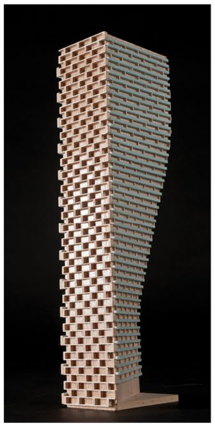
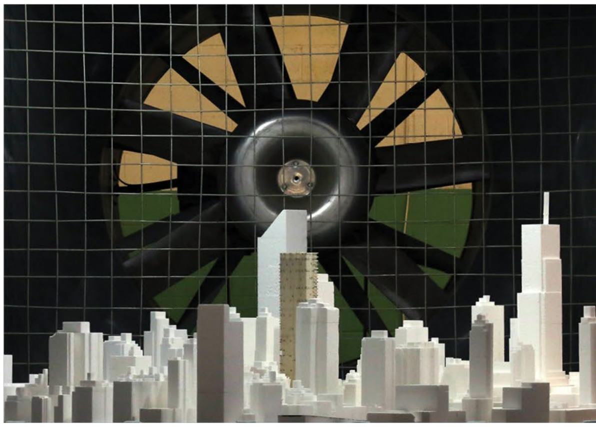
TRANSPORTATION NOISE ASSESSMENT

640 Compass Street
Ottawa, Ontario

Report: 22-305-Transportation Noise





November 7, 2024

PREPARED FOR
Richcraft
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EXECUTIVE SUMMARY

This report describes a transportation noise assessment performed for a proposed development located at 640 Compass Street in Ottawa, Ontario (hereinafter referred to as the "subject site", "study site", or "proposed development").

The study site is bordered by Brian Coburn Boulevard to the north, Compass Street to the west, an empty lot to the east, and low-rise buildings to the south. The proposed development comprises 6 blocks of stacked dwelling units, a utility building, an outdoor amenity area, and surface parking. The major sources of noise are Brian Coburn Boulevard and a Future Cumberland Transitway (Bus Rapid Transit).

The results of the current analysis indicate that noise levels will range between 43 and 71 dBA during the daytime period (07:00-23:00) and between 35 and 63 dBA during the nighttime period (23:00-07:00) at POW receptors. The highest noise level (71 dBA) occurs at the north façade of Blocks 5 and 6 which are nearest to the transportation noise sources. As the noise levels exceed 65 dBA ENCG criterion, upgraded building components as described in Section 5.2 will be required.

The results of the analysis indicate that Blocks 2, 5, and 6 will require central air conditioning or a similar mechanical system, while Blocks 1, 3, and 4 require forced air heating with provisions for air conditioning. Air conditioning would allow windows to be closed thus providing a quiet and comfortable indoor environment. Richcraft plans to provide air conditioning for all units. Therefore, a Type D warning clause will be required on all Lease, Purchase and Sale Agreements, as summarized in Section 6.

There are no outdoor living areas (OLA) associated with this development. Balconies of less than 4 m in depth are not considered as point of assessment for a noise study. The landscaped area south of the utility building labeled amenity area, is also not an OLA because it is not immediately accessible from the buildings and will function more as a parkette which is not considered OLA as per the ENCG.

No major pieces of mechanical equipment are expected to be associated with the development, thus impacts of stationary noise sources on the surroundings and the development itself will be negligible.

The surroundings comprise existing and future low-rise residential buildings and as such no existing sources of noise were identified around the site.

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Richcraft to undertake a transportation noise assessment for the proposed residential development located at 640 Compass Street in Ottawa, Ontario, in support of a Site Plan (SPA) application. This report summarizes the methodology, results, and recommendations related to the assessment of exterior noise levels generated by local transportation.

This assessment is based on theoretical noise calculation methods conforming to the Ministry of the Environment, Conservation and Parks (MECP) Noise Control Guidelines (NPC-300) [1], and the City of Ottawa's Environmental Noise Control Guidelines (ENCG). Noise calculations were based on architectural drawings prepared by M. David Blakeley Architects Inc. in October 2024, with future traffic volumes corresponding to the ENCG Appendix B.

2. TERMS OF REFERENCE

The focus of this transportation noise study is a proposed stacked terrace flat development located at 640 Compass Street in Ottawa, Ontario. The proposed development comprises 6 blocks of stacked dwelling units, at-grade surface parking, a utility building, and an outdoor amenity area south of the utility building.

There are no outdoor living areas (OLA) associated with this development. Balconies of less than 4 m in depth are not considered as point of assessment for a noise study. The landscaped area south of the utility building labeled amenity area, is also not an OLA because it is not immediately accessible from the buildings and will function more as a parkette which is not considered OLA as per the ENCG. The primary points of reception in this report are the building façades (plane of window-POW).

The primary sources of noise are Brian Coburn Avenue which is classified as an arterial roadway, and the future Cumberland Transitway (Bus rapid transit).

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[1] Ontario Ministry of the Environment and Climate Change – Environmental Noise Guidelines, Publication NPC-300, Queens Printer for Ontario, Toronto, 2013

3. OBJECTIVES

The principal objectives of this study are to (i) calculate the future noise and vibration levels on the study buildings produced by local transportation, and (ii) determine whether exterior noise levels exceed the allowable limits specified by the ENCG as outlined in Section 4.2 of this report.

