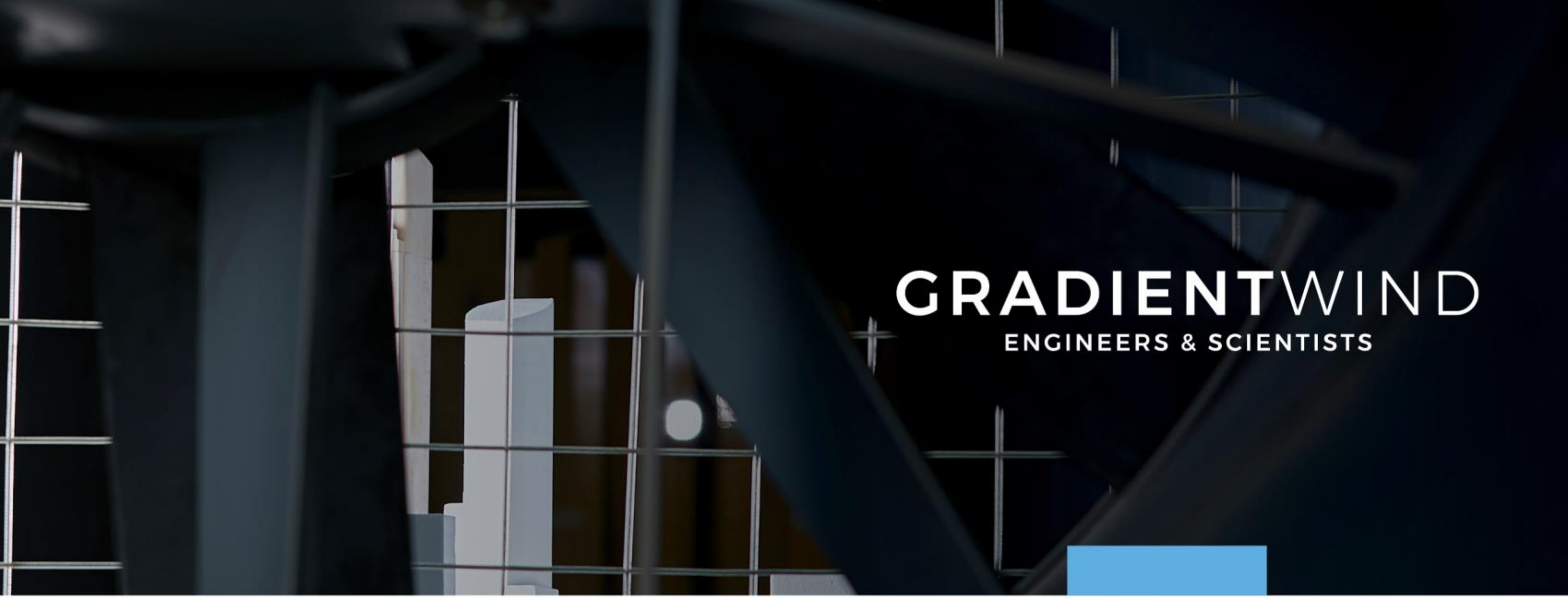
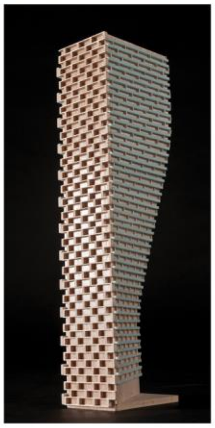
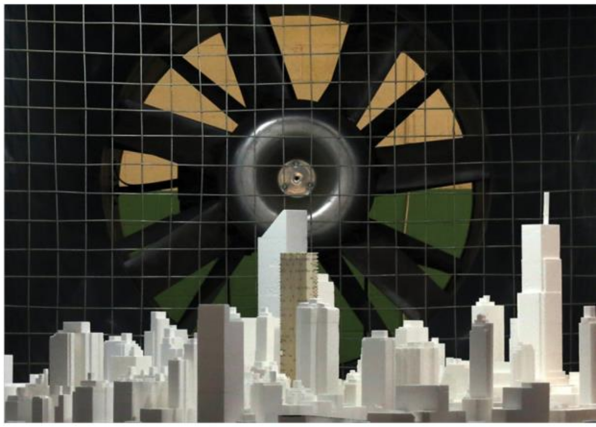


STATIONARY NOISE FEASIBILITY ASSESSMENT

1740-1760 St. Laurent Boulevard
Ottawa, Ontario

REPORT: GW20-142– Stationary Noise





July 14, 2021

PREPARED FOR
Heafey Group
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PREPARED BY
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Joshua Foster, P.Eng., Principal

EXECUTIVE SUMMARY

This report describes a stationary noise feasibility assessment performed for the proposed mixed-use, multi-building development located at 1740-1760 St. Laurent Boulevard in Ottawa, Ontario.

The study site is bounded by St. Laurent Boulevard to the east, an existing low-rise building to the south, proposed mid-rise buildings to the west, and an existing mid-rise building to the north. Everest Private, aligned in the east-west direction, bisects the development site providing access to the study site as well as future and existing adjacent developments to the west from St. Laurent Boulevard. Figure 1 illustrates a site plan with the surrounding context.

