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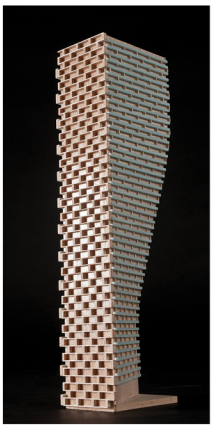
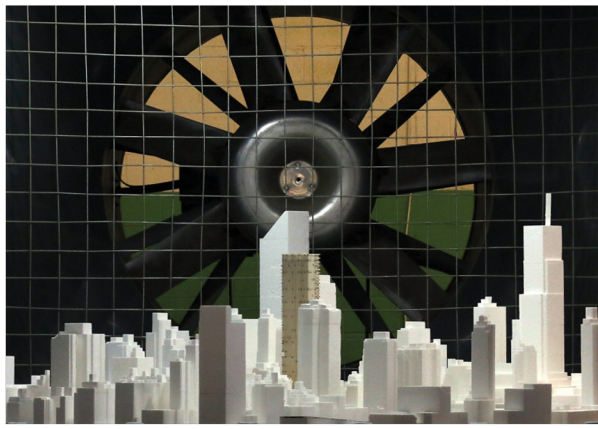
STATIONARY NOISE ASSESSMENT

652 Flagstaff Drive
Ottawa, Ontario

REPORT: 23-079-Stationary Noise





August 28, 2023

PREPARED FOR

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PREPARED BY

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EXECUTIVE SUMMARY

This report describes a stationary noise assessment performed for a proposed commercial development located at 652 Flagstaff Drive in Ottawa, Ontario. The proposed development comprises a commercial plaza with 14 units arranged in an 'L' shape along the west and south of a rectangular parcel of land. The site also contains a patio area to the south, parking to the north, and landscapes space around the perimeter. 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) site plan drawings provided by 25:8 Architecture + Urban Design in May 2023, and; (iv) mechanical information provided by NUKK Borrisokane Inc..

The results of the current assessment 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 followed during the detailed design process. 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 9621962 Canada Inc. to undertake a stationary noise assessment for the proposed commercial development located at 652 Flagstaff Drive 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 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, site plan drawings provided by 25:8 Architecture + Urban Design in May 2023, mechanical information provided by NUKK Borrisokane Inc., 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 commercial development located at 652 Flagstaff Drive in Ottawa, Ontario. The development is located on an rectangular parcel of land bound by Borrisokane Road to the west, Flagstaff Drive to the south, and vacant land to the east and north.

The proposed development comprises a commercial plaza with 14 units arranged in an 'L' shape along the west and south of a rectangular parcel of land. The site also contains a patio area to the south, parking to the north, and landscapes space around the perimeter. The development site is located near future residential properties to the east and southeast. Figure 1 illustrates the site plan and surrounding context.

As a conservative approach, the facilities are assumed to operate 24 hours a day with a majority of the operations taking place during the daytime period. However, certain sources are likely to have reduced operation during the nighttime period between 23:00 and 07:00. Sources of stationary noise include rooftop air handling equipment. Figure 3 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

According to NPC-300 Section A5.5[3], sources that are not considered as stationary sources include "*occasional movement of vehicles on the property such as delivery of goods to and the removal of goods/refuse from convenience stores, fast food restaurants and similar commercial facilities, etc.*". Based on Gradient Wind's past experience with similar commercial developments, it is expected that delivery/removal of goods for the development will occur occasionally on site (less than 2 occurrences per week). As such, noise generated in relation to these deliveries are expected to be minimal and were omitted from the analysis.

2.1 Assumptions

Mechanical information for the development was provided by NUKK Borrisokane Inc. 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 locations and quantity of rooftop units (RTU) have been assumed based on Gradient Wind's experience with similar commercial developments.
(ii) Sound data for the RTUs were based on data from the manufacturer.
(iii) The rooftop mechanical units were assumed to operate continuously over a 1-hour period during the daytime and at 50% operation during the nighttime period.
(iv) Screening effects of a 1m tall (height above roof) parapet was included in the modelling.
(v) For rear yards within the residential area, as well as open spaces, the ground region was modelled as absorptive due to the presence of soft ground (grass).

