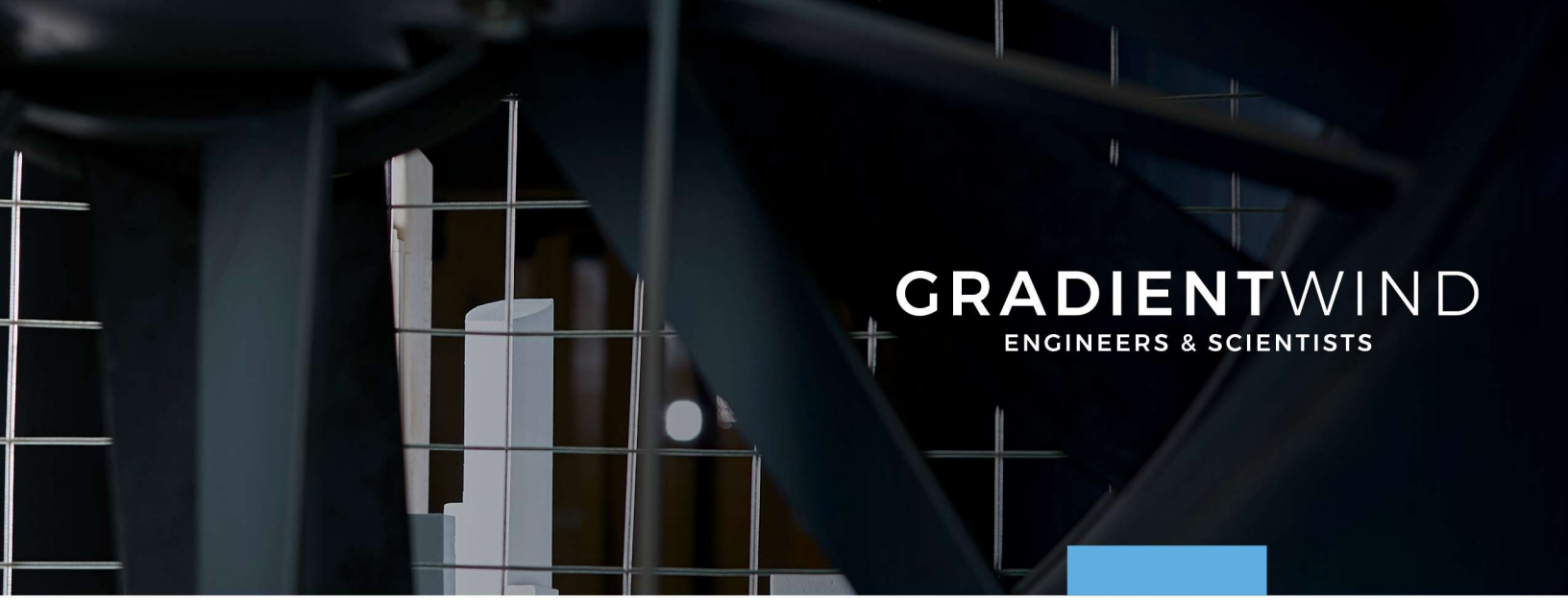
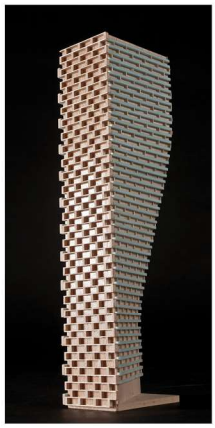


GRADIENTWIND
ENGINEERS & SCIENTISTS

STATIONARY NOISE ASSESSMENT

St. Laurent Volvo
1328 Michael Street, Ottawa, Ontario

REPORT: GW21-168-Stationary Noise



January 18, 2022

PREPARED FOR

Bytek Volkswagen
1325 St. Laurent Boulevard
Ottawa, ON K1G 0Z7

PREPARED BY

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EXECUTIVE SUMMARY

This report describes a stationary noise assessment performed for the proposed car dealership located at 1328 Michael Street in Ottawa, Ontario. The development comprises a two-storey dealership located on the southeast side of a triangular property parcel, at the northwest intersection of Michael Street and Parisien Street. Sources of stationary noise include rooftop air handling equipment, and service garage doors.

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) architectural drawings prepared by Brian K. Clark Architect dated October 14, 2021.

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 for noise control as outlined in Section 2.1 are adhered to during the detailed design process. The main contributor of noise at the points of reception are the rooftop air handling units. The loudest rooftop equipment should be located toward the centre of the rooftop, avoiding direct line of sight with sensitive areas if possible. With consideration of Gradient Wind's recommendations, the proposed development is expected to be compatible with the existing 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 installation of the equipment.

