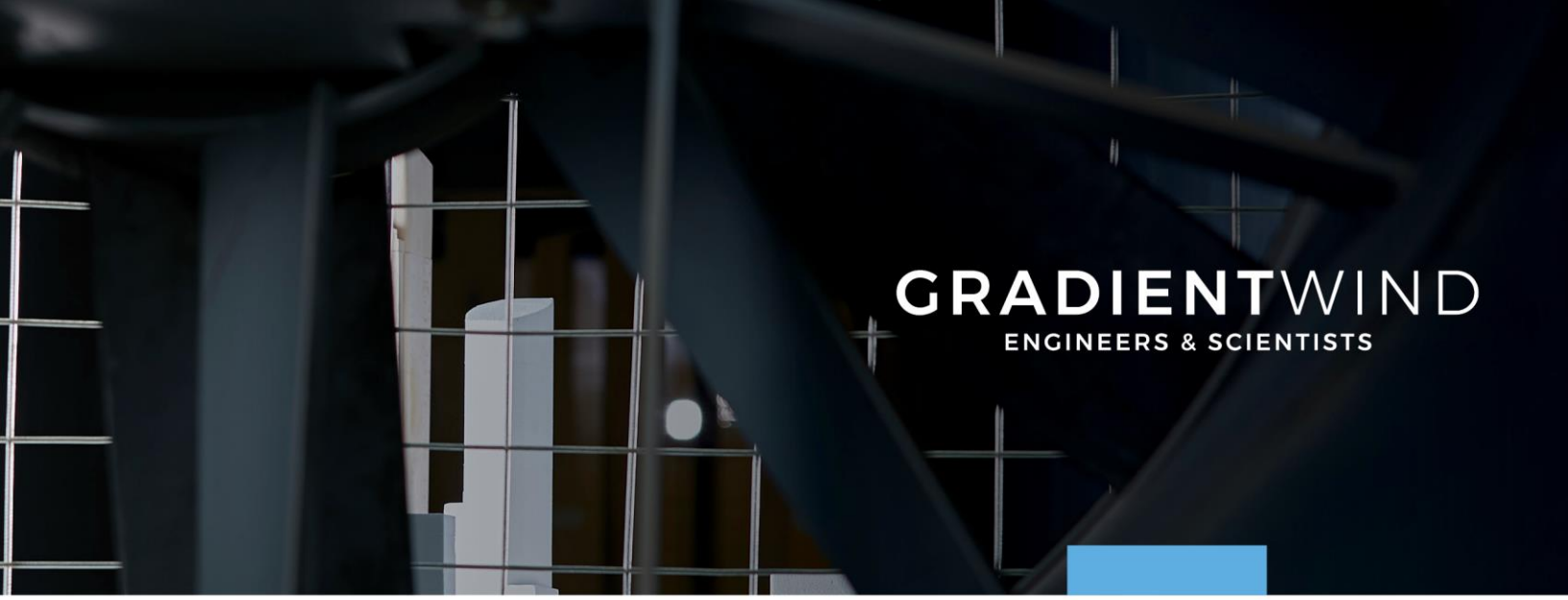

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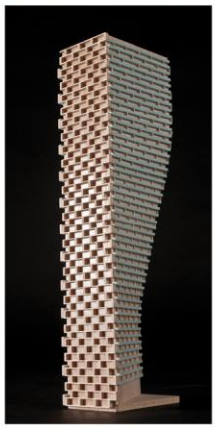
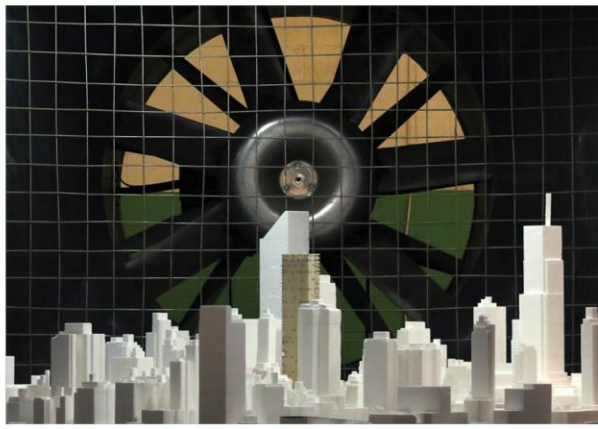
ROADWAY TRAFFIC NOISE FEASIBILITY ASSESSMENT

178-200 Isabella Street
Ottawa, Ontario

Report: 20-139-Traffic Noise





September 3, 2020

PREPARED FOR

Minto Communities - Canada
200-180 Kent Street
Ottawa, ON K1P 0B6

PREPARED BY

Michael Lafortune, C.E.T., Environmental Scientist
Joshua Foster, P.Eng., Principal

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EXECUTIVE SUMMARY

This report describes a roadway traffic noise feasibility assessment undertaken to satisfy the requirements for a zoning by-law amendment (ZBA) submission for a proposed mixed-use residential and retail development located at 178-200 Isabella Street in Ottawa, Ontario. The proposed development is a 16-storey building of rectangular planform. The major sources of roadway traffic noise are Highway 417, Isabella Street and Bank Street. 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 concept drawings prepared by Quadrangle Architects Ltd.

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. Due to the limited information available at the time of the study, which was prepared for Zoning By-law Amendment (ZBA) 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 development will require central air conditioning, or a similar ventilation system, which will allow occupants to keep windows closed and maintain a comfortable living environment. Warning Clauses will also be required in all Lease, Purchase and Sale Agreements.

Terrace noise levels were found to exceed 60 dBA during the daytime period, which is above the ENCG criteria. To limit the extent of noise control measures, it is recommended that Outdoor Living Areas (OLAs) be positioned away from Highway 417 to reduce noise levels. Noise control measures can be further reduced by placing penthouse massing between the OLA and Highway 417. If the need arises for OLA noise mitigation, this can be addressed during site plan control. Figure 3 illustrates potential noise barrier location.

With regards to stationary noise impacts, a stationary noise study will be performed once mechanical plans for the proposed building become available. This study would assess (i) stationary noise impacts on the study building from neighbouring rooftop mechanical units, and (ii) impacts of stationary noise from rooftop mechanical units serving the proposed building on surrounding noise-sensitive areas. This study will include recommendations for any noise control measures that may be necessary to ensure noise levels fall below ENCG limits.

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.

TABLE OF CONTENTS

1. INTRODUCTION 1

2. TERMS OF REFERENCE 1

3. OBJECTIVES 2

4. METHODOLOGY 2

4.1 Background 2

4.2 Roadway Traffic Noise 2

4.2.1 Criteria for Roadway Traffic Noise 2

4.2.2 Theoretical Roadway Noise Predictions 4

4.2.3 Roadway Traffic Volumes 4

5. RESULTS AND DISCUSSION 5

5.1 Roadway Traffic Noise Levels 5

6. CONCLUSIONS AND RECOMMENDATIONS 5

FIGURES

APPENDICES

Appendix A – STAMSON 5.04 Input and Output Data and Supporting Information

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Minto Communities – Canada to undertake a roadway traffic noise feasibility assessment to satisfy the requirements for a zoning by-law amendment (ZBA) submission for a proposed mixed-use residential and retail development located at 178-200 Isabella Street in Ottawa, Ontario. This report summarizes the methodology, results, and recommendations related to the assessment of exterior noise levels generated by local roadway traffic.

Our work is based on theoretical noise calculation methods conforming to the City of Ottawa[1] and Ministry of the Environment, Conservation and Parks (MECP)[2] guidelines. Noise calculations were based on architectural concept drawings prepared by Quadrangle Architects Ltd., with future traffic volumes corresponding to the City of Ottawa's Official Plan (OP) roadway classifications.