3. OBJECTIVES

The main goals of this work are to (i) calculate the future noise levels on the surrounding 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.

[3] NPC – 300, page 20

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. Thirteen 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"[4].

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,

[4] NPC – 300, page 16

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"[5]. 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 in a suburban 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 Area" boundary as defined in Schedule A and B of the City of Ottawa Official Plan[6]. Furthermore, Borrisokane Road and Flagstaff Drive are classified as arterial and collector roadways, respectively, and are the main contributors to ambient noise in the area. There is additional influence from Highway 416 located to the southwest. These conditions indicate that the sound field is dominated by manmade sources.

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 NUKK Borrisokane Inc. A review of the final equipment selections and locations by a qualified acoustical engineer will be required prior to installation of the equipment. Table 2 summarizes the sound power of each source used in the analysis.

[5] NPC – 300, page 14
[6] City of Ottawa Official Plan Vol 1: Section 6

TABLE 2: EQUIPMENT SOUND POWER LEVELS (dBA)

Source	Description	Height Above Grade/Roof (m)	Frequency (Hz)								
			63	125	250	500	1000	2000	4000	8000	Total
S1-14	RTU	0.8	57	69	74	78	78	76	72	63	**83**

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 thirteen 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. 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 modelling data is available upon request.

TABLE 3: RECEPTOR LOCATIONS

Receptor Number	Receptor Location	Height Above Grade (m)
R1	POW - 138 Main Halyard Lane - West Facade	4.5
R2	POW - 144 Main Halyard Lane - West Facade	4.5
R3	POW - 634 Flagstaff Drive - North Facade	4.5
R4	POW - 634 Flagstaff Drive - West Facade	4.5
R5	POW - 634 Flagstaff Drive - South Facade	4.5
R6	POW - Block 517 - North Facade	4.5
R7	POW - Block 517 - West Facade	4.5
R8	POW - Block 517 - West Facade	4.5
R9	OPOR - 138 Main Halyard Lane - Rear Yard	1.5
R10	OPOR - 144 Main Halyard Lane - Rear Yard	1.5
R11	OPOR - 634 Flagstaff Drive - Rear Yard	1.5
R12	OPOR - Block 517 - Rear Yard	1.5
R13	OPOR - Block 517 - Rear Yard	1.5

TABLE 4: 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

5. RESULTS AND DISCUSSION

Noise levels on the surroundings produced by the mechanical equipment associated with the proposed commercial development are presented in Table 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	Noise Level (dBA)		Sound Level Limits		Meets ENCG Class 1 Criteria	
		Day	Night	Day	Night	Day	Night
R1	POW - 138 Main Halyard Lane - West Facade	34	31	50	45	**Yes**	**Yes**
R2	POW - 144 Main Halyard Lane - West Facade	34	31	50	45	**Yes**	**Yes**
R3	POW - 634 Flagstaff Drive - North Facade	36	33	50	45	**Yes**	**Yes**
R4	POW - 634 Flagstaff Drive - West Facade	37	34	50	45	**Yes**	**Yes**
R5	POW - 634 Flagstaff Drive - South Facade	22	19	50	45	**Yes**	**Yes**
R6	POW - Block 517 - North Facade	36	33	50	45	**Yes**	**Yes**
R7	POW - Block 517 - West Facade	36	33	50	45	**Yes**	**Yes**
R8	POW - Block 517 - West Facade	35	32	50	45	**Yes**	**Yes**
R9	OPOR - 138 Main Halyard Lane - Rear Yard	33	N/a*	50	N/a*	**Yes**	**N/a***
R10	OPOR - 144 Main Halyard Lane - Rear Yard	33	N/a*	50	N/a*	**Yes**	**N/a***
R11	OPOR - 634 Flagstaff Drive - Rear Yard	35	N/a*	50	N/a*	**Yes**	**N/a***
R12	OPOR - Block 517 - Rear Yard	34	N/a*	50	N/a*	**Yes**	**N/a***
R13	OPOR - Block 517 - Rear Yard	33	N/a*	50	N/a*	**Yes**	**N/a***

*Noise levels at OPORs during the nighttime period are not considered as per ENCG.

