



Axio Power Canada Inc./  
SunEdison Canada

Natural Heritage Assessment  
Environmental Impact Study Report

For

Norfolk Bloomsburg TS  
Solar Energy Project

H335467  
Rev. 0  
November 25, 2011

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Project Report

November 25, 2011

## **Axio Power Canada Inc./SunEdison Canada Norfolk Bloomsburg TS - Solar Energy Project**

### **Natural Heritage Assessment Environmental Impact Study Report**

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## 1. Introduction

As part of Ontario's Green Energy Plan, Axio Power Canada Inc./SunEdison Canada ("Axio/SunEdison") is proposing to develop a 10 megawatt (MW) solar photovoltaic project within the single tier municipality of Norfolk County, Ontario. The proposed Project Location<sup>1</sup> will be situated on 29 hectares of land located approximately 4 km northwest of Simcoe on Part of Lots 3 and 4, Concession 12, and within the St. Thomas Ecodistrict 7E-2.

As stated in Sections 37 and 38 of Ontario Regulation (O. Reg.) 359/09 *Renewable Energy Approvals Under Part V.0.1 of the Act*, (herein referred to as the "REA Regulation"), an environmental impact study is required for all significant natural features determined to be within a specified setback in order to obtain a Renewable Energy Approval (REA). The *Natural Heritage Assessment Environmental Impact Study Report* identifies the potential negative environmental effects, documents the proposed mitigation measures, and describes the environmental effects monitoring plan for the natural features.

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

## 2. Renewable Energy Approval Legislative Requirements

As per Section 4 of the REA Regulation, ground-mounted solar facilities with a nameplate capacity greater than 10 kilowatts (kW) are classified as Class 3 solar facilities and do require an REA.

The REA process requires the preparation of several reports with respect to natural features on and adjacent to (i.e. 120 m) the Project Location, including the *Natural Heritage Assessment Records Review Report*, *Natural Heritage Site Investigation Report*, *Natural Heritage Assessment Evaluation of Significance Report* and if necessary a *Natural Heritage Environmental Impact Study Report*. The legislative requirements for these reports are summarized in the following sections.

### 2.1 Natural Heritage Assessment Records Review Report

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 is:

1. in a natural feature
2. within 50 m of an area of natural and scientific interest (ANSI) (earth science)
3. within 120 m of a natural feature that is not an ANSI (earth science).

Natural features are defined under Subsection 1(1) of the REA Regulation to be all or part of:

- a) an 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 25 (3) 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). The *Natural Heritage Assessment Records Review Report* (Hatch Ltd., 2011a) was prepared to meet these requirements.

### 2.2 Natural Heritage Assessment Site Investigation Report

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:

- whether the results of the analysis summarized in the *Natural Heritage Assessment Records Review Report* prepared under Subsection 25 (3) are correct or require correction, and identifying any required corrections

- whether any additional natural features exist, other than those that were identified in the natural heritage records review report
- the boundaries of any natural feature that was identified in the *Natural Heritage Assessment Records Review Report* or the site investigation within 120 m of the Project Location, and
- the distance from the Project Location to the boundaries determined under clause (c).

The *Natural Heritage Assessment Site Investigation Report* (Hatch Ltd., 2011b) was prepared to meet these requirements.

### 2.3 Natural Heritage Assessment Evaluation of Significance Report

Section 27 (1) of the REA Regulation requires proponents of Class 3 solar projects to prepare an *Natural Heritage Assessment Evaluation of Significance Report* for natural features identified during the records review and site investigation that sets out:

- a determination of whether the natural feature is:
  - ◆ provincially significant or not provincially significant (wetlands)
  - ◆ significant or not significant (all other natural features)
- a summary of the evaluation criteria or procedures used to make the determinations
- the name and qualifications of any person who applied the evaluation criteria or procedures.

The *Natural Heritage Assessment Evaluation of Significance Report* (Hatch Ltd., 2011c) for the natural features identified within 120 m of the Project Location was prepared to meet these requirements.

### 2.4 Natural Heritage Assessment Environmental Impact Study Report

Section 38 (1) of the REA Regulation prohibits the construction, installation or expansion of any component of a solar Project within the following locations:

- a provincially significant northern wetland or within 120 m of a provincially significant northern wetland
- within 120 m of a provincially significant southern wetland
- within 120 m of a provincially significant coastal wetland
- a provincially significant ANSI (earth science) or within 50 m of a provincially significant ANSI (earth science)
- a provincially significant ANSI (life science) or within 120 m of a provincially significant ANSI (life science)
- a significant valleyland or within 120 m of a significant valleyland
- a significant woodland or within 120 m of a significant woodland
- a significant wildlife habitat or within 120 m of a significant wildlife habitat

- within 120 m of a provincial park
- within 120 m of a conservation reserve.

However, Section 38 (2) allows proponents to construct within the locations noted above, subject to the completion of an environmental impact study to assess negative effects and evaluate appropriate mitigation and monitoring measures.

Section 38 (2) of the REA Regulation indicate that the environmental impact study report must:

- identify and assess any negative environmental effects of the project on a natural feature, provincial park or conservation reserve referred to in Section 38 (1)
- identify mitigation measures in respect of any negative environmental effects
- describe how the environmental effects monitoring plan in the design and operations report (Hatch Ltd., 2011d) addresses any negative environmental effects
- describe how the construction plan report (Hatch Ltd., 2011e) addresses any negative environmental effects.

This *Natural Heritage Assessment Environmental Impact Study Report* has been prepared to address these requirements for the construction of Project components within 120 m of natural features identified in Subsection 1(1) of the REA Regulation.

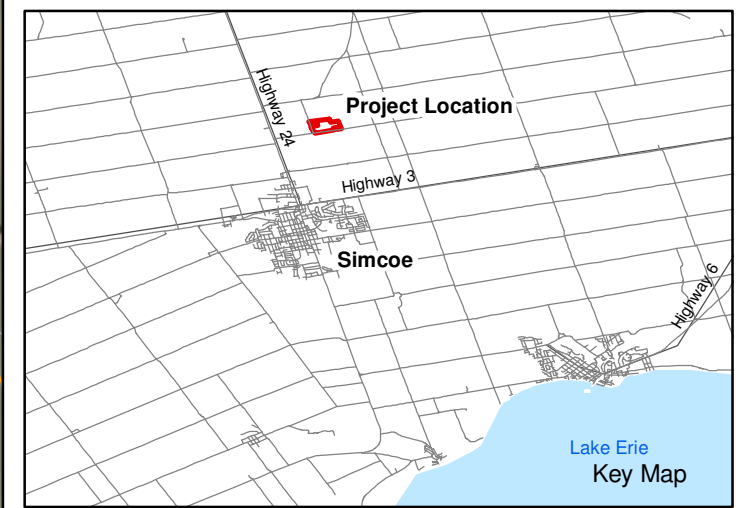
The following steps outline the methodology that was used to prepare this *Natural Heritage Assessment Environmental Impact Study Report*:

1. Documentation of Project components and activities during all Project phases including construction, operations and decommissioning as well as the identification of temporal and spatial boundaries.
2. Background data collection on the natural features within 120 m of the Project Location through the records review and site investigation processes.
3. Identification of the potential impacts on the environmental components that may occur as a result of implementing the Project.
4. Proposed mitigation measures to avoid or minimize potential negative impacts on the natural features.
5. Design of an environmental effects monitoring program to confirm the predicted effects and the effectiveness of mitigation measures.

### 3. General Description of Project Components and Activities

The following sections briefly describe the construction, operation and decommissioning phases of the Project. More detailed information on the Project phases can be found in the *Construction Plan Report* (Hatch Ltd., 2011e), *Design and Operations Report* (Hatch Ltd., 2011d) and *Decommissioning Plan Report* (Hatch Ltd., 2011f).

The proposed site layout including solar panels, layout area, access roads, substation, and electrical connection point occupies approximately 29 ha of the Project Location (Appendix A). The facility will be constructed on lands identified in the *Natural Heritage Assessment Site Investigation Report* (Hatch Ltd., 2011b) as agricultural lands (Figure 3.1). New facilities and utility infrastructure improvements for the proposed Project will be located in previously disturbed, cultivated areas of the site. No undeveloped land will be affected by the proposed Project.



**LEGEND**

- R Residence
- Road
- Topographic Contour (5 m interval)
- Parcel
- Project Location
- 120 m from Project Location
- Project Site

**Significant Woodland**

- Woodland

**Significant Wildlife Habitat**

**Rare Vegetation Communities**

- Tallgrass Prairie

**Specialized Habitats for Wildlife**

- Area-sensitive Grassland Bird Species
  - Eastern Meadowlark, Grasshopper Sparrow, Northern Harrier, Savannah Sparrow, Short-eared Owl, Upland Sandpiper

**Habitats of Species of Conservation Concern**

- Grassland Bird Species of Conservation Concern
  - American Kestrel, Eastern Kingbird, Eastern Meadowlark, Grasshopper Sparrow, Northern Harrier, Savannah Sparrow, Short-eared Owl, Upland Sandpiper
- Forest Bird Species of Conservation Concern
  - Red-headed Woodpecker

**ELC Codes**

- AG - Agricultural Field
- FOD5-7 - Dry - Fresh Sugar Maple - Black Cherry Deciduous Forest
- TP01-1 - Dry Tallgrass Prairie

**Notes:**

1. OBM and NRVIS data downloaded from LIO, with permission.
2. Spatial Referencing UTM NAD 83, August 2010
3. Satellite imagery from Google Earth Pro, April 2009.

0 50 100 200 Metres NORTH  
Scale 1:5,000

Figure 3.1  
Axio Power Canada Inc./SunEdison Canada  
**Norfolk Bloomsburg TS**  
**Natural Heritage Features**

### 3.1 Construction

Construction is anticipated to occur over an approximately six month period. The activities associated with construction as described in the *Norfolk Bloomsburg TS Solar Energy Project Construction Plan Report* (Hatch Ltd., 2011e) are summarized in Table 3.1.

**Table 3.1 General Description of Construction Activities for the Norfolk Bloomsburg TS Solar Energy Project.**

Activity	Description
Temporary Power Installation	A temporary connection to the existing electrical system will be constructed to supply power for construction activities.
Survey and Stake Facility	The site will be surveyed and staked to delineate the outline of excavations, roads and foundation locations.
Laydown Area Preparation and Setup	<p>Part of the Project Location area will be graded and fenced for security and used as a construction staging area which will include construction offices, a first aid station, worker parking, truck loading and unloading facilities, and waste disposal/pick-up area. Construction of the construction laydown/long-term parking area (~ 30 m by 50 m) will include:</p> <ul style="list-style-type: none"> <li>• clear and grub laydown area</li> <li>• strip and remove all topsoil</li> <li>• shape and proof-roll subgrade</li> <li>• shape ditches and swales</li> <li>• place, shape and compact granular sub-base and base materials</li> <li>• revegetate ditches and swales.</li> </ul>
Access Road Construction	<p>The construction of a new 5-m wide asphalt site access road will be necessary to support construction activities and will provide access to the site during the operation phase of the Project. In addition, several gravel roads, about 3.7 m wide will be constructed to allow maintenance access to the solar arrays during operation of the Project. Activities associated with construction of internal access roads will include:</p> <ul style="list-style-type: none"> <li>• clear and grub laydown area</li> <li>• strip and remove all topsoil</li> <li>• shape and proof-roll subgrade</li> <li>• shape ditches and swales</li> <li>• place, shape and compact granular sub-base and base materials</li> <li>• revegetate ditches and swales</li> </ul>
Water Usage	In order to meet the water demand during construction, the contractor will have a temporary water storage facility and bring the water from outside sources using a tanker. The water supply demand is estimated to be less than 50,000 litres per day and therefore doesn't require additional details for a permit to take water. The water will be used for construction, sanitary and dust control purposes.

