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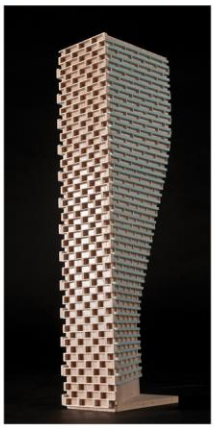
ENGINEERS & SCIENTISTS

# STATIONARY NOISE FEASIBILITY ASSESSMENT

Block 4, 850 Champlain Street
Ottawa, Ontario

REPORT: 16-152-Stationary Noise Block 4



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PREPARED FOR
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# EXECUTIVE SUMMARY

This report describes a stationary noise feasibility assessment undertaken in support of site plan application (SPA) submission for a proposed long-term care (LTC) facility located on Block 4 at 850 Champlain Street in Ottawa, Ontario. The development is a 5-storey building with an irregular-shaped planform. The building features two (2) rectangular extensions at the east side and rectangular extensions at each the north and south side, which provide 16 beds at each level for a total of 320-beds within the building. Grade-level courtyards are located at the centre of the east side of the site between the two eastern extensions as well as the southwest corner near the main building entrance. Sources of stationary noise include rooftop air handling equipment and an 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) a site plan drawing prepared by MMMC Architects in May 2020, and ; (iv) mechanical information assumed by Gradient Wind based on experience with similar projects.

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 adhered to during the detailed design process. 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.

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## 1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Revera Inc. to undertake a stationary noise feasibility assessment for a proposed long-term care (LTC) facility located on Block 4 at 850 Champlain 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 and an 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, a site plan drawing prepared by MMMC Architects in May 2020, 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 feasibility is a proposed long-term care (LTC) facility located on Block 4 at 850 Champlain Street in Ottawa, Ontario. The study site is located near the middle of a parcel of land bounded by Jeanne d'Arc Boulevard to the north, Champlain Street to the east, a parking lot to the south and Du Bois Avenue and Bilberry Drive to the west.

The development is a 5-storey building with an irregular-shaped planform. The building features two (2) rectangular extensions at the east side and rectangular extensions at each the north and south side, which provide 16 beds at each level for a total of 320-beds within the building. Grade-level courtyards are located at the centre of the east side of the site between the two eastern extensions as well as the southwest corner near the main building entrance.

The development site is currently bordered by open green space from the south clockwise to the north and Champlain Street to the east, followed by low-rise residential dwellings along the west perimeter of the

[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

subdivision, to the north beyond Jeanna d'Arc Boulevard and to the east beyond Champlain Street, which are the nearest points of reception. Figure 1 illustrates the site plan and surrounding context.

The facilities are expected to operate 24 hours a day. 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 and an emergency generator. Figure 2 illustrates the location of all noise sources included in this study.

A municipal 'Park & Ride' lot is located immediately south of Block 5, between the study site and Highway 174. According to NPC-300[3], sources that are not considered as stationary sources include "*parking lots for private passenger vehicles at offices or commercial facilities such as retail stores, plazas or shopping malls, or employee parking lots at industries and commuter parking lots*". The nearby 'Park & Ride' lot would be considered a commuter parking lot and therefore was omitted from this analysis.

## 2.1 Assumptions

Gradient Wind has assumed the preliminary mechanical information of the development based on experience with similar developments and guidance from a 'Mechanical Systems Basis of Design Report' prepared by EXP. 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) The locations, quantity and tonnage of rooftop units has been assumed based on Gradient Wind's experience with similar developments and guidance from a 'Mechanical Systems Basis of Design Report' prepared by EXP.

(ii) Sound data for rooftop units are based on Gradient Wind's experience with similar developments and information provided in a 'Mechanical Systems Basis of Design Report' prepared by EXP.

(iii) 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.

(iv) The emergency generator will only be tested during the daytime.

[3] NPC-300, page 20

(v) The ground was modelled as being soft (absorptive) ground, with the exclusion of surrounding roadways and parking lots which were modelled as hard (reflective) surfaces.

(vi) Screening effects of the parapets have been conservatively excluded in the modelling.

## 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.

## 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. Ten (10) receptor locations were selected for the study site, as illustrated in Figure 3.

### 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" [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, 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"[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, campgrounds, 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 a major collector roadway 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 along a major collector roadway (Champlain Street) and in proximity to Highway 174. These conditions indicate that the sound field is dominated by manmade sources.

