September 28th, 2022

Falsetto Homes Inc.
Attn: Sam Falsetto
52 Sullivan Dr.
Ottawa ON, K2G 1V2

Dear Mr. Falsetto:

Re: Roadway Traffic Noise Brief
255 Metcalfe Street, Ottawa, ON
GWE File No.: 22-260 – Roadway Traffic Noise

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Falsetto Homes Inc. to undertake a roadway traffic noise brief for the proposed three new residential basement units in an existing 8-storey residential apartment to ensure that future residents are afforded comfortable used of the indoor space. The study was requested by the City of Ottawa, as the subject property is within 100 meters (m) of two urban arterial roadways, Metcalfe Street and Somerset Street West. This roadway traffic noise brief summarizes the methodology, results and recommendations related to a roadway traffic noise assessment. Gradient Wind's scope of work involved assessing exterior noise levels generated by local roadway traffic to ensure that the development does not require a detailed analysis for noise control measures and mitigation. The roadway traffic noise assessment was performed on the basis of theoretical noise calculation methods conforming to the City of Ottawa[1] and Ministry of the Environment, Conservation and Parks (MECP)[2] guidelines. Our study was based on basement floor plan drawing prepared by Muzaiko Architecture dated April 12th, 2021, future traffic volumes corresponding to the City of Ottawa's Official Plan (OP), and CAD mapping obtained through the City of Ottawa.

[1] City of Ottawa – Environmental Noise Control Guidelines, January 2016
[2] Ministry of the Environment and Climate Change (MOECC) – Environmental Noise Guideline, Publication NPC-300, August 2013

2. TERMS OF REFERENCE

The focus of this noise brief are the proposed three basement residential units located in an existing 8-storey residential building located at 255 Metcalfe Street in Ottawa, Ontario. The study building is bounded by Metcalfe Street to the west, MacLaren Street north, a legal structure and apartment building directly east, and a private driveway to the south. Basement residential unit B01 is located in the southeast corner of the site floorplan while units B02 and B03, adjacent to one another, are located in the southwest corner. The garage is north of the floor and typical building services, i.e., laundry and mechanical room, are situated south, separating unit B01 from B02 and B03. Figure 1 illustrates a complete site plan with surrounding context.

3. OBJECTIVES

The main goals of this work are to: (i) calculate the future noise levels on the study buildings produced by local roadway traffic and (ii) ensure that exterior noise levels do not exceed the ENCG objective limit, as specified in Section 4.2.1 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 Roadway Traffic Noise

4.2.1 Criteria for Roadway Traffic Noise

For vehicle 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.

Predicted noise levels at the plane of window (POW) and outdoor living area (OLA) dictate the action required to achieve the recommended indoor and OLA sound levels, as specified in the ENCG. When noise levels at these areas meet or exceed the ENCG objective limit of 55 dBA, specific outdoor, ventilation and Warning Clause requirements may apply. In addition, where noise levels exceed 65 dBA, upgraded building components must be designed to ensure indoor sound level limits can be met.

4.2.2 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[3] which provides 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 1 (below) summarizes the AADT values used for the roadway included in this assessment.

TABLE 1: ROADWAY TRAFFIC DATA

Roadway	Roadway Class	Speed Limit (km/h)	Official Plan AADT
Metcalfe Street	2-Lane Urban Arterial (2-UAU)	50	**15,000**
Somerset Street West	2-Lane Urban Arterial (2-UAU)	50	**15,000**

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

4.2.3 Theoretical Roadway Traffic Noise Predictions

Noise predictions were performed with the aid of the MECP 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, and by using existing building locations as noise barriers. In addition to the traffic volumes summarized in Table 1, 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 was taken to be 92% / 8% respectively for all streets
- Reflective intermediate ground surfaces are used
- The study site was treated as having flat or gently sloping topography
- Two noise receptors were strategically placed throughout the development (Figure 2)
- STAMSON parameters can be seen in Figure 3.

