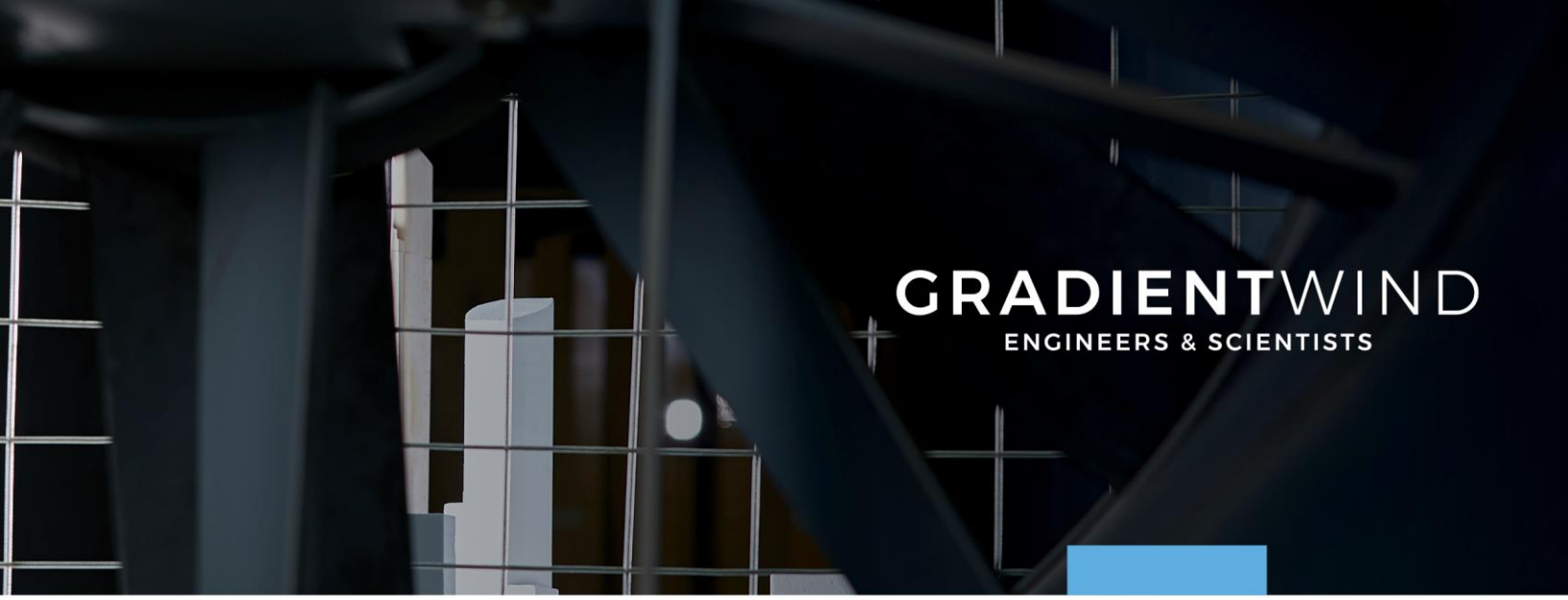
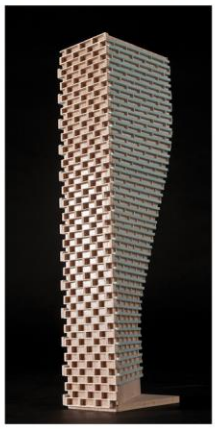


