



27 Monk Street

Ottawa, Ontario

Noise Impact Study

SACL #SW19618

Dec 16, 2019

Submitted to:

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ART Properties and Construction

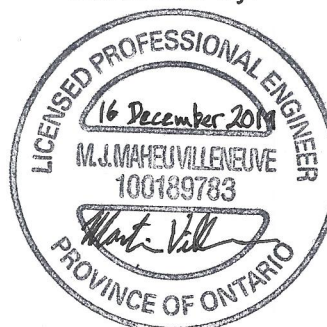
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1. Introduction

At the request of ART Properties and Construction (ART), Swallow Acoustic Consultants Ltd. / Thornton Tomasetti (SACL / TT) is pleased to present this Noise Impact Study (NIS) for the proposed 4-storey apartment building (the Project) to be located at 27 Monk Street in Ottawa, Ontario (the Site). This NIS assesses noise impacts from nearby surface transportation sources. Based on observations made at the site and surrounding area, there are no significant off-site stationary noise sources that may exceed the applicable sound level criteria for the Project.

The Project is an apartment building consisting of new construction. There are no rooftop amenity areas associated with this project. However, the backyard (at grade) is considered as part of the assessment for noise due to transportation noise sources.

Adjacent properties consist of two- and three-storey residential buildings to the west, north and south. One- and two-storey commercial buildings are located along Bank Street, east of the Project. A new 9-storey retirement residence is also currently under construction directly south of the Project; the exact building footprint is unknown to SACL and this building was therefore excluded from this study, resulting in a more conservative assessment, since the new retirement residence is expected to provide additional acoustical shielding to the Project from transportation sources.

The main surface transportation corridors impacting on the Project are Bank Street and Fifth Avenue, based on their roadway classifications per the City of Ottawa, and their proximity to the development. An aerial photo of the area is presented in Figure 1 and a site plan of the proposed Project is shown in Figure 2, which has also been marked-up to show the Point of Reception (POR) locations.

2. Noise Assessment Criteria

The City of Ottawa requirements for environmental noise impact assessments are outlined in the Environmental Noise Control Guidelines (ENCG [1]), which in turn reference the Environmental Noise Guideline, NPC-300 [2], prepared by the Ontario Ministry of the Environment, Conservation and Parks (MECP). The Project is located in a Class 1 area, which is defined as an area with an acoustical environment typical of a major population centre.

The sections below describe the applicable noise assessment criteria for surface transportation noise sources and stationary noise sources.

2.1. Surface Transportation Noise Assessment Criteria

Sound level limits values outlined in ENCG for road traffic noise impacting on noise-sensitive areas applicable to the Project are summarized in Table 1. Furthermore, based on the plane-of-window calculations for indoor spaces, upgraded building components, ventilation systems and



warning clauses may be required. The ENCG building component and ventilation requirements for road noise are shown in Tables 2 and 3, respectively.

Table 1: Sound Level Limits for Noise-Sensitive Areas

Type of Point of Reception	Time Period	Sound Level Limit for Road Traffic Noise L_{eq} [dBA]
Outdoor Living Area	Daytime (07:00 to 23:00)	55
Living/dining, den areas of residences (indoor)	Daytime (07:00 to 23:00)	45
	Nighttime (23:00 to 07:00)	45
Sleeping quarters of residences (indoor)	Daytime (07:00 to 23:00)	45
	Nighttime (23:00 to 07:00)	40

Table 2: ENCG Building Component Requirements (Road Noise)

Assessment Location	Sound Level (time as noted)	Building Component Requirements
Plane of Living Room Window and/or Bedroom Window	Daytime $L_{EQ-16HR}$ Less than or equal to 65 dBA	Building compliant with the Ontario Building Code
	Daytime $L_{EQ-16HR}$ Greater than 65 dBA	Building components (walls, windows, etc.) must be designed to achieve indoor sound level criteria
Plane of Living Room Window and/or Bedroom Window	Night-time L_{EQ-8HR} Less than or equal to 60 dBA	Building compliant with the Ontario Building Code
	Night-time L_{EQ-8HR} Greater than 60 dBA	Building components (walls, windows, etc.) must be designed to achieve indoor sound level criteria

(Reference: MECP NPC-300, Section C7.1.3 – Indoor Living Areas: Building Components)