As Table 5 summarizes, noise levels fall below ENCG criteria at all receptors. Noise contours at 4.5 metres above grade for HVAC equipment can be seen in Figures 4 and 5 for daytime and nighttime conditions. As a general recommendation, rooftop equipment should be located toward the centre of the rooftop, avoiding direct line of sight with noise sensitive areas if possible.

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 followed during the detailed design process. Once the mechanical design progresses and updated equipment information becomes available, these should be forwarded to Gradient Wind for review.

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

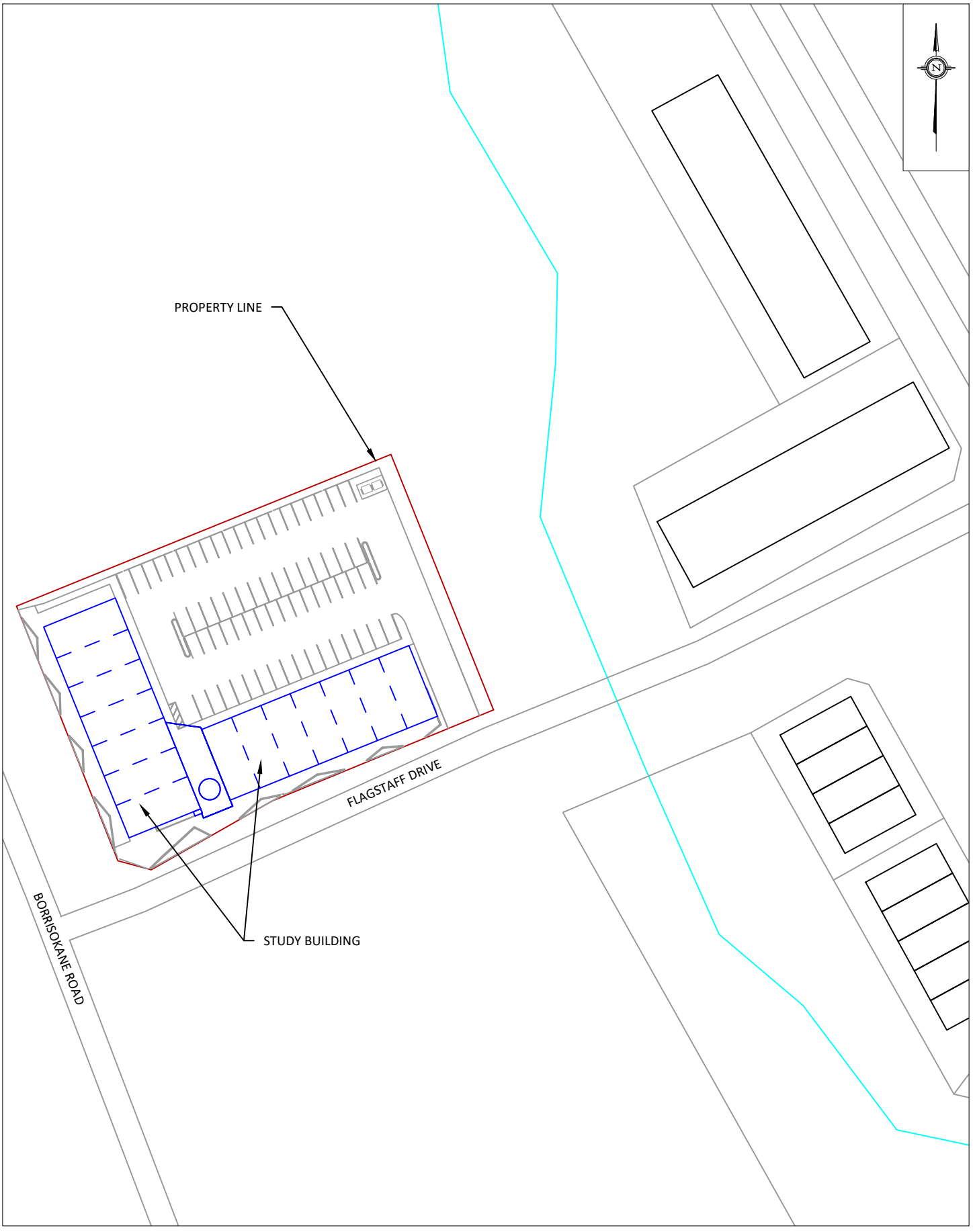
This concludes our stationary noise assessment and report. If you have any questions or wish to discuss our findings, please advise us. In the interim, we thank you for the opportunity to be of service.

