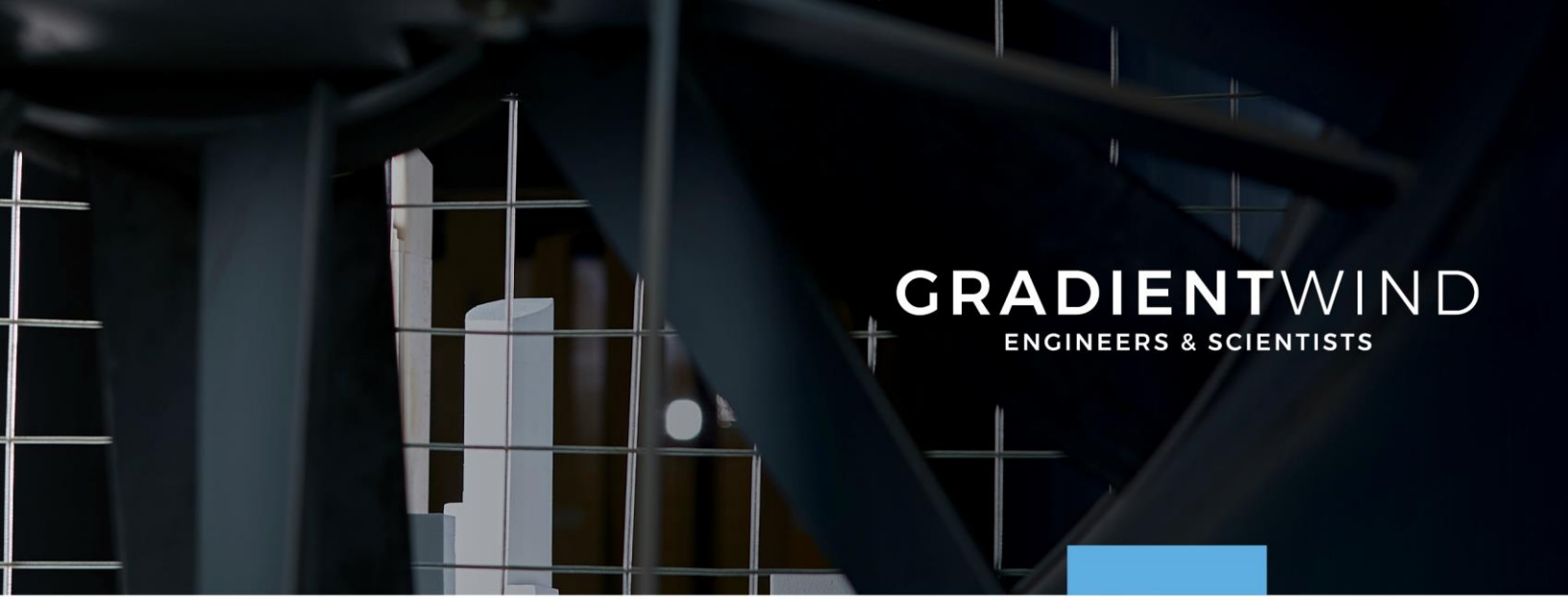

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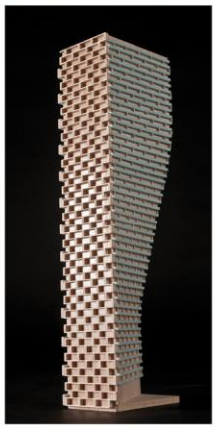
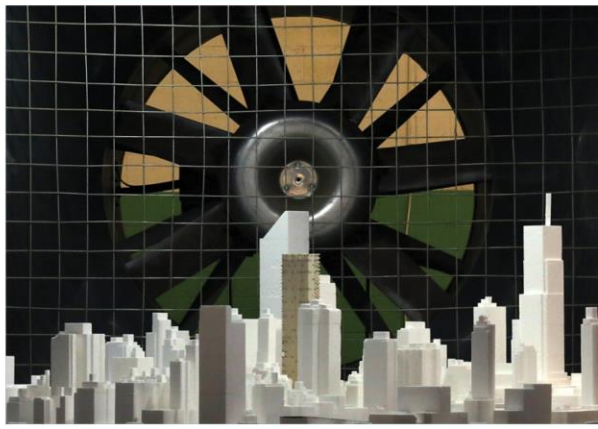
STATIONARY NOISE ASSESSMENT

Paul-Desmarais School
Ottawa, Ontario

REPORT: 22-232-Stationary Noise





February 2nd, 2023

PREPARED FOR

Conseil des Écoles Catholiques du Centre-Est
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PREPARED BY

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EXECUTIVE SUMMARY

This report describes a stationary noise assessment performed for the proposed addition to the Écoles Secondaries Catholique Paul-Desmarais, located at 5315 Abbott Street East in Stittsville (Ottawa), Ontario. The proposed development comprises a two-storey nominally rectangular addition to the school along the north elevation of the existing 2-storey secondary school. Sources of stationary noise included in this assessment are the four (4) rooftop units. Figure 1 illustrates a site plan with the surrounding context.