4. METHODOLOGY

4.1 Background

Noise can be defined as any obtrusive sound. It is created at a source, transmitted through a medium, such as air, and intercepted by a receiver. Noise may be characterized in terms of the power of the source or the sound pressure at a specific distance. While the power of a source is characteristic of that particular source, the sound pressure depends on the location of the receiver and the path that the noise takes to reach the receiver. Measurement of noise is based on the decibel unit, dBA, which is a logarithmic ratio referenced to a standard noise level (2×10^{-5} Pascals). The 'A' suffix refers to a weighting scale, which better represents how the noise is perceived by the human ear. With this scale, a doubling of power results in a 3 dBA increase in measured noise levels and is just perceptible to most people. An increase of 10 dBA is often perceived to be twice as loud.

4.2 Transportation Noise

4.2.1 Criteria for Transportation Traffic Noise

For vehicular traffic, the equivalent sound energy level, L_{eq}, provides a measure of the time-varying noise levels, which is well-correlated with the annoyance of sound. It is defined as the continuous sound level, which has the same energy as a time-varying noise level over a period of time. For roadways, the L_{eq} is commonly calculated on the basis of a 16-hour (L_{eq16}) daytime (07:00-23:00) / 8-hour (L_{eq8}) nighttime (23:00-07:00) split to assess its impact on residential buildings. The ENCG guidelines specify the recommended indoor noise limits, as listed in Table 1.

TABLE 1: INDOOR SOUND LEVEL CRITERIA

Type of Space	Time Period	Road
		L_{eq} (dBA)
General offices, reception areas, retail stores, etc.	07:00 – 23:00	50
Living/dining/den areas of residences, hospitals, schools, nursing/retirement homes, day-care centres, theatres, places of worship, libraries, individual or semi-private offices, conference rooms, etc.	07:00 – 23:00	45
Sleeping quarters of hotels/motels	23:00 – 07:00	45
Sleeping quarters of residences, hospitals, nursing/retirement homes, etc.	23:00 – 07:00	40

Predicted noise levels at the plane of window (POW) dictate the action required to achieve the recommended sound levels. An open window is considered to provide a 10 dBA reduction in noise, while a standard closed window is capable of providing a minimum 20 dBA noise reduction[2]. A closed window due to a ventilation requirement will bring noise levels down to achieve an acceptable indoor environment[3]. Therefore, where noise levels exceed 55 dBA daytime and 50 dBA nighttime, the ventilation for the building should consider the need for having windows and doors closed, which normally triggers the requirement for central air conditioning. Where noise levels exceed 65 dBA daytime and 60 dBA nighttime, building components will require higher levels of sound attenuation[4].

The sound level criterion for OLAs is 55 dBA, which applies during the daytime (07:00 to 23:00). When noise levels exceed 55 dBA but are less than 60 dBA, mitigation should be provided to reduce noise levels where technically and administratively feasible to acceptable levels at or below the criterion. Where noise levels exceed 60 dBA, noise mitigation is required. Mitigation measures include earth berms, noise barriers, or a combination of both for at-grade outdoor areas. Parapet walls, solid glass screens, planters, or a combination of these can be used at the perimeter of OLAs such as amenity terraces as noise barriers.

[2] Burberry, P.B. (2014). Mitchell's Environment and Services. Routledge, Page 125
[3] MECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.8
[4] MECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.1.3

If mitigation measures for OLAs are not provided, prospective purchasers or tenants should be informed of potential noise problems by a warning clause.

4.2.2 Theoretical Transportation Noise Predictions

The impact of transportation noise sources on the development was determined by computer modelling. Transportation noise source modelling is based on the software program *Predictor-Lima* which utilizes the United States Federal Highway Administration's Traffic Noise Model (TNM) to represent the roadway line sources. The TNM analysis model has been recognized by the Ministry of Transportation Ontario (MTO) as the recommended noise model for transportation projects (Environmental Guide for Noise, 2022 by the MTO[5]). The MECP has also adopted the TNM model as per their "Draft Guideline Noise Pollution Control Publications 306 (NPC-306)[6].

The *Predictor-Lima* computer program can represent three-dimensional surfaces and the first reflection of sound waves over a suitable spectrum for human hearing. Calculations were performed for receptors around the study site to determine the noise impact from roadway and railway sources.

Roadway noise calculations were performed by treating each roadway segment as a separate line source of noise, and by using existing building locations as noise barriers. In addition to the traffic volumes summarized in Table 2, theoretical noise predictions were based on the following parameters:

- Topography was assumed to be a flat/gentle slope.
- Noise receptors were strategically placed at 10 locations (10 POW) around the study area (see Figure 2).
- The ground surface was modelled as reflective due to the presence of pavement and concrete in the proximity of the study site.
- The day/night split was taken to be 92%/8% respectively for all roadways.
- Truck traffic on all roadways was taken to comprise 5% heavy trucks and 7% medium trucks.

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[5] Ministry of Transportation, Environmental Guide for Noise, 2022. Retrieved from Environmental Guide for Noise 2022

[6] Ministry of Environment, Conservation and Parks, Ontario, "Methods to determine Sound Levels Due to Road and Rail Traffic", Draft February 12, 2020

4.2.3 Roadway Traffic Volumes

The ENCG dictates that noise calculations consider future sound levels based on a roadway's classification at the mature state of development. Therefore, traffic volumes are based on the roadway classifications outlined in the City of Ottawa's Official Plan (OP) and Transportation Master Plan[7] which provide additional details on future roadway expansions. Average Annual Daily Traffic (AADT) volumes are then based on data in Table B1 of the ENCG for each roadway classification. Table 2 (below) summarizes the AADT values used for each roadway included in this assessment.

