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Bridor Developments – 1592 Tenth Line Apartment Buildings
Noise Impact Study

Dear Eric,

We are pleased to present the following traffic noise study for a new proposed residential development of two stacked townhome apartment buildings at 1592 Tenth Line Road 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 consisting of stacked townhomes with a total of 27 residential units between the two buildings, which is in proximity to Tenth Line 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 Tenth Line Road (~12.5m from the east façade of 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 each of the PORs analyzed are above 55 dBA and a detailed building component analysis was completed. Mitigation measures above the Ontario Building Code (OBC) were found to be required for windows of Block A, the building closest to Tenth Line Road. Our full traffic nose analysis is provided in Section 4.0 and 5.0. 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 6.0.

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 stacked townhomes to be located at 1592 Tenth Line Road 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 Tenth Line Road has been analyzed. Section 5.0 provides a detailed analysis of the building components of the development, as the noise levels at the exterior PORs is above 55 dBA.

2.0 Site Plan Evaluation

2.1 Project Description

The proposed development consists of two new residential buildings, with three storeys of stacked townhomes. The building is located at 1592 Tenth Line Road in Ottawa, Ontario. The area surrounding the development consists primarily of low-rise residential and public buildings, including a recreation complex and public library across the road. We have considered traffic noise from Tenth Line 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 Tenth Line Road, which is located approximately 12.5m from the closest façade of the closest building. Figure 2.2 shows the proposed site with the distance and angles to Tenth Line Road indicated. Tenth Line Road is indicated as an arterial road, as per City of Ottawa Schedule G.

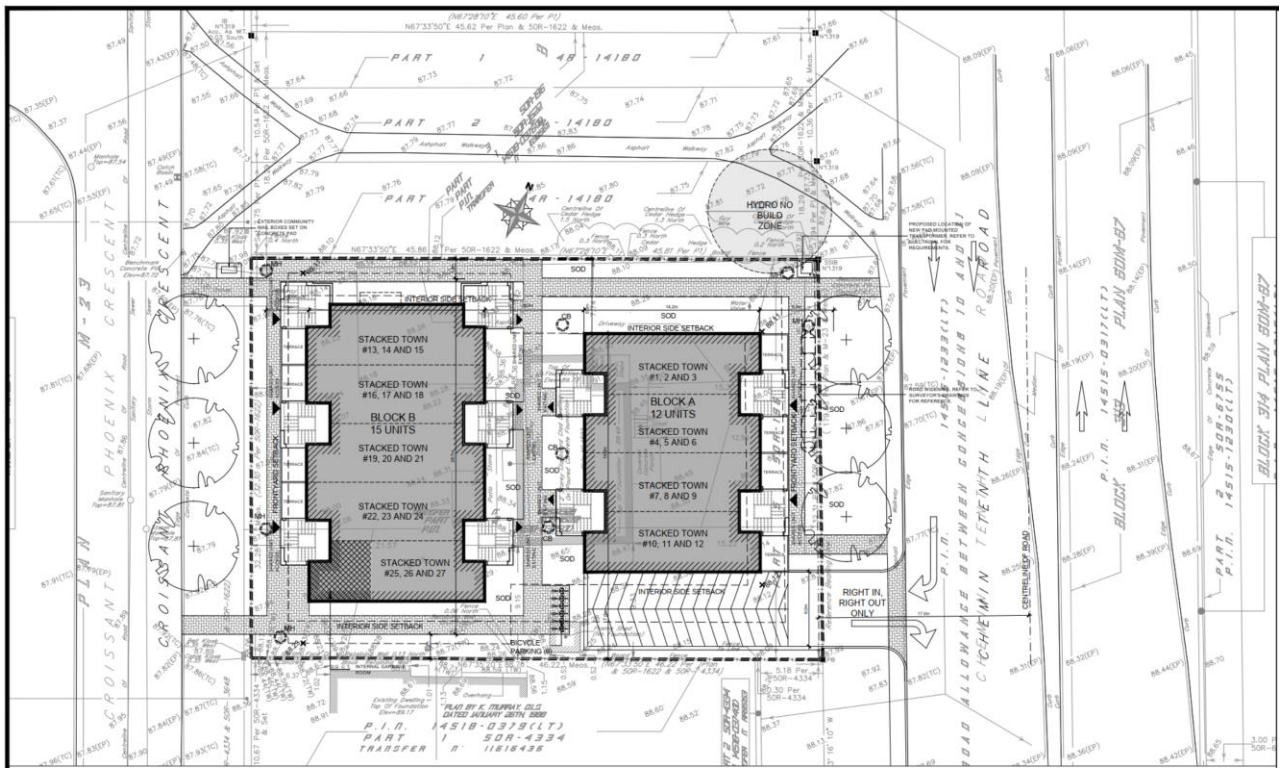

Figure 2.1 – Site plan of 1592 Tenth Line Road.

