4.29
INV4	661746	4926749	2	0	4000	74.3	1144.45	3.25	72.17	0	-1.65	0	0	37.5	-33.73
INV4	661746	4926749	2	0	8000	77.1	1144.45	3.25	72.17	0	-1.65	0	0	133.77	-127.19

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
INV3	661705	4926858	2	0	32	-39.4	1239.63	3.25	72.87	0	-5.53	0	0	0.04	-106.78
INV3	661705	4926858	2	0	63	60.2	1239.63	3.25	72.87	0	-5.53	0	0	0.15	-7.29
INV3	661705	4926858	2	0	125	76.5	1239.63	3.25	72.87	0	4.47	0	0	0.51	-1.35
INV3	661705	4926858	2	0	250	76.2	1239.63	3.25	72.87	0	3.51	0	0	1.29	-1.47
INV3	661705	4926858	2	0	500	80.8	1239.63	3.25	72.87	0	-0.1	0	0	2.39	5.65
INV3	661705	4926858	2	0	1000	81	1239.63	3.25	72.87	0	-1.56	0	0	4.53	5.16
INV3	661705	4926858	2	0	2000	77.3	1239.63	3.25	72.87	0	-1.66	0	0	11.98	-5.89
INV3	661705	4926858	2	0	4000	74.3	1239.63	3.25	72.87	0	-1.66	0	0	40.62	-37.53
INV3	661705	4926858	2	0	8000	77.1	1239.63	3.25	72.87	0	-1.66	0	0	144.89	-139

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
INV10	662083	4926814	2	0	32	-39.4	1336.34	3.25	73.52	0	-5.56	0	0	0.04	-107.4
INV10	662083	4926814	2	0	63	60.2	1336.34	3.25	73.52	0	-5.56	0	0	0.16	-7.92
INV10	662083	4926814	2	0	125	76.5	1336.34	3.25	73.52	0	4.49	0	0	0.55	-2.06
INV10	662083	4926814	2	0	250	76.2	1336.34	3.25	73.52	0	3.5	0	0	1.39	-2.22
INV10	662083	4926814	2	0	500	80.8	1336.34	3.25	73.52	0	-0.11	0	0	2.58	4.82
INV10	662083	4926814	2	0	1000	81	1336.34	3.25	73.52	0	-1.57	0	0	4.89	4.17
INV10	662083	4926814	2	0	2000	77.3	1336.34	3.25	73.52	0	-1.67	0	0	12.91	-7.46
INV10	662083	4926814	2	0	4000	74.3	1336.34	3.25	73.52	0	-1.67	0	0	43.79	-41.34
INV10	662083	4926814	2	0	8000	77.1	1336.34	3.25	73.52	0	-1.67	0	0	156.19	-150.94

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
INV2	661718	4926969	2	0	32	-39.4	1350.77	3.25	73.61	0	-5.57	0	0	0.04	-107.49
INV2	661718	4926969	2	0	63	60.2	1350.77	3.25	73.61	0	-5.57	0	0	0.16	-8.01
INV2	661718	4926969	2	0	125	76.5	1350.77	3.25	73.61	0	4.49	0	0	0.56	-2.16
INV2	661718	4926969	2	0	250	76.2	1350.77	3.25	73.61	0	3.5	0	0	1.41	-2.32
INV2	661718	4926969	2	0	500	80.8	1350.77	3.25	73.61	0	-0.11	0	0	2.6	4.7
INV2	661718	4926969	2	0	1000	81	1350.77	3.25	73.61	0	-1.57	0	0	4.94	4.02
INV2	661718	4926969	2	0	2000	77.3	1350.77	3.25	73.61	0	-1.67	0	0	13.05	-7.7
INV2	661718	4926969	2	0	4000	74.3	1350.77	3.25	73.61	0	-1.67	0	0	44.26	-41.91
INV2	661718	4926969	2	0	8000	77.1	1350.77	3.25	73.61	0	-1.67	0	0	157.88	-152.72

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
T11	661696	4926321	1.4	0	32	38.2	723.06	2.95	68.18	0	-5.27	0	0	0.02	-24.74
T11	661696	4926321	1.4	0	63	57.4	723.06	2.95	68.18	0	-5.27	0	0	0.09	-5.61
T11	661696	4926321	1.4	0	125	69.5	723.06	2.95	68.18	0	3.97	0	0	0.3	-2.95
T11	661696	4926321	1.4	0	250	72	723.06	2.95	68.18	0	4.44	0	0	0.75	-1.38
T11	661696	4926321	1.4	0	500	77.4	723.06	2.95	68.18	0	2.4	0	0	1.39	5.42
T11	661696	4926321	1.4	0	1000	74.6	723.06	2.95	68.18	0	-0.98	0	0	2.64	4.75
T11	661696	4926321	1.4	0	2000	70.8	723.06	2.95	68.18	0	-1.58	0	0	6.99	-2.79
T11	661696	4926321	1.4	0	4000	65.6	723.06	2.95	68.18	0	-1.58	0	0	23.69	-24.7
T11	661696	4926321	1.4	0	8000	56.5	723.06	2.95	68.18	0	-1.58	0	0	84.51	-94.62

