Bornish Wind LP

Bornish Wind Energy Centre – Project Modifications Report

Report

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Bornish Wind Energy Centre – Project Modifications Report

Prepared by:

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Project Number:

60333825

Date:

December, 2015

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Appendices

1. Introduction

The Bornish Wind Energy Centre (the Project) is a currently operating wind project, located in south-western Ontario, in the Municipality of North Middlesex, Middlesex County, Ontario. The Project operates under a Renewable Energy Approval (REA), number 2494-94QQ97, dated April 26, 2013. The Project and Approval include a transformer substation for the Project, located on Kerwood Road, and an additional transformer substation as part of the Parkhill Interconnect.

Modifications are sought to the REA to allow for use of a spare transformer, in the event of maintenance or failure of the approved transformer at the substation on Kerwood Road.

1.1 The Proponent

The Project will be owned and operated by Bornish Wind LP (Bornish), a wholly owned subsidiary of NextEra Energy Canada, LP (NextEra). NextEra's indirect parent company is NextEra Energy Resources, LLC. The primary contact for the Project is as follows:

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1.2 Project Study Area

The Project is located in south-western Ontario, in the Municipality of North Middlesex, Middlesex County, Ontario. More specifically, the Project Area is located south of Elginfield Road, east of Pete Sebe Road, north Elmtree Drive and west of Fort Rose Road. The Project Area has not changed from the original REA submission.

The site plan from the original REA submission is provided in Appendix A of the appended Substation Spare Transformer Noise Assessment Report. The site plan has not changed since the original REA submission.

2. Proposed Project Modification

Bornish is proposing to use a spare transformer in the event of failure or maintenance of the approved transformer at the substation on Kerwood Road. The spare transformer will only be used in place of the approved transformer, not simultaneously. The currently approved transformer is an 85 MVA transformer with a maximum sound power level of 102.8 dB(A). The spare transformer to be used is a 150 MVA transformer, identical to the central transformer used by the Jericho Wind Energy Centre, with a sound power level of 103.8 dB(A).

3. Edits to the REA Reports

As a result of the proposed Project modification, an amendment to the REA Noise Impact Assessment (NIA) was prepared (Appendix A). The amendment assesses the compliance of the Project's substation spare transformer with respect to the applicable Ontario Ministry of the Environment and Climate Change (MOECC) noise level limits. The results of the amended NIA indicate that the use of the spare transformer is predicted to operate in compliance with MOECC noise level limits at all points of reception for 6 metres per second (m/s) to 10 m/s wind speeds.

Edits are not required as a result of this proposed Project modification for the other REA reports that were submitted as part of the REA Application process.

4. Summary and Conclusion

The proposed Project modification described in this report is not anticipated to change the results of the REA reports (July, 2012).

Appendix A

Bornish Wind Energy Centre – Substation Spare Transformer Noise Assessment Report

Bornish Wind, LP.

Bornish Wind Energy Centre – Substation Spare Transformer Noise Assessment Report

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Project Number:

60447187

Date:

4 March 2016

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- may be based on information provided to Consultant which has not been independently verified;
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AECOM: 2012-01-06

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Revision Log

Revision #	Revised By	Date	Issue / Revision Description
0	Courtney Clarke / Alex Dundon	10 December 2015	Initial version
1	Alex Dundon	4 March 2016	Addition of generator sound power test data and sample calculation for VLR210

AECOM Signatures

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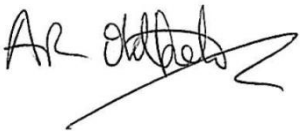

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Executive Summary

AECOM Canada Ltd. was retained by Bornish Wind, LP. (Bornish) to prepare an amendment to the Renewable Energy Approval – Noise Impact Assessment (NIA) – Bornish Wind Energy Centre prepared by GL Garrad Hassan Canada, Inc. This amendment assesses the compliance of the substation spare transformer at the Bornish Wind Energy Centre (the Project). The Bornish Wind Energy Centre is an existing wind project operating under the Renewable Energy Approval number 2494-94QQ97, dated April 26, 2013. The Project is located in south-western Ontario, in the Municipality of North Middlesex, Middlesex County, Ontario.

The spare transformer will be used in the event of failure or maintenance. The spare transformer will only be used in place of the approved transformer, not simultaneously.

This noise assessment evaluates noise emissions from the Project, under a scenario where the spare transformer is used instead of the existing approved transformer, with respect to the applicable Ontario Ministry of the Environment and Climate Change (MOECC) noise level limits.

The outdoor noise emissions produced by the operation of the Project were assessed at all Points of Reception, Participating Receptors, and Vacant Lot Receptors within 1500 m of the turbines or substation as identified in the NIA. Results of the assessment indicate that use of the spare transformer instead of the existing approved transformer in the Bornish Wind Energy Centre is predicted to operate in compliance with MOECC noise level limits at all points of reception for 6 m/s to 10 m/s wind speeds.

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Appendices

1. Introduction

The Bornish Wind Energy Centre (the Project) is a currently operating wind project, located in south-western Ontario, in the Municipality of North Middlesex, Middlesex County, Ontario. The Project operates under a Renewable Energy Approval, number 2494-94QQ97, dated April 26, 2013. The Project and Approval include a transformer substation for the Project, located on Kerwood Road, and an additional transformer substation as part of the Parkhill Interconnect.

Modifications are sought to the Renewable Energy Approval (REA) to allow for use of a spare transformer, in the event of maintenance or failure of the existing approved transformer at the substation on Kerwood Road. The currently approved transformer is an 85 MVA transformer with a maximum sound power level of 102.8 dB(A). The spare transformer to be used is a 150 MVA transformer, identical to the central transformer used by the Jericho Wind Energy Centre, with a sound power level of 103.8 dB(A).

As part of the Renewable Energy Approval Application, a Noise Impact Assessment (NIA) was prepared by GL Garrad Hassan Canada, Inc. This report assesses changes in noise impacts from the NIA, due to the proposed use of the substation spare transformer at the Project. Resultant noise levels have been assessed in accordance with the requirements of the Ontario Ministry of the Environment and Climate Change (MOECC) guideline *Noise Guidelines for Wind Farms – Interpretation for Applying MOE NPC Publications to Wind Power Generation Facilities* (October 2008).

As the substation spare transformer at the Bornish Wind Energy Centre is identical to the central transformer used in the Jericho Wind Energy Centre, this noise impact assessment has used the substation transformer specifications and information provided in the Jericho Wind Energy Centre – Revised Noise Assessment Report prepared in February 2014.

2. Project Layout

The Project is located in south-western Ontario, in the Municipality of North Middlesex, Middlesex County, Ontario. More specifically, the Project Area is located south of Elginfield Road, east of Pete Sebe Road, north of Elmtree Drive and west of Fort Rose Road. The Project Area has not changed from the original REA submission.

Site plans from the original REA submission are provided in Appendix A.

3. Points of Reception

The points of reception (POR) used in the Noise Impact Assessment (NIA) were also used for this assessment. These points of reception were classified into four different categories, which are outlined in Table 1 below.

Table 1: Receptor details for the Bornish Wind Energy Centre

Class	Description	Quantity	Remarks
NP	Non-participating	79	MOE Limits Apply
PR	Participating	25	MOE Limits Do Not Apply
VNP	Vacant Lot Non-participating	54	MOE Limits Apply
VPR	Vacant Lot Participating	43	MOE Limits Do Not Apply

The height of each POR was estimated to be 1.5, 4.5, or 7.5 metres for one storey, two storey, or three storey buildings, respectively. Participating receptors are residences or vacant lots located on the same premises as Bornish Wind Energy Centre project related infrastructure. A site layout is provided in Appendix A and coordinates are available in Section 9 summary tables.

The project area is best defined as a Class 3 area. The MOECC Publication NPC-300, *Environmental Noise Guideline for Stationary and transportation Sources – Approval and Planning,* defines Class 3 areas as “a rural area with an acoustical environment that is dominated by natural sounds having little or no road traffic, such as: a small community, agricultural area, a rural recreational area such as a cottage or a resort area or a wilderness area.”

4. Noise Source Summary

4.1 Wind turbine noise sources

The wind turbine technology used for this Project is the GE 1.6-100 Wind Turbine with Low-Noise Trailing Edges (LNTE). This model has the following features:

- 100 metre rotor diameter, with a swept area of 7,854 m^2
- Hub height of 80 metres
- Maximum generation capacity of 1.62 Megawatts

The REA for the Project approved 48 wind turbine generator locations, of which 45 have been constructed. This assessment includes noise emissions from all approved turbine locations, regardless of whether they have been constructed or not. No changes have been made, or are proposed, to the currently approved turbines.

As part of this assessment, existing and crystalized wind turbines (defined as those that have published Draft Site Plan Reports) within 5,000 metres of the transformer substation have also been considered. At the time of the Draft Site Plan Report for the Project, there were no adjacent operating or crystalized wind projects.

At this time, there are still no other existing or proposed wind turbines within 5,000 metres of the transformer substation.

Noise levels for Project turbines at varying wind speeds were provided in the approved REA application. No changes are proposed to the approved noise levels for Project wind turbines.

4.2 Substation noise source

The currently approved transformer for the Project is a Prolec GE 51/68/85 MVA transformer. The proposed spare transformer for the Project is a Prolec GE 102/136/170 MVA transformer, which will be used in the event that the primary transformer requires servicing.

The performance specification for the spare transformer will require that the average sound pressure level measured in accordance with ANSI/IEEE C57.12.90 shall not exceed 75 dB(A) over the measurement surface (as defined in the ANSI/IEEE standard). An estimate of noise emissions expected from the spare transformer is provided in Table 5. Appendix C includes a detailed calculation to support the transformer emission estimate. Note that a 5 dB penalty has been added to the transformer emission level in the noise prediction modelling as per the requirements of *Noise Guidelines for Wind Farms*.

Consistent with the methodology presented in the Bornish Noise Impact Assessment Report, substation noise levels have been modelled using a global ground absorption, G, of 0.7. The co-ordinates of the transformer are provided in Table 2.

Table 2: Substation Transformer coordinates (UTM17-NAD83) and geometry

Identifier	Equipment Make & Model	UTM Coordinates (NAD83 Zone 17N)	
		Easting	Northing
Spare Transformer	Prolec GE 102/136/170 MVA Transformer	441434	4775841
Primary Transformer	Prolec GE 51/68/85 MVA Transformer	441434	4775841

5. Assessment Criteria

Part V.0.1 of the Ontario Environmental Protection Act R.S.O. 1990 (EPA) addresses the approvals process required for renewable energy projects and Ontario Regulation 359/09 outlines the specific requirements for obtaining a Renewable Energy Approval (REA) from the MOECC.

As required by O. Reg. 359/09, noise from wind energy projects requiring approval within Ontario is assessed using the MOECC guideline *Noise Guidelines for Wind Farms – Interpretation for Applying MOE NPC Publications to Wind Power Generation Facilities* (PIBS 4709e, October 2008). This guideline, in conjunction with the regulation, sets the definitions, assessments and noise level limits for noise assessments of wind energy projects.

The MOECC noise level limits, at integer wind speeds, for points of reception in Class 3 areas are summarized in Table 3 below.

Table 3: Noise Level Limits for Wind Turbines

Point of Reception Classifications	1-hr L_{eq} Sound Level Limit (dB(A)) at 10m height Wind Speeds (m/s)				
	Less than or equal to 6 m/s	7 m/s	8 m/s	9 m/s	Greater than or equal to 10 m/s
Class 1 & 2 Areas	45.0	45.0	45.0	49.0	51.0
Class 3 Areas	40.0	43.0	45.0	49.0	51.0

The subject area is best described as Class 3 rural, based on the definition provided in NPC-300. The most stringent noise level limit for a Class 3 Area, 40 dBA at a wind speed of 6 m/s, was the Performance Noise Level Limit applied at each Point of Reception.

6. Noise Impact Assessment

The noise impact analysis for the proposed amendment was completed using the Cadna/A environmental noise modelling software. The noise modelling was conducted in accordance with the international standard ISO 9613-2. Noise impact calculations were completed using octave band spectral values in the range of 63 to 8000 Hz. All noise predictions were completed in accordance with the detailed requirements of the MOECC noise guideline (PIBS 4709e). Consistent with the approach in the approved REA application, the transformer was modelled as a point source, using the top of the transformer cover as the height of the point source. Global ground absorption was set to 0.7.

In order to determine the impacts of the proposed amendment to the REA, noise modeling was done using the existing approved substation transformer to determine the contribution of the transformer at each noise receptor within the study area. This level was then subtracted (logarithmically) from the total predicted level in the approved NIA to obtain approved turbine-only noise levels at all receptors.

All receptors were then modelled with the proposed spare transformer used in place of the existing approved transformer, in order to determine its partial contribution to noise levels throughout the study area. This partial contribution was then added logarithmically to the turbine-only noise level from the NIA to determine the impact of the amendment to the REA.

The total noise impact was then evaluated against the 40 dB(A) noise level limit described in Section 5.

Ground topography for the area was obtained from publicly available resources using digital elevation data from the Geogratis Geospatial Data Extraction tool[1]. The digital elevation data was used to generate ground elevation contour lines in the noise model.

[1] *Natural Resources Canada– Geospatial Data Extraction. Retrieved from http://geogratis.gc.cenga/site//extraction. Date accessed 16 October 2015.*

7. Results and Compliance

The results of the noise modelling show that the Project is predicted to operate in compliance with MOECC noise level limits at all points of reception within 1,500 metres of the Project turbines.

The Project is predicted to comply with the MOECC sound level limits for Wind Turbines in Class 3 areas for all of the non-participating and vacant lot non-participating points of reception assessed. The closest non-participating receptors to the transformer substation are receptors VLR210, VLR130 and VLR162. These receptors have predicted noise levels of 39.1, 37.8 and 37.7 respectively.

Table 4 presents the five non-participating receptors with the highest predicted noise levels with the spare transformer operating.

Table 4: Five non-participating receptors with the highest predicted noise level

POR ID	Easting (m)	Northing (m)	Calculated Sound Pressure Level at Receptor (dB(A)) at selected Wind Speed in m/s					Noise Level Performance Limit (dB(A))
			6 or <	7	8	9	10	
VLR255	442369	4771150	39.2	39.2	39.2	39.2	39.2	40.0
VLR210	441581	4776492	39.1	39.1	39.1	39.1	39.1	40.0
VLR226	440877	4773298	39.1	39.1	39.1	39.1	39.1	40.0
VLR221	441536	4773146	39.1	39.1	39.1	39.1	39.1	40.0
PoR62	441521	4774943	39.1	39.1	39.1	39.1	39.1	40.0

The overall predicted noise levels at the identified PORs and Participants due to the Project including the substation spare transformer are summarized in Table 7 and Table 8. Modelling calculations are included in Appendix D.

8. References

1. Ontario Ministry of the Environment, Environmental Noise Guideline Publication NPC-300: Stationary and Transportation Sources - Approval and Planning, August 2013.
2. International Organization for Standardization, ISO 9613-2: Acoustics - Attenuation of Sound during Propagation Outdoors Part 2: General Method of Calculation, Geneva, Switzerland, 1996.
3. PIBS 4709e, Noise Guidelines for Wind Farms – Interpretation for Applying MOE NPC Publications to Wind Power Generation Facilities, Ontario Ministry of the Environment, Queens Printer for Ontario, October 2008.
4. Bornish Wind Energy Centre Renewable Energy Approval Application Noise Impact Assessment, GL Garrad Hassan, April 2013.
5. ANSI/IEEE C57.12.90, Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers, Institute of Electrical and Electronics Engineers, Inc.
6. IEC 61400-11, Wind turbine generator systems – Part 11: Acoustic noise measurement techniques, International Electrotechnical Commission, 2006.
7. Parkhill Interconnect – Noise Impact Assessment, GL Garrad Hassan, September 2012

9. Summary Tables

Table 5: Bornish Primary Transformer Acoustic Emission Summary

Octave Band Centre Frequency (Hz)	63	125	250	500	1000	2000	4000	8000	Overall
Transformer Sound Power (dB(A))	74.2	86.3	88.8	94.2	91.4	87.6	82.4	73.3	97.8
Tonal Penalty (dB)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Resultant Transformer Sound Power (dB(A))	**79.2**	**91.3**	**93.8**	**99.2**	**96.4**	**92.6**	**87.4**	**78.3**	**102.8**

Table 6: Bornish Spare Transformer Acoustic Emission Summary

Octave Band Centre Frequency (Hz)	63	125	250	500	1000	2000	4000	8000	Overall
Transformer Sound Power (dB(A))	75.2	87.3	89.8	95.2	92.4	88.6	83.4	74.3	98.8
Tonal Penalty (dB)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Resultant Transformer Sound Power (dB(A))	**80.2**	**92.3**	**94.8**	**100.2**	**97.4**	**93.6**	**88.4**	**79.3**	**103.8**

Table 7: Noise Impact Assessment Summary Table - Non-participating

Point of Reception ID	Description	Height	UTM Coordinates		Distance to Nearest Project Turbine (m)	Nearest Project Turbine ID	Distance to Project Transformer Substation (m)	Calculated Sound Level (dBA) at Selected Wind Speeds (m/s)					Sound Level Limit (dBA) at Selected Wind Speeds (m/s)					Compliance Test
			x	y				6	7	8	9	10	6	7	8	9	10	
PoR1	NP	4.5	440492	4771514	897	35	4428	36.5	36.5	36.5	36.5	36.5	40.0	43.0	45.0	49.0	51.0	C
PoR3	NP	4.5	440033	4771602	905	34	4465	37.1	37.1	37.1	37.1	37.1	40.0	43.0	45.0	49.0	51.0	C
PoR4	NP	4.5	439966	4771712	783	34	4382	37.9	37.9	37.9	37.9	37.9	40.0	43.0	45.0	49.0	51.0	C
PoR5	NP	4.5	439532	4771702	825	34	4555	37.2	37.2	37.2	37.2	37.2	40.0	43.0	45.0	49.0	51.0	C
PoR6	NP	1.5	439562	4771796	726	34	4457	36.2	36.2	36.2	36.2	36.2	40.0	43.0	45.0	49.0	51.0	C
PoR7	NP	4.5	439422	4771758	818	34	4552	37.2	37.2	37.2	37.2	37.2	40.0	43.0	45.0	49.0	51.0	C
PoR8	NP	1.5	439363	4771853	768	34	4494	35.9	35.9	35.9	35.9	35.9	40.0	43.0	45.0	49.0	51.0	C
PoR9	NP	1.5	439361	4771770	838	34	4568	35.4	35.4	35.4	35.4	35.4	40.0	43.0	45.0	49.0	51.0	C
PoR10	NP	1.5	439307	4771775	864	34	4589	35.3	35.3	35.3	35.3	35.3	40.0	43.0	45.0	49.0	51.0	C
PoR11	NP	4.5	439071	4771955	904	34	4548	37.6	37.6	37.6	37.6	37.6	40.0	43.0	45.0	49.0	51.0	C
PoR12	NP	4.5	438788	4771895	1175	34	4751	36.5	36.5	36.5	36.5	36.5	40.0	43.0	45.0	49.0	51.0	C
PoR13	NP	1.5	438402	4771331	1486	46	5434	30.7	30.7	30.7	30.7	30.7	40.0	43.0	45.0	49.0	51.0	C
PoR14	NP	4.5	436943	4772310	1043	46	5713	33.0	33.0	33.0	33.0	33.0	40.0	43.0	45.0	49.0	51.0	C
PoR15	NP	4.5	437210	4772352	785	46	5479	35.2	35.2	35.2	35.2	35.2	40.0	43.0	45.0	49.0	51.0	C
PoR16	NP	7.5	437540	4772183	653	46	5343	37.0	37.0	37.0	37.0	37.0	40.0	43.0	45.0	49.0	51.0	C
PoR17	NP	1.5	438244	4771973	831	46	5014	34.5	34.5	34.5	34.5	34.5	40.0	43.0	45.0	49.0	51.0	C
PoR19	NP	4.5	440754	4771654	796	35	4242	37.3	37.3	37.3	37.3	37.3	40.0	43.0	45.0	49.0	51.0	C
PoR20	NP	1.5	440685	4771333	1092	35	4570	33.5	33.5	33.5	33.5	33.5	40.0	43.0	45.0	49.0	51.0	C
PoR21	NP	4.5	441164	4771421	1094	39	4428	36.5	36.5	36.5	36.5	36.5	40.0	43.0	45.0	49.0	51.0	C
PoR22	NP	1.5	441310	4771389	972	39	4454	34.8	34.8	34.8	34.8	34.8	40.0	43.0	45.0	49.0	51.0	C
PoR23	NP	1.5	441490	4771253	891	39	4588	34.9	34.9	34.9	34.9	34.9	40.0	43.0	45.0	49.0	51.0	C
PoR25	NP	4.5	442335	4771021	803	39	4903	38.0	38.0	38.0	38.0	38.0	40.0	43.0	45.0	49.0	51.0	C
PoR26	NP	1.5	442469	4770950	905	39	4999	35.8	35.8	35.8	35.8	35.8	40.0	43.0	45.0	49.0	51.0	C
PoR29	NP	4.5	445950	4770504	604	44	6991	37.3	37.3	37.3	37.3	37.3	40.0	43.0	45.0	49.0	51.0	C
PoR30	NP	4.5	446671	4770136	1314	45	7744	31.4	31.4	31.4	31.4	31.4	40.0	43.0	45.0	49.0	51.0	C
PoR31	NP	4.5	449038	4771469	1368	27	8771	30.1	30.1	30.1	30.1	30.1	40.0	43.0	45.0	49.0	51.0	C
PoR32	NP	1.5	448751	4771458	1221	27	8529	29.4	29.4	29.4	29.4	29.4	40.0	43.0	45.0	49.0	51.0	C
PoR33	NP	4.5	448414	4771614	956	27	8160	33.8	33.8	33.8	33.8	33.8	40.0	43.0	45.0	49.0	51.0	C
PoR34	NP	4.5	448177	4771580	964	27	7976	34.3	34.3	34.3	34.3	34.3	40.0	43.0	45.0	49.0	51.0	C
PoR35	NP	1.5	447805	4771673	953	27	7613	33.9	33.9	33.9	33.9	33.9	40.0	43.0	45.0	49.0	51.0	C
PoR36	NP	4.5	447683	4771839	810	26	7421	37.1	37.1	37.1	37.1	37.1	40.0	43.0	45.0	49.0	51.0	C
PoR37	NP	1.5	447456	4771732	965	26	7290	34.3	34.3	34.3	34.3	34.3	40.0	43.0	45.0	49.0	51.0	C
PoR38	NP	1.5	447320	4771865	900	26	7103	35.2	35.2	35.2	35.2	35.2	40.0	43.0	45.0	49.0	51.0	C
PoR39	NP	4.5	447191	4771732	1081	26	7073	36.1	36.1	36.1	36.1	36.1	40.0	43.0	45.0	49.0	51.0	C
PoR41	NP	4.5	446141	4772012	663	45	6068	37.9	37.9	37.9	37.9	37.9	40.0	43.0	45.0	49.0	51.0	C
PoR42	NP	4.5	444909	4772422	1101	23	4875	36.7	36.7	36.7	36.7	36.7	40.0	43.0	45.0	49.0	51.0	C
PoR43	NP	1.5	444801	4772492	1169	23	4749	34.9	34.9	34.9	34.9	34.9	40.0	43.0	45.0	49.0	51.0	C
PoR44	NP	1.5	444787	4772434	1190	43	4780	34.9	34.9	34.9	34.9	34.9	40.0	43.0	45.0	49.0	51.0	C
PoR45	NP	1.5	444930	4772401	1093	23	4905	34.6	34.6	34.6	34.6	34.6	40.0	43.0	45.0	49.0	51.0	C
PoR46	NP	1.5	444943	4772456	1055	23	4876	34.6	34.6	34.6	34.6	34.6	40.0	43.0	45.0	49.0	51.0	C
PoR47	NP	4.5	444657	4772426	1069	43	4696	37.5	37.5	37.5	37.5	37.5	40.0	43.0	45.0	49.0	51.0	C
PoR51	NP	4.5	441208	4773238	1083	35	2613	38.5	38.5	38.5	38.5	38.5	40.0	43.0	45.0	49.0	51.0	C
PoR54	NP	1.5	436989	4774194	1374	28	4740	31.4	31.4	31.4	31.4	31.4	40.0	43.0	45.0	49.0	51.0	C

