ACOUSTIC ASSESSMENT REPORT

HYDRO ONE – LEAMINGTON TRANSFORMER STATION
LEAMINGTON, ONTARIO

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1.0 INTRODUCTION

Conestoga-Rovers & Associates (CRA) was retained by Hydro One Networks Inc. (Hydro One) to prepare an Acoustic Assessment Report (Assessment) for the proposed Leamington Transformer Station (Station) located at 609 Mersea Road 6 in Leamington, Ontario. The Assessment has been prepared to support the Certificate of Approval (C of A) (Air) Application for the installation of two transformers identified as T1 and T2.

The transformers operate 24 hours per day, 7 days per week.

The Assessment presented herein provides an evaluation of the potential noise impacts from the Station's noise emissions generated during normal operations on the sensitive receptors located nearest to the Station. The Assessment was prepared consistent with the following Ministry of the Environment (MOE) guidance:

- NPC-233, "*Information to be Submitted for Approval of Stationary Sources of Sound, October 1995*"
- "*Appendix A – Supporting Information for an Acoustic Assessment Report or Vibration Assessment Report Required by a Basic Comprehensive C of A*" as specified in the MOE guidance entitled "*Basic Comprehensive Certificates of Approval (Air) – User Guide, April 2004*"
- NPC-232, "*Sound Level Limits for Stationary Sources in Class 3 Areas (Rural), October 1995*"
- NPC-103, "*Procedures, August 1978*"
- NPC-104, "*Sound Level Adjustments*"

The Station is located on land zoned as Agricultural (A3). The land use immediately surrounding the Station is zoned as Agricultural (A1-A5) and Institutional (I). A Station location map is provided as Figure 1 and zoning maps and definitions are provided in Appendix A. Hydro One site plans are provided in Appendix B.

The Station is located in an Acoustical Class 3 area defined by NPC-232 as an "a rural area with an acoustical environment that is dominated by natural sounds having little or no road traffic". The topography surrounding the Station is essentially flat.

2.0 NOISE SOURCE SUMMARY

This Assessment focused on the sound emissions from the noise sources identified at the Station with a potential to adversely impact the sensitive receptor(s). The Noise Source Summary is provided in Table 1.

The proposed Station will be installing two transformers identified as T1 and T2.

The Assessment is based on two new identical 125 MVA Hyundai Heavy Industries Co., LTD. transformer units. The manufacturer measured maximum sound power level under the rated voltage and with cooling fans operating is 65.24 dBA and the manufacturer specification is provided in Appendix C. The manufacturer sound level specification was used to assess noise emissions from the proposed transformer units and is provided in accordance with IEEE C57.12.90-2006, "IEEE Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers."

The transformer outline drawing for the unit is provided in Appendix D.

The sound level calculations for the transformers that were subject of this Assessment are based on the IEEE standard and are summarized in Appendix E.

For proposed transformers the IEEE calculation results in a total A-weighted sound power level based on the manufacturer's specified sound power level and the total surface area of the transformer unit including the radiator cooling fans, if applicable. The total A-weighted sound power level must be adjusted to obtain octave band data for modelling purposes, however the total A-weighted sound power level must not be increased or decreased. Octave band correction factors were obtained from Table 1 of the Encyclopedia of Acoustics, 1997, Chapter 86 – "Sound Power Level Predictions for Industrial Machinery."

There are no other sources of noise emissions at the Station.

3.0 POINT OF RECEPTION SUMMARY

The identification of appropriate sensitive point(s)-of-reception is necessary to conduct the Assessment for the Station. A "point-of-reception" is any point on the premises of a person where sound, originating from other than those premises, is received. The point-of-reception may be located on permanent or seasonal residences, hotels/motels, nursing/retirement homes, rental residences, hospitals, campgrounds, parks, schools, cemeteries or places of worship.

The objective of this Assessment is to determine the predictable worst-case 1-hour equivalent sound level (1-hour Leq) at the worst-case point(s)-of-reception. The worst-case point(s)-of-reception is defined as the sensitive receptor(s) with the greatest potential exposure to the Facility noise sources due to proximity and direct line-of-sight exposure.

The worst-case sensitive point(s)-of-reception has been identified as follows:

- POR1 – Mersea Rd. Residential Façade (4.5 metres [m] above grade [AG]) located approximately 195 m south-west of the Station
- POR2 – Mersea Rd. Residential Property Line (1.5 m AG) located approximately 144 m south of the Station
- POR3 – Mersea Rd. Residential Property Line (1.5 m AG) located approximately 200 m south-east of the Station
- POR4 – Mersea Rd. Church Façade (4.5 m AG) located approximately 297 m west of the Station

The noise impact at all potential receiver locations were considered, however only the most-exposed and worst-case residential receivers were subject of this Assessment. The location of the worst-case PORs is identified on Figures 1 and 2.

4.0 SOUND LEVEL MEASUREMENTS

4.1 BACKGROUND SOUND LEVEL MEASUREMENTS

CRA conducted background sound level monitoring from November 23 to November 24, 2009. The monitoring was necessary in order to characterize the ambient sound environment of the area and to estimate the background sound levels at the nearest sensitive receptors of interest.

Long-term background sound level monitoring was conducted at the southern side of the proposed Hydro One site and identified as location LT on Figure 1. Location "LT" had similar line-of-sight exposure and proximity to Mersea Road 6 as POR2.

The long-term sound level monitoring was conducted using a microphone and data logging system. The sound level measurements were taken using a Larson-Davis 870B Class 1 Precision Integrating SLM (Serial Number 870B1409) and a Larson-Davis 2560 $^1/_2$" Microphone (Serial Number 2785). The system was calibrated and checked at 114 decibels (dBA) before and after the measurement period using a Larson-Davis CAL200 Acoustic Calibrator (Serial Number 0931).

Continuous sound level measurements were taken with the detector in slow response. Meteorological weather conditions during the noise-monitoring period were obtained from Environment Canada. The Windsor station data was used to estimate adverse weather conditions that could have affected the sound level measurements and was considered in validating the minimum background levels used in this Assessment.

The background sound level was estimated at the selected PORs using the lowest validated one-hour Leq for the day and nighttime periods. The complete long-term sound level data was reviewed and determined to be invalid due to inclement weather.