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
INV1	661780	4927079	2	0	32	-39.4	1472.02	3.25	74.36	0	-5.6	0	0	0.05	-108.2
INV1	661780	4927079	2	0	63	60.2	1472.02	3.25	74.36	0	-5.6	0	0	0.18	-8.73
INV1	661780	4927079	2	0	125	76.5	1472.02	3.25	74.36	0	4.49	0	0	0.6	-2.95
INV1	661780	4927079	2	0	250	76.2	1472.02	3.25	74.36	0	3.49	0	0	1.54	-3.19
INV1	661780	4927079	2	0	500	80.8	1472.02	3.25	74.36	0	-0.12	0	0	2.84	3.73
INV1	661780	4927079	2	0	1000	81	1472.02	3.25	74.36	0	-1.59	0	0	5.38	2.84
INV1	661780	4927079	2	0	2000	77.3	1472.02	3.25	74.36	0	-1.68	0	0	14.23	-9.6
INV1	661780	4927079	2	0	4000	74.3	1472.02	3.25	74.36	0	-1.68	0	0	48.24	-46.62
INV1	661780	4927079	2	0	8000	77.1	1472.02	3.25	74.36	0	-1.68	0	0	172.05	-167.63

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
INV9	662261	4926880	2	0	32	-39.4	1486.34	3.25	74.44	0	-5.61	0	0	0.05	-108.28
INV9	662261	4926880	2	0	63	60.2	1486.34	3.25	74.44	0	-5.61	0	0	0.18	-8.82
INV9	662261	4926880	2	0	125	76.5	1486.34	3.25	74.44	0	4.49	0	0	0.61	-3.04
INV9	662261	4926880	2	0	250	76.2	1486.34	3.25	74.44	0	3.49	0	0	1.55	-3.28
INV9	662261	4926880	2	0	500	80.8	1486.34	3.25	74.44	0	-0.12	0	0	2.87	3.62
INV9	662261	4926880	2	0	1000	81	1486.34	3.25	74.44	0	-1.59	0	0	5.44	2.71
INV9	662261	4926880	2	0	2000	77.3	1486.34	3.25	74.44	0	-1.68	0	0	14.36	-9.82
INV9	662261	4926880	2	0	4000	74.3	1486.34	3.25	74.44	0	-1.68	0	0	48.71	-47.17
INV9	662261	4926880	2	0	8000	77.1	1486.34	3.25	74.44	0	-1.68	0	0	173.73	-169.39

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
INV8	662222	4926990	2	0	32	-39.4	1558.31	3.25	74.85	0	-5.62	0	0	0.05	-108.68
INV8	662222	4926990	2	0	63	60.2	1558.31	3.25	74.85	0	-5.62	0	0	0.19	-9.22
INV8	662222	4926990	2	0	125	76.5	1558.31	3.25	74.85	0	4.49	0	0	0.64	-3.48
INV8	662222	4926990	2	0	250	76.2	1558.31	3.25	74.85	0	3.49	0	0	1.63	-3.76
INV8	662222	4926990	2	0	500	80.8	1558.31	3.25	74.85	0	-0.13	0	0	3	3.07
INV8	662222	4926990	2	0	1000	81	1558.31	3.25	74.85	0	-1.59	0	0	5.7	2.04
INV8	662222	4926990	2	0	2000	77.3	1558.31	3.25	74.85	0	-1.69	0	0	15.06	-10.93
INV8	662222	4926990	2	0	4000	74.3	1558.31	3.25	74.85	0	-1.69	0	0	51.07	-49.93
INV8	662222	4926990	2	0	8000	77.1	1558.31	3.25	74.85	0	-1.69	0	0	182.14	-178.2

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
INV7	662182	4927100	2	0	32	-39.4	1634.98	3.25	75.27	0	-5.64	0	0	0.05	-109.08
INV7	662182	4927100	2	0	63	60.2	1634.98	3.25	75.27	0	-5.64	0	0	0.2	-9.63
INV7	662182	4927100	2	0	125	76.5	1634.98	3.25	75.27	0	4.49	0	0	0.67	-3.93
INV7	662182	4927100	2	0	250	76.2	1634.98	3.25	75.27	0	3.48	0	0	1.71	-4.26
INV7	662182	4927100	2	0	500	80.8	1634.98	3.25	75.27	0	-0.14	0	0	3.15	2.51
INV7	662182	4927100	2	0	1000	81	1634.98	3.25	75.27	0	-1.6	0	0	5.98	1.35
INV7	662182	4927100	2	0	2000	77.3	1634.98	3.25	75.27	0	-1.69	0	0	15.8	-12.08
INV7	662182	4927100	2	0	4000	74.3	1634.98	3.25	75.27	0	-1.69	0	0	53.58	-52.86
INV7	662182	4927100	2	0	8000	77.1	1634.98	3.25	75.27	0	-1.69	0	0	191.1	-187.58

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
INV6	662144	4927210	2	0	32	-39.4	1717.05	3.25	75.7	0	-5.66	0	0	0.05	-109.49
INV6	662144	4927210	2	0	63	60.2	1717.05	3.25	75.7	0	-5.66	0	0	0.21	-10.05
INV6	662144	4927210	2	0	125	76.5	1717.05	3.25	75.7	0	4.48	0	0	0.71	-4.38
INV6	662144	4927210	2	0	250	76.2	1717.05	3.25	75.7	0	3.48	0	0	1.79	-4.76
INV6	662144	4927210	2	0	500	80.8	1717.05	3.25	75.7	0	-0.14	0	0	3.31	1.93
INV6	662144	4927210	2	0	1000	81	1717.05	3.25	75.7	0	-1.6	0	0	6.28	0.63
INV6	662144	4927210	2	0	2000	77.3	1717.05	3.25	75.7	0	-1.7	0	0	16.59	-13.29
INV6	662144	4927210	2	0	4000	74.3	1717.05	3.25	75.7	0	-1.7	0	0	56.27	-55.97
INV6	662144	4927210	2	0	8000	77.1	1717.05	3.25	75.7	0	-1.7	0	0	200.69	-197.59