Activity	Description
Vegetation Clearing and Grading	The existing non-significant hedgerow within the southwest corner of the site will be cleared. Larger trees will be felled by chainsaw; smaller brush will be removed by a bulldozer with a brush rake. Material will be re-used on site or managed in accordance with regulatory requirements. Minor grading will be undertaken as required.
Substation Preparation	The substation area (~20 m by 20 m) will be excavated for the transformer foundation and oil containment area. The substation site will be prepared and excavated for the footings required for the termination equipment and control house foundation pad.
Array Foundation Installation	Array foundations will consist of structural footings (e.g., steel piles, screw piles, concrete piers or a foundation on bedrock) designed and installed depending on the geotechnical conditions.
Foundations for Substation, Transformer and Inverters	Foundations will be formed with plywood and reinforced with structural steel. Concrete will be poured from a ready-mix concrete truck to create foundations.
Cable Trench and Conduit Installation	Cable trench and conduits will be installed for the photovoltaic collection and aggregation system. Activities include: <ul style="list-style-type: none"> <li>• trench excavation by backhoe</li> <li>• installation of levelled layer of compacted stone on base of trench</li> <li>• installation of conduit within trench</li> <li>• installation of cables within the conduit</li> <li>• burying of conduit a minimum of 46 cm below grade.</li> </ul>
Dead End Structures	Wood pole dead end structures consisting of wood poles and associated insulators and connectors will be installed to connect the substation to the distribution line.
Control House Installation	A pre-fabricated control house (approximately 6 m by 9 m) will be installed on the foundation pad in the substation area. The staging areas will include construction offices, a first aid station, worker parking, truck loading and unloading facilities, and waste disposal/pick-up area. Temporary construction trailers and portable facilities will be used for the offices and the first aid station. Temporary toilets and washing stations will be maintained to meet the daily sanitary needs of the workforce during the construction. These staging areas will be decommissioned and removed when construction is completed.
Fencing	The site will be gated and fenced. The fence design includes a chain-link fence, about 2.4 m high, with 0.6 m high barbed wire on top of the fence.
PV Array Installation	Activities include: <ul style="list-style-type: none"> <li>• installation of outdoor transformers and inverter units on the foundation pads</li> <li>• erection of photovoltaic support structures</li> <li>• installation of photovoltaic modules in the support structures</li> <li>• installation of combiner boxes on the rear of the finished photovoltaic arrays.</li> </ul>
Substation Installation	Installation of main power transformer, switchgear cells, metering, service transformer and disconnect switches in the substation area.

Activity	Description
Commissioning	The substation equipment, inverters, collector system and photovoltaic array systems will be tested and commercial operations will commence. Activities will include testing, calibration and troubleshooting.
Site Restoration	Once major construction has been completed, the site will be reseeded/revegetated with native seed.

### 3.2 Operation

The facility will operate 365 d/yr when sufficient solar radiation exists to generate electricity. The facility will be remotely monitored with no regular on-site employees. Periodic inspections will be conducted during the operations phase with maintenance conducted as required. Operations and maintenance requirements are summarized in Table 3.2. Operationally, the lifespan of the Project will be at least 20 years, which can be extended up to 30 years or more with proper maintenance, component replacement and repowering.

**Table 3.2 General Description of Operating Activities for the Norfolk Bloomsburg TS Solar Energy Project.**

Activity	Description
Expected Commercial Operation Date	Summer/Fall 2012
On-Site Employees	No permanent on-site employees. Two-three part-time maintenance personnel.
Periodic Inspection and Maintenance	Periodic inspections will be conducted with minor maintenance undertaken as required. Activities may include vegetation control, panel washing, transformer inspection, inspection of primary system components, replacement of air filters and other minor adjustments or maintenance as needed. Maintenance activities associated with the maintaining the fence, if required, will be conducted from the Project side (i.e., within the fence).
Major Maintenance	In the event of a component failure, all major maintenance can be performed utilizing existing roads and site access.
Water Use/Cleaning of Panels	The Project operation does not require any on site facilities to supply groundwater (wells) or surface water (ponds, watercourses). Rainwater is expected to be sufficient to clean the panels. If required, water will be brought to the site by truck. Water only is used for cleaning - no cleaning solutions of any kind are used to wash the panels.
Fuel Consumption	None.
Solid Waste	None – Operation of the project will not produce waste of any type. All debris as a result of equipment repairs, facility maintenance or cleaning will be removed from the site immediately by the contracted party.
Air Emissions	None. The Project does not have any facilities (e.g. emergency back-up diesel generators) that will discharge contaminants or pollutants to the air.
Wastewater	None. The Project will not generate any wastewater or discharge any liquid effluent from its operation.

### 3.3 Decommissioning

Decommissioning would occur when the decision has been made that it is no longer economically feasible to continue operation or refurbish generating equipment. It is anticipated that decommissioning would not occur until at least 2042.

All decommissioning and site restoration activities would adhere to the requirements of appropriate regulatory authorities and would be conducted in accordance with all applicable federal, provincial and municipal permits and other requirements. The decommissioning and restoration process comprises the following activities:

- removal of above-ground structures (i.e., solar panels, upper racking, inverters, distribution line and interconnection equipment, fencing and access road materials)
- removal of below ground structures to a depth of at least 1.2 m (i.e., below ground racking/piers, transformer/inverter pads and footings)
- site grading (to remove ditches, access road, etc.) and replacement of topsoil where moved and reseed with native grass species.

## 4. Potential Negative Effects by Project Phase

The following sections (4.1 to 4.3) outline the potential negative environmental effects of the solar Project by phase of development as they generally relate to natural features, wildlife habitat and wildlife species. Specific effects to natural features identified in the *Natural Heritage Assessment Evaluation of Significance Report* are discussed in Section 5. Details of the effects of the Project on hydrology and proposed mitigation measures are found in the construction plan report (Hatch Ltd., 2011e) and the waterbodies report (Hatch Ltd., 2011g).

### 4.1 Construction Phase

If development activities such as land grading, excavations, construction of access roads, and trenching, are proposed during the breeding wildlife period (generally May through July), the areas potentially impacted will be searched by a trained biologist within 48 hours of the proposed activity in order to determine if birds are currently nesting in these areas. If an active nest of a species covered under the federal *Migratory Birds Convention Act* (MBCA) or the provincial *Fish and Wildlife Conservation Act* (FWCA) is located within a proposed work area, a mitigation plan (which may include 100 m buffer around the nest location until such time as the nest is successful or abandoned) will be developed to prevent impacts on birds or their active nests, and submitted to Environment Canada (for MBCA species) or Ontario Ministry of Natural Resources (MNR) (for FWCA species) for review prior to implementation. Use of these mitigation measures is anticipated to prevent potential effects to nesting wildlife.

The installation of the fence may trap wildlife within the Project Location. Once the fence is completed, a visual search of the Project Location will be conducted to search for any trapped wildlife species. If species are observed, they will be either directed off of the Project Location (i.e., in the case of deer) or collected by a designated employee, who has been provided with protocols for the safe handling and transport of wildlife, and transported to the nearest available location off-site and released.

In order to minimize the potential for incidental take of wildlife, speeds on access roads of the Project Location will be restricted. In addition, the construction workforce will be made aware of the potential for wildlife occurring on the Project Location and that measures should be taken to avoid wildlife wherever possible. If wildlife are observed on the Project Location, they will be either directed off of the Project Location by the worker (without the use of vehicles) or collected by a designated employee, who has been provided with protocols for the safe handling and transport of wildlife, and transported to the nearest available location off-site and released.

Some incidental take may still occur during construction; however, levels should be negligible; however, species observed on the Project Location are common to the regional area and loss of one or a few individuals will have a negligible effect on population size at the local and regional levels.

Known occurrences of incidental take will be documented in the monthly environmental report. If a species at risk is noted, work within the area will be ceased immediately, and the MNR / Environment Canada will be contacted to make them aware of the occurrence. Work in the area will remain ceased until a survey is conducted by a trained biologist to ensure that there are no species at risk present in the area.

The presence of the construction workforce and construction activities associated with the Project will also result in auditory and visual disturbance of local wildlife populations. Wildlife populations within the significant natural features may retreat from these areas as a result of the disturbance. It is expected that wildlife populations that typically occurred on the Project Location will abandon these sites throughout the duration of construction.

## 4.2 Operations Phase

Regular maintenance of the solar facility is anticipated to occur infrequently during the year. This activity would be consistent with levels of disturbance similar to agricultural operations.

Wildlife communities within the solar facility post-construction is expected to be similar to those found in nearby adjacent old field communities. The assemblage of species may differ in respect to composition and density depending on individual species ability to make use of the new habitat. It is anticipated that many bird and small mammal, and insect species will readily use the habitat found on the Project Location. Some species will likely not re-inhabit the area due to avoidance of man-made structures.

In order to minimize the potential for incidental take of wildlife, speeds on access roads of the Project Location will be restricted. Further, visual monitoring of the access roads will be completed. In addition, the construction workforce will be made aware of the potential for wildlife occurring on the Project Location and that measures should be taken to avoid wildlife wherever possible. If wildlife are observed on the Project Location, they will be either directed off of the Project Location by the worker (without the use of vehicles) or collected by a designated employee, who has been provided with protocols for the safe handling and transport of wildlife, and transported to the nearest available location off site and released.

Mowing of vegetation beneath and around the solar panels, if required, may result in incidental take. It is anticipated that ground-nesting birds will use the Project Location. Mowing will occur outside the nesting period (mid May to mid July) to minimize the incidental take. Known occurrences of incidental take will be reported, and the species impacted will be determined. If the species is determined to be a Species of Conservation Concern, work within the area will be ceased immediately, and the MNR / Environment Canada will be contacted to make them aware of the occurrence. Work in the area will remain ceased until a survey is conducted by a trained biologist to ensure that there are no further species of conservation concern present in the area.

Travel along the access roads will be infrequent and no will not impact on animal movement through the corridor is anticipated. Though fencing will be in place during the operations phase around the perimeter of the facility, there will be no fencing installed across the corridor in order to ensure animal movement is maintained.

### **4.3 Decommissioning Phase**

During the decommissioning phase, disturbances present in the area will be similar to those that may occur during the construction phase as described in Section 4.2.1. In order to minimize potential impacts to wildlife communities of the significant natural feature, decommissioning will take the same approach as the construction phase. Though there may be some avoidance of the significant natural features near the Project Location during decommissioning, these effects are temporary, and following decommissioning the site will be restored to existing conditions.

## 5. Potential Negative Effects to Significant Natural Features and Proposed Mitigation Measures

This section describes potential negative environmental effects that could occur as a result of construction, operation and decommissioning phases of the Project.

Mitigation measures are proposed to minimize, eliminate or alleviate any potential negative environmental effects. Potential negative effects are discussed by environmental component, where development of a solar facility could negatively affect the significant natural features. The relevant environmental components that may be impacted by the proposed Project include:

- **Significant Woodland**
- **Significant Wildlife Habitat** – significant wildlife habitat is found on and/or within 120 m of the Project Location for the following habitat types:
  - ◆ rare vegetation communities, namely tallgrass prairie
  - ◆ habitat for area-sensitive species, namely grassland/agriculture bird species
  - ◆ habitats of species of conservation concern, namely Red-headed Woodpecker

These significant natural features and their locations in relation to the Project Location are shown in Figure 3.1.