Table 7: Noise Impact Assessment Summary Table - Non-participating

Point of Reception ID	Description	Height	UTM Coordinates		Distance to Nearest Project Turbine (m)	Nearest Project Turbine ID	Distance to Project Transformer Substation (m)	Calculated Sound Level (dBA) at Selected Wind Speeds (m/s)					Sound Level Limit (dBA) at Selected Wind Speeds (m/s)					Compliance Test
			x	y				6	7	8	9	10	6	7	8	9	10	
PoR55	NP	4.5	437435	4775794	1362	12	3999	31.8	31.8	31.8	31.8	31.8	40.0	43.0	45.0	49.0	51.0	C
PoR56	NP	4.5	437496	4775876	1390	12	3938	31.7	31.7	31.7	31.7	31.7	40.0	43.0	45.0	49.0	51.0	C
PoR57	NP	4.5	437989	4775657	967	12	3450	34.8	34.8	34.8	34.8	34.8	40.0	43.0	45.0	49.0	51.0	C
PoR58	NP	4.5	438086	4775744	1026	12	3349	34.6	34.6	34.6	34.6	34.6	40.0	43.0	45.0	49.0	51.0	C
PoR59	NP	1.5	438543	4775543	840	12	2906	35.4	35.4	35.4	35.4	35.4	40.0	43.0	45.0	49.0	51.0	C
PoR62	NP	4.5	441521	4774943	872	17	902	39.1	39.1	39.1	39.1	39.1	40.0	43.0	45.0	49.0	51.0	C
PoR63	NP	1.5	442089	4774807	962	5	1224	36.6	36.6	36.6	36.6	36.6	40.0	43.0	45.0	49.0	51.0	C
PoR65	NP	1.5	444543	4774133	869	8	3547	36.6	36.6	36.6	36.6	36.6	40.0	43.0	45.0	49.0	51.0	C
PoR66	NP	1.5	444496	4774220	770	8	3465	37.1	37.1	37.1	37.1	37.1	40.0	43.0	45.0	49.0	51.0	C
PoR67	NP	4.5	444493	4773978	871	21	3582	38.7	38.7	38.7	38.7	38.7	40.0	43.0	45.0	49.0	51.0	C
PoR68	NP	1.5	445664	4773957	705	10	4631	35.6	35.6	35.6	35.6	35.6	40.0	43.0	45.0	49.0	51.0	C
PoR69	NP	4.5	446511	4773750	850	11	5491	37.8	37.8	37.8	37.8	37.8	40.0	43.0	45.0	49.0	51.0	C
PoR70	NP	4.5	446563	4773650	882	11	5577	37.9	37.9	37.9	37.9	37.9	40.0	43.0	45.0	49.0	51.0	C
PoR73	NP	1.5	448024	4773393	791	26	7030	36.3	36.3	36.3	36.3	36.3	40.0	43.0	45.0	49.0	51.0	C
PoR74	NP	1.5	448171	4773387	843	27	7170	35.6	35.6	35.6	35.6	35.6	40.0	43.0	45.0	49.0	51.0	C
PoR76	NP	4.5	448583	4773286	839	27	7592	35.5	35.5	35.5	35.5	35.5	40.0	43.0	45.0	49.0	51.0	C
PoR77	NP	1.5	448799	4773131	845	27	7848	33.1	33.1	33.1	33.1	33.1	40.0	43.0	45.0	49.0	51.0	C
PoR78	NP	4.5	449553	4772906	1408	27	8633	29.7	29.7	29.7	29.7	29.7	40.0	43.0	45.0	49.0	51.0	C
PoR79	NP	4.5	448486	4774894	1456	11	7115	29.7	29.7	29.7	29.7	29.7	40.0	43.0	45.0	49.0	51.0	C
PoR80	NP	1.5	447960	4775018	1076	11	6578	29.9	29.9	29.9	29.9	29.9	40.0	43.0	45.0	49.0	51.0	C
PoR81	NP	4.5	447316	4775164	875	11	5921	33.8	33.8	33.8	33.8	33.8	40.0	43.0	45.0	49.0	51.0	C
PoR82	NP	1.5	447105	4775353	1050	11	5692	31.0	31.0	31.0	31.0	31.0	40.0	43.0	45.0	49.0	51.0	C
PoR83	NP	4.5	446795	4775234	997	11	5395	34.3	34.3	34.3	34.3	34.3	40.0	43.0	45.0	49.0	51.0	C
PoR84	NP	1.5	446545	4775477	1059	10	5124	31.4	31.4	31.4	31.4	31.4	40.0	43.0	45.0	49.0	51.0	C
PoR85	NP	4.5	444009	4776036	1138	8	2582	36.3	36.3	36.3	36.3	36.3	40.0	43.0	45.0	49.0	51.0	C
PoR87	NP	1.5	443235	4776297	738	4	1858	35.6	35.6	35.6	35.6	35.6	40.0	43.0	45.0	49.0	51.0	C
PoR88	NP	4.5	443429	4776574	1073	4	2125	34.8	34.8	34.8	34.8	34.8	40.0	43.0	45.0	49.0	51.0	C
PoR89	NP	4.5	443349	4776596	1040	4	2058	34.9	34.9	34.9	34.9	34.9	40.0	43.0	45.0	49.0	51.0	C
PoR90	NP	1.5	443471	4776774	1256	4	2241	31.5	31.5	31.5	31.5	31.5	40.0	43.0	45.0	49.0	51.0	C
PoR91	NP	7.5	443526	4777025	1494	4	2404	32.7	32.7	32.7	32.7	32.7	40.0	43.0	45.0	49.0	51.0	C
PoR92	NP	1.5	442955	4776289	574	4	1586	37.1	37.1	37.1	37.1	37.1	40.0	43.0	45.0	49.0	51.0	C
PoR93	NP	4.5	442456	4776303	604	4	1122	38.9	38.9	38.9	38.9	38.9	40.0	43.0	45.0	49.0	51.0	C
PoR94	NP	4.5	442311	4776526	869	4	1113	37.2	37.2	37.2	37.2	37.2	40.0	43.0	45.0	49.0	51.0	C
PoR96	NP	4.5	442012	4776698	948	3	1034	36.4	36.4	36.4	36.4	36.4	40.0	43.0	45.0	49.0	51.0	C
PoR97	NP	4.5	441091	4776727	950	Subs.	950	36.8	36.8	36.8	36.8	36.8	40.0	43.0	45.0	49.0	51.0	C
PoR98	NP	4.5	440782	4776706	828	1	1083	37.3	37.3	37.3	37.3	37.3	40.0	43.0	45.0	49.0	51.0	C
PoR99	NP	4.5	440666	4776840	779	1	1260	36.8	36.8	36.8	36.8	36.8	40.0	43.0	45.0	49.0	51.0	C
PoR100	NP	4.5	440538	4776746	621	1	1274	38.1	38.1	38.1	38.1	38.1	40.0	43.0	45.0	49.0	51.0	C
PoR102	NP	1.5	439421	4777027	828	1	2336	32.7	32.7	32.7	32.7	32.7	40.0	43.0	45.0	49.0	51.0	C
PoR103	NP	4.5	439351	4777038	886	1	2402	34.0	34.0	34.0	34.0	34.0	40.0	43.0	45.0	49.0	51.0	C
PoR104	NP	4.5	439165	4777198	1131	1	2644	32.2	32.2	32.2	32.2	32.2	40.0	43.0	45.0	49.0	51.0	C
PoR105	NP	4.5	445721	4776028	1281	9	4291	32.4	32.4	32.4	32.4	32.4	40.0	43.0	45.0	49.0	51.0	C
PoR106	NP	4.5	445829	4775845	1238	9	4395	33.0	33.0	33.0	33.0	33.0	40.0	43.0	45.0	49.0	51.0	C

Table 7: Noise Impact Assessment Summary Table - Non-participating

Point of Reception ID	Description	Height	UTM Coordinates		Distance to Nearest Project Turbine (m)	Nearest Project Turbine ID	Distance to Project Transformer Substation (m)	Calculated Sound Level (dBA) at Selected Wind Speeds (m/s)					Sound Level Limit (dBA) at Selected Wind Speeds (m/s)					Compliance Test
			x	y				6	7	8	9	10	6	7	8	9	10	
PoR107	NP	4.5	445553	4775384	764	9	4144	36.3	36.3	36.3	36.3	36.3	40.0	43.0	45.0	49.0	51.0	C
PoR109	NP	4.5	445333	4773628	872	23	4483	36.8	36.8	36.8	36.8	36.8	40.0	43.0	45.0	49.0	51.0	C
PoR110	NP	1.5	445068	4773388	921	23	4384	34.8	34.8	34.8	34.8	34.8	40.0	43.0	45.0	49.0	51.0	C
PoR111	NP	1.5	445193	4773159	716	23	4618	35.5	35.5	35.5	35.5	35.5	40.0	43.0	45.0	49.0	51.0	C
PoR112	NP	4.5	444977	4773035	904	23	4520	37.1	37.1	37.1	37.1	37.1	40.0	43.0	45.0	49.0	51.0	C
PoR113	NP	4.5	444945	4773179	960	23	4406	37.1	37.1	37.1	37.1	37.1	40.0	43.0	45.0	49.0	51.0	C
PoR116	NP	1.5	444591	4771289	823	47	5540	35.5	35.5	35.5	35.5	35.5	40.0	43.0	45.0	49.0	51.0	C
PoR117	NP	4.5	444425	4770964	820	47	5721	36.9	36.9	36.9	36.9	36.9	40.0	43.0	45.0	49.0	51.0	C
PoR118	NP	4.5	444358	4770042	1443	44	6494	32.4	32.4	32.4	32.4	32.4	40.0	43.0	45.0	49.0	51.0	C
PoR119	NP	4.5	444440	4770060	1367	44	6516	32.5	32.5	32.5	32.5	32.5	40.0	43.0	45.0	49.0	51.0	C
PoR120	NP	4.5	446141	4769567	1490	44	7843	29.8	29.8	29.8	29.8	29.8	40.0	43.0	45.0	49.0	51.0	C
PoR121	NP	4.5	446627	4770918	630	45	7156	36.6	36.6	36.6	36.6	36.6	40.0	43.0	45.0	49.0	51.0	C
PoR122	NP	4.5	436488	4772701	1410	46	5859	31.0	31.0	31.0	31.0	31.0	40.0	43.0	45.0	49.0	51.0	C
PoR123	NP	1.5	447915	4775316	1266	11	6502	28.5	28.5	28.5	28.5	28.5	40.0	43.0	45.0	49.0	51.0	C
PoR126	NP	1.5	440597	4771573	842	35	4349	35.0	35.0	35.0	35.0	35.0	40.0	43.0	45.0	49.0	51.0	C
PoR127	NP	4.5	439189	4771452	1199	34	4930	34.8	34.8	34.8	34.8	34.8	40.0	43.0	45.0	49.0	51.0	C
PoR128	NP	4.5	443682	4775839	801	6	2248	38.6	38.6	38.6	38.6	38.6	40.0	43.0	45.0	49.0	51.0	C
VLR129	VNP	4.5	445707	4775908	1186	9	4274	33.0	33.0	33.0	33.0	33.0	40.0	43.0	45.0	49.0	51.0	C
VLR130	VNP	4.5	441644	4776609	796	Subs.	796	37.8	37.8	37.8	37.8	37.8	40.0	43.0	45.0	49.0	51.0	C
VLR131	VNP	4.5	446870	4775258	995	11	5467	34.0	34.0	34.0	34.0	34.0	40.0	43.0	45.0	49.0	51.0	C
VLR132	VNP	4.5	444973	4772414	1049	23	4926	36.7	36.7	36.7	36.7	36.7	40.0	43.0	45.0	49.0	51.0	C
VLR133	VNP	4.5	444301	4770688	946	47	5897	35.7	35.7	35.7	35.7	35.7	40.0	43.0	45.0	49.0	51.0	C
VLR134	VNP	4.5	443825	4776098	1097	6	2405	36.4	36.4	36.4	36.4	36.4	40.0	43.0	45.0	49.0	51.0	C
VLR135	VNP	4.5	446985	4775358	1067	11	5572	33.1	33.1	33.1	33.1	33.1	40.0	43.0	45.0	49.0	51.0	C
VLR136	VNP	4.5	448883	4771535	1223	27	8604	31.1	31.1	31.1	31.1	31.1	40.0	43.0	45.0	49.0	51.0	C
VLR137	VNP	4.5	446419	4774981	567	10	5059	37.7	37.7	37.7	37.7	37.7	40.0	43.0	45.0	49.0	51.0	C
VLR138	VNP	4.5	446861	4771880	873	45	6719	37.0	37.0	37.0	37.0	37.0	40.0	43.0	45.0	49.0	51.0	C
VLR139	VNP	4.5	447819	4771781	849	27	7566	36.6	36.6	36.6	36.6	36.6	40.0	43.0	45.0	49.0	51.0	C
VLR140	VNP	4.5	436921	4774350	1431	12	4753	32.8	32.8	32.8	32.8	32.8	40.0	43.0	45.0	49.0	51.0	C
VLR141	VNP	4.5	448973	4771391	1393	27	8754	30.0	30.0	30.0	30.0	30.0	40.0	43.0	45.0	49.0	51.0	C
VLR142	VNP	4.5	447628	4775207	1020	11	6226	32.3	32.3	32.3	32.3	32.3	40.0	43.0	45.0	49.0	51.0	C
VLR143	VNP	4.5	445899	4770213	804	44	7184	34.7	34.7	34.7	34.7	34.7	40.0	43.0	45.0	49.0	51.0	C
VLR144	VNP	4.5	449099	4771934	1092	27	8603	31.8	31.8	31.8	31.8	31.8	40.0	43.0	45.0	49.0	51.0	C
VLR145	VNP	4.5	442400	4776432	744	4	1132	37.7	37.7	37.7	37.7	37.7	40.0	43.0	45.0	49.0	51.0	C
VLR146	VNP	4.5	438947	4777122	1257	1	2798	31.8	31.8	31.8	31.8	31.8	40.0	43.0	45.0	49.0	51.0	C
VLR147	VNP	4.5	444669	4771475	877	47	5434	37.4	37.4	37.4	37.4	37.4	40.0	43.0	45.0	49.0	51.0	C
VLR148	VNP	4.5	444713	4775890	811	9	3279	36.1	36.1	36.1	36.1	36.1	40.0	43.0	45.0	49.0	51.0	C
VLR149	VNP	4.5	440306	4776925	578	1	1564	37.7	37.7	37.7	37.7	37.7	40.0	43.0	45.0	49.0	51.0	C
VLR150	VNP	4.5	441388	4776671	831	Subs.	831	37.4	37.4	37.4	37.4	37.4	40.0	43.0	45.0	49.0	51.0	C
VLR151	VNP	4.5	445634	4775674	979	9	4203	34.4	34.4	34.4	34.4	34.4	40.0	43.0	45.0	49.0	51.0	C
VLR152	VNP	4.5	439639	4777082	741	1	2182	35.2	35.2	35.2	35.2	35.2	40.0	43.0	45.0	49.0	51.0	C
VLR153	VNP	4.5	439918	4777743	1310	1	2432	31.0	31.0	31.0	31.0	31.0	40.0	43.0	45.0	49.0	51.0	C
VLR155	VNP	4.5	444315	4775983	1040	9	2884	36.0	36.0	36.0	36.0	36.0	40.0	43.0	45.0	49.0	51.0	C

Table 7: Noise Impact Assessment Summary Table - Non-participating

Point of Reception ID	Description	Height	UTM Coordinates		Distance to Nearest Project Turbine (m)	Nearest Project Turbine ID	Distance to Project Transformer Substation (m)	Calculated Sound Level (dBA) at Selected Wind Speeds (m/s)					Sound Level Limit (dBA) at Selected Wind Speeds (m/s)					Compliance Test
			x	y				6	7	8	9	10	6	7	8	9	10	
VLR156	VNP	4.5	446787	4775404	1127	10	5371	33.3	33.3	33.3	33.3	33.3	40.0	43.0	45.0	49.0	51.0	C
VLR157	VNP	4.5	447218	4775303	1001	11	5809	33.0	33.0	33.0	33.0	33.0	40.0	43.0	45.0	49.0	51.0	C
VLR158	VNP	4.5	445481	4774483	603	10	4269	38.4	38.4	38.4	38.4	38.4	40.0	43.0	45.0	49.0	51.0	C
VLR159	VNP	4.5	445406	4770328	596	44	6795	36.7	36.7	36.7	36.7	36.7	40.0	43.0	45.0	49.0	51.0	C
VLR160	VNP	4.5	442694	4776362	600	4	1363	38.5	38.5	38.5	38.5	38.5	40.0	43.0	45.0	49.0	51.0	C
VLR161	VNP	4.5	445724	4775530	980	9	4301	34.9	34.9	34.9	34.9	34.9	40.0	43.0	45.0	49.0	51.0	C
VLR162	VNP	4.5	441551	4776633	800	Subs.	801	37.7	37.7	37.7	37.7	37.7	40.0	43.0	45.0	49.0	51.0	C
VLR163	VNP	4.5	449588	4773068	1491	27	8613	29.3	29.3	29.3	29.3	29.3	40.0	43.0	45.0	49.0	51.0	C
VLR165	VNP	4.5	445603	4770282	640	44	6949	36.2	36.2	36.2	36.2	36.2	40.0	43.0	45.0	49.0	51.0	C
VLR166	VNP	4.5	439756	4777055	666	1	2071	36.0	36.0	36.0	36.0	36.0	40.0	43.0	45.0	49.0	51.0	C
VLR167	VNP	4.5	447378	4773582	756	11	6359	38.7	38.7	38.7	38.7	38.7	40.0	43.0	45.0	49.0	51.0	C
VLR168	VNP	4.5	447032	4775224	928	11	5632	34.0	34.0	34.0	34.0	34.0	40.0	43.0	45.0	49.0	51.0	C
VLR169	VNP	4.5	447693	4773507	722	25	6680	38.3	38.3	38.3	38.3	38.3	40.0	43.0	45.0	49.0	51.0	C
VLR170	VNP	4.5	444715	4771743	958	47	5250	37.3	37.3	37.3	37.3	37.3	40.0	43.0	45.0	49.0	51.0	C
VLR171	VNP	4.5	444748	4771867	1029	47	5174	37.2	37.2	37.2	37.2	37.2	40.0	43.0	45.0	49.0	51.0	C
VLR172	VNP	4.5	444779	4771980	1074	43	5108	37.0	37.0	37.0	37.0	37.0	40.0	43.0	45.0	49.0	51.0	C
VLR173	VNP	4.5	444804	4772098	1110	43	5037	36.9	36.9	36.9	36.9	36.9	40.0	43.0	45.0	49.0	51.0	C
VLR174	VNP	4.5	444656	4772531	1081	22	4619	37.5	37.5	37.5	37.5	37.5	40.0	43.0	45.0	49.0	51.0	C
VLR175	VNP	4.5	444768	4772504	1181	22	4717	37.1	37.1	37.1	37.1	37.1	40.0	43.0	45.0	49.0	51.0	C
VLR176	VNP	4.5	444442	4772583	898	22	4434	38.4	38.4	38.4	38.4	38.4	40.0	43.0	45.0	49.0	51.0	C
VLR177	VNP	4.5	444939	4772702	969	23	4705	36.9	36.9	36.9	36.9	36.9	40.0	43.0	45.0	49.0	51.0	C
VLR178	VNP	4.5	445238	4773361	761	23	4541	37.2	37.2	37.2	37.2	37.2	40.0	43.0	45.0	49.0	51.0	C
VLR179	VNP	4.5	444333	4770006	1485	44	6515	32.2	32.2	32.2	32.2	32.2	40.0	43.0	45.0	49.0	51.0	C
VLR180	VNP	4.5	440411	4771504	912	35	4456	36.5	36.5	36.5	36.5	36.5	40.0	43.0	45.0	49.0	51.0	C
VLR181	VNP	4.5	440184	4771680	800	35	4345	37.8	37.8	37.8	37.8	37.8	40.0	43.0	45.0	49.0	51.0	C
VLR182	VNP	4.5	439812	4771640	839	34	4503	37.2	37.2	37.2	37.2	37.2	40.0	43.0	45.0	49.0	51.0	C
VLR183	VNP	4.5	439475	4771843	718	34	4452	38.1	38.1	38.1	38.1	38.1	40.0	43.0	45.0	49.0	51.0	C
VLR184	VNP	4.5	438235	4772135	683	46	4896	37.7	37.7	37.7	37.7	37.7	40.0	43.0	45.0	49.0	51.0	C
VLR185	VNP	4.5	438038	4772180	566	46	4994	38.4	38.4	38.4	38.4	38.4	40.0	43.0	45.0	49.0	51.0	C
VLR186	VNP	4.5	437917	4772078	651	46	5151	37.1	37.1	37.1	37.1	37.1	40.0	43.0	45.0	49.0	51.0	C
VLR187	VNP	4.5	436765	4772484	1159	46	5751	32.3	32.3	32.3	32.3	32.3	40.0	43.0	45.0	49.0	51.0	C
VLR188	VNP	4.5	441026	4771358	1173	35	4502	35.9	35.9	35.9	35.9	35.9	40.0	43.0	45.0	49.0	51.0	C
VLR189	VNP	4.5	441222	4771305	1089	39	4541	36.1	36.1	36.1	36.1	36.1	40.0	43.0	45.0	49.0	51.0	C
VLR190	VNP	4.5	441529	4771371	790	39	4471	37.6	37.6	37.6	37.6	37.6	40.0	43.0	45.0	49.0	51.0	C
VLR191	VNP	4.5	441933	4771140	716	39	4727	38.0	38.0	38.0	38.0	38.0	40.0	43.0	45.0	49.0	51.0	C
VLR192	VNP	4.5	442736	4770948	877	41	5063	38.1	38.1	38.1	38.1	38.1	40.0	43.0	45.0	49.0	51.0	C
VLR193	VNP	4.5	443123	4770852	849	41	5267	37.9	37.9	37.9	37.9	37.9	40.0	43.0	45.0	49.0	51.0	C
VLR194	VNP	4.5	444427	4770541	1138	47	6087	34.8	34.8	34.8	34.8	34.8	40.0	43.0	45.0	49.0	51.0	C
VLR195	VNP	4.5	444576	4770502	1018	44	6195	34.7	34.7	34.7	34.7	34.7	40.0	43.0	45.0	49.0	51.0	C
VLR196	VNP	4.5	444355	4770237	1337	44	6320	33.3	33.3	33.3	33.3	33.3	40.0	43.0	45.0	49.0	51.0	C
VLR197	VNP	4.5	443508	4770760	779	47	5488	37.5	37.5	37.5	37.5	37.5	40.0	43.0	45.0	49.0	51.0	C
VLR198	VNP	4.5	446461	4770211	1176	45	7548	32.6	32.6	32.6	32.6	32.6	40.0	43.0	45.0	49.0	51.0	C
VLR199	VNP	4.5	447010	4771962	890	24	6793	37.3	37.3	37.3	37.3	37.3	40.0	43.0	45.0	49.0	51.0	C

Table 7: Noise Impact Assessment Summary Table - Non-participating

Point of Reception ID	Description	Height	UTM Coordinates		Distance to Nearest Project Turbine (m)	Nearest Project Turbine ID	Distance to Project Transformer Substation (m)	Calculated Sound Level (dBA) at Selected Wind Speeds (m/s)					Sound Level Limit (dBA) at Selected Wind Speeds (m/s)					Compliance Test
			x	y				6	7	8	9	10	6	7	8	9	10	
VLR200	VNP	4.5	445388	4774038	848	10	4346	37.0	37.0	37.0	37.0	37.0	40.0	43.0	45.0	49.0	51.0	C
VLR201	VNP	4.5	443728	4775979	946	6	2298	37.5	37.5	37.5	37.5	37.5	40.0	43.0	45.0	49.0	51.0	C
VLR202	VNP	4.5	438611	4775632	946	12	2831	36.6	36.6	36.6	36.6	36.6	40.0	43.0	45.0	49.0	51.0	C
VLR203	VNP	4.5	439058	4775529	1005	48	2396	37.7	37.7	37.7	37.7	37.7	40.0	43.0	45.0	49.0	51.0	C
VLR204	VNP	4.5	437038	4774317	1328	12	4653	33.5	33.5	33.5	33.5	33.5	40.0	43.0	45.0	49.0	51.0	C
VLR205	VNP	4.5	437347	4774247	1070	12	4387	35.5	35.5	35.5	35.5	35.5	40.0	43.0	45.0	49.0	51.0	C
VLR206	VNP	4.5	437584	4774189	901	12	4189	37.2	37.2	37.2	37.2	37.2	40.0	43.0	45.0	49.0	51.0	C
VLR207	VNP	4.5	437648	4774047	801	28	4190	37.9	37.9	37.9	37.9	37.9	40.0	43.0	45.0	49.0	51.0	C
VLR208	VNP	4.5	437312	4774120	1077	28	4467	35.5	35.5	35.5	35.5	35.5	40.0	43.0	45.0	49.0	51.0	C
VLR209	VNP	4.5	442232	4774787	859	5	1322	39.0	39.0	39.0	39.0	39.0	40.0	43.0	45.0	49.0	51.0	C
VLR210	VNP	4.5	441581	4776492	667	Subs.	667	39.1	39.1	39.1	39.1	39.1	40.0	43.0	45.0	49.0	51.0	C
VLR211	VNP	4.5	441048	4773237	986	35	2632	38.4	38.4	38.4	38.4	38.4	40.0	43.0	45.0	49.0	51.0	C
VLR212	VNP	4.5	436544	4772431	1386	46	5962	30.8	30.8	30.8	30.8	30.8	40.0	43.0	45.0	49.0	51.0	C
VLR213	VNP	4.5	443867	4776602	1417	4	2549	33.5	33.5	33.5	33.5	33.5	40.0	43.0	45.0	49.0	51.0	C
VLR214	VNP	4.5	448138	4775084	1255	11	6747	30.6	30.6	30.6	30.6	30.6	40.0	43.0	45.0	49.0	51.0	C
VLR221	VNP	4.5	441536	4773146	858	18	2697	39.1	39.1	39.1	39.1	39.1	40.0	43.0	45.0	49.0	51.0	C
VLR223	VNP	4.5	446561	4770059	1349	45	7728	31.4	31.4	31.4	31.4	31.4	40.0	43.0	45.0	49.0	51.0	C
VLR226	VNP	4.5	440877	4773298	863	33	2603	39.1	39.1	39.1	39.1	39.1	40.0	43.0	45.0	49.0	51.0	C
VLR230	VNP	4.5	441039	4776637	888	Subs.	889	37.4	37.4	37.4	37.4	37.4	40.0	43.0	45.0	49.0	51.0	C
VLR232	VNP	4.5	441336	4773207	1008	18	2636	38.6	38.6	38.6	38.6	38.6	40.0	43.0	45.0	49.0	51.0	C
VLR241	VNP	4.5	441021	4773387	1032	33	2489	38.6	38.6	38.6	38.6	38.6	40.0	43.0	45.0	49.0	51.0	C
VLR244	VNP	4.5	443596	4775913	832	6	2163	38.4	38.4	38.4	38.4	38.4	40.0	43.0	45.0	49.0	51.0	C
VLR248	VNP	4.5	445827	4772140	808	23	5744	37.4	37.4	37.4	37.4	37.4	40.0	43.0	45.0	49.0	51.0	C
VLR254	VNP	4.5	437557	4772297	551	46	5253	37.9	37.9	37.9	37.9	37.9	40.0	43.0	45.0	49.0	51.0	C
VLR255	VNP	4.5	442369	4771150	685	39	4783	39.2	39.2	39.2	39.2	39.2	40.0	43.0	45.0	49.0	51.0	C
VLR257	VNP	4.5	446826	4771275	662	45	7066	36.5	36.5	36.5	36.5	36.5	40.0	43.0	45.0	49.0	51.0	C
VLR258	VNP	4.5	445323	4773814	1029	23	4386	36.7	36.7	36.7	36.7	36.7	40.0	43.0	45.0	49.0	51.0	C
VLR268	VNP	4.5	445236	4774083	955	10	4189	36.9	36.9	36.9	36.9	36.9	40.0	43.0	45.0	49.0	51.0	C
PoR269	NP	4.5	448795	4773832	1422	27	7630	31.6	31.6	31.6	31.6	31.6	40.0	43.0	45.0	49.0	51.0	C