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
TR5	661780	4926639	2	0	32	35.6	1050.23	3.25	71.43	0	-5.44	0	0	0.03	-30.42
TR5	661780	4926639	2	0	63	54.8	1050.23	3.25	71.43	0	-5.44	0	0	0.13	-11.31
TR5	661780	4926639	2	0	125	66.9	1050.23	3.25	71.43	0	4.39	0	0	0.43	-9.35
TR5	661780	4926639	2	0	250	69.4	1050.23	3.25	71.43	0	3.54	0	0	1.1	-6.66
TR5	661780	4926639	2	0	500	74.8	1050.23	3.25	71.43	0	-0.08	0	0	2.02	1.43
TR5	661780	4926639	2	0	1000	72	1050.23	3.25	71.43	0	-1.54	0	0	3.84	-1.73
TR5	661780	4926639	2	0	2000	68.2	1050.23	3.25	71.43	0	-1.63	0	0	10.15	-11.74
TR5	661780	4926639	2	0	4000	63	1050.23	3.25	71.43	0	-1.63	0	0	34.42	-41.21
TR5	661780	4926639	2	0	8000	53.9	1050.23	3.25	71.43	0	-1.63	0	0	122.75	-138.65

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
TR4	661742	4926749	2	0	32	35.6	1143.34	3.25	72.16	0	-5.49	0	0	0.04	-31.11
TR4	661742	4926749	2	0	63	54.8	1143.34	3.25	72.16	0	-5.49	0	0	0.14	-12.01
TR4	661742	4926749	2	0	125	66.9	1143.34	3.25	72.16	0	4.44	0	0	0.47	-10.18
TR4	661742	4926749	2	0	250	69.4	1143.34	3.25	72.16	0	3.53	0	0	1.19	-7.48
TR4	661742	4926749	2	0	500	74.8	1143.34	3.25	72.16	0	-0.09	0	0	2.2	0.52
TR4	661742	4926749	2	0	1000	72	1143.34	3.25	72.16	0	-1.55	0	0	4.18	-2.79
TR4	661742	4926749	2	0	2000	68.2	1143.34	3.25	72.16	0	-1.65	0	0	11.05	-13.37
TR4	661742	4926749	2	0	4000	63	1143.34	3.25	72.16	0	-1.65	0	0	37.47	-44.98
TR4	661742	4926749	2	0	8000	53.9	1143.34	3.25	72.16	0	-1.65	0	0	133.64	-150.25

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
TR3	661702	4926859	2	0	32	35.6	1239.94	3.25	72.87	0	-5.53	0	0	0.04	-31.78
TR3	661702	4926859	2	0	63	54.8	1239.94	3.25	72.87	0	-5.53	0	0	0.15	-12.69
TR3	661702	4926859	2	0	125	66.9	1239.94	3.25	72.87	0	4.47	0	0	0.51	-10.95
TR3	661702	4926859	2	0	250	69.4	1239.94	3.25	72.87	0	3.51	0	0	1.29	-8.28
TR3	661702	4926859	2	0	500	74.8	1239.94	3.25	72.87	0	-0.1	0	0	2.39	-0.36
TR3	661702	4926859	2	0	1000	72	1239.94	3.25	72.87	0	-1.56	0	0	4.54	-3.84
TR3	661702	4926859	2	0	2000	68.2	1239.94	3.25	72.87	0	-1.66	0	0	11.98	-14.99
TR3	661702	4926859	2	0	4000	63	1239.94	3.25	72.87	0	-1.66	0	0	40.63	-48.84
TR3	661702	4926859	2	0	8000	53.9	1239.94	3.25	72.87	0	-1.66	0	0	144.93	-162.24

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
TR10	662079	4926814	2	0	32	35.6	1334.38	3.25	73.51	0	-5.56	0	0	0.04	-32.39
TR10	662079	4926814	2	0	63	54.8	1334.38	3.25	73.51	0	-5.56	0	0	0.16	-13.31
TR10	662079	4926814	2	0	125	66.9	1334.38	3.25	73.51	0	4.49	0	0	0.55	-11.64
TR10	662079	4926814	2	0	250	69.4	1334.38	3.25	73.51	0	3.5	0	0	1.39	-9
TR10	662079	4926814	2	0	500	74.8	1334.38	3.25	73.51	0	-0.11	0	0	2.57	-1.17
TR10	662079	4926814	2	0	1000	72	1334.38	3.25	73.51	0	-1.57	0	0	4.88	-4.81
TR10	662079	4926814	2	0	2000	68.2	1334.38	3.25	73.51	0	-1.67	0	0	12.9	-16.53
TR10	662079	4926814	2	0	4000	63	1334.38	3.25	73.51	0	-1.67	0	0	43.73	-52.56
TR10	662079	4926814	2	0	8000	53.9	1334.38	3.25	73.51	0	-1.67	0	0	155.96	-173.9

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
TR2	661714	4926969	2	0	32	35.6	1349.91	3.25	73.61	0	-5.57	0	0	0.04	-32.48
TR2	661714	4926969	2	0	63	54.8	1349.91	3.25	73.61	0	-5.57	0	0	0.16	-13.4
TR2	661714	4926969	2	0	125	66.9	1349.91	3.25	73.61	0	4.49	0	0	0.55	-11.75
TR2	661714	4926969	2	0	250	69.4	1349.91	3.25	73.61	0	3.5	0	0	1.41	-9.12
TR2	661714	4926969	2	0	500	74.8	1349.91	3.25	73.61	0	-0.11	0	0	2.6	-1.3
TR2	661714	4926969	2	0	1000	72	1349.91	3.25	73.61	0	-1.57	0	0	4.94	-4.97
TR2	661714	4926969	2	0	2000	68.2	1349.91	3.25	73.61	0	-1.67	0	0	13.05	-16.78
TR2	661714	4926969	2	0	4000	63	1349.91	3.25	73.61	0	-1.67	0	0	44.24	-53.17
TR2	661714	4926969	2	0	8000	53.9	1349.91	3.25	73.61	0	-1.67	0	0	157.78	-175.82

