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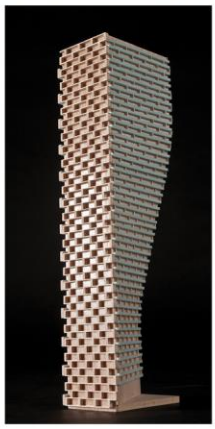
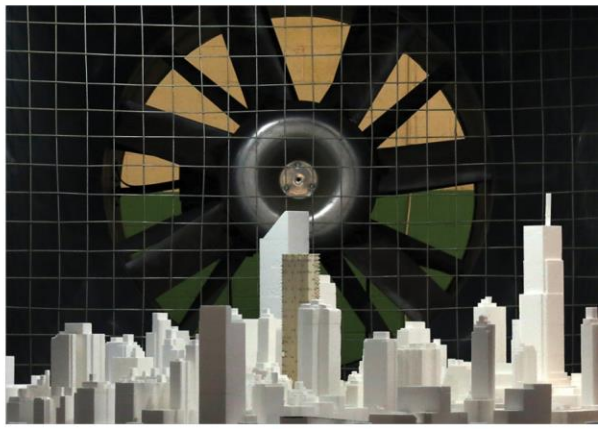
ENGINEERS & SCIENTISTS

STATIONARY NOISE FEASIBILITY ASSESSMENT

180 Metcalfe Street
Ottawa, Ontario

REPORT: GW18-115-Stationary Noise R2





May 25, 2020

PREPARED FOR

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EXECUTIVE SUMMARY

This report describes a stationary noise feasibility assessment performed for a proposed mixed-use development located at 180 Metcalfe Street in Ottawa, Ontario. The proposed development consists of a 30-storey mixed-use tower, with the first floor intended for retail, utility, amenity and lobby space use, and residential suites occupying the remaining floors. The tower will contain amenity areas in the form of private balconies, indoor amenity areas and a potential terrace on the roof of the 6th floor. 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, fluid cooler, and emergency generator. 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; (iv) architectural drawings provided by RLA Architect in April of 2020 and; (v) mechanical drawings prepared by Jain Sustainability Consultants Inc..

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.

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1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Jadco Group Construction to undertake a stationary noise feasibility assessment for the proposed development at 180 Metcalfe Street 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, fluid cooler, and emergency generator. 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 Architects and mechanical information provided by Jain Sustainability Consultants Inc.; surrounding street layouts obtained from the City of Ottawa; and recent site imagery.

2. TERMS OF REFERENCE

The development is located at the north corner of a city block bounded by Nepean Street to the north, Metcalfe Street to the east, Lisgar Street to the south, and O'Connor Street to the west. There is one development currently under construction directly north of the site (two 27-storey towers with one tower located at 91 Nepean Street and the other located at 70 Gloucester Street). The remaining immediate surroundings comprise a mix of low, medium, and high-rise buildings, as well as surface-level parking.

The proposed development comprises a 30-storey mixed-use, residential and commercial building that will be integrated into an existing six-storey heritage building, a smaller part of which would be demolished. The building will contain six levels of below-grade parking with the entrance located at the northwest corner of the development. The first floor will comprise retail, utilities, amenities, and lobby space. The main building entrance is located on the east side. The second-floor plan steps back within the building on the east side, creating a space open to the floor below. The remainder of the floor area contains residential units. The third-floor plan steps back out on the east side within the structure, allowing for the entire floor plan to contain residential units. The floorplan remains constant up to the

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

sixth floor. The seventh floor will include residential units and an amenity space located in the northeast corner. The floorplan from the floors eight to twenty-nine consist of residential units. The thirtieth floor is an amenity floor with a swimming pool and gym facility. The proposed mechanical equipment will be located on the west roof deck on the thirtieth floor with a communal rooftop terrace situated on the east roof deck. There is a terrace on the roof of the 6th floor. Although private balconies are located over the various floors, they are not considered to be Outdoor Points of Reception (OPOR) as they are less than 4-metres in depth.

The major sources of stationary noise are the rooftop mechanical equipment located on the west roof deck on the thirtieth floor, including an air handling unit, a fluid cooler, and an emergency generator. Figure 1 illustrates a complete site plan with surrounding context

2.1 Assumptions

Gradient Wind has been provided sound data of the roof top mechanical equipment by Jain Sustainability Consultants Inc. The following assumptions have been made in the analysis:

(i) Sound data for rooftop units is 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 generator will only be tested during the daytime hours (07:00 to 19:00).