Table 8: Noise Impact Assessment Summary Table - Participating

Point of Reception ID	Description	Height	UTM Coordinates		Distance to Nearest Project Turbine (m)	Nearest Project Turbine ID	Distance to Project Transformer Substation (m)	Calculated Sound Level (dBA) at Selected Wind Speeds (m/s)					Sound Level Limit (dBA) at Selected Wind Speeds (m/s)					Compliance Test	Participating/ Vacant Lot Receptor ID
			x	y				6	7	8	9	10	6	7	8	9	10		
PR2	PR	4.5	440418	4771606	810	35	4355	37.2	37.2	37.2	37.2	37.2	-	-	-	-	-	-	PR2
PR18	PR	4.5	438688	4772081	1020	30	4656	37.5	37.5	37.5	37.5	37.5	-	-	-	-	-	-	PR18
PR24	PR	4.5	441977	4771297	554	39	4576	39.6	39.6	39.6	39.6	39.6	-	-	-	-	-	-	PR24
PR27	PR	1.5	442804	4771133	685	41	4903	38.2	38.2	38.2	38.2	38.2	-	-	-	-	-	-	PR27
PR28	PR	1.5	445577	4770404	516	44	6836	36.6	36.6	36.6	36.6	36.6	-	-	-	-	-	-	PR28
PR40	PR	4.5	446689	4772025	853	45	6494	37.5	37.5	37.5	37.5	37.5	-	-	-	-	-	-	PR40
PR48	PR	4.5	443326	4772729	494	42	3642	42.9	42.9	42.9	42.9	42.9	-	-	-	-	-	-	PR48
PR49	PR	4.5	443253	4772892	530	20	3465	42.8	42.8	42.8	42.8	42.8	-	-	-	-	-	-	PR49
PR50	PR	1.5	442080	4773157	484	18	2761	40.1	40.1	40.1	40.1	40.1	-	-	-	-	-	-	PR50
PR52	PR	1.5	440110	4773577	691	33	2623	39.4	39.4	39.4	39.4	39.4	-	-	-	-	-	-	PR52
PR53	PR	1.5	439608	4773718	741	16	2800	39.8	39.8	39.8	39.8	39.8	-	-	-	-	-	-	PR53
PR60	PR	4.5	439974	4775313	686	2	1553	39.8	39.8	39.8	39.8	39.8	-	-	-	-	-	-	PR60
PR61	PR	4.5	440556	4775164	700	17	1109	40.0	40.0	40.0	40.0	40.0	-	-	-	-	-	-	PR61
PR64	PR	4.5	444080	4774330	580	8	3047	40.8	40.8	40.8	40.8	40.8	-	-	-	-	-	-	PR64
PR71	PR	4.5	447074	4773519	679	24	6099	39.1	39.1	39.1	39.1	39.1	-	-	-	-	-	-	PR71
PR72	PR	7.5	447611	4773383	580	25	6648	40.0	40.0	40.0	40.0	40.0	-	-	-	-	-	-	PR72
PR75	PR	7.5	448300	4773234	698	27	7344	38.2	38.2	38.2	38.2	38.2	-	-	-	-	-	-	PR75
PR86	PR	1.5	443148	4776144	569	4	1741	37.6	37.6	37.6	37.6	37.6	-	-	-	-	-	-	PR86
PR95	PR	1.5	441938	4776421	664	3	768	37.1	37.1	37.1	37.1	37.1	-	-	-	-	-	-	PR95
PR101	PR	1.5	439911	4776901	474	1	1856	37.5	37.5	37.5	37.5	37.5	-	-	-	-	-	-	PR101
PR108	PR	4.5	445556	4774768	581	10	4259	38.6	38.6	38.6	38.6	38.6	-	-	-	-	-	-	PR108
PR114	PR	1.5	444972	4771983	1195	44	5235	34.5	34.5	34.5	34.5	34.5	-	-	-	-	-	-	PR114
PR115	PR	4.5	444918	4771559	873	44	5520	36.9	36.9	36.9	36.9	36.9	-	-	-	-	-	-	PR115
PR124	PR	1.5	441090	4774106	505	17	1769	38.5	38.5	38.5	38.5	38.5	-	-	-	-	-	-	PR124
PR125	PR	4.5	443131	4773964	553	20	2530	42.2	42.2	42.2	42.2	42.2	-	-	-	-	-	-	PR125
PV154	VPR	4.5	445618	4775074	720	10	4254	37.5	37.5	37.5	37.5	37.5	-	-	-	-	-	-	PV154
PV164	VPR	4.5	447601	4775090	904	11	6213	33.2	33.2	33.2	33.2	33.2	-	-	-	-	-	-	PV164
PV215	VPR	4.5	438901	4773767	668	13	3274	42.0	42.0	42.0	42.0	42.0	-	-	-	-	-	-	PV215
PV216	VPR	4.5	440056	4775182	686	15	1527	40.2	40.2	40.2	40.2	40.2	-	-	-	-	-	-	PV216
PV217	VPR	4.5	438919	4773859	576	13	3202	42.1	42.1	42.1	42.1	42.1	-	-	-	-	-	-	PV217
PV218	VPR	4.5	446189	4772137	788	45	6027	37.7	37.7	37.7	37.7	37.7	-	-	-	-	-	-	PV218
PV219	VPR	4.5	439002	4773842	597	13	3148	42.1	42.1	42.1	42.1	42.1	-	-	-	-	-	-	PV219
PV220	VPR	4.5	440306	4773432	577	33	2660	41.2	41.2	41.2	41.2	41.2	-	-	-	-	-	-	PV220
PV222	VPR	4.5	438344	4774001	663	28	3596	41.5	41.5	41.5	41.5	41.5	-	-	-	-	-	-	PV222
PV224	VPR	4.5	444868	4771858	1139	47	5259	36.8	36.8	36.8	36.8	36.8	-	-	-	-	-	-	PV224
PV225	VPR	4.5	439692	4773576	656	31	2857	41.9	41.9	41.9	41.9	41.9	-	-	-	-	-	-	PV225
PV227	VPR	4.5	439253	4775378	922	14	2230	38.7	38.7	38.7	38.7	38.7	-	-	-	-	-	-	PV227
PV228	VPR	4.5	442894	4772911	597	19	3274	42.7	42.7	42.7	42.7	42.7	-	-	-	-	-	-	PV228
PV229	VPR	4.5	445477	4774997	636	9	4130	38.2	38.2	38.2	38.2	38.2	-	-	-	-	-	-	PV229
PV231	VPR	4.5	446325	4772012	680	45	6212	37.8	37.8	37.8	37.8	37.8	-	-	-	-	-	-	PV231
PV233	VPR	4.5	441358	4774889	705	17	955	39.2	39.2	39.2	39.2	39.2	-	-	-	-	-	-	PV233
PV234	VPR	4.5	437868	4774111	761	12	3963	39.2	39.2	39.2	39.2	39.2	-	-	-	-	-	-	PV234
PV235	VPR	4.5	438986	4773748	688	30	3221	41.9	41.9	41.9	41.9	41.9	-	-	-	-	-	-	PV235
PV236	VPR	4.5	443143	4770986	715	41	5147	39.1	39.1	39.1	39.1	39.1	-	-	-	-	-	-	PV236
PV237	VPR	4.5	443492	4772771	542	42	3696	42.6	42.6	42.6	42.6	42.6	-	-	-	-	-	-	PV237

Table 8: Noise Impact Assessment Summary Table - Participating

Point of Reception ID	Description	Height	UTM Coordinates		Distance to Nearest Project Turbine (m)	Nearest Project Turbine ID	Distance to Project Transformer Substation (m)	Calculated Sound Level (dBA) at Selected Wind Speeds (m/s)					Sound Level Limit (dBA) at Selected Wind Speeds (m/s)					Compliance Test	Participating/ Vacant Lot Receptor ID
			x	y				6	7	8	9	10	6	7	8	9	10		
PV238	VPR	4.5	442457	4772940	625	37	3076	42.5	42.5	42.5	42.5	42.5	-	-	-	-	-	-	PV238
PV239	VPR	4.5	439363	4775352	892	14	2128	39.0	39.0	39.0	39.0	39.0	-	-	-	-	-	-	PV239
PV240	VPR	4.5	447264	4773592	720	11	6249	38.8	38.8	38.8	38.8	38.8	-	-	-	-	-	-	PV240
PV242	VPR	4.5	442893	4772828	661	38	3348	42.7	42.7	42.7	42.7	42.7	-	-	-	-	-	-	PV242
PV243	VPR	4.5	442173	4772996	615	18	2939	41.9	41.9	41.9	41.9	41.9	-	-	-	-	-	-	PV243
PV245	VPR	4.5	445387	4774609	701	10	4141	38.3	38.3	38.3	38.3	38.3	-	-	-	-	-	-	PV245
PV246	VPR	4.5	443538	4770892	646	47	5378	38.8	38.8	38.8	38.8	38.8	-	-	-	-	-	-	PV246
PV247	VPR	4.5	445002	4772467	998	23	4911	36.7	36.7	36.7	36.7	36.7	-	-	-	-	-	-	PV247
PV249	VPR	4.5	444968	4772337	1095	23	4977	36.6	36.6	36.6	36.6	36.6	-	-	-	-	-	-	PV249
PV250	VPR	4.5	444986	4772908	892	23	4606	37.0	37.0	37.0	37.0	37.0	-	-	-	-	-	-	PV250
PV251	VPR	4.5	445127	4772880	753	23	4733	37.2	37.2	37.2	37.2	37.2	-	-	-	-	-	-	PV251
PV252	VPR	4.5	439661	4771799	696	34	4414	38.3	38.3	38.3	38.3	38.3	-	-	-	-	-	-	PV252
PV253	VPR	4.5	437841	4772230	502	46	5094	38.8	38.8	38.8	38.8	38.8	-	-	-	-	-	-	PV253
PV256	VPR	4.5	444821	4771249	763	44	5706	37.2	37.2	37.2	37.2	37.2	-	-	-	-	-	-	PV256
PV259	VPR	4.5	444209	4774204	705	8	3222	40.0	40.0	40.0	40.0	40.0	-	-	-	-	-	-	PV259
PV260	VPR	4.5	443234	4773956	534	20	2606	42.3	42.3	42.3	42.3	42.3	-	-	-	-	-	-	PV260
PV261	VPR	4.5	443260	4774529	537	7	2248	41.7	41.7	41.7	41.7	41.7	-	-	-	-	-	-	PV261
PV262	VPR	4.5	443372	4774501	486	7	2356	41.9	41.9	41.9	41.9	41.9	-	-	-	-	-	-	PV262
PV263	VPR	4.5	442565	4774695	723	5	1610	39.8	39.8	39.8	39.8	39.8	-	-	-	-	-	-	PV263
PV264	VPR	4.5	442122	4774705	996	5	1328	38.6	38.6	38.6	38.6	38.6	-	-	-	-	-	-	PV264
PV265	VPR	4.5	441884	4774756	1073	3	1175	38.4	38.4	38.4	38.4	38.4	-	-	-	-	-	-	PV265
PV266	VPR	4.5	440467	4775090	665	17	1224	40.3	40.3	40.3	40.3	40.3	-	-	-	-	-	-	PV266
PV267	VPR	4.5	441471	4776535	695	Subs.	695	38.6	38.6	38.6	38.6	38.6	-	-	-	-	-	-	PV267

Table 9: Overall Project Emissions Calculations – Non-participating receptors (all levels in dB(A))

POR ID	NIA – Approved Sound Pressure Level at 6 m/s	Approved Substation Transformer Partial Contribution	Approved Turbine-only Partial Contribution at 6m/s	Substation Spare Transformer Partial Contribution	Total Sound Pressure Level at 6 m/s
PoR1	36.5	7.1	36.5	8.1	36.5
PoR3	37.1	7.0	37.1	8.0	37.1
PoR4	37.9	7.3	37.9	8.3	37.9
PoR5	37.2	6.8	37.2	7.8	37.2
PoR6	36.2	6.4	36.2	7.4	36.2
PoR7	37.2	6.8	37.2	7.8	37.2
PoR8	35.9	6.3	35.9	7.3	35.9
PoR9	35.4	6.1	35.4	7.1	35.4
PoR10	35.3	6.0	35.3	7.0	35.3
PoR11	37.6	6.8	37.6	7.8	37.6
PoR12	36.5	6.2	36.5	7.2	36.5
PoR13	30.7	3.6	30.7	4.6	30.7
PoR14	33.0	3.5	33.0	4.5	33.0
PoR15	35.2	4.1	35.2	5.1	35.2
PoR16	37.0	4.7	37.0	5.6	37.0
PoR17	34.5	4.8	34.5	5.8	34.5
PoR19	37.3	7.7	37.3	8.7	37.3
PoR20	33.5	6.0	33.5	7.0	33.5
PoR21	36.5	7.1	36.5	8.1	36.5
PoR22	34.8	6.3	34.8	7.3	34.8
PoR23	34.9	5.9	34.9	6.9	34.9
PoR25	38.0	5.6	38.0	6.6	38.0
PoR26	35.8	4.6	35.8	5.6	35.8
PoR29	37.3	0.2	37.3	1.2	37.3
PoR30	31.4	-1.4	31.4	-0.4	31.4
PoR31	30.1	-3.3	30.1	-2.3	30.1
PoR32	29.4	-3.2	29.4	-2.2	29.4
PoR33	33.8	-2.2	33.8	-1.2	33.8
PoR34	34.3	-1.9	34.3	-0.9	34.3
PoR35	33.9	-1.5	33.9	-0.5	33.9
PoR36	37.1	-0.8	37.1	0.2	37.1
PoR37	34.3	-0.9	34.3	0.1	34.3
PoR38	35.2	-0.5	35.2	0.5	35.2
PoR39	36.1	0.0	36.1	1.0	36.1
PoR41	37.9	2.3	37.9	3.3	37.9
PoR42	36.7	9.6	36.7	10.6	36.7
PoR43	34.9	7.4	34.9	8.4	34.9
PoR44	34.9	7.3	34.9	8.3	34.9
PoR45	34.6	7.0	34.6	7.9	34.6
PoR46	34.6	7.1	34.6	8.0	34.6
PoR47	37.5	10.2	37.5	11.1	37.5
PoR51	38.5	18.6	38.5	19.6	38.5
PoR54	31.4	7.9	31.4	8.8	31.4
PoR55	31.8	13.1	31.7	14.1	31.8
PoR56	31.7	13.4	31.6	14.3	31.7
PoR57	34.8	15.3	34.8	16.2	34.8
PoR58	34.6	15.7	34.5	16.7	34.6
PoR59	35.4	15.0	35.4	16.0	35.4
PoR62	38.9	30.7	38.2	31.7	39.1
PoR63	36.5	24.9	36.2	25.9	36.6
PoR65	36.6	11.6	36.6	12.6	36.6
PoR66	37.1	11.9	37.1	12.9	37.1
PoR67	38.7	14.1	38.7	15.1	38.7
PoR68	35.6	7.8	35.6	8.8	35.6

POR ID	NIA – Approved Sound Pressure Level at 6 m/s	Approved Substation Transformer Partial Contribution	Approved Turbine-only Partial Contribution at 6m/s	Substation Spare Transformer Partial Contribution	Total Sound Pressure Level at 6 m/s
PoR69	37.8	7.8	37.8	8.7	37.8
PoR70	37.9	7.5	37.9	8.5	37.9
PoR73	36.3	-0.3	36.3	0.7	36.3
PoR74	35.6	-0.6	35.6	0.4	35.6
PoR76	35.5	-1.1	35.5	-0.1	35.5
PoR77	33.1	-2.0	33.1	-1.0	33.1
PoR78	29.7	-3.1	29.7	-2.1	29.7
PoR79	29.7	3.6	29.7	4.6	29.7
PoR80	29.9	2.6	29.9	3.6	29.9
PoR81	33.8	6.6	33.8	7.5	33.8
PoR82	31.0	4.8	31.0	5.7	31.0
PoR83	34.3	8.1	34.3	9.0	34.3
PoR84	31.4	6.3	31.4	7.3	31.4
PoR85	36.3	18.6	36.2	19.6	36.3
PoR87	35.6	20.2	35.5	21.1	35.6
PoR88	34.8	21.2	34.6	22.1	34.8
PoR89	34.9	21.6	34.7	22.5	34.9
PoR90	31.5	17.9	31.3	18.9	31.5
PoR91	32.6	19.9	32.4	20.9	32.7
PoR92	37.1	22.1	37.0	23.1	37.1
PoR93	38.8	28.5	38.4	29.4	38.9
PoR94	37.0	28.7	36.3	29.7	37.2
PoR96	36.2	29.7	35.1	30.7	36.4
PoR97	36.5	31.4	34.9	32.4	36.8
PoR98	37.1	30.1	36.1	31.1	37.3
PoR99	36.6	28.3	35.9	29.3	36.8
PoR100	38.0	28.2	37.5	29.2	38.1
PoR102	32.7	18.1	32.5	19.1	32.7
PoR103	34.0	20.4	33.8	21.3	34.0
PoR104	32.2	19.1	32.0	20.0	32.2
PoR105	32.4	11.6	32.4	12.5	32.4
PoR106	33.0	11.2	33.0	12.2	33.0
PoR107	36.3	12.1	36.3	13.0	36.3
PoR109	36.8	10.9	36.8	11.8	36.8
PoR110	34.8	8.6	34.8	9.6	34.8
PoR111	35.5	7.8	35.5	8.8	35.5
PoR112	37.1	10.8	37.1	11.7	37.1
PoR113	37.1	11.1	37.1	12.1	37.1
PoR116	35.5	3.1	35.5	4.1	35.5
PoR117	36.9	3.2	36.9	4.2	36.9
PoR118	32.4	1.3	32.4	2.3	32.4
PoR119	32.5	1.3	32.5	2.3	32.5
PoR120	29.8	-1.6	29.8	-0.6	29.8
PoR121	36.6	-0.2	36.6	0.8	36.6
PoR122	31.0	3.1	31.0	4.1	31.0
PoR123	28.5	2.8	28.5	3.8	28.5
PoR126	35.0	6.7	35.0	7.7	35.0
PoR127	34.8	5.6	34.8	6.6	34.8
PoR128	38.6	20.4	38.5	21.3	38.6
VLR129	33.0	11.6	33.0	12.6	33.0
VLR130	37.5	32.8	35.7	33.7	37.8
VLR131	34.0	7.9	34.0	8.8	34.0
VLR132	36.7	9.5	36.7	10.4	36.7
VLR133	35.7	2.8	35.7	3.8	35.7
VLR134	36.4	19.5	36.3	20.5	36.4
VLR135	33.1	7.6	33.1	8.5	33.1

POR ID	NIA – Approved Sound Pressure Level at 6 m/s	Approved Substation Transformer Partial Contribution	Approved Turbine-only Partial Contribution at 6m/s	Substation Spare Transformer Partial Contribution	Total Sound Pressure Level at 6 m/s
VLR136	31.1	-3.0	31.1	-2.0	31.1
VLR137	37.7	9.1	37.7	10.0	37.7
VLR138	37.0	0.8	37.0	1.8	37.0
VLR139	36.6	-1.1	36.6	-0.1	36.6
VLR140	32.8	10.4	32.8	11.4	32.8
VLR141	30.0	-3.3	30.0	-2.3	30.0
VLR142	32.3	5.8	32.3	6.7	32.3
VLR143	34.7	-0.3	34.7	0.7	34.7
VLR144	31.8	-3.0	31.8	-2.0	31.8
VLR145	37.6	28.4	37.0	29.4	37.7
VLR146	31.7	18.3	31.5	19.3	31.8
VLR147	37.4	4.0	37.4	5.0	37.4
VLR148	36.1	15.4	36.1	16.4	36.1
VLR149	37.6	25.8	37.3	26.8	37.7
VLR150	37.0	32.6	35.0	33.6	37.4
VLR151	34.4	11.9	34.4	12.8	34.4
VLR152	35.2	21.6	35.0	22.6	35.2
VLR153	30.9	20.2	30.5	21.1	31.0
VLR155	36.0	17.2	35.9	18.1	36.0
VLR156	33.3	8.1	33.3	9.1	33.3
VLR157	33.0	6.9	33.0	7.8	33.0
VLR158	38.4	11.6	38.4	12.6	38.4
VLR159	36.7	0.6	36.7	1.6	36.7
VLR160	38.4	26.3	38.1	27.3	38.5
VLR161	34.9	11.5	34.9	12.5	34.9
VLR162	37.3	32.8	35.4	33.8	37.7
VLR163	29.3	-3.0	29.3	-2.0	29.3
VLR165	36.2	0.3	36.2	1.3	36.2
VLR166	36.0	22.3	35.8	23.3	36.0
VLR167	38.7	5.4	38.7	6.4	38.7
VLR168	34.0	7.4	34.0	8.3	34.0
VLR169	38.3	4.6	38.3	5.6	38.3
VLR170	37.3	8.5	37.3	5.5	37.3
VLR171	37.2	8.7	37.2	9.7	37.2
VLR172	37.0	8.9	37.0	9.8	37.0
VLR173	36.9	9.1	36.9	10.1	36.9
VLR174	37.5	10.4	37.5	11.4	37.5
VLR175	37.1	10.1	37.1	11.1	37.1
VLR176	38.4	11.1	38.4	12.0	38.4
VLR177	36.9	10.2	36.9	11.1	36.9
VLR178	37.2	10.7	37.2	11.6	37.2
VLR179	32.2	1.3	32.2	2.3	32.2
VLR180	36.5	7.0	36.5	8.0	36.5
VLR181	37.8	7.4	37.8	8.4	37.8
VLR182	37.2	6.9	37.2	7.9	37.2
VLR183	38.1	7.1	38.1	8.1	38.1
VLR184	37.7	5.8	37.7	6.8	37.7
VLR185	38.4	5.5	38.4	6.5	38.4
VLR186	37.1	5.0	37.1	6.0	37.1
VLR187	32.3	3.4	32.3	4.4	32.3
VLR188	35.9	6.9	35.9	7.9	35.9
VLR189	36.1	6.7	36.1	7.7	36.1
VLR190	37.6	6.9	37.6	7.9	37.6
VLR191	38.0	6.1	38.0	7.1	38.0
VLR192	38.1	5.1	38.1	6.1	38.1
VLR193	37.9	4.5	37.9	5.5	37.9

POR ID	NIA – Approved Sound Pressure Level at 6 m/s	Approved Substation Transformer Partial Contribution	Approved Turbine-only Partial Contribution at 6m/s	Substation Spare Transformer Partial Contribution	Total Sound Pressure Level at 6 m/s
VLR194	34.8	2.3	34.8	3.3	34.8
VLR195	34.7	2.0	34.7	3.0	34.7
VLR196	33.3	1.7	33.3	2.7	33.3
VLR197	37.5	3.9	37.5	4.9	37.5
VLR198	32.6	-1.0	32.6	0.0	32.6
VLR199	37.3	0.6	37.3	1.6	37.3
VLR200	37.0	11.3	37.0	12.3	37.0
VLR201	37.5	20.1	37.4	21.1	37.5
VLR202	36.6	18.1	36.5	19.0	36.6
VLR203	37.7	20.3	37.6	21.3	37.7
VLR204	33.5	10.8	33.5	11.7	33.5
VLR205	35.5	11.7	35.5	12.6	35.5
VLR206	37.2	12.3	37.2	13.3	37.2
VLR207	37.9	12.3	37.9	13.3	37.9
VLR208	35.5	11.4	35.5	12.3	35.5
VLR209	38.9	26.5	38.6	27.5	39.0
VLR210	38.7	34.6	36.6	35.6	39.1
VLR211	38.4	18.6	38.4	19.5	38.4
VLR212	30.8	2.9	30.8	3.9	30.8
VLR213	33.5	18.8	33.4	19.8	33.5
VLR214	30.6	4.5	30.6	5.4	30.6
VLR221	39.1	18.2	39.1	19.1	39.1
VLR223	31.4	-1.4	31.4	-0.4	31.4
VLR226	39.1	18.7	39.1	19.7	39.1
VLR230	37.1	32.2	35.4	33.2	37.4
VLR232	38.6	18.5	38.6	19.5	38.6
VLR241	38.6	19.3	38.5	20.3	38.6
VLR244	38.4	20.9	38.3	21.8	38.4
VLR248	37.4	7.1	37.4	8.0	37.4
VLR254	37.9	4.8	37.9	5.8	37.9
VLR255	39.2	5.9	39.2	6.9	39.2
VLR257	36.5	0.0	36.5	1.0	36.5
VLR258	36.7	11.2	36.7	12.2	36.7
VLR268	36.9	11.9	36.9	12.8	36.9
PoR269	31.6	2.5	31.6	3.4	31.6

Table 10: Overall Project Emissions Calculations – Participating Receptors (all levels in dB(A))

