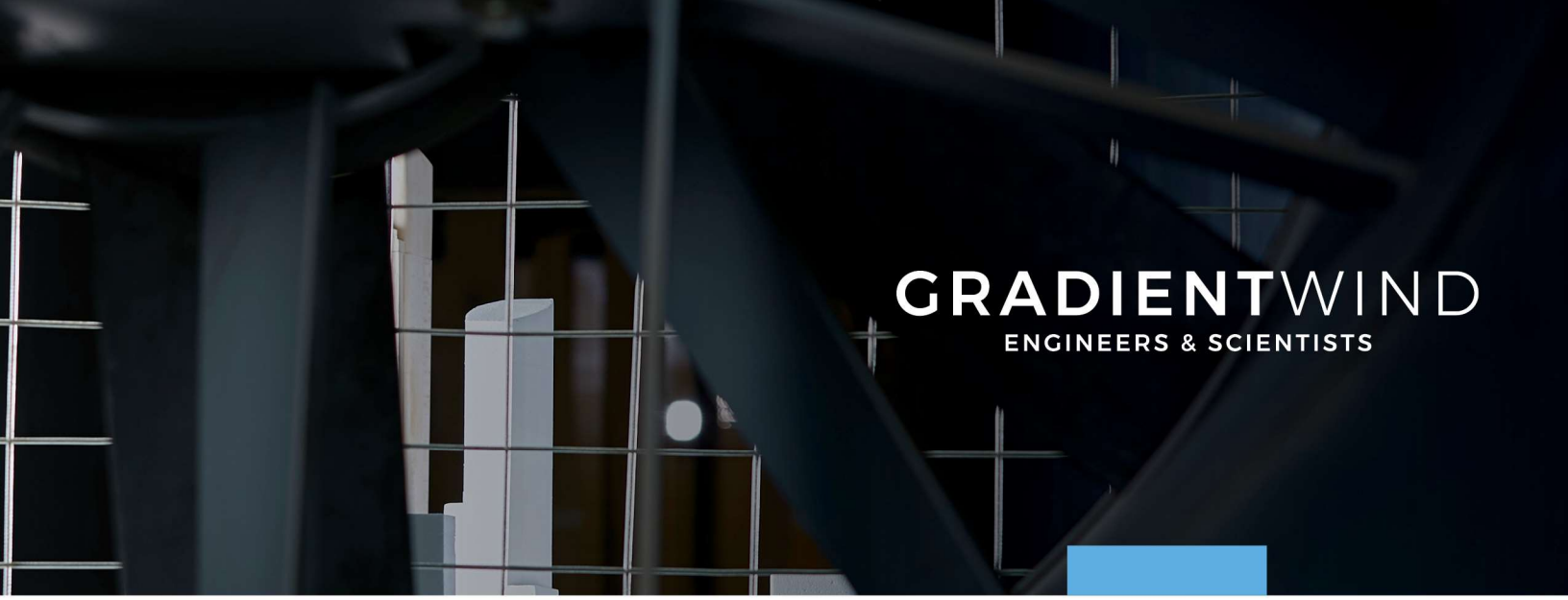
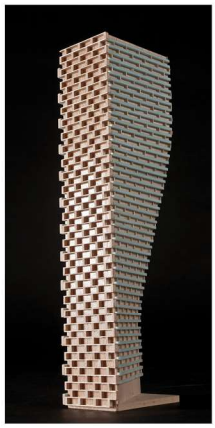


GRADIENTWIND
ENGINEERS & SCIENTISTS

ROADWAY TRAFFIC NOISE ASSESSMENT

44 Eccles Street
Ottawa, Ontario

REPORT: GW21-363 – Traffic Noise



November 22, 2021

PREPARED FOR

Cornerstone Housing for Women
314 Booth Street
Ottawa, ON
K1R 7K2

PREPARED BY

Tanyon Matheson-Fitchett, B.Eng., Junior Environmental Scientist
Joshua Foster, P.Eng., Principal

EXECUTIVE SUMMARY

This report describes a roadway traffic noise assessment for a proposed residential redevelopment of the existing 4-storey office building at 44 Eccles Street in Ottawa, Ontario. The study site is located on a rectangular parcel of land with Eccles Street to the north. Separated by a row of houses on either side, Booth Street and Lebreton Street North are located approximately 30 meters to the west and east, respectively. The major source of roadway traffic noise is Booth Street to the west of the site, classified as a major collector roadway. Roadways beyond 100 metres of the study site are not included as sources influencing the study site as per ENCG Section 2.1. 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 (MECP) 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) site plan drawings provided by Cahdco in October 2021.

The results of the current analysis indicate that noise levels will range between 51 and 57 dBA during the daytime period (07:00-23:00) and between 45 and 49 dBA during the nighttime period (23:00-07:00). The highest noise level (57 dBA) occurs at the west façade, which is nearest and most exposed to Booth Street. As noise levels do not exceed 65 dBA at the building façades, standard building components in conformance with the Ontario Building Code (OBC 2020) will provide sufficient attenuation and upgraded building components will not be required.

