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Axio Power Canada Inc./
SunEdison Canada

Noise Study Report

For

Kingston Gardiner TS Unity Road
Solar Energy Project

H335467
Rev. 1
September 17, 2012

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Project Report

September 17, 2012

SunEdison Canada
Kingston Gardiner TS Unity Road Solar Energy Project

Noise Study Report

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Executive Summary

This report presents the results of the noise assessment study required for Solar Facilities under Ontario Regulation 359/09 and 521/10, as part of the Renewable Energy Approval (REA) Process.

SunEdison Canada ("SunEdison") is proposing to develop a 10-Megawatt (MW) solar photovoltaic (PV) project Kingston Gardiner TS Unity Road Solar Energy Project (the "Project"). The Project is located on approximately 34 hectares of land on Part of Lot 12, Concession 6, City of Kingston, County of Frontenac.

This Noise Study Report has been prepared based on the document entitled "Basic Comprehensive Certificates of Approval (Air) – User Guide" by the Ontario Ministry of the Environment (MOE, 2004). The sound pressure levels at the points of reception (POR) used to model Noise Receptors have been estimated using ISO 9613-2, implemented in the CADNA-A computer code. The performance limits used for verification of compliance correspond to the values for rural areas of 40 dBA. The results presented in this report are based on the best available information at this time. It is the intention that, in the detailed engineering phase of the project, certified noise data based on final plans and designs will confirm the conclusions of this noise study.

The results obtained in this study show that the sound pressure levels at the Noise Receptors, resulting from the Project operation, will not exceed MOE requirements for rural areas of 40 dBA.

1. Introduction

1.1 Project Description

SunEdison Canada ("SunEdison") is proposing to develop a 10-megawatt (MW) solar photovoltaic (PV) project titled Kingston Gardiner TS Unity Road Solar Energy Project (the "Project"). The Project Location[1] is situated on approximately 34 hectares of land on Part of Lot 12, Concession 6, City of Kingston, County of Frontenac.

The Project is proposed to be constructed on privately owned land previously used for agriculture, but now covered with seasonal vegetation and some trees. The Project Site is located approximately 1.6 km west of the village of Elginburg. Local roads include Unity Road immediately south of the site and Sydenham Road further east of the site.

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 inverter units which will also step-up the voltage to 27.6-kV. A main transformer, located in the substation, will step up the voltage from the inverter units to 44-kV prior to being sent to the existing local distribution line. In order to meet the Ontario Power Authority (OPA)'s Feed-In-Tariff (FIT) Program requirements, a specific percentage of equipment will be manufactured in Ontario.

The construction of the Project will begin once the Renewable Energy Approval (REA) has been obtained and a power purchase agreement is finalized with the OPA. The construction period is estimated to be approximately 6 months. Operationally, the anticipated lifespan of the Project will be 30 years.

1.2 Renewable Energy Approval Legislative Requirements

Ontario Regulation 359/09 and 521/10, made under the Environmental Protection Act identify the Renewable Energy Approval (REA) requirements for green energy projects in Ontario. As per Section 4 of the Ontario Regulation 359/09 and its amendment (Ontario Regulation 521/10), ground mounted solar facilities with a name plate capacity greater than 12 kilowatts (kW) are classified as a Class 3 solar facility, and therefore, require an REA.

Section 13 of the Ontario Regulation 359/09 requires proponents of Class 3 solar facilities to complete a Noise Study Report 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).

The Noise Study Report is to include a general description of the facility, noise sources, Noise Receptors, assessment of compliance, as well as all the supporting information relevant to the Project. A draft of the Noise Study Report must be made available to the public, the local municipality and identified Aboriginal communities, at least 60 days prior to the final public consultation meeting in accordance with Ontario Regulation 359/09 and 521/10.

[1] "Project Location" in the context of this study is an area occupied by the Project infrastructure.

2. Facility Description

The Project will utilize photovoltaic (PV) panels mounted on the ground. The panels will be equipped with a sun tracking mechanism that allows the panels to track the sun throughout the day. The PV panels generate DC electricity which will be converted to AC electricity by inverter units. The Project layout is based on 10 inverter units (i.e., building enclosures), each one containing two inverters and one medium-voltage transformer, and one 27.6-kV/44-kV/10-MVA substation transformer. The 27.6-kV power, collected from the inverter units, will be stepped-up to 44 kV by the substation transformer prior to being sent to the existing local distribution line.

Since the panels will be ground-mounted and the total nameplate capacity is over 12-kW, the Project is considered to be a Class 3 Solar Facility, according to the classification presented in Ontario Regulation 521/10.

Table 2.1 General Project Description

Project Description	Ground-mounted Solar PV, Class 3
System Nameplate Capacity	10-MW AC
Local Distribution Company	Hydro One Networks Inc.

2.1 Project Location

The Project Location consists of agricultural land totalling approximately 34 hectares, located west of the village of Elginburg. Figure 2.1 shows the site layout plan while the zoning designation plan (Figure A.1) and area location plan (Figure A.2) drawings are included in Appendix A. 130 Noise Receptors are located within 1.2-km from the Project Site[2] boundary.

2.2 Acoustical Environment

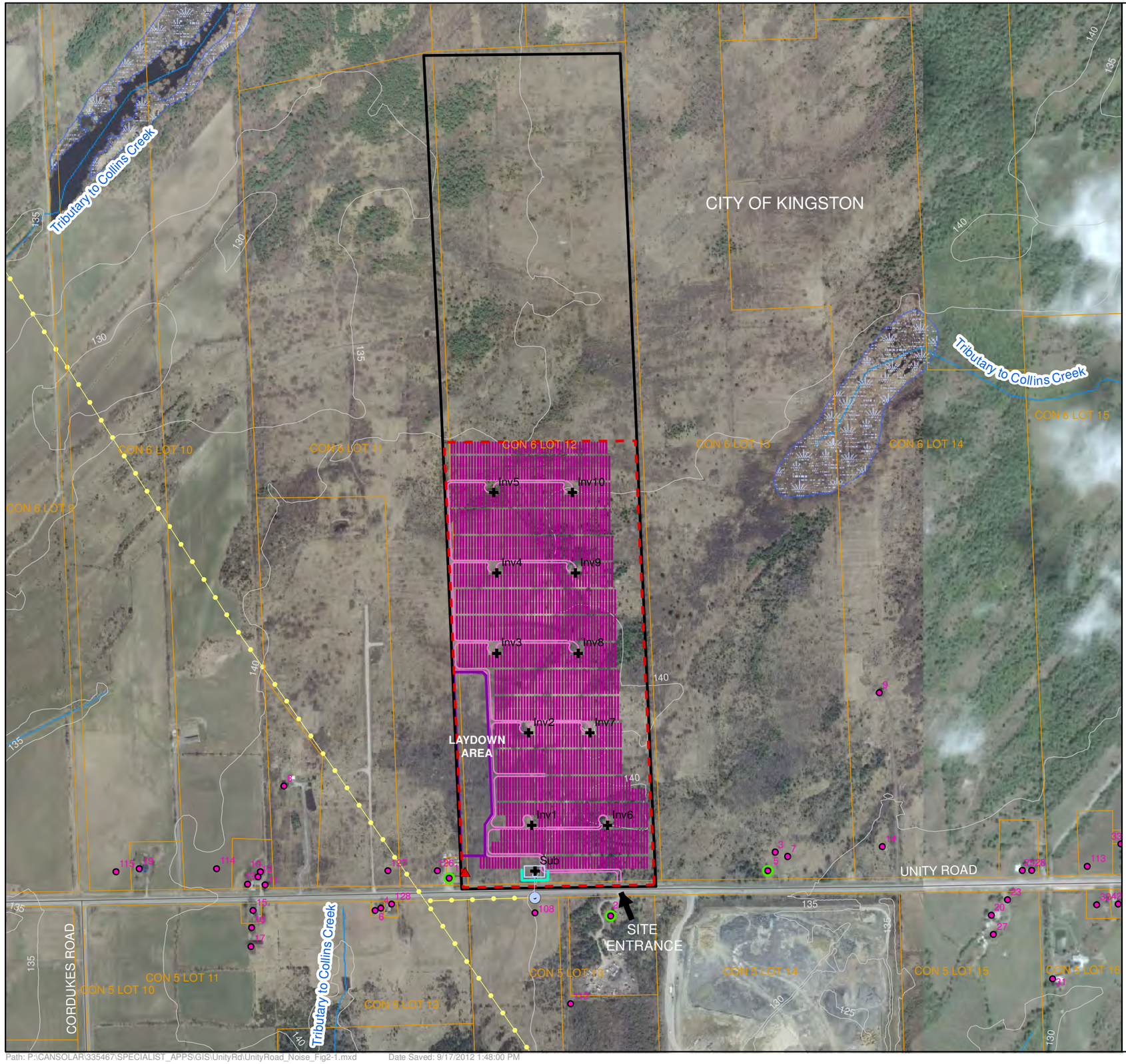
The Project Location is mainly surrounded by farmland, with some wooded areas to the north and east sides. An active rock quarry is located immediately southeast of the Project Location. Within the quarry, steady sounds are produced from the operation of machinery and trucks (reversing, loading and unloading). The spot sound measurements taken around the site showed sound pressure levels somewhat above those typical of rural areas (>40 dBA) with a significant contribution from the quarry.

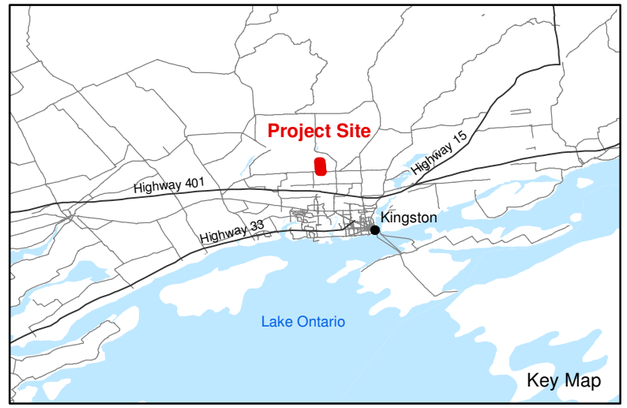
Traffic noise is perceived from Unity Road with the village of Elginburg located less than 2-km from the project site. No other industrial facilities or airports are found within 3 km from the site.

2.3 Life of Project

The expected life of the Project is 30 years. At that time (or earlier if the 20 year power purchase agreement is not extended), the Project will be decommissioned or refurbished depending on market conditions and/or technological changes.

[2] Project Site is the complete area owned by the Project but not necessarily occupied by the Project infrastructure.





LEGEND

Existing Features

- Communication Tower
- Road
- Railway
- Topographic Contour (5m Interval)
- Transmission Line
- Watercourse
- Parcel
- Wetland Area

Proposed Project Components

- Project Location
- Project Site
- Substation Transformer (Sub)
- Inverter Unit (Inv#)
- Noise Receptor (#)
- Representative Noise Receptor (#)
- Access Roads
- Noise Barrier (Not to scale)
- Panel Layout
- Transmission Line
- Substation
- Connection Point

0 75 150 300 Metres

1:8,000

NORTH

Notes:
1. OBM and NRVIS data downloaded from LIO,with permission.
2. Spatial referencing UTM NAD 83, August 2010.
3. Air Photos obtained from Cataraqui Region Conservation Authority, flown in 2008, scale 1:2000. Imagery to the east of the site from Google Earth Pro, 2005 and 2006.

Figure 2.1
SunEdison Canada
Kingston Gardiner TS Unity Road Solar Energy Project
Site Layout Plan

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2.4 Operating Hours

Solar PV facilities produce electricity during the daytime hours, when the sun's rays are collected by the panels. After sunset, the facility will not receive solar radiation to generate any electricity. Under these conditions the inverters will not produce any noise and the transformers will be energized, but not in operation (no fans).

2.5 Approach to the Study

The sound pressure levels at the POR were predicted using procedures from ISO 9613-2, which is a widely used and generally accepted standard for the evaluation of noise impact in environmental assessments. The sound power level for the inverter units was provided by the manufacturer while the sound power level for the substation transformer was estimated. The software package CADNA-A, which implements ISO-9613-2, was used to predict the noise levels at the POR. This numerical modeling software is able to simulate sound sources as well as sound mitigation measures taking into account atmospheric and ground attenuation. Some of the CADNA-A configurations used in the modeling are shown in Figure 2.2.

Elevation contours were not included in the CADNA-A model. This conservative approach was applied in order to avoid including any barrier effects of ground surface obstacles.

For modeling purposes, the vegetation that blocks some of the POR from the sources has not been incorporated.

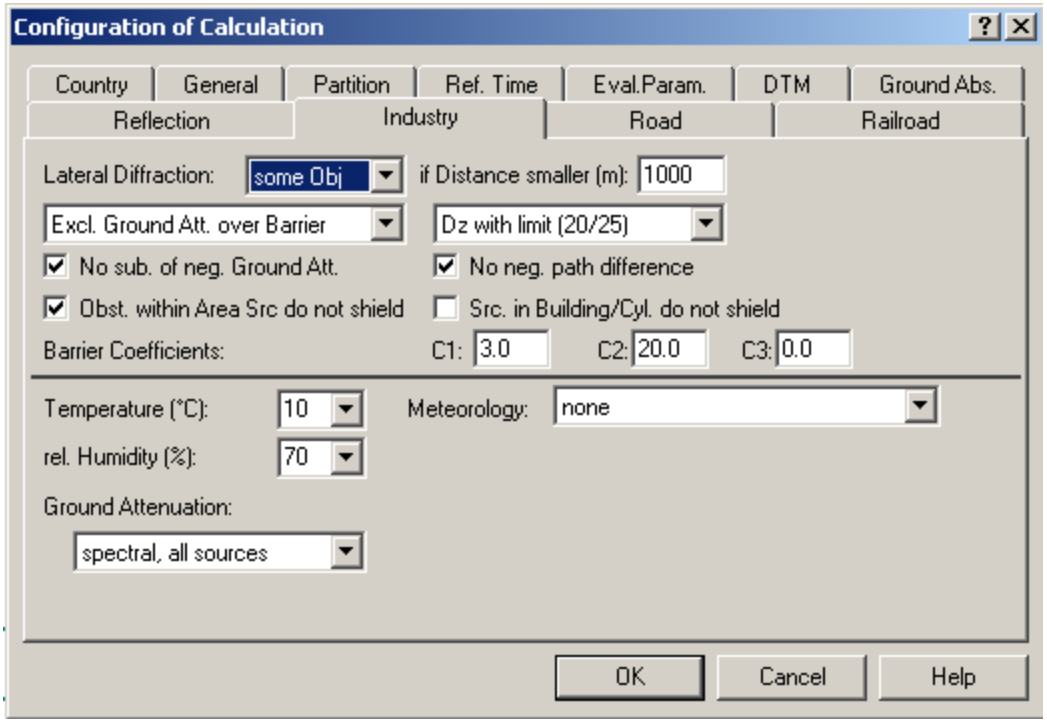

Figure 2.2 CADNA-A Configurations

3. Noise Sources

The main sources of noise from the Project will be 10 inverter units, each one containing two inverters and one medium-voltage transformer, and a substation containing the main step up transformer. SunEdison provided a layout of the solar PV facility (see Figure 2.1). The coordinates of each noise source are presented in Table B.1 of Appendix B.

All noise sources were modeled as non-directional point sources.

Switchgear and a small step-down transformer used for lighting, located at the substation, do not emit any significant noise and consequently have not been considered as sources of noise. The solar panels will be coupled with tracking systems that allow the panels to track the sun throughout the day. The trackers operate using small motors and only emit noise when moving the panels, this noise is not significant and the motors were not considered sources of noise.

For the purpose of this study it is assumed that all inverters and transformers will be operating 24 hours at full capacity.

3.1 Substation Transformer

A step-up transformer that will step-up the 27.6-kV power to the 44 kV, required by the local distribution company, will be located in the substation. The sound power levels resulting from the operation of the transformer were evaluated using data from NEMA TRI – 1993 (2000) and 35-m^2 transformer surface area. This standard provides maximum sound level values for transformers, and manufacturers routinely meet this specification. Hence, the results based on NEMA may slightly overestimate the impact at POR since the actual transformer is expected to be quieter.

The NEMA levels were then converted into frequency spectra using empirical correlations for transformer noise (Crocker, 2007). This calculation is available in Figure B.1 of Appendix B.

Power transformers are considered by the MOE to be tonal noise sources. A 5-dB penalty was added to the sound power spectrum, as recommended by Publication NPC-104, "Sound Level Adjustments" for tonality. Table B.2 in Appendix B shows the frequency spectrum used to model the substation transformer. Also, typical dimensions for a 27-kV/44-kV/10-MVA transformer have been supplied by Magna Electric Corporation, as seen in Figure B.3. These dimensions are expected to be similar to the installed dimensions of the substation transformer.

3.2 Inverter Units

SunEdison will use ten SMA Sunny Central 1000MV (SC1000MV) inverter units in the Project. Each SC1000MV inverter unit comprises of two inverters and one medium voltage transformer contained in an e-house or enclosure (see Appendix B). The main sources of noise are the cooling/ventilation fans, the electrical components of the inverters and the medium-voltage transformer. It is assumed that the current configuration of the SC1000MV unit, as specified in Appendix B, will be modified, if required according the CADNA-A model, to have the following features: 1) all openings will be equipped with acoustical louvers (silencers); 2) all external walls will be soundproof (i.e., sound emissions through the walls will be significantly lower than the sound emissions through the louvers).

The installed capacity of each inverter unit is 1 MW. SMA provided third-octave noise data for the SC1000MV unit, which takes into account combined noise emissions from the two inverters and transformer (see Appendix B). The provided third octave spectrum was converted to a full octave spectrum for use with CADNA-A model (calculations are available in Figure B.2 of Appendix B). A 5-dBA penalty was added to the frequency spectrum, as stipulated in Publication NPC-104, "Sound Level Adjustments," to allow for tonality. The frequency spectra used for SC1000MV units is shown in Table B.2, Appendix B.