5.0 ASSESSMENT CRITERIA

Assessment criteria may be determined for a point-of-reception based on the MOE's minimum exclusionary sound level limits, as presented in NPC-232, 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 Station, and would include traffic sound levels and sound from neighboring industrial/commercial activity. The higher of the two assessment criteria is selected for purpose of assessment.

The Station is located in an Acoustic Class 3 Area. Class 3 Areas have the following generic minimum sound level limits expressed as a 1-hour Leq that can be applied to assess the sound levels emitted by the Station noise sources:

Time of Day	*Minimum Sound Level*
7:00 a.m. to 7:00 p.m.	45 dBA
7:00 p.m. to 7:00 a.m.	40 dBA

CRA observed that the background sound levels were characteristic of a Class 3 Acoustic Area but were below the MOE minimum sound level limits. Therefore, the MOE minimum noise limits are applicable and were selected as the most conservative criterion for the purpose of compliance assessment.

6.0 IMPACT ASSESSMENT

6.1 STEADY-STATE SOUND LEVELS

The worst-case assessment of steady-state noise sources at the selected points-of-reception was based on manufacturer sound power level data. Cadna A Acoustical Modelling Software (Cadna A), version 3.7, was used to model the potential impacts of the significant noise sources. Cadna A calculates sound level emissions based on the ISO 9613-2 standard "Acoustics – Attenuation of sound during propagation outdoors".

The worst-case cumulative Station-wide sound levels estimated at the receptor(s) included attenuation affects due to geometric divergence, atmospheric attenuation, barriers/berms, ground absorption and directivity, as applicable for all significant noise sources.

Cadna A modelling assumptions used in this Assessment included:

- Noise Source: The adjusted 1/1 sound power octave band levels were modelled using a point-type noise source to account for noise emissions radiating from the transformer core
- Noise Source Elevation: Transformer noise was modelled at 75% height of the transformer core as it is not accurate to model the noise emissions from the maximum height of the transformer unit since the noise is emitted from the core
- Reflection Order: Maximum reflection order of 1 was evaluated to consider indirect noise impact from one reflecting surface
- Ground Absorption: The area surrounding the transformer Station property is predominantly agricultural, therefore, a ground absorption factor of 1.0 was used in the Cadna A model to represent this; a value of 0.5 was used to represent the gravel ground cover at the Station
- Receptor elevation: PORs 1 and 4 were modelled at a height of 4.5 m to represent a two story house elevation, POR2 and POR3 were modelled to a height of 1.5 m to represent the nearest and most exposed property line
- Noise Source Directivity: No directivity was applied to any sources

The typical noise emitted from a transformer is characterized by the hum of the current passing through the transformer, which emits tonal sound. Therefore, a tonal penalty of 5 dBA was assigned to each transformer.

The steady-state unattenuated noise impact at the selected PORs is summarized in Table 2 and the noise contour plot is shown as Figure 2.

7.0 CONCLUSIONS & RECOMMENDATIONS

The Station-wide steady state sound levels estimated at the selected worst-case PORs comply with the minimum MOE sound level limits as summarized in Table 3. This includes the addition of a 5 dBA tonal penalty. No additional noise control measures are required to mitigate sound levels from this Station.

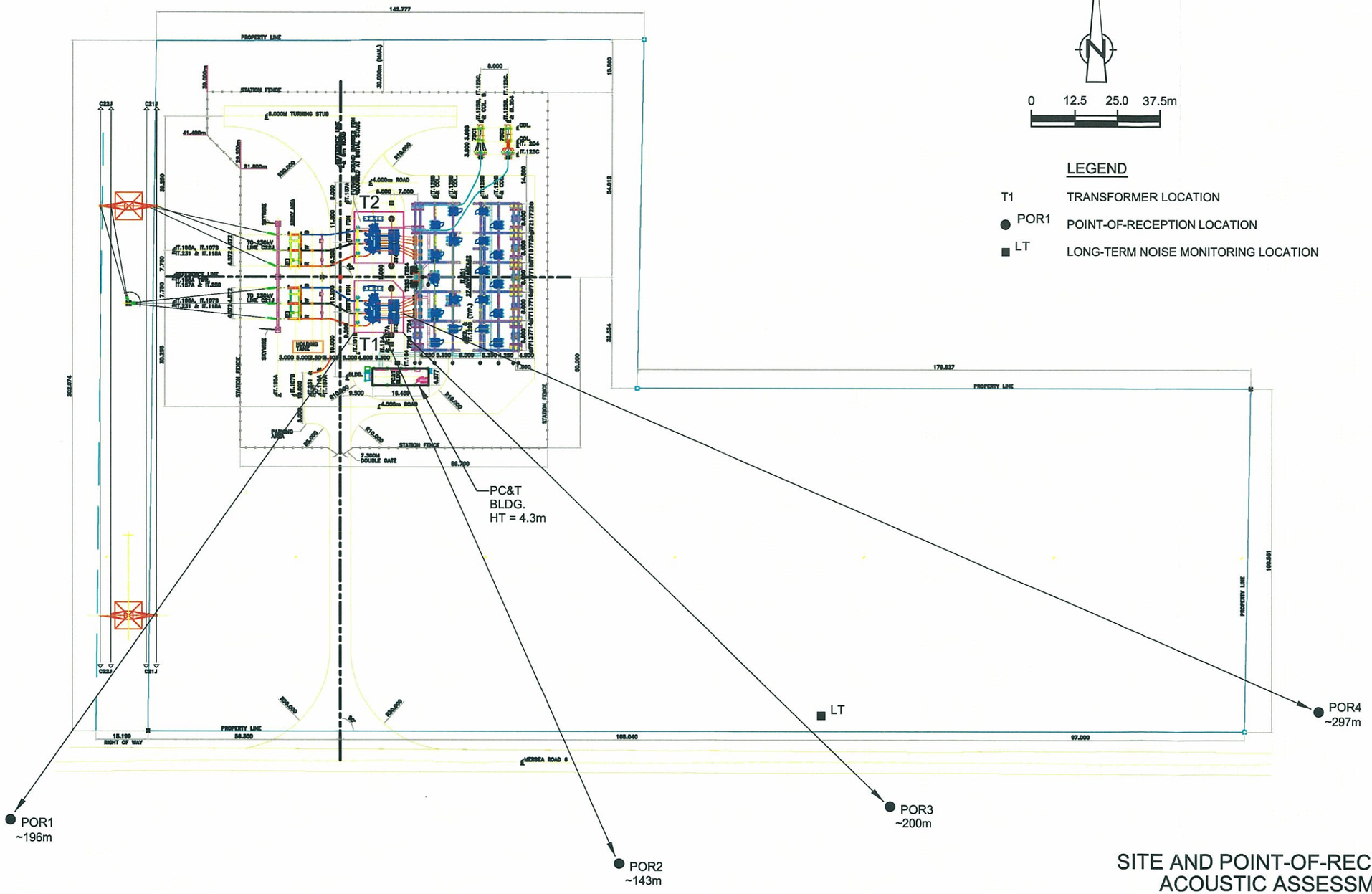


figure 1

SITE AND POINT-OF-RECEPTION PLAN
ACOUSTIC ASSESSMENT REPORT
LEAMINGTON TRANSFORMER STATION
Hydro One, Leamington, Ontario