(iv) A 2.2m and 1.3m high parapet enclosing the mechanical roof deck was included in the analysis as per the architectural drawings (see Figure 3).

The equipment assumed in the model consisted of:

(i) MAU: Make-Up Air Unit (Engineered Air Model)

(ii) FC: Fluid Cooler Unit (Evapco Model eco-LSWE 10-4M18)

(iii) Gen: Emergency Generator (Genrac Model SD350)

Figure 3 illustrates the location of all 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. Four 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].

[3] NPC – 300, page 16

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 (OPOR) 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]. An OPOR 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 1 area in an urban environment adjacent to arterial and collector roadways at a POR are outlined in Table 1 below. The study site is considered to be in a Class 1 area because it is located at the intersection of arterial roadways. These conditions indicate that the sound field is dominated by manmade sources. When analysing standby power equipment such as emergency generators, the ENCG specifies a noise level limit of 55 dBA for daytime testing. Generators are also considered separately, without the combined effect of other equipment.

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] NPC – 300, page 14

4.3 Determination of Noise Source Power Levels

Preliminary mechanical information for the development has been provided by Jain Sustainability Consultants Inc. Table 2 summarizes the sound power of each source used in the analysis, which are illustrated in Figure 3. *Predictor-Lima* sample calculations are available upon request.

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	Fluid Cooler Intake	90.7	75	83	86	91	89	89	86	81	**96**
S2	MUA Intake	89.8	66	77	80	84	88	85	79	69	**92**
S3	Emergency Generator	89.8	65	81	90	88	91	90	90	59	**97**

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 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. The MUA, fluid cooler and generator were represented as point sources in the Predictor model. 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. Given the urban environment hard ground was assumed. Existing and proposed buildings were added to the model to account for screening and reflection effects from building façades.

TABLE 3: RECEPTOR LOCATIONS

Receptor Number	Receptor Location	Height Above Grade (m)
R1	OPOR – 7th Floor Terrace	21.5
R2	OPOR – 30th Floor Terrace	89.3
R3	POW – 193 Metcalfe Street	82
R4	POW – 89 Nepean Street	80

TABLE 4: CALCULATION SETTINGS

Parameter	Setting
Meteorological correction method	Single value for C0
Value C0	2.0
Default ground attenuation factor	0
Temperature (K)	283.15
Pressure (kPa)	101.33
Air humidity (%)	70

5. RESULTS AND DISCUSSION

Noise levels produced by the generator are presented in Table 5, while those due to the mechanical HVAC equipment are presented in Table 6. Emergency generators are only tested during the daytime period (07:00 – 19:00). Therefore, the criterion is 55 dBA. The emergency generator was evaluated separately from other sources of noise[5] (See NPC-300 C4.5.3). Noise levels at all outdoor points of reception and

[5] Environmental Noise Guideline "Stationary and Transportation Sources – Approval and Planning" NPC-300

other plane of window receptors due to the generator fall below ENCG criteria provided our assumptions for noise control in Section 2.1 are adhered to.

TABLE 5: NOISE LEVELS FROM GENERATOR

Receptor Number	Plane of Window Receptor Location	Noise Level (dBA)	Sound Level Limits	Meets ENCG Class 1 Criteria
		Day	Day	Day
R1	OPOR – 7th Floor Terrace	29	55	Yes
R2	OPOR – 30th Floor Terrace	35	55	Yes
R3	POW – 193 Metcalfe Street	29	55	Yes
R4	POW – 89 Nepean Street	43	55	Yes

TABLE 6: NOISE LEVELS FROM HVAC 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	OPOR – 7th Floor Terrace	28	N/A	50	N/A	Yes	Yes
R2	OPOR – 30th Floor Terrace	36	N/A	50	N/A	Yes	Yes
R3	POW – 193 Metcalfe Street	31	28	50	45	Yes	Yes
R4	POW – 89 Nepean Street	48	45	50	45	Yes	Yes

As Table 5 and 6 summarizes, noise levels at nearby sensitive receptors meet or fall below ENCG criteria for stationary noise, provided the assumptions in Section 2.1 are followed. Noise contours for the site at 80 meters above grade are outlined in Figures 4-6. Given the rooftop units' sound power rating as well as their current location, the units should not exceed the values stated in Table 2.

