

**ROADWAY TRAFFIC NOISE  
DETAILED ASSESSMENT**

1649 Montreal Road  
Ottawa, Ontario

REPORT: GW21-088-Detailed Traffic Noise



August 18, 2022

**DRAFT**

PREPARED FOR  
Bertone Montreal Road LP  
1285 Hodge Street, Suite 200  
Montreal, Quebec  
H4N 2B6

PREPARED BY  
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## EXECUTIVE SUMMARY

This report describes a roadway traffic noise detailed assessment undertaken to satisfy requirements for a Site Plan Control (SPC) application submission for the proposed mixed-use development located at 1649 Montreal Road in Ottawa, Ontario. The proposed development comprises a 26-storey mixed-use residential building. The subject site is surrounded by low-rise residential building to the northeast and southeast, low-rise office/research buildings to the southwest and northwest (operated by the National Research Council of Canada), and low-rise commercial properties toward the east, along Montreal Road. The major sources of traffic noise are Montreal Road and Blair Road. Figure 1 illustrates a complete site plan with surrounding context.

The assessment is based on (i) theoretical noise prediction methods that conform to the Ministry of the Environment, Conservation and Parks (MOECP) and City of Ottawa requirements; (ii) noise level criteria as specified by the City of Ottawa's Environmental Noise Control Guidelines (ENCG); (iii) future vehicular traffic volumes based on the City of Ottawa's Official Plan roadway classifications; and (iv) architectural drawings prepared by Roderick Lahey Architect Inc. in July 2022.

The results of the current analysis indicate that noise levels will range between 52 and 73 dBA during the daytime period (07:00-23:00) and between 52 and 65 dBA during the nighttime period (23:00-07:00). The highest noise level (73 dBA) occurs at the south façade, which is nearest and most exposed to Montreal Road. Noise levels at the 5<sup>th</sup> Floor terrace, and therefore 2<sup>nd</sup> Floor terrace, fall below the ENCG criterion for outdoor living areas, therefore OLA mitigation is not required. Building components with a higher Sound Transmission Class (STC) rating will be required where exterior noise levels exceed 65 dBA, as indicated in Figure 3.

Results of the calculations also indicate that the development will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. The Type D Warning Clause will also be required to be placed on all Lease, Purchase and Sale Agreements, as summarized in Section 6.

Regarding stationary noise, impacts from the surroundings on the study building are expected to be minimal. Sources associated with commercial buildings to the east and west are at a sufficient setback



distance, and smaller units associated with adjacent residential are expected to be in compliance with the MECP's noise guideline NPC-216 - Residential Air Conditioning and City of Ottawa Noise By-Law No. 2017-255.

Stationary noise impacts from the development on the surroundings can be minimized by judicious placement mechanical equipment such as its placement on a roof or in a mechanical penthouse, or the incorporation of silencers and noise screens as necessary. It is recommended that any large pieces of HVAC equipment be placed in the middle of the roof, avoiding line of site with the surrounding residential dwellings.

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## 1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Bertone Montreal Road LP to undertake a roadway traffic noise feasibility assessment to satisfy requirements for a Site Plan Control (SPC) application submission for the proposed mixed-use development located at 1649 Montreal Road in Ottawa, Ontario (hereinafter referred to as “subject site” or “proposed development”). This report summarizes the methodology, results, and recommendations related to the assessment of exterior noise levels generated by local roadway traffic.

Our work is based on theoretical noise calculation methods conforming to the City of Ottawa<sup>1</sup> and Ministry of the Environment, Conservation and Parks (MECP)<sup>2</sup> guidelines. Noise calculations were based on architectural drawings prepared by Roderick Lahey Architect Inc. in July 2022, with future traffic volumes corresponding to the City of Ottawa’s Official Plan (OP) roadway classifications.

## 2. TERMS OF REFERENCE

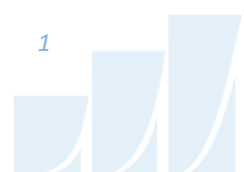
The subject site is located at 1649 Montreal Road in Ottawa, on a parcel of land situated at the northeast corner of the intersection of Montreal Road and Blair Road. The proposed development comprises a 26-storey mixed-use residential building. At Level 1, the floorplan includes commercial space along Montreal Road, as well as lobby, amenity, storage, and building services space. The primary entrance is located on the west elevation. The roof of the 1 storey podium includes amenity space along the north and east elevations of the building. A pool will be located at the north of this outdoor amenity space, while seating will be located at the northeast corner. Levels 2 and above comprise residential units. At Level 5 the building steps back from all elevations, and the tower floorplan remains consistent from Level 5 to Level 22. The north end of the floorplan steps back from the west, north, and east elevations at Level 23; the building then steps back from the south elevation at Level 25.

The subject site is surrounded by low-rise residential building to the northeast and southeast, low-rise office/research buildings to the southwest and northwest (operated by the National Research Council of

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<sup>1</sup> City of Ottawa Environmental Noise Control Guidelines, January 2016

<sup>2</sup> Ontario Ministry of the Environment and Climate Change – Environmental Noise Guidelines, Publication NPC-300, Queens Printer for Ontario, Toronto, 2013



Canada), and low-rise commercial properties toward the east, along Montreal Road. The major sources of traffic noise are Montreal Road and Blair Road. Figure 1 illustrates a complete site plan with surrounding context.

### **3. OBJECTIVES**

The principal objectives of this study are to (i) calculate the future noise levels on the study buildings produced by local roadway traffic, and (ii) ensure that interior and exterior noise levels do not exceed the allowable limits specified by the City of Ottawa’s Environmental Noise Control Guidelines 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 ( $2 \times 10^{-5}$  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 Roadway Traffic Noise**

##### **4.2.1 Criteria for Roadway Traffic Noise**

For surface roadway traffic noise, 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 City of Ottawa’s Environmental Noise Control Guidelines (ENCG) specifies that the recommended indoor noise limit range



(that is relevant to this study) is 45 and 40 dBA for living rooms and sleeping quarters respectively for roadway as listed in Table 1.

**TABLE 1: INDOOR SOUND LEVEL CRITERIA (ROAD)<sup>3</sup>**

Type of Space	Time Period	Leq (dBA)
General offices, reception areas, <b>retail stores</b> , etc.	07:00 – 23:00	50
Living/dining/den areas of <b>residences</b> , 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 <b>residences</b> , 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<sup>4</sup>. A closed window due to a ventilation requirement will bring noise levels down to achieve an acceptable indoor environment<sup>5</sup>. 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 triggers the need for forced air heating with provision for central air conditioning. Where noise levels exceed 65 dBA daytime and 60 dBA nighttime, air conditioning will be required and building components will require higher levels of sound attenuation<sup>6</sup>.

The sound level criterion for outdoor living areas is 55 dBA, which applies during the daytime (07:00 to 23:00). When noise levels exceed 55 dBA, mitigation must be provided to reduce noise levels where technically and administratively feasible to acceptable levels at or below the criterion.