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); and (iii) mechanical engineering drawings and data provided by Goodkey, Weedmark & Associates Limited.

The results of the current study indicate that noise levels at nearby points of reception are expected to fall below the NPC-300 and ENCG noise criteria, provided that the assumptions for noise control as outlined in Section 2.1 are followed. As such, the proposed development is expected to be compatible with the existing and proposed noise-sensitive land uses and will satisfy all site plan conditions. A review of the final equipment selections 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 Conseil des Écoles Catholiques du Centre-Est (CECCE) to undertake a stationary noise assessment for the proposed addition to the Écoles Secondaries Catholique Paul-Desmarais, located at 5315 Abbott Street East in Stittsville (Ottawa), Ontario. This report summarizes the methodology, results and recommendations related to a stationary noise assessment.

The present scope of work involves assessing exterior noise levels generated by the rooftop units onto the school itself and neighbouring developments. 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, mechanical engineering drawings and data provided by Goodkey, Weedmark & Associates in September and October of 2022, surrounding street layouts obtained from the City of Ottawa, and recent site imagery.

2. TERMS OF REFERENCE

The focus of this stationary noise assessment is a proposed addition to the Écoles Secondaries Catholique Paul-Desmarais, located at 5315 Abbott Street East in Stittsville (Ottawa), Ontario. The proposed development comprises two-storey nominally rectangular addition to the school along the north elevation. The addition includes classrooms, washrooms, and storage at grade. On Level Two, there are additional classrooms, washrooms, and laboratories.

The development is surrounded by vacant land to the East and South, and industrial properties to the west. The study site is bounded by Abbott Street East to the south and Iber Road to the west.

As a conservative approach, the building equipment is assumed to operate at all hours of the day, with reduced operation during the nighttime period. Sources of stationary noise included in this study are four rooftop units, indicated in Figure 2.

[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 following assumptions have been made in the analysis, based on mechanical information provided by Goodkey, Weekmark & Associates:

(i) The locations and quantity of rooftop units have been based on mechanical drawings provided.

(ii) Sound data for all noise sources for the development have been based on sound power data provided.

(iii) The rooftop units operate at 75% fan speed as a worst case, based on manufacturer's data.

(iv) The rooftop units were assumed to operate continuously over a 1-hour period during the daytime and at 50% operation during the nighttime period.

(v) The ground region was conservatively modelled as reflective due to the presence of hard ground (pavement).

3. OBJECTIVES

The main goals of this work are to (i) calculate the future on-site and off-site noise levels produced by stationary sources 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 residential 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. Eighteen receptor locations were selected for the study site, as illustrated in Figure 3.

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 NPC-300 as "a source of sound or combination of sources of sound that are included and normally operated within the property lines of a facility and includes the premises of a person as one stationary source, unless the dominant source of sound on those premises is construction"[3].

4.2 Stationary Noise Criteria

The equivalent sound energy level, L_{eq}, 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, the L_{eq} is commonly calculated on an hourly interval, while for roadways, the L_{eq} 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 outdoor points of reception (POR). A POR is defined under NPC-300 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 places of worship. The recommended maximum noise levels for a Class 1 area in an urban environment adjacent to arterial roadways at a POR are outlined in Table 1 below. The study site is considered to be Class 1 as it is located within the "Urban

[3] NPC – 300, page 16
[4] NPC – 300, page 14

Area" boundary as defined in Schedule A and B of the City of Ottawa Official Plan[5]. These conditions indicate that the sound field is dominated by manmade sources.

Additionally, when analysing standby power equipment such as emergency generators, NPC-300 specifies a noise level limit of 55 dBA for daytime testing. Generators are also investigated separately, without the combined effect of other equipment.

TABLE 1: EXCLUSIONARY LIMITS FOR CLASS 1 AREA

Time of Day	Outdoor Points of Reception (dBA)	Plane of Window (dBA)
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

Mechanical information for the development was provided by Goodkey, Weedmark, & Associates Ltd. In October 2022. Table 2 summarizes the sound power of each source used in the analysis. The table summarizes the unmitigated noise levels based on the data provided.

