



- **Future Solar Developments Inc.**

Acoustic Assessment Report

Type of Document
Final

Project Name
Acoustic Assessment Report LP1

Project Location
9307 Union Drive, Township of Strathroy-Caradoc, ON

Project Number
WSL-00002250-A0

Prepared By:

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CANADA

**Acoustic Assessment Report, LP#1
9307 Union Drive, Strathroy-Caradoc, ON**

Prepared for
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February 2012



Version Control

Version	Date	Revision Description	Author Initials	Reviewer Initials
1.0	February 16, 2012	Original Report	CRT	Re.

Executive Summary

Exp services Inc. (**exp**) was retained by Future Solar Developments Inc. to conduct an acoustic assessment for a proposed solar facility that will be installed on the site located at 9307 Union Drive in the Township of Strathroy-Caradoc (herein referred to as the “Site”). The assessment was required for a Renewable Energy Approval for a Type 3 solar panel project under O.Reg. 359/09, Renewable Energy Approvals Under Part V.0.1 of the Act as amended by O.Reg. 521/10 and O.Reg. 231/11.

The proposed facility would comprise of a solar panel array, ground mounts for the array, one (1) Satcon 100kW UL inverter to convert Direct Current (DC) energy harvested by the panels to Alternating Current (AC), and one (1) transformer to step-up the power to enable feed into the Hydro One distribution system.

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

In addition to project LP#1, a similar project (LP#7) is proposed for 9274 Union Drive. As these projects have the potential to impact on coincident points of reception the potential noise impact of both proposed projects operating simultaneously has been assessed within this report.

The noise assessment conducted and reported below was based on MOE guidance documentation (“Basic Comprehensive Certificates of Approval (Air) – User Guide”, MOE, 2004). The following summary presents results, conclusions, and recommendations:

Equipment to be operated at the site that has the potential to give rise to environmental noise is limited to one (1) inverter and one (1) transformer. The operation of solar panels does not give rise to environmental noise.

The critical noise receptors have been identified as permanent residences. Point of Reception 1 (POR1) is located approximately 250 m north of the Site on the north side of Union Drive and POR 2 is located approximately 260 m northwest of the Site north of Union Drive. Reported distances are between noise sources and the closer of the point of reception property boundary and a point 30 m from the permanent residence.

Potential noise impact from operation of the solar facility on the critical receptors was calculated and assessed versus criteria detailed in MOE NPC-232.

Solar facilities operate during daylight hours, the earliest sunrise at the Site is approximately 5:45 am and the latest sunset is approximately 9:10 pm. As such, it is appropriate to evaluate the project against MOE daytime (07:00 – 19:00), evening (19:00 – 23:00) and nighttime (23:00 – 07:00) hours.

Simultaneous operation of stationary sources, results in a calculated maximum noise impact of 29 dBA at POR 1 (including stationary sources associated with the proposed solar facility LP#7 at 9274 Union Drive) and 26 dBA at POR2 (excluding stationary sources associated with the

proposed solar facility LP#7 as this proposed facility is located at POR2). As the calculated worst predictable case noise impacts are significantly lower than the applicable MOE exclusionary limits of 45 / 40 / 40 dBA for daytime / evening /nighttime periods respectively, it is concluded that the proposed facility would be in compliance with MOE noise criteria.

This executive summary is a brief summary of the report and should not be used as substitute for reading the report in its entirety.

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1 Introduction

Exp services Inc. (**exp**) was retained by Future Solar Developments Inc. to prepare an acoustic assessment report (AAR) for a proposed solar facility on the site located at 9307 Union Drive in the Township of Strathroy-Caradoc (herein referred to as the “Site”). The assessment was required for a Type 3 solar panel project under O.Reg. 359/09, Renewable Energy Approvals Under Part V.0.1 of the Act as amended by O.Reg. 521/10 and O.Reg. 231/11.

The proposed facility would comprise of a solar panel array, ground mounts for the array, one (1) Satcon 100kW UL inverter to convert DC energy harvested by the panels to AC, and one (1) transformer to step-up the power to enable feed into the Hydro One distribution system.

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

In addition to project LP#1, a similar project (LP#7) is proposed for 9274 Union Drive. As these projects have the potential to impact on coincident points of reception the potential noise impact of both proposed projects operating simultaneously has been assessed within this report.

The proposed project is considered a Type 3 Renewable Energy Project as it would have a maximum name plate capacity greater than 12 kW. The electricity produced by the solar facility is intended to be fed into a local Hydro One distribution line. Equipment to be installed at the facility complies with the Ontario manufactured percentages as required by the Ontario Power Authority’s Feed-in-Tariff Program.

This report assesses noise arising from identified sources, details the anticipated impact on the nearest receptors, and evaluates the calculated impact versus MOE criteria.

In accordance with legislative requirements, a copy of this report is to be made available to interested parties including the public and the local municipality at least 60 days prior to the final public consultation meeting.

2 Facility Description

The proposed facility consists of a ground-mounted solar array that will produce electricity from the sun's energy. The direct current generated by the solar array will be converted into alternating current and transformed to enable power to be fed into the Hydro One Network.

The proposed solar array will be attached to mounts on concrete blocks installed in the ground and will occupy an area of approximately 66 by 37 metres. As such the facility represents a fixed system and therefore the array will not produce any noise (c.f. sun tracking arrays). The associated inverter and transformer will be located to the north side of the solar array (south of the existing farm buildings).

