2023-11-29

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Bridor Developments – 2380-2396 Cleroux Crescent Apartment Buildings
Noise Impact Study – R2

Dear Eric,

We are pleased to present the following traffic noise study for a new proposed residential development of two apartment buildings (Block A and Block B) to be located at 2380-2396 Cleroux Crescent in Ottawa, Ontario. As part of the Site Plan Application (SPA), the City of Ottawa has requested a noise study to be completed. The planned development is for two new apartment buildings with a total of 40 units in each building, for a total of 80 units. The development is in proximity to Innes Road. As per City of Ottawa requirements, noise from traffic and noise from the new buildings to the surrounding area must be considered. There is no significant or large noise-making equipment included in the design of the new building, therefore noise from the new development to the surrounding area will be minimal and we will only be conducting a brief analysis for noise from small condensing units to be used for each unit. In addition, there are no sources of significant noise from the surrounding area that may impact the new development.

This study considers traffic noise from Innes Road (~98m from the north-west corner of Block A, which is the closest building). This noise source is the only traffic noise source considered in this study. All other noise sources, such as other main or arterial roads, principal rail lines and airport influence zone are outside of limits as per the City of Ottawa ENCG and Schedule G of the City of Ottawa Official Plan.

It was found that noise levels at the plane of window (POW) at the POR analyzed are above 55 dBA but below 65 dBA and a detailed building component analysis was not required. No additional mitigation measures above the Ontario Building Code (OBC) are required for windows. Our full traffic noise analysis is provided in Section 4.0. In addition, we have also addressed any potential noise from the condensing units to the surrounding area for the new development as well and have provided some general recommendations in Section 5.0.

Note that this revision contains the most up to date site plan and has modified Warning Clause C language to more accurately reflect the heating and cooling systems used for each unit. No other changes have been made from the previous revision and no calculations, results or recommendations have been changed.

1.0 Introduction

State of the Art Acoustik Inc. was commissioned by Bridor Developments to complete a noise impact study as requested by the City of Ottawa for the site plan application of two proposed apartment buildings (Block A and Block B) consisting of 40 units each to be located at 2380-2396 Cleroux Crescent in Ottawa, Ontario. We have followed the 2016 City of Ottawa Environmental Noise Control Guidelines (ENCG), which are compliant with the Ministry of Environment, Conservation and Parks (MECP) NPC-300.

In Section 2.0, the site plan of the building is shown and surrounding area is analyzed for possible noise sources which would impact the proposed development. This section also shows angles and distances from the sources to receptor points. This study includes only noise from road sources and there is no other nearby sources. In addition, this analysis includes a brief analysis of stationary noise to the surrounding area from the small condensing units that are to be used for heating and air conditioning in each unit.

In Section 3.0, the noise impact calculation procedure is described and in Section 4.0, the predicted noise impact from Innes Road has been analyzed. Section 5.0 describes required measures for this development and provides a brief overview of the noise generating equipment planned for the development.

2.0 Site Plan Evaluation

2.1 Project Description

The proposed development consists of two new residential buildings, each with three storeys and 40 units. The buildings are located at 2380 and 2396 Cleroux Crescent in Ottawa, Ontario. The area surrounding the development consists primarily of low-rise residential homes to the west and a secondary school across the road to the east. We have considered traffic noise from Innes Road as the only traffic noise source for this location, as per the City of Ottawa requirements, and all other potential road noise sources are outside of the distances outlined in Section 2.2.1 of the City of Ottawa Environmental Noise Control Guidelines.

2.2 Site Plan Review

The following Figure 2.1 shows the site plan of the proposed buildings including its proximity to Innes Road, which is located approximately 98m from the closest façade of the closest building (Block A). Figure 2.2 shows the proposed site with the distance and angles to Innes Road indicated. Innes Road is indicated as an arterial road, as per City of Ottawa Schedule G.