<sup>3</sup> Adapted from ENCG 2016 – Tables 2.2b and 2.2c

<sup>4</sup> Burberry, P.B. (2014). Mitchell’s Environment and Services. Routledge, Page 125

<sup>5</sup> MOECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.8

<sup>6</sup> MOECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.1.3

## 4.2.2 Theoretical Roadway Noise Predictions

Noise predictions were performed with the aid of the MOECP computerized noise assessment program, STAMSON 5.04, for road analysis. Appendix A includes the STAMSON 5.04 input and output data.

Roadway traffic noise calculations were performed by treating each roadway segment as separate line sources of noise. In addition to the traffic volumes summarized in Table 2, theoretical noise predictions were based on the following parameters:

- Truck traffic on all roadways was taken to comprise 5% heavy trucks and 7% medium trucks, as per ENCG requirements for noise level predictions.
- The day/night split for all streets was taken to be 92%/8%, respectively.
- Ground surfaces were taken to be reflective due to the presence of hard (paved) ground.
- Topography was assumed to be a flat/gentle slope surrounding the study building.
- Noise receptors were strategically placed at 5 locations around the study area (see Figure 2).
- Receptor distances and exposure angles are illustrated in Appendix A.

## 4.2.3 Roadway Traffic Volumes

The ENCG dictates that noise calculations should 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<sup>7</sup> 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.

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<sup>7</sup> City of Ottawa Transportation Master Plan, November 2013



**TABLE 2: ROADWAY TRAFFIC DATA**

Segment	Roadway Traffic Data	Speed Limit (km/h)	Traffic Volumes
Montreal Road	4-Lane Urban Arterial Divided	60	<b>35,000</b>
Blair Road North of Montreal Road	2-Lane Major Collector	50	<b>12,000</b>
Blair Road South of Montreal Road	2-Lane Urban Arterial	50	<b>15,000</b>

### 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.

As per Section 4.2, when daytime noise levels (from road and rail 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<sup>8</sup> 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

<sup>8</sup> Building Practice Note: Controlling Sound Transmission into Buildings by J.D. Quirt, National Research Council of Canada, September 1985

Based on published research<sup>9</sup>, 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. Due to the limited information available at the time of the study, which was prepared for site plan approval, detailed floor layouts and building elevations have not been finalized; therefore, detailed STC calculations could not be performed at this time. As a guideline, the anticipated STC requirements for windows have been estimated based on the overall noise reduction required for each intended use of space (STC = outdoor noise level – targeted indoor noise levels).

## 5. RESULTS AND DISCUSSION

### 5.1 Roadway Traffic Noise Levels

The results of the roadway traffic noise calculations are summarized in Table 3 below. A complete set of input and output data from all STAMSON 5.04 calculations are available in Appendix A.

**TABLE 3: EXTERIOR NOISE LEVELS DUE TO ROAD TRAFFIC**

Receptor Number	Receptor Height Above Grade (m)	Receptor Location	STAMSON 5.04 Noise Level (dBA)	
			Day	Night
1	60.5	POW – 20 <sup>th</sup> Floor – North Façade	59	52
2	60.5	POW – 20 <sup>th</sup> Floor – East Façade	68	60
3	60.5	POW – 20 <sup>th</sup> Floor – South Façade	73	65
4	60.5	POW – 20 <sup>th</sup> Floor – West Façade	71	63
5	15.5	OLA – 5 <sup>th</sup> Floor Terrace	52	N/A

The results of the current analysis indicate that noise levels will range between 52 and 73 dBA during the daytime period (07:00-23:00) and between 52 and 65 dBA during the nighttime period (23:00-07:00). The highest noise level (73 dBA) occurs at the south façade, which is nearest and most exposed to Montreal Road. Noise levels at the 5<sup>th</sup> Floor terrace, and therefore 2<sup>nd</sup> Floor terrace, fall below the ENCG criterion for outdoor living areas, therefore OLA mitigation is not required.

<sup>9</sup> CMHC, Road & Rail Noise: Effects on Housing

## 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 overall noise reduction required for each intended use of space (STC = outdoor noise level – targeted indoor noise levels). As per city of Ottawa requirements, detailed STC calculations will be required to be completed prior to building permit application for each unit type. The STC requirements for the windows are summarized below for various units within the development (see Figure 3):

- **Bedroom Windows**
  - (i) Bedroom windows facing south will require a minimum STC of 36
  - (ii) Bedroom windows facing west will require a minimum STC of 34
  - (iii) Bedroom windows facing east will require a minimum STC of 31
  - (iv) All other bedroom windows are to satisfy Ontario Building Code (OBC 2020) requirements
  
- **Living Room Windows**
  - (i) Living room windows facing south will require a minimum STC of 31
  - (ii) Living room windows facing west will require a minimum STC of 29
  - (iii) Living room windows facing east will require a minimum STC of 26
  - (iv) All other living room windows are to satisfy Ontario Building Code (OBC 2020) requirements
  
- **Retail Windows**
  - (v) Retail windows facing south will require a minimum STC of 26
  - (vi) Retail windows facing west will require a minimum STC of 26
  - (vii) Retail windows facing east will require a minimum STC of 26
  - (viii) All other retail windows are to satisfy Ontario Building Code (OBC 2020) requirements

- **Exterior Walls**

- (i) Exterior wall components on the east, south and west façades will require a minimum STC of 45, which will be achieved with brick cladding or an acoustical equivalent according to NRC test data<sup>10</sup>

The STC requirements apply to windows, doors, spandrel panels and curtainwall elements. Exterior wall components on these façades are recommended to have a minimum STC of 45, where a window/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. We have specified an example window configuration, however several manufacturers and various combinations of window components, such as those proposed, 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 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.

Results of the calculations also indicate that the development will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. In addition to ventilation requirements, Warning Clauses will also be required in 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 52 and 73 dBA during the daytime period (07:00-23:00) and between 52 and 65 dBA during the nighttime period (23:00-07:00). The highest noise level (73 dBA) occurs at the south façade, which is nearest and most exposed to Montreal Road. Noise levels at the 5<sup>th</sup> Floor terrace, and therefore 2<sup>nd</sup> Floor terrace, fall below the ENCG criterion for outdoor living areas, therefore OLA mitigation is not required. Building components with a higher

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<sup>10</sup> J.S. Bradley and J.A. Birta. Laboratory Measurements of the Sound Insulation of Building Façade Elements, National Research Council October 2000.



Sound Transmission Class (STC) rating will be required where exterior noise levels exceed 65 dBA, as indicated in Figure 3.

Results of the calculations also indicate that the development will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. The following Type D Warning Clause<sup>11</sup> will also be required be placed on all Lease, Purchase and Sale Agreements, as summarized below:

*"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, Conservation and Parks."*

Regarding stationary noise, impacts from the surroundings on the study building are expected to be minimal. Sources associated with commercial buildings to the east and west are at a sufficient setback distance, and smaller units associated with adjacent residential are expected to be in compliance with the MECP's noise guideline NPC-216 - Residential Air Conditioning and City of Ottawa Noise By-Law No. 2017-255.