Table 3: ENCG Ventilation and Warning Clause Requirements (Road noise)

Assessment Location	Sound Level (time as noted)	Ventilation Requirement	Warning Clause Requirement
Plane of Living Room Window and/or Bedroom Window	Daytime $L_{EQ-16HR}$ Less than or equal to 55 dBA	None required	Not required
	Daytime $L_{EQ-16HR}$ Greater than 55 dBA to less than or equal to 65 dBA	Forced air heating with provision for central air conditioning	Required Type C
	Daytime $L_{EQ-16HR}$ Greater than 65 dBA	Central air conditioning	Required Type D
Plane of Living Room Window and/or Bedroom Window	Night-time L_{EQ-8HR} Greater than 50 dBA to less than or equal to 60 dBA	Forced air heating with provision for central air conditioning	Required Type C
	Night-time L_{EQ-8HR} Greater than 60 dBA	Central air conditioning	Required Type D

(Reference: MECP NPC-300, Section C7.1.2 – Plane of a Window: Ventilation Requirements)



2.2. Stationary Source Noise Assessment Criteria

Stationary sources of noise include all sources of sound and vibration that exist or operate on nearby premises, excluding construction noise sources. The noise level criterion for noise from stationary sources in a given time period is the higher value between (1) the time period exclusion limit value prescribed by the MECP, and (2) the corresponding minimum hourly background/ambient sound level ($L_{eq,1hr}$) due to traffic during the time period. Exclusion limit values outlined in the ENCG for new noise-sensitive land uses in proximity to existing stationary noise sources have been summarized in Table 4 for Class 1 areas.

Table 4: ENCG Exclusion Limit Values for Class 1 Areas (New Noise-Sensitive Land Uses in Proximity to Existing Stationary Sources)

Type of Point of Reception	Time Period (Description)	Exclusion Limit - $L_{eq,1hr}$ [dBA]
Outdoor Living Area (OLA)	07:00 to 23:00 (Daytime)	50
Plane of Window (Living Quarters)	07:00 to 23:00 (Daytime)	50
Plane of Window (Sleeping Quarters)	23:00 to 07:00 (Night-time)	45

The exclusion limits outlined in Table 4 apply to both neighbouring “off-site” stationary noise sources which may impact the Project, as well as “on-site” stationary noise sources associated with the Project which may impact neighbouring noise sensitive land uses (in this case, the neighbouring residences).

3. Surface Transportation Noise

3.1. Surface Transportation Noise – Road Noise Levels

The surface transportation corridors impacting on the Project are Bank Street and Fifth Avenue, which are respectively classified as “Arterial” and “Collector” roadways as per the City of Ottawa Transportation Master Plan (TMP) [3]. Bank Street is located within 100 m of the Project’s limits, while Fifth Avenue is located approximately 107 m of the Project’s limits; while located over 100 m away, Fifth Avenue was nonetheless included as part of this NIS in order to ensure a conservative assessment. Other major transportation routes in the area are beyond the distance limits required for assessment, per the ENCG.

The “ultimate” road and traffic data information, including the Annual Average Daily Traffic (AADT), for Bank Street and Fifth Avenue was obtained from the ENCG based on their roadway classifications and are summarized in Table 5. Of note, the “4-lane Urban Arterial (Undivided)” AADT data was used for Bank Street, despite the fact that only three lanes are expected to be actively used during worst-case times due to parking limits. As such, the actual noise impact from Bank Street is expected to be lower than what is predicted in this NIS. These parameters were used to predict the traffic noise levels following the prediction method outlined in the Ontario Road Noise Analysis Method for Environment and Transportation (ORNAMENT) [4], developed by the



MECP. Software developed by the MECP to perform ORNAMENT calculations, STAMSON Version 5.04, was used to predict the noise levels. Calculation results from STAMSON are available in Appendix A.

Table 5: ENCG Traffic and Road Parameters for STAMSON Modelling

Road	Implied Roadway Class	Speed Limit [km/h]	Ultimate AADT [Vehicles/day]	Day/Night Split [%]	Medium Trucks [%]	Heavy Trucks [%]
Bank Street	4-Lane Urban Arterial - Undivided (4-UAU)	40	30,000	92/8	7	5
Fifth Avenue	2-Lane Collector (2-UMCU)	40	8,000	92/8	7	5

Separation distances were taken from the centreline of the road segment to the POR.

