2022-07-15

Empire Holdings
C/O GRC Architects
47 Clarence Street, Suite 401
Ottawa, Ontario | K1N 9K1
T: 613-241-8203 x241
rrowat@grcarchitects.com

Empire Holdings – 197-201 Wilbrod Apartment Building
Noise Impact Study R1

Dear Randall,

We are pleased to present the following noise impact study in regard to a newly proposed residential apartment building to be located at 197-201 Wilbrod Street in Ottawa, Ontario. The City of Ottawa has requested a noise impact study be completed and included as part of the Site Plan Application (SPA) for this project. The SPA details the construction of a 4-storey apartment building with a total of 20 residential units, which will be located in proximity to King Edward Street. As per City of Ottawa requirements, surface transportation noise onto the new building must be considered, as must stationary noise from the building's 8 rooftop mechanical units to the surrounding area.

Regarding the surface transportation noise portion of this report, King Edward Street, located approximately 53 m from the east façade of the building, is the only traffic source that need be considered. All other sources of surface transportation noise, such as additional arterial roads (i.e., Laurier Avenue East), or principal rail lines (i.e., the LRT rail line), are beyond the setback distances established in the City of Ottawa Environmental Noise Control Guidelines (ENCG) and Schedule F of the City of Ottawa Official Plan. Furthermore, the location of the proposed building is outside the airport influence zone, therefore, an analysis of aircraft noise is not required.

Based on our surface transportation noise analysis, we predict that noise levels at all points of reception (PORs) considered will not exceed 65 dBA. Our full surface transportation noise analysis is presented in **Sections 3.0** and **4.0**. Furthermore, we also address the stationary noise impact expected from the building's proposed rooftop mechanical units to the surrounding area, and provide general recommendations in **Section 5.0**.

1.0 Introduction

State of the Art Acoustik Inc. has been commissioned by Empire Holdings to complete a noise impact study, as requested by the City of Ottawa, for the SPA detailing the construction of a 4-storey apartment building to be located at 197-201 Wilbrod Street in Ottawa, Ontario. The ensuing report follows the 2016 City of Ottawa ENCG, which are compliant with the Ministry of Environment, Conservation, and Park's (MECP) NPC-300.

In **Section 2.0**, the site plan of the building is shown, along with angles, and distances from the relevant source of traffic noise to the PORs.

In **Sections 3.0** and **4.0**, the noise impact from King Edward Street is quantified.

In **Section 5.0** the environmental noise impact from the building's 8 mechanical rooftop units to the surrounding area is assessed.

2.0 Site Plan Evaluation

2.1 Project Description

The proposed development consists of a residential building with 20 units spread across 4 floors. The building is to be located at 197-201 Wilbrod Street in Ottawa, Ontario. The area surrounding the development consists primarily of low-rise residential and commercial buildings. Noise from King Edward Street is the only relevant source of traffic noise for this location. All other traffic noise sources, be they surficial or aerial, are beyond the setback distances outlined in **Section 2.2.1** of the City of Ottawa's ENCG and Official Plan.

2.2 Site Plan Review

Figure 2.1 shows the site plan of the proposed building, whose east façade is located approximately 53 m from King Edward Street. **Figure 2.2** shows the proposed building site with the distance and angles to King Edward Street indicated. King Edward Street is classified as an arterial road, as per the City of Ottawa Official Plan, Schedule F.