The surrounding land use to the south, north and west is designated as General Agriculture (A1). To the northeast, there are areas of General Agriculture as well as areas of Environmental Protection (EP). Zoning maps have been included in Appendix A, as well as Site Plan Aerial maps which show details of the surrounding properties. Given the existing land use and land use in the surrounding area, the project is considered to be in a rural environment. Whilst background sound measurements have not been taken in support of this assessment, the acoustical environment is expected to be dominated by natural sounds as the closest significant roads are Amiens Road approximately 750 m from the Site and Highway 402 approximately 1,600 m from the Site.

Solar facilities operate during daylight hours, the earliest sunrise at the Site is approximately 5:45 am and the latest sunset is approximately 9:10 pm. As such, it is appropriate to evaluate the project against MOE daytime (07:00 – 19:00), evening (19:00 – 23:00) and nighttime (23:00 – 07:00) hours.

3 Noise Source Summary

The locations of all noise sources can be found in the Site Location Aerial Maps (Appendix A).

3.1 Noise Sources

The following noise sources were identified:

- One (1) Satcon 100 kW UL inverter located south of the farm buildings; and,
- One (1) oil-filled step-up transformer (make and model to be confirmed) located adjacent to the inverter.

The proposed solar array is a fixed system and therefore does not include motors etc. as required with tracking systems.

3.2 Road Traffic

Other than construction traffic, the proposed renewable energy project will result in minimal increase in on-site road traffic associated with troubleshooting / maintenance visits as required. As such visits will be infrequent, road traffic noise associated with the proposed project is considered negligible.

3.3 Technical Information – Sources

Table 1 summarizes the specifications and locations of each significant stationary noise source of the proposed renewable solar energy project:

Table 3.1. Technical Information and Locations of Noise Source

ID	Description	Location	Make	Model #	Rating
I01	Inverter	South of farm buildings, 9307 Union Drive, Strathroy-Caradoc, ON. Detailed location indicated on map in Appendix A.	Satcon	PowerGate Plus PVS-100-UL	100 kW
T01	Transformer	Adjacent to inverter	To Be Confirmed	To Be Confirmed	To Be Confirmed

The planned locations of significant noise sources are provided in Figure 1 and approximate co-ordinates are provided in Table 5, Appendix B.



4 Points of Reception

Points of Reception for the approval of new sources, including verifying compliance with the Environmental Protection Act, are defined in Publication NPC-205¹ as premises in use, or zoned for future use, as:

- Permanent or seasonal residences;
- Hotels/motels
- Nursing/retirement homes;
- Rental residences;
- Hospitals;
- Camp grounds; and,
- Noise sensitive buildings such as schools and places of worship.

The closest points of reception to the project LP1 are located approximately 250 m and 260 m from the project. Other receptors are located >500 m from the proposed project location. Below is a description of each point of reception. As per MOE noise guidelines for a Class 3 area, the points of reception have been taken as a point within 30 m of a dwelling or a camping area. For both POR1 and POR2 this point is coincident with the POR property boundary closest to the noise source.

POR1: Located 250 metres north of the project noise sources. It is a residential and agricultural property, with a house and a barn located north of Union Drive. Source to receptor separation distances based on planned equipment locations are provided in Table 3, Appendix B.

POR2: Located 260 metres northwest of the project noise sources. It is a residential and agricultural property with both a house and a barn/work shed. The property is located north of Union Drive. Source to receptor separation distances based on planned equipment locations are provided in Table 3, Appendix B.

5 Assessment Criteria (Performance Limits)

The subject property is located in the Township of Strathroy-Caradoc, a rural area (Class 3 Area). Criteria for assessing the impact of noise from stationary sources are provided in the MOE Publication NPC-232 (Sound Level Limits for Stationary Sources in Class 3 Areas (Rural), October 1995, Ministry of the Environment):

NPC-232 Table 232-1: Minimum Values of One Hour L_{eq} or L_{lm} by Time of Day

	One Hour L_{eq} (dBA) or L_{LM} (dBAI)
Time of Day	Class 3 Area
07:00 – 19:00	45
19:00 – 23:00	40
23:00 – 07:00	40

Dependent on day of the year, the facility may generate electricity between 5:45 and 21:10. Both POR1 and POR2 are located in Class 3 areas where background noise is anticipated to be dominated by natural sounds. Therefore, the appropriate limits for total equipment operation are the MOE exclusionary limits of 45 dBA / 40 dBA (Class 3 Area, 07:00 – 19:00 (daytime operation) / 19:00 – 7:00 (evening and nighttime operation)).

6 Impact Assessment

Noise produced by the inverter was assessed by using the sound rating given in the manufacturer's specifications for the unit. The inverter manufacturer's specifications is provided in Appendix C.

In the absence of a selected make and model number, noise produced by the transformer was assessed based on data published in Table 0.3 of NEMA Standards Publication No. TR 1-1993 (R2000). The transformer size was conservatively assumed to be in the range 101 – 300 kVA (expected size is 100 kVA).

As the noise producing stationary sources at the facility are limited to two (2) pieces of equipment, a simple assessment considering only attenuation due to geometric divergence using procedures detailed in ISO 9613 Part 2 has been conducted. This method of assessment is expected to produce a conservative estimate of noise impact as no consideration is given to attenuation through ground absorption, atmospheric absorption or barrier affects.

The predicted sound levels at the selected PORs due to operation of each noise source are summarized in Table 3 (Appendix B). Distances between each source and POR are also provided in this table.

Sample calculations are provided in Appendix D and an Acoustic Assessment Summary Table is provided as Table 4 in Appendix B.

Consideration of additional solar facilities known to be planned within 500 m of POR1 and POR2 is provided in Section 7. The combined noise impact due to all of these known proposed solar facilities in simultaneous operation is summarized below.