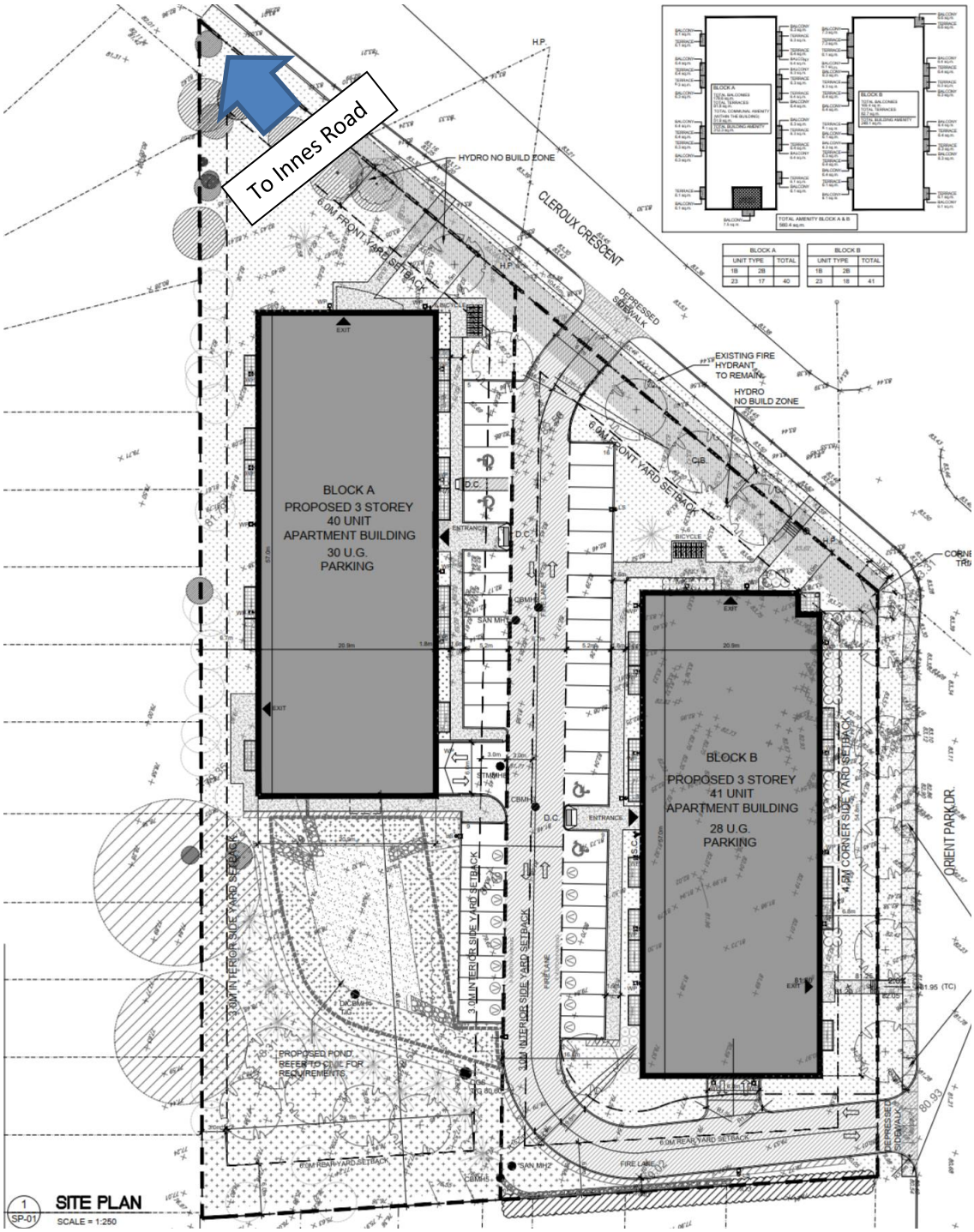

Figure 2.1 – Site plan of 2380 and 2396 Cleroux Crescent.

Figure 2.2 – Surrounding area of 2380 and 2396 Cleroux Crescent with locations, distances and angles of relevant noise sources

3.0 NOISE IMPACT PROCEDURE

3.1 Procedure Used to Assess Noise Impacts

This assessment uses the City of Ottawa Environmental Noise Control Guidelines (ENCG), dated January 2016, to assess and mitigate noise from roads, transit ways, railways and aircraft. The maximum road noise levels for indoor areas that apply to this building are taken from Table 2.2b of the ENCG and summarized in Table 3.1.