SOURCE: HYDRO ONE NETWORKS INC., LEAMINGTON TS, FEASIBILITY STUDY, BASIC LAYOUT ULTIMATE, OCTOBER 19, 2009

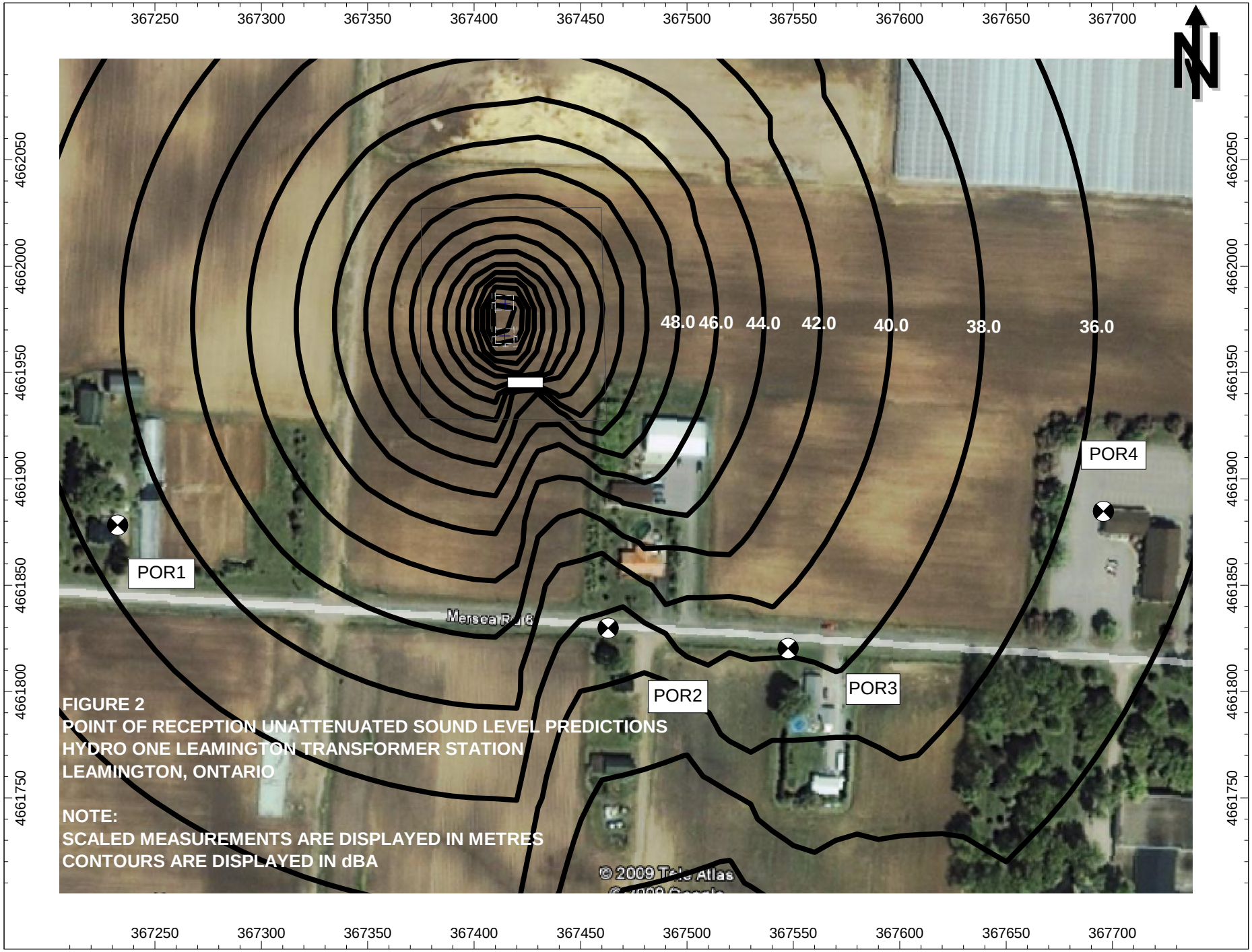


FIGURE 2
POINT OF RECEPTION UNATTENUATED SOUND LEVEL PREDICTIONS
HYDRO ONE LEAMINGTON TRANSFORMER STATION
LEAMINGTON, ONTARIO

NOTE:
SCALED MEASUREMENTS ARE DISPLAYED IN METRES
CONTOURS ARE DISPLAYED IN dBA

TABLE 1

NOISE SOURCE SUMMARY
HYDRO ONE - LEAMINGTON TRANSFORMER STATION
LEAMINGTON, ONTARIO

Source ID	*Source Description*	*Type of Noise Source*	*Sound Power Level (1) (dBA)*	*Source Location (2)*	*Sound Characteristics (3)*	*Noise Control Measures (4)*
T1	Transformer 1	*Point Source*	94.1	O	S, T	U
T2	Transformer 2	*Point Source*	94.1	O	S, T	U

Notes:

(1) Sound Power Level in dBA calculated from manufacturer's specifications or measured sound pressure level data and includes + 5 dBA tonal penalty.