Figure 2.2 – Surrounding area 1592 Tenth Line Road 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 below with outdoor level limits shown in Table 3.2.

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

Tenth Line 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 1592 Tenth Line Road are indicated in Section 5.2.

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 55 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 1592 Tenth Line Road.

4.1 Road Traffic Information

For this study, the only surface transportation noise sources considered was traffic from Tenth Line Road, which is located to the east of the front façade 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 (%)
Tenth Line Rd.	4 Lane Urban Arterial - Undivided	30,000	60 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 four points of reception (POR); two at the north east corner on the ground floor of each townhome building and two at the same location on the 3rd floor of both Block A and Block B. According to the drawings, there are no bedrooms along the façade of the building closest to Tenth Line Rd (Block A) and these rooms are the main living area of each unit on each floor. In the building further from Tenth Line Road (Block B), there are bedrooms along the façade closest to Tenth Line Rd and therefore the most north east bedroom will be the second and fourth point of reception. Each POR is at the plane of window (POW) of the 1st and 3rd floors at a height of 1.5m (POR1 and POR2) and 7.5m (POR3 and POR4). The position of our points of reception is shown in Figure 4.1 and 4.2 indicated by the blue cross. Table 4.2 below summarizes receiver heights, distances and angles.

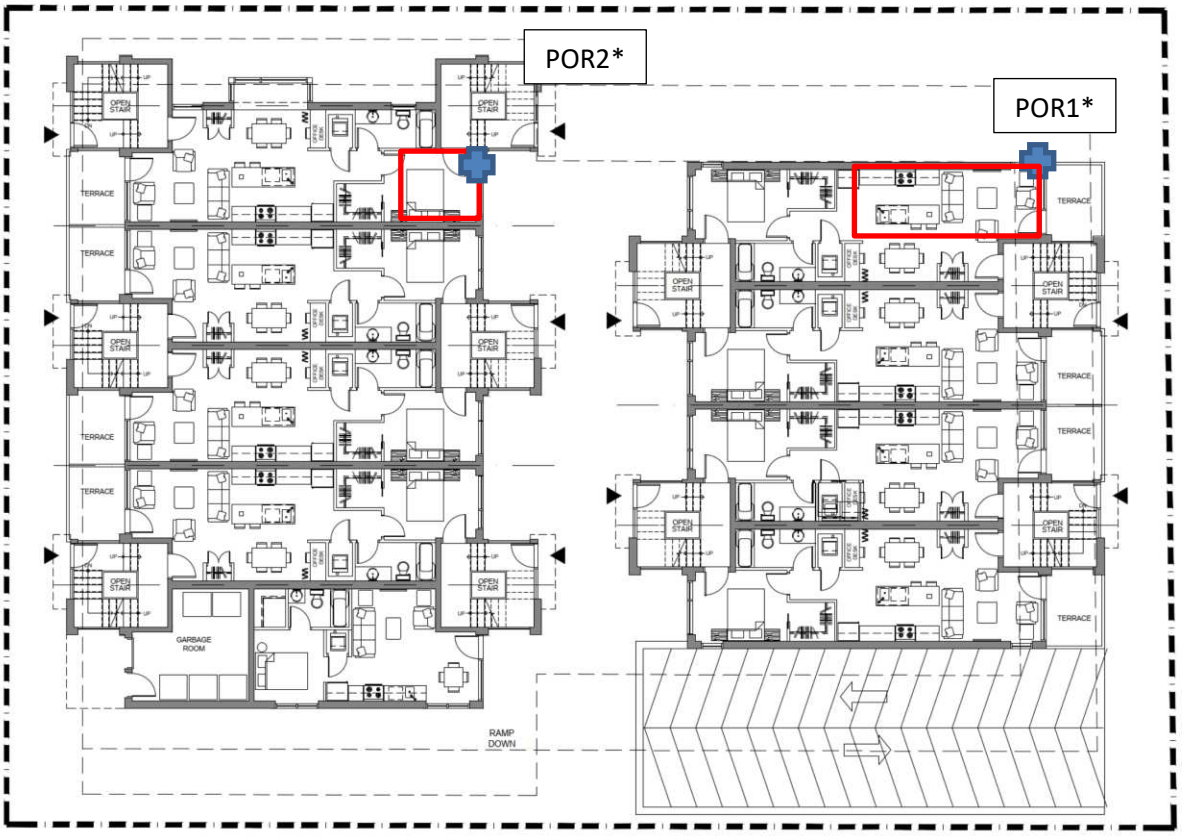

Figure 4.1 – 1st floor plan view showing POR1 and POR2.
*POR3 and POR4 are in the same location as POR1 and POR2, respectively, at a height of 7.5m.

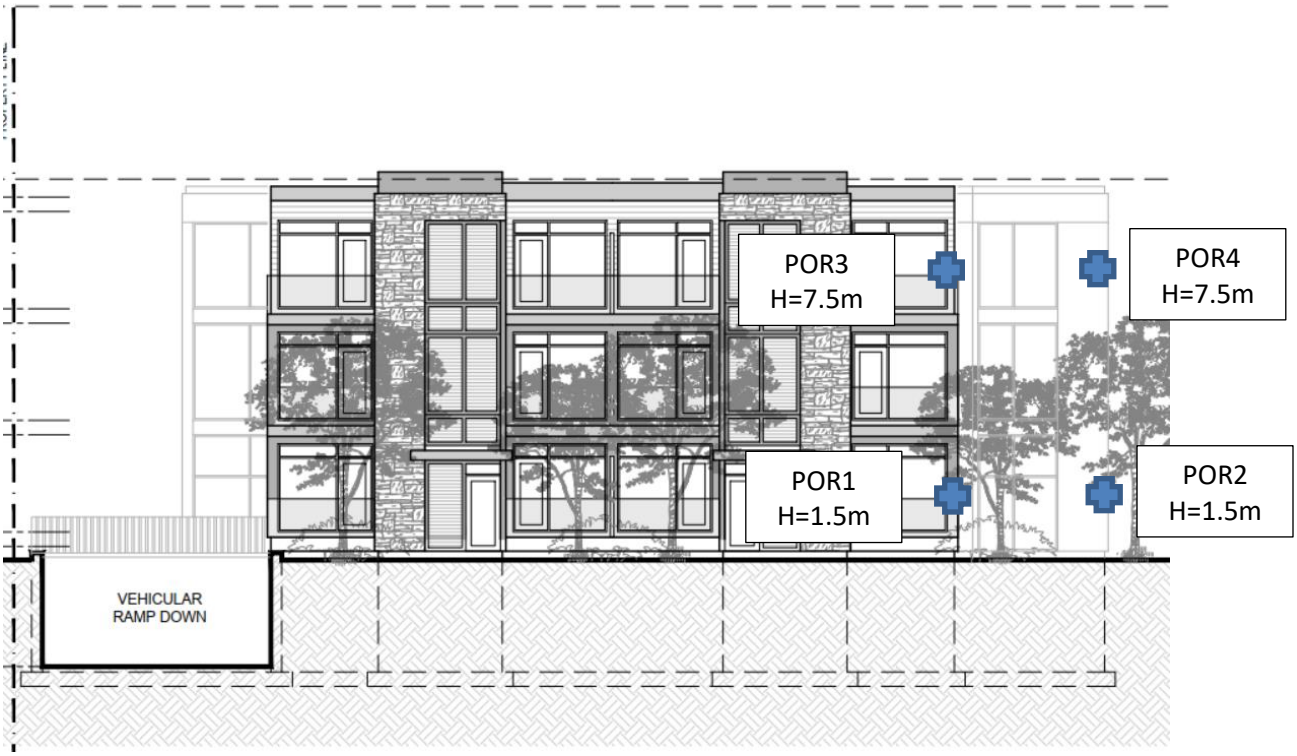

Figure 4.2 – Front elevation view showing PORs, with POR2 and POR4 shown in the background for Block B.