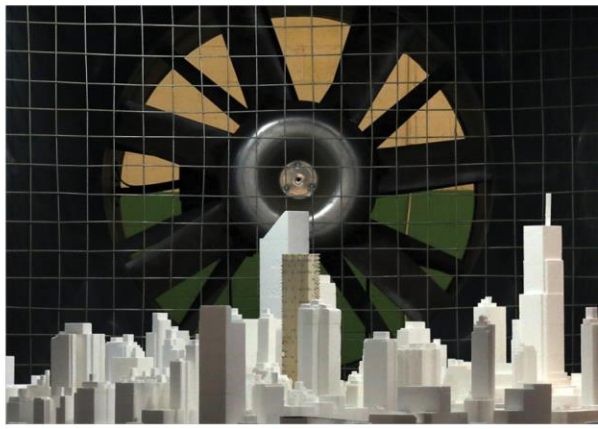
GRADIENTWIND
ENGINEERS & SCIENTISTS

STATIONARY NOISE ASSESSMENT

Greenabank & Cambrian Road
Ottawa, Ontario

REPORT: 20-153– Stationary Noise





August 24, 2020

PREPARED FOR

Metro Ontario Inc.
5150 Spectrum Way, Suite 401
Mississauga, ON L4W 5G2
Canada

PREPARED BY

Efser Kara, MSc, LEED GA, Acoustic Scientist
Joshua Foster, P.Eng., Principal

EXECUTIVE SUMMARY

This report describes a stationary noise assessment performed for a proposed commercial development located at future Greenbank and Cambrian Road intersection in Ottawa, Ontario. The development consists of two single-storey buildings (Retail A and B), a two-storey building (Retail C) and a one-and-a-half-storey grocery store (Metro Food Store). Sources of stationary noise include rooftop air handling equipment, fans, refrigerated trailers (reefers) and delivery trucks, and an emergency generator. Figure 1 illustrates a site plan with the surrounding context.

The focus of this study is the exterior noise levels generated by the stationary noise sources. The assessment is based on (i) theoretical noise prediction methods that conform to the Ministry of the Environment, Conservation and Parks (MECP) and City of Ottawa requirements; (ii) noise level criteria as specified by the City of Ottawa's Environmental Noise Control Guidelines (ENCG); (iii) architectural drawings prepared by RLA Architecture.; (iv) mechanical equipment data provided by McGregor Allsop Consulting Engineers for the food store.; and (v) sound power data for garbage compactor, idling and moving trucks, and rooftop equipment on the other retail spaces were based on Gradient Wind's past experience with similar projects.

Our stationary noise assessment indicates that noise levels at nearby points of reception are expected to fall below the ENCG noise criteria provided that the assumptions outlined in Section 2.1 and the mitigation measures as indicated in Section 5 are followed and the sound power levels of the stationary noise sources don't exceed the levels shown in Table 2. As such, the proposed development is expected to be compatible with the existing and future noise-sensitive land uses. A review of final equipment selection and locations by a qualified acoustical engineer will be required prior to the installation of the equipment.

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Metro Ontario Inc. to undertake a stationary noise assessment for the proposed commercial development located at the intersection of future Greenbank and Cambrian Roads in Ottawa, Ontario. This report summarizes the methodology, results and recommendations related to a stationary noise assessment.

The present scope of work involves assessing the impact of the stationary noise sources of the proposed development on the surrounding residential neighbourhood. The assessment was performed based on theoretical noise calculation methods conforming to the City of Ottawa[1] and Ministry of the Environment, Conservation and Parks (MECP) NPC-300[2] guidelines, architectural drawings prepared by RLA Architecture, mechanical equipment data provided by McGregor Allsop Consulting Engineers, surrounding street layouts obtained from the City of Ottawa, and recent site imagery. The sound power data for the garbage compactor, idling trucks, and rooftop equipment on the retail buildings are based on Gradient Wind's past experience with similar projects.

2. TERMS OF REFERENCE

The focus of this stationary noise assessment is a proposed commercial development located at the southeast corner of future Greenbank and Cambrian Road intersection in Ottawa, Ontario. The development consists of two single-storey buildings (Retail A and B), a two-storey building (Retail C) and a one-and-a-half-storey grocery store (Metro Food Store). A loading dock serving the food store is located in the southeast corner of the site. Sources of stationary noise include rooftop air handling equipment, fans, condensers, refrigerated trailers (reefers), garbage compactor, and an emergency generator.

The site is surrounded by low-rise residential buildings and green space on the south and east side. Future Cambrian Road is located along the north side and future Greenbank Road along the west side of the development site. Figure 1 illustrates the site plan and the surrounding context.