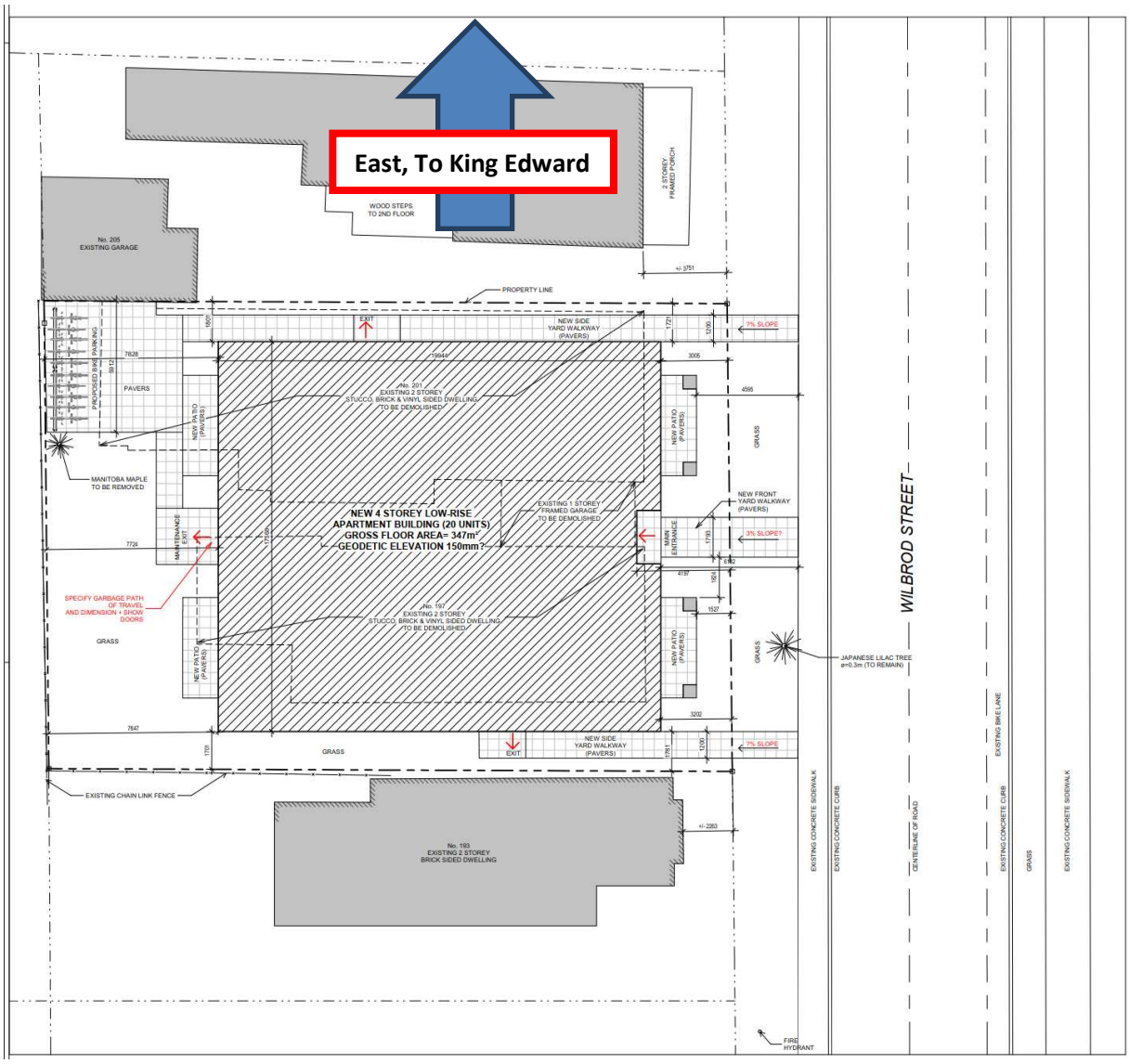

Figure 2.1 – Site plan of 197-201 Wilbrod St.

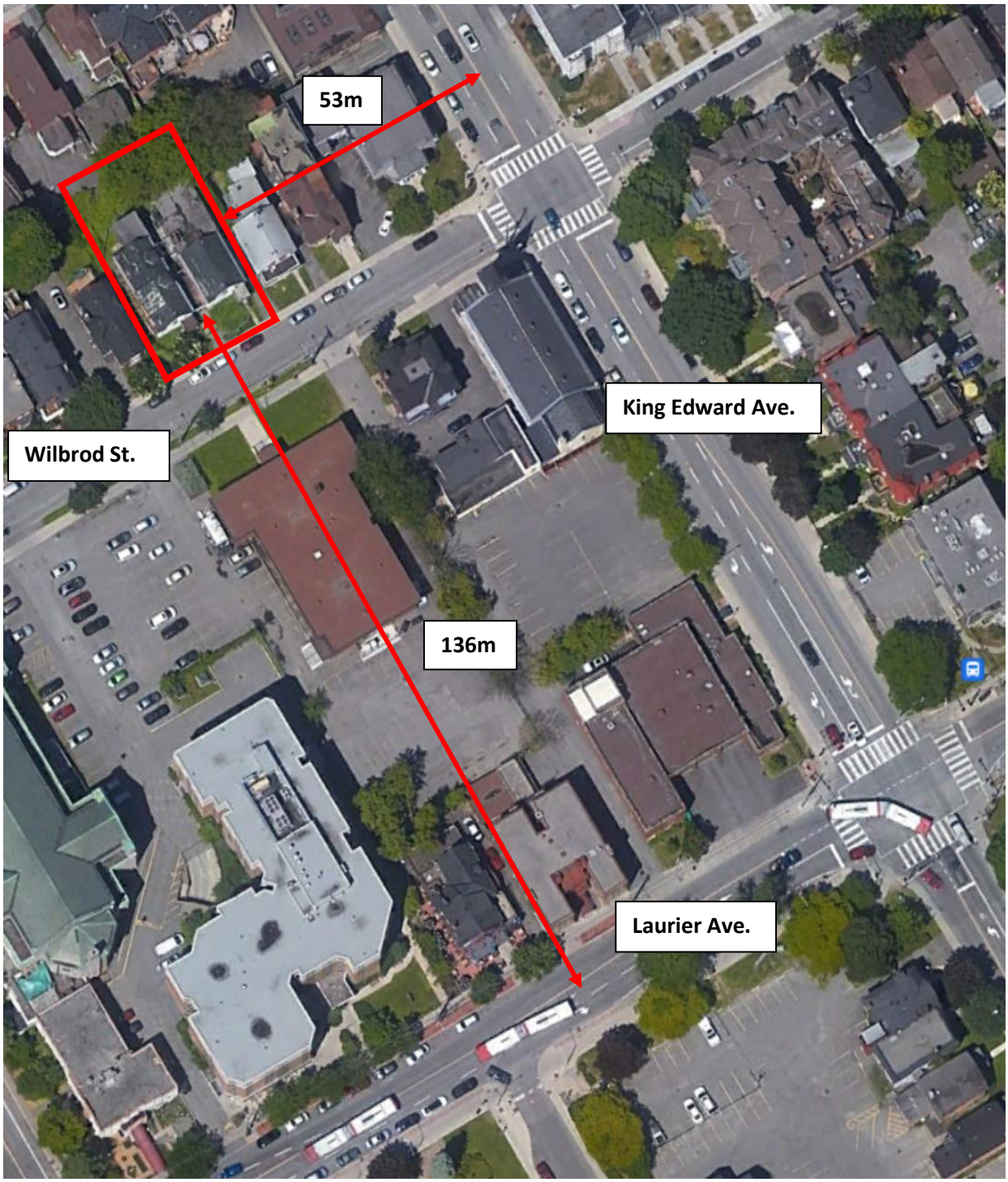

Figure 2.2 – 197-201 Wilbrod Street and surrounding area with locations, distances, and angles of relevant noise sources. The building site is indicated by the red box.

3.0 Surface Transportation Noise Impact

The following sections describe our analysis of the surface traffic noise impact on the proposed structure at 197-201 Wilbrod Street from all relevant sources.