Receiver	Height (m)	Distance from Closest Source	Angle to source segment from POR (left)	Angle to source segment from POR (right)
POR1	1.5	~12.5m (Tenth Line Rd.)	90°	90°
POR2	1.5	~34m (Tenth Line Rd.)	90°	90°
POR3	7.5	~12.5m (Tenth Line Rd.)	90°	90°
POR4	7.5	~34m (Tenth Line 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:	**Tenth Line 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)*	15

Table 4.3 – Parameters used in STAMSON model at POR1 (1st floor living area, Block A)

*The minimum source-receiver distance that can be input into STAMSON is 15m.

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

Parameter	Values Used
Noise Source:	**Tenth Line 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)	34

Table 4.4 – Parameters used in STAMSON model at POR 2 (north-east bedroom, Block B)

The parameters used in STAMSON to assess the noise impact at POR3 are shown below in Table 4.5:

Parameter	Values Used
Noise Source:	**Tenth Line 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)*	15

Table 4.5 – Parameters used in STAMSON model at POR3 (3rd floor living area, Block A)

*The minimum source-receiver distance that can be input into STAMSON is 15m.

The parameters used in STAMSON to assess the noise impact at POR4 are shown below in Table 4.6:

Parameter	Values Used
Noise Source:	**Tenth Line 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)	34

Table 4.6 – Parameters used in STAMSON model at POR4 (north-east bedroom, Block B)

We have assessed both daytime and nighttime levels for each POR.

4.5 Surface Transportation Noise Levels

Table 4.7 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 Tenth Line Rd.

	POR 1 (dBA)		POR 2 (dBA)		POR 3 (dBA)		POR 4 (dBA)	
	Day	**Night**	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**
Tenth Line Rd.	73.8	66.2	69.5	61.8	73.8	66.2	69.5	61.8
Total	**73.8***	**66.2***	**69.5**	**61.8**	**73.8***	**66.2***	**69.5**	**61.8**

Table 4.7 – Predicted Road Noise at each Point of Reception

*Values have been adjusted as per Ministry of Environment ORNAMENT Technical Document to account for distances less than 15m from road noise source to POR as described below.

Equation (13) in Section 5.5 of ORNAMENT document has been used in conjunction with Figure 3 on Page 39. The equation used was for reflective ground and was added to the value calculated in STAMSON:

Adjustment = 10*log (15/D) where D = 12.5m, the perpendicular distance to the source from the POR. Therefore, the adjustment to each result marked with a * in Table 4.7 above is +0.79 dB, which has been reflected in the final sound prediction calculation.

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 **73.8 dBA**, at POR1, **69.5 dBA** at POR2, **73.8 dBA** at POR3 and **69.5 dBA** at POR4. The 8h L_{eq} for nighttime hours is **66.2 dBA** at POR1, **61.8 dBA** at POR2, **66.2 dBA** at POR3 and **61.8 dBA** at POR4. Note that levels do not change at different heights, as the intermediate surface in the calculation was set as reflective and therefore the difference in sound levels on the 1st floor and the 3rd

floor is insignificant. As the levels during the day and at night are above 65 dBA, an evaluation of exterior building components (AIF analysis) is required. Detailed preliminary assemblies for the exterior walls were not yet available, however we the exterior is to be a combination of vinyl siding and brick and we have based preliminary assemblies based on this information and common exterior wall assemblies. POR1 and POR3 are located on a part of the building with vinyl siding and POR2 and POR4 are located on a part of Block B with brick/stone. The assembly is listed below for the PORs in this report and is analyzed in the following section.

EXTERIOR VINYL SIDING WALL – POR1 and POR3
-Vinyl/wood siding
-1" rigid insulation
-6" steel studs @16" o.c. max.
-5.5" batt insulation
-5/8" Type X gypsum board

EXTERIOR STONE / BRICK MASONRY WALL – POR2 and POR4
-Stone / brick masonry.
-1" rigid insulation
-6" steel studs @16" o.c. max.
-5.5" batt insulation
-5/8" Type X gypsum board

5.0 Exterior Building Component Analysis (AIF Method)

In this section, we determine if the building complies with the City of Ottawa's ENCG indoor noise requirements based on the existing or proposed wall and window construction. We compare the required minimum façade AIF to the estimated AIF of the currently selected façade materials.

