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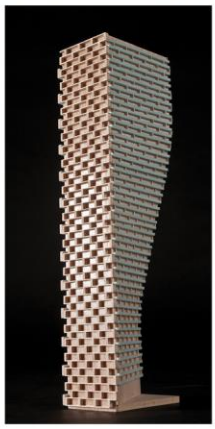
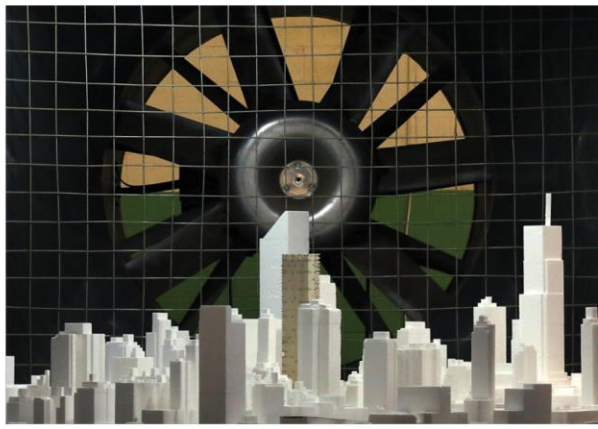
ROADWAY TRAFFIC NOISE FEASIBILITY ASSESSMENT

16 Edgewater Street
Ottawa, Ontario

REPORT: GW21-349-Traffic Noise





October 25, 2021

PREPARED FOR

Park River Properties
206 - 900 Boulevard de la Carriere
Gatineau, QC, J8Y 6T5

PREPARED BY

Michael Lafortune, C.E.T., Environmental Scientist
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EXECUTIVE SUMMARY

This report describes a roadway traffic noise feasibility assessment undertaken for a proposed residential development located at 16 Edgewater Street in Ottawa, Ontario. The proposed development features a rectangular parcel of land located to the east of Edgewater Street, comprising a 10-storey residential building (Building A) and three three-storey townhouse buildings (Building B-D). The major sources of roadway traffic noise are Edgewater Street, Terry Fox Drive, and Hazeldean 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 (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 CSV Architects.

The noise levels predicted due to roadway traffic exceed the criteria listed in the ENCG for building components and upgraded building components will be required for Building A and B. The building layouts should consider placing non-sensitive uses, such as bathrooms and utility rooms, along the west façades. Due to the limited information available at the time of the study, which was prepared for rezoning application, detailed STC calculations could not be performed at this time. A detailed review of the window and wall assemblies should be performed by a qualified engineer with expertise in acoustics during the detailed design stage of the building.

Results of the calculations also indicate that the Building A and B will require central air conditioning, or a similar ventilation system, which will allow occupants to keep windows closed and maintain a comfortable living environment. Building C and D will require forced air heating with provisions for central air conditioning. Warning Clauses will also be required in all Lease, Purchase and Sale Agreements.

Rear yard noise levels for Building D fall below the ENCG criteria, therefore no mitigation will be required. However, it is recommended that outdoor living areas (OLA) be positioned away from the roadway to reduce noise levels. Building massing should be used to provide blockage from the surrounding roadways. If the need arises for OLA noise mitigation, this can be addressed during site plan control. A detailed

roadway traffic noise study will be required at the time of site plan approval to determine specific noise control measures for the development.

With regards to on-site stationary noise sources, impacts can generally be minimized by judicious selection and placement of the equipment. Where necessary, noise screens and silencers can be placed into the design. The primary off-site stationary noise sources are the surrounding industrial/commercial properties; however these are not expected to be significant. It is recommended a stationary noise study be conducted once mechanical plans for the proposed building become available. This study would assess impacts of stationary noise from rooftop mechanical units serving the proposed building on surrounding noise-sensitive areas, as well as from the surrounding industrial/commercial properties. This study will include recommendations for any noise control measures that may be necessary to ensure noise levels fall below ENCG limits.

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Park River Properties to undertake a roadway traffic noise feasibility assessment for a proposed residential development at 16 Edgewater 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 CSV Architects, with future traffic volumes corresponding to the City of Ottawa's Official Plan (OP) roadway classifications.

2. TERMS OF REFERENCE

The proposed development features a rectangular parcel of land located to the east of Edgewater Street, comprising a 10-storey residential building (Building A) and three three-storey townhouse buildings (Building B-D). Vehicular access is provided via Edgewater Street. Underground parking will be available on this site with ramp access east of Building A.

The site is surrounded by low-rise residential buildings to the east, and low-rise commercial/light industrial properties to the south, west and north. The major sources of roadway traffic noise are Edgewater Street, Terry Fox Drive, and Hazeldean 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.

[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

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) [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].

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.