5. RESULTS AND CONCLUSIONS

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 2: EXTERIOR NOISE LEVELS DUE TO ROADWAY TRAFFIC SOURCES

Receptor Number	Receptor Location	Noise Level (dBA)	
		Day	Night
1	POW – North Façade	65	58
2	POW – West Façade	68	61

The results of the current study indicate that noise levels will range between 65 and 68 dBA during the daytime period (07:00-23:00) and between 58 and 61 dBA during the nighttime period (23:00-07:00). The highest noise levels occur along the west façade which is nearest and most exposed to Metcalfe Street. Since noise levels exceed the ENCG objective limit of 55 dBA and 50 dBA during the daytime and nighttime respectively, upgraded building components will be required for noise mitigation purposes. Standard double pane windows having a minimum air space of 13 mm will be sufficient for noise attenuation.

Results of the calculation also indicate that the development will require air conditioning, or similar ventilation system, which will allow occupants to keep windows closed and maintain a comfortable living environment, along with a Type D Warning Clause on all Lease, Purchase and Sale Agreements:

> *"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."*

This concludes our 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.

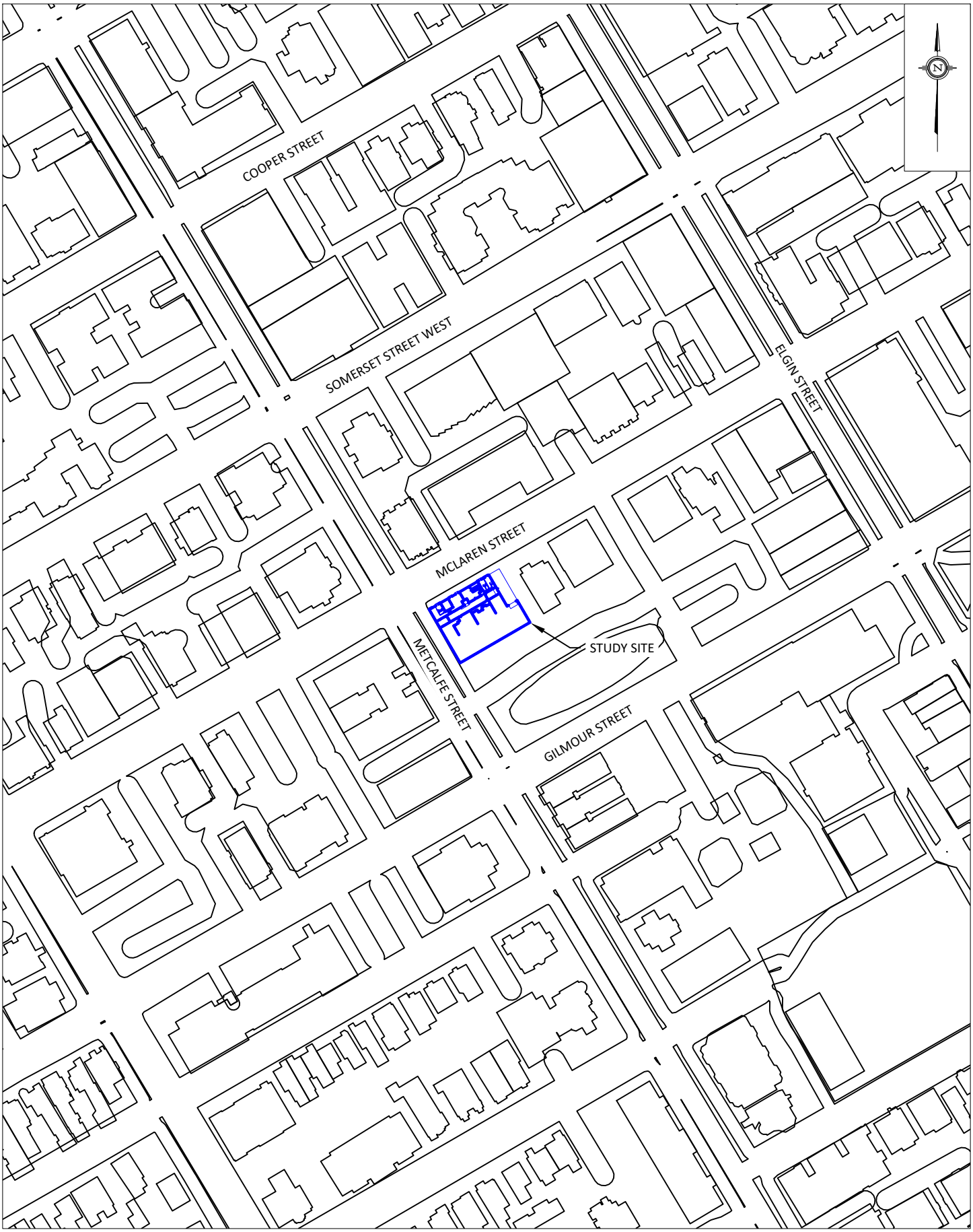
Sincerely,

Gradient Wind Engineering Inc.