3.2. Surface Transportation Noise - Points of Reception

PORs were chosen to represent worst-case scenarios at the Plane of Window (PoW) of occupied spaces and Outdoor Living Areas (OLA). Only one PoW POR was considered, which represents the worst-case location due to exposure to both road segments. Similarly, one OLA POR was considered for the backyard, in a location consistent with the ENCG's definition of 'Outdoor Living Area'. Table 6 contains a description of the location of the PORs, and their locations are shown in Figure 2. An aerial photo with receptor locations and distance measurements between source and receivers is given in Figures 3 and 4.

Table 6: Points of Reception (POR) Locations

Point of Reception (POR)	Height (ref. Grade) [m]	Storey	Building Facade	Notes/Comments
POR 1	9.7	4 th	Northeast	PoW: Worst-case location - typical bedroom.
OLA 1	1.5	Grade	East	OLA: Backyard

Of note, noise from Bank Street is partially obstructed by several low-rise buildings northeast of the Project. These are mostly 2-storey commercial buildings, which are modelled by SACL as a noise barrier in STAMSON for POR 1, starting at the corner of the 866 Bank Street building and continuing north along Bank Street. Furthermore, a 12-storey building south of the project, located at 920 Bank Street, also partially obstructs noise from Bank Street, which was modelled by SACL by limiting the exposure angle to +77 degrees. Fifth Avenue is also obstructed by several low-rise building north of the Project. These are mostly 2-storey residential and commercial buildings, which are modelled by SACL as a noise barrier in STAMSON for POR 1, running along Fifth Avenue. See Figure 3 for details.



For OLA 1, located at grade, the low-rise buildings to the north and east of the Project, as well as the Project itself, obstruct noise from both Bank Street and Fifth Avenue. These were modelled by SACL as noise barriers in STAMSON for OLA 1. See Figure 4 for details.

Bank Street was modelled with sound-reflective ground surfaces. The ground surface between Fifth Avenue and the Project includes many backyards and dwellings, and is therefore modelled as sound-absorptive in our analysis.

3.3. Surface Transportation Noise - Calculations

STAMSON transportation noise calculations can be found in Appendix A. Table 7 shows the daytime and night-time noise level prediction results at each POR, along with a comparison to the daytime criteria for noise control measures outlined in Section 2.

Table 7: Daytime Calculated Noise Levels Due to Surface Transportation Noise

Point of Reception (POR)	Transportation Noise Level Calculation [dBA]		Building Component Requirement	Minimum Ventilation Requirement	Noise Mitigation Measures	Warning Clause
	Daytime	Night-time				
POR 1	64	57	OBC-compliant	Forced air heating with provision for central air conditioning	N/A	Type C
OLA 1	49	N/A	N/A	N/A	None	None

The criteria limit for noise control measures are exceeded at the POR due to noise from Bank Street and Fifth Avenue. Therefore, noise control measures are required for all units associated with the proposed development.

4. Noise Control – Surface Transportation Noise

4.1. Indoor Noise Control Measures

4.1.1. Ventilation Requirements

The results shown in Table 7 indicate that the calculated surface transportation noise levels exceed the applicable sound level limits at the plane of windows for the Project, which represents occupied living areas (bedroom) on the north and east facades (worst-case location, due to exposure to both Bank Street and Fifth Avenue). Therefore, as per Table 3, forced air heating with provisions for central air conditioning must be provided to all units associated with the Project.

4.1.2. Building Component Requirements

As indicated in Table 7, the sound levels at the north and east façades (worst-case locations) do not exceed 65 dBA during the daytime, and 60 dBA during the night-time, due to road traffic.



Therefore, as indicated in Table 2, the building envelope components (exterior walls and windows) of all façades must be designed to meet Ontario Building Code specifications.

4.2. Outdoor Noise Control Measures

The calculated outdoor noise level at the backyard OLA is 49 dBA, which is below the City of Ottawa daytime limit of 55 dBA. Therefore, per the ENCG, noise control measures are not required for the backyard outdoor living area.

4.3. Warning Clause Requirements

Per the ENCG, warning clause Type 'C' must be included in agreements of offers of purchase and sale, as well as any lease/rental agreements associated with the Project. Sample wording from the ENCG have been adapted below for the Project.