[1] City of Ottawa Environmental Noise Control Guidelines, January 2016
[2] Ministry of the Environment, Conservation and Parks (MECP), Environmental Noise Guideline – Publication NPC-300, August 2013

2.1 Assumptions

The sound power levels of the rooftop air handling units, fans, condenser, and the generator for the food store are based on manufacturer data provided by McGregor Allsop Consulting Engineers. Sound power data for the rooftop equipment on the retail buildings are based on Gradient Wind's experience. A review of the equipment selections and locations that will form the requirements of the construction documents/contract has been made by a qualified acoustical engineer; final equipment selections will be verified to meet or exceed the performance requirements prior to the installation of the equipment.

The following assumptions have been made in the analysis:

(i) The sound power levels of the rooftop air handling units, fans, condenser, and the generator for the food store are based on the data provided by McGregor Allsop Consulting Engineers.

(ii) Sound power data for garbage compactor, idling & moving trucks, and rooftop equipment on the retail buildings are based on Gradient Wind's past experience with similar projects.

(iii) The rooftop air handling units, fans, and the condenser are assumed to operate continuously over a 1-hour period during the daytime periods and at 50% during the nighttime periods.

(iv) The generator is assumed to be running in parallel continuously over a 1-hour period during the daytime period.

(v) The ground region was modelled as reflective ground due to the presence of pavement (hard ground). The ground was also assumed to be flat.

(vi) A total of 17 receptors, each Plane of Window (POW) receptor having two different heights, were strategically placed on the closest noise-sensitive buildings in the surrounding area. The location of the receptors can be seen in Figure 2.

3. OBJECTIVES

The main goals of this work are to (i) calculate the future noise levels on the neighbouring noise-sensitive buildings produced by stationary sources of the proposed development and (ii) ensure that exterior noise levels do not exceed the allowable limits specified by the ENCG, as outlined in Section 4 of this report.

4. METHODOLOGY

The impact of the external stationary noise sources on the nearby noise-sensitive areas was determined by computer modelling. Stationary noise source modelling is based on the software program *Predictor-Lima* developed from the International Standards Organization (ISO) standard 9613 Parts 1 and 2. This computer program simulates three-dimensional surfaces and first reflections of sound waves over a suitable spectrum for human hearing. This methodology has been used on numerous assignments and has been accepted by the MECP as part of Environmental Compliance Approvals applications. 17 receptor locations were selected for the study site, as illustrated in Figure 2.

4.1 Perception of Noise

Noise can be defined as any obtrusive sound. It is created at a source, transmitted through a medium, such as air, and intercepted by a receiver. Noise may be characterized in terms of the power of the source or the sound pressure at a specific distance. While the power of a source is characteristic of that source, the sound pressure depends on the location of the receiver and the path that the noise takes to reach the receiver. Its measurement is based on the decibel unit, dBA, which is a logarithmic ratio referenced to a standard noise level (2×10^{-5} Pascals). The 'A' suffix refers to a weighting scale, which represents the noise perceived by the human ear. With this scale, a doubling of sound power at the source results in a 3 dBA increase in measured noise levels at the receiver and is just perceptible to most people. An increase of 10 dBA is often perceived to be twice as loud.

Stationary sources are defined in the ENCG as "all sources of sound and vibration, whether fixed or mobile, that exist or operate on a premises, property or facility, the combined sound and vibration levels of which are emitted beyond the property boundary of the premises, property or facility, unless the source(s) is (are) due to construction" [3].

4.2 Stationary Noise Criteria

The equivalent sound energy level, Leq, provides a weighted measure of the time-varying noise levels, which is well correlated with the annoyance of sound. It is defined as the continuous sound level, which has the same energy as a time-varying noise level over a selected period of time. For stationary sources,

[3] City of Ottawa Environmental Noise Control Guidelines, page 10

the Leq is commonly calculated on an hourly interval, while for roadways, the Leq is calculated on the basis of a 16-hour daytime/8-hour nighttime split.