Time	Indoor Leq Levels (dBA) Class 1, 2 & 3 Areas
	Road Traffic Noise Level Limit (dBA)
07:00 – 23:00	**45** for living/dining areas of residences and sleeping quarters
07:00 – 23:00	**50** for general offices, reception areas, retail stores, etc.
23:00 - 07:00	**40** for sleeping quarters

Table 3.1 – Criteria for Indoor Area Road Noise Levels

The ENCG states that noise control studies are to be prepared when the indoor area is within the following setback distances from the road, highway and railway noise sources:

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

Innes Road is within 100m of the planned development and therefore an analysis of the impact of traffic noise is required.

3.2 Noise Attenuation Requirements

This section outlines the required noise control measures and warning clauses and when to apply them, as stipulated by the ENCG and Ministry of Environment, Conservation and Parks (MOECP) for placement within purchase agreements.

If sound levels are predicted to be less than the specified criteria, no attenuation measures are required on the part of the proponent. If the predicted noise exceeds the criteria, the City of Ottawa recommends several attenuation measures.

These attenuation measures may include any or all of the following:

- construction of a noise barrier wall and/or berm;
- installation of a forced air ventilation system with provision for central air;
- installation of central air;
- acoustically selected building façade components

Where excessive noise levels may adversely affect the property or its use, the ENCG requires notices in the form of a Warning Clause 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 notices on title must be included in the Development Agreement(s) and in the Agreement(s) or Offer(s) of Purchase and Sale.

The City of Ottawa requires a Warning Clause whenever noise could meet or exceed 55 dBA 16 hour L_{eq} at the Outdoor Living Area or Plane of Window of any living or sleeping area prior to any noise mitigation. Table 3.2 provides the types of warning clauses which are taken from Section C8.1 Transportation Sources of the MOECP NPC-300 which also states:

"The use of warning clauses or easements in respect of noise are recommended when circumstances warrant. Noise warning clauses may be used to warn of potential annoyance due to an existing source of noise and/or to warn of excesses above the sound level limits. Direction on the use of warning clauses should be included in agreements that are registered on title to the lands in question. The warning clauses would be included in agreements of Offers of Purchase and Sale, lease/rental agreements and condominium declarations."

In addition Section Section C8 also notes: "*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*."

Specific examples of warning clauses in regards to the new development at 2380-2396 Cleroux Crescent are indicated in Section 4.7.

TYPE	Warning Clause Text
Type A	Purchasers/tenants are advised that sound levels due to increasing road/rail/Light Rail/transit way traffic may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the City and the Ministry of the Environment.
Type B	Purchasers/tenants are advised that despite the inclusion of noise control features in the development and within the building units, sound levels due to increasing road/rail/Light Rail/transitway traffic may on occasions interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the City and the Ministry of the Environment.
Type C	This dwelling unit has been designed with the provision for adding central air conditioning at the occupant's discretion. Installation of central air condition 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 City and the Ministry of Environment.
Type D	This dwelling has been supplied with a central air conditioning system which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the City and the Ministry of Environment.

Table 3.3 - Warning Clause Types (from MOECP NPC-300 Section C8.1)

3.3 Building Component Assessment (AIF Analysis)

According to the ENCG, when noise levels could exceed 65 dBA at the Plane of Windows (POW) of a living area (day) or sleeping quarters (night) 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[1]) method as an appropriate analysis technique.

To comply with the City of Ottawa policies, the building envelope will require a minimum AIF rating to provide the indoor noise level required for living, dining and bedrooms of residential dwellings as described below.

The City of Ottawa's ENCG outlines the following maximum indoor L_{eq} limits:

- maximum daytime indoor L_{eq} for living spaces should be 45 dBA
- maximum nighttime indoor L_{eq} for bedrooms should be 40 dBA

For the overall exterior wall of any room, the required AIF for road and rail transportation noise is:

Required AIF = Outside L_{eq} - Indoor L_{eq} (Req) + 2dB (1)

When the exterior is comprised of components, then the AIF required of each component is determined by the following equation[1]:

Required AIF = Outside L_{eq} - Indoor L_{eq} (Req) + 10 $\log_{10}$ (Number of Components) + 2dB (2)

The required AIF is based on the Outside L_{eq}, Indoor L_{eq} required and the total number of exterior façade components. The AIF method allows for the number of components to be reduced if any component significantly exceeds the required AIF[1]:

"If the AIF of any component exceeds the required AIF by 10 or more, the calculation should be repeated for the other components with the 'total number of components' reduced by one. This reduction in the number of components lowers the required AIF for the others."