2. TERMS OF REFERENCE

The subject site is located on the north edge of a parcel of land bounded by Bank Street to the west, Isabella Street to the north, O'Connor Street to the east, and Pretoria Avenue to the south. The proposed mixed-use residential and retail development comprises a 16-storey tower. Above four levels of underground parking, the ground floor provides a residential lobby at the northeast corner, retail space at the northwest corner, residential space at the southwest corner, and shared building support at the southeast corner. Level 2, which overhangs the grade level on the north, east, and west elevations, comprises interior amenity space along the north, and residential space along the south. All other floors contain residential units. Above Level 2, the building rises with a constant rectangular planform to Level 10, where the building steps back at the east and west elevations creating potential terraces. The building maintains a constant planform from Level 10 to Level 16.

The site is surrounded by low-rise commercial buildings to the west, low and medium-rise residential buildings to the east and south, with the Highway 417 corridor to the north. The major sources of roadway

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

traffic noise are Highway 417, Isabella Street and Bank Street. 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 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)[3]

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[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 due to the presence of hard (paved) ground.
- Topography was assumed to be a flat/gentle slope surrounding the study building. Highway 417 is elevated approximately 4 m above local grade.
- Noise receptors were strategically placed at 5 locations around the study area (see Figure 2).
- Receptor distances and exposure angles are illustrated in Figures 4-7.

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.

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

TABLE 2: ROADWAY TRAFFIC DATA

Segment	Roadway Traffic Data	Speed Limit (km/h)	Traffic Volumes
Highway 417	6-Lane Freeway	100	**110,000**
Isabella Street	2-Lane Urban Arterial (2-UAU)	50	**15,000**
Bank Street	4-Lane Urban Arterial (2-UAU)	40	**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 – 9th Floor – North Façade	80	72
2	28.5	POW – 9th Floor – East Façade	76	68
3	28.5	POW – 9th Floor – South Façade	57	50
4	28.5	POW – 9th Floor – West Façade	76	69
5	34	OLA – Rooftop Outdoor Amenity Area	64	57

The results of the current analysis indicate that noise levels will range between 64 and 80 dBA during the daytime period (07:00-23:00) and between 57 and 72 dBA during the nighttime period (23:00-07:00). The highest noise level (80 dBA) occurs at the north façade, which is nearest and most exposed to Highway 417.

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. Due to the limited information available at the time of the study, which was prepared for ZBA 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.

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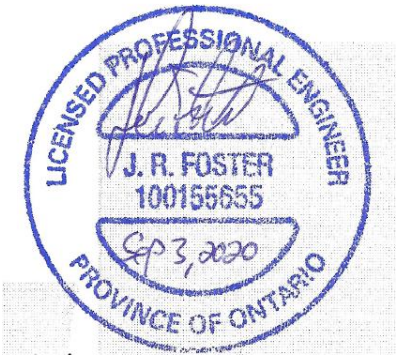
A detailed roadway traffic noise study will be required at the time of site plan approval to determine specific noise control measures for the development.

This concludes our traffic noise feasibility 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,

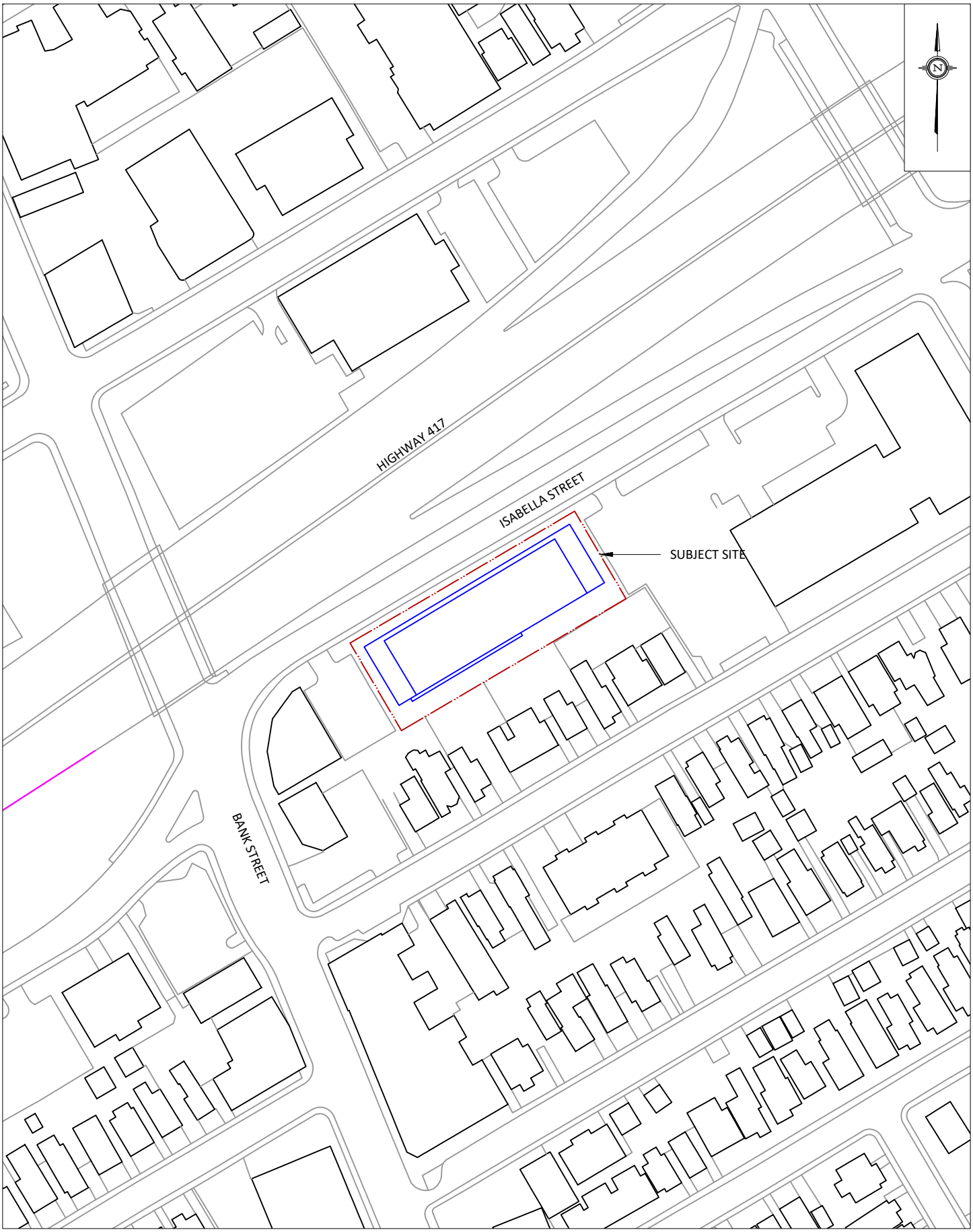
Gradient Wind Engineering Inc.