POR ID	NIA – Approved Sound Pressure Level at 6 m/s	Approved Substation Transformer Partial Contribution	Approved Turbine-only Partial Contribution at 6m/s	Substation Spare Transformer Partial Contribution	Total Sound Pressure Level at 6 m/s
PR2	37.2	7.4	37.2	8.4	37.2
PR18	37.5	6.5	37.5	7.5	37.5
PR24	39.6	6.6	39.6	7.6	39.6
PR27	38.2	4.9	38.2	5.9	38.2
PR28	36.6	0.1	36.6	1.1	36.6
PR40	37.5	1.3	37.5	2.3	37.5
PR48	42.9	13.9	42.9	14.9	42.9
PR49	42.8	14.7	42.8	15.6	42.8
PR50	40.1	15.1	40.1	16.1	40.1
PR52	39.4	16.1	39.4	17.1	39.4
PR53	39.8	15.3	39.8	16.3	39.8
PR60	39.8	25.7	39.6	26.6	39.8
PR61	39.9	29.4	39.5	30.3	40.0

POR ID	NIA – Approved Sound Pressure Level at 6 m/s	Approved Substation Transformer Partial Contribution	Approved Turbine-only Partial Contribution at 6m/s	Substation Spare Transformer Partial Contribution	Total Sound Pressure Level at 6 m/s
PR64	40.8	16.4	40.8	17.3	40.8
PR71	39.1	6.1	39.1	7.0	39.1
PR72	40.0	5.3	40.0	6.2	40.0
PR75	38.2	3.7	38.2	4.7	38.2
PR86	37.6	20.9	37.5	21.9	37.6
PR95	36.9	30.4	35.8	31.4	37.1
PR101	37.5	21.1	37.4	22.1	37.5
PR108	38.6	11.6	38.6	12.6	38.6
PR114	34.5	3.9	34.5	4.9	34.5
PR115	36.9	3.7	36.9	4.7	36.9
PR124	38.5	21.0	38.4	22.0	38.5
PR125	42.2	18.8	42.2	19.8	42.2
PV154	37.5	11.7	37.5	12.6	37.5
PV164	33.2	5.8	33.2	6.8	33.2
PV215	42.0	15.9	42.0	16.8	42.0
PV216	40.2	25.8	40.0	26.8	40.2
PV217	42.1	16.2	42.1	17.1	42.1
PV218	37.7	6.3	37.7	7.2	37.7
PV219	42.1	16.4	42.1	17.4	42.1
PV220	41.2	18.5	41.2	19.5	41.2
PV222	41.5	14.6	41.5	15.5	41.5
PV224	36.8	8.5	36.8	9.4	36.8
PV225	41.9	17.7	41.9	18.6	41.9
PV227	38.7	21.2	38.6	22.2	38.7
PV228	42.7	15.5	42.7	16.4	42.7
PV229	38.2	12.1	38.2	13.1	38.2
PV231	37.8	2.0	37.8	3.0	37.8
PV233	39.1	30.3	38.5	31.3	39.2
PV234	39.2	13.2	39.2	14.1	39.2
PV235	41.9	16.1	41.9	17.0	41.9
PV236	39.1	4.8	39.1	5.8	39.1
PV237	42.6	13.7	42.6	14.7	42.6
PV238	42.5	16.3	42.5	17.3	42.5
PV239	39.0	21.8	38.9	22.8	39.0
PV240	38.8	5.7	38.8	6.7	38.8
PV242	42.7	15.2	42.7	16.1	42.7
PV243	41.9	17.0	41.9	17.9	41.9
PV245	38.3	12.1	38.3	13.0	38.3
PV246	38.8	4.2	38.8	5.2	38.8
PV247	36.7	9.5	36.7	10.4	36.7
PV249	36.6	9.3	36.6	10.2	36.6
PV250	37.0	10.5	37.0	11.4	37.0
PV251	37.2	10.1	37.2	11.0	37.2
PV252	38.3	7.2	38.3	8.2	38.3
PV253	38.8	5.2	38.8	6.2	38.8
PV256	37.2	3.2	37.2	4.2	37.2
PV259	40.0	15.6	40.0	16.6	40.0
PV260	42.3	18.5	42.3	19.4	42.3
PV261	41.7	20.3	41.7	21.3	41.7
PV262	41.9	19.7	41.9	20.7	41.9
PV263	39.8	24.3	39.7	25.3	39.8
PV264	38.5	26.5	38.2	27.5	38.6
PV265	38.3	27.8	37.9	28.8	38.4
PV266	40.2	28.2	39.9	29.2	40.3
PV267	38.2	34.4	35.9	35.4	38.6

Appendices

Appendix A

Appendix A: Extracted Site Plan (taken from Bornish Wind Energy Centre REA Application)

Legend

Project Components

- Wind Turbine (48)
- Proposed 115 kV Line
- Collection System
- Directional Drilling
- Access Road
- Point of Interconnection
- Substation
- O&M Buildings Area
- Laydown Area
- Project Location
- 120 m Boundary
- 300 m Boundary

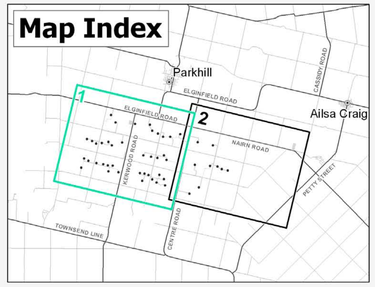
Other Components

- 1 Storey
- 2 Storey Receptor
- 3 Storey Receptor
- Vacant Lot Receptor
- Existing 500 kV Line
- Arterial Road
- Local Road / Street
- Permanent Watercourse
- Intermittent Watercourse
- Air Strip
- Pit or Quarry
- Waterbody
- Wetland

Significant Natural Features

- Woodland
- Wetland
- Valleyland
- Amphibian Breeding Habitat
- Bat Maternity Area
- Raptor Wintering Area

Map Index



0 375 750 1 500 Meters

NEXTera ENERGY

Bornish Wind Energy Centre

SITE PLAN
MAP 1

GL Garrad Hassan

1008-200412-003-FL

April 20, 2012

Projection: UTM Zone 17, NAD83
Sources: Ontario Base Mapping, Ontario Road Network, Land Information Ontario, Geobase, CanVec

Legend

Project Components

- Wind Turbine (48)
- Proposed 115 kV Line
- Collection System
- Directional Drilling
- Access Road
- Point of Interconnection
- Substation
- O&M Buildings Area
- Laydown Area
- Project Location
- 120 m Boundary
- 300 m Boundary

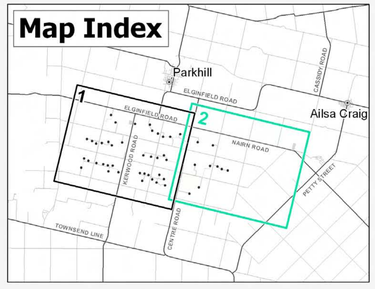
Other Components

- 1 Storey
- 2 Storey Receptor
- 3 Storey Receptor
- Vacant Lot Receptor
- Existing 500 kV Line
- Arterial Road
- Local Road / Street
- Permanent Watercourse
- Intermittent Watercourse
- Air Strip
- Pit or Quarry
- Waterbody
- Wetland

Significant Natural Features

- Woodland
- Wetland
- Valleyland
- Amphibian Breeding Habitat
- Bat Maternity Area
- Raptor Wintering Area

Map Index



0 375 750 1 500 Meters

NEXTera ENERGY

Bornish Wind Energy Centre

SITE PLAN
MAP 2

GL Garrad Hassan

1008-200412-004-FL

April 20, 2012

Projection: UTM Zone 17, NAD83
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Appendix B

Appendix B: Approved Bornish Noise Impact Assessment Report (April 2013)

RENEWABLE ENERGY APPROVAL APPLICATION
NOISE IMPACT ASSESSMENT

BORNISH WIND ENERGY CENTRE

April 2013

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RENEWABLE ENERGY APPROVAL APPLICATION -
NOISE IMPACT ASSESSMENT
BORNISH WIND ENERGY CENTRE, ONTARIO

Client	NextEra Energy Canada, ULC
Contact	Ben Greenhouse
Document No	1008-CAMO-R-02
Issue	I
Status	Final
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Date	15 April 2013

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REVISION HISTORY

Issue	Issue date	Summary
A	22 December 2011	Original Release (electronic version only)
B	13 January 2012	Update with new turbine specifications
C	30 April 2012	Update to Appendix D coordinates
D	28 June 2012	Updated receptor list and turbine noise specs
E	19 July 2012	Updated receptor list
F	20 September 2012	Responses to MOE comments
G	21 September 2012	Responses to MOE comments
H	20 March 2013	Updated substation location and sound level, new sound power level spectrum for GE turbine, and ground factor justification.
I	15 April 2013	Revised transformer height as per MOE request.

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1 INTRODUCTION

GL Garrad Hassan Canada Inc. ("GL GH") was retained by NextEra Energy Canada, ULC ("Client" or "NextEra") to prepare a Noise Impact Assessment ("NIA") of the Bornish Wind Energy Centre ("Project") in accordance with the Ontario Regulation 359/09 (Renewable Energy Approvals (REA) under Part V.0.1 of the Ontario Environmental Protection Act (EPA)) [1]. This NIA also follows the Ontario Ministry of the Environment (MOE) 2008 NPC Noise Interpretation Guidelines [2].

The proposed Bornish Wind Energy Centre is located in south-western Ontario, in the Municipality of North Middlesex, Middlesex County, Ontario.

The layout being evaluated is comprised of forty-eight (48) GE 1.6-100 (1.62 MW) turbines manufactured by General Electric (GE), though only 45 turbines will be constructed. The substation transformer location has been determined and it has been included in this assessment.

The objective of this assessment is twofold:

1. Confirm the sound level limit requirements for the Project by providing an assessment of the existing baseline environmental noise conditions in the vicinity of the wind farm; and

2. Predict the noise levels generated by the Project at all Points of Reception, Participants and Vacant Lot Receptors within 1,500 m of the turbines.

2 GENERAL DESCRIPTION OF PROJECT SITE

2.1 General Characteristics

The proposed Bornish Wind Energy Centre is located in south-western Ontario, in the Municipality of North Middlesex, Middlesex County, Ontario. More specifically, the Project is located south of Elginfield Road, east of Pete Sebe Road, north of Elmtree Drive and west of Fort Rose Road. It has a total project area of approximately 5,177 ha. Project components will be installed on privately-owned agricultural lots within this area.

The Project has been configured using forty-eight (48) GE 1.6-100 (1.62 MW), though only 45 turbines will be constructed. The wind turbines have been strategically sited on lands that the Client holds under lease options. It is anticipated that the Projects collection system may be partially located on public Right of Ways.

Energy generated by the Project will be collected via underground cabling and overhead lines and directed to a substation. A project-owned 115 kV transmission line will then travel north; approximately 11.4 km to a proponent owned switchyard and from there will connect to a Hydro One 500 kV transmission line located approximately 11 km east of the project switchyard.

The landscape in the study area is predominantly characterized by agricultural fields and associated farms punctuated with numerous hedgerows, isolated woodlands, and the occasional watercourse. Photographs included in Figure 2-1 show typical views of the land and features of the study area.

Figure 2-1: Land Features of the Bornish Wind Energy Centre

2.2 Land Use Description

The site is located within two two-tiered municipal systems. The County of Middlesex makes up the upper tier of the region, while Adelaide Metcalfe, North Middlesex and Strathroy-Caradoc, along with five additional townships and municipalities, have lower tier municipal status. Agriculture is the predominant economic activity and land use throughout the County of Middlesex; however, the municipalities that comprise the study area each have features creating distinct community character.

Surrounding properties and lands are characterized as low density residential while also including a number of agricultural buildings. Other land use within the study area includes rural and urban-rural, providing a foundation for manufacturing, business and tourism development. Access to the Bornish Project is provided by small paved and unpaved municipal roads that stem from larger municipal roads. The North Middlesex Zoning map can be found in Appendix A.

2.3 Points of Reception

Receptor locations (i.e. Points of Reception) for the Project were identified by GL GH using base data from recent aerial photos obtained from the Client, and field reconnaissance to verify locations and building types. The height of each Point of Reception - taken to be 1.5 m, 4.5 m and 7.5 m for one-storey, two-storey and three-storey houses respectively - was also noted. All Points of Reception, as per the definition of the MOE, were considered in this NIA.

The MOE Noise Guidelines [2] generally define a Point of Reception (POR) as a house, campground, church, school or other sensitive building that is not located on the same premises as the wind farm, including its turbines and ancillary structures. Points of Reception can also include locations on vacant lots that have residences as a permitted use; in this case GL GH, and a third-party consultant (IBI Group), identified Vacant Lot Receptors (VLR) on such lots in a location consistent with the building pattern in the area, as per the O. Reg. 359/09 and the Ontario MOE Noise Guidelines.

A residence located on the same premises as the wind turbine(s) or other Project infrastructure is not a Point of Reception as defined by the MOE noise guidelines, and considered a “Participating Receptor” and thus MOE noise limits do not apply.

The coordinates of each of the Points of Reception, Participants and Vacant Lot Receptors are listed in Appendix C and Appendix D, respectively.

3 DESCRIPTION OF POINTS OF RECEPTION

There is a total of 201 Points of Reception (PoR) located within a radius 1,500 m of a wind turbine or the substation, among which 97 are Vacant Lot Receptors (VLRs) and 104 are dwellings or other sensitive receptors such as churches and cemeteries. There are 25 dwellings and 43 Vacant Lot Receptors considered as Participants.

3.1 Receptor Classes

The MOE categorizes Points of Reception into three classes: 1, 2, and 3. Class 1 refers to an acoustic environment typical of a major population centre where the background noise is dominated by the urban hum. These areas are highly urbanized and have moderate to high noise levels throughout the day and night. Class 2 areas have an acoustic environment characterized by low ambient sound levels between 19:00 and 07:00, whereby the evening and night time levels are defined by natural sounds, infrequent human activity and no clearly audible sounds from stationary sources (e.g. industrial and commercial facilities). Class 3 areas are typical of rural and/or small communities (i.e. with populations of less than 1000) and an acoustic environment that is dominated by natural sounds with little or no road traffic.

Within the study area the main sources of ambient sound that currently exist include:

- Vehicular traffic on the local concession and side roads, some of which are gravel roads;
- Occasional sounds due to agricultural activities;
- Occasional sounds due to anthropogenic domestic activities; and
- Natural sounds.

Based on these conditions, **all Points of Reception are considered as having a Class 3 acoustic environment.**

3.2 Determination of Applicable Noise Limits

As stated in the MOE guidelines, the noise limits for a wind farm are set according to the existing MOE noise guidelines in NPC-205/NPC-232 while taking into account the wind-generated background noise.

For a Class 3 area, the sound level limits as defined by the MOE Interpretation are described in the sections below.

3.2.1 Wind Turbine Installations in Class 3 Areas (Rural), Wind Speeds Below 6 m/s

The lowest sound level limit expressed in terms of L_{eq} is: i) 40 dB(A); or ii) the minimum hourly background sound level established in accordance with Publications NPC-232/NPC-233, whichever is higher.

3.2.2 Class 3 Areas, Wind Speeds Above 6 m/s

The lowest sound level limit expressed in terms of L_{eq} is: i) the wind-induced background sound level, expressed in terms of ninetieth percentile sound level (L_{A90}) plus 7 dB; or ii) the minimum hourly background sound level established in accordance with Publications NPC-205/NPC-232/NPC-233, whichever is higher.

The applicable noise limits should be those defined by the MOE as summarized below in Table 3-1. A sample calculation of how noise modeling was determined for each Point of Reception appears in Appendix B where intermediate and cumulative A-weighted sound pressure levels from each turbine are provided.

Table 3-1: Summary of Noise Limits for Points of Reception (Class 3)

Wind Turbine Noise Criterion NPC-232 [dB(A)]	Wind Speed [m/s]				
	6	**7**	**8**	**9**	**10**
	40	43	45	49	51

4 DESCRIPTION OF SOURCES

4.1 Turbine Description

The proposed GE 1.6-100 turbine is a 3-bladed, upwind, horizontal-axis turbine. The total rotor diameter of the turbine is 100 m, resulting in a swept area of 7,854 m^2, and is designed to operate at between 9.75 and 16.18 revolutions per minute (rpm). The turbine rotor and nacelle are mounted on top of an 80 m tubular tower which is manufactured in sections from steel plate. Each turbine is mounted on a steel reinforced concrete foundation and equipped with a transformer, located outside the base of the tower.

Table 4-1 presents the general specifications of the wind turbine.

Table 4-1: Turbine Description – GE 1.6 - 100

Model	**GE 1.6 - 100**
Design	Steel, tubular, white; 3 sections
Rated power	1.62 MW
Hub height	80 m
Rotor diameter	100 m
Rotor swept area	7854 m^2
Operational interval	9.75 – 16.18 rpm
Number of blades	3
Cut-in wind speed	3 m/s
Cut-out wind speed	25 m/s
Nominal wind speed	12 m/s

Full noise specifications as provided by the manufacturer can be found in Appendix E. Coordinates of all turbines are listed in Appendix F.

The layout being evaluated consists of 48 GE1.6-100 turbines. The collector system will connect to the substation, where the voltage will be elevated to 115 kV. The main power transformer has been included in this NIA.

It should be noted that no adjacent wind farms in operation or under development within 5000m of the project are to be considered for this NIA.

5 NOISE EMISSION RATINGS

5.1 Noise Emission Rating of the Turbines

Broadband sound power levels and octave band sound power levels of the GE 1.6-100 wind turbine were provided by the manufacturer and are shown in Appendix E. Measurements were made in accordance with the IEC 61400 – 11 Ed. 2.1[3] method using standardized wind speeds at 10 m height. The worst case octave band and broadband sound power levels of the turbine were retained for the purpose of the noise impact assessment to account for summer night-time shear. These values correspond to a 10 m height wind speed of 10 m/s or more. The proposed version of the GE 1.6-100 wind turbine uses Low Noise Trailing Edge (LNTE) serrated blade technology, which results in a lower broadband sound level than the previous version.

The GE 1.6-100 wind turbine has an expected value for tonal audibility of $\Delta La,k < 2$ dB, irrespective of wind speed, hub height, and grid frequency based on the IEC 61400-11 standard. A letter confirming the current sound power levels and stating the tonality of the turbine is attached in Appendix E.

The octave band sound power levels used for the simulation in this NIA are those stated for each octave band centre frequency in Table 5-1.

Table 5-1: GE 1.6 100 Wind Turbine Acoustic Emission Summary

Make and Model : GE 1.6 100										
Electrical Rating : 1.6 MW										
Hub Height (m) : 80 m										
Wind Shear Coefficient : Typical summer night time shear of the region										
	Octave Band Sound Power Level [dB]									
	Manufacturer's Emission Levels					Adjusted Emission Levels				
Wind Speed [m/s]	6	7	8	9	10	6	7	8	9	10
Frequency [Hz]										
31.5	109.5	112.9	113.1	113	112.9	112.9	112.9	112.9	112.9	112.9
63	106.5	110.2	110.3	110.3	110.2	110.2	110.2	110.2	110.2	110.2
125	104.5	107.7	107.9	107.9	107.8	107.8	107.8	107.8	107.8	107.8
250	103.3	104	103.9	104	104.1	104.1	104.1	104.1	104.1	104.1
500	98.7	100.3	99.8	99.9	100.2	100.2	100.2	100.2	100.2	100.2
1000	91.8	97.1	97.5	97.6	97.8	97.8	97.8	97.8	97.8	97.8
2000	91.2	94.5	94.5	94.3	93.9	93.9	93.9	93.9	93.9	93.9
4000	87.9	88.7	88.1	87.4	86.9	86.9	86.9	86.9	86.9	86.9
8000	71.4	71.5	71.7	70.5	70.2	70.2	70.2	70.2	70.2	70.2
A-weighted	100.5	103	103	103	103	103	103	103	103	103

5.2 Noise Emission Rating of the Adjacent Wind Farm Turbines

There are no adjacent crystallized wind farms located less than 5 km from the Bornish wind farm. NextEra's Adelaide wind farm is located 6.9 km from the Bornish wind farm, and Suncor's Adelaide Project layout was not publicly available prior to the Site Plan Release of the Bornish Wind Energy Centre and was therefore not considered for cumulative effect in the Bornish NIA.

5.3 Noise Emission Rating of the Substation Transformer

The cumulative effect that the substation would have on nearby residents has been considered in this analysis.

Noise emission from the substation mainly originates from one (1) high-voltage 51/68/85 MVA, 121/34.5 kV, Wye/ Delta step-up transformer. The equipment proposed for the substation will be compliant with applicable standards (CAN/CSA-C88-M90, IEEE C57.12.90).

The Broadband Sound Power Level for the noise modelling calculations was calculated to be 102.8 dB(A), based on an audible noise level of 75 dBA guaranteed by the transformer manufacturer (shown in Appendix E), in accordance with the application of standard IEEE C57.12.90, for utility scale transformers. The 102.8 dB(A) includes a 5 dB(A) tonal penalty, as prescribed in Publication NPC-104.

The substation transformer drawings that were used to calculate the transformer's measurement surface area as defined in standard IEEE C57.12.90 are included in Appendix E. The calculated measurement surface area S was found to be 190.6 m². This calculation is based on an 8 sided polygon perimeter that includes a 2 m offset from both fan cooled surfaces and a 0.3 m offset from the other surfaces, as well as the top area of the transformer, in accordance with standard IEEE C57.12.90.

It excludes the reservoir above the main transformer tank since that height is not considered when determining the height of the IEEE C57.12.90 microphone placement, and therefore not part of the measurement surface area. The substation coordinates, as provided by the Client, are included in Appendix F.

Table 5-2 provides the octave band sound power levels of the substation transformer, using a typical transformer octave band sound distribution for a large transformer from the Handbook of Acoustics [4]. The point source representing the substation transformer was conservatively modelled at a height of 4.5 m agl at the request of the MOE. Table 5-3 details the octave band calculation.

Table 5-2: Bornish Project – Substation Transformer Sound Power Level

Transformer	Octave Band Sound Power Level* (dBA)									
Frequency (Hz)	31.5	63	125	250	500	1000	2000	4000	8000	Broadband
PWL (dBA)	60.0	79.2	91.3	93.8	99.2	96.4	92.6	87.4	78.3	102.8

*Includes 5 dBA penalty to account for tonality

Table 5-3: Transformer Octave Band Calculation Details

31.5	63	125	250	500	1000	2000	4000	8000	
-1	5	7	2	2	-4	-9	-14	-21	**Typical Outdoor Transformer Octave band relative distribution** [4] **[dB Lin]**
-39.4	-26.2	-16.1	-8.6	-3.2	0.0	1.2	1.0	-1.1	**dB Lin to dBA Conversion Scale**
-40.4	-21.2	-9.1	-6.6	-1.2	-4.0	-7.8	-13.0	-22.1	**Typical Outdoor Transformer Octave band relative distribution [dBA]**
60.0	79.2	91.3	93.8	99.2	96.4	92.6	87.4	78.3	**Scaled to 102.8 dBA Transformer**

6 NOISE IMPACT ASSESSMENT

The sound pressure levels at each Point of Reception, Participant and VLR for the aggregate of all wind turbines and substation associated with the Project were calculated based on the ISO 9613-2 method.

The ISO 9613 standard[5], [6] provides a prediction of the equivalent continuous A-weighted sound pressure level at a distance from one or more point sources under meteorological conditions favourable to propagation from sources of sound emission. These conditions are for downwind propagation or, equivalently, propagation under a well-developed moderate ground-based temperature inversion, commonly occurring at night.

The method consists of octave-band algorithms (i.e., with nominal mid-band frequencies from 63 Hz to 8 kHz) for calculating the attenuation of the emitted sound. The algorithm takes into account the following physical effects:

- Geometrical divergence – attenuation due to spherical spreading from the sound source;
- Atmospheric absorption – attenuation due to absorption by the atmosphere; and
- Ground effect – attenuation due to the acoustical properties of the ground.

ISO-9613-2 parameters were set as follows:

- Ambient air temperature: 10ºC;
- Ambient barometric pressure: 101.32 kPa;
- Humidity: 70%;
- Source ground factor: 0.7;
- Middle ground factor: 0.7;
- Receptor ground factor: 0.7;
- The effect of topography was considered

Justification for the use of a global ground factor of 0.7 is presented in Section 6.1.

Additional calculations concerning propagation through foliage were not performed in this NIA, implying that the values calculated for sound attenuation are likely to be conservative in areas where there is foliage present in the line of sight between any turbine and a Point of Reception. The estimated accuracy of the ISO 9613 method, as stated in ISO 9613-2, is ± 3 dB.

The noise emission ratings used for each octave band were those specified in Table 5-1and Table 5-2. The noise impact was calculated for each Point of Reception and Participant located within 1,500 m of one or more turbines or substation, and the calculated noise level was then compared with the applicable noise limit for each Point of Reception as stated in Table 3-1.

Noise levels were calculated at 4.5 m and 7.5 m a.g.l for 2-storey and 3-storey Points of Reception/Participants respectively, and at 1.5 m agl at 16 points along a 30-m radius circle for each 1-storey Point of Reception/Participant. For the latter, the highest of these 16 values was chosen and presented in the table of noise levels.

6.1 Justification of global ground factor G

GL GH has undertaken a refined estimate of the noise propagation around the project substation, based on recent comments from the MOE since this part of the site will have the largest area of hard ground, as well as the shortest source-receiver distance. This section presents a detailed ground factor calculation for the area expected to be most sensitive to ground factor assumptions. For the transformer-to-VLR210 case, ground factors for the source, middle, and receiver regions have been calculated based on ISO 9613-2. The distance from the transformer to VLR210 is 667 m. Figure 6-1 shows the regions and ground cover, including the gravel area around the substation.

