FINAL

Acoustic Assessment Report

Hydro One Networks Inc.
Clarington Transformer Station

Prepared for:

Hydro One Networks Inc.
483 Bay Street
Toronto, ON M5G 2P5

January 7, 2015

Pinchin File: 70337.002

MEMBER OF
THE PINCHIN GROUP

Company Name: Hydro One Networks Inc.

Company Address:

LocationofFacility:

The attached Acoustic Assessment Report was prepared in accordance with the guidance in the ministry document "Information to be Submitted for Approval Qf Stationary Sources of Sound" (NPC 233) dated October 1995 and the minimum required information identified in the check-list on the reverse of this sheet has been submitted.

Company Contact:

Name:

Title:

Phone Number:

Signature:

Date:

Technical Contact:

Name: Pinchin Ltd.

Representing:

Phone Number:

Signature:

Date:

ACOUSTIC ASSESSMENT REPORT CHECKLIST

	Required Information		
		Submitted	Explanation/Reference
1.0	**Introduction** (Project Background and Overview)	☑ Yes	Section 1
2.0	**Facility Description**		
	2.1 Operating hours of facility and significant Noise Sources	☑ Yes	Section 2
	2.2 Site Plan identifying all significant Noise Sources	☑ Yes	Figure 2
3.0	**Noise Source Summary**		
	3.1 ***Noise Source Summary Table***	☑ Yes	Table 1
	3.2 Source noise emissions specifications	☑ Yes	Section 3
	3.3 Source power/capacity ratings	☑ Yes	Table 1
	3.4 Noise control equipment description and acoustical specifications	☐ Yes	N/A
4.0	**Point of Reception Noise Impact Calculations**		
	4.1 ***Point of Reception Noise Impact Table***	☑ Yes	Table 2
	4.2 Point(s) of Reception (POR) list and description	☑ Yes	Table 2, Section 4
	4.3 Land-use Zoning Plan	☑ Yes	Appendix C
	4.4 Scaled Area Location Plan	☑ Yes	Figure 1
	4.5 Procedure used to assess noise impacts at each POR	☑ Yes	Section 6
	4.6 List of parameters/assumptions used in calculations	☑ Yes	Section 6
5.0	**Acoustic Assessment Summary**		
	5.1 ***Acoustic Assessment Summary Table***	☑ Yes	Table 3
	5.2 Rationale for selecting applicable noise guideline limits	☑ Yes	Section 5
	5.3 Predictable Worst Case Impacts Operating Scenario	☑ Yes	Section 5
6.0	**Conclusions**		
	6.1 Statement of compliance with the selected noise performance limits	☑ Yes	Section 7
7.0	**Appendices** (Provide details such as)	☑ Yes	
	Listing of Insignificant Noise Sources	☑ Yes	Appendix E
	Manufacture's Noise Specifications	☑ Yes	Appendix D
	Calculations	☑ Yes	Appendix D
	Instrumentation	☐ Yes	n/a
	Meteorology during Sound Level Measurements	☐ Yes	n/a
	Raw Data from Measurements	☐ Yes	n/a
	Drawings (Facility / Equipment)	☑ Yes	Appendix D

Issued to:	**Hydro One Networks Inc.**
Contact:	**Environmental Engineering and Project Support**
Issued on:	**January 7, 2015**
Pinchin file:	**70337.002**
Issuing Office:	**2470 Milltower Court, Mississauga, ON L5N 7W5**

Author: _____

Reviewer: _____

VERSION CONTROL

Rev	Date	Revision Description	Pinchin File	Author's Initials
0.0	August 21, 2012	Original Document for ECA Application	70337.002	WNL
1.0	August 20, 2014	Original Document for ECA Application - Updates to include receptors in vacant lots	70337.002	WNL
2.0	October 6, 2014	Original Document for ECA Application - Revisions on the AAR	70337.002	WNL
3.0	November 12, 2014	Original Document for ECA Application - Revisions on the AAR	70337.002	WNL
4.0	January 7, 2015	Original Document for ECA Application - Adding additional sources	70337.002	WNL

EXECUTIVE SUMMARY

Pinchin Ltd. (Pinchin) was retained by Hydro One Networks Inc. (Hydro One) to assess the environmental sound emissions at Clarington Transformer Station (Clarington TS) located on 2745 Townline Road North, Municipality of Clarington, ON. This report has been prepared in support of an Environmental Compliance Approval application.

The measurements and analysis indicate that the noise impact from Clarington TS meets the sound level limits set out in MOE Publication NPC-300 at the selected noise sensitive receptor locations. No special noise control measures are warranted.

TABLE OF CONTENTS

APPENDICES

1.0 INTRODUCTION

Pinchin Ltd. (Pinchin) was retained by Hydro One Networks Inc. (Hydro One) to assess the environmental sound emissions at Clarington Transformer Station (Clarington TS) located on 2745 Townline Road North, Municipality of Clarington, ON. This report has been prepared in support of an Environmental Compliance Approval application.

The assessment presented herein provides an evaluation of the potential noise impacts from Clarington TS on the selected off-site noise sensitive receptor locations. The assessment was prepared consistent with the following Ministry of the Environment (MOE) guidelines:

- Ministry of the Environment Publication NPC-233, "Information to be Submitted for Approval of Stationary Sources of Sound", October 1995.
- Ministry of the Environment, "Basic Comprehensive Certificates of Approval User Guide", Version 2.1, March 2011.
- Ministry of the Environment Publication NPC-103, "Procedures", published under the Model Municipal Noise Control Bylaw, 1977.
- Ministry of the Environment Publication NPC-104, "Sound Level Adjustments", published under the Model Municipal Noise Control Bylaw, 1977.
- Ministry of the Environment Publication NPC-300, "Environmental Noise Guideline Stationary and Transportation Sources – Approval and Planning", August 2013.

Clarington TS is located on land zoned for Agricultural use (A zoning). The lands surrounding Clarington TS are zoned for Agricultural (A zoning). A copy of the zoning map and general provisions were obtained from the Municipality of Clarington and are included in Appendix C. An area plan is provided in Figure 1, Appendix B.

Clarington TS is located in an acoustical Class 3 Area defined by NPC-300 as an area with an acoustical environment dominated by natural sounds.

The topographic information of the area surrounding Clarington TS was provided through a Hydro One Land Survey as well as data extracted from Google Earth.

2.0 FACILITY DESCRIPTION

The proposed Clarington TS is anticipated to operate 24 hours per day, 7 days per week. The primary noise sources associated with Clarington TS include two new transformers (2T2 and 2T3). The scheduled in-service dates are December 2016 for transformer 2T3 and January 2017 for transformer 2T2, respectively. Please note that the IDs for both transformers have been changed.

3.0 NOISE SOURCE SUMMARY

This assessment focused on the sound emissions from the noise sources identified at Clarington TS with the potential to adversely impact the sensitive receptors. The Noise Source Summary is provided in Table 1, Appendix A.

At Clarington TS, there will be two new identical 750 MVA 500/240/28 kV transformers, designated 2T2 and 2T3. The manufacturer measured sound levels of the new transformer cores under the rated voltage and also measured the sound levels of the transformer cooling fans with the transformer de-energized. These measurements were provided by Hydro One. Details of transformer outline drawings, manufacturer sound data, and sound level calculations are provided in Appendix D.

The calculated octave band sound power levels were used to model the two transformer units as point sources.

In addition to the two transformers (2T2 and 2T3), Pinchin, in collaboration with Hydro One, assessed other minor noise sources that are planned to be installed at Clarington TS. The assessment included reviews of manufacturers' sound data, and in-field inspection of similar equipment at another Hydro One transformer station.

The additional noise sources as shown in Figure 2, Appendix B include the following:

- Six (6) reactor coils (sources 3R1_1 to 3R1_3 and 3R4_1 to 3R4_3);
- Six (6) capacitor banks (sources SC1_1 to SC1_3 and SC4_1 to SC4_3).
- Ten (10) AC units serving relay buildings A and B (sources AC1_A to AC5_A and AC1_B to AC5_B); and
- Eleven (11) exhaust fans serving relay buildings A and B (sources EF1_A to EF6_A and EF1_B to EF5_B).

It was advised by Hydro One that only two 4 ton AC units would run at any time for each building, 1 ton AC unit would run on an as-needed basis, and the exhaust fans would only operate 5 minutes per hour. However, as a very conservative estimate, all AC units and exhaust fans were modelled operating 60 minutes in any one hour. It should be noted that this worst case scenario actually is not even possible.

Detailed manufacturer's sound data and engineering drawings for the above sources are provided in Appendix D.

Noise sources considered to be insignificant contributors to the overall facility noise levels have been listed in Appendix E.

4.0 POINT OF RECEPTION NOISE IMPACT CALCULATIONS

Points of reception for a noise assessment are those locations identified to be noise sensitive. The facility-attributable sound level is the sum of the individual source contributions at each point of reception. A point of reception, as defined in MOE Publication NPC-300, may be located on a property used for residential, noise sensitive commercial or institutional purposes.

The objective of this assessment is to determine the predictable worst-case 1-hour equivalent sound level (L_{eq}, 1 hour) at the worst-case points of reception. The worst-case point of reception is defined as the sensitive receptor with the greatest potential exposure to the noise sources due to proximity and direct line-of-sight.

The worst-case points of reception have been identified as follows:

- R1 – a two-storey home along Concession Road 7, approximately 525 m to the south of the nearest transformer (4.5 m above local grade);
- R1-OPOR – an outdoor POR associated with receptor R1 (30 m from R1 and 1.5 m above local grade);
- R2 – a two-storey home along Concession Road 7, approximately 555 m to the south of the nearest transformer (4.5 m above local grade);
- R2-OPOR – an outdoor POR associated with receptor R2 (30 m from R2 and 1.5 m above local grade);
- R3 – a two-storey home along Langmaid Road, approximately 460 m to the east of the nearest transformer (4.5 m above local grade); and
- R3-OPOR – an outdoor POR associated with receptor R3 (30 m from R3 and 1.5 m above local grade);

In addition to these receptors, there are several vacant lots located around Clarington TS. As per the guidelines in MOE Publication NPC-300, the receptor location on vacant lots zoned to allow for noise sensitive land use was determined by the following:

- If the area of the vacant lot was smaller than 1 hectare (10,000 m²), the location of the point of reception was approximately in the centre of the vacant lot, having regard for the existing zoning by-law, the typical building pattern in the area and an appropriate or likely future use of the vacant lot, at a height of 4.5 metres above ground.
- If the area of the vacant lot was greater than 1 hectare (10,000 m²), the area of the vacant lot for noise assessment purposes was considered limited to 1 hectare (10,000 m²). This 1 hectare portion of the vacant lot was consistent with the existing zoning by-

law, the typical building pattern in the area and an appropriate or likely future use of the vacant lot. The location of the point of reception was the centre of this 1 hectare portion of the vacant lot, at a height of 4.5 metres above ground.