### 5.1 Significant Woodland

The woodland located within the 120 m setback was evaluated in the *Natural Heritage Assessment Evaluation of Significance Report* as significant as it potentially provides habitat for species of conservation concern. The habitat is too small for area sensitive species or those requiring interior forest conditions, but does provide potential nesting habitat for a species of conservation concern within the forest habitat guild (Red-headed Woodpecker).

The Project components will be situated approximately 50 m from the proximal edge of the woodland. The Project and woodland is also separated by Concession Road 13. There are minimal negative environmental impacts to the woodland as a result of the Project development. The potential impacts and recommended mitigation measures are discussed below.

#### Potential Impacts

- Potential impacts are minimal and are primarily associated with disturbance and site avoidance during site preparation, construction and decommissioning of the solar facility.
- Adjacency effects associated with the Project (primarily visual) may reduce the quality of the habitat for some avian species.
- Potential avoidance of wildlife species to this habitat type as a result of increased noise and traffic volumes during construction and decommissioning phases (and possibly operation).

### **Recommended/Implemented Mitigation Measures**

- To the extent possible activities within 120 m of the woodland will be avoided during the breeding season (generally late May through July).
- Construction will occur outside the peak hours of breeding bird singing (approximately one half hour before sunset to approximately 8:30 a.m.) during the breeding season. The impacts of noise on wildlife species is expected to be negligible, therefore there is no direct mitigation measures recommended.
- Best management practices will be followed during all phases of the Project. A noise study, conducted by Hatch Ltd. ensures that background noise from the Project will be less than 40 dB, as required by Ontario Regulation 359/09 and in accordance with Appendix A of the publication "Basic Comprehensive Certificates of Approval (Air) – User Guide, 2004" by the Ministry of the Environment (MOE, 2004). Noise resulting from construction and decommissioning activities will be not occur during the time of peak hours of breeding bird singing (approximately one half hour before sunset to approximately 8:30 a.m.). The impacts of noise on wildlife species is expected to be negligible, therefore there is no direct mitigation measures recommended.

## **5.2 Significant Wildlife Habitat**

### **5.2.1 Rare Vegetation Communities**

#### *5.2.1.1 Tallgrass Prairie*

A restored tallgrass prairie is located southwest of the Project Location on historic agricultural land. It is considered a rare vegetation community in the province. The Project Location is situated across Concession Road 13 from the tallgrass prairie and no direct impacts will occur to this habitat as a result of the Project. There are potential indirect impacts to wildlife using the prairie.

#### **Potential Impacts**

- Potential avoidance of wildlife species to this habitat type as a result of increased noise and traffic volumes during construction and decommissioning phases (and possibly operation).

#### **Recommended/Implemented Mitigation Measures**

- The breeding bird season is from May to the end of July with the peak hours of breeding bird singing occurring approximately one half hour before sunset to approximately 8:30 a.m. The impacts of noise on wildlife species is expected to be negligible, therefore there is no direct mitigation measures recommended.
- Increased traffic volumes during construction and decommissioning phases is expected to be negligible, however, restricted speed limits is recommended to minimize the potential for incidental take.

### **5.2.2 Habitat for Area-sensitive Species**

The *Natural Heritage Assessment Evaluation of Significance Report* (Hatch Ltd., 2011b) identified the restored tallgrass prairie identified above as significant habitat for these area-sensitive grassland/agriculture bird species: Eastern Meadowlark, Grasshopper Sparrow, Savannah Sparrow, Short-eared Owl, Northern Harrier and Upland Sandpiper.

### **Potential Impacts**

- The Project Location is situated approximately 50 m from the closest edge of this habitat type. A county road separates the Project from this habitat and there is also a residential dwelling in between them. Therefore the potential impacts of the Project to this habitat are negligible. Area-sensitive bird species can be susceptible to noise disturbance and there is the potential avoidance of birds to this habitat type as a result of increased noise and traffic volumes during construction and decommissioning phases (and possibly operation).

### **Recommended/Implemented Mitigation Measures**

- Best management practices will be followed during all phases of the Project. A noise study, conducted by Hatch Ltd. ensures that background noise from the Project will be less than 40 dB, as required by Ontario Regulation 359/09 and in accordance with Appendix A of the publication “Basic Comprehensive Certificates of Approval (Air) – User Guide, 2004” by the Ministry of the Environment (MOE, 2004). Noise resulting from construction and decommissioning activities will not occur during the time of peak hours of breeding bird singing (approximately one half hour before sunset to approximately 8:30 a.m.). The impacts of noise on wildlife species is expected to be negligible, therefore there is no direct mitigation measures recommended.

## **5.2.3 Habitats of Species of Conservation Concern**

### **5.2.3.1 Forest Bird Guild Habitat**

Red-headed Woodpecker habitat is found within the woodland located adjacent to (i.e. within 120 m) the Project Location. This woodland is located across Concession road 13 and southwest of the Project Location and is not expected to be directly impacted by the proposed development. There are potential indirect impacts that may have an adverse effect on the overall function and use of the habitat by the Red-headed Woodpecker during construction and decommissioning phases.

### **Potential Impacts**

- Potential avoidance of habitat by the Red-headed Woodpecker as a result of increased noise and traffic volumes during construction and decommissioning phases.

### **Recommended/Implemented Mitigation Measures**

- The impacts of noise on the Red-headed Woodpecker is expected to be negligible. A noise study, conducted by Hatch Ltd. ensures that background noise from the Project will be less than 40 dB, as required by Ontario Regulation 359/09 and in accordance with Appendix A of the publication “Basic Comprehensive Certificates of Approval (Air) – User Guide, 2004” by the Ministry of the Environment (MOE, 2004). Noise resulting from construction and decommissioning activities will not occur during the time of peak hours of breeding bird singing (approximately one half hour before sunset to approximately 8:30 a.m.). The impacts of noise on wildlife species is expected to be negligible, therefore there is no direct mitigation measures recommended.

### **5.2.3.2 Grassland Bird Guild Habitat**

The following bird species belong to the grassland bird guild and may occur at the Project Location: American Kestrel, Eastern Kingbird, Eastern Meadowlark, Grasshopper Sparrow, Savannah Sparrow, Short-eared Owl, Northern Harrier and Upland Sandpiper.

The Project Location is situated approximately 50 m from the closest edge of the grassland. Concession road 13 separates the Project from the grassland and there is also a residential dwelling in between them. Therefore the potential impacts of the Project to this habitat are negligible and are primarily associated with noise as a result of construction, operation and decommissioning.

**Potential Impacts**

- Potential avoidance of habitat by grassland birds as a result of increased noise and traffic volumes during construction, operation and decommissioning phases.

**Recommended/Implemented Mitigation Measures**

- The impacts of noise on the grassland guild birds is expected to be negligible. Best management practices will be followed during all phases of the Project. A noise study, conducted by Hatch Ltd. ensures that background noise from the Project will be less than 40 dB, as required by Ontario Regulation 359/09 and in accordance with Appendix A of the publication "Basic Comprehensive Certificates of Approval (Air) – User Guide, 2004" by the Ministry of the Environment (MOE, 2004). Noise resulting from construction and decommissioning activities will not occur during the time of peak hours of breeding bird singing (approximately one half hour before sunset to approximately 8:30 a.m.).

## 6. Environmental Effects Monitoring Plan – Design and Operations Report

As discussed in the design and operations report (Hatch Ltd., 2011d), environmental effects monitoring is proposed in respect of any negative environmental effects that may result from engaging in the Project. As per the REA Regulation, the monitoring plan identifies:

- performance objectives in respect of the negative environmental effects
- mitigation measures to assist in achieving the performance objectives
- a program for monitoring negative environmental effects for the Project duration, including a contingency plan to be implemented if any mitigation measures fail.

The monitoring proposed will serve to verify that mitigation measures are functioning as designed to meet performance objectives (Table 7.1). If monitoring shows that performance objectives are not being met, the contingency measures (Table 4.1) will be used to ensure that remedial action is undertaken as necessary to meet the performance objectives.

## 7. Construction Plan Report

The REA Regulation requires proponents of Class 3 solar projects to prepare a construction plan report. Hatch Ltd. (2011e) prepared the construction plan report which outlines the potential negative effects and mitigation measures. The construction plan report is a stand-alone report that will be included as part of the REA application.

The construction plan report details the location and timing of construction and installation activities, any negative environmental effects that result from construction activities within 300 m of the Project Location and mitigation measures for the identified negative environmental effects. The construction plan report addresses all potential effects of construction on natural features within 300 m of the Project Location in a general manner. The mitigation proposed in the construction plan report with respect to preventing or minimizing negative effects on natural features is the same as discussed in this Natural Heritage Environmental Impact Study. Additional mitigation is proposed to address negative effects during construction not related to natural features. Therefore, the construction plan report and this *Natural Heritage Assessment Environmental Impact Study Report* should be read in conjunction with each other, although all negative effects and mitigation requirements with respect to significant natural features are contained within this *Natural Heritage Assessment Environmental Impact Study Report* and duplicated in the construction plan report.

**Table 7.1 Environmental Effects Monitoring Requirements with Respect to Significant Natural Features for the Norfolk Bloomsburg TS Solar Energy Project.**

Negative Effect	Natural Features Affected	Mitigation Strategy	Performance Objective	Monitoring Plan					Contingency Measures
				Methodology	Monitoring Locations	Frequency	Rationale	Reporting Requirements	
<b>Construction Phase</b>									
Dust generation and off-site transport	Woodland, tallgrass prairie, forest and grassland bird guilds	Standard construction site best management practices to prevent fugitive dust.	Minimize fugitive dust from the construction site.	Visual monitoring of visible dust plumes during construction.	Throughout construction site.	Periodically during all construction activities.	Visual dust monitoring would identify if dust plumes are an issue and where their source may be.	Reported in monthly environmental monitoring report during construction.	Dust control measures implemented as necessary to prevent/minimize dust generation.
Incidental take of wildlife	Forest and grassland bird guilds	Daily visual monitoring of work areas and construction equipment prior to start of work. Wildlife observed will be removed from areas of impact through established protocols.  Speeds to be limited on Project Location and construction workforce to be made aware of potential for wildlife on the Project Location.	Avoid occurrences of incidental take.	Daily visual monitoring will be conducted by workers on foot of the areas to be worked on the given day.  Any wildlife observed will be either directed off of the Project Location or collected by a designated employee and transported to the nearest available location off-site and released.	Throughout construction site.	Ongoing during construction on a continued basis.	Incidental take will be reported by construction workforce to the on-site personnel responsible for environmental protection if incidents occur.	Reported in monthly environmental monitoring report during construction, unless the species is a species of conservation concern in which case reporting will be immediate to the MNR/Environment Canada.	If incidental take of species of conservation concern are recorded, work will be ceased until such time as a trained biologist can state that the species is no longer present in the area.
Negative effects of noise on breeding birds	Woodland, tallgrass prairie, forest and grassland bird guilds	Construction will not occur during the time of peak hours of breeding bird singing (approximately one half hour before sunset to approximately 8:30 a.m.) during the breeding season.	Limit noise that may interfere with breeding birds.	A construction plan will outline the permitted hours of construction activity, outside the times of peak breeding bird activity.	Throughout construction site.	Ongoing during construction on a continued basis.	Ongoing	Daily start and end times of construction activities will be reported in a monthly environmental monitoring report during construction.	Site manager will ensure protocols are adhered to.
<b>Operations Phase</b>									
Incidental take of wildlife	Forest and grassland bird guilds	Speeds to be limited on Project Location and maintenance workforce to be made aware of potential for wildlife on the Project Location.  Visual monitoring of access roads for wildlife species.	Avoid occurrences of incidental take.	Occasions of incidental take to be reported as they are identified.	Throughout Project Location.	Ongoing during maintenance activities.	Incidental take will be reported by maintenance staff to the on-site personnel responsible for environmental protection if incidents occur.	No requirement; unless the incident involves a species of conservation concern in which case reporting will be immediate to the MNR/Environment Canada.	If incidental take of species of conservation concern are recorded, work will be ceased until such time as a trained biologist can state that the species is no longer present in the area.