[1] J.D. Quirt, Building Research Note: Acoustic Insulation Factor: A Rating for the Insulation of Buildings against Outdoor Noise, National Rearch Council [Revised June 1980]

4.0 Surface Transportation Noise Study

The following section describes our analysis of the road noise impact on the two new proposed buildings at 2380 and 2396 Cleroux Crescent.

4.1 Road Traffic Information

For this study, the only surface transportation noise sources considered was traffic from Innes Road, which is located to the north-west of the nearest point of the new building. The new proposed buildings are farther than 100m from any other collector or arterial road, and are not near any rail lines or within the zone of influence of the airport therefore no other surface noise sources are considered.

Table 4.1 below summarizes the roadway's parameters obtained from Table B1 on p. 75 of The City of Ottawa Environmental Noise Control Guidelines 2016, "Appendix B: Table of Traffic and Road Parameters To Be Used For Sound Level Predictions" for the respective roadway class.

Roadway	Implied Roadway Class	Annual Average Daily Traffic (AADT) Veh/Day	Posted Speed	Day/Night Split (%)	Medium Trucks (%)	Heavy Trucks (%)
Innes Rd.	2 Lane Major Collector (2-UMCU)	12,000	50 km/h	92/8	7	5

Table 4.1 – Summary of Major Roadway Noise Sources.

4.2 Procedure Used for Roadway Noise Analysis

In order to calculate the road noise impact at the proposed development, we utilized the Ministry of Environment's STAMSON modeling software version 5.04. This program allows us to input variables of a road such as traffic volume, types of vehicles, speed, barrier locations and topography to determine the environmental noise impact at a point of reception.

4.3 Points of Reception

To determine the worst case noise impact on the façade of the building, we have chosen two points of reception (POR) at the north-west corner on the ground floor and the 3rd floor of the Block A building. According to the drawings, there is a bedroom located at this point on all three floors of the Block A building closest to Innes Rd. The PORs are at the plane of window (POW) of the 1st floor at a height of 1.5m and at the plane of window (POW) of the 3rd floor at a height of 7.5m. The position of the points of reception is shown in Figure 4.1 and 4.2 indicated by the blue cross. Table 4.2 below summarizes the receiver height and distance.