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[6] (See NPC-300 C4.5.3).

[4] City of Ottawa Environmental Noise Control Guidelines, page 10
[5] City of Ottawa Environmental Noise Guidelines, page 9
[6] Environmental Noise Guideline "Stationary and Transportation Sources – Approval and Planning" NPC-300

**TABLE 1: EXCLUSIONARY LIMITS FOR CLASS 1 AREA**

| Time of Day | Outdoor Points of Reception (OPOR) | Plane of Window (POW) |
|---|---|---|
| 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 guidance from a 'Mechanical Systems Basis of Design Report' prepared by EXP. Table 2 summarizes the sound power of each source used in the analysis.

**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 | Dry Cooler | 2.6 | - | - | - | - | 95 | - | - | - | 95 |
| S2-3 | ERV | 3.5 | - | - | - | - | 90 | - | - | - | 90 |
| S4 | Emergency Generator | 2.0 | - | - | - | - | 100 | - | - | - | 100 |

## 4.4 Stationary Source Noise Predictions

A total of 10 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 3. 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. Modelling data can be provided upon request.

### TABLE 3: RECEPTOR LOCATIONS

| Receptor Number | Receptor Location | Height Above Grade (m) |
|---|---|---|
| R1 | POW – 879 Champlain Street | 4.5 |
| R2 | POW – 873 Champlain Street | 4.5 |
| R3 | OPOR – 873 Champlain Street | 1.5 |
| R4 | POW – 867 Champlain Street | 4.5 |
| R5 | OPOR – 867 Champlain Street | 1.5 |
| R6 | POW – 858 Champlain Street | 4.5 |
| R7 | POW – 866 Balsam Drive | 1.5 |
| R8 | POW – 7003 Du Bois Avenue | 4.5 |
| R9 | POW – 7010 Bilberry Drive | 4.5 |
| R10 | OPOR – 7010 Bilberry Drive | 1.5 |

### TABLE 4: 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 at nearby sensitive receptors fall below ENCG criteria for stationary noise, as summarized in Tables 5 and 6 below for the HVAC equipment and emergency generator, respectively. The sound levels listed in Table 5 and 6 are based on the assumptions outlined in Section 2.1.

### TABLE 5: NOISE LEVELS FROM HVAC SOURCES

| Receptor Number | Plane of Window Receptor Location | Noise Level (dBA) | | Sound Level Limits (dBA) | | Meets ENCG Class 1 Criteria | |
|---|---|---|---|---|---|---|---|
| | | Day | Night | Day | Night | Day | Night |
| R1 | POW – 879 Champlain Street | 37 | 34 | 50 | 45 | Yes | Yes |
| R2 | POW – 873 Champlain Street | 35 | 32 | 50 | 45 | Yes | Yes |
| R3 | OPOR – 873 Champlain Street | 26 | N/A | 50 | N/A | Yes | N/A |
| R4 | POW – 867 Champlain Street | 43 | 40 | 50 | 45 | Yes | Yes |
| R5 | OPOR – 867 Champlain Street | 29 | N/A | 50 | N/A | Yes | N/A |
| R6 | POW – 858 Champlain Street | 38 | 35 | 50 | 45 | Yes | Yes |
| R7 | POW – 866 Balsam Drive | 37 | 34 | 50 | 45 | Yes | Yes |
| R8 | POW – 7003 Du Bois Avenue | 43 | 40 | 50 | 45 | Yes | Yes |
| R9 | POW – 7010 Bilberry Drive | 42 | 39 | 50 | 45 | Yes | Yes |
| R10 | OPOR – 7010 Bilberry Drive | 42 | N/A | 50 | N/A | Yes | N/A |