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
TR1	661777	4927079	2	0	32	35.6	1471.3	3.25	74.35	0	-5.6	0	0	0.05	-33.2
TR1	661777	4927079	2	0	63	54.8	1471.3	3.25	74.35	0	-5.6	0	0	0.18	-14.13
TR1	661777	4927079	2	0	125	66.9	1471.3	3.25	74.35	0	4.49	0	0	0.6	-12.55
TR1	661777	4927079	2	0	250	69.4	1471.3	3.25	74.35	0	3.49	0	0	1.54	-9.98
TR1	661777	4927079	2	0	500	74.8	1471.3	3.25	74.35	0	-0.12	0	0	2.84	-2.27
TR1	661777	4927079	2	0	1000	72	1471.3	3.25	74.35	0	-1.59	0	0	5.38	-6.15
TR1	661777	4927079	2	0	2000	68.2	1471.3	3.25	74.35	0	-1.68	0	0	14.22	-18.69
TR1	661777	4927079	2	0	4000	63	1471.3	3.25	74.35	0	-1.68	0	0	48.21	-57.89
TR1	661777	4927079	2	0	8000	53.9	1471.3	3.25	74.35	0	-1.68	0	0	171.97	-190.74

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
TR9	662257	4926880	2	0	32	35.6	1484.1	3.25	74.43	0	-5.61	0	0	0.05	-33.27
TR9	662257	4926880	2	0	63	54.8	1484.1	3.25	74.43	0	-5.61	0	0	0.18	-14.2
TR9	662257	4926880	2	0	125	66.9	1484.1	3.25	74.43	0	4.49	0	0	0.61	-12.63
TR9	662257	4926880	2	0	250	69.4	1484.1	3.25	74.43	0	3.49	0	0	1.55	-10.07
TR9	662257	4926880	2	0	500	74.8	1484.1	3.25	74.43	0	-0.12	0	0	2.86	-2.37
TR9	662257	4926880	2	0	1000	72	1484.1	3.25	74.43	0	-1.59	0	0	5.43	-6.27
TR9	662257	4926880	2	0	2000	68.2	1484.1	3.25	74.43	0	-1.68	0	0	14.34	-18.89
TR9	662257	4926880	2	0	4000	63	1484.1	3.25	74.43	0	-1.68	0	0	48.63	-58.38
TR9	662257	4926880	2	0	8000	53.9	1484.1	3.25	74.43	0	-1.68	0	0	173.46	-192.31

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
TR8	662218	4926990	2	0	32	35.6	1556.27	3.25	74.84	0	-5.62	0	0	0.05	-33.67
TR8	662218	4926990	2	0	63	54.8	1556.27	3.25	74.84	0	-5.62	0	0	0.19	-14.61
TR8	662218	4926990	2	0	125	66.9	1556.27	3.25	74.84	0	4.49	0	0	0.64	-13.07
TR8	662218	4926990	2	0	250	69.4	1556.27	3.25	74.84	0	3.49	0	0	1.62	-10.55
TR8	662218	4926990	2	0	500	74.8	1556.27	3.25	74.84	0	-0.13	0	0	3	-2.91
TR8	662218	4926990	2	0	1000	72	1556.27	3.25	74.84	0	-1.59	0	0	5.69	-6.94
TR8	662218	4926990	2	0	2000	68.2	1556.27	3.25	74.84	0	-1.69	0	0	15.04	-19.99
TR8	662218	4926990	2	0	4000	63	1556.27	3.25	74.84	0	-1.69	0	0	51	-61.15
TR8	662218	4926990	2	0	8000	53.9	1556.27	3.25	74.84	0	-1.69	0	0	181.9	-201.15

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
TR7	662179	4927100	2	0	32	35.6	1633.6	3.25	75.26	0	-5.64	0	0	0.05	-34.07
TR7	662179	4927100	2	0	63	54.8	1633.6	3.25	75.26	0	-5.64	0	0	0.2	-15.02
TR7	662179	4927100	2	0	125	66.9	1633.6	3.25	75.26	0	4.49	0	0	0.67	-13.52
TR7	662179	4927100	2	0	250	69.4	1633.6	3.25	75.26	0	3.48	0	0	1.7	-11.05
TR7	662179	4927100	2	0	500	74.8	1633.6	3.25	75.26	0	-0.14	0	0	3.15	-3.48
TR7	662179	4927100	2	0	1000	72	1633.6	3.25	75.26	0	-1.6	0	0	5.98	-7.64
TR7	662179	4927100	2	0	2000	68.2	1633.6	3.25	75.26	0	-1.69	0	0	15.79	-21.16
TR7	662179	4927100	2	0	4000	63	1633.6	3.25	75.26	0	-1.69	0	0	53.53	-64.1
TR7	662179	4927100	2	0	8000	53.9	1633.6	3.25	75.26	0	-1.69	0	0	190.94	-210.61

ID	X	Y	Z	ReflOrd	Freq	LxN	Dist.	hm	Adiv	K0b	Agr	Abar	z	Aatm	LtotN
TR6	662139	4927210	2	0	32	35.6	1714.97	3.25	75.69	0	-5.66	0	0	0.05	-34.48
TR6	662139	4927210	2	0	63	54.8	1714.97	3.25	75.69	0	-5.66	0	0	0.21	-15.43
TR6	662139	4927210	2	0	125	66.9	1714.97	3.25	75.69	0	4.48	0	0	0.7	-13.97
TR6	662139	4927210	2	0	250	69.4	1714.97	3.25	75.69	0	3.48	0	0	1.79	-11.55
TR6	662139	4927210	2	0	500	74.8	1714.97	3.25	75.69	0	-0.14	0	0	3.31	-4.05
TR6	662139	4927210	2	0	1000	72	1714.97	3.25	75.69	0	-1.6	0	0	6.27	-8.36
TR6	662139	4927210	2	0	2000	68.2	1714.97	3.25	75.69	0	-1.7	0	0	16.57	-22.36
TR6	662139	4927210	2	0	4000	63	1714.97	3.25	75.69	0	-1.7	0	0	56.2	-67.19
TR6	662139	4927210	2	0	8000	53.9	1714.97	3.25	75.69	0	-1.7	0	0	200.45	-220.54