Although for the modeling purposes it was assumed that the facility will operate 24 h at full capacity, in reality at night the facility will be idle. Under these conditions the inverters do not produce noise. The transformers are energized and make some magnetostrictive noise at a reduced level, but no cooling fans are in operation.

3.3 Noise Summary Table

A summary of the sound sources described above, including sound level, characteristics and proposed noise control measures, is presented in Table 3.1.

Table 3.1 Noise Source Summary (Day and Night Time)

Source ID	Description	Total Sound Power Level (dBA)	Source Location	Sound Characteristics	Noise Control Measures
Sub	27.6-kV/44-kV/10-MVA Substation transformer	90.8	O	S-T	B
Inv1	Sunny Central 1000MV inverter unit	102.2	O	S-T	E-S
Inv2	Sunny Central 1000MV inverter unit	102.2	O	S-T	E-S
Inv3	Sunny Central 1000MV inverter unit	102.2	O	S-T	E-S
Inv4	Sunny Central 1000MV inverter unit	102.2	O	S-T	E-S
Inv5	Sunny Central 1000MV inverter unit	102.2	O	S-T	E-S
Inv6	Sunny Central 1000MV inverter unit	102.2	O	S-T	E-S
Inv7	Sunny Central 1000MV inverter unit	102.2	O	S-T	E-S
Inv8	Sunny Central 1000MV inverter unit	102.2	O	S-T	E-S
Inv9	Sunny Central 1000MV inverter unit	102.2	O	S-T	E-S
Inv10	Sunny Central 1000MV inverter unit	102.2	O	S-T	E-S

Notes:
1. A 5-dBA penalty is included in this table.
2. Location: Inside building (I), Outside building (O).
3. Sound Characteristics: Steady (S), Tonal (T), Impulsive (I), Quasi-Steady Impulsive (QSI).
4. Noise Control: Silencer (S), Acoustic lining (A), Barrier (B), Lagging (L), Enclosure (E), Other (O), Uncontrolled (U).

3.4 Adjacent Solar Projects

To identify the adjacent solar projects Hatch's internal database of solar projects and MOE records available in http://www.ene.gov.on.ca/environment/en/subject/renewable_energy/projects/index.htm were searched (September 17, 2012).

There are no POR that are within 1 km of equipment in the Project and any adjacent project. As a result, there are no adjacent projects included in this study.

4. Noise Receptors and Points of Reception

The Noise Receptors used in this study were initially identified from the OBM and Google Earth imagery (July 2005) within 1.2-km distance from the Project Site boundary. Following this, the potential Noise Receptors located closest to the Project Location were then visually verified during a site visit held in September 2010. Based on this, a number of additional receptors (residential buildings) that were observed at the time of the inspection were added to the model.

The Noise Receptors corresponding to the vacant lots were added based on parcel information provided by First Base Solutions (Teranet Data) and located according to the requirements outlined in Ontario Regulation 359/09, and its amendment (Ontario Regulation 521/10).

The total number of Noise Receptors considered in this study, within a 1.2-km distance from the Project Site boundary, is 130 (see Figure A.1 and Figure A.2 in Appendix A). Three of these Noise Receptors, identified in Table 4.1, were chosen as representative receptors for evaluating the noise contribution from each individual source (i.e., substation and 10 inverter units). These three receptors were chosen in order to represent sound pressure level contributions on different areas around the Project Location. The complete set of results for all 130 Noise Receptors is provided in Table 6.2, with corresponding noise maps from CADNA-A included in Appendix C.

Each Noise Receptor was represented by a point of reception placed in the middle of the Noise Receptor footprint and elevated 4.5 m. Also, noise compliance was verified within 30-m distance from any given Noise Receptor center located at 1.5 m above the ground level.

Table 4.1 Noise Impact from Individual Kingston Gardiner TS Unity Road Solar Energy Project Sources - POR at 4.5 m in the middle of Noise Receptor Footprint.

Source ID	Noise Receptor ID					
	1		2		5	
	Distance (m)	L_{eq} Sound Level (dBA)	Distance (m)	L_{eq} Sound Level (dBA)	Distance (m)	L_{eq} Sound Level (dBA)
Sub	173	31.3	177	28.7	468	24.0
Inv1	197	30.1	242	28.1	484	21.6
Inv2	333	25.1	403	23.3	555	20.3
Inv3	463	22.0	576	19.9	700	18.0
Inv4	622	19.2	727	17.7	810	16.6
Inv5	780	17.0	883	15.8	939	15.2
Inv6	336	25.0	183	30.9	335	25.0
Inv7	407	23.2	370	24.1	453	22.2
Inv8	522	20.8	533	20.7	581	19.8
Inv9	665	18.5	693	18.1	713	17.9
Inv10	814	16.6	854	16.1	856	16.1

5. Mitigation Measures

Mitigation for operation of the solar facility has been modeled and shown to be feasible in the form of soundproof (i.e., sound emissions through the walls will be significantly lower than the sound emissions through the louvers) enclosures with acoustical louvers for all inverter units. The Noise Reduction and Sound Transmission characteristics of the acoustical louvers considered in this study are presented in Table B.3 of Appendix B. Technical specifications of the proposed louvers are included in Appendix B as well.

Also, a noise barrier is required at the substation transformer. Coordinates of the barrier are provided in Table B.5 while sound absorption properties used to model the barrier is available in Table B.4. The barrier shall be continuous, with a material density of 20 kg/m^2 or greater having the same or better absorption properties than those of Table B.4. A schematic drawing showing the relative location of the barrier/transformer arrangement are presented in Figure B.4.

6. Impact Assessment

The purpose of the acoustic assessment report is to demonstrate that the facility is in compliance with the noise performance limits. The Project will be located in a Class 3 Area, based on the classification defined in Publication NPC-232 by the MOE. Class 3 area means a rural area with an acoustical environment that is dominated by natural sounds, having little or no traffic, such as an agricultural area.

Table 6.1 shows the performance limits set by the MOE for Class 3 Areas, according to Publication NPC-232.

Table 6.1 Performance Limits (One-Hour L_{eq}) by Time of Day for Class 3 Areas

Time of Day	One Hour L_{eq} (dBA) Class 3 Area
07:00 to 19:00	45.0
19:00 to 23:00	40.0
23:00 to 07:00	40.0

The solar facility will be operating during the daylight hours, that is, between 07:00 and 19:00 during most days of the year. However, in the summer months the sun may shine before 07:00 or until past 19:00. As such, during the summer the facility will be operating at the time when the applicable performance limit changes from 45 dBA to 40 dBA. Also, the transformers remain energized at night. In order to account for this the study assumes that the facility will be operating 24 hours and compares the impact from the facility with the 40-dBA limit. In reality, the cooling fans will not be in operation at night.

For this study, the overall ground attenuation coefficient was estimated to be 0.7. Appendix D includes a list of all the parameters used in the CADNA-A model to predict the sound pressure levels at the POR.

The modelling does not consider the effect of the solar panels on the predicted sound pressure levels at the POR. The solar panels may act as barriers to further reduce noise at the POR.

6.1 Compliance with Performance Limits

Table 6.2 presents the predicted sound pressure levels for the POR representing the Noise Receptors. Appendix D includes a detailed calculation log of the POR corresponding to the representative Noise Receptors with the highest sound pressure level.

Effect of the noise emissions at the Noise Receptors was also accessed by intersecting the 40-dBA sound pressure contours calculated at 1.5 m above ground with 30-m radius circles placed around the Noise Receptor centers (Figure C.2). The results show that none of the 30-m radius zones are affected by the noise emissions.

The results of this study show that all Noise Receptors are compliant with MOE guidelines based on the 40-dBA performance limit.

Table 6.2 Calculated Sound Pressure Levels at POR.

Shaded rows correspond to representative Noise Receptors
All Noise Receptors were modeled by POR placed in the middle of Noise Receptor footprint and elevated at 4.5 m above ground
Existing = Existing dwelling
Vacant = Vacant Lot Receptor

Noise Receptor ID	Description	Total Sound Pressure (dBA)	Performance Limit (dBA)	POR Coordinates NAD83 Zone 18		Min dist. to source (m)
				X (m)	Y (m)	
1	Existing	35.7	40.0	375048	4908456	173
2	Existing	35.5	40.0	375373	4908380	177
3	Existing	31.9	40.0	375704	4908508	342
4	Existing	31.5	40.0	374910	4908396	320
5	Existing	31.2	40.0	375689	4908471	335
6	Existing	31.3	40.0	374899	4908391	331
7	Existing	31.4	40.0	375730	4908499	368
8	Existing	30.6	40.0	374715	4908641	504
9	Existing	28.8	40.0	375915	4908828	589
10	Existing	28.8	40.0	374668	4908469	553
11	Existing	28.7	40.0	374677	4908443	544
12	Existing	28.7	40.0	374663	4908459	558
13	Existing	28.3	40.0	374642	4908444	579
14	Existing	28.7	40.0	375920	4908519	555
15	Existing	28.1	40.0	374653	4908391	573
16	Existing	27.8	40.0	374650	4908357	582
17	Existing	27.5	40.0	374649	4908319	592
18	Existing	26.4	40.0	375565	4908003	581
19	Existing	26.1	40.0	374424	4908475	795
20	Existing	25.2	40.0	376140	4908382	794
21	Existing	25.1	40.0	375536	4907873	675
22	Existing	24.9	40.0	375601	4907886	698
23	Existing	25.0	40.0	376172	4908413	819
24	Existing	24.9	40.0	375617	4907888	705
25	Existing	24.9	40.0	376202	4908472	841
26	Existing	24.9	40.0	375618	4907883	709
27	Existing	24.9	40.0	376144	4908343	808
28	Existing	24.2	40.0	376221	4908472	859
29	Existing	23.8	40.0	374095	4908792	1055
30	Existing	23.5	40.0	376420	4908785	1077
31	Existing	23.1	40.0	376263	4908254	948
32	Existing	22.9	40.0	376352	4908403	998
33	Existing	22.8	40.0	376401	4908524	1035
34	Existing	23.5	40.0	374061	4908779	1090

Noise Receptor ID	Description	Total Sound Pressure (dBA)	Performance Limit (dBA)	POR Coordinates NAD83 Zone 18		Min dist. to source (m)
				X (m)	Y (m)	
35	Existing	23.2	40.0	376456	4908827	1121
36	Existing	23.2	40.0	376456	4908816	1119
37	Existing	23.4	40.0	374051	4908771	1101
38	Existing	23.1	40.0	376467	4908819	1130
39	Existing	22.6	40.0	376413	4908486	1049
40	Existing	23.1	40.0	376467	4908787	1123
41	Existing	23.4	40.0	374049	4908732	1108
42	Existing	22.6	40.0	376395	4908404	1041
43	Existing	23.3	40.0	374033	4908775	1118
44	Existing	23.0	40.0	376486	4908821	1149
45	Existing	23.2	40.0	374018	4908782	1132
46	Existing	22.4	40.0	376428	4908424	1071
47	Existing	23.1	40.0	374012	4908742	1143
48	Existing	22.1	40.0	376473	4908471	1110
49	Existing	22.0	40.0	376464	4908401	1109
50	Existing	22.0	40.0	376501	4908496	1137
51	Existing	21.9	40.0	376517	4908502	1152
52	Existing	21.9	40.0	374041	4908368	1184
53	Existing	21.9	40.0	376475	4908372	1125
54	Existing	21.8	40.0	374031	4908341	1197
55	Existing	21.6	40.0	376543	4908488	1179
56	Existing	21.6	40.0	373995	4908355	1231
57	Existing	21.5	40.0	376570	4908492	1206
58	Existing	21.4	40.0	376579	4908501	1214
59	Existing	21.4	40.0	376559	4908415	1202
60	Existing	21.3	40.0	373970	4908332	1258
61	Existing	21.2	40.0	376582	4908416	1224
62	Existing	21.2	40.0	376575	4908390	1221
63	Existing	21.0	40.0	376599	4908391	1245
64	Existing	21.1	40.0	374114	4908001	1202
65	Existing	21.0	40.0	376563	4908279	1230
66	Existing	21.0	40.0	376639	4908497	1274
67	Existing	21.1	40.0	374112	4907985	1211
68	Existing	20.9	40.0	376619	4908384	1265
69	Existing	21.0	40.0	374120	4907962	1213
70	Existing	20.8	40.0	376639	4908427	1280
71	Existing	21.0	40.0	374125	4907944	1216
72	Existing	20.9	40.0	374292	4907740	1182
73	Existing	20.7	40.0	374295	4907701	1204
74	Existing	20.7	40.0	374302	4907684	1210
75	Existing	20.4	40.0	374370	4907584	1229
76	Existing	19.3	40.0	374270	4907464	1385

Noise Receptor ID	Description	Total Sound Pressure (dBA)	Performance Limit (dBA)	POR Coordinates NAD83 Zone 18		Min dist. to source (m)
				X (m)	Y (m)	
77	Existing	19.3	40.0	374294	4907445	1382
78	Existing	19.5	40.0	375711	4910569	1401
79	Existing	19.0	40.0	374470	4907277	1410
80	Existing	19.5	40.0	375130	4910648	1417
81	Existing	19.4	40.0	375350	4910651	1422
82	Existing	18.7	40.0	374425	4907247	1460
83	Existing	19.1	40.0	374176	4910350	1476
84	Existing	18.8	40.0	375810	4910665	1523
85	Existing	18.7	40.0	375839	4910662	1530
86	Existing	18.6	40.0	375582	4910750	1546
87	Existing	18.5	40.0	375616	4910758	1560
88	Existing	18.6	40.0	375312	4910797	1566
89	Existing	18.4	40.0	375520	4910793	1578
90	Existing	18.4	40.0	375596	4910786	1584
91	Existing	18.3	40.0	375738	4910769	1600
92	Existing	18.3	40.0	375694	4910780	1599
93	Existing	18.2	40.0	376006	4910684	1617
94	Existing	18.2	40.0	375836	4910752	1614
95	Existing	18.2	40.0	375781	4910778	1621
96	Existing	18.0	40.0	375946	4910750	1652
97	Existing	18.0	40.0	376124	4910680	1669
98	Existing	17.9	40.0	375940	4910769	1667
99	Existing	17.9	40.0	375883	4910801	1676
100	Existing	17.5	40.0	376338	4910643	1755
101	Existing	17.4	40.0	375943	4910864	1756
102	Existing	17.3	40.0	376471	4910596	1801
103	Existing	17.2	40.0	376516	4910592	1828
104	Existing	17.2	40.0	376479	4910622	1826
105	Existing	17.1	40.0	376291	4910758	1822
106	Existing	16.2	40.0	376487	4910842	2003
107	Existing	16.0	40.0	376511	4910891	2057
108	Vacant	36.0	40.0	375221	4908386	84
109	Vacant	16.0	40.0	376511	4910891	2057
110	Vacant	20.5	40.0	374300	4907665	1224
111	Vacant	21.5	40.0	374361	4907792	1096
112	Vacant	30.5	40.0	375293	4908203	277
113	Vacant	23.3	40.0	376333	4908480	970
114	Vacant	27.8	40.0	374580	4908475	640
115	Vacant	25.6	40.0	374377	4908469	842
116	Vacant	19.4	40.0	374937	4910638	1422
117	Vacant	19.4	40.0	375103	4910659	1428
118	Vacant	19.7	40.0	375235	4910613	1384

Noise Receptor ID	Description	Total Sound Pressure (dBA)	Performance Limit (dBA)	POR Coordinates NAD83 Zone 18		Min dist. to source (m)
				X (m)	Y (m)	
119	Vacant	19.5	40.0	375594	4910604	1405
120	Vacant	18.8	40.0	375982	4910595	1527
121	Vacant	18.7	40.0	375428	4910762	1537
122	Vacant	18.7	40.0	374944	4910752	1533
123	Vacant	18.5	40.0	374763	4910743	1558
124	Vacant	18.1	40.0	374557	4910741	1619
125	Vacant	17.8	40.0	374358	4910729	1689
126	Vacant	35.4	40.0	375024	4908471	197
127	Vacant	32.9	40.0	374925	4908471	296
128	Vacant	32.0	40.0	374933	4908403	296
129	Vacant	20.3	40.0	374374	4907565	1240
130	Vacant	18.5	40.0	375663	4910759	1572

7. Conclusions and Recommendations

For the Kingston Gardiner TS Unity Road Solar Energy Project, the sound pressure levels at the points of reception used to model the Noise Receptors have been estimated using the CADNA-A model based on ISO 9613-2. The performance limits used for comparison correspond to Class 3 areas, with a 40-dBA threshold. Mitigation for operation of the Project has been modeled and shown to be feasible.

Based on the results obtained in this study, it is concluded that the sound pressure levels at the Noise Receptors, resulting from the Project operation, will be below MOE requirements for Class 3 areas of 40 dBA at all times.