Results of the calculations also indicate that the development will require forced air heating with provision for the installation of central air conditioning. This would allow occupants to keep windows closed and maintain a comfortable living environment if installed at the owner's discretion. A Warning Clause[1] will also be required on all Lease, Purchase and Sale Agreements, as summarized below in Section 6.

[1] City of Ottawa Environmental Noise Control Guidelines, January 2016

Noise levels at the Outdoor Living Area are below 55 dBA, therefore noise control measures are not required for this space.

Regarding stationary noise, impacts from the surroundings on the study building are expected to be minimal. Sources associated with commercial buildings to the north 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. Impacts from the development on the surroundings can be minimized by judicious placement mechanical equipment, 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.

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Cahdco on behalf of Cornerstone Housing for Women to undertake a roadway traffic noise assessment for a proposed residential redevelopment of the existing 4-storey office building at 44 Eccles Street in Ottawa, Ontario. This report summarizes the methodology, results, and recommendations related to the assessment of exterior and interior noise levels generated by local roadway traffic.

Our work is based on theoretical noise calculation methods conforming to the City of Ottawa[2] and Ministry of the Environment, Conservation and Parks (MECP)[3] guidelines. Noise calculations were based on site plan drawings received from Cahdco in October 2021, with future traffic volumes corresponding to the City of Ottawa's Official Plan (OP) roadway classifications.

2. TERMS OF REFERENCE

The focus of this roadway traffic noise assessment is a proposed residential redevelopment of the existing 4-storey office building at 44 Eccles Street in Ottawa, Ontario. The study site is located in the middle of a rectangular parcel of land with Eccles Street to the north. Separated by a row of houses on either side, Booth Street and Lebreton Street North are located approximately 30 meters to the west and east, respectively. Outdoor parking and an amenity area are located on the south side of the building. The site is surrounded by low-rise residential buildings in all compass directions, with low rise commercial buildings along Somerset Street West to the north.

The major source of roadway traffic noise is Booth Street to the west of the site, classified as a major collector roadway. Roadways beyond 100 metres of the study site are not included as sources influencing the study site as per ENCG Section 2.1. Figure 1 illustrates a complete site plan with surrounding context.

[2] City of Ottawa Environmental Noise Control Guidelines, January 2016
[3] 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 levels on the study building 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 (2×10^{-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) [4]

Type of Space	Time Period	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[5]. A closed window due to a ventilation requirement will bring noise levels down to achieve an acceptable indoor environment[6]. 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[7].

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.

[4] Adapted from ENCG 2016 – Tables 2.2b and 2.2c
[5] Burberry, P.B. (2014). Mitchell's Environment and Services. Routledge, Page 125
[6] MECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.8
[7] MECP, 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 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. 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 or absorptive based on the source-receiver path for each individual receiver.
- Topography was assumed to be a flat/gentle slope surrounding the study building.
- Receptor height was taken to be 12.5 metres at Level 4 for the centre of the window for Receptors 1-3, and 1.5 m for ground-level Receptor 4.
- Existing houses and buildings were modelled as barriers, partially obstructing receiver exposure to noise sources.
- Noise receptors were strategically placed at 4 locations around the study area (see Figure 2).
- Receptor distances and exposure angles are illustrated in Figures 3 and 4.

4.2.1 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[8] 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.

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

TABLE 2: ROADWAY TRAFFIC DATA

Segment	Roadway Traffic Data	Speed Limit (km/h)	Traffic Volumes
Booth Street	2-Lane Major Collector	40	**12,000**

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	12.5	POW – 4th Floor – North Façade	55	48
2	12.5	POW – 4th Floor – West Façade	57	49
3	12.5	POW – 4th Floor – East Façade	52	45
4	1.5	OLA – Ground-Level – South Side	51	N/A*

*Nighttime noise levels not considered at Outdoor Living Areas as per ENCG

The results of the current analysis indicate that noise levels will range between 51 and 57 dBA during the daytime period (07:00-23:00) and between 45 and 49 dBA during the nighttime period (23:00-07:00). The highest noise level (57 dBA) occurs at the west façade, which is nearest and most exposed to Booth Street.

6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current analysis indicate that noise levels will range between 51 and 57 dBA during the daytime period (07:00-23:00) and between 45 and 49 dBA during the nighttime period (23:00-07:00). The highest noise level (57 dBA) occurs at the west façade, which is nearest and most exposed to Booth Street. As noise levels do not exceed 65 dBA at the building façades, standard building components in conformance with the Ontario Building Code (OBC 2020) will provide sufficient attenuation and upgraded building components will not be required.