7 Impact of Known Additional Planned Solar Facilities

Exp has been requested to conduct a noise assessment of an additional proposed solar facility, Project LP#7, to be located at 9274 Union Drive. Implementation of both LP#1 and LP#7 would result in the operation of stationary noise sources in addition to those identified above with the potential to impact the points of reception discussed in this report. To determine the predictable worst case noise impact, the potential noise arising from simultaneous operation of all stationary sources associated with proposed solar facilities located in and around 9274 Union Drive in the Township of Strathroy-Caradoc has been calculated at critical points of reception:

Combined Impact Summary Table

POR ID	POR Description	Time of Day	Sound Level at POR due to LP#1 (dBA)	Sound Level at POR due to LP#7 (dBA)	Total sound level at POR (dBA)	Performance Limit (dBA) Leq	Compliance with Performance Limit (Yes/No)
POR1	Permanent residence	Day	27	24	29	45	Yes
		Evening/night	27	24	29	40	Yes

8 Proposed Noise Control Measures

Noise control measures are not necessary for this renewable energy project since the noise resulting from the operation of the solar panels results in a noise level below the MOE exclusionary limits for daytime, evening and nighttime operation.

9 Conclusions

It is concluded that operation of stationary sources associated with proposed Project LP#1 at the Site located at 9307 in the Township of Strathroy-Caradoc, Ontario, would result in noise levels at critical points of reception that are below MOE exclusionary limits for a Class 3 Area.

It is further concluded that, with respect to noise impact, operation of the proposed site would be compatible with existing land use planning guidance.

Simultaneous operation of the facility with the additional planned solar facility for 9274 Union Drive would result in noise levels at critical points of reception that are below MOE exclusionary limits for a Class 3 Area.

10 References

1. International Organization for Standardization, ISO 9613-2: *Acoustics – Attenuation of Sound During Propagation Outdoors Part 2: General Method of Calculation*, Geneva, Switzerland, 1996.
2. Ontario Ministry of the Environment, *Publication NPC-232: Sound Level Limits for Stationary Sources in Class 3 Areas (Rural)*, October 1995.
3. Ontario Ministry of the Environment, *Publication NPC-233: Information to be Submitted for Approval of Stationary Sources of Sound*, October 1995.
4. Ontario Ministry of the Environment, *Model Municipal Noise Control by-Law Publication NPC-103*, August 1978.
5. Ontario Ministry of the Environment, *Model Municipal Noise Control By-Law Publication NPC-104*, August 1978.
6. Ontario Ministry of the Environment, Environmental Assessment and Approvals Branch, *Basic Comprehensive Certificates of Approval (Air) User Guide Version 2.0*, April 2004.

