NORTHLAND POWER

Burk's Falls East Solar Project

Noise Assessment Study Report

December 16, 2011

Northland Power Inc.
on behalf of
Northland Power Solar
Burk's Falls East L.P.
Toronto, Ontario

Noise Assessment 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. Northland Power Solar Burk's Falls East L.P. ("Northland") is proposing to develop a 10-Megawatt (MW) solar photovoltaic (PV) project titled Burk's Falls East Solar Project (the "Project"). The Project will be located on approximately 80 hectares (ha) of land on Chetwynd Road in the single tier Municipality of Armour Township, Ontario.

This Noise Assessment 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) 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 impact assessment study.

The results obtained in this study show that the sound pressure levels at POR will not exceed MOE requirements for rural areas of 40-dBA.

Project Report

November 29, 2011

Northland Power Inc.
Burk's Falls East Solar Project

Noise Assessment Study Report

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1. Introduction

1.1 Project Description

Northland Power Solar Burk's Falls East L.P. ("Northland") is proposing to develop a 10-megawatt (MW) solar photovoltaic (PV) project titled Burk's Falls East Solar Project (the "Project"). The Project will be located on approximately 80-ha of land within Armour Township, Ontario.

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 clusters 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 clusters to 44-kV prior to being transmitted 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 anticipated operational lifespan of the Project is 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 these regulations, 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, sources and points of reception (POR), 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.

2. Facility Description

The Project will utilize photovoltaic (PV) panels installed on fixed racking structures mounted on the ground. The PV panels generate DC electricity which will be converted to AC electricity by inverters. The Project layout is based on seven inverter clusters each one containing two inverters and one medium-voltage (27.6-kV/1.6-MVA) transformer, and one 44-kV/10-MVA substation transformer. The 27.6-kV power, collected from the inverter clusters, will be stepped up to 44 kV by the substation transformer prior to being transmitted 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[1] will be on privately owned land totalling approximately 80-ha. The Project Location is zoned as rural land in accordance to the zoning by-law for Armour Township. Figure A.1 in Appendix A shows the zoning designation plan. Also, Figure A.2 presents the Project Area Location Plan.

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

2.2 Acoustical Environment

The Project will be surrounded by farmland and forested areas to the north and south. The background noise levels are expected to be typical of rural areas classified as a Class 3 based on Publication NPC-232 by the MOE. Some traffic noise is expected from Chetwynd Road (north of the Project) mainly during day hours. There are no airports within 5 km distance from the Project area and there are no large industrial facilities nearby. The closest town, Burk's Falls, is located about 4 km northwest of the proposed location.

2.3 Life of Project

The expected life of the Project is 30 years. The manufacturer's warranty on the PV modules is 25years and the expected life of solar power plants of this type is typically 35 to 40 years. At that time (or earlier if the 20-yr power purchase agreement is not extended), the Project will be decommissioned or refurbished depending on market conditions and/or technological changes.

2.4 Operating Hours

Solar PV facilities produce electricity during the day 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 in operation).

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 inverters was provided by the manufacturer while the sound power level for the transformers 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 2.1. The height contours for the site were taken from the Ontario Base Maps (OBM).

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

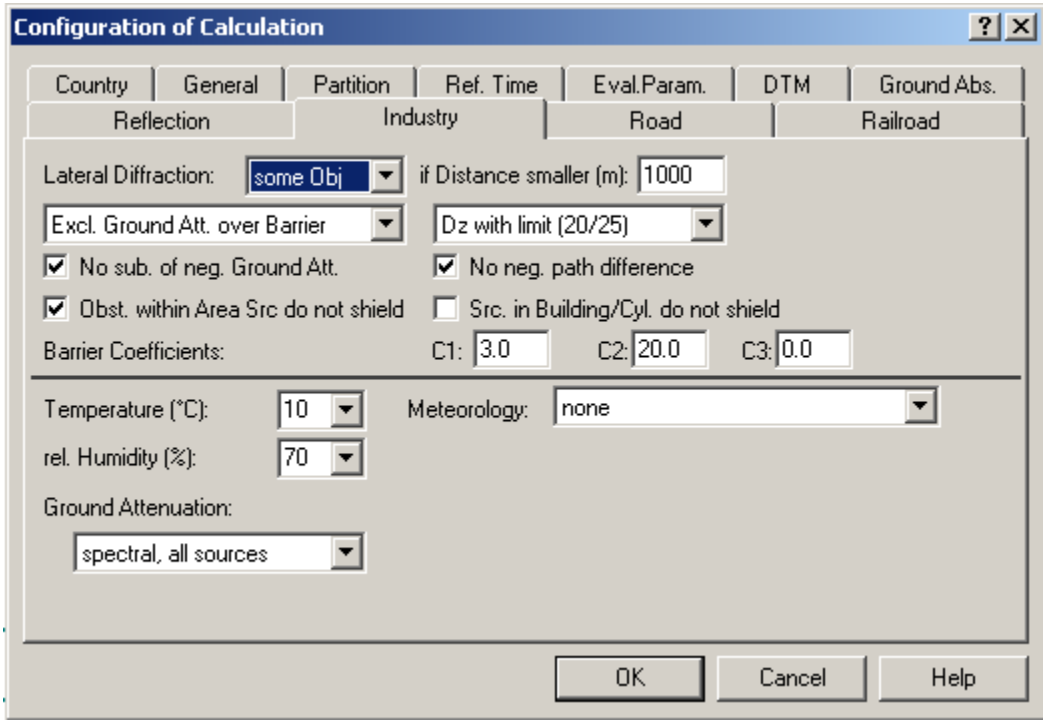

Figure 2.1 CADNA-A Configurations

3. Noise Sources

The main sources of noise from the Project will be seven inverter clusters, each one containing two inverters and one medium-voltage transformer, and a substation containing the main step-up transformer. The Project layout is provided in Figure A.2. 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.

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

3.1 Substation Transformer

A 10-MVA step-up transformer that will step up the 27.6-kV power to 44 V, required by the local distribution company, will be located in the substation. Since the transformer make and model has not been selected at this point (although it is known that the transformer will be of ONAF (oil natural air forced) type), a conservative estimate of sound power level was based on the 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 on 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.3 of Appendix B. The transformer configurations are expected to be similar to those shown in Figure B.2. Noise source height representing the transformer was assumed 3.5-m.

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.

3.2 Inverter Clusters

Northland is planning to use inverters manufactured by SMA. Seven inverter clusters will be installed as part of the Project. Each cluster comprises of two SMA Sunny Central 800CP inverters and one medium voltage transformer. A schematic layout with approximate dimensions of such cluster is available in Figure 3.1, additional information regarding details of the inverter cluster can be found in Appendix B). The cluster components listed above were modeled as point sources shown in Figure 3.2. *Note that the planned enclosure over the inverters was not taken into account as a mitigation measure in the noise model.*

The installed capacity of each Sunny Central 800CP inverter is 800-kW. SMA provided third-octave noise data for the Sunny Central 800CP inverter (Figure B.1 of Appendix B). The provided third octave spectrum was converted to a full octave spectrum and the contribution from two inverters was combined into a single sound power spectrum for use with CADNA-A model (calculations are available in Figure B.4 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

spectrum used to model combined noise emission from the two inverters located next to each other within the same cluster is shown in Table B.2 of Appendix B.

A 1.6-MVA transformer used to step-up the 360-V power from the inverters to 27.6 kV will be located in close proximity to the inverters. Since the transformer make and model have not been selected at this point (although it is known that the transformer will be of ONAN (oil natural air natural) type), the sound power levels resulting from the operation of the transformer were evaluated using data from NEMA TR 1-1993 (R2000) and 14.88-m^2 transformer surface area. The NEMA levels were then converted into frequency spectrum using empirical correlations for transformer noise (Crocker, 2007). This calculation is available in Figure B.5 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 transformers located in the clusters.

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 (at the substation and clusters) are energized and make some magnetostrictive noise at a reduced level, but no cooling fans are in operation.

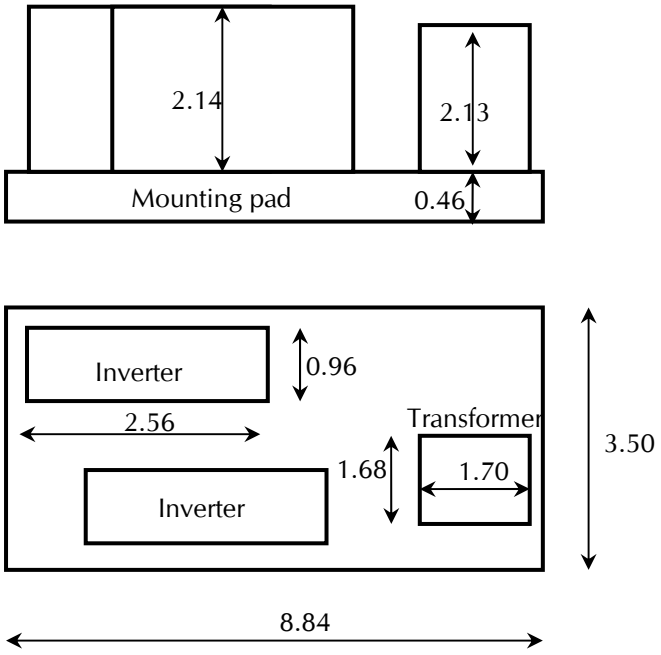

Figure 3.1 Schematic Inverter Cluster Layout
(all dimensions in metres)

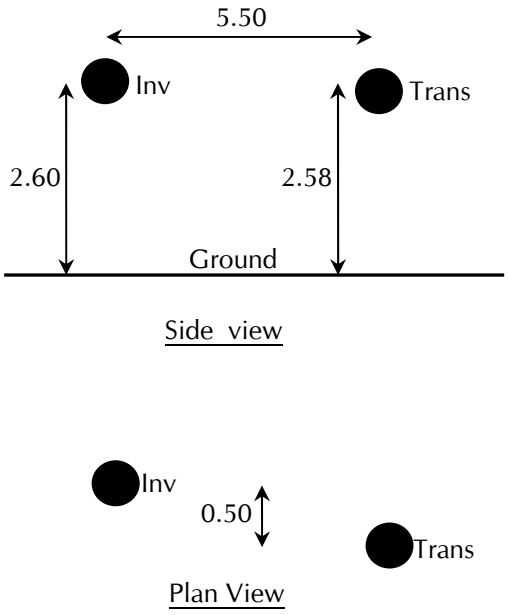

Figure 3.2 Inverter Cluster CADNA-A Acoustical Model

where: Inv = Noise Source Representing Two Sunny Central 800CP Inverters; and Trans = Noise Source Representing 27.6-kV/1.6-MVA Cluster Transformer (all dimensions in metres).

3.3 Noise Summary Table

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

Table 3.1 Noise Source Summary for Burk's Falls East Solar Project

Source ID	Description	Total Sound Power Level (dBA)	Source Location	Sound Characteristics	Noise Control Measures
Sub	44-kV/10-MVA substation transformer	90.8	O	S-T	U
Inv1	Two Sunny Central 800CP inverters at Cluster 1	91.3	O	S-T	U
Inv2	Two Sunny Central 800CP inverters at Cluster 2	91.3	O	S-T	U
Inv3	Two Sunny Central 800CP inverters at Cluster 3	91.3	O	S-T	U
Inv4	Two Sunny Central 800CP inverters at Cluster 4	91.3	O	S-T	U
Inv5	Two Sunny Central 800CP inverters at Cluster 5	91.3	O	S-T	U
Inv6	Two Sunny Central 800CP inverters at Cluster 6	91.3	O	S-T	U
Inv7	Two Sunny Central 800CP inverters at Cluster 7	91.3	O	S-T	U
Trans1	27.6-kV/1.6-MVA cluster transformer at Cluster 1	80.1	O	S-T	U
Trans2	27.6-kV/1.6-MVA cluster transformer at Cluster 2	80.1	O	S-T	U
Trans3	27.6-kV/1.6-MVA cluster transformer at Cluster 3	80.1	O	S-T	U
Trans4	27.6-kV/1.6-MVA cluster transformer at Cluster 4	80.1	O	S-T	U
Trans5	27.6-kV/1.6-MVA cluster transformer at Cluster 5	80.1	O	S-T	U
Trans6	27.6-kV/1.6-MVA cluster transformer at Cluster 6	80.1	O	S-T	U
Trans7	27.6-kV/1.6-MVA cluster transformer at Cluster 7	80.1	O	S-T	U

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. (December 2, 2011)

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. Points of Reception

The POR used in this study were identified from the OBM and Google Earth Pro aerial imagery (September 2007) within 1 km distance from the Project Site[2] boundary, and also from visual observations of the Project Site surroundings conducted in Summer 2010.

