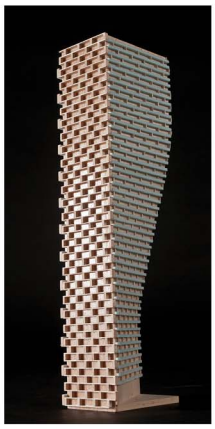
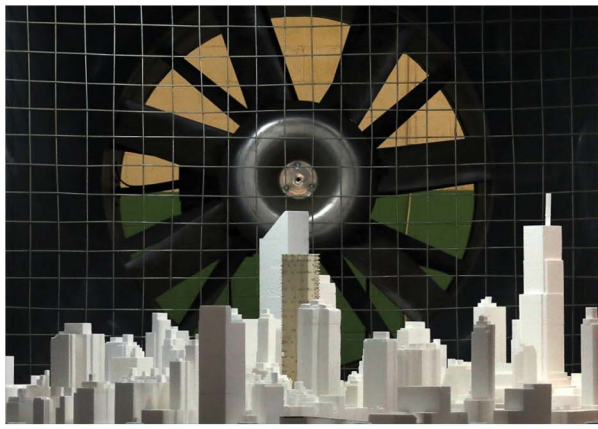
GRADIENTWIND
ENGINEERS & SCIENTISTS

STATIONARY NOISE FEASIBILITY ASSESSMENT

3802-3812 Greenbank Road
Ottawa, Ontario

REPORT: GWE18-147-Stationary Noise





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EXECUTIVE SUMMARY

This report describes a stationary noise feasibility assessment performed for a proposed development located at 3802-3812 Greenbank Road in Ottawa, Ontario. The proposed development comprises a one-storey rectangular planform retail building of approximately 850 m^2 and features 28 surface parking spaces, accessed by Greenbank Road. The site is located near the intersection of Greenbank Road and Kilbirnie Drive. Surrounding the site is a mix of low and medium rise residential buildings. This study examines the noise impact of the proposed mechanical equipment of the development onto the surrounding area. Sources of stationary noise include rooftop air handling equipment. Figure 1 illustrates a site plan with 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); (iii) future residential and commercial developments in the surrounding area, and; (iv) architectural and mechanical drawings prepared by SJ Lawrence Architect Inc and Quadrant Engineering Ltd. respectively.

The results of the current assessment for the proposed development indicates that, provided our assumptions for noise control in Section 2.1 are adhered to in the detailed design process, noise levels at nearby points of reception are expected to fall below the ENCG noise criteria at all receptors. As such, the proposed development is expected to be compatible with the existing on and off-site noise sensitive land uses. A review of final equipment selection and locations by a qualified acoustical engineer will be required prior to installation of the equipment.

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Fotenn to undertake a stationary noise feasibility assessment for the proposed development at 3802-3812 Greenbank Road in Ottawa, Ontario. This report summarizes the methodology, results and recommendations related to a stationary noise feasibility assessment.

The present scope of work involves assessing exterior noise levels generated by rooftop air handling equipment. 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 SJ Lawrence Architects Inc.; mechanical information provided by Quadrant Engineering Ltd; surrounding street layouts obtained from the City of Ottawa; and recent site imagery.

2. TERMS OF REFERENCE

The focus of this stationary noise feasibility assessment is the proposed development located at 3802-3812 Greenbank Road in Ottawa, Ontario. The proposed development comprises a one-storey rectangular planform retail building of approximately 850 m^2 and features 28 surface parking spaces, accessed by Greenbank Road. The site is located near the intersection of Greenbank Road and Kilbirnie Drive. This study examines the noise impact of the proposed mechanical equipment of the development onto the surrounding area. Figure 1 illustrates a site plan with surrounding context.

The major sources of stationary noise are the rooftop mechanical equipment such as the air handling units required for each retail space. The site is surrounded by low to medium rise residential buildings in all directions as well as Greenbank Road to the east. A golf course is situated to the east beyond Greenbank Road. Figure 1 illustrates a complete site plan with the surrounding context.