Michael Lafortune, C.E.T.
Environmental Scientist

Joshua Foster, P.Eng.
Principal

Gradient Wind File #20-139-Traffic Noise



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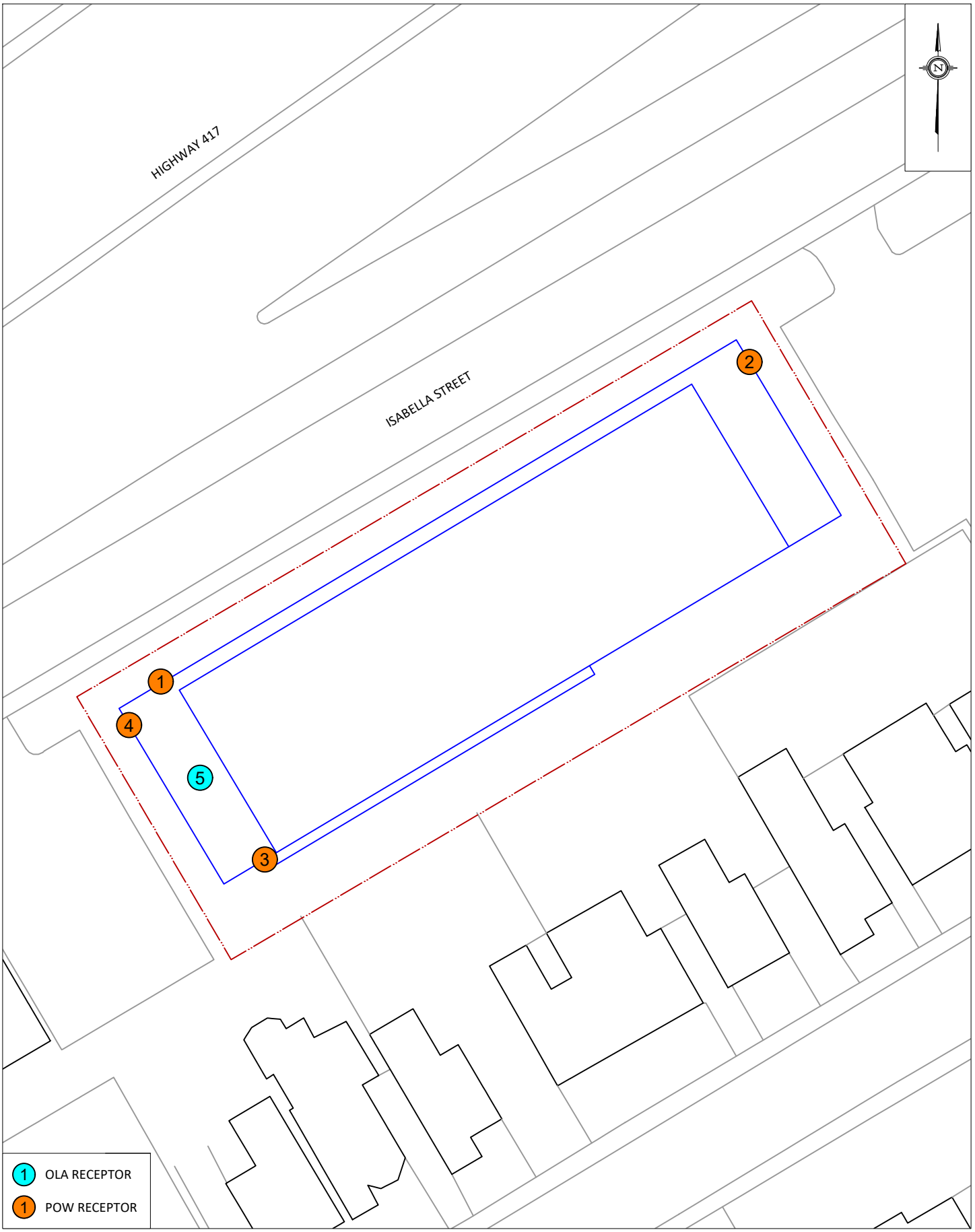
PROJECT	178-200 ISABELLA STREET, OTTAWA ROADWAY TRAFFIC NOISE FEASIBILITY ASSESSMENT
SCALE	1:1500 (APPROX.)
DRAWING NO.	GW20-139-1
DATE	AUGUST 20, 2020
DRAWN BY	M.L.

DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT



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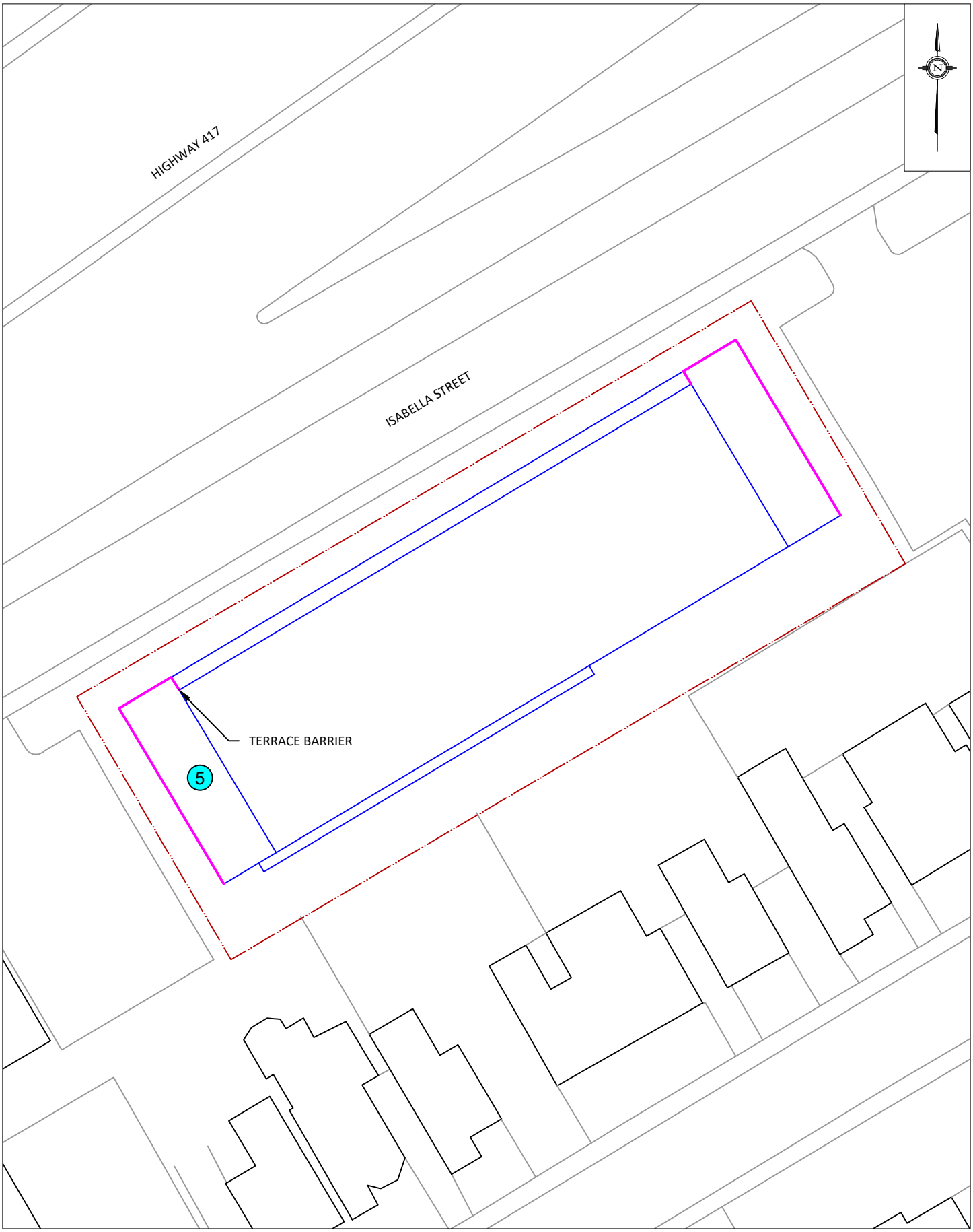
SCALE	1:500 (APPROX.)
DRAWING NO.	GW20-139-2
DATE	AUGUST 20, 2020
DRAWN BY	M.L.
DESCRIPTION	FIGURE 2: RECEPTOR LOCATIONS