Limit. Value D/N:	40
Level D/N:	39.5826

APPENDIX H POINT OF RECEPTION NOISE IMPACT TABLE

Source ID	Point of Reception 3		Point of Reception 7	
	Distance to PoR 3 [m]	Sound Level at PoR 3 [dBA] [1]	Distance to PoR 7 [m]	Sound Level at PoR 7 [dBA] [1]
Inv1	1222	19.9	586	27.1
Inv2	1116	20.9	480	28.9
Inv3	1084	21.2	458	29.3
Inv4	963	17.3	343	25.6
Inv5	935	17.5	337	25.8
Inv6	809	18.8	299	26.7
Inv7	674	25.8	244	34.8
Inv8	582	21.5	309	26.4
Inv9	593	21.3	358	25.3
Inv10	773	24.5	474	29.0
Inv11	1358	18.9	718	25.2
T1	1226	3.5	590	11.4
T2	1121	4.5	485	13.4
T3	1089	4.8	462	13.9
T4	967	6.1	347	16.7
T5	940	6.5	340	16.9
T6	813	8.1	299	18.1
T7	678	10.0	243	20.0
T8	586	11.5	306	17.9
T9	596	11.3	355	16.5
T10	776	8.6	472	13.7
T11	1363	2.2	723	9.3
T12	620	22.4	518	24.3
San_INV1	2112	2.9	1472	7.4
San_INV2	1990	3.6	1351	8.5
San_INV3	1880	4.4	1240	9.5
San_INV4	1785	5.0	1144	10.4
San_INV5	1692	5.7	1051	11.4
San_INV6	2354	1.4	1717	5.5
San_INV7	2268	1.9	1635	6.1
San_INV8	2186	2.4	1558	6.7
San_INV9	2107	2.9	1486	7.3
San_INV10	1967	3.8	1336	8.6
San_TR1	2112	-4.2	1471	0.2
San_TR2	1989	-3.5	1350	1.2
San_TR3	1880	-2.8	1240	2.2
San_TR4	1784	-2.1	1143	3.1
San_TR5	1691	-1.5	1050	4.0
San_TR6	2352	-5.6	1715	-1.7
San_TR7	2267	-5.2	1634	-1.1
San_TR8	2185	-4.7	1556	-0.5

San_TR9	2105	-4.2	1484	0.1
San_TR10	1966	-3.3	1334	1.3
San_TRS	2085	7.9	1450	12.4
TOTAL		**32.6**		**39.6**

1. 5 dBA tonal penalty included

APPENDIX G TECHNICAL SPECIFICATIONS OF COMPONENTS

CanadianSolar

CS6P

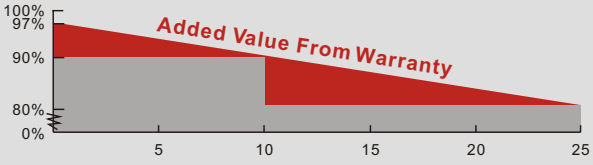
230/235/240/245/250P

On-grid Module

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

- Top ranked PVUSA (PTC) rating in California for higher energy production
- Industry first comprehensive warranty insurance by AM Best rated leading insurance companies in the world
- Industry leading plus only power tolerance: 0 ~ +5W
- Strong framed module, passing mechanical load test of 5400Pa to withstand heavier snow load
- The 1st manufacturer in the PV industry certified for ISO:TS16949 (The automotive quality management system) in module production since 2003
- ISO17025 qualified manufacturer owned testing lab, fully complying to IEC, TUV, UL testing standards
- **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

Applications

- On-grid residential roof-tops
- On-grid commercial/industrial roof-tops
- Solar power stations
- Other on-grid applications

Quality Certificates

- IEC 61215, IEC 61730, UL1703, CEC Listed, CE and MCS
- ISO9001: 2008: Standards for quality management systems
- ISO/TS16949:2009: The automotive quality management system

Environmental Certificates

- ISO14001:2004: Standards for Environmental management systems
- QC080000 HSPM: The Certification for Hazardous Substances Regulations

www.canadiansolar.com

CS6P-230/235/240/245/250P

Electrical Data

STC	CS6P-230P	CS6P-235P	CS6P-240P	CS6P-245P	CS6P-250P
Nominal Maximum Power (Pmax)	230W	235W	240W	245W	250W
Optimum Operating Voltage (Vmp)	29.6V	29.8V	29.9V	30.0V	30.1V
Optimum Operating Current (Imp)	7.78A	7.90A	8.03A	8.17A	8.30A
Open Circuit Voltage (Voc)	36.8V	36.9V	37.0V	37.1V	37.2V
Short Circuit Current (Isc)	8.34A	8.46A	8.59A	8.74A	8.87A
Module Efficiency	14.30%	14.61%	14.92%	15.23%	15.54%
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/m^2, spectrum AM 1.5 and cell temperature of 25℃