WARNING CLAUSE TYPE 'C':

"This residential development has been designed with the provision for adding central air conditioning at the owner's discretion. Installation of central air conditioning by the owner 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, Conservation and Parks."

5. Neighbouring Stationary Source Noise

As noted during a site visit undertaken on December 12th 2019, there are no significant stationary noise sources neighbouring the Project that were identified to cause noise levels in excess of MECP and City of Ottawa requirements.

6. The Project as Stationary Noise Source

The Project may also be considered a Stationary Source for adjacent land uses. Mechanical equipment selections have not yet been made, and therefore, a detailed analysis is not possible at this time. The final design will be required to comply with ENCG sound level limits from a Stationary Source at all nearby noise-sensitive land uses.

7. Concluding Comments

With the incorporation of the noise control measures and warning clauses as presented in Section 4 of this report, the impact of transportation noise on the proposed residential development will meet ENCG requirements. In summary, these noise control measures include:

- forced air heating with provisions for central air conditioning provided to all units



The proposed residential development, to be located at 27 Monk Street in Ottawa, should therefore be approved from a noise aspect.

----- End -----



References

1. City of Ottawa Environmental Noise Control Guidelines (ENCG), approved by Ottawa City Council in January 2016.
2. Ministry of the Environment, Conservation and Parks (MECP) Publication NPC-300: Stationary and Transportation Sources - Approval and Planning, published in October 2013.
3. City of Ottawa Transportation Master Plan (TMP), published by the City of Ottawa on November 2013.
4. Ontario Road Noise Analysis Method for Environment and Transportation (ORNAMENT), Technical document published by the MOECC in October 1989.