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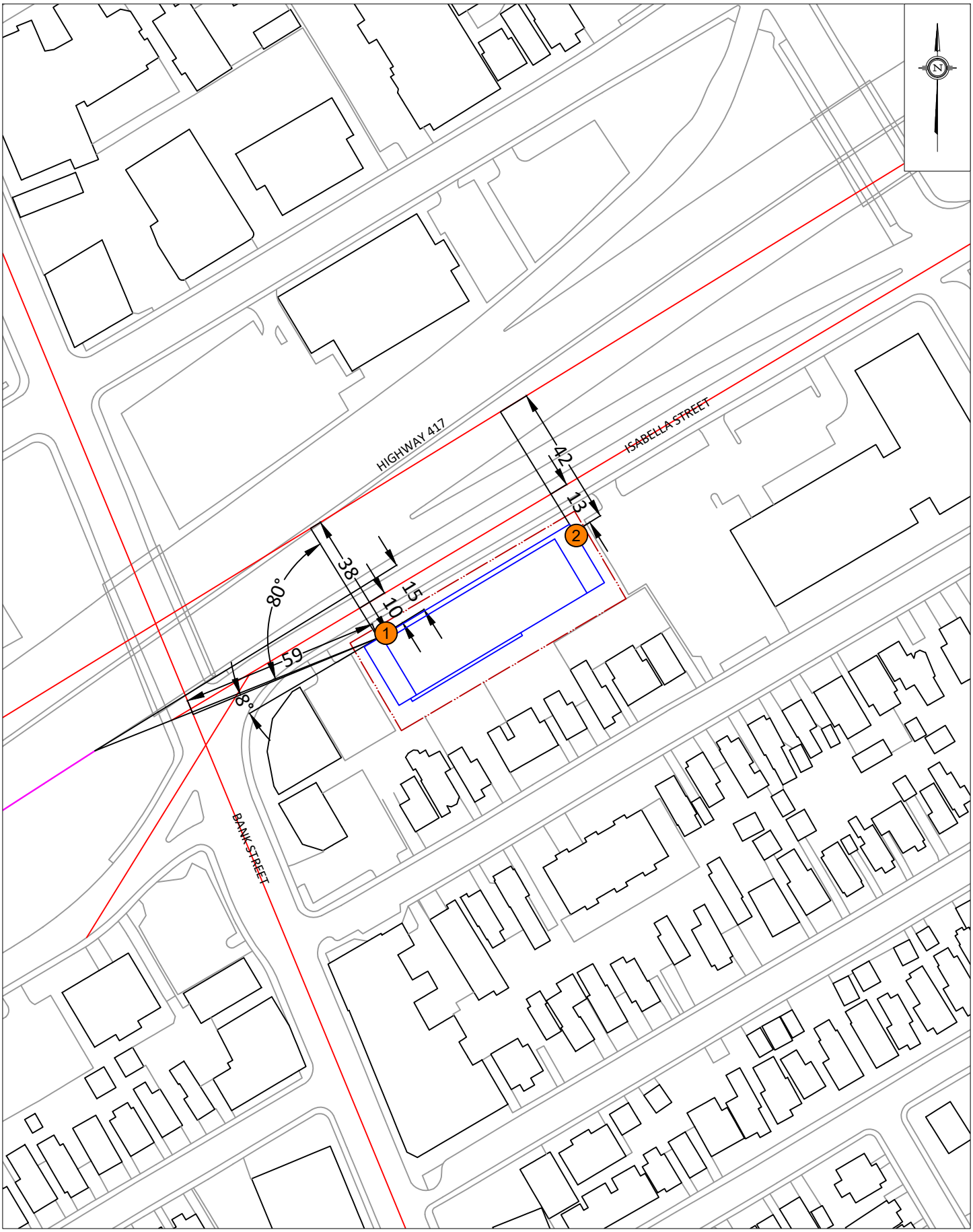
PROJECT	178-200 ISABELLA STREET, OTTAWA ROADWAY TRAFFIC NOISE FEASIBILITY ASSESSMENT
SCALE	1:500 (APPROX.)
DRAWING NO.	GW20-139-1
DATE	AUGUST 20, 2020
DRAWN BY	M.L.
DESCRIPTION	FIGURE 3: NOISE BARRIER LOCATION



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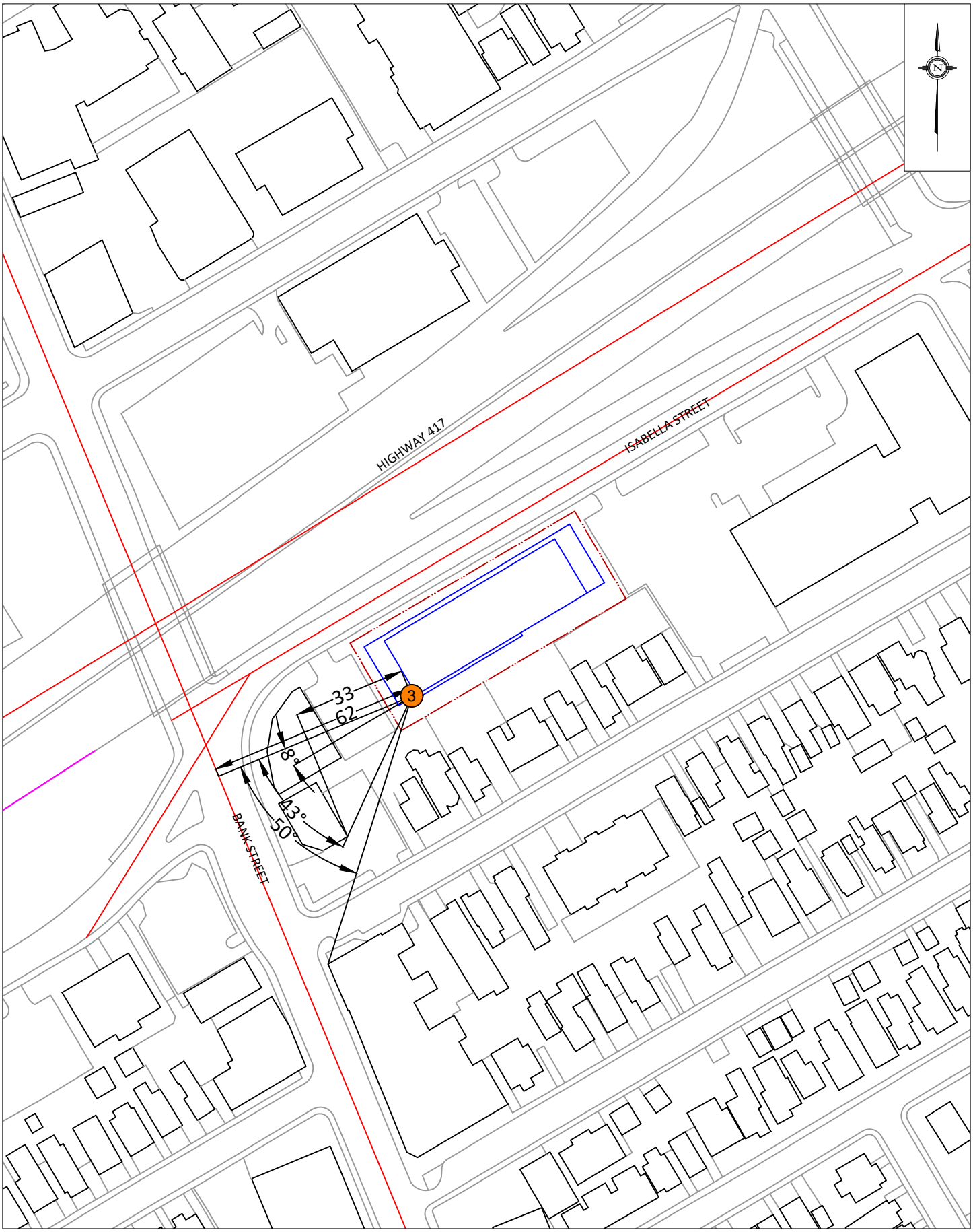
PROJECT	178-200 ISABELLA STREET, OTTAWA ROADWAY TRAFFIC NOISE FEASIBILITY ASSESSMENT		DESCRIPTION
SCALE	1:1500 (APPROX.)	DRAWING NO.	GW20-139-4
DATE	AUGUST 20, 2020	DRAWN BY	M.L.