Results of the calculations also indicate that the development will require forced air heating with provision for the installation of central air conditioning. This would allow occupants to keep windows closed and maintain a comfortable living environment' if installed at their discretion. The following Warning Clause[9] will also be required on all Lease, Purchase and Sale Agreements, as summarized below:

> *"This dwelling unit has been designed with the provision for adding central air conditioning at the occupant's discretion. Installation of central air conditioning by the occupant in low and medium density developments will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment."*

Noise levels at the Outdoor Living Area are below 55 dBA, therefore noise control measures are not required for this space.

Regarding stationary noise, impacts from the surroundings on the study building are expected to be minimal. Sources associated with commercial buildings to the north 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. Impacts from the development on the surroundings can be minimized by judicious placement mechanical equipment, or the incorporation of silencers and noise screens as necessary. It is recommended that any

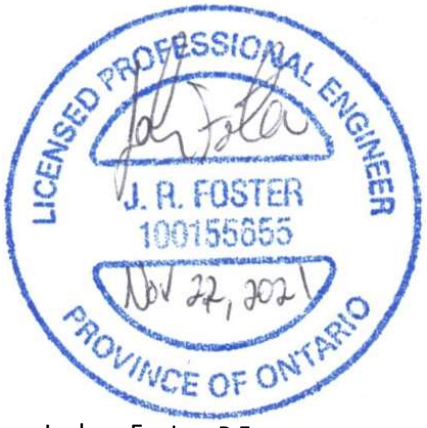
[9] City of Ottawa Environmental Noise Control Guidelines, January 2016

large pieces of HVAC equipment be placed in the middle of the roof, avoiding line of site with the surrounding residential dwellings.

This concludes our roadway 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,

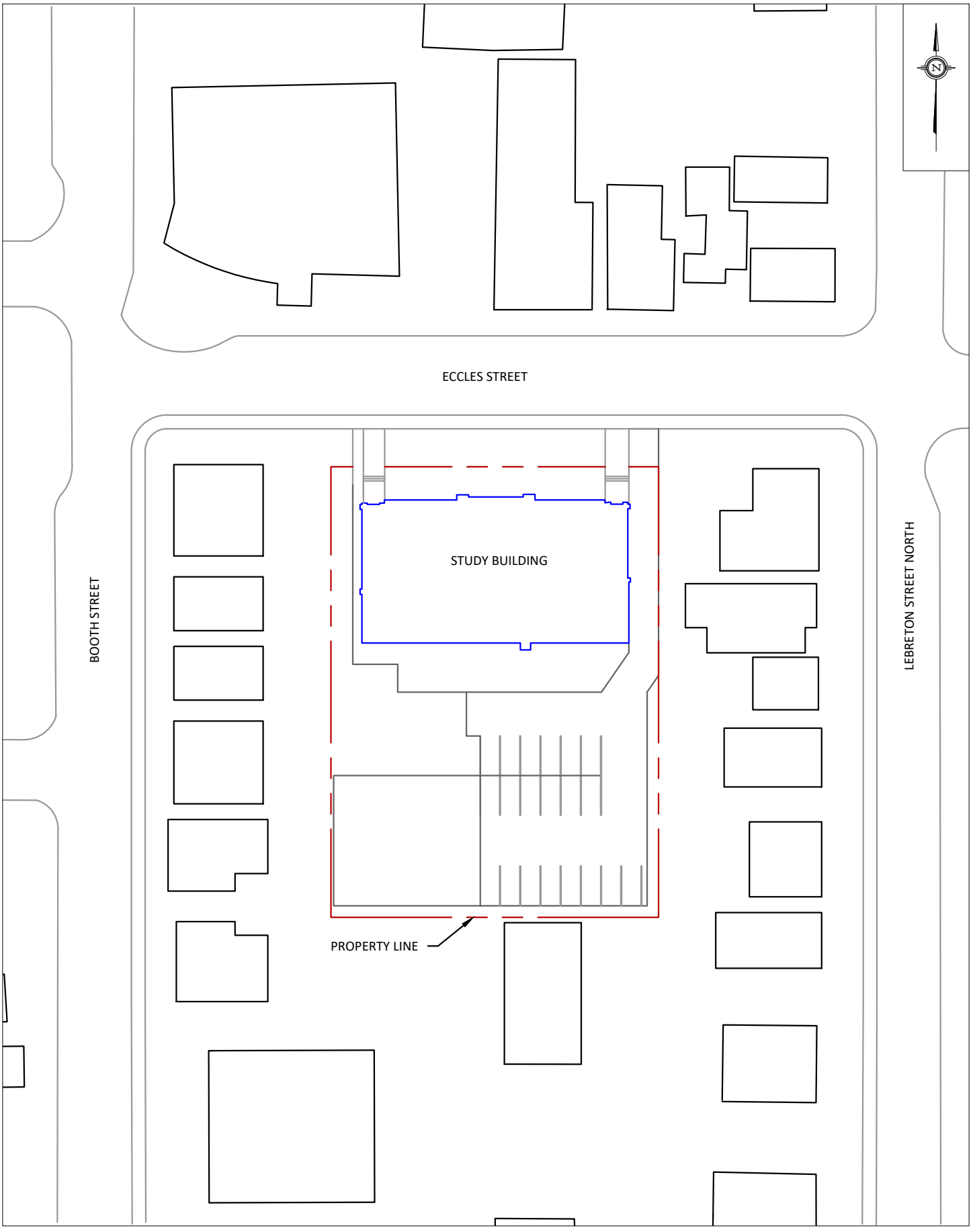
Gradient Wind Engineering Inc.