Based on preliminary information the likely notable pieces of equipment that will produce noise exterior of the building include generators and cooling towers located on the rooftop of each tower. Figure 2 illustrates the location of receptors and noise sources included in this study.

The focus of this study is the exterior noise levels generated by the generators and cooling towers. 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 provided by Pierre Martin & Associés | Architectes and LaPalme Rheault Architectes + Associés; and (iv) mechanical equipment data provided by Heafy Group.

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 are followed and the sound power levels of the cooling towers and generators do not exceed the levels shown in Table 2. As such, 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.

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Heafy Group to undertake a stationary noise feasibility assessment for the proposed mixed-use, multi-building development located at 1740-1760 St. Laurent Boulevard 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 the rooftop mechanical units. 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 and architectural drawings provided by Pierre Martin & Associés | Architectes and LaPalme Rheault Architectes + Associés, mechanical equipment data provided by Heafy Group, and 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 mixed-use, multi-building development located on a trapezoidal parcel of land at 1740-1760 St. Laurent Boulevard in Ottawa, Ontario.

The proposed development comprises four (4) buildings; Tower 1 (15 storeys), Tower 2 (12 storeys), Tower 3 (15 storeys) and Tower 4 (12 storeys), situated at the northeast, southeast, northwest and southwest of the site, respectively. At grade, the site features a garden to the east of Tower 4 and surface vehicular parking spaces to the west of Towers 1 and 3.

Tower 1 comprises commercial space at grade, common areas at Level 2 and residential units at all levels above. A drive-through at the west side of the building provides access to the development from Everest Private. At Level 2, the floorplate extends at the south and west sides to cover the commercial terrace and drive through below. The floorplate also sets back at the southeast corner of Level 3 and the north side of Level 4 and continues to rise with a uniform, nearly rectangular planform until Level 15 at which it sets backs at the west side. Tower 2 comprises common space at the ground floor followed by residential

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[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

suites at all levels above grade. The floorplate sets back at the north side of Level 2 to provide a green roof covering the grade-level parking spaces below and creating a nearly rectangular floorplan. The floorplate sets back at the west side of Level 7 and the east side of Level 12.

Tower 3 comprises commercial space at grade and a mixture of common areas and residential suites at Level 2. All levels above are reserved for residential occupancy. The floorplate sets back at the southeast corner of Level 3 and the north side and partial east side of Level 4. Levels 5-14 rise with a uniform, nearly L-shaped planform with its long axis oriented north-south along St. Laurent Boulevard and the short access oriented east-west along Everest Private. At Level 15, the floorplate sets back at the west side of the short axis and the south side of the long axis. Tower 4 comprises common areas and residential units at grade with all levels above reserved for residential occupancy. The building has a nearly L-shaped shaped floorplan with a diagonal south wall oriented parallel to the property line. The floorplate sets back at the north side and southeast corner of Level 12.

As the balconies serving the residential suites of each tower extend less than 4 metres from the façade, they do not require consideration as outdoor points of reception (OPOR) in this study. The grade-level garden at the east side of Tower 4 and the terraces more than 4 metres deep were considered as an OPOR.

The study site is surrounded by a low-rise commercial building to the east, across St. Laurent Boulevard, and south along St. Laurent Boulevard, low and mid-rise residential buildings to the west and southwest, a low-rise fire station to the northwest and a mid-rise office building to the north. Additionally, a future, proposed mid-rise building is located to the west of the study site. Everest Private, aligned in the east-west direction, bisects the development site providing access to the study site as well as future and existing adjacent developments to the west from St. Laurent Boulevard. Figure 1 illustrates a complete site plan with the surrounding context.

A generator and a cooling tower will be located on the rooftop of each tower. Figure 2 illustrates the location of receptors and noise sources included in this study.

2.1 Assumptions

The sound power levels of the generators are based on data provided by Heafy Group and the cooling towers are based on Gradient Wind's past experience with similar projects. A review of the final equipment selections and locations by a qualified acoustical engineer will be required prior to the installation of the equipment.

The following assumptions have been made in the analysis:

(i) 32 receptors were strategically placed on the closest on-site and off-site noise-sensitive buildings and outdoor areas. 20 of the receptors were defined as plane of window (POW) receptors and 12 of the receptors were defined as outdoor point of reception (OPOR) receptors. The location of the receptors and noise sources can be seen in Figure 2.

(ii) The cooling towers are assumed to operate continuously at 100% over a 1-hour period during the daytime period, and at 50% during the nighttime period.

(iii) The generators are assumed to be running continuously at 100% over a 1-hour period during the daytime period.

(iv) Noise screens have been placed around the generators, located at Tower 2 and 4, and the cooling towers. The height of the noise screens should be at the height of the mechanical equipment or 0.5 metres higher. The location and heights of the noise screen can be seen in Figure 4.