TABLE 2: EQUIPMENT SOUND POWER LEVELS (dBA)

Source	Description	Height Above Roof (m)	Correction Applied	Sound Power (dBZ)								Total (dBA)
				63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
S1-S4	RTU 20- RTU 23	1.5	Unmitigated	93	88	84	83	78	75	72	71	**84**

[5] City of Ottawa Official Plan Vol 1: Section 6

4.4 Stationary Source Noise Predictions

The impact of stationary noise sources on nearby noise-sensitive areas was determined by computer modelling using the software program Predictor-Lima. This program was developed from the International Standards Organization (ISO) standard 9613 Parts 1 and 2 and is capable of representing three-dimensional surfaces and first reflections of sound waves over a suitable spectrum for human hearing. The methodology has been used on numerous assignments and has been accepted by the Ministry of the Environment, Conservation and Parks (MECP) as part of Environmental Compliance Approval applications.

A total of eighteen receptor locations were chosen around the site to measure the noise impact at points of reception (POR) during the daytime/evening period (07:00 – 23:00), as well as during the nighttime period (23:00 – 07:00). POR locations include outdoor points of reception (OPOR) and the plane of windows (POW) of the adjacent residential properties. Sensor locations are described in Table 4 and illustrated in Figure 3. The units were represented as point sources and emitting facade objects 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. Predictor-Lima modelling data 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 lawn areas	1
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 Location	Height Above Grade/Roof (m)
R1	327 Livery Street – North Façade	4.5
R2	327 Livery Street – West Façade	4.5
R3	Paul-Desmarais Secondary (Existing Main Building) – North Façade	4.5
R4	Paul-Desmarais Secondary (Existing Main Building) – East Façade	4.5
R5	Paul-Desmarais Secondary (Existing Main Building) – North Façade	4.5
R6	335 Livery Street – North Façade	4.5
R7	335 Livery Street – West Façade	4.5
R8	721 Putney Crescent – North façade	4.5
R9	721 Putney Crescent – East Façade	4.5
R10	Future Development opposite Robert Grant Avenue	4.5
R11	Future Development opposite Robert Grant Avenue	4.5
R12	Future Development opposite Robert Grant Avenue	4.5
R13	Future Development opposite Robert Grant Avenue	4.5
R14	Future Development opposite Robert Grant Avenue	4.5
R15	Paul-Desmarais Secondary (040)* – South Façade	1.5
R16	Paul-Desmarais Secondary (040)* – East Façade	1.5
R17	Paul-Desmarais Secondary (080)* – North Façade	1.5
R18	Paul-Desmarais Secondary (113)* – North Façade	1.5

*Portable Classrooms

5. RESULTS AND DISCUSSION

Noise levels on the surroundings and the existing school produced by the mechanical equipment associated with the proposed development are presented in Tables 5. The sound levels are based on the assumptions outlined in Section 2.1.

TABLE 5: NOISE LEVELS FROM HVAC STATIONARY SOURCES

Receptor Number	Receptor Location	Height Above Grade/Roof (m)	Noise Level (dBA)		Sound Level Limits		Meets ENCG Class 1 Criteria	
			Day	Night	Day	Night	Day	Night
R1	327 Livery Street – North Façade	4.5	31	28	50	45	**Yes**	**Yes**
R2	327 Livery Street – West Façade	4.5	31	28	50	45	**Yes**	**Yes**
R3	Paul-Desmarais Secondary (Existing Main Building) – North Façade	4.5	47	N/A*	50	N/A*	**Yes**	**N/A***
R4	Paul-Desmarais Secondary (Existing Main Building) – East Façade	4.5	37	N/A*	50	N/A*	**Yes**	**N/A***
R5	Paul-Desmarais Secondary (Existing Main Building) – North Façade	4.5	47	N/A*	50	N/A*	**Yes**	**N/A***
R6	335 Livery Street – North Façade	4.5	31	28	50	45	**Yes**	**Yes**
R7	335 Livery Street – West Façade	4.5	30	27	50	45	**Yes**	**Yes**
R8	721 Putney Crescent – North façade	4.5	28	25	50	45	**Yes**	**Yes**
R9	721 Putney Crescent – East Façade	4.5	28	25	50	45	**Yes**	**Yes**
R10	Future Development opposite Robert Grant Avenue	4.5	40	37	50	45	**Yes**	**Yes**
R11	Future Development opposite Robert Grant Avenue	4.5	42	39	50	45	**Yes**	**Yes**
R12	Future Development opposite Robert Grant Avenue	4.5	42	39	50	45	**Yes**	**Yes**
R13	Future Development opposite Robert Grant Avenue	4.5	43	40	50	45	**Yes**	**Yes**
R14	Future Development opposite Robert Grant Avenue	4.5	43	40	50	45	**Yes**	**Yes**
R15	Paul-Desmarais Secondary (040) – South Façade	1.5	40	N/A*	50	N/A*	**Yes**	**N/A***

*The school is not expected to be occupied during the nighttime.