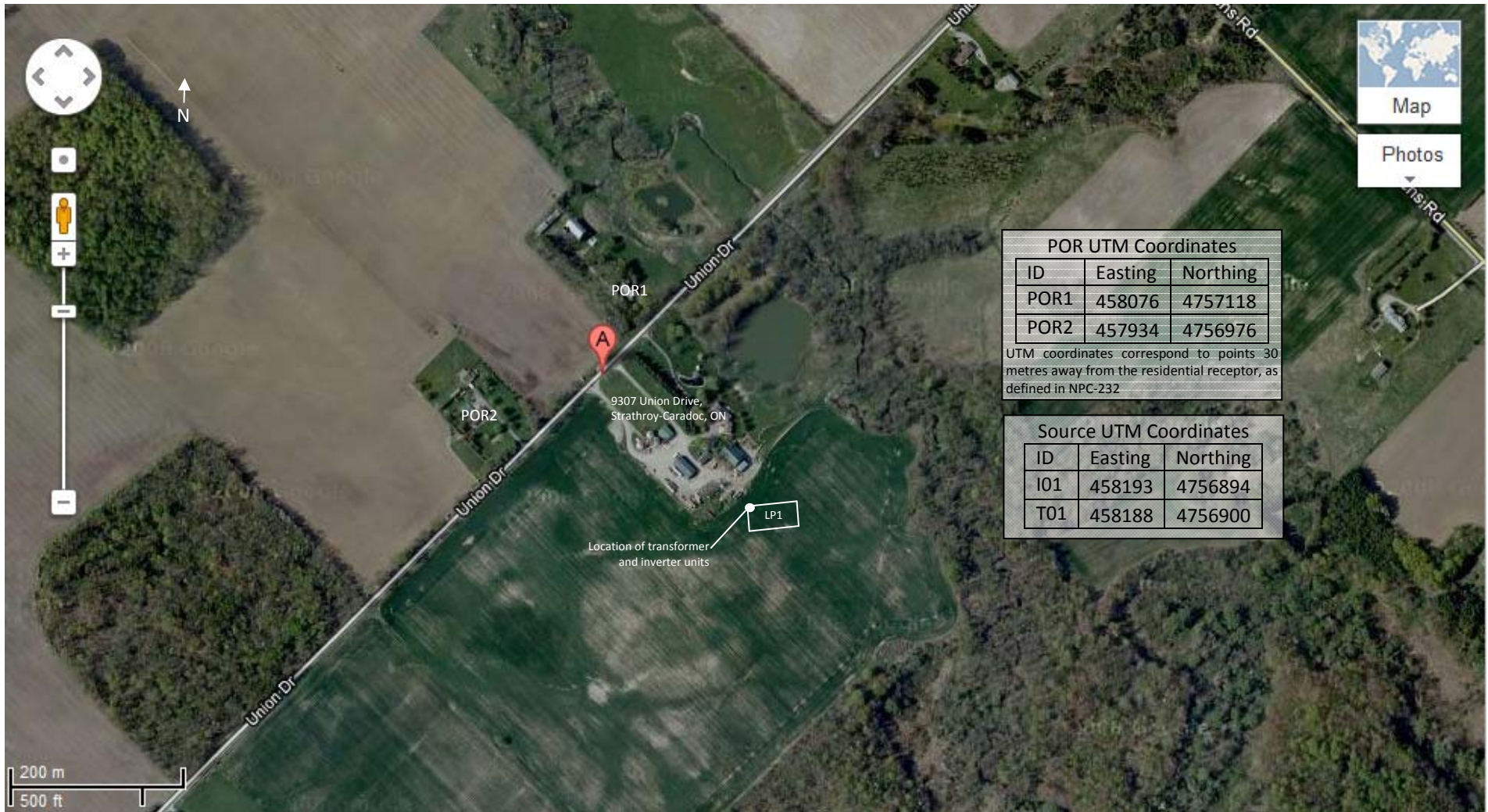
11 Limitations

The objective of this report was to assess noise impact from operation of equipment and processes within the context of our contract with respect to existing Regulations and Guidelines within the applicable jurisdiction. Compliance of past and current owners with applicable local, provincial and federal government laws and regulations was not included in our contract for services.

The conclusions of this report are based, in part, on the information provided by others and any testing and analyses described in the report. The possibility remains that unexpected environmental conditions may be encountered. Should such an event occur, **exp** should be notified in order that we may determine if modifications to our conclusions are necessary.

This report has been prepared for the exclusive use of Future Solar Developments Inc. in accordance with accepted environmental study and/or engineering practices for a Noise Study. No other warranties, either expressed or implied, are made as to the professional services provided under the terms of the Survey and included in this report. Any use which a third party makes of this report, or any part hereof, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. **Exp** Services Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Appendix A – Figures



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 561 Bryne Drive, Barrie, Ontario L4N 9Y3
 (705) 734-6222



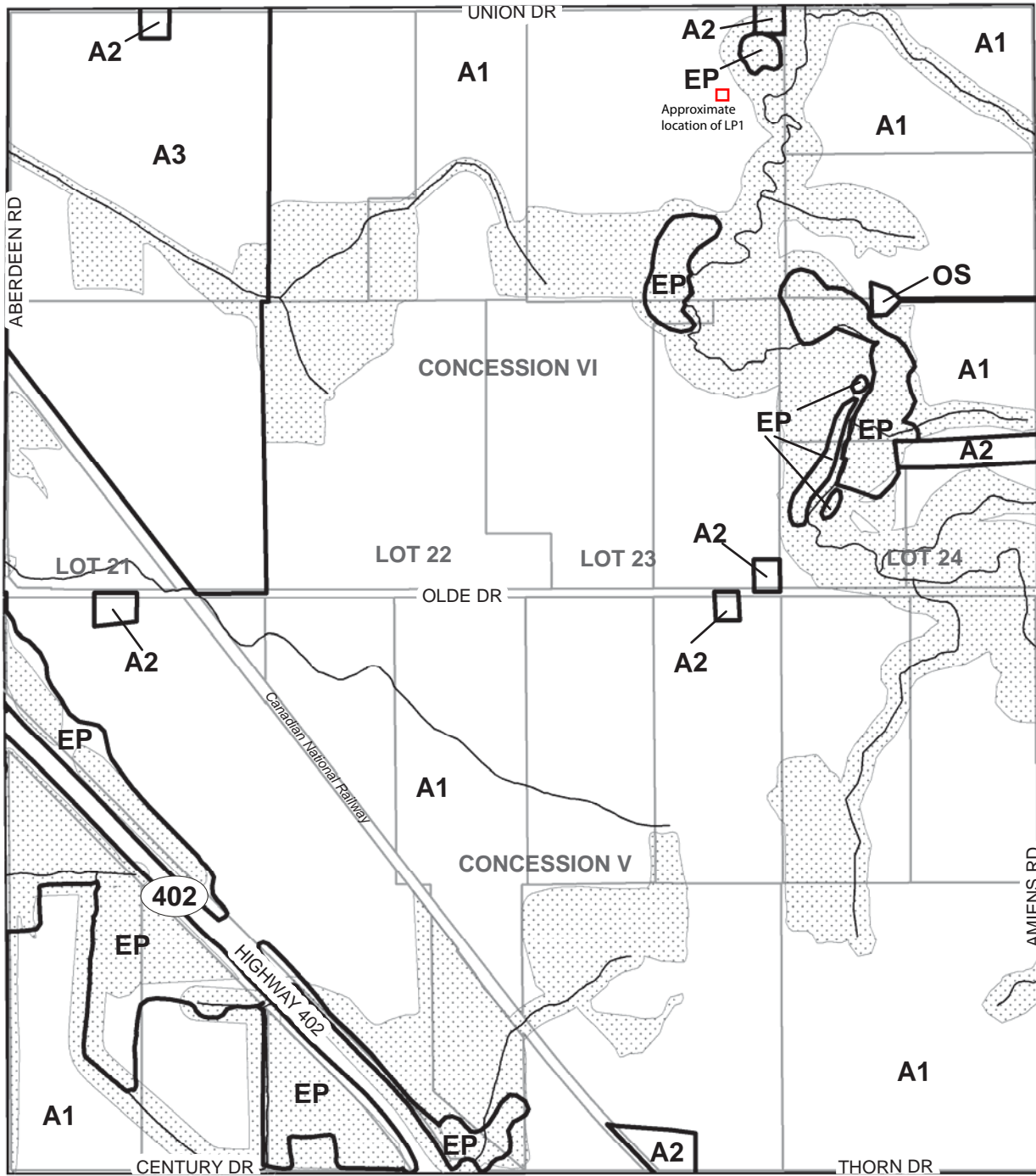
Drawing Title: Site Plan Closest Receptors LP1