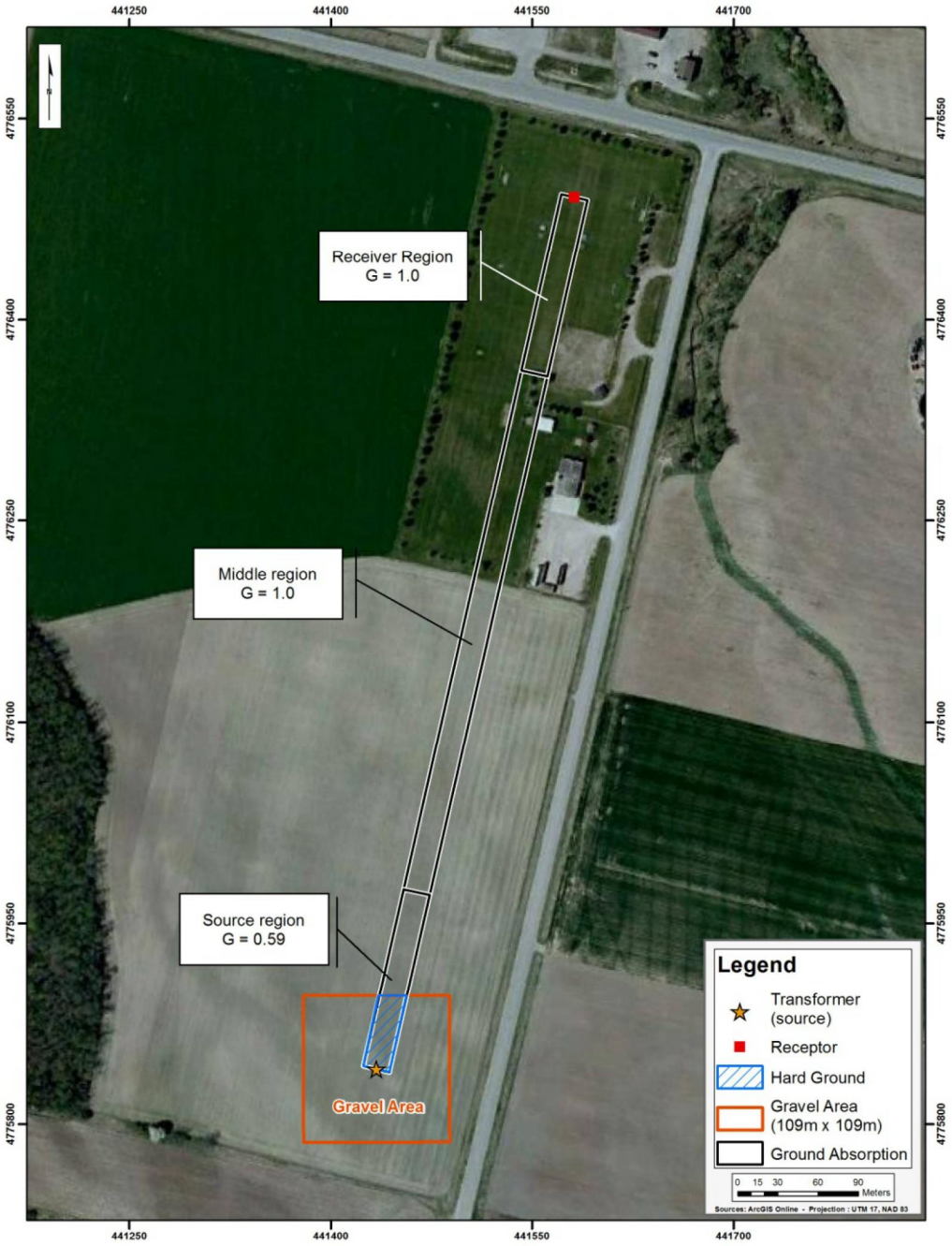


Figure 6-1: Ground factor coverage near Bornish substation

Source region ground factor G_S

As defined by ISO 9613-2, the source region extends over a distance of $30h_S$ from the source towards the receiver, where h_S is the source height of 4.5 m. The source region length is therefore 135 m. NextEra has supplied site plans indicating that an area of approximately 11,860 m^2 will be covered with gravel. A

geometric analysis has indicated that 56 m of the source region is covered with gravel. Based on aerial photography, the remaining 79 m is covered with grass. The source region ground factor G_S is then 0.59 (79 m / 135 m), as per ISO 9613-2.

Receiver region ground factor G_R
As defined by ISO 9613-2, the receiver region extends over a distance of $30h_R$ from the receiver towards the source, where h_R is the receiver height of 4.5 m. The receiver region length is 135 m. Based on aerial photography, 0% of the receiver region is covered by hard ground. The entire region that faces the transformer is covered by soft ground. The receiver region ground factor G_R is then 1.0, as per ISO 9613-2.

Middle region ground factor G_M
As defined by ISO 9613-2, the middle region stretches over the distance between the source and receiver regions. The middle region length is 397 m. Based on aerial photography, 0% of the receiver region is covered by roads or other hard ground. The entire region is covered by soft ground. The middle region ground factor G_M is then 1.0, as per ISO 9613-2.

CadnaA Calculations
Two sets of CadnaA calculations have been carried out. The first uses the three ground factors calculated as described above:

$G_S = 0.59$
$G_M = 1.00$
$G_R = 1.00$

The second CadnaA calculation uses a global ground factor of 0.7 for all three regions. The estimated sound pressure level at VLR210 is shown below for each case.

Case	Case 1, Global G = 0.7	Case 2, Specific G values for each region
Sound Pressure Level at VLR210 [dBA]	38.7	38.3

As seen in the table, Case 1 produces a sound pressure level of 38.7 dBA at VLR210, which is higher and therefore a more conservative assumption than Case 2. Because a global value of 0.7 has been shown to be more conservative for the most sensitive source-receiver case in the vicinity of the transformer, GL GH considers this to be further support that this value can be considered appropriate for use across the rest of the Bornish site, based on ISO 9613-2. Therefore the opinion of GL GH is that based on ISO 9613-2, a global ground factor of 0.7 is suitable for use when modeling noise propagation at the Bornish site.

7 NOISE IMPACT ASSESSMENT SUMMARY TABLE

7.1 Results

The noise level at each critical Point of Reception within 1,500 m of any turbine or substation of the Bornish Project, for wind speeds between 6 m/s and 10 m/s, is tabulated in Table 7-1. For each Point of Reception, the following information is provided:

- The distance to the closest wind turbine or substation;
- For Points of Reception at 1.5 m a.g.l., the sound pressure level presented for wind speeds from 6 m/s to 10 m/s is the maximum noise level on the circumference of a 30 m radius circle centered on the Point of Reception;
- For Points of Reception at 4.5 m or 7.5 m a.g.l., the sound pressure level presented for wind speeds from 6 m/s to 10 m/s is the noise level at the Point of Reception location at its respective height;
- The sound level limit for that Point of Reception according to the MOE noise guidelines at each wind speed from 6 m/s to 10 m/s;
- The applicable background sound level; and
- Whether or not the noise levels at the Point of Reception comply with the MOE guidelines (for continued reference, compliance is confirmed for all Points of Reception).

The closest distance between a wind turbine and a Point of Reception for this project is 574 m between Turbine 4 and Point of Reception 92, and 551 m between turbine 46 and VLR 254.

The highest calculated noise level was found at VLR255 at 39.2 dB(A) and at receptor PoR62 at 38.9 dB(A).

The results show that the Bornish Wind Energy Centre complies with the applicable MOE environmental noise guidelines at all wind speeds modelled (i.e., 6, 7, 8, 9 and 10 m/s). Noise iso-contour maps illustrating the maximum noise contribution of the Bornish Wind Project are shown in Appendix A.

Similarly, the maximum noise level at each Participant within 1,500 m of any turbine or substation is tabulated in Table 7-2.

Table 7-1: Noise Impact Assessment Summary

Point of Reception ID	Receptor height [m]	Distance to Nearest Turbine [m]	Nearest Turbine [ID]	Calculated Sound Pressure Level at Receptor [dB(A)] at selected Wind Speed in m/s					Sound Level Limit [dB(A)] at selected Wind Speed in m/s					Applicable Background Sound Level	Compliance With Limit (Yes/No)
				6 or <	7	8	9	10	6 or <	7	8	9	10	NPC 232 (C 3)	
PoR1	4.5	897	35	36.5	36.5	36.5	36.5	36.5	40	43	45	49	51	40	Yes
PoR3	4.5	905	34	37.1	37.1	37.1	37.1	37.1	40	43	45	49	51	40	Yes
PoR4	4.5	783	34	37.9	37.9	37.9	37.9	37.9	40	43	45	49	51	40	Yes
PoR5	4.5	825	34	37.2	37.2	37.2	37.2	37.2	40	43	45	49	51	40	Yes
PoR6	1.5	726	34	36.2	36.2	36.2	36.2	36.2	40	43	45	49	51	40	Yes
PoR7	4.5	818	34	37.2	37.2	37.2	37.2	37.2	40	43	45	49	51	40	Yes
PoR8	1.5	768	34	35.9	35.9	35.9	35.9	35.9	40	43	45	49	51	40	Yes
PoR9	1.5	838	34	35.4	35.4	35.4	35.4	35.4	40	43	45	49	51	40	Yes
PoR10	1.5	864	34	35.3	35.3	35.3	35.3	35.3	40	43	45	49	51	40	Yes
PoR11	4.5	904	34	37.6	37.6	37.6	37.6	37.6	40	43	45	49	51	40	Yes
PoR12	4.5	1175	34	36.5	36.5	36.5	36.5	36.5	40	43	45	49	51	40	Yes
PoR13	1.5	1486	46	30.7	30.7	30.7	30.7	30.7	40	43	45	49	51	40	Yes
PoR14	4.5	1043	46	33.0	33.0	33.0	33.0	33.0	40	43	45	49	51	40	Yes
PoR15	4.5	785	46	35.2	35.2	35.2	35.2	35.2	40	43	45	49	51	40	Yes
PoR16	7.5	653	46	37.0	37.0	37.0	37.0	37.0	40	43	45	49	51	40	Yes
PoR17	1.5	831	46	34.5	34.5	34.5	34.5	34.5	40	43	45	49	51	40	Yes
PoR19	4.5	796	35	37.3	37.3	37.3	37.3	37.3	40	43	45	49	51	40	Yes
PoR20	1.5	1092	35	33.5	33.5	33.5	33.5	33.5	40	43	45	49	51	40	Yes
PoR21	4.5	1094	39	36.5	36.5	36.5	36.5	36.5	40	43	45	49	51	40	Yes
PoR22	1.5	972	39	34.8	34.8	34.8	34.8	34.8	40	43	45	49	51	40	Yes
PoR23	1.5	891	39	34.9	34.9	34.9	34.9	34.9	40	43	45	49	51	40	Yes
PoR25	4.5	803	39	38.0	38.0	38.0	38.0	38.0	40	43	45	49	51	40	Yes
PoR26	1.5	905	39	35.8	35.8	35.8	35.8	35.8	40	43	45	49	51	40	Yes
PoR29	4.5	604	44	37.3	37.3	37.3	37.3	37.3	40	43	45	49	51	40	Yes
PoR30	4.5	1314	45	31.4	31.4	31.4	31.4	31.4	40	43	45	49	51	40	Yes
PoR31	4.5	1368	27	30.1	30.1	30.1	30.1	30.1	40	43	45	49	51	40	Yes
PoR32	1.5	1221	27	29.4	29.4	29.4	29.4	29.4	40	43	45	49	51	40	Yes
PoR33	4.5	956	27	33.8	33.8	33.8	33.8	33.8	40	43	45	49	51	40	Yes

Point of Reception ID	Receptor height [m]	Distance to Nearest Turbine [m]	Nearest Turbine [ID]	Calculated Sound Pressure Level at Receptor [dB(A)] at selected Wind Speed in m/s					Sound Level Limit [dB(A)] at selected Wind Speed in m/s					Applicable Background Sound Level	Compliance With Limit (Yes/No)
				6 or <	7	8	9	10	6 or <	7	8	9	10	NPC 232 (C 3)	
PoR34	4.5	964	27	34.3	34.3	34.3	34.3	34.3	40	43	45	49	51	40	Yes
PoR35	1.5	953	27	33.9	33.9	33.9	33.9	33.9	40	43	45	49	51	40	Yes
PoR36	4.5	810	26	37.1	37.1	37.1	37.1	37.1	40	43	45	49	51	40	Yes
PoR37	1.5	965	26	34.3	34.3	34.3	34.3	34.3	40	43	45	49	51	40	Yes
PoR38	1.5	900	26	35.2	35.2	35.2	35.2	35.2	40	43	45	49	51	40	Yes
PoR39	4.5	1081	26	36.1	36.1	36.1	36.1	36.1	40	43	45	49	51	40	Yes
PoR41	4.5	663	45	37.9	37.9	37.9	37.9	37.9	40	43	45	49	51	40	Yes
PoR42	4.5	1101	23	36.7	36.7	36.7	36.7	36.7	40	43	45	49	51	40	Yes
PoR43	1.5	1169	23	34.9	34.9	34.9	34.9	34.9	40	43	45	49	51	40	Yes
PoR44	1.5	1190	43	34.9	34.9	34.9	34.9	34.9	40	43	45	49	51	40	Yes
PoR45	1.5	1093	23	34.6	34.6	34.6	34.6	34.6	40	43	45	49	51	40	Yes
PoR46	1.5	1055	23	34.6	34.6	34.6	34.6	34.6	40	43	45	49	51	40	Yes
PoR47	4.5	1069	43	37.5	37.5	37.5	37.5	37.5	40	43	45	49	51	40	Yes
PoR51	4.5	1083	35	38.5	38.5	38.5	38.5	38.5	40	43	45	49	51	40	Yes
PoR54	1.5	1374	28	31.4	31.4	31.4	31.4	31.4	40	43	45	49	51	40	Yes
PoR55	4.5	1362	12	31.8	31.8	31.8	31.8	31.8	40	43	45	49	51	40	Yes
PoR56	4.5	1390	12	31.7	31.7	31.7	31.7	31.7	40	43	45	49	51	40	Yes
PoR57	4.5	967	12	34.8	34.8	34.8	34.8	34.8	40	43	45	49	51	40	Yes
PoR58	4.5	1026	12	34.6	34.6	34.6	34.6	34.6	40	43	45	49	51	40	Yes
PoR59	1.5	840	12	35.4	35.4	35.4	35.4	35.4	40	43	45	49	51	40	Yes
PoR62	4.5	872	17	38.9	38.9	38.9	38.9	38.9	40	43	45	49	51	40	Yes
PoR63	1.5	962	5	36.5	36.5	36.5	36.5	36.5	40	43	45	49	51	40	Yes
PoR65	1.5	869	8	36.6	36.6	36.6	36.6	36.6	40	43	45	49	51	40	Yes
PoR66	1.5	770	8	37.1	37.1	37.1	37.1	37.1	40	43	45	49	51	40	Yes
PoR67	4.5	871	21	38.7	38.7	38.7	38.7	38.7	40	43	45	49	51	40	Yes
PoR68	1.5	705	10	35.6	35.6	35.6	35.6	35.6	40	43	45	49	51	40	Yes
PoR69	4.5	850	11	37.8	37.8	37.8	37.8	37.8	40	43	45	49	51	40	Yes
PoR70	4.5	882	11	37.9	37.9	37.9	37.9	37.9	40	43	45	49	51	40	Yes
PoR73	1.5	791	26	36.3	36.3	36.3	36.3	36.3	40	43	45	49	51	40	Yes
PoR74	1.5	843	27	35.6	35.6	35.6	35.6	35.6	40	43	45	49	51	40	Yes

Point of Reception ID	Receptor height [m]	Distance to Nearest Turbine [m]	Nearest Turbine [ID]	Calculated Sound Pressure Level at Receptor [dB(A)] at selected Wind Speed in m/s					Sound Level Limit [dB(A)] at selected Wind Speed in m/s					Applicable Background Sound Level	Compliance With Limit (Yes/No)
				6 or <	7	8	9	10	6 or <	7	8	9	10	NPC 232 (C 3)	
PoR76	4.5	839	27	35.5	35.5	35.5	35.5	35.5	40	43	45	49	51	40	Yes
PoR77	1.5	845	27	33.1	33.1	33.1	33.1	33.1	40	43	45	49	51	40	Yes
PoR78	4.5	1408	27	29.7	29.7	29.7	29.7	29.7	40	43	45	49	51	40	Yes
PoR79	4.5	1456	11	29.7	29.7	29.7	29.7	29.7	40	43	45	49	51	40	Yes
PoR80	1.5	1076	11	29.9	29.9	29.9	29.9	29.9	40	43	45	49	51	40	Yes
PoR81	4.5	875	11	33.8	33.8	33.8	33.8	33.8	40	43	45	49	51	40	Yes
PoR82	1.5	1050	11	31.0	31.0	31.0	31.0	31.0	40	43	45	49	51	40	Yes
PoR83	4.5	997	11	34.3	34.3	34.3	34.3	34.3	40	43	45	49	51	40	Yes
PoR84	1.5	1059	10	31.4	31.4	31.4	31.4	31.4	40	43	45	49	51	40	Yes
PoR85	4.5	1138	8	36.3	36.3	36.3	36.3	36.3	40	43	45	49	51	40	Yes
PoR87	1.5	738	4	35.6	35.6	35.6	35.6	35.6	40	43	45	49	51	40	Yes
PoR88	4.5	1073	4	34.8	34.8	34.8	34.8	34.8	40	43	45	49	51	40	Yes
PoR89	4.5	1040	4	34.9	34.9	34.9	34.9	34.9	40	43	45	49	51	40	Yes
PoR90	1.5	1256	4	31.5	31.5	31.5	31.5	31.5	40	43	45	49	51	40	Yes
PoR91	7.5	1494	4	32.6	32.6	32.6	32.6	32.6	40	43	45	49	51	40	Yes
PoR92	1.5	574	4	37.1	37.1	37.1	37.1	37.1	40	43	45	49	51	40	Yes
PoR93	4.5	604	4	38.8	38.8	38.8	38.8	38.8	40	43	45	49	51	40	Yes
PoR94	4.5	869	4	37.0	37.0	37.0	37.0	37.0	40	43	45	49	51	40	Yes
PoR96	4.5	948	3	36.2	36.2	36.2	36.2	36.2	40	43	45	49	51	40	Yes
PoR97	4.5	950	Subs.	36.5	36.5	36.5	36.5	36.5	40	43	45	49	51	40	Yes
PoR98	4.5	828	1	37.1	37.1	37.1	37.1	37.1	40	43	45	49	51	40	Yes
PoR99	4.5	779	1	36.6	36.6	36.6	36.6	36.6	40	43	45	49	51	40	Yes
PoR100	4.5	621	1	38.0	38.0	38.0	38.0	38.0	40	43	45	49	51	40	Yes
PoR102	1.5	828	1	32.7	32.7	32.7	32.7	32.7	40	43	45	49	51	40	Yes
PoR103	4.5	886	1	34.0	34.0	34.0	34.0	34.0	40	43	45	49	51	40	Yes
PoR104	4.5	1131	1	32.2	32.2	32.2	32.2	32.2	40	43	45	49	51	40	Yes
PoR105	4.5	1281	9	32.4	32.4	32.4	32.4	32.4	40	43	45	49	51	40	Yes
PoR106	4.5	1238	9	33.0	33.0	33.0	33.0	33.0	40	43	45	49	51	40	Yes
PoR107	4.5	764	9	36.3	36.3	36.3	36.3	36.3	40	43	45	49	51	40	Yes
PoR109	4.5	872	23	36.8	36.8	36.8	36.8	36.8	40	43	45	49	51	40	Yes

Point of Reception ID	Receptor height [m]	Distance to Nearest Turbine [m]	Nearest Turbine [ID]	Calculated Sound Pressure Level at Receptor [dB(A)] at selected Wind Speed in m/s					Sound Level Limit [dB(A)] at selected Wind Speed in m/s					Applicable Background Sound Level	Compliance With Limit (Yes/No)
				6 or <	7	8	9	10	6 or <	7	8	9	10	NPC 232 (C 3)	
PoR110	1.5	921	23	34.8	34.8	34.8	34.8	34.8	40	43	45	49	51	40	Yes
PoR111	1.5	716	23	35.5	35.5	35.5	35.5	35.5	40	43	45	49	51	40	Yes
PoR112	4.5	904	23	37.1	37.1	37.1	37.1	37.1	40	43	45	49	51	40	Yes
PoR113	4.5	960	23	37.1	37.1	37.1	37.1	37.1	40	43	45	49	51	40	Yes
PoR116	1.5	823	47	35.5	35.5	35.5	35.5	35.5	40	43	45	49	51	40	Yes
PoR117	4.5	820	47	36.9	36.9	36.9	36.9	36.9	40	43	45	49	51	40	Yes
PoR118	4.5	1443	44	32.4	32.4	32.4	32.4	32.4	40	43	45	49	51	40	Yes
PoR119	4.5	1367	44	32.5	32.5	32.5	32.5	32.5	40	43	45	49	51	40	Yes
PoR120	4.5	1490	44	29.8	29.8	29.8	29.8	29.8	40	43	45	49	51	40	Yes
PoR121	4.5	630	45	36.6	36.6	36.6	36.6	36.6	40	43	45	49	51	40	Yes
PoR122	4.5	1410	46	31.0	31.0	31.0	31.0	31.0	40	43	45	49	51	40	Yes
PoR123	1.5	1266	11	28.5	28.5	28.5	28.5	28.5	40	43	45	49	51	40	Yes
PoR126	1.5	842	35	35.0	35.0	35.0	35.0	35.0	40	43	45	49	51	40	Yes
PoR127	4.5	1199	34	34.8	34.8	34.8	34.8	34.8	40	43	45	49	51	40	Yes
PoR128	4.5	801	6	38.6	38.6	38.6	38.6	38.6	40	43	45	49	51	40	Yes
VLR129	4.5	1186	9	33.0	33.0	33.0	33.0	33.0	40	43	45	49	51	40	Yes
VLR130	4.5	796	Subs.	37.5	37.5	37.5	37.5	37.5	40	43	45	49	51	40	Yes
VLR131	4.5	995	11	34.0	34.0	34.0	34.0	34.0	40	43	45	49	51	40	Yes
VLR132	4.5	1049	23	36.7	36.7	36.7	36.7	36.7	40	43	45	49	51	40	Yes
VLR133	4.5	946	47	35.7	35.7	35.7	35.7	35.7	40	43	45	49	51	40	Yes
VLR134	4.5	1097	6	36.4	36.4	36.4	36.4	36.4	40	43	45	49	51	40	Yes
VLR135	4.5	1067	11	33.1	33.1	33.1	33.1	33.1	40	43	45	49	51	40	Yes
VLR136	4.5	1223	27	31.1	31.1	31.1	31.1	31.1	40	43	45	49	51	40	Yes
VLR137	4.5	567	10	37.7	37.7	37.7	37.7	37.7	40	43	45	49	51	40	Yes
VLR138	4.5	873	45	37.0	37.0	37.0	37.0	37.0	40	43	45	49	51	40	Yes
VLR139	4.5	849	27	36.6	36.6	36.6	36.6	36.6	40	43	45	49	51	40	Yes
VLR140	4.5	1431	12	32.8	32.8	32.8	32.8	32.8	40	43	45	49	51	40	Yes
VLR141	4.5	1393	27	30.0	30.0	30.0	30.0	30.0	40	43	45	49	51	40	Yes
VLR142	4.5	1020	11	32.3	32.3	32.3	32.3	32.3	40	43	45	49	51	40	Yes
VLR143	4.5	804	44	34.7	34.7	34.7	34.7	34.7	40	43	45	49	51	40	Yes

Point of Reception ID	Receptor height [m]	Distance to Nearest Turbine [m]	Nearest Turbine [ID]	Calculated Sound Pressure Level at Receptor [dB(A)] at selected Wind Speed in m/s					Sound Level Limit [dB(A)] at selected Wind Speed in m/s					Applicable Background Sound Level	Compliance With Limit (Yes/No)
				6 or <	7	8	9	10	6 or <	7	8	9	10	NPC 232 (C 3)	
VLR144	4.5	1092	27	31.8	31.8	31.8	31.8	31.8	40	43	45	49	51	40	Yes
VLR145	4.5	744	4	37.6	37.6	37.6	37.6	37.6	40	43	45	49	51	40	Yes
VLR146	4.5	1257	1	31.7	31.7	31.7	31.7	31.7	40	43	45	49	51	40	Yes
VLR147	4.5	877	47	37.4	37.4	37.4	37.4	37.4	40	43	45	49	51	40	Yes
VLR148	4.5	811	9	36.1	36.1	36.1	36.1	36.1	40	43	45	49	51	40	Yes
VLR149	4.5	578	1	37.6	37.6	37.6	37.6	37.6	40	43	45	49	51	40	Yes
VLR150	4.5	831	Subs.	37.0	37.0	37.0	37.0	37.0	40	43	45	49	51	40	Yes
VLR151	4.5	979	9	34.4	34.4	34.4	34.4	34.4	40	43	45	49	51	40	Yes
VLR152	4.5	741	1	35.2	35.2	35.2	35.2	35.2	40	43	45	49	51	40	Yes
VLR153	4.5	1310	1	30.9	30.9	30.9	30.9	30.9	40	43	45	49	51	40	Yes
VLR155	4.5	1040	9	36.0	36.0	36.0	36.0	36.0	40	43	45	49	51	40	Yes
VLR156	4.5	1127	10	33.3	33.3	33.3	33.3	33.3	40	43	45	49	51	40	Yes
VLR157	4.5	1001	11	33.0	33.0	33.0	33.0	33.0	40	43	45	49	51	40	Yes
VLR158	4.5	603	10	38.4	38.4	38.4	38.4	38.4	40	43	45	49	51	40	Yes
VLR159	4.5	596	44	36.7	36.7	36.7	36.7	36.7	40	43	45	49	51	40	Yes
VLR160	4.5	600	4	38.4	38.4	38.4	38.4	38.4	40	43	45	49	51	40	Yes
VLR161	4.5	980	9	34.9	34.9	34.9	34.9	34.9	40	43	45	49	51	40	Yes
VLR162	4.5	800	Subs.	37.3	37.3	37.3	37.3	37.3	40	43	45	49	51	40	Yes
VLR163	4.5	1491	27	29.3	29.3	29.3	29.3	29.3	40	43	45	49	51	40	Yes
VLR165	4.5	640	44	36.2	36.2	36.2	36.2	36.2	40	43	45	49	51	40	Yes
VLR166	4.5	666	1	36.0	36.0	36.0	36.0	36.0	40	43	45	49	51	40	Yes
VLR167	4.5	756	11	38.7	38.7	38.7	38.7	38.7	40	43	45	49	51	40	Yes
VLR168	4.5	928	11	34.0	34.0	34.0	34.0	34.0	40	43	45	49	51	40	Yes
VLR169	4.5	722	25	38.3	38.3	38.3	38.3	38.3	40	43	45	49	51	40	Yes
VLR170	4.5	958	47	37.3	37.3	37.3	37.3	37.3	40	43	45	49	51	40	Yes
VLR171	4.5	1029	47	37.2	37.2	37.2	37.2	37.2	40	43	45	49	51	40	Yes
VLR172	4.5	1074	43	37.0	37.0	37.0	37.0	37.0	40	43	45	49	51	40	Yes
VLR173	4.5	1110	43	36.9	36.9	36.9	36.9	36.9	40	43	45	49	51	40	Yes
VLR174	4.5	1081	22	37.5	37.5	37.5	37.5	37.5	40	43	45	49	51	40	Yes
VLR175	4.5	1181	22	37.1	37.1	37.1	37.1	37.1	40	43	45	49	51	40	Yes