Stationary noise impacts from the development on the surroundings can be minimized by judicious placement mechanical equipment such as its placement on a roof or in a mechanical penthouse, or the incorporation of silencers and noise screens as necessary. It is recommended that any large pieces of HVAC equipment be placed in the middle of the roof, avoiding line of site with the surrounding residential dwellings.

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<sup>11</sup> City of Ottawa Environmental Noise Control Guidelines, January 2016



This concludes our traffic 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,

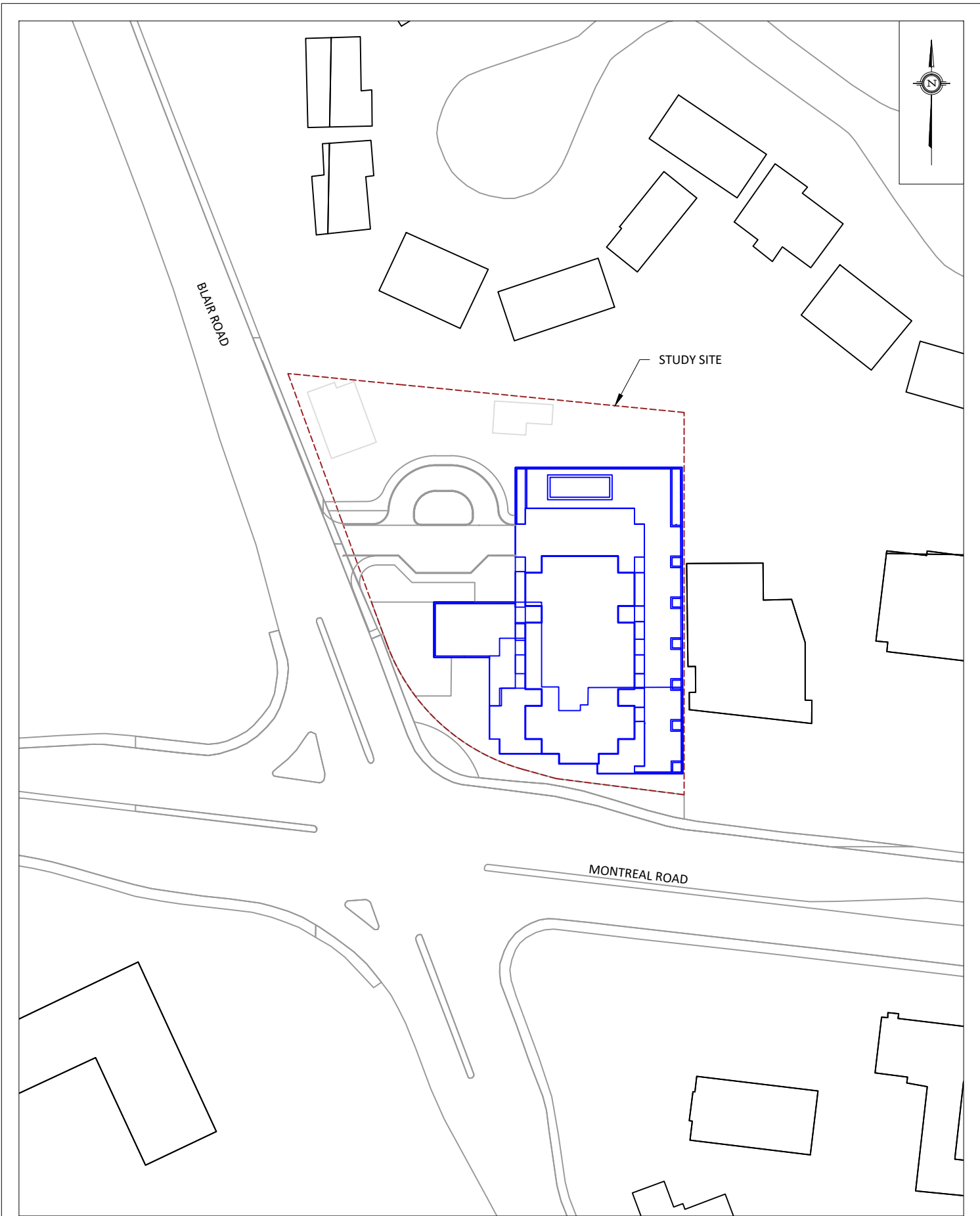
***Gradient Wind Engineering Inc.***

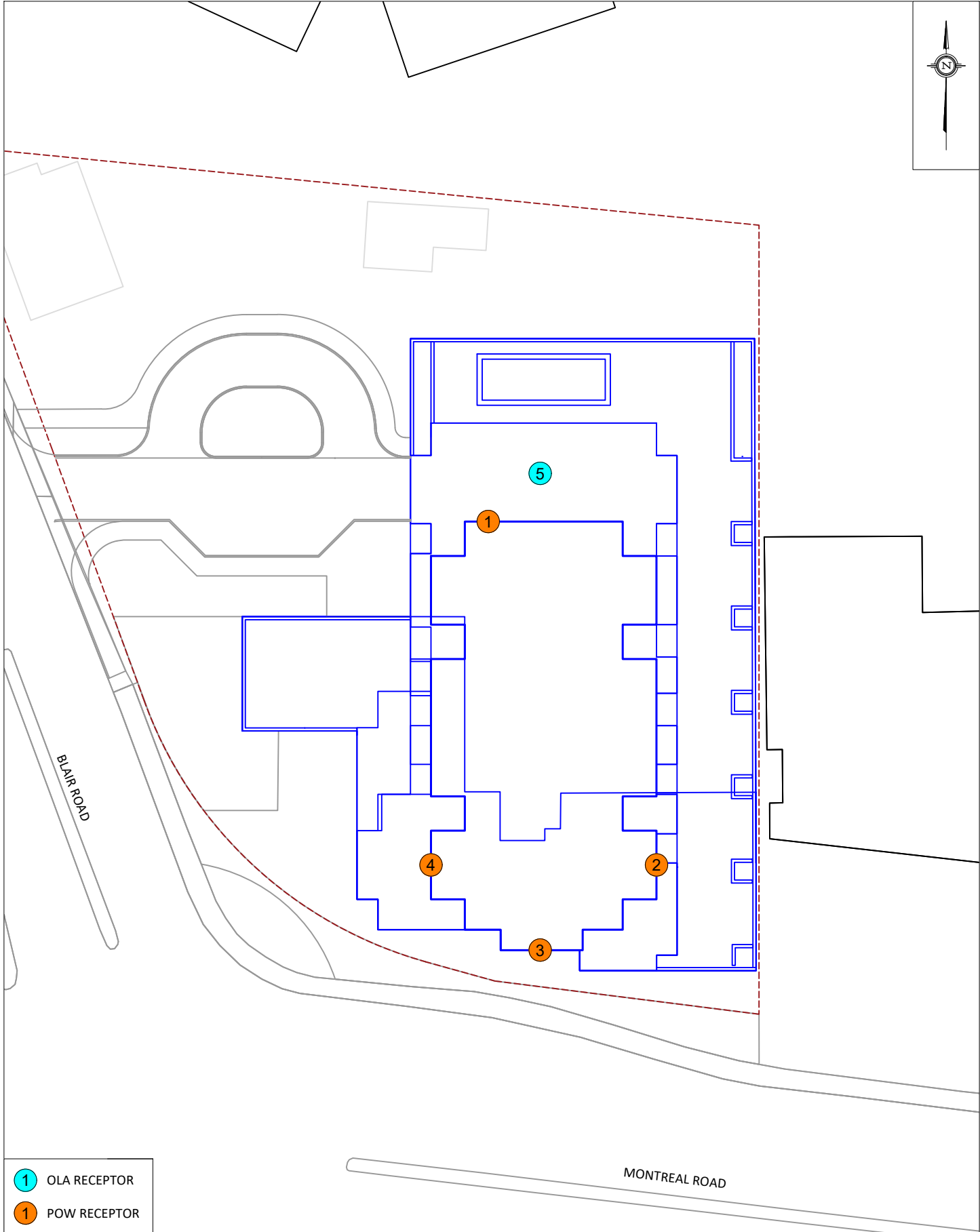
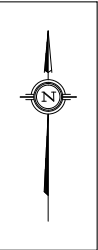
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Michael Lafortune, C.E.T.  
Environmental Scientist