6. CONCLUSIONS AND RECOMMENDATIONS

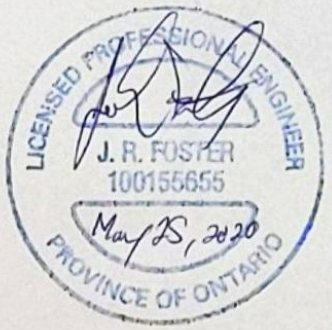
The results of the current assessment for the proposed development indicates that, provided our assumptions for noise control in Section 2.1 are adhered to in the detailed design process, noise levels at nearby points of reception are expected to fall below the ENCG noise criteria at all receptors. As 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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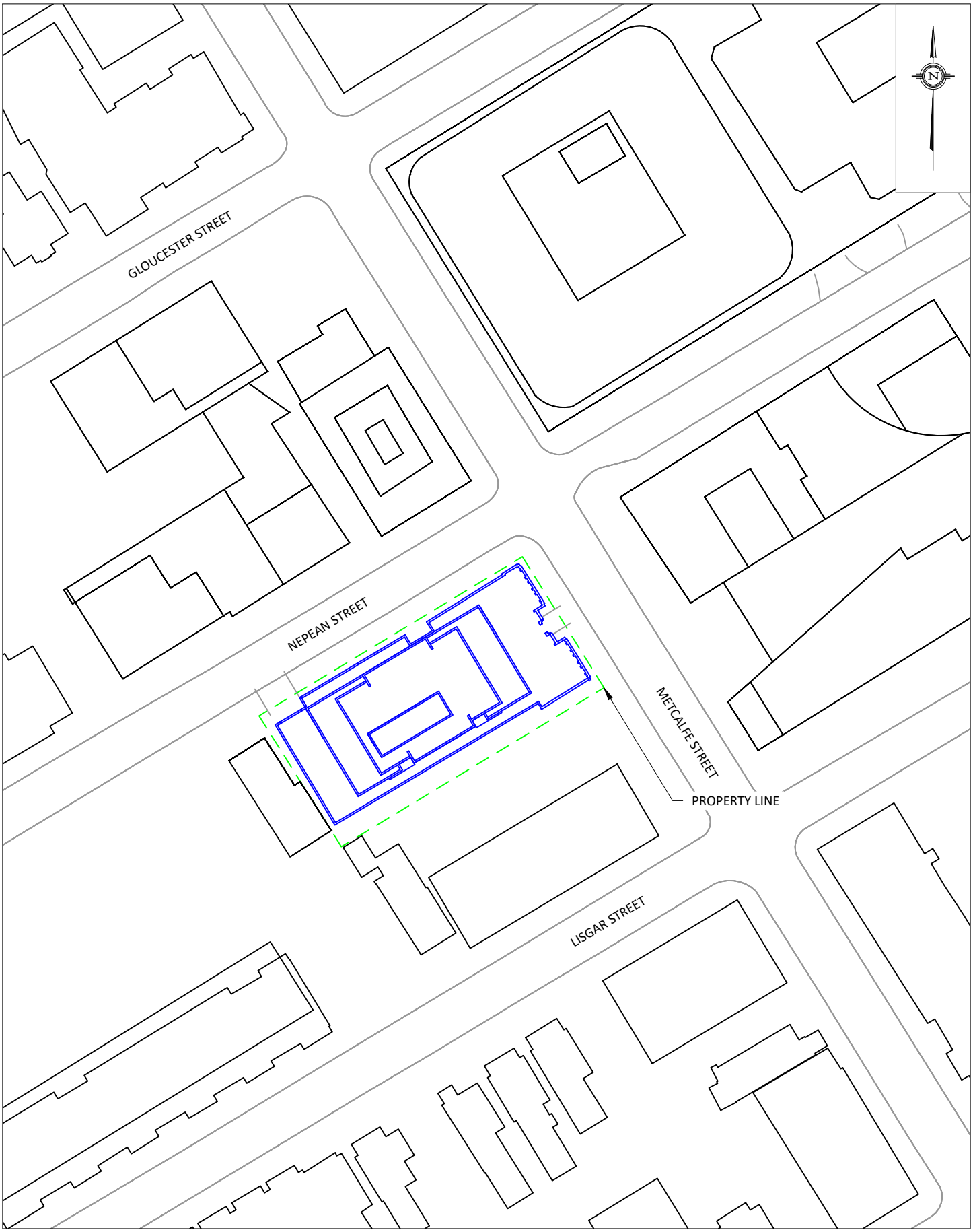