Tanyon Matheson-Fitchett, B.Eng.
Junior Environmental Scientist

Joshua Foster, P.Eng.
Principal

Gradient Wind File No.: 21-363 - Traffic Noise



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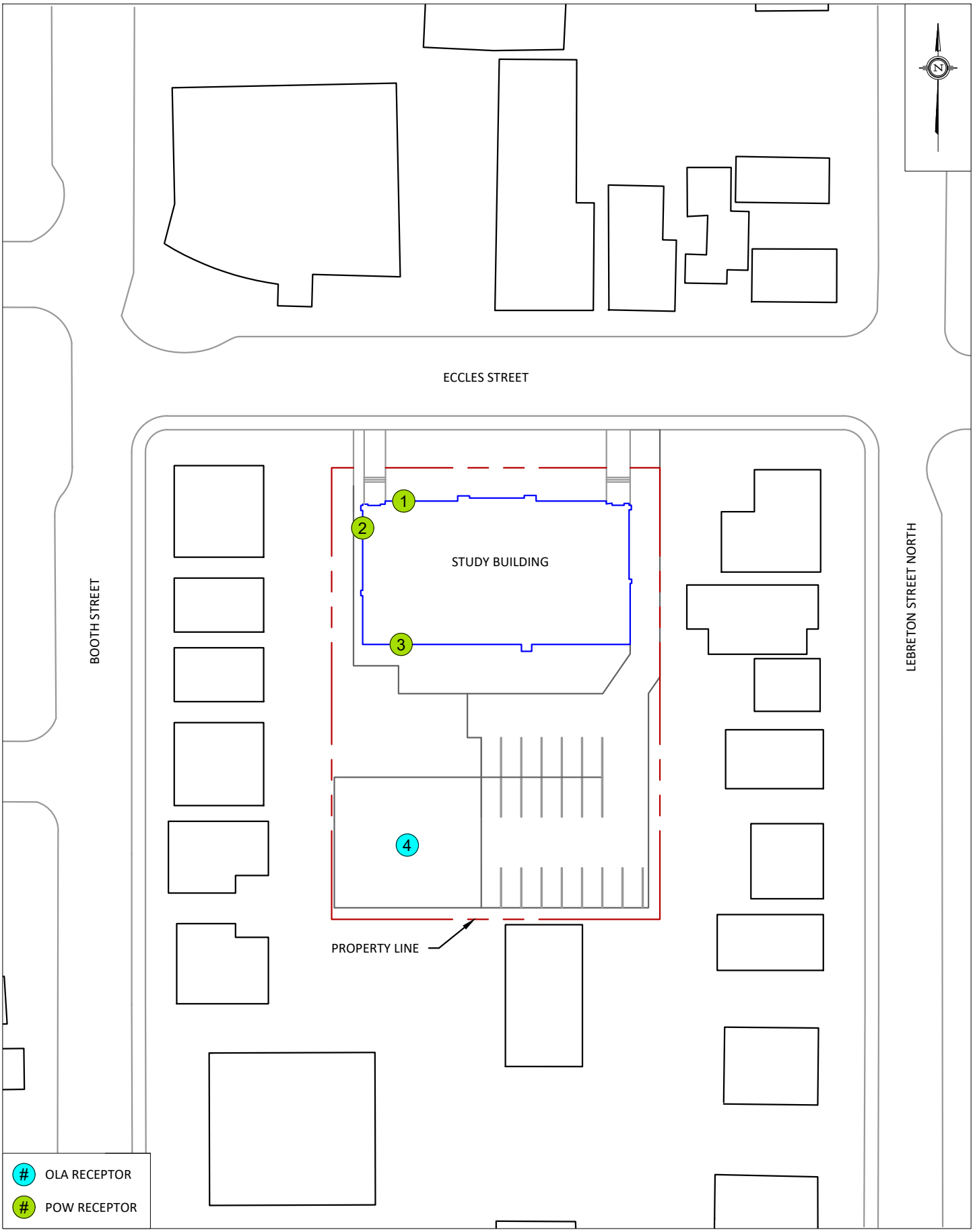
PROJECT	44 ECCLES STREET, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:700 (APPROX.)
DRAWING NO.	GW21-363-1
DATE	NOVEMBER 15, 2021
DRAWN BY	T.M.F.

DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT



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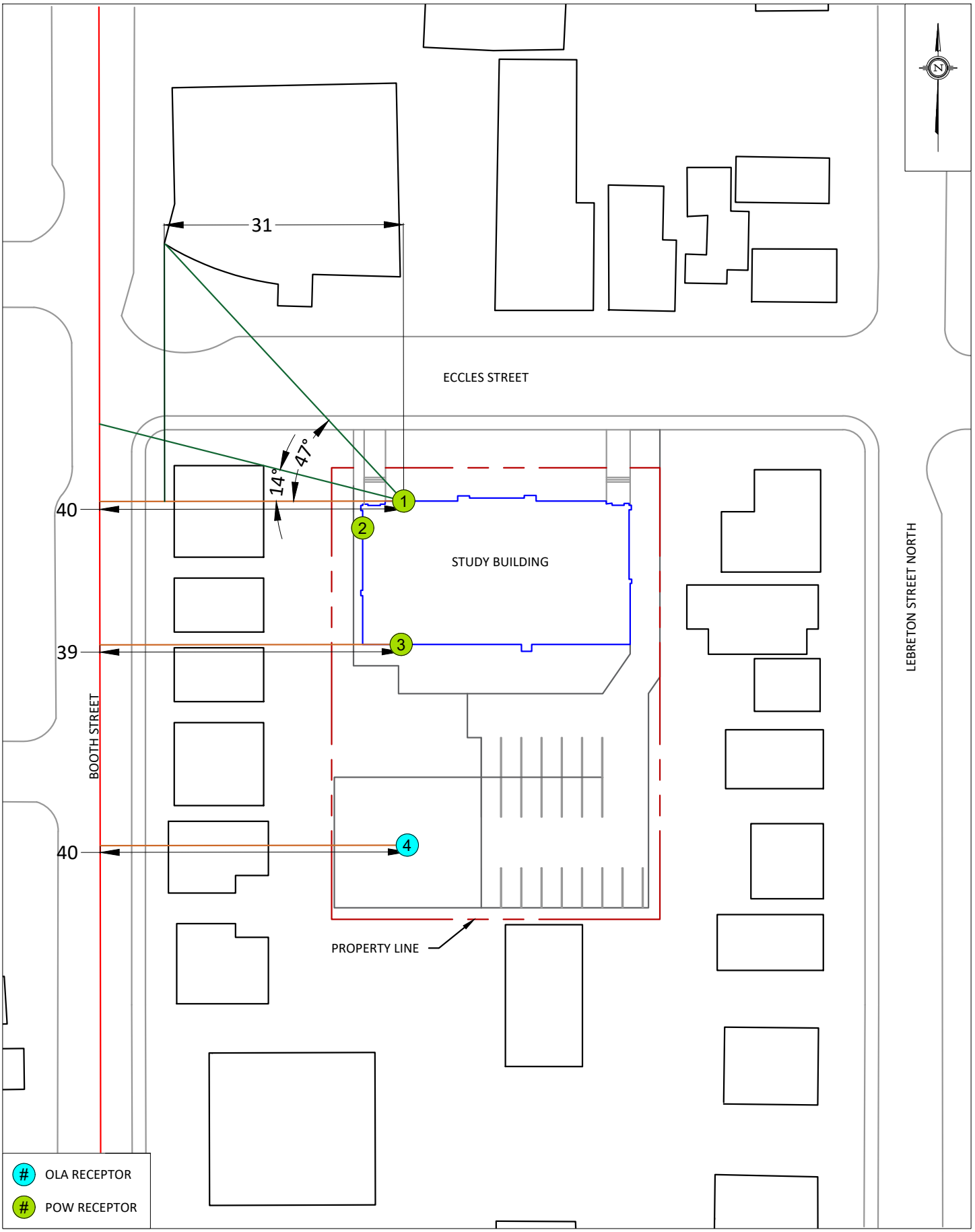
PROJECT	44 ECCLES STREET, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:700 (APPROX.)
DRAWING NO.	GW21-363-2
DATE	NOVEMBER 15, 2021
DRAWN BY	T.M.F.