3.1 Procedure to Assess Relevant Traffic Noise Sources

In general, sources of traffic noise may include city roads, major highways, railways, transitway corridors, and air traffic. However, as the noise impact from traffic sources to structures depends on the distance of the structure to the source, not all potential sources of traffic noise are significant.

The City of Ottawa ENCG states that surface transportation noise control studies are to be prepared when the indoor area of the structure under consideration is within the following setback distances from potential road, highway, and railway noise sources:

- 100 m from an arterial road, a major collector, light rail corridor, or bus rapid transitway
- 250 m from an existing or proposed highway
- 300 m from a proposed or existing rail corridor or secondary main railway line
- 500 m from a 400-series provincial highway or principle main railway line

According to the City of Ottawa's Schedule F, and as demonstrated in **Figure 2.2**, King Edward Street is the only arterial road that satisfies the above criteria. The next closest arterial road, Laurier Avenue East, is more than 100 m from the south façade of 197-201 Wilbrod Street. Furthermore, because the location of the proposed structure is outside the airport influence zone established by the City of Ottawa, an analysis of air traffic noise is not required at this location.

3.2 Classification and Parameters of Relevant Traffic Noise Sources

King Edward Street is classified as a 4-lane, urban, arterial, undivided road. As such, **Table 3.1** below summarizes the roadway parameters to be used for traffic noise analyses, as stipulated by the City of Ottawa ENCG. These values have been reproduced from **Table B1** on page 75 of the City of Ottawa ENCG, titled, “Appendix B: Table of Traffic and Road Parameters To Be Used For Sound Level Predictions”.

Roadway	Implied Roadway Class	Annual Average Daily Traffic (AADT) [Vehicles/Day]	Posted Speed [km/h]	Day/Night Split [%]	Medium Trucks [%]	Heavy Trucks [%]
King Edward St.	4 Lane Urban Arterial - Undivided	30,000	50 km/h	92/8	7	5

Table 3.1 – Summary of Major Roadway Noise Sources and Parameters.

3.3 Sound Level Limits for Outdoor Living Areas

197-201 Wilbrod contains two communal balconies to be considered as Outdoor Living Areas. These balconies are located on the second and third floor of the proposed development, facing Wilbrod Street. The location of the OLA is shown on **Figure 3.2** of this report. Individual unit balconies are not considered as OLAs, as their size does not meet the minimum requirement as stipulated in the ENCG (4 meter depth).

As per the ENCG requirements, the noise impact at OLAs is calculated at the center of the OLA. At 197-201 Wilbrod, the OLA is surrounded on three sides by the building, which provides shielding from King Edward St.

3.4 Sound Levels Limits for Relevant Traffic Noise Sources

Given that an analysis of surface transportation noise is required for the proposed structure at 197-201 Wilbrod Street, **Table 3.2** below summarizes the maximum permissible road noise levels for indoor areas. The values in **Table 3.2** have been taken from **Table 2.2b** of the ENCG.

Time	Sound Level Limits (L_{eq} in dBA) For Class 1, 2, & 3 Areas
07:00 – 23:00	**45** for living/dining areas of residences and sleeping quarters
23:00 - 07:00	**40** for sleeping quarters
07:00 – 23:00	**55** for outdoor living areas

Table 3.2 – Criteria for road noise levels.

3.5 Software Used for Roadway Noise Analysis

In order to calculate the impact of traffic noise on the proposed structure, we utilize the Ministry of Environment's STAMSON modeling software, version 5.04. This program allows one to input the variables listed in **Table 3.1**, such as traffic volume, vehicle types, posted speed limits, barrier locations, and topography, to determine the environmental noise impact at specific PORs.

3.6 Points of Reception

To determine the worst-case noise impact on the façade of the building, we have chosen three PORs, two located at the plane of window (POW) of the ground floor, at a height of 1.5 m, and one located at the POW on the second floor, at a height of 4.5 m. The ground floor PORs are positioned at the south-east corner of the building and bedroom window of Unit 104, respectively. The second floor POR is also positioned at the south-east corner of the building. These points are the closest to the right of way on King Edward Street. The positions of our points of reception are shown in **Figures 3.1**, **3.2**, and **3.3**, using blue crosses. **Table 3.3** below summarizes the POR heights and distances.