Noise criteria taken from the ENCG and NPC-300 apply to points of reception (POR). A POR is defined under the ENCG as "any location on a noise-sensitive land use where noise from a stationary source is received"[4]. A POR can be located on an existing or zoned for future use premises of permanent or seasonal residences, hotels/motels, nursing/retirement homes, rental residences, hospitals, campgrounds, and noise-sensitive buildings such as schools and daycares. As the site is bordered by two arterial roads, the area is considered as a Class 1 area as per the ENCG. The recommended maximum noise levels for a Class 1 area at a POR are outlined in Table 1 below.

TABLE 1: EXCLUSIONARY LIMITS FOR CLASS 1 AREA

Time of Day	Point of Reception (POR)	
	Outdoor Points of Reception (OPOR)	Plane of Window (POW)
07:00 – 19:00	50	50
19:00 – 23:00	50	50
23:00 – 07:00	N/A	45

4.3 Determination of Noise Source Power Levels

Table 2 summarizes the sound power of each source used in the analysis. As per NPC-300, the generator was evaluated separately from other sources. The stationary noise source locations can be seen in Figure 3.

[4] City of Ottawa Environmental Noise Guidelines, page 9

TABLE 2: EQUIPMENT SOUND POWER LEVELS (DBA)

Source ID	Description	Height Above Grade (m)	Frequency (Hz)								
			63	125	250	500	1000	2000	4000	8000	Total
S1	RTU-01 – Food Store	9		63	66	70	71	68	62	53	**75**
S2	RTU-02– Food Store	9		62	66	70	69	66	60	50	**74**
S1	RTU-03– Food Store	9	78	83	86	91	89	87	84	82	**96**
S2	RTU-04– Food Store	9	70	75	78	83	82	79	76	73	**88**
S3	RTU-05– Food Store	9	70	75	78	83	82	79	76	73	**88**
S4	EF-01	7.7	--	--	--	--	77	--	--	--	**77**
S5	EF-02	7.7	--	--	--	--	77	--	--	--	**77**
S6	EF-03	7.7	--	--	--	--	76	--	--	--	**76**
S7	EF-04	7.7	--	--	--	--	74	--	--	--	**74**
S8	EF-05	7.7	--	--	--	--	74	--	--	--	**74**
S9	EF-06	7.7	--	--	--	--	67	--	--	--	**67**
S10	CEF-01	7.7	--	--	--	--	85	--	--	--	**85**
S11	Generator	9	86	90	87	90	84	81	76	69	**95**
S12	Condenser	9	--	--	--	--	90.5	--	--	--	**90.5**
S13	Garbage Compactor	0.5	--	--	--	--	95	--	--	--	**95**
S14	Idling Reefer	2.7	--	--	--	--	101	--	--	--	**101**
S15	Truck Route	2.7	65	72	76	85	90	89	83	74	**94**
S16, S17, S18, S19	RTU (Retail A)	6	67	72	75	80	79	76	73	70	**85**
S20, S21, S22, S23	RTU (Retail B)	6	67	72	75	80	79	76	73	70	**85**
S24, S25	RTU (Retail C)	11	67	72	75	80	79	76	73	70	**85**

4.4 Stationary Source Noise Predictions

A total of 17 receptor locations were chosen on the surrounding noise-sensitive buildings to measure the noise impact at the outdoor point of reception (OPOR) and plane of window (POW) receptors during the daytime/evening period (07:00 – 23:00), as well as during the nighttime period (23:00 – 07:00). Receptor locations are described in Table 4 and illustrated in Figure 2. At each POW receptor location, the noise was assessed at 2 different heights for a total of 20 discrete points of reception. Besides POW receptors, the noise levels investigated at 7 different OPOR locations. All mechanical units were represented as point sources in the Predictor model. Table 3 below contains Predictor-Lima calculation settings. These are typical settings that have been based on ISO 9613 standards and guidance from the MECP.

Ground absorption over the study area was determined based on topographical features (such as water, concrete, grassland, etc.). An absorption value of 0 is representative of hard ground, while a value of 1 represents grass and similar soft surface conditions. Existing and proposed buildings were added to the model to account for screening and reflection effects from building façades. A Predictor-Lima sample output is available upon request.