Sincerely,

Gradient Wind Engineering Inc.

Joshua Foster, P.Eng.
Lead Engineer

Gradient Wind File 23-079



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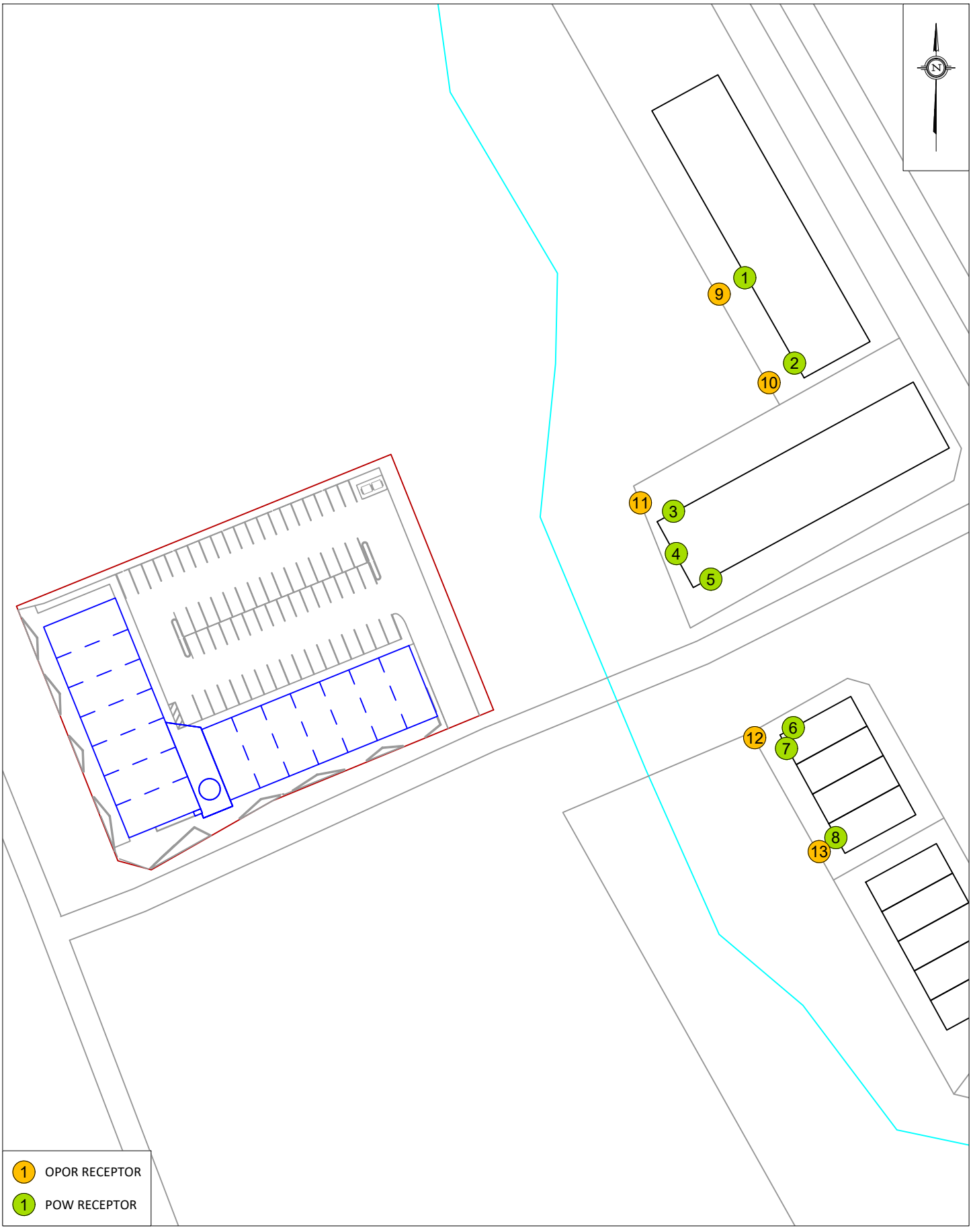
PROJECT	652 FLAGSTAFF DRIVE, OTTAWA STATIONARY NOISE ASSESSMENT		
SCALE	1:1000 (APPROX.)	DRAWING NO.	GW23-079-1
DATE	JUNE 12, 2023	DRAWN BY	G.G.

DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT



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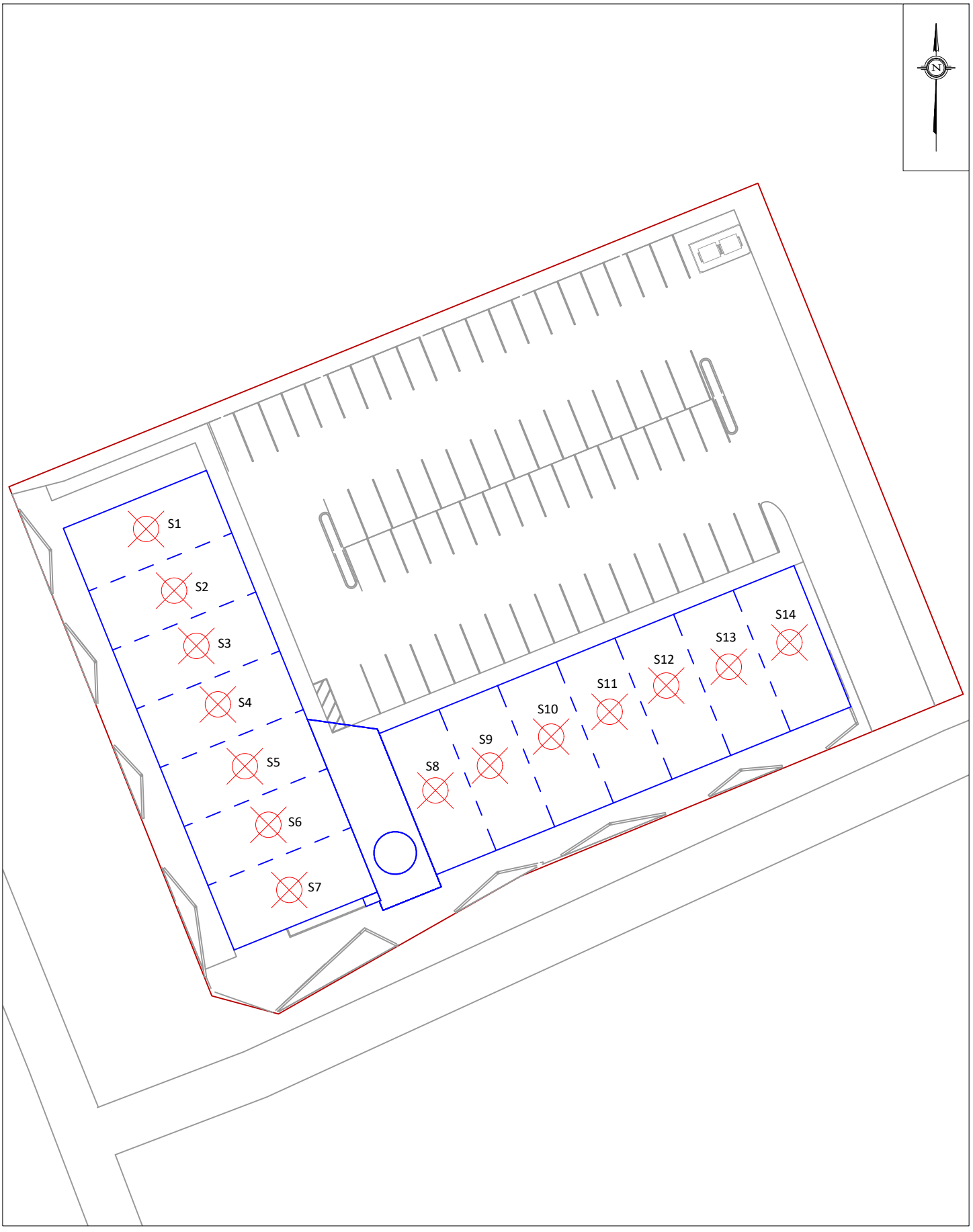
PROJECT	652 FLAGSTAFF DRIVE, OTTAWA STATIONARY NOISE ASSESSMENT		DESCRIPTION
SCALE	1:1000 (APPROX.)	DRAWING NO. GW23-079-2	FIGURE 2: RECEPTOR LOCATIONS
DATE	JUNE 12, 2023	DRAWN BY G.G.	



