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Waste Management of Canada
Richmond Landfill Site
Napanee, Ontario

Final Report

Acoustic Assessment Report
RWDI # 1101776
September 16, 2011

SUBMITTED TO:

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EXECUTIVE SUMMARY

RWDI AIR Inc. (RWDI) was retained by Comcor Environmental Limited (Comcor) to complete an Acoustic Assessment Report (assessment) for the flaring compound (Facility) at the Richmond Landfill (Landfill). The Richmond Landfill is operated by Waste Management of Canada Corporation (WM) and located at 1271 Beechwood Road in Napanee, Ontario. This assessment is intended to support an amendment application for existing Certificate of Approval (Air and Noise) (C of A) number 8-4078-99-006 to include a new contingency flaring system.

The existing enclosed flare and new candlestick landfill gas flare will operate independently. The intent of the candlestick flare is to provide back-up to the existing enclosed flaring system. However, both flares were assessed together (i.e., operates concurrently) as a conservative assumption. The flaring systems were assumed to operate 24-hours per day, 7 days per week.

Noise impact modelling was completed using Cadna/A, a commercially available software implementation of the ISO-9613 environmental noise propagation algorithms. Noise impacts were assessed at the nearest noise sensitive receptors (residential houses) surrounding the Landfill and compared to the MOE NPC-232 sound level limits.

The Landfill noise impacts for the worst-case operations were predicted to meet the applicable MOE NPC-232 noise guidelines at all receptors. This assessment shows that with the inclusion of the new candlestick gas flare installation and associated equipment, noise impacts from all stationary noise equipment are predicted to be in compliance with the MOE guidelines.

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1. INTRODUCTION

RWDI AIR Inc. (RWDI) was retained by Comcor Environmental Limited (Comcor) to complete an Acoustic Assessment Report (assessment) for the flaring compound (Facility) at the Richmond Landfill (Landfill). The Richmond Landfill is operated by Waste Management of Canada Corporation (WM) and located at 1271 Beechwood Road in Napanee, Ontario. This assessment is intended to support an amendment application for existing Certificate of Approval (Air and Noise) (C of A) number 8-4078-99-006 to include a new contingency flaring system.

The MOE "Guide for Applying for Approval (Air & Noise) s.9 EPA" [1], dated November 2005 (guide dated 2005), has been used in the preparation of this assessment. The NAICS code for the Landfill operations is 562210, Waste Treatment and Disposal. The "Noise Screening Process for s.9 Applications" [2] referenced in the guide dated 2005 was completed, and a copy is included in Appendix A. Based on the results of the Noise Screening Process, the facility is expected to have a radius of influence up to 1000 m. Since there are noise sensitive receptors within the area of influence, supporting information for a noise and vibration assessment is required.

Operations at the facility do not include large sources of vibration (e.g., stamping presses, shaker tables, large rotating machinery, etc.). Therefore, a detailed vibration impact assessment is not required.

The assessment is intended to meet the requirements outlined in the MOE publication NPC-233, "Information to be Submitted for Approval of Stationary Sources of Sound", dated October 1995 [3]. Guidance regarding report format is taken from MOE publication, "Basic Comprehensive Certificates of Approval, User Guide v2.0, Appendix A, Supporting Information to be Submitted for an Acoustic Assessment Report or Vibration Assessment Report Required by a Basic Comprehensive C of A", dated April 2004 [4]. A completed copy of the MOE Noise Assessment Checklist has been included in Appendix A.

This assessment was completed through detailed modelling.Modelling based on source-specific measurements and data on file was used to capture conditions representative of predictable worst-case facility impacts.

The Landfill is located on Beechwood Road in Greater Napanee, east of Tyendinaga Township in the Southeastern portion of the province of Ontario. The Landfill is located on land that is zoned Waste Management Industrial. The land zoning adjacent to the Landfill includes Rural and Agricultural land uses in all directions, and Community Facility to the southwest, and Environmental Protection areas within a 1000 m radius to the north and south. Copies of the Town of Greater Napanee and Tyendinaga Township zoning maps and descriptions of the applicable zoning areas are found in Appendix B.