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PROJECT	180 METCALFE STREET - STATIONARY NOISE ASSESSMENT		
SCALE	1:1000 (APPROX.)	DRAWING NO.	GW18-115-1
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DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT

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DATE	MAY 14, 2020
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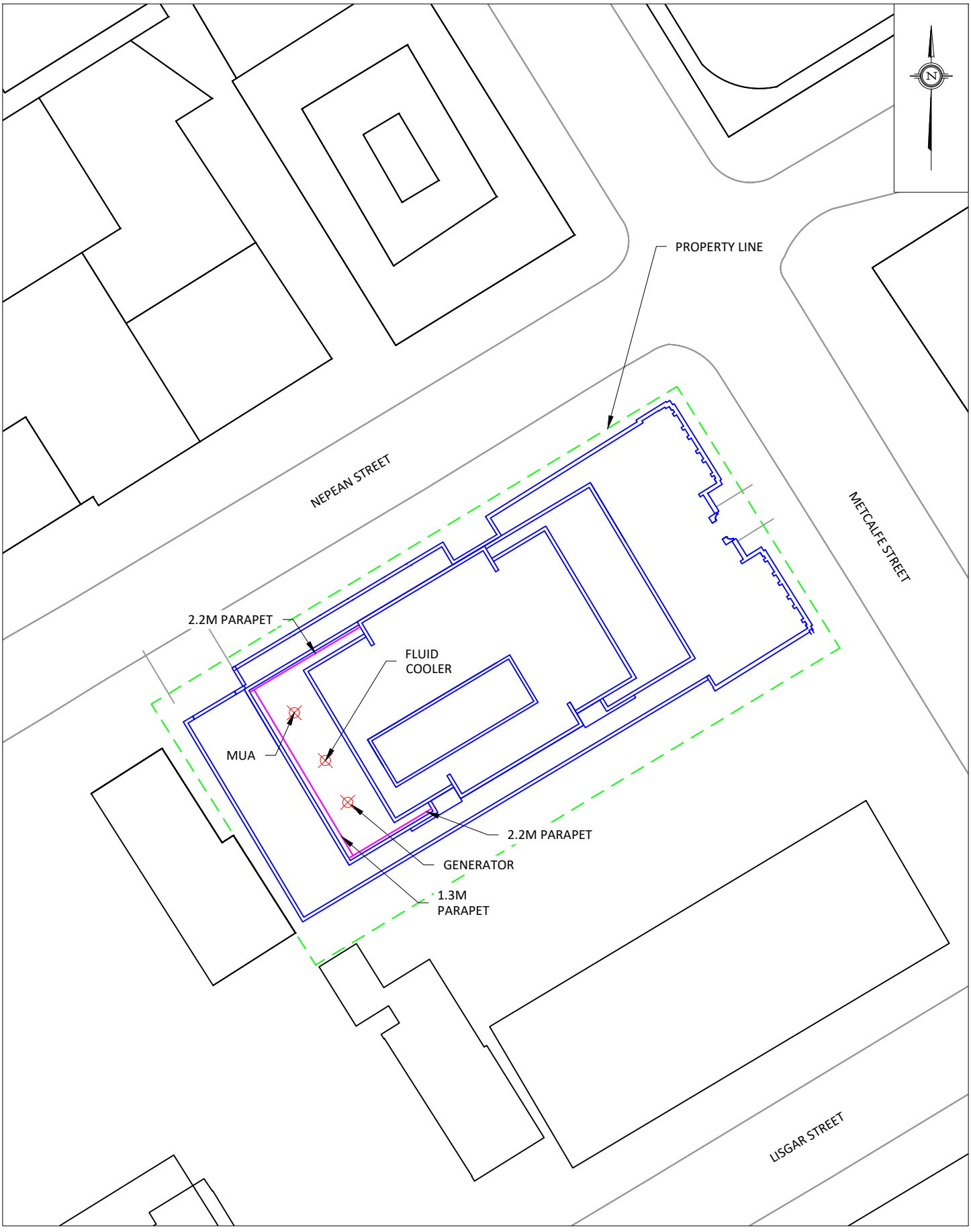
DESCRIPTION

FIGURE 2:
RECEPTOR LOCATIONS



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SCALE	1:500 (APPROX.)	DRAWING NO.	GW18-115-3
DATE	MAY 14, 2020	DRAWN BY	G.G.