Figures



Figure 1. Site Aerial

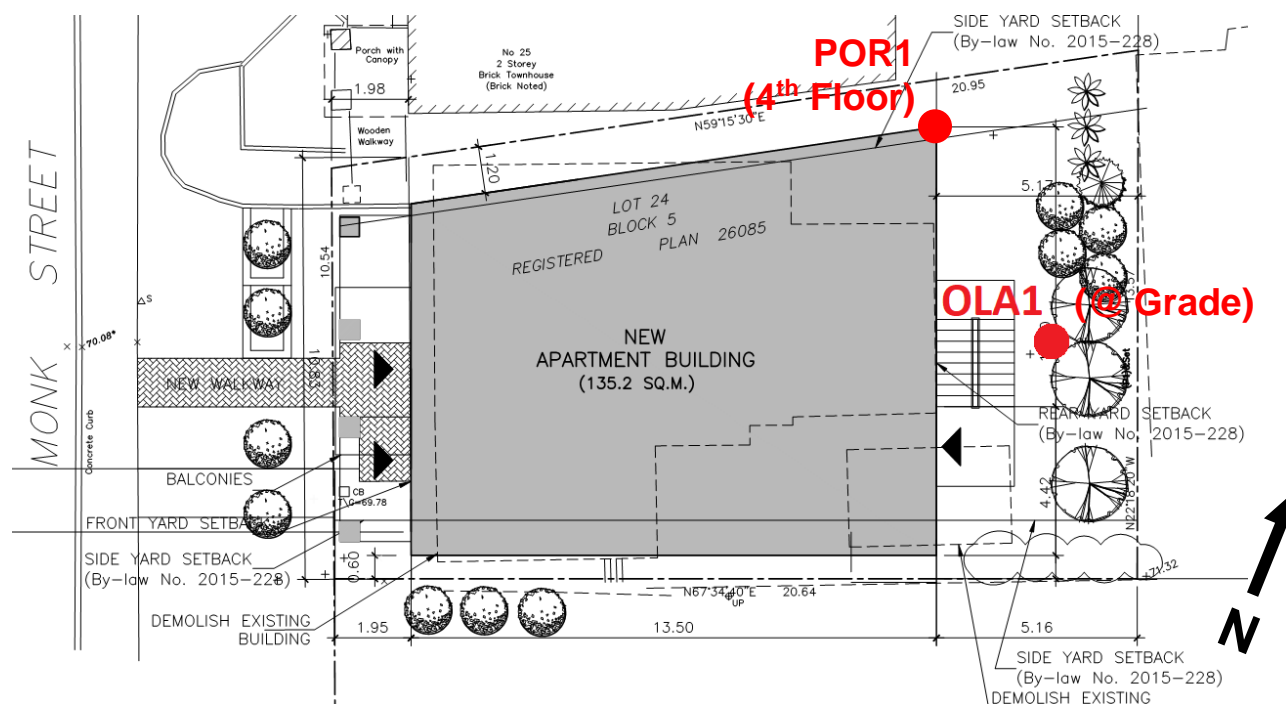


Figure 2. Site Plan with POR Locations

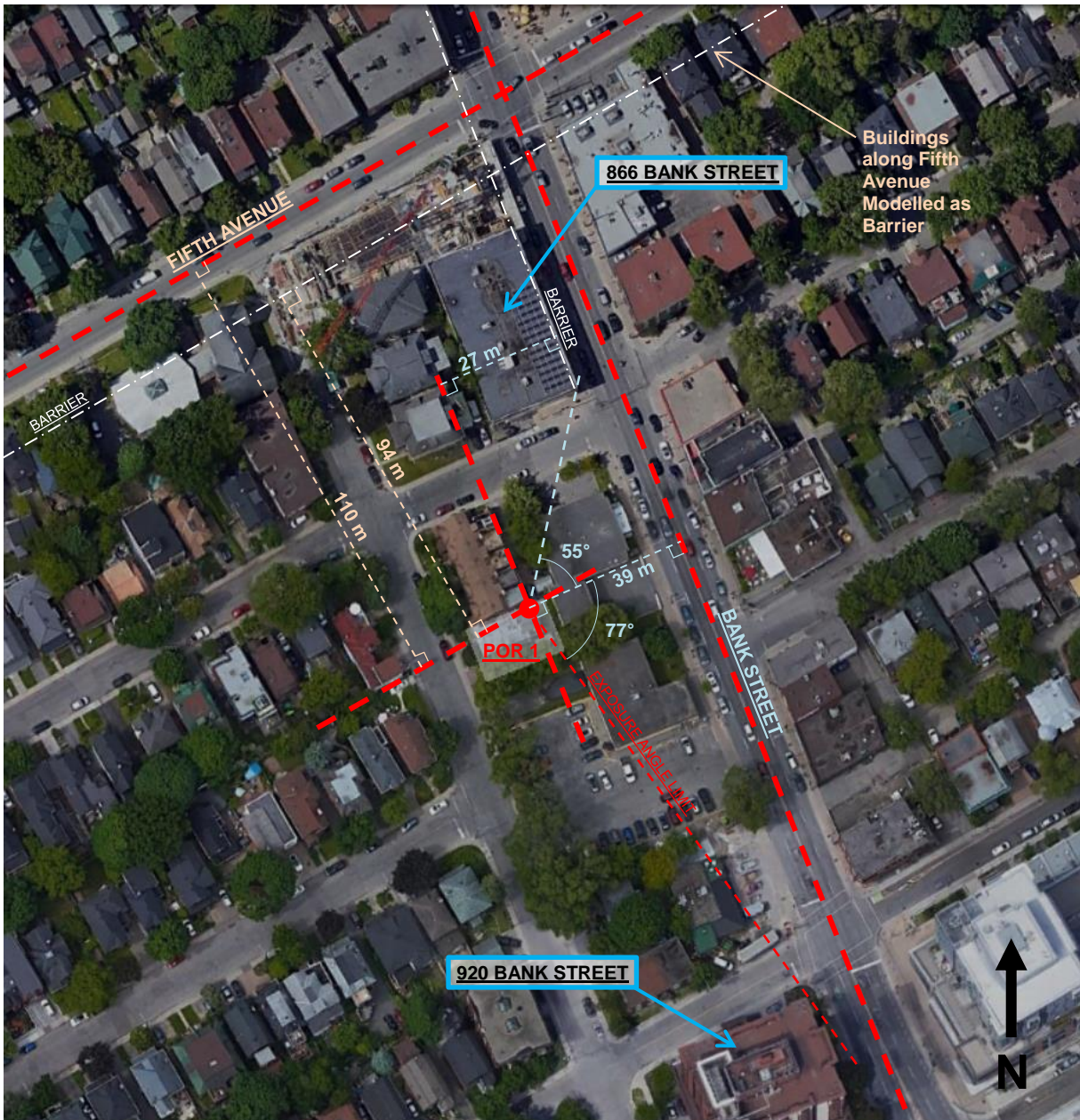


Figure 3. POR 1 Location, with Distances from Source to Receptors.