TABLE 5 (CONTINUED): NOISE LEVELS FROM HVAC STATIONARY SOURCES

Receptor Number	Receptor Location	Height Above Grade/Roof (m)	Noise Level (dBA)		Sound Level Limits		Meets ENCG Class 1 Criteria	
			Day	Night	Day	Night	Day	Night
R16	Paul-Desmarais Secondary (040) – East Façade	1.5	37	N/A*	50	N/A*	**Yes**	**N/A***
R17	Paul-Desmarais Secondary (080) – South Façade	1.5	37	N/A*	50	N/A*	**Yes**	**N/A***
R18	Paul-Desmarais Secondary (113) – South Façade	1.5	37	N/A*	50	N/A*	**Yes**	**N/A***

*The school is not expected to be occupied during the nighttime.

As Table 5 summarizes, noise levels fall below ENCG criteria at all receptors. Noise contours at 4.5 meters above grade for HVAC equipment sources can be seen in Figures 4-5 for daytime and nighttime conditions. The current selection for the rooftop units, operating at 75% fan speed, achieves noise impacts that comply with NPC-300 and ENCG guidelines.

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 NPC-300 and ENCG noise criteria, provided that the assumptions for noise control as outlined in Section 2.1 are followed and the rooftop units sound power levels comply with Table 2.

As such, the proposed development is expected to be compatible with the existing and proposed noise-sensitive land uses and will satisfy all site plan conditions. A review of the final equipment selections and locations by a qualified acoustical engineer will be required prior to the installation of the equipment.

This concludes our stationary noise 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.