DESCRIPTION

FIGURE 3:
STATIONARY NOISE SOURCE LOCATIONS

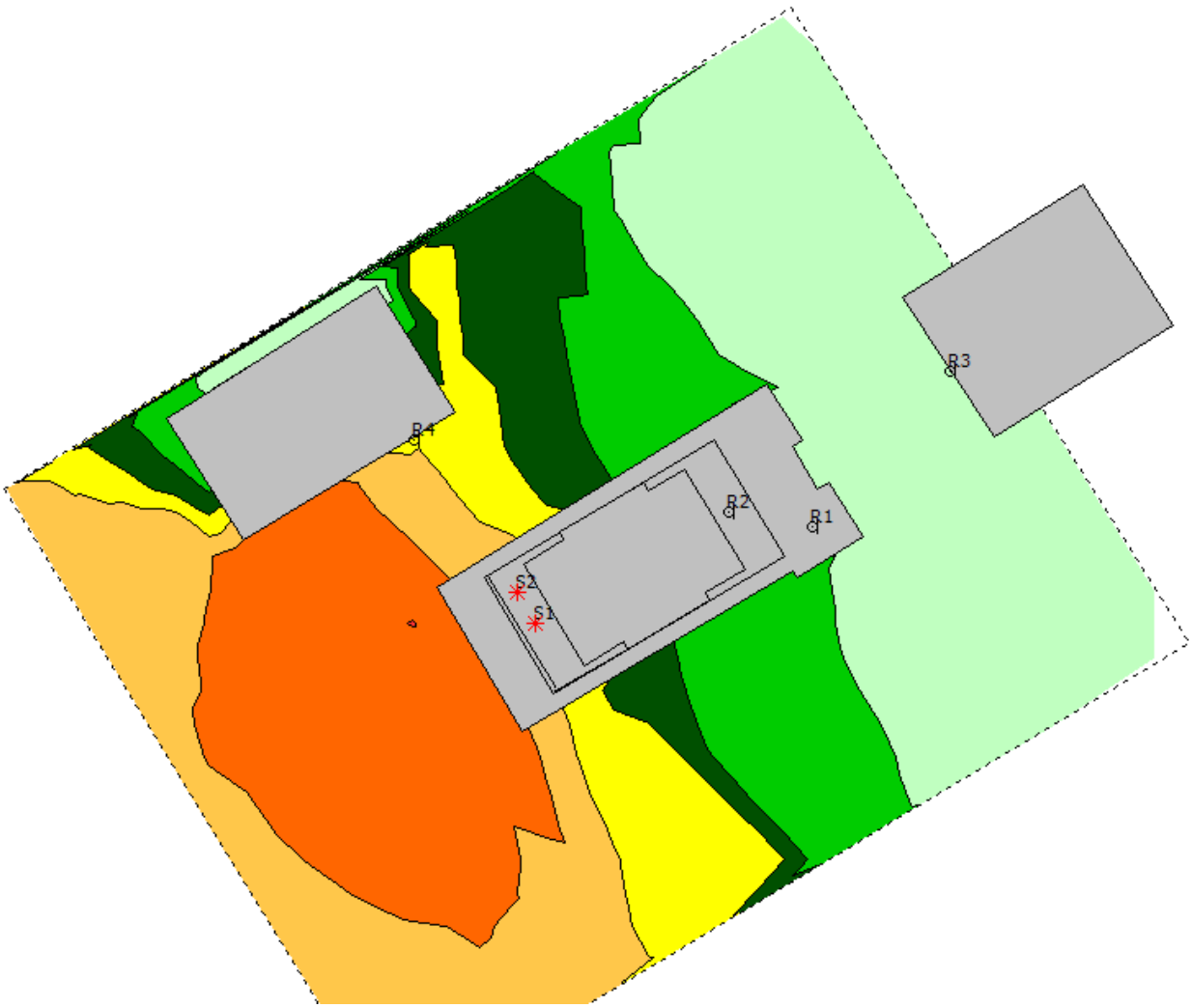

FIGURE 4: DAYTIME STATIONARY NOISE CONTOURS (80 METERS ABOVE GRADE) (HVAC)