5.1.1 Building Components

The current design of each POR's façades is made up of the following components:

1) Exterior wall (Vinyl/wood siding for POR1 and POR3)
2) Exterior wall (Brick/stone for POR2 and POR4)
3) Window (No assembly yet specified, will be determined through AIF analysis)

The proposed exterior wall compositions at each POR are as given in the previous section and Table 5.1 below. The façades are composed of vinyl/wood siding and stone/brick and as shown in Figure 4.2. The wall type for POR1 and POR3 is sufficiently similar to wall type EW2 and the wall type for POR2 and POR4 (stone) is sufficiently similar to wall type EW5 described in the Canada Mortgage and Housing Corporation (CMHC) document "Road and Rail Noise: Effects on Housing". Table 5.1 shows a comparison of these wall compositions.

Exterior Wall Assembly	CMHC Road and Rail Noise Wall Type
-Vinyl/wood siding -1" rigid insulation -6" steel studs @16" o.c. max. -5.5" batt insulation -5/8" type x gypsum board	**Wall Type EW2** -Metal/wood siding with fibre backer board -25-30mm rigid insulation -50mm mineral wool or glass fibre batts -38x89mm wood studs -12.7mm gypsum board
-Stone / brick masonry. -1" rigid insulation -6" steel studs @16" o.c. max. -5.5" batt insulation -5/8" type x gypsum board	**Wall Type EW5** -100mm brick veener -25mm airspace -Sheathing -50mm mineral wool or glass fibre batts -38x89mm wood studs -12.7mm gypsum board

Table 5.1 – Comparison of new building exterior wall and equivalent wall from CMHC, Road and Rail Noise: Effects on Housing.

There are no glazing assemblies indicated in the drawings and therefore we have assumed a double pane window that meets minimum OBC requirements such as the following example:

Basic Window Assembly
3m glazing 13mm interplane spacing 3mm glazing

Table 5.2 –Window Assembly used in Calculations

The calculation of AIF for each building component depends on the ratio of the area of a given component on the exterior to the total floor area of the corresponding interior room. Using plan view and elevation drawings, we have determined these dimensions for the living area of POR1 and bedroom of POR2 for which we determined the noise impact at each POR. The areas of the exterior wall components and ratios to the floor are given in Table 5.3 below. The layouts of the two spaces are shown in Figure 5.1 and Figure 5.2.

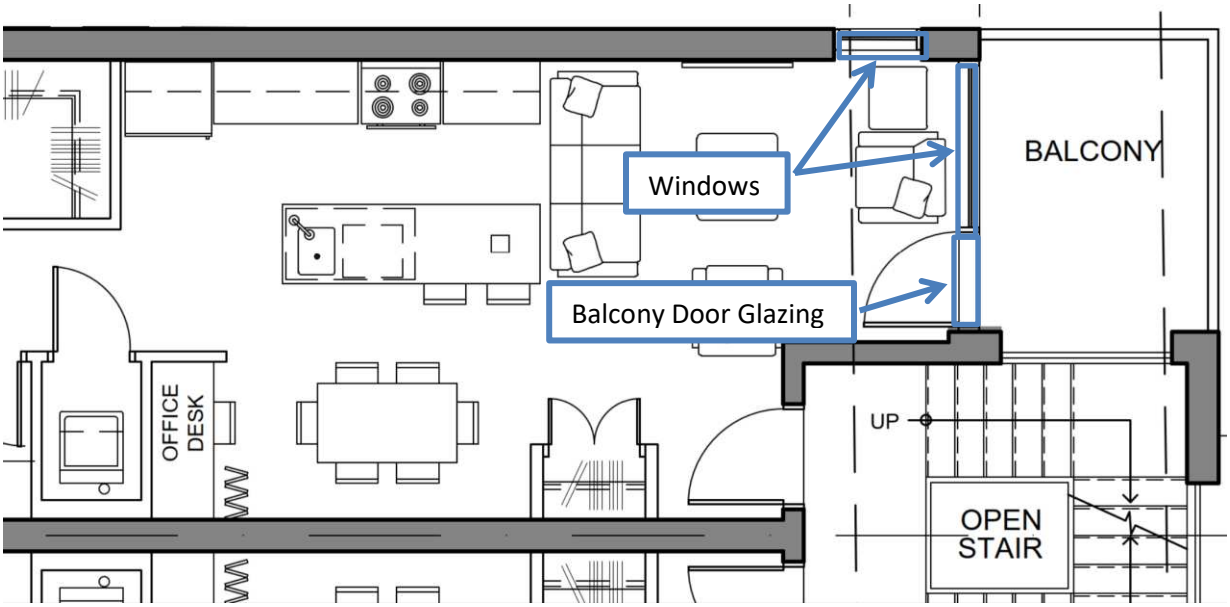

Figure 5.1 – Layout of living area in ground floor and 3rd floor unit used for analysis of POR1 and POR3 for Block A. Exterior wall assembly equivalent to CMHC wall type EW2.