Essraa Alqassab, BASc
Junior Environmental Scientist

Joshua Foster, P.Eng.
Lead Engineer

Gradient Wind File #22-260 – Roadway Traffic Noise



GRADIENTWIND
ENGINEERS & SCIENTISTS

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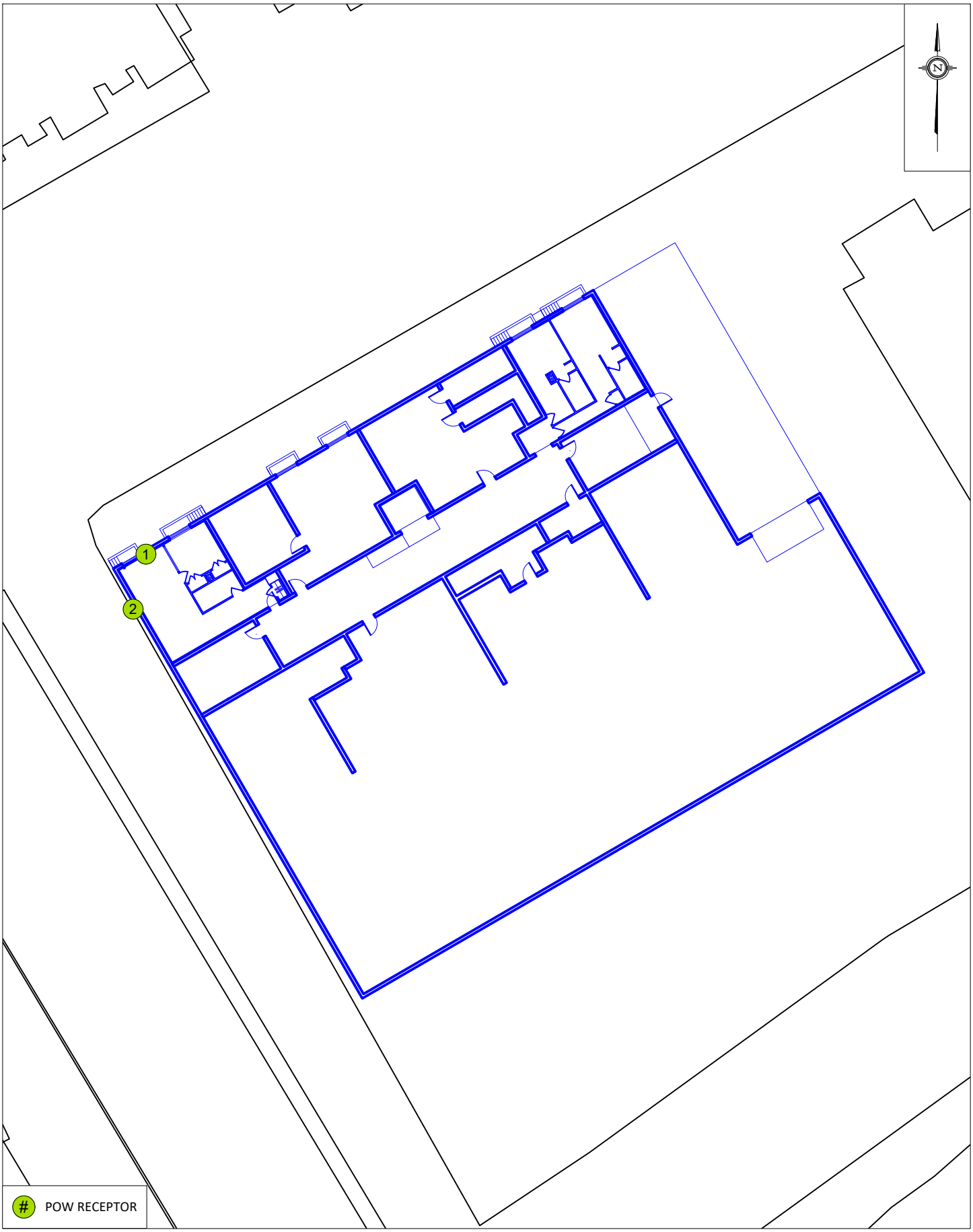
PROJECT	255 METCALFE STREET, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:2000 (APPROX.)
DRAWING NO.	GW22-260-1
DATE	SEPTEMBER 13, 2022
DRAWN BY	E.A.

DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT



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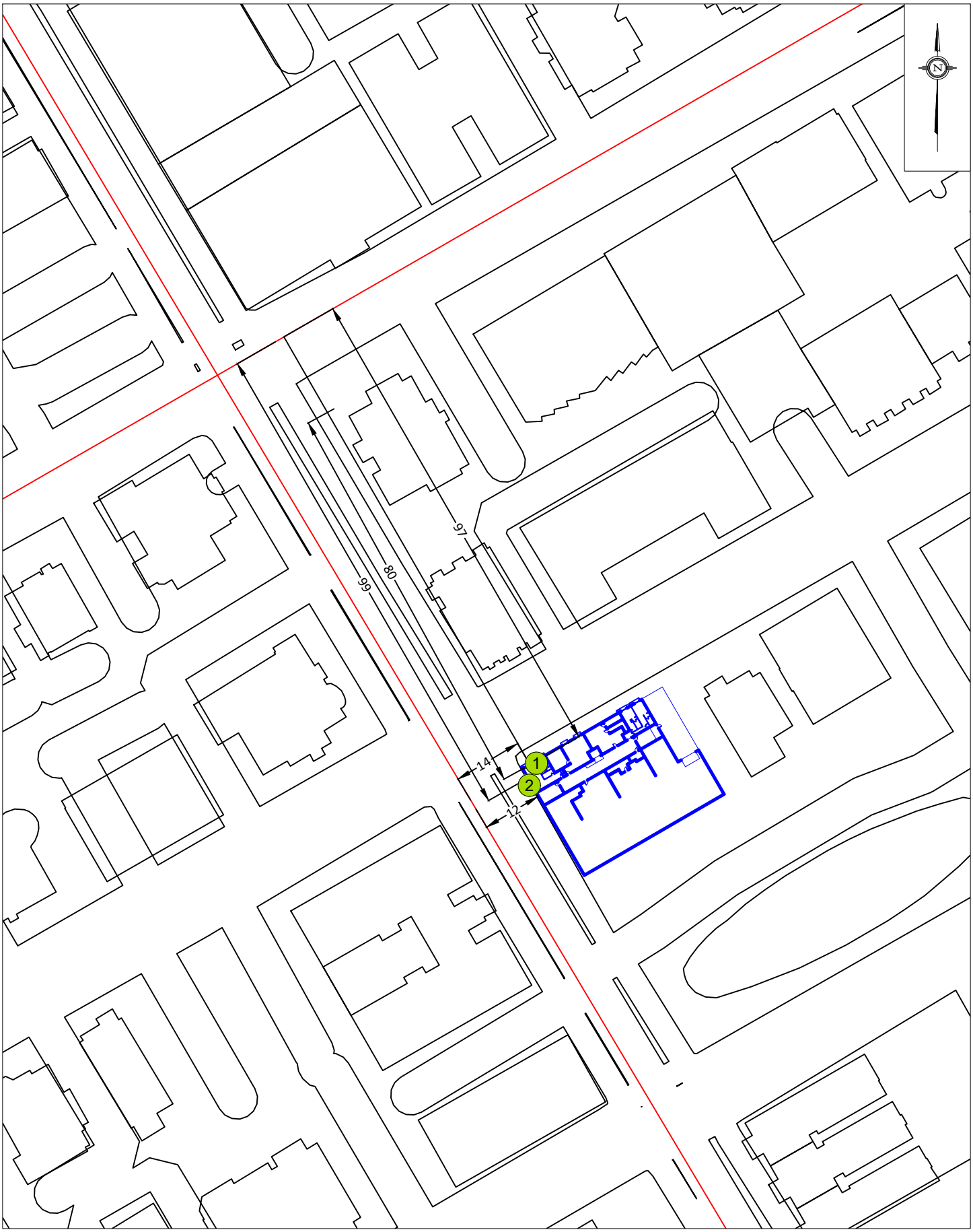
PROJECT	255 METCALFE STREET, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		DESCRIPTION
SCALE	1:400 (APPROX.)	DRAWING NO.	GW22-260-2
DATE	SEPTEMBER 13, 2022	DRAWN BY	E.A.