[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] MECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.8
[6] 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 intermediate ground characteristics.
- 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 Figure 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[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.

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

TABLE 2: ROADWAY TRAFFIC DATA

Segment	Roadway Traffic Data	Speed Limit (km/h)	Traffic Volumes
Edgewater Street	2-Lane Urban Collector	50	**8,000**
Terry Fox Drive	4-Lane Urban Arterial Divided	70	**35,000**
Hazeldean Road	4-Lane Urban Arterial Undivided	70	**30,000**

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	28.5	POW – Building A West Façade	68	60
2	7.5	POW – Building B West Façade	67	60
3	7.5	POW – Building C South Façade	57	49
4	7.5	POW – Building D South Façade	64	56
5	1.5	OLA – Building D Rear Yard	53	N/A

The results of the current analysis indicate that noise levels will range between 53 and 68 dBA during the daytime period (07:00-23:00) and between 49 and 60 dBA during the nighttime period (23:00-07:00). The highest noise level (68 dBA) occurs at the west façade of Building A, which is nearest and most exposed to Edgewater Street and Terry Fox Drive.

6. CONCLUSIONS AND RECOMMENDATIONS

The noise levels predicted due to roadway traffic exceed the criteria listed in the ENCG for building components and upgraded building components will be required for Building A and B. The building layouts should consider placing non-sensitive uses, such as bathrooms and utility rooms, along the west façades. Due to the limited information available at the time of the study, which was prepared for rezoning application, detailed STC calculations could not be performed at this time. A detailed review of the window and wall assemblies should be performed by a qualified engineer with expertise in acoustics during the detailed design stage of the building.

Results of the calculations also indicate that the Building A and B will require central air conditioning, or a similar ventilation system, which will allow occupants to keep windows closed and maintain a comfortable living environment. Building C and D will require forced air heating with provisions for central air conditioning. Warning Clauses will also be required in all Lease, Purchase and Sale Agreements.

Rear yard noise levels for Building D fall below the ENCG criteria, therefore no mitigation will be required. However, it is recommended that outdoor living areas (OLA) be positioned away from the roadway to reduce noise levels. Building massing should be used to provide blockage from the surrounding roadways. If the need arises for OLA noise mitigation, this can be addressed during site plan control. A detailed roadway traffic noise study will be required at the time of site plan approval to determine specific noise control measures for the development.

With regards to on-site stationary noise sources, impacts can generally be minimized by judicious selection and placement of the equipment. Where necessary, noise screens and silencers can be placed into the design. The primary off-site stationary noise sources are the surrounding industrial/commercial properties; however these are not expected to be significant. It is recommended a stationary noise study be conducted once mechanical plans for the proposed building become available. This study would assess impacts of stationary noise from rooftop mechanical units serving the proposed building on surrounding noise-sensitive areas, as well as from the surrounding industrial/commercial properties. This study will include recommendations for any noise control measures that may be necessary to ensure noise levels fall below ENCG limits.

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.