Prepared By: Rebecca Orth
 Date: February 2012
 Project No.: WSL-00002250-00

Acoustic Assessment, LP1
 Future Solar Developments Inc.
 8-3400 Pharmacy Ave.
 Scarborough, Ontario M1W 3J8

Map 12

Approximate location of LP7



Map 17


TOWNSHIP OF MIDDLESEX CENTRE

Map 24



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

LEGEND

 Natural Environment Overlay

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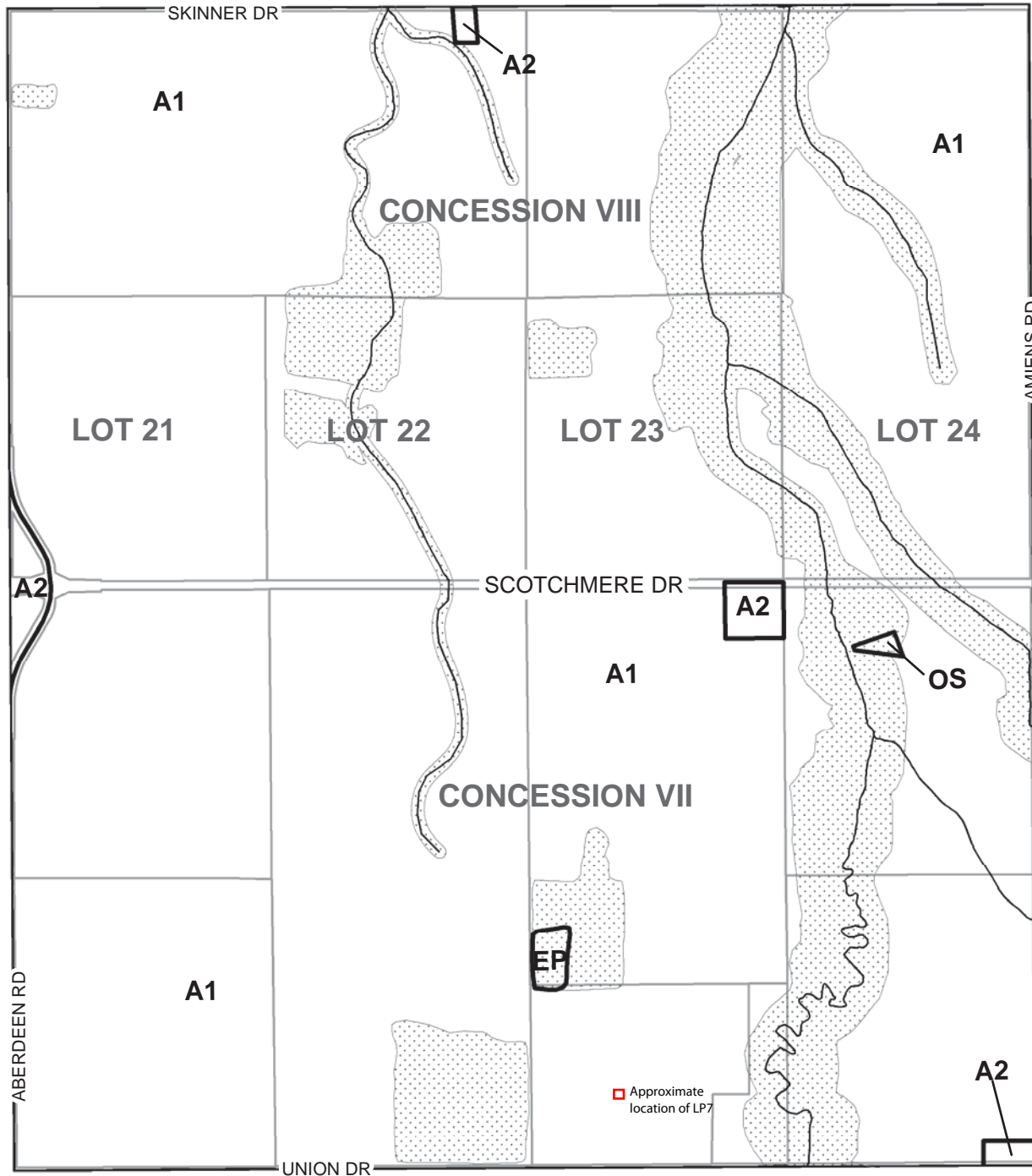
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Metres



SCHEDULE 'A'
MAP #18

Map 6



Map 11

TOWNSHIP OF MIDDLESEX CENTRE


Map 18

Approximate location of LP1



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

LEGEND

 Natural Environment Overlay

1:15,000

0 145 290 580

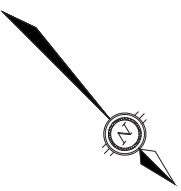
Metres



SCHEDULE 'A'
MAP #12

DRAFT

KEY PLAN



LEGEND	
	POINT OF CONNECTION
	PROPERTY LIMIT
	APPROX. SORCA REGULATION BOUNDARY
	APPROX. PROVINCIAL WETLAND BOUNDARY

STATISTICS:

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

NOTE:
 AERIAL IMAGERY, TOPOGRAPHIC INFORMATION, AND PROPERTY LIMITS SHOWN AS SUPPLIED BY FIRST BASE SOLUTIONS.