The acoustic environment surrounding the Landfill is characterized primarily by the sounds of nature and light road traffic.

2. FACILITY DESCRIPTION

The existing Facility consists of one enclosed gas flare, and one landfill gas blower in an enclosure with operable windows. The new installation will include the addition of one candlestick gas flare and one unenclosed blower.

The flares are fed by a collection network consisting landfill gas extraction wells connected through a network of piping which terminates in the flaring compound. Under normal operating conditions landfill gas is combusted in the enclosed flare. The landfill gas flare is used as part of the integrated landfill gas control system to manage landfill gas odour and emissions from the site. The new candlestick flare will be used as a backup system during planned maintenance activities or unplanned shutdowns.

The facility will operate 24-hours per day and 7 days per week with a single flare and associated blower active at all times.

3. NOISE SOURCE SUMMARY

The existing noise sources were identified during a site visit to the facility by RWDI personnel on July 4, 2011. Locations of proposed sources were identified on-site by WM personnel. The impact of noise emissions from the Facility on its surroundings was predicted based on data obtained from source-specific measurements of existing equipment and historical data on file. The locations of the significant steady state noise sources and their respective IDs are illustrated in Figure 1. There are no noise sources identified to be impulsive.

Following the installation of the contingency flaring system, significant noise sources at the facility will include two (2) enclosed flare vents, one (1) blower in an enclosure with operable windows, one (1) candlestick flare and one (1) unenclosed blower motor.

The facility will have two modes of operation. During normal operation, the enclosed flare and associated blower will operate. During planned and unplanned shutdowns, the candlestick flare and associated blower will operate. A single conservative scenario has been developed for the purpose of noise modelling, where all sources operate simultaneously. This is a conservative assessment as typically the flares would not operate concurrently.

Sound power levels for the sources were obtained from a combination of measurements of existing sources, and historical measurements used as proxy for proposed equipment. A noise source summary is provided in Table 1, including sound power level (PWL), location, characteristics, and any applicable noise control measures. Additional information such as 1/1-octave band sound power spectra, height above grade, Cartesian coordinates have been included in Appendix C.

Proxy sound level data for the candlestick flare (source C_FLARE_stk) and unenclosed blower motor (source C_FLARE_motor) were obtained from historical measurements of similar noise sources. The measured sound level data is included in Appendix C.

Sound pressure level (SPL) measurements were conducted for existing noise sources in operation during a site visit by RWDI personnel on July 4, 2011. All measurements were consistent with ISO 3744:1994(E) [6] and ISO 3746:1995 [7] measurement standards, and the applicable portions of the MOE Publication NPC-103 [8]. The measured SPLs were converted into PWLs based on measurement distances and the size of the equipment being measured, as appropriate. A complete summary showing details on the SPL to PWL conversions, octave band sound power data, measurement output files, and manufacturer's data is included in Appendix C. Weather conditions and measurement equipment are in compliance with the requirement set out in MOE Publication NPC-103 [8]. The measurement weather conditions and information pertaining to the sound level measurement equipment are summarized in Appendix D.

Two vents are located opposite one another around the base of the enclosed flare. The vent with the higher sound pressure level was measured, and modelling of source Enclosed flare vent (source E_FLARE_vent) was based on this measurement. The PWL for E_FLARE_vent is equal to twice the PWL calculated from the measurement of a single vent, to account for the presence of two vents.

Noise sources considered to be insignificant contributors to the overall facility noise level have been listed separately. A summary of insignificant sources is included in Appendix E.

4. POINT OF RECEPTION SUMMARY

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.Noise sensitive receptors of interest, as defined under NPC-232 [5] guidelines include the following existing or zoned for future use noise sensitive land uses:

- Permanent, seasonal, or rental residences;
- Hotels, motels and campgrounds;
- Schools, universities, libraries and daycare centres;
- Hospitals and clinics, nursing / retirement homes; and
- Churches and places of worship.