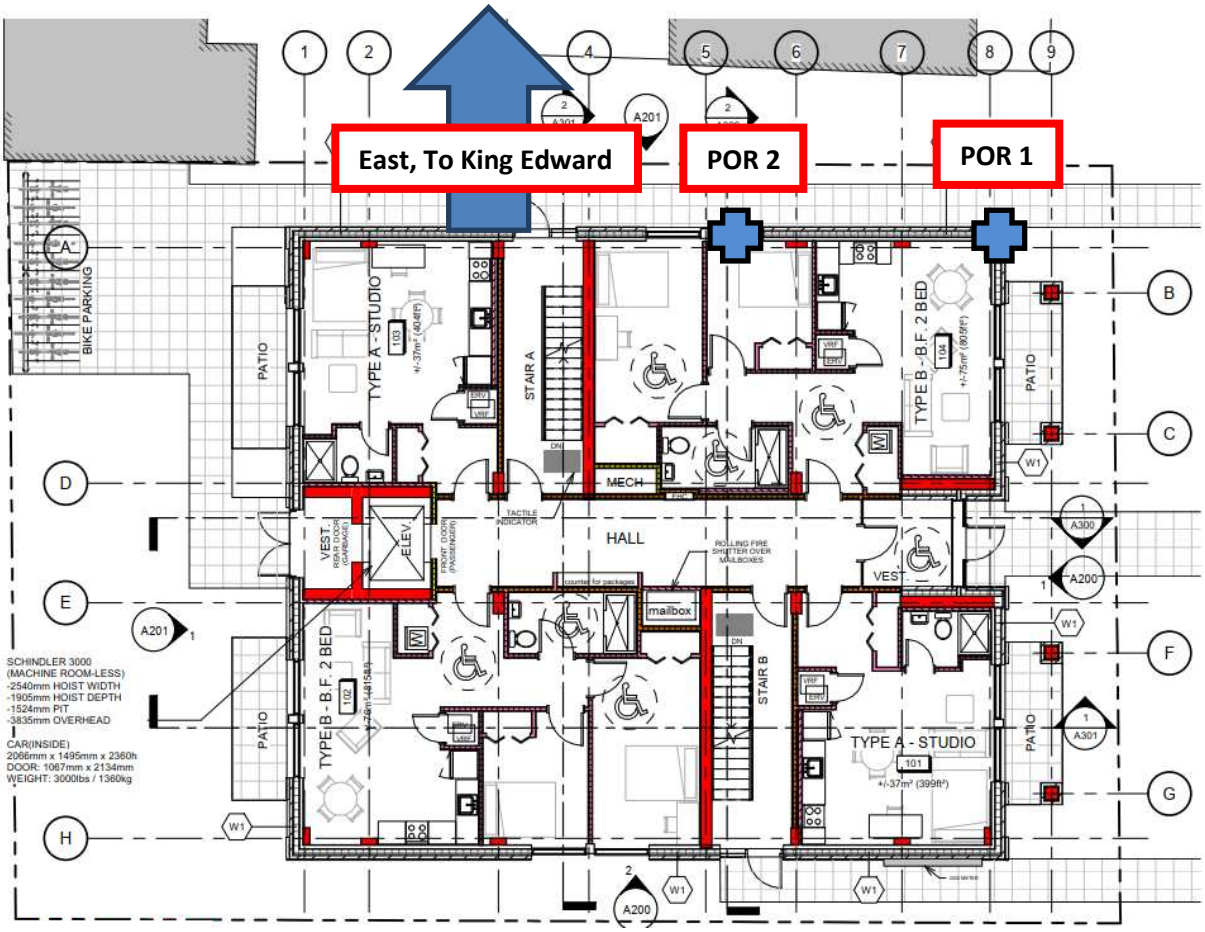

Figure 3.1 – 1st floor plan view showing POR 1 and POR 2.

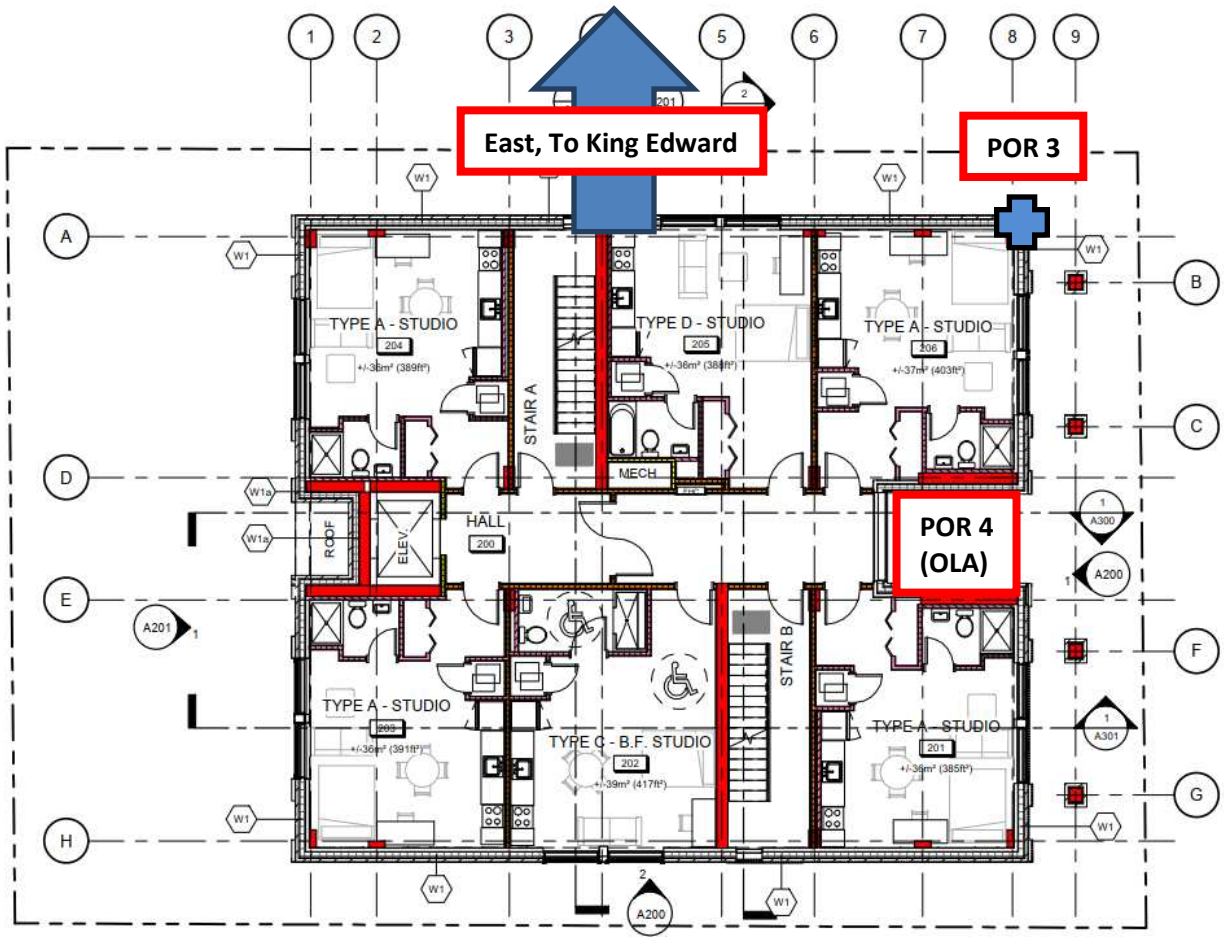

Figure 3.2 –2nd floor plan view showing POR 3 and POR 4

Figure 3.3 – Front/south elevation view showing the PORs.