When these guidelines resulted in a potential receptor location greater than 600 m from the closest noise source, the receptor was not considered in the assessment. Also, inaccessible vacant lots were not considered.

The worst-case potential points of reception on vacant lots surrounding Clarington TS were identified as follows:

- FR1 – a potential POR along Winchester Road East, approximately 575 m to the southwest of the nearest transformer (4.5 m above local grade); and
- FR2 – a potential POR along Concession Road 7, approximately 500 m to the south of the nearest transformer (4.5 m above local grade).

Figures 1 and 2 show the locations of the selected receptors and property boundaries of the lands surrounding Clarington TS.

5.0 ACOUSTIC ASSESSMENT CRITERIA

Assessment criteria may be determined for PORs based on the MOE's exclusionary sound level limits, as presented in Tables B-1 and B-2 of NPC-300, in comparison to the background sound levels experienced in the area. The "background sound level" is defined as the sound level present in the environment that is produced by noise sources other than those from the site, and would include traffic sound levels and sound from neighboring industrial/commercial activities. The higher of the two assessment criteria is selected for the purpose of this assessment.

The acoustical environment surrounding Clarington TS and the selected receptors is characterized as in a Class 3 Area. Class 3 areas have the following exclusionary sound level limits expressed as a 1-hour L_{eq} that can be applied to assess the sound levels emitted by the applicable noise sources:

Time of Day	Exclusionary Sound Levels
7:00 a.m. to 7:00 p.m.	45 dBA
7:00 p.m. to 11:00 p.m.	40 dBA
11:00 p.m. to 7:00 a.m.	40 dBA

For the purpose of this assessment, the MOE’s exclusionary nighttime sound level limit of 40 dBA has been selected as the applicable noise criterion at all receptor locations.

6.0 IMPACT ASSESSMENT

The worst-case assessment of the steady-state noise sources at the selected points of reception was based on measured and estimated sound level data. CadnaA Acoustical Modelling Software (CadnaA), version 4.4.145, was used to model the potential impact of the significant noise sources. CadnaA calculates sound level emissions based on the ISO 9613-2 standard "Acoustics – Attenuation of sound during propagation outdoors".

The worst-case cumulative sound level estimated at the receptors included attenuation affects due to geometric divergence, atmospheric attenuation, barriers/berms, ground absorption and directivity, as applicable for all significant noise sources.

CadnaA modelling assumptions used in this assessment included:

- Noise Sources: The calculated A-weighted or 1/1 octave band sound power levels were modelled using point sources.
- Noise Source Elevation: Transformer noise was modelled at 100 percent height of the transformer cores/fan banks. For other minor sources, the height was determined from the top of the equipment to the local ground.
- Reflection Order: Maximum reflection order of one was evaluated to consider indirect noise impact from one reflecting surface.
- Ground Absorption: The agricultural lands surrounding Clarington TS were modelled with a ground absorption factor of 1. At Clarington TS, ground absorption of 0.5 was used to represent the mostly gravel surface. For reflective surfaces such as public roads, ground absorption was set to 0.0. Please note that there will be no paved roads inside Clarington TS. A basic layout plan showing ground surface coverage is provided in Appendix D.
- Receptor Elevation: All receptors were modelled at a height of 1.5 m and 4.5 m above local ground to represent outdoor PORs and two-storey homes, respectively.
- Terrain: The topographic information of the area surrounding Clarington TS was provided through a Hydro One Land Survey as well as data extracted from Google Earth.
- Noise Source Directivity: No directivity was applied to the significant sources.
- Noise Controls: Both transformers will be located outdoors without noise control measures. All other sources were also modelled without any noise controls.

The noise emitted from a transformer core is characterized by the hum of current passing through the transformer, which emits tonal sound. However, as stated in the IEEE and IEC standards (IEEE C57.12.90-2010 and IEC 60076-10:2005), fans and pumps typically generate broadband noise due to the forced air/oil flow, which does not exhibit tonal characteristics.

In an effort to verify the tonal characteristics of transformer fan banks, Pinchin conducted sound level measurements on 'sister' transformer units of the same design, ratings and manufacturer as those to be used at Clarington TS at another Hydro One site on Tuesday October 28, 2014. These transformers have the exact same model of fans as those to be used at Clarington TS.

The sound level measurement results show that the fan noise has broadband 1/3 octave band spectrum without any noticeable spikes. Furthermore, the fans did not exhibit audible tonality during the testing. This demonstrates that the fan noise does not exhibit tonal characteristics. Consequently, in the calculations of transformer sound power levels, a 5 dBA tonal penalty was only applied to the core sound levels.

In addition, a 5 dBA tonal penalty was applied to each phase of reactor coils and capacitor banks.

Noise impact contour map is presented in Figure 3. The predicted sound levels are provided in Table 3.

7.0 CONCLUSIONS

The measurements and analysis indicate that the noise impact from Clarington TS meets the sound level limits set out in MOE Publication NPC-300 at the selected noise sensitive receptor locations. No special noise control measures are warranted.

APPENDIX A

Tables

(5 Pages)

Table 1: Noise Source Summary Table

Source ID [1]	Source Description	Sound Power Level dBA [2] (Including Applicable 5 dBA Tonal Penalty)	Source Location [3]	Sound Characteristics [4]	Noise Control Measures [5]	Source of Data [6]
2T2	Transformer 2T2	98	O	T	U	Man
2T3	Transformer 2T3	98	O	T	U	Man
AC1_A	Relay Building A - Air Conditioner	84	O	S	U	Man
AC2_A	Relay Building A - Air Conditioner	84	O	S	U	Man
AC3_A	Relay Building A - Air Conditioner	84	O	S	U	Man
AC4_A	Relay Building A - Air Conditioner	84	O	S	U	Man
AC5_A	Relay Building A - Air Conditioner	79	O	S	U	Man
EF1_A	Relay Building A - 250kV Charger & DC Panel Room	58	O	S	U	Man
EF2_A	Relay Building A - 250kV Battery Room	58	O	S	U	Man
EF3_A	Relay Building A - 48V Battery Room	58	O	S	U	Man
EF4_A	Relay Building A - AC Distribution Room	58	O	S	U	Man
EF5_A	Relay Building A - Washroom	48	O	S	U	Man
EF6_A	Relay Building A - Workshop	58	O	S	U	Man
AC1_B	Relay Building B - Air Conditioner	84	O	S	U	Man
AC2_B	Relay Building B - Air Conditioner	84	O	S	U	Man
AC3_B	Relay Building B - Air Conditioner	84	O	S	U	Man
AC4_B	Relay Building B - Air Conditioner	84	O	S	U	Man
AC5_B	Relay Building B - Air Conditioner	79	O	S	U	Man
EF1_B	Relay Building B - 250kV Charger & DC Panel Room	58	O	S	U	Man
EF2_B	Relay Building B - 250kV Battery Room	58	O	S	U	Man
EF3_B	Relay Building B - 48V Battery Room	58	O	S	U	Man
EF4_B	Relay Building B - AC Distribution Room	58	O	S	U	Man
EF5_B	Relay Building B - Washroom	48	O	S	U	Man

Table 1: Noise Source Summary Table

Source ID [1]	Source Description	Sound Power Level dBA [2] (Including Applicable 5 dBA Tonal Penalty)	Source Location [3]	Sound Characteristics [4]	Noise Control Measures [5]	Source of Data [6]
3R1_1	Reactor Coil - 3R1 (Phase 1)	75	O	T	U	H1
3R1_2	Reactor Coil - 3R1 (Phase 2)	75	O	T	U	H1
3R1_3	Reactor Coil - 3R1 (Phase 3)	75	O	T	U	H1
3R4_1	Reactor Coil - 3R4 (Phase 1)	75	O	T	U	H1
3R4_2	Reactor Coil - 3R4 (Phase 2)	75	O	T	U	H1
3R4_3	Reactor Coil - 3R4 (Phase 3)	75	O	T	U	H1
SC1_1	Capacitor Banks (Phase 1)	74	O	T	U	H1
SC1_2	Capacitor Banks (Phase 2)	74	O	T	U	H1
SC1_3	Capacitor Banks (Phase 3)	74	O	T	U	H1
SC4_1	Capacitor Banks (Phase 1)	74	O	T	U	H1
SC4_2	Capacitor Banks (Phase 2)	74	O	T	U	H1
SC4_3	Capacitor Banks (Phase 3)	74	O	T	U	H1

Notes:

1. Wherever possible, the source ID assigned by the client is used.
2. For transformers 2T2 and 2T3, the sound power levels in dBA were calculated from manufacturer's specifications AND included 5 dBA tonal penalty.
   For reactor coils and capacitor banks, the sound power levels include 5 dBA tonal penalty.
3. Source Location:
   O - located/installed outside the building, including on the roof
   I - located/installed inside the building
4. Sound Characteristic

S = Steady	I = Impulsive	T = Tonal
Q = Quasi-Steady Impulsive	B = Buzzing	C = Cyclic

5. Noise Control Measures

S = Silencer/Muffler	L = Lagging	O = other
A = Acoustic lining, plenum	E = acoustic enclosure	U = uncontrolled
B = Barrier, berm, screening		

6. Source of Data

Mea - Measured	Man - Manufacturer's Data or Advised by Hydro One
Cal = Engineering Calculations	H1 - Advised by Hydro One