(v) The ground region was modelled as reflective (Ground Factor=0) due to the presence of paved and concrete areas around the subject site.

3. OBJECTIVES

The main goals of this work are to (i) calculate the future noise levels generated by the mechanical equipment serving the proposed development on the neighbouring noise-sensitive buildings and the proposed development (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.

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].

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

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, campgrounds, and noise-sensitive buildings such as schools and daycares. 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 subject site is bordered by St. Laurent Boulevard, which is an Arterial Road, to the east. Therefore, the site is considered to be in a Class 1 area.

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

The sound power levels of the generators are based on manufacturer data provided by Heafy Group and the cooling towers are based on Gradient Wind's past experience with similar projects. Table 2 summarizes the sound power of each source used in the analysis.

[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	Tw-1 Generator	48	-	-	-	-	95	-	-	-	**95**
S2	Tw-2 Generator	48	-	-	-	-	95	-	-	-	**95**
S3	Tw-3 Generator	39	-	-	-	-	95	-	-	-	**95**
S4	Tw-4 Generator	39	-	-	-	-	95	-	-	-	**95**
S5	Tw-1 Cooling Tower	51	68	74	75	79	81	80	78	76	**87**
S6	Tw-2 Cooling Tower	42	68	74	75	79	81	80	78	76	**87**
S7	Tw-3 Cooling Tower	51	68	74	75	79	81	80	78	76	**87**
S8	Tw-4 Cooling Tower	42	68	74	75	79	81	80	78	76	**87**

4.1 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 32 receptor locations were chosen on the surrounding noise-sensitive buildings to measure the noise impact at plane of window (POW) and outdoor point of reception OPOR 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. Generators and cooling towers 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 (grass, foliage, etc)	1
Ground attenuation factor (roadways, paved areas, etc)	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	Tower 2 – North Façade	36.1
R2	POW	Tower 2 – East Façade	36.1
R3	POW	Tower 2 – South Façade	36.1
R4	POW	Tower 4 – East Façade	33.1
R5	POW	Tower 4 – East Façade	36.1
R6	POW	Tower 4 – East Façade	36.1
R7	POW	Tower 4 – East Façade	36.1
R8	POW	Tower 4 – East Façade	37.1
R9	POW	Tower 4 – East Façade	34.1
R10	POW	Tower 3 – West Façade	45.0

TABLE 4: RECEPTOR LOCATIONS (CONT.)

Receptor Number	Receptor Type	Receptor Location	Height Above Grade (m)
R11	POW	Tower 3 – West Façade	42.1
R12	POW	Tower 3 – West Façade	45.0
R13	POW	Tower 3 – North Façade	45.0
R14	POW	Tower 1 – South Façade	42.1
R15	POW	Tower 1 – West Façade	45.0
R16	POW	Tower 1 – West Façade	42.1
R17	OPOR	Tower 2 – East Terrace	36.1
R18	OPOR	Tower 2 – North Terrace	9.4
R19	OPOR	Tower 4 – North Terrace	36.1
R20	OPOR	Tower 4 – East Terrace	37.1
R21	OPOR	Tower 3 – West Terrace	45.1
R22	OPOR	Tower 3 – South Terrace	45.1
R23	OPOR	Tower 3 – East Terrace	9.4
R24	OPOR	Tower 1 – South Terrace	6.4
R25	OPOR	Tower 1 – North Terrace	12.3
R26	OPOR	Tower 1 – West Terrace	6.4
R27	OPOR	Tower 1 – West Terrace	45.1
R28	OPOR	Tower 4 - Garden	1.5
R29	POW	1730 St. Laurent Boulevard – South Façade	28.0
R30	POW	374 (H) Everest Private – East Façade	22.3
R31	POW	355 Everest Private – East Façade	22.6
R32	POW	355 Everest Private – East Façade	22.6

5. RESULTS AND DISCUSSION

Noise levels at nearby sensitive receptors are 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 COOLING TOWERS

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	36.1	39	36	50	45	Yes	Yes
R2	POW	36.1	44	41	50	45	Yes	Yes
R3	POW	36.1	45	42	50	45	Yes	Yes
R4	POW	33.1	48	45	50	45	Yes	Yes
R5	POW	36.1	46	43	50	45	Yes	Yes
R6	POW	36.1	48	45	50	45	Yes	Yes
R7	POW	36.1	46	43	50	45	Yes	Yes
R8	POW	37.1	46	42	50	45	Yes	Yes
R9	POW	34.1	42	39	50	45	Yes	Yes
R10	POW	45.0	44	41	50	45	Yes	Yes
R11	POW	42.1	46	43	50	45	Yes	Yes
R12	POW	45.0	45	42	50	45	Yes	Yes
R13	POW	45.0	47	44	50	45	Yes	Yes
R14	POW	42.1	43	40	50	45	Yes	Yes
R15	POW	45.0	45	42	50	45	Yes	Yes
R16	POW	42.1	46	43	50	45	Yes	Yes
R17	OPOR	36.1	47	N/A*	50	N/A*	Yes	N/A*
R18	OPOR	9.4	36	N/A*	50	N/A*	Yes	N/A*
R19	OPOR	36.1	47	N/A*	50	N/A*	Yes	N/A*
R20	OPOR	37.1	47	N/A*	50	N/A*	Yes	N/A*
R21	OPOR	45.1	46	N/A*	50	N/A*	Yes	N/A*
R22	OPOR	45.1	39	N/A*	50	N/A*	Yes	N/A*
R23	OPOR	9.4	26	N/A*	50	N/A*	Yes	N/A*
R24	OPOR	6.4	39	N/A*	50	N/A*	Yes	N/A*

TABLE 5: NOISE LEVELS FROM COOLING TOWERS (CONT.)