Joshua Foster, P.Eng.  
Lead Engineer

*Gradient Wind File #21-088-Detailed Traffic Noise*



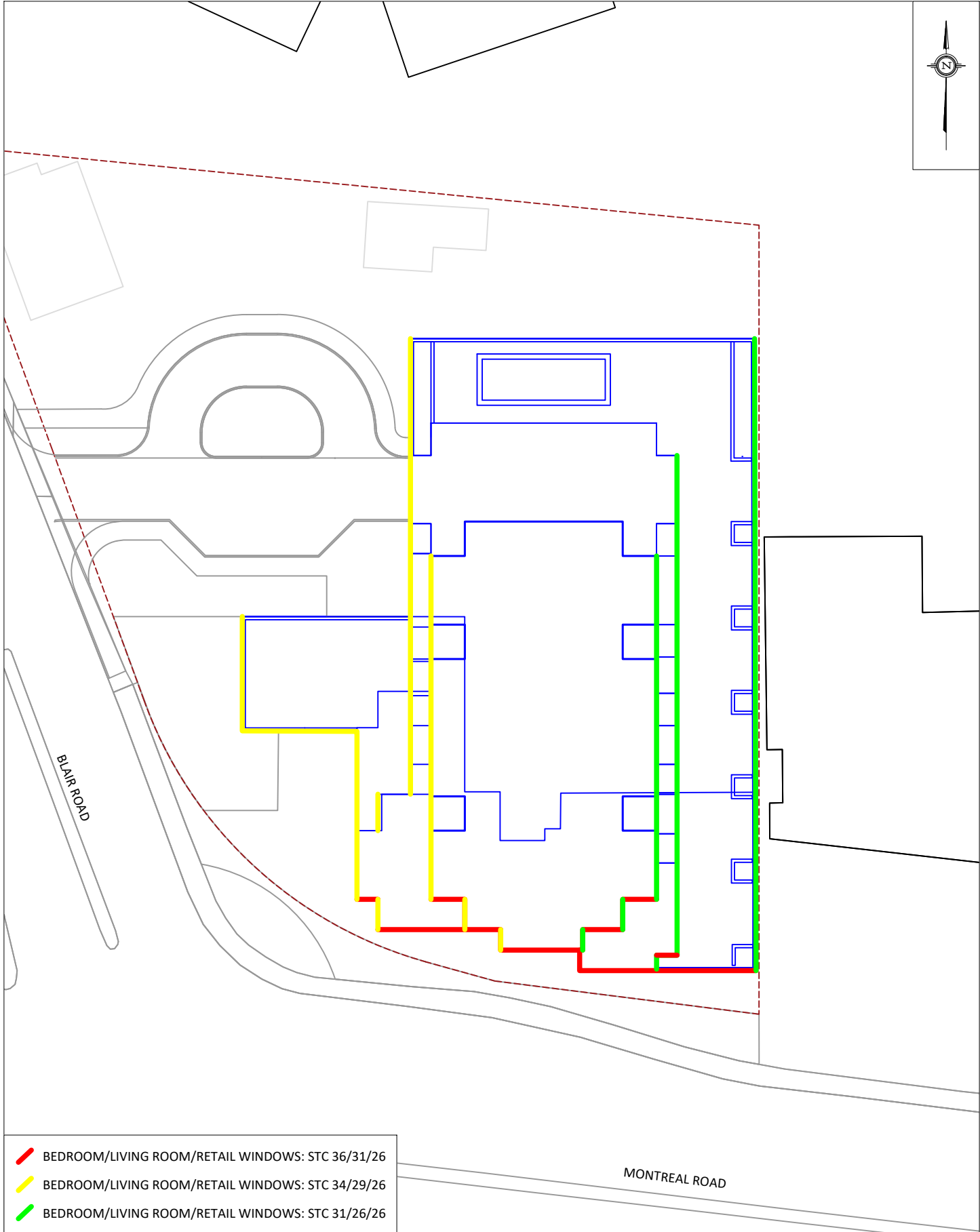
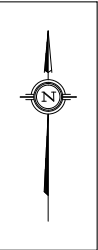


- 1 OLA RECEPTOR
- 1 POW RECEPTOR

PROJECT	1649 MONTREAL ROAD, OTTAWA DETAILED ROADWAY TRAFFIC NOISE ASSESSMENT	DESCRIPTION
SCALE	1:500 (APPROX.)	DRAWING NO. GW21-088-2
DATE	AUGUST 18, 2022	DRAWN BY M.L.

FIGURE 2:  
RECEPTOR LOCATIONS



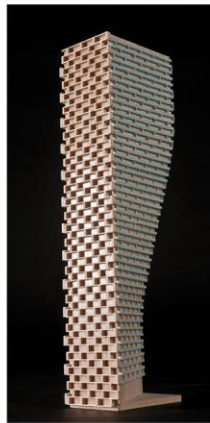


- BEDROOM/LIVING ROOM/RETAIL WINDOWS: STC 36/31/26
- BEDROOM/LIVING ROOM/RETAIL WINDOWS: STC 34/29/26
- BEDROOM/LIVING ROOM/RETAIL WINDOWS: STC 31/26/26

PROJECT	1649 MONTREAL ROAD, OTTAWA DETAILED ROADWAY TRAFFIC NOISE ASSESSMENT	
SCALE	1:500 (APPROX.)	DRAWING NO. GW21-088-3
DATE	AUGUST 18, 2022	DRAWN BY M.L.