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PROJECT	652 FLAGSTAFF DRIVE, OTTAWA STATIONARY NOISE ASSESSMENT		DESCRIPTION
SCALE	1:500 (APPROX.)	DRAWING NO.	GW23-079-3
DATE	JUNE 12, 2023	DRAWN BY	G.G.

FIGURE 3:
NOISE SOURCE LOCATIONS

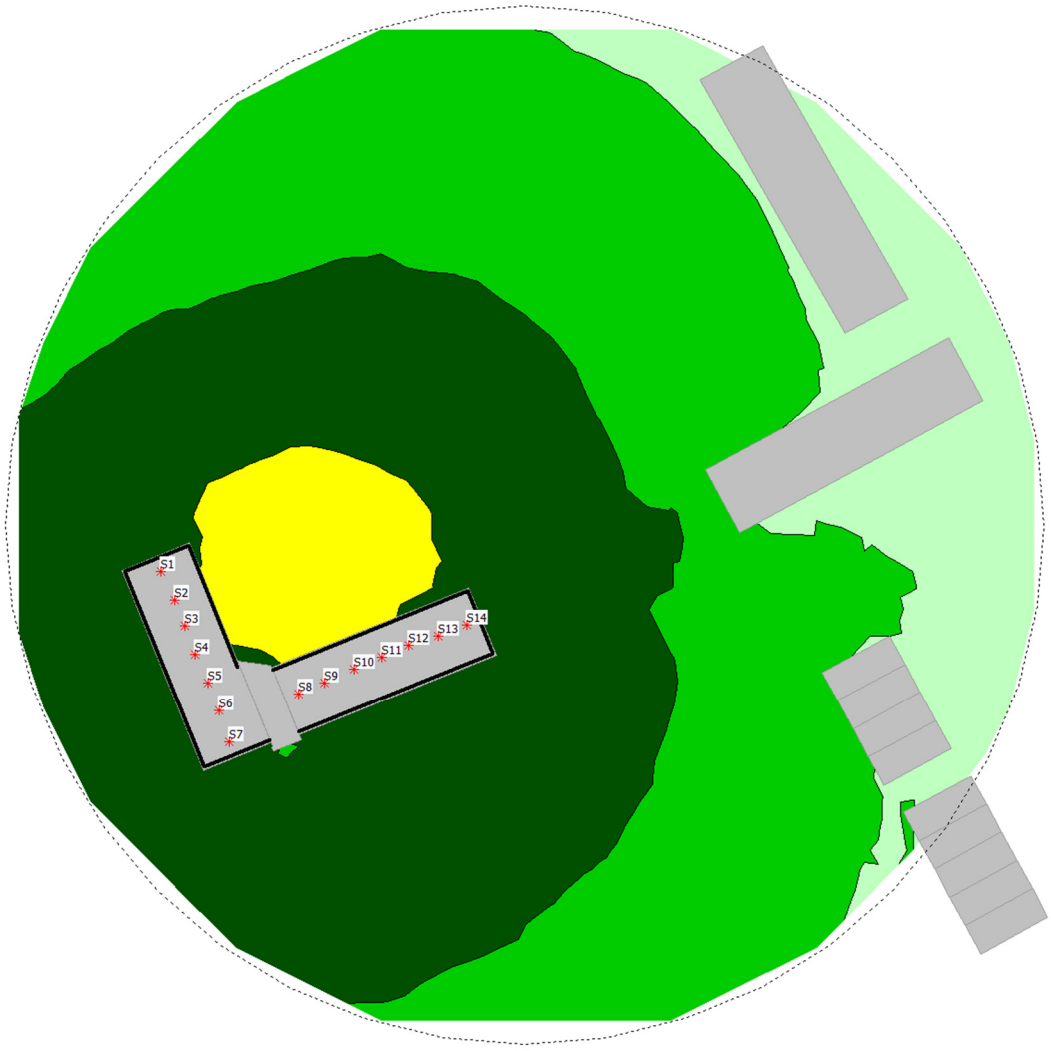

FIGURE 4: DAYTIME STATIONARY NOISE CONTOURS – HVAC EQUIPMENT (4.5 METERS ABOVE GRADE)