DESCRIPTION

FIGURE 2:
RECEPTOR LOCATIONS



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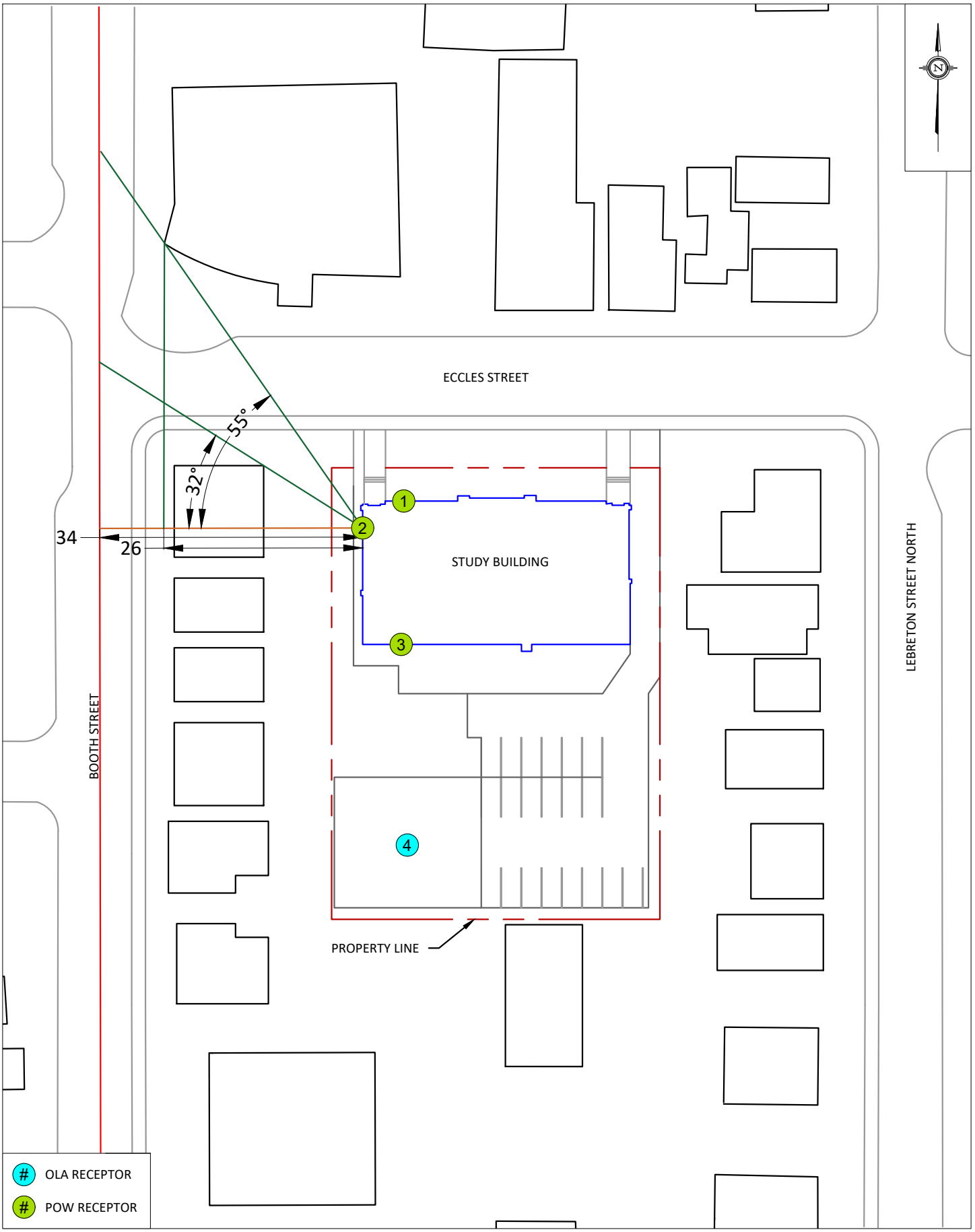
PROJECT	44 ECCLES STREET, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:700 (APPROX.)
DRAWING NO.	GW21-363-3
DATE	NOVEMBER 15, 2021
DRAWN BY	T.M.F.

DESCRIPTION

FIGURE 3:
RECEPTORS 1, 3, AND 4
STAMSON INPUT PARAMETERS



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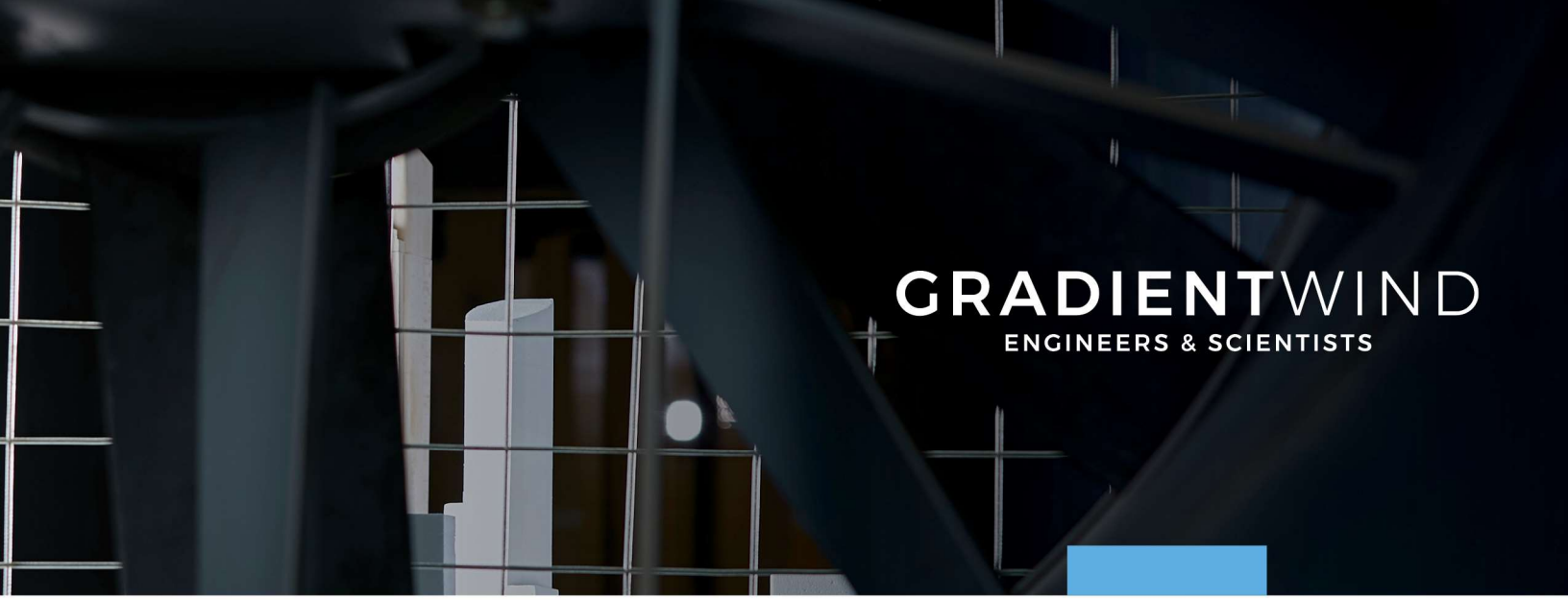
PROJECT	44 ECCLES STREET, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:700 (APPROX.)
DRAWING NO.	GW21-363-4
DATE	NOVEMBER 15, 2021
DRAWN BY	T.M.F.