The noise sensitive receptors adjacent to the Landfill have been selected based on the worst-case impacts of the Facility. The nearest noise sensitive receptors are as follows:

- Two-storey home at 1181 Beechwood Road located to the southeast (NR1);
- Two-storey home at 1254 Beechwood Road located to the south (NR2);
- Two-storey Church at 1340 Deseronto Road located to the southwest (NR4); and
- Two-storey home at Deseronto Road and Tucker Road (NR4).

There are no noise sensitive receptors located to the north or northeast within a 1000 m radius of the Landfill.

The locations of the noise sensitive receptors are shown in relation to the Landfill noise sources on Figure 2.

Noise impact modelling was completed using Cadna/A. Cadna/A is a commercially available software implementation of the ISO-9613 [6, 7] environmental noise propagation algorithms, produced by Datakustik GmbH. The modelling took into account the following factors:

- Source sound power level and directivity;
- Distance attenuation;
- Source-receptor geometry;
- Barrier effects of the blower building;
- Ground attenuation and Air (atmospheric) attenuation; and
- Meteorological effects on noise propagation.

The topography between the noise sources and the noise sensitive receptors is essentially flat, and has been modelled as such. Ground between the facility and the noise sensitive receptors is soft. Key modelling parameters are summarized in Appendix F.

The modelled contributions of each source to the overall facility-attributable sound levels at the noise receptors are summarized in Table 2. Noise contours (isopleths of equal noise level) have been generated and are presented in Figure 2. Appendix F includes a sample modelling output file, showing step-by-step calculations of noise impacts due to each of the sources at receptor NR2.

5. ASSESSMENT CRITERIA

The applicable noise guideline limits for the receptors adjacent to the Facility are the MOE "Stationary Source" guidelines for Class 3 (rural) area, set out in MOE Publication NPC-232. These guidelines state that one-hour sound exposures (L_{eq}(l hour) dBA values) from continuous noise sources in Class 3 (rural) areas shall not exceed that of the background L_{eq} (l hour) sound level. The background L_{eq} (l hour) is defined as the sound level present in the environment produced by noise sources (typically caused by road traffic) other than those associated with the facility under assessment. The MOE Publication NPC-232 sound level limits are outlined as follows:

- The higher of 45 dBA or background noise, during the daytime hours (0700-1900h);
- The higher of 40 dBA or background noise, during the evening hours (1900 2300h); and
- The higher of 40 dBA or background noise, during the night-time hours (2300 0700h).

The applicable noise criteria are the higher of the background sound level and the MOE's minimum sound level limit. As the ambient sound levels have not been established by traffic modelling or long term measurements, the MOE's minimum daytime and evening/night-time sound level limits of 45 dBA, and 40 dBA, respectively, are the applicable sound level limits for the noise sensitive receptors.

6. IMPACT ASSESSMENT

The combined L_{eq} (1 hour) dBA values were calculated using the sound emissions from the Landfill noise sources. The predicted Landfill noise levels at all receptors are below the applicable MOE daytime, evening and night-time sound level limits of 45 dBA, 40 dBA and 40 dBA, respectively, as shown in Table 3. Modelled noise impact contours are shown in Figure 2, indicating Facility sound levels are predicted to meet the MOE sound level limits at all noise sensitive receptors.

7. CONCLUSIONS AND RECOMMENDATIONS

An assessment of the facility-attributable sound levels was completed by modelling the individual contributions of all existing and proposed noise sources. The noise impacts from the Landfill noise sources were predicted to meet the MOE NPC-232 Class 3 guideline limits at surrounding noise sensitive receptors. This assessment shows that the Facility will be in compliance with the MOE guidelines following the installation of the candlestick gas flare and associated equipment.

8. REFERENCES

1. Ontario Ministry of the Environment (MOE), “Guide for Applying for Approval (Air&Noise) s.9 EPA”, November 2005.

2. Ontario Ministry of the Environment (MOE), “Noise Screening Process for S.9 Applications, Supplement to Application for Approval”, February 2005.

3. Ontario Ministry of the Environment Publication NPC-233, "Information to be Submitted for Approval of Stationary Sources of Sound", October 1995.