FIGURE 2:
RECEPTOR LOCATIONS



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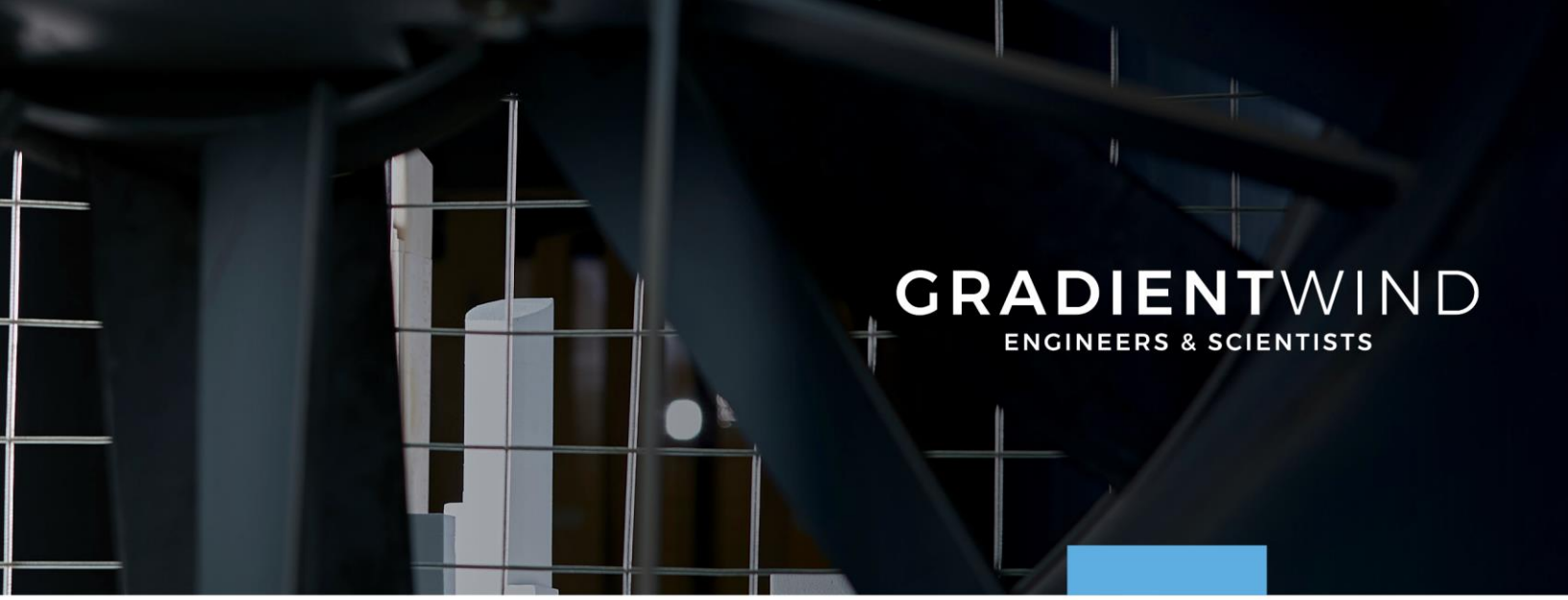
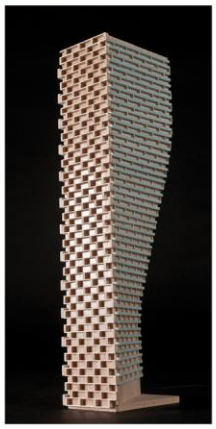
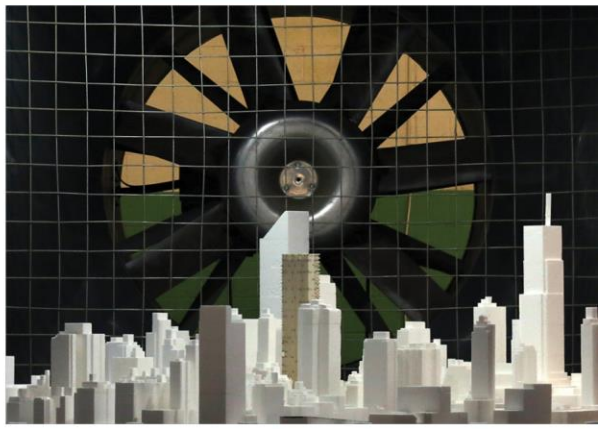
PROJECT	255 METCALFE STREET, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		DESCRIPTION
SCALE	1:1000 (APPROX.)	DRAWING NO.	GW22-260-3
DATE	SEPTEMBER 13, 2022	DRAWN BY	E.A.