Table 2: Point of Reception Noise Impact Table

Source ID [1]	Source Description	Point of Reception R1 [2]		Point of Reception R1-OPOR - 1.5 m [2]		Point of Reception R2 [2]		Point of Reception R2-OPOR - 1.5 m [2]	
		Distance	Sound Level	Distance	Sound Level	Distance	Sound Level	Distance	Sound Level
		(m)	at POR [3]	(m)	at POR [3]	(m)	at POR [3]	(m)	at POR [3]
2T2	Transformer 2T2	575	31	546	26	555	31	525	27
2T3	Transformer 2T3	525	32	495	27	592	30	562	26
AC1_A	Relay Building A - Air Conditioner	592	2	562	-1	606	0	576	-1
AC2_A	Relay Building A - Air Conditioner	598	0	569	-2	603	2	573	0
AC3_A	Relay Building A - Air Conditioner	577	15	547	15	590	20	560	15
AC4_A	Relay Building A - Air Conditioner	580	15	550	15	588	20	558	15
AC5_A	Relay Building A - Air Conditioner	589	1	559	-3	608	-5	578	-7
EF1_A	Relay Building A - 250kV Charger & DC Panel Room	582	-11	553	-12	603	-17	573	-18
EF2_A	Relay Building A - 250kV Battery Room	579	-11	550	-12	600	-16	570	-17
EF3_A	Relay Building A - 48V Battery Room	592	-19	563	-19	592	-12	561	-11
EF4_A	Relay Building A - AC Distribution Room	596	-20	566	-20	595	-12	565	-12
EF5_A	Relay Building A - Washroom	585	-22	555	-22	586	-22	556	-22
EF6_A	Relay Building A - Workshop	597	-20	568	-20	597	-12	567	-12
AC1_B	Relay Building B - Air Conditioner	575	2	545	0	620	0	590	-2
AC2_B	Relay Building B - Air Conditioner	580	0	550	-1	615	2	585	0
AC3_B	Relay Building B - Air Conditioner	559	16	529	15	604	20	574	15
AC4_B	Relay Building B - Air Conditioner	562	16	532	15	602	20	572	15
AC5_B	Relay Building B - Air Conditioner	572	1	542	-3	622	-5	593	-8
EF1_B	Relay Building B - 250kV Charger & DC Panel Room	566	-11	536	-11	617	-18	588	-19
EF2_B	Relay Building B - 250kV Battery Room	563	-11	533	-11	614	-17	584	-18
EF3_B	Relay Building B - 48V Battery Room	573	-18	544	-18	603	-9	574	-12
EF4_B	Relay Building B - AC Distribution Room	577	-19	547	-19	607	-9	577	-12
EF5_B	Relay Building B - Washroom	566	-22	536	-22	598	-18	568	-22
3R1_1	Reactor Coil - 3R1 (Phase 1)	731	1	702	1	672	2	642	2
3R1_2	Reactor Coil - 3R1 (Phase 2)	734	1	705	1	672	2	642	2
3R1_3	Reactor Coil - 3R1 (Phase 3)	736	1	707	1	672	2	642	2
3R4_1	Reactor Coil - 3R4 (Phase 1)	629	3	600	3	750	6	721	1
3R4_2	Reactor Coil - 3R4 (Phase 2)	629	2	600	3	748	6	719	1
3R4_3	Reactor Coil - 3R4 (Phase 3)	630	2	600	3	746	6	717	1
SC1_1	Capacitor Banks (Phase 1)	705	1	676	0	641	1	612	1
SC1_2	Capacitor Banks (Phase 2)	708	1	679	0	641	1	612	1
SC1_3	Capacitor Banks (Phase 3)	711	1	682	0	641	1	612	1
SC4_1	Capacitor Banks (Phase 1)	599	2	570	2	724	5	695	1
SC4_2	Capacitor Banks (Phase 2)	599	2	570	2	721	5	692	1
SC4_3	Capacitor Banks (Phase 3)	600	2	570	2	718	5	689	1

Notes:

1 .Wherever possible, the source ID assigned by the client is used.

2. Point of Reception (POR) height is 4.5 m unless otherwise stated.

The distances were measured from the approximate geometric centers to receptors.

3. Sound Level Unit

A-Weighted one hour equivalent sound level (Leq,1-hr) in dBA.

Table 2: Point of Reception Noise Impact Table

Source ID [1]	Source Description	Point of Reception R3 [2]		Point of Reception R3-OPOR - 1.5 m [2]		Point of Reception FR1 [2]		Point of Reception FR2 [2]	
		Distance	Sound Level	Distance	Sound Level	Distance	Sound Level	Distance	Sound Level
		(m)	at POR [3]	(m)	at POR [3]	(m)	at POR [3]	(m)	at POR [1]
2T2	Transformer 2T2	453	33	423	31	681	25	529	32
2T3	Transformer 2T3	562	32	532	29	576	26	509	32
AC1_A	Relay Building A - Air Conditioner	471	22	441	18	665	-2	559	2
AC2_A	Relay Building A - Air Conditioner	458	23	428	18	677	-2	562	1
AC3_A	Relay Building A - Air Conditioner	480	8	450	7	655	14	543	16
AC4_A	Relay Building A - Air Conditioner	473	9	443	7	662	14	544	16
AC5_A	Relay Building A - Air Conditioner	479	17	449	13	658	-9	558	0
EF1_A	Relay Building A - 250kV Charger & DC Panel Room	483	-17	453	-16	653	-13	552	-11
EF2_A	Relay Building A - 250kV Battery Room	485	-9	455	-10	651	-13	548	-11
EF3_A	Relay Building A - 48V Battery Room	457	-6	427	-6	677	-23	554	-15
EF4_A	Relay Building A - AC Distribution Room	455	-6	425	-5	680	-24	558	-15
EF5_A	Relay Building A - Washroom	463	-25	433	-25	671	-23	547	-21
EF6_A	Relay Building A - Workshop	454	-6	424	-5	681	-24	560	-16
AC1_B	Relay Building B - Air Conditioner	514	22	484	17	628	3	553	2
AC2_B	Relay Building B - Air Conditioner	500	22	470	18	640	1	555	1
AC3_B	Relay Building B - Air Conditioner	522	6	492	5	617	15	536	16
AC4_B	Relay Building B - Air Conditioner	514	6	485	6	623	15	537	16
AC5_B	Relay Building B - Air Conditioner	522	16	492	12	621	4	552	1
EF1_B	Relay Building B - 250kV Charger & DC Panel Room	526	-17	496	-17	616	-12	546	-11
EF2_B	Relay Building B - 250kV Battery Room	527	-18	497	-17	614	-12	543	-11
EF3_B	Relay Building B - 48V Battery Room	498	-8	468	-8	639	-22	546	-13
EF4_B	Relay Building B - AC Distribution Room	496	-6	467	-6	641	-23	550	-14
EF5_B	Relay Building B - Washroom	504	-30	474	-29	632	-23	539	-21
3R1_1	Reactor Coil - 3R1 (Phase 1)	308	14	278	10	829	0	678	7
3R1_2	Reactor Coil - 3R1 (Phase 2)	304	14	274	10	832	0	680	7
3R1_3	Reactor Coil - 3R1 (Phase 3)	299	14	269	10	836	0	681	7
3R4_1	Reactor Coil - 3R4 (Phase 1)	618	8	591	4	593	8	640	7
3R4_2	Reactor Coil - 3R4 (Phase 2)	614	8	586	4	595	8	640	7
3R4_3	Reactor Coil - 3R4 (Phase 3)	609	8	582	4	598	8	639	7
SC1_1	Capacitor Banks (Phase 1)	323	12	293	8	811	-1	650	6
SC1_2	Capacitor Banks (Phase 2)	318	13	288	9	815	-1	652	6
SC1_3	Capacitor Banks (Phase 3)	313	13	283	9	820	-1	654	6
SC4_1	Capacitor Banks (Phase 1)	626	7	598	2	569	7	611	7
SC4_2	Capacitor Banks (Phase 2)	621	7	593	3	572	7	610	7
SC4_3	Capacitor Banks (Phase 3)	616	7	587	3	575	7	609	7

Notes:

1 .Wherever possible, the source ID assigned by the client is used.

2. Point of Reception (POR) height is 4.5 m unless otherwise stated.

The distances were measured from the approximate geometric centers to receptors.

3. Sound Level Unit

A-Weighted one hour equivalent sound level (Leq,1-hr) in dBA.

Table 3: Acoustic Assessment Summary Table

Point of Reception ID	Point of Reception Description	Time Period [1]	Total Level at POR (L_{eq}, 1-hr) [2]	Verified by Acoustic Audit (Yes/No)	Performance Limit (L_{eq} 1-hr) [3]	Compliance with Performance Limit (Yes/No)
R1	Home to South	1 Hour	34	No	40	Yes
R1-OPOR	Outdoor POR with R1	1 Hour	30	No	40	Yes
R2	Home to South	1 Hour	34	No	40	Yes
R2-OPOR	Outdoor POR with R2	1 Hour	30	No	40	Yes
R3	Home to Northeast	1 Hour	37	No	40	Yes
R3-OPOR	Outdoor POR with R3	1 Hour	34	No	40	Yes
FR1	Potential POR to Southwest (On Vacant Lot)	1 Hour	29	No	40	Yes
FR2	Potential POR to South (On Vacant Lot)	1 Hour	35	No	40	Yes

Notes:

1 The predictable worst-case one (1) hour period was considered in the study.
2. Worst-case one hour equivalent sound level from all applicable sources operating in dBA.
3. NPC-300 exclusionary nighttime sound levels of one hour L_{eq} for Class 3 Areas.