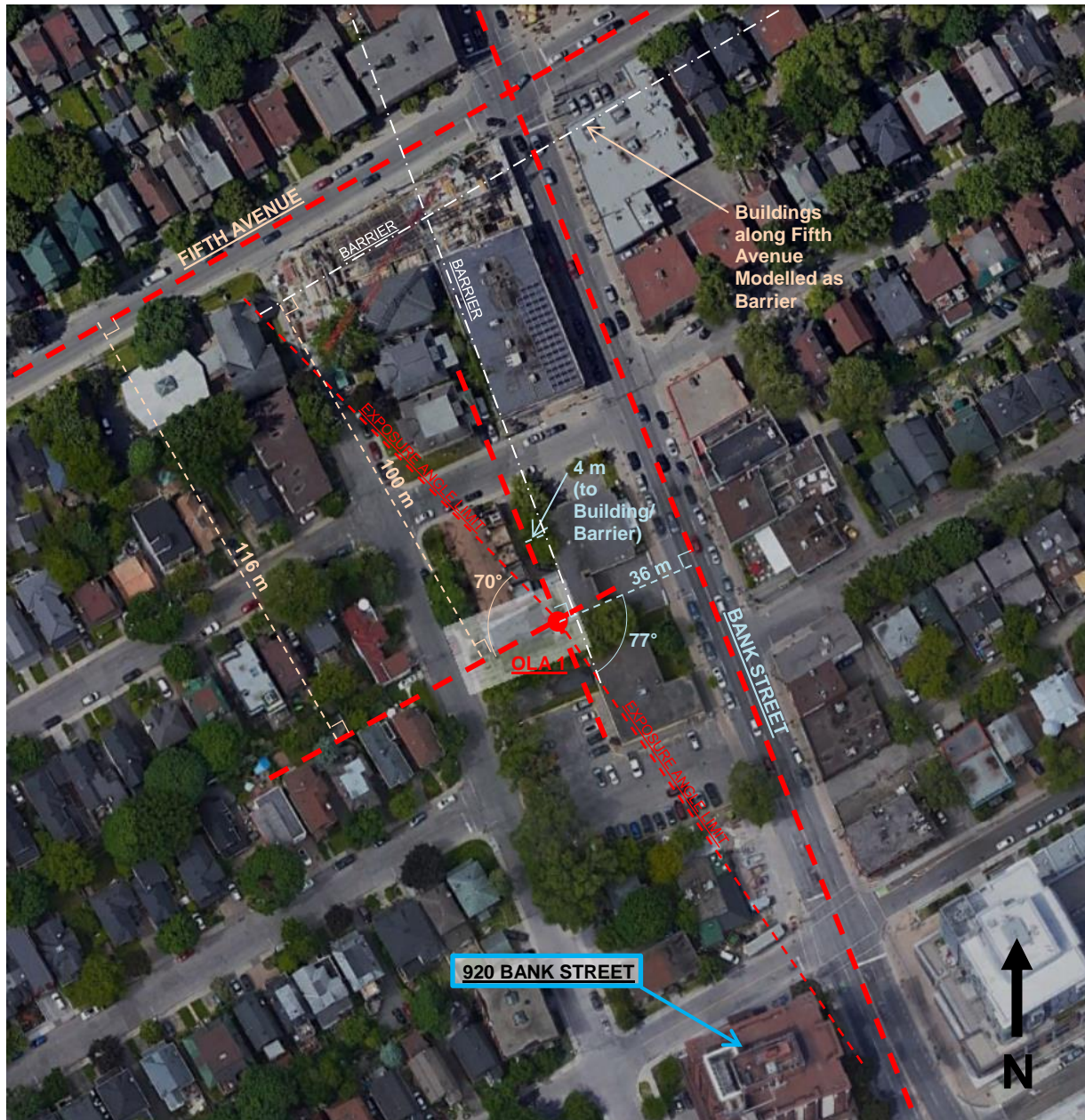


Figure 4. OLA 1 Location, with Distances from Source to Receptors.



Appendices



APPENDIX A: Transportation Noise Results from STAMSON

STAMSON 5.0 SUMMARY REPORT Date: 16-12-2019 09:51:40
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: monkpor.te Time Period: Day/Night 16/8 hours
Description: Noise level prediction at POR1.