The POR 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 POR within a 1-km distance from the Project Site of Burk's Falls East Solar Project boundary is 88, including the vacant lots. Three of these noise receptors, identified in Table 4.1, were chosen as representative receptors for evaluating the noise contribution from each individual source. 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 88 noise receptors is provided in Table 6.2.

For this study, the elevation above ground used for the POR is 4.5-m. Also, noise compliance was verified within 30-m distance from any given POR located at 1.5-m above the ground level.

Table 4.1 Point of Reception Noise Impact from Individual Noise Sources of Burk's Falls East Solar Project

Source ID	POR 50		POR 58		POR 71	
	Distance (m)	L_{eq} Sound Level (dBA)	Distance (m)	L_{eq} Sound Level (dBA)	Distance (m)	L_{eq} Sound Level (dBA)
Sub	153	35.9	244	31.6	704	21.7
Inv1	393	27.3	661	22.3	984	14.3
Inv2	249	31.4	492	25.2	851	15.8
Inv3	247	31.4	282	30.3	646	22.5
Inv4	655	22.4	565	19.9	531	24.5
Inv5	525	24.6	397	27.2	464	25.8
Inv6	471	25.6	284	30.2	425	26.6
Inv7	444	26.2	168	34.9	413	26.8
Trans1	392	16.4	663	11.3	989	7.1
Trans2	246	20.6	494	14.2	856	4.4
Trans3	242	20.8	283	19.4	651	11.5
Trans4	650	11.5	562	8.7	533	13.5
Trans5	520	13.7	394	16.4	467	14.7
Trans6	466	14.8	281	19.5	429	15.6
Trans7	439	15.4	164	24.3	418	15.8

[2] "Project Site" in the context of this study is the complete area designated for the Project but not necessary occupied with the project infrastructure. Project Location is always contained within Project Site.

5. Mitigation Measures

The analysis indicates that no mitigation measures are necessary to meet the MOE requirement of 40 dBA for all POR.

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, with little or no traffic noise, 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 daylight hours; assumed to be until 19:00 during most days of the year. It is noted that in the summer months the sun may shine until past 21:00, however the inverters will be well below 100% loading conditions. As such, during the summer the facility will be operating at the time 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 noise model assumes that the cluster transformers and substation transformer 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 points of reception. 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 located within 1 km from the Project Site. Sound pressure contours at 4.5 m and 1.5 m are available in Figure C.1 and Figure C.2. Appendix D includes a detailed calculation log of the representative POR with the highest Sound Pressure Level.

Effect of the noise emissions at the POR 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 POR (Figure C.2). The results show that none of the 30-m radius zones are affected by the noise emissions.

Table 6.2 Calculated Sound Pressure Levels at POR within 1-km of Burk's Falls East Solar Project
(Shaded rows correspond to representative POR)
Existing = Existing dwelling, Vacant = Vacant Lot.
The performance limit is 40.0-dBA**.**

POR ID	Description	Sound Pressure Level (dBA)	Performance Limit (dBA)	POR Height (m)	Min distance to Source (m)	UTM Coordinates NAD 83 Zone 17 (m)		
						X	Y	Z
1	Vacant	17.3	40.0	4.5	1549	626602	5052664	329.5
2	Existing	22.3	40.0	4.5	1347	626769	5052492	341.2
3	Existing	22.5	40.0	4.5	1324	626790	5052478	341.3
4	Existing	22.9	40.0	4.5	1227	626896	5052513	338.1
5	Existing	23.2	40.0	4.5	1159	626915	5052290	330.3
6	Existing	23.4	40.0	4.5	1140	626929	5052271	326.3
7	Existing	23.8	40.0	4.5	1170	626934	5052401	338.3
8	Existing	21.2	40.0	4.5	1196	626936	5052550	337.6
9	Vacant	21.2	40.0	4.5	990	626996	5051938	299.5
10	Vacant	22.2	40.0	4.5	957	627045	5052033	300.5
11	Vacant	22.6	40.0	4.5	911	627068	5051829	299.5
12	Vacant	22.8	40.0	4.5	1023	627126	5051264	299.5
13	Existing	25.2	40.0	4.5	863	627127	5051958	306.4
14	Existing	24.1	40.0	4.5	827	627153	5051808	299.5
15	Existing	25.5	40.0	4.5	834	627160	5051982	309.5
16	Vacant	25.4	40.0	4.5	933	627167	5052356	326.9
17	Vacant	23.8	40.0	4.5	904	627215	5051345	299.5
18	Existing	26.5	40.0	4.5	721	627266	5051927	309.5
19	Existing	26.7	40.0	4.5	717	627276	5051962	309.5
20	Existing	26.3	40.0	4.5	800	627289	5052282	316.4
21	Existing	27.3	40.0	4.5	676	627323	5051988	309.5
22	Existing	27.3	40.0	4.5	746	627324	5052217	314.6
23	Existing	27.3	40.0	4.5	664	627330	5051965	309.5
24	Existing	27.4	40.0	4.5	729	627333	5052190	314.5
25	Existing	27.5	40.0	4.5	722	627336	5052173	314.5
26	Existing	20.7	40.0	4.5	1476	627342	5050496	302.6
27	Vacant	20.6	40.0	4.5	1491	627364	5050470	301.5
28	Existing	20.4	40.0	4.5	1528	627376	5050423	299.7
29	Existing	28.3	40.0	4.5	642	627404	5052112	313.9
30	Vacant	21.6	40.0	4.5	1352	627404	5050604	299.5
31	Existing	20.3	40.0	4.5	1552	627405	5050386	299.5
32	Existing	28.5	40.0	4.5	588	627421	5052010	312.0
33	Existing	28.5	40.0	4.5	537	627445	5051881	308.6
34	Existing	19.8	40.0	4.5	1622	627463	5050290	303.1
35	Vacant	29.1	40.0	4.5	580	627467	5052112	315.0
36	Existing	29.1	40.0	4.5	533	627473	5051992	311.6

POR ID	Description	Sound Pressure Level (dBA)	Performance Limit (dBA)	POR Height (m)	Min distance to Source (m)	UTM Coordinates NAD 83 Zone 17 (m)		
						X	Y	Z
37	Existing	22.2	40.0	4.5	898	627497	5052921	355.2
38	Existing	20.2	40.0	4.5	1576	627499	5050327	299.5
39	Vacant	29.8	40.0	4.5	536	627516	5052126	315.7
40	Existing	29.8	40.0	4.5	508	627518	5052039	314.5
41	Existing	29.3	40.0	4.5	479	627522	5051685	309.5
42	Existing	29.2	40.0	4.5	483	627523	5051669	309.5
43	Existing	29.9	40.0	4.5	516	627523	5052068	314.5
44	Existing	30.3	40.0	4.5	512	627554	5052168	318.1
45	Vacant	31.6	40.0	4.5	432	627655	5052197	316.4
46	Vacant	24.1	40.0	4.5	1039	627694	5050829	301.4
47	Vacant	25.2	40.0	4.5	913	627738	5050947	301.8
48	Existing	38.1	40.0	4.5	198	627901	5052205	324.2
49	Existing	33.7	40.0	4.5	338	627901	5052528	342.5
50	Existing	39.5	40.0	4.5	153	627944	5052218	324.8
51	Existing	38.8	40.0	4.5	155	627950	5052308	329.5
52	Vacant	24.1	40.0	4.5	1080	627968	5050747	306.4
53	Vacant	22.5	40.0	4.5	1236	627973	5050591	303.3
54	Existing	22.2	40.0	4.5	1163	628072	5050667	311.8
55	Existing	20.9	40.0	4.5	1153	628100	5050680	314.4
56	Existing	22.6	40.0	4.5	1123	628112	5050711	317.9
57	Vacant	17.3	40.0	4.5	1510	628228	5050337	300.4
58	Existing	39.2	40.0	4.5	164	628259	5052429	340.6
59	Existing	25.2	40.0	4.5	1017	628263	5050849	339.5
60	Existing	25.7	40.0	4.5	962	628263	5050906	336.1
61	Vacant	17.0	40.0	4.5	1508	628353	5050365	301.5
62	Existing	21.7	40.0	4.5	951	628374	5053262	359.5
63	Existing	20.6	40.0	4.5	1077	628413	5053387	359.5
64	Existing	21.2	40.0	4.5	996	628440	5053305	357.5
65	Existing	21.5	40.0	4.5	971	628444	5053279	357.5
66	Existing	21.7	40.0	4.5	948	628449	5053256	357.3
67	Existing	21.8	40.0	4.5	929	628457	5053236	357.4
68	Existing	21.1	40.0	4.5	917	628489	5053221	355.0
69	Existing	21.2	40.0	4.5	837	628586	5053121	354.5
70	Existing	21.1	40.0	4.5	905	628604	5053187	354.5
71	Existing	33.3	40.0	4.5	413	628780	5052408	354.5
72	Existing	30.8	40.0	4.5	529	628852	5052546	359.5
73	Existing	30.6	40.0	4.5	536	628864	5052538	359.5
74	Existing	23.4	40.0	4.5	793	628927	5052883	362.3
75	Existing	26.0	40.0	4.5	628	628970	5052521	343.8
76	Vacant	25.5	40.0	4.5	929	628972	5051116	367.2
77	Existing	25.1	40.0	4.5	707	629017	5052615	351.2

POR ID	Description	Sound Pressure Level (dBA)	Performance Limit (dBA)	POR Height (m)	Min distance to Source (m)	UTM Coordinates NAD 83 Zone 17 (m)		
						X	Y	Z
78	Vacant	25.2	40.0	4.5	952	629054	5051139	370.0
79	Existing	23.0	40.0	4.5	932	629152	5052831	359.1
80	Existing	22.6	40.0	4.5	969	629178	5052859	359.5
81	Existing	21.8	40.0	4.5	979	629256	5052745	347.2
82	Existing	21.5	40.0	4.5	1016	629286	5052767	347.6
83	Existing	20.7	40.0	4.5	1105	629373	5052793	348.3
84	Existing	22.4	40.0	4.5	1139	629567	5051454	349.5
85	Existing	21.1	40.0	4.5	1299	629693	5051348	354.5
86	Existing	20.2	40.0	4.5	1415	629791	5051283	356.8
87	Existing	19.6	40.0	4.5	1502	629871	5051250	356.1
88	Existing	19.4	40.0	4.5	1539	629907	5051239	358.8

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

7. Conclusions and Recommendations

For the Burk's Falls East Solar Project, the sound pressure levels at the POR have been estimated using the CADNA-A model, based on ISO 9613-2. It has been determined that no mitigation measures are needed for the Project operation in accordance with Ontario Regulation 359/09 and 521/10.

Based on the results obtained in this study, it is concluded that the sound pressure levels at the POR will be below MOE requirements for Class 3 areas of 40-dBA at all time.

8. Signatures

Report Prepared By

_____

Kyle Cassidy, Mechanical Engineering Intern

Report Reviewed and Approved By

_____

Joaquin Moran, Ph.D., P.Eng.

9. References

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IEEE. 2006. C57.12.90-2006: Standard Test Code for Liquid-Immersed, Power and Regulating Transformers. pp 64 to 76.

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NEMA. 2000. Standards Publication No. TR 1-1993 (R2000): Transformers, Regulators and Reactors. National Electrical Manufacturers Association. 31 pp. (This reference probably not needed now).

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International Organization for Standardization (ISO). Standard 1913-2: Acoustics – Attenuation of sound during propagation outdoors – Part 2: General Method of Calculation.

Appendix A

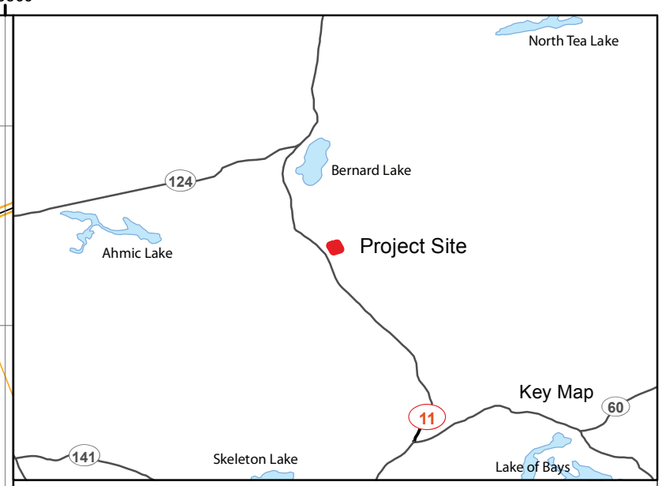
Land Use Zoning Designation Plan and Area Location Plan

626500 627000 627500 628000 628500 629000 629500 630000 630500

5053500 5053000 5052500 5052000 5051500 5051000 5050500 5050000

CHETWYND RD
RELATIVE RD
BLIND LINE
TOWER RD
LEGGETTS RD
HWY 11
SANDY COVE DR

Cluster 1
Cluster 2
Cluster 3
Cluster 4
Cluster 5
Cluster 6
Cluster 7
SUB
50
58
71



Legend

- Cluster # — Inverter Cluster
- SUB — Substation Transformer
- # — Noise Receptor - Existing
- # — Noise Receptor - Vacant
- # — Representative Noise Receptor
- Railway
- Road
- Parcel
- Project Site
- 1000 m from Project Site
- Waterbody

Zones

- RU Rural
- R Residential
- MX Extractive Industrial
- W Wetlands Protection
- FP Floodplain
- C Commercial
- P Public
- I Institutional

NORTH

0 125 250 500 Metres

1:15,000

Notes:
1. Produced by Hatch under licence from Ontario Ministry of Natural Resources, Copyright (c) Queens Printer 2011.
2. Spatial referencing UTM NAD 83.