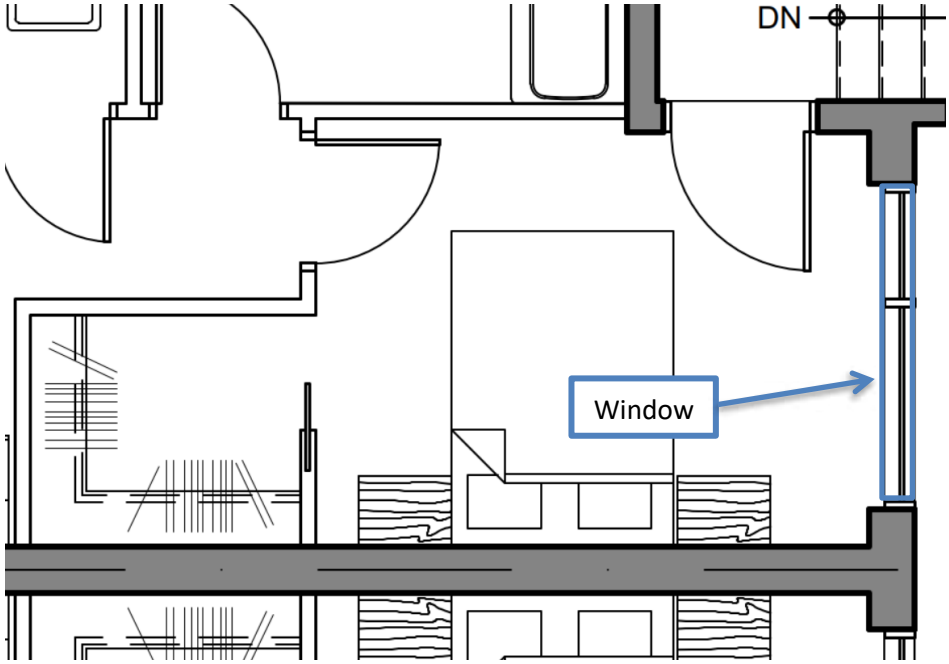

Figure 5.2 – Layout of bedroom in north east ground floor and 3rd floor unit used for analysis of POR2 and POR4 for Block B. Exterior wall assembly equivalent to CMHC wall type EW5.

5.1.2 AIF Calculations

Below in Table 5.3 and 5.4, we provide the results of our AIF calculations based on the procedure given in Section 3.3 and the building component information given in Section 5.1 and dimensions from the plans for each component at all PORs. Component AIFs are determined based on component area ratio to floor area given in Tables 6.2 and 6.3 of CMHC "Road and Rail Noise: Effects on Housing". As stated in Section 3.3, if the AIF of any component exceeds the required AIF by 10 or more (Comp1 AIF > Init AIF +10), the calculation should be repeated for the other components with the 'total number of components' reduced by one. This gives the Final Required AIF for component 2 for which the component AIF is compared to.

POR1/POR3												
Room Floor Area (m^2)	Number of Components	Component Number	Component Type	Component Area (m^2)	Component Area ratio to Floor Area (%)	Outside Leq	Required Indoor Leq	Initial Required AIF	Component AIF	Comp1 AIF > Init AIF +10	Final Required AIF	Acceptable Component AIF
30.9	2	1	Exterior Wall	20.2	65%	73.8	45	34	35	No	34	**Yes**
30.9	2	2	Window	8	26%	73.8	45	34	30	No	34	**No**

Table 5.3 – POR1 AIF parameters used in calculations, resulting required AIF and component AIF, and statement if component AIF is acceptable.