Negative Effect	Natural Features Affected	Mitigation Strategy	Performance Objective	Monitoring Plan					Contingency Measures
				Methodology	Monitoring Locations	Frequency	Rationale	Reporting Requirements	
Negative effects of noise on breeding birds	Woodland, tallgrass prairie, forest and grassland bird guilds	The facility has been designed to keep noise below 40 decibels at significant receptors.	Limit noise that may interfere with breeding birds.	An operation plan will outline the monitoring of noise resulting from the operation of the facility.	Noise will be monitored at receptors adjacent to the Project.	Once operational an acoustic audit will be conducted as outlined in the Noise Report to ensure the Project is compliant with MOE regulations.	Noise levels set by the MOE ensure that the Project does not negatively impact the environment.	Noise levels will be monitored and reported once the facility is operational.	The Proponent will ensure that an acoustic audit is conducted and that the Project is compliant with MOE regulations.
<b>Decommissioning Phase</b>									
Dust generation and off-site transport	Woodland, tallgrass prairie, forest and grassland bird guilds	Standard site best management practices to prevent fugitive dust.	Minimize fugitive dust from the Project Location.	Visual monitoring of visible dust plumes during construction.	Throughout Project Location.	Periodically during all decommissioning activities.	Visual dust monitoring would identify if dust plumes are an issue and where their source may be.	Reported in monthly environmental monitoring report during decommissioning.	Dust control measures implemented as necessary to prevent/minimize dust generation.
Incidental take of wildlife	Forest and grassland bird guilds	Daily visual monitoring of work areas and decommissioning equipment prior to start of work.  Speeds to be limited on Project Location and construction workforce to be made aware of potential for wildlife on the Project Location.	Avoid occurrences of incidental take.	Daily visual monitoring will be conducted by workers on foot of the areas to be worked on the given day.  Any wildlife observed will be either directed off of the Project Location or collected by a designated employee and transported to the nearest available location off-site and released.	Throughout decommissioning site.	Ongoing during decommissioning on a continued basis.	Incidental take will be reported by decommissioning workforce to the on-site personnel responsible for environmental protection if incidents occur.	Reported in monthly environmental monitoring report during decommissioning, unless the species is a species of conservation concern in which case reporting will be immediate to the MNR/Environment Canada.	If incidental take of species of conservation concern are recorded, work will be ceased until such time as a trained biologist can state that the species is no longer present in the area.
Negative effects of noise on breeding birds	Woodland, tallgrass prairie, forest and grassland bird guilds	Decommissioning will not occur during the time of peak hours of breeding bird singing (approximately one half hour before sunset to approximately 8:30 a.m.).	Limit noise that may interfere with breeding birds.	A decommissioning plan will outline the permitted hours of construction activity, outside the times of peak breeding bird activity.	Throughout construction site.	Ongoing during decommissioning on a continued basis.	Ongoing	Daily start and end times of construction activities will be reported in a monthly environmental monitoring report during construction.	Site manager will ensure protocols are adhered to.

## 8. Summary and Conclusions

As discussed in the *Natural Assessment Heritage Records Review Report* (Hatch Ltd., 2011a) and the *Natural Heritage Assessment Site Investigation Report* (Hatch Ltd., 2011b) significant natural heritage features occur within the 120 m setback of the Project Location, but not on the Project footprint. This *Natural Heritage Assessment Environmental Impact Study Report* has been prepared to identify potential negative environmental effects that all phases of the Project may have on those natural features identified in the *Natural Heritage Assessment Evaluation of Significance Report* (Hatch Ltd., 2011c) as significant.

Mitigation measures have been proposed to prevent these effects from occurring or minimize the magnitude, extent, duration and frequency in the event that they do occur. The primary mitigation measure was site selection and Project layout design which limits the adverse effects on the natural features. Accordingly, the Project does not encroach onto any significant natural features. The environmental impact study determined that the Project will have negligible environmental effects on *rare vegetation communities* (i.e. tallgrass prairie), *habitat for area-sensitive grassland/agricultural species* and *habitats of species of conservation concern* for forest guild and grassland guild bird species. Both of these habitats are separated from the Project by Concession Road 13.

Best management practices outlined in Section 7 will mitigate indirect environmental effects. Monitoring measures have been proposed to confirm that mitigation measures are having the intended effect and that performance objectives are being met.

## 9. References

Hatch Ltd. 2011a. Norfolk Bloomsburg TS Solar Energy Project – Natural Heritage Assessment Records Review Report. Axio Power Canada Inc./SunEdison Canada. November 2011. Niagara Falls, Ontario.

Hatch Ltd. 2011b. Norfolk Bloomsburg TS Solar Energy Project – Natural Heritage Assessment Site Investigations Report. Axio Power Canada Inc./SunEdison Canada. November 2011. Niagara Falls, Ontario.

Hatch Ltd. 2011c. Norfolk Bloomsburg TS Solar Energy Project – Natural Heritage Assessment Evaluation of Significance. Axio Power Canada Inc./SunEdison Canada. November 2011. Niagara Falls, Ontario.

Hatch Ltd. 2011d. Norfolk Bloomsburg TS Solar Energy Project – Design and Operations Report. Axio Power Canada Inc./SunEdison Canada. November 2011. Niagara Falls, Ontario.

Hatch Ltd. 2011e. Norfolk Bloomsburg TS Solar Energy Project – Construction Plan Report. Axio Power Canada Inc./SunEdison Canada. November 2011. Niagara Falls, Ontario.

Hatch Ltd. 2011f. Norfolk Bloomsburg TS Solar Energy Project – Decommissioning Plan Report. Axio Power Canada Inc./SunEdison Canada. November 2011. Niagara Falls, Ontario.

Hatch Ltd. 2011g. Norfolk Bloomsburg TS Solar Energy Project – Waterbody Assessment Report. Axio Power Canada Inc./SunEdison Canada. November 2011. Niagara Falls, Ontario.

# Appendix A

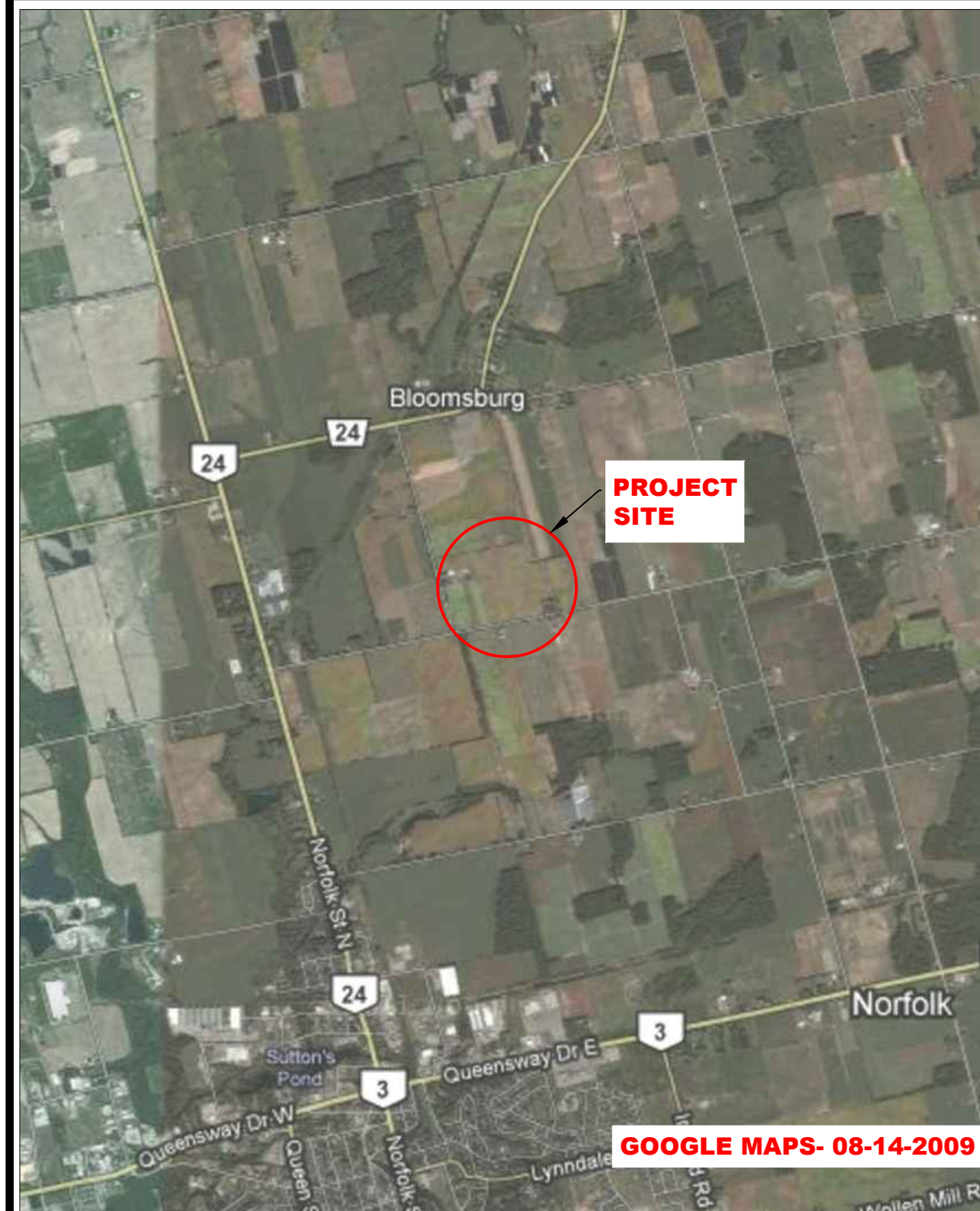
## Site Layout Plan

# NORFOLK BLOOMSBURG TS SOLAR PROJECT

PART OF LOTS 3 AND 4, CONCESSION 12, COUNTY OF NORFOLK, ON

SOLAR ELECTRIC SYSTEM PROJECT - 10.0 MW AC

## VICINITY MAP:



## PROJECT SCOPE:

**SOLAR ELECTRIC SYSTEM**

THE PROPOSED PROJECT IS A RENEWABLE ENERGY GENERATION FACILITY WHICH WILL USE SOLAR PHOTOVOLTAIC TECHNOLOGY TO GENERATE ELECTRICITY. ELECTRICITY GENERATED BY SOLAR PHOTOVOLTAIC PANELS WILL BE CONVERTED FROM DIRECT CURRENT (DC) TO ALTERNATING CURRENT (AC) BY INVERTERS, WHICH WILL ALSO STEP-UP THE VOLTAGE TO 27.6 kV PRIOR TO BEING CONNECTED TO THE EXISTING LOCAL DISTRIBUTION LINE. TO MEET ONTARIO POWER AUTHORITY'S (OPA) FEED-IN-TARIFF (FIT) PROGRAM REQUIREMENTS, A SPECIFIC PERCENTAGE OF EQUIPMENT WILL BE MANUFACTURED IN ONTARIO. THIS PROJECT IS CLASSIFIED AS A CLASS 3 SOLAR FACILITY AND THEREFORE REQUIRES A RENEWABLE ENERGY APPROVAL (REA).