Figure A.1
Northland Power Solar
Burk's Falls East L.P.

Burk's Falls East Solar Project
Zoning Designation Plan

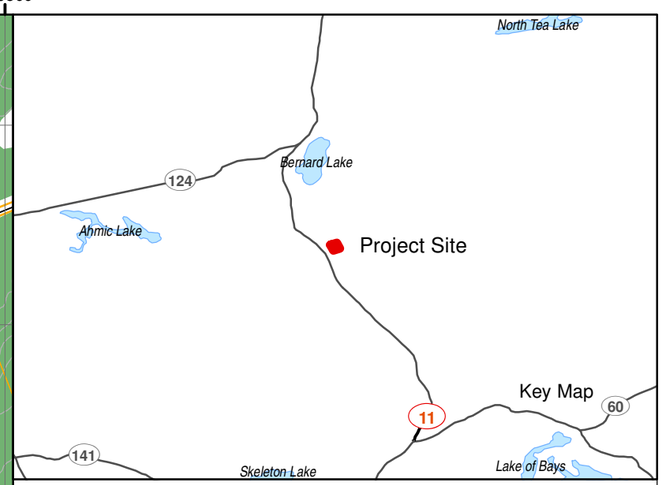
HATCH™

626500 627000 627500 628000 628500 629000 629500 630000 630500

5053500 5053000 5052500 5052000 5051500 5051000 5050500 5050000

CHETWYND RD
RELATIVE RD
BLIND LINE
SANDY COVE DR
TOWER RD
LEGGETTS RD
HWY 11

Cluster 1
Cluster 2
Cluster 3
Cluster 4
Cluster 5
Cluster 6
Cluster 7
SUB
50
58
71



Legend

- Cluster # — Inverter Cluster
- SUB — Substation Transformer
- # — Receptors - Existing
- # — Receptors - Vacant
- # — Representative Noise Receptor
- Railway
- Road
- Topographic Contour (5 m interval)
- Watercourse
- Parcel
- Project Site
- 1000 m from Project Site
- Waterbody
- Wooded Area

Notes:
1. Produced by Hatch under licence from Ontario Ministry of Natural Resources, Copyright (c) Queens Printer 2011.
2. Spatial referencing UTM NAD 83.
3. Due to scale limitations, the three-part inverter unit is represented as a single point.

0 125 250 500 Metres

1:15,000

NORTH

Figure A.2
Northland Power Solar
Burk's Falls East L.P.

Burk's Falls East Solar Project
Scaled Area Location Plan

HATCH™

Path: P:\NORTHLAND\333751\DATABASES\334844\GIS\BurksFallsE\Burks FallsE_Noise_A2_ScaledPlan.mxd Date Saved: 12/7/2011 8:03:57 AM

Appendix B

Noise Sources

Table B.1 Point Sources from Burk's Falls East Solar Project Used in CADNA-A, Includes Tonality Penalty of 5.0-dBA.

Source ID	Description	Spectra ID	Total sound power level (dBA)	Correction (dBA)	Height (m)	Coordinates, UTM NAD 83 Zone 17 (m)		
						X	Y	Z
Sub	44-kV/10-MVA substation transformer	T44kV_10MVA	90.8	5.0	3.50	628093.9	5052249.9	326.5
Inv1	Two Sunny Central 800CP inverters at Cluster 1	SMA_SC800CPX2	91.3	5.0	2.60	627985.3	5051826.9	307.6
Inv2	Two Sunny Central 800CP inverters at Cluster 2	SMA_SC800CPX2	91.3	5.0	2.60	628039.3	5051988.4	312.6
Inv3	Two Sunny Central 800CP inverters at Cluster 3	SMA_SC800CPX2	91.3	5.0	2.60	628184.1	5052157.5	322.5
Inv4	Two Sunny Central 800CP inverters at Cluster 4	SMA_SC800CPX2	91.3	5.0	2.60	628535.4	5051936.5	327.6
Inv5	Two Sunny Central 800CP inverters at Cluster 5	SMA_SC800CPX2	91.3	5.0	2.60	628451.0	5052081.0	333.6
Inv6	Two Sunny Central 800CP inverters at Cluster 6	SMA_SC800CPX2	91.3	5.0	2.60	628414.8	5052191.5	336.2
Inv7	Two Sunny Central 800CP inverters at Cluster 7	SMA_SC800CPX2	91.3	5.0	2.60	628378.6	5052310.5	332.8
Trans1	27.6-kV/1.6-MVA cluster transformer at Cluster 1	T27.6kV_1.6MVA	80.1	5.0	2.58	627979.8	5051827.4	307.6
Trans2	27.6-kV/1.6-MVA cluster transformer at Cluster 2	T27.6kV_1.6MVA	80.1	5.0	2.58	628033.8	5051988.9	312.6
Trans3	27.6-kV/1.6-MVA cluster transformer at Cluster 3	T27.6kV_1.6MVA	80.1	5.0	2.58	628178.6	5052158.0	322.2
Trans4	27.6-kV/1.6-MVA cluster transformer at Cluster 4	T27.6kV_1.6MVA	80.1	5.0	2.58	628529.9	5051937.0	327.4
Trans5	27.6-kV/1.6-MVA cluster transformer at Cluster 5	T27.6kV_1.6MVA	80.1	5.0	2.58	628445.5	5052081.5	333.6
Trans6	27.6-kV/1.6-MVA cluster transformer at Cluster 6	T27.6kV_1.6MVA	80.1	5.0	2.58	628409.3	5052192.0	335.9
Trans7	27.6-kV/1.6-MVA cluster transformer at Cluster 7	T27.6kV_1.6MVA	80.1	5.0	2.58	628373.1	5052311.0	332.6

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
SMA_SC800CPX2		63.1	73.9	80.5	82.3	78.7	74.1	65.0	72.7	86.3	95.0
T27.6kV_1.6MVA	32.3	51.5	63.6	66.1	71.5	68.7	64.9	59.7	50.6	75.1	83.7
T44kV_10MVA	43.0	62.2	74.3	76.8	82.2	79.4	75.6	70.4	61.3	85.8	94.4

SC 720CP-10 / SC 760CP-10 / SC 800CP-10

Economic

- Direct deployment in the field due to outdoor enclosure
- Simplified shipping without concrete substation

Efficient

- Full nominal power at ambient temperatures up to 50 °C
- 10 % additional power for constant operation at ambient temperatures up to 25 °C

Flexible

- Powerful grid management functions (including LVRT)
- DC voltage range configurable

Reliable

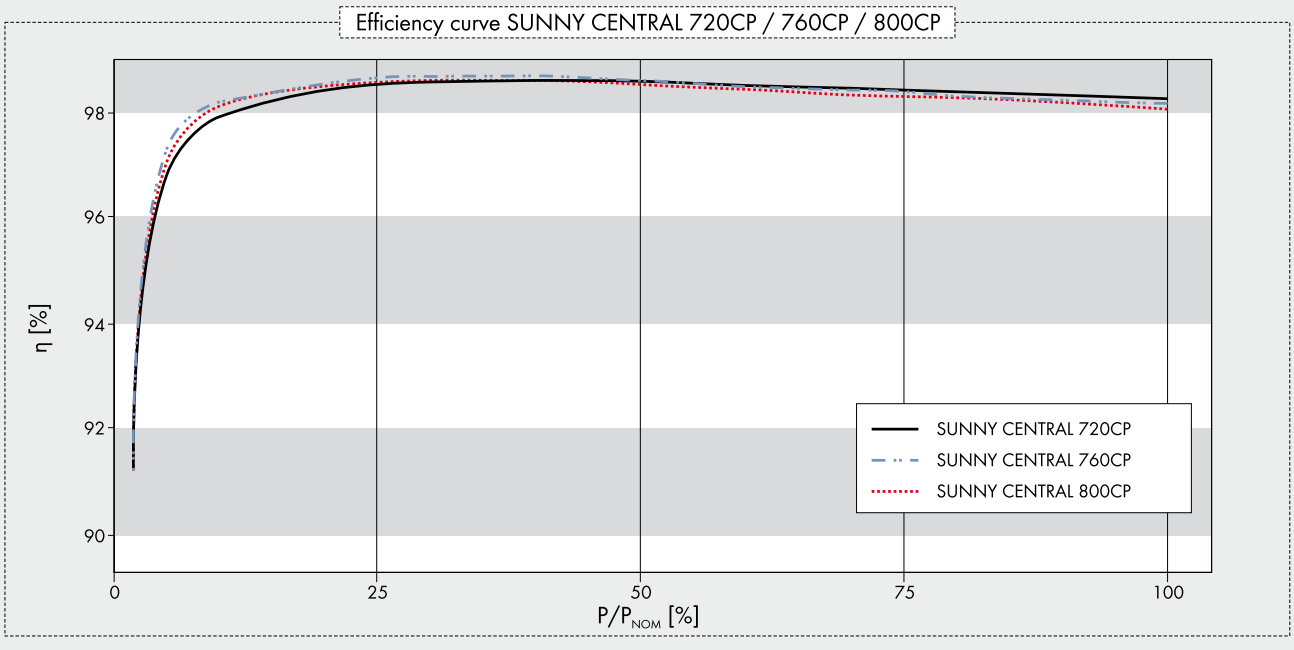
- Easy and safe installation due to a separate connection area
- Optional: extended input voltage range up to 1,100 V

SUNNY CENTRAL 720CP / 760CP / 800CP

High performance as standard

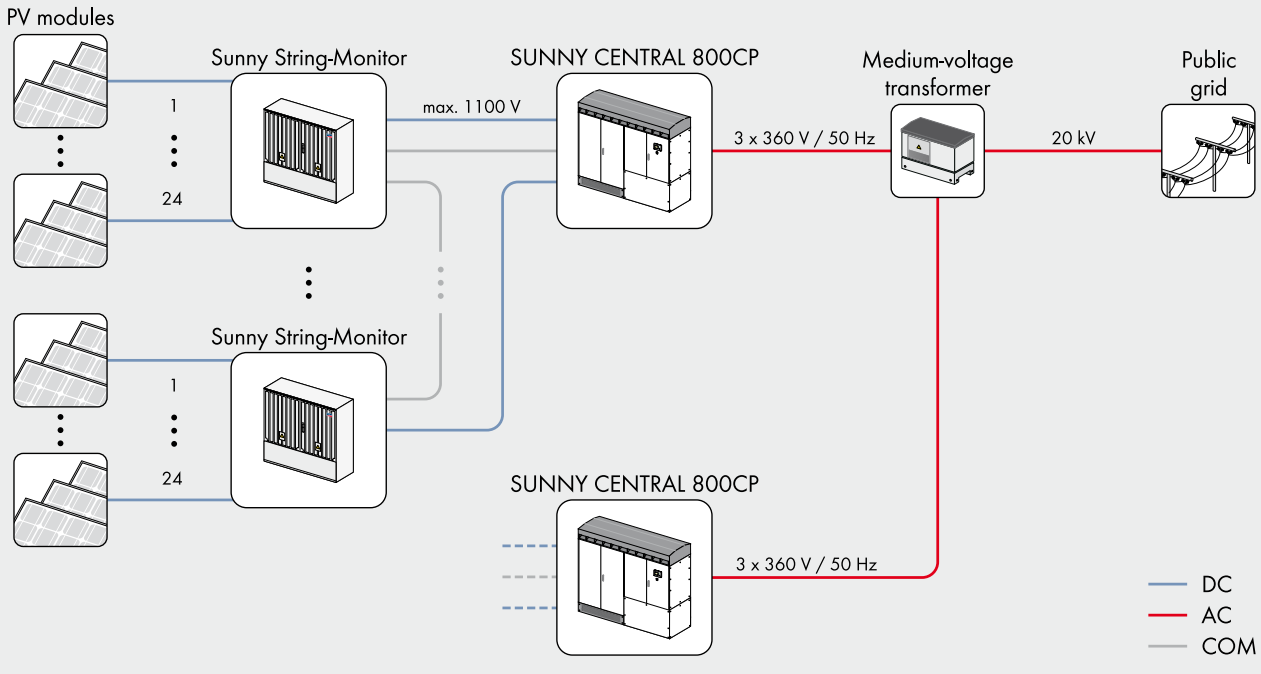
The completely new design of the Sunny Central CP series saves you real money. The compact and weatherproof enclosure is easy to load and transport and can be installed almost anywhere – there is no need for heavy protective concrete substations any longer. The innovative cooling concept OptiCool allows it to operate at full nominal power with ambient temperatures up to 50 °C. With the powerful grid management functions you are perfectly prepared for today's utility requirements as well as those still to come. The intelligent power management is the most important feature: in continuous operation, the Sunny Central 800CP can feed 880 kVA to the grid at ambient temperatures of up to 25 °C – that's 10 % more than the rated nominal power.