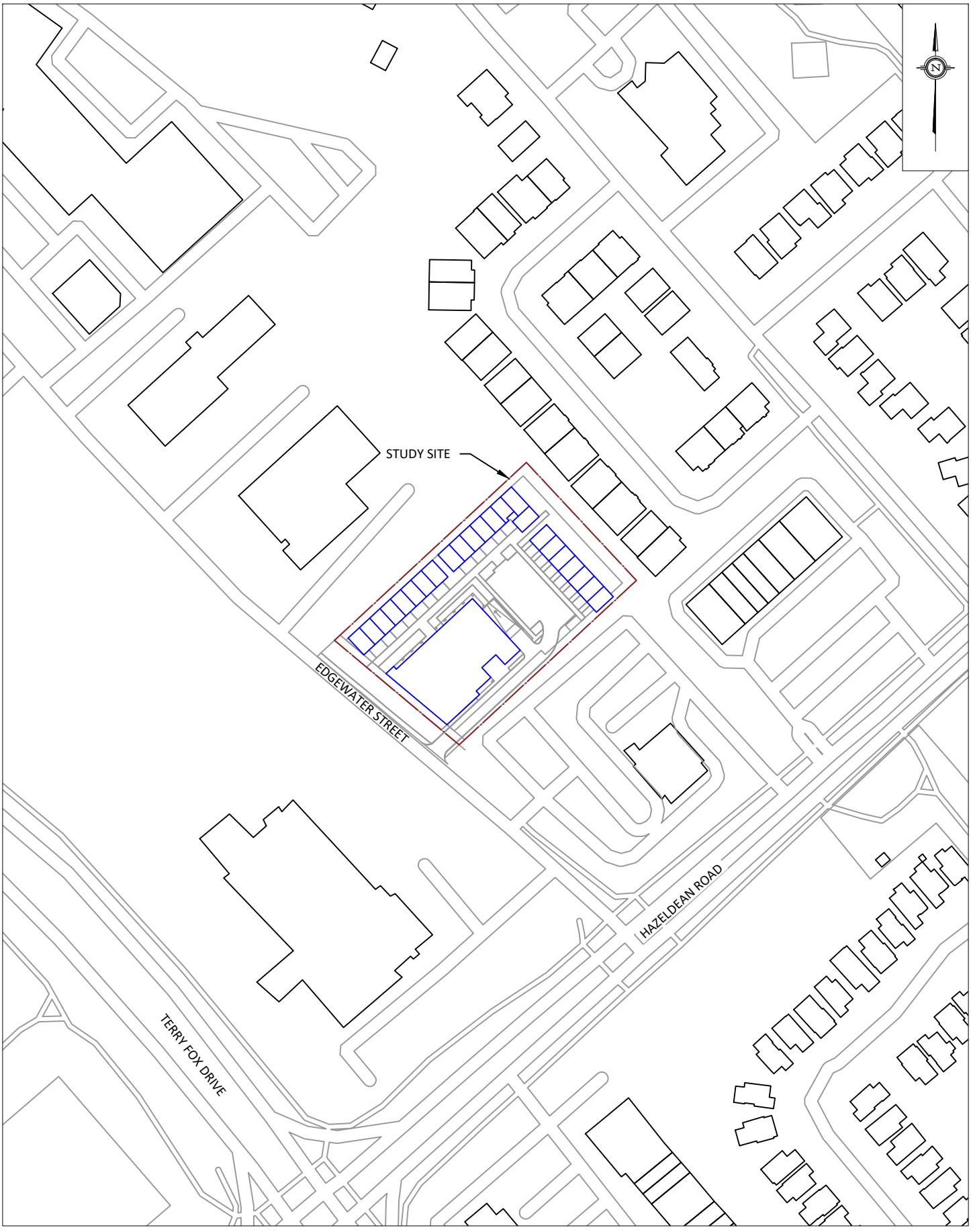
Sincerely,

Gradient Wind Engineering Inc.

Michael Lafortune, C.E.T.
Environmental Scientist

Joshua Foster, P.Eng.
Principal

Gradient Wind File #21-349-Traffic Noise



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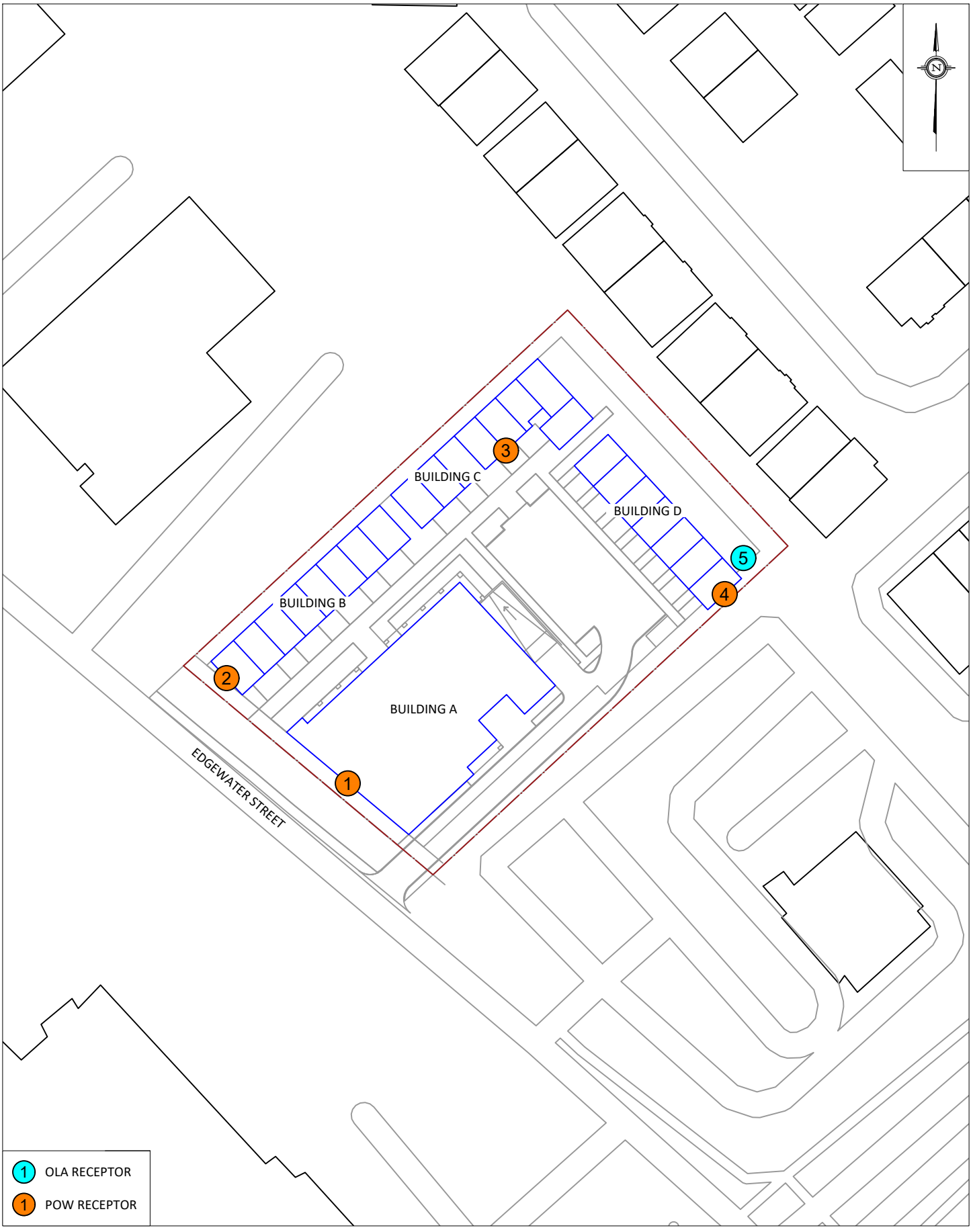
PROJECT	16 EDGEWATER STREET, OTTAWA ROADWAY TRAFFIC NOISE FEASIBILITY ASSESSMENT		DESCRIPTION
SCALE	1:2000 (APPROX.)	DRAWING NO.	GW21-349-1
DATE	OCTOBER 22, 2021	DRAWN BY	M.L.