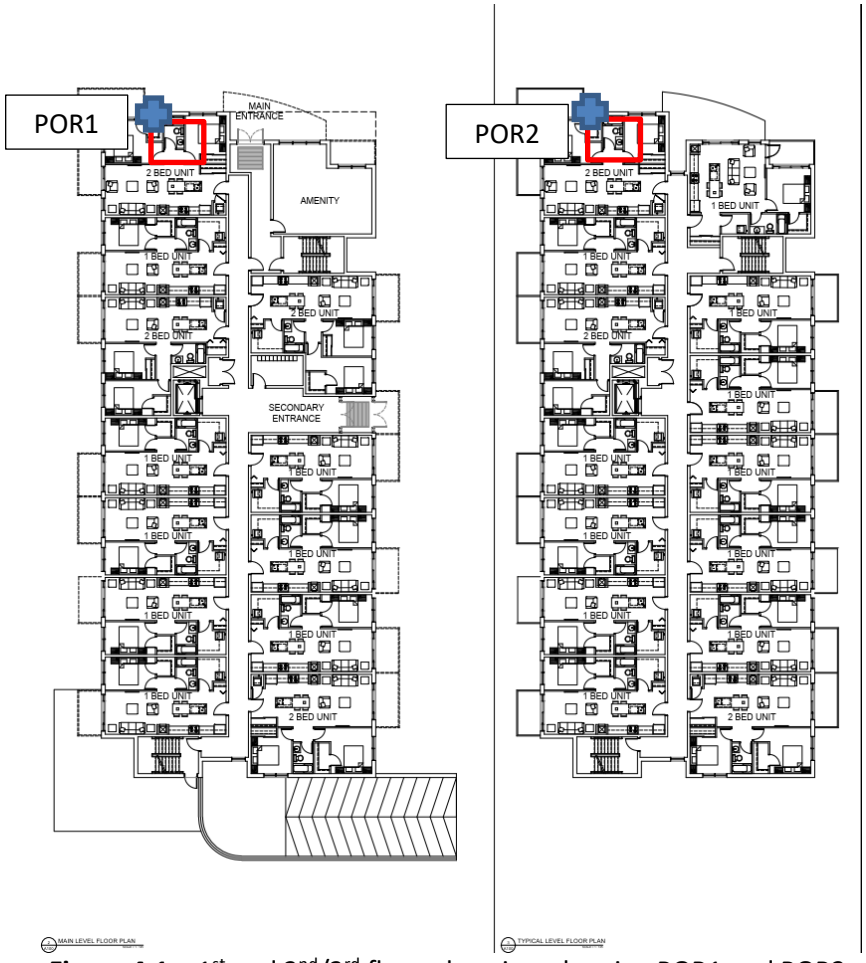

Figure 4.1 – 1st and 2nd/3rd floor plan view showing POR1 and POR2.

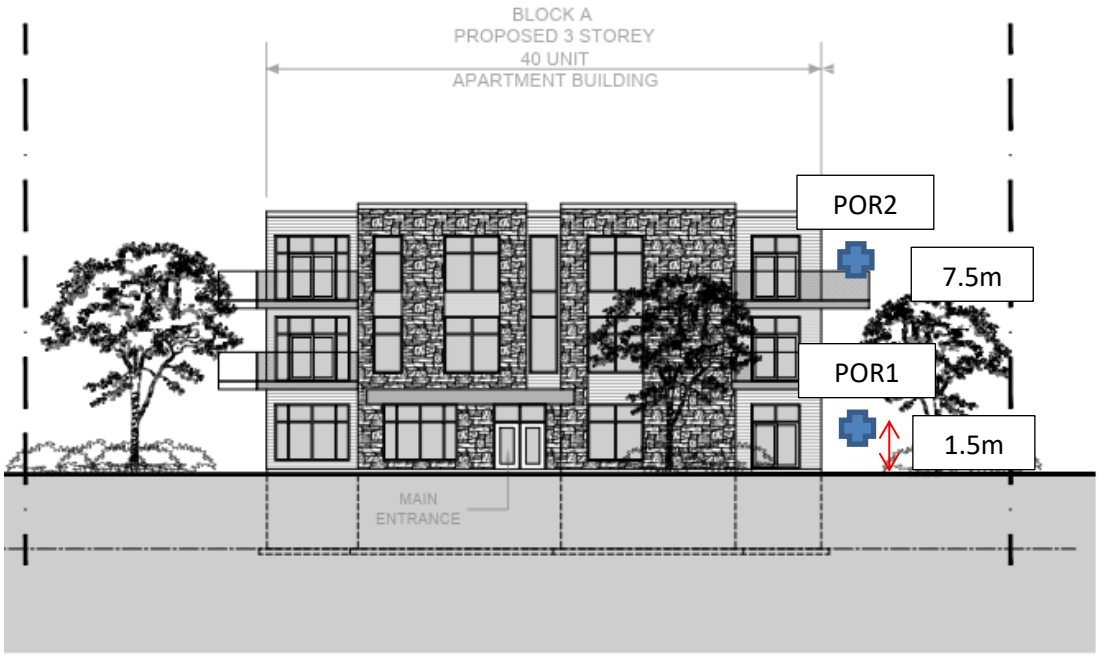

Figure 4.2 – Front elevation view showing POR1 and POR2.

A front view elevation of the building further from Tenth Line was not provided however is similar to the front elevation shown for POR1 and POR2.

Receiver	Height (m)	Distance from Closest Source	Angle to source segment from POR (left)	Angle to source segment from POR (right)
POR1	1.5	~98m (Innes Rd.)	90°	90°
POR2	7.5	~98m (Innes Rd.)	90°	90°

Table 4.2 – Table of receiver height and distance from noise source.