Road data, segment # 1: Bank Street (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 : 40 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 : 0.00
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: Bank Street (day/night)

Angle1 Angle2 : -90.00 deg 77.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 39.00 / 39.00 m
Receiver height : 9.70 / 9.70 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : -55.00 deg
Barrier height : 6.00 m
Barrier receiver distance : 27.00 / 27.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

Road data, segment # 2: Fifth Avenue (day/night)

Car traffic volume : 6477/563 veh/TimePeriod *



Medium truck volume : 515/45 veh/TimePeriod *
 Heavy truck volume : 368/32 veh/TimePeriod *
 Posted speed limit : 40 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): 8000
 Percentage of Annual Growth : 0.00
 Number of Years of Growth : 0.00
 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 # 2: Fifth Avenue (day/night)

 Angle1 Angle2 : -90.00 deg 90.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 1 (Absorptive ground surface)
 Receiver source distance : 110.00 / 110.00 m
 Receiver height : 9.70 / 9.70 m
 Topography : 2 (Flat/gentle slope; with barrier)
 Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
 Barrier height : 6.00 m
 Barrier receiver distance : 94.00 / 94.00 m
 Source elevation : 0.00 m
 Receiver elevation : 0.00 m
 Barrier elevation : 0.00 m
 Reference angle : 0.00

Result summary (day)

	! source !	Road !	Total
	! height !	Leq !	Leq
	! (m) !	(dBA) !	(dBA)
1.Bank Street	! 1.50 !	64.41 !	64.41
2.Fifth Avenue	! 1.50 !	44.03 !	44.03
Total			64.45 dBA

Result summary (night)



	!	source	!	Road	!	Total
	!	height	!	Leq	!	Leq
	!	(m)	!	(dBA)	!	(dBA)
1.Bank Street	!	1.50	!	56.81	!	56.81
2.Fifth Avenue	!	1.50	!	36.44	!	36.44
Total						56.85 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 64.45
 (NIGHT): 56.85



STAMSON 5.0 SUMMARY REPORT Date: 16-12-2019 09:54:45
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: monkola.te Time Period: Day/Night 16/8 hours
Description: Noise level prediction at OLA1.

Road data, segment # 1: Bank Street (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 : 40 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 : 0.00
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: Bank Street (day/night)

Angle1 Angle2 : -90.00 deg 77.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 36.00 / 36.00 m
Receiver height : 1.50 / 1.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 77.00 deg
Barrier height : 6.00 m
Barrier receiver distance : 4.00 / 4.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

Road data, segment # 2: Fifth Avenue (day/night)

Car traffic volume : 6477/563 veh/TimePeriod *
Medium truck volume : 515/45 veh/TimePeriod *
Heavy truck volume : 368/32 veh/TimePeriod *



Posted speed limit : 40 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): 8000
 Percentage of Annual Growth : 0.00
 Number of Years of Growth : 0.00
 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 # 2: Fifth Avenue (day/night)

 Angle1 Angle2 : -20.00 deg 90.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 1 (Absorptive ground surface)
 Receiver source distance : 116.00 / 116.00 m
 Receiver height : 1.50 / 1.50 m
 Topography : 2 (Flat/gentle slope; with barrier)
 Barrier angle1 : -20.00 deg Angle2 : 90.00 deg
 Barrier height : 6.00 m
 Barrier receiver distance : 100.00 / 100.00 m
 Source elevation : 0.00 m
 Receiver elevation : 0.00 m
 Barrier elevation : 0.00 m
 Reference angle : 0.00

Result summary (day)

	! source !	Road !	Total
	! height !	Leq !	Leq
	! (m) !	(dBA) !	(dBA)
1.Bank Street	! 1.50 !	48.30 !	48.30
2.Fifth Avenue	! 1.50 !	36.65 !	36.65
Total			48.59 dBA

Result summary (night)

! source ! Road ! Total



	!	height	!	Leq	!	Leq
	!	(m)	!	(dBA)	!	(dBA)
1.Bank Street	!	1.50	!	40.70	!	40.70
2.Fifth Avenue	!	1.50	!	29.06	!	29.06
	!		!		!	
		Total				40.99 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 48.59
 (NIGHT): 40.99