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

2.1 Assumptions

Gradient Wind has been provided sound data of the roof top mechanical equipment by Quadrant Engineering Ltd. The following assumptions have been made in the analysis:

(i) Sound data for rooftop units are based on manufacturer's data.
(ii) The rooftop mechanical units are assumed to operate continuously over a 1-hour period during the daytime and at 50% operation during the nighttime period.
(iii) The locations and quantity of rooftop units has been assumed based on information provided by Quadrant Engineering.
(iv) Noise walls enclosing rear yards of the residential lots were conservatively omitted in addition to the walls along Greenbank Road.
(v) Ground region was modelled as being porous (absorptive) throughout the site excluding roadways and parking lots which were modeled as hard (reflective ground).
(vi) Screening effects of buildings have been considered in the modelling.
(vii) Screening effects of the 1-meter parapets on the building have been included in the modelling.
(viii) Noise walls used to separate adjacent lots were conservatively omitted.

The equipment assumed in the model consisted of:

(i) Ten Make-Up Air Units, 4 to 5 ton rating (based on a DAIKIN Model: MPSA05C) – Identified as (S1)

Figure 3 illustrates the location of all the stationary sources within the development.

3. OBJECTIVES

The main goals of this work are to (i) calculate the future noise levels on the surrounding noise sensitive properties, dwellings and outdoor points of reception 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. Seventeen 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 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,

[3] NPC – 300, page 16

the L_{eq} is 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) and Plane of Window (POW) receivers. 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, camp grounds, and noise sensitive buildings such as schools, places of worship and daycare facilities. The recommended maximum noise levels for a Class 2 area in a suburban environment adjacent to arterial roadways at a POR are outlined in Table 1 below. The study site is considered to be in a Class 2 area because it is located on the outskirts of the downtown core and close to an arterial roadway. These conditions indicate that the sound field is dominated by manmade sources.

TABLE 1: EXCLUSIONARY LIMITS FOR CLASS 2 AREA

Time of Day	Outdoor Points of Reception	Plane of Window
07:00 – 19:00	50	50
19:00 – 23:00	45	50
23:00 – 07:00	N/A	45

4.3 Determination of Noise Source Power Levels

Preliminary mechanical information for the development has been provided by Quadrant Engineering Inc. Table 2 summarizes the sound power of each source used in the analysis, which are illustrated in Figure 3.

[4] NPC – 300, page 14

TABLE 2: EQUIPMENT SOUND POWER LEVELS (dBA)

Source ID	Description	Height Above Rooftop (m)	Frequency (Hz)								
			63	125	250	500	1000	2000	4000	8000	Total
S1 x10	MUA Radiated	0.88	51	67	72	77	77	76	74	71	83*

* Maximum sound power level permissible given the equipment's current location in order to maintain compliance with ENCG criteria.

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 19 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 2. All sound sources were modelled as point sources. Table 5 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 4: RECEPTOR LOCATIONS

Receptor Number	Receptor Location	Height Above Grade (m)
R1	OPOR – 854 Kilbirnie Drive	1.5
R2	OPOR – 301 Centerra Court	1.5
R3	OPOR – 309 Centerra Court	1.5
R4	OPOR – 3782 Greenbank Road	1.5
R5	OPOR – 105 Damselfly Way	1.5
R6	OPOR – 109 Damselfly Way	1.5
R7	OPOR – 113 Damselfly Way	1.5
R8	POW– 854 Kilbirnie Drive	6
R9	POW – 301 Centerra Court	5.5
R10	POW – 309 Centerra Court	5.5
R11	POW – 319 Centerra Court	5.5
R12	POW – 91 Damselfly Way	6
R13	POW – 105 Damselfly Way	5
R14	POW – 109 Damselfly Way	5
R15	POW – 113 Damselfly Way	5
R16	POW – 885 Kilbirnie Drive	8
R17	POW – 3782 Greenbank Road	1.5

TABLE 5: CALCULATION SETTINGS

Parameter	Setting
Meteorological correction method	Single value for C0
Value C0	2.0
Default ground attenuation factor	1
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 produced by the mechanical equipment are presented in Table 6.