FIGURE 3:
STAMSON PARAMETERS







APPENDIX A

STAMSON 5.04 – INPUT AND OUTPUT DATA

127 WALGREEN ROAD, OTTAWA, ON, CANADA K0A 1L0 | 613 836 0934
GRADIENTWIND.COM

```
STAMSON 5.0        NORMAL REPORT        Date: 13-09-2022 11:46:11
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Metcalfe (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 # 1: Metcalfe (day/night)
--------------------------------------------
Angle1   Angle2           :   0.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  15.00 / 15.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Road data, segment # 2: Somerset (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 # 2: Somerset (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  :  97.00 / 97.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :  18.00 m
Barrier receiver distance :  78.00 / 78.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Results segment # 1: Metcalfe (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 65.47 + 0.00) = 65.47 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
     0     90   0.00  68.48   0.00   0.00  -3.01   0.00   0.00   0.00
65.47
-------------------------------------------------------------------------------
--

Segment Leq : 65.47 dBA


Results segment # 2: Somerset (day)
-----------------------------------

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !        1.50 !        1.50 !         1.50
```

```
ROAD (0.00 + 41.83 + 0.00) = 41.83 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  68.48   0.00  -8.11   0.00   0.00   0.00 -18.54
41.83
-------------------------------------------------------------------------
--

Segment Leq : 41.83 dBA

Total Leq All Segments: 65.49 dBA


Results segment # 1: Metcalfe (night)
-------------------------------------

Source height = 1.50 m

ROAD (0.00 + 57.87 + 0.00) = 57.87 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
     0     90   0.00  60.88   0.00   0.00  -3.01   0.00   0.00   0.00
57.87
-------------------------------------------------------------------------
--

Segment Leq : 57.87 dBA


Results segment # 2: Somerset (night)
-------------------------------------

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !        1.50 !        1.50 !         1.50

ROAD (0.00 + 34.24 + 0.00) = 34.24 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
```

```
   -90     90   0.00  60.88   0.00  -8.11   0.00   0.00   0.00 -18.54
34.24
-------------------------------------------------------------------------
--

Segment Leq : 34.24 dBA

Total Leq All Segments: 57.89 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 65.49
                           (NIGHT): 57.89
```

```
STAMSON 5.0        NORMAL REPORT        Date: 13-09-2022 11:49:31
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Metcalfe (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 # 1: Metcalfe (day/night)
----------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  15.00 / 15.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Results segment # 1: Metcalfe (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 68.48 + 0.00) = 68.48 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     90    0.00  68.48   0.00   0.00   0.00   0.00   0.00   0.00
68.48
-------------------------------------------------------------------------------
--
```

```
Segment Leq : 68.48 dBA

Total Leq All Segments: 68.48 dBA

Results segment # 1: Metcalfe (night)
-------------------------------------

Source height = 1.50 m

ROAD (0.00 + 60.88 + 0.00) = 60.88 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  60.88   0.00   0.00   0.00   0.00   0.00   0.00
60.88
-------------------------------------------------------------------------
--

Segment Leq : 60.88 dBA

Total Leq All Segments: 60.88 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 68.48
                           (NIGHT): 60.88
```