TABLE 2: TRANSPORTATION TRAFFIC DATA

Segment	Roadway Traffic Data	Speed Limit (km/h)	Traffic Volumes
Brian Coburn Boulevard	4 Lane Arterial	70	**30,000**
Cumberland Transitway	Bus Rapid Transit	80	**488 / 42***

*Day / Night Volumes based on the Biran Coburn Expansion and Cumberland Transitway Environmental Assessment

4.3 Indoor Noise Calculations

The difference between outdoor and indoor noise levels is the noise attenuation provided by the building envelope. According to common industry practice, complete walls and individual wall elements are rated according to the Sound Transmission Class (STC). The STC ratings of common residential walls built in conformance with the Ontario Building Code (2012) typically exceed STC 35, depending on exterior cladding, thickness and interior finish details. For example, brick veneer walls can achieve STC 50 or more. Standard commercially sided exterior metal stud walls have around STC 45. Standard good quality double-glazed non-operable windows can have STC ratings ranging from 25 to 40, depending on the window manufacturer, pane thickness and inter-pane spacing. As previously mentioned, the windows are the known weak point in a partition.

[7] City of Ottawa Transportation Master Plan, November 2013

As per Section 4.2.1, when daytime noise levels from road sources at the plane of the window exceed 65 dBA, calculations must be performed to evaluate the sound transmission quality of the building components to ensure acceptable indoor noise levels. The calculation procedure[8] considers:

- Window type and total area as a percentage of total room floor area
- Exterior wall type and total area as a percentage of the total room floor area
- Acoustic absorption characteristics of the room
- Outdoor noise source type and approach geometry
- Indoor sound level criteria, which varies according to the intended use of a space

Based on published research[9], exterior walls possess specific sound attenuation characteristics that are used as a basis for calculating the required STC ratings of windows in the same partition. Indoor nose calculations were performed based on the NRC Building Practice Note 56 and elevation and floor plans provided by Richcraft, see Appendix A.

[8] Building Practice Note: Controlling Sound Transmission into Buildings by J.D. Quirt, National Research Council of Canada, September 1985

[9] CMHC, Road & Rail Noise: Effects on Housing

5. TRANSPORTATION NOISE RESULTS

5.1 Transportation Noise Levels

The results of the transportation noise calculations are summarized in Table 3.

TABLE 3: EXTERIOR NOISE LEVELS DUE TO TRANSPORTATION SOURCES

Receptor Number / Type	Receptor Location	Receptor Height Above Grade (m)	Roadway Noise Levels (dBA)	
			Day	Night
R1	POW - Block 2 - North Facade	1.5	68	60
		4.5	68	61
R2	POW - Block 5 - West Facade	1.5	66	59
		4.5	67	59
R3	POW - Block 5 - North Facade	1.5	70	63
		4.5	71	63
R4	POW - Block 6 - East Facade	1.5	66	59
		4.5	66	59
R5	POW - Block 4 - North Facade	1.5	57	50
		4.5	59	51
R6	POW - Block 4 - West Facade	1.5	43	35
		4.5	45	37
R7	POW – Block 2 – West Facade	1.5	66	59
		4.5	67	60
R8	POW - Block 1 - East Facade	1.5	49	42
		4.5	51	44
R9	POW - Block 1 - West Facade	1.5	61	54
		4.5	63	55
R10	POW - Block 4 - East Facade	1.5	57	49
		4.5	60	52

The results of the current analysis indicate that noise levels will range between 43 and 71 dBA during the daytime period (07:00-23:00) and between 35 and 63 dBA during the nighttime period (23:00-07:00) at POW receptors. The highest noise level (71 dBA) occurs at the north façade of Blocks 5 and 6 which are nearest to the transportation noise sources.

5.2 Noise Control Measures

The noise levels predicted due to roadway traffic exceed the criteria listed in Section 4.2 for building components. As discussed in Section 4.3, the anticipated STC requirements for windows have been estimated based on the NRC Building Practice Noite #56 The STC requirements for the windows are summarized below for various units within the development (see Figure 3):

- **Bedroom and Living Room Windows**

(i) Windows facing north on Blocks 5 and 6 will require a minimum STC of 35.

(ii) Windows facing east and west on Blocks 5 and 6; and north and west on Block 2 will require a minimum STC of 32.

(iii) All other bedroom windows are to satisfy Ontario Building Code (OBC 2012) requirements.

- **Exterior Walls**

(i) Exterior wall components on the north, east, and west façades of Blocks 5 and 6, and north and west façades of Block 2 will require a minimum STC of 40, which will be achieved with brick cladding or an acoustical equivalent according to NRC test data[10] or vinal sided walls with 13 mm OSB sheathing, 38 x 140 mm wood studs, batt insulation in the full cavity and 16 mm type X gypsum wall board.

The STC requirements apply to windows, doors. Exterior wall components on these façades are recommended to have a minimum STC of 40, where a stud wall system is used. A review of window supplier literature indicates that the specified STC ratings can be achieved by a variety of window systems having a combination of glass thickness and inter-pane spacing. Several manufacturers and various combinations of window components will offer the necessary sound attenuation rating. It is the responsibility of the manufacturer to ensure that the specified window achieves the required STC. This

[10] J.S. Bradley and J.A. Birta. Laboratory Measurements of the Sound Insulation of Building Façade Elements, National Research Council October 2000.

can only be assured by using window configurations that have been certified by laboratory testing. The requirements for STC ratings assume that the remaining components of the building are constructed and installed according to the minimum standards of the Ontario Building Code. The specified STC requirements also apply to swinging and/or sliding patio doors.

The results of the analysis indicate that Blocks 2, 5, and 6 will require central air conditioning or a similar mechanical system, while Blocks 1, 3, and 4 require forced air heating with provisions for air conditioning. Air conditioning would allow windows to be closed thus providing a quiet and comfortable indoor environment. Richcraft plans to provide air conditioning for all units. Therefore, a Type D warning clause will be required on all Lease, Purchase and Sale Agreements, as summarized in Section 6.