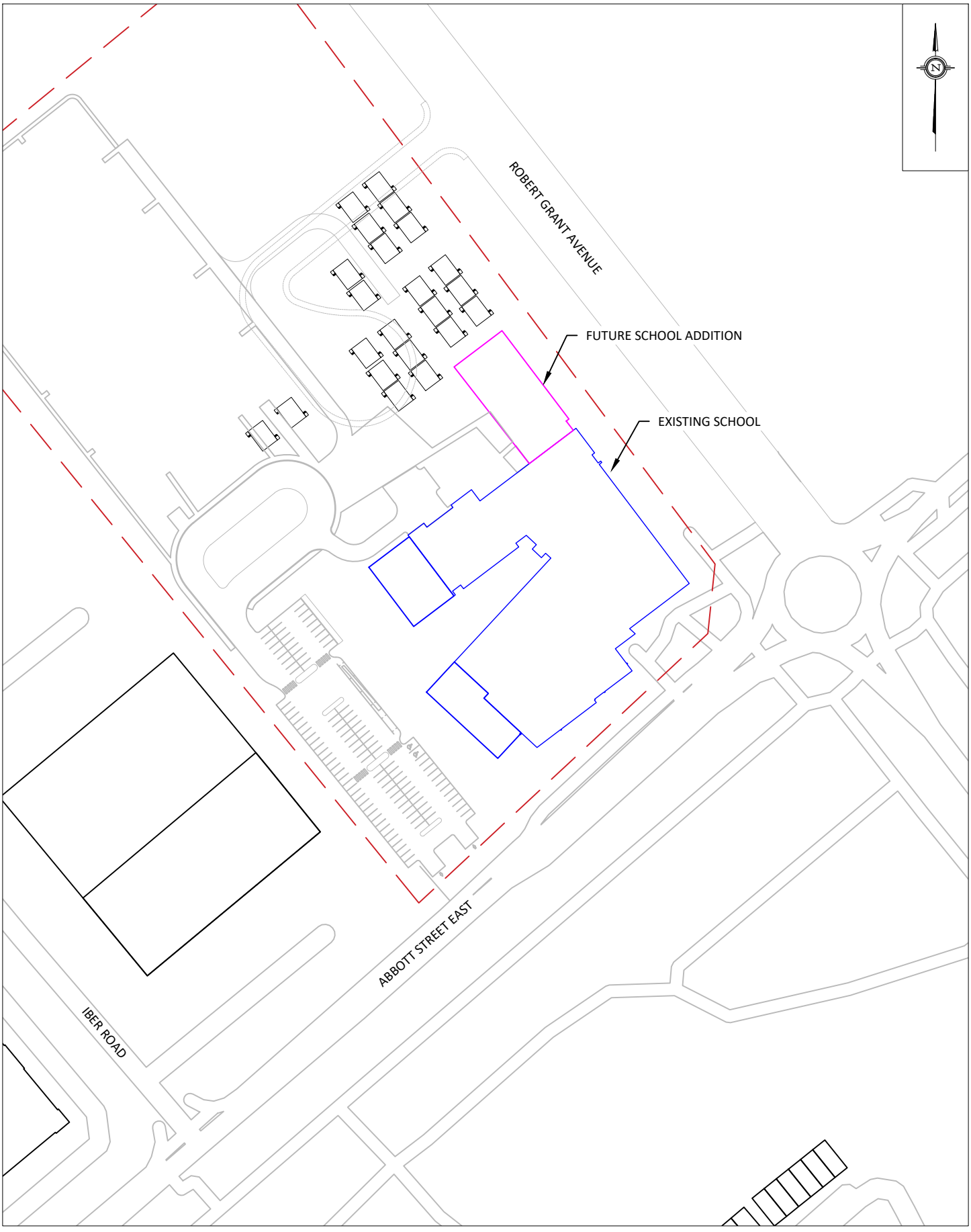
Sincerely,

Gradient Wind Engineering Inc.

Essraa Alqassab, BASc
Junior Environmental Scientist

Joshua Foster, P.Eng.
Lead Engineer

Gradient Wind File #22-232 – Stationary Noise



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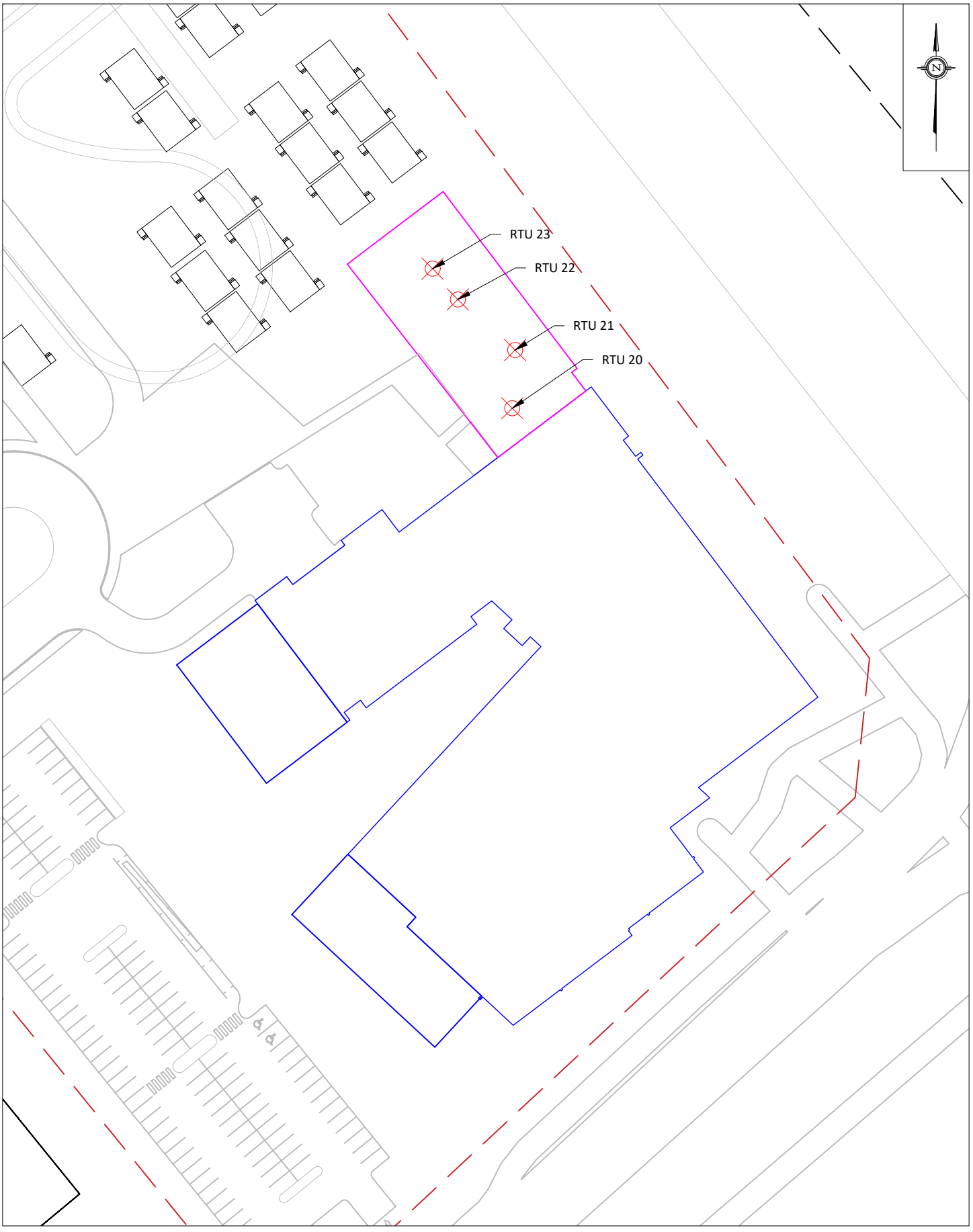
PROJECT	PAUL-DESMARAIS SECONDARY SCHOOL, OTTAWA STATIONARY NOISE ASSESSMENT		DESCRIPTION
SCALE	1:4000 (APPROX.)	DRAWING NO.	GW22-232-1
DATE	OCTOBER 4 2022	DRAWN BY	E.A.