Point of Reception ID	Receptor height [m]	Distance to Nearest Turbine [m]	Nearest Turbine [ID]	Calculated Sound Pressure Level at Receptor [dB(A)] at selected Wind Speed in m/s					Sound Level Limit [dB(A)] at selected Wind Speed in m/s					Applicable Background Sound Level	Compliance With Limit (Yes/No)
				6 or <	7	8	9	10	6 or <	7	8	9	10	NPC 232 (C 3)	
VLR176	4.5	898	22	38.4	38.4	38.4	38.4	38.4	40	43	45	49	51	40	Yes
VLR177	4.5	969	23	36.9	36.9	36.9	36.9	36.9	40	43	45	49	51	40	Yes
VLR178	4.5	761	23	37.2	37.2	37.2	37.2	37.2	40	43	45	49	51	40	Yes
VLR179	4.5	1485	44	32.2	32.2	32.2	32.2	32.2	40	43	45	49	51	40	Yes
VLR180	4.5	912	35	36.5	36.5	36.5	36.5	36.5	40	43	45	49	51	40	Yes
VLR181	4.5	800	35	37.8	37.8	37.8	37.8	37.8	40	43	45	49	51	40	Yes
VLR182	4.5	839	34	37.2	37.2	37.2	37.2	37.2	40	43	45	49	51	40	Yes
VLR183	4.5	718	34	38.1	38.1	38.1	38.1	38.1	40	43	45	49	51	40	Yes
VLR184	4.5	683	46	37.7	37.7	37.7	37.7	37.7	40	43	45	49	51	40	Yes
VLR185	4.5	566	46	38.4	38.4	38.4	38.4	38.4	40	43	45	49	51	40	Yes
VLR186	4.5	651	46	37.1	37.1	37.1	37.1	37.1	40	43	45	49	51	40	Yes
VLR187	4.5	1159	46	32.3	32.3	32.3	32.3	32.3	40	43	45	49	51	40	Yes
VLR188	4.5	1173	35	35.9	35.9	35.9	35.9	35.9	40	43	45	49	51	40	Yes
VLR189	4.5	1089	39	36.1	36.1	36.1	36.1	36.1	40	43	45	49	51	40	Yes
VLR190	4.5	790	39	37.6	37.6	37.6	37.6	37.6	40	43	45	49	51	40	Yes
VLR191	4.5	716	39	38.0	38.0	38.0	38.0	38.0	40	43	45	49	51	40	Yes
VLR192	4.5	877	41	38.1	38.1	38.1	38.1	38.1	40	43	45	49	51	40	Yes
VLR193	4.5	849	41	37.9	37.9	37.9	37.9	37.9	40	43	45	49	51	40	Yes
VLR194	4.5	1138	47	34.8	34.8	34.8	34.8	34.8	40	43	45	49	51	40	Yes
VLR195	4.5	1018	44	34.7	34.7	34.7	34.7	34.7	40	43	45	49	51	40	Yes
VLR196	4.5	1337	44	33.3	33.3	33.3	33.3	33.3	40	43	45	49	51	40	Yes
VLR197	4.5	779	47	37.5	37.5	37.5	37.5	37.5	40	43	45	49	51	40	Yes
VLR198	4.5	1176	45	32.6	32.6	32.6	32.6	32.6	40	43	45	49	51	40	Yes
VLR199	4.5	890	24	37.3	37.3	37.3	37.3	37.3	40	43	45	49	51	40	Yes
VLR200	4.5	848	10	37.0	37.0	37.0	37.0	37.0	40	43	45	49	51	40	Yes
VLR201	4.5	946	6	37.5	37.5	37.5	37.5	37.5	40	43	45	49	51	40	Yes
VLR202	4.5	946	12	36.6	36.6	36.6	36.6	36.6	40	43	45	49	51	40	Yes
VLR203	4.5	1005	48	37.7	37.7	37.7	37.7	37.7	40	43	45	49	51	40	Yes
VLR204	4.5	1328	12	33.5	33.5	33.5	33.5	33.5	40	43	45	49	51	40	Yes
VLR205	4.5	1070	12	35.5	35.5	35.5	35.5	35.5	40	43	45	49	51	40	Yes

Point of Reception ID	Receptor height [m]	Distance to Nearest Turbine [m]	Nearest Turbine [ID]	Calculated Sound Pressure Level at Receptor [dB(A)] at selected Wind Speed in m/s					Sound Level Limit [dB(A)] at selected Wind Speed in m/s					Applicable Background Sound Level	Compliance With Limit (Yes/No)
				6 or <	7	8	9	10	6 or <	7	8	9	10	NPC 232 (C 3)	
VLR206	4.5	901	12	37.2	37.2	37.2	37.2	37.2	40	43	45	49	51	40	Yes
VLR207	4.5	801	28	37.9	37.9	37.9	37.9	37.9	40	43	45	49	51	40	Yes
VLR208	4.5	1077	28	35.5	35.5	35.5	35.5	35.5	40	43	45	49	51	40	Yes
VLR209	4.5	859	5	38.9	38.9	38.9	38.9	38.9	40	43	45	49	51	40	Yes
VLR210	4.5	667	Subs.	38.7	38.7	38.7	38.7	38.7	40	43	45	49	51	40	Yes
VLR211	4.5	986	35	38.4	38.4	38.4	38.4	38.4	40	43	45	49	51	40	Yes
VLR212	4.5	1386	46	30.8	30.8	30.8	30.8	30.8	40	43	45	49	51	40	Yes
VLR213	4.5	1417	4	33.5	33.5	33.5	33.5	33.5	40	43	45	49	51	40	Yes
VLR214	4.5	1255	11	30.6	30.6	30.6	30.6	30.6	40	43	45	49	51	40	Yes
VLR221	4.5	858	18	39.1	39.1	39.1	39.1	39.1	40	43	45	49	51	40	Yes
VLR223	4.5	1349	45	31.4	31.4	31.4	31.4	31.4	40	43	45	49	51	40	Yes
VLR226	4.5	863	33	39.1	39.1	39.1	39.1	39.1	40	43	45	49	51	40	Yes
VLR230	4.5	888	Subs.	37.1	37.1	37.1	37.1	37.1	40	43	45	49	51	40	Yes
VLR232	4.5	1008	18	38.6	38.6	38.6	38.6	38.6	40	43	45	49	51	40	Yes
VLR241	4.5	1032	33	38.6	38.6	38.6	38.6	38.6	40	43	45	49	51	40	Yes
VLR244	4.5	832	6	38.4	38.4	38.4	38.4	38.4	40	43	45	49	51	40	Yes
VLR248	4.5	808	23	37.4	37.4	37.4	37.4	37.4	40	43	45	49	51	40	Yes
VLR254	4.5	551	46	37.9	37.9	37.9	37.9	37.9	40	43	45	49	51	40	Yes
VLR255	4.5	685	39	39.2	39.2	39.2	39.2	39.2	40	43	45	49	51	40	Yes
VLR257	4.5	662	45	36.5	36.5	36.5	36.5	36.5	40	43	45	49	51	40	Yes
VLR258	4.5	1029	23	36.7	36.7	36.7	36.7	36.7	40	43	45	49	51	40	Yes
VLR268	4.5	955	10	36.9	36.9	36.9	36.9	36.9	40	43	45	49	51	40	Yes
PoR269	4.5	1422	27	31.6	31.6	31.6	31.6	31.6	40	43	45	49	51	40	Yes

Table 7-2: Noise Impact Assessment Summary – Participants

Participant ID	Height [m]	Distance to Nearest Turbine [m]	Nearest Turbine [ID]	Calculated Sound Pressure Level at Dwelling [dB(A)]
PR2	4.5	810	35	37.2
PR18	4.5	1020	30	37.5
PR24	4.5	554	39	39.6
PR27	1.5	685	41	38.2
PR28	1.5	516	44	36.6
PR40	4.5	853	45	37.5
PR48	4.5	494	42	42.9
PR49	4.5	530	20	42.8
PR50	1.5	484	18	40.1
PR52	1.5	691	33	39.4
PR53	1.5	741	16	39.8
PR60	4.5	686	2	39.8
PR61	4.5	700	17	39.9
PR64	4.5	580	8	40.8
PR71	4.5	679	24	39.1
PR72	7.5	580	25	40.0
PR75	7.5	698	27	38.2
PR86	1.5	569	4	37.6
PR95	1.5	664	3	36.9
PR101	1.5	474	1	37.5
PR108	4.5	581	10	38.6
PR114	1.5	1195	44	34.5
PR115	4.5	873	44	36.9
PR124	1.5	505	17	38.5
PR125	4.5	553	20	42.2
PV154	4.5	720	10	37.5
PV164	4.5	904	11	33.2
PV215	4.5	668	13	42.0
PV216	4.5	686	15	40.2
PV217	4.5	576	13	42.1
PV218	4.5	788	45	37.7

Participant ID	Height [m]	Distance to Nearest Turbine [m]	Nearest Turbine [ID]	Calculated Sound Pressure Level at Dwelling [dB(A)]
PV219	4.5	597	13	42.1
PV220	4.5	577	33	41.2
PV222	4.5	663	28	41.5
PV224	4.5	1139	47	36.8
PV225	4.5	656	31	41.9
PV227	4.5	922	14	38.7
PV228	4.5	597	19	42.7
PV229	4.5	636	9	38.2
PV231	4.5	680	45	37.8
PV233	4.5	705	17	39.1
PV234	4.5	761	12	39.2
PV235	4.5	688	30	41.9
PV236	4.5	715	41	39.1
PV237	4.5	542	42	42.6
PV238	4.5	625	37	42.5
PV239	4.5	892	14	39.0
PV240	4.5	720	11	38.8
PV242	4.5	661	38	42.7
PV243	4.5	615	18	41.9
PV245	4.5	701	10	38.3
PV246	4.5	646	47	38.8
PV247	4.5	998	23	36.7
PV249	4.5	1095	23	36.6
PV250	4.5	892	23	37.0
PV251	4.5	753	23	37.2
PV252	4.5	696	34	38.3
PV253	4.5	502	46	38.8
PV256	4.5	763	44	37.2
PV259	4.5	705	8	40.0
PV260	4.5	534	20	42.3
PV261	4.5	537	7	41.7
PV262	4.5	486	7	41.9
PV263	4.5	723	5	39.8

Participant ID	Height [m]	Distance to Nearest Turbine [m]	Nearest Turbine [ID]	Calculated Sound Pressure Level at Dwelling [dB(A)]
PV264	4.5	996	5	38.5
PV265	4.5	1073	3	38.3
PV266	4.5	665	17	40.2
PV267	4.5	695	Subs.	38.2

8 CONCLUSION

Based on the approach presented in this NIA, the Bornish Wind Energy Centre is compliant with the MOE noise limits at all Points of Reception and Vacant Lot Receptors within 1,500 m of the Project's noise sources, for wind speeds of 6, 7, 8, 9, and 10 m/s.

9 REFERENCES

[1] Ontario Regulation 359/09 (Renewable Energy Approvals (REA)

[2] MOE Noise Guidelines for Wind Farms, Interpretation for Applying NPC Publications, October 2008.

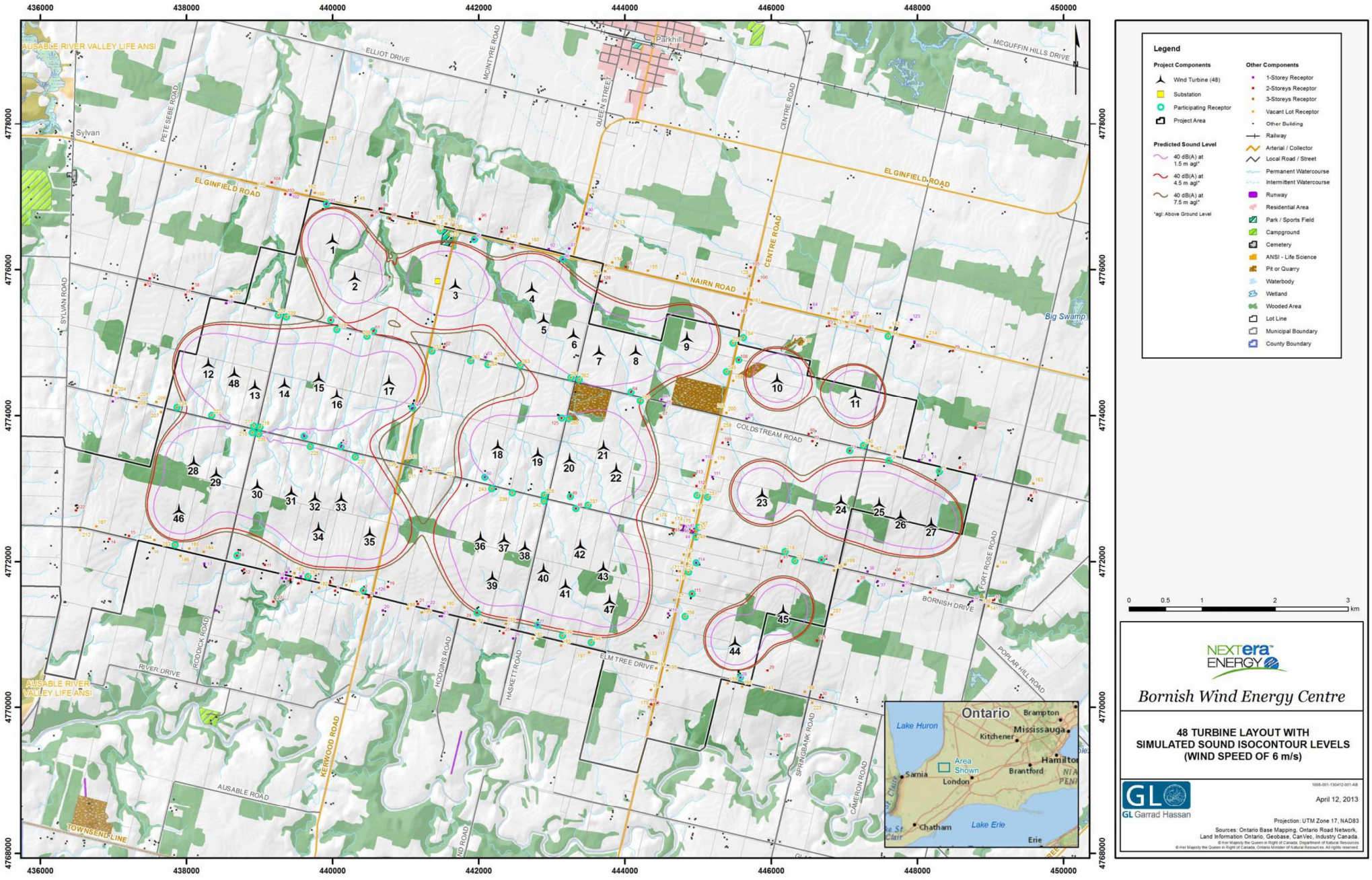
[3] International Electrotechnical Commission (IEC), 2006. IEC 61400 – 11 Ed. 2.1 Wind turbine generator systems – Part 11: Acoustic noise measurement techniques. 46 p.

[4] Handbook of Acoustics – Malcolm J. Crocker, 1998.

[5] International Organization for Standardization (ISO), 1993. Acoustics - Attenuation of Sound During Propagation Outdoors - Calculation of the Absorption of Sound by the Atmosphere. ISO 9613-1. 33 p.

[6] International Organization for Standardization (ISO), 1996. Acoustics - Attenuation of Sound During Propagation Outdoors - General Method of Calculation. ISO 9613-2. 25 p.

APPENDIX A ZONING AND NOISE ISO-CONTOUR MAPS



Legend

Project Components
- Wind Turbine (48)
- Substation
- Participating Receptor
- Project Area

Predicted Sound Level
- 40 dB(A) at 1.5 m agl*
- 40 dB(A) at 4.5 m agl*
- 40 dB(A) at 7.5 m agl*

*agl: Above Ground Level

Other Components
- 1-Storey Receptor
- 2-Storeys Receptor
- 3-Storeys Receptor
- Vacant Lot Receptor
- Other Building
- Railway
- Arterial / Collector
- Local Road / Street
- Permanent Watercourse
- Intermittent Watercourse
- Runway
- Residential Area
- Park / Sports Field
- Campground
- Cemetery
- ANSI - Life Science
- Pit or Quarry
- Waterbody
- Wetland
- Wooded Area
- Lot Line
- Municipal Boundary
- County Boundary

0 0.5 1 2 3 km

NEXTera ENERGY

Bornish Wind Energy Centre

48 TURBINE LAYOUT WITH SIMULATED SOUND ISOCONTOUR LEVELS (WIND SPEED OF 6 m/s)

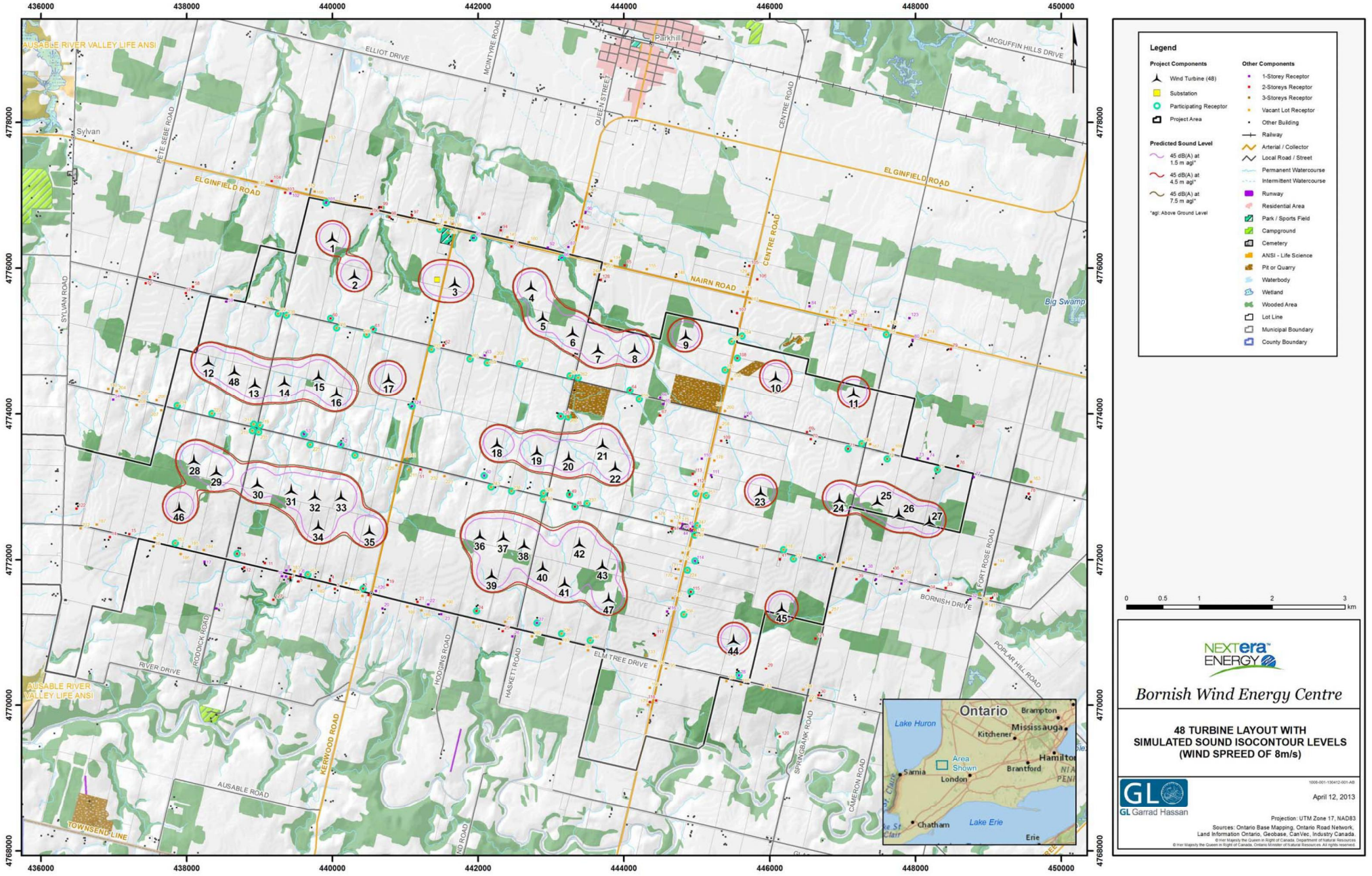
GL Garrad Hassan

1008-001-130412-001-A8

April 12, 2013

Projection: UTM Zone 17, NAD83

Sources: Ontario Base Mapping, Ontario Road Network, Land Information Ontario, Geobase, CanVec, Industry Canada.



NEXTera ENERGY

Bornish Wind Energy Centre

48 TURBINE LAYOUT WITH SIMULATED SOUND ISOCONTOUR LEVELS (WIND SPREED OF 8m/s)

GL Garrad Hassan

1005-001-130412-001-AB

April 12, 2013

Projection: UTM Zone 17, NAD83

Sources: Ontario Base Mapping, Ontario Road Network, Land Information Ontario, Geobase, CanVec, Industry Canada.

APPENDIX B SAMPLE CALCULATION FOR NOISE MODELING

Resulting A-weighted sound pressure level at Receptors PoR 62 and VLR 255

The calculation of cumulative receptor noise levels from wind turbines uses the methodology of ISO 9613-2, "*Acoustics — Attenuation of sound during propagation outdoors: Part 2: General method of calculation*". These calculations are conducted with CadnaA *(which is an implementation of ISO 9613-1 and ISO 9613-2)*.

As an example, in this appendix, the results are presented at PoR 62 and VLR 255. The following conditions were used:

- Turbine locations (Appendix F);
- Receptor locations (Appendix C).

Turbine characteristics and modelling parameters:

- Hub-heights: 80 m (GE 1.6 100);
- Ambient air temperature: 10ºC;
- Ambient barometric pressure: 101.32 kPa;
- Relative humidity: 70%;
- Wind speed (10 m agl): 6 m/s;
- Source ground factor: 0.7;
- Middle ground factor: 0.7; and
- Receptor ground factor: 0.7
- See Table 5-1 for broadband and octave band sound power level;

The following table presents an example result and intermediate values of the calculations as the A-weighted sound pressure levels at two chosen example receptors, due to each turbine or substation and each octave band. The net result, the A-weighted sound pressure level at the example receptors PoR 62 and VLR 255 for all bands and all noise sources within 5,000 m of the example receptor, is 38.9 and 39.2 dB(A) respectively.