6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current analysis indicate that noise levels will range between 43 and 71 dBA during the daytime period (07:00-23:00) and between 35 and 63 dBA during the nighttime period (23:00-07:00) at POW receptors. The highest noise level (71 dBA) occurs at the north façade of Blocks 5 and 6 which are nearest to the transportation noise sources. As the noise levels exceed 65 dBA ENCG criterion, upgraded building components as described in Section 5.2 will be required.

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Type D

> *"This dwelling unit 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 Municipality and the Ministry of the Environment."*

There are no outdoor living areas (OLA) associated with this development. Balconies of less than 4 m in depth are not considered as point of assessment for a noise study. The landscaped area south of the utility building labeled amenity area, is also not an OLA because it is not immediately accessible from the buildings and will function more as a parkette which is not considered OLA as per the ENCG.

No major pieces of mechanical equipment are expected to be associated with the development, thus impacts of stationary noise sources on the surroundings and the development itself will be negligible.

The surroundings comprise existing and future low-rise residential buildings and as such no existing sources of noise were identified around the site.

This concludes our transportation noise assessment and report. If you have any questions or wish to discuss our findings, please advise us. In the interim, we thank you for the opportunity to be of service.

Sincerely,

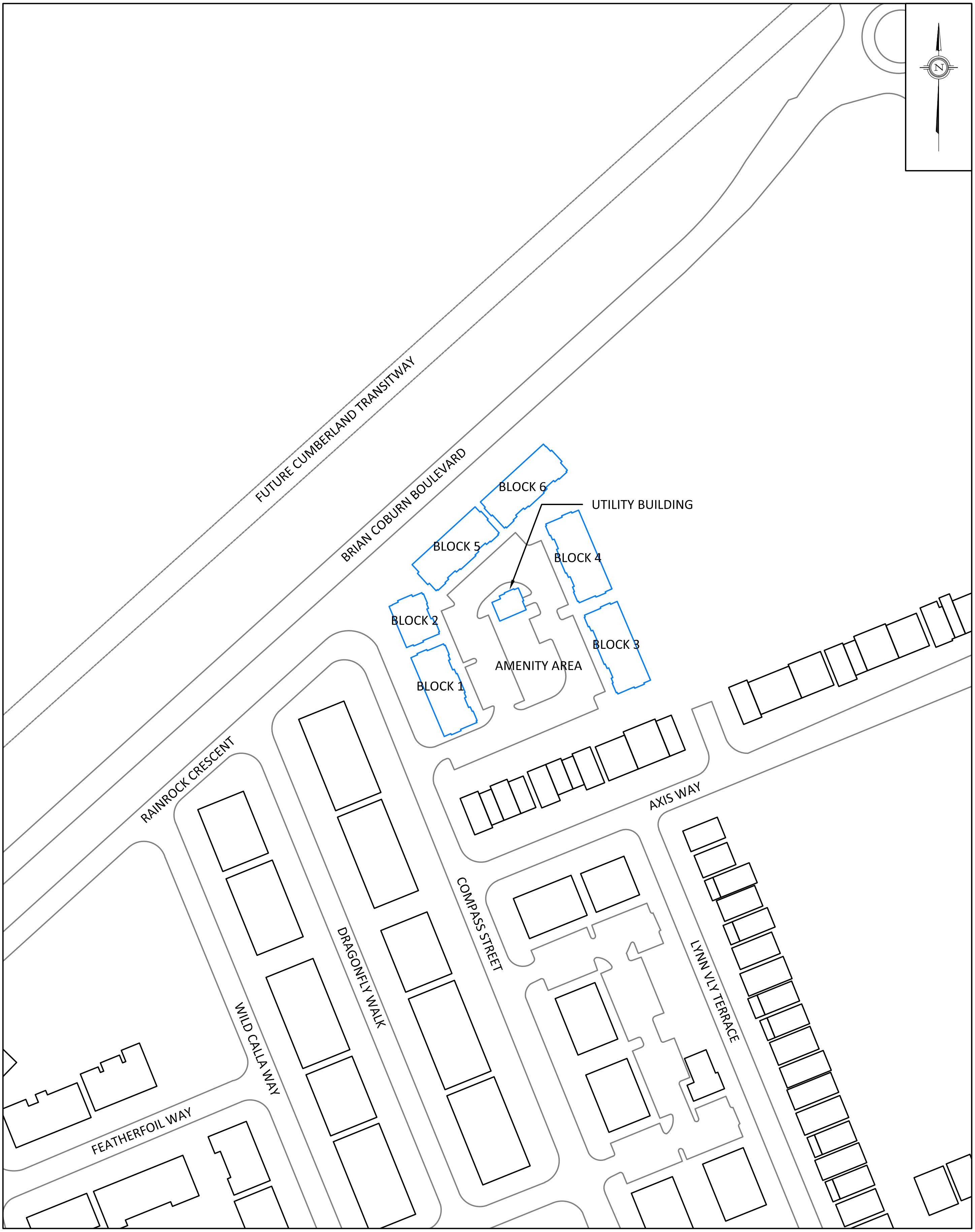
Gradient Wind Engineering Inc.