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1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Bytek Volkswagen to undertake a stationary noise assessment for the proposed car dealership (St. Laurent Volvo) development located at 1328 Michael Street in 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 rooftop mechanical equipment and automotive shop operations. 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 Brian K. Clark Architect dated October 14, 2021, mechanical information assumed by Gradient Wind based on experience with similar projects, 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 the proposed development located on a triangular parcel of land bounded by Michael Street from the west to the east and Parisien Street to the south. There is an existing dealership on the north/northeast side of the site. The proposed development will comprise a two-storey dealership located on the southeast side of the property at the northwest intersection of Michael Street and Parisien Street. The primary building access point (entrance) will be provided on the west side of the building, with vehicular access provided via both Michael Street and Parisien Street. Workshop space, storage, offices, reception, and a service drive-through occupy the ground floor with administrative space occupying the second floor.

The expected operating hours of the business are during daytime hours, between 07:00 and 19:00. Sources of stationary noise include rooftop air handling equipment, and service garage doors. Figure 2 illustrates the location of all noise sources included in this study.

[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

Mechanical information for the development has not yet been finalized and therefore assumptions were made to best represent what the final configuration might resemble. Gradient Wind has assumed the preliminary mechanical information of the development based on experience with similar developments. A review of the final equipment selections and locations by a qualified acoustical engineer will be required prior to installation of the equipment. The following assumptions have been made in the analysis:

(i) The quantity, location, and sound power of the mechanical equipment has been approximated based off a previous Orleans car dealership development roof plan.
(ii) All rooftop units are assumed to operate continuously during the daytime period and for 30 minutes per hour during the nighttime period
(iii) All exhaust fans are assumed to operate continuously during the daytime period and for 30 minutes per hour during the nighttime period
(iv) All compressor units are assumed to operate continuously during the daytime period and for 30 minutes per hour during the nighttime period
(v) Screening effects of building parapets have been conservatively excluded in the modeling

3. OBJECTIVES

The main goals of this work are to (i) calculate the future noise levels on the nearby noise-sensitive dwellings 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. Four (4) 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, 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 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, camp grounds, and noise sensitive buildings such as schools and places of worship. The recommended maximum noise levels for a Class 1 area at a POR in a suburban environment in proximity to the highway are outlined in Table 1.

[3] City of Ottawa Environmental Noise Control Guidelines, page 10
[4] City of Ottawa Environmental Noise Control Guidelines, page 9

The study site is considered to be in a Class 1 area because it is located in close proximity to the Highway 417. Therefore, the sound field is dominated by manmade sources.

TABLE 1: EXCLUSIONARY LIMITS FOR CLASS 1 AREA

Time of Day	Outdoor Points of Reception	Plane of Window
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

Preliminary mechanical information for the development has been based on Gradient Wind's experience with similar developments. Table 2 summarizes the sound power of each source used in the analysis.

TABLE 2: EQUIPMENT SOUND POWER LEVELS

Source ID	Description	Height Above Grade (m)	Sound Power Level (dBA)
S1 - S3	Rooftop Unit	1.5	94
S4 - S6	Exhaust Fan	0.75	84
S7	Compressor Inlet	1.0	80
S8 - S9	Garage doors	3.0	86

4.4 Stationary Source Noise Predictions

The impact of stationary noise sources on nearby residential 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 four (4) 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 3 and illustrated in Figure 2. All units were represented as point sources in the Predictor model, except for garage doors which were modeled as emitting façades. Table 4 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 in Appendix A. Further modelling data is available upon request.

TABLE 3: RECEPTOR LOCATIONS

Receptor Number	Receptor Location	Height Above Grade (m)
R1	POW – 1353 Michael Street	4.5
R2	POW – 1353 Michael Street	4.5
R3	OPOR – 1360 Gosset Street	1.5
R4	POW – 1118 Parisien Street	4.5

TABLE 4: 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

5. RESULTS AND DISCUSSION

Noise levels at nearby sensitive receptors fall below ENCG criteria for stationary noise, as summarized in Table 5 below. The sound levels listed in Table 5 are based on the assumptions outlined in Section 2.1.