TABLE 6: NOISE LEVELS FROM STATIONARY SOURCES

Receptor Number	Plane of Window Receptor Location	Noise Level (dBA)		Sound Level Limits		Meets ENCG Class 2 Criteria	
		Day/Evening	Night	Day/Evening	Night	Day/Evening	Night
R1	OPOR – 854 Kilbirnie Drive	39	36	50/45	N/A	Yes	Yes
R2	OPOR – 301 Centerra Ct	38	35	50/45	N/A	Yes	Yes
R3	OPOR – 309 Centerra Ct	41	38	50/45	N/A	Yes	Yes
R4	OPOR – 3782 Greenbank Road	41	38	50/45	N/A	Yes	Yes
R5	OPOR – 105 Damselfly Way	40	37	50/45	N/A	Yes	Yes
R6	OPOR – 109 Damselfly Way	43	40	50/45	N/A	Yes	Yes
R7	OPOR – 113 Damselfly Way	39	36	50/45	N/A	Yes	Yes

TABLE 6 (CONTINUED): NOISE LEVELS FROM STATIONARY SOURCES

Receptor Number	Plane of Window Receptor Location	Noise Level (dBA)		Sound Level Limits		Meets ENCG Class 2 Criteria	
		Day/Evening	Night	Day/Evening	Night	Day/Evening	Night
R8	POW– 854 Kilbirnie Drive	44	41	50	45	Yes	Yes
R9	POW – 301 Centerra Ct	38	35	50	45	Yes	Yes
R10	POW – 309 Centerra Ct	42	39	50	45	Yes	Yes
R11	POW – 319 Centerra Ct	39	36	50	45	Yes	Yes
R12	POW – 91 Damselfly Way	36	33	50	45	Yes	Yes
R13	POW – 105 Damselfly Way	46	43	50	45	Yes	Yes
R14	POW – 109 Damselfly Way	48	45	50	45	Yes	Yes
R15	POW – 113 Damselfly Way	44	41	50	45	Yes	Yes
R16	POW – 885 Kilbirnie Drive	39	36	50	45	Yes	Yes
R17	POW – 3782 Greenbank Road	39	36	50	45	Yes	Yes

As Table 6 summarizes, noise levels at nearby sensitive receptors are below the ENCG criteria for stationary noise. The sound levels listed are based on the assumptions outlined in Section 2.1. Noise contours at 1.5 m above grade can be seen in Figure 4 and 5 for daytime and nighttime conditions respectively. The rooftop equipment should be located closer toward the east façade fronting Greenbank Road, increasing the distance from noise sensitive areas as much as possible. The proposed parapet along the west façade of the building should be no less than 1-meter above the rooftop. With consideration of Gradient Wind's recommendations, the proposed development is expected to be compatible with the existing land uses.

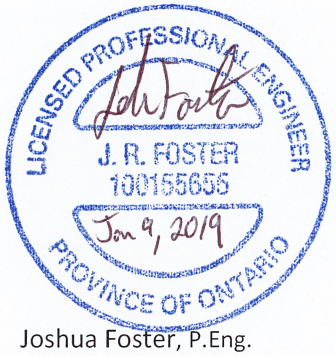
6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current assessment for the proposed development indicates that, provided our assumptions for noise control in Section 2.1 are adhered to in the detailed design process, noise levels at nearby points of reception are expected to fall below the ENCG noise criteria at all receptors. As such, the proposed development is expected to be compatible with the existing on and off-site noise sensitive land uses. A review of final equipment selection 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.