APPENDIX B

Figures & Drawings

(3 Pages)

Figure 1 - Scaled Area Plan, Showing Clarington TS and Receptors

N

Drawn by: WNL

Scale: 1:15,000

Date: January 7, 2015

Hydro One Networks Inc., Clarington TS, 2745 Townline Road North, Municipality of Clarington

Pinchin Project: 70337.002

PINCHIN

Figure 3 - Noise Impact Contour Map

N

Drawn by: WNL

Scale: 1:15,000

Date: January 7, 2015

Hydro One Networks Inc., Clarington TS, 2745 Townline Road North, Municipality of Clarington

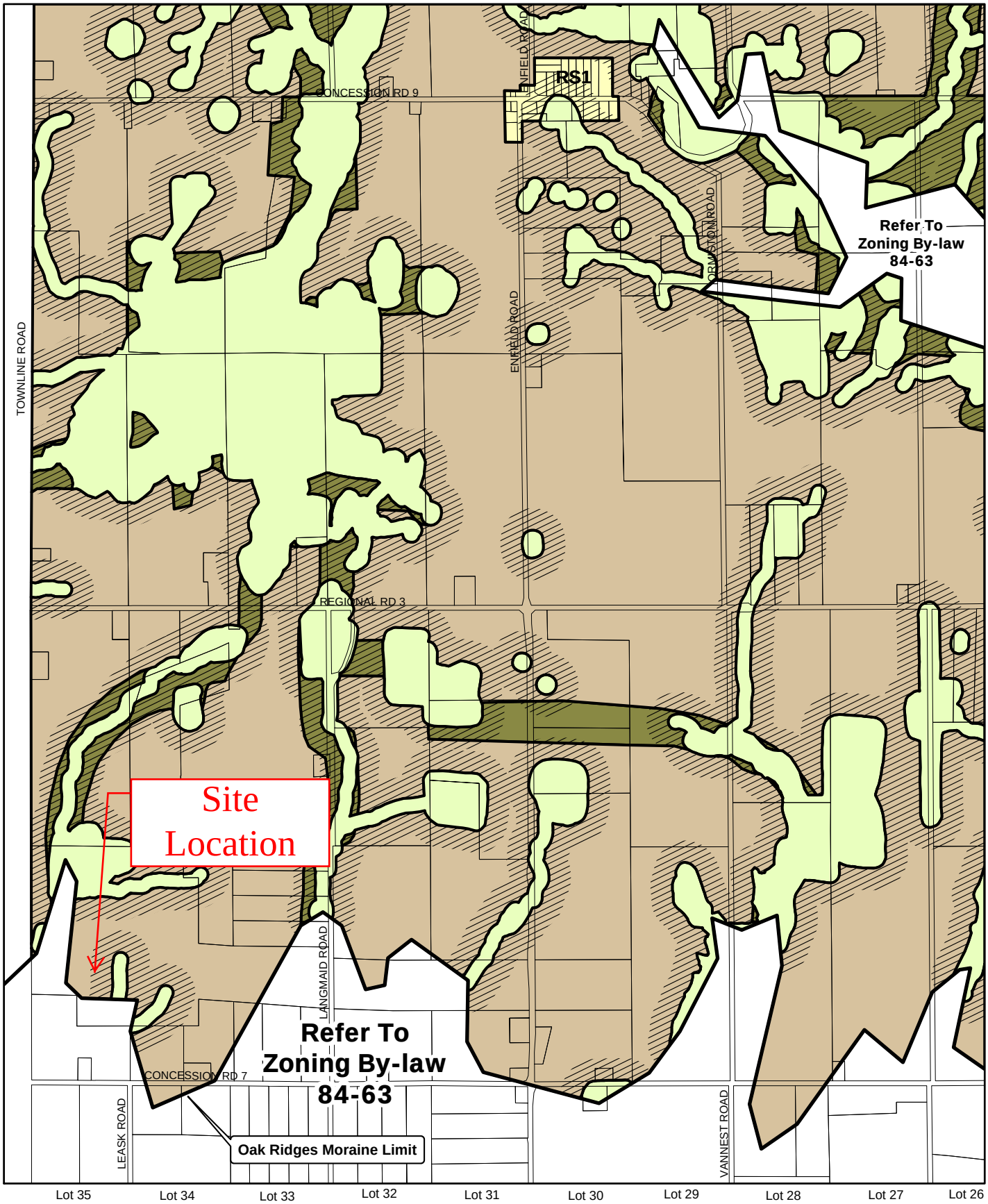
Pinchin Project: 70337.002

PINCHIN

APPENDIX C

Zoning Information

(3 Pages)



RS
EP
NC
NL
A
C
AE
N
P
MAOI (Minimum Area of Influence)

Zoning By-law 2005-109

December, 2010

Scale 1:20000

N

Oshawa E1 E9 E10 E17

SECTION 4

4. ZONES AND ZONE MAPPING

ZONES

For the purposes of this By-law, the following zones are used and the same are established within the defined areas on the Schedules attached hereto.

SECTION	ZONE SYMBOL	ZONE TITLE
5	EP	ENVIRONMENTAL PROTECTION
6	A	AGRICULTURAL
7	RC	RURAL CLUSTER
8	RE	RESIDENTIAL ESTATE
9	RH	RESIDENTIAL HAMLET
10	RM	RESIDENTIAL MOBILE HOME
11	RS	RESIDENTIAL SHORELINE
12	Rl	URBAN RESIDENTIAL TYPE ONE
13	R2	URBAN RESIDENTIAL TYPE TWO
14	R3	URBAN RESIDENTIAL TYPE THREE
15	R4	URBAN RESIDENTIAL TYPE FOUR
15A	P1	MAJOR INSTITUTIONAL ZONE
16	Cl	GENERAL COMMERCIAL
17	C2	NEIGHBOURHOOD COMMERCIAL
18	C3	HAMLET COMMERCIAL
19	C4	SPECIAL PURPOSE COMMERCIAL
20	C5	SPECIAL PURPOSE COMMERCIAL (SERVICED)
21	C6	SERVICE STATION COMMERCIAL
22	C7	SERVICE STATION COMMERCIAL (SERVICED)
22A	C8	HIGHWAY COMMERCIAL
22B	C9	STREET RELATED COMMERCIAL
23	M1	LIGHT INDUSTRIAL
23A	MO1	ENERGY PARK OFFICE
23B	MO2	ENERGY PARK PRESTIGE
23C	ML1	ENERGY PARK LIGHT INDUSTRIAL
23D	ML2	ENERGY PARK GENERAL INDUSTRIAL
24	M2	GENERAL INDUSTRIAL
25	M3	EXTRACTIVE INDUSTRIAL

APPENDIX D

Site Plans, Transformer Outline Drawings, Manufacturers' Sound Data, and Calculations

(21 Pages)

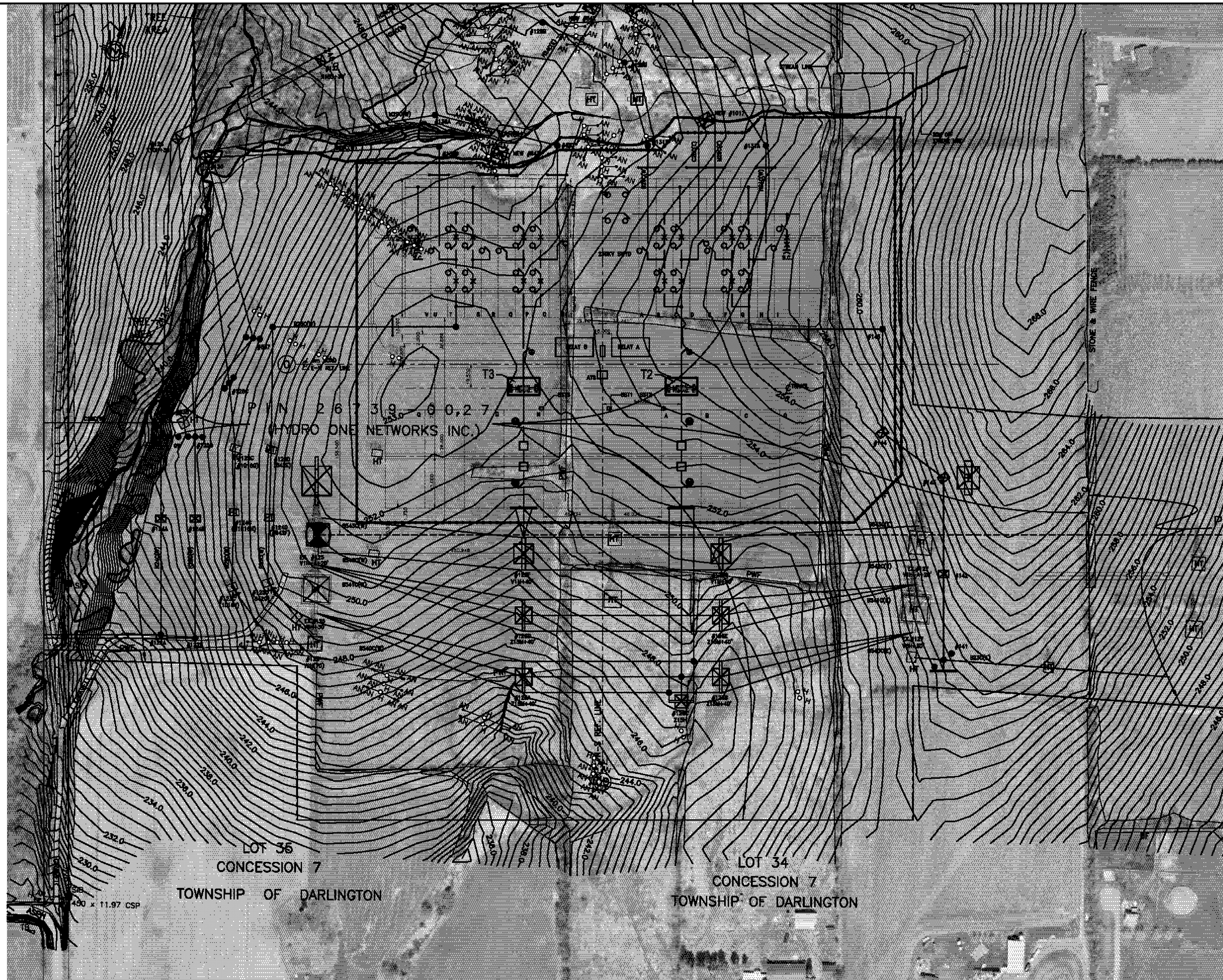
ZONING MAPS

The extent and boundaries of the said zones are shown on the Schedules attached hereto which form part of this By-law. Such zones are described on the Schedules by the appropriate zone symbol.

4.1 SPECIAL EXCEPTIONS

A number of the zones set out in this By-law and listed above, contain a section which describes "special exceptions". Special exceptions are indicated on the Schedules to this By-law by adding a dash (-) and a number to the basic zone symbol (for example, R1-3).

Where a special exception is applied to a lot, such lot may only be used in accordance with the special exceptions described in the text. Where there is a conflict between a special exception and any other section of this By-law, the special exception shall apply. Where the special exception is silent on any matter, the provisions of this By-law shall apply.