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT



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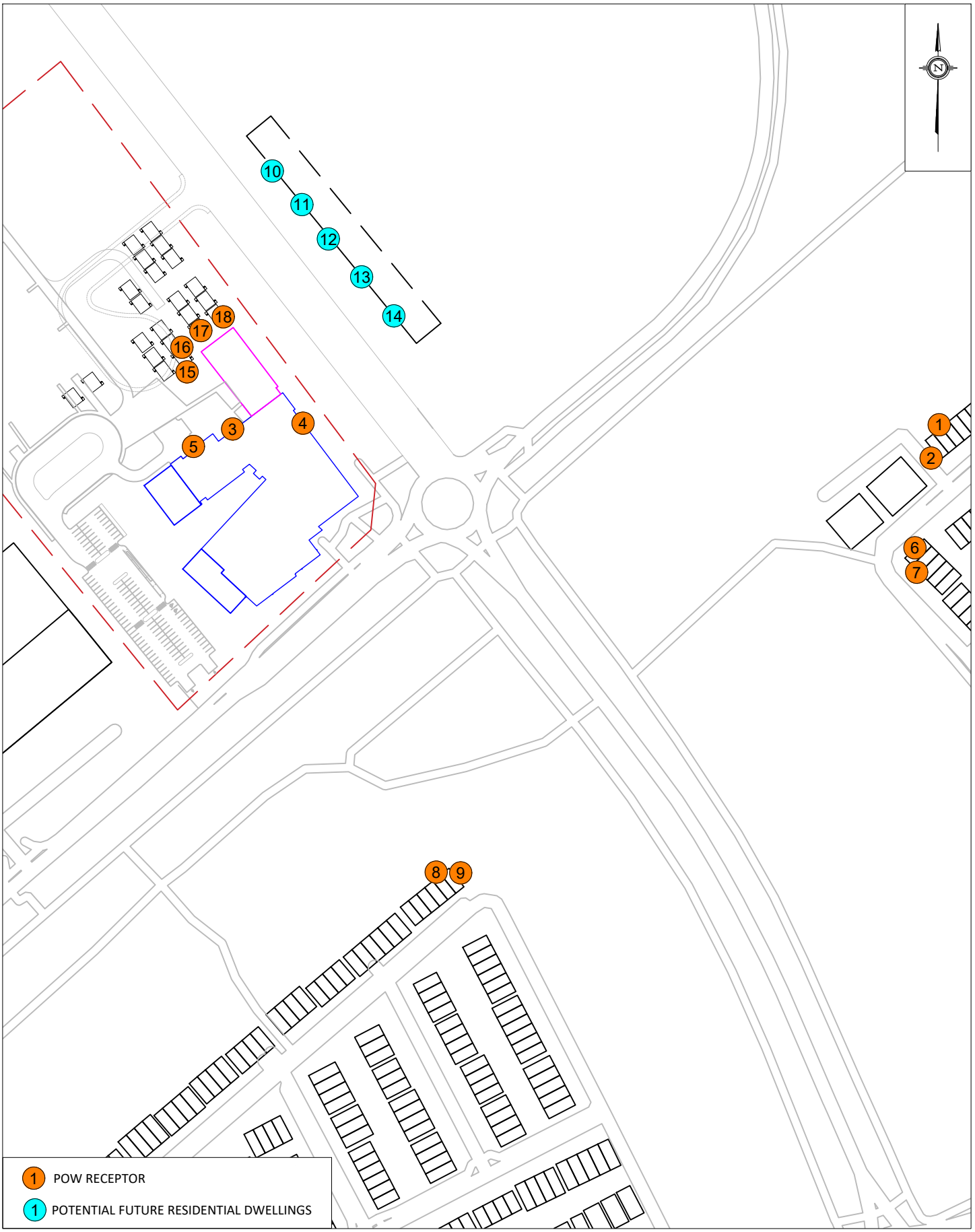
PROJECT	PAUL-DESMARAIS SECONDARY SCHOOL, OTTAWA STATIONARY NOISE ASSESSMENT		DESCRIPTION
SCALE	1:1000 (APPROX.)	DRAWING NO.	GW22-232-2
DATE	OCTOBER 4 2022	DRAWN BY	E.A.