THE SYSTEM WILL BE INTERCONNECTED AND WILL BE OPERATED IN PARALLEL WITH THE ENERGY PROVIDER'S ELECTRIC GRID AS PER THE REQUIREMENTS OF THE ONTARIO ELECTRICAL SAFETY CODE (OESC).

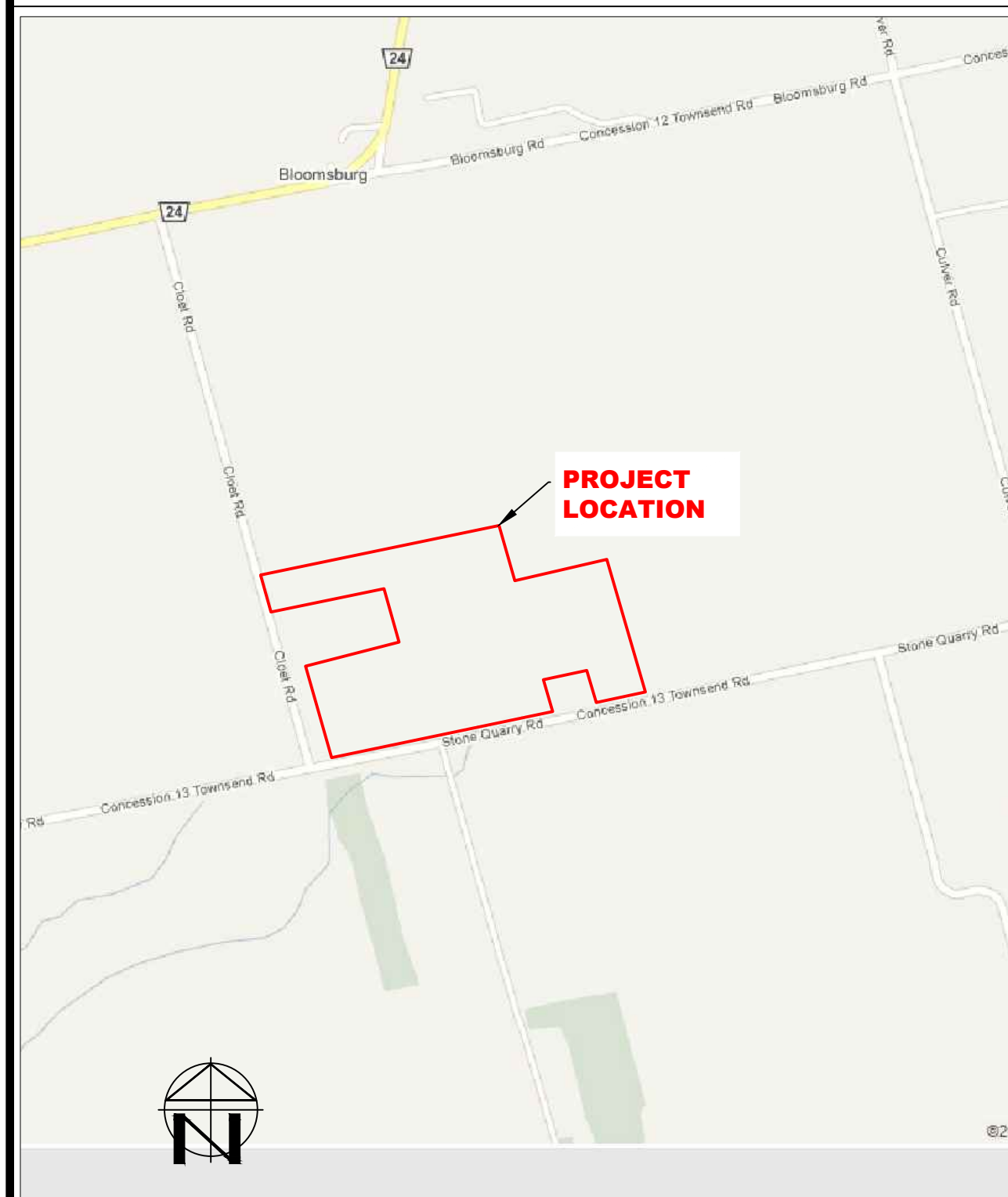
## DRAWING INDEX:

G-001	TITLE SHEET
ES-101	EXISTING SITE PLAN
ES-102	ARRAY PLAN
EP-501	ELECTRICAL DETAILS
EP-801	SINGLE LINE DIAGRAM
S-101	RACKING AND ANCHOR DETAILS
S-102	RACKING AND ANCHOR OPTIONS

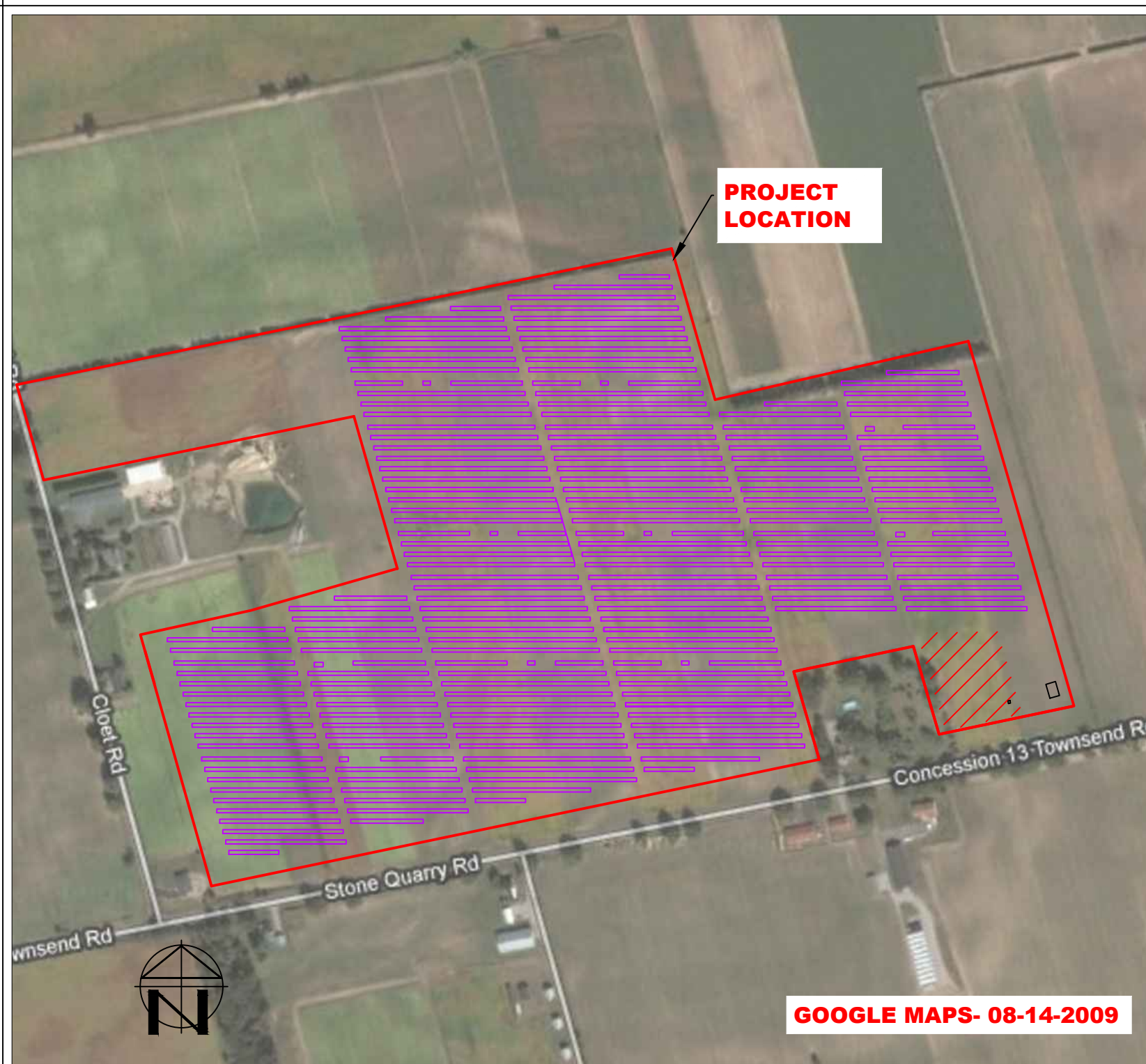
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REV. NO.	DESCRIPTION	DATE	BY

## STREET MAP:



## AERIAL VIEW:



## PROJECT TEAM:

**PROJECT CONTACT:**  
 PROJECT: NORFOLK BLOOMSBURG TS SOLAR PROJECT  
 AXIO POWER CANADA INC.  
 945 PRINCESS STREET, SUITE 252  
 KINGSTON, ON, K7L 3N6  
 CONTACT: ROBERT BARKLEY  
 TEL: (613) 545.0215  
 FAX: (613) 545.0692  
 EMAIL: rbarkley@axiopower.com

**DESIGN ENGINEERING FIRM:**  
 BLUE OAK ENERGY CANADA CORP.  
 200 VINYL COURT, UNIT D  
 VAUGHAN, ON L4L 4A3  
 CONTACT: VINCE GREEN, PE  
 TEL: (905) 850-3200  
 EMAIL: vince@blueoakenergy.com



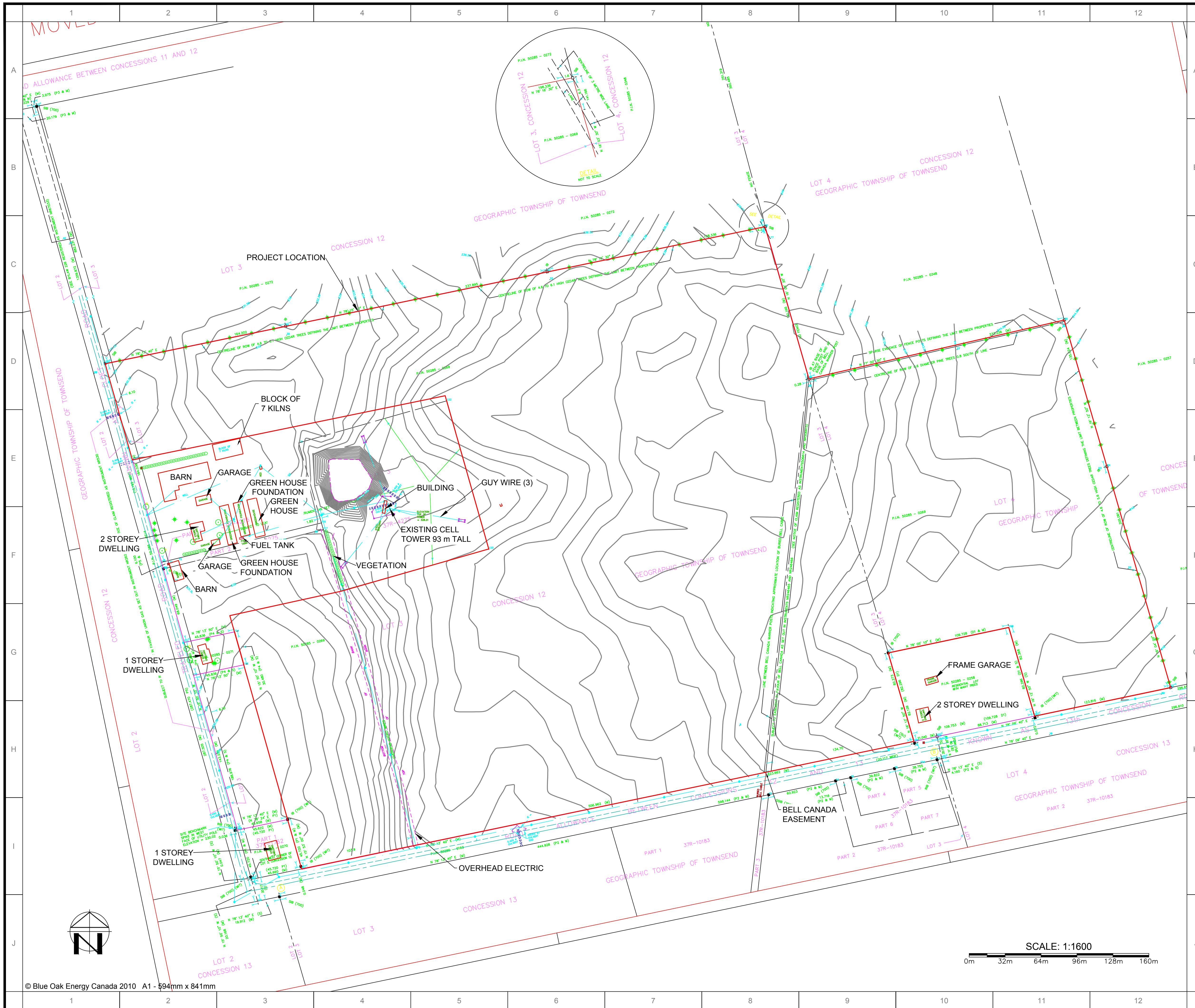
**AXIO POWER  
 CANADA INC**

945 PRINCESS STREET, SUITE 252  
 KINGSTON, ON K7L 3N6

PROJECT SITE:  
**NORFOLK  
 BLOOMSBURG TS  
 SOLAR PROJECT**  
 PART OF LOTS 3 AND 4, CONCESSION 12  
 NORFOLK COUNTY, ONTARIO, CAN