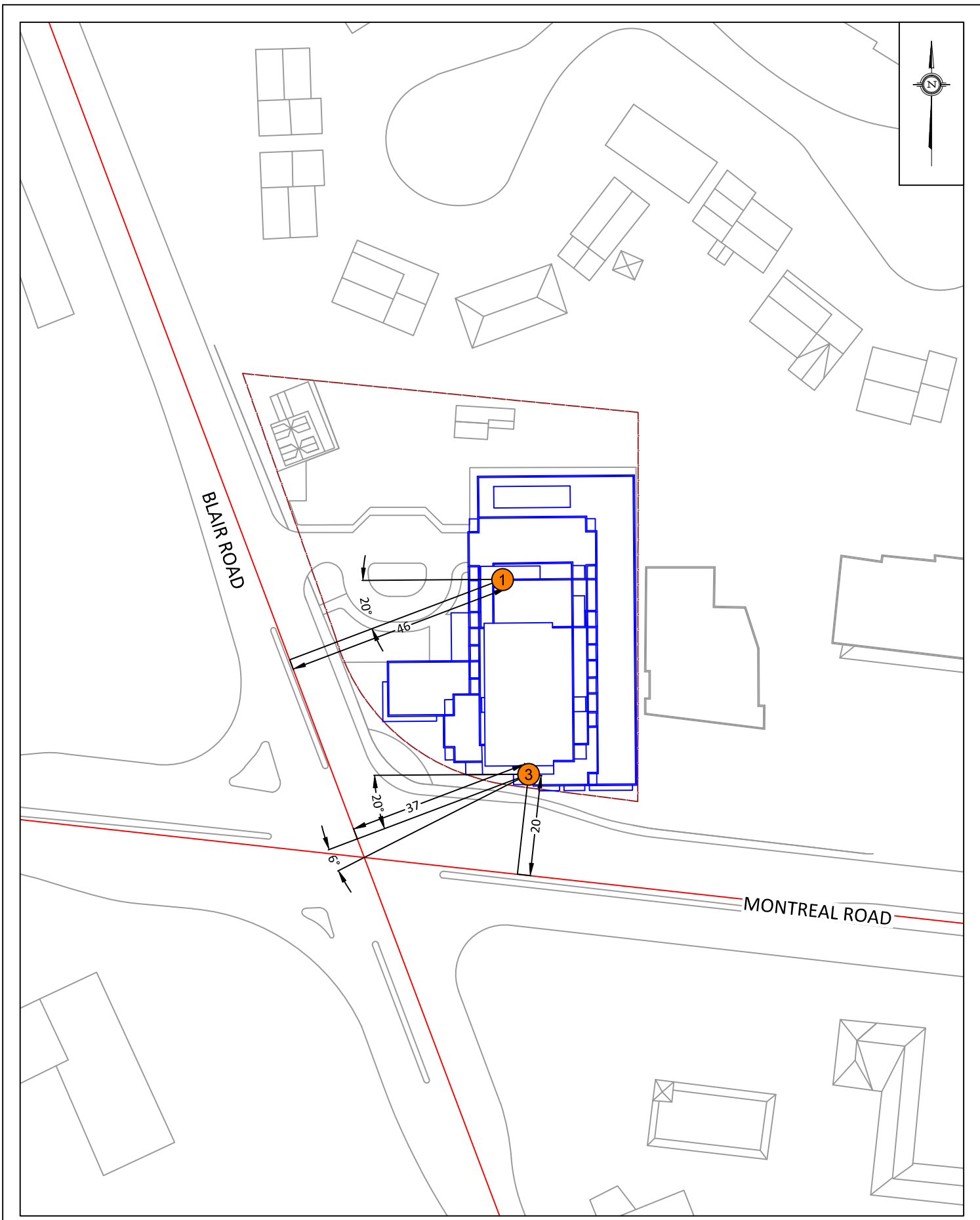
# GRADIENTWIND

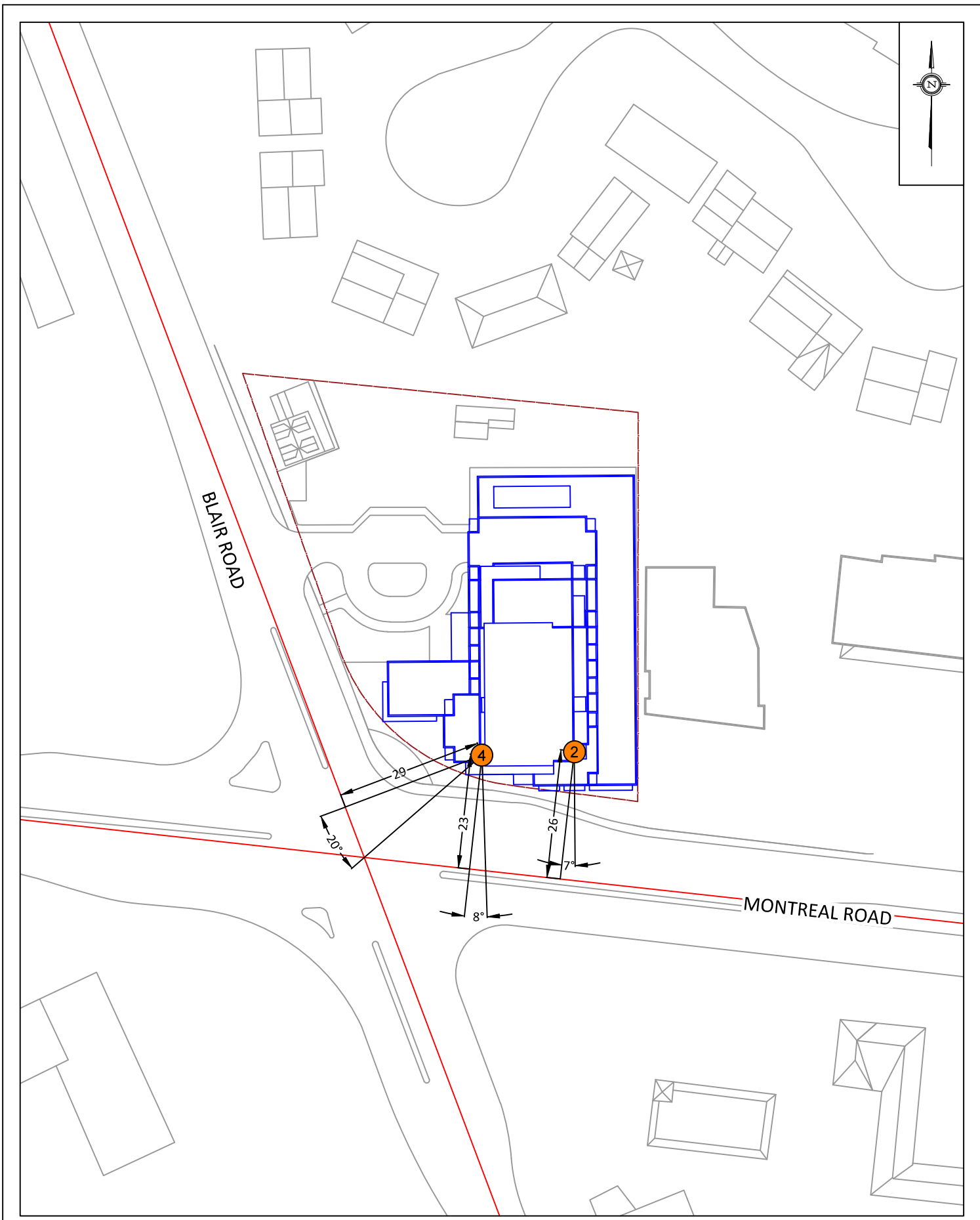
ENGINEERS & SCIENTISTS

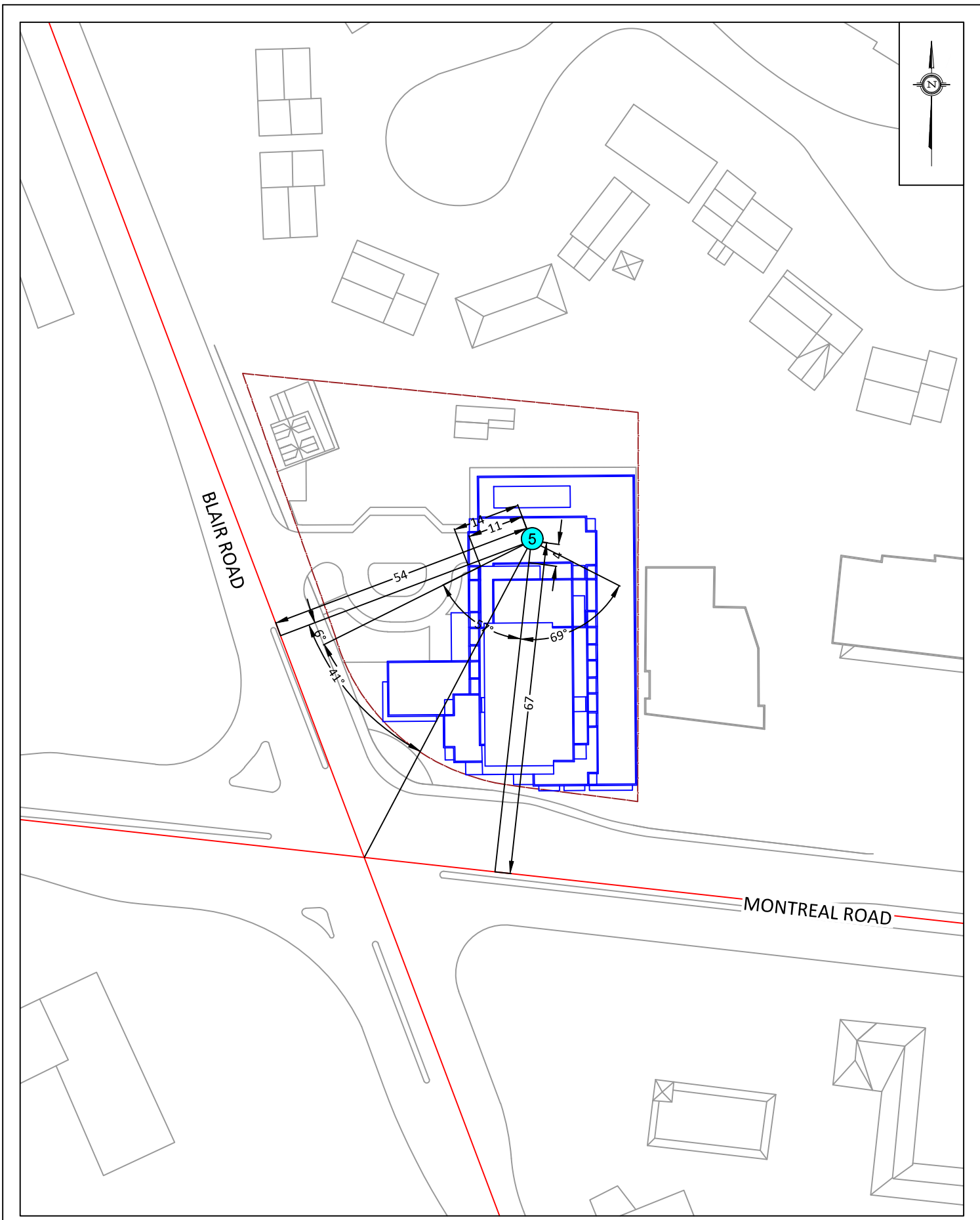


## APPENDIX A

### STAMSON 5.04 – INPUT AND OUTPUT DATA







PROJECT	1649 MONTREAL ROAD, OTTAWA ROADWAY TRAFFIC NOISE FEASIBILITY ASSESSMENT	
SCALE	1:1000 (APPROX.)	DRAWING NO. GW21-088-5
DATE	APRIL 30, 2021	DRAWN BY M.L.

DESCRIPTION	FIGURE 5: STAMSON INPUT PARAMETERS - RECEPTOR 5
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# GRADIENTWIND

ENGINEERS & SCIENTISTS

STAMSON 5.0                      NORMAL REPORT                      Date: 29-04-2021 34:45:06  
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r1.te    Time Period: Day/Night 16/8 hours  
Description:

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

-----  
Angle1    Angle2                      : 20.00 deg    90.00 deg  
Wood depth                      : 0            (No woods.)  
No of house rows                : 0 / 0  
Surface                            : 2            (Reflective ground surface)  
Receiver source distance        : 46.00 / 46.00 m  
Receiver height                 : 60.50 / 60.50 m  
Topography                        : 1            (Flat/gentle slope; no barrier)  
Reference angle                  : 0.00



Results segment # 1: BlairN (day)

Source height = 1.50 m