LICENSED PROFESSIONAL ENGINEER
J. R. FOSTER
100155655
Nov 7, 2024
PROVINCE OF ONTARIO

Efser Kara, MSc, LEED GA
Acoustic Scientist

Joshua Foster, P.Eng.
Lead Engineer

Gradient Wind File 22-305 -Transportation Noise



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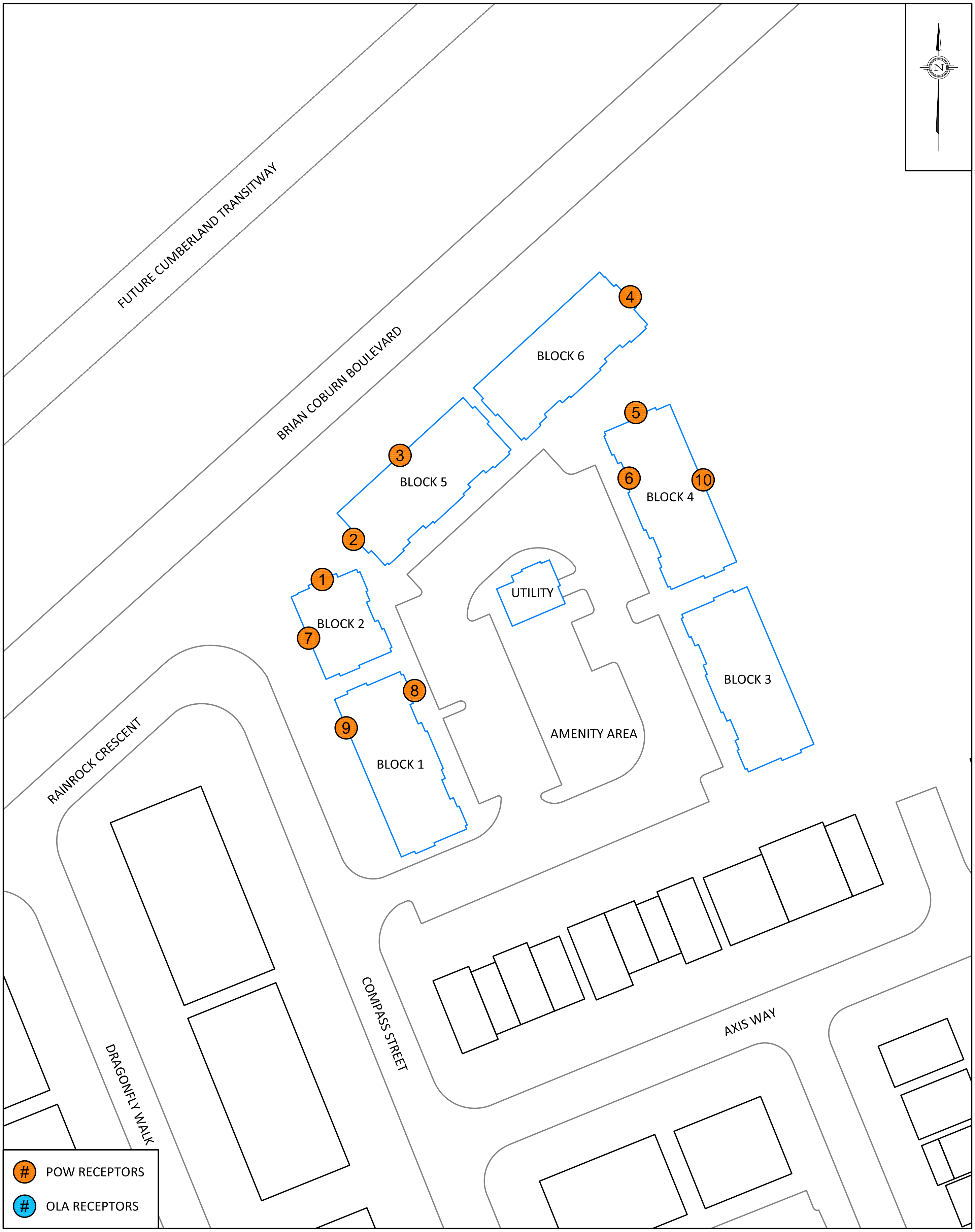
PROJECT	640 COMPASS STREET, OTTAWA TRANSPORTATION NOISE ASSESSMENT
SCALE	1:2000 (APPROX.)
DRAWING NO.	22-305-1
DATE	NOVEMBER 5, 2024
DRAWN BY	T.K.
DESCRIPTION	FIGURE 1: PROPERTY LINE AND SURROUNDING CONTEXT