FIGURE 2:
SOURCE LOCATIONS



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PROJECT	PAUL-DESMARAIS SECONDARY SCHOOL, OTTAWA STATIONARY NOISE ASSESSMENT		DESCRIPTION
SCALE	1:3000 (APPROX.)	DRAWING NO.	GW22-232-3
DATE	OCTOBER 4 2022	DRAWN BY	E.A.

FIGURE 3:
RECEPTOR LOCATIONS

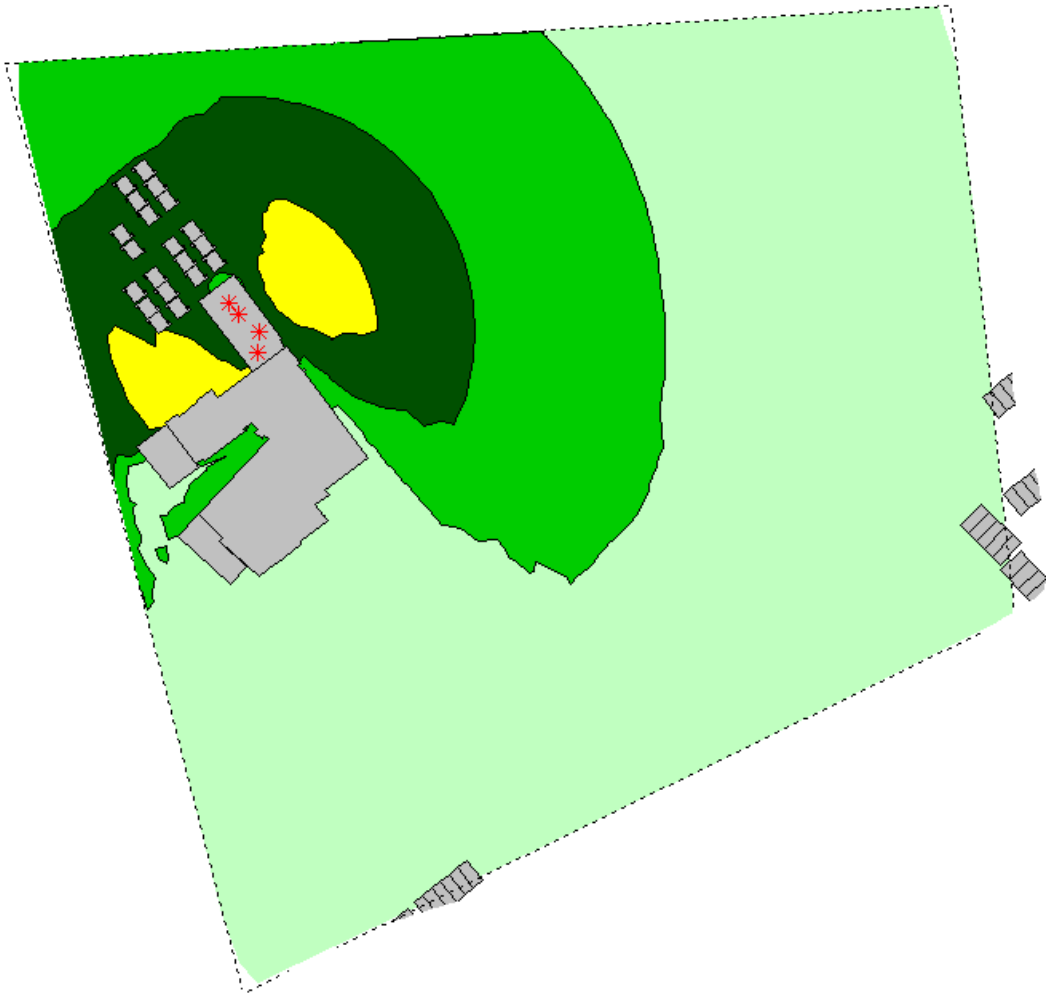

FIGURE 4: DAYTIME STATIONARY NOISE CONTOURS (4.5 METERS ABOVE GRADE)