DRAWING:  
 TITLE SHEET

DRAWING NO.  
**G-001**



**NOTES:**  
 1. SEE PROJECT CIVIL DRAWINGS FOR OFFICIAL LANDMARKS, SITE INFORMATION AND SURVEYING. SHOWN HERE AS REFERENCE ONLY.

- LEGEND**
- SURVEY MONUMENT FOUND
  - SURVEY MONUMENT SET
  - SIB STANDARD IRON BAR
  - SSIB SHORT STANDARD IRON BAR
  - IB IRON BAR
  - RIB ROUND IRON BAR
  - WIT WITNESS
  - (700) H. V. JEWITT OLS.
  - (1582) KIM HUSTED SURVEYING LTD.
  - (CAS) C. A. SEXTON LIMITED OLS.
  - (SU) SOURCE UNKNOWN
  - (P1) DEPOSITED PLAN 37R-1762
  - (P2) DEPOSITED PLAN 37R-10183
  - (P3) PLAN OF SURVEY BY H. V. JEWITT OLS. ATTACHED TO INSTRUMENT NR342824 (P.I.N. 50285 - 0274)
  - (P4) PLAN OF SURVEY BY H. V. JEWITT OLS. ATTACHED TO INSTRUMENT NR516886 (P.I.N. 50285 - 0271)
  - (P5) DEPOSITED PLAN 37R-4275
  - (D1) MEASURED
  - (M) SET
  - (S) CONCESSION
  - CON CONCESSION
  - P.I.N. PROPERTY IDENTIFIER NUMBER
  - UTILITY POLE
  - BELL PEDESTAL
  - GAS VALVE
  - LIGHT STANDARD
  - GUY WIRE
  - EDGE OF ASPHALT
  - CENTRELINE OF ASPHALT
  - DECIDUOUS TREE
  - CONIFEROUS TREE
  - BELL CANADA EASEMENT
  - OVERHEAD ELECTRIC
  - PROJECT LOCATION

ELECTRICAL ENGINEER:  
**PRELIMINARY DRAWING**  
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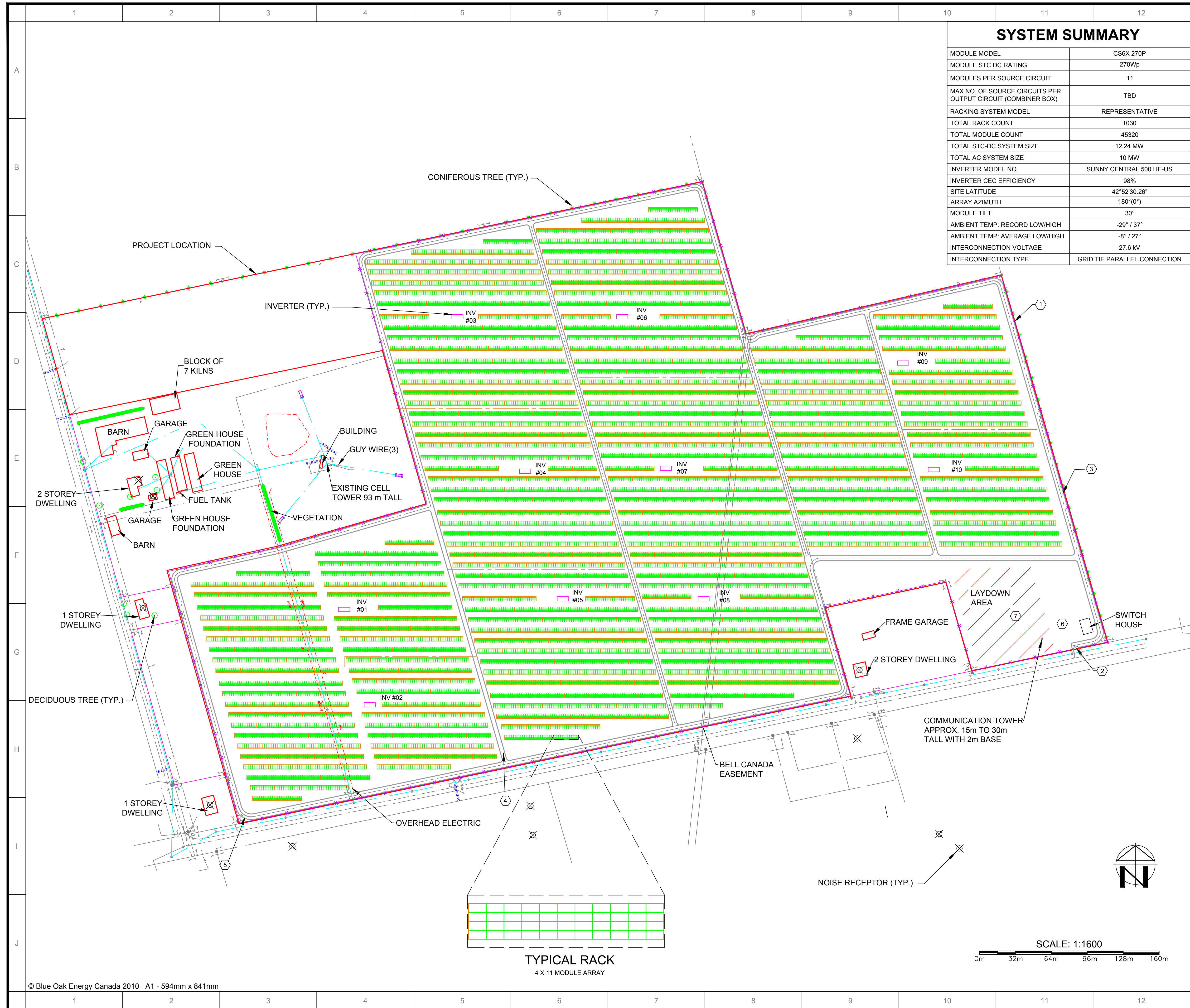
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**AXIO POWER CANADA INC**  
 945 PRINCESS STREET, SUITE 252  
 KINGSTON, ON K7L 3N6

PROJECT SITE:  
**NORFOLK BLOOMSBURG TS SOLAR PROJECT**  
 PART OF LOTS 3 AND 4, CONCESSION 12  
 NORFOLK COUNTY, ONTARIO, CAN

DRAWING: EXISTING SITE PLAN  
 DRAWING NO. **ES-101**



### SYSTEM SUMMARY

MODULE MODEL	CS6X 270P
MODULE STC DC RATING	270Wp
MODULES PER SOURCE CIRCUIT	11
MAX NO. OF SOURCE CIRCUITS PER OUTPUT CIRCUIT (COMBINER BOX)	TBD
RACKING SYSTEM MODEL	REPRESENTATIVE
TOTAL RACK COUNT	1030
TOTAL MODULE COUNT	45320
TOTAL STC-DC SYSTEM SIZE	12.24 MW
TOTAL AC SYSTEM SIZE	10 MW
INVERTER MODEL NO.	SUNNY CENTRAL 500 HE-US
INVERTER CEC EFFICIENCY	98%
SITE LATITUDE	42°52'30.26"
ARRAY AZIMUTH	180°(0°)
MODULE TILT	30°
AMBIENT TEMP: RECORD LOW/HIGH	-29° / 37°
AMBIENT TEMP: AVERAGE LOW/HIGH	-8° / 27°
INTERCONNECTION VOLTAGE	27.6 kV
INTERCONNECTION TYPE	GRID TIE PARALLEL CONNECTION

- NOTES:**
- PV RACKS SUPPORTING FIXED TILTED PV MODULES WITH DC WIRING AND COMBINER BOXES ABOVE GROUND. DC CABLING FROM COMBINER BOXES TO ROUTE UNDERGROUND TO INVERTER / POWER ENCLOSURES.
  - INVERTER / POWER ENCLOSURES TO BE LOCATED WITHIN ARRAY AREA TO COLLECT DC POWER, CONVERT AND OUTPUT MEDIUM VOLTAGE AC POWER.
  - DIMENSIONS ARE IN METERS UNLESS OTHERWISE NOTED.
  - UPHILL ELEVATION GAIN FROM SOUTH-WEST UPWARDS TO NORTH-EAST EXPECTED TO HAVE LITTLE EFFECT ON ROW TO ROW SPACING OR SELF-SHADING.
  - SEE RACK DETAIL DRAWINGS IN S-101 FOR RACK ELEVATION AND TOLERANCES.
  - CONTACT, COORDINATE AND ATTAIN APPROVAL FROM AGENCIES HAVING EASEMENTS AND ROW SPACING IN PROJECT AREA.
  - PV MODULES TO BE CANADIAN SOLAR MODEL CS6X 270P OR EQUAL.

- KEYED NOTES:**
- PROJECT SECURITY FENCE, 2m TALL, SET APPROXIMATELY 0.5m INSIDE PROJECT BOUNDARY LINE.
  - DOUBLE SWING GATES, 2.5m EACH SECTION.
  - PERIMETER SERVICE ROAD, 5m WIDTH. SEE SECTION DETAILS IN S-101.
  - INTERIOR SERVICE ROADS, 3.7m WIDTH SEE SECTION DETAILS IN S-101.
  - 9m TURNING RADIUS AT ROAD CENTER LINES ON PERIMETER SERVICE ROAD AND ON TRANSITIONS TO INTERIOR SERVICE ROADS TO MEET TYPICAL SAFETY AGENCY REQUIREMENTS.
  - AREA AROUND GATES AND SWITCH HOUSE COMPACTED, SLOPED FOR DRAINAGE AND TOPPED WITH "ROAD BASE" ROCK AND SAND MIXTURE. PROVIDES PARKING FOR APPROX. 10 VEHICLES.
  - LAYDOWN AREA TO BE COMPACTED NATIVE SOIL ALLOWING TEMPORARY PARKING, STORAGE, ETC. DURING CONSTRUCTION. TO BE FINISH GRADED AND SEEDED AT END OF CONSTRUCTION.