TABLE 3: CALCULATION SETTINGS

Parameter	Setting
Meteorological correction method	Single value for C0
Value C0	2.0
Ground attenuation factor for roadways and paved areas	0
Temperature (K)	283.15
Pressure (kPa)	101.33
Air humidity (%)	70

TABLE 4: RECEPTOR LOCATIONS

Receptor Number	Receptor Type	Receptor Location	Height Above Grade (m)
R1	POW	2440-2442 Nutgrove Ave – West Façade	4.5
			1.5
R2	POW	2448 Nutgrove Ave – West Façade	4.5
			1.5
R3	POW	2456 Nutgrove Ave – West Façade	4.5
			1.5
R4	POW	2462 Nutgrove Ave – West Façade	4.5
			1.5
R5	POW	2470 Nutgrove Ave – West Façade	4.5
			1.5
R6	POW	2472 Nutgrove Ave – West Façade	4.5
			1.5
R7	OPOR	2440-2442 Nutgrove Ave - Backyard	1.5
R8	OPOR	2448 Nutgrove Ave – Backyard	1.5
R9	OPOR	2456-2462 Nutgrove Ave – Backyard	1.5
R10	OPOR	2470 Nutgrove Ave – Backyard	1.5
R11	OPOR	2472 Nutgrove Ave – Backyard	1.5
R12	POW	245 Pastel Way – North Facade	4.5
			1.5
R13	POW	278 Pastel Way – North Facade	4.5
			1.5
R14	POW	700 Egret Way – North Facade	4.5
			1.5
R15	POW	696 Egret Way – North Facade	4.5
			1.5
R16	OPOR	Greenbank Road West Side	1.5
R17	OPOR	Greenbank Road West Side	1.5

5. RESULTS AND MITIGATION MEASURES

The preliminary calculations showed that the impact of the proposed equipment on the closest residential buildings will exceed the ENCG required criteria, therefore noise mitigation will be required. In order to control noise levels, mitigation measures were investigated. The results of the calculations without any mitigation measures can be seen in Table 5.

TABLE 5: HVAC NOISE LEVELS WITHOUT MITIGATION MEASURES

Receptor Number	Receptor Type	Height Above Grade (m)	Noise Level (dBA)		Sound Level Limits		Meets ENCG Class 1 Criteria	
			Day*	Night	Day*	Night	Day*	Night
R1	POW	4.5	60	48	50	45	**No**	**No**
		1.5	60	45	50	45	**No**	Yes
R2	POW	4.5	52	46	50	45	**No**	**No**
		1.5	50	43	50	45	Yes	Yes
R3	POW	4.5	43	40	50	45	Yes	Yes
		1.5	41	38	50	45	Yes	Yes
R4	POW	4.5	44	40	50	45	Yes	Yes
		1.5	42	38	50	45	Yes	Yes
R5	POW	4.5	45	41	50	45	Yes	Yes
		1.5	43	38	50	45	Yes	Yes
R6	POW	4.5	44	40	50	45	Yes	Yes
		1.5	41	38	50	45	Yes	Yes
R7	OPOR	1.5	45	40	50	45	Yes	N/A
R8	OPOR	1.5	44	41	50	45	Yes	N/A
R9	OPOR	1.5	60	50	50	45	**No**	N/A
R10	OPOR	1.5	60	47	50	45	**No**	N/A
R11	OPOR	1.5	56	49	50	45	**No**	N/A
R12	POW	4.5	55	46	50	45	**No**	**No**
		1.5	55	48	50	45	**No**	**No**
R13	POW	4.5	53	46	50	45	**No**	**No**
		1.5	54	48	50	45	**No**	**No**
R14	POW	4.5	52	45	50	45	**No**	Yes
		1.5	53	49	50	45	**No**	**No**
R15	POW	4.5	50	43	50	45	Yes	Yes
		1.5	61	45	50	45	**No**	Yes
R16	OPOR	1.5	60	47	50	45	**No**	N/A
R17	OPOR	1.5	55	46	50	45	**No**	N/A

* Day values include both day and evening results.