Sample Calculations

Sound Pressure Levels at PoR 62

Turbine ID	Distance* [m]	Octave Band Sound Pressure Levels [dB(A)]									Total A-Weighted Sound Pressure Level by Turbine and for all Octave Bands [dB(A)]
		31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
17	876	6.6	17.0	19.8	24.7	26.4	25.7	17.7	-9.7	N/A	31.1
3	884	6.5	17.0	19.7	24.6	26.3	25.5	17.5	-10.1	N/A	31.0
Subs.	902	-5.0	14.1	17.1	22.3	28.9	24.5	15.3	-10.7	N/A	31.3
5	1426	2.4	12.7	15.3	19.9	21.1	19.4	8.1	-32.0	N/A	25.7
4	1459	2.2	12.5	15.0	19.6	20.8	19.1	7.6	-33.3	N/A	25.4
18	1532	1.7	12.1	14.6	19.1	20.2	18.4	6.5	-36.1	N/A	24.9
2	1561	1.6	11.9	14.4	18.9	20.0	18.1	6.1	-37.2	N/A	24.7
16	1598	1.4	11.7	14.2	18.7	19.7	17.8	5.5	-38.6	N/A	24.4
15	1758	0.5	10.9	13.3	17.7	18.6	16.4	3.1	-44.7	N/A	23.3
6	1789	0.4	10.7	13.1	17.5	18.4	16.1	2.7	-45.9	N/A	23.0
19	1933	-0.3	10.0	12.4	16.7	17.4	14.9	0.6	-51.3	N/A	22.1
1	2127	-1.1	9.2	11.5	15.6	16.2	13.3	-2.2	-58.6	N/A	20.9
7	2132	-1.1	9.2	11.5	15.7	16.2	13.4	-2.1	-58.4	N/A	20.9
14	2232	-1.5	8.8	11.0	15.1	15.6	12.6	-3.5	-62.3	N/A	20.3
20	2299	-1.8	8.5	10.7	14.8	15.2	12.1	-4.5	-64.8	N/A	20.0
33	2492	-2.5	7.8	10.0	13.9	14.2	10.7	-7.0	-71.8	N/A	19.0
21	2570	-2.7	7.5	9.7	13.6	13.8	10.1	-8.0	-74.6	N/A	18.6
8	2627	-2.9	7.4	9.5	13.3	13.5	9.7	-8.8	-76.7	N/A	18.3
13	2637	-2.9	7.4	9.4	13.3	13.4	9.7	-8.9	-77.0	N/A	18.3
36	2643	-2.9	7.4	9.4	13.3	13.4	9.6	-9.0	-77.2	N/A	18.3
32	2705	-3.0	7.2	9.2	13.0	13.1	9.2	-9.7	-79.4	N/A	18.0
35	2729	-3.1	7.2	9.1	12.9	13.0	9.1	-10.0	-80.3	N/A	17.9
37	2748	-3.1	7.1	9.1	12.8	12.9	8.9	-10.3	-81.0	N/A	17.8
31	2871	-3.4	6.8	8.7	12.4	12.3	8.1	-11.8	-85.3	N/A	17.3
22	2887	-3.4	6.8	8.6	12.3	12.2	8.0	-12.0	-85.9	N/A	17.2
48	2887	-3.4	6.8	8.6	12.3	12.2	8.0	-12.0	-85.9	N/A	17.2
38	2942	-3.6	6.7	8.5	12.1	12.0	7.7	-12.7	-87.9	N/A	17.0
34	3003	-3.7	6.5	8.3	11.9	11.7	7.3	-13.4	N/A	N/A	16.7
30	3171	-4.0	6.2	7.8	11.3	10.9	6.3	-15.5	N/A	N/A	16.1
39	3205	-4.1	6.1	7.7	11.2	10.8	6.0	-15.9	N/A	N/A	16.0
12	3231	-4.1	6.1	7.6	11.1	10.7	5.9	-16.2	N/A	N/A	15.9
42	3288	-4.3	5.9	7.4	10.9	10.4	5.5	-16.9	N/A	N/A	15.6
9	3331	-4.3	5.9	7.3	10.7	10.2	5.3	-17.4	N/A	N/A	15.5
40	3327	-4.3	5.9	7.3	10.7	10.3	5.3	-17.4	N/A	N/A	15.5
29	3558	-4.8	5.4	6.7	10.0	9.3	3.9	-20.1	N/A	N/A	14.7
41	3649	-4.9	5.2	6.4	9.6	8.9	3.4	-21.2	N/A	N/A	14.4
43	3718	-5.1	5.1	6.3	9.4	8.6	3.0	-22.0	N/A	N/A	14.1
28	3762	-5.2	5.0	6.2	9.3	8.4	2.7	-22.6	N/A	N/A	14.0
47	4138	-5.8	4.3	5.2	8.1	6.9	0.6	-27.0	N/A	N/A	12.8
46	4247	-6.0	4.1	5.0	7.8	6.5	0.0	-28.2	N/A	N/A	12.4
10	4582	-6.5	3.6	4.2	6.8	5.2	-1.9	-32.1	N/A	N/A	11.4
23	4793	-6.9	3.2	3.8	6.2	4.5	-3.0	-34.5	N/A	N/A	10.9
Total A-Weighted Sound Pressure Level											**38.9**

* Includes the heights of noise sources and receptors.
N/A indicates values below -88.0 dBA

Sound Pressure Levels at VLR 255

Turbine ID	Distance* [m]	Octave Band Sound Pressure Levels [dB(A)]									Total A-Weighted Sound Pressure Level by Turbine and for all Octave Bands [dB(A)]
		31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
39	690	8.7	19.1	22.0	26.9	28.8	28.4	21.6	-1.6	-78.4	33.7
40	926	6.1	16.6	19.3	24.1	25.8	25.0	16.7	-11.9	N/A	30.5
41	990	5.6	16.0	18.6	23.5	25.1	24.2	15.5	-14.6	N/A	29.8
38	1106	4.6	15.0	17.6	22.4	23.9	22.8	13.4	-19.3	N/A	28.6
37	1178	4.0	14.4	17.0	21.8	23.2	22.0	12.2	-22.2	N/A	27.9
36	1251	3.5	13.9	16.5	21.2	22.5	21.2	11.0	-25.2	N/A	27.2
47	1464	2.1	12.5	15.0	19.6	20.8	19.0	7.5	-33.5	N/A	25.4
42	1494	2.0	12.3	14.8	19.4	20.5	18.7	7.1	-34.7	N/A	25.2
43	1554	1.6	12.0	14.5	19.0	20.1	18.2	6.2	-36.9	N/A	24.7
35	2249	-1.6	8.7	11.0	15.0	15.5	12.4	-3.8	-62.9	N/A	20.3
19	2393	-2.2	8.1	10.4	14.3	14.7	11.4	-5.7	-68.2	N/A	19.5
20	2435	-2.3	8.0	10.2	14.2	14.5	11.1	-6.3	-69.7	N/A	19.3
18	2458	-2.4	7.9	10.1	14.0	14.3	10.9	-6.6	-70.6	N/A	19.1
22	2618	-2.8	7.4	9.5	13.4	13.5	9.8	-8.6	-76.3	N/A	18.4
21	2792	-3.2	7.0	8.9	12.7	12.7	8.7	-10.8	-82.5	N/A	17.6
33	2843	-3.3	6.9	8.8	12.5	12.4	8.3	-11.5	-84.3	N/A	17.4
34	2886	-3.4	6.8	8.6	12.3	12.2	8.0	-12.0	-85.9	N/A	17.2
32	3139	-4.0	6.3	7.9	11.4	11.1	6.5	-15.1	N/A	N/A	16.2
44	3148	-4.0	6.2	7.8	11.4	11.0	6.4	-15.2	N/A	N/A	16.2
31	3453	-4.6	5.6	7.0	10.3	9.7	4.5	-18.9	N/A	N/A	15.0
17	3710	-5.1	5.1	6.3	9.5	8.6	3.0	-22.0	N/A	N/A	14.1
45	3805	-5.2	4.9	6.0	9.1	8.3	2.5	-23.1	N/A	N/A	13.8
16	3913	-5.4	4.7	5.8	8.8	7.8	1.9	-24.4	N/A	N/A	13.5
30	3899	-5.4	4.8	5.8	8.9	7.9	1.9	-24.2	N/A	N/A	13.5
23	3943	-5.5	4.7	5.7	8.7	7.7	1.7	-24.7	N/A	N/A	13.4
7	3964	-5.5	4.6	5.7	8.7	7.6	1.6	-24.9	N/A	N/A	13.3
6	4093	-5.7	4.4	5.3	8.3	7.1	0.8	-26.5	N/A	N/A	12.9
8	4156	-5.8	4.3	5.2	8.1	6.9	0.5	-27.2	N/A	N/A	12.7
5	4224	-6.0	4.2	5.0	7.9	6.6	0.1	-28.0	N/A	N/A	12.5
15	4248	-6.0	4.1	5.0	7.8	6.5	0.0	-28.3	N/A	N/A	12.4
29	4474	-6.4	3.7	4.5	7.1	5.7	-1.3	-30.9	N/A	N/A	11.8
14	4486	-6.4	3.7	4.4	7.1	5.6	-1.4	-31.0	N/A	N/A	11.7
4	4627	-6.6	3.5	4.1	6.7	5.1	-2.1	-32.6	N/A	N/A	11.3
9	4656	-6.6	3.4	4.1	6.6	5.0	-2.3	-32.9	N/A	N/A	11.2
3	4711	-6.7	3.3	3.9	6.5	4.8	-2.6	-33.6	N/A	N/A	11.1
13	4752	-6.8	3.3	3.8	6.4	4.6	-2.8	-34.0	N/A	N/A	11.0
46	4742	-6.8	3.3	3.9	6.4	4.7	-2.7	-33.9	N/A	N/A	11.0
28	4820	-6.9	3.2	3.7	6.2	4.4	-3.2	-34.8	N/A	N/A	10.8
24	4895	-7.0	3.1	3.5	6.0	4.1	-3.6	-35.7	N/A	N/A	10.6
Subs.	4784	-23.7	-4.9	0	-0.6	2.4	-8.7	-41.2	N/A	N/A	6.1
Total A-Weighted Sound Pressure Level											**39.2**

* Includes the heights of noise sources and receptors.
N/A indicates values below -88.0 dBA

APPENDIX C COORDINATES OF POINTS OF RECEPTION

Coordinates of all modeled Points of Reception and Vacant Lot Receptors for the Bornish Wind Energy Centre (UTM17-NAD83 projection) are given in the tables below:

Point of Reception ID	Easting [m]	Northing [m]
PoR1	440492	4771514
PoR3	440033	4771602
PoR4	439966	4771712
PoR5	439532	4771702
PoR6	439562	4771796
PoR7	439422	4771758
PoR8	439363	4771853
PoR9	439361	4771770
PoR10	439307	4771775
PoR11	439071	4771955
PoR12	438788	4771895
PoR13	438402	4771331
PoR14	436943	4772310
PoR15	437210	4772352
PoR16	437540	4772183
PoR17	438244	4771973
PoR19	440754	4771654
PoR20	440685	4771333
PoR21	441164	4771421
PoR22	441310	4771389
PoR23	441490	4771253
PoR25	442335	4771021
PoR26	442469	4770950
PoR29	445950	4770504
PoR30	446671	4770136
PoR31	449038	4771469
PoR32	448751	4771458
PoR33	448414	4771614
PoR34	448177	4771580
PoR35	447805	4771673

Point of Reception ID	Easting [m]	Northing [m]
PoR36	447683	4771839
PoR37	447456	4771732
PoR38	447320	4771865
PoR39	447191	4771732
PoR41	446141	4772012
PoR42	444909	4772422
PoR43	444801	4772492
PoR44	444787	4772434
PoR45	444930	4772401
PoR46	444943	4772456
PoR47	444657	4772426
PoR51	441208	4773238
PoR54	436989	4774194
PoR55	437435	4775794
PoR56	437496	4775876
PoR57	437989	4775657
PoR58	438086	4775744
PoR59	438543	4775543
PoR62	441521	4774943
PoR63	442089	4774807
PoR65	444543	4774133
PoR66	444496	4774220
PoR67	444493	4773978
PoR68	445664	4773957
PoR69	446511	4773750
PoR70	446563	4773650
PoR73	448024	4773393
PoR74	448171	4773387
PoR76	448583	4773286
PoR77	448799	4773131

Point of Reception ID	Easting [m]	Northing [m]
PoR78	449553	4772906
PoR79	448486	4774894
PoR80	447960	4775018
PoR81	447316	4775164
PoR82	447105	4775353
PoR83	446795	4775234
PoR84	446545	4775477
PoR85	444009	4776036
PoR87	443235	4776297
PoR88	443429	4776574
PoR89	443349	4776596
PoR90	443471	4776774
PoR91	443526	4777025
PoR92	442955	4776289
PoR93	442456	4776303
PoR94	442311	4776526
PoR96	442012	4776698
PoR97	441091	4776727
PoR98	440782	4776706
PoR99	440666	4776840
PoR100	440538	4776746
PoR102	439421	4777027
PoR103	439351	4777038
PoR104	439165	4777198
PoR105	445721	4776028
PoR106	445829	4775845
PoR107	445553	4775384
PoR109	445333	4773628
PoR110	445068	4773388
PoR111	445193	4773159

Point of Reception ID	Easting [m]	Northing [m]
PoR112	444977	4773035
PoR113	444945	4773179
PoR116	444591	4771289
PoR117	444425	4770964
PoR118	444358	4770042
PoR119	444440	4770060
PoR120	446141	4769567
PoR121	446627	4770918
PoR122	436488	4772701
PoR123	447915	4775316
PoR126	440597	4771573
PoR127	439189	4771452
PoR128	443682	4775839
VLR129	445707	4775908
VLR130	441644	4776609
VLR131	446870	4775258
VLR132	444973	4772414
VLR133	444301	4770688
VLR134	443825	4776098
VLR135	446985	4775358
VLR136	448883	4771535
VLR137	446419	4774981
VLR138	446861	4771880
VLR139	447819	4771781
VLR140	436921	4774350
VLR141	448973	4771391
VLR142	447628	4775207
VLR143	445899	4770213
VLR144	449099	4771934
VLR145	442400	4776432

Point of Reception ID	Easting [m]	Northing [m]
VLR146	438947	4777122
VLR147	444669	4771475
VLR148	444713	4775890
VLR149	440306	4776925
VLR150	441388	4776671
VLR151	445634	4775674
VLR152	439639	4777082
VLR153	439918	4777743
VLR155	444315	4775983
VLR156	446787	4775404
VLR157	447218	4775303
VLR158	445481	4774483
VLR159	445406	4770328
VLR160	442694	4776362
VLR161	445724	4775530
VLR162	441551	4776633
VLR163	449588	4773068
VLR165	445603	4770282
VLR166	439756	4777055
VLR167	447378	4773582
VLR168	447032	4775224
VLR169	447693	4773507
VLR170	444715	4771743
VLR171	444748	4771867
VLR172	444779	4771980
VLR173	444804	4772098
VLR174	444656	4772531
VLR175	444768	4772504
VLR176	444442	4772583
VLR177	444939	4772702

Point of Reception ID	Easting [m]	Northing [m]
VLR178	445238	4773361
VLR179	444333	4770006
VLR180	440411	4771504
VLR181	440184	4771680
VLR182	439812	4771640
VLR183	439475	4771843
VLR184	438235	4772135
VLR185	438038	4772180
VLR186	437917	4772078
VLR187	436765	4772484
VLR188	441026	4771358
VLR189	441222	4771305
VLR190	441529	4771371
VLR191	441933	4771140
VLR192	442736	4770948
VLR193	443123	4770852
VLR194	444427	4770541
VLR195	444576	4770502
VLR196	444355	4770237
VLR197	443508	4770760
VLR198	446461	4770211
VLR199	447010	4771962
VLR200	445388	4774038
VLR201	443728	4775979
VLR202	438611	4775632
VLR203	439058	4775529
VLR204	437038	4774317
VLR205	437347	4774247
VLR206	437584	4774189
VLR207	437648	4774047

Point of Reception ID	Easting [m]	Northing [m]
VLR208	437312	4774120
VLR209	442232	4774787
VLR210	441581	4776492
VLR211	441048	4773237
VLR212	436544	4772431
VLR213	443867	4776602
VLR214	448138	4775084
VLR221	441536	4773146
VLR223	446561	4770059
VLR226	440877	4773298
VLR230	441039	4776637
VLR232	441336	4773207
VLR241	441021	4773387
VLR244	443596	4775913
VLR248	445827	4772140
VLR254	437557	4772297
VLR255	442369	4771150
VLR257	446826	4771275
VLR258	445323	4773814
VLR268	445236	4774083
PoR269	448795	4773832

APPENDIX D COORDINATES OF PARTICIPANTS

Coordinates of all modeled participants for the Bornish Wind Energy Centre (UTM17-NAD83 projection) are given in the table below:

Participant ID	Easting [m]	Northing [m]
PR2	440418	4771606
PR18	438688	4772081
PR24	441977	4771297
PR27	442804	4771133
PR28	445577	4770404
PR40	446689	4772025
PR48	443326	4772729
PR49	443253	4772892
PR50	442080	4773157
PR52	440110	4773577
PR53	439608	4773718
PR60	439974	4775313
PR61	440556	4775164
PR64	444080	4774330
PR71	447074	4773519
PR72	447611	4773383
PR75	448300	4773234
PR86	443148	4776144
PR95	441938	4776421
PR101	439911	4776901
PR108	445556	4774768
PR114	444972	4771983
PR115	444918	4771559
PR124	441090	4774106
PR125	443131	4773964
PV154	445618	4775074
PV164	447601	4775090
PV215	438901	4773767
PV216	440056	4775182
PV217	438919	4773859
PV218	446189	4772137
PV219	439002	4773842
PV220	440306	4773432
PV222	438344	4774001

Participant ID	Easting [m]	Northing [m]
PV224	444868	4771858
PV225	439692	4773576
PV227	439253	4775378
PV228	442894	4772911
PV229	445477	4774997
PV231	446325	4772012
PV233	441358	4774889
PV234	437868	4774111
PV235	438986	4773748
PV236	443143	4770986
PV237	443492	4772771
PV238	442457	4772940
PV239	439363	4775352
PV240	447264	4773592
PV242	442893	4772828
PV243	442173	4772996
PV245	445387	4774609
PV246	443538	4770892
PV247	445002	4772467
PV249	444968	4772337
PV250	444986	4772908
PV251	445127	4772880
PV252	439661	4771799
PV253	437841	4772230
PV256	444821	4771249
PV259	444209	4774204
PV260	443234	4773956
PV261	443260	4774529
PV262	443372	4774501
PV263	442565	4774695
PV264	442122	4774705
PV265	441884	4774756
PV266	440467	4775090
PV267	441471	4776535

APPENDIX E TURBINE AND TRANSFORMER TECHNICAL SPECIFICATIONS

GE Energy

Parker D. Powell
Technical Leader

March 19, 2013

Don Karwisch
NextEra Energy Resources
700 Universe Blvd
Juno Beach, FL 33408

RE: Tonality of 1.6-100 Wind Turbine Generator

Mr. Karwisch:

On September 20, 2012, I responded to your request to help respond to the Ministry of Environment's request to "Provide a letter and report from manufacturer indicating that GE1.6-100, 1.62 MW is not tonal based on IEC 61400-11-ed.2.1: 2006. State the tonality of the turbines in the report."

IEC 61400-11 only requires a report of any tonality that exceeds 3dB, but appears not to define the term "tonal".

The 1.6-100 turbine (with or without low-noise trailing edges) has an expected value for tonal audibility of $\Delta L_{a,k} < 2$ dB, irrespective of wind speed, hub height, and grid frequency based on the IEC 61400-11 standard and thuse does not require a report.

Nonetheless, please refer to the attached report on the 1.6-100 with LNTE's, the model NextEra plans to install, for more detailed acoustic information. This is an updated version of what was provided with my September 20, 2012 letter. The following changes were made:

- Tabel 1 was replaced to include lower wind speeds and to update the low frequencies based on measurement data.
- The description for Audible Tonality was updated to conform with IEC 61400-11 standard. It now says, "The tonal audibility ($\Delta L_{a,k}$), when measured in accordance with the IEC 61400-11 standard, for the GE's 1.6-100 with LNTE is less than or equal to 2 dB.".

Best regards,

Parker D. Powell

Attachment: Technical Description of the 1.6-100 Wind Turbine with Low-Noise Trailing Edges (LNTE's) and Major Components Rev 3

GE Energy
Bldg. 53-405B
1 River Road
Schenectady, NY 12345

1
Phone 518-385-5838
Cell 518-867-6298
email parker.powell@ge.com

2 Normal Operation Calculated Apparent Sound Power Level

The apparent sound power levels $L_{WA,k}$ are initially calculated as a function of the hub height wind speed v_{HH}. The corresponding wind speeds v_{10m} at 10 m height above ground level have been evaluated assuming a logarithmic wind profile. In this case a surface roughness of $z_{0ref} = 0.05$ m has been used, which is representative of average terrain conditions.

$$v_{10m} = v_{HH} \frac{\ln\left(10m / z_{0ref}\right)}{\ln\left(hub\ height / z_{0ref}\right)} \quad *$$

The calculated apparent sound power levels $L_{WA,k}$ and the associated octave-band spectra are given in Table 1 and Table 2 for two different hub heights. The values are provided as mean levels as a function of v_{10m} for Normal Operation (NO) over cut-in to cut-out wind speed range. The uncertainties for octave sound power levels are generally higher than for total sound power levels. Guidance is given in IEC 61400-11, Annex D.

1.6-100 with LNTE – Normal Operation Octave Spectra									
Standard wind speed at 10 m [m/s]		3	4	5	6	7	8	9	10-Cutout
Hub height wind speed at 80 m [m/s]		4.2	5.6	7.0	8.4	9.7	11.1	12.5	14-Cutout
Frequency (Hz)	31.5	62.5	62.2	66.1	70.1	73.5	73.7	73.6	73.5
	63	72.1	71.9	75.9	80.3	84.0	84.1	84.1	84.0
	125	79.0	79.2	83.8	88.4	91.6	91.8	91.8	91.7
	250	84.0	84.6	89.4	94.7	95.4	95.3	95.4	95.5
	500	85.5	84.9	89.7	95.5	97.1	96.6	96.7	97.0
	1000	83.4	83.0	86.9	91.8	97.1	97.5	97.6	97.8
	2000	81.7	83.4	87.9	92.4	95.7	95.7	95.5	95.1
	4000	74.9	77.7	83.5	88.9	89.7	89.1	88.4	87.9
	8000	55.5	57.6	63.5	70.3	70.4	70.6	69.4	69.1
	16000	7.9	13.2	18.9	24.7	27.2	26.6	27.5	29.0
Total apparent sound power level $L_{WA,k}$ [dB]		90.4	90.7	95.3	100.5	103.0	103.0	103.0	103.0

Table 1: Normal Operation Calculated Apparent Sound Power Level, 1.6-100 with LNTE with 80 m hub height as a function of 10 m wind speed ($z_{0ref} = 0.05$ m), the octave band spectra are for information only

* Simplified from IEC 61400-11, ed. 2.1: 2006 equation 7

NEXTera ENERGY	TRANSFORMER SPECIFICATION BORNISH COLLECTION STATION DETAIL REQUIREMENTS	Spec. No. Exhibit 1 Rev. No. 0 Date 7/24/12 Page 1 of 3

TRANSFORMER RATINGS

Application: (Wind Farm / Solar) Generator Step-Up (GSU)

Phase	3	Cooling	HV Volts (L-L)		XV Volts(L-L)		YV Volts		ZV(TV) Volts		Sound Level dBA
Frequency	60	Class	121 kV		34.5kV						
Cooling medium	Oil	Connection	Wye		Delta						
Phasor Diagram	YND1	ONAN	51	MVA	51	MVA		MVA		MVA	75@
Oil preservation	Conservator /diaphragm	ONAF	68	MVA	68	MVA		MVA		MVA	Top
		ONAF	85	MVA	85	MVA		MVA		MVA	ONAF

ADDITIONAL TAP VOLTAGES

Terminal	Style	Taps or kV	Capacity
HV	MR	± 10 % HV Line Voltage (33 Taps ULTC)	Full Capacity ULTC
XV	N/A	N/A	N/A

PERCENT IMPEDANCE VOLTS

%	Windings	At MVA
8.0	H - X	51 MVA
	H - Y	
	X - Y	

TEMPERATURE RISES	°C	MVA
Winding	≤65	Top ONAF
Metallic Part	≤100	Top ONAF
Metallic Part in contact with paper	≤80	Top ONAF
Top Oil	≤65	Top ONAF

PD = <300 pC
RIV = < 100 uV

Winding and Bushing Ratings

	Winding				Bushing					
Terminal	MVA	Voltage (kV)	BIL (kV)	Ampere (A)	Class (kV)	BIL (kV)	Ampere (A)	Min Strike Dist Ph to Ph	Min Strike Dist Ph to Gnd	Ext. Creep
HV Line	85	121	550		145	650				
HV Neutral			200		36	200				
XV Line	85	34.5	200		36	200				
XV Neutral										
YV Line										
YV Neutral										

UNUSUAL SERVICE CONDITIONS
Yes x No (Check one) – Conform to CSA-C88-M90

Ambient Temp. in °C (Max, Avg, Min)	38, 20, -30
Elevation/Wind Speed	See Exhibit 2
Seismic Zone Designation (see Appendix H)	See Exhibit 2
Snow/Ice Accumulation (under energized, but no load)	See Exhibit 2
Short-time emergency Overloading (except GSU)	See IEEE C57.91-1995 Table 8
Long-time emergency Overloading (except GSU)	
Abnormal harmonic currents solid-state short circuits	no
Geomagnetically Induced Current (GIC) location	yes
High-current isolated-phase bus duct connection	no
Parallel operation	yes
Neutral grounding resistor	no

FOUNDATION
Specific Details and Measurements

Foundation Type:	
Distance from Center of Foundation:	
To Segment 1	
To Segment 2	
To Segment 3	
To Segment 4	**LOSS EVALUATION**
No Load losses per kW will be evaluated at	See Appendix F
Load losses per kW will be evaluated at	See Appendix F
Auxiliary losses per kW will be evaluated at	See Appendix F

Exhibit 1 **NEXTERA ENERGY Transformer Detailed Requirements**

APPENDIX F COORDINATES OF TURBINES

Coordinates of turbines considered in the Bornish Wind Energy Centre are listed below in UTM17-NAD83 projection, though only 45 turbines will be constructed:

Turbine ID	Easting [m]	Northing [m]
1	440000	4776435
2	440302	4775915
3	441679	4775810
4	442726	4775763
5	442888	4775342
6	443298	4775136
7	443646	4774902
8	444147	4774906
9	444848	4775090
10	446083	4774524
11	447155	4774304
12	438297	4774740
13	438935	4774435
14	439343	4774461
15	439811	4774541
16	440057	4774307
17	440771	4774498
18	442262	4773605
19	442807	4773502
20	443243	4773422
21	443709	4773598
22	443882	4773285
23	445877	4772947
24	446958	4772850
25	447480	4772818
26	447771	4772644
27	448192	4772544
28	438099	4773385
29	438407	4773226
30	438971	4773061
31	439437	4772972
32	439760	4772893
33	440119	4772886
34	439808	4772479
35	440509	4772411
36	442023	4772350
37	442348	4772325
38	442633	4772221
39	442186	4771810
40	442888	4771912
41	443189	4771699
42	443389	4772239
43	443706	4771937
44	445507	4770915
45	446168	4771350
46	437898	4772729
47	443792	4771485
48	438655	4774608
Substation	441434	4775841

Appendix C

Appendix C: Transformer Noise Emissions

Purchaser : GENERAL ELECTRIC CANADA
Rating : 102.000/136.000/170.000 MVA

Serial No:G2994-02
Date :03/07/2015

AUDIBLE SOUND LEVEL
MEASUREMENTS (dB)