REFERENCE DRAWINGS:

1. [illegible]
2. [illegible]
3. [illegible]

Hydro One Networks Inc.
ENGINEERING & CONSTRUCTION SERVICES

CLARINGTON TS — NK296

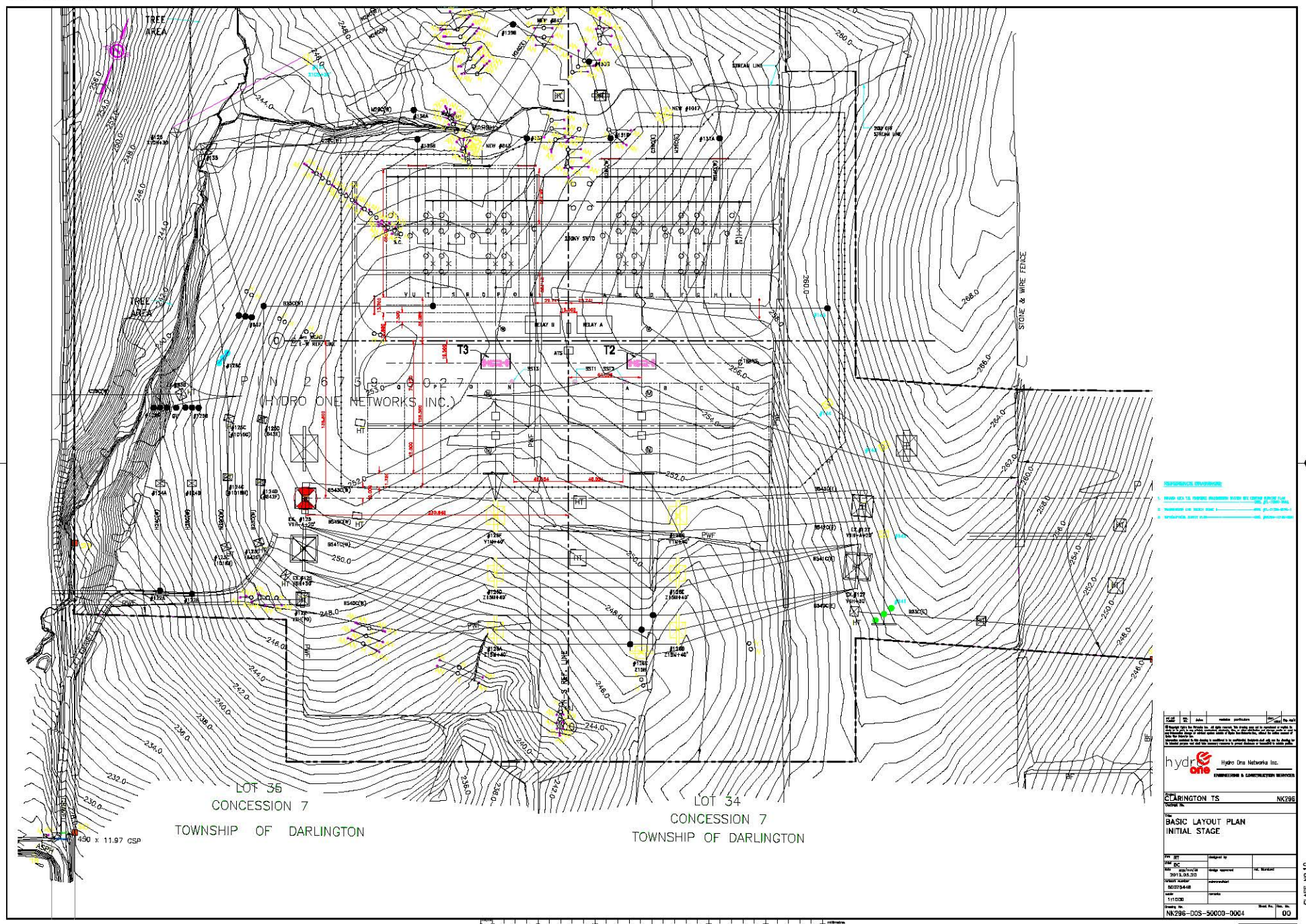
BASIC LAYOUT PLAN
INITIAL STAGE

2012.05.30
80075449
1:1000

Drawing No. NK296-D0S-50000-0004 — Rev. No. 00

CLASS NO 10

A0 (841 x 1189)


TREE AREA
TREE AREA
STREAM LINE
STONE & WIRE FENCE
T3
T2
PIN 26758-0027
(HYDRO ONE NETWORKS INC.)
LOT 35
CONCESSION 7
TOWNSHIP OF DARLINGTON
LOT 34
CONCESSION 7
TOWNSHIP OF DARLINGTON
490 x 11.97 CSP
hydro one
Hydro One Networks Inc.
ENGINEERING & CONSTRUCTION SERVICES
DARLINGTON TS
NK296
BASIC LAYOUT PLAN
INITIAL STAGE
NK296-DDS-50000-0004
00
CLASS NO 10
AO (841 x 1189)

HYUNDAI
HEAVY INDUSTRIES CO.,LTD.
ELECTRO ELECTRIC SYSTEM

ADDRESS : 1, Jeonha-dong Dong-gu, Ulsan, 682-792, Korea TEL : (052) 202-8295 / FAX : (052) 202-8668

CERTIFICATE OF CONFORMANCE

Ref. No. : QDC-TR-10336 Issued Date : Dec. 20, 2010

Customer : HYDRO ONE RFT NETWORKS INC.

Project Name : HYDRO ONE 17248

Contract No. : —

Item(s) : Oil-immersed Transformer
3Ø 450 / 600 / 750 MVA 500 / 240 / 28 kV, 60 Hz, 1 Set
Serial No. : 20092466TGF002.

This is to certify that this equipment has been duly inspected and tested prior to shipment in accordance with customer's requirements.
Its mechanical, electrical and operational performances were found to be conforming to or better than the purchase order specification.
A copy of this test certificate is on file at Electro Electric System (Division) and available for review any time.

Certified by :

J. H. Park / General Manager
Transformer Laboratory
Quality Management Dep't

HYUNDAI HEAVY INDUSTRIES CO.,LTD.

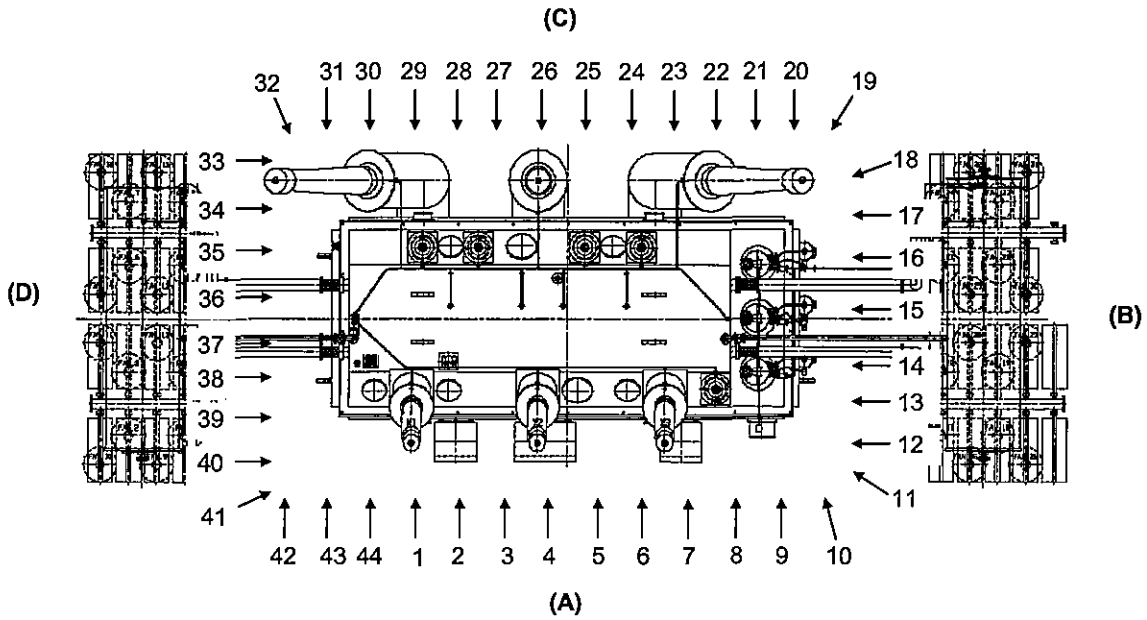
Measurement of sound level

Serial No.
20092466TGF002

At rated voltage 500.0 / 240.0 / 28kV, frequency 60 Hz, and type of cooling (ONAN) in accordance with ANSI C57 Sound meter calibration STD=114dB, Meter=114.7dB

1. Guaranteed value : 74.0 dB
2. Measured value : 71.8 dB Tank only, without fans and pumps (0.31m)
3. Ambient sound level : 57.3 dB (A : 57 B : 58 C : 57 D : 57)
4. Corrected value : 71.1 dB
5. Measured value(Unit : dB)

	1/3 H	2/3 H		1/3 H	2/3 H		1/3 H	2/3 H
1	71.2	69.8	21	74.3	69.4	41	70.6	68.9
2	71.8	74.4	22	71.4	71.7	42	70.7	69.4
3	73.4	73.5	23	71.2	74.6	43	70.7	71.7
4	69.6	73.1	24	72.2	74.2	44	72.9	71.4
5	71.0	70.2	25	71.0	72.6	45		
6	73.0	69.6	26	74.2	71.9	46		
7	68.7	69.4	27	71.0	73.3	47		
8	70.5	73.5	28	71.9	75.8	48		
9	70.4	71.7	29	73.3	72.1	49		
10	72.1	70.5	30	72.1	74.9	50		
11	73.9	70.6	31	72.3	72.9	51		
12	69.3	72.0	32	75.1	74.1	52		
13	70.3	72.2	33	76.7	74.2	53		
14	72.0	74.5	34	69.6	71.5	54		
15	72.7	75.4	35	71.7	70.0	55		
16	71.7	72.5	36	70.2	71.0	56		
17	72.1	72.0	37	71.1	71.4	57		
18	70.5	73.3	38	70.6	71.8	58		
19	72.5	71.2	39	66.7	72.0	59		
20	73.9	66.8	40	69.5	73.4	60		



Date of Test : 2010. 12. 14	Tested by : C. W. Park

Test Enviroment Condition ONAN

Tank only, without fans and pumps (0.31m)

Test Room surface Sv =	5712	[m^2]
The length of test position L=	44	[m]
Height of object H =	5.465	[m]
Distance of test point =	0.31	[m]

Calculation of sound power level

★ Sound power level of the unit is calculated according to IEC 60076-10 clause 11.3

$$L_{pA} = L_{pA,object} - L_{pA,background} - K$$

L_{PA} = $10\log(10^{Lpa,object/10} - 10^{Lpa,background/10}) - K$

= 66.88 [dB]

L_{WA} = $L_{PA} + 10 \log(S)$

= 92.04 [dB]

$L_{pA,object}$: sound pressure level of test object (71 dB)

$L_{pA,background}$: background noise (57 dB)

K : environmental correction

Calculated overall sound power level of the unit is **92.04 dBA**

(Guar. : dBA)

★ Environment collection factor K

$$K = 10\log_{10}\left[1 + \frac{4}{(A/S)}\right]$$

$A = \alpha S_V$: sound absorption area

α : mean acoustic absorption coefficient = 0.15

S_V : total area of the surface of the test room, [m2]

S : measurement surface[m2]

S = 1.25 × L × H [m] (at 0.3m)

(2 + H) × L [m] (the others)

A = 856.8 [m^2]

S = 328.5 [m^2]

K = 4.037

HYUNDAI HEAVY INDUSTRIES CO.,LTD.