PRELIMINARY
 NOT FOR CONSTRUCTION

NOTES
 THE POSITION OF ALL POLE LINES, CONDUITS, WATERMANS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THIS PLAN. THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, CONTRACTORS SHOULD VERIFY THE LOCATION AND DEPTH OF ALL UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

NO.	REVISION DESCRIPTION	DATE	BY	APP'D NO.	ISSUED FOR	REVISION DESCRIPTION	DD/MM/YY	ABC	ABC
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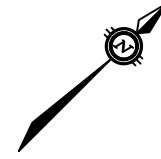
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exp. 3400 PHARMACY AVE, SCARBOROUGH, ON EXP SERVICES INC. 1000 SHEPPARD AV. EAST, SUITE 100 SCARBOROUGH, ON M1B 4Y7 TEL: (416) 291-1111 WWW.EXPSERVICES.COM		CUSTOMER: FUTURE SOLAR DEVELOPMENTS INC. 3400 PHARMACY AVE, SCARBOROUGH, ON	PROJECT: FUTURE SOLAR 9307 UNION DR, STRATHROY, ON	PROJECT NO: WSL-2250
DRAWN BY: K.H.	CHECKED BY: G.B.	DATE: OCT 7, 2011	TITLE: PRELIMINARY SITE PLAN	DRAWN NO: SP 1

Filename: I:2250 - future solar\p\plan\exp2250 - lp1.dwg
 Last Saved: 11/02/2011 12:46 PM
 Last Plotted: 11/02/2011 11:05:19 AM Plotted by: Hidingworth
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DRAFT

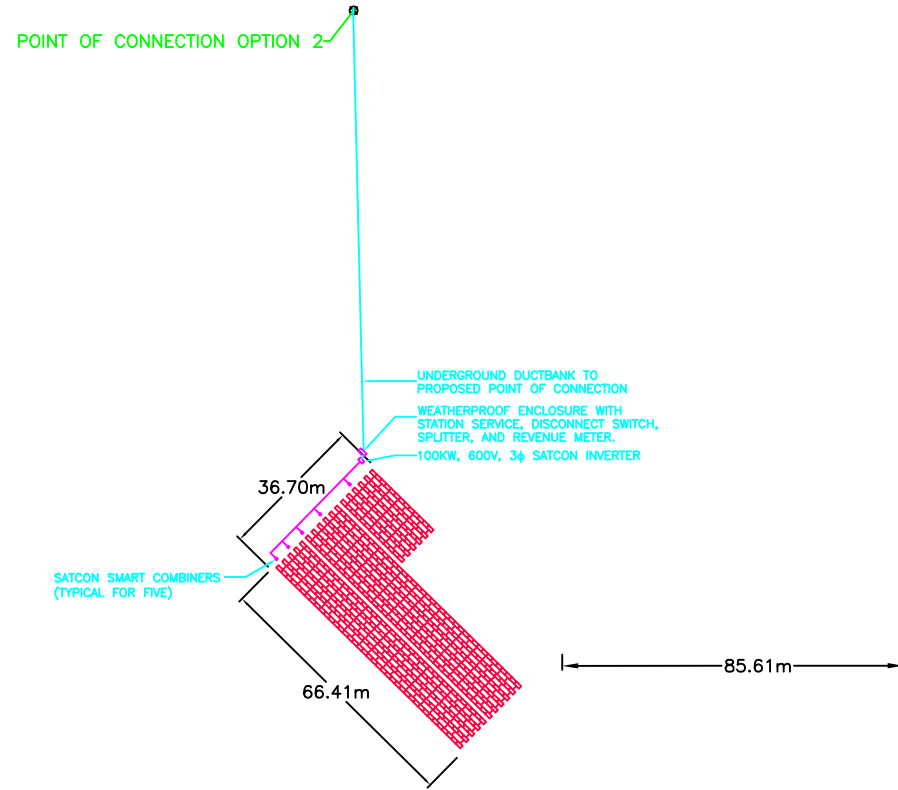
KEY PLAN



UNION DRIVE



LEGEND



STATISTICS:

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

NOTE:
 AERIAL IMAGERY, TOPOGRAPHIC INFORMATION, AND PROPERTY LIMITS SHOWN AS SUPPLIED BY FIRST BASE SOLUTIONS.

NOTES

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

PRELIMINARY
 NOT FOR CONSTRUCTION

NO.	REVISION DESCRIPTION	DATE	BY	APPD	NO.	REVISION DESCRIPTION	DATE	BY	APPD
1	ISSUED FOR ??????								

SCALE	DESIGNED BY	REVIEWED BY
HORZ 1:750 VERT 1:50		
0 5m 10m 20m		

CLIENT
FUTURE SOLAR DEVELOPMENTS INC.
 3400 PHARMACY AVE, SCARBOROUGH, ON

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BASE PLAN	DESIGN	CHECKED	DATE
K.H.	J.W.	J.W.	
PROJ. MAN.	APPROVED		
B.B.	B.B.		

PROJECT	TITLE
FUTURE SOLAR 9274 UNION DR, STRATHROY, ON	PRELIMINARY SITE PLAN
	LP1

PROJ. NO.	SURVEY	DATE	DRAWING NO.
11-080	FBS	OCT 7, 2011	ES-1

Appendix B –Tables

Table 1: Noise Summary Table

Source	Sound Power Level (dBA)	Location	Sound Characteristics	Existing Noise Control Measures
Satcon 100 kW Inverter	90.5 ^a	O	S, T	U
Transformer (liquid filled)	71.0 ^a	O	S, T	U

^a A 5 dB penalty has been applied to these sources as required by the MOE publication NPC 104, and included in the Sound Power Level provided in this table.