4.4 Parameters Used for Analysis

The parameters used in STAMSON to assess the noise impact at POR1 are shown below in Table 4.3:

Parameter	Values Used
Noise Source:	**Innes Rd**
Time Period	16h/8h
Topography	Flat/gentle slope no barrier
Rows of Houses	0
Density of First Row%	N/A
Intermediate Surface	Reflective
Receiver Height (m)	1.5
Source Receiver Distance (m)	98

Table 4.3 – Parameters used in STAMSON model at POR1 (1st bedroom of Block A)

The parameters used in STAMSON to assess the noise impact at POR2 are shown below in Table 4.4:

Parameter	Values Used
Noise Source:	**Innes Rd**
Time Period	16h/8h
Topography	Flat/gentle slope no barrier
Rows of Houses	0
Density of First Row%	N/A
Intermediate Surface	Reflective
Receiver Height (m)	7.5
Source Receiver Distance (m)	98

Table 4.4 – Parameters used in STAMSON model at POR1 (1st bedroom of Block A)

We have assessed both daytime and nighttime levels for POR1 and POR2.

4.5 Surface Transportation Noise Levels

Table 4.5 below summarizes the predicted sound pressure levels at the points of reception from the results of the STAMSON environmental noise software calculation (Appendix A) for Innes Rd.

	POR 1 (dBA)		POR 2 (dBA)	
	Day	**Night**	**Day**	**Night**
Innes Rd.	59.4	51.8	59.4	51.8
Total	**59.4**	**51.8**	**59.4**	**51.8**

Table 4.5 – Predicted Road Noise at each Point of Reception

4.6 Roadway Noise Summary and Analysis

We have calculated the predicted noise level caused by traffic using STAMSON and have shown a 16h L_{eq} for daytime hours is **59.4 dBA** at POR1 and POR2. The 8h L_{eq} for nighttime hours at POR1 and POR2 is **51.8 dBA.** As we have used the reflective surface option in order to account for a worst case scenario in our calculations, the predicted levels are the same at different heights, as the software only accounts for a change in height when the intermediate surface is absorptive. As the levels during the day are above 55 dBA, warning clauses are required, but because they are below 65 dBA, an evaluation of exterior building components (AIF analysis) is not required.

4.7 Warning Clauses

Since the predicted noise level from surface transportation exceeds 55 dBA, warning clauses must be added to the development agreement. Note that the units are supplied with a split air ductless air system for heating and air conditioning and not central air as noted in MOECP NPC-300. Warning Clause C has been modified to suit this change.

In addition Section Section C8 also notes: "*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*."

TYPE	Warning Clause Text
Type A	Purchasers/tenants are advised that sound levels due to increasing road/rail/Light Rail/transit way traffic may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the City and the Ministry of the Environment.
Type B	Purchasers/tenants are advised that despite the inclusion of noise control features in the development and within the building units, sound levels due to increasing road/rail/Light Rail/transitway traffic may on occasions interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the City and the Ministry of the Environment.
Type C	This dwelling unit has been designed with the provision for adding air conditioning at the occupant's discretion. Installation of 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 City and the Ministry of Environment.
Type D	This dwelling has been supplied with a central air conditioning system which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the City and the Ministry of Environment.

Table 4.6 - Warning Clause Types (from MOECP NPC-300 Section C8.1)

A Type C Warning Clause for both Block A and Block B is required, as noise levels exceed 55 dBA at the plane of window of Block A and will do so at Block B as well as it is only slightly further away from Innes Road.

5.0 Additional Noise Considerations

5.1 Stationary Noise to Surrounding Area

In addition to the noise impact from traffic onto the new development, it was also requested that the impact from equipment from the new development be addressed. Bridor Developments has indicated that there will not be any significant noise-making equipment associated with the proposed development such as MUA/AHUs, chillers, cooling towers, generators, etc. and that residential units are intended to have an internal boiler system with a small air handler in each unit with an AC condenser on the balcony. Therefore the only exterior noise generating equipment is the condensers on the balcony of each unit which do not generate a significant amount of noise. We have been provided with the proposed condensing units to be used, which are to be located on balconies, meaning that the closest condensing unit to an adjacent property will be approximately 5.5m from the balconies of the west façade of Block A to the property lines of the residences on Autumn Hill Crescent to the west. The units that will be used, as shown in the Appendix, have sound power levels of 54 dBA from which we can determine the sound pressure at a certain distance away. With a basic calculation, using the distance from the property line (5.5m), we can see that the resulting sound pressure levels are well below 45 dBA in Figure 5.1 and that even multiple units at this distance will not result in a sound pressure level of a maximum of 45 dBA.