Receiver	Height [m]	Distance from Closest Source [m]	Left angle to source segment from POR	Right angle to source segment from POR
POR1	1.5	53 (King Edward St.)	-90°	90°
POR2	1.5	53 (King Edward St.)	-90°	90°
POR3	4.5	53 (King Edward St.)	-90°	90°
POR4 (OLA)	4.5	53 (King Edward St.)	62°	90°

Table 3.3 – Table of POR heights, distances, and angles from noise source.

3.7 STAMSON Parameters

The parameters used in STAMSON to assess the noise impact at POR 1, 2, 3 and 4 are shown below in **Tables 3.4-3.7**:

Parameter	Values Used
Noise Source:	**King Edward St.**
Time Period	16h/8h
Topography	Flat/gentle slope no barrier
Rows of Houses	3
Density of First Row %	50
Intermediate Surface	Reflective
Receiver Height (m)	1.5
Source Receiver Distance (m)	53

Table 3.4 – Parameters used in STAMSON model at POR 1 (1st floor, south-east corner**)**

Parameter	Values Used
Noise Source:	**King Edward St.**
Time Period	16h/8h
Topography	Flat/gentle slope no barrier
Rows of Houses	3
Density of First Row %	50
Intermediate Surface	Reflective
Receiver Height (m)	1.5
Source Receiver Distance (m)	53

Table 3.5 – Parameters used in STAMSON model at POR 2 (Unit 104 bedroom**)**

Parameter	Values Used
Noise Source:	**King Edward St.**
Time Period	16h/8h
Topography	Flat/gentle slope no barrier
Rows of Houses	3
Density of First Row %	50
Intermediate Surface	Reflective
Receiver Height (m)	4.5
Source Receiver Distance (m)	53

Table 3.6 – Parameters used in STAMSON model at POR 3 (2nd floor, south-east corner)

Parameter	Values Used
Noise Source:	**King Edward St.**
Time Period	16h/8h
Topography	Flat/gentle slope no barrier
Rows of Houses	3
Density of First Row %	50
Intermediate Surface	Reflective
Receiver Height (m)	4.5
Source Receiver Distance (m)	59

Table 3.7 – Parameters used in STAMSON model at POR 4 (2nd floor, east OLA)

3.8 Resulting Surface Transportation Noise Levels

Table 3.8 below summarizes the predicted sound pressure levels at the PORs from the results of the STAMSON environmental noise software calculation for 197-201 Wilbrod Street (full calculation details are included in **Appendix A**).

	POR 1 (dBA)		POR 2 (dBA)		POR 3 (dBA)		POR 4 (dBA)	
	Day	**Night**	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**
King Edward Street	60.3	N/A	60.3	52.7	60.3	52.7	50.0	N/A
Total	**62.5**	**N/A**	**62.4**	**54.8**	**62.5**	**54.9**	**50.0**	N/A

Table 3.8 – Predicted Road Noise at each Point of Reception

3.9 Surface Transportation Noise Summary and Analysis

We have determined that an analysis of surface transportation from a single source is required for 197-201 Wilbrod Street. The single source of traffic noise is King Edward Street, located approximately 53 m from the east façade of the proposed building. We have calculated the predicted noise level caused by this single source using STAMSON. STAMSON predicts a 16 h L_{eq} for daytime hours of 62.5, 62.4, and 62.5 dBA, at PORs 1, 2, 3, respectively. The 8 h L_{eq} for nighttime hours at PORs 2 and 3 is predicted to be 54.8 dBA and 54.9 dBA, respectively.

4.0 Further Analyses

4.1 Building Component Assessment (AIF Analysis)

According to the NPC-300, **Section C7**, when noise levels could exceed 65 dBA at the Plane of Window (POW) of a living area or sleeping quarters, the exterior cladding system of the building envelope must be acoustically designed to ensure the indoor noise criteria is achieved. The City of Ottawa recognizes the Acoustic Insulation Factor (AIF) method as an appropriate analysis technique. Because the noise levels at the exterior PORs do not exceed 65 dBA, a detailed analysis of the building components of the development is not required.

4.2 Noise Warning Clauses

The City of Ottawa requires a warning clause whenever environmental noise could meet or exceed a 16-hour daytime L_{eq} of 55 dBA at the plane of window of any living or sleeping area prior to any noise mitigation. The warning clause is required to be placed on title in order to alert the buyer or renter of a possible environmental noise condition or a limitation on his/her property rights. The notice(s) on title must be included in the Development Agreement(s) and in the Agreement(s) or Offer(s) of Purchase and Sale.

Because the noise levels at the exterior PORs analyzed in this report exceed 55 dBA, but are still below 65 dBA, a **Type C** warning clause from NPC-300 is recommended. The **Type C** warning clause from **Section C8.1** of NPC-300 reads:

"This dwelling unit has been designed with the provision for adding central air conditioning at the occupant's discretion. Installation of central air conditioning by the occupant in low and medium density developments will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment."

In addition, **Appendix A** of the ENCG states:

"*A warning clause is not considered a form of noise mitigation. It is not acceptable therefore to use warning clauses in place of physical noise control measures to identify an excess over the MOE or City noise limits*."

5.0 Environmental Noise Impact

The following sections describe our analysis of the environmental noise impact expected from the eight mechanical rooftop units currently scheduled for installation at 197-201 Wilbrod Street to the surrounding area.