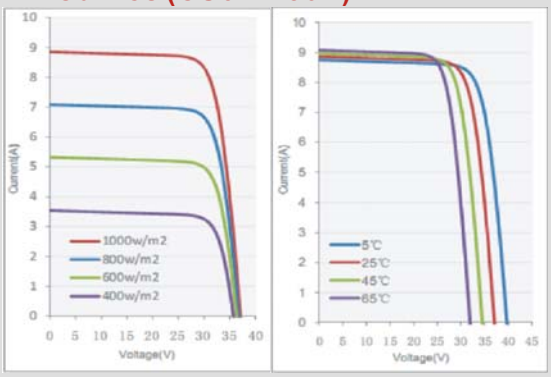
NOCT	CS6P-230P	CS6P-235P	CS6P-240P	CS6P-245P	CS6P-250P
Nominal Maximum Power (Pmax)	167W	170W	174W	178W	181W
Optimum Operating Voltage (Vmp)	27.0V	27.2V	27.3V	27.4V	27.5V
Optimum Operating Current (Imp)	6.18A	6.27A	6.38A	6.49A	6.60A
Open Circuit Voltage (Voc)	33.8V	33.9V	34.0V	34.1V	34.2V
Short Circuit Current (Isc)	6.76A	6.86A	6.96A	7.08A	7.19A

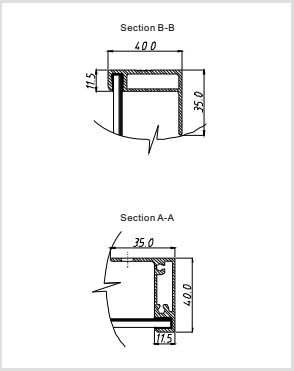
Under Normal Operating Cell Temperature, Irradiance of 800 W/m^2, spectrum AM 1.5, ambient temperature 20℃, wind speed 1 m/s

Mechanical Data

Cell Type	Poly-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	20kg (44.1 lbs)
Front Cover	3.2mm Tempered glass
Frame Material	Anodized aluminium alloy
J-BOX	IP65, 3 diodes
Cable	4mm^2(IEC)/12AWG(UL), 1100mm
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-250P)





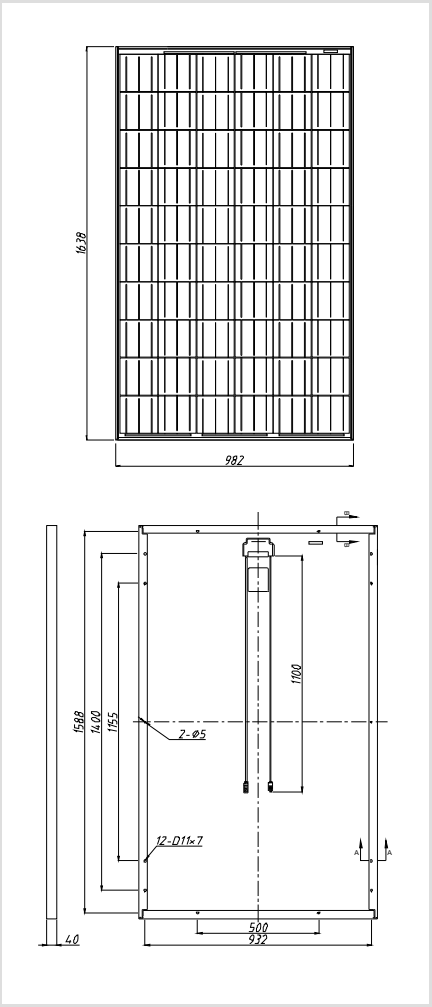
Temperature Characteristics

Temperature Coefficient	Pmax	-0.43%/℃
	Voc	-0.34 %/℃
	Isc	0.065 %/℃
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/m^2 to 200w/m^2 (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 already expanded its module manufacturing capacity to 2.05GW and cell manufacturing capacity to 1.3GW in 2011.

Headquarters | 650 Riverbend Drive, Suite B
Kitchener, Ontario | Canada N2K 3S2
Tel: +1-519-954-2057
Fax: +1-519-578-2097
inquire.ca@canadiansolar.com
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SUNNY CENTRAL 500HE-US

High Yields
- 98% CEC efficiency
- Suitable for ambient temperatures of up to 60 °C (140 °F)
- OptiCool™ intelligent temperature management

Low System Costs
- Outdoor-rated enclosure
- Couples to medium-voltage external transformer
- Available as integrated solution

Strong Peripherals
- Optional DC & AC disconnects
- Optional combiner boxes with string monitoring
- Sunny WebBox, Modbus® & OPC compatible

UL Certified
- UL 1741 / IEEE-1547 compliant

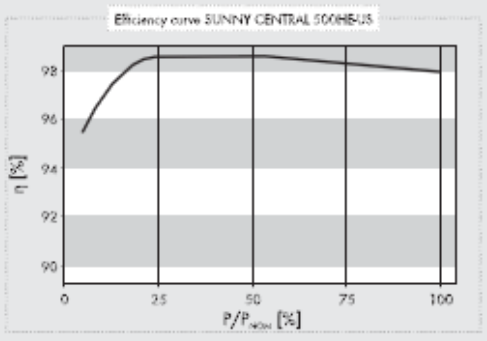
SUNNY CENTRAL 500HE-US

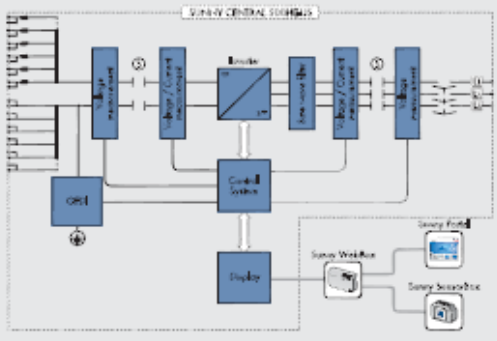
The ideal solution for large-scale North American solar power plants

The Sunny Central 500HE-US couples to an external medium-voltage transformer to accommodate long distance power feeds to distribution substations and delivers the highest efficiency available for large PV inverters. An updated user interface features a large LCD that provides a graphical view of the daily plant production as well as the status of the inverter and the utility grid. Flexible plant monitoring is available through various communications solutions such as Ethernet, Modbus, RS485 and OPC. Designed for easy installation, operation and performance monitoring, the UL-certified Sunny Central 500HE-US is the ideal choice for large-scale PV projects.