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT



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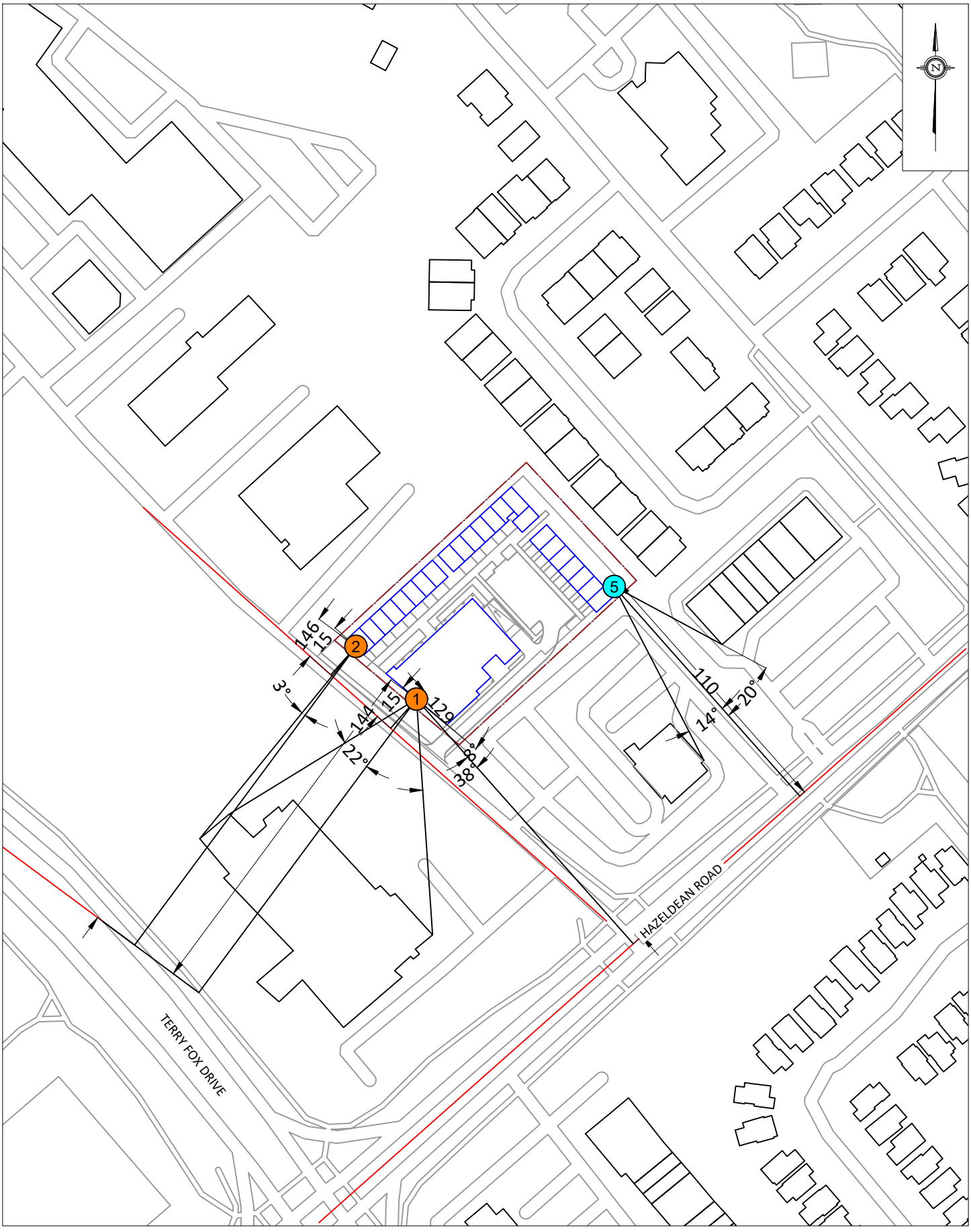
PROJECT	16 EDGEWATER STREET, OTTAWA ROADWAY TRAFFIC NOISE FEASIBILITY ASSESSMENT
SCALE	1:1000 (APPROX.)
DRAWING NO.	GW21-349-2
DATE	OCTOBER 22, 2021
DRAWN BY	M.L.
DESCRIPTION	FIGURE 2: RECEPTOR LOCATIONS