Measurement of sound level

Serial No.
20092466TGF002

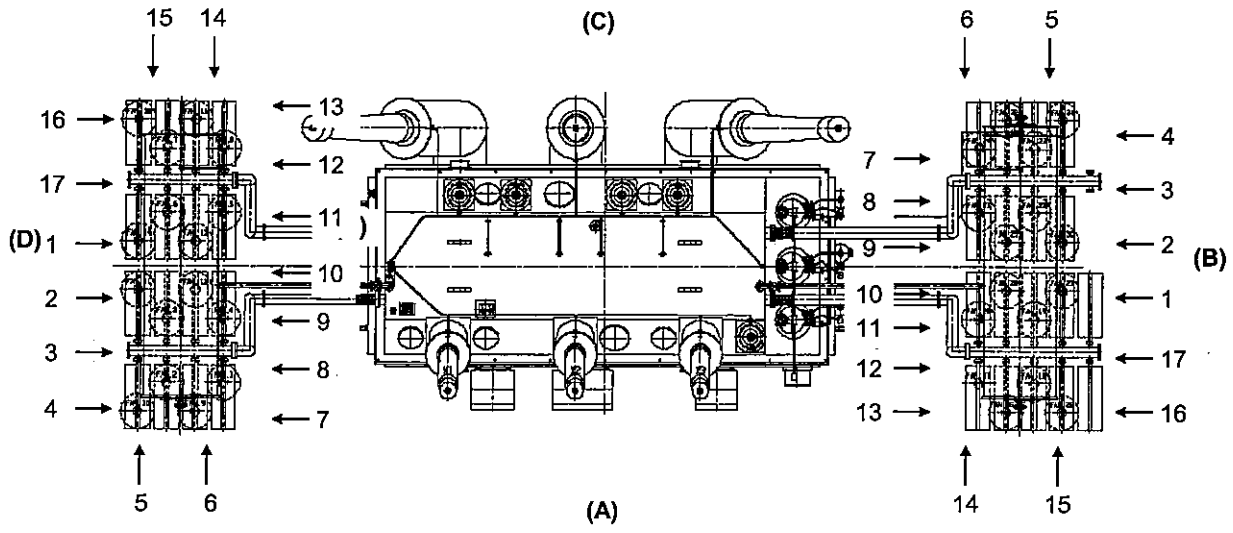
Transformer de-energized and type of cooling (ODAF2) in accordance with ANSI C57 Sound meter calibration STD=114dB, Meter=114.7dB

1. Guaranteed value : 74.0 dB
2. Measured value (Total) : 68.6 dB around cooler bank with fans and pumps (1.83m)
3. Ambient sound level : 57.3 dB (A : 57 B : 58 C : 57 D : 57)
4. Corrected value : 67.9 dB
5. Measured value(Unit : dB)

Left cooler			Right cooler					
Average : 68.5 (dB)			Average : 68.6 (dB)					
	1/3 H	2/3 H		1/3 H	2/3 H		1/3 H	2/3 H
1	67.8	68.1	1	68.9	68.3			
2	67.2	67.7	2	69.1	68.2			
3	66.7	68.7	3	68.7	68.7			
4	68.8	67.9	4	68.9	68.6			
5	67.5	67.4	5	68.7	68.0			
6	68.8	68.1	6	68.7	68.2			
7	68.5	67.6	7	68.6	68.1			
8	69.2	69.2	8	68.4	69.0			
9	69.9	69.3	9	68.2	69.3			
10	69.8	69.9	10	68.9	69.0			
11	69.7	69.8	11	69.3	69.5			
12	69.7	69.4	12	68.8	69.5			
13	69.4	69.3	13	68.8	68.7			
14	68.8	68.5	14	68.0	68.7			
15	68.9	68.0	15	68.5	68.1			
16	68.2	67.4	16	68.5	67.8			
17	67.7	67.5	17	68.2	67.5			

Left Cooler(16Fans + 2pumps)

Right Cooler(16Fans + 2pumps)



Date of Test : 2010. 12. 14	Tested by : C. W. Park

Test Enviroment Condition ODAF2
around cooler bank with fans and pumps (1.83m)

Test Room surface Sv =	5712	[m^2]
The length of test position L=	17	[m]
Height of object H =	5.465	[m]
Distance of test point =	1.83	[m]

Calculation of sound power level

★ Sound power level of the unit is calculated according to IEC 60076-10 clause 11.3

$$L_{pA} = L_{pA,object} - L_{pA,background} - K$$

$L_{PA} = 10\log(10^{Lpa,object/10} - 10^{Lpa,background/10}) - K$

$= 65.48$ [dB]

$L_{WA} = L_{PA} + 10 \log(S)$

$= 86.52$ [dB]

$L_{pA,object}$: sound pressure level of test object (68 dB)

$L_{pA,background}$: background noise (57 dB)

K : environmental correction

Calculated overall sound power level of the unit is **86.52 dBA**

(Guar. : dBA)

★ Environment collection factor K

$$K = 10\log_{10}\left[1 + \frac{4}{(A/S)}\right]$$

$A = \alpha S_V$: sound absorption area

α : mean acoustic absorption coefficient = 0.15

S_V : total area of the surface of the test room, [m2]

S : measurement surface[m2]

S = 1.25 × L × H [m] (at 0.3m)

(2 + H) × L [m] (the others)

A = 856.8 [m^2]

S = 126.9 [m^2]

K = 2.021

Transformers 2T2 and 2T3 Core Data [1]

Length of Prescribed Contour, m	46.4
Height of Object, m	5.7
Measurement Surface, m^2	330.7
Corrected Sound Level L_{PA}, dB [2]	66.9
Calculated Overall PWL, dB [3]	92.1

Octave Band Centre Frequency, Hz

	31.5	63	125	250	500	1000	2000	4000	8000	dBA	Notes
Correction Factor	-3	3	5	0	0	-6	-11	-16	-23		See Note [4]
Calculated Core PWL, dB	89	95	97	92	92	86	81	76	69	92	

Notes

1. Manufacturer tested sound level and calculations in accordance with IEC 60076-10 Clause 11.3.
2. The corrected value (L_{PA}) is the adjusted value based on the measured value, background sound level, and environmental correction factor.
2. Calculated overall sound power level of the core.
4. Octave band correction factors were obtained from Table 1 of the Encyclopedia of Acoustics, 1997, Chapter 86 - "Sound Power Level Predictions for Industrial Machinery".

Transformers 2T2 and 2T3 Fan Data [1]

Length of Prescribed Contour, m	29.7
Height of Object, m	5.9
Measurement Surface, m^2	234.6
Corrected Sound Level L_{PA}, dB [2]	64.3
Calculated Overall PWL, dB [3]	88.0

Octave Band Centre Frequency, Hz

	31.5	63	125	250	500	1000	2000	4000	8000	dBA	Notes
Correction Factor	-3	3	5	0	0	-6	-11	-16	-23		See Note [4]
Calculated Fan PWL, dB	85	91	93	88	88	82	77	72	65	88	

Notes

1. Manufacturer tested sound level and calculations in accordance with IEC 60076-10 Clause 11.3.
2. The corrected value (L_{PA}) was the manufacturer's adjusted value based on the measured value, background sound level, and environmental correction factor.
   Additional adjustment was made to account for the differences between manufacturer calculated area (127 m^2) and the area calculated as per the IEC standard (234 m^2).
2. Calculated overall sound power level of the fan banks.
4. Octave band correction factors were obtained from Table 1 of the Encyclopedia of Acoustics, 1997,
   Chapter 86 - "Sound Power Level Predictions for Industrial Machinery".

Transformers 2T2 and 2T3 Combined Sound Power Level Data [1]