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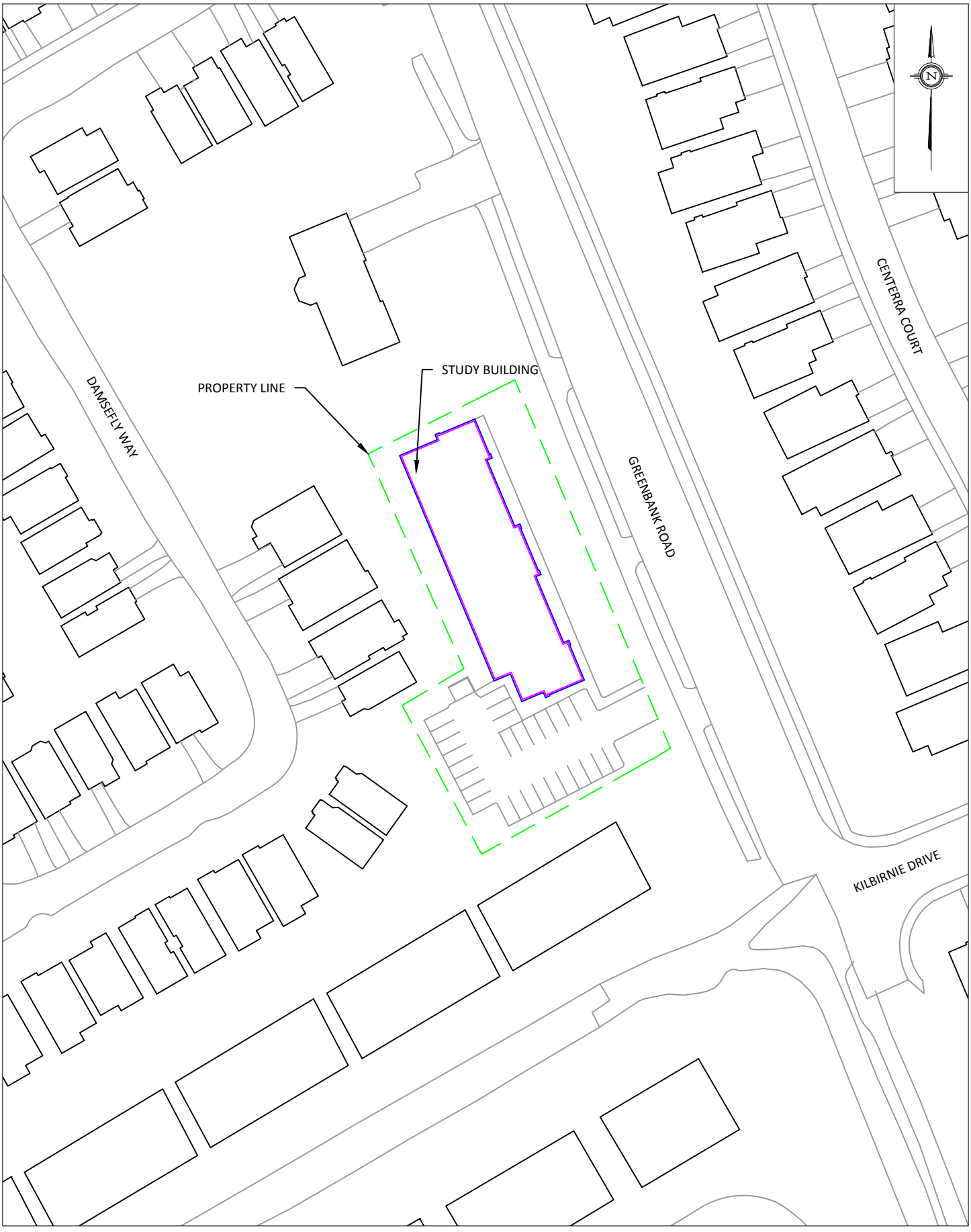