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8. References

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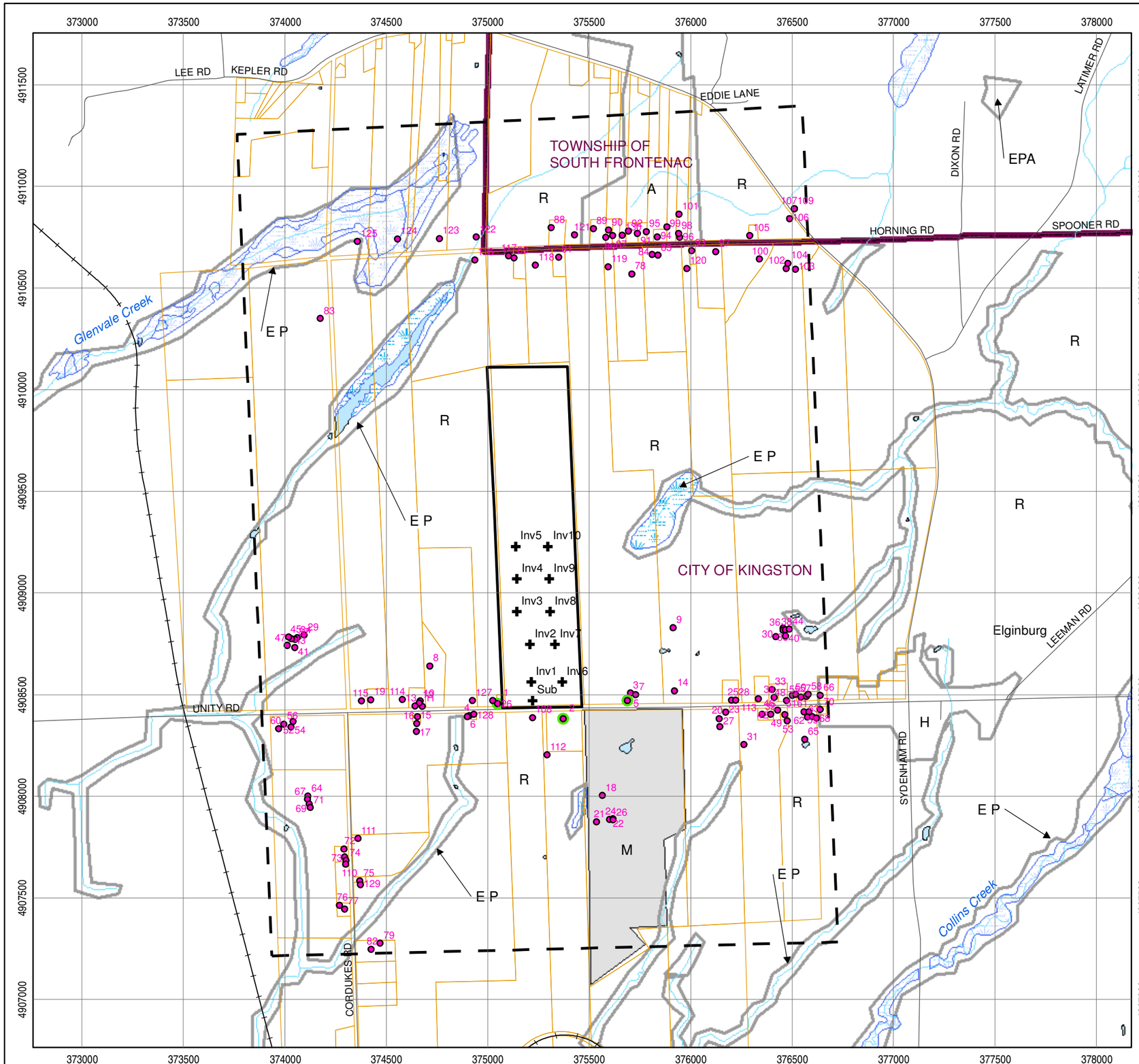
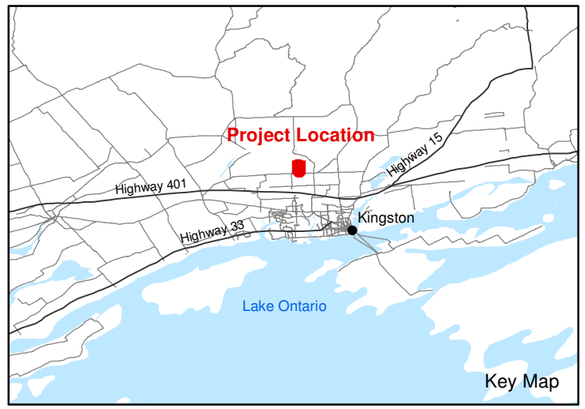
Appendix A

Land-Use Zoning Designation Plan, Area Location Plan and Facility Layout





LEGEND

- Substation Transformer
- Inverter Unit
- Noise Receptor
- Representative Noise Receptor
- 1200m Envelope
- Railway
- Road
- Parcel
- Watercourse
- Authorized Aggregate Site
- Project Site
- Water Body
- Wetland
- Zoning

Land Use

EP	Environmental Protection
EPA	Environmental Protection Area
M	Mineral Resource Area
H	Hamlet
R	Rural
A	Agricultural

Notes:
1. OBM and NRVIS data downloaded from LIO,with permission.
2. Spatial referencing UTM NAD 83, August 2010.
3. Land Use information obtained from City of Kingston Official Plan, Schedule 3-B, Approved Jan 27, 2010 and Official Plan of the Township of South Frontenac, Schedule A, Oct. 2014

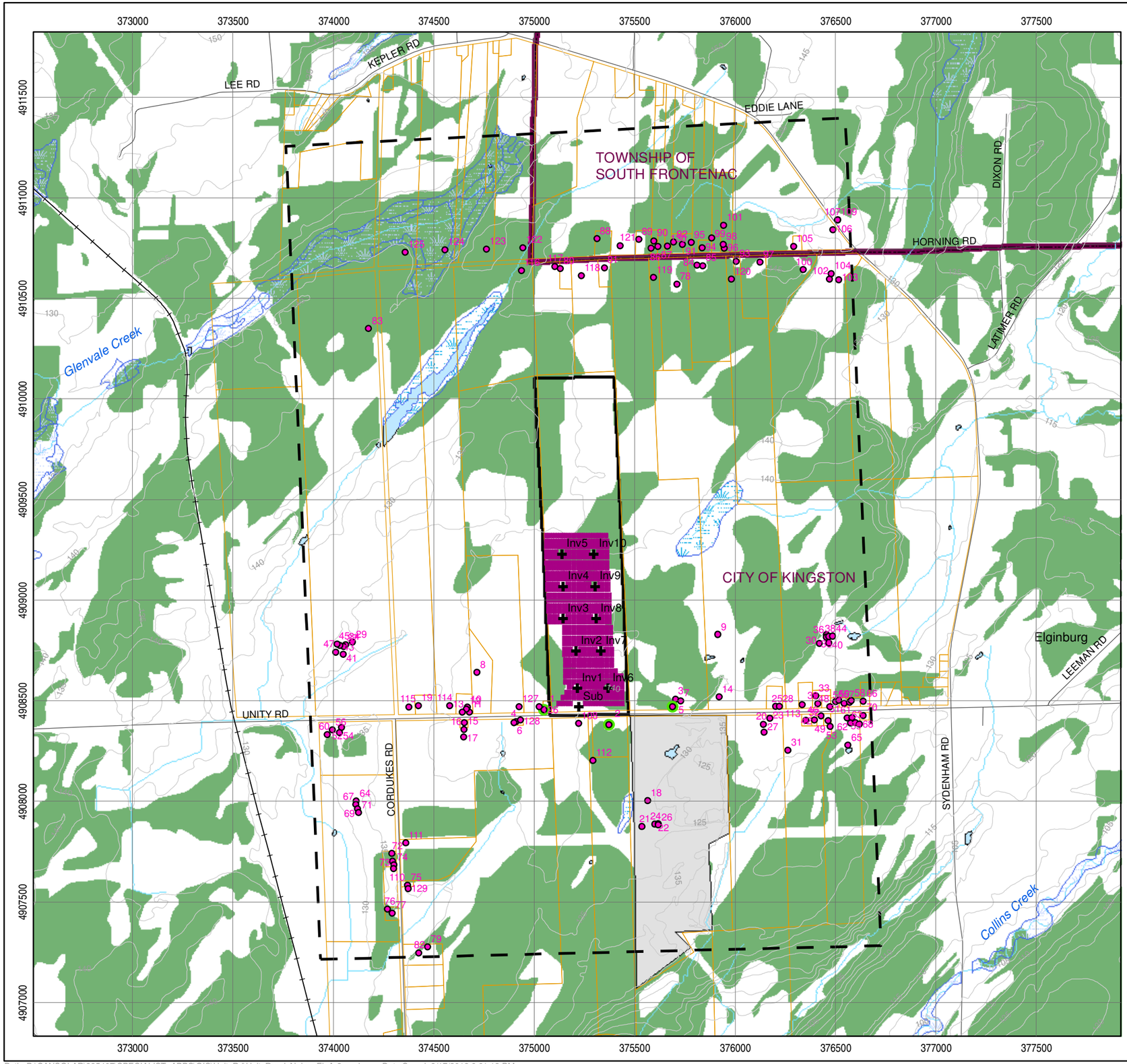
0 0.25 0.5 1 Km

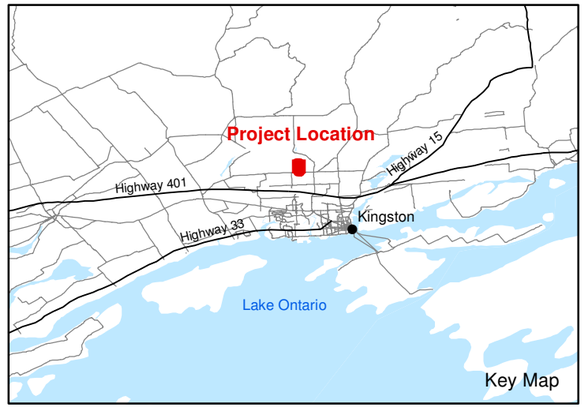
NORTH

Scale 1:20,000

Figure A.1
SunEdison Canada
Kingston Gardiner TS Unity Road Solar Energy Project
Land Use Plan

HATCH





LEGEND

- Substation Transformer
- Inverter Unit
- Noise Receptor
- Representative Noise Receptor
- Solar PV Panels
- 1200m Envelope
- Railway
- Road
- Topographic Contour (5 m Interval)
- Parcel
- Watercourse
- Authorized Aggregate Site
- Project Site
- Water Body
- Wetland
- Woodland

Notes:
1. OBM and NRVIS data downloaded from LIO,with permission.
2. Spatial referencing UTM NAD 83, August 2010.

0 0.25 0.5 1 Kilometers

NORTH

Scale 1:20,000

Figure A.2
SunEdison Canada
Kingston Gardiner TS Unity Road Solar Energy Project
Area Location Plan

HATCH

Path: P:\CANSOLAR\335467\SPECIALIST_APPS\GIS\UnityRd\UnityRoad_Noise_FigA-2.mxd Date Saved: 9/17/2012 6:01:13 PM

Appendix B

Noise Sources

Table B.1: Point Sources Used in CADNA-A, Includes Tonality Penalty of 5.0-dBA. NAD83 Zone18

Source ID	Description	Spectra ID	Total Sound Power Level - 24 Hours (dBA)	Correction - 24 Hours (dBA)	Height (m)	Coordinates , UTM NAD83 Zone 18	
						X	Y
Sub	27.6-kV/44-kV/10-MVA Substation transformer	Transformer10MVA	90.8	5.0	3.0	375221.1	4908470.3
Inv1	Sunny Central 1000MV inverter unit	SC1000MV	102.2	5.0	3.5	375214.2	4908562.5
Inv2	Sunny Central 1000MV inverter unit	SC1000MV	102.2	5.0	3.5	375208.3	4908747.8
Inv3	Sunny Central 1000MV inverter unit	SC1000MV	102.2	5.0	3.5	375143.4	4908908.7
Inv4	Sunny Central 1000MV inverter unit	SC1000MV	102.2	5.0	3.5	375143.8	4909069.7
Inv5	Sunny Central 1000MV inverter unit	SC1000MV	102.2	5.0	3.5	375137.9	4909230.7
Inv6	Sunny Central 1000MV inverter unit	SC1000MV	102.2	5.0	3.5	375366.8	4908562.5
Inv7	Sunny Central 1000MV inverter unit	SC1000MV	102.2	5.0	3.5	375331.6	4908747.8
Inv8	Sunny Central 1000MV inverter unit	SC1000MV	102.2	5.0	3.5	375307.7	4908908.7
Inv9	Sunny Central 1000MV inverter unit	SC1000MV	102.2	5.0	3.5	375302.2	4909069.7
Inv10	Sunny Central 1000MV inverter unit	SC1000MV	102.2	5.0	3.5	375296.4	4909230.7

Table B.2: Frequency Spectra Used for Modelling the Noise Sources, Not Including Tonality Penalty

Spectra ID	Octave Spectrum (dBA)										
	31.5	63	125	250	500	1000	2000	4000	8000	A	lin
Transformer10MVA	43.0	62.2	74.3	76.8	82.2	79.4	75.6	70.4	61.3	85.8	94.4
SC1000MV		64.8	78.9	93	91.6	90.1	87.6	79.9	65.4	97.2	103.7

Table B.3: Noise Reduction and Sound Transmission Characteristics of the Acoustical Louvers

Name	Octave Spectrum (dBA)								
	31.5	63	125	250	500	1000	2000	4000	8000
Greenheck Louver	0	10	10	12	16	23	18	0	0

Table B.4 Absorption Coefficient α for the Barrier (Source: Daniel R. Raichel; 2000; The Science and Applications of Acoustics; Table 11.1)

	Octave Spectrum									
Spectra ID	**31.5**	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**Aw**
Wood_2in	0.00	0.00	0.01	0.05	0.05	0.04	0.04	0.04	0.00	0.05

Table B.5 Coordinates of Barriers as Modeled in CADNA-A
Note, slight variations may exist between the modeled and true barrier dimensions.

ID	Location	Height [m]	Length [m]	Coordinates , UTM NAD83 Zone 18	
				X	Y
Barrier_Sub	Sub	4.5	13.0	375217.86	4908470.63
				375217.86	4908467.63
				375224.86	4908467.63
				375224.86	4908470.63

SUNNY CENTRAL 800MV / 1000MV / 1250MV

SC 800MV-11 / SC 1000MV-11 / SC 1250MV-11

Efficient

- Without low-voltage transformer: greater plant efficiency due to direct connection to the medium-voltage grid

Turnkey Delivery

- With medium-voltage transformer and concrete substation for outdoor installation

Optional

- Medium-voltage switchgear systems for a flexible structure of large solar parks
- AC transfer station with measurement
- Medium-voltage transformers for other grid voltages (deviating from 20 kV)

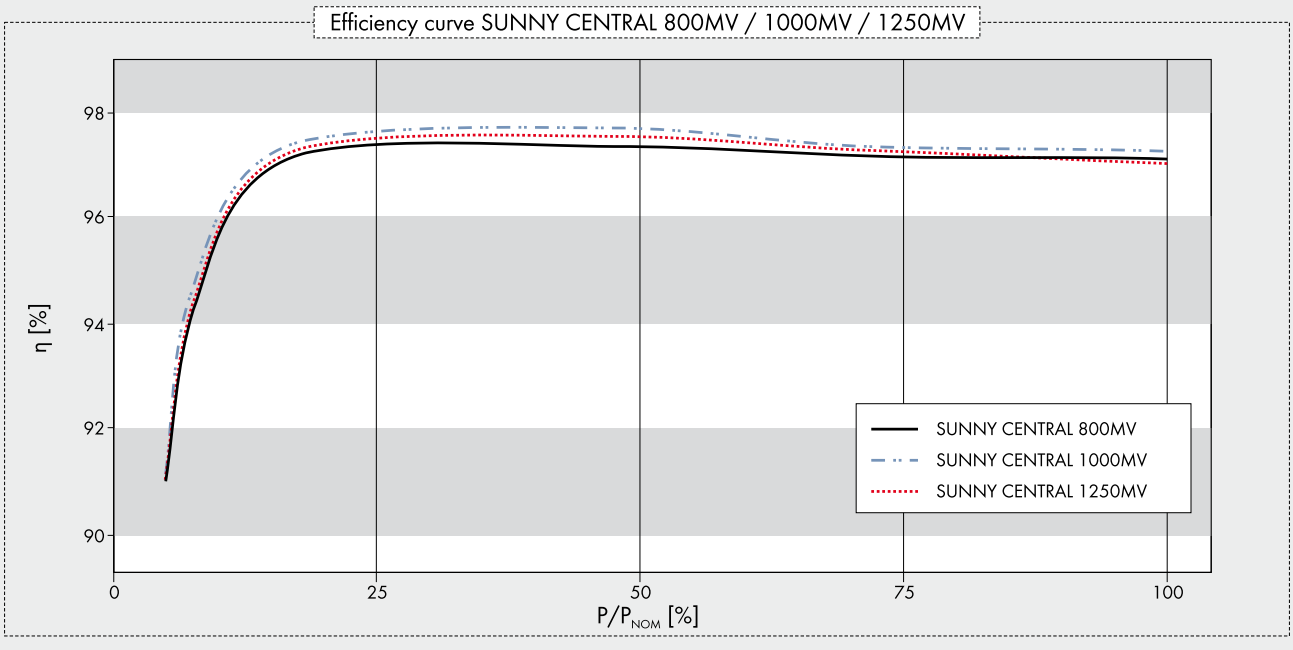
SUNNY CENTRAL for Direct medium-voltage feed-in 800MV / 1000MV / 1250MV

High-performance medium-voltage station

For even more power: Two powerful Sunny Central HE inverters are components of a medium-voltage station (MV) which feeds directly into a shared medium-voltage transformer. In this way, for example, two Sunny Central 630HE inverters are combined into a powerful Sunny Central 1250MV station. The advantage: By removing the need for the low-voltage transformer, the plant operator realizes greater yields and at the same time lower inverter costs. The Sunny Central MV is delivered as a "turnkey" concrete substation for outside installation. On top of that, the Sunny Central MV actively participates in grid management, and thereby fulfils all requirements of the Medium-Voltage Directive valid as of July 2010.