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
R25	OPOR	12.3	38	N/A*	50	N/A*	Yes	N/A*
R26	OPOR	6.4	37	N/A*	50	N/A*	Yes	N/A*
R27	OPOR	45.1	47	N/A*	50	N/A*	Yes	N/A*
R28	OPOR	1.5	35	N/A*	50	N/A*	Yes	N/A*
R29	POW	28.0	42	42	50	45	Yes	Yes
R30	POW	22.3	38	38	50	45	Yes	Yes
R31	POW	22.6	37	37	50	45	Yes	Yes
R32	POW	22.6	29	29	50	45	Yes	Yes

*OPOR noise levels during the nighttime are not considered as per ENCG

TABLE 6: NOISE LEVELS FROM GENERATORS

Receptor Number	Receptor Type	Height Above Grade (m)	Noise Level (dBA)	Sound Level Limits	Meets ENCG Class 1 Criteria
			Day	Day	Day
R1	POW	36.1	43	55	Yes
R2	POW	36.1	44	55	Yes
R3	POW	36.1	47	55	Yes
R4	POW	33.1	51	55	Yes
R5	POW	36.1	52	55	Yes
R6	POW	36.1	46	55	Yes
R7	POW	36.1	49	55	Yes
R8	POW	37.1	44	55	Yes
R9	POW	34.1	38	55	Yes
R10	POW	45.0	52	55	Yes
R11	POW	42.1	53	55	Yes
R12	POW	45.0	53	55	Yes

TABLE 6: NOISE LEVELS FROM GENERATORS

Receptor Number	Receptor Type	Height Above Grade (m)	Noise Level (dBA)	Sound Level Limits	Meets ENCG Class 1 Criteria
			Day	Day	Day
R13	POW	45.0	51	55	Yes
R14	POW	42.1	53	55	Yes
R15	POW	45.0	54	55	Yes
R16	POW	42.1	54	55	Yes
R17	OPOR	36.1	48	55	Yes
R18	OPOR	9.4	36	55	Yes
R19	OPOR	36.1	53	55	Yes
R18	OPOR	37.1	45	55	Yes
R19	OPOR	45.1	53	55	Yes
R20	OPOR	45.1	36	55	Yes
R21	OPOR	9.4	37	55	Yes
R22	OPOR	6.4	38	55	Yes
R23	OPOR	12.3	41	55	Yes
R24	OPOR	6.4	38	55	Yes
R25	OPOR	45.1	55	55	Yes
R26	OPOR	1.5	35	55	Yes
R27	OPOR	28.0	43	55	Yes
R28	OPOR	22.3	39	55	Yes
R29	POW	22.6	34	55	Yes
R30	POW	22.6	31	55	Yes
R31	POW	36.1	51	55	Yes
R32	POW	36.1	53	55	Yes

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 are followed and the sound power levels of the cooling towers and generators do not exceed the levels shown in Table 2. As such, 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.

To ensure compliance with the ENCG, the following noise control measures are recorded:

- The sound power levels of the cooling towers and generators should not exceed the levels shown in Table 2.
- The noise screens should be placed at the heights of the mechanical units or 0.5 metres higher. Potential noise screen locations are shown in Figure 4.

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.