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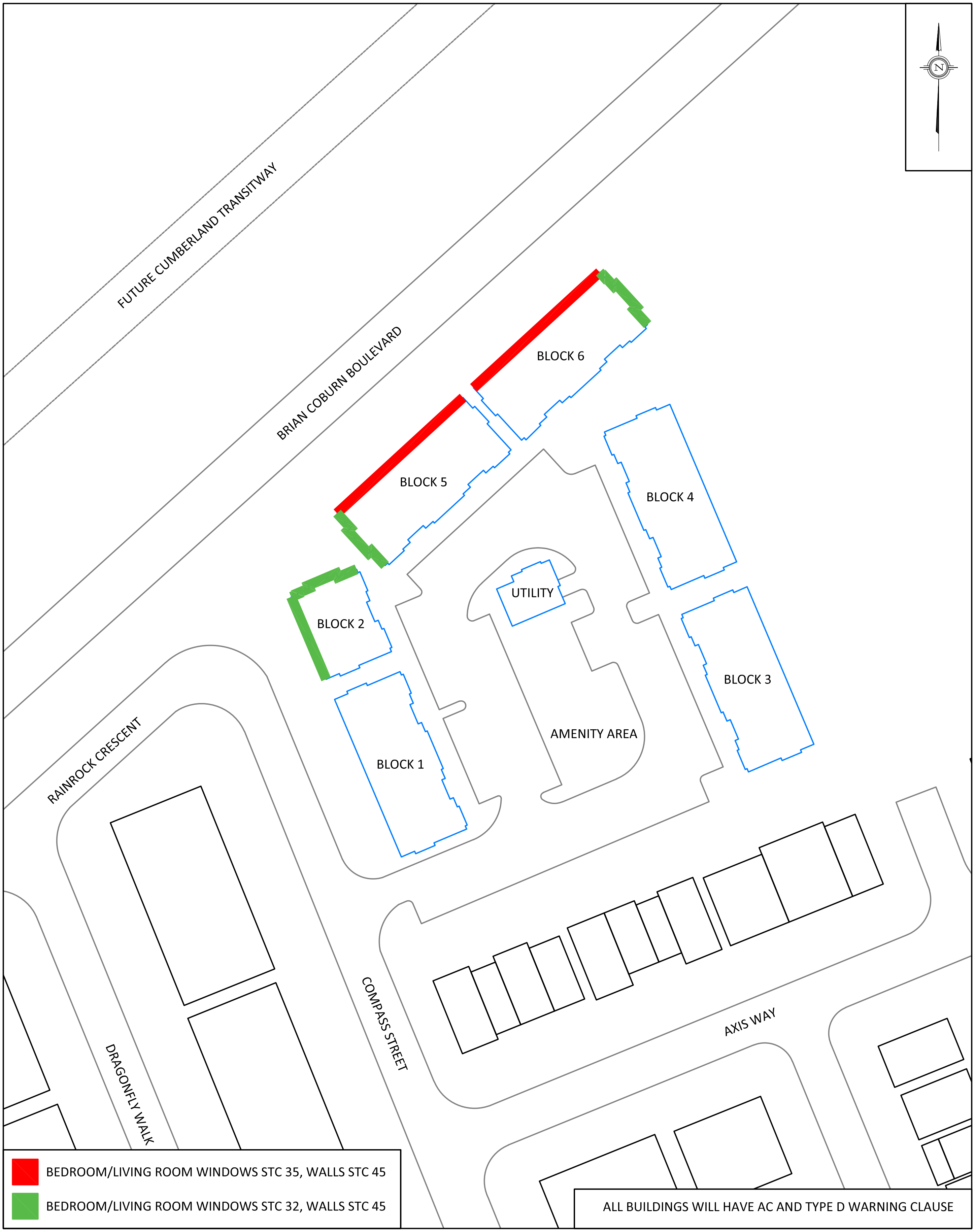
SCALE	1:1000 (APPROX.)
DRAWING NO.	22-305-2
DATE	NOVEMBER 5, 2024
DRAWN BY	T.K.
DESCRIPTION	FIGURE 2: RECEPTOR LOCATION



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PROJECT	640 COMPASS STREET, OTTAWA TRANSPORTATION NOISE ASSESSMENT		
SCALE	1:1000 (APPROX.)	DRAWING NO.	22-305-3
DATE	NOVEMBER 5, 2024	DRAWN BY	T.K.