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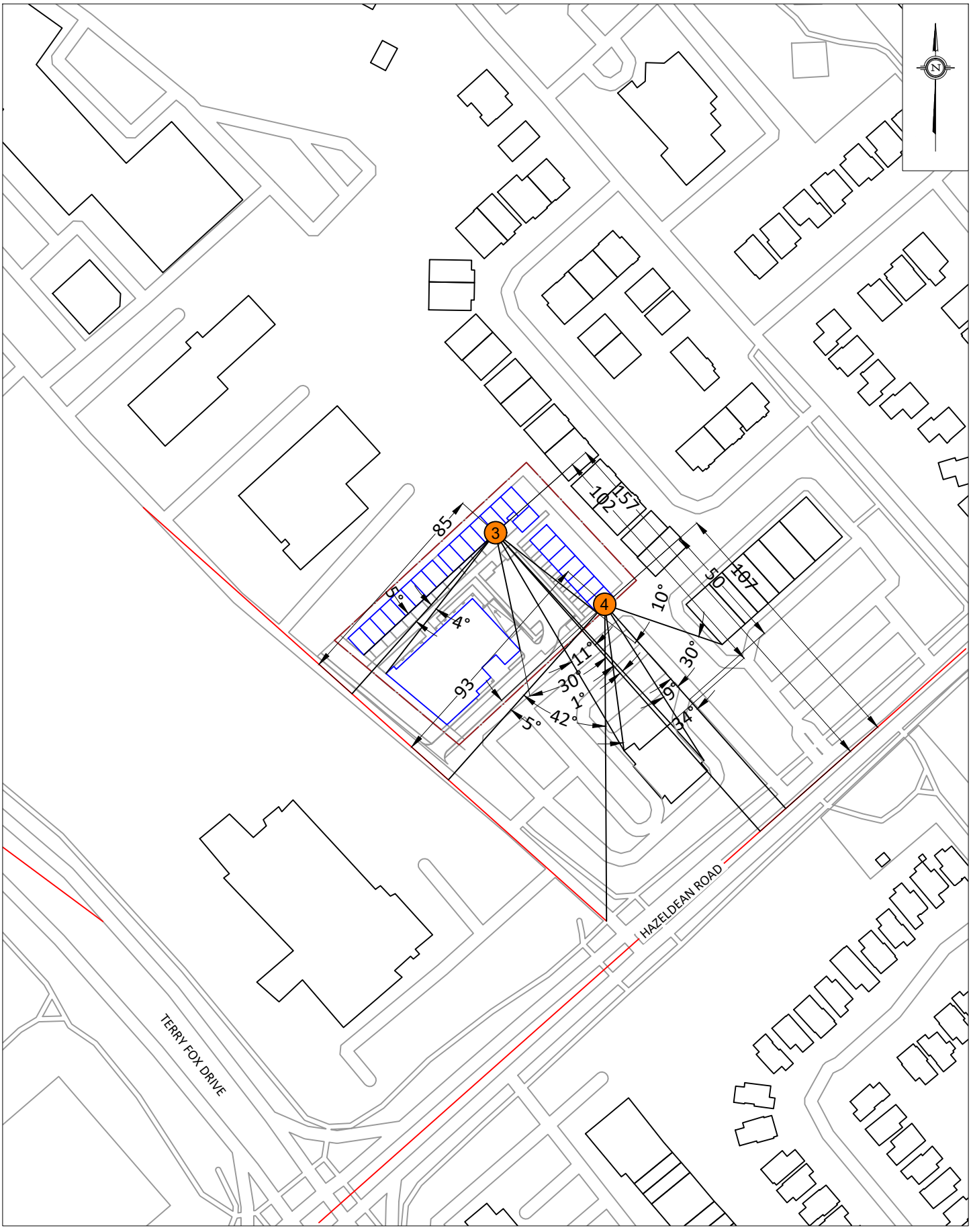
PROJECT	16 EDGEWATER STREET, OTTAWA ROADWAY TRAFFIC NOISE FEASIBILITY ASSESSMENT
SCALE	1:2000 (APPROX.)
DRAWING NO.	GW21-349-3
DATE	OCTOBER 22, 2021
DRAWN BY	M.L.

DESCRIPTION

FIGURE 3:
STAMSON INPUT PARAMETERS - RECEPTOR 1,2,5



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PROJECT	16 EDGEWATER STREET, OTTAWA ROADWAY TRAFFIC NOISE FEASIBILITY ASSESSMENT
SCALE	1:2000 (APPROX.)
DRAWING NO.	GW21-349-4
DATE	OCTOBER 22, 2021
DRAWN BY	M.L.

DESCRIPTION

FIGURE 4:
STAMSON INPUT PARAMETERS - RECEPTOR 3,4

APPENDIX A

STAMSON 5.04 – INPUT AND OUTPUT DATA

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```
STAMSON 5.0        NORMAL REPORT        Date: 22-10-2021 14:07:26
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Edgewater (day/night)
----------------------------------------------
Car traffic volume  :  6477/563   veh/TimePeriod  *
Medium truck volume :   515/45    veh/TimePeriod  *
Heavy truck volume  :   368/32    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):   8000
    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: Edgewater (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           :  28.50 / 28.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 2: Terry (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  :    70 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 # 2: Terry (day/night)
---------------------------------------
Angle1   Angle2           :  22.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  : 144.00 / 144.00 m
Receiver height           :  28.50 / 28.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 3: Hazel (day/night)
-----------------------------------------
Car traffic volume  : 24288/2112  veh/TimePeriod  *
Medium truck volume :  1932/168   veh/TimePeriod  *
Heavy truck volume  :  1380/120   veh/TimePeriod  *
Posted speed limit  :    70 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):  30000
    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: Hazel (day/night)
---------------------------------------
Angle1   Angle2           :  -8.00 deg   38.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  : 129.00 / 129.00 m
Receiver height           :  28.50 / 28.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 65.75 + 0.00) = 65.75 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     90   0.00  65.75   0.00   0.00   0.00   0.00   0.00   0.00
65.75
-------------------------------------------------------------------------------
--

Segment Leq : 65.75 dBA


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

Source height = 1.50 m

ROAD (0.00 + 60.94 + 0.00) = 60.94 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
    22     90   0.00  75.00   0.00  -9.82  -4.23   0.00   0.00   0.00
60.94
-------------------------------------------------------------------------------
--

Segment Leq : 60.94 dBA
```

```
Results segment # 3: Hazel (day)
--------------------------------

Source height = 1.50 m

ROAD (0.00 + 59.06 + 0.00) = 59.06 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    -8     38   0.00  74.33   0.00  -9.34  -5.93   0.00   0.00   0.00
59.06
-------------------------------------------------------------------------
--

Segment Leq : 59.06 dBA

Total Leq All Segments: 67.64 dBA


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

Source height = 1.50 m

ROAD (0.00 + 58.16 + 0.00) = 58.16 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  58.16   0.00   0.00   0.00   0.00   0.00   0.00
58.16
-------------------------------------------------------------------------
--

Segment Leq : 58.16 dBA
```

```
Results segment # 2: Terry (night)
----------------------------------

Source height = 1.50 m

ROAD (0.00 + 53.35 + 0.00) = 53.35 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    22     90   0.00  67.40   0.00  -9.82  -4.23   0.00   0.00   0.00
53.35
-------------------------------------------------------------------------
--

Segment Leq : 53.35 dBA


Results segment # 3: Hazel (night)
----------------------------------

Source height = 1.50 m

ROAD (0.00 + 51.46 + 0.00) = 51.46 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    -8     38   0.00  66.73   0.00  -9.34  -5.93   0.00   0.00   0.00
51.46
-------------------------------------------------------------------------
--

Segment Leq : 51.46 dBA

Total Leq All Segments: 60.05 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 67.64
                           (NIGHT): 60.05
```

```
STAMSON 5.0        NORMAL REPORT        Date: 22-10-2021 14:07:32
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Edgewater (day/night)
----------------------------------------------
Car traffic volume  :  6477/563   veh/TimePeriod  *
Medium truck volume :   515/45    veh/TimePeriod  *
Heavy truck volume  :   368/32    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):   8000
    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: Edgewater (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           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 2: Terry (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  :    70 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 # 2: Terry (day/night)
----------------------------------------
Angle1   Angle2           :   3.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  : 146.00 / 146.00 m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 65.75 + 0.00) = 65.75 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  65.75   0.00   0.00   0.00   0.00   0.00   0.00
65.75
-------------------------------------------------------------------------
--

Segment Leq : 65.75 dBA


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

Source height = 1.50 m

ROAD (0.00 + 61.96 + 0.00) = 61.96 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
     3     90   0.00  75.00   0.00  -9.88  -3.16   0.00   0.00   0.00
61.96
-------------------------------------------------------------------------
--

Segment Leq : 61.96 dBA

Total Leq All Segments: 67.27 dBA
```

```
Results segment # 1: Edgewater (night)
---------------------------------------

Source height = 1.50 m

ROAD (0.00 + 58.16 + 0.00) = 58.16 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  58.16   0.00   0.00   0.00   0.00   0.00   0.00
58.16
-------------------------------------------------------------------------
--

Segment Leq : 58.16 dBA


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

Source height = 1.50 m

ROAD (0.00 + 54.36 + 0.00) = 54.36 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
     3     90   0.00  67.40   0.00  -9.88  -3.16   0.00   0.00   0.00
54.36
-------------------------------------------------------------------------
--

Segment Leq : 54.36 dBA

Total Leq All Segments: 59.67 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 67.27
                           (NIGHT): 59.67
```

```
STAMSON 5.0        NORMAL REPORT        Date: 22-10-2021 14:07:37
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Edgewater (day/night)
----------------------------------------------
Car traffic volume  :  6477/563   veh/TimePeriod  *
Medium truck volume :   515/45    veh/TimePeriod  *
Heavy truck volume  :   368/32    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):   8000
    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: Edgewater (day/night)
-------------------------------------------
Angle1   Angle2           :  -4.00 deg   5.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  85.00 / 85.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 2: Hazel (day/night)
----------------------------------------
Car traffic volume  : 24288/2112  veh/TimePeriod  *
Medium truck volume :  1932/168   veh/TimePeriod  *
Heavy truck volume  :  1380/120   veh/TimePeriod  *
Posted speed limit  :    70 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):  30000
    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: Hazel (day/night)
----------------------------------------
Angle1   Angle2           : -10.00 deg   30.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  : 157.00 / 157.00 m
Receiver height           :   7.50 / 7.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :  -1.00 deg   Angle2 : 11.00 deg
Barrier height            :   5.00 m
Barrier receiver distance : 102.00 / 102.00 m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 45.21 + 0.00) = 45.21 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    -4      5   0.00  65.75   0.00  -7.53 -13.01   0.00   0.00   0.00
45.21
-------------------------------------------------------------------------
--

Segment Leq : 45.21 dBA


Results segment # 2: Hazel (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 !        7.50 !        3.60 !         3.60

ROAD (51.12 + 46.07 + 54.36) = 56.46 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -10     -1   0.00  74.33   0.00 -10.20 -13.01   0.00   0.00   0.00
51.12
-------------------------------------------------------------------------
--
    -1     11   0.00  74.33   0.00 -10.20 -11.76   0.00   0.00  -6.30
46.07
-------------------------------------------------------------------------
--
    11     30   0.00  74.33   0.00 -10.20  -9.77   0.00   0.00   0.00
54.36
-------------------------------------------------------------------------
--

Segment Leq : 56.46 dBA

Total Leq All Segments: 56.77 dBA
```

```
Results segment # 1: Edgewater (night)
---------------------------------------

Source height = 1.50 m

ROAD (0.00 + 37.61 + 0.00) = 37.61 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
    -4      5   0.00  58.16   0.00  -7.53 -13.01   0.00   0.00   0.00
37.61
-------------------------------------------------------------------------------
--

Segment Leq : 37.61 dBA
```

```
Results segment # 2: Hazel (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 !        7.50 !        3.60 !         3.60

ROAD (43.52 + 38.47 + 46.77) = 48.87 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -10     -1   0.00  66.73   0.00 -10.20 -13.01   0.00   0.00   0.00
43.52
-------------------------------------------------------------------------------
--
    -1     11   0.00  66.73   0.00 -10.20 -11.76   0.00   0.00  -6.30
38.47
-------------------------------------------------------------------------------
--
    11     30   0.00  66.73   0.00 -10.20  -9.77   0.00   0.00   0.00
46.77
-------------------------------------------------------------------------------
--