The measures listed below should be followed in order to provide required noise levels:

- 5 m high noise barrier wall on the east side of the development site (see Figure 4).
- 1.2 m high parapet wall around the rooftop units of Retail A, B and Food Store was used in the calculations. The parapet wall of Retail C is 0.5 m tall aa there are no noise-sensitive buildings that Retail C is close to.

The parapet walls and the noise barrier wall should be built with a minimum surface mass of 20 kg/m² and without any gaps. The mitigation measures are summarized in Figure 4. The noise level results with the mitigation measures can be seen in Table 6.

TABLE 6: NOISE LEVELS WITH 5 M HIGH NOISE BARRIER

Receptor Number	Receptor Type	Height Above Grade (m)	Noise Level (dBA)		Sound Level Limits		Meets ENCG Class 1 Criteria	
			Day*	Night	Day*	Night	Day*	Night
R1	POW	4.5	50	40	50	45	Yes	Yes
		1.5	41	30	50	45	Yes	Yes
R2	POW	4.5	50	41	50	45	Yes	Yes
		1.5	40	30	50	45	Yes	Yes
R3	POW	4.5	48	40	50	45	Yes	Yes
		1.5	39	31	50	45	Yes	Yes
R4	POW	4.5	47	40	50	45	Yes	Yes
		1.5	40	34	50	45	Yes	Yes
R5	POW	4.5	49	44	50	45	Yes	Yes
		1.5	47	43	50	45	Yes	Yes
R6	POW	4.5	50	44	50	45	Yes	Yes
		1.5	49	40	50	45	Yes	Yes
R7	OPOR	1.5	41	28	50	45	Yes	N/A
R8	OPOR	1.5	41	28	50	45	Yes	N/A
R9	OPOR	1.5	36	29	50	45	Yes	N/A
R10	OPOR	1.5	50	43	50	45	Yes	N/A
R11	OPOR	1.5	49	40	50	45	Yes	N/A
R12	POW	4.5	43	40	50	45	Yes	Yes
		1.5	41	38	50	45	Yes	Yes
R13	POW	4.5	44	40	50	45	Yes	Yes
		1.5	42	38	50	45	Yes	Yes
R14	POW	4.5	44	40	50	45	Yes	Yes
		1.5	42	37	50	45	Yes	Yes
R15	POW	4.5	43	39	50	45	Yes	Yes
		1.5	41	37	50	45	Yes	Yes
R16	OPOR	1.5	42	39	50	45	Yes	N/A
R17	OPOR	1.5	42	39	50	45	Yes	N/A

* Day values include both day and evening results

Generator noise levels at all receptors will be within the ENCG criteria as can be seen in Table 7, provided that the generator noise levels do not exceed the levels listed in Table 2.

TABLE 7: GENERATOR NOISE LEVELS

Receptor Number	Receptor Type	Height Above Grade (m)	Noise Level (dBA)		Sound Level Limits		Meets ENCG Class 1 Criteria	
			Day	Night	Day	Night	Day	Night
R1	POW	4.5	49	N/A	55	N/A	Yes	N/A
		1.5	42	N/A	55	N/A	Yes	N/A
R2	POW	4.5	49	N/A	55	N/A	Yes	N/A
		1.5	41	N/A	55	N/A	Yes	N/A
R3	POW	4.5	47	N/A	55	N/A	Yes	N/A
		1.5	39	N/A	55	N/A	Yes	N/A
R4	POW	4.5	46	N/A	55	N/A	Yes	N/A
		1.5	38	N/A	55	N/A	Yes	N/A
R5	POW	4.5	44	N/A	55	N/A	Yes	N/A
		1.5	44	N/A	55	N/A	Yes	N/A
R6	POW	4.5	42	N/A	55	N/A	Yes	N/A
		1.5	42	N/A	55	N/A	Yes	N/A
R7	OPOR	1.5	42	N/A	55	N/A	Yes	N/A
R8	OPOR	1.5	41	N/A	55	N/A	Yes	N/A
R9	OPOR	1.5	39	N/A	55	N/A	Yes	N/A
R10	OPOR	1.5	44	N/A	55	N/A	Yes	N/A
R11	OPOR	1.5	43	N/A	55	N/A	Yes	N/A
R12	POW	4.5	39	N/A	55	N/A	Yes	N/A
		1.5	39	N/A	55	N/A	Yes	N/A
R13	POW	4.5	40	N/A	55	N/A	Yes	N/A
		1.5	39	N/A	55	N/A	Yes	N/A
R14	POW	4.5	40	N/A	55	N/A	Yes	N/A
		1.5	39	N/A	55	N/A	Yes	N/A
R15	POW	4.5	39	N/A	55	N/A	Yes	N/A
		1.5	38	N/A	55	N/A	Yes	N/A
R16	OPOR	1.5	39	N/A	55	N/A	Yes	N/A
R17	OPOR	1.5	35	N/A	55	N/A	Yes	N/A