DESCRIPTION

FIGURE 3:
STC REQUIREMENTS

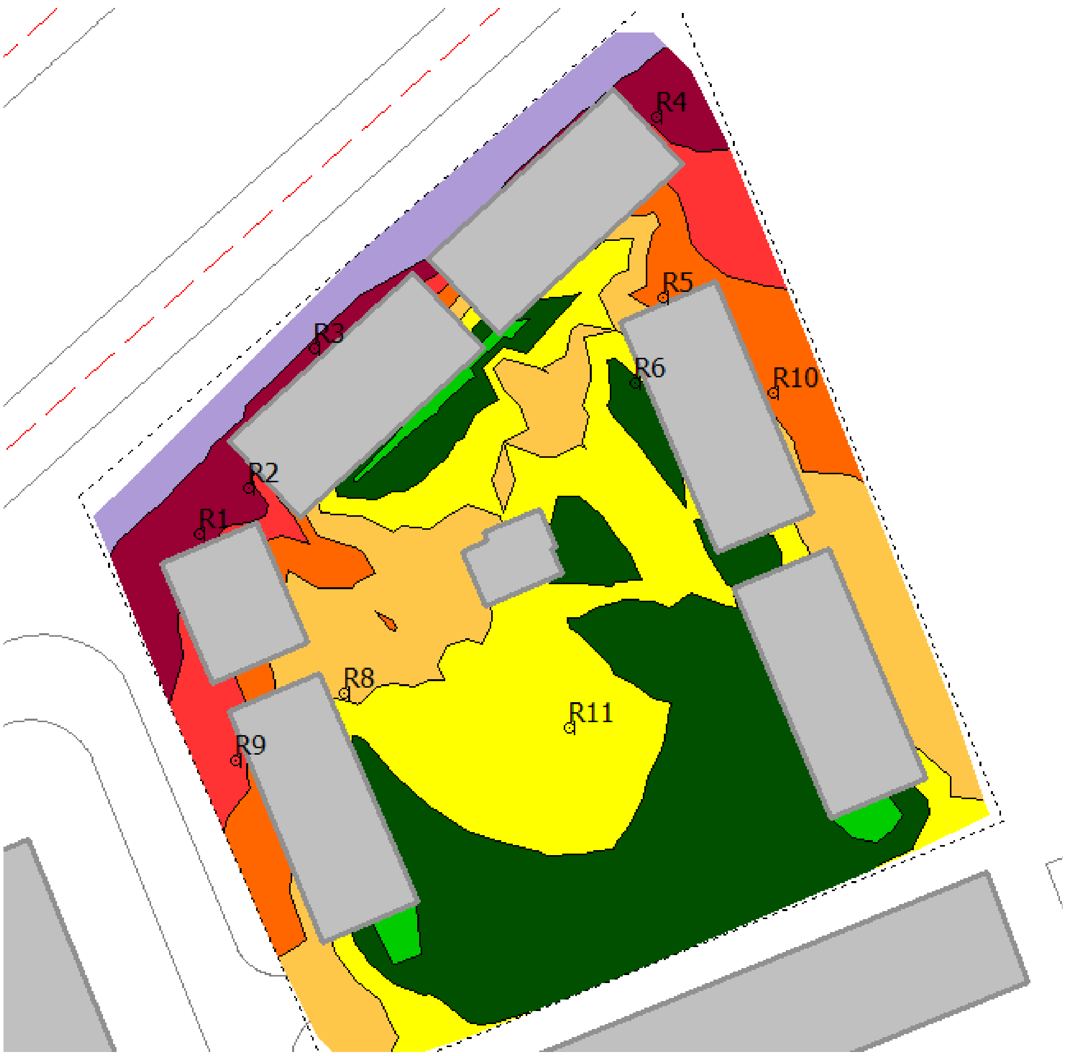


FIGURE 4: DAYTIME NOISE CONTOURS (1.5 M ABOVE GRADE)

80 – 85 dB
75 – 80 dB
70 – 75 dB
65 – 70 dB
60 – 65 dB
55 – 60 dB
50 – 55 dB
45 – 50 dB
40 – 45 dB
35 – 40 dB
0 – 35 dB

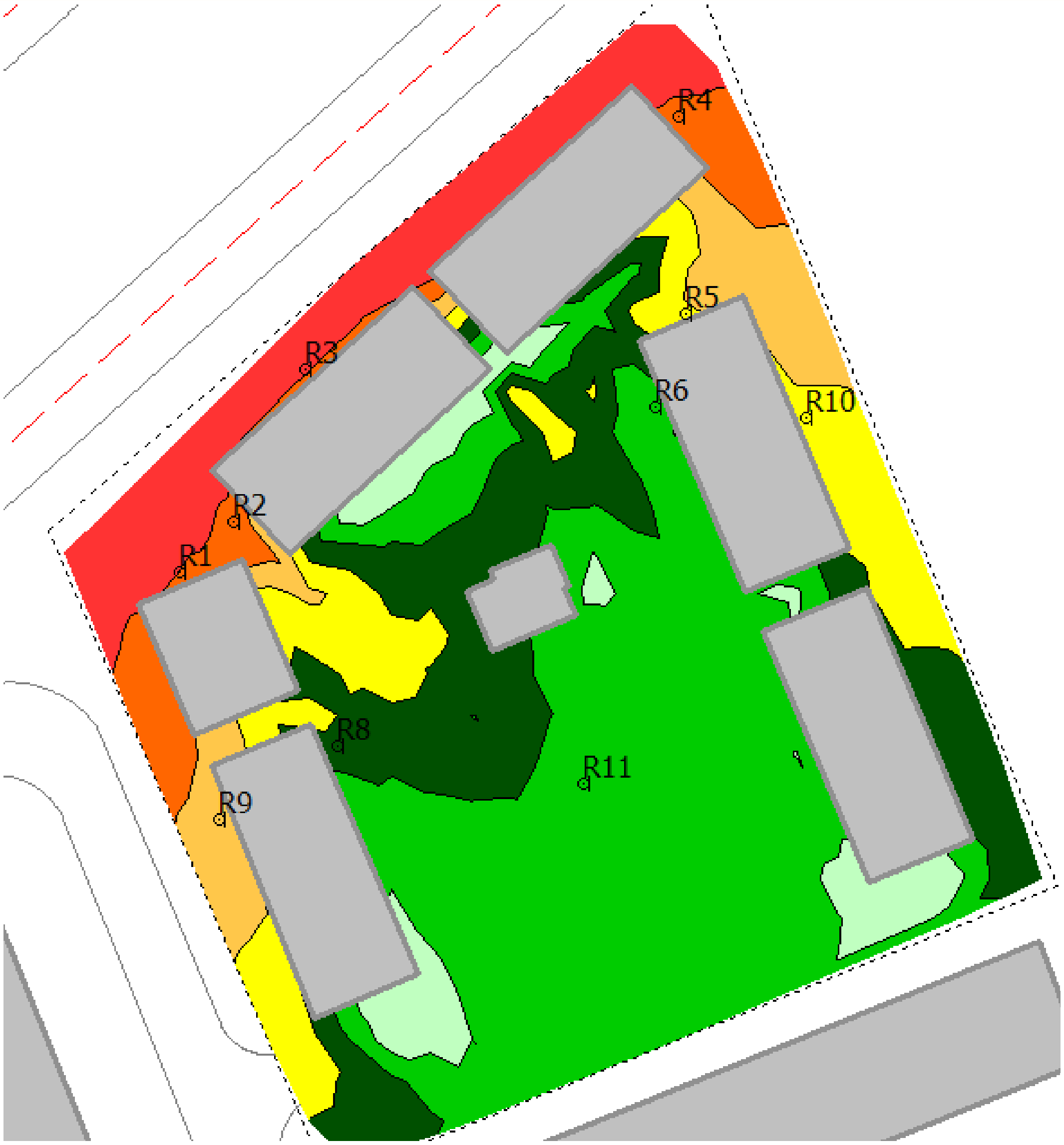
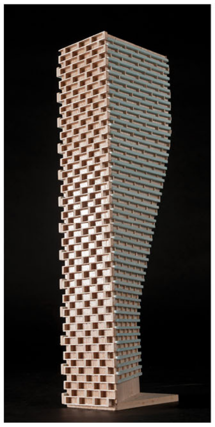
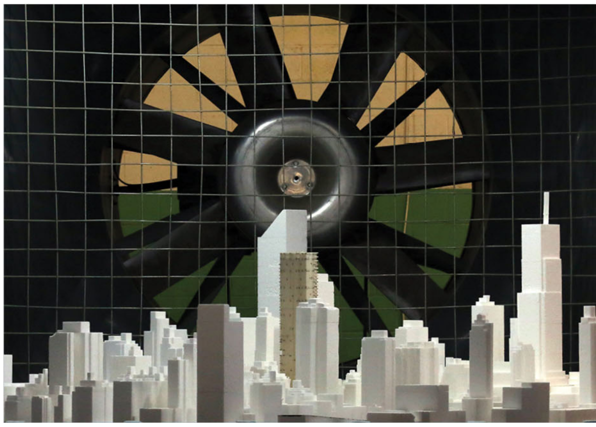