Technical data	Sunny Central 720CP	Sunny Central 760CP	Sunny Central 800CP
Input Data			
MPP voltage range	515 V – 820 V [3] [5]	545 V – 820 V [3] [5]	570 V – 820 V [3] [5]
Max. DC voltage		1000 V / 1100 V [1] Optional	
Max. DC current	1400 A	1400 A	1400 A
Number of DC inputs		9 fused inputs	
Output Values			
Nominal AC output @ 50 °C	720 kVA	760 kVA	800 kVA
Continuous AC power @ 25 °C	792 kVA	836 kVA	880 kVA
Max. AC current	1411 A	1411 A	1411 A
Nominal AC-current	1283 A	1283 A	1283 A
Nominal AC-voltage ±10 %	324 V	342 V	360 V
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	< 1500 W [4]	< 1500 W [4]	< 1500 W [4]
Standby consumption	< 100 W	< 100 W	< 100 W
External auxiliary voltage	3 x 230 V, 50 / 60 Hz	3 x 230 V, 50 / 60 Hz	3 x 230 V, 50 / 60 Hz
Dimensions and Weight			
Dimensions (W / H / D) in mm	2562 / 2279 / 956	2562 / 2279 / 956	2562 / 2279 / 956
Weight	1800 kg	1800 kg	1800 kg
Efficiency [2]			
Max. efficiency	98.6 %	98.6 %	98.6 %
Euro ETA	98.4 %	98.4 %	98.4 %
CEC-eta	98.4 %	98.4 %	98.4 %
Protection Rating and Ambient Conditions			
Protection rating (as per IEC 60529)	IP54	IP54	IP54
Protection rating (as per IEC 60721-3-3) Ambient conditions: fixed location, with protection against wind and weather	• Classification of chemically active substances: 3C2 • Classification of mechanically active substances: 3S2		
Operation temperature range	–20 °C ... +50 °C	–20 °C ... +50 °C	–20 °C ... +50 °C
Rel. humidity	15 % ... 95 %	15 % ... 95 %	15 % ... 95 %
Fresh air consumption	3000 m³/h	3000 m³/h	3000 m³/h
Max. altitude above sea level	2000 m	2000 m	2000 m

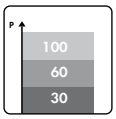


	Sunny Central 720CP	Sunny Central 760CP	Sunny Central 800CP
Features			
Sunny WebBox	●	●	●
Communication	Ethernet (optical fiber optional)	Ethernet (optical fiber optional)	Ethernet (optical fiber optional)
Communication with Sunny String-Monitor	RS485	RS485	RS485
LCD graphic display	●	●	●
Enclosure color	RAL 9016	RAL 9016	RAL 9016
Color of base	RAL 7005	RAL 7005	RAL 7005
Color of roof	RAL 7004	RAL 7004	RAL 7004
Ground fault monitoring / insulation monitoring	●	●	●
Circuit breaker AC side	●	●	●
Motor driven load disconnection switch on DC side	●	●	●
AC overvoltage protector	●	●	●
DC overvoltage protector	●	●	●
Overvoltage protectors for auxiliary supply	●	●	●
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 ❍ Optional features – Not available			
Type name	SC 720CP-10	SC 760CP-10	SC 800CP-10

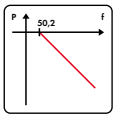
1) Startup at DC voltage < 1000 V
2) Efficiency measured without internal power supply
3) Further AC voltages, DC voltages and power classes can be configured (For detailed information see Technical Information „Innovations_CP“ at www.SMA.de)
4) Internal consumption at nominal power
5) At 1.05 $U_{AC,nom}$ and cos φ= 1
6) With complete dynamic grid support



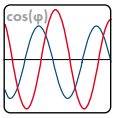
POWERFUL GRID MANAGEMENT FUNCTIONS



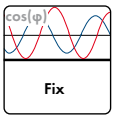
Remote controlled power reduction in case of grid overload
In order to avoid short-term grid overload, the grid operator presets a nominal active power value which the inverter will implement within 60 seconds. The nominal value is transmitted to the inverters via a ripple control receiver in combination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



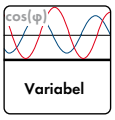
Frequency-dependent control of active power
As of a grid frequency of 50.2 Hz, the inverter automatically reduces the fed-in of active power according to a definable characteristic curve which thereby contributes to the stabilization of the grid frequency.



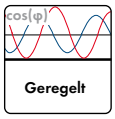
Static voltage support based on reactive power
To stabilize the grid voltage, SMA inverters feed reactive power (leading or lagging) into the grid. Three different modes are available:



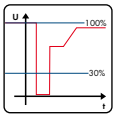
a) Fixed definition of the reactive power by the grid operator
The grid operator defines a fixed reactive power value or a fixed displacement factor between $\cos(\varphi)_{leading}$= 0.90 and $\cos(\varphi)_{lagging}$= 0.90.



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.

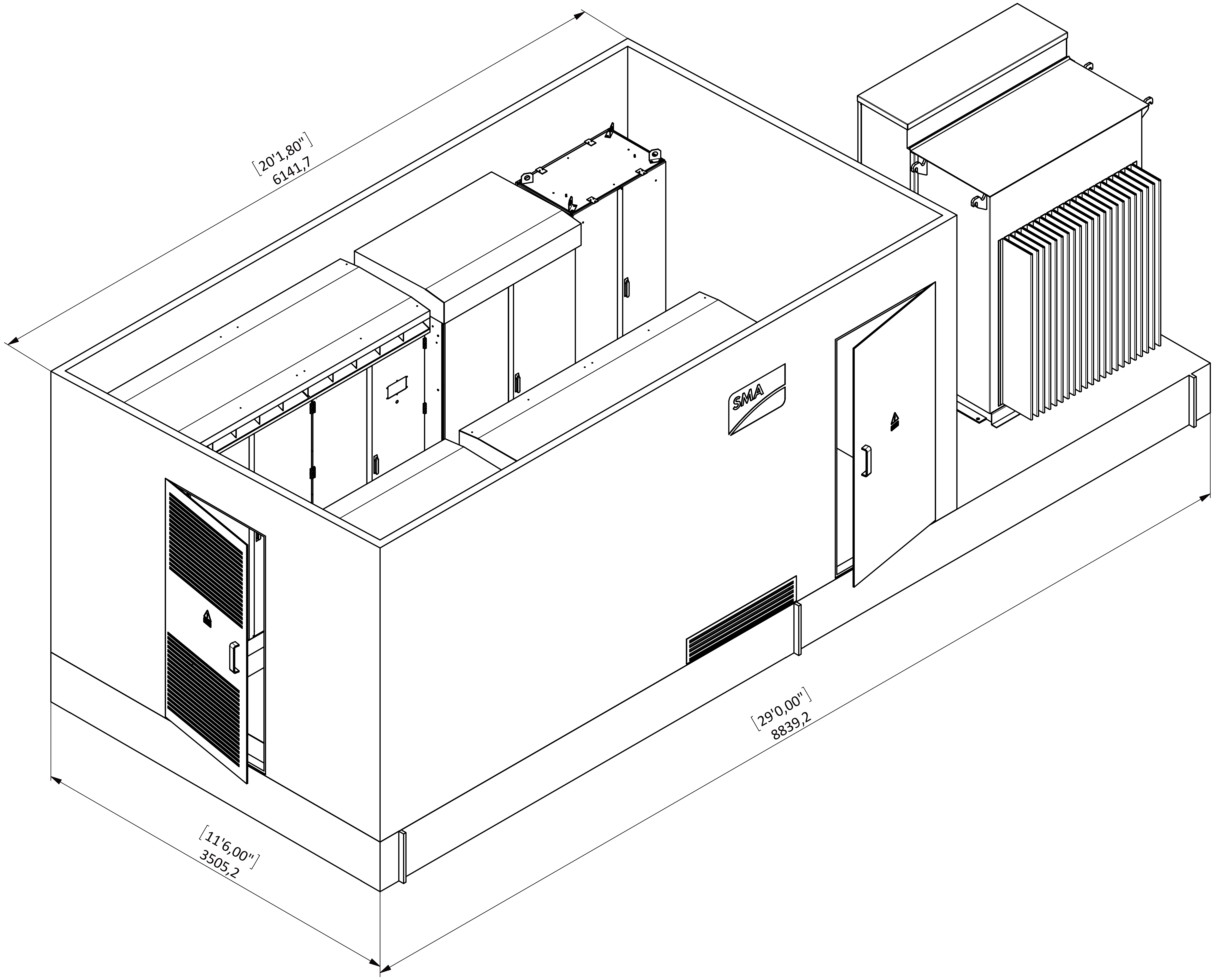


c) Control of the reactive power over a characteristic curve
The reactive power or the phase shift is controlled by a pre-defined characteristic curve – depending on the active power fed into the grid or the grid voltage.



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.

Dynamic Grid Support
LVRT (Low-Voltage Ride Through): The inverter stays connected to the grid during voltage drops and supports the grid by feeding reactive power.



Verwendbar für: / To be used for:

SMA SKID

all dimensions and tolerances are in millimeters [feet / inches]
alle Maß- und Toleranzangaben sind in mm [feet / inches]

Layout enclosure

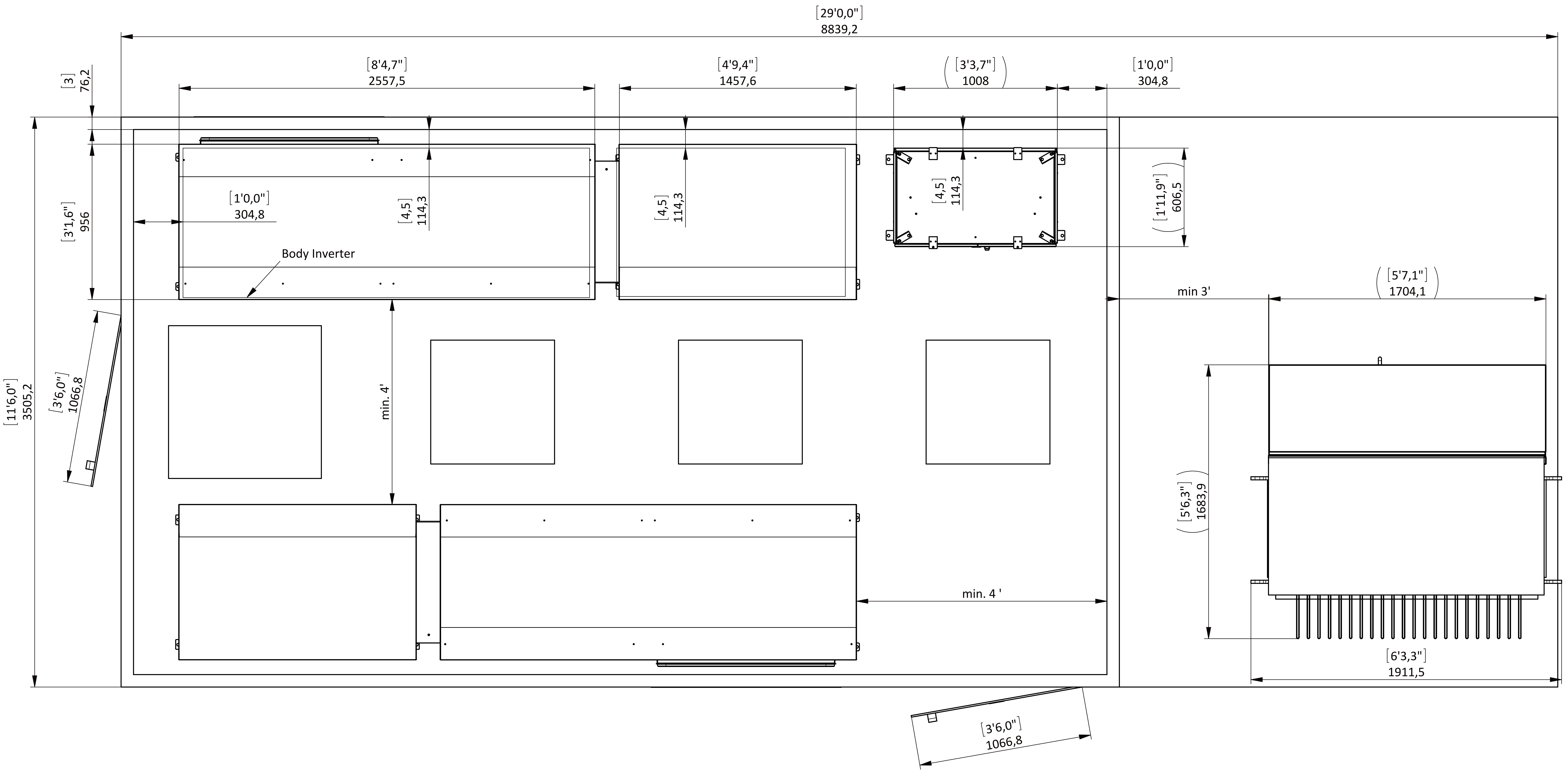
	Datum / Date	Name
Bearb.	25.02.2011	Mihelic
Gepr.		
Norm		
Freigabe		