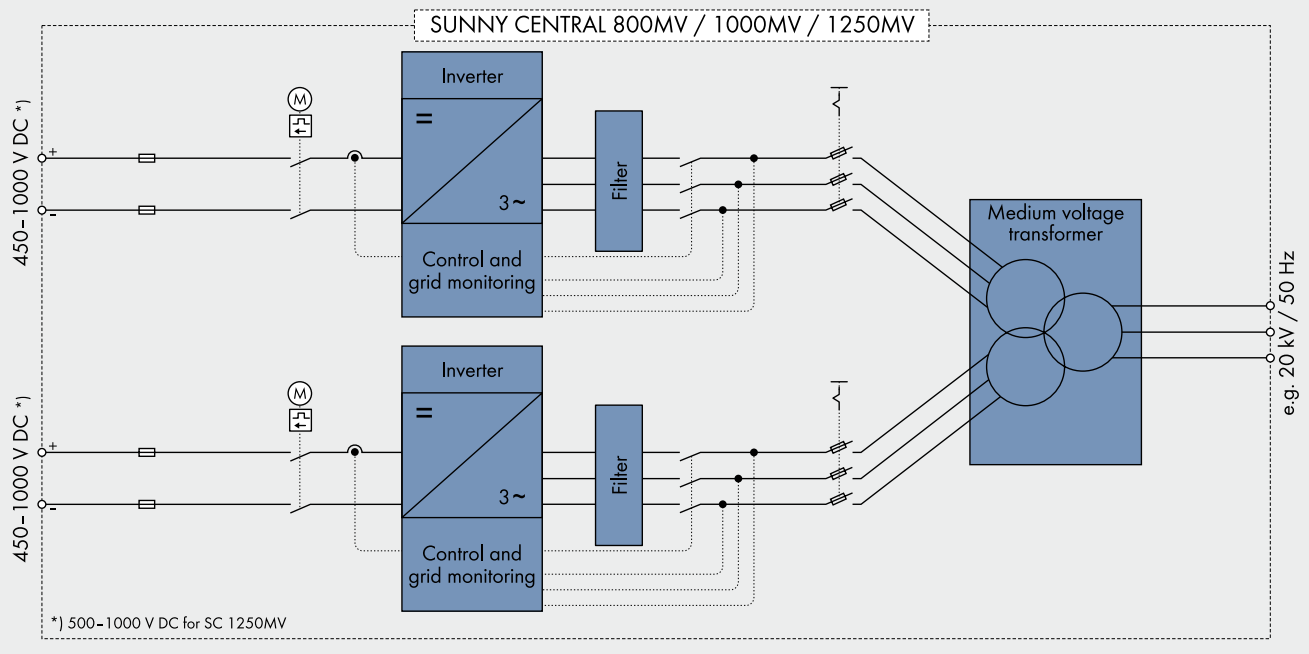
SUNNY CENTRAL 800MV / 1000MV / 1250MV

Technical data	Sunny Central 800MV	Sunny Central 1000MV	Sunny Central 1250MV
Input data			
Nominal DC power	816 kW	1018 kW	1284 kW
Max. DC power	900 kWp[1)]	1120 kWp[1)]	1410 kWp[1)]
MPP voltage range	450 V – 820 V [5)]	450 V – 820 V [5)]	500 V – 820 V [5) 7)]
Max. DC voltage	1000 V	1000 V	1000 V
Max. DC current	1986 A	2484 A	2844 A
Number of DC inputs	(16 + 16) + 4 DCHV	(16 + 16) + 4 DCHV	(16 + 16) + 4 DCHV
Output data			
Nominal AC power @ 45 °C	800 kVA	1000 kVA	1250 kVA
Continuous AC power @ 25 °C	880 kVA	1100 kVA	1400 kVA
Nominal AC voltage	20000 V	20000 V	20000 V
Nominal AC current	23.2 A	28.8 A	36.1 A
AC grid frequency 50 Hz	●	●	●
AC grid frequency 60 Hz	●	●	●
Power factor (cos φ)		0.9 leading ... 0.9 lagging	
Max. THD	< 3 %	< 3 %	< 3 %
Power consumption			
Internal consumption in operation	< 3000 W [4)]	< 3000 W [4)]	< 3000 W [4)]
Standby consumption	< 180 W + 1100 W	< 180 W + 1100 W	< 180 W + 1350 W
External auxiliary supply voltage	3 x 230 V, 50/60 Hz	3 x 230 V, 50/60 Hz	3 x 230 V, 50/60 Hz
External back-up fuse for auxiliary supply	B 20 A, 3-pole	B 20 A, 3-pole	B 20 A, 3-pole
Dimensions and weight			
Height	3620 mm	3620 mm	3620 mm
Width	5400 mm	5400 mm	5400 mm
Depth	3000 mm	3000 mm	3000 mm
Weight	35000 kg	35000 kg	35000 kg
Efficiency [2)]			
Max. efficiency	97.7 %	97.9 %	97.8 %
Euro-eta	97.3 %	97.5 %	97.4 %
Protection rating and ambient conditions			
Protection rating (as per EN 60529)	IP54	IP54	IP54
Operating temperature range	–20 °C ... +45 °C	–20 °C ... +45 °C	–20 °C ... +45 °C
Rel. humidity	15 % ... 95 %	15 % ... 95 %	15 % ... 95 %
Fresh air consumption	12400 m³/h	12400 m³/h	12400 m³/h
Max. altitude (above sea level)	1000 m	1000 m	1000 m

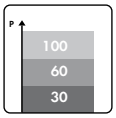


	Sunny Central 800MV	Sunny Central 1000MV	Sunny Central 1250MV
Features			
Display: text line / graphic	●/–	●/–	●/–
Ground fault monitoring	●	●	●
Heating	●	●	●
Emergency stop	●	●	●
Circuit breaker AC side	SI load disconnection switch	SI load disconnection switch	SI load disconnection switch
Circuit breaker DC side	Switch-disconnector with motor	Switch-disconnector with motor	Switch-disconnector with motor
Monitored overvoltage protectors AC / DC	●/●	●/●	●/●
Monitored overvoltage protectors for auxiliary supply	●	●	●
SCC (Sunny Central Control) interfaces			
Communication (NET Piggy-Back, optional)	analog, ISDN, Ethernet	analog, ISDN, Ethernet	analog, ISDN, Ethernet
Analog inputs	10 x A_{in} [3]	10 x A_{in} [3]	10 x A_{in} [3]
Overvoltage protection for analog inputs	O	O	O
Sunny String-Monitor connection (COM1)	RS485	RS485	RS485
PC connection (COM3)	RS232	RS232	RS232
Electrically separated relay (ext. alert signal)	2	2	2
Certificates / listings			
EMC	EN 61000-6-2 EN 61000-6-4		
CE conformity	●	●	●
BDEW-MSRL / FGW / TR8 [6]	●	●	●
RD 1633 / 2000	●	●	●
Arrêté du 23/04/08	●	●	●
● standard features O optional features – not available			
Type designation	SC 800MV-11	SC 1000MV-11	SC 1250MV-11

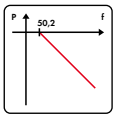
HE: High Efficiency, inverter without galvanic isolation for connection to a medium-voltage transformer (taking into account the SMA specification for the transformer)
1) Specifications apply to irradiation values below STC
2) Efficiency measured without an internal power supply at U_{DC} = 500 V
3) 2x inputs for the external nominal value specification for active power and reactive power, 1x external alarm input, 1x irradiation sensor, 1x pyranometer
4) Internal consumption at nominal power
5) At 1.05 $U_{AC, nom}$ and cos φ = 1
6) With limited dynamic grid support
7) At f_{grid} = 60 Hz: 510 V - 820 V
Please note: in certain countries the substations may differ from the substations shown in the images



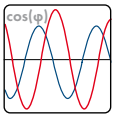
POWERFUL GRID MANAGEMENT FUNCTIONS



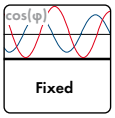
Remote controlled power reduction in case of grid overload
In order to avoid short-term grid overload, the grid operator presets a nominal active power value which the inverter will implement within 60 seconds. The nominal value is transmitted to the inverters via a ripple control receiver in combination with the SMA Power Reducer Box. Typical limit values are 100, 60, 30 or 0 per cent of the nominal power.



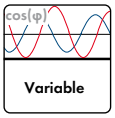
Frequency-dependent control of active power
As of a grid frequency of 50.2 Hz, the inverter automatically reduces the fed-in of active power according to a definable characteristic curve which thereby contributes to the stabilization of the grid frequency.



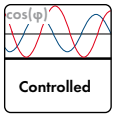
Static voltage support based on reactive power
To stabilize the grid voltage, SMA inverters feed reactive power (leading or lagging) into the grid. Three different modes are available:



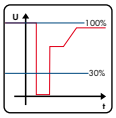
a) Fixed definition of the reactive power by the grid operator
The grid operator defines a fixed reactive power value or a fixed displacement factor between $\cos(\varphi)_{leading}$= 0.90 and $\cos(\varphi)_{lagging}$= 0.90.



b) Definition of a dynamic setpoint of the reactive power by the utility operator
The grid operator defines a dynamic displacement factor - any value between $\cos(\varphi)_{leading}$= 0.90 und $\cos(\varphi)_{lagging}$= 0.90. It is transmitted either through a communication unit the evaluation can e.g. be evaluated and processed by the SMA Power Reducer Box.



c) Control of the reactive power over a characteristic curve
The reactive power or the phase shift is controlled by a pre-defined characteristic curve – depending on the active power fed into the grid or the grid voltage.

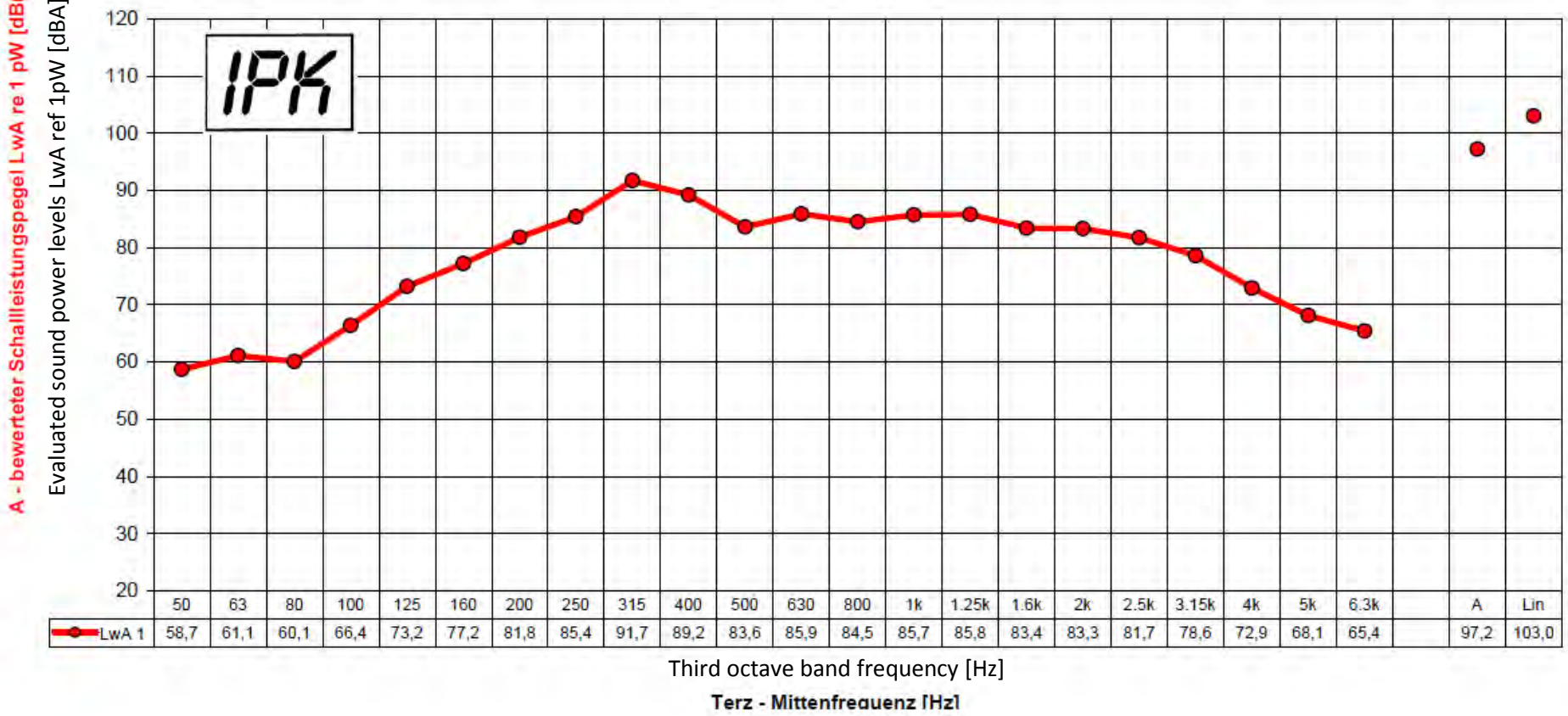


Limited Dynamic Grid Support
The inverter continues to feed to the grid after short term voltage drops – as long as the grid voltage is within a defined voltage window.

SMA Solar Technologie Umrichteranlage Sunny Central SC 1000MV
Betrieb bei Nennleistung und 50 Hz; 1000 KW

SMA Solar Technologies Inverter Unit Sunny Central SC 1000MV

Name Plate Capacity 1000 kW at 50 Hz



	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	6.3k		A	Lin
LwA 1	58,7	61,1	60,1	66,4	73,2	77,2	81,8	85,4	91,7	89,2	83,6	85,9	84,5	85,7	85,8	83,4	83,3	81,7	78,6	72,9	68,1	65,4		97,2	103,0

Third octave band frequency [Hz]

Terz - Mittenfrequenz [Hz]

Estimated Frequency Spectra for Transformers

Transformer - 44kV/10MVA

From Handbook of Noise and Vibration Control (Crocker, 2007, page 1335-1336, Eq. 18 and Table 20) and Beranek's old notes (page 7-19)

Average LpA	68 dBA	Based on NEMA TR1-1993 (R2000), Table 0-2
Estimated surface area	35 m^2	Can be assumed, 25% of change will produce a difference of 1 dB on Lw, try to estimate on the high side

Correction factors are in dB

Freq. (Hz)	31	63	125	250	500	1000	2000	4000	8000	Notes
C1	-11.0	-5.0	-3.0	-8.0	-8.0	-14.0	-19.0	-24.0	-31.0	Outdoors, indoors in mechanical room over 140 m^3
C2	-11	-2	3	-2	-2	-11	-19	-24	-31	Indoors
C3	-11	-2	3	2	2	-4	-9	-14	-21	Serious Noise Problems

Sound Power Level calculated as Lw=Average LpA + 10*log(Estimated surface area) + C + 10

Freq. (Hz)	31	63	125	250	500	1000	2000	4000	8000	Combined [dB]
C1 based [dB]	82.4	88.4	90.4	85.4	85.4	79.4	74.4	69.4	62.4	**94.5**
C2 based [dB]	82.4	91.4	96.4	91.4	91.4	82.4	74.4	69.4	62.4	**99.5**
C3 based [dB]	82.4	91.4	96.4	95.4	95.4	89.4	84.4	79.4	72.4	**101.5**

Resulting A-weighted sound power level

Freq. (Hz)	A-Weight	C1 based [dBA]	C2 based [dBA]	C2 based [dBA]
31	-39.4	43.0	52.0	57.0
63	-26.2	62.2	65.2	65.2
125	-16.1	74.3	80.3	80.3
250	-8.6	76.8	82.8	86.8
500	-3.2	82.2	88.2	92.2
1000	0	79.4	82.4	89.4
2000	1.2	75.6	75.6	85.6
4000	1	70.4	70.4	80.4
8000	-1.1	61.3	61.3	71.3
LwA [dBA]		**85.8**	**90.8**	**95.6**

Used in the study

Figure B.1: Sound Power Level Calculation for 27.6-kV/44-kV/10-MVA Substation Transformer

Third octave, as provided		
Freq #	Freq (Hz)	LwA (dBA)
1	25	
2	31.5	
3	40	
4	50	58.7
5	63	61.1
6	80	60.1
7	100	66.4
8	125	73.2
9	160	77.2
10	200	81.8
11	250	85.4
12	315	91.7
13	400	89.2
14	500	83.6
15	630	85.9
16	800	84.5
17	1000	85.7
18	1250	85.8
19	1600	83.4
20	2000	83.3
21	2500	81.7
22	3150	78.6
23	4000	72.9
24	5000	68.1
25	6300	65.4
26	8000	
27	10000	
	Total LwA	97.2

Full octave, as used in CADNA-A model		
Freq #	Freq (Hz)	LwA (dBA)
	31.5	
5	63	64.8
8	125	78.9
11	250	93.0
14	500	91.6
17	1000	90.1
20	2000	87.6
23	4000	79.9
26	8000	65.4
	Total LwA	97.2

$$\rightarrow 10\log\left(10^{\frac{58.7}{10}}+10^{\frac{61.1}{10}}+10^{\frac{60.1}{10}}\right)=64.8dBA$$

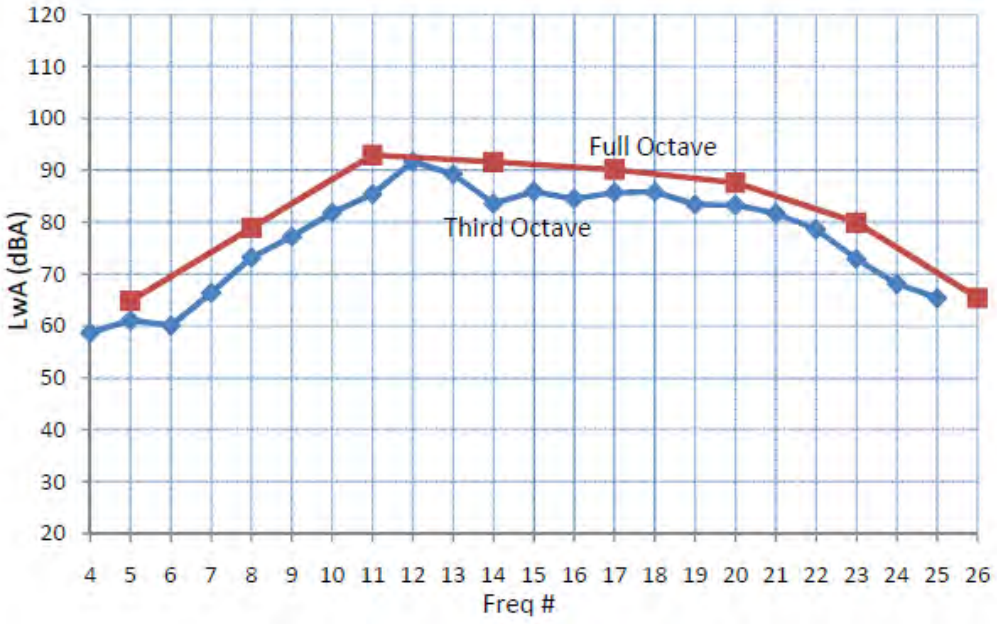


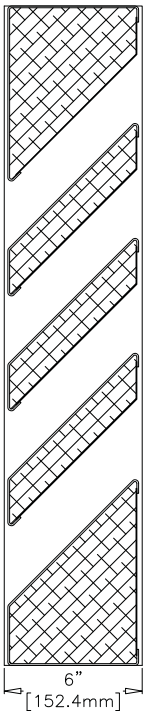
Figure B.2: Sound Power Level Calculation for SMA Sunny Central 1000MV, 100% LOAD

GREENHECK AFJ-601

Acoustical Louver
J Blade

Application and Design

AFJ-601 is an acoustical weather louver designed to protect air intake and exhaust openings in building exterior walls. Design incorporates J style insulated acoustical blades and high free area to provide maximum resistance to sound transmission, rain and weather while providing minimum resistance to airflow. The AFJ-601 is an extremely efficient louver with **AMCA LICENSED PERFORMANCE DATA** enabling designers to select and apply with confidence.



amca CERTIFIED RATINGS
WATER PENETRATION
SOUND AND AIR PERFORMANCE
AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL, INC.