FIGURE 5: NIGHTTIME NOISE CONTOURS (4.5 M ABOVE GRADE)

80 – 85 dB
75 – 80 dB
70 – 75 dB
65 – 70 dB
60 – 65 dB
55 – 60 dB
50 – 55 dB
45 – 50 dB
40 – 45 dB
35 – 40 dB
0 – 35 dB





APPENDIX A

OUTDOOR – INDOOR NOISE CALCUALTIONS

(SAMPLE CALCULATIONS)

127 WALGREEN ROAD, OTTAWA, ON, CANADA K0A 1L0 | 613 836 0934
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SAMPLE CALCULATIONS TO REDUCE INTERIOR ROAD TRAFFIC NOISE

Outdoor Sound Level	=	71	dBA
Source Geometry Correction:	=	0	dBA
Correction For Surface Reflection:	=	3	dBA
Target Indoor Noise Level:	=	40	dBA
Required Noise Reduction:	=	34	dBA

COMPONENT: Wall		Required Noise Reduction:	34	dBA
Transmits:	50 % of Total Sound Energy	Correction:	3	dBA
Room Floor Area:	7.2 m²			
Component Area:	3.2 m²	Correction:		
Component / Floor (%):	44 %		-3	dBA
Noise Spectrum Type:	D			
Component Category:	d	Correction:	7	dBA
Room Absorption Category	Intermediate	Required STC:	41	

COMPONENT: Window		Required Noise Reduction:	34	dBA
Transmits:	50 % of Total Sound Energy	Correction:	3	dBA
Room Floor Area:	7.2 m²			
Component Area:	1.5 m²	Correction:		
Component / Floor (%):	21 %		-6	dBA
Noise Spectrum Type:	D			
Component Category:	b	Correction:	2	dBA
Room Absorption Category	Intermediate	Required STC:	33	

COMPONENT: Brick Wall		STC Is:	40	
Noise Spectrum Type	D			
Component Category	d	Correction:	7	dBA
Room Floor Area:	7.2 m²			
Component Area:	3.2 m²			
Component / Floor (%):	44 %	Correction:		
Room Absorption Category:	Intermediate		-3	dBA
Noise Reduction If Only This Component Transmits Sound Energy:			36	dBA
Component Transmits	70 % Of Sound	Required Noise Reduction:	34	dBA

COMPONENT: Window		Required Noise Reduction Is:	34	dBA
Percentage Of Sound Energy Transmitted:			30	%
Room Floor Area:	7.2 m²	Correction:	5	
Component Area:	1.5 m²			
Component / Floor (%):	21 %			
Room Absortion Category:	Intermediate	Correction:	-6	dBA
Noise Spectrum	D			
Component Category	b	Correction:	2	dBA
		Required STC Is:	35	

BLUE INDICATES REQUIRED FIELDS
ALL VALUES MUST BE IN METERS
DO NOT MOVE ANYTHING. IF ANY CELLS MOVE THE ENTIRE SHEET COULD MALFUNCTION

Surface Reflection	3
Outdoor Noise Level	71
Target Noise Level	40
Wall Area	3.2
Room Floor Area	7.2
Window Area	1.5
Wall Spectrum Type	d
Window Spectrum Type	b
Noise Source Type	D
Absorption Level	Intermediate

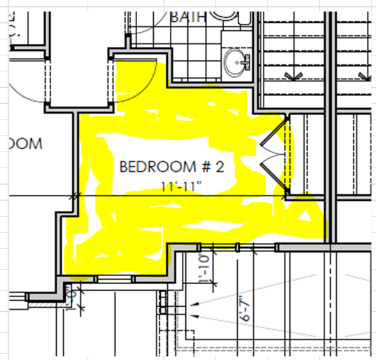
Absorption Coefficient			
	0.5	0.8	Hard
	0.8		Intermediate
	1.25		Very Absorptive

Building Component		A	B	C	D	E	F
Noise Source Spectrum Type		Large Aircraft Landing	Average Aircraft Noise, Railway Wheel Noise	Railway Wheel Noise Screened By Barrier	Mixed Road Traffic, Distant Aircraft	Road Traffic Screened By Barrier	Diesel Railway Locomotive
Single Exterior Door	a	-1	0	0	1	1	1
Double Exterior Door, Single Glazed Window, Openable Thin Window	b	0	1	2	2	3	3
Sealed Thin Window, Openable Thick Window	c	0	1	3	4	6	6
Sealed Thick Window, Exterior Wall, Roof/Ceiling	d	0	2	5	7	9	10

Window Value	2
Wall Value	7

Enter Value From Table Into Box

0 = Perpendicular To Surface	Correction
60 to 90 degrees	3
40 to 90 degrees	2
30 to 90 degrees	1
0 to 90 degrees	0
Value	0



BLOCK 4 - FRONT (EAST) ELEVATION