5.1 Equipment Site Plan & Operation Hours

The sources considered in this assessment of the stationary noise to nearby structures include five air conditioning units (VRF-01 through VRF-05), two gas-fired heating units (GFH-01 and GFH-02), and a single make-up air unit (MAU-01). In accordance with the predictable worst-case operating scenario, all exterior mechanical elements are assumed to be in constant operation, under a full load. **Figure 5.1** below shows the latest plans in order to identify the locations of the sound generating equipment. All units except for MAU-01 are currently planned for installation within an enclosed mechanical penthouse.

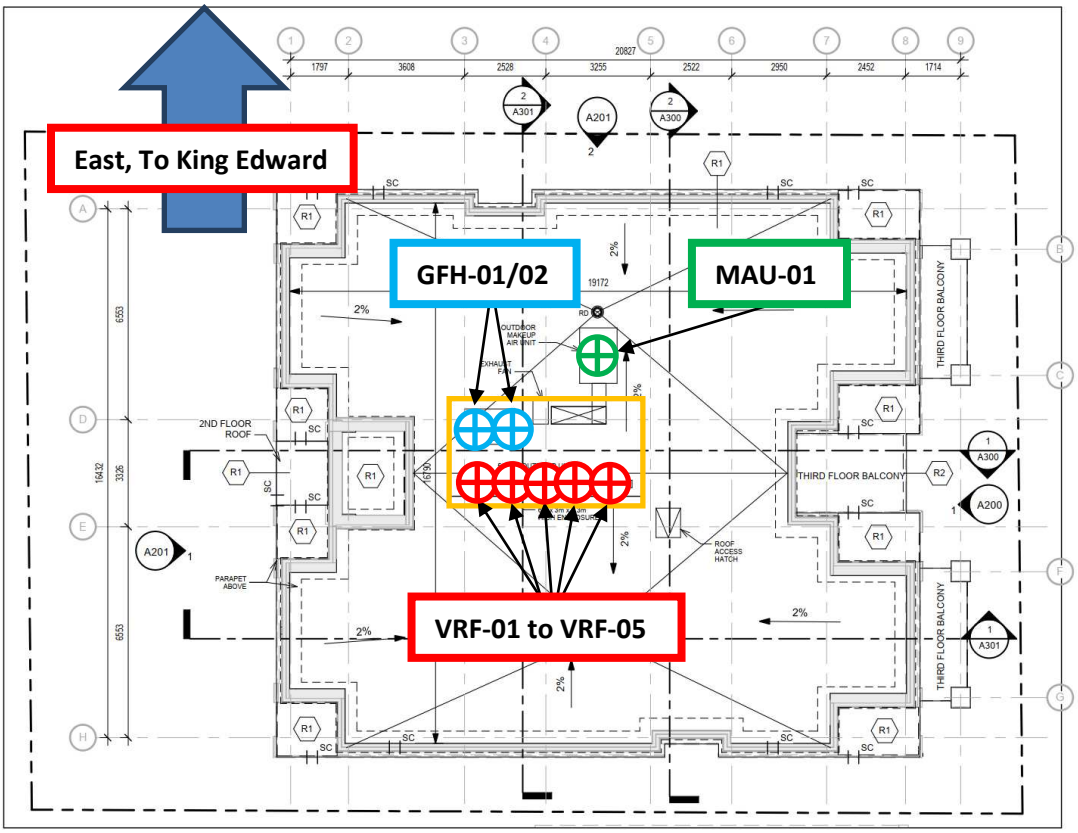

Figure 5.1 - 197 - 201 Wilbrod rooftop plan, showing current equipment layout. The mechanical penthouse is highlighted in orange. Units VRF-01 through VRF-05 are indicated with red crosses, units GFH-01 and GFH-02 are indicated with blue crosses, and the MAU is indicated with a green cross.

5.2 Applicable By-Laws

The City of Ottawa Noise Bylaw has the same limit as the MECP NPC-300 for daytime permissible Sound Pressure Level (SPL) at a noise sensitive location in a Class 1 area of 50 dBA. The Bylaw is to be used in conjunction with the ENCG, which are based on the MECP NPC-300 Noise Control Guidelines. The City of Ottawa ENCG requires a SPL of 45 dBA at night or ambient noise, whichever is higher.

Therefore, when analyzing equipment for environmental noise studies, all non-emergency equipment in operation must meet the ENCG limit of 50 dBA during the day and 45 dBA at night. There is no emergency equipment planned for this project, there an analysis of generator noise is not required.

For our analysis, points of reception are chosen based on the principle of the predictable worst-case scenario for noise impact. This allows us to calculate the largest noise impact and mitigate it accordingly.

5.3 Noise Sources

This report evaluates eight noise sources, as detailed in **Section 5.1**. **Table 5.1** lists the sound data used in our evaluation. Sound data was not provided for the air conditioning units, therefore, representative data from similar sized (5-ton) units were used. Regarding the gas-fired heaters, we were provided with a SPL at a distance of 15 ft. Assuming hemispherical radiation from a point-source, we converted this SPL to a sound power level. Cutsheets of sound data for all equipment analyzed are included in the **Appendix**.

	Frequency [Hz]								Total [dBA]
Noise Source	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	
1. Air Conditioning Units[1] (VRF-01—05)	84.7	83.6	77.1	74.6	72.3	68.3	64.7	60.9	77.6
2. Gas-Fired Heater[2] (GFH-01, GFH-02)	Sound Pressure Level at 15 ft = 51 dBA								75.2
3. Make-up Air Unit (MAU-01)	82.3	86.6	81.3	81.4	82.4	75.8	68.8	61.7	85.2

Table 5.1 – Octave band sound power levels of noise sources.

[1] Representative data from similarly sized units were used for these sources.