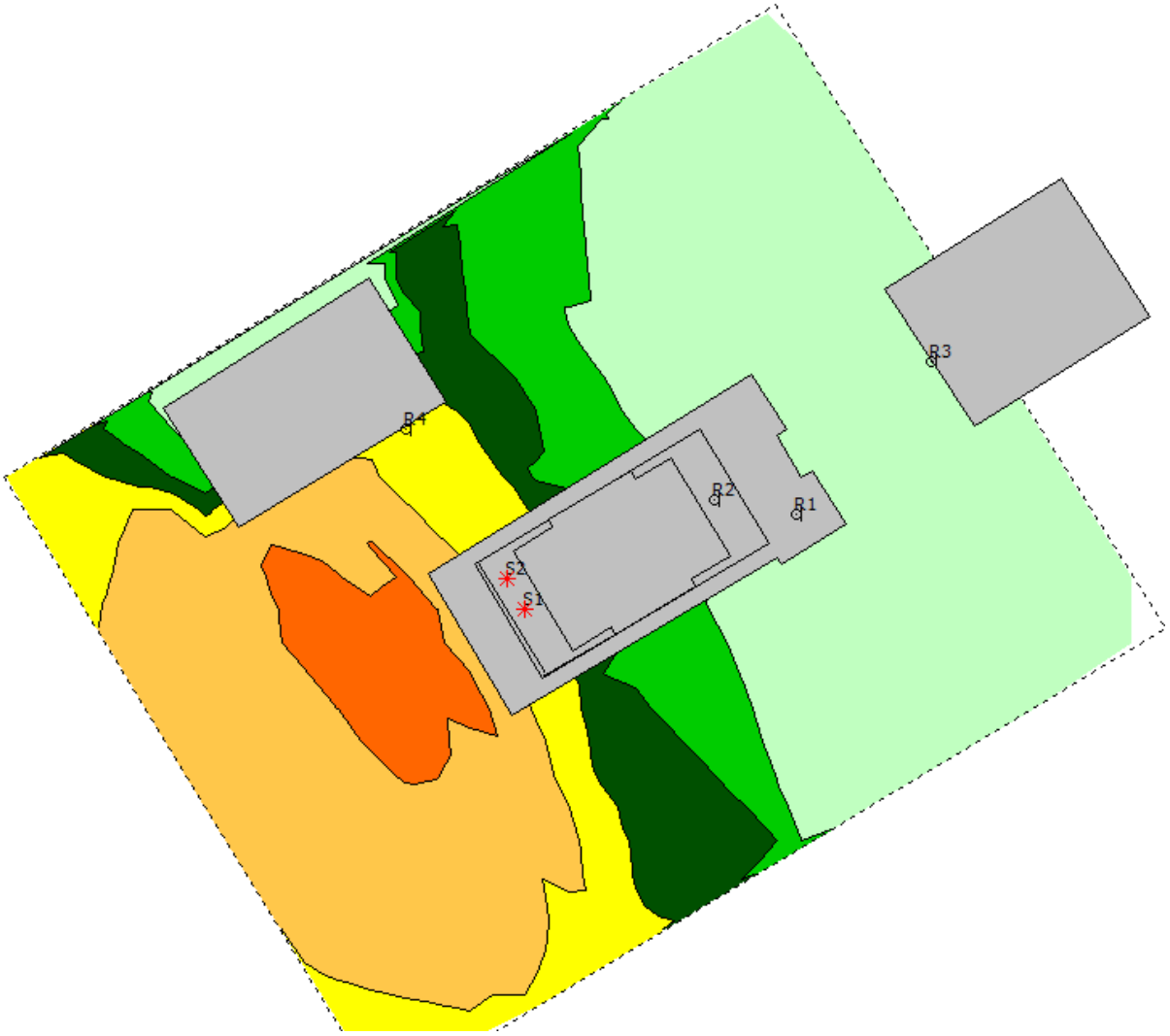

FIGURE 5: NIGHTTIME STATIONARY NOISE CONTOURS (80 METERS ABOVE GRADE) (HVAC)