Standard Construction

Frame . . . . . . Heavy gauge formed aluminum, 6 in. x 0.080 in. nominal wall thickness

Blades. . . . . . J style, heavy gauge formed aluminum, 0.080 in. nominal wall thickness, positioned at 45° on approximately 5 in. centers

Construction . . . Mechanically fastened

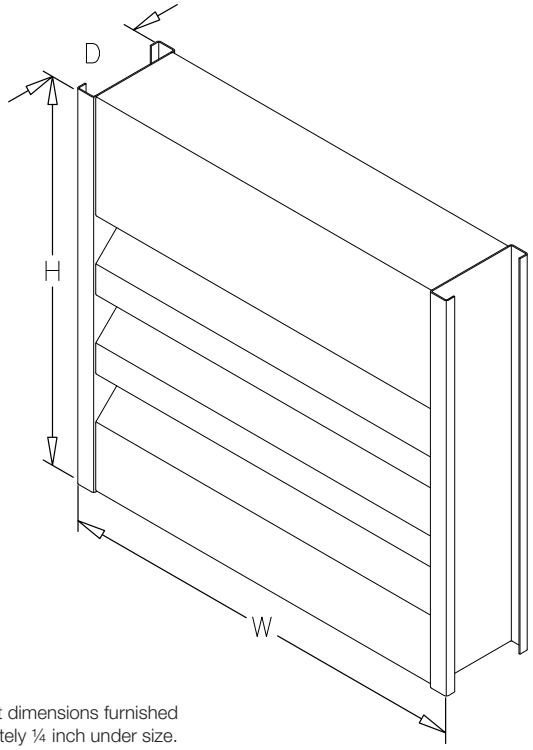
Acoustical Insulation . . . . . Fiberglass Insulation

Birdscreen. . . . . 3/4 in. x 0.051 flattened expanded aluminum in removable frame, inside mount (rear)

Finish. . . . . . Mill

Minimum Size . . 12 in. W x 15 in. H

Maximum Single Section Size . . . 60 in. W x 120 in. H



*Width and height dimensions furnished approximately ¼ inch under size.

Options *(at additional cost)*

- A variety of bird and insect screens
- Blank off panels
- Clip angles
- Extended sill
- Filter racks
- Flanged frame
- Galvanized steel frame and blade
- Security bars
- A variety of architectural finishes including:
  - Clear anodize
  - Integral color anodize
  - Baked enamel paint
  - Kynar paint

PERFORMANCE DATA

AFJ-601

J Blade Acoustical Louver
Formed Aluminum

Free Area Chart (Sq. ft.)

Louver Height Inches	Louver Width Inches								
	12	18	24	30	36	42	**48**	54	60
15	0.12	0.21	0.29	0.37	0.45	0.53	0.61	0.69	0.77
18	0.25	0.41	0.57	0.74	0.90	1.06	1.22	1.38	1.55
24	0.37	0.62	0.86	1.10	1.35	1.59	1.83	2.08	2.32
30	0.50	0.82	1.15	1.47	1.80	2.12	2.44	2.77	3.09
36	0.62	1.03	1.43	1.84	2.24	2.65	3.05	3.46	3.86
42	0.75	1.24	1.72	2.21	2.69	3.18	3.67	4.15	4.64
48	1.00	1.65	2.30	2.94	3.59	4.24	**4.89**	5.54	6.18
54	1.12	1.85	2.58	3.31	4.04	4.77	5.50	6.23	6.96
60	1.25	2.06	2.87	3.68	4.49	5.30	6.11	6.92	7.73
66	1.37	2.26	3.16	4.05	4.94	5.83	6.72	7.61	8.50
72	1.50	2.47	3.44	4.41	5.39	6.36	7.33	8.30	9.27
78	1.75	2.88	4.02	5.15	6.28	7.42	8.55	9.69	10.82
84	1.87	3.09	4.30	5.52	6.73	7.95	9.16	10.38	11.59
90	2.00	3.29	4.59	5.89	7.18	8.48	9.77	11.07	12.37
96	2.12	3.50	4.88	6.25	7.63	9.01	10.38	11.76	13.14
102	2.25	3.71	5.16	6.62	8.08	9.54	11.00	12.45	13.91
108	2.50	4.12	5.74	7.36	8.98	10.60	12.22	13.84	15.46
114	2.62	4.32	6.02	7.73	9.43	11.13	12.83	14.53	16.23
120	2.75	4.53	6.31	8.09	9.88	11.66	13.44	15.22	17.00

Greenheck Fan Corporation certifies that the AFJ-601 louvers shown herein are licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 511 and comply with the requirements of the AMCA Certified Ratings Program. The AMCA Certified Ratings Seal applies to water penetration, air performance and sound ratings.

Sound Transmission Class

The Sound Transmission Class (STC) is a rating of the effectiveness of an assembly in isolating or reducing airborne sound transmission. STC is a single number that summarizes airborne sound transmission loss data. Assemblies with higher STC ratings are more efficient at reducing sound transmission. STC is determined in accordance with ASTM E413-04.

Transmission Loss

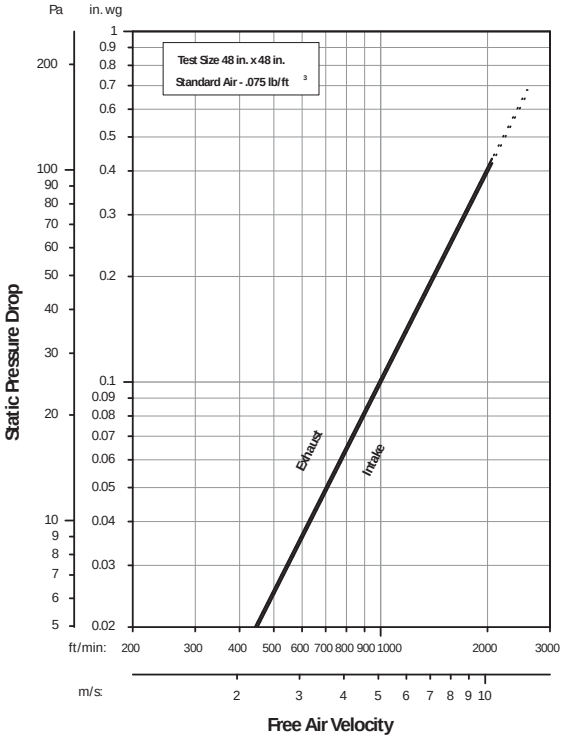
Transmission loss (TL) is a measurement of the reduction of sound power transmission (dB) through an assembly at a given frequency. The more sound power that is reduced, the greater the TL. TL is tested in accordance with ASTM E90-04.

Free Field Noise Reduction in Decibels

Free Field Noise Reduction is determined by adding 6 dB to the Transmission Loss.

Octave Band	2	3	4	5	6	7	STC
Frequency (Hz)	63	125	250	500	1000	2000	
Transmission Loss (dB)	4	4	6	10	17	12	10
Free Field Noise Reduction (dB)	10	10	12	16	23	18	

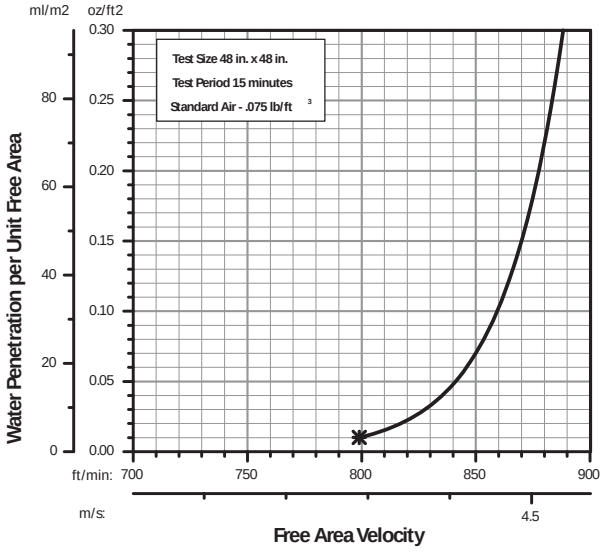
Airflow Resistance (Standard Air - .075 lb/ft³)



Model AFJ-601 resistance to airflow (pressure drop) varies depending on louver application (air intake or air exhaust). Free area velocities (shown) are higher than average velocity through the overall louver size. See louver selection information.

Water Penetration (Standard Air - .075 lb/ft³)

Test size 48 in. x 48 in. Test duration of 15 min.



The AMCA Water Penetration Test provides a method for comparing various louver models and designs as to their efficiency in resisting the penetration of rainfall under specific laboratory test conditions. The beginning point of water penetration is defined as that velocity where the water penetration curve projects through .01 oz. of water (penetration) per sq. ft. of louver free area. ***The beginning point of water penetration for Model AFJ-601 is 799 fpm free area velocity.** These performance ratings do not guarantee a louver to be weatherproof or stormproof and should be used in combination with other factors including good engineering judgement in selecting louvers.

INSTALLATION DETAILS

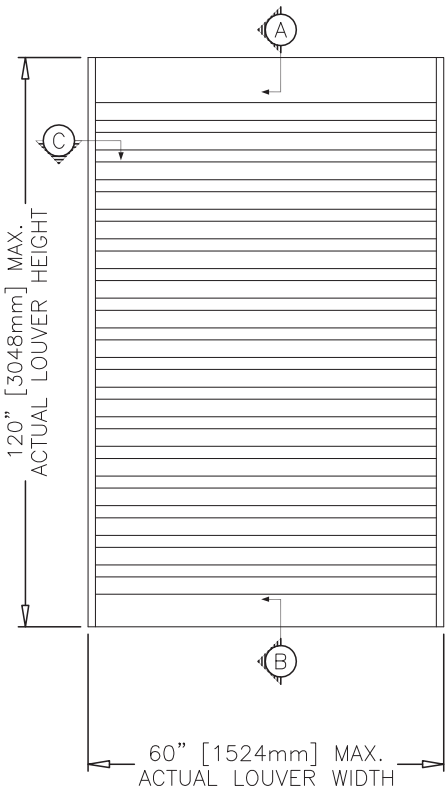
AFJ-601

J Blade Acoustical Louver
Formed Aluminum

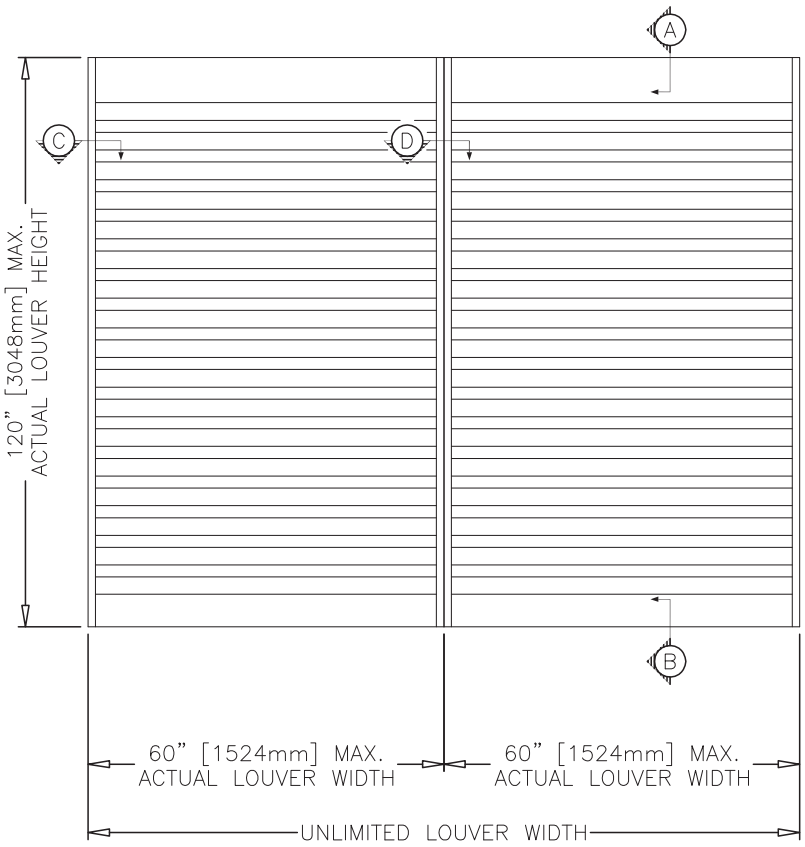
Maximum Size and Installation Information

Maximum single section size for model AFJ-601 is 60 in. W x 120 in. H. Larger openings require field assembly of multiple louver panels to make up the overall opening size. Individual louver panels are designed to withstand a 25 PSF wind-load (please consult Greenheck if the louvers must withstand higher wind-loads). Structural reinforcing members may be required to adequately support and install multiple louver panels within a large opening. Structural reinforcing members along with any associated installation hardware is not provided by Greenheck unless indicated otherwise by Greenheck. Additional information on louver installation may be found in AMCA Publication #501, Louver Application Manual.