6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current study indicate that noise levels at nearby points of reception are expected to fall below the ENCG noise criteria provided that the assumptions outlined in Section 2.1 and the mitigation measures as indicated in Section 5 are followed and the sound power levels of the stationary noise sources don't exceed the levels shown in Table 2.

As such, the proposed development is expected to be compatible with the existing and future noise-sensitive land uses. A review of the equipment selections and locations that will form the requirements of the construction documents/contract has been made by a qualified acoustical engineer; final equipment selections will be verified to meet or exceed the performance requirements prior to the installation of the equipment.

To ensure compliance with the ENCG, one of the noise control measures recorded in Section 5 should be adhered to.

This concludes our assessment and report. If you have any questions or wish to discuss our findings, please advise us. In the interim, we thank you for the opportunity to be of service.

Sincerely,

Gradient Wind Engineering Inc.

LICENSED PROFESSIONAL ENGINEER
J. R. FOSTER
100155655
Aug 26, 2020
PROVINCE OF ONTARIO

Efser Kara, MSc, LEED GA
Acoustic Scientist

Joshua Foster, P.Eng.
Principal

Gradient Wind File #20-153 – Stationary Noise

GRADIENTWIND
ENGINEERS & SCIENTISTS

127 WALGREEN ROAD , OTTAWA, ON
613 836 0934 • GRADIENTWIND.COM

PROJECT	1949 GREENBANK ROAD STATIONARY NOISE ASSESSMENT
SCALE	1:1500 (APPROX.)
DRAWING NO.	GW20-153-1
DATE	AUGUST 24, 2020
DRAWN BY	E.K.

DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT

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PROJECT	1949 GREENBANK ROAD STATIONARY NOISE ASSESSMENT		DESCRIPTION
SCALE	1:1500 (APPROX.)	DRAWING NO.	GW20-153-2
DATE	AUGUST 24, 2020	DRAWN BY	E.K.

FIGURE 2:
RECEPTOR LOCATIONS

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PROJECT	1949 GREENBANK ROAD STATIONARY NOISE ASSESSMENT		DESCRIPTION
SCALE	1:1000 (APPROX.)	DRAWING NO.	GW20-153-3
DATE	AUGUST 24, 2020	DRAWN BY	E.K.

FIGURE 3:
SOURCE LOCATIONS

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PROJECT	1949 GREENBANK ROAD STATIONARY NOISE ASSESSMENT		DESCRIPTION
SCALE	1:1000 (APPROX.)	DRAWING NO. GW20-153-4	FIGURE 4: MITIGATION MEASURES
DATE	AUGUST 24, 2020	DRAWN BY E.K.	

FIGURE 5: DAYTIME NOISE CONTOURS (4.5 M ABOVE GRADE)

FIGURE 6: NIGHTTIME NOISE CONTOURS (4.5 M ABOVE GRADE)

- *80 – 85 dB*
- *75 – 80 dB*
- *70 – 75 dB*
- *65 – 70 dB*
- *60 – 65 dB*
- *55 – 60 dB*
- *50 – 55 dB*
- *45 – 50 dB*
- *40 – 45 dB*
- *35 – 40 dB*
- *0 – 35 dB*