DESCRIPTION

FIGURE 4:
RECEPTOR 2
STAMSON INPUT PARAMETERS



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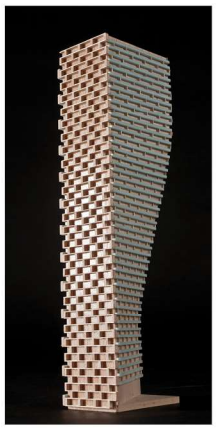

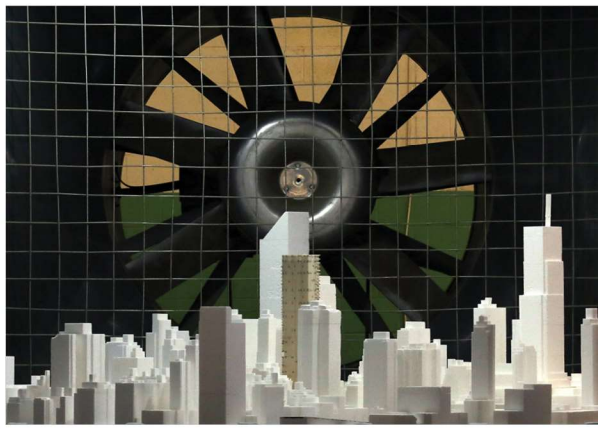

APPENDIX A

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: 15-11-2021 12:12:37
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Booth1 (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  :    40 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  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: Booth1 (day/night)
----------------------------------------
Angle1   Angle2           :   0.00 deg   14.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  40.00 / 40.00  m
Receiver height           :  12.50 / 12.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 2: Booth2 (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  :    40 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  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: Booth2 (day/night)
----------------------------------------
Angle1   Angle2           :  14.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  40.00 / 40.00  m
Receiver height           :  12.50 / 12.50  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :  47.00 deg   Angle2 : 90.00 deg
Barrier height            :  12.00 m
Barrier receiver distance :  31.00 / 31.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Results segment # 1: Booth1 (day)
---------------------------------

Source height = 1.50 m

ROAD (0.00 + 44.27 + 0.00) = 44.27 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     14   0.00  65.72   0.00  -4.26 -11.09   0.00  -6.10   0.00  44.27
-------------------------------------------------------------------------------

Segment Leq : 44.27 dBA
```

```
Results segment # 2: Booth2 (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 !       12.50 !        3.97 !         3.97

ROAD (54.09 + 39.99 + 0.00) = 54.26 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    14     47   0.00  65.72   0.00  -4.26  -7.37   0.00   0.00   0.00  54.09
-------------------------------------------------------------------------------
    47     90   0.00  65.72   0.00  -4.26  -6.22   0.00   0.00 -15.25  39.99
-------------------------------------------------------------------------------

Segment Leq : 54.26 dBA

Total Leq All Segments: 54.67 dBA

Results segment # 1: Booth1 (night)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 42.77 + 0.00) = 42.77 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     14   0.00  58.12   0.00  -4.26 -11.09   0.00   0.00   0.00  42.77
-------------------------------------------------------------------------------

Segment Leq : 42.77 dBA
```

```
Results segment # 2: Booth2 (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 !       12.50 !        3.97 !         3.97

ROAD (46.49 + 32.39 + 0.00) = 46.66 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    14     47   0.00  58.12   0.00  -4.26  -7.37   0.00   0.00   0.00  46.49
-------------------------------------------------------------------------------
    47     90   0.00  58.12   0.00  -4.26  -6.22   0.00   0.00 -15.25  32.39
-------------------------------------------------------------------------------