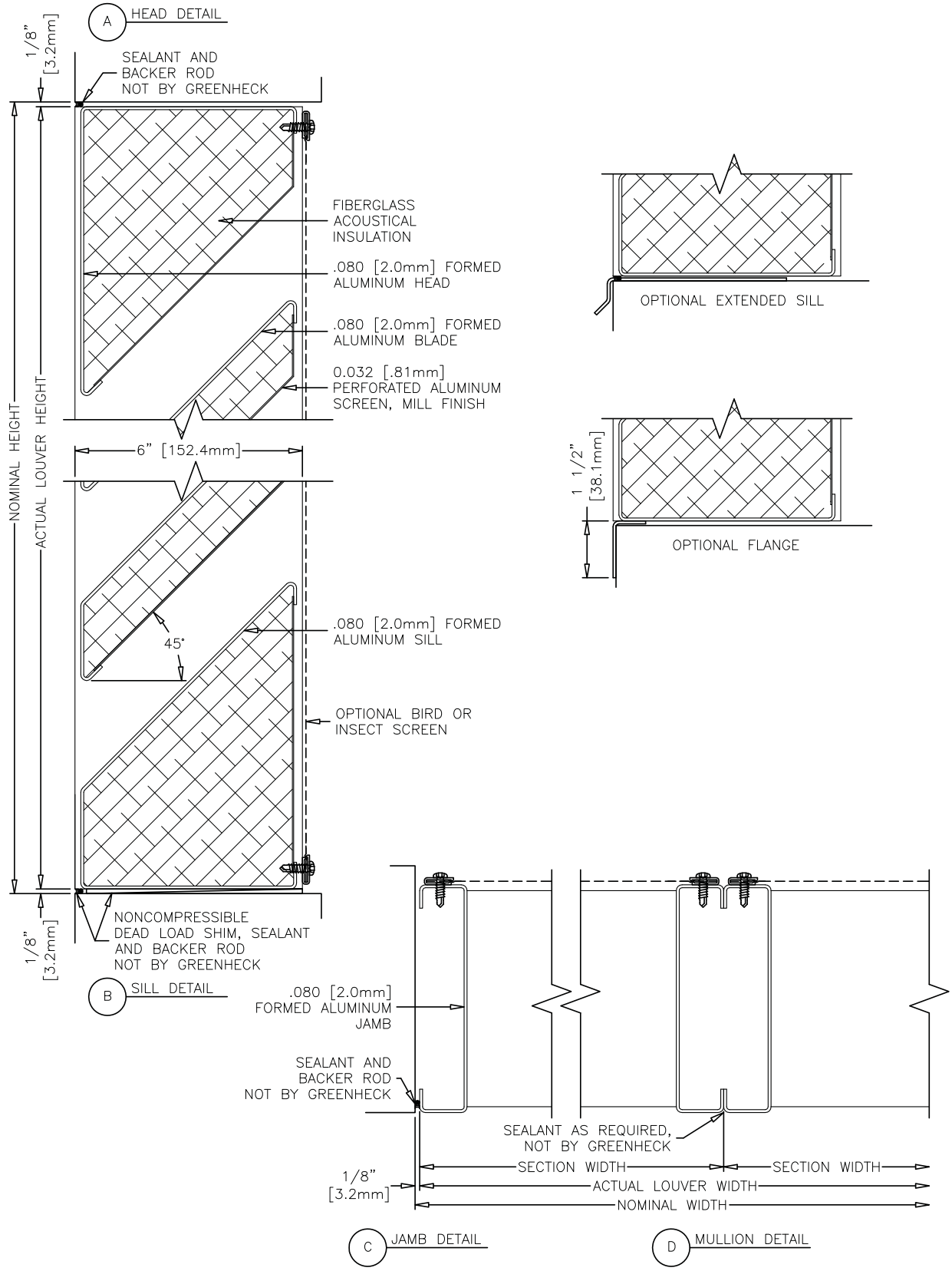
SINGLE SECTION



MULTIPLE SECTION W/ MULLION



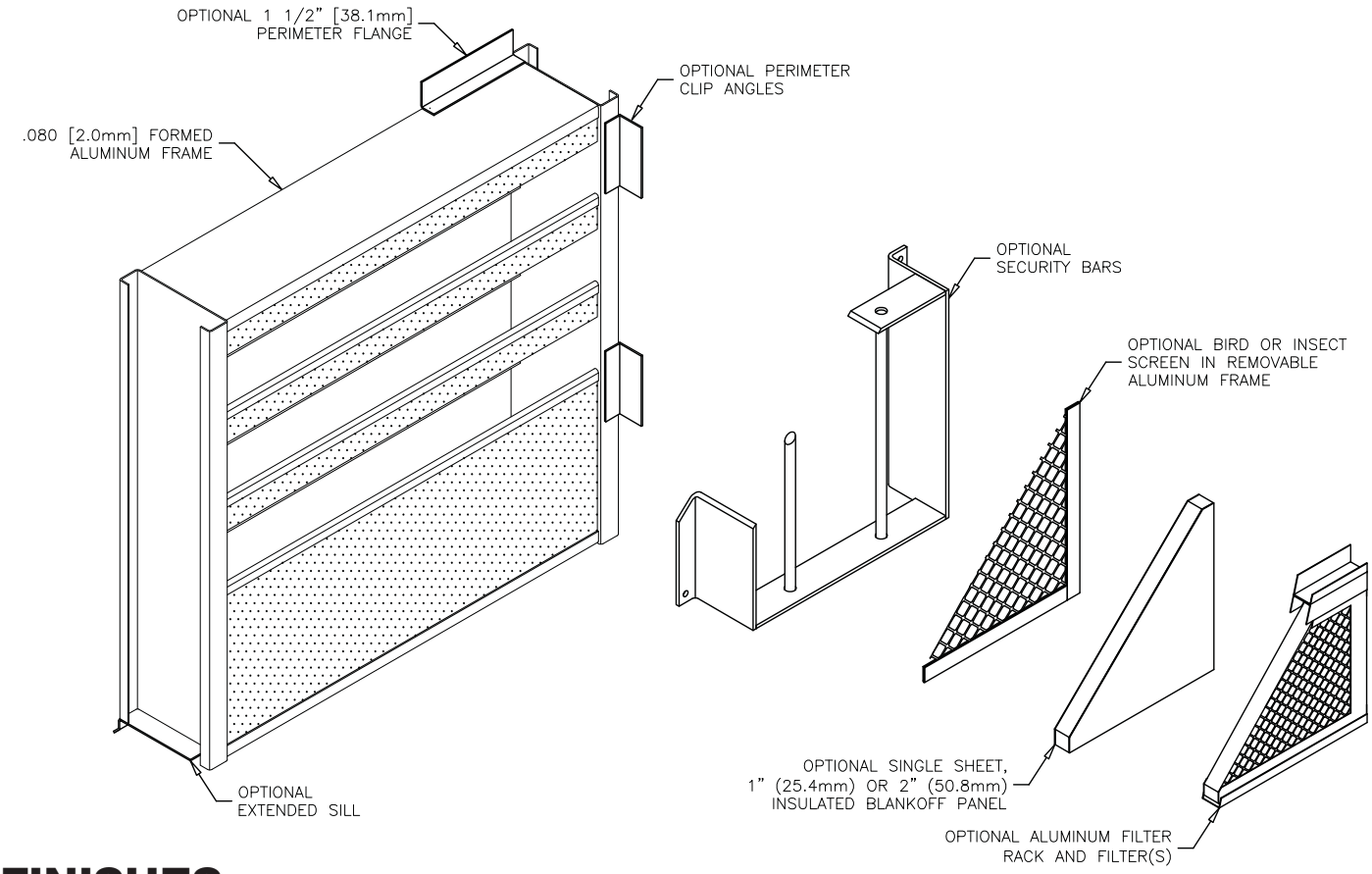
Minimum Single Section Size	Maximum Single Section Size
12 in. W x 15 in. H	60 in. W x 120 in. H


A HEAD DETAIL
1/8" [3.2mm]
SEALANT AND BACKER ROD NOT BY GREENHECK
FIBERGLASS ACOUSTICAL INSULATION
.080 [2.0mm] FORMED ALUMINUM HEAD
.080 [2.0mm] FORMED ALUMINUM BLADE
0.032 [.81mm] PERFORATED ALUMINUM SCREEN, MILL FINISH
NOMINAL HEIGHT
ACTUAL LOUVER HEIGHT
6" [152.4mm]
45°
.080 [2.0mm] FORMED ALUMINUM SILL
OPTIONAL BIRD OR INSECT SCREEN
NONCOMPRESSIBLE DEAD LOAD SHIM, SEALANT AND BACKER ROD NOT BY GREENHECK
1/8" [3.2mm]
B SILL DETAIL
OPTIONAL EXTENDED SILL
1 1/2" [38.1mm]
OPTIONAL FLANGE
.080 [2.0mm] FORMED ALUMINUM JAMB
SEALANT AND BACKER ROD NOT BY GREENHECK
SEALANT AS REQUIRED, NOT BY GREENHECK
SECTION WIDTH
SECTION WIDTH
1/8" [3.2mm]
ACTUAL LOUVER WIDTH
NOMINAL WIDTH
C JAMB DETAIL
D MULLION DETAIL

OPTION DRAWINGS

AFJ-601

J Blade Acoustical Louver
Formed Aluminum



FINISHES

Finish Type	Description/Application	Color Selection	Standard Warranty (Aluminum)
2-coat 70% KYNAR 500®/HYLAR 5000® AAMA 2605 – Dry film thickness 1.2 mil. (AKA: Duranar®, Fluoropon®, Trinar®, Flouropolymer, Polyvinylidene Fluoride, PVDF2)	***"Best."*** The premier finish for extruded aluminum. Tough, long-lasting coating has superior color retention and abrasive properties. Resists chalking, fading, chemical abrasion and weathering.	**Standard Colors:** Any of the 24 standard colors shown can be furnished in 70% or 50% KYNAR 500®/HYLAR 5000® or Baked Enamel. **2-Coat Mica:** Greenheck offers 9 standard 2-coat Mica colors. Other colors are available. Consult Greenheck for possible extra cost when selecting non-standard colors or special finishes.	10 Years (Consult Greenheck for availability of extended warranty)
2-coat 50% KYNAR 500®/HYLAR 5000® AAMA 2604 – Dry film thickness 1.2 mil. (AKA: Acroflur®, Acrynar®)	***"Better."*** Tough, long-lasting coating has excellent color retention and abrasive properties. Resists chalking, fading, chemical abrasion and weathering.		5 Years
Baked Enamel AAMA 2603 – Dry film thickness 0.8 mil. (AKA: Acrabond Plus®, Duracron®)	***"Good."*** Provides good adhesion and resistance to weathering, corrosion and chemical stain.		1 Year
Integral Color Anodize AA-M10C22A42 (>0.7 mil)	"Two-step" anodizing is produced by following the normal anodizing step with a second, colorfast process.	Light, Medium or Dark Bronze; Champagne; Black	5 years
Clear Anodize 215 R-1 AA-M10C22A41 (>0.7 mil)	Clear, colorless and hard oxide aluminum coating that resists weathering and chemical attack.	Clear	5 years
Clear Anodize 204 R-1 AA-M10C22A31 (0.4-0.7 mil)	Clear, colorless and hard oxide aluminum coating that resists weathering and chemical attack.	Clear	1 Year
Industrial coatings	Greenheck offers a number of industrial coatings such as Hi-Pro Polyester, Epoxy, and Permatector®. Consult a Greenheck Product Specialist for complete color and application information.		Consult Greenheck
Mill	Materials may be supplied in natural aluminum or galvanized steel finish when normal weathering is acceptable and there is no concern for color or color change.		n/a

Finishes meet or exceed AAMA 2605, AAMA 2604, and AAMA 2603 requirements. Please consult www.greenheck.com for complete information on standard and extended paint warranties. Paint finish warranties are not applicable to steel products.

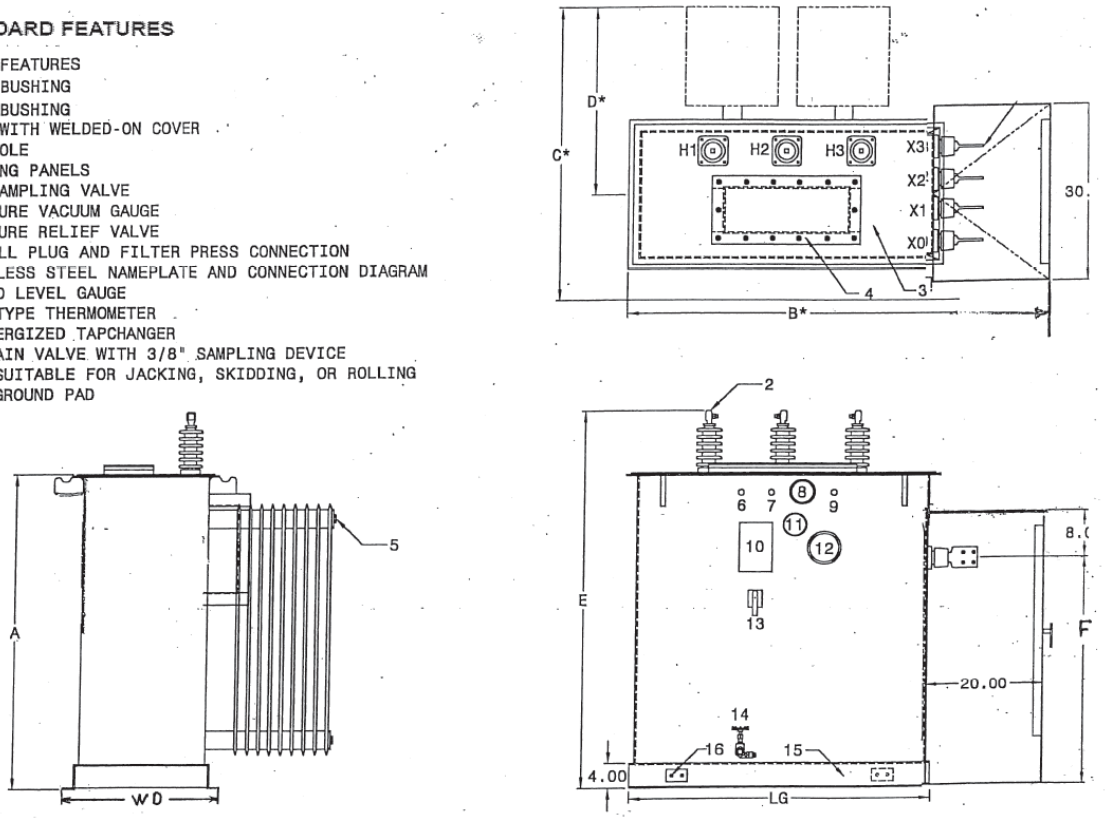
GREENHECK®

P.O. Box 410 • Schofield, WI 54476-0410 • 715.359.6171 • greenheck.com

AFJ-601
August 2010 Rev. 1

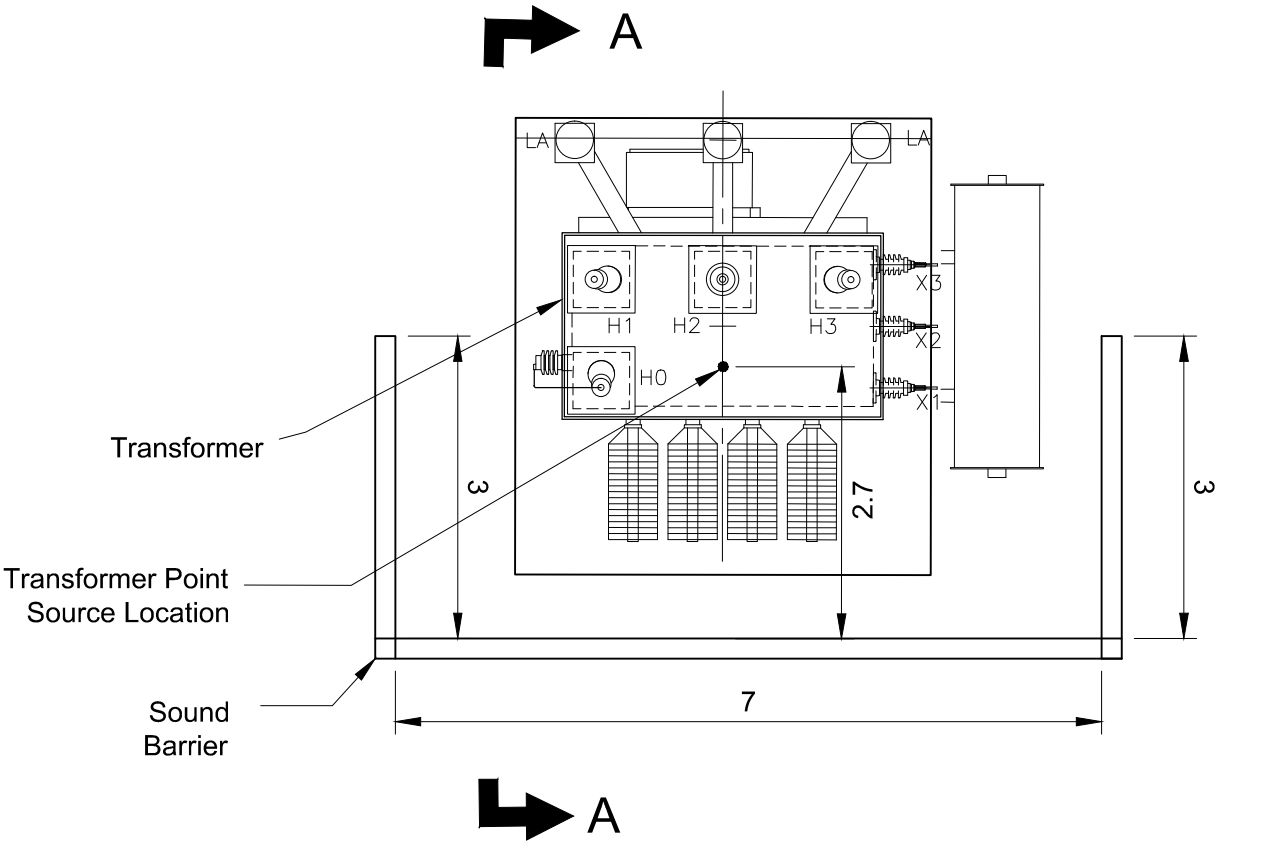
STANDARD FEATURES

STANDARD FEATURES
1. L.V. BUSHING
2. H.V. BUSHING
3. TANK WITH WELDED-ON COVER
4. HANDHOLE
5. COOLING PANELS
6. GAS SAMPLING VALVE
7. PRESSURE VACUUM GAUGE
8. PRESSURE RELIEF VALVE
9. 1" FILL PLUG AND FILTER PRESS CONNECTION
10. STAINLESS STEEL NAMEPLATE AND CONNECTION DIAGRAM
11. LIQUID LEVEL GAUGE
12. DIAL-TYPE THERMOMETER
13. DE-ENERGIZED TAPCHANGER
14. 1" DRAIN VALVE WITH 3/8" SAMPLING DEVICE
15. BASE SUITABLE FOR JACKING, SKIDDING, OR ROLLING
16. NEMA GROUND PAD

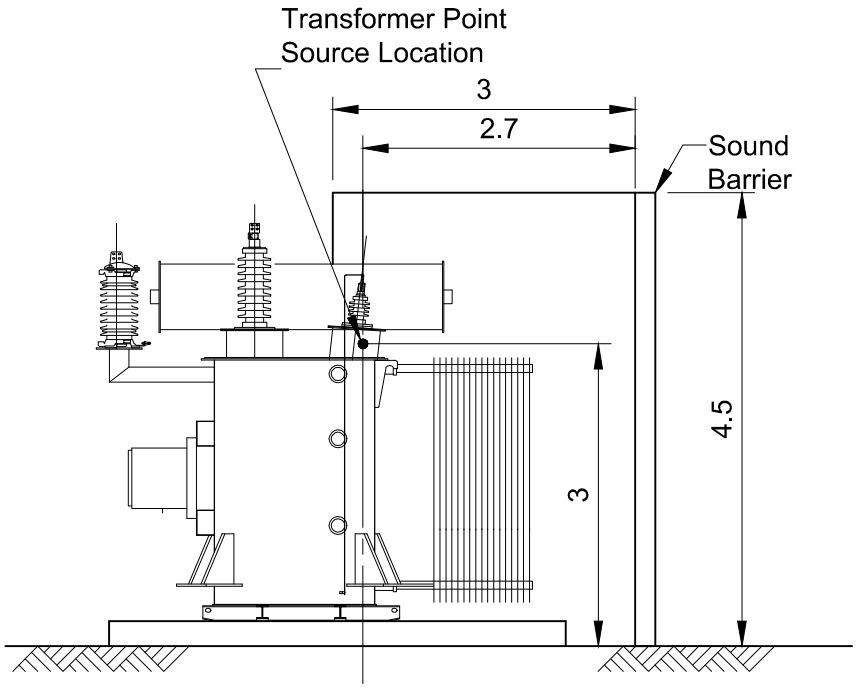


KVA	Fluid	Cond	HV BIL	LV BIL	WD	LG	A	B	C	D	E	F	Gal Liquid	Weight
10000	O	C	250	150	48	95	111	113	138	TBD	132	82	1530	37597

Figure B.3 Catalogue Dimensions (inches) of Substation Transformer, Obtained from Magna Electric Corporation.