TABLE 5: NOISE LEVELS FROM STATIONARY SOURCES

Receptor Number	Plane of Window Receptor Location	Noise Level (dBA)		Sound Level Limits		Meets ENCG Class 1 Criteria	
		Day	Night	Day	Night	Day	Night
R1	POW – 1353 Michael Street	49	44	50	45	Yes	Yes
R2	POW – 1353 Michael Street	50	45	50	45	Yes	Yes
R3	OPOR – 1360 Gosset Street	44	41	50	N/A	Yes	N/A
R4	POW – 1118 Parisien Street	43	40	50	45	Yes	Yes

As Table 5 summarizes, noise levels fall below ENCG criteria at all receptors. Noise contours at 1.5 m above grade can be seen in Figure 3 and 4 for daytime and nighttime conditions, respectively. The main contributor of noise at these locations are the rooftop air handling units. The orientation of the garage doors which face away from the residential dwellings leads to minimal impacts from these sources.

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 for noise control as outlined in Section 2.1 are adhered to during the detailed design process. The main contributor of noise at the points of reception are the rooftop air handling units. The loudest rooftop equipment should be located toward the centre of the rooftop, avoiding direct line of sight with sensitive areas if possible. With consideration of Gradient Wind's recommendations, the proposed development is expected to be compatible with the existing 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 installation of the equipment.

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.

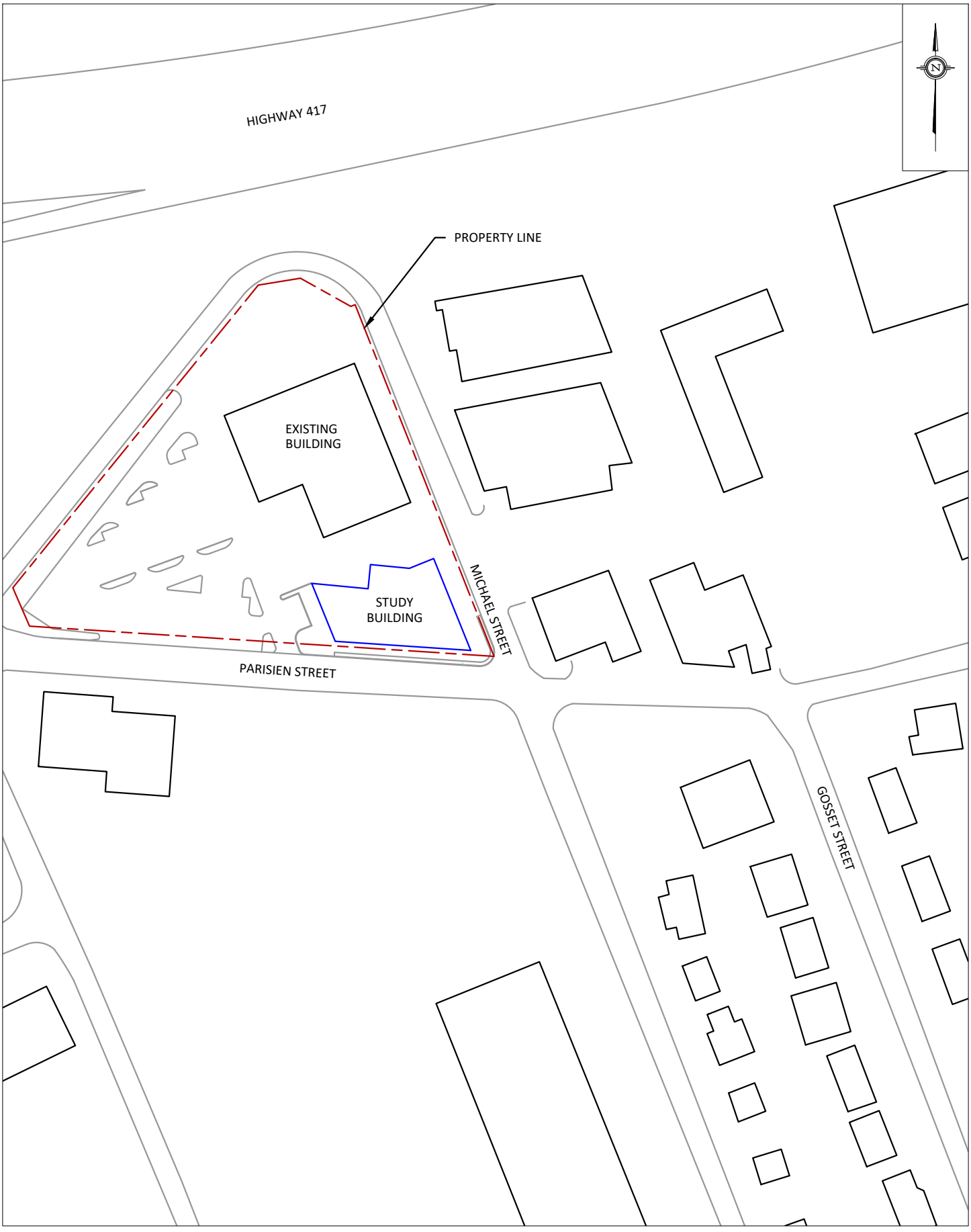
Sincerely,

Gradient Wind Engineering Inc.