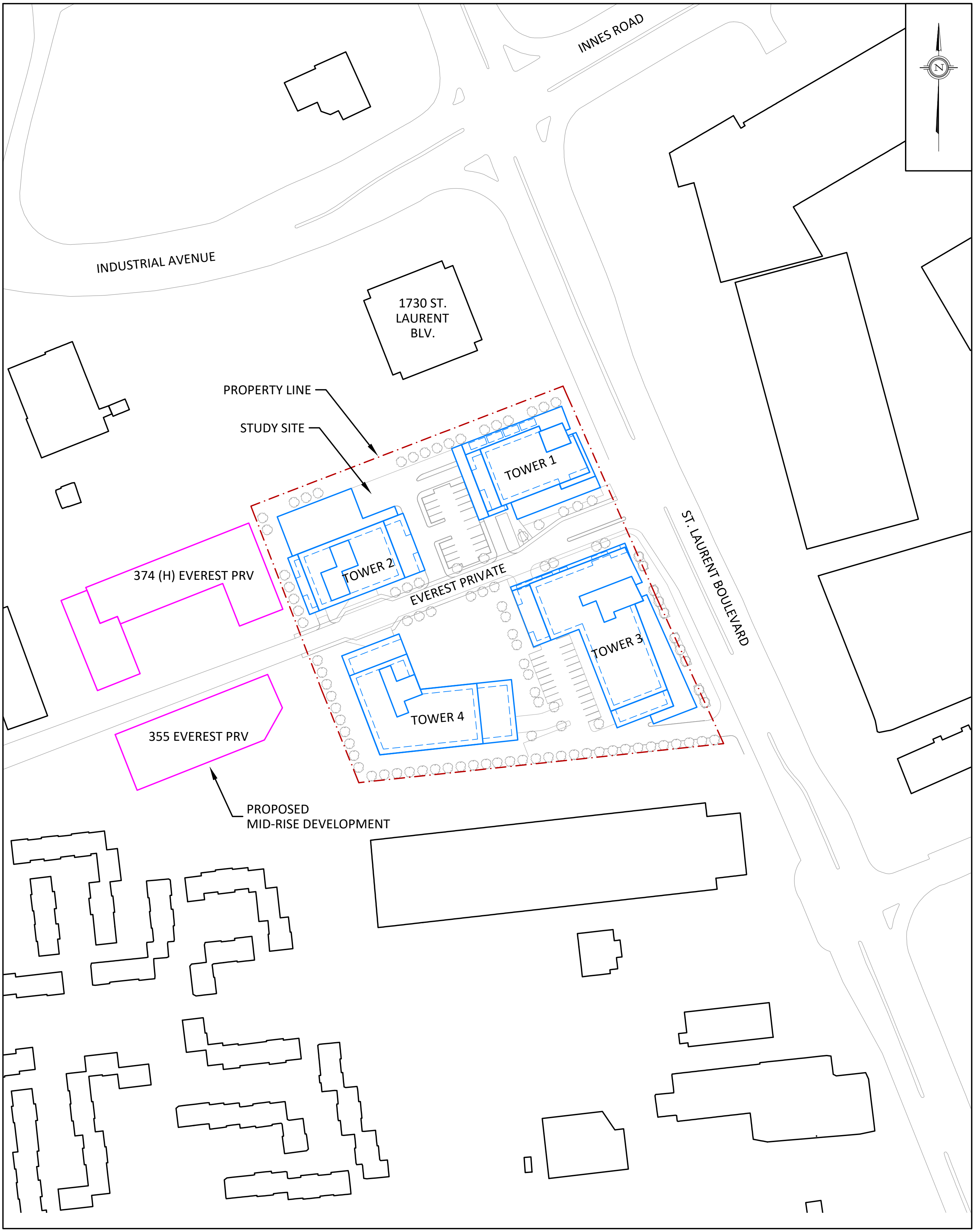
Sincerely,

Gradient Wind Engineering Inc.