Location	Sound Characteristics	Existing Noise Control Measures
O – Outside building I – Inside building	S – Steady QSI – quasi-steady impulsive I – Impulsive B – Buzzing T – Tonal C – Cyclic	S – Silencer A – Acoustic Lining B – Barrier L - Lagging E – Enclosure O – Other U – Uncontrolled

Table 2: Performance Limits Summary Table

Point of Reception ID	MOE Designation	Performance Limit (dBA)	
		Day-time	Evening / Night-time
POR1	Class 3	45	40
POR2	Class 3	45	40

Table 3: Point of Reception Noise Impact Table

Source ID	POR1			POR2		
	Distance (m)	Sound Level (dBA)		Distance (m)	Sound Level (dBA)	
		Day	Evening/Night		Day	Evening/Night
I01	253	26	26	272	26	26
T01	245	7	7	265	7	7

Table 4: Acoustic Assessment Summary Table

POR ID	POR Description	Time of Day	Sound Level at POR (dBA)	Verified by Acoustic Audit? (Yes/No)	Performance Limit (dBA) Leq	Compliance with Performance Limit (Yes/No)
POR1	Permanent residence	Day	27	No	45	Yes
		Evening/night	27	No	40	Yes
POR2	Permanent residence	Day	26	No	45	Yes
		Evening/night	26	No	40	Yes

Appendix C –Manufacturer’s Data

PowerGate Plus 100 kW UL

PVS-100-UL

Satcon PowerGate Plus PV inverters are the world's most widely deployed solutions, powering many of the largest commercial and utility-scale solar installations.

Advanced Performance

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

Utility-Ready Features

- Open communication protocol, compatible with virtually any third-party monitoring system and easily integrated into SCADA systems allowing fast communications
- Remote control of real and reactive power
- Low-voltage ride through
- Power factor control
- Simplified grid interconnection

Edge MPPT

- Provides rapid and accurate control that boosts PV plant kilowatt yield
- Provides a wide range of operation across all photovoltaic cell technologies

Printed Circuit Board Durability

- Conformal coated to withstand extreme humidity and air-pollution levels



Profitable PV Power

The Satcon® PowerGate® Plus 100 kW PV inverters have a significant impact on the profitability dynamic of large-scale solar PV systems. With its system intelligence, next-generation Edge® MPPT technology and industrial-grade engineering, the PowerGate Plus 100 kW inverters maximize system uptime and power production, even in the harshest environments.

Advanced, Rugged, and Reliable

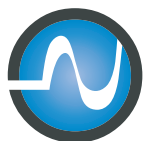
Engineered from the ground up to meet the demands of large-scale installations, Satcon PV inverters feature an outdoor-rated enclosure, advanced monitoring and control capabilities and Edge, Satcon's next-generation MPPT solution.

Proven Performance

The proven leader in solar PV inverter solutions for commercial installations, Satcon sets the standards for efficient large-scale power conversion.

Increased PV Plant Yield

At the heart of PowerGate Plus is Edge, Satcon's next-generation power optimization solution. With rapid and accurate MPPT control, Edge increases PV plant kilowatt yield by extending the production window of arrays, enabling them to operate at optimal voltage and current levels for longer periods of time—even in varied sun conditions. To maximize efficiency, Edge improves the performance of all PV technologies, including fixed and tracking solar arrays, enabling you to get the most from your investment.



Satcon®

Utility-Ready Solar Inverters

PowerGate Plus 100 kW UL

Streamlined Design

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

Rugged Construction

- Engineered for outdoor environments
- Wide thermal operating range: from -4° F to +122° F (-20° C to +50° C) without derating
- Solar shield attached to exterior of enclosure dissipate solar radiation, reduce heat buildup
- Dual cooling fans
- Single cabinet with small footprint

Easy Maintenance

- Modular components make service efficient
- Convenient access to all components
- Customizable large in-floor cable gland plates make installation of DC and AC cables easy
- Integrated DC two-pole disconnect switch isolates the inverter, with the exception of the GFDI (Ground Fault Detection and Interruption) circuit, from the photovoltaic power system to allow inspection and maintenance

Proven Reliability

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

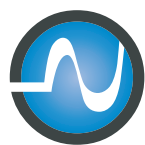
Safety

- UBC seismic Zone 4 compliant
- Built-in DC and AC disconnect switches
- Protective covers over exposed power connections

Output Transformer

- Provides galvanic isolation
- Matches the output voltage of the PV inverter to the grid

PowerGate Plus 100 kW Specifications		UL/CSA		
Input Parameters				
Input Voltage Range		315-600 VDC		
Maximum Array Input Voltage		600 VDC		
Maximum Operating Input Current ¹		331 ADC		
PV Array Configuration	Negative Ground	•		
	Positive Ground	•		
DC Input Combiner Options				
Combiner Bus Bar Inputs	•	6		
Number of Inputs and Fuses	○	5 x 110A		
	○	6 x 100A		
Transformer				
Integrated Transformer ²		Yes		
Efficiency				
Maximum ³	96.6%	96.5%	96.7%	
CEC	96%			
Output Parameters				
Nominal Power		100 kW		
Nominal Output Voltage		208 VAC	240 VAC	480 VAC
Output Voltage Range, [-12%/10%]		183-229 VAC	211-264 VAC	422-528 VAC
Maximum Output Current/Phase		278 A	241 A	121 A
Standby Consumptions (tare losses including control power and aux.)		62 W	62 W	66 W
Nominal Output Frequency, 3-Phase		60 Hz		
Harmonic Distortion		<3%		
Power Factor, Full Load		>99%		
Dynamic Power Factor Control		+/- 0.8		
Power Curtailment		0-100%, 1% steps		
Environment				
Operating Temperature Range (Nominal Power)		-4° F to +122° F (-20° C to +50° C)		
Storage Temperature Range		-22° F to +158° F (-30° C to +70° C)		
Cooling		Forced Air		
Noise Level (Distance of 3 m)		<65 dB(A)		
Relative Humidity (Non-Condensing)		15 - 90%		



Satcon[®]