(2) Source Location:

- O - located/installed outside of building
- I - located/installed inside of building

(3) Sound Characteristics:

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

(4) Noise Control Measures:

- S - silencer, acoustic louvre, muffler
- A - acoustic lining, plenum
- B - barrier, berm, screening
- L - lagging
- E - acoustic enclosure
- O - other
- U - uncontrolled

TABLE 2

POINT-OF-RECEPTION NOISE IMPACT - UNATTENUATED SOUND LEVELS
HYDRO ONE - LEAMINGTON TRANSFORMER STATION
LEAMINGTON, ONTARIO

		Mersea Rd. Residential Façade - POR1		*Mersea Rd. Residential Property Line - POR2*		*Mersea Rd. Residential Property Line - POR3*		*Mersea Rd. Church Façade - POR4*	
Source ID	*Source Description*	*Distance to Receptor (m)*	*Sound Level at Receptor (Leq)*	*Distance to Receptor (m)*	*Sound Level at Receptor (Leq)*	*Distance to Receptor (m)*	*Sound Level at Receptor (Leq)*	*Distance to Receptor (m)*	*Sound Level at Receptor (Leq)*
T1	Transformer 1	200	36.0 dBA	189	33.8 dBA	198	32.8 dBA	280	32.5
T2	Transformer 2	210	35.7 dBA	199	33.4 dBA	208	33.4 dBA	290	32.4
Worst-case Total Facility Sound Level (1-hour Leq)			**38.9 dBA**		**36.6 dBA**		**36.1 dBA**		**35.5 dBA**

Note:

(1) Sound level impacts were calculated using Cadna A Acoustical Modelling Software. A 5dBA tonal penalty was applied to Transformer sound levels.

TABLE 3

ACOUSTIC ASSESSMENT SUMMARY - STEADY STATE SOUND LEVELS
HYDRO ONE - LEAMINGTON TRANSFORMER STATION
LEAMINGTON, ONTARIO

Point-of-Reception ID	*Point-of-Reception Description*	*Unattenuated Sound Level at Point-of-Reception*	*Verified by Acoustic Audit*	*Performance Limit (1)*	*Compliance with Performance Limit*
		Predicted (Leq)	*(Yes/No)*	*(Leq)*	*(Yes/No)*
POR1	Mersea Rd. Residential Façade	38.9 (dBA)	No	40.0 (dBA)	Yes
POR2	Mersea Rd. Residential Property Line	36.6 (dBA)	No	40.0 (dBA)	Yes
POR3	Mersea Rd. Residential Property Line	36.1 (dBA)	No	40.0 (dBA)	Yes
POR4	Mersea Rd. Church Façade	35.5 (dBA)	No	45.0 (2) (dBA)	Yes

Notes:
(1) NPC-232 minimum exclusionary nighttime noise limit.
(2) NPC-232 minimum exclusionary daytime noise limit as Institutional Property operates only during the 7a.m. to 7p.m. period.

APPENDIX A

ZONING DEFINITIONS

Legend

ZONING DESIGNATION

- AGRICULTURAL
- COMMERCIAL
- INSTITUTIONAL
- RECREATIONAL

Title:

MUNICIPALITY OF LEAMINGTON
ZONING BY-LAW
SCHEDULE "A"
MAP 21

Scale: 1:15,000

0 200 400 800 Meters

N W E S

LEAMINGTON ONTARIO CANADA

Provided by the: Municipality of Leamington Engineering Department - GIS Services
38 Erie Street North, Leamington, Ontario N8H 2Z3
TEL: (519) 326-5761 FAX: (519) 326-2481

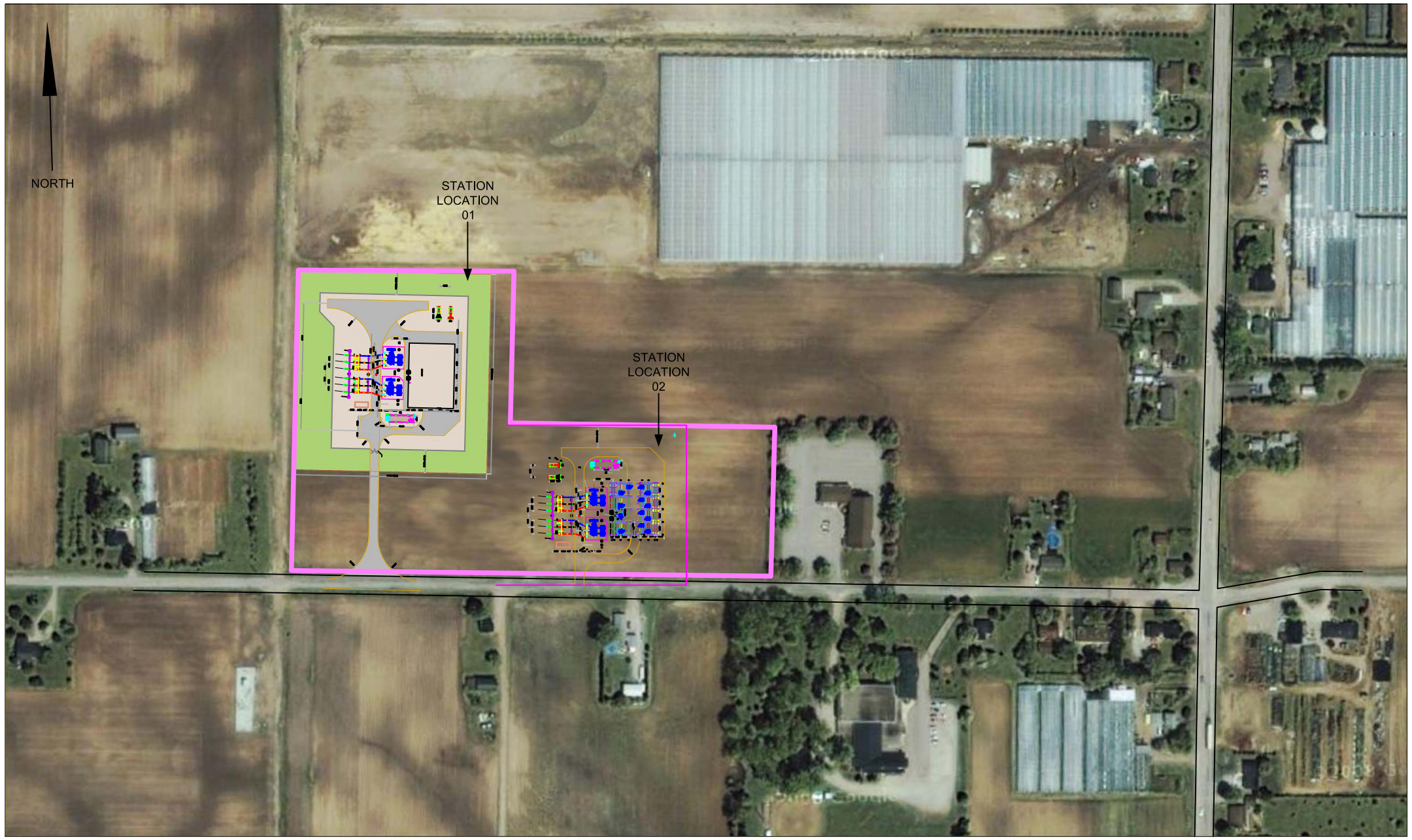
KEY MAP

17	18	19
	22	23
24	25	26

Y:\Maps\Planning\2009 Zoning By-law\ZONING_BYLAW_SERIES_2008_master.mxd - 1/12/2009 @ 11:07:11 AM