Efser Kara, MSc, LEED GA
Acoustic Scientist

Joshua Foster, P.Eng.
Principal

Gradient Wind File #20-142 – Stationary Noise



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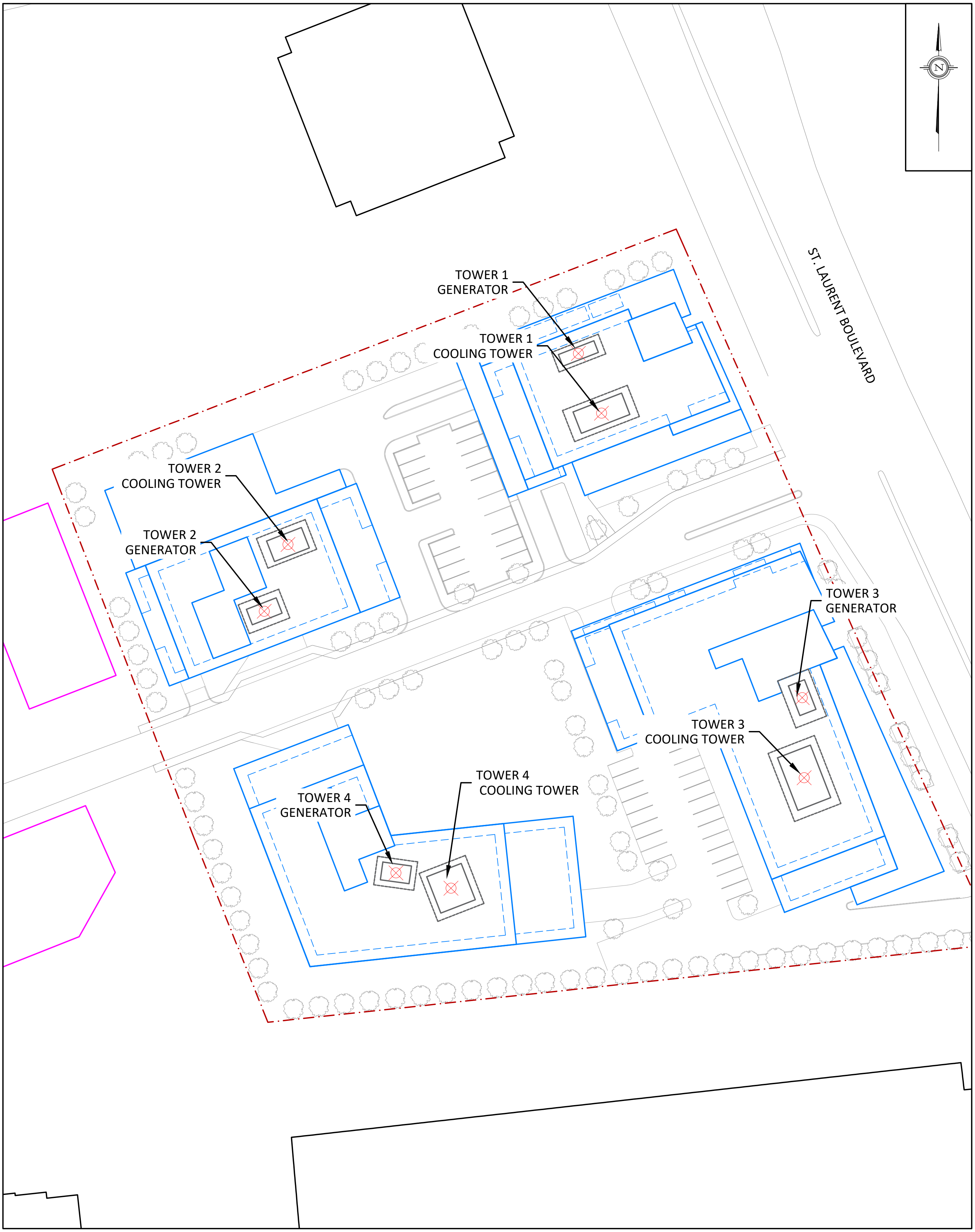
PROJECT: 1740-1760 ST. LAURENT BOULEVARD, OTTAWA STATIONARY NOISE ASSESSMENT		DESCRIPTION: FIGURE 1: SITE PLAN AND SURROUNDING CONTEXT
SCALE: 1:2000 (APPROX.)	DRAWING NO.: GW20-142-1	
DATE: JULY 7, 2021	DRAWN BY: E.K.	