FIGURE 4:
STAMSON INPUT PARAMETERS - RECEPTOR 1,2



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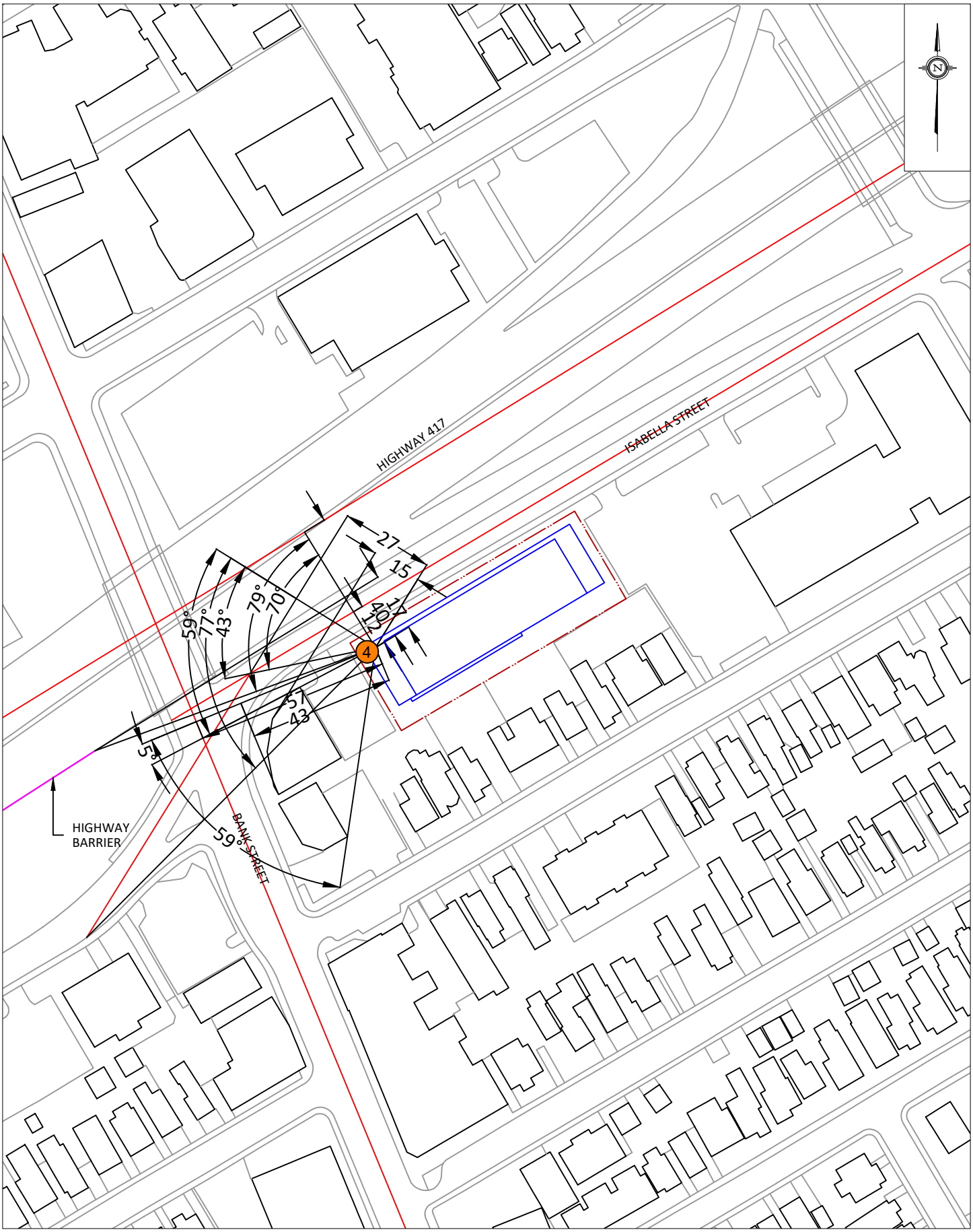
PROJECT	178-200 ISABELLA STREET, OTTAWA ROADWAY TRAFFIC NOISE FEASIBILITY ASSESSMENT
SCALE	1:1500 (APPROX.)
DRAWING NO.	GW20-139-5
DATE	AUGUST 20, 2020
DRAWN BY	M.L.

DESCRIPTION

FIGURE 5:
STAMSON INPUT PARAMETERS - RECEPTOR 3



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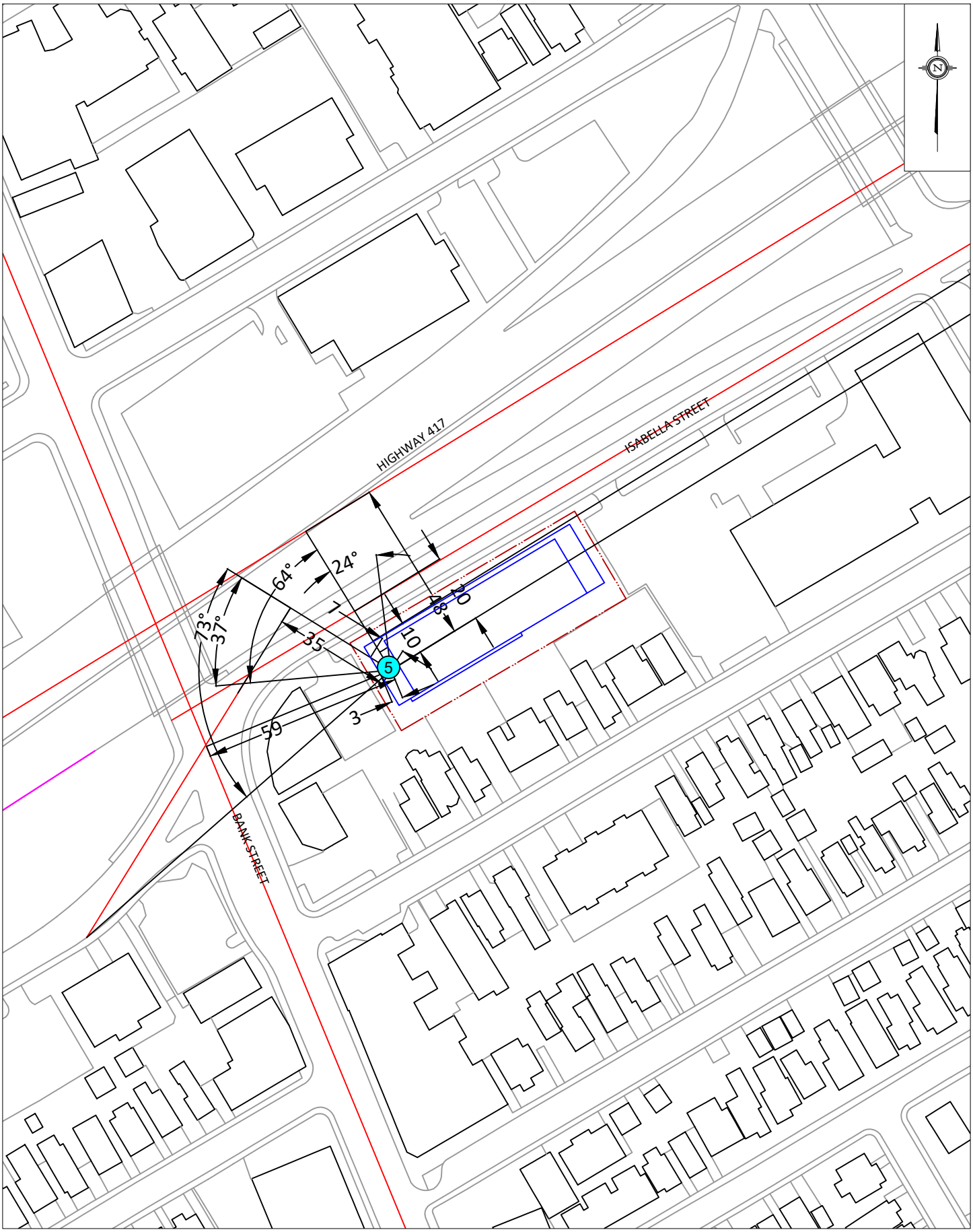
PROJECT	178-200 ISABELLA STREET, OTTAWA ROADWAY TRAFFIC NOISE FEASIBILITY ASSESSMENT		DESCRIPTION
SCALE	1:1500 (APPROX.)	DRAWING NO.	GW20-139-6
DATE	AUGUST 20, 2020	DRAWN BY	M.L.

FIGURE 6:
STAMSON INPUT PARAMETERS - RECEPTOR 4



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PROJECT	178-200 ISABELLA STREET, OTTAWA ROADWAY TRAFFIC NOISE FEASIBILITY ASSESSMENT
SCALE	1:1500 (APPROX.)
DRAWING NO.	GW20-139-7
DATE	AUGUST 20, 2020
DRAWN BY	M.L.

DESCRIPTION

FIGURE 7:
STAMSON INPUT PARAMETERS - RECEPTOR 5

APPENDIX A

STAMSON 5.04 – INPUT AND OUTPUT DATA

127 WALGREEN ROAD, OTTAWA, ON, CANADA K0A 1L0 | 613 836 0934
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```
STAMSON 5.0        NORMAL REPORT        Date: 26-06-2020 15:57:06
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: 417 (day/night)
---------------------------------------
Car traffic volume  : 89056/7744  veh/TimePeriod  *
Medium truck volume :  7084/616   veh/TimePeriod  *
Heavy truck volume  :  5060/440   veh/TimePeriod  *
Posted speed limit  :   100 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): 110000
    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: 417 (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  :  38.00 / 38.00  m
Receiver height           :  28.50 / 28.50  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : -80.00 deg
Barrier height            :   3.00 m
Barrier receiver distance :  15.00 / 15.00  m
Source elevation          :   4.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   4.00 m
Reference angle           :   0.00
```

```
Road data, segment # 2: Isabella (day/night)
---------------------------------------------
Car traffic volume  : 12144/1056  veh/TimePeriod  *
Medium truck volume :   966/84    veh/TimePeriod  *
Heavy truck volume  :   690/60    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  15000
    Percentage of Annual Growth         :   0.00
    Number of Years of Growth           :   0.00
    Medium Truck % of Total Volume      :   7.00
    Heavy Truck  % of Total Volume      :   5.00
    Day (16 hrs) % of Total Volume      :  92.00

Data for Segment # 2: Isabella (day/night)
-------------------------------------------
Angle1   Angle2           : -80.00 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 # 3: Bank (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  :    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):  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: Bank (day/night)
---------------------------------------
Angle1   Angle2           :  -8.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  59.00 / 59.00  m
Receiver height           :  28.50 / 28.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Results segment # 1: 417 (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 !       28.50 !       15.42 !        19.42

ROAD (0.00 + 66.57 + 78.87) = 79.12 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -80   0.00  83.16   0.00  -4.04 -12.55   0.00   0.00  -0.15  66.41*
   -90    -80   0.00  83.16   0.00  -4.04 -12.55   0.00   0.00   0.00  66.57
-------------------------------------------------------------------------------
   -80     90   0.00  83.16   0.00  -4.04  -0.25   0.00   0.00   0.00  78.87
-------------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 79.12 dBA


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

Source height = 1.50 m

ROAD (0.00 + 68.23 + 0.00) = 68.23 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -80     90   0.00  68.48   0.00   0.00  -0.25   0.00   0.00   0.00  68.23
-------------------------------------------------------------------------------

Segment Leq : 68.23 dBA
```

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

Source height = 1.50 m

ROAD (0.00 + 61.11 + 0.00) = 61.11 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    -8     90   0.00  69.70   0.00  -5.95  -2.64   0.00   0.00   0.00  61.11
-------------------------------------------------------------------------------

Segment Leq : 61.11 dBA

Total Leq All Segments: 79.52 dBA


Results segment # 1: 417 (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 !       28.50 !       15.42 !        19.42

ROAD (0.00 + 58.97 + 71.28) = 71.52 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -80   0.00  75.56   0.00  -4.04 -12.55   0.00   0.00  -0.15  58.82*
   -90    -80   0.00  75.56   0.00  -4.04 -12.55   0.00   0.00   0.00  58.97
-------------------------------------------------------------------------------
   -80     90   0.00  75.56   0.00  -4.04  -0.25   0.00   0.00   0.00  71.28
-------------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 71.52 dBA
```

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

Source height = 1.50 m

ROAD (0.00 + 60.64 + 0.00) = 60.64 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -80     90   0.00  60.88   0.00   0.00  -0.25   0.00   0.00   0.00  60.64
-------------------------------------------------------------------------------

Segment Leq : 60.64 dBA


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

Source height = 1.50 m

ROAD (0.00 + 53.51 + 0.00) = 53.51 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    -8     90   0.00  62.10   0.00  -5.95  -2.64   0.00   0.00   0.00  53.51
-------------------------------------------------------------------------------

Segment Leq : 53.51 dBA

Total Leq All Segments: 71.92 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 79.52
                           (NIGHT): 71.92
```

```
STAMSON 5.0         NORMAL REPORT         Date: 21-08-2020 09:51:23
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: 417 (day/night)
---------------------------------------
Car traffic volume  : 89056/7744  veh/TimePeriod  *
Medium truck volume :  7084/616   veh/TimePeriod  *
Heavy truck volume  :  5060/440   veh/TimePeriod  *
Posted speed limit  :   100 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): 110000
    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: 417 (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  :  42.00 / 42.00  m
Receiver height           :  28.50 / 28.50  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :   0.00 deg   Angle2 : 90.00 deg
Barrier height            :   0.00 m
Barrier receiver distance :  10.00 / 10.00  m
Source elevation          :   4.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   4.00 m
Reference angle           :   0.00
```

```
Road data, segment # 2: Isabella (day/night)
-------------------------------------------
Car traffic volume  : 12144/1056  veh/TimePeriod  *
Medium truck volume :   966/84    veh/TimePeriod  *
Heavy truck volume  :   690/60    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  15000
    Percentage of Annual Growth         :   0.00
    Number of Years of Growth           :   0.00
    Medium Truck % of Total Volume      :   7.00
    Heavy Truck  % of Total Volume      :   5.00
    Day (16 hrs) % of Total Volume      :  92.00

Data for Segment # 2: Isabella (day/night)
-------------------------------------------
Angle1   Angle2           :   0.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  15.00 / 15.00  m
Receiver height           :  28.50 / 28.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Results segment # 1: 417 (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 !       28.50 !       19.02 !        23.02

ROAD (0.00 + 75.68 + 0.00) = 75.68 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     90   0.00  83.16   0.00  -4.47  -3.01   0.00   0.00  -0.01  75.67*
     0     90   0.00  83.16   0.00  -4.47  -3.01   0.00   0.00   0.00  75.68
-------------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 75.68 dBA


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

Source height = 1.50 m

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

Segment Leq : 65.47 dBA

Total Leq All Segments: 76.08 dBA
```

```
Results segment # 1: 417 (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 !       28.50 !       19.02 !        23.02

ROAD (0.00 + 68.08 + 0.00) = 68.08 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     90   0.00  75.56   0.00  -4.47  -3.01   0.00   0.00  -0.01  68.07*
     0     90   0.00  75.56   0.00  -4.47  -3.01   0.00   0.00   0.00  68.08
-------------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 68.08 dBA