Segment Leq : 46.66 dBA

Total Leq All Segments: 48.15 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 54.67
                           (NIGHT): 48.15
```

```
STAMSON 5.0        NORMAL REPORT        Date: 15-11-2021 12:17:22
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Booth1 (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  :    40 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  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: Booth1 (day/night)
----------------------------------------
Angle1   Angle2           : -90.00 deg   32.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1 / 1
House density             :     80 %
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  34.00 / 34.00  m
Receiver height           :  12.50 / 12.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 2: Booth2 (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  :    40 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  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: Booth2 (day/night)
----------------------------------------
Angle1   Angle2           :  32.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  34.00 / 34.00  m
Receiver height           :  12.50 / 12.50  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :  55.00 deg   Angle2 : 90.00 deg
Barrier height            :  12.00 m
Barrier receiver distance :  26.00 / 26.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Results segment # 1: Booth1 (day)
---------------------------------

Source height = 1.50 m

ROAD (0.00 + 54.31 + 0.00) = 54.31 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     32   0.00  65.72   0.00  -3.55  -1.69   0.00  -6.16   0.00  54.31
-------------------------------------------------------------------------------

Segment Leq : 54.31 dBAResults segment # 2: Booth2 (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 !       12.50 !        4.08 !         4.08

ROAD (53.23 + 40.30 + 0.00) = 53.44 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    32     55   0.00  65.72   0.00  -3.55  -8.94   0.00   0.00   0.00  53.23
-------------------------------------------------------------------------------
    55     90   0.00  65.72   0.00  -3.55  -7.11   0.00   0.00 -14.75  40.30
-------------------------------------------------------------------------------

Segment Leq : 53.44 dBA

Total Leq All Segments: 56.91 dBA

Results segment # 1: Booth1 (night)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 46.71 + 0.00) = 46.71 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     32   0.00  58.12   0.00  -3.55  -1.69   0.00  -6.16   0.00  46.71
-------------------------------------------------------------------------------

Segment Leq : 46.71 dBA
```

```
Results segment # 2: Booth2 (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 !       12.50 !        4.08 !         4.08

ROAD (45.63 + 32.70 + 0.00) = 45.84 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    32     55   0.00  58.12   0.00  -3.55  -8.94   0.00   0.00   0.00  45.63
-------------------------------------------------------------------------------
    55     90   0.00  58.12   0.00  -3.55  -7.11   0.00   0.00 -14.75  32.70
-------------------------------------------------------------------------------

Segment Leq : 45.84 dBA

Total Leq All Segments: 49.31 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 56.91
                           (NIGHT): 49.31
```

```
STAMSON 5.0        NORMAL REPORT        Date: 15-11-2021 12:20:14
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Booth1 (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  :    40 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  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: Booth1 (day/night)
----------------------------------------
Angle1   Angle2           : -90.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1 / 1
House density             :     80 %
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  39.00 / 39.00  m
Receiver height           :  12.50 / 12.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Results segment # 1: Booth1 (day)
---------------------------------

Source height = 1.50 m

ROAD (0.00 + 52.45 + 0.00) = 52.45 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90      0   0.00  65.72   0.00  -4.15  -3.01   0.00  -6.11   0.00  52.45
-------------------------------------------------------------------------------

Segment Leq : 52.45 dBA

Total Leq All Segments: 52.45 dBA

Results segment # 1: Booth1 (night)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 44.85 + 0.00) = 44.85 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90      0   0.00  58.12   0.00  -4.15  -3.01   0.00  -6.11   0.00  44.85
-------------------------------------------------------------------------------

Segment Leq : 44.85 dBA

Total Leq All Segments: 44.85 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 52.45
                           (NIGHT): 44.85
```

```
STAMSON 5.0        NORMAL REPORT        Date: 15-11-2021 12:13:12
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT
STAMSON 5.0        NORMAL REPORT        Date: 15-11-2021 12:22:50
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Booth1 (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  :    40 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  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: Booth1 (day/night)
----------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1 / 1
House density             :     80 %
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  40.00 / 40.00  m
Receiver height           :   1.50 / 12.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Results segment # 1: Booth1 (day)
---------------------------------

Source height = 1.50 m

ROAD (0.00 + 51.09 + 0.00) = 51.09 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.66  65.72   0.00  -7.07  -1.46   0.00  -6.10   0.00  51.09
-------------------------------------------------------------------------------

Segment Leq : 51.09 dBA

Total Leq All Segments: 51.09 dBA

Results segment # 1: Booth1 (night)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 45.52 + 0.00) = 45.52 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.33  58.12   0.00  -5.67  -0.83   0.00  -6.10   0.00  45.52
-------------------------------------------------------------------------------

Segment Leq : 45.52 dBA

Total Leq All Segments: 45.52 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 51.09
                           (NIGHT): 45.52
```