POR2/POR4												
Room Floor Area (m2)	Number of Components	Component Number	Component Type	Component Area (m2)	Component Area ratio to Floor Area (%)	Outside Leq	Required Indoor Leq	Initial Required AIF	Component AIF	Comp1 AIF > Init AIF +10	Final Required AIF	Acceptable Component AIF
10.1	2	1	Exterior Wall	9	89%	69.5	45	30	48	Yes	27	**Yes**
10.1	2	2	Window	5.7	56%	69.5	45	30	27	Yes	27	**Yes**

Table 5.4 – POR2 AIF parameters used in calculations, resulting required AIF and component AIF, and statement if component AIF is acceptable.

As noted in the final column of Table 5.3, the window assembly used in our calculation does not meet the AIF requirement for POR1 and POR3 and needs to be improved.

For POR1 and POR3, the window assembly must be a minimum AIF of AIF 34, which can be translated into an STC rating for the glazing, using the percentage area of the window to the total floor area in Table D2 in Appendix D of CMHC "Road and Rail Noise: Effects on Housing". By using this table, we obtain that a glazing assembly of at least STC 35 is to be used and have provided options in Table 5.5 below for meeting this requirement.

Recommended Glazing Assembly	STC Rating
3mm | 0.76 laminate layer| 3mm	STC 36 (Test ID TR16-122
6mm glazing 20mm airspace 6mm glazing	STC 35

Table 5.5 – Example glazing assemblies to meet AIF requirements at POR1.

An STC 35 rated glazing assembly for all windows and glass doors of Block A (the building closest to Tenth Line Road, Units 1 through 12) is required.

5.2 Warning Clauses

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.

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"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*."

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.
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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)
Table 5.6 – Warning Clause Types and Example Text from the City of Ottawa (from ENCG Table A1)

Because the predicted noise level from surface transportation exceeds 55 dBA, a Type C warning clause, with the amendment that air conditioning is provided per individual suite and is not central air conditioning, must be added to the development agreement for all units for both Block A and Block B.

5.3 Traffic Noise Assessment Summary

Exterior Walls

Exterior Wall Assemblies
EXTERIOR VINYL SIDING WALL – POR1 and POR3
-Vinyl/wood siding
-1" rigid insulation
-6" steel studs @16" o.c. max.
-5.5" batt insulation
-5/8" Type X gypsum board

EXTERIOR STONE / BRICK MASONRY WALL
-Stone / brick masonry.
-1" rigid insulation
-6" steel studs @16" o.c. max.
-5.5" batt insulation
-5/8" type x gypsum board

The AIF value for the exterior walls is equivalent or exceeds the requirements and no changes are required.

Exterior Glazing

We have provided recommended window assemblies for Block A in Table 5.5 and have determined that an STC of at least STC 35 is required for all windows and doors with glazing on the building.

In addition, because the predicted noise level from surface transportation exceeds 55 dBA, a Type C warning clause, with the amendment that air conditioning is provided per individual suite and is not central air conditioning, must be added to the development agreement for all units in each building.

6.0 Additional Noise Considerations

6.1 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 12.5m from the balcony of the south west unit to the property line of the residence to the south. 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 (12.5m), we can see that the resulting sound pressure levels are well below 45 dBA in Figure 6.2 and that even multiple units at this distance will not result in a sound pressure level even close to 45 dBA.

Point Source Lp from Lw, hemi-spherical radiation				Metric
	Lw		R1	
	54.0	dB	12.5	m
			41.01	ft
	Lp			
	24.1	dB		

Figure 6.2 – Sound pressure level calculation at a distance of 12.5m 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.

7.0 Conclusion

We have analyzed the traffic noise impact for road sources for the new proposed development to be located at 1592 Tenth Line Road. A detailed building component analysis was required as noise levels from the traffic noise sources (Tenth Line Rd) was greater than 55 dBA at the Plane of Window (POW) at each of the PORs. After completing a detailed AIF analysis of the exterior building components, the proposed exterior wall assemblies as listed in Section 5.1 are acceptable. We have recommended window assemblies for the windows and glass doors of Block A have an STC rating of at least STC 35 on all floors. We have provided sample assemblies to meet this requirement in Table 5.5.

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 6.1.