APPENDIX B

HYDRO ONE SITE PLAN



LEAMINGTON TS STUDY AREA and LANDSCAPE LAYOUT CONCEPT (OPTION 1 & 2)

ref cell number	rev. no.	date:	revision particulars	dwn / chkd	Eng. App'd

hydro one — Hydro One Networks Inc.
ENGINEERING & CONSTRUCTION SERVICES

Project: LEAMINGTON TS
Contract No.:
Title: LANDSCAPE LAYOUT CONCEPT

dwn RT	designed by DC/RT	
chkd D.CHEE		
date yyyy/mm/dd 04/07/2009	design approved D.CHEE	ref. Standard
network number ------	subconsultant	
scale not specified	remarks	
Drawing No. RT-DXS-15400-001	Sheet No.	Rev. No. 00

CLASS NO

A1 (594 x 841)

0 10 50 100 200 250 300 millimetres

microfilm no.

APPENDIX C

MANUFACTURER SOUND LEVEL SPECIFICATIONS

ISO 9001 REGISTERED
MGMT. SYS. RvA C 024
HYUNDAI
HEAVY INDUSTRIES CO.,LTD.
ELECTRO ELECTRIC SYSTEM
ADDRESS : 1.CHEONHA-DONG DONG. KU, ULSAN, KOREA TEL : (052) 230-8290 / FAX : (052) 230-8668

TEST CERTIFICATE

Ref. No. : QDC-TR-04073 Issued Date : Dec. 30. '04

Customer : HYDRO ONE NETWORK SERVICES ONC.

Project Name : HYDRO ONE #9643 ITEM 2D

Contract No. : —

Item(s) : Oil-immersed Transformer
3φ75/100/125MVA 210/28-28kV, 60Hz, 1Set
Serial No. : 41144TL0007-002

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 :

K. Y. Kim / General Manager
Quality Management Dep't

HYUNDAI
HEAVY INDUSTRIES CO., LTD.
Electro Electric SYSTEMS

HEAD OFFICE
#1.CHUNHA-DONG, DONG-GU, ULSAN KOREA
Tel : (052) 230-8290, Fax : (052) 230-8668

SEOUL OFFICE
HYUNDAI B/D,140-2,KYE-DONG,CHONGRO-GU
SEOUL, KOREA
Tel : (02)746-1114, Fax :(02)746-7648,7675

INSPECTION & TEST REPORT

FOR
TRANSFORMER

Customer	:	HYDRO ONE NETWORK SERVICES INC
Project Name	:	HYDRO ONE #9643 ITEM 2C
Applicable Standard	:	CSA C88-M90
Cooling Type	:	ONAN / ONAF/ODAF
Phase	:	3
Frequency (Hz)	:	60
Capacity (MVA)	:	75 / 100 / 125
High Voltage (KV)	:	215.5
Tap Voltage (KV)	:	215.5 ±16 × 1.16% steps (33 taps)
Low Voltage-1 (KV)	:	28.00
Low Voltage-2 (KV)	:	28.00
Vector Group	:	YNzn1zn1
Quantity (set)	:	2
Serial No.	:	~~41144TL0007-001~~

41144TL0007-002 (OCT 12 ~ OCT 20) by Peter Bee
(Dec 26 ~ Dec 29) by C.C.Yi

APPROVED BY : H.D.Lee WITNESSED BY

PB 41144TL0007-001
Witnessed/
Checked by
Date 20 Oct 04

CHECKED BY : C. H. Lee

TESTED BY : S. N. Jin

HYUNDAI HEAVY INDUSTRIES CO.,LTD.

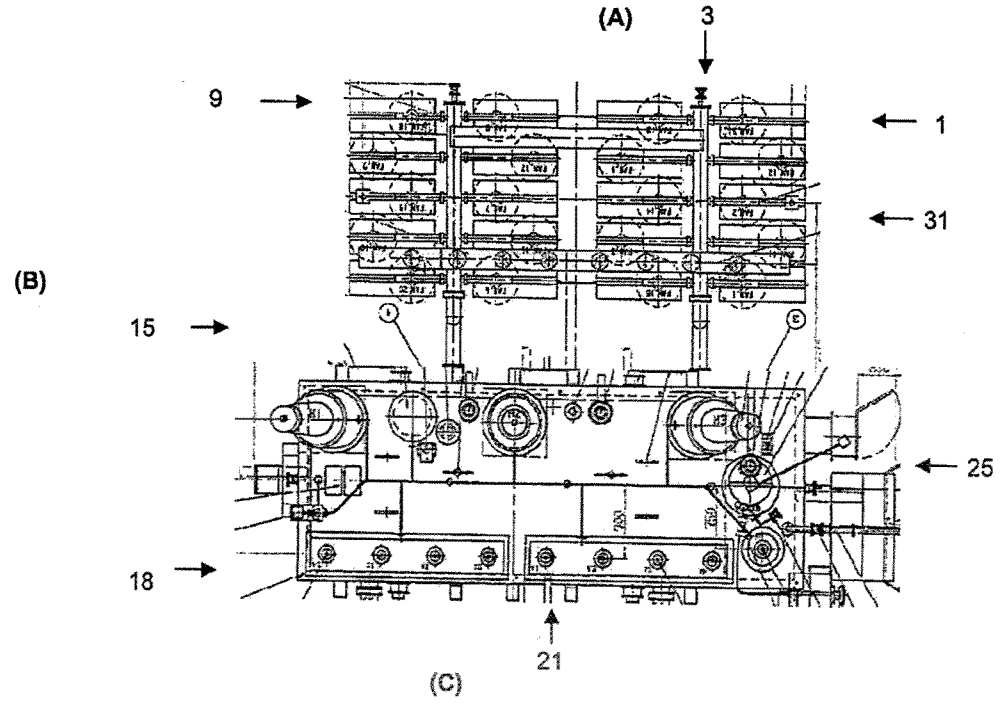
Measurement of sound level

Serial No. 20091010TLD003-002

At rated voltage 215.5/28-28 kV, frequency 60 Hz, and type of cooling (ODAF) in accordance with CAN/CSA-C88-M