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PROJECT	3802 GREENBANK ROAD - STATIONARY NOISE STUDY		DESCRIPTION
SCALE	1:1000 (APPROX.)	DRAWING NO.	GWE18-147-1
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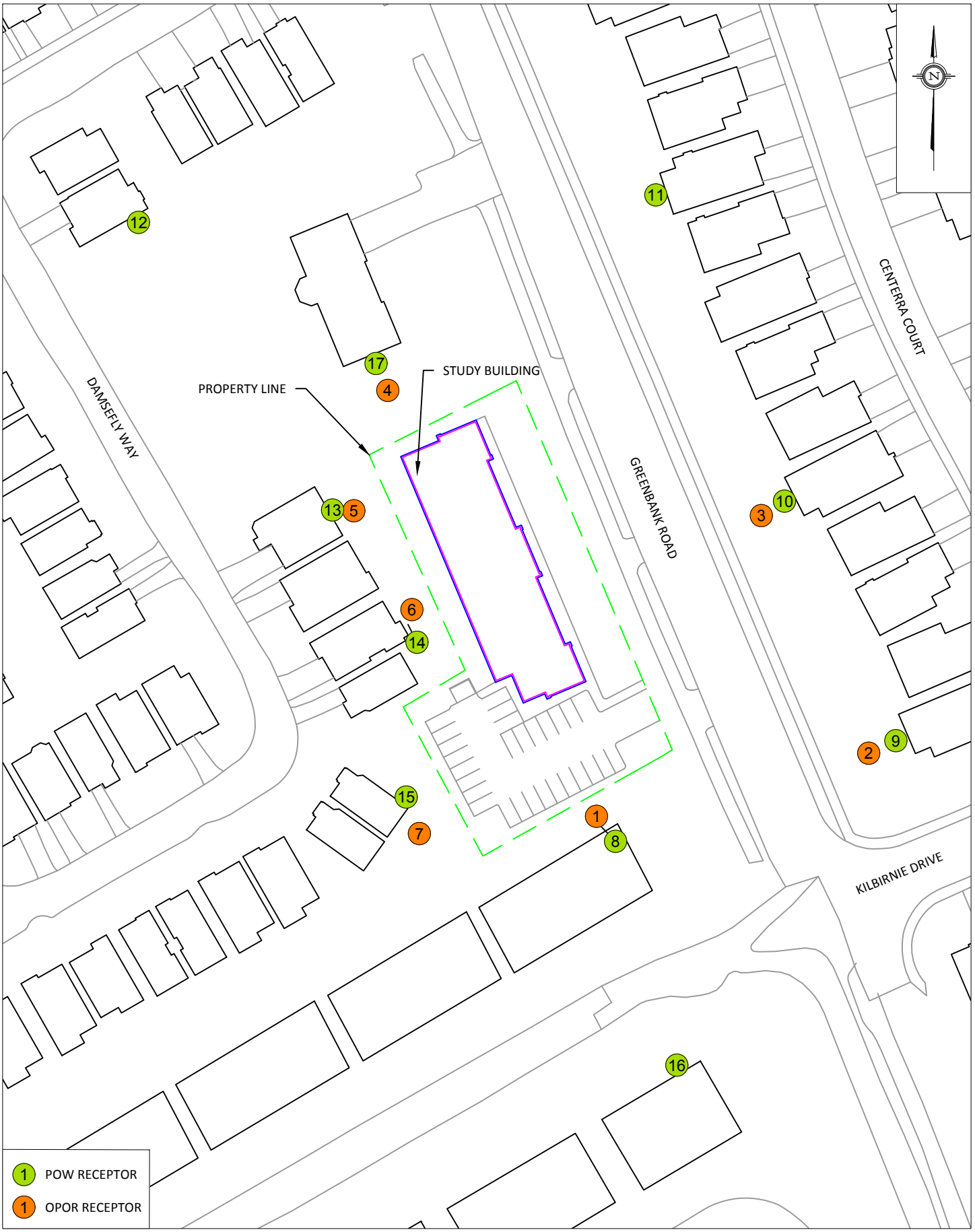
FIGURE 1:
SITEPLAN AND SURROUNDING CONTEXT



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DATE	JANUARY 7, 2019
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DESCRIPTION

FIGURE 2:
RECEPTOR LOCATIONS

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DATE	JANUARY 7, 2019	DRAWN BY	G.G.