Sound Pressure Level Lp from Point Source Lw, hemi-spherical radiation

Lw		R1	
54.0	dB	5.5	m
		18.04	ft
Lp			
31.2	dB		

Figure 5.1 – Sound pressure level calculation at a distance of 5.5m at the closest property line.

Even combining two sources of the same sound power levels at the same distance away will result in a 3 dBA increase of the resulting sound power levels at the given distance. Therefore, the condensing units will not have a significant noise impact on the surrounding existing properties. We have also provided some general recommendations for these condensing units:

- Install units on neoprene mounts or pads such as Mason BR mounts or Mason SW pads so that minimal vibration is transmitted to the balcony and to the structure itself.
- Shield condensing units as much as possible from adjacent balconies, ideally with solid balcony dividers.
- Select quiet versions of condensing unit models if possible.

6.0 Conclusion

We have analyzed the traffic noise impact for road sources for the new proposed development to be located at 2380 and 2396 Cleroux Crescent. A detailed building component analysis was not required as noise levels from the traffic noise sources (Innes Rd) was greater than 55 dBA but less than 65 dBA at the Plane of Window (POW) at the chosen POR. A Type C warning clause is required for both Block A and Block B as 55 dBA will be exceeded at the plane of window at each building.

In addition, the only noise generating equipment from the development to the surrounding area will be small condensing units on residential balconies, which should not be problematic for neighbouring properties however we have provided some general recommendations in order to minimize issues to adjacent units within the new development in Section 5.1.

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

Sincerely,

Patrick Richard, M.Sc.E.
Acoustic Consultant

Appendix A
STAMSON Calculations

STAMSON 5.0 NORMAL REPORT Date: 10-03-2021 16:17:02
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: Cleroux.te Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Innes (day/night)

Car traffic volume : 9715/845 veh/TimePeriod *
Medium truck volume : 773/67 veh/TimePeriod *
Heavy truck volume : 552/48 veh/TimePeriod *
Posted speed limit : 50 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 12000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 10.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Innes (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 98.00 / 98.00 m
Receiver height : 1.50 / 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Innes (day)

Source height = 1.50 m

ROAD (0.00 + 59.36 + 0.00) = 59.36 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.00 67.51 0.00 -8.15 0.00 0.00 0.00 0.00 59.36

Segment Leq : 59.36 dBA

Total Leq All Segments: 59.36 dBA

Results segment # 1: Innes (night)

Source height = 1.50 m

ROAD (0.00 + 51.76 + 0.00) = 51.76 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	59.91	0.00	-8.15	0.00	0.00	0.00	0.00	51.76

Segment Leq : 51.76 dBA

Total Leq All Segments: 51.76 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.36
(NIGHT): 51.76

STAMSON 5.0 NORMAL REPORT Date: 07-04-2022 11:54:19
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: cleroux2.te Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Innes (day/night)

Car traffic volume : 9715/845 veh/TimePeriod *
Medium truck volume : 773/67 veh/TimePeriod *
Heavy truck volume : 552/48 veh/TimePeriod *
Posted speed limit : 50 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 12000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 10.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Innes (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 98.00 / 98.00 m
Receiver height : 7.00 / 7.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Innes (day)

Source height = 1.50 m

ROAD (0.00 + 59.36 + 0.00) = 59.36 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	67.51	0.00	-8.15	0.00	0.00	0.00	0.00	59.36

Segment Leq : 59.36 dBA

Total Leq All Segments: 59.36 dBA

Results segment # 1: Innes (night)

Source height = 1.50 m

ROAD (0.00 + 51.76 + 0.00) = 51.76 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	59.91	0.00	-8.15	0.00	0.00	0.00	0.00	51.76

Segment Leq : 51.76 dBA

Total Leq All Segments: 51.76 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.36
(NIGHT): 51.76