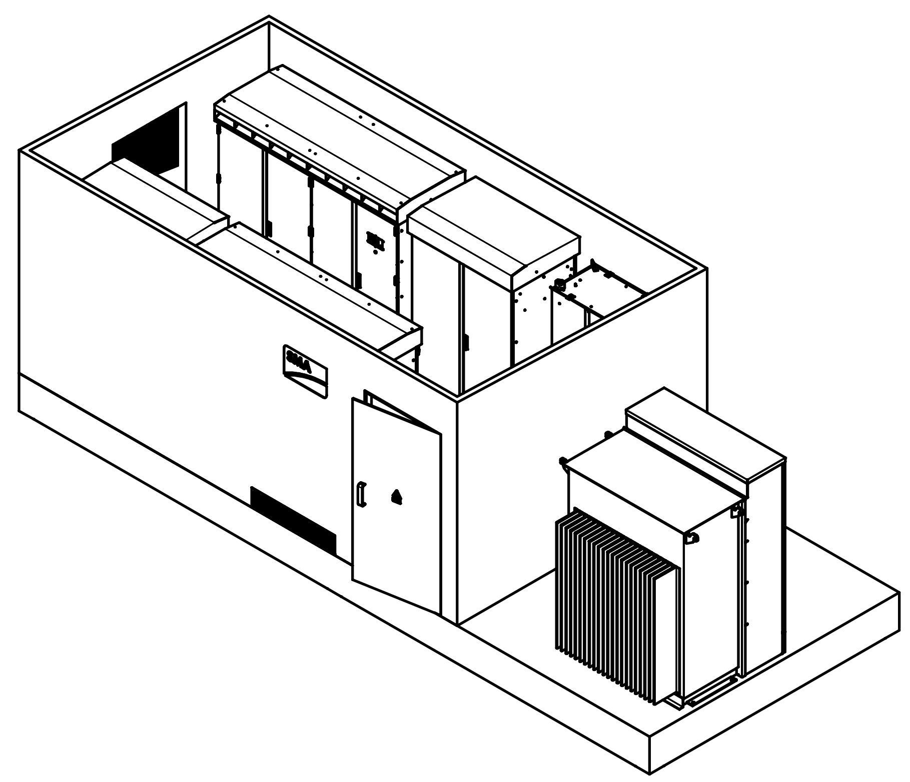
Rev.	Datum	Name

SMA Solar Technology AG
Sonnenallee 1
34266 Niestetal
Tel.: +49 561 9522-0

Urspr.: / Origin.:

Z-Nr.:
D.-No.:
A2
Blatt Page 1
EDV-Nr.:
Bl. / o.P. 1
Name :
Erstellt mit SolidWorks





Verwendbar für: / To be used for: **SMA SKID**						all dimensions and tolerances are in millimeters [feet / inches] alle Maß- und Toleranzangaben sind in mm [feet / inches]
				Datum / Date	Name	**Clearance**
			Bearb.	25.02.2011	Mihelic	
			Gepr.			
			Norm			
			Freigabe			
			SMA Solar Technology AG Sonnenallee 1 34266 Niestetal Tel.: +49 561 9522-0			Z-Nr.: D.-No.: / A2 / Blatt Page 1
						EDV-Nr.: / Bl. / o.P. 1
Rev.	Datum	Name	Urspr.: / Origin.:			Name : / Erstellt mit SolidWorks

Terz-midle-frequency [kHz]	Soundpower-level L_{xpA} [dB_A]500kW	Soundpower-level L_{xpA} [dB_A]640kW	Soundpower-level L_{xpA} [dB_A]720kW	Soundpower-level L_{xpA} [dB_A]760kW	Soundpower level L_{xpA} [dB_A]800kW
0,05	63,30	55,30	57,70	67,00	56,50
0,063	60,80	53,10	56,80	63,20	54,00
0,08	63,90	56,30	56,50	59,50	55,20
0,1	64,10	66,20	65,00	66,50	68,10
0,125	65,70	64,50	60,60	65,20	62,00
0,16	72,30	65,80	65,50	63,20	66,40
0,2	67,30	64,60	66,80	64,90	67,80
0,25	66,10	76,20	77,50	70,80	72,40
0,315	78,40	79,80	77,70	82,20	75,10
0,4	73,70	73,90	73,90	72,80	66,70
0,5	77,80	78,70	77,70	77,40	74,70
0,63	78,90	78,90	74,60	77,40	77,00
0,8	70,60	72,50	74,10	70,60	72,00
1	72,20	71,00	70,00	68,90	67,90
1,25	72,40	72,00	71,50	70,80	71,80
1,6	67,30	68,30	76,70	68,60	68,50
2	69,30	66,30	66,50	67,20	65,30
2,5	65,10	66,80	64,60	64,80	63,90
3,15	62,60	64,30	65,00	63,20	61,00
4,0	53,50	54,20	54,70	52,30	53,80
5,0	51,30	49,50	50,50	51,20	49,80
6,3	68,90	72,60	73,50	73,50	69,70

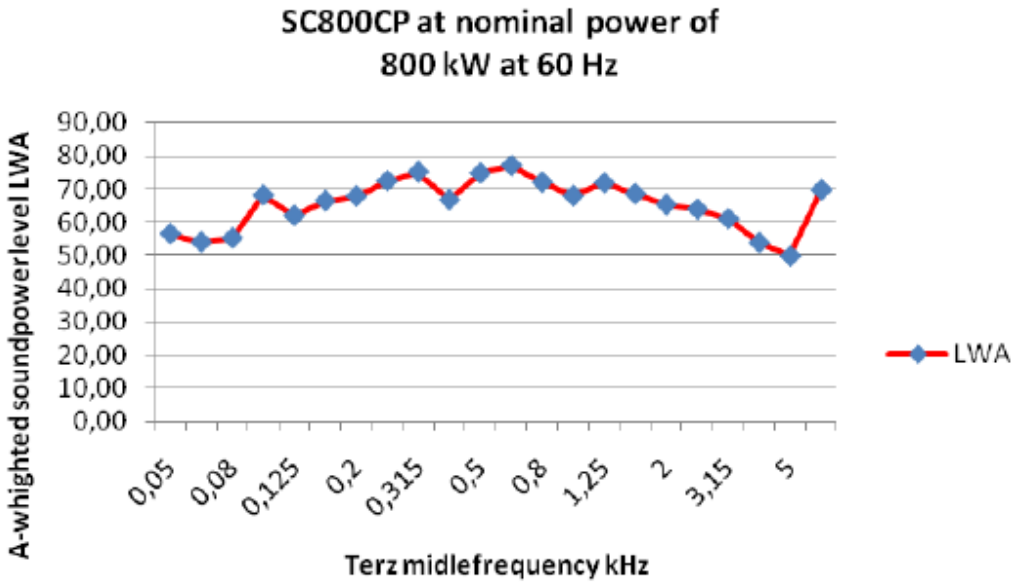
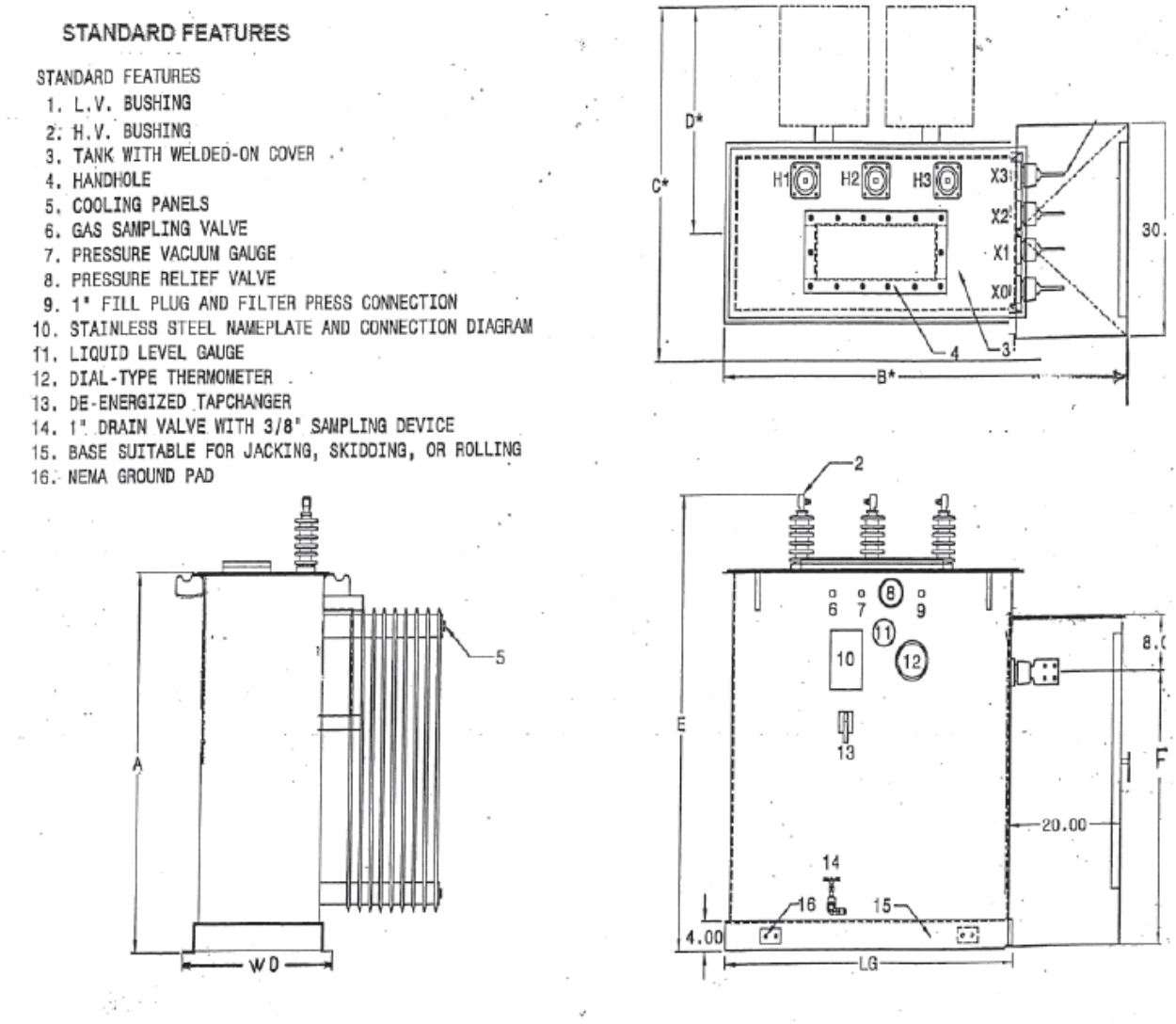


Figure B.1 SC800CP Inverter Sound Power Level as Provided by SMA. Note that the Header in the Table above Represents Various Inverter Models of CS###CP Series.



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.2 44-kVA/10-MVA Substation Transformer Catalogue Dimensions (inches).

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)

Average LpA	68 dBA	Based on NEMA TR1-1993 (R2000), Table 0-2
Estimated surface area	35 m^2	Estimated based on similar transformer dimensions

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.3 Sound Power Level Calculation for 44-kV/10-MVA Substation Transformer.