GRADIENTWIND ENGINEERS & SCIENTISTS 127 WALGREEN ROAD , OTTAWA, ON 613 836 0934 • GRADIENTWIND.COM	PROJECT: 1740-1760 ST. LAURENT BOULEVARD, OTTAWA STATIONARY NOISE ASSESSMENT		DESCRIPTION: FIGURE 2: RECEPTOR LOCATIONS
	SCALE: 1:1000 (APPROX.)	DRAWING NO.: GW20-142-2	
	DATE: JULY 7, 2021	DRAWN BY: E.K.	



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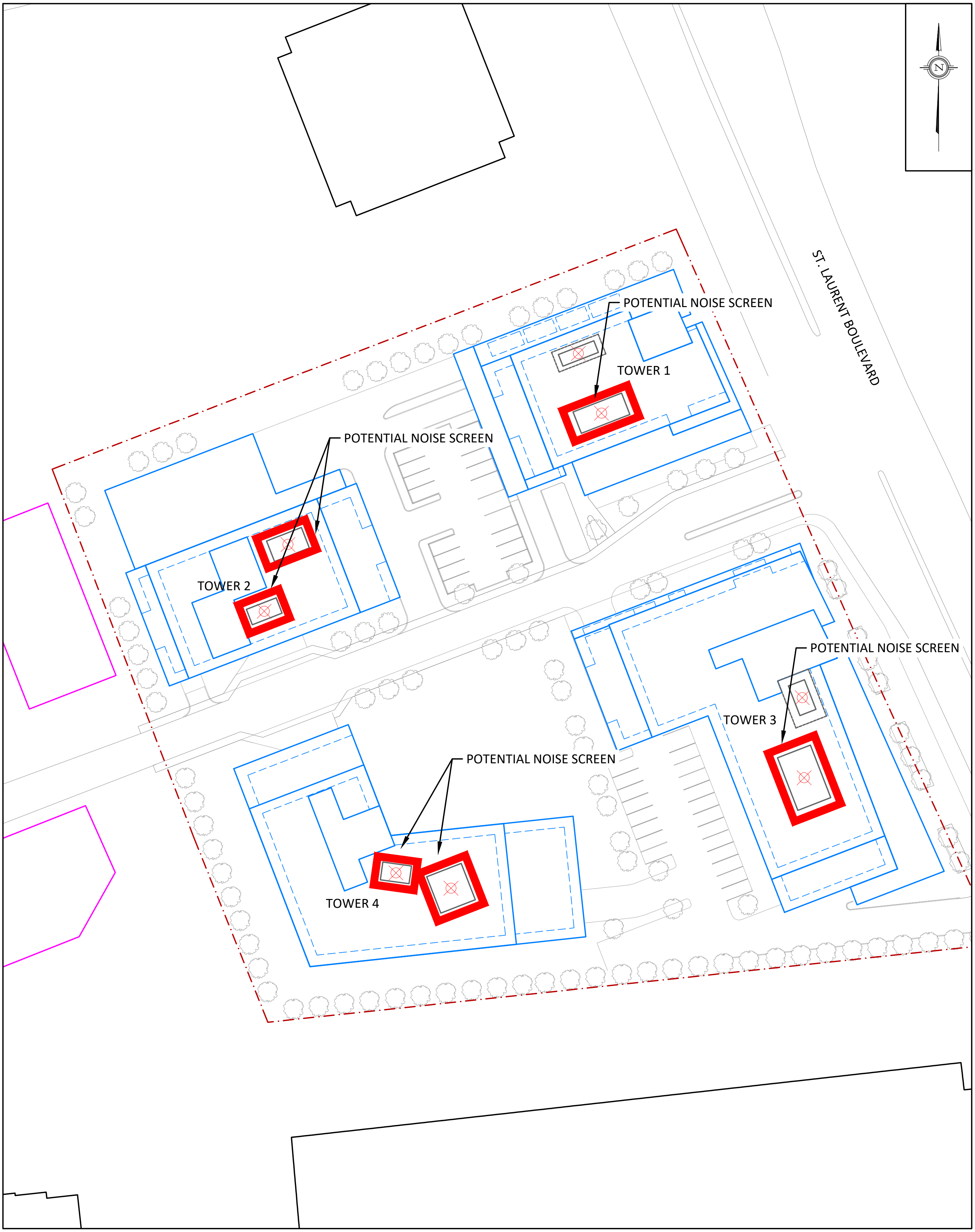
SCALE	1:1000 (APPROX.)	DRAWING NO.	GW20-142-3
DATE	JULY 7, 2021	DRAWN BY	E.K.