4. Ontario Ministry of the Environment, “Basic Comprehensive Certificates of Approval, User Guide v2.0, Appendix A, Supporting Information to be Submitted for an Acoustic Assessment Report or Vibration Assessment Report Required by a Basic Comprehensive C of A”, April 2004.

5. Ontario Ministry of the Environment Publication NPC-232, "Sound Level Limits for Stationary Sources in Class 3 Areas (Rural)", October 1995.

6. ISO-9613-1. *Acoustics –Attenuation of Sound during propagation outdoors*. *Part - 1 Calculation of the absorption of sound by the atmosphere.*

7. ISO-9613-2. *Acoustics –Attenuation of Sound during propagation outdoors.* *Part - 2 General method of calculation*.

8. Ontario Ministry of the Environment Publication NPC-103, "Procedures", published under the Model Municipal Noise Control Bylaw, 1977.

TABLES

Table 1: Noise Source Summary

Waste Management of Canada Richmond Landfill Site - Napanee, Ontario

Notes to Table:

- "Table A1" in Appendix A of Basic CCofA Guide.

1. Wherever possible, the Source ID matches the identifiers used in the ESDM report.

2. Sound Power Levels of continuous noise sources, in dBA, do not include sound characteristic adjustments per NPC-104. Values are unadjusted, unmitigated PWLs. Sound Power Levels of impulsive noise sources, in dBAI, are A-weighted incorporating an impulsive time weighting.

3. Source Location: O = Outside of building, including the roof, I = Inside of building

4. Sound Characteristic, per NPC-104

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		

Source ID [1]	Source Description	Sound Power Level [2] (dBA/dBAI)	Source Location [3] (I or O)	Sound Characteristics [4] (S,Q,I,B,T,C)	Existing Noise Control Measures [5] (S,A,B,L,E,O,U)
C_FLARE_stk	Candlestick flare exhaust	95	O	S	U
C_FLARE_motor	Candlestick flare motor	94	O	S	U
E_FLARE_vent	Enclosed flare vent at base 425 cfm	71	O	S	U
BLWR_BLDG_sw	Blower enclosure south window	83	O	S	U
BLWR_BLDG_ww	Blower enclosure west window	82	O	S	U
BLWR_BLDG_nw	Blower enclosure north window	83	O	S	U

Table 2: Point of Reception Noise Impact

Receptors: NR1, NR2, NR3, NR4

Waste Management of Canada Richmond Landfill Site - Napanee, Ontario

Notes to Table:

- "Table A2" in Appendix A of Basic CCofA Guide.

- "Continuous" noise sources includes sum of steady, quasi-steady impulsive, tonal, cyclical and buzzing noise sources, with appropriate penalties applied, in accordance with documents NPC-104, NPC-205 and/or NPC-232.

1. Wherever possible, the Source ID matches the identifiers used in the ESDM report.

2. Sound level at PoR predicted based on ISO-9613 algorithms.

3. Sound Level units
   dBA = 1-hour energy equivalent sound level (L_{eq} (1-hr)), in terms of A-Weighted decibels.
   dBAI = Logarithmic mean impulsive noise level (L_{LM}), in terms of A-Weighted decibels incorporating an impulsive time weighting

-- Noise and vibration receptors representative of worst-case potential impacts have been selected. For the purposes of noise and vibration impact assessment, the following land uses (existing or zoned for future use) have been considered:
   - permanent , seasonal, or rental residences
   - hotels, motels and campgrounds
   - nursing / retirement homes
   - hospitals and clinics
   - schools, universities, libraries and daycare centres
   - churches and places of worship

	Point of Reception ID	Point of Reception ID	Point of Reception ID	Point of Reception ID
	NR1	NR2	NR3	NR4
	Point of Reception Description	Point of Reception Description	Point of Reception Description	Point of Reception Description
	2-storey Home at 1181 Beechwood Road	2-storey Home at 1254 Beechwood Road	2-storey Church at 1340 Deseronto Road	2-storey Home at Deseronto Road and Tucker Road
	Point of Reception Co-ords (m)	Point of Reception Co-ords (m)	Point of Reception Co-ords (m)	Point of Reception Co-ords (m)
	X / Y / Z	X / Y / Z	X / Y / Z	X / Y / Z
	18335800 / 4902743 / 4.5	18335397 / 4902557 / 4.5	18334769 / 4902578 / 4.5	18334452 / 4903393 / 4.5

