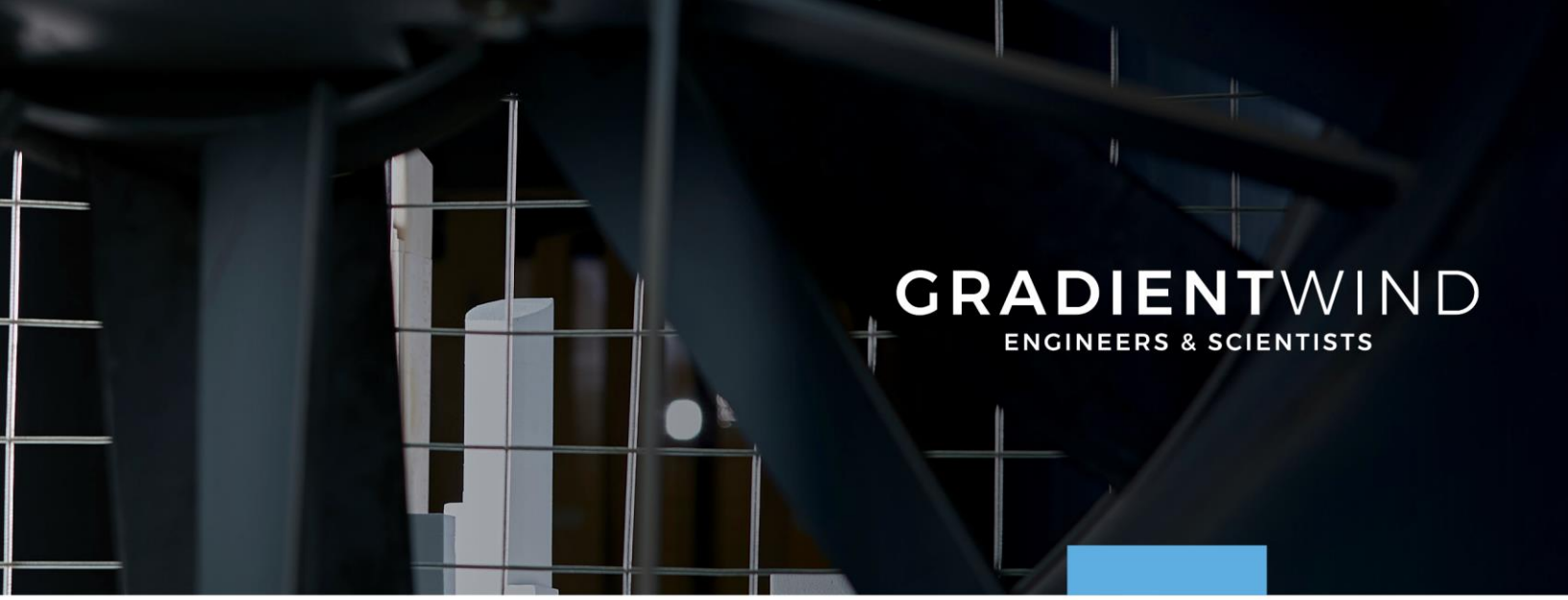

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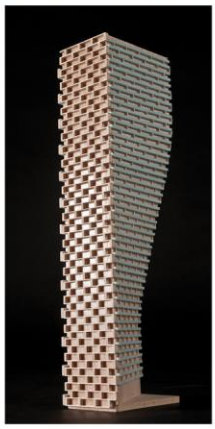
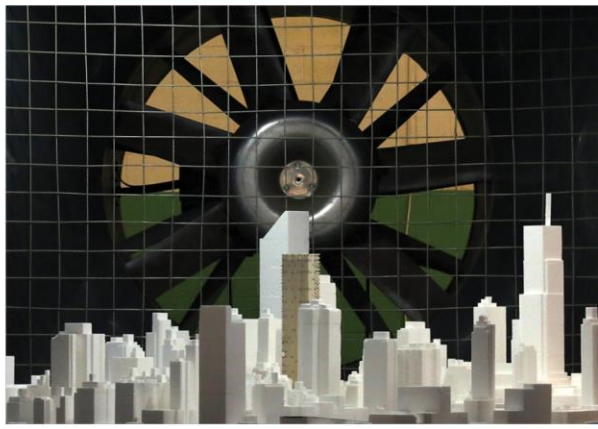
ROