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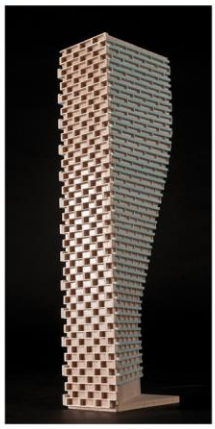
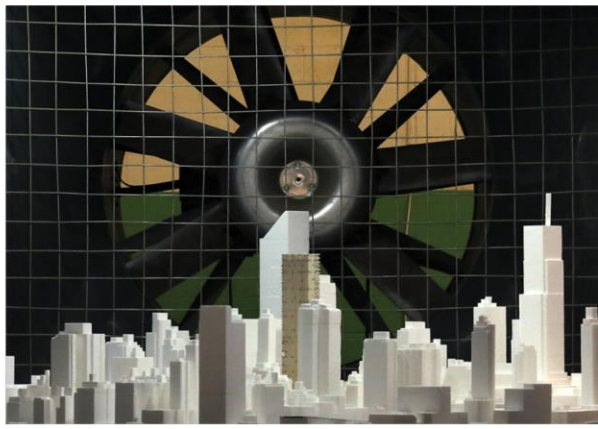
ROADWAY TRAFFIC NOISE ASSESSMENT

246 Gilmour Street
Ottawa, Ontario

GRADIENT WIND REPORT: 19-183 – Traffic Noise





October 18, 2019

PREPARED FOR

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EXECUTIVE SUMMARY

This report describes a roadway traffic noise assessment undertaken in support of a joint Zoning By-law Amendment (ZBA) and Site Plan Application (SPA) for a proposed low-rise residential building located at 246 Gilmour Street in Ottawa, Ontario. The proposed development is a 6-storey multi-unit residential building overlooking Gilmour Street. Residential units are provided on all levels above grade. The basement level comprises storage, a lobby and building support facilities. The rooftop provides terraces at the north and south sides. The primary source of traffic noise on the development is Metcalfe Street to the west. 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) architectural drawings prepared by Robertson Martin Architects dated September 27, 2019

The results of the current analysis indicate that noise levels will range between 48 and 58 dBA during the daytime period (07:00-23:00) and between 40 and 51 dBA during the nighttime period (23:00-07:00). The highest noise level (58 dBA) occurs at the north façade, which is nearest to Gilmour Street and most exposed to Metcalfe Street.

Results of the calculations also indicate the development will require forced air heating with provisions for central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. The following Warning Clause will also be required on all Lease, Purchase and Sale Agreements, as summarized in Section 6. Noise levels at the roof top terrace are expected to fall below 55 dBA during the daytime period. Therefore, no acoustic mitigation is required.

As the building design progresses, the stationary noise impacts of the building on the surroundings would be considered. Stationary noise sources associated with the development are expected to comprise of DX Split Air Conditioning units. These sources are not expected to be a concern at noise sensitive spaces and surrounding properties, provided the following are considered in the design: judicious selection of the equipment, locating the equipment on a high roof away from nearby residential receptors, and where

necessary, installing silencers or noise screens. Installation of the equipment should be done in accordance with NPC-216 Residential Air Conditioning Devices.

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Epcon Enterprises to undertake a roadway traffic noise assessment in support of a joint Zoning By-law Amendment (ZBA) and Site Plan Application (SPA) for a proposed low-rise residential building located at 246 Gilmour 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[1] and Ministry of the Environment, Conservation and Parks (MECP)[2] guidelines. Noise calculations were based on architectural drawings prepared by Robertson Martin Architects, 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 multi-unit residential building located at 246 Gilmour Street in Ottawa, Ontario. The development comprises a 6-storey rectangular planform residential building. Residential units are provided on all levels above grade. The basement level comprises storage, a lobby and building support facilities. The rooftop provides terraces at the north and south sides. The floorplate steps back at the north side of Level 4 to provide a balcony. The development site is located on a rectangular parcel of land bounded by Gilmour Street to the north, an existing parking lot to the east, Lewis Street to the south and existing apartment buildings to the west. Surrounding the site are a mix of low-rise and medium-rise residential and commercial buildings.

The rooftop terrace associated with the development was included in the assessment as an outdoor living area (OLA). The primary source of traffic noise on the development is Metcalfe Street to the west. Figure 1 illustrates a complete site plan with surrounding context.

As the building design progresses, the stationary noise impacts of the building on the surroundings would be considered. Stationary noise sources associated with the development are expected to comprise of DX

[1] City of Ottawa Environmental Noise Control Guidelines, January 2016
[2] Ontario Ministry of the Environment and Climate Change – Environmental Noise Guidelines, Publication NPC-300, Queens Printer for Ontario, Toronto, 2013

Split Air Conditioning units. These sources are not expected to be a concern at noise sensitive spaces and surrounding properties, provided the following are considered in the design: judicious selection of the equipment, locating the equipment on a high roof away from nearby residential receptors, and where necessary, installing silencers or noise screens. Installation of the equipment should be done in accordance with NPC-216 Residential Air Conditioning Devices.

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 (2×10^{-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. Based on Gradient Wind's experience, more comfortable indoor noise levels should be targeted, towards 42 and 37 dBA, respectively, to control peak noise and deficiencies in building envelope construction.

TABLE 1: INDOOR SOUND LEVEL CRITERIA (ROAD) [3]

Type of Space	Time Period	Leq (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[4]. A closed window due to a ventilation requirement will bring noise levels down to achieve an acceptable indoor environment[5]. 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[6].

[3] Adapted from ENCG 2016 – Tables 2.2b and 2.2c
[4] Burberry, P.B. (2014). Mitchell's Environment and Services. Routledge, Page 125
[5] MOECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.8
[6] MOECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.1.3

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.

4.2.2 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 due to the presence of hard (paved) ground.
- Topography was assumed to be a flat/gentle slope surrounding the study building.
- Receptor height was taken to be 16.74 metres above grade at the 6th storey for the centre of the plane of window for Receptors 1-3, and 19.79 meters above grade for the roof top terrace outdoor living area (OLA) for Receptor 4.
- For select sources where appropriate, Receptors 1-4 considered the surrounding buildings as a barrier partially or fully obstructing exposure to the source as illustrated by exposure angles in Figures 3 and 4.
- 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.

4.2.3 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[7] which provide additional details on future roadway expansions. Average Annual Daily Traffic (AADT) volumes are then based on data in Table B1 of the ENCG for each roadway classification. Table 2 (below) summarizes the AADT values used for each roadway included in this assessment.

TABLE 2: ROADWAY TRAFFIC DATA

Segment	Roadway Traffic Data	Speed Limit (km/h)	Traffic Volumes
Metcalfe Street	2-Lane Urban Arterial Undivided (2-UAU)	50	**15,000**

5. ROADWAY TRAFFIC NOISE RESULTS

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	16.74	POW – 6th Floor – North Façade	58	51
2	16.74	POW – 6th Floor – West Façade	48	40
3	16.74	POW – 6th Floor – South Façade	56	48
4	19.79	OLA – Roof Top Terrace	48	N/A

N/A = Nighttime noise levels for the OLA are not considered as per ENCG

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

The results of the current analysis indicate that noise levels will range between 48 and 58 dBA during the daytime period (07:00-23:00) and between 40 and 51 dBA during the nighttime period (23:00-07:00). The highest noise level (58 dBA) occurs at the north façade, which is nearest to Gilmour Street and most exposed to Metcalfe Street. Since noise levels are less than 65 dBA at the building façade, standard building components in compliance with Ontario Building Code standards will be sufficient to attenuate noise levels indoors when windows are closed.

The noise levels predicted due to roadway traffic are between 55 dBA and 65 dBA for the development. Therefore, this building will require forced air heating with provisions for central air conditioning, which if installed at the owner's discretion, will allow building 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. As for the rooftop terrace, noise levels are expected to be below the noise level criteria for OLAs. Therefore, no acoustic mitigation is required for the roof top terrace.

6. DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

The results of the current analysis indicate that noise levels will range between 48 and 58 dBA during the daytime period (07:00-23:00) and between 40 and 51 dBA during the nighttime period (23:00-07:00). The highest noise level (58 dBA) occurs at the north façade, which is nearest to Gilmour Street and most exposed to Metcalfe Street.

Results of the calculations also indicate that standard building components will be sufficient, however the development will require forced air heating with provisions for central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. The following Warning Clause will also be required on all Lease, Purchase and Sale Agreements, as summarized below:

> *"Purchasers/tenants are advised that sound levels due to increasing road traffic may, on occasion, interfere with some activities of the dwelling occupants, as the sound levels exceed the sound level limits of the City and the Ministry of the Environment, Conservation and Parks.*

This dwelling unit has also been designed with forced air heating with provisions for central air conditioning at the occupant's discretion. These noise measures will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the City and the Ministry of Environment, Conservation and Parks.

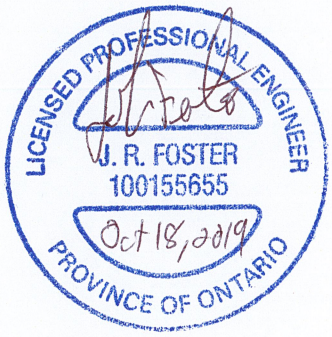
To ensure that provincial sound level limits are not exceeded, it is important to maintain these sound attenuation features."

Noise levels at the rooftop terrace are expected to fall below 55 dBA during the daytime period. Therefore, no acoustic mitigation is required.

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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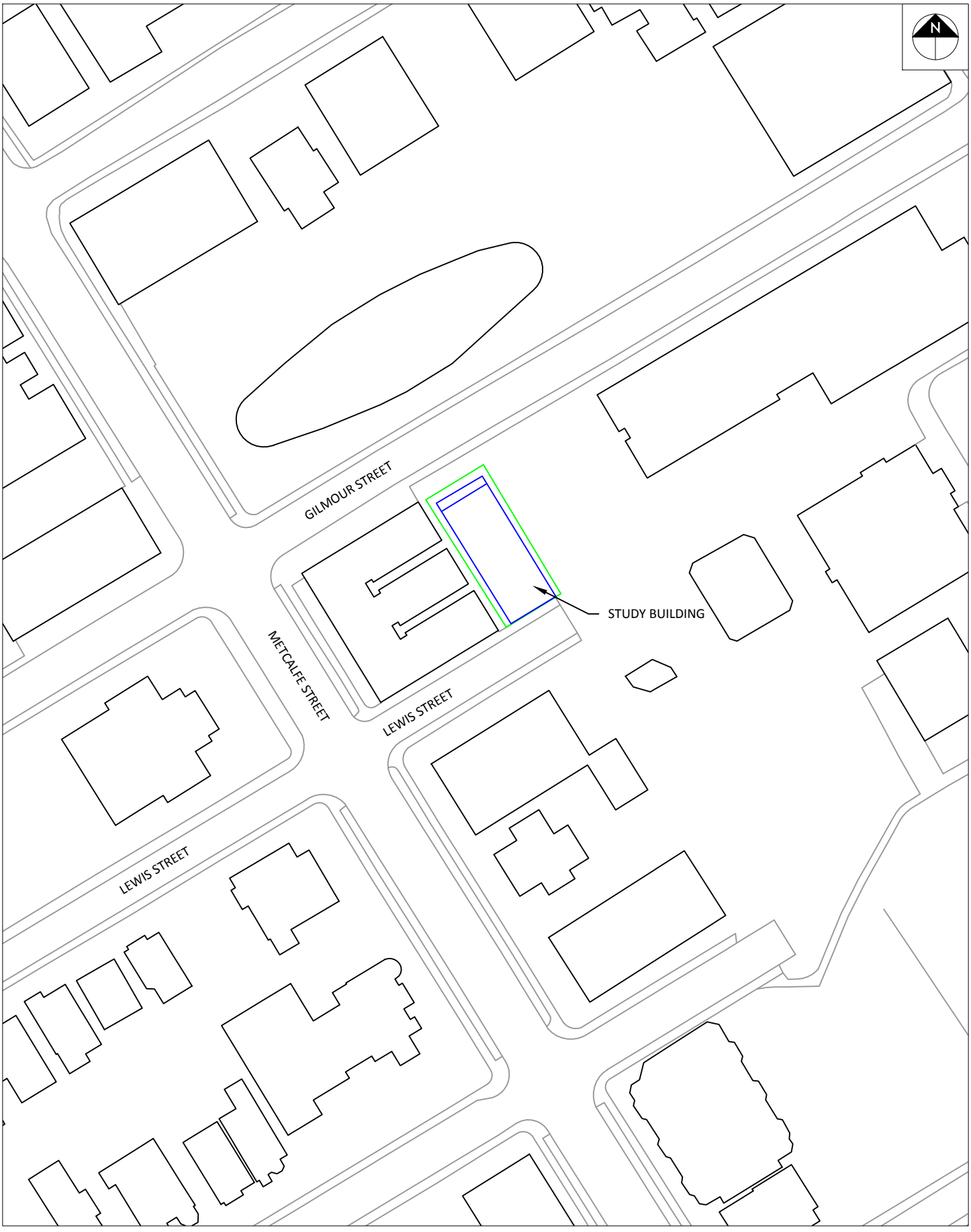

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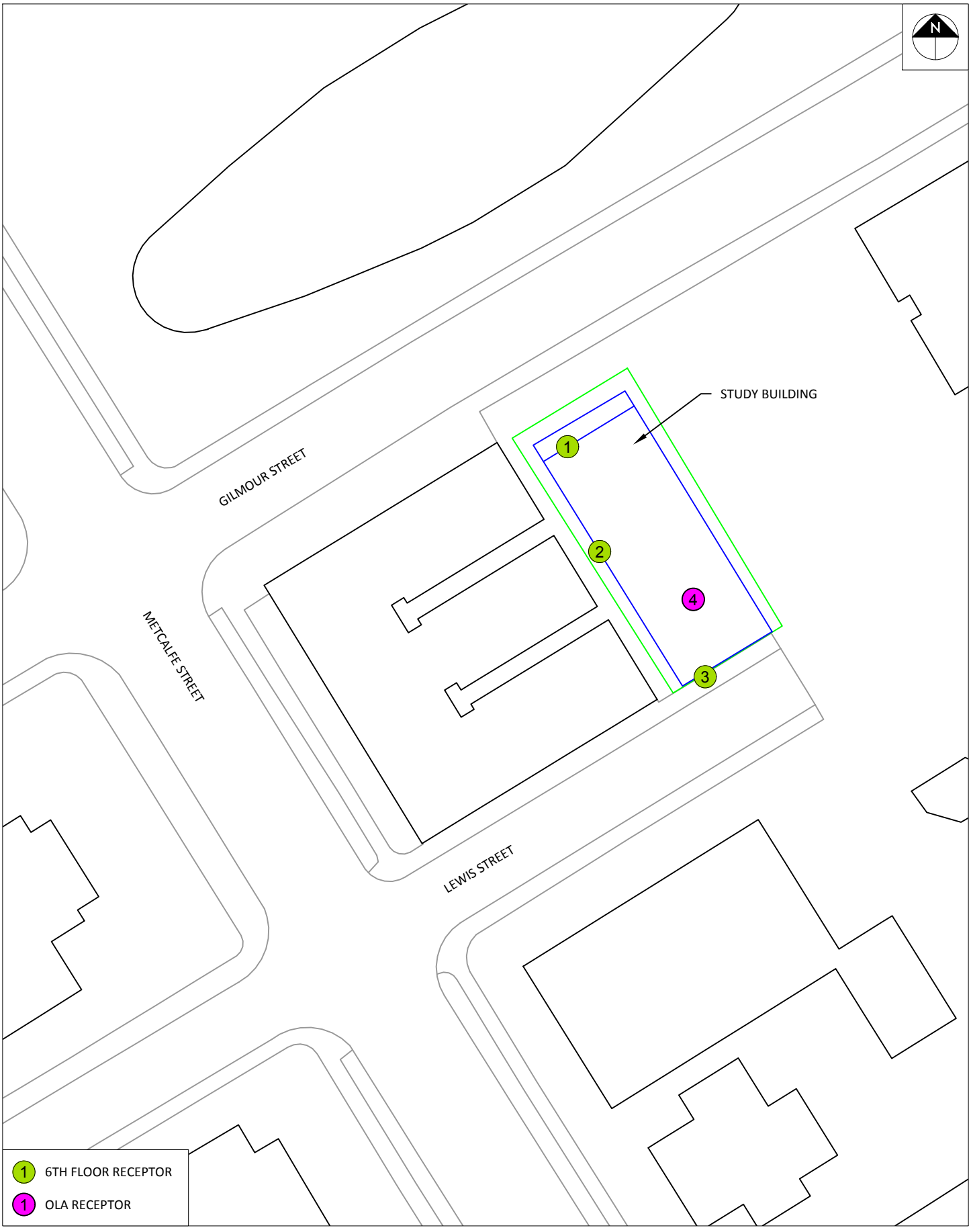
PROJECT	246 GILMOUR STREET, OTTAWA TRAFFIC NOISE ASSESSMENT
SCALE	1:1000 (APPROX.)
DRAWING NO.	GWE19-183-1
DATE	OCTOBER 11, 2019
DRAWN BY	G.G.

DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT



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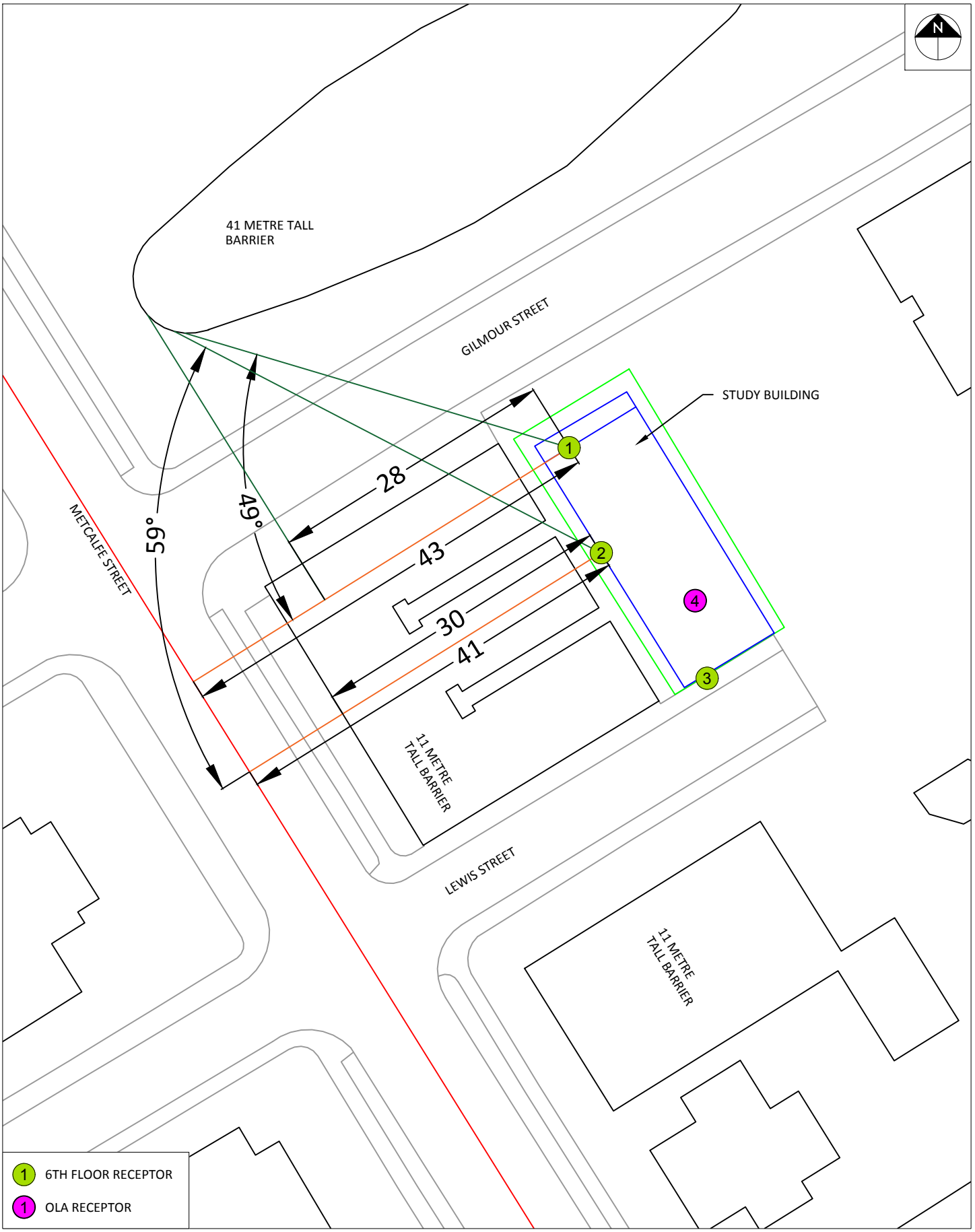
PROJECT	246 GILMOUR STREET, OTTAWA TRAFFIC NOISE ASSESSMENT		DESCRIPTION
SCALE	1:500 (APPROX.)	DRAWING NO. GWE19-183-2	FIGURE 2: RECEPTOR LOCATIONS
DATE	OCTOBER 11, 2019	DRAWN BY G.G.	



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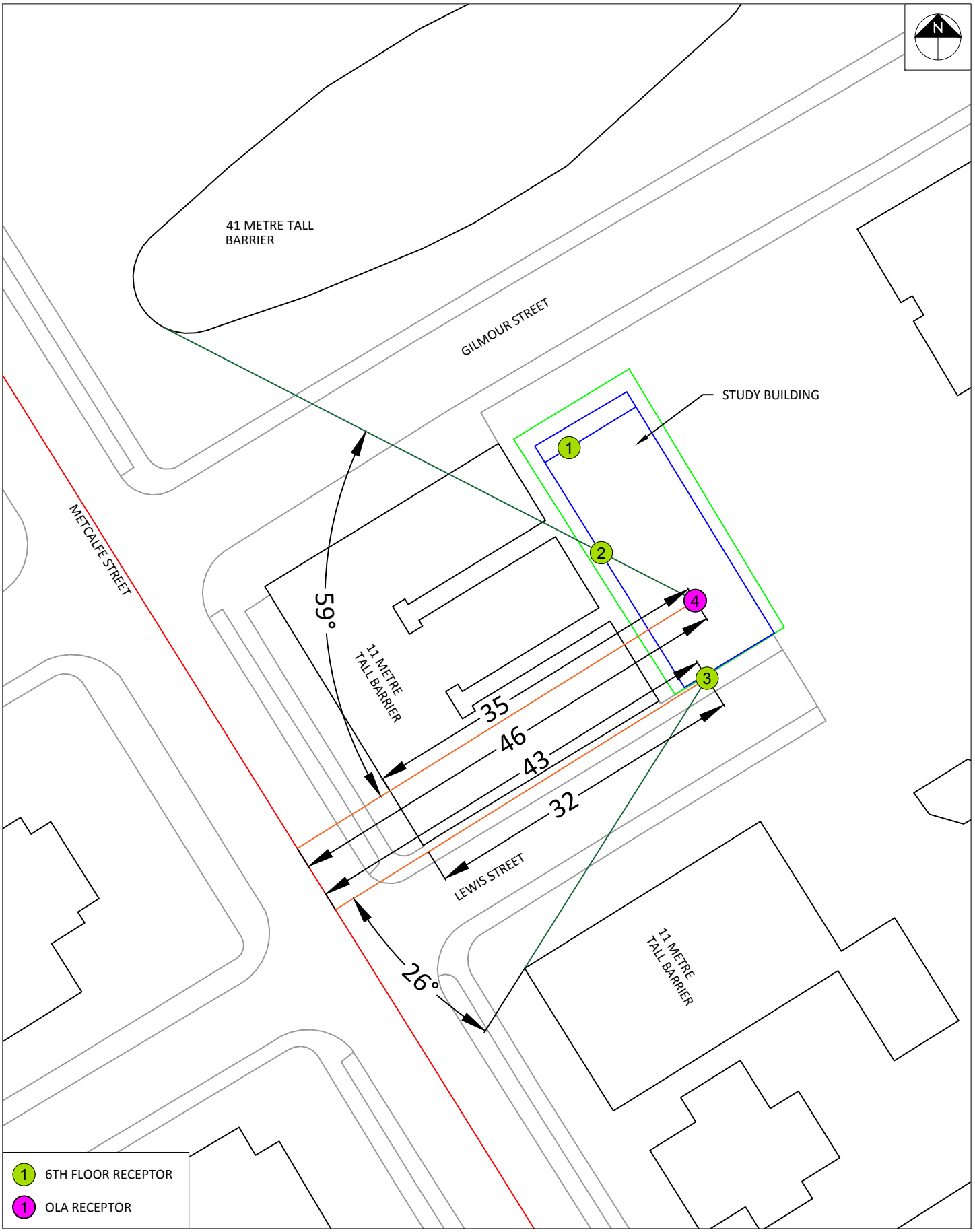
PROJECT	246 GILMOUR STREET, OTTAWA TRAFFIC NOISE ASSESSMENT
SCALE	1:500 (APPROX.)
DRAWING NO.	GWE19-183-3
DATE	OCTOBER 11, 2019
DRAWN BY	G.G.

DESCRIPTION

FIGURE 3:
RECEPTOR 1, 2 STAMSON INPUT PARAMETERS



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PROJECT	246 GILMOUR STREET, OTTAWA TRAFFIC NOISE ASSESSMENT
SCALE	1:500 (APPROX.)
DRAWING NO.	GWE19-183-4
DATE	OCTOBER 11, 2019
DRAWN BY	G.G.

DESCRIPTION

FIGURE 4:
RECEPTOR 3, 4 STAMSON INPUT PARAMETERS

APPENDIX A

STAMSON 5.04 – INPUT AND OUTPUT DATA

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```
STAMSON 5.0        NORMAL REPORT        Date: 11-10-2019 09:19:05
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Metcalfe St (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 St (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  :  43.00 / 43.00  m
Receiver height           :  16.74 / 16.74  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :  49.00 deg   Angle2 : 90.00 deg
Barrier height            :  41.00 m
Barrier receiver distance :  28.00 / 28.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Results segment # 1: Metcalfe St (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 !       16.74 !        6.81 !         6.81

ROAD (58.26 + 38.29 + 0.00) = 58.30 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
     0     49   0.00  68.48   0.00  -4.57  -5.65   0.00   0.00   0.00
58.26
-------------------------------------------------------------------------
--
    49     90   0.00  68.48   0.00  -4.57  -6.42   0.00   0.00 -19.19
38.29
-------------------------------------------------------------------------
--

Segment Leq : 58.30 dBA

Total Leq All Segments: 58.30 dBA

Results segment # 1: Metcalfe St (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 !       16.74 !        6.81 !         6.81

ROAD (50.66 + 30.70 + 0.00) = 50.70 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
     0     49   0.00  60.88   0.00  -4.57  -5.65   0.00   0.00   0.00
50.66
-------------------------------------------------------------------------
    49     90   0.00  60.88   0.00  -4.57  -6.42   0.00   0.00 -19.19
30.70
-------------------------------------------------------------------------

Segment Leq : 50.70 dBA
Total Leq All Segments: 50.70 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 58.30
                           (NIGHT): 50.70
```