N/A = sound levels during the nighttime are not considered as per ENCG

### TABLE 6: NOISE LEVELS FROM EMERGENCY GENERATOR

| Receptor Number | Plane of Window Receptor Location | Noise Level (dBA) | Sound Level Limits (dBA) | Meets ENCG Class 1 Criteria |
|---|---|---|---|---|
| | | Day | Day | Day |
| R1 | POW – 879 Champlain Street | 39 | 55 | Yes |
| R2 | POW – 873 Champlain Street | 38 | 55 | Yes |
| R3 | OPOR – 873 Champlain Street | 35 | 55 | Yes |
| R4 | POW – 867 Champlain Street | 42 | 55 | Yes |
| R5 | OPOR – 867 Champlain Street | 28 | 55 | Yes |
| R6 | POW – 858 Champlain Street | 40 | 55 | Yes |
| R7 | POW – 866 Balsam Drive | 42 | 55 | Yes |
| R8 | POW – 7003 Du Bois Avenue | 45 | 55 | Yes |
| R9 | POW – 7010 Bilberry Drive | 45 | 55 | Yes |
| R10 | OPOR – 7010 Bilberry Drive | 44 | 55 | Yes |

As Tables 5 and 6 summarizes, noise levels fall below ENCG criteria at all receptors. Noise contours at 4.5 m above grade can be seen in Figures 4 and 5 for daytime and nighttime conditions, respectively, for the HVAC sources and Figure 6 for the daytime conditions for the emergency generator. The main contributor of noise at these locations is the dry cooler. The loudest rooftop equipment should be located toward the centre of the rooftop with the exhausts and intakes located away from the residential areas, avoiding a 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 land uses.

## 6. CONCLUSIONS AND RECOMMENDATIONS

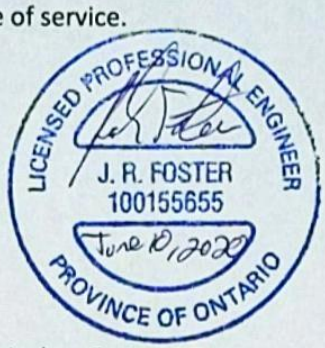
The results of the current study indicate that noise levels at nearby points of reception are expected to fall below the ENCG noise criteria, provided that the assumptions for noise control as outlined in Section 2.1 are adhered to during the detailed design process. As such, the proposed development 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.

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.***

Samantha Phillips, B.Eng.
Environmental Scientist

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*Gradient Wind File #16-152-Stationary Noise Block 4*


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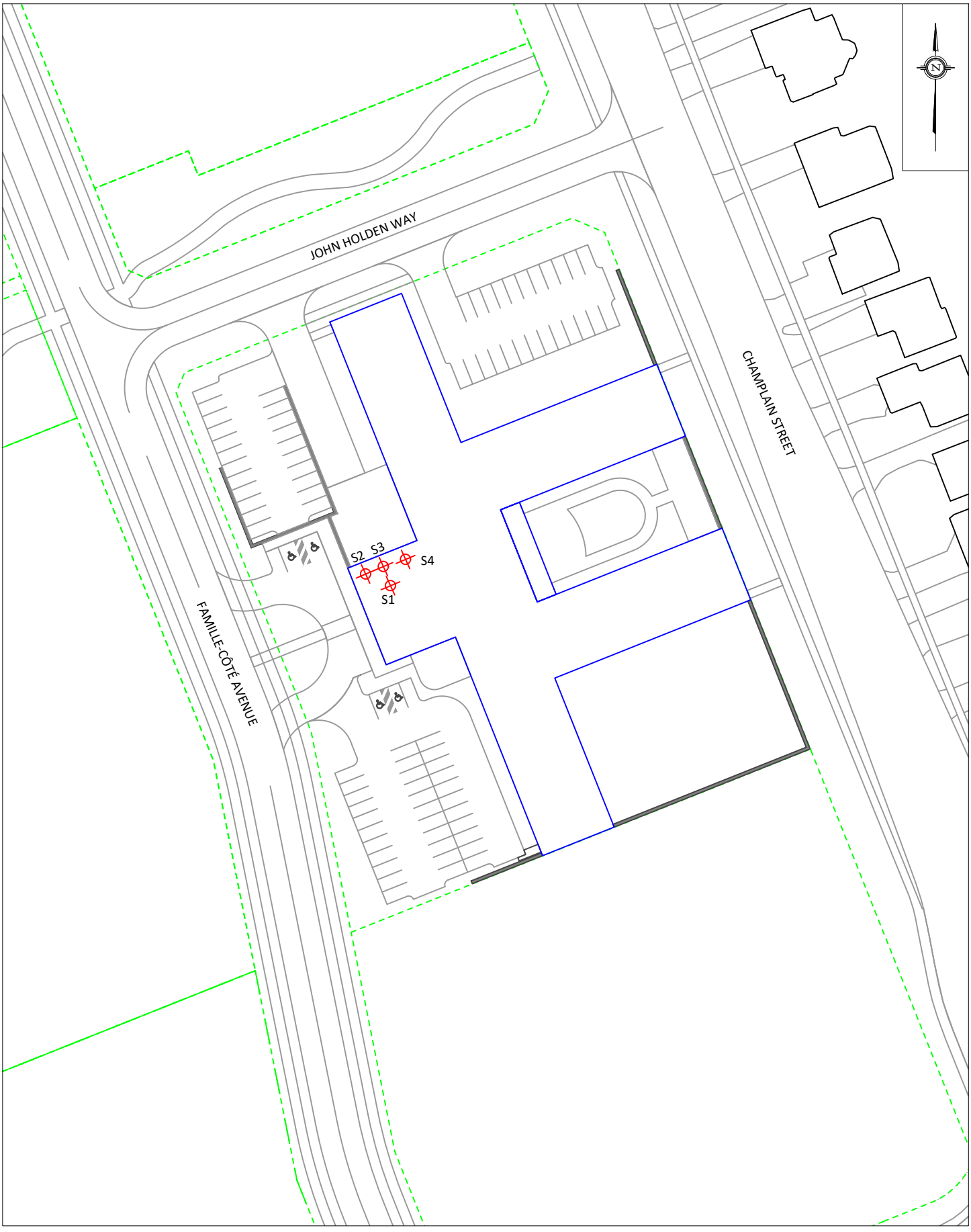
| DATE | JUNE 9, 2020 | DRAWN BY | S.P. |