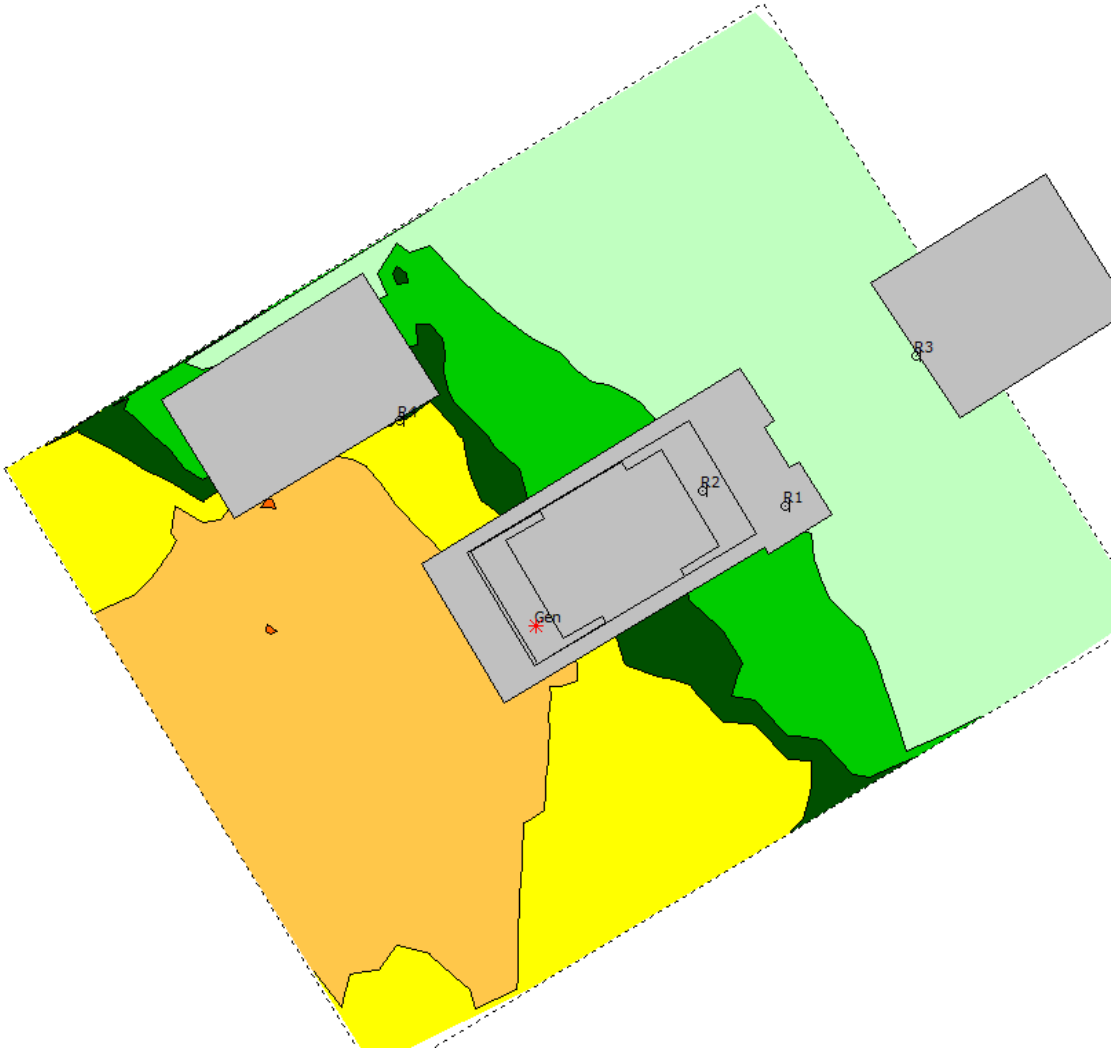

FIGURE 6: DAYTIME STATIONARY NOISE CONTOURS (80 METERS ABOVE GRADE) (GENERATOR)