1. Guaranteed value : ~~76.00 dB~~
2. Measured value : 65.24 dB with cooling system (6.0ft), Tank (1ft) EMERGENCY OPEN
3. Ambient sound level : 58.25 dB (A : 58 B : 58 C : 59 D : 58)
4. Measured value(Unit : dB)

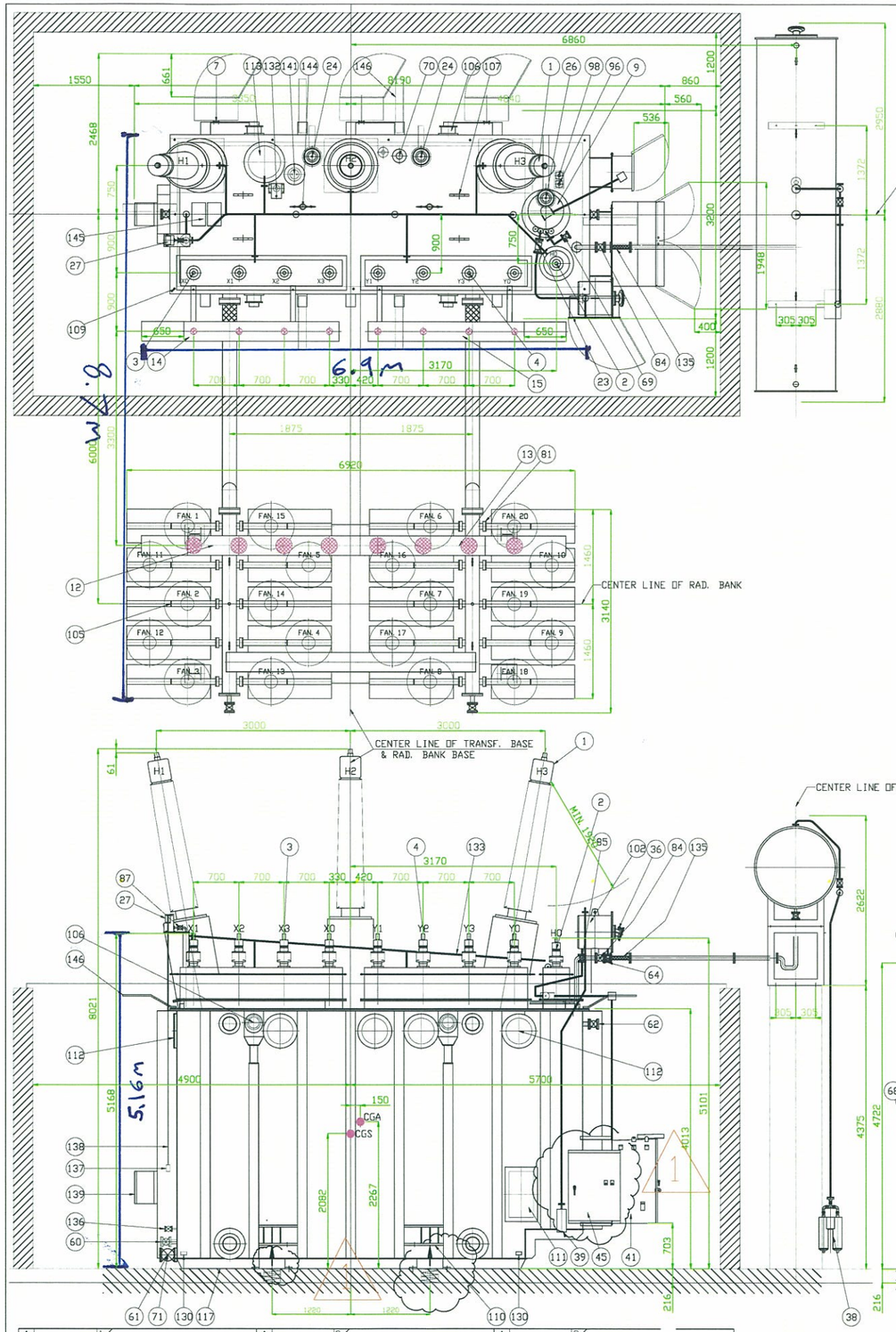
	1/3 H	2/3 H		1/3 H	2/3 H		1/3 H	2/3 H
1	65.0	65.0	12	65.0	65.0	23	66.0	66.0
2	64.0	64.0	13	66.0	66.0	24	66.0	66.0
3	64.0	65.0	14	67.0	66.0	25	66.0	66.0
4	65.0	64.0	15	66.0	65.0	26	66.0	66.0
5	65.0	65.0	16	66.0	65.0	27	66.0	65.0
6	65.0	64.0	17	66.0	65.0	28	66.0	66.0
7	64.0	64.0	18	66.0	65.0	29	66.0	65.0
8	64.0	64.0	19	66.0	66.0	30	65.0	65.0
9	64.0	64.0	20	66.0	67.0	31	65.0	65.0
10	64.0	63.0	21	66.0	67.0	32		
11	63.0	64.0	22	66.0	67.0	33		