DESCRIPTION

FIGURE 3:
SOUND SOURCE LOCATIONS

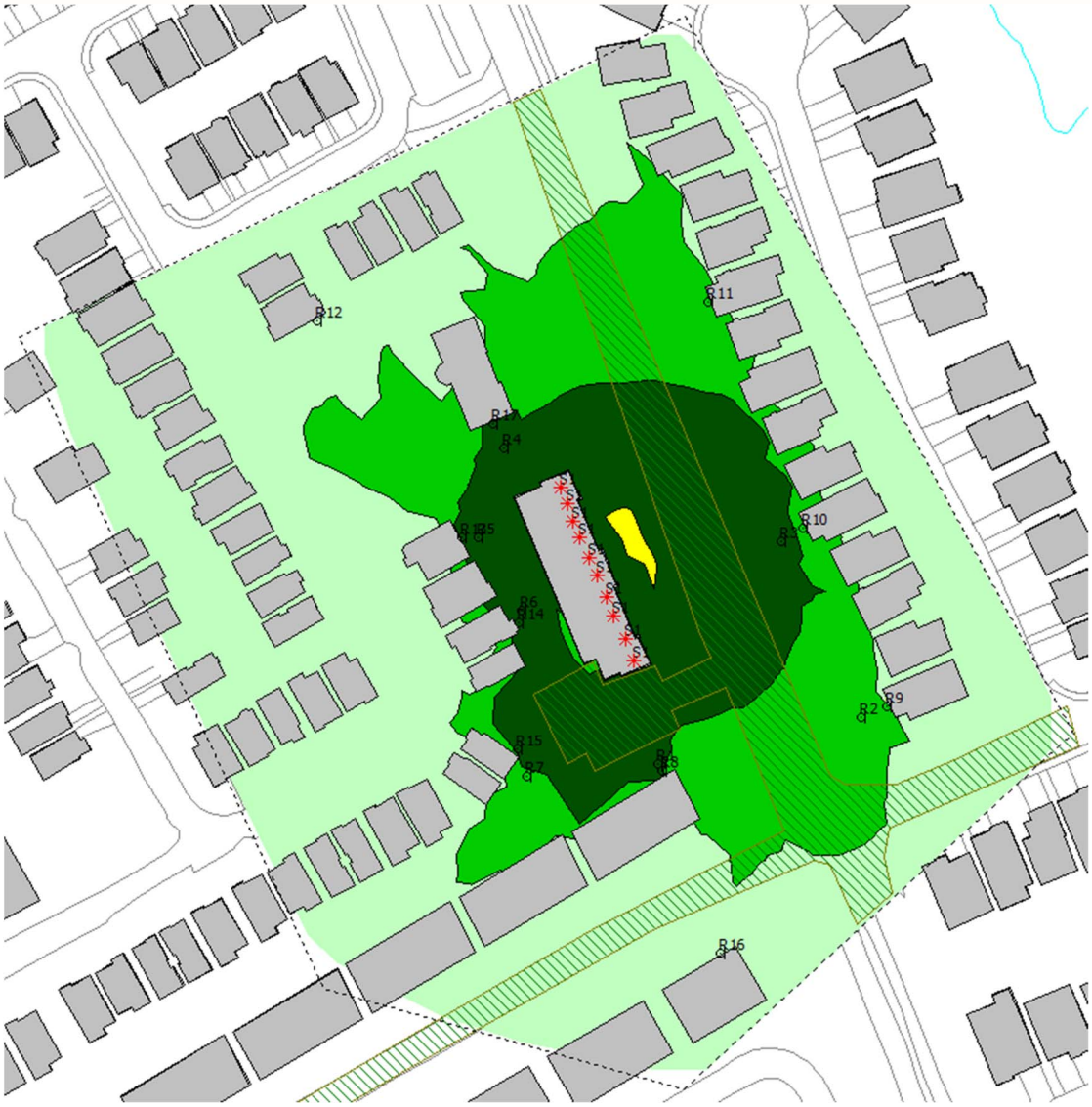

FIGURE 4: DAYTIME STATIONARY NOISE CONTOURS (1.5 METERS ABOVE GRADE)