[2] Total sound power derived from SPL at 15ft assuming hemispherical radiation from a point-source.

5.4 Points of Reception for Environmental Noise POR(e)

Noise sensitive buildings adjacent to 197-201 Wilbrod include multiple low-rise residential housing on all sides. **Figure 5.2** indicates the locations and heights of 4 POR(e)s used to evaluate the local impact of the noise generating equipment. POR(e) 1 is located at 183 Wilbrod., POR(e) 2 is located at 205 Wilbrod, POR(e) is located at 208 Wilbrod, and POR(e) 4 is located at 200 Wilbrod. We also evaluated sound pressure levels at residential properties beyond those shown, but the impact was negligible.

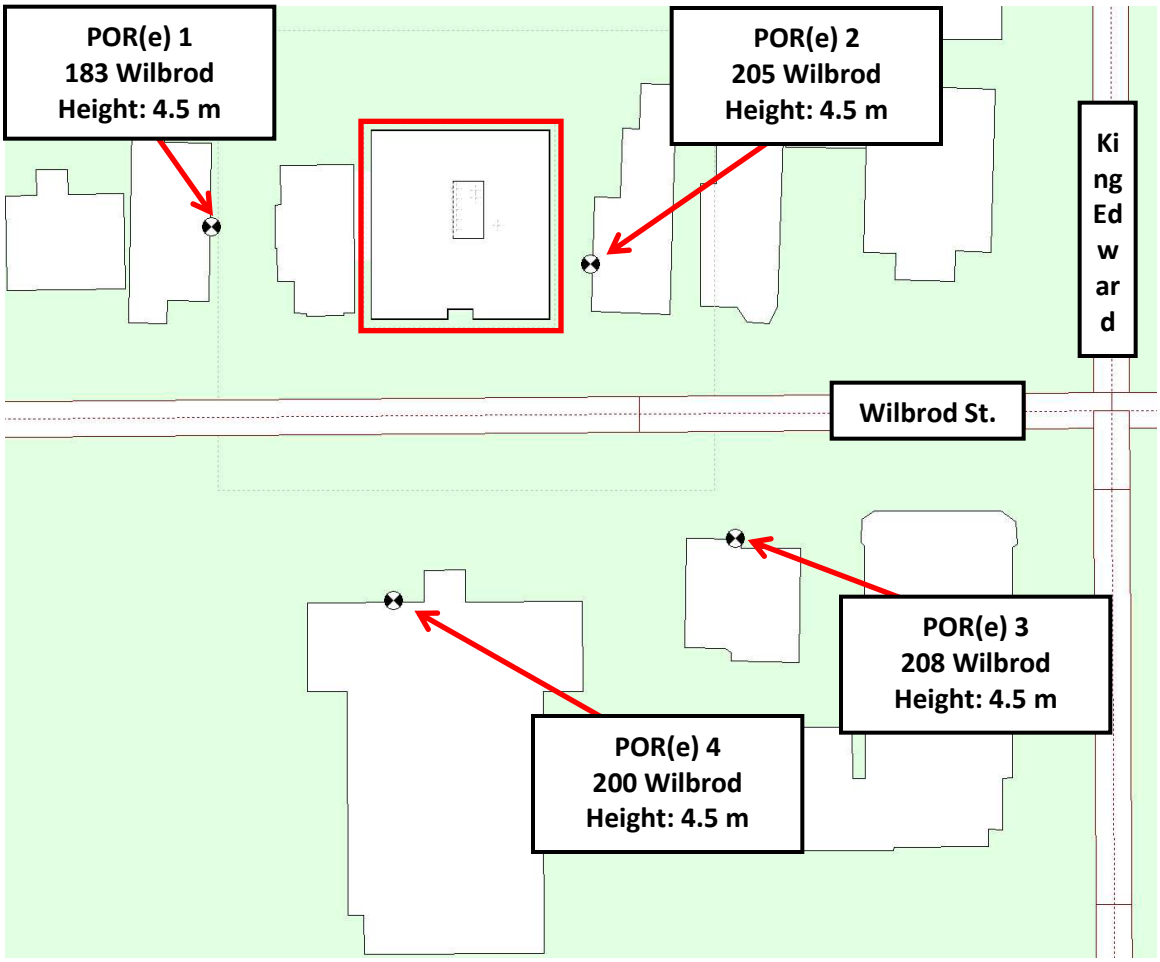

Figure 5.2 – Locations and heights of points of reception (POR(e)s). 197-201 Wilbrod highlighted in red.

5.5 Methodology Used in Noise Impact Calculation

The environmental noise analysis was completed using an environmental noise modeling software called CadnaA, which references ISO 9613. CadnaA predicts environmental noise through calculations based on a 3D model which uses geometrical, landscape, and topography data, combined with details of the proposed construction, and the noise source power levels.

We created a 3D rendering of the neighbourhood around 197-201 Wilbrod, placed the noise sources in the model at the appropriate locations, and then and applied the sound power levels described in this report. However, given that 7/8 of the rooftop noise sources are housed in a fully enclosed mechanical penthouse, we modelled the combined noise from these sources as follows.

First, we calculated the combined total sound power level of all sources housed in the mechanical penthouse. Second, we included a louver on the side of the mechanical penthouse with a total area of 5.6 m^2 (5 x 1.3 m) in the model. It should be noted that because the detailed design of project is still in preliminary stages, the size and location of the louvre were assumed for this analysis. Finally, we used CadnaA to model the sound radiating from the interior of the mechanical penthouse, through this louver, to the exterior.

In addition to the modelling process described above, the following table lists the parameters used in the CadnaA model:

Parameter	Value/Condition
Temperature (°C)	10
Relative Humidity (%)	70
All Buildings, Roads and Land Fully Reflective	Absorption Coefficient Alpha = 0
Maximum Order of Reflection	2
No Sub. of Neg. Ground Att.	ON
No Neg. Path Difference	ON

Table 5.2 – Parameters used in CadnaA modeling.