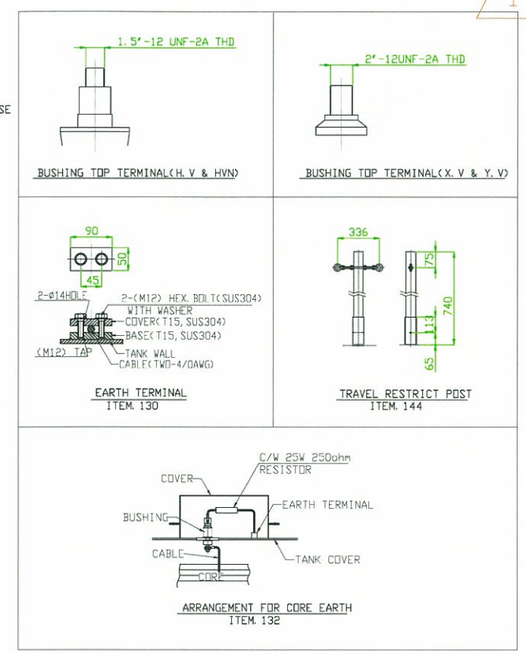


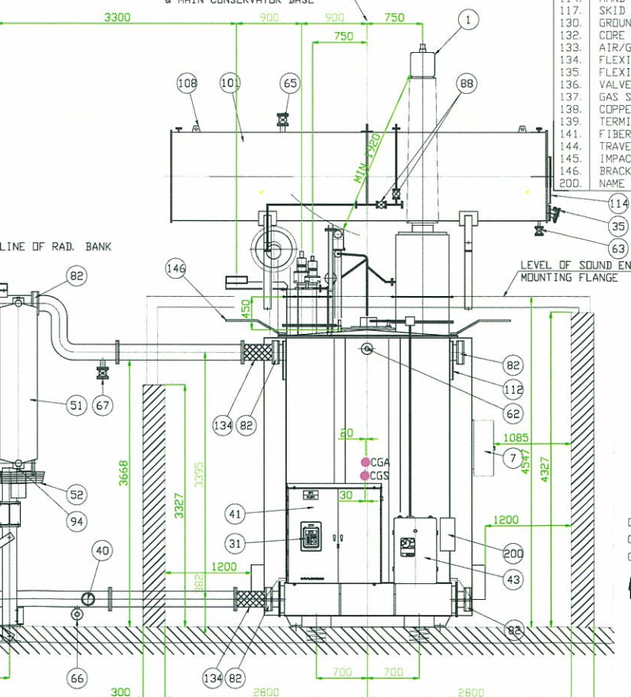
Date of Test : 2009. 11. 13 | Tested by : S. R. Kim

APPENDIX D

HYDRO ONE TRANSFORMER DRAWINGS

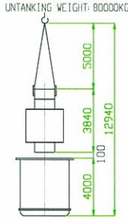






NO.	DESCRIPTIONS	SPEC	Q'TY
1.	H.V BUSHING	ABB/245G1200MK(1200A)	3
2.	H.V.N BUSHING	ABB/015G1200FA(1200A)	1
3.	X.V BUSHING	ABB/028G2000HA(2000A)	4
4.	Y.V BUSHING	ABB/028G2000HA(2000A)	4
7.	BUSHING POTENTIAL DEVICES(PROVISION)	SUPPLIED BY HYDRO ONE	3
9.	ON-LOAD TAP CHANGER(OLTC)	MIII-600Y-123/D-18353W/MR	1
12.	SUPPORTING BRACKET FOR X.V POST INSULATOR	-	1
13.	SUPPORTING BRACKET FOR Y.V POST INSULATOR	-	1
14.	SUPPORTING BRACKET FOR X.V ARRESTER	-	1
15.	SUPPORTING BRACKET FOR Y.V ARRESTER	-	1
23.	PROTECTIVE RELAY	RS2004/MR	1
24.	PRESSURE RELIEF DEVICE FOR TANK(WITH SHROUD)	213-001-07/QUALITROL	2
26.	PRESSURE RELIEF DEVICE FOR OLTC(WITH SHROUD)	213-006-01/QUALITROL	1
27.	GAS DETECTOR RELAY WITH PROTECTION COVER	MODEL 12/ABB	1
31.	TRANSFORMER TEMPERATURE MONITOR	ETM509-100/QUALITROL	1
35.	OIL LEVEL INDICATOR FOR MAIN CONSERVATOR	TJD-0231G04H04/TAIJIN	1
36.	OIL LEVEL INDICATOR FOR OLTC CONSERVATOR	TJD-0265 G04H01/TAIJIN	1
38.	BREATHER FOR MAIN CONSERVATOR	MTRAB-DB200(RM)D-T/MESSKO	1
39.	BREATHER FOR OLTC CONSERVATOR	MTRAB-DB100(RM)MESSKO	1
40.	OIL FLOW INDICATOR	TJD-0310/TAIJIN	2
41.	LOCAL CONTROL PANEL	TL1562-L01	1
43.	MOTOR DRIVE UNIT FOR OLTC	ED-100S (L566XW335XH903)	1
45.	OIL FILTER UNIT (FLUIDIX PIER ENGINEERING)	DLF-505P2F-1NS. z	1
51.	RADIATOR (HYUN DAI)	VR520XL2200XP34	20
52.	CUULING FAN	KRENZ-VEN1/1/3HP 208V	20
53.	OIL PUMP (GEA)	PR200/6-60HZ. 208V)	2
60.	VALVE FOR HYDRAN (FUTURE)	GATE TYPE 2"	1
61.	OIL DRAIN AND LOWER FILTERING VALVE	GATE TYPE 4"	1
62.	UPPER FILTERING VALVE	GATE TYPE 2"	1
63.	OIL DRAIN VALVE FOR MAIN CONSERVATOR	GATE TYPE 1"	1
64.	OIL DRAIN VALVE FOR OLTC CONSERVATOR	GATE TYPE 1"	1
65.	OIL FILTERING VALVE	GATE TYPE 2"	1
66.	OIL DRAIN VALVE FOR LOWER RADIATOR BANK	GATE TYPE 1"	2
67.	OIL DRAIN VALVE FOR UPPER RADIATOR BANK	GATE TYPE 1"	2
68.	OIL FILTERING VALVE FOR RADIATOR BANK	GATE TYPE 2"	4
69.	OIL DRAIN VALVE FOR OLTC	GATE TYPE 1"	1
70.	VACUUM VALVE	GATE TYPE 4"	1
71.	OIL SAMPLING VALVE FOR LOWER PART	NW15 (1/2")	1
81.	CONNECTION VALVE FOR RADIATOR	BUTTERFLY TYPE 3"	40
82.	CONNECTION VALVE FOR RADIATOR BANK	BUTTERFLY TYPE 8"	12
84.	CONNECTION VALVE FOR MAIN CONSERVATOR	GATE TYPE 2"	1
85.	CONNECTION VALVE FOR OLTC CONSERVATOR	GATE TYPE 1"	1
87.	CONNECTION VALVE FOR GAS DETECTOR	BALL TYPE 3/4"/HS2211-572	1
88.	VACUUM VALVE FOR MAIN CONSERVATOR	GATE TYPE 1"	2
91.	AIR VENT FOR RADIATOR	APB-24 (M24X1.5THD)	20
94.	OIL DRAIN PLUG FOR RADIATOR	DPB-24 (M24X1.5THD)	20
96.	POCKET FOR ETM SENSOR	-	1
98.	POCKET FOR SPARE	-	1
101.	MAIN CONSERVATOR (RUBBER CELL TYPE)	RB500-HDD	1
102.	OLTC CONSERVATOR (OPEN TYPE)	-	1
103.	LIFTING EYE FOR RADIATOR BANK	-	4
105.	LIFTING EYE FOR RADIATOR	-	20
106.	LIFTING HOOK FOR COMPLETE TRANSFORMER	-	4
107.	LIFTING EYE FOR ACTIVE PART WITH TANK COVER	-	4
108.	LIFTING EYE FOR CONSERVATOR	-	2
109.	SAFETY POST	DIA.24XL75	N
110.	JACK PAD WITH PULLING EYE	-	4
111.	MAN HOLE FOR (SIDE)	INSIZE 390X710	1
112.	HAND HOLE(SIDE)	INSIZE DIA.400	8
113.	HAND HOLE(TOP)	INSIZE DIA.500	1
114.	HAND HOLE FOR CONSERVATOR	INSIDE DIA.500	1
117.	SKID BASE	TL1562-A52	1
130.	GROUNDING PAD FOR MAIN BODY	NEMA 2HOLES TYPE	2
132.	CORE GROUNDING DEVICE(SEE DETAIL)	TBA01022G+RESISTER	1
133.	AIR/GAS VENTING PIPE LINE	2"+1"+3/4" STEEL PIPE	1
134.	FLEXIBLE JOINT	8"	4
135.	FLEXIBLE JOINT	2"	1
136.	VALVE FOR CALISTO FUTURE	GATE TYPE 1/2"	2
137.	GAS SAMPLING VALVE FOR GAS DETECTOR RELAY	VLV-602-2	1
138.	COPPER PIPE FOR GAS DETECTOR RELAY	PIPE DIA.8	1
139.	TERMINAL BOX FOR BCT METERING(LOCKABLE)	-	1
141.	FIBER OPTIC BOX(BEING REMOVED AFTER TEST)	FOR THERMAL TEST	1
144.	TRAVEL RESTRICT POST	STEEL PIPE(SEE DETAIL)	2
145.	IMPACT RECORDER	ANALOG+DIGITAL(3WE,RD317)	2
146.	BRACKETS FOR HEAT ACTIVATED DEVICES	-	6
200.	NAME PLATE	TL1562-A11,12	2