Sound Power Level Calculation for SMA Sunny Central 800CP, 100% LOAD

Third octave, as provided		
Freq #	Freq (Hz)	LwA (dBA)
1	25	
2	31.5	
3	40	
4	50	56.5
5	63	54.0
6	80	55.2
7	100	68.1
8	125	62.0
9	160	66.4
10	200	67.8
11	250	72.4
12	315	75.1
13	400	66.7
14	500	74.7
15	630	77.0
16	800	72.0
17	1000	67.9
18	1250	71.8
19	1600	68.5
20	2000	65.3
21	2500	63.9
22	3150	61.0
23	4000	53.8
24	5000	49.8
25	6300	69.7
26	8000	
27	10000	
	Total LwA	**83.3**

Full octave, as used in CADNA-A model			
Freq #	Freq (Hz)	LwA 1 inverter (dBA)	LwA 2 inverters (dBA)
	31.5		
5	63	60.1	63.1
8	125	70.9	73.9
11	250	77.5	80.5
14	500	79.3	82.3
17	1000	75.7	78.7
20	2000	71.1	74.1
23	4000	62.0	65.0
26	8000	69.7	72.7
	Total LwA	**83.3**	**86.3**

$$10\log\left(10^{\frac{56.5}{10}}+10^{\frac{54.0}{10}}+10^{\frac{55.2}{10}}\right)=60.1dBA$$

$$10\log\left(10^{\frac{60.1}{10}}+10^{\frac{60.1}{10}}\right)=63.1dBA$$

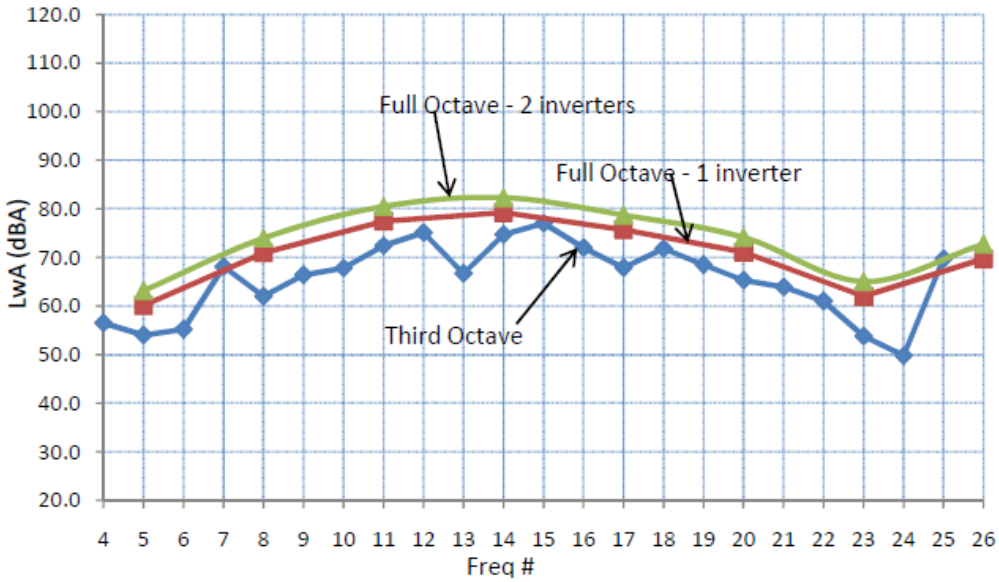


Figure B.4 Sound Power Level Calculation for SMA Sunny Central 800CP, 100% LOAD.

Estimated Frequency Spectra for Transformers

Transformer - 27.6kV/1.6MVA

From Handbook of Noise and Vibration Control (Crocker, 2007, page 1335-1336, Eq. 18 and Table 20)

Average LpA	61 dBA	Based on NEMA TR1-1993 (R2000), Table 0-2
Estimated surface area	14.872 m^2	Estimated based on client transformer drawings

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]	71.7	77.7	79.7	74.7	74.7	68.7	63.7	58.7	51.7	**83.8**
C2 based [dB]	71.7	80.7	85.7	80.7	80.7	71.7	63.7	58.7	51.7	**88.8**
C3 based [dB]	71.7	80.7	85.7	84.7	84.7	78.7	73.7	68.7	61.7	**90.8**

Resulting A-weighted sound power level

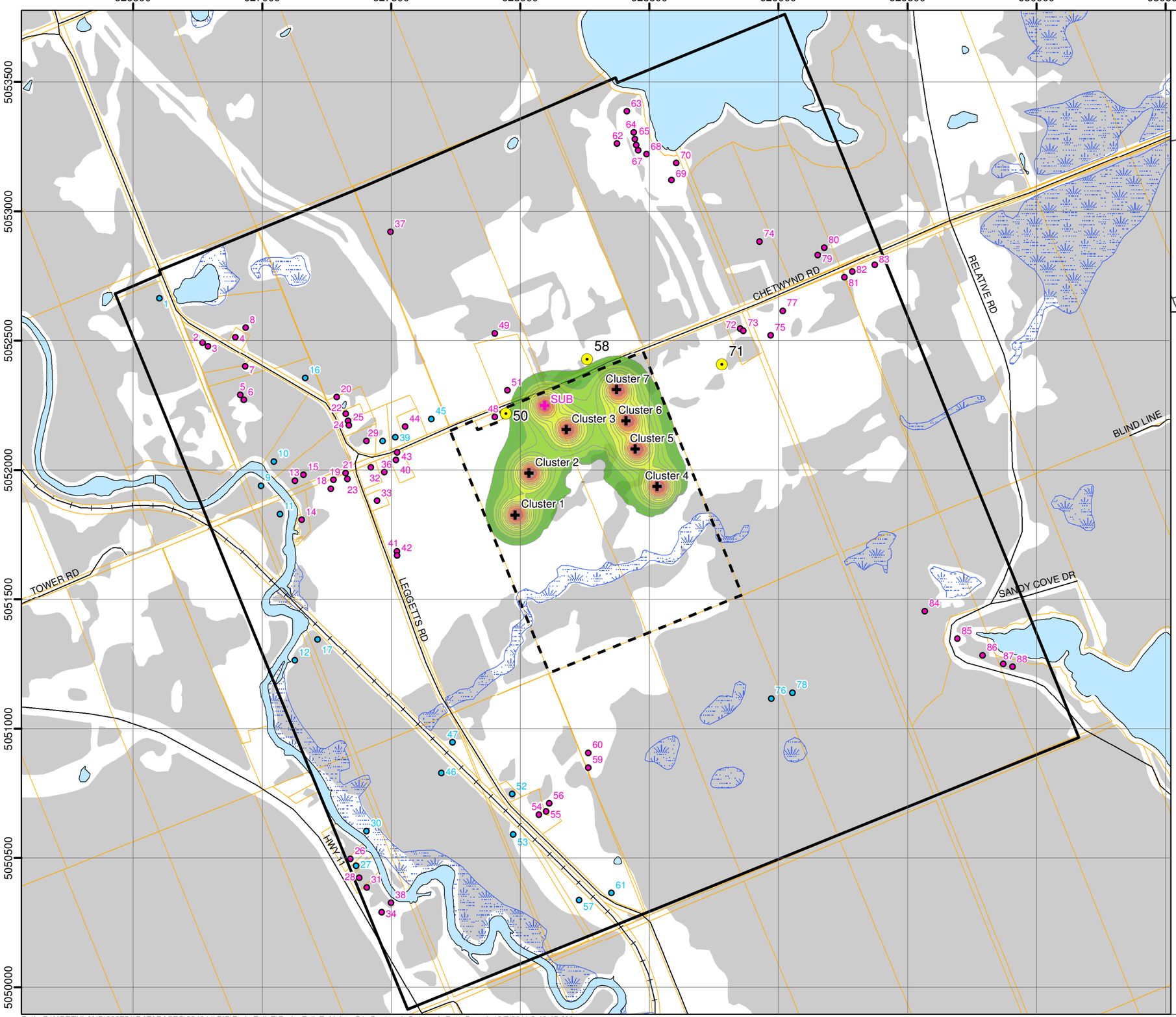
Freq. (Hz)	A-Weight	C1 based [dBA]	C2 based [dBA]	C2 based [dBA]
31	-39.4	32.3	41.3	46.3
63	-26.2	51.5	54.5	54.5
125	-16.1	63.6	69.6	69.6
250	-8.6	66.1	72.1	76.1
500	-3.2	71.5	77.5	81.5
1000	0	68.7	71.7	78.7
2000	1.2	64.9	64.9	74.9
4000	1	59.7	59.7	69.7
8000	-1.1	50.6	50.6	60.6
LwA [dBA]		**75.1**	**80.1**	**84.9**

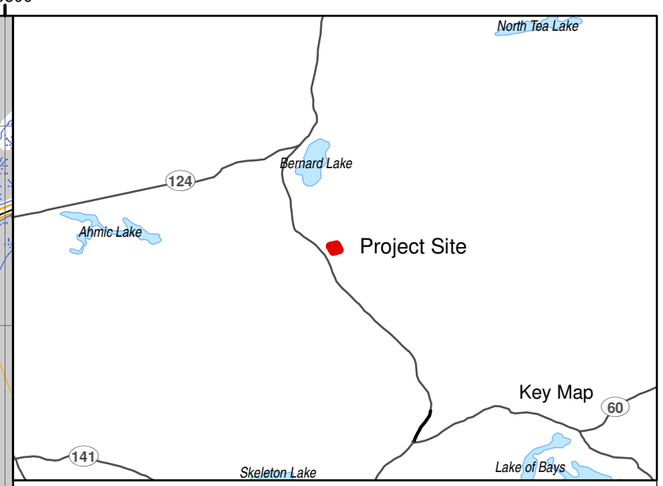
Used in the study

Figure B.5 Sound Power Level Calculation for 27.6-kV/1.6-MVA Cluster Transformer.

Appendix C

Noise Maps from CADNA-A





Legend

- Cluster # — Inverter Cluster
- SUB — Substation Transformer
- # — Noise Receptor - Existing
- # — Noise Receptor - Vacant
- # — Representative Noise Receptor
- Railway
- Road
- Parcel
- Project Site
- 1000 m from Project Site
- Waterbody
- Wetland
- Wooded Area

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. Produced by Hatch under licence from Ontario Ministry of Natural Resources, Copyright (c) Queens Printer 2011.
2. Spatial referencing UTM NAD 83.

0 125 250 500 Metres

NORTH

1:15,000

Figure C.1
Northland Power Solar
Burk's Falls East L.P.

Burk's Falls East Solar Project
Noise Contours at 4.5 m

HATCH™

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627750
628000
628250
628500
628750
5052500
5052250
5052000
5051750
49
58
72
71
51
50
48
CHETWYND RD
SUB
Cluster 7
Cluster 6
Cluster 3
Cluster 5
Cluster 2
Cluster 4
Cluster 1
North Tea Lake
Bernard Lake
124
Ahmic Lake
Project Site
Key Map
60
141
Skeleton Lake
Lake of Bays
Legend
Cluster # Inverter Cluster
SUB Substation Transformer
Noise Receptor - Existing
Noise Receptor - Vacant
Representative Noise Receptor
Road
Parcel
Project Site
30 m from Noise Receptor
Waterbody
Wetland
Wooded Area
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. Produced by Hatch under licence from Ontario Ministry of Natural Resources, Copyright (c) Queens Printer 2011.
2. Spatial referencing UTM NAD 83.
0 25 50 100 Metres
1:4,000
NORTH
Figure C.2
Northland Power Solar
Burk's Falls East L.P.
Burk's Falls East Solar Project
Noise Contours at 1.5 m
HATCH
Path: P:\NORTHLAND\333751\DATABASES\334844\GIS\BurksFallsE\Burks FallsE_Noise_C2_Contour1_5.mxd Date Saved: 12/7/2011 9:45:37 AM

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: 50.0
X: 627944.18
Y: 5052218.04
Z: 324.81