ROAD (0.00 + 58.54 + 0.00) = 58.54 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

20	90	0.00	67.51	0.00	-4.87	-4.10	0.00	0.00	0.00
58.54									

Segment Leq : 58.54 dBA

Total Leq All Segments: 58.54 dBA

Results segment # 1: BlairN (night)

Source height = 1.50 m

ROAD (0.00 + 50.94 + 0.00) = 50.94 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

20	90	0.00	59.91	0.00	-4.87	-4.10	0.00	0.00	0.00
50.94									

Segment Leq : 50.94 dBA

Total Leq All Segments: 50.94 dBA

TOTAL Leq FROM ALL SOURCES (DAY) : 58.54  
(NIGHT) : 50.94



# GRADIENTWIND

ENGINEERS & SCIENTISTS

STAMSON 5.0                      NORMAL REPORT                      Date: 29-04-2021 34:45:11  
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r2.te    Time Period: Day/Night 16/8 hours  
Description:

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

-----  
Car traffic volume : 28336/2464 veh/TimePeriod \*  
Medium truck volume : 2254/196 veh/TimePeriod \*  
Heavy truck volume : 1610/140 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): 35000  
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: Montreal (day/night)

-----  
Angle1 Angle2 : -90.00 deg -7.00 deg  
Wood depth : 0 (No woods.)  
No of house rows : 0 / 0  
Surface : 2 (Reflective ground surface)  
Receiver source distance : 26.00 / 26.00 m  
Receiver height : 60.50 / 60.50 m  
Topography : 1 (Flat/gentle slope; no barrier)  
Reference angle : 0.00