UNTANKING WEIGHT: 80000KG



UNTANKING DWG

RATINGS	
PHASE	3 PH
FREQUENCY	60 HZ
CAPACITY	75/100/125 MVA
RATED VOLTAGE	215.5/28-28 KV

WEIGHT (KG)	
CORE/COIL ASSEMBLY	75000
OIL(52300LT)	47070
TANK & FITTINGS	43930
TOTAL WEIGHT	166000
WEIGHT OF MAIN BODY	138500
WEIGHT OF RADIATOR BANK	23000
WEIGHT OF MAIN CONSERVATOR	4500

SHIPPING(MAIN BODY)	
DIMENSION	SIZE: L8190XW3200XH4400
WEIGHT(WITHOUT OIL)	100000 KG

OVERALL DIMENSION TOLERANCE ±2%
CGA : CENTER OF GRAVITY(COMPLETE TR)
CGS : CENTER OF GRAVITY (SHIPPING OF MAIN BODY)
: JACKING POINT

ARRANGEMENT "A"

DSN	CHK	APP	PROJ.	3RD	TITLE: 3PH 60HZ 75/100/125MVA, 215.5/28-28KV
080707	080707	080707	UNIT	mm	OUTLINE FOR TRANSFORMER
			SCALE	1/40	PROJECT NO.
M.C. SHIN	H.P. KIM	J.K. LEE	SIZE	A1	CAD NO. LM/11562a01 SHEET
HYUNDAI HEAVY INDUSTRIES CO., LTD.					REF. NO. /
					DWG. NO. TL1562-A01 REV. 1

B	J.K. LEE	1	REVISED BY COMMENTS	2	3
C	H.P. KIM				
D	080822 M.C. SHIN				

APPENDIX E

TRANSFORMER SOUND LEVEL CALCULATIONS

TABLE E.1

TRANSFORMER 1 SOUND POWER LEVEL CALCULATIONS
HYDRO ONE - LEAMINGTON TRANSFORMER STATION
LEAMINGTON, ONTARIO

Transformer Core Data - T1 & T2

Length	**6.90 m**
Width	**8.70 m**
Height	**5.16 m**

Measured or Manufacturer Tested Sound Pressure Level (dBA) (1)	**65.24**
Transformer Surface Area (inclusive of fan banks) (m^2) (2)	**221**
Transformer Calculated Sound Power Rating (dBA) (3)	**88.7**

Octave Band (Hz)	**32**	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	
Correction Factor (4)	-3	3	5	0	0	-6	-11	-16	-23	Total
Sound Power Level (dB)	**86**	**92**	**94**	**89**	**89**	**83**	**78**	**73**	**66**	97.7
A-weighting	-39.4	-26.2	-16.1	-8.6	-3.2	0.0	1.2	1.0	-1.1	
Sound Power Level (dBA	**46.3**	**65.5**	**77.6**	**80.1**	**85.5**	**82.7**	**78.9**	**73.7**	**64.6**	**89.1**

Notes:

(1) Manufacturer tested sound level in accordance with IEEE or equivalent. See letter from manufacturer.

(2) The following transformer surface area calculation based on 5 exposed sides and design dimensions provided by Hydro One:
=(2*(6.9*5.16))+(2*(8.7*5.16))+(6.9*8.7)

(3) Calculated as per IEEE C57.12.90-2006, "IEEE Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers."

(4) Octave band correction factors obtained from Table 1 of the Encyclopedia of Acoustics, 1997, Chapter 86 - "Sound Power Level Predictions for Industrial Ma