DESCRIPTION

FIGURE 3:
SOURCE LOCATIONS



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SCALE	1:1000 (APPROX.)	DRAWING NO.	GW20-142-4
DATE	JULY 7, 2021	DRAWN BY	E.K.

DESCRIPTION

FIGURE 4:
POTENTIAL NOISE SCREEN LOCATIONS

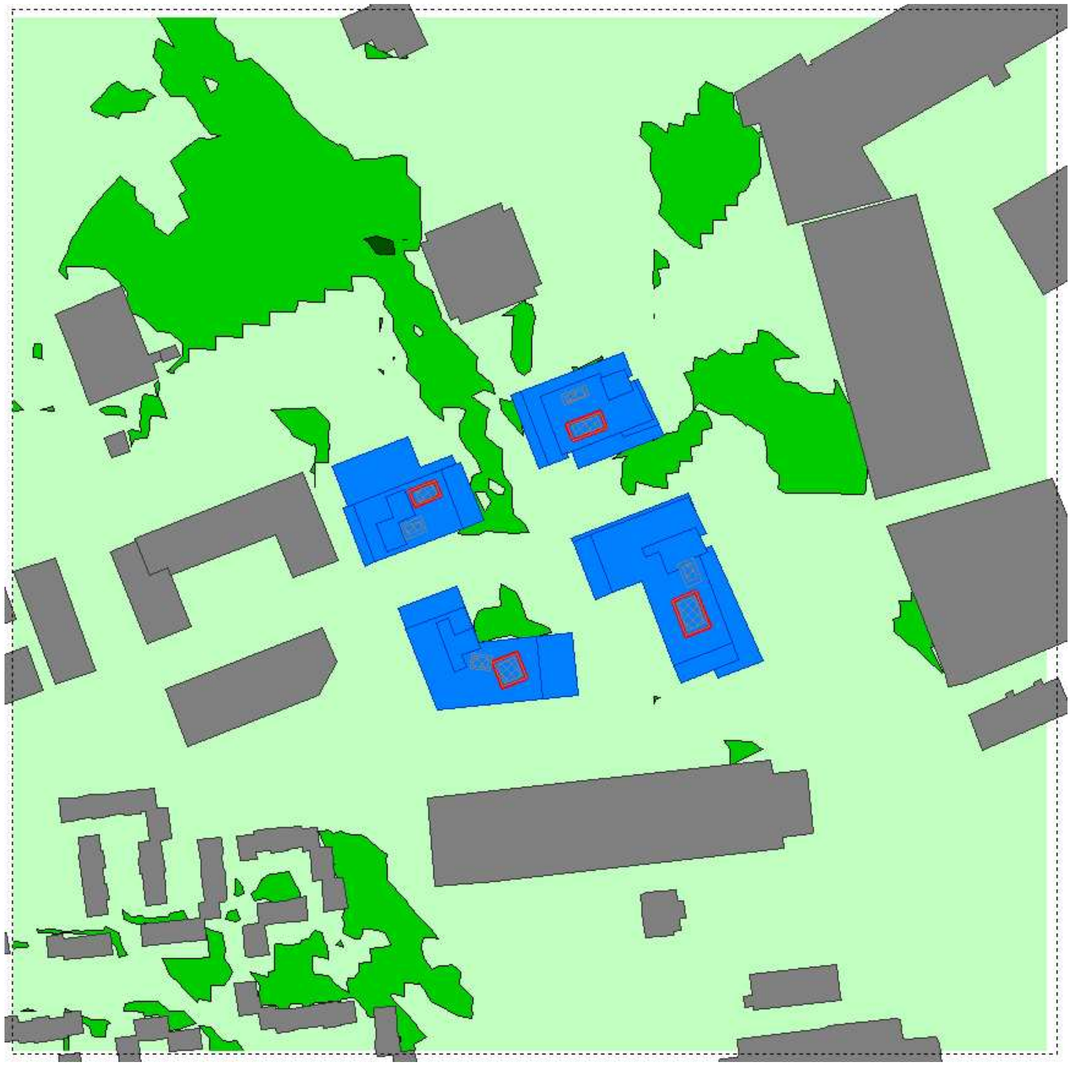

FIGURE 5: COOLING TOWERS DAYTIME NOISE CONTOURS (4.5 M ABOVE GRADE)

	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

FIGURE 6: COOLING TOWERS 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

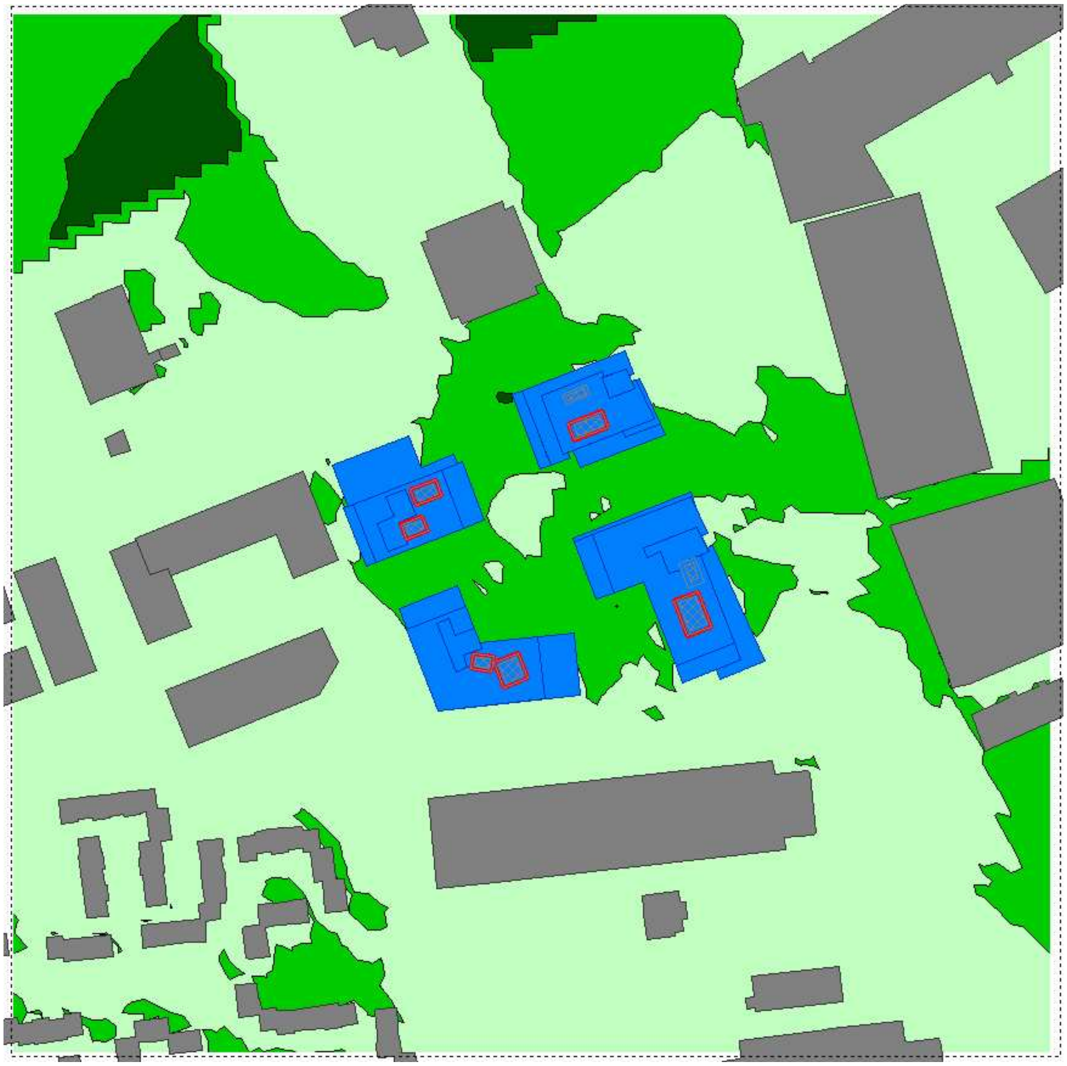

FIGURE 7: GENERATORS DAYTIME NOISE CONTOURS (4.5 M ABOVE GRADE)

	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