Results segment # 1: Montreal (day)

Source height = 1.50 m

ROAD (0.00 + 67.93 + 0.00) = 67.93 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

--									
-90	-7	0.00	73.68	0.00	-2.39	-3.36	0.00	0.00	0.00
67.93									

Segment Leq : 67.93 dBA

Total Leq All Segments: 67.93 dBA

Results segment # 1: Montreal (night)

Source height = 1.50 m

ROAD (0.00 + 60.33 + 0.00) = 60.33 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

--									
-90	-7	0.00	66.08	0.00	-2.39	-3.36	0.00	0.00	0.00
60.33									

Segment Leq : 60.33 dBA

Total Leq All Segments: 60.33 dBA

TOTAL Leq FROM ALL SOURCES (DAY) : 67.93  
(NIGHT) : 60.33



# GRADIENTWIND

ENGINEERS & SCIENTISTS

STAMSON 5.0                      NORMAL REPORT                      Date: 29-04-2021 34:45:16  
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r3.te    Time Period: Day/Night 16/8 hours  
Description:

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

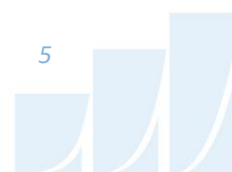
-----  
Car traffic volume : 28336/2464 veh/TimePeriod \*  
Medium truck volume : 2254/196 veh/TimePeriod \*  
Heavy truck volume : 1610/140 veh/TimePeriod \*  
Posted speed limit : 60 km/h  
Road gradient : 0 %  
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 35000  
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: Montreal (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              : 20.00 / 20.00 m  
Receiver height                        : 60.50 / 60.50 m  
Topography                             : 1              (Flat/gentle slope; no barrier)  
Reference angle                        : 0.00



# GRADIENTWIND

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

-----  
Angle1 Angle2 : -6.00 deg 20.00 deg  
Wood depth : 0 (No woods.)  
No of house rows : 0 / 0  
Surface : 2 (Reflective ground surface)  
Receiver source distance : 37.00 / 37.00 m  
Receiver height : 60.50 / 60.50 m  
Topography : 1 (Flat/gentle slope; no barrier)  
Reference angle : 0.00

# GRADIENTWIND

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Road data, segment # 3: BlairS (day/night)

-----  
Car traffic volume : 12144/1056 veh/TimePeriod \*  
Medium truck volume : 966/84 veh/TimePeriod \*  
Heavy truck volume : 690/60 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): 15000  
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 # 3: BlairS (day/night)

-----  
Angle1 Angle2 : -90.00 deg -6.00 deg  
Wood depth : 0 (No woods.)  
No of house rows : 0 / 0  
Surface : 2 (Reflective ground surface)  
Receiver source distance : 37.00 / 37.00 m  
Receiver height : 60.50 / 60.50 m  
Topography : 1 (Flat/gentle slope; no barrier)  
Reference angle : 0.00



Results segment # 1: Montreal (day)

Source height = 1.50 m

ROAD (0.00 + 72.43 + 0.00) = 72.43 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-90	90	0.00	73.68	0.00	-1.25	0.00	0.00	0.00	0.00
72.43									

Segment Leq : 72.43 dBA

Results segment # 2: BlairN (day)

Source height = 1.50 m

ROAD (0.00 + 55.19 + 0.00) = 55.19 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-6	20	0.00	67.51	0.00	-3.92	-8.40	0.00	0.00	0.00
55.19									

Segment Leq : 55.19 dBA



Results segment # 3: BlairS (day)

Source height = 1.50 m

ROAD (0.00 + 61.25 + 0.00) = 61.25 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

--									
-90	-6	0.00	68.48	0.00	-3.92	-3.31	0.00	0.00	0.00
61.25									

Segment Leq : 61.25 dBA

Total Leq All Segments: 72.82 dBA

Results segment # 1: Montreal (night)

Source height = 1.50 m

ROAD (0.00 + 64.83 + 0.00) = 64.83 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

--									
-90	90	0.00	66.08	0.00	-1.25	0.00	0.00	0.00	0.00
64.83									

Segment Leq : 64.83 dBA

Results segment # 2: BlairN (night)

Source height = 1.50 m

ROAD (0.00 + 47.59 + 0.00) = 47.59 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

--									
-6	20	0.00	59.91	0.00	-3.92	-8.40	0.00	0.00	0.00
47.59									

Segment Leq : 47.59 dBA

Results segment # 3: BlairS (night)

Source height = 1.50 m

ROAD (0.00 + 53.65 + 0.00) = 53.65 dBA

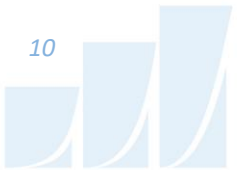
Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

--									
-90	-6	0.00	60.88	0.00	-3.92	-3.31	0.00	0.00	0.00
53.65									

Segment Leq : 53.65 dBA

Total Leq All Segments: 65.22 dBA

TOTAL Leq FROM ALL SOURCES (DAY) : 72.82  
(NIGHT) : 65.22



# GRADIENTWIND

ENGINEERS & SCIENTISTS

STAMSON 5.0                      NORMAL REPORT                      Date: 29-04-2021 34:45:20  
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r4.te    Time Period: Day/Night 16/8 hours  
Description:

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

-----  
Car traffic volume : 28336/2464 veh/TimePeriod \*  
Medium truck volume : 2254/196 veh/TimePeriod \*  
Heavy truck volume : 1610/140 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): 35000  
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: Montreal (day/night)

-----  
Angle1    Angle2                      : -8.00 deg    90.00 deg  
Wood depth                            : 0            (No woods.)  
No of house rows                     : 0 / 0  
Surface                                : 2            (Reflective ground surface)  
Receiver source distance             : 23.00 / 23.00 m  
Receiver height                       : 60.50 / 60.50 m  
Topography                            : 1            (Flat/gentle slope; no barrier)  
Reference angle                       : 0.00



# GRADIENTWIND

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

-----  
Angle1 Angle2 : -20.00 deg 90.00 deg  
Wood depth : 0 (No woods.)  
No of house rows : 0 / 0  
Surface : 2 (Reflective ground surface)  
Receiver source distance : 29.00 / 29.00 m  
Receiver height : 60.50 / 60.50 m  
Topography : 1 (Flat/gentle slope; no barrier)  
Reference angle : 0.00

Road data, segment # 3: BlairS (day/night)

-----  
Car traffic volume : 12144/1056 veh/TimePeriod \*  
Medium truck volume : 966/84 veh/TimePeriod \*  
Heavy truck volume : 690/60 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): 15000  
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 # 3: BlairS (day/night)

-----  
Angle1 Angle2 : -90.00 deg -20.00 deg  
Wood depth : 0 (No woods.)  
No of house rows : 0 / 0  
Surface : 2 (Reflective ground surface)  
Receiver source distance : 29.00 / 29.00 m  
Receiver height : 60.50 / 60.50 m  
Topography : 1 (Flat/gentle slope; no barrier)  
Reference angle : 0.00