Tanyon Matheson-Fitchett, B.Eng.
Junior Environmental Scientist

Joshua Foster, P.Eng.
Lead Engineer

Gradient Wind File No. 21-168



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127 WALGREEN ROAD , OTTAWA, ON
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PROJECT	1328 MICHAEL STREET, OTTAWA STATIONARY NOISE ASSESSMENT		
SCALE	1:1700 (APPROX.)	DRAWING NO.	GW21-168-1
DATE	NOVEMBER 8, 2021	DRAWN BY	T.M.F.

DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT

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PROJECT	1328 MICHAEL STREET, OTTAWA STATIONARY NOISE ASSESSMENT
SCALE	1:1700 (APPROX.)
DRAWING NO.	GW21-168-2
DATE	NOVEMBER 8, 2021
DRAWN BY	T.M.F.

DESCRIPTION

FIGURE 2:
NOISE SOURCE AND RECEPTOR LOCATIONS

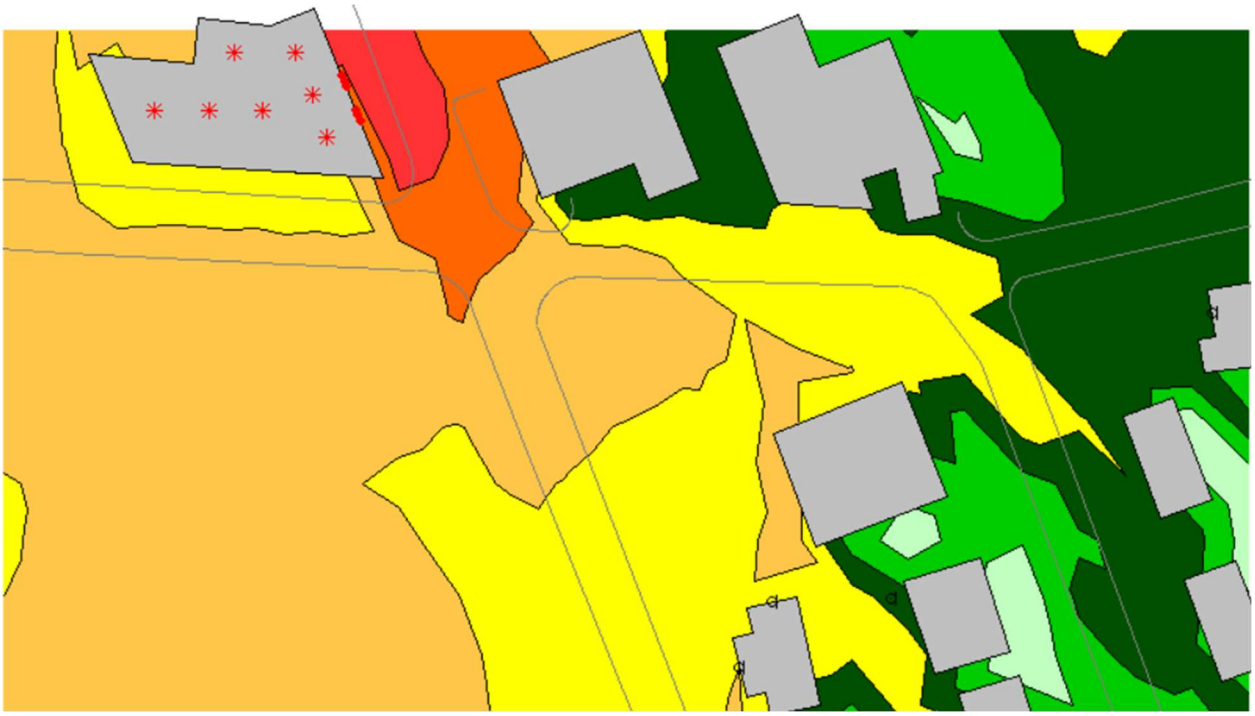

FIGURE 3: DAYTIME STATIONARY NOISE CONTOURS (1.5 METERS ABOVE GRADE)

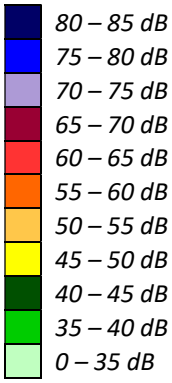

FIGURE 4: NIGHTTIME STATIONARY NOISE CONTOURS (1.5 METERS ABOVE GRADE)