ELECTRICAL ENGINEER:  
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 KINGSTON, ON K7L 3N6

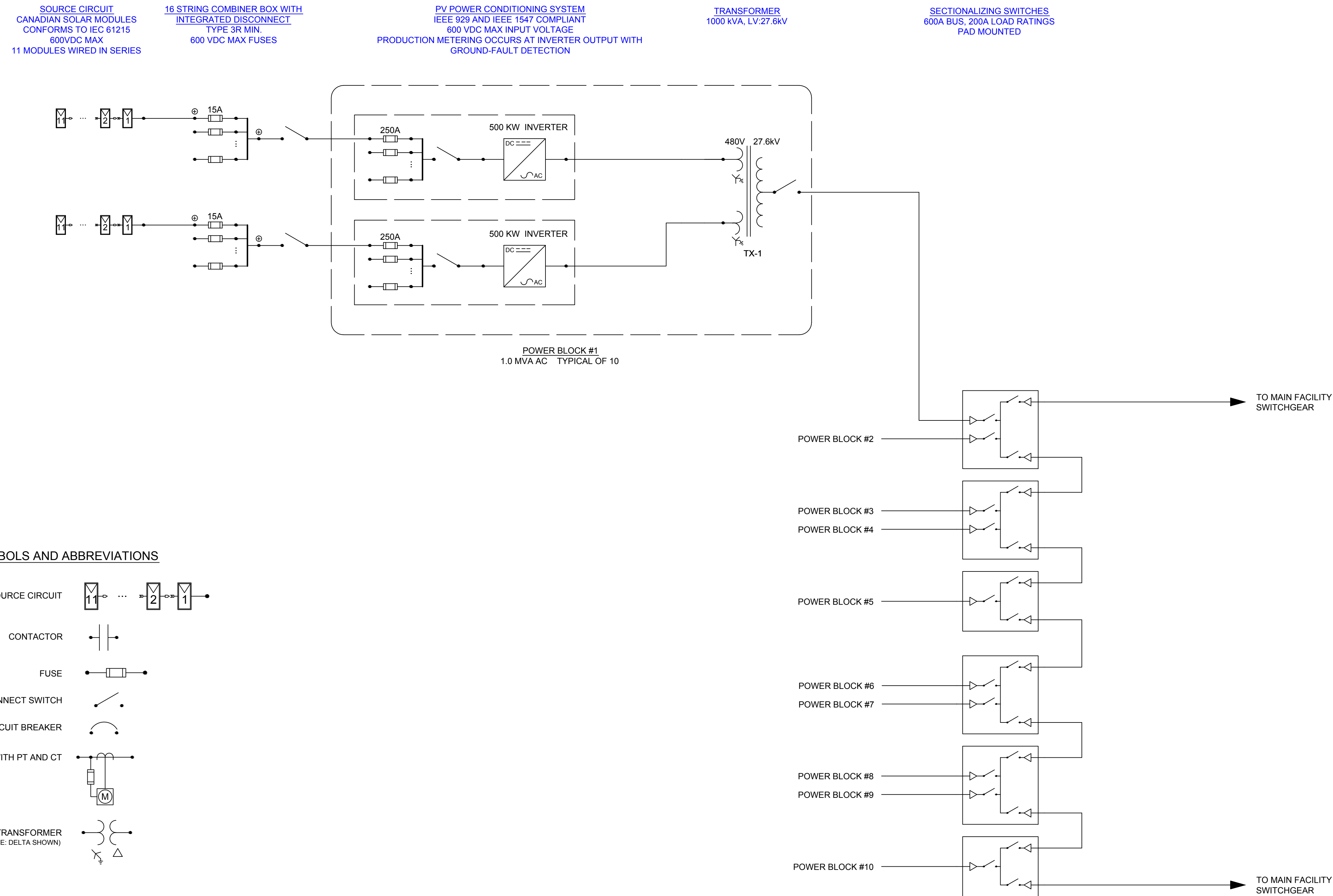
PROJECT SITE:  
**NORFOLK BLOOMSBURG TS SOLAR PROJECT**  
 PART OF LOTS 3 AND 4, CONCESSION 12  
 NORFOLK COUNTY, ONTARIO, CAN

DRAWING: ARRAY PLAN  
 DRAWING NO. **ES-102**

# PV SYSTEM GENERATOR CALCULATIONS

MODULE	CANADIAN SOLAR CS6X-270 (TYPICAL)	
MODULE STC POWER	270Wp	
MODULE TILT	30°	
ARRAY AZIMUTH	180°	
	GENERATOR, TYPICAL OF 10	SITE TOTAL
GENERATOR MANUFACTURER	SMA	SMA
GENERATOR MODEL	SUNNY CENTRAL 500HE	SUNNY CENTRAL 500HE
NUMBER OF MODULES PER GENERATOR	4,532	45,320
DC RATING	1.2236 MW	12,236 MW
AC NAMEPLATE RATING	1.0 MW	10 MW
NUMBER OF SOURCE CIRCUITS	412	4,160
SOURCE CIRCUIT COMBINERS	26	260

GENERAL NOTES:  
 1. THIS DRAWING IS FOR PRELIMINARY DESIGN PURPOSES ONLY. THE DESIGN SHOWN HERE IS NOT FOR CONSTRUCTION.



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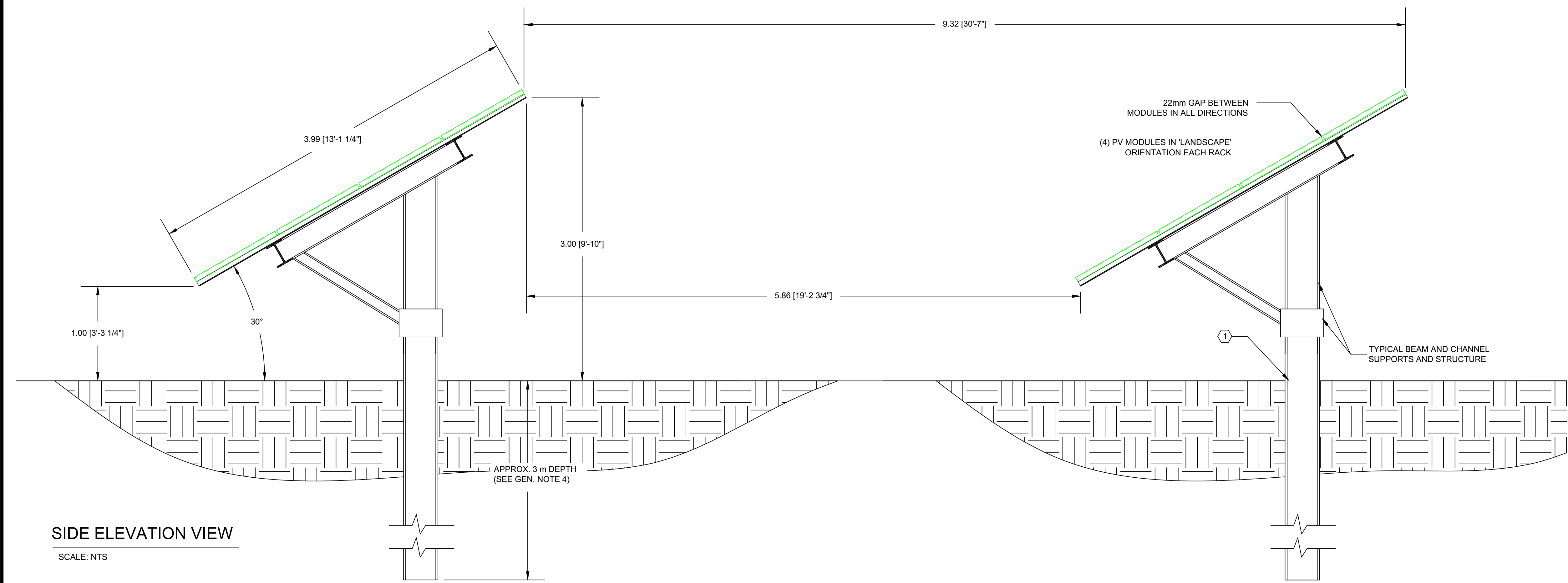
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 KINGSTON, ON K7L 3N6

PROJECT SITE:  
**NORFOLK BLOOMSBURG TS SOLAR PROJECT**  
 PART OF LOTS 3 AND 4, CONCESSION 12  
 NORFOLK COUNTY, ONTARIO, CAN

DRAWING: SINGLE LINE DIAGRAM  
 DRAWING NO. **EP-801**



- GENERAL NOTES:**
- EACH RACK INCORPORATES 44 CANADIAN SOLAR; CS6X 270P MODULES.
  - PV MODULES WIRED IN SERIES-PARALLEL COMBINATIONS ABOVE GROUND ALONG RACK STRUCTURES TO CREATE PV STRING CIRCUITS. 600V DC MAX. STRINGS TERMINATE IN PV COMBINER BOXES.
  - COMBINER BOX OUTPUT (50-150A DC EACH) IS ROUTED UNDERGROUND IN RIGID NON-METALIC CONDUIT OR DIRECT BURIAL 2-CONDUCTOR CABLE TO PV INVERTER STATIONS.
  - DEPTHS ARE APPROXIMATE, PENDING FINAL RACK AND STRUCTURAL ENGINEERING.
  - FOUNDATIONS AND DEPTH OF PILES/POST ARE REPRESENTATIVE ONLY. ACTUAL SPECIFICATION WILL BE DETERMINED BY A LICENSED STRUCTURAL ENGINEER BASED ON THE GEOTECHNICAL STUDY.
  - DIMENSIONS ARE IN METERS UNLESS OTHERWISE NOTED.
  - APPROXIMATELY 3 PILES PER 44 MODULES

- KEYED NOTES:**
- FOUNDATION OPTIONS INCLUDE DRIVEN PILE, HELICAL GROUND ANCHOR, DRILLED PILE WITH CONCRETE REINFORCEMENT. DEPENDS ON SOIL TYPE AND PROPERTIES.