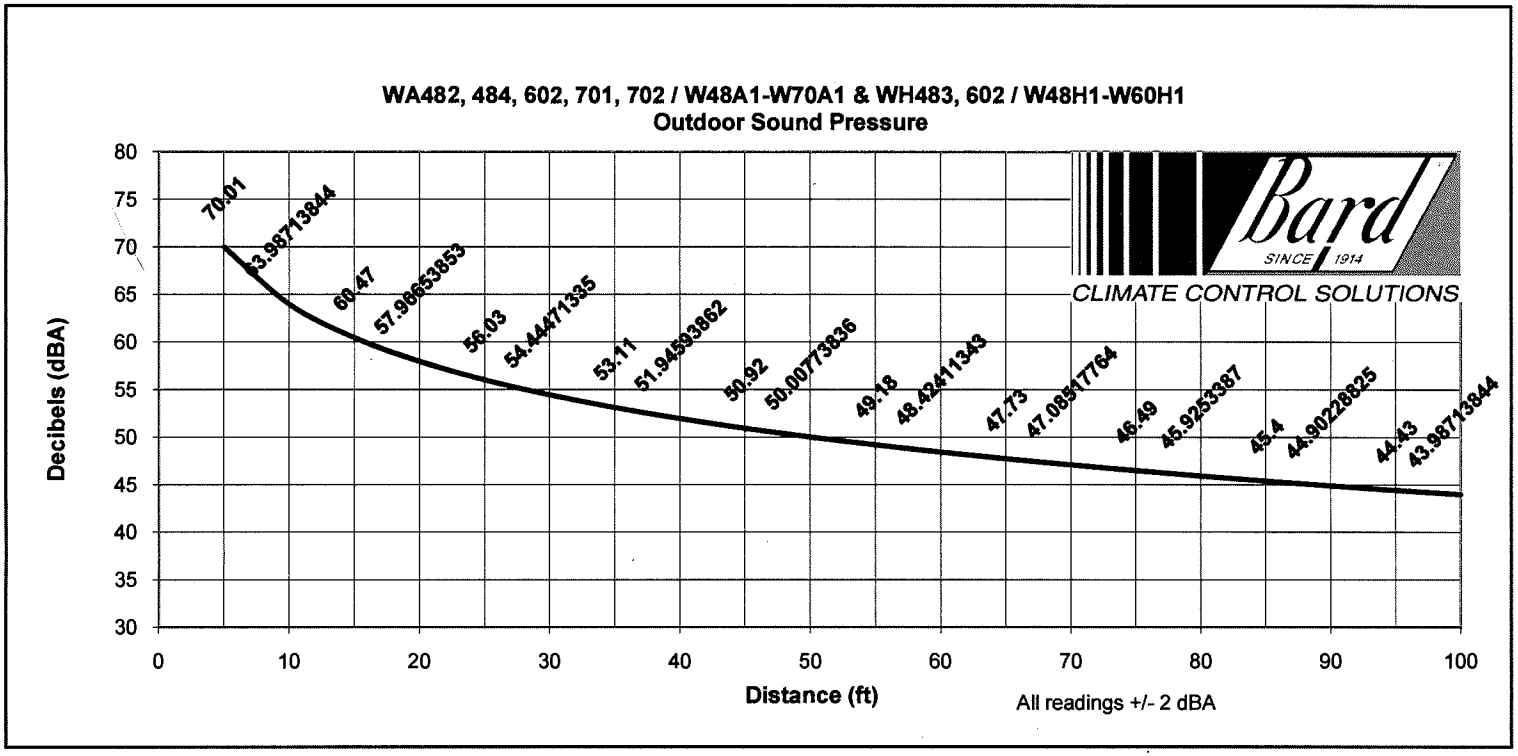
Octave Band Centre Frequency, Hz

	31.5	63	125	250	500	1000	2000	4000	8000	dBA	Notes
Core Sound Power Level, dB	89	95	97	92	92	86	81	76	69	92	From Core Tab
Core Sound Power Level + 5 dB Tonal Penalty, dB	94	100	102	97	97	91	86	81	74	97	Core + 5 dBA
Left Fan Sound Power Level, dB	85	91	93	88	88	82	77	72	65	88	From Fan Tab
Right Fan Sound Power Level, dB	85	91	93	88	88	82	77	72	65	88	From Fan Tab
Combined Sound Power Level, dB	**95**	**101**	**103**	**98**	**98**	**92**	**87**	**82**	**75**	**98**	

Notes

1. The combined sound power level is calculated from the individual sound power levels of one core and 2 cooling fan banks.

As explained in the report, a 5 dBA tonal penalty was only applied to the core sound power level.

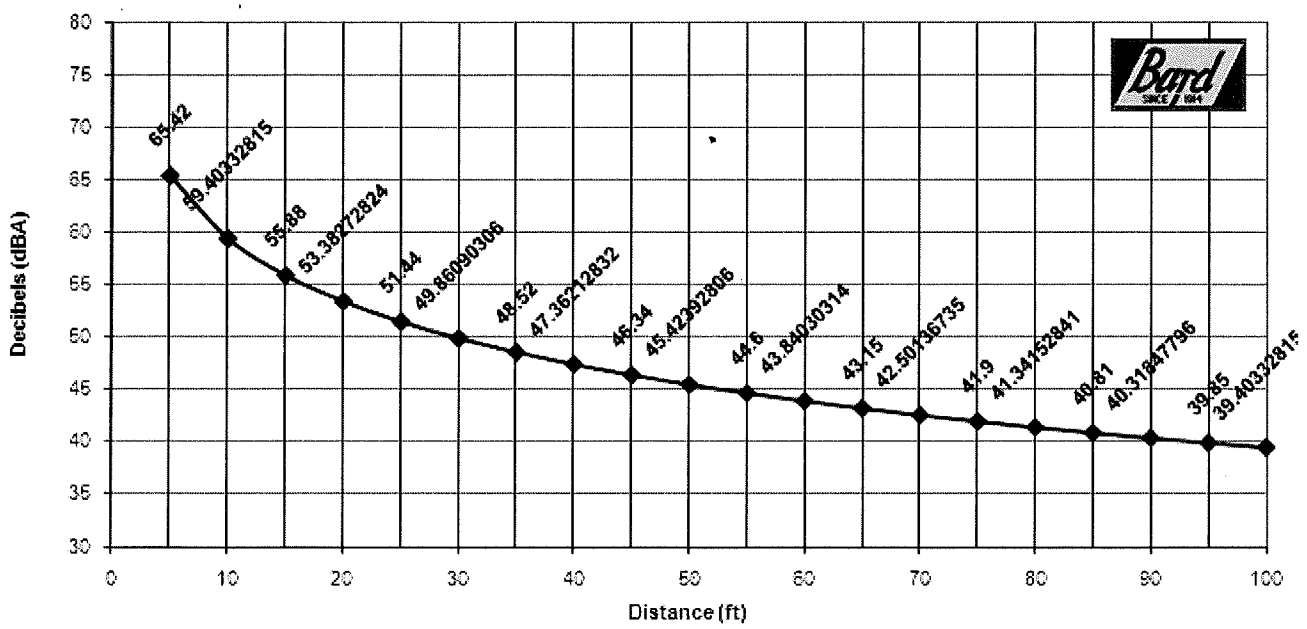


Actual Field Application Results May Vary Based On Accousitcal Environmental Parameters

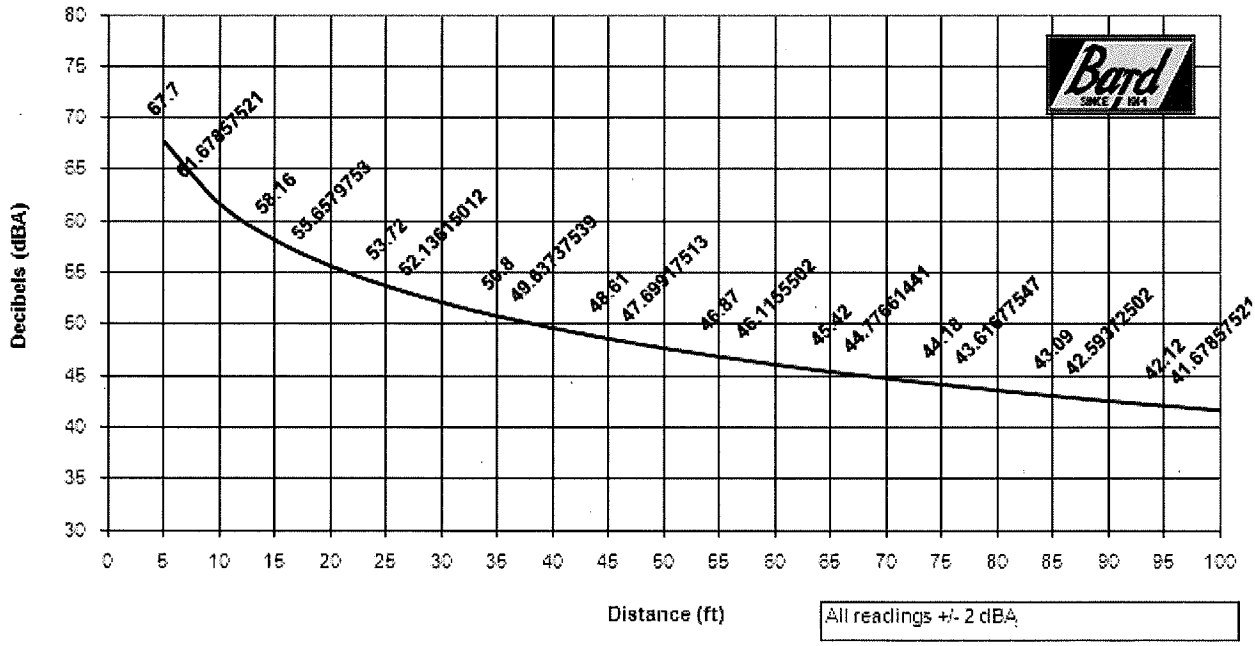
Wall-Mount Outdoor Sound Levels

8/12/2011

W17A1 to W24A1/W18H1 to W24H1 Outdoor Sound Pressure



W30A1 to W36A1/W30H1 to W36H1, S26H1 to S31H1 Outdoor Sound Pressure



General Note: All readings +/- 2 dBA

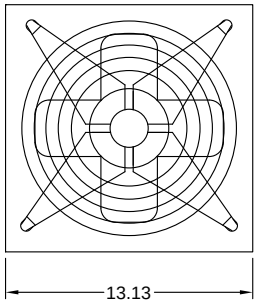
Actual Field Application Results May Vary Based On Acoustical Environmental Parameters

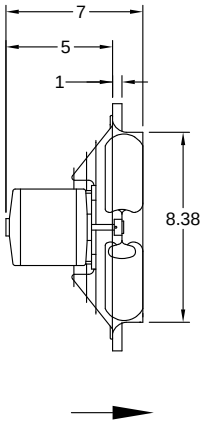
GREENHECK
Building Value in Air.