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT

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| DATE | JUNE 9, 2020 | DRAWN BY | S.P. |

FIGURE 2:
STATIONARY NOISE SOURCES

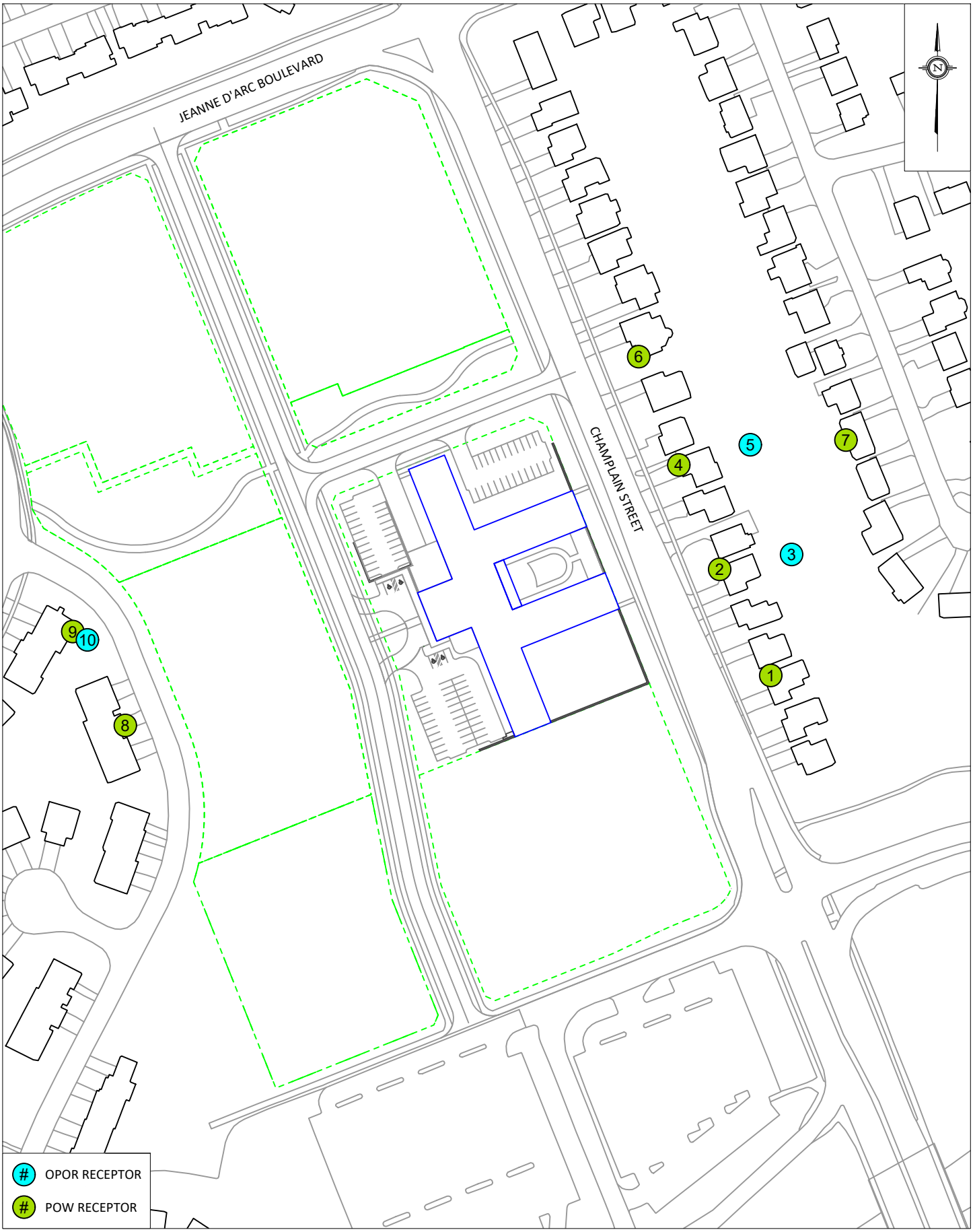


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FIGURE 3:
RECEPTOR LOCATIONS

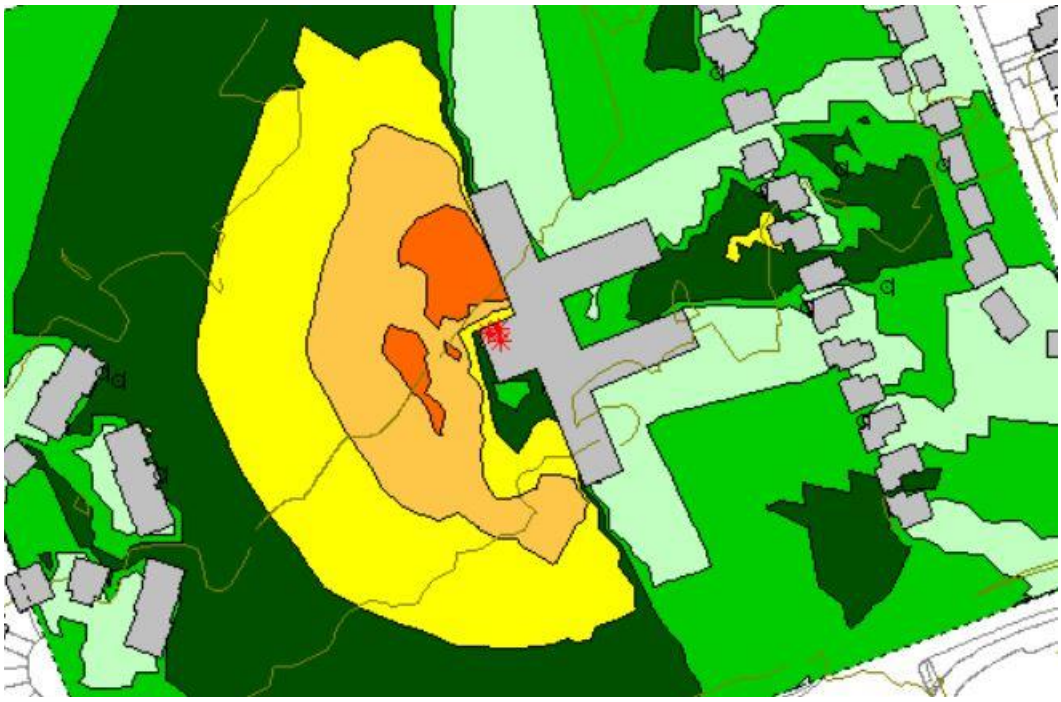


**FIGURE 4: HVAC NOISE CONTOURS 4.5 METERS ABOVE GRADE (DAYTIME PERIOD)**


**FIGURE 5: HVAC NOISE CONTOURS 4.5 METERS ABOVE GRADE (NIGHTTIME PERIOD)**


**FIGURE 6: GENERATOR NOISE CONTOURS 4.5 METERS ABOVE GRADE (DAYTIME PERIOD)**