Source ID [1]	Source Description	Point of Reception 1			Point of Reception 2			Point of Reception 3			Point of Reception 4		
		Distance (m)	Sound Level at PoR [2]	Units [3] (dBA, dBAI)	Distance (m)	Sound Level at PoR [2]	Units [3] (dBA, dBAI)	Distance (m)	Sound Level at PoR [2]	Units [3] (dBA, dBAI)	Distance (m)	Sound Level at PoR [2]	Units [3] (dBA, dBAI)
C_FLARE_stk	Candlestick flare exhaust	594	27	dBA	321	34	dBA	503	29	dBA	952	22	dBA
C_FLARE_motor	Candlestick flare motor	590	20	dBA	321	31	dBA	509	27	dBA	954	20	dBA
E_FLARE_vent	Enclosed flare vent at base 425 cfm	588	2	dBA	314	9	dBA	506	4	dBA	960	0	dBA
BLWR_BLDG_sw	Blower enclosure south window	577	16	dBA	311	23	dBA	519	8	dBA	966	0	dBA
BLWR_BLDG_ww	Blower enclosure west window	580	4	dBA	312	22	dBA	516	16	dBA	964	8	dBA
BLWR_BLDG_nw	Blower enclosure north window	580	1	dBA	314	7	dBA	517	17	dBA	963	9	dBA

Table 3: Acoustic Assessment Summary

Waste Management of Canada Richmond Landfill Site - Napanee, Ontario

Notes to Table:

- "Table A3" in Appendix A of Basic CCofA Guide.

1. "Continuous" noise sources includes sum of steady, quasi-steady impulsive, tonal, cyclical and buzzing noise sources, with appropriate penalties applied, in accordance with documents NPC-104, NPC-205 and/or NPC-232. Impulsive noise sources are assessed separately from continuous noise sources.