RATING : **ONAN**
H.V. TAP POSITION : NOM
L. V. TAP POSITION : NOM

TEST VOLTAGE : 34500 V

1. Before test meas.	
Side	**Ambient**
A	65.2
B	66.0
C	65.7
D	66.4

3.- After test meas.	
Side	**Ambient**
A	65.1
B	65.4
C	64.2
D	64.6

4.- Average Ambient
65.0

6.- Average Corrected
68.0

Pos.	2.- Ambient + Transformer meas. 1/3 Height	2/3 Height	5.- Corrected Transformer meas. 1/3 Height	2/3 Height
1	69.2	69.4	67.6	67.8
2	68.3	68.6	66.7	67.0
3	69.4	69.7	67.8	68.1
4	68.6	68.6	67.0	67.0
5	69.4	70.1	67.8	68.5
6	69.2	69.4	67.6	67.8
7	68.1	68.3	66.5	66.7
8	68.6	69.2	67.0	67.6
9	68.9	69.1	67.3	67.5
10	69.7	69.1	68.1	67.5
11	70.1	69.9	68.5	68.3
12	69.2	70.1	67.6	68.5
13	69.1	70.0	67.5	68.4
14	70.2	69.4	68.6	67.8
15	70.1	70.2	68.5	68.6
16	69.4	69.2	67.8	67.6
17	69.3	68.3	67.7	66.7
18	70.1	69.4	68.5	67.8
19	69.4	70.1	67.8	68.5
20	69.2	70.2	67.6	68.6
21	68.7	69.4	67.1	67.8

Guaranteed Level 72 dB

Average transformer sound pressure level at ANSI surface (Lp)	68.0	db(A)
Height of the Transformer tank (H)	4.0	m
Length of the prescribed contour (Pm)	28.5	m
Measurement Surface Area (S)	143	m
Sound Power Level (Lw)	90.0	db(A)

Results : Accepted

COMMENTS :

Test Engineer

Design Engineer

Purchaser : GENERAL ELECTRIC CANADA
Rating : 102.000/136.000/170.000 MVA

Serial No:G2994-02
Date :03/07/2015

AUDIBLE SOUND LEVEL
MEASUREMENTS (dB)

RATING : **ONAN**
H.V. TAP POSITION : NOM
L. V. TAP POSITION : NOM

TEST VOLTAGE : 34500 V

1. Before test meas.	
Side	**Ambient**
A	65.2
B	66.0
C	65.7
D	66.4

3.- After test meas.	
Side	**Ambient**
A	65.1
B	65.4
C	64.2
D	64.6

4.- Average Ambient
65.0

6.- Average Corrected
68.0

Pos.	2.- Ambient + Transformer meas. 1/3 Height	2/3 Height	5.- Corrected Transformer meas. 1/3 Height	2/3 Height
22	68.6	69.1	67.0	67.5
23	70.1	68.1	68.5	66.5
24	69.4	69.2	67.8	67.6
25	70.2	69.3	68.6	67.7
26	69.3	70.1	67.7	68.5
27	69.9	69.2	68.3	67.6
28	70.0	69.4	68.4	67.8
29	70.1	69.2	68.5	67.6

Guaranteed Level 72 dB

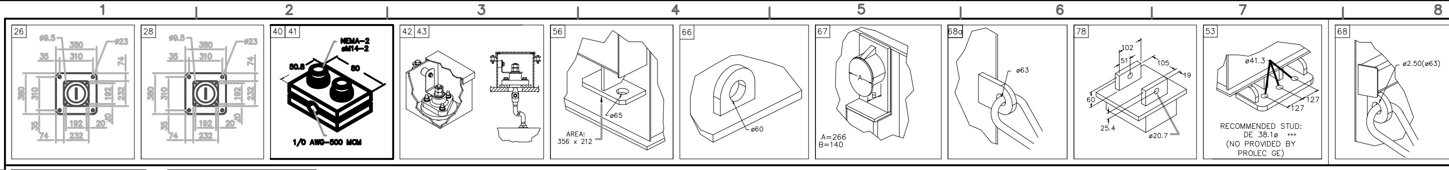
Average transformer sound pressure level at ANSI surface (Lp)	68.0	db(A)
Height of the Transformer tank (H)	4.0	m
Length of the prescribed contour (Pm)	28.5	m
Measurement Surface Area (S)	143	m
Sound Power Level (Lw)	90.0	db(A)

Results : Accepted

COMMENTS :

Test Engineer

Design Engineer



NOTES:
a) ITEMS REMOVED FOR SHIPMENT ARE MARKED WITH (*).
b) NUMBERING IS ACCORDING WITH G.E. PROLEC STD. LIST.
c) THE NUMBER IN COLUMN "GUIDE" CORRESPONDS TO THE "IN-FIELD ASSEMBLY GUIDE".

OPERATION CENTER OF GRAVITY
SHIPPING CENTER OF GRAVITY

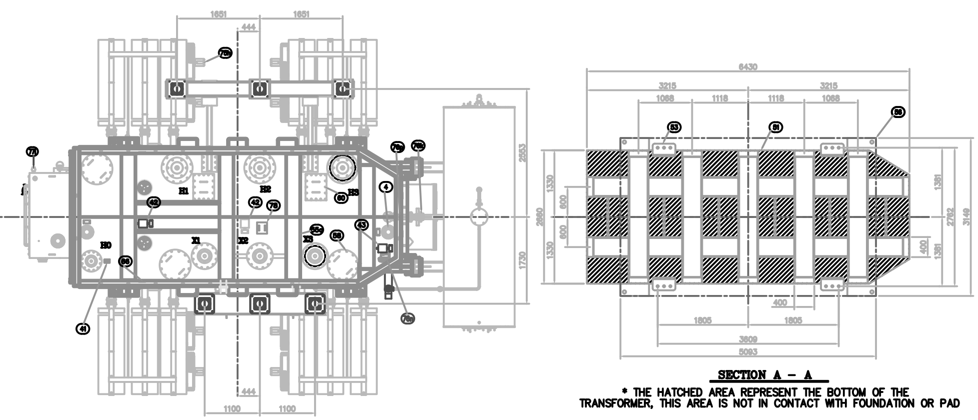
TOLERANCES

GENERAL ELECTRIC CANADA
P.O. No: 512-03118
GE Req No: TD7-04344
CUSTOMER ID: JERICHO
PROLEC GE Serial No: G2994-01

STEP UP TRANSFORMER
ONAN/ONAF/ONAF
102/136/170 MVA
60 HZ. THREE PHASE, 65°C, 1000 MASL
121/69.86 KV ⅄ – 34.5 KV ◁

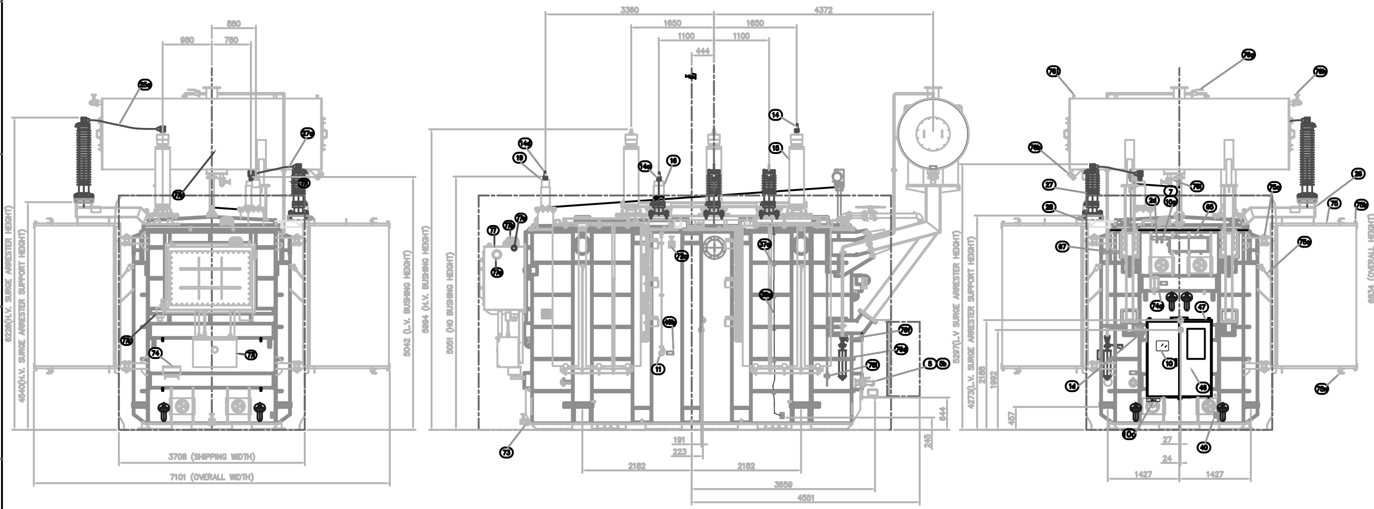
PROLEC
APPROVAL DRAWING
FEB/15/2013
DEAR CUSTOMER :
WE WANT TO SERVE YOU BETTER. PLEASE REVIEW THIS DRAWING AND SEND BACK WITH YOUR COMMENTS TO PROLEC-GE IN THE TIMEFRAME OF 10 DAYS AFTER THE DATE MARKED IN THIS STAMP.

APPROXIMATE WEIGHTS (KGS)	
CORE AND COILS	94780
TANK AND FITTINGS	40330
MAIN TANK INSULATING LIQUID (45730 LTS)	41160
COOLING EQUIPMENT INSULATING LIQUID (4015 LTS)	3615
CONSERVATOR TANK INSULATING LIQUID (2355 LTS)	2120
LTC TANK INSULATING LIQUID (1300 LTS)	1170
TOTAL WEIGHT	183175
UNTANKING WEIGHT (HEAVIEST PIECE)	94780
SHIPPING WEIGHT (WITHOUT INSULATING LIQUID)	116240



* THE HATCHED AREA REPRESENT THE BOTTOM OF THE TRANSFORMER, THIS AREA IS NOT IN CONTACT WITH FOUNDATION OR PAD

GUIDE		QTY.	ITEM	DESCRIPTION	CAT./MOD.
		1	1d	LIQUID TEMPERATURE INDICATOR (26Q-1)	QUALITROL, 104-885-03
		1	2d	THERMO-WELL FOR LIQUID TEMPERATURE INDICATOR	
5.4	*	2	4	PRESSURE RELIEF DEVICE WITH SEMAPHORE (63PR-1,2)	QUALITROL, 208-60F
5.6	*	1	5	RAPID PRESSURE RELAY (OIL) (63FP-1)	QUALITROL, 900-003-02
		1	5b	RAPID PRESSURE RELAY VALVE (2.00 ø) BALL-TYPE	
		1	7	THERMO-WELL FOR RESISTANCE TEMPERATURE DEVICE FOR ETM (TOP)	
		1	10	ELECTRONIC TEMPERATURE MONITOR (INSIDE CONTROL CABINET)	APT, ECLIPSE-000H
		1	10a	RESISTANCE TEMPERATURE DEVICE FOR ETM (TOP OIL) RTD-1	
		1	10c	RESISTANCE TEMPERATURE DEVICE FOR ETM (AMBIENT) RTD-2	
		1	11	PRESSURE-VACUUM GAUGE FOR SHIPPING	QUALITROL, 050-35E
5.15	*	3	14	H.V. BUSHING EXTERNAL CONNECTOR	DELTA, PM80C12-1-4N4-E
5.15	*	3	14a	L.V. BUSHING EXTERNAL CONNECTOR	DELTA, PM80C12-1-422-M1-E
5.15	*	1	14d	NEUTRAL BUSHING H0 EXTERNAL CONNECTOR	BURNDY, FD67C12W
3.2	*	3	15	H.V. BUSHING	PCORE, POC050G1210CMS
3.2	*	3	16	L.V. BUSHING	ABB 034Z3000AS
3.2	*	1	19	NEUTRAL BUSHING H0	ABB 034Z0412UT
4.2	*	3	25	H.V. SURGE-ARRESTERS	SIEMENS, 3EQ4 108-2PK31-4NH5
	*	3	25a	H.V. BUSHING TO SURGE-ARRESTER FLEXIBLE CONNECTOR	
4.1	*	1	26	H.V. SURGE-ARRESTER SUPPORT	
4.2	*	3	27	L.V. SURGE-ARRESTER	SIEMENS 3EQ4 045-2PD31-4NH5
	*	3	27a	L.V. BUSHING TO SURGE-ARRESTER FLEXIBLE CONNECTOR	
4.1	*	1	28	L.V. SURGE-ARRESTER SUPPORT	
	*	5	37	H.V. SURGE-ARRESTERS GROUND CABLE CONNECTOR	
	*	5	37a	L.V. SURGE-ARRESTERS GROUND CABLE CONNECTOR	
	*	1	38	H.V. SURGE-ARRESTERS COPPER GROUND CABLE	
	*	1	38a	L.V. SURGE-ARRESTERS COPPER GROUND CABLE	
		5	40	GROUND PAD	
		1	41	NEUTRAL H0 GROUND PAD	
		1	42	CORE GROUND BUSHING TERMINAL BOX (MAIN UNIT)	
		1	43	FRAME GROUND BUSHING BOX	
		1	46	NAMEPLATE	
		7	46b	IDENTIFICATION NAMEPLATE	
		1	47	CONTROL CABINET	
		1	51	REINFORCED BASE WELDED TO TANK	
		4	53	TRANSFORMER ANCHOR PADS	
		13	55	TANK BRACES	
		4	55a	COVER BRACES	
		4	56	JACKING PADS AND PULLING EYES	
		1	57	MAIN COVER	
		3	58	INSPECTION MANHOLE (COVER)	
		2	60	INSPECTION RECTANGULAR MANHOLE (COVER)	
		3	65	CT TERMINAL BOX	
		4	66	LIFTING EYE COVER ONLY	
		4	67	LIFTING HOOK FOR LIFTING COMPLETE UNIT	
		4	68	SHIPPING LUGS FOR SECURING THE UNIT LONGITUDINALLY (SHORT LUGS)	
		4	68a	SHIPPING LUGS FOR SECURING THE UNIT LONGITUDINALLY (LONG LUGS)	
		1	72c	TOP FILTER PRESS VALVE (50.8 ø) GLOBE-TYPE	
		1	73	MAIN TANK DRAIN VALVE (50.8ø) GLOBE-TYPE WITH SAMPLING DEVICE (9.65) AND PLUG	
		1	74	IMPACT RECORDER FOR SHIPPING	
		1	74a	ELECTRONIC IMPACT RECORDER FOR SHIPPING	
1.3	*	9	75	COOLING RADIATORS	
		18	75b	RADIATOR VENT AND DRAIN PLUG (25.4 ø)	
		18	75c	RADIATOR VALVE BUTTERFLY-TYPE (101.6 ø)	
		24	75h	COOLING FAN	KRENZ, F26-A8878
1.4	*	4	75n	TOP/BOTTOM RADIATOR SUPPORTS	
1.2	*	7	75o	RADIATOR BRACE	
2.3	*	1	76	CONSERVATOR TANK WITH INTERNAL BLADDER	
2.1	*	2	76a	CONSERVATOR TANK SUPPORT	
2.2	*	1	76b	CONSERVATOR MAGNETIC LIQUID LEVEL GAUGE (71Q-1)	QUALITROL, 042-144-07
		1	76c	HANDHOLE TO INSTALL BLADDER	
5.8	*	1	76d	SILICA-GEL BREATHER WITH PIPE	MESSKO, DB200-RM-T
		2	76e	CONSERVATOR MANHOLE	
5.8	*	1	76f	SILICA-GEL SHUT OFF VALVE (12.7 ø) BALL-TYPE	
		1	76g	CONSERVATOR PRESSURE EQUALIZATION VALVE (25.4 ø) GLOBE-TYPE	
		1	76h	CONSERVATOR FILL VALVE (50.8 ø) GLOBE-TYPE	
		1	76i	CONSERVATOR DRAIN VALVE (50.8 ø) GLOBE-TYPE	
		1	76j	CONSERVATOR TANK NIPPLE FOR VENT WITH CAP.	
2.2	*	1	76k	CONSERVATOR TANK TO MAIN TANK VALVE (76.2 ø) BALL-TYPE	
		1	76l	GAS SAMPLING DEVICE	
5.13	*	1	76n	GAS ACCUMULATION DEVICE (63G-1)	QUALITROL, 038-002-02
2.4	*	1	76p	EXPANSION JOINT FOR PIPING	
		1	77	ON-LOAD TAP-CHANGER	MR, RMV-II-1500-72.5
		1	77a	LTC MAGNETIC LIQUID LEVEL GAUGE (71Q-2)	
		1	77b	LTC PRESSURE RELIEF DEVICE (63PR-4)	
		1	77i	LTC DRAIN VALVE (25.4 ø) GATE-TYPE WITH SAMPLING DEVICE (9.65 ø) AND PLUG	
5.8	*	1	77k	LTC SILICA-GEL BREATHER WITH PIPE	
		1	77l	LTC MOTOR DRIVE CABINET	
		1	78	TETHER POLE MOUNTING PLATE	
		2	79	VALVES FOR INSTALLATION OF A KELMAN MINITRANS DGA MONITOR (BALL TYPE)	



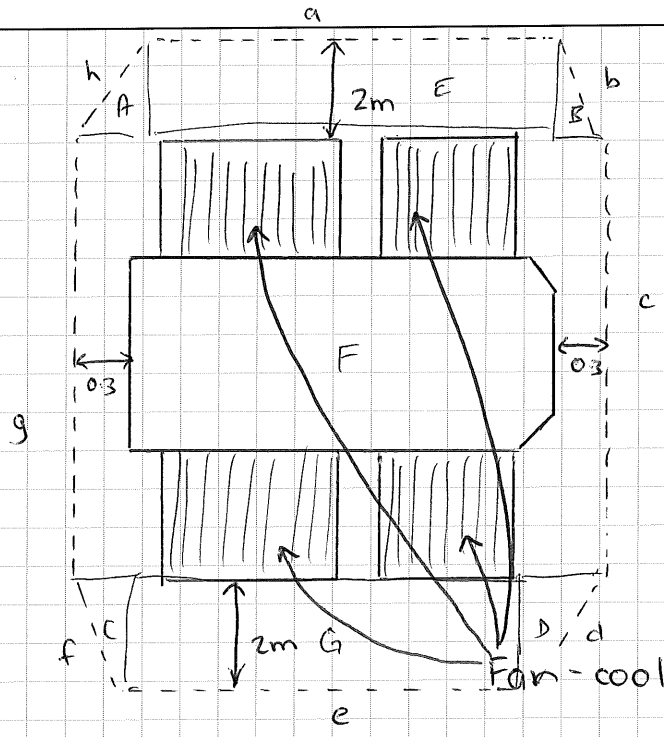
PROLEC GE

PROLEC GE ENGINEERING POWER DIVISION
http://www.prolecge.com

PROJECTION	
SCALE:	1:45
DIMENSIONS:	MM
REVISION:	INDICATED
TITLE:	TRANSFORMER'S OUTLINE
DFTM:	CTC 01/18/2013
CHKD:	CSP 01/18/2013
DRAWING NO.:	G299401D801
sheet:	1 of 1
REV / DESCRIPTION / DESIGN GROUP	2

AECOM

JOB TITLE Jericho Wind Energy Centre
JOB NO. 60155032 CALCULATION NO.
ORIGINATOR AD DATE Measurement Area
REVIEWER DATE Genset
SCALE SHEET NO. OF



Perimeter = a + b + c + d + e + f + g + h

e = a = 6.43 m (from drawing)

f = h = d = b = $\sqrt{2^2 + 0.3^2}$ = 2.02m

c = g = 7.10m

∴ Perimeter = 35.14m

Top Area = 4 triangles (A + B + C + D)
+2 Rectangles (E + G)
+1 Rectangle (F)

Area of A = B = C = D = $\frac{1}{2} \times 2 \times 0.3$
= 0.6m²

Area of E = a × 2 = 12.86m² = G
Area of F = [a + (2 × 0.3)] × c
= 49.9m²

∴ Top area = 78.02m²

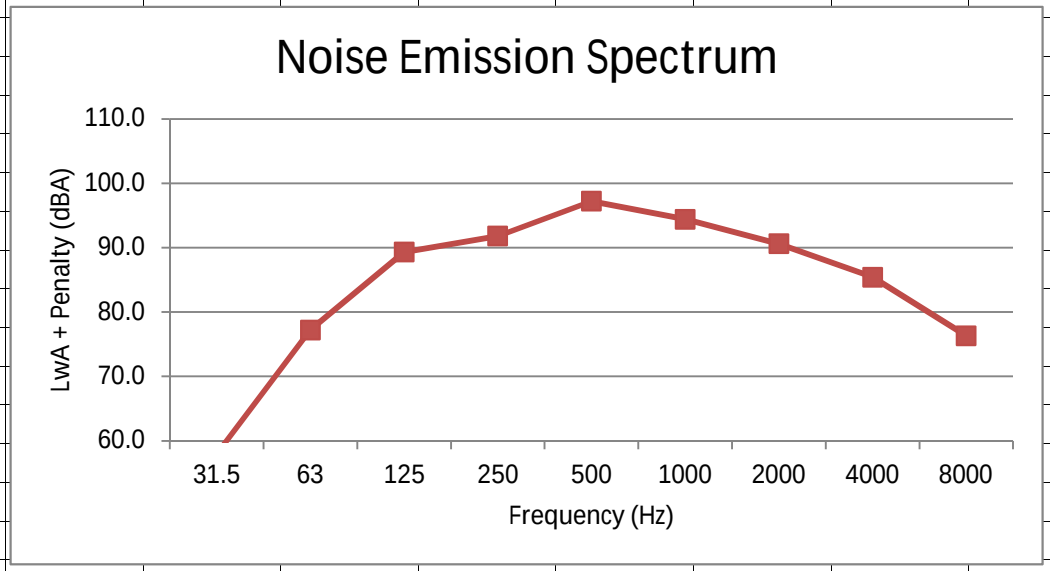
Side area = perimeter × (height + 0.3)
= 35.14 × 4.573 = 160.7m²

∴ Total area = 78.0 + 160.7
Area = 238.7m²

Grid: 5x5 = 1 in

Transformer Noise Emissions

Noise Rating	72.0	dBA
Measurement Dist	0.30	m
Measurement Surface Area	238.7	m^2
Sound Power Level	95.78	dBA
Tonal Penalty	5.0	dB
Sound Power Level	100.8	dBA



Octave Band Emission Estimates

Centre Frequency	Corr[1]	Ncor[2]	Lw	LwA	Tonal Penalty	Lw + Penalty	LwA + Penalty
31.5	-1.0	-2.37	92.4	53.0	5.0	97.4	58.0
63	5.0	-2.37	98.4	72.2	5.0	103.4	77.2
125	7.0	-2.37	100.4	84.3	5.0	105.4	89.3
250	2.0	-2.37	95.4	86.8	5.0	100.4	91.8
500	2.0	-2.37	95.4	92.2	5.0	100.4	97.2
1000	-4.0	-2.37	89.4	89.4	5.0	94.4	94.4
2000	-9.0	-2.37	84.4	85.6	5.0	89.4	90.6
4000	-14.0	-2.37	79.4	80.4	5.0	84.4	85.4
8000	-21.0	-2.37	72.4	71.3	5.0	77.4	76.3
Overall Sound Power Level			104.4	95.78		109.4	100.8

1. Correction from "Engineering Noise Control", David A. Bies and Colin H. Hansen

2. Normalization correction to ensure total sound power after band corrections does not exceed measured overall value

Appendix D

Appendix D: Calculations

CadnaA Sample Calculation for Receiver closest to substation

Configuration	
Parameter	Value
General	
Country	(user defined)
Max. Error (dB)	0.00
Max. Search Radius (m)	20000.00
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)	60.00
Reference Time Night (min)	60.00
Daytime Penalty (dB)	0.00
Recr. Time Penalty (dB)	6.00
Night-time Penalty (dB)	10.00
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	Off
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: Point of Reception210
ID: VLR210
X: 441581.00
Y: 4776492.00
Z: 211.50

Point Source, ISO 9613, Name: "Substation Spare", ID: "SS2"																			
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	441363.00	4775880.00	212.65	0	32	61.0	61.0	0.0	0.0	67.3	0.0	-4.8	0.0	0.0	0.0	0.0	-0.0	-1.5	-1.5
2	441363.00	4775880.00	212.65	0	63	80.2	80.2	0.0	0.0	67.3	0.1	-4.8	0.0	0.0	0.0	0.0	-0.0	17.7	17.7
3	441363.00	4775880.00	212.65	0	125	92.3	92.3	0.0	0.0	67.3	0.3	3.6	0.0	0.0	0.0	0.0	-0.0	21.2	21.2
4	441363.00	4775880.00	212.65	0	250	94.8	94.8	0.0	0.0	67.3	0.7	0.7	0.0	0.0	0.0	0.0	-0.0	26.2	26.2
5	441363.00	4775880.00	212.65	0	500	100.2	100.2	0.0	0.0	67.3	1.3	-1.4	0.0	0.0	0.0	0.0	-0.0	33.1	33.1
6	441363.00	4775880.00	212.65	0	1000	97.4	97.4	0.0	0.0	67.3	2.4	-1.4	0.0	0.0	0.0	0.0	-0.0	29.2	29.2
7	441363.00	4775880.00	212.65	0	2000	93.6	93.6	0.0	0.0	67.3	6.3	-1.4	0.0	0.0	0.0	0.0	-0.0	21.5	21.5
8	441363.00	4775880.00	212.65	0	4000	88.4	88.4	0.0	0.0	67.3	21.3	-1.4	0.0	0.0	0.0	0.0	-0.0	1.3	1.3
9	441363.00	4775880.00	212.65	0	8000	79.3	79.3	0.0	0.0	67.3	75.9	-1.4	0.0	0.0	0.0	0.0	-0.0	-62.4	-62.4