Top View



View A-A

All Dimensions in Metres

Figure B.4

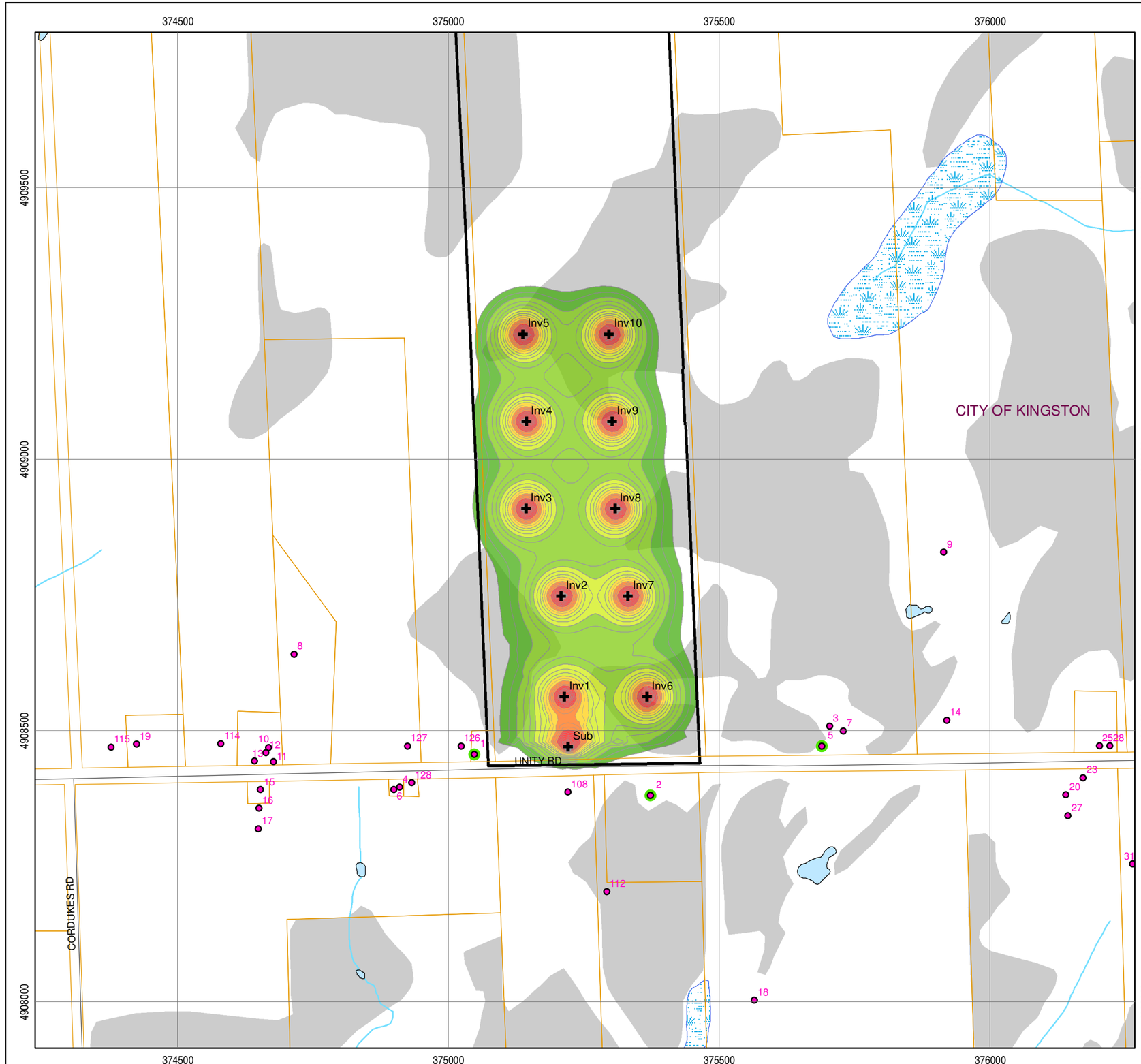
Kingston Gardiner TS Unity Road
Solar Energy Project

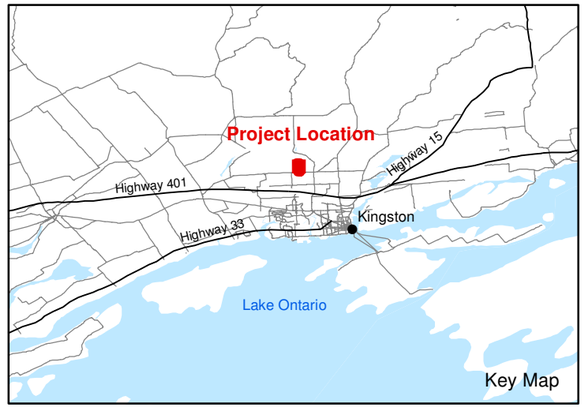
Diagram of Sound Barrier at Substation Transformer

HATCH

Appendix C

Noise Contours from CADNA-A





LEGEND

- Substation Transformer (Sub)
- Inverter Unit (Inv#)
- Noise Receptor (#)
- Representative Noise Receptor (#)
- Road
- Parcel
- Watercourse
- Project Site
- Water Body
- Wetland
- Woodland

Sound Pressure Level (dBA)

40.0 - 41.0	41.1 - 44.0	44.1 - 47.0	47.1 - 49.0	49.1 - 52.0	> 52.1

Notes:
1. OBM and NRVIS data downloaded from LIO,with permission.
2. Spatial referencing UTM NAD 83, August 2010.

0 50 100 200 300 400 Metres

NORTH

Scale 1:7,500

Figure C.1
SunEdison Canada
Kingston Gardiner TS Unity Road Solar Energy Project
Noise Contours at 4.5 m

HATCH

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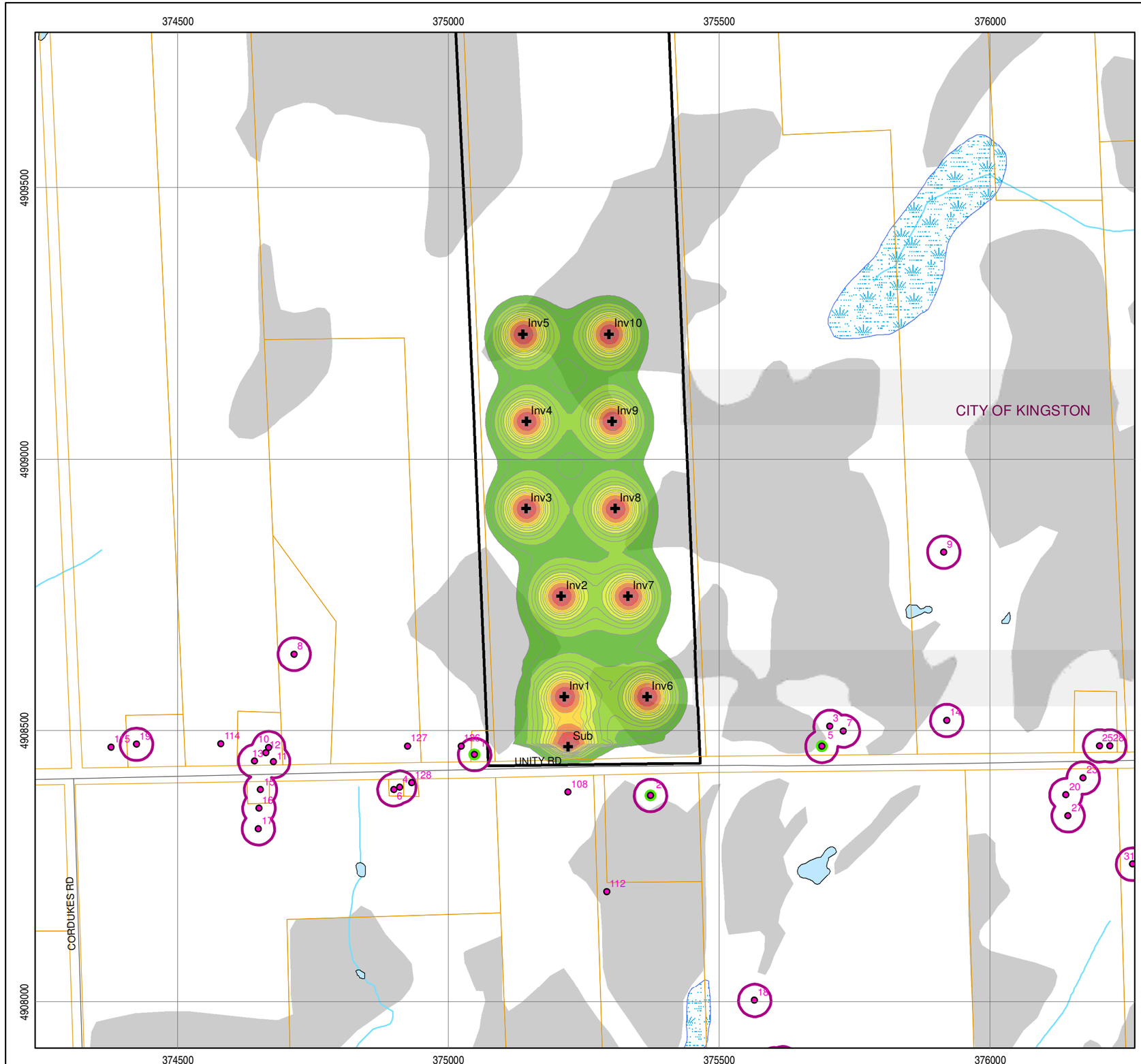

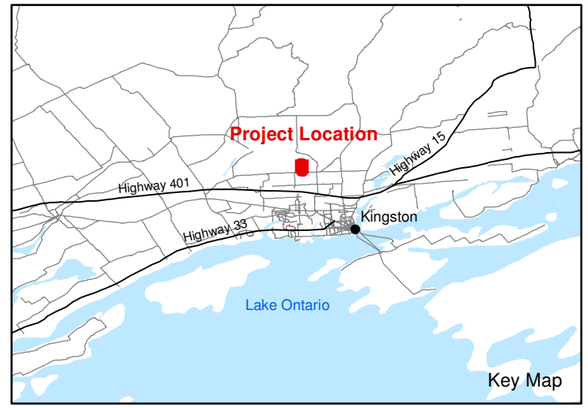

LEGEND

- Sub — Substation Transformer
- Inv# — Inverter Unit
- # — Noise Receptor
- # — Representative Noise Receptor
- Road
- Parcel
- Watercourse
- Project Site
- 30 m from Noise Receptor
- Water Body
- Wetland
- Woodland

Sound Pressure Level (dBA)

40.0 - 41.0	41.1 - 44.0	44.1 - 47.0	47.1 - 49.0	49.1 - 52.0	> 52.1

Notes:
1. OBM and NRVIS data downloaded from LIO,with permission.
2. Spatial referencing UTM NAD 83, August 2010.

0 50 100 200 300 400 Metres

NORTH

Scale 1:7,500

Figure C.2
SunEdison Canada
Kingston Gardiner TS Unity Road Solar Energy Project
Noise Contours at 1.5 m

HATCH

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Appendix D

CADNA-A Sample Calculations

Configuration	
Parameter	Value
General	
Country	(user defined)
Max. Error (dB)	0.00
Max. Search Radius (m)	3000.00
Min. Dist Src to Rcvr	0.00
Partition	
Raster Factor	0.50
Max. Length of Section (m)	1000.00
Min. Length of Section (m)	1.00
Min. Length of Section (%)	0.00
Proj. Line Sources	On
Proj. Area Sources	On
Ref. Time	
Reference Time Day (min)	960.00
Reference Time Night (min)	480.00
Daytime Penalty (dB)	0.00
Recr. Time Penalty (dB)	0.00
Night-time Penalty (dB)	0.00
DTM	
Standard Height (m)	0.00
Model of Terrain	Triangulation
Reflection	
max. Order of Reflection	1
Search Radius Src	100.00
Search Radius Rcvr	100.00
Max. Distance Source - Rcvr	1000.00 1000.00
Min. Distance Rvcr - Reflector	1.00 1.00
Min. Distance Source - Reflector	0.10
Industrial (ISO 9613)	
Lateral Diffraction	some Obj
Obst. within Area Src do not shield	On
Screening	Excl. Ground Att. over Barrier
	Dz with limit (20/25)
Barrier Coefficients C1,2,3	3.0 20.0 0.0
Temperature (°C)	10
rel. Humidity (%)	70
Ground Absorption G	0.70
Wind Speed for Dir. (m/s)	3.0
Roads (RLS-90)	
Strictly acc. to RLS-90	
Railways (Schall 03)	
Strictly acc. to Schall 03 / Schall-Transrapid	
Aircraft (???)	
Strictly acc. to AzB	

Receiver
Name: Receptors - Existing
ID: 1.0
X: 375048.37
Y: 4908455.50
Z: 4.50

Point Source, ISO 9613, Name: "Sub", ID: "Sub"																			
Nr.	X	Y	Z	Refl.	Freq.	LxT	LxN	K0	Dc	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	LrT	LrN
	(m)	(m)	(m)		(Hz)	dB(A)	dB(A)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)	dB(A)
1	375221.11	4908470.33	3.00	0	32	48.0	48.0	0.0	0.0	55.8	0.0	-3.0	0.0	0.0	1.8	0.0	-0.0	-6.6	-6.6
2	375221.11	4908470.33	3.00	0	63	67.2	67.2	0.0	0.0	55.8	0.0	-3.0	0.0	0.0	2.3	0.0	-0.0	12.1	12.1
3	375221.11	4908470.33	3.00	0	125	79.3	79.3	0.0	0.0	55.8	0.1	2.5	0.0	0.0	1.7	0.0	-0.0	19.2	19.2
4	375221.11	4908470.33	3.00	0	250	81.8	81.8	0.0	0.0	55.8	0.2	2.6	0.0	0.0	2.7	0.0	-0.0	20.5	20.5
5	375221.11	4908470.33	3.00	0	500	87.2	87.2	0.0	0.0	55.8	0.3	-0.8	0.0	0.0	5.0	0.0	-0.0	26.8	26.8
6	375221.11	4908470.33	3.00	0	1000	84.4	84.4	0.0	0.0	55.8	0.6	-0.9	0.0	0.0	6.6	0.0	-0.0	22.3	22.3
7	375221.11	4908470.33	3.00	0	2000	80.6	80.6	0.0	0.0	55.8	1.7	-0.9	0.0	0.0	8.6	0.0	-0.0	15.5	15.5
8	375221.11	4908470.33	3.00	0	4000	75.4	75.4	0.0	0.0	55.8	5.7	-0.9	0.0	0.0	11.0	0.0	-0.0	3.9	3.9
9	375221.11	4908470.33	3.00	0	8000	66.3	66.3	0.0	0.0	55.8	20.3	-0.9	0.0	0.0	13.4	0.0	-0.0	-22.2	-22.2
10	375221.11	4908470.33	3.00	1	500	87.2	87.2	0.0	0.0	56.1	0.4	-0.8	0.0	0.0	6.5	0.0	0.2	24.7	24.7
11	375221.11	4908470.33	3.00	1	1000	84.4	84.4	0.0	0.0	56.1	0.7	-0.9	0.0	0.0	7.8	0.0	0.2	20.5	20.5
12	375221.11	4908470.33	3.00	1	2000	80.6	80.6	0.0	0.0	56.1	1.8	-0.9	0.0	0.0	9.5	0.0	0.2	13.9	13.9
13	375221.11	4908470.33	3.00	1	4000	75.4	75.4	0.0	0.0	56.1	5.9	-0.9	0.0	0.0	11.7	0.0	0.2	2.3	2.3
14	375221.11	4908470.33	3.00	1	8000	66.3	66.3	0.0	0.0	56.1	21.1	-0.9	0.0	0.0	14.3	0.0	-0.0	-24.4	-24.4

Point Source, ISO 9613, Name: "Inv1", ID: "Inv1"																			
Nr.	X	Y	Z	Refl.	Freq.	LxT	LxN	K0	Dc	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	LrT	LrN
	(m)	(m)	(m)		(Hz)	dB(A)	dB(A)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)	dB(A)
1	375214.19	4908562.51	3.50	0	63	59.8	59.8	0.0	0.0	56.9	0.0	-3.0	0.0	0.0	0.0	0.0	-0.0	5.9	5.9
2	375214.19	4908562.51	3.50	0	125	73.9	73.9	0.0	0.0	56.9	0.1	2.9	0.0	0.0	0.0	0.0	-0.0	14.0	14.0
3	375214.19	4908562.51	3.50	0	250	86.0	86.0	0.0	0.0	56.9	0.2	2.0	0.0	0.0	0.0	0.0	-0.0	26.9	26.9
4	375214.19	4908562.51	3.50	0	500	80.6	80.6	0.0	0.0	56.9	0.4	-0.9	0.0	0.0	0.0	0.0	-0.0	24.2	24.2
5	375214.19	4908562.51	3.50	0	1000	72.1	72.1	0.0	0.0	56.9	0.7	-0.9	0.0	0.0	0.0	0.0	-0.0	15.4	15.4
6	375214.19	4908562.51	3.50	0	2000	74.6	74.6	0.0	0.0	56.9	1.9	-0.9	0.0	0.0	0.0	0.0	-0.0	16.7	16.7
7	375214.19	4908562.51	3.50	0	4000	84.9	84.9	0.0	0.0	56.9	6.5	-0.9	0.0	0.0	0.0	0.0	-0.0	22.4	22.4
8	375214.19	4908562.51	3.50	0	8000	70.4	70.4	0.0	0.0	56.9	23.1	-0.9	0.0	0.0	0.0	0.0	-0.0	-8.7	-8.7