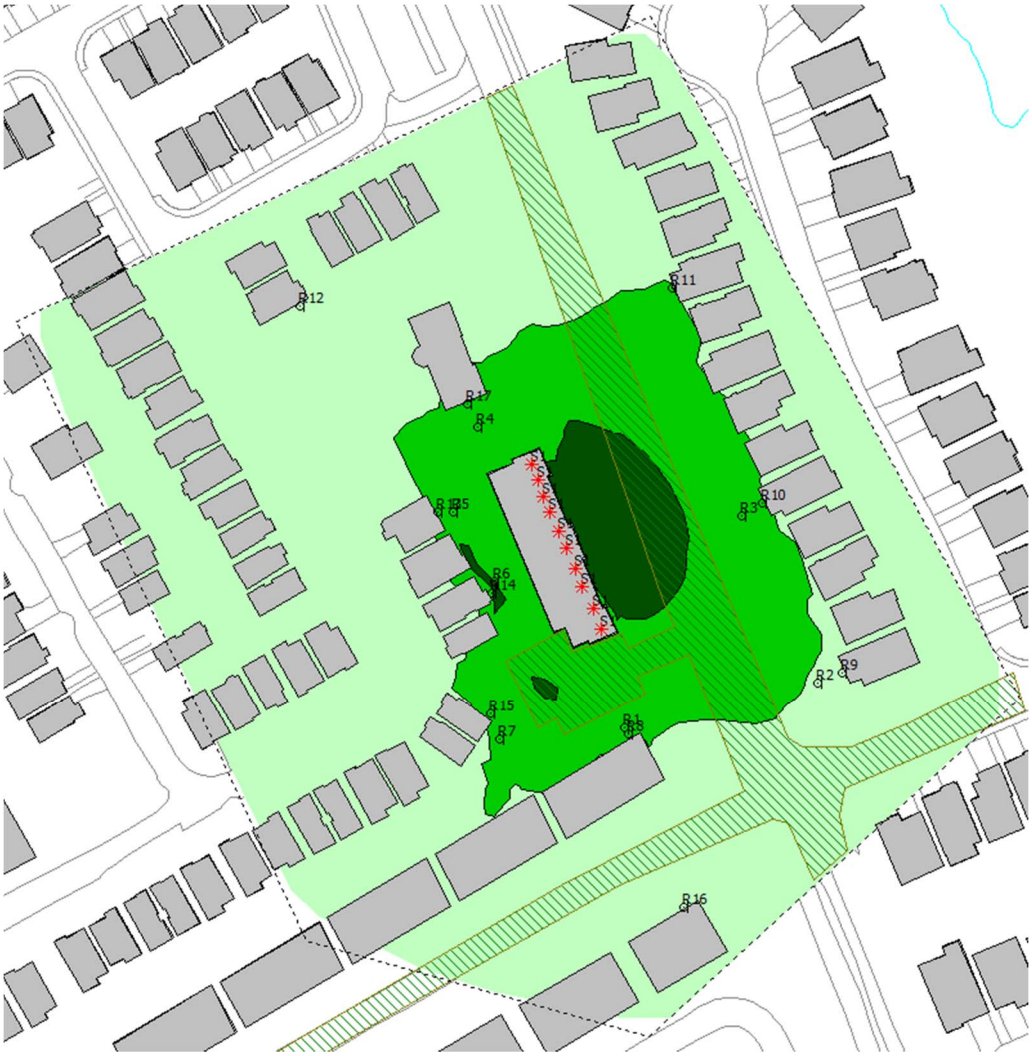

FIGURE 5: NIGHTTIME STATIONARY NOISE CONTOURS (1.5 METERS ABOVE GRADE)