Segment Leq : 48.87 dBA

Total Leq All Segments: 49.18 dBA


TOTAL Leq FROM ALL SOURCES (DAY): 56.77
                           (NIGHT): 49.18
```

```
STAMSON 5.0        NORMAL REPORT        Date: 22-10-2021 14:07:50
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Edgewater (day/night)
----------------------------------------------
Car traffic volume  :  6477/563   veh/TimePeriod  *
Medium truck volume :   515/45    veh/TimePeriod  *
Heavy truck volume  :   368/32    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):   8000
    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: Edgewater (day/night)
-------------------------------------------
Angle1   Angle2           : -42.00 deg   5.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  93.00 / 93.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 2: Hazel (day/night)
----------------------------------------
Car traffic volume  : 24288/2112  veh/TimePeriod  *
Medium truck volume :  1932/168   veh/TimePeriod  *
Heavy truck volume  :  1380/120   veh/TimePeriod  *
Posted speed limit  :    70 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):  30000
    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: Hazel (day/night)
----------------------------------------
Angle1   Angle2           : -30.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  : 107.00 / 107.00 m
Receiver height           :   7.50 / 7.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :   9.00 deg   Angle2 : 34.00 deg
Barrier height            :   5.00 m
Barrier receiver distance :  50.00 / 50.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 51.99 + 0.00) = 51.99 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -42      5   0.00  65.75   0.00  -7.92  -5.83   0.00   0.00   0.00
51.99
-------------------------------------------------------------------------
--

Segment Leq : 51.99 dBA


Results segment # 2: Hazel (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 !        7.50 !        4.69 !         4.69

ROAD (59.15 + 52.13 + 60.72) = 63.36 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -30      9   0.00  74.33   0.00  -8.53  -6.64   0.00   0.00   0.00
59.15
-------------------------------------------------------------------------
--
     9     34   0.00  74.33   0.00  -8.53  -8.57   0.00   0.00  -5.09
52.13
-------------------------------------------------------------------------
--
    34     90   0.00  74.33   0.00  -8.53  -5.07   0.00   0.00   0.00
60.72
-------------------------------------------------------------------------
--

Segment Leq : 63.36 dBA

Total Leq All Segments: 63.67 dBA
```

```
Results segment # 1: Edgewater (night)
---------------------------------------

Source height = 1.50 m

ROAD (0.00 + 44.40 + 0.00) = 44.40 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -42      5   0.00  58.16   0.00  -7.92  -5.83   0.00   0.00   0.00
44.40
-------------------------------------------------------------------------
--

Segment Leq : 44.40 dBA
```

```
Results segment # 2: Hazel (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 !        7.50 !        4.69 !         4.69

ROAD (51.55 + 44.54 + 53.13) = 55.76 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -30       9   0.00  66.73   0.00  -8.53  -6.64   0.00   0.00   0.00
51.55
-------------------------------------------------------------------------------
--
     9      34   0.00  66.73   0.00  -8.53  -8.57   0.00   0.00  -5.09
44.54
-------------------------------------------------------------------------------
--
    34      90   0.00  66.73   0.00  -8.53  -5.07   0.00   0.00   0.00
53.13
-------------------------------------------------------------------------------
--

Segment Leq : 55.76 dBA

Total Leq All Segments: 56.07 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 63.67
                           (NIGHT): 56.07
```

```
STAMSON 5.0        NORMAL REPORT        Date: 22-10-2021 14:07:55
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Hazel (day/night)
----------------------------------------
Car traffic volume  : 24288/2112  veh/TimePeriod  *
Medium truck volume :  1932/168   veh/TimePeriod  *
Heavy truck volume  :  1380/120   veh/TimePeriod  *
Posted speed limit  :    70 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):  30000
    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: Hazel (day/night)
---------------------------------------
Angle1   Angle2           : -20.00 deg   14.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 110.00 / 110.00 m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 52.68 + 0.00) = 52.68 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -20     14   0.66  74.33   0.00 -14.36  -7.28   0.00   0.00   0.00
52.68
-------------------------------------------------------------------------
--

Segment Leq : 52.68 dBA

Total Leq All Segments: 52.68 dBA


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

Source height = 1.50 m

ROAD (0.00 + 45.08 + 0.00) = 45.08 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -20     14   0.66  66.73   0.00 -14.36  -7.28   0.00   0.00   0.00
45.08
-------------------------------------------------------------------------
--

Segment Leq : 45.08 dBA

Total Leq All Segments: 45.08 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 52.68
                           (NIGHT): 45.08
```