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

Source height = 1.50 m

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

Segment Leq : 57.87 dBA

Total Leq All Segments: 68.48 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 76.08
                           (NIGHT): 68.48
```

```
STAMSON 5.0        NORMAL REPORT        Date: 26-06-2020 15:57:24
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Bank (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  :    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):  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: Bank (day/night)
--------------------------------------
Angle1   Angle2           : -50.00 deg   -8.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  62.00 / 62.00  m
Receiver height           :  28.50 / 28.50  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -43.00 deg   Angle2 : -8.00 deg
Barrier height            :   9.00 m
Barrier receiver distance :  33.00 / 33.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Results segment # 1: Bank (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 !       28.50 !       14.13 !        14.13

ROAD (49.43 + 56.42 + 0.00) = 57.21 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -50    -43   0.00  69.70   0.00  -6.16 -14.10   0.00   0.00   0.00  49.43
-------------------------------------------------------------------------------
   -43     -8   0.00  69.70   0.00  -6.16  -7.11   0.00   0.00   0.00  56.42*
   -43     -8   0.00  69.70   0.00  -6.16  -7.11   0.00   0.00   0.00  56.42
-------------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 57.21 dBA

Total Leq All Segments: 57.21 dBA


Results segment # 1: Bank (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 !       28.50 !       14.13 !        14.13

ROAD (41.83 + 48.82 + 0.00) = 49.62 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -50    -43   0.00  62.10   0.00  -6.16 -14.10   0.00   0.00   0.00  41.83
-------------------------------------------------------------------------------
   -43     -8   0.00  62.10   0.00  -6.16  -7.11   0.00   0.00   0.00  48.82*
   -43     -8   0.00  62.10   0.00  -6.16  -7.11   0.00   0.00   0.00  48.82
-------------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 49.62 dBA

Total Leq All Segments: 49.62 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 57.21
                           (NIGHT): 49.62
```

```
STAMSON 5.0        NORMAL REPORT        Date: 26-06-2020 15:57:28
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: 417 (day/night)
---------------------------------------
Car traffic volume  : 89056/7744  veh/TimePeriod  *
Medium truck volume :  7084/616   veh/TimePeriod  *
Heavy truck volume  :  5060/440   veh/TimePeriod  *
Posted speed limit  :   100 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): 110000
    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: 417 (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  :  40.00 / 40.00  m
Receiver height           :  28.50 / 28.50  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : -79.00 deg
Barrier height            :   3.00 m
Barrier receiver distance :  17.00 / 17.00  m
Source elevation          :   4.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   4.00 m
Reference angle           :   0.00
```

```
Road data, segment # 2: Isabella (day/night)
-------------------------------------------
Car traffic volume  : 12144/1056  veh/TimePeriod  *
Medium truck volume :   966/84    veh/TimePeriod  *
Heavy truck volume  :   690/60    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  15000
    Percentage of Annual Growth         :   0.00
    Number of Years of Growth           :   0.00
    Medium Truck % of Total Volume      :   7.00
    Heavy Truck  % of Total Volume      :   5.00
    Day (16 hrs) % of Total Volume      :  92.00

Data for Segment # 2: Isabella (day/night)
-------------------------------------------
Angle1   Angle2           : -77.00 deg   -43.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  27.00 / 27.00  m
Receiver height           :  28.50 / 28.50  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -77.00 deg   Angle2 : -59.00 deg
Barrier height            :   9.00 m
Barrier receiver distance :  15.00 / 15.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Road data, segment # 3: Isabella2 (day/night)
-----------------------------------------------
Car traffic volume  : 12144/1056  veh/TimePeriod  *
Medium truck volume :   966/84    veh/TimePeriod  *
Heavy truck volume  :   690/60    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  15000
    Percentage of Annual Growth         :   0.00
    Number of Years of Growth           :   0.00
    Medium Truck % of Total Volume      :   7.00
    Heavy Truck  % of Total Volume      :   5.00
    Day (16 hrs) % of Total Volume      :  92.00

Data for Segment # 3: Isabella2 (day/night)
-------------------------------------------
Angle1   Angle2           : -70.00 deg   0.00 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 # 4: Bank (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  :    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):  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 # 4: Bank (day/night)
--------------------------------------
Angle1   Angle2           : -59.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  57.00 / 57.00  m
Receiver height           :  28.50 / 28.50  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -59.00 deg   Angle2 : -5.00 deg
Barrier height            :   9.00 m
Barrier receiver distance :  43.00 / 43.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Results segment # 1: 417 (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 !       28.50 !       14.72 !        18.72

ROAD (0.00 + 66.76 + 75.32) = 75.89 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -79   0.00  83.16   0.00  -4.26 -12.14   0.00   0.00  -0.16  66.60*
   -90    -79   0.00  83.16   0.00  -4.26 -12.14   0.00   0.00   0.00  66.76
-------------------------------------------------------------------------------
   -79      0   0.00  83.16   0.00  -4.26  -3.58   0.00   0.00   0.00  75.32
-------------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 75.89 dBA


Results segment # 2: Isabella (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 !       28.50 !       13.50 !        13.50

ROAD (0.00 + 55.93 + 55.42) = 58.69 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -77    -59   0.00  68.48   0.00  -2.55 -10.00   0.00   0.00   0.00  55.93*
   -77    -59   0.00  68.48   0.00  -2.55 -10.00   0.00   0.00   0.00  55.93
-------------------------------------------------------------------------------
   -59    -43   0.00  68.48   0.00  -2.55 -10.51   0.00   0.00   0.00  55.42
-------------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 58.69 dBA
```

```
Results segment # 3: Isabella2 (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 64.38 + 0.00) = 64.38 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -70      0   0.00  68.48   0.00   0.00  -4.10   0.00   0.00   0.00  64.38
-------------------------------------------------------------------------------

Segment Leq : 64.38 dBA


Results segment # 4: Bank (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 !       28.50 !        8.13 !         8.13

ROAD (0.00 + 52.64 + 61.12) = 61.70 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -59     -5   0.00  69.70   0.00  -5.80  -5.23   0.00   0.00  -6.03  52.64
-------------------------------------------------------------------------------
    -5     90   0.00  69.70   0.00  -5.80  -2.78   0.00   0.00   0.00  61.12
-------------------------------------------------------------------------------

Segment Leq : 61.70 dBA

Total Leq All Segments: 76.41 dBA
```

```
Results segment # 1: 417 (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 !       28.50 !       14.72 !        18.72

ROAD (0.00 + 59.16 + 67.72) = 68.29 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -79   0.00  75.56   0.00  -4.26 -12.14   0.00   0.00  -0.16  59.01*
   -90    -79   0.00  75.56   0.00  -4.26 -12.14   0.00   0.00   0.00  59.16
-------------------------------------------------------------------------------
   -79      0   0.00  75.56   0.00  -4.26  -3.58   0.00   0.00   0.00  67.72
-------------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 68.29 dBA


Results segment # 2: Isabella (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 !       28.50 !       13.50 !        13.50

ROAD (0.00 + 48.33 + 47.82) = 51.09 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -77    -59   0.00  60.88   0.00  -2.55 -10.00   0.00   0.00   0.00  48.33*
   -77    -59   0.00  60.88   0.00  -2.55 -10.00   0.00   0.00   0.00  48.33
-------------------------------------------------------------------------------
   -59    -43   0.00  60.88   0.00  -2.55 -10.51   0.00   0.00   0.00  47.82
-------------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 51.09 dBA
```

```
Results segment # 3: Isabella2 (night)
---------------------------------------

Source height = 1.50 m

ROAD (0.00 + 56.78 + 0.00) = 56.78 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -70      0   0.00  60.88   0.00   0.00  -4.10   0.00   0.00   0.00  56.78
-------------------------------------------------------------------------------