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	627985.28	5051826.92	307.60	0	63	68.1	-88.0	0.0	0.0	62.9	0.1	-4.4	0.0	0.0	0.0	0.0	-0.0	9.5	-88.0
2	627985.28	5051826.92	307.60	0	125	78.9	-88.0	0.0	0.0	62.9	0.2	2.8	0.0	0.0	0.0	0.0	-0.0	13.1	-88.0
3	627985.28	5051826.92	307.60	0	250	85.5	-88.0	0.0	0.0	62.9	0.4	2.9	0.0	0.0	0.0	0.0	-0.0	19.3	-88.0
4	627985.28	5051826.92	307.60	0	500	87.3	-88.0	0.0	0.0	62.9	0.8	-0.9	0.0	0.0	0.0	0.0	-0.0	24.5	-88.0
5	627985.28	5051826.92	307.60	0	1000	83.7	-88.0	0.0	0.0	62.9	1.4	-1.3	0.0	0.0	0.0	0.0	-0.0	20.7	-88.0
6	627985.28	5051826.92	307.60	0	2000	79.1	-88.0	0.0	0.0	62.9	3.8	-1.3	0.0	0.0	0.0	0.0	-0.0	13.7	-88.0
7	627985.28	5051826.92	307.60	0	4000	70.0	-88.0	0.0	0.0	62.9	12.9	-1.3	0.0	0.0	0.0	0.0	-0.0	-4.5	-88.0
8	627985.28	5051826.92	307.60	0	8000	77.7	-88.0	0.0	0.0	62.9	46.0	-1.3	0.0	0.0	0.0	0.0	-0.0	-29.9	-88.0

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	628039.28	5051988.42	312.60	0	63	68.1	-88.0	0.0	0.0	58.9	0.0	-3.4	0.0	0.0	0.0	0.0	-0.0	12.6	-88.0
2	628039.28	5051988.42	312.60	0	125	78.9	-88.0	0.0	0.0	58.9	0.1	2.5	0.0	0.0	0.0	0.0	-0.0	17.4	-88.0
3	628039.28	5051988.42	312.60	0	250	85.5	-88.0	0.0	0.0	58.9	0.3	3.2	0.0	0.0	0.0	0.0	-0.0	23.1	-88.0
4	628039.28	5051988.42	312.60	0	500	87.3	-88.0	0.0	0.0	58.9	0.5	-0.6	0.0	0.0	0.0	0.0	-0.0	28.5	-88.0
5	628039.28	5051988.42	312.60	0	1000	83.7	-88.0	0.0	0.0	58.9	0.9	-1.0	0.0	0.0	0.0	0.0	-0.0	24.9	-88.0
6	628039.28	5051988.42	312.60	0	2000	79.1	-88.0	0.0	0.0	58.9	2.4	-1.0	0.0	0.0	0.0	0.0	-0.0	18.8	-88.0
7	628039.28	5051988.42	312.60	0	4000	70.0	-88.0	0.0	0.0	58.9	8.2	-1.0	0.0	0.0	0.0	0.0	-0.0	4.0	-88.0
8	628039.28	5051988.42	312.60	0	8000	77.7	-88.0	0.0	0.0	58.9	29.1	-1.0	0.0	0.0	0.0	0.0	-0.0	-9.3	-88.0

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	628184.08	5052157.47	322.49	0	63	68.1	-88.0	0.0	0.0	58.9	0.0	-3.4	0.0	0.0	0.0	0.0	-0.0	12.6	-88.0
2	628184.08	5052157.47	322.49	0	125	78.9	-88.0	0.0	0.0	58.9	0.1	2.5	0.0	0.0	0.0	0.0	-0.0	17.4	-88.0
3	628184.08	5052157.47	322.49	0	250	85.5	-88.0	0.0	0.0	58.9	0.3	3.2	0.0	0.0	0.0	0.0	-0.0	23.2	-88.0
4	628184.08	5052157.47	322.49	0	500	87.3	-88.0	0.0	0.0	58.9	0.5	-0.6	0.0	0.0	0.0	0.0	-0.0	28.5	-88.0
5	628184.08	5052157.47	322.49	0	1000	83.7	-88.0	0.0	0.0	58.9	0.9	-1.0	0.0	0.0	0.0	0.0	-0.0	24.9	-88.0
6	628184.08	5052157.47	322.49	0	2000	79.1	-88.0	0.0	0.0	58.9	2.4	-1.0	0.0	0.0	0.0	0.0	-0.0	18.9	-88.0
7	628184.08	5052157.47	322.49	0	4000	70.0	-88.0	0.0	0.0	58.9	8.1	-1.0	0.0	0.0	0.0	0.0	-0.0	4.0	-88.0
8	628184.08	5052157.47	322.49	0	8000	77.7	-88.0	0.0	0.0	58.9	28.9	-1.0	0.0	0.0	0.0	0.0	-0.0	-9.1	-88.0

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	628535.43	5051936.47	327.60	0	63	68.1	-88.0	0.0	0.0	67.3	0.1	-5.0	0.0	0.0	0.0	0.0	-0.0	5.7	-88.0
2	628535.43	5051936.47	327.60	0	125	78.9	-88.0	0.0	0.0	67.3	0.3	3.5	0.0	0.0	0.0	0.0	-0.0	7.8	-88.0
3	628535.43	5051936.47	327.60	0	250	85.5	-88.0	0.0	0.0	67.3	0.7	2.7	0.0	0.0	0.0	0.0	-0.0	14.8	-88.0
4	628535.43	5051936.47	327.60	0	500	87.3	-88.0	0.0	0.0	67.3	1.3	-1.1	0.0	0.0	0.0	0.0	-0.0	19.8	-88.0
5	628535.43	5051936.47	327.60	0	1000	83.7	-88.0	0.0	0.0	67.3	2.4	-1.5	0.0	0.0	0.0	0.0	-0.0	15.5	-88.0
6	628535.43	5051936.47	327.60	0	2000	79.1	-88.0	0.0	0.0	67.3	6.3	-1.5	0.0	0.0	0.0	0.0	-0.0	7.0	-88.0
7	628535.43	5051936.47	327.60	0	4000	70.0	-88.0	0.0	0.0	67.3	21.5	-1.5	0.0	0.0	0.0	0.0	-0.0	-17.3	-88.0
8	628535.43	5051936.47	327.60	0	8000	77.7	-88.0	0.0	0.0	67.3	76.5	-1.5	0.0	0.0	0.0	0.0	-0.0	-64.7	-88.0

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	628451.03	5052080.97	333.57	0	63	68.1	-88.0	0.0	0.0	65.4	0.1	-4.8	0.0	0.0	0.0	0.0	-0.0	7.4	-88.0
2	628451.03	5052080.97	333.57	0	125	78.9	-88.0	0.0	0.0	65.4	0.2	3.2	0.0	0.0	0.0	0.0	-0.0	10.1	-88.0
3	628451.03	5052080.97	333.57	0	250	85.5	-88.0	0.0	0.0	65.4	0.6	2.8	0.0	0.0	0.0	0.0	-0.0	16.7	-88.0
4	628451.03	5052080.97	333.57	0	500	87.3	-88.0	0.0	0.0	65.4	1.0	-1.0	0.0	0.0	0.0	0.0	-0.0	21.9	-88.0
5	628451.03	5052080.97	333.57	0	1000	83.7	-88.0	0.0	0.0	65.4	1.9	-1.4	0.0	0.0	0.0	0.0	-0.0	17.8	-88.0

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)
6	628451.03	5052080.97	333.57	0	2000	79.1	-88.0	0.0	0.0	65.4	5.1	-1.4	0.0	0.0	0.0	0.0	-0.0	10.1	-88.0
7	628451.03	5052080.97	333.57	0	4000	70.0	-88.0	0.0	0.0	65.4	17.2	-1.4	0.0	0.0	0.0	0.0	-0.0	-11.2	-88.0
8	628451.03	5052080.97	333.57	0	8000	77.7	-88.0	0.0	0.0	65.4	61.4	-1.4	0.0	0.0	0.0	0.0	-0.0	-47.6	-88.0

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	628414.83	5052191.47	336.24	0	63	68.1	-88.0	0.0	0.0	64.5	0.1	-4.6	0.0	0.0	0.0	0.0	-0.0	8.2	-88.0
2	628414.83	5052191.47	336.24	0	125	78.9	-88.0	0.0	0.0	64.5	0.2	3.0	0.0	0.0	0.0	0.0	-0.0	11.2	-88.0
3	628414.83	5052191.47	336.24	0	250	85.5	-88.0	0.0	0.0	64.5	0.5	2.9	0.0	0.0	0.0	0.0	-0.0	17.7	-88.0
4	628414.83	5052191.47	336.24	0	500	87.3	-88.0	0.0	0.0	64.5	0.9	-1.0	0.0	0.0	0.0	0.0	-0.0	22.9	-88.0
5	628414.83	5052191.47	336.24	0	1000	83.7	-88.0	0.0	0.0	64.5	1.7	-1.4	0.0	0.0	0.0	0.0	-0.0	18.9	-88.0
6	628414.83	5052191.47	336.24	0	2000	79.1	-88.0	0.0	0.0	64.5	4.6	-1.4	0.0	0.0	0.0	0.0	-0.0	11.5	-88.0
7	628414.83	5052191.47	336.24	0	4000	70.0	-88.0	0.0	0.0	64.5	15.5	-1.4	0.0	0.0	0.0	0.0	-0.0	-8.5	-88.0
8	628414.83	5052191.47	336.24	0	8000	77.7	-88.0	0.0	0.0	64.5	55.1	-1.4	0.0	0.0	0.0	0.0	-0.0	-40.5	-88.0

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	628378.63	5052310.47	332.77	0	63	68.1	-88.0	0.0	0.0	63.9	0.1	-4.6	0.0	0.0	0.0	0.0	-0.0	8.7	-88.0
2	628378.63	5052310.47	332.77	0	125	78.9	-88.0	0.0	0.0	63.9	0.2	2.9	0.0	0.0	0.0	0.0	-0.0	11.9	-88.0
3	628378.63	5052310.47	332.77	0	250	85.5	-88.0	0.0	0.0	63.9	0.5	2.9	0.0	0.0	0.0	0.0	-0.0	18.2	-88.0
4	628378.63	5052310.47	332.77	0	500	87.3	-88.0	0.0	0.0	63.9	0.9	-0.9	0.0	0.0	0.0	0.0	-0.0	23.4	-88.0
5	628378.63	5052310.47	332.77	0	1000	83.7	-88.0	0.0	0.0	63.9	1.6	-1.4	0.0	0.0	0.0	0.0	-0.0	19.5	-88.0
6	628378.63	5052310.47	332.77	0	2000	79.1	-88.0	0.0	0.0	63.9	4.3	-1.4	0.0	0.0	0.0	0.0	-0.0	12.2	-88.0
7	628378.63	5052310.47	332.77	0	4000	70.0	-88.0	0.0	0.0	63.9	14.6	-1.4	0.0	0.0	0.0	0.0	-0.0	-7.1	-88.0
8	628378.63	5052310.47	332.77	0	8000	77.7	-88.0	0.0	0.0	63.9	51.9	-1.4	0.0	0.0	0.0	0.0	-0.0	-36.8	-88.0

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	628093.94	5052249.93	326.54	0	32	48.0	48.0	0.0	0.0	54.7	0.0	-3.0	0.0	0.0	0.0	0.0	-0.0	-3.7	-3.7
2	628093.94	5052249.93	326.54	0	63	67.2	67.2	0.0	0.0	54.7	0.0	-3.0	0.0	0.0	0.0	0.0	-0.0	15.5	15.5
3	628093.94	5052249.93	326.54	0	125	79.3	79.3	0.0	0.0	54.7	0.1	2.7	0.0	0.0	0.0	0.0	-0.0	21.8	21.8
4	628093.94	5052249.93	326.54	0	250	81.8	81.8	0.0	0.0	54.7	0.2	1.9	0.0	0.0	0.0	0.0	-0.0	25.0	25.0
5	628093.94	5052249.93	326.54	0	500	87.2	87.2	0.0	0.0	54.7	0.3	-0.9	0.0	0.0	0.0	0.0	-0.0	33.1	33.1
6	628093.94	5052249.93	326.54	0	1000	84.4	84.4	0.0	0.0	54.7	0.6	-0.9	0.0	0.0	0.0	0.0	-0.0	30.0	30.0
7	628093.94	5052249.93	326.54	0	2000	80.6	80.6	0.0	0.0	54.7	1.5	-0.9	0.0	0.0	0.0	0.0	-0.0	25.3	25.3
8	628093.94	5052249.93	326.54	0	4000	75.4	75.4	0.0	0.0	54.7	5.0	-0.9	0.0	0.0	0.0	0.0	-0.0	16.6	16.6
9	628093.94	5052249.93	326.54	0	8000	66.3	66.3	0.0	0.0	54.7	17.9	-0.9	0.0	0.0	0.0	0.0	-0.0	-5.4	-5.4