2 Daytime occurs from 0700-1900h. Evening occurs from 1900-2300h. Night-time occurs from 2300-0700h.

3 Worst-case cumulative sound level from all applicable sources operating.

4. Has an acoustic audit (as defined in Publication NPC-233) been conducted with source in place and operating?

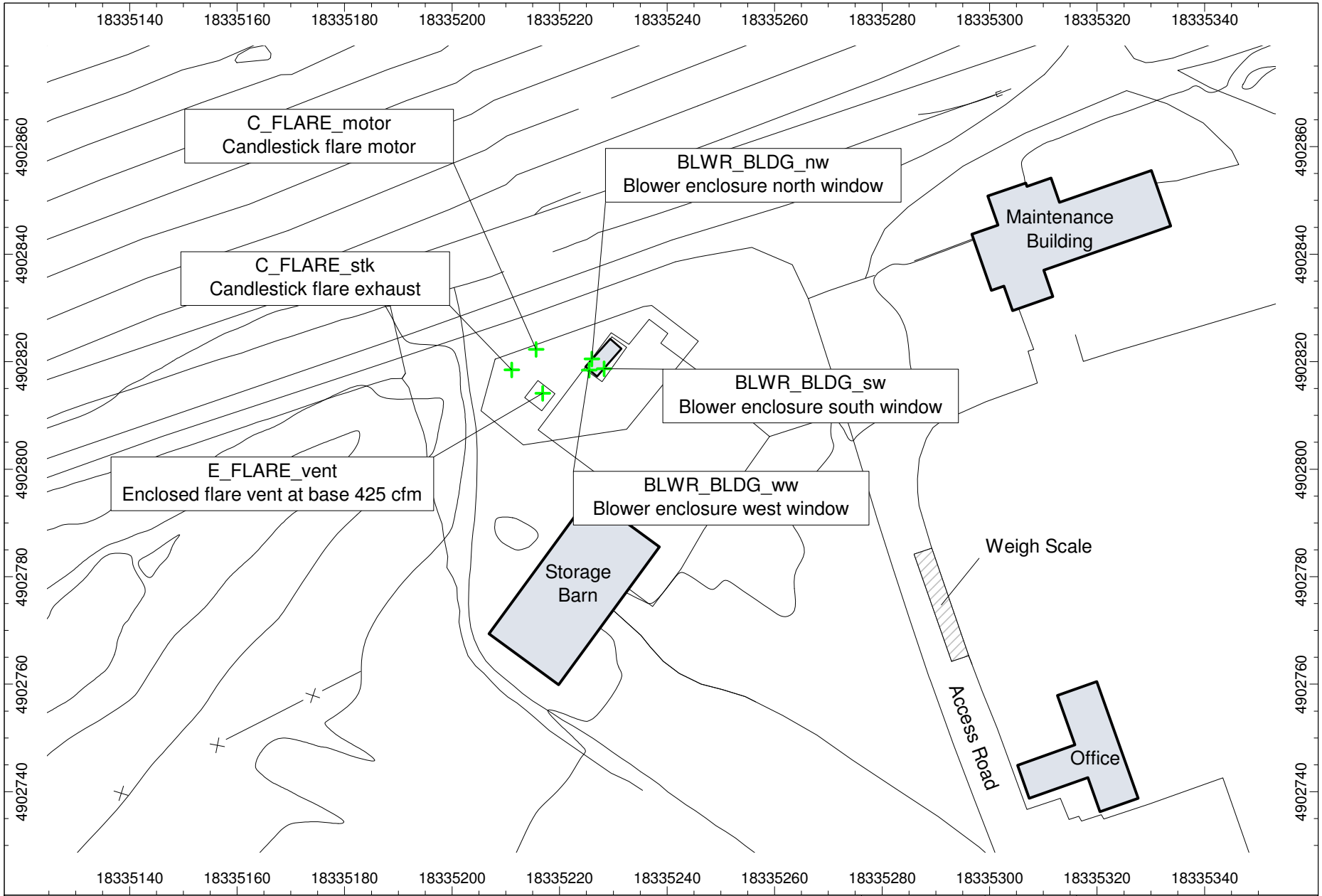
5. Applicable worst-case NPC-205 / NPC-232 sound level limit.

6. Performance limit (aka guideline limit) based on following:
   C = Calculated based on road traffic volumes in compliance with NPC-206 requirements.
   M = Measured based on monitoring for a minimum 48 hour period, in accordance with NPC-233 requirements.
   D = Default guideline minima per NPC-205 / NPC-232, as applicable (e.g., 50 dBA daytime for NPC-205).

Assessment of Impacts for "Continuous" Noise Sources [1]

Point of Reception ID	Point of Reception Description	Time Period [2]	Total Sound Level at PoR [3] (dBA)	Verified by Acoustic Audit [4] (Yes/No)	Performance Limit [5] (dBA)	Performance Limit Source [6] (C / M/ D)	Compliance with Performance Limit (Yes/No)
NR1	2-storey Home at 1181 Beechwood Road	Daytime	28	No	45	D	Yes
		Evening	28	No	40		Yes
		Night-time	28	No	40		Yes
NR2	2-storey Home at 1254 Beechwood Road	Daytime	36	No	45	D	Yes
		Evening	36	No	40		Yes
		Night-time	36	No	40		Yes
NR3	2-storey Church at 1340 Deseronto Road	Daytime	31	No	45	D	Yes
		Evening	31	No	40		Yes
		Night-time	31	No	40		Yes
NR4	2-storey Home at Deseronto Road and Tucker Road	Daytime	25	No	45	D	Yes
		Evening	25	No	40		Yes
		Night-time	25	No	40		Yes

FIGURES



Significant Noise Source Locations

True North

Drawn by: NTN	Figure: **1**
Scale: 1:1000	
Date: July 26, 2011	

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Predicted Noise Impact Contours and Noise Sensitive Receptor Locations

True North

Drawn by: NTN	Figure: **2**
Scale:	1:7500
Date:	July 18, 2011

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