Segment Leq : 56.78 dBA


Results segment # 4: Bank (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 !       28.50 !        8.13 !         8.13

ROAD (0.00 + 45.04 + 53.53) = 54.10 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -59     -5   0.00  62.10   0.00  -5.80  -5.23   0.00   0.00  -6.03  45.04
-------------------------------------------------------------------------------
    -5     90   0.00  62.10   0.00  -5.80  -2.78   0.00   0.00   0.00  53.53
-------------------------------------------------------------------------------

Segment Leq : 54.10 dBA

Total Leq All Segments: 68.81 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 76.41
                           (NIGHT): 68.81
```

```
STAMSON 5.0        NORMAL REPORT        Date: 20-08-2020 16:41:51
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: 417 (day/night)
---------------------------------------
Car traffic volume  : 89056/7744  veh/TimePeriod  *
Medium truck volume :  7084/616   veh/TimePeriod  *
Heavy truck volume  :  5060/440   veh/TimePeriod  *
Posted speed limit  :   100 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): 110000
    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: 417 (day/night)
---------------------------------------
Angle1   Angle2           : -90.00 deg   24.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  48.00 / 48.00  m
Receiver height           :  34.00 / 34.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 24.00 deg
Barrier height            :  32.50 m
Barrier receiver distance :  10.00 / 10.00  m
Source elevation          :   4.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Road data, segment # 2: 4172 (day/night)
----------------------------------------
Car traffic volume  : 89056/7744  veh/TimePeriod  *
Medium truck volume :  7084/616   veh/TimePeriod  *
Heavy truck volume  :  5060/440   veh/TimePeriod  *
Posted speed limit  :   100 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): 110000
    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: 4172 (day/night)
--------------------------------------
Angle1   Angle2           :  24.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  48.00 / 48.00  m
Receiver height           :  34.00 / 34.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :  24.00 deg   Angle2 : 90.00 deg
Barrier height            :  53.50 m
Barrier receiver distance :  10.00 / 10.00  m
Source elevation          :   4.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Road data, segment # 3: Isabella (day/night)
-------------------------------------------
Car traffic volume  : 12144/1056  veh/TimePeriod  *
Medium truck volume :   966/84    veh/TimePeriod  *
Heavy truck volume  :   690/60    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  15000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 3: Isabella (day/night)
-------------------------------------------
Angle1   Angle2           : -73.00 deg   -37.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  35.00 / 35.00  m
Receiver height           :  34.00 / 34.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -73.00 deg   Angle2 : -37.00 deg
Barrier height            :  32.50 m
Barrier receiver distance :  10.00 / 10.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Road data, segment # 4: Isabella2 (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 # 4: Isabella2 (day/night)
-------------------------------------------
Angle1   Angle2           : -64.00 deg   24.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  20.00 / 20.00  m
Receiver height           :  34.00 / 34.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -64.00 deg   Angle2 : 24.00 deg
Barrier height            :  32.50 m
Barrier receiver distance :  10.00 / 10.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Road data, segment # 5: Isabella3 (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 # 5: Isabella3 (day/night)
-------------------------------------------
Angle1   Angle2           :  24.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  20.00 / 20.00  m
Receiver height           :  34.00 / 34.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :  24.00 deg   Angle2 : 90.00 deg
Barrier height            :  53.50 m
Barrier receiver distance :  10.00 / 10.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Road data, segment # 6: Bank (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  :    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):  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 # 6: Bank (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  :  59.00 / 59.00  m
Receiver height           :  34.00 / 34.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :  32.50 m
Barrier receiver distance :   3.00 / 3.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Results segment # 1: 417 (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 !       34.00 !       28.06 !        28.06

ROAD (0.00 + 62.32 + 0.00) = 62.32 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     24   0.00  83.16   0.00  -5.05  -1.98   0.00   0.00 -13.80  62.32
-------------------------------------------------------------------------------

Segment Leq : 62.32 dBA


Results segment # 2: 4172 (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 !       34.00 !       28.06 !        28.06

ROAD (0.00 + 54.38 + 0.00) = 54.38 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    24     90   0.00  83.16   0.00  -5.05  -4.36   0.00   0.00 -19.36  54.38
-------------------------------------------------------------------------------

Segment Leq : 54.38 dBA
```

```
Results segment # 3: Isabella (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 !       34.00 !       24.71 !        24.71

ROAD (0.00 + 39.63 + 0.00) = 39.63 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -73    -37   0.00  68.48   0.00  -3.68  -6.99   0.00   0.00 -18.18  39.63
-------------------------------------------------------------------------------

Segment Leq : 39.63 dBA


Results segment # 4: Isabella2 (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 !       34.00 !       17.75 !        17.75

ROAD (0.00 + 44.12 + 0.00) = 44.12 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -64     24   0.00  68.48   0.00  -1.25  -3.11   0.00   0.00 -20.00  44.12
-------------------------------------------------------------------------------

Segment Leq : 44.12 dBA
```

```
Results segment # 5: Isabella3 (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 !       34.00 !       17.75 !        17.75

ROAD (0.00 + 43.35 + 0.00) = 43.35 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    24     90   0.00  68.48   0.00  -1.25  -4.36   0.00   0.00 -19.52  43.35
-------------------------------------------------------------------------------

Segment Leq : 43.35 dBA


Results segment # 6: Bank (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 !       34.00 !       32.35 !        32.35

ROAD (0.00 + 58.65 + 0.00) = 58.65 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  69.70   0.00  -5.95   0.00   0.00   0.00  -5.09  58.65
-------------------------------------------------------------------------------

Segment Leq : 58.65 dBA

Total Leq All Segments: 64.42 dBA
```

```
Results segment # 1: 417 (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 !       34.00 !       28.06 !        28.06

ROAD (0.00 + 54.72 + 0.00) = 54.72 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     24   0.00  75.56   0.00  -5.05  -1.98   0.00   0.00 -13.80  54.72
-------------------------------------------------------------------------------

Segment Leq : 54.72 dBA


Results segment # 2: 4172 (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 !       34.00 !       28.06 !        28.06

ROAD (0.00 + 46.79 + 0.00) = 46.79 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    24     90   0.00  75.56   0.00  -5.05  -4.36   0.00   0.00 -19.36  46.79
-------------------------------------------------------------------------------

Segment Leq : 46.79 dBA
```

```
Results segment # 3: Isabella (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 !       34.00 !       24.71 !        24.71

ROAD (0.00 + 32.04 + 0.00) = 32.04 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -73    -37   0.00  60.88   0.00  -3.68  -6.99   0.00   0.00 -18.18  32.04
-------------------------------------------------------------------------------

Segment Leq : 32.04 dBA


Results segment # 4: Isabella2 (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 !       34.00 !       17.75 !        17.75

ROAD (0.00 + 36.53 + 0.00) = 36.53 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -64     24   0.00  60.88   0.00  -1.25  -3.11   0.00   0.00 -20.00  36.53
-------------------------------------------------------------------------------

Segment Leq : 36.53 dBA
```

```
Results segment # 5: Isabella3 (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 !       34.00 !       17.75 !        17.75

ROAD (0.00 + 35.76 + 0.00) = 35.76 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    24     90   0.00  60.88   0.00  -1.25  -4.36   0.00   0.00 -19.52  35.76
-------------------------------------------------------------------------------

Segment Leq : 35.76 dBA


Results segment # 6: Bank (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 !       34.00 !       32.35 !        32.35

ROAD (0.00 + 51.06 + 0.00) = 51.06 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  62.10   0.00  -5.95   0.00   0.00   0.00  -5.09  51.06
-------------------------------------------------------------------------------

Segment Leq : 51.06 dBA

Total Leq All Segments: 56.83 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 64.42
                           (NIGHT): 56.83
```