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

Sincerely,

Patrick Richard, M.Sc.E.
Acoustic Consultant

Approved By:

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

Appendix A
STAMSON Calculations

STAMSON 5.0 NORMAL REPORT Date: 10-02-2021 16:48:24
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 1592tlr.te Time Period: Day/Night 16/8 hours
Description:

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

Car traffic volume : 24288/2112 veh/TimePeriod *
Medium truck volume : 1932/168 veh/TimePeriod *
Heavy truck volume : 1380/120 veh/TimePeriod *
Posted speed limit : 60 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): 30000
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: Tenth Line (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 : 15.00 / 15.00 m
Receiver height : 1.50 / 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Tenth Line (day)

Source height = 1.50 m

ROAD (0.00 + 73.01 + 0.00) = 73.01 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.00 73.01 0.00 0.00 0.00 0.00 0.00 0.00 73.01

Segment Leq : 73.01 dBA

Total Leq All Segments: 73.01 dBA

Results segment # 1: Tenth Line (night)

Source height = 1.50 m

ROAD (0.00 + 65.41 + 0.00) = 65.41 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	65.41	0.00	0.00	0.00	0.00	0.00	0.00	65.41

Segment Leq : 65.41 dBA

Total Leq All Segments: 65.41 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 73.01
(NIGHT): 65.41

STAMSON 5.0 NORMAL REPORT Date: 10-02-2021 16:47:36
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 1592TLR2.te Time Period: Day/Night 16/8 hours
Description:

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

Car traffic volume : 24288/2112 veh/TimePeriod *
Medium truck volume : 1932/168 veh/TimePeriod *
Heavy truck volume : 1380/120 veh/TimePeriod *
Posted speed limit : 60 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): 30000
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: Tenth Line (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 : 34.00 / 34.00 m
Receiver height : 1.50 / 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Tenth Line (day)

Source height = 1.50 m

ROAD (0.00 + 69.45 + 0.00) = 69.45 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	73.01	0.00	-3.55	0.00	0.00	0.00	0.00	69.45

Segment Leq : 69.45 dBA

Total Leq All Segments: 69.45 dBA

Results segment # 1: Tenth Line (night)

Source height = 1.50 m

ROAD (0.00 + 61.86 + 0.00) = 61.86 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	65.41	0.00	-3.55	0.00	0.00	0.00	0.00	61.86

Segment Leq : 61.86 dBA

Total Leq All Segments: 61.86 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 69.45
(NIGHT): 61.86

STAMSON 5.0 NORMAL REPORT Date: 06-07-2022 11:40:57
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 1592tlr3.te Time Period: Day/Night 16/8 hours
Description:

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

Car traffic volume : 24288/2112 veh/TimePeriod *
Medium truck volume : 1932/168 veh/TimePeriod *
Heavy truck volume : 1380/120 veh/TimePeriod *
Posted speed limit : 60 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): 30000
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: Tenth Line (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 : 15.00 / 15.00 m
Receiver height : 7.50 / 7.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Tenth Line (day)

Source height = 1.50 m

ROAD (0.00 + 73.01 + 0.00) = 73.01 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	73.01	0.00	0.00	0.00	0.00	0.00	0.00	73.01

Segment Leq : 73.01 dBA

Total Leq All Segments: 73.01 dBA

Results segment # 1: Tenth Line (night)

Source height = 1.50 m

ROAD (0.00 + 65.41 + 0.00) = 65.41 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	65.41	0.00	0.00	0.00	0.00	0.00	0.00	65.41

Segment Leq : 65.41 dBA

Total Leq All Segments: 65.41 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 73.01
(NIGHT): 65.41

STAMSON 5.0 NORMAL REPORT Date: 06-07-2022 11:44:37
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 1592tlr2.te Time Period: Day/Night 16/8 hours
Description:

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

Car traffic volume : 24288/2112 veh/TimePeriod *
Medium truck volume : 1932/168 veh/TimePeriod *
Heavy truck volume : 1380/120 veh/TimePeriod *
Posted speed limit : 60 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): 30000
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: Tenth Line (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 : 34.00 / 34.00 m
Receiver height : 7.50 / 7.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Tenth Line (day)

Source height = 1.50 m

ROAD (0.00 + 69.45 + 0.00) = 69.45 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.00 73.01 0.00 -3.55 0.00 0.00 0.00 0.00 69.45

Segment Leq : 69.45 dBA

Total Leq All Segments: 69.45 dBA

Results segment # 1: Tenth Line (night)

Source height = 1.50 m

ROAD (0.00 + 61.86 + 0.00) = 61.86 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	65.41	0.00	-3.55	0.00	0.00	0.00	0.00	61.86

Segment Leq : 61.86 dBA

Total Leq All Segments: 61.86 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 69.45
(NIGHT): 61.86