Results segment # 1: Montreal (day)

Source height = 1.50 m

ROAD (0.00 + 69.18 + 0.00) = 69.18 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-8	90	0.00	73.68	0.00	-1.86	-2.64	0.00	0.00	0.00
69.18									

Segment Leq : 69.18 dBA

Results segment # 2: BlairN (day)

Source height = 1.50 m

ROAD (0.00 + 62.51 + 0.00) = 62.51 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-20	90	0.00	67.51	0.00	-2.86	-2.14	0.00	0.00	0.00
62.51									

Segment Leq : 62.51 dBA

Results segment # 3: BlairS (day)

Source height = 1.50 m

ROAD (0.00 + 61.52 + 0.00) = 61.52 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

--									
-90	-20	0.00	68.48	0.00	-2.86	-4.10	0.00	0.00	0.00
61.52									

Segment Leq : 61.52 dBA

Total Leq All Segments: 70.60 dBA

Results segment # 1: Montreal (night)

Source height = 1.50 m

ROAD (0.00 + 61.58 + 0.00) = 61.58 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

--									
-8	90	0.00	66.08	0.00	-1.86	-2.64	0.00	0.00	0.00
61.58									

Segment Leq : 61.58 dBA

Results segment # 2: BlairN (night)

Source height = 1.50 m

ROAD (0.00 + 54.91 + 0.00) = 54.91 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

--									
-20	90	0.00	59.91	0.00	-2.86	-2.14	0.00	0.00	0.00
54.91									

Segment Leq : 54.91 dBA

Results segment # 3: BlairS (night)

Source height = 1.50 m

ROAD (0.00 + 53.92 + 0.00) = 53.92 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

--									
-90	-20	0.00	60.88	0.00	-2.86	-4.10	0.00	0.00	0.00
53.92									

Segment Leq : 53.92 dBA

Total Leq All Segments: 63.00 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 70.60  
(NIGHT): 63.00

# GRADIENTWIND

ENGINEERS & SCIENTISTS

STAMSON 5.0                      NORMAL REPORT                      Date: 29-04-2021 34:45:25  
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r5.te    Time Period: Day/Night 16/8 hours  
Description:

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

-----  
Car traffic volume : 28336/2464 veh/TimePeriod \*  
Medium truck volume : 2254/196 veh/TimePeriod \*  
Heavy truck volume : 1610/140 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): 35000  
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: Montreal (day/night)

-----  
Angle1    Angle2                      : -69.00 deg    57.00 deg  
Wood depth                            : 0                      (No woods.)  
No of house rows                      : 0 / 0  
Surface                                : 2                      (Reflective ground surface)  
Receiver source distance               : 67.00 / 67.00 m  
Receiver height                        : 15.50 / 15.50 m  
Topography                             : 2                      (Flat/gentle slope; with barrier)  
Barrier angle1                         : -69.00 deg    Angle2 : 57.00 deg  
Barrier height                         : 88.00 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

# GRADIENTWIND

ENGINEERS & SCIENTISTS

Road data, segment # 2: BlairN1 (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 : 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: BlairN1 (day/night)

-----  
Angle1 Angle2 : -41.00 deg -6.00 deg  
Wood depth : 0 (No woods.)  
No of house rows : 0 / 0  
Surface : 2 (Reflective ground surface)  
Receiver source distance : 54.00 / 54.00 m  
Receiver height : 15.50 / 15.50 m  
Topography : 2 (Flat/gentle slope; with barrier)  
Barrier angle1 : -41.00 deg Angle2 : -6.00 deg  
Barrier height : 88.00 m  
Barrier receiver distance : 11.00 / 11.00 m  
Source elevation : 0.00 m  
Receiver elevation : 0.00 m  
Barrier elevation : 0.00 m  
Reference angle : 0.00



# GRADIENTWIND

ENGINEERS & SCIENTISTS

Road data, segment # 3: BlairN2 (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 : 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 # 3: BlairN2 (day/night)

-----  
Angle1 Angle2 : -6.00 deg 90.00 deg  
Wood depth : 0 (No woods.)  
No of house rows : 0 / 0  
Surface : 2 (Reflective ground surface)  
Receiver source distance : 54.00 / 54.00 m  
Receiver height : 15.50 / 15.50 m  
Topography : 2 (Flat/gentle slope; with barrier)  
Barrier angle1 : -6.00 deg Angle2 : 90.00 deg  
Barrier height : 14.00 m  
Barrier receiver distance : 14.00 / 14.00 m  
Source elevation : 0.00 m  
Receiver elevation : 0.00 m  
Barrier elevation : 0.00 m  
Reference angle : 0.00



# GRADIENTWIND

ENGINEERS & SCIENTISTS

Results segment # 1: Montreal (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	15.50	14.66	14.66

ROAD (0.00 + 45.63 + 0.00) = 45.63 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
-69	57	0.00	73.68	0.00	-6.50	-1.55	0.00	0.00	-20.00

SubLeq  
45.63

Segment Leq : 45.63 dBA

Results segment # 2: BlairN1 (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	15.50	12.65	12.65

ROAD (0.00 + 34.84 + 0.00) = 34.84 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
-41	-6	0.00	67.51	0.00	-5.56	-7.11	0.00	0.00	-20.00

SubLeq  
34.84

Segment Leq : 34.84 dBA



# GRADIENTWIND

ENGINEERS & SCIENTISTS

Results segment # 3: BlairN2 (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	15.50	11.87	11.87

ROAD (0.00 + 50.19 + 0.00) = 50.19 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
-6	90	0.00	67.51	0.00	-5.56	-2.73	0.00	0.00	-9.02

SubLeq

Segment Leq : 50.19 dBA

Total Leq All Segments: 51.59 dBA

Results segment # 1: Montreal (night)

Source height = 1.50 m

Barrier height for grazing incidence

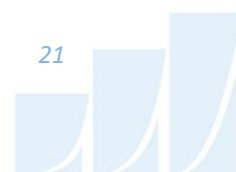
Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	15.50	14.66	14.66

ROAD (0.00 + 38.03 + 0.00) = 38.03 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
-69	57	0.00	66.08	0.00	-6.50	-1.55	0.00	0.00	-20.00

SubLeq

Segment Leq : 38.03 dBA



# GRADIENTWIND

ENGINEERS & SCIENTISTS

Results segment # 2: BlairN1 (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	15.50	12.65	12.65

ROAD (0.00 + 27.24 + 0.00) = 27.24 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-41	-6	0.00	59.91	0.00	-5.56	-7.11	0.00	0.00	-20.00
27.24									

Segment Leq : 27.24 dBA

Results segment # 3: BlairN2 (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	15.50	11.87	11.87

ROAD (0.00 + 42.59 + 0.00) = 42.59 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-6	90	0.00	59.91	0.00	-5.56	-2.73	0.00	0.00	-9.02
42.59									

Segment Leq : 42.59 dBA

Total Leq All Segments: 43.99 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 51.59

(NIGHT): 43.99