Printed Date: 12/5/2014
Job: HydroOne-Greenheck SE1-440
Mark: FAN-1

Model: SE1-8-440-D

Sidewall Direct Drive Exhaust Fan



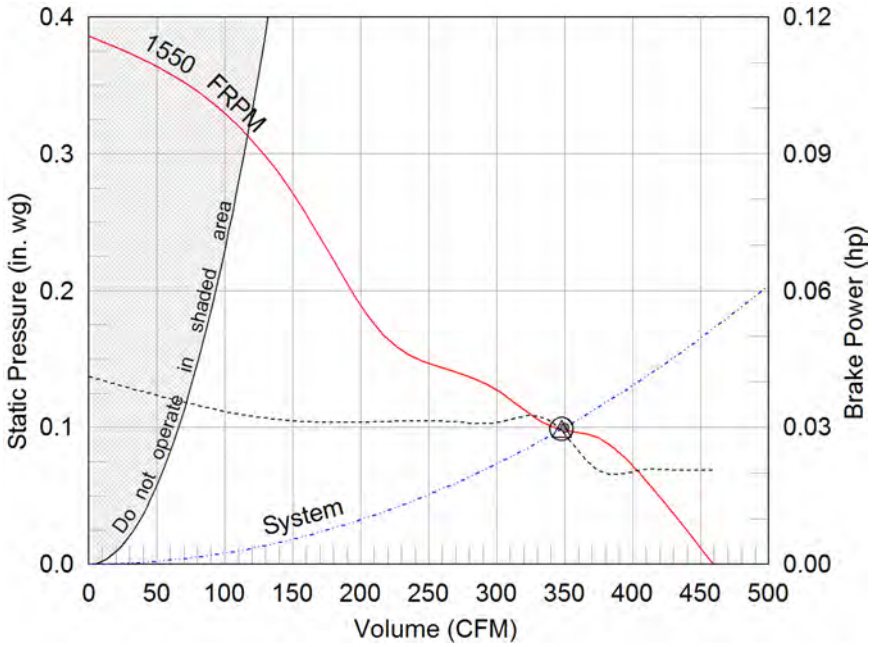


AIR FLOW

Dimensional	
Quantity	1
Weight w/o Acc's (lb)	12
Weight w/ Acc's (lb)	12
Wall Opening (in.)	10.5 x 10.5

See the Assembly Drawing For Selected Accessories

Performance	
Requested Volume (CFM)	350
Actual Volume (CFM)	348
External SP (in. wg)	0.1
Total SP (in. wg)	0.099
Fan RPM	1550
Operating Power (hp)	0.03
Elevation (ft)	568
Airstream Temp.(F)	70
Air Density (ft3)	0.073
Tip Speed (ft/min)	3,246
Static Eff. (%)	19



External SP	0.1	in. wg
Direct Drive RPM Adjustment	-0.001	in. wg
Total SP	0.099	in. wg

Motor	
Motor Mounted	Yes
Size (hp)	1/30
V/C/P	115/60/1
Enclosure	TEAO
Motor RPM	1550
Windings	1
NEC FLA* (Amps)	NA

Sound Power by Octave Band

Sound Data	62.5	125	250	500	1000	2000	4000	8000	LwA	dBA	Sones
Inlet	62	70	55	50	51	50	43	38	58	47	4.6

Notes:

All dimensions shown are in units of in.
*FLA - based on tables 150 or 148 of National Electrical Code 2002. Actual motor FLA may vary, for sizing thermal overload, consult factory.
LwA - A weighted sound power level, based on ANSI S1.4
dBA - A weighted sound pressure level, based on 11.5 dB attenuation per Octave band at 5 ft - dBA levels are not licensed by AMCA International
Sones - calculated using AMCA 301 at 5 ft

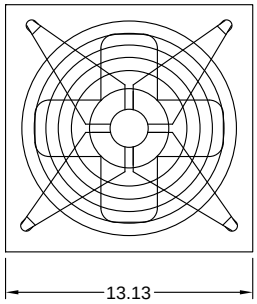
amca WORLDWIDE CERTIFIED RATINGS SOUND AND AIR PERFORMANCE

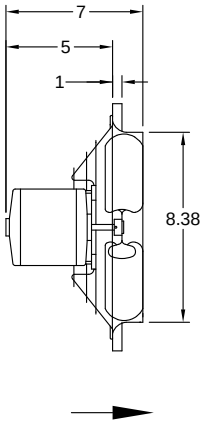
GREENHECK
Building Value in Air.

Printed Date: 12/5/2014
Job: HydroOne-Greenheck SE1-440
Mark: FAN-2

Model: SE1-8-428-P

Sidewall Direct Drive Exhaust Fan



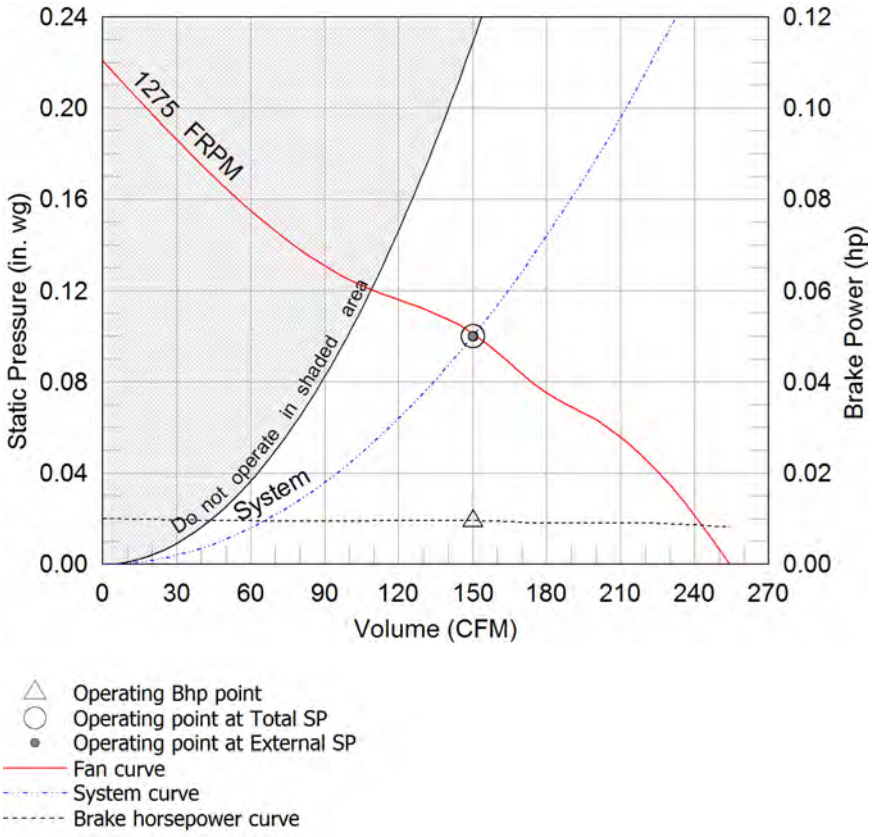


AIR FLOW

See the Assembly Drawing For Selected Accessories

Dimensional	
Quantity	1
Weight w/o Acc's (lb)	12
Weight w/ Acc's (lb)	13
Wall Opening (in.)	10.5 x 10.5

Performance	
Requested Volume (CFM)	150
Actual Volume (CFM)	150
External SP (in. wg)	0.1
Total SP (in. wg)	0.1
Fan RPM	1275
Operating Power (hp)	0.01
Elevation (ft)	568
Airstream Temp.(F)	70
Air Density (ft3)	0.073
Tip Speed (ft/min)	2,671
Static Eff. (%)	25



Motor	
Motor Mounted	Yes
Size (hp)	1/40
V/C/P	115/60/1
Enclosure	TEAO
Motor RPM	1650
Windings	1
NEC FLA* (Amps)	NA

Sound Power by Octave Band

Sound Data	62.5	125	250	500	1000	2000	4000	8000	LwA	dBA	Sones
Inlet	57	53	45	44	43	40	35	30	48	36	1.9

Notes:

All dimensions shown are in units of in.
*FLA - based on tables 150 or 148 of National Electrical Code 2002. Actual motor FLA may vary, for sizing thermal overload, consult factory.
LwA - A weighted sound power level, based on ANSI S1.4
dBA - A weighted sound pressure level, based on 11.5 dB attenuation per Octave band at 5 ft - dBA levels are not licensed by AMCA International
Sones - calculated using AMCA 301 at 5 ft

amca WORLDWIDE CERTIFIED RATINGS SOUND AND AIR PERFORMANCE

From:
Sent: December-16-14 8:10 AM
To:
Cc:
Subject: RE: Clarington TS Reactors and Cap Bank Sound Levels

All,

For this bank at 300MVAR we get a sound power of 69 db(A) at the equipment.
At 2m, sound pressure is down to 52-55db(A) range.

Tx,

From:
Sent: Monday, December 15, 2014 10:11 AM
To:
Cc:
Subject: RE: Clarington TS Reactors and Cap Bank Sound Levels

I have requested vendor to advise the noise level for a 250KV, 300MX cap bank. So far we only have confirmation of 59dB for a 250KV, 125MX.

Tx,

From:
Sent: Monday, December 15, 2014 9:55 AM
To:
Cc:
Subject: Clarington TS Reactors and Cap Bank Sound Levels

As discussed, we have been asked by the MOE to provide an inventory of all noise generating equipment planned for Clarington.

From the equipment list –

Capacitor Bank, 300MVAR,250KV, 900KV BIL,3-PH,60Hz,ungrd Y- Y, Fuseless, Shunt, C/W CT, Cap unit 18KV, 625Kvar, 150KV bushing BIL -2 stacks of 4 racks per phase	10011077 ABB

Series Reactors, 230kV, 3.3 mH, 1500 A,63kA/1sec,170kAp, 900kV BIL between reactor terminals,1050 kV to ground, 60Hz, dry type air core series reactor **(completed with 12 foot fibreglass pedestal)**	10011524 TRENCH

has provided a maximum sound pressure and sound power level per phase of the reactor of 50 dBA and 70 dBA respectively.

could you please provide a drawing of the reactor.

could you please provide a sound level for the entire cap bank as well as a drawing of the bank if available.

Thx,

APPENDIX E

Summary of Insignificant Sources

(1 Page)

Table E - Summary of Insignificant Noise Sources

Source Description - 500 kV Switchyard	Rationale for Insignificance
6 Current Limiting Reactors – wire coils (3 adjacent to each 750 MVA transformer)	Inaudible in Field
6 Outdoor Voltage Transformers 28.9 kV, 16.7 kV-120/67v	Inaudible in Field
6 Outdoor Voltage Transformers 600/208v, 112.5 KVA	Inaudible in Field
6 Capacitance Voltage Transformers (CVTs) – for monitoring voltage	Inaudible in Field
1 x 1.2 MVA Station Service Transformer 44kV/600v	Inaudible in Field
2 x 1.2 MVA Station Service Transformers 28kV/600v	Inaudible in Field
Source Description - 230 kV Switchyard	**Rationale for Insignificance**
48 Capacitance Voltage Transformers (CVTs)	Inaudible in Field

"Inaudible in Field": the above units were verified during a field inspection of similar equipment at Hydro One's Parkway TS.