Technical data	Sunny Central 500HE-US
Input data	
Max. DC power	565 kWp [1]
MPP voltage range	330 V – 600 V
Max. DC voltage	600 V
Feed starting at [U] / [P]	380 V / 5000 W
Max. DC current	1600 A
Number of DC inputs	6 – 9
Output data	
Nominal AC power	500 kVA @ 45 °C (113 °F)
Max. AC current	1470 A @ 200 V
AC grid frequency	60 Hz
AC voltage range	180 V – 220 V
AC voltage range, full active power	196 V – 210 V
Power factor (cos φ)	> 0.99
Max. THD	< 5%
Efficiency [2]	
Max. efficiency	98.6%
CEC efficiency	98.0%
Euro-eta	97.9%
Ambient conditions	
Operating temperature range	–25 °C ... +60 °C (–13 °F ... +140 °F)
Max. temperature for nominal conditions	+45 °C (+113 °F)
Protection rating	NEMA 3R
Installation indoors / outdoors	●/●
Rel. humidity	15% ... 95%
Fresh air consumption	3000 m³/h
Internal consumption at nominal power	< 1600 W
Standby consumption (P_{night})	< 110 W
Dimensions and weight	
Height	2277 mm (90 in)
Width	2562 mm (101 in)
Depth	956 mm (38 in)
Weight	< 1800 kg (3970 lb)
Certificates / listings	
Certificates	UL 1741, UL 1998, IEEE 1547
EMC conformity	FCC, Part 15, Class A
Interfaces	
RS485 / Ethernet / analog	o/o/o
Display: text line / graphic	–/●
Communication protocols	Modbus / TCP
SSM-US connection	RS485
Plant monitoring	Sunny Portal
● Standard features o Optional features – Not available	
Type designation	SC 500HE-US

1) Specifications apply to irradiation values below STC
2) Measured without an internal power supply at U_{DC} = 330 V





5.3 Soundpower at third-octave band frequency

Terz-frequency [kHz]	Soundpower-level L_{pA} [dB_A]500kW
0,05	62,50
0,063	60,20
0,08	63,90
0,1	64,60
0,125	61,20
0,16	64,90
0,2	65,00
0,25	68,90
0,315	75,20
0,4	74,60
0,5	68,20
0,63	69,20
0,8	67,30
1	61,10
1,25	67,70
1,6	60,00
2	59,80
2,5	54,20
3,15	52,10
4,0	47,00
5,0	44,30
6,3	58,60

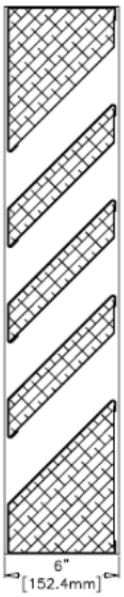
NOISE CONTROL MEASURES

GREENHECK AFJ-601

Acoustical Louver
J Blade

Application and Design

AFJ-601 is an acoustical weather louver designed to protect air intake and exhaust openings in building exterior walls. Design incorporates J style insulated acoustical blades and high free area to provide maximum resistance to sound transmission, rain and weather while providing minimum resistance to airflow. The AFJ-601 is an extremely efficient louver with **AMCA LICENSED PERFORMANCE DATA** enabling designers to select and apply with confidence.



Standard Construction

Frame . . . . . Heavy gauge formed aluminum, 6 in. x 0.080 in. nominal wall thickness

Blades . . . . . J style, heavy gauge formed aluminum, 0.080 in. nominal wall thickness, positioned at 45° on approximately 5 in. centers

Construction . . . Mechanically fastened

Acoustical Insulation . . . . . Fiberglass Insulation

Birdscreen. . . . . 3/4 in. x 0.051 flattened expanded aluminum in removable frame, inside mount (rear)

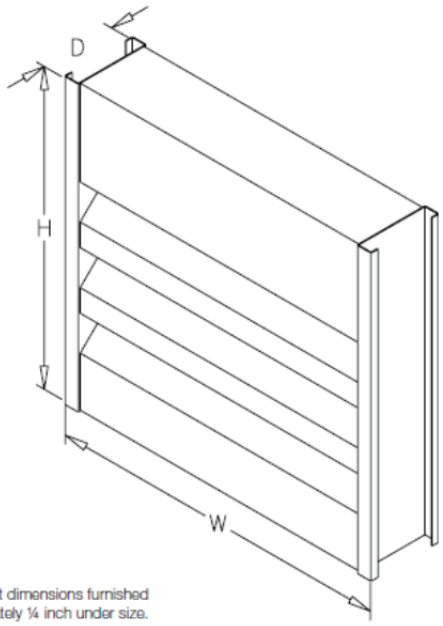
Finish. . . . . Mill

Minimum Size . . 12 in. W x 15 in. H

Maximum Single Section Size . . . 60 in. W x 120 in. H

Options *(at additional cost)*

- A variety of bird and insect screens
- Blank off panels
- Clip angles
- Extended sill
- Filter racks
- Flanged frame
- Galvanized steel frame and blade
- Security bars
- Welded construction
- A variety of architectural finishes including:
  - Clear anodize
  - Integral color anodize
  - Baked enamel paint
  - Kynar paint



*Width and height dimensions furnished approximately ¼ inch under size.