Point Source, ISO 9613, Name: "Trans1", ID: "Trans1"																			
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	627979.78	5051827.42	307.58	0	32	37.3	37.3	0.0	0.0	62.9	0.0	-4.4	0.0	0.0	0.0	0.0	-0.0	-21.2	-21.2
2	627979.78	5051827.42	307.58	0	63	56.5	56.5	0.0	0.0	62.9	0.1	-4.4	0.0	0.0	0.0	0.0	-0.0	-2.0	-2.0
3	627979.78	5051827.42	307.58	0	125	68.6	68.6	0.0	0.0	62.9	0.2	2.8	0.0	0.0	0.0	0.0	-0.0	2.8	2.8
4	627979.78	5051827.42	307.58	0	250	71.1	71.1	0.0	0.0	62.9	0.4	3.0	0.0	0.0	0.0	0.0	-0.0	4.8	4.8
5	627979.78	5051827.42	307.58	0	500	76.5	76.5	0.0	0.0	62.9	0.8	-0.9	0.0	0.0	0.0	0.0	-0.0	13.7	13.7
6	627979.78	5051827.42	307.58	0	1000	73.7	73.7	0.0	0.0	62.9	1.4	-1.3	0.0	0.0	0.0	0.0	-0.0	10.7	10.7
7	627979.78	5051827.42	307.58	0	2000	69.9	69.9	0.0	0.0	62.9	3.8	-1.3	0.0	0.0	0.0	0.0	-0.0	4.5	4.5
8	627979.78	5051827.42	307.58	0	4000	64.7	64.7	0.0	0.0	62.9	12.9	-1.3	0.0	0.0	0.0	0.0	-0.0	-9.7	-9.7
9	627979.78	5051827.42	307.58	0	8000	55.6	55.6	0.0	0.0	62.9	45.9	-1.3	0.0	0.0	0.0	0.0	-0.0	-51.9	-51.9

Point Source, ISO 9613, Name: "Trans2", ID: "Trans2"																			
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	628033.78	5051988.92	312.58	0	32	37.3	37.3	0.0	0.0	58.8	0.0	-3.4	0.0	0.0	0.0	0.0	-0.0	-18.1	-18.1
2	628033.78	5051988.92	312.58	0	63	56.5	56.5	0.0	0.0	58.8	0.0	-3.4	0.0	0.0	0.0	0.0	-0.0	1.1	1.1
3	628033.78	5051988.92	312.58	0	125	68.6	68.6	0.0	0.0	58.8	0.1	2.5	0.0	0.0	0.0	0.0	-0.0	7.2	7.2
4	628033.78	5051988.92	312.58	0	250	71.1	71.1	0.0	0.0	58.8	0.3	3.2	0.0	0.0	0.0	0.0	-0.0	8.8	8.8
5	628033.78	5051988.92	312.58	0	500	76.5	76.5	0.0	0.0	58.8	0.5	-0.6	0.0	0.0	0.0	0.0	-0.0	17.8	17.8
6	628033.78	5051988.92	312.58	0	1000	73.7	73.7	0.0	0.0	58.8	0.9	-1.0	0.0	0.0	0.0	0.0	-0.0	15.0	15.0

Point Source, ISO 9613, Name: "Trans2", ID: "Trans2"																			
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)
7	628033.78	5051988.92	312.58	0	2000	69.9	69.9	0.0	0.0	58.8	2.4	-1.0	0.0	0.0	0.0	0.0	-0.0	9.7	9.7
8	628033.78	5051988.92	312.58	0	4000	64.7	64.7	0.0	0.0	58.8	8.1	-1.0	0.0	0.0	0.0	0.0	-0.0	-1.2	-1.2
9	628033.78	5051988.92	312.58	0	8000	55.6	55.6	0.0	0.0	58.8	28.8	-1.0	0.0	0.0	0.0	0.0	-0.0	-31.0	-31.0

Point Source, ISO 9613, Name: "Trans3", ID: "Trans3"																			
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	628178.58	5052157.97	322.24	0	32	37.3	37.3	0.0	0.0	58.7	0.0	-3.4	0.0	0.0	0.0	0.0	-0.0	-18.0	-18.0
2	628178.58	5052157.97	322.24	0	63	56.5	56.5	0.0	0.0	58.7	0.0	-3.4	0.0	0.0	0.0	0.0	-0.0	1.2	1.2
3	628178.58	5052157.97	322.24	0	125	68.6	68.6	0.0	0.0	58.7	0.1	2.5	0.0	0.0	0.0	0.0	-0.0	7.3	7.3
4	628178.58	5052157.97	322.24	0	250	71.1	71.1	0.0	0.0	58.7	0.3	3.2	0.0	0.0	0.0	0.0	-0.0	8.9	8.9
5	628178.58	5052157.97	322.24	0	500	76.5	76.5	0.0	0.0	58.7	0.5	-0.6	0.0	0.0	0.0	0.0	-0.0	17.9	17.9
6	628178.58	5052157.97	322.24	0	1000	73.7	73.7	0.0	0.0	58.7	0.9	-1.0	0.0	0.0	0.0	0.0	-0.0	15.1	15.1
7	628178.58	5052157.97	322.24	0	2000	69.9	69.9	0.0	0.0	58.7	2.3	-1.0	0.0	0.0	0.0	0.0	-0.0	9.9	9.9
8	628178.58	5052157.97	322.24	0	4000	64.7	64.7	0.0	0.0	58.7	7.9	-1.0	0.0	0.0	0.0	0.0	-0.0	-0.9	-0.9
9	628178.58	5052157.97	322.24	0	8000	55.6	55.6	0.0	0.0	58.7	28.3	-1.0	0.0	0.0	0.0	0.0	-0.0	-30.4	-30.4

Point Source, ISO 9613, Name: "Trans4", ID: "Trans4"																			
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	628529.93	5051936.97	327.42	0	32	37.3	37.3	0.0	0.0	67.3	0.0	-5.0	0.0	0.0	0.0	0.0	-0.0	-25.0	-25.0
2	628529.93	5051936.97	327.42	0	63	56.5	56.5	0.0	0.0	67.3	0.1	-5.0	0.0	0.0	0.0	0.0	-0.0	-5.8	-5.8
3	628529.93	5051936.97	327.42	0	125	68.6	68.6	0.0	0.0	67.3	0.3	3.5	0.0	0.0	0.0	0.0	-0.0	-2.5	-2.5
4	628529.93	5051936.97	327.42	0	250	71.1	71.1	0.0	0.0	67.3	0.7	2.8	0.0	0.0	0.0	0.0	-0.0	0.4	0.4
5	628529.93	5051936.97	327.42	0	500	76.5	76.5	0.0	0.0	67.3	1.3	-1.1	0.0	0.0	0.0	0.0	-0.0	9.0	9.0
6	628529.93	5051936.97	327.42	0	1000	73.7	73.7	0.0	0.0	67.3	2.4	-1.5	0.0	0.0	0.0	0.0	-0.0	5.6	5.6
7	628529.93	5051936.97	327.42	0	2000	69.9	69.9	0.0	0.0	67.3	6.3	-1.5	0.0	0.0	0.0	0.0	-0.0	-2.1	-2.1
8	628529.93	5051936.97	327.42	0	4000	64.7	64.7	0.0	0.0	67.3	21.3	-1.5	0.0	0.0	0.0	0.0	-0.0	-22.3	-22.3
9	628529.93	5051936.97	327.42	0	8000	55.6	55.6	0.0	0.0	67.3	75.9	-1.5	0.0	0.0	0.0	0.0	-0.0	-86.1	-86.1

Point Source, ISO 9613, Name: "Trans5", ID: "Trans5"																			
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	628445.53	5052081.47	333.57	0	32	37.3	37.3	0.0	0.0	65.3	0.0	-4.8	0.0	0.0	0.0	0.0	-0.0	-23.3	-23.3
2	628445.53	5052081.47	333.57	0	63	56.5	56.5	0.0	0.0	65.3	0.1	-4.8	0.0	0.0	0.0	0.0	-0.0	-4.1	-4.1
3	628445.53	5052081.47	333.57	0	125	68.6	68.6	0.0	0.0	65.3	0.2	3.1	0.0	0.0	0.0	0.0	-0.0	-0.1	-0.1
4	628445.53	5052081.47	333.57	0	250	71.1	71.1	0.0	0.0	65.3	0.5	2.8	0.0	0.0	0.0	0.0	-0.0	2.4	2.4
5	628445.53	5052081.47	333.57	0	500	76.5	76.5	0.0	0.0	65.3	1.0	-1.0	0.0	0.0	0.0	0.0	-0.0	11.2	11.2
6	628445.53	5052081.47	333.57	0	1000	73.7	73.7	0.0	0.0	65.3	1.9	-1.4	0.0	0.0	0.0	0.0	-0.0	7.9	7.9
7	628445.53	5052081.47	333.57	0	2000	69.9	69.9	0.0	0.0	65.3	5.0	-1.4	0.0	0.0	0.0	0.0	-0.0	1.0	1.0
8	628445.53	5052081.47	333.57	0	4000	64.7	64.7	0.0	0.0	65.3	17.0	-1.4	0.0	0.0	0.0	0.0	-0.0	-16.2	-16.2
9	628445.53	5052081.47	333.57	0	8000	55.6	55.6	0.0	0.0	65.3	60.7	-1.4	0.0	0.0	0.0	0.0	-0.0	-69.0	-69.0

Point Source, ISO 9613, Name: "Trans6", ID: "Trans6"																			
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	628409.33	5052191.97	335.89	0	32	37.3	37.3	0.0	0.0	64.4	0.0	-4.6	0.0	0.0	0.0	0.0	-0.0	-22.4	-22.4
2	628409.33	5052191.97	335.89	0	63	56.5	56.5	0.0	0.0	64.4	0.1	-4.6	0.0	0.0	0.0	0.0	-0.0	-3.3	-3.3
3	628409.33	5052191.97	335.89	0	125	68.6	68.6	0.0	0.0	64.4	0.2	3.0	0.0	0.0	0.0	0.0	-0.0	1.1	1.1
4	628409.33	5052191.97	335.89	0	250	71.1	71.1	0.0	0.0	64.4	0.5	2.9	0.0	0.0	0.0	0.0	-0.0	3.4	3.4
5	628409.33	5052191.97	335.89	0	500	76.5	76.5	0.0	0.0	64.4	0.9	-0.9	0.0	0.0	0.0	0.0	-0.0	12.2	12.2
6	628409.33	5052191.97	335.89	0	1000	73.7	73.7	0.0	0.0	64.4	1.7	-1.4	0.0	0.0	0.0	0.0	-0.0	9.0	9.0
7	628409.33	5052191.97	335.89	0	2000	69.9	69.9	0.0	0.0	64.4	4.5	-1.4	0.0	0.0	0.0	0.0	-0.0	2.4	2.4
8	628409.33	5052191.97	335.89	0	4000	64.7	64.7	0.0	0.0	64.4	15.3	-1.4	0.0	0.0	0.0	0.0	-0.0	-13.6	-13.6
9	628409.33	5052191.97	335.89	0	8000	55.6	55.6	0.0	0.0	64.4	54.5	-1.4	0.0	0.0	0.0	0.0	-0.0	-61.8	-61.8

Point Source, ISO 9613, Name: "Trans7", ID: "Trans7"																			
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	628373.13	5052310.97	332.58	0	32	37.3	37.3	0.0	0.0	63.8	0.0	-4.5	0.0	0.0	0.0	0.0	-0.0	-22.0	-22.0
2	628373.13	5052310.97	332.58	0	63	56.5	56.5	0.0	0.0	63.8	0.1	-4.5	0.0	0.0	0.0	0.0	-0.0	-2.8	-2.8
3	628373.13	5052310.97	332.58	0	125	68.6	68.6	0.0	0.0	63.8	0.2	2.9	0.0	0.0	0.0	0.0	-0.0	1.7	1.7
4	628373.13	5052310.97	332.58	0	250	71.1	71.1	0.0	0.0	63.8	0.5	2.9	0.0	0.0	0.0	0.0	-0.0	3.9	3.9

Point Source, ISO 9613, Name: "Trans7", ID: "Trans7"																			
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)
5	628373.13	5052310.97	332.58	0	500	76.5	76.5	0.0	0.0	63.8	0.9	-0.9	0.0	0.0	0.0	0.0	-0.0	12.7	12.7
6	628373.13	5052310.97	332.58	0	1000	73.7	73.7	0.0	0.0	63.8	1.6	-1.4	0.0	0.0	0.0	0.0	-0.0	9.6	9.6
7	628373.13	5052310.97	332.58	0	2000	69.9	69.9	0.0	0.0	63.8	4.2	-1.4	0.0	0.0	0.0	0.0	-0.0	3.2	3.2
8	628373.13	5052310.97	332.58	0	4000	64.7	64.7	0.0	0.0	63.8	14.4	-1.4	0.0	0.0	0.0	0.0	-0.0	-12.2	-12.2
9	628373.13	5052310.97	332.58	0	8000	55.6	55.6	0.0	0.0	63.8	51.3	-1.4	0.0	0.0	0.0	0.0	-0.0	-58.2	-58.2