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REV. NO.	DESCRIPTION	DATE	BY

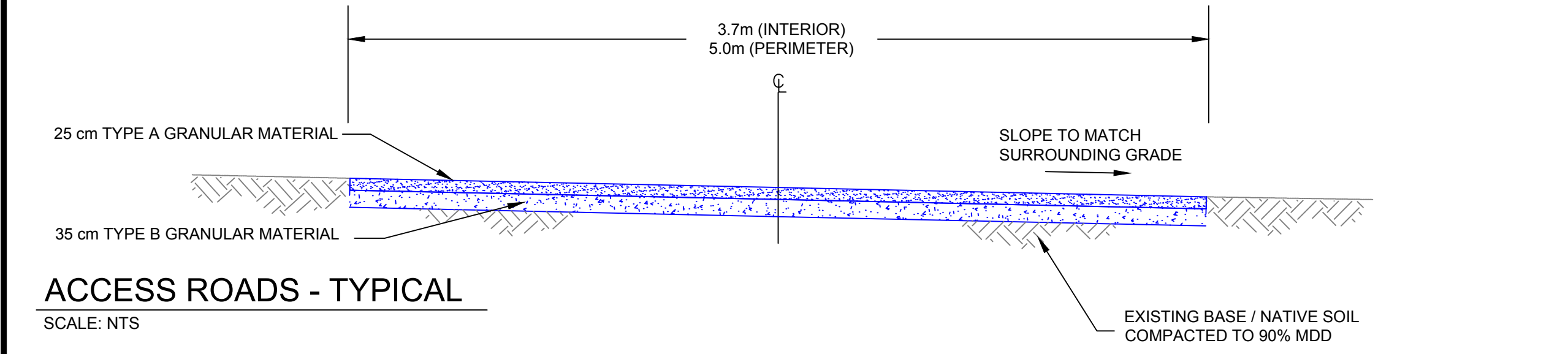


**AXIO POWER CANADA INC**  
 945 PRINCESS STREET, SUITE 252  
 KINGSTON, ON K7L 3N6

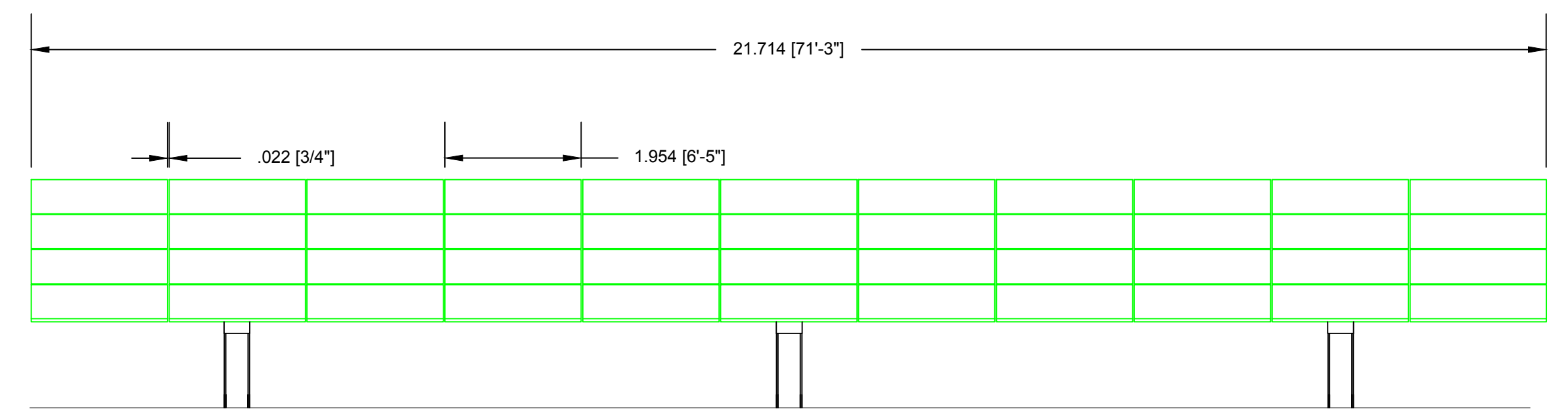
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**NORFOLK BLOOMSBURG TS SOLAR PROJECT**  
 PART OF LOTS 3 AND 4, CONCESSION 12  
 NORFOLK COUNTY, ONTARIO, CAN

DRAWING:  
 RACKING & ANCHOR DETAILS

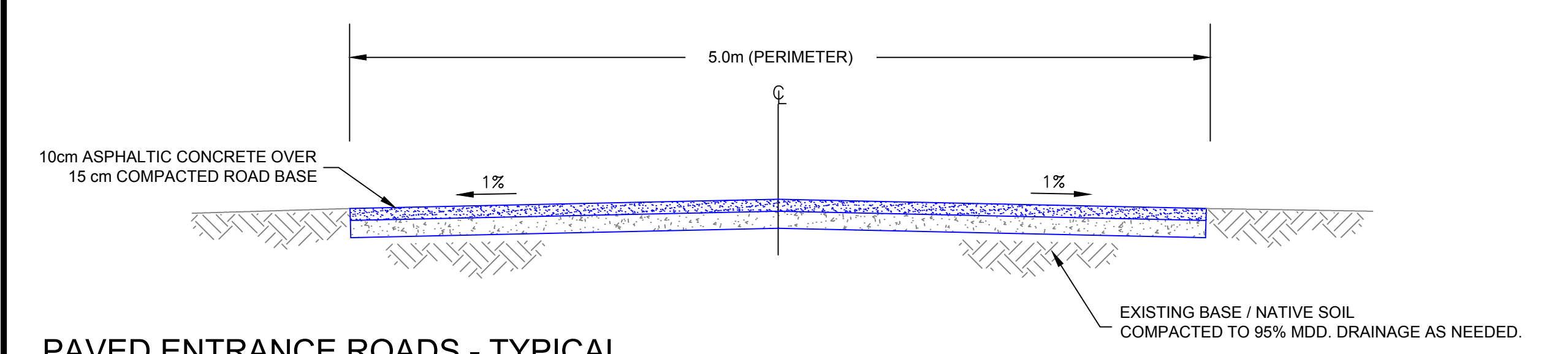
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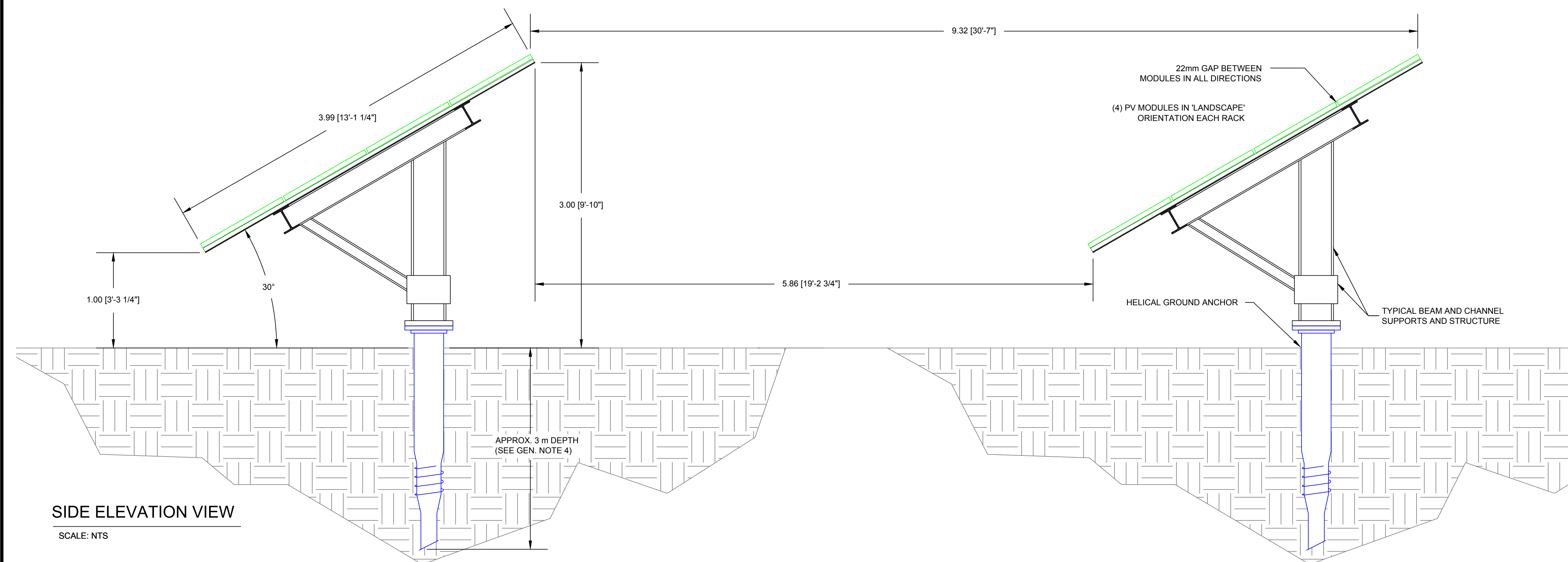
**ACCESS ROADS - TYPICAL**  
 SCALE: NTS



**FRONT VIEW**  
 SCALE: NTS

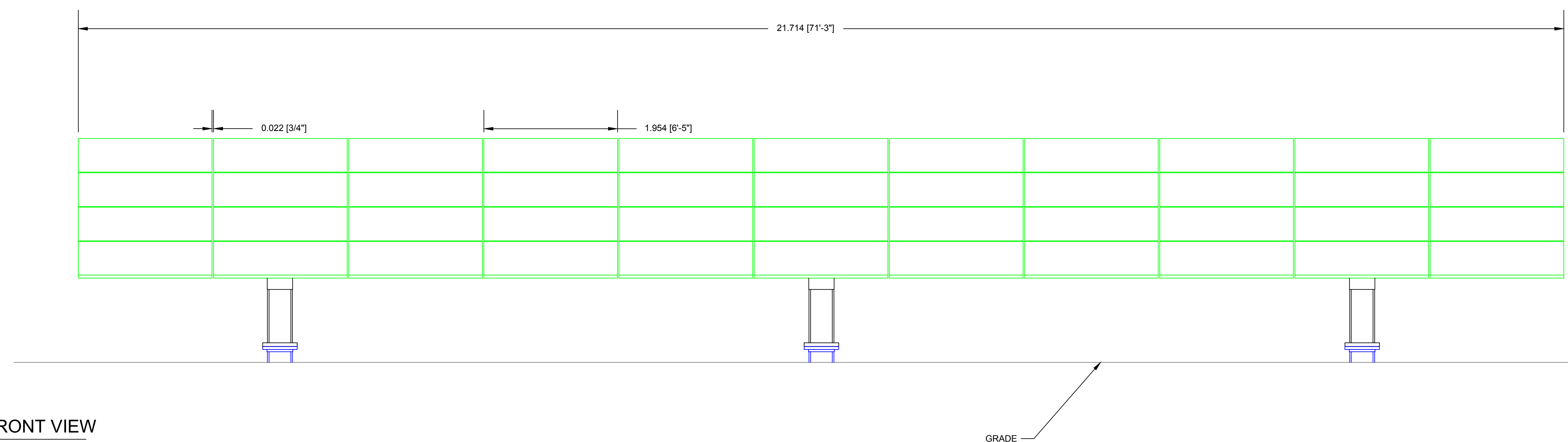


**PAVED ENTRANCE ROADS - TYPICAL**  
 SCALE: NTS



**SIDE ELEVATION VIEW**

SCALE: NTS



**FRONT VIEW**

SCALE: NTS

**GENERAL NOTES:**

1. EACH RACK INCORPORATES 44 CANADIAN SOLAR; CS6X 270P MODULES.
2. PV MODULES WIRED IN SERIES-PARALLEL COMBINATIONS ABOVE GROUND ALONG RACK STRUCTURES TO CREATE PV STRING CIRCUITS. 600V DC MAX. STRINGS TERMINATE IN PV COMBINER BOXES.
3. COMBINER BOX OUTPUT (50-150A DC EACH) IS ROUTED UNDERGROUND IN RIGID NON-METALIC CONDUIT OR DIRECT BURIAL 2-CONDUCTOR CABLE TO PV INVERTER STATIONS.
4. DEPTHS ARE APPROXIMATE, PENDING FINAL RACK AND STRUCTURAL ENGINEERING.
5. DIMENSIONS ARE IN METERS UNLESS OTHERWISE NOTED.
6. APPROXIMATELY 3 GROUND ANCHORS PER 44 MODULES.

ELECTRICAL ENGINEER:

**PRELIMINARY DRAWING**  
 FOR REVIEW ONLY  
 NOT FOR CONSTRUCTION

DATE: X-XX-XXXX


REV. NO.	DESCRIPTION	DATE	BY



**AXIO POWER  
 CANADA INC**

945 PRINCESS STREET, SUITE 252  
 KINGSTON, ON K7L 3N6

PROJECT SITE:  
**NORFOLK  
 BLOOMSBURG TS  
 SOLAR PROJECT**  
 PART OF LOTS 3 AND 4, CONCESSION 12  
 NORFOLK COUNTY, ONTARIO, CAN

DRAWING:  
 RACKING & ANCHOR OPTIONS

DRAWING NO.:

**S-102**



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