```
STAMSON 5.0        NORMAL REPORT        Date: 11-10-2019 09:19:18
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Metcalfe St (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 St (day/night)
---------------------------------------------
Angle1   Angle2           : -90.00 deg   59.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  41.00 / 41.00  m
Receiver height           :  16.74 / 16.74  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 59.00 deg
Barrier height            :  11.00 m
Barrier receiver distance :  30.00 / 30.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Results segment # 1: Metcalfe St (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 !       16.74 !        5.59 !         5.59

ROAD (0.00 + 47.68 + 0.00) = 47.68 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     59   0.00  68.48   0.00  -4.37  -0.82   0.00   0.00 -15.61
47.68
-------------------------------------------------------------------------
--

Segment Leq : 47.68 dBA

Total Leq All Segments: 47.68 dBA

Results segment # 1: Metcalfe St (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 !       16.74 !        5.59 !         5.59

ROAD (0.00 + 40.09 + 0.00) = 40.09 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     59   0.00  60.88   0.00  -4.37  -0.82   0.00   0.00 -15.61
40.09
-------------------------------------------------------------------------
--

Segment Leq : 40.09 dBA

Total Leq All Segments: 40.09 dBA


TOTAL Leq FROM ALL SOURCES (DAY): 47.68
                           (NIGHT): 40.09
```

```
STAMSON 5.0        NORMAL REPORT        Date: 11-10-2019 09:19:34
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Metcalfe St (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 St (day/night)
---------------------------------------------
Angle1   Angle2           : -90.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  43.00 / 43.00  m
Receiver height           :  16.74 / 16.74  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : -26.00 deg
Barrier height            :  11.00 m
Barrier receiver distance :  32.00 / 32.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Results segment # 1: Metcalfe St (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 !       16.74 !        5.40 !         5.40

ROAD (0.00 + 45.68 + 55.50) = 55.93 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90    -26   0.00  68.48   0.00  -4.57  -4.49   0.00   0.00 -13.74
45.68
-------------------------------------------------------------------------
--
   -26      0   0.00  68.48   0.00  -4.57  -8.40   0.00   0.00   0.00
55.50
-------------------------------------------------------------------------
--

Segment Leq : 55.93 dBA

Total Leq All Segments: 55.93 dBA

Results segment # 1: Metcalfe St (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 !       16.74 !        5.40 !         5.40

ROAD (0.00 + 38.08 + 47.91) = 48.34 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90    -26   0.00  60.88   0.00  -4.57  -4.49   0.00   0.00 -13.74
38.08
-------------------------------------------------------------------------
--
   -26      0   0.00  60.88   0.00  -4.57  -8.40   0.00   0.00   0.00
47.91
-------------------------------------------------------------------------
Segment Leq : 48.34 dBA

Total Leq All Segments: 48.34 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 55.93
                           (NIGHT): 48.34
```

```
STAMSON 5.0        NORMAL REPORT        Date: 11-10-2019 09:19:58
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Metcalfe St (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 St (day/night)
---------------------------------------------
Angle1   Angle2           : -90.00 deg   59.00 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           :  19.79 / 19.79  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 59.00 deg
Barrier height            :  11.00 m
Barrier receiver distance :  35.00 / 35.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Results segment # 1: Metcalfe St (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 !       19.79 !        5.87 !         5.87

ROAD (0.00 + 47.83 + 0.00) = 47.83 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     59   0.00  68.48   0.00  -4.87  -0.82   0.00   0.00 -14.96
47.83
-------------------------------------------------------------------------
--

Segment Leq : 47.83 dBA

Total Leq All Segments: 47.83 dBA

Results segment # 1: Metcalfe St (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 !       19.79 !        5.87 !         5.87

ROAD (0.00 + 40.24 + 0.00) = 40.24 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     59   0.00  60.88   0.00  -4.87  -0.82   0.00   0.00 -14.96
40.24
-------------------------------------------------------------------------
--

Segment Leq : 40.24 dBA

Total Leq All Segments: 40.24 dBA


TOTAL Leq FROM ALL SOURCES (DAY): 47.83
                           (NIGHT): 40.24
```