Utility-Ready Solar Inverters

PowerGate Plus 100 kW Specifications	UL/CSA
Enclosure	
Dimensions (H x W x D)	80 x 57 x 31 in. (203 x 145 x 78 cm)
Weight ⁴	2,350 lbs. (1068 kg)
Finish	RAL 7032
Protection Rating	NEMA 3R/IP44
Warranty and Services	
Five Year Warranty	•
Extended Warranty (1 and 5 year increments)	◦
Preventative Maintenance Agreement	◦
Uptime Guarantee ⁵	◦
Design Services	◦
APEX Project Management	◦
Communication Interface	
Modbus RS485	•
Modbus TCP/IP	◦
Monitoring	
PV View Plus	◦
PV Zone	◦
Third-Party Compatibility	•
Regulations and Standards Conformity	
UL1741, CSA 107.1, IEEE 1547, IEEE C62.41.2	•
UBC Zone 4 Seismic Rating	•

- Standard / Standard Option
- Optional

¹ Calculated at nominal power and minimum DC voltage.

² The 20% boost tap on the isolation transformer increases the AC voltage output range for applications where the solar array DC operating voltage is at or near the lower end of the DC input range. This boost allows for continued inverter operation at lower DC voltage input levels.

³ Calculated without auxiliary power.

⁴ Dependent on options selected.

⁵ Requires Preventative Maintenance Agreement.

NOTE: All specifications are subject to change.

Output Options

PowerGate Plus 100 kW		Power Level	Efficiency*
UL/CSA	208 VAC Output	10%	93.2%
	240 VAC Output	20%	96.1%
	480 VAC Output	30%	95.5%
		50%	96.7%
		75%	96.5%
		100%	96.1%

* 480V model

Power Efficiency

Energy Equity Protection (EEP)

Satcon provides a wide range of optional value-added services to protect your investment across the entire lifecycle of your project.

Design Services

Satcon's Design Services organization can guide you through all phases of project development using our broad experience and engineering skills.

APEX Project Management

Satcon APEX™ Project Management ensure that your project comes in on time and on budget.

- Project planning
- Logistics
- Project supervision
- Mitigating risk, maximizing ROI

Warranty and Services

- Help desk
- Training programs
- Support services
- Extended warranty
- Preventative maintenance plans
- 99% Uptime Guarantee

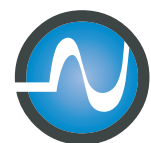
PowerGate Plus Options

- Satcon Smart Subcombiners: Intelligent string monitoring
- Fused input combiners
- Satcon communication card: CCM Gateway
- Weather station
- PV View Plus monitoring system

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Please visit Satcon's Resource Library for additional tools and product information, including:

- Satcon's product configurator
- Satcon's string sizing calculator
- Training and support resources:
 - On-demand video training
 - Articles, white papers and case studies



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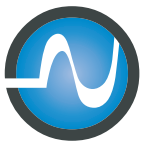
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Appendix D –Calculations

Calculation of Sound Power Levels

Inverter

Satcon specifications indicate a sound pressure level of <65 dB(A) at a distance of 3 m. Sound power level for the inverter has been calculated using the following equation:

$$L_w = L_p - \log(d_r/d_t) + 11$$

Where:

L_w = sound power (dBA)

d_r = Reference distance (1 m)

d_t = Test distance

$$L_w = 65 - \log(1/3) + 11 = 85.5 \text{ dB(A)}$$

In the absence of frequency spectra for the inverter it has been assumed that noise from the inverter is tonal and a 5 dB penalty has therefore been applied as required by Section 4 of NPC-104.

Transformer

In the absence of a transformer make and model number, sound pressure has been calculated using data published in NEMA TR 1 – 1993 (R2000) Table 0.3. From Table 0.3, for an immersed transformer:

Transformer Size	Average Sound Pressure (at ≤ 1 m)
51 – 100 kVA	51 dB
101 – 300 kVA	55 dB

Anticipated transformer size is 100 kVA, as this size is at the limit of a size range the average sound pressure (at ≤ 1 m) for the next highest size range has been conservatively applied. The sound power level for the transformer has been calculated using the following equation:

$$L_w = L_p - \log(d_r/d_t) + 11$$

Where:

L_w = sound power (dBA)

d_r = Reference distance (1 m)

d_t = Test distance

$$L_w = 55 - \log(1/1) + 11 = 66.0 \text{ dB(A)}$$

In the absence of frequency spectra for the inverter it has been assumed that noise from the transformer is tonal and a 5 dB penalty has therefore been applied as required by Section 4 of NPC-104.

Sound Pressure Levels

Sound pressure levels have been calculated conservatively assuming that sound attenuation between the source and the PORs was due solely to geometric divergence (atmospheric absorption, barriers and absorptive ground were not taken into consideration).

The on-site road traffic associated to the renewable energy project will be restricted to occasional visits for maintenance or engineering purposes. As such traffic will be infrequent and so excluded as per Annex to Publication NPC-232 section A.3 (2).

The following equations were employed to calculate sound pressure at points of reception from source power levels including attenuation due to geometric divergence only (from ISO 9613 (Part 2) and to calculate the total sound pressure level at points of reception due to operation of multiple stationary sources:

$$Lp2 = Lp1 + 20 \log \left(\frac{r1}{r2} \right)$$

Where:

r1 = distance 1 (reference)

r2 = distance 2 (receptor)

Lp1 = Sound pressure level at r1

Lp2 = Sound pressure level at r2

$$L_{tot} = 10 \log \left(\sum_{i=1}^n \text{antilog} \frac{L_n}{10} \right)$$

Where:

L_{tot} = total sound pressure at POR for all sources

L_n = sound pressure level at POR from source n

Tables 3 and 4 in Appendix B summarize results obtained through application of the above equations.