Point Source, ISO 9613, Name: "Inv2", ID: "Inv2"																			
Nr.	X	Y	Z	Refl.	Freq.	LxT	LxN	K0	Dc	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	LrT	LrN
	(m)	(m)	(m)		(Hz)	dB(A)	dB(A)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)	dB(A)
1	375208.27	4908747.76	3.50	0	63	59.8	59.8	0.0	0.0	61.4	0.0	-3.8	0.0	0.0	0.0	0.0	-0.0	2.1	2.1
2	375208.27	4908747.76	3.50	0	125	73.9	73.9	0.0	0.0	61.4	0.1	3.0	0.0	0.0	0.0	0.0	-0.0	9.3	9.3
3	375208.27	4908747.76	3.50	0	250	86.0	86.0	0.0	0.0	61.4	0.4	1.8	0.0	0.0	0.0	0.0	-0.0	22.4	22.4
4	375208.27	4908747.76	3.50	0	500	80.6	80.6	0.0	0.0	61.4	0.6	-1.1	0.0	0.0	0.0	0.0	-0.0	19.6	19.6
5	375208.27	4908747.76	3.50	0	1000	72.1	72.1	0.0	0.0	61.4	1.2	-1.2	0.0	0.0	0.0	0.0	-0.0	10.6	10.6
6	375208.27	4908747.76	3.50	0	2000	74.6	74.6	0.0	0.0	61.4	3.2	-1.2	0.0	0.0	0.0	0.0	-0.0	11.1	11.1
7	375208.27	4908747.76	3.50	0	4000	84.9	84.9	0.0	0.0	61.4	10.9	-1.2	0.0	0.0	0.0	0.0	-0.0	13.7	13.7
8	375208.27	4908747.76	3.50	0	8000	70.4	70.4	0.0	0.0	61.4	38.9	-1.2	0.0	0.0	0.0	0.0	-0.0	-28.8	-28.8

Point Source, ISO 9613, Name: "Inv3", ID: "Inv3"																			
Nr.	X	Y	Z	Refl.	Freq.	LxT	LxN	K0	Dc	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	LrT	LrN
	(m)	(m)	(m)		(Hz)	dB(A)	dB(A)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)	dB(A)
1	375143.37	4908908.70	3.50	0	63	59.8	59.8	0.0	0.0	64.3	0.1	-4.5	0.0	0.0	0.0	0.0	-0.0	-0.1	-0.1
2	375143.37	4908908.70	3.50	0	125	73.9	73.9	0.0	0.0	64.3	0.2	3.2	0.0	0.0	0.0	0.0	-0.0	6.2	6.2
3	375143.37	4908908.70	3.50	0	250	86.0	86.0	0.0	0.0	64.3	0.5	1.6	0.0	0.0	0.0	0.0	-0.0	19.6	19.6
4	375143.37	4908908.70	3.50	0	500	80.6	80.6	0.0	0.0	64.3	0.9	-1.3	0.0	0.0	0.0	0.0	-0.0	16.7	16.7
5	375143.37	4908908.70	3.50	0	1000	72.1	72.1	0.0	0.0	64.3	1.7	-1.3	0.0	0.0	0.0	0.0	-0.0	7.4	7.4
6	375143.37	4908908.70	3.50	0	2000	74.6	74.6	0.0	0.0	64.3	4.5	-1.3	0.0	0.0	0.0	0.0	-0.0	7.1	7.1
7	375143.37	4908908.70	3.50	0	4000	84.9	84.9	0.0	0.0	64.3	15.2	-1.3	0.0	0.0	0.0	0.0	-0.0	6.8	6.8
8	375143.37	4908908.70	3.50	0	8000	70.4	70.4	0.0	0.0	64.3	54.1	-1.3	0.0	0.0	0.0	0.0	-0.0	-46.7	-46.7

Point Source, ISO 9613, Name: "Inv4", ID: "Inv4"																			
Nr.	X	Y	Z	Refl.	Freq.	LxT	LxN	K0	Dc	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	LrT	LrN
	(m)	(m)	(m)		(Hz)	dB(A)	dB(A)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)	dB(A)
1	375143.76	4909069.73	3.50	0	63	59.8	59.8	0.0	0.0	66.9	0.1	-4.8	0.0	0.0	0.0	0.0	-0.0	-2.3	-2.3
2	375143.76	4909069.73	3.50	0	125	73.9	73.9	0.0	0.0	66.9	0.3	3.5	0.0	0.0	0.0	0.0	-0.0	3.3	3.3
3	375143.76	4909069.73	3.50	0	250	86.0	86.0	0.0	0.0	66.9	0.7	1.5	0.0	0.0	0.0	0.0	-0.0	17.0	17.0
4	375143.76	4909069.73	3.50	0	500	80.6	80.6	0.0	0.0	66.9	1.2	-1.4	0.0	0.0	0.0	0.0	-0.0	14.0	14.0
5	375143.76	4909069.73	3.50	0	1000	72.1	72.1	0.0	0.0	66.9	2.3	-1.5	0.0	0.0	0.0	0.0	-0.0	4.4	4.4
6	375143.76	4909069.73	3.50	0	2000	74.6	74.6	0.0	0.0	66.9	6.0	-1.5	0.0	0.0	0.0	0.0	-0.0	3.2	3.2
7	375143.76	4909069.73	3.50	0	4000	84.9	84.9	0.0	0.0	66.9	20.4	-1.5	0.0	0.0	0.0	0.0	-0.0	-0.9	-0.9
8	375143.76	4909069.73	3.50	0	8000	70.4	70.4	0.0	0.0	66.9	72.6	-1.5	0.0	0.0	0.0	0.0	-0.0	-67.7	-67.7

Point Source, ISO 9613, Name: "Inv5", ID: "Inv5"																			
Nr.	X	Y	Z	Refl.	Freq.	LxT	LxN	K0	Dc	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	LrT	LrN
	(m)	(m)	(m)		(Hz)	dB(A)	dB(A)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)	dB(A)
1	375137.86	4909230.72	3.50	0	63	59.8	59.8	0.0	0.0	68.8	0.1	-5.1	0.0	0.0	0.0	0.0	-0.0	-4.1	-4.1
2	375137.86	4909230.72	3.50	0	125	73.9	73.9	0.0	0.0	68.8	0.3	3.7	0.0	0.0	0.0	0.0	-0.0	1.0	1.0
3	375137.86	4909230.72	3.50	0	250	86.0	86.0	0.0	0.0	68.8	0.8	1.5	0.0	0.0	0.0	0.0	-0.0	14.9	14.9
4	375137.86	4909230.72	3.50	0	500	80.6	80.6	0.0	0.0	68.8	1.5	-1.5	0.0	0.0	0.0	0.0	-0.0	11.7	11.7
5	375137.86	4909230.72	3.50	0	1000	72.1	72.1	0.0	0.0	68.8	2.8	-1.5	0.0	0.0	0.0	0.0	-0.0	1.9	1.9
6	375137.86	4909230.72	3.50	0	2000	74.6	74.6	0.0	0.0	68.8	7.5	-1.5	0.0	0.0	0.0	0.0	-0.0	-0.3	-0.3
7	375137.86	4909230.72	3.50	0	4000	84.9	84.9	0.0	0.0	68.8	25.6	-1.5	0.0	0.0	0.0	0.0	-0.0	-8.0	-8.0
8	375137.86	4909230.72	3.50	0	8000	70.4	70.4	0.0	0.0	68.8	91.2	-1.5	0.0	0.0	0.0	0.0	-0.0	-88.1	-88.1

Point Source, ISO 9613, Name: "Inv6", ID: "Inv6"																			
Nr.	X	Y	Z	Refl.	Freq.	LxT	LxN	K0	Dc	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	LrT	LrN
	(m)	(m)	(m)		(Hz)	dB(A)	dB(A)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)	dB(A)
1	375366.81	4908562.51	3.50	0	63	59.8	59.8	0.0	0.0	61.5	0.0	-3.9	0.0	0.0	0.0	0.0	-0.0	2.1	2.1
2	375366.81	4908562.51	3.50	0	125	73.9	73.9	0.0	0.0	61.5	0.1	3.0	0.0	0.0	0.0	0.0	-0.0	9.2	9.2
3	375366.81	4908562.51	3.50	0	250	86.0	86.0	0.0	0.0	61.5	0.4	1.8	0.0	0.0	0.0	0.0	-0.0	22.3	22.3
4	375366.81	4908562.51	3.50	0	500	80.6	80.6	0.0	0.0	61.5	0.7	-1.1	0.0	0.0	0.0	0.0	-0.0	19.6	19.6
5	375366.81	4908562.51	3.50	0	1000	72.1	72.1	0.0	0.0	61.5	1.2	-1.2	0.0	0.0	0.0	0.0	-0.0	10.5	10.5
6	375366.81	4908562.51	3.50	0	2000	74.6	74.6	0.0	0.0	61.5	3.3	-1.2	0.0	0.0	0.0	0.0	-0.0	11.0	11.0
7	375366.81	4908562.51	3.50	0	4000	84.9	84.9	0.0	0.0	61.5	11.0	-1.2	0.0	0.0	0.0	0.0	-0.0	13.5	13.5
8	375366.81	4908562.51	3.50	0	8000	70.4	70.4	0.0	0.0	61.5	39.3	-1.2	0.0	0.0	0.0	0.0	-0.0	-29.2	-29.2

Point Source, ISO 9613, Name: "Inv7", ID: "Inv7"																			
Nr.	X	Y	Z	Refl.	Freq.	LxT	LxN	K0	Dc	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	LrT	LrN
	(m)	(m)	(m)		(Hz)	dB(A)	dB(A)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)	dB(A)
1	375331.57	4908747.75	3.50	0	63	59.8	59.8	0.0	0.0	63.2	0.1	-4.2	0.0	0.0	0.0	0.0	-0.0	0.8	0.8
2	375331.57	4908747.75	3.50	0	125	73.9	73.9	0.0	0.0	63.2	0.2	3.1	0.0	0.0	0.0	0.0	-0.0	7.4	7.4
3	375331.57	4908747.75	3.50	0	250	86.0	86.0	0.0	0.0	63.2	0.4	1.7	0.0	0.0	0.0	0.0	-0.0	20.7	20.7
4	375331.57	4908747.75	3.50	0	500	80.6	80.6	0.0	0.0	63.2	0.8	-1.2	0.0	0.0	0.0	0.0	-0.0	17.9	17.9
5	375331.57	4908747.75	3.50	0	1000	72.1	72.1	0.0	0.0	63.2	1.5	-1.3	0.0	0.0	0.0	0.0	-0.0	8.7	8.7
6	375331.57	4908747.75	3.50	0	2000	74.6	74.6	0.0	0.0	63.2	3.9	-1.3	0.0	0.0	0.0	0.0	-0.0	8.8	8.8
7	375331.57	4908747.75	3.50	0	4000	84.9	84.9	0.0	0.0	63.2	13.3	-1.3	0.0	0.0	0.0	0.0	-0.0	9.6	9.6
8	375331.57	4908747.75	3.50	0	8000	70.4	70.4	0.0	0.0	63.2	47.6	-1.3	0.0	0.0	0.0	0.0	-0.0	-39.1	-39.1

Point Source, ISO 9613, Name: "Inv8", ID: "Inv8"																			
Nr.	X	Y	Z	Refl.	Freq.	LxT	LxN	K0	Dc	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	LrT	LrN
	(m)	(m)	(m)		(Hz)	dB(A)	dB(A)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)	dB(A)
1	375307.71	4908908.70	3.50	0	63	59.8	59.8	0.0	0.0	65.4	0.1	-4.6	0.0	0.0	0.0	0.0	-0.0	-1.0	-1.0
2	375307.71	4908908.70	3.50	0	125	73.9	73.9	0.0	0.0	65.4	0.2	3.3	0.0	0.0	0.0	0.0	-0.0	5.0	5.0
3	375307.71	4908908.70	3.50	0	250	86.0	86.0	0.0	0.0	65.4	0.5	1.6	0.0	0.0	0.0	0.0	-0.0	18.5	18.5
4	375307.71	4908908.70	3.50	0	500	80.6	80.6	0.0	0.0	65.4	1.0	-1.4	0.0	0.0	0.0	0.0	-0.0	15.6	15.6
5	375307.71	4908908.70	3.50	0	1000	72.1	72.1	0.0	0.0	65.4	1.9	-1.4	0.0	0.0	0.0	0.0	-0.0	6.2	6.2
6	375307.71	4908908.70	3.50	0	2000	74.6	74.6	0.0	0.0	65.4	5.0	-1.4	0.0	0.0	0.0	0.0	-0.0	5.6	5.6
7	375307.71	4908908.70	3.50	0	4000	84.9	84.9	0.0	0.0	65.4	17.1	-1.4	0.0	0.0	0.0	0.0	-0.0	3.8	3.8
8	375307.71	4908908.70	3.50	0	8000	70.4	70.4	0.0	0.0	65.4	61.0	-1.4	0.0	0.0	0.0	0.0	-0.0	-54.6	-54.6

Point Source, ISO 9613, Name: "Inv9", ID: "Inv9"																			
Nr.	X	Y	Z	Refl.	Freq.	LxT	LxN	K0	Dc	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	LrT	LrN
	(m)	(m)	(m)		(Hz)	dB(A)	dB(A)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)	dB(A)
1	375302.23	4909069.66	3.50	0	63	59.8	59.8	0.0	0.0	67.5	0.1	-4.9	0.0	0.0	0.0	0.0	-0.0	-2.8	-2.8
2	375302.23	4909069.66	3.50	0	125	73.9	73.9	0.0	0.0	67.5	0.3	3.6	0.0	0.0	0.0	0.0	-0.0	2.6	2.6
3	375302.23	4909069.66	3.50	0	250	86.0	86.0	0.0	0.0	67.5	0.7	1.5	0.0	0.0	0.0	0.0	-0.0	16.4	16.4

Point Source, ISO 9613, Name: "Inv9", ID: "Inv9"																			
Nr.	X	Y	Z	Refl.	Freq.	LxT	LxN	K0	Dc	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	LrT	LrN
	(m)	(m)	(m)		(Hz)	dB(A)	dB(A)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)	dB(A)
4	375302.23	4909069.66	3.50	0	500	80.6	80.6	0.0	0.0	67.5	1.3	-1.4	0.0	0.0	0.0	0.0	-0.0	13.3	13.3
5	375302.23	4909069.66	3.50	0	1000	72.1	72.1	0.0	0.0	67.5	2.4	-1.5	0.0	0.0	0.0	0.0	-0.0	3.7	3.7
6	375302.23	4909069.66	3.50	0	2000	74.6	74.6	0.0	0.0	67.5	6.4	-1.5	0.0	0.0	0.0	0.0	-0.0	2.2	2.2
7	375302.23	4909069.66	3.50	0	4000	84.9	84.9	0.0	0.0	67.5	21.8	-1.5	0.0	0.0	0.0	0.0	-0.0	-2.8	-2.8
8	375302.23	4909069.66	3.50	0	8000	70.4	70.4	0.0	0.0	67.5	77.7	-1.5	0.0	0.0	0.0	0.0	-0.0	-73.3	-73.3

Point Source, ISO 9613, Name: "Inv10", ID: "Inv10"																			
Nr.	X	Y	Z	Refl.	Freq.	LxT	LxN	K0	Dc	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	LrT	LrN
	(m)	(m)	(m)		(Hz)	dB(A)	dB(A)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)	dB(A)
1	375296.36	4909230.65	3.50	0	63	59.8	59.8	0.0	0.0	69.2	0.1	-5.1	0.0	0.0	0.0	0.0	-0.0	-4.4	-4.4
2	375296.36	4909230.65	3.50	0	125	73.9	73.9	0.0	0.0	69.2	0.3	3.8	0.0	0.0	0.0	0.0	-0.0	0.6	0.6
3	375296.36	4909230.65	3.50	0	250	86.0	86.0	0.0	0.0	69.2	0.9	1.4	0.0	0.0	0.0	0.0	-0.0	14.5	14.5
4	375296.36	4909230.65	3.50	0	500	80.6	80.6	0.0	0.0	69.2	1.6	-1.5	0.0	0.0	0.0	0.0	-0.0	11.3	11.3
5	375296.36	4909230.65	3.50	0	1000	72.1	72.1	0.0	0.0	69.2	3.0	-1.5	0.0	0.0	0.0	0.0	-0.0	1.5	1.5
6	375296.36	4909230.65	3.50	0	2000	74.6	74.6	0.0	0.0	69.2	7.9	-1.5	0.0	0.0	0.0	0.0	-0.0	-0.9	-0.9
7	375296.36	4909230.65	3.50	0	4000	84.9	84.9	0.0	0.0	69.2	26.7	-1.5	0.0	0.0	0.0	0.0	-0.0	-9.5	-9.5
8	375296.36	4909230.65	3.50	0	8000	70.4	70.4	0.0	0.0	69.2	95.1	-1.5	0.0	0.0	0.0	0.0	-0.0	-92.4	-92.4

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