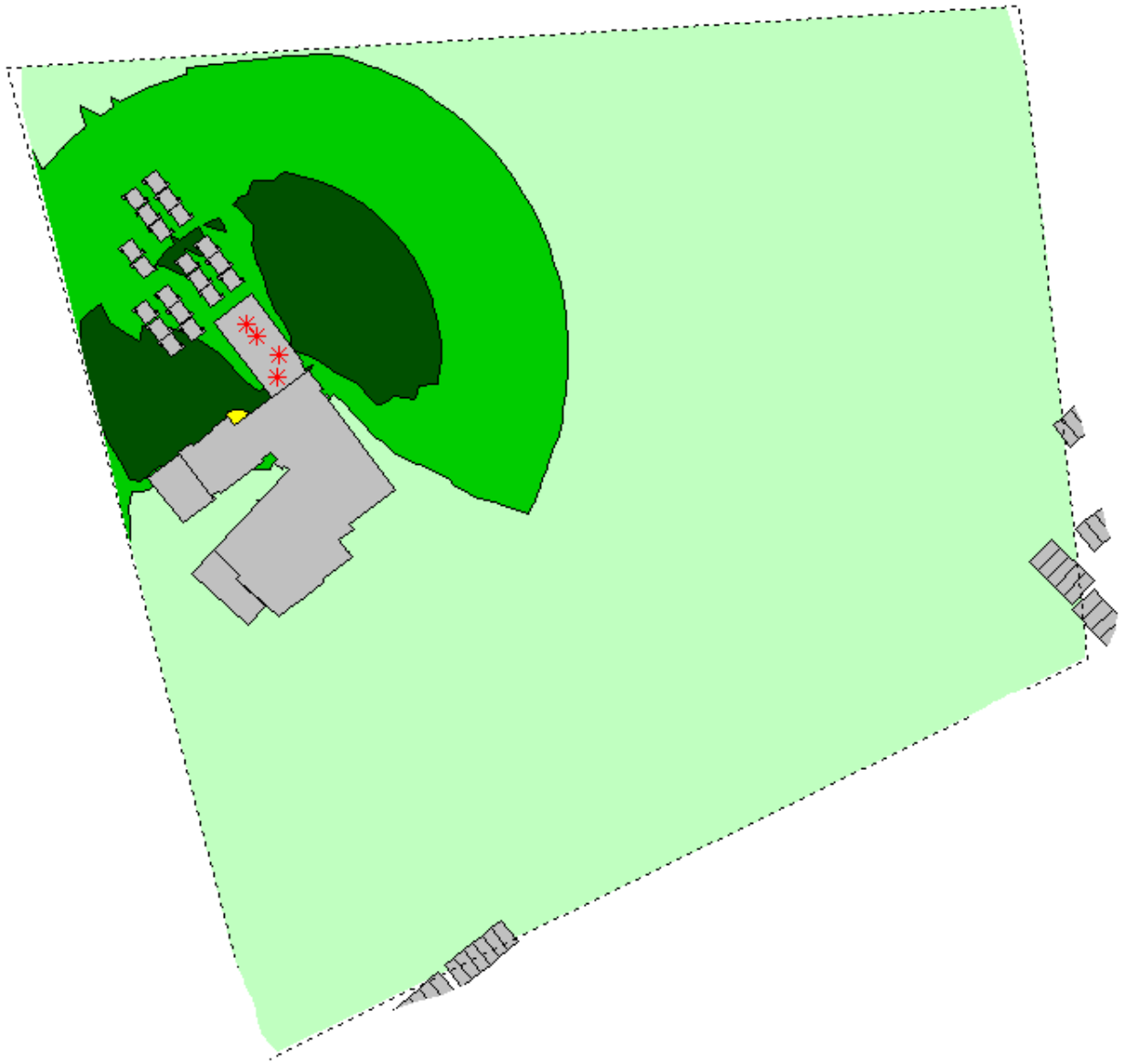

FIGURE 5: NIGHTTIME STATIONARY NOISE CONTOURS (4.5 METERS ABOVE GRADE)

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