PERFORMANCE DATA

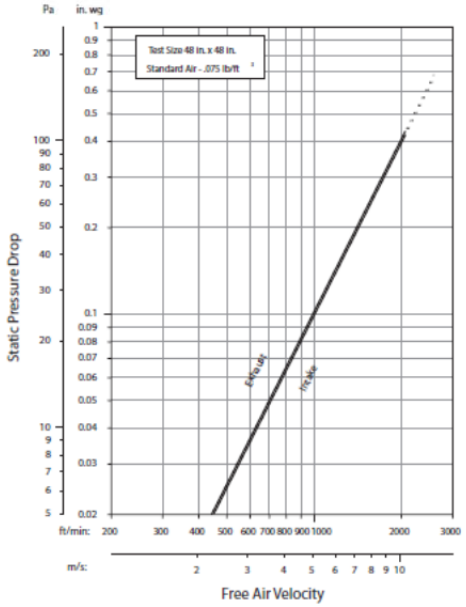
AFJ-601

J Blade Acoustical Louver
Formed Aluminum

Free Area Chart (Sq. ft.)

Louver Height Inches	Louver Width Inches								
	12	18	24	30	36	42	**48**	54	60
15	0.12	0.21	0.29	0.37	0.45	0.53	0.61	0.69	0.77
18	0.25	0.41	0.57	0.74	0.90	1.06	1.22	1.38	1.55
24	0.37	0.62	0.86	1.10	1.35	1.59	1.83	2.08	2.32
30	0.50	0.82	1.15	1.47	1.80	2.12	2.44	2.77	3.09
36	0.62	1.03	1.43	1.84	2.24	2.65	3.05	3.46	3.86
42	0.75	1.24	1.72	2.21	2.69	3.18	3.67	4.15	4.64
48	1.00	1.65	2.30	2.94	3.59	4.24	**4.89**	5.54	6.18
54	1.12	1.85	2.58	3.31	4.04	4.77	5.50	6.23	6.96
60	1.25	2.06	2.87	3.68	4.49	5.30	6.11	6.92	7.73
66	1.37	2.26	3.16	4.05	4.94	5.83	6.72	7.61	8.50
72	1.50	2.47	3.44	4.41	5.39	6.36	7.33	8.30	9.27
78	1.75	2.88	4.02	5.15	6.28	7.42	8.55	9.69	10.82
84	1.87	3.09	4.30	5.52	6.73	7.95	9.16	10.38	11.59
90	2.00	3.29	4.59	5.89	7.18	8.48	9.77	11.07	12.37
96	2.12	3.50	4.88	6.25	7.63	9.01	10.38	11.76	13.14
102	2.25	3.71	5.16	6.62	8.08	9.54	11.00	12.45	13.91
108	2.50	4.12	5.74	7.36	8.98	10.60	12.22	13.84	15.46
114	2.62	4.32	6.02	7.73	9.43	11.13	12.83	14.53	16.23
120	2.75	4.53	6.31	8.09	9.88	11.66	13.44	15.22	17.00

Airflow Resistance (Standard Air - .075 lb/ft³)



Model AFJ-601 resistance to airflow (pressure drop) varies depending on louver application (air intake or air exhaust). Free area velocities (shown) are higher than average velocity through the overall louver size. See louver selection information.

Greenheck Fan Corporation certifies that the AFJ-601 louvers shown herein are licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 511 and comply with the requirements of the AMCA Certified Ratings Program. The AMCA Certified Ratings Seal applies to water penetration, air performance and sound ratings.

Sound Transmission Class

The Sound Transmission Class (STC) is a rating of the effectiveness of an assembly in isolating or reducing airborne sound transmission. STC is a single number that summarizes airborne sound transmission loss data. Assemblies with higher STC ratings are more efficient at reducing sound transmission. STC is determined in accordance with ASTM E413-04.

Transmission Loss

Transmission loss (TL) is a measurement of the reduction of sound power transmission (dB) through an assembly at a given frequency. The more sound power that is reduced, the greater the TL. TL is tested in accordance with ASTM E90-04.

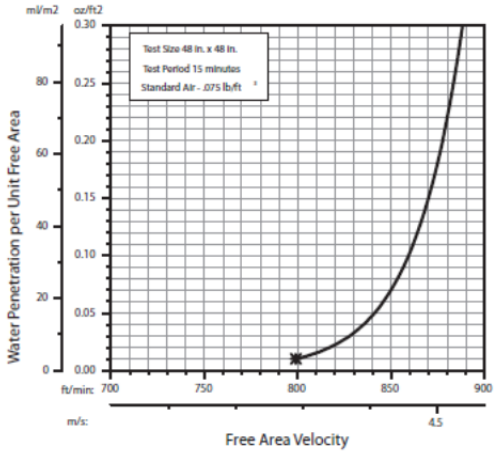
Free Field Noise Reduction in Decibels

Free Field Noise Reduction is determined by adding 6 dB to the Transmission Loss.

Octave Band	2	3	4	5	6	7	STC
Frequency (Hz)	125	250	500	1000	2000	4000	
Transmission Loss (dB)	4	4	6	10	17	12	10
Free Field Noise Reduction (dB)	10	10	12	16	23	18	

Water Penetration (Standard Air - .075 lb/ft³)

Test size 48 in. x 48 in. Test duration of 15 min.



The AMCA Water Penetration Test provides a method for comparing various louver models and designs as to their efficiency in resisting the penetration of rainfall under specific laboratory test conditions. The beginning point of water penetration is defined as that velocity where the water penetration curve projects through .01 oz. of water (penetration) per sq. ft. of louver free area. ***The beginning point of water penetration for Model AFJ-601 is 799 fpm free area velocity.** These performance ratings do not guarantee a louver to be weatherproof or stormproof and should be used in combination with other factors including good engineering judgement in selecting louvers.