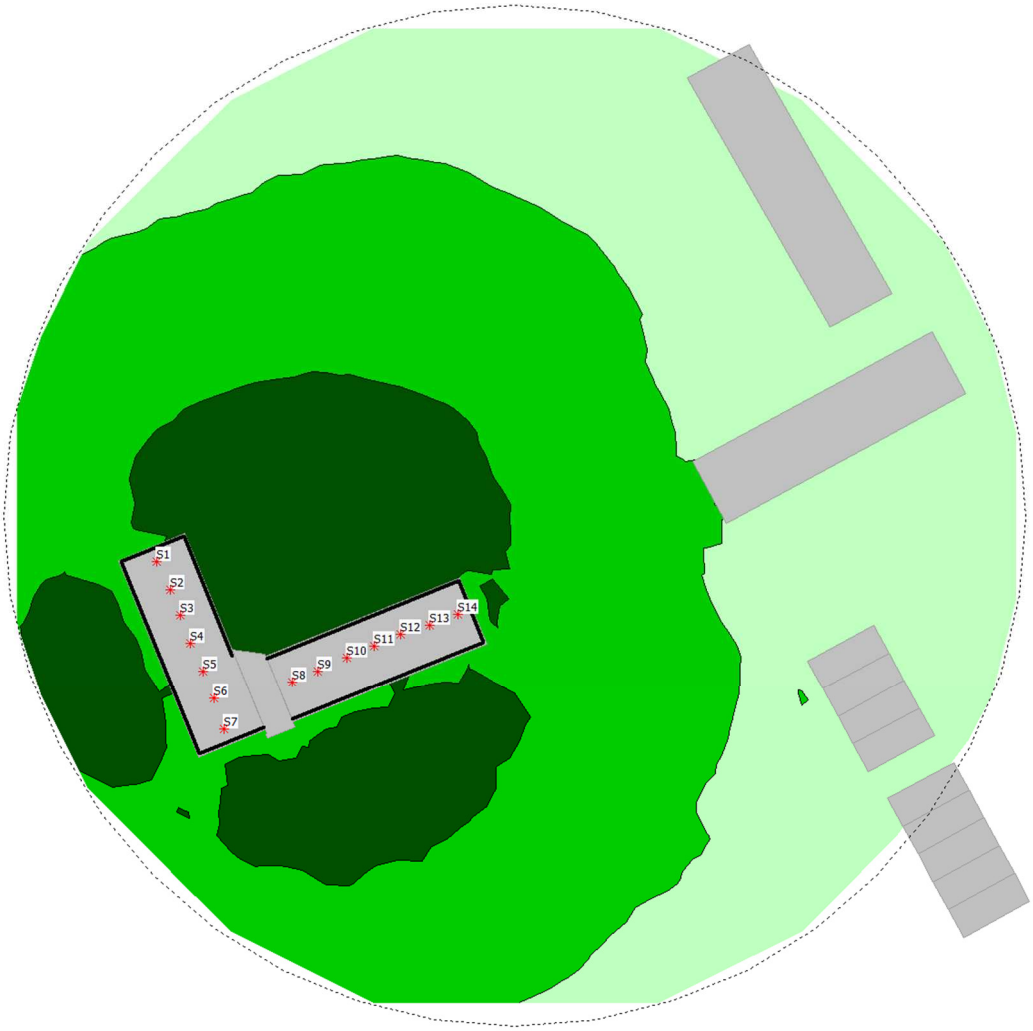

FIGURE 5: NIGHTTIME STATIONARY NOISE CONTOURS – HVAC EQUIPMENT (4.5 METERS ABOVE GRADE)