5.6 Results & Noise Control Measures and Recommendations

Figure 5.3 shows the noise prediction grid generated by CadnaA at a height of 4.5 m for daytime operations, that is, with all noise generating equipment running at full capacity. To meet the daytime target of 50 dBA, there should be no red, purple, or blue at the POR(e)s in the figure. The predicted noise levels at the POR(e)s are displayed in **Figure 5.3**.

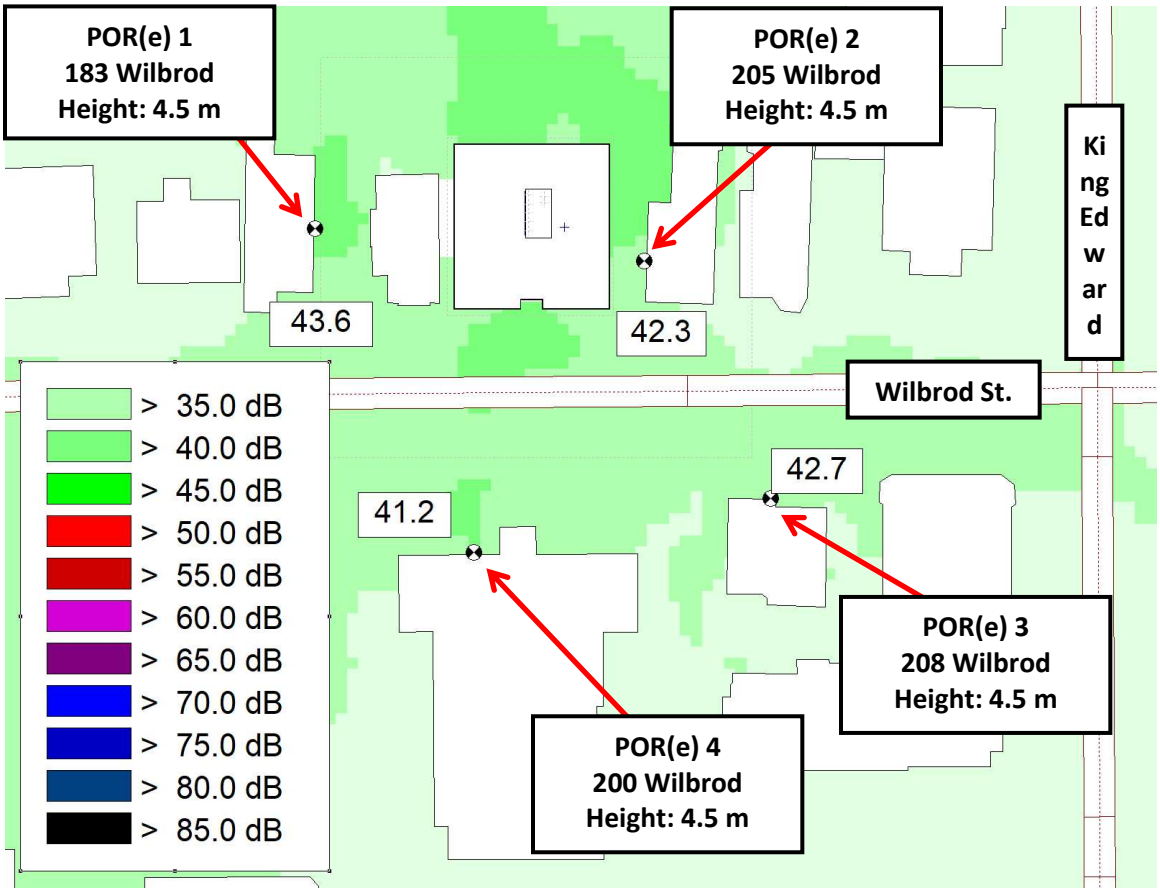

Figure 5.3 – Locations and heights of points of reception (POR(e)s).

Given the predicted sound pressure levels shown in **Figure 5.3**, and the current mechanical plans, no sound mitigation measures are required for the rooftop mechanical equipment on 197-201 Wilbrod.

Regarding the final design of the mechanical penthouse however, we recommend that any louvers be installed on the west side of the building, and that they not exceed a height of 1.5 m from the base of the penthouse. Such a placement will ensure that the 45 dBA limit is met.

6.0 Conclusion

We have analyzed the traffic noise impact of nearby road sources onto the newly proposed development to be located at 197-201 Wilbrod St. A detailed building component analysis was not required as noise levels from King Edward Street were not greater than 65 dBA at the Plane of Window (POW) at each of the PORs, nor was the 55 dBA limit exceeded at the Outdoor Living Area. However, the predicted noise levels require that the following warning clause be added to the notice(s) on title must be included in the Development Agreement(s) and in the Agreement(s) or Offer(s) of Purchase and Sale:

"This dwelling unit has been designed with the provision for adding central air conditioning at the occupant's discretion. Installation of central air conditioning by the occupant in low and medium density developments will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment."

We have also addressed the noise impact from exterior mechanical units scheduled for installation to the surrounding area and have found that no mitigation measures are required, as long as any louvers installed on the mechanical penthouse are located on the west side of the structure, and do not exceed a height of 1.5 m. If these recommendations are observed, then noise generated by the new development will not be problematic for neighbouring properties.

If you have any questions or concerns regarding this report, please let us know.

Sincerely,

Alexandre Fortier, B.Sc.,
Principal

Approved By:

Donald Buchan, P.Eng.
Principal
Buchan Lawton Parent Ltd.

Appendix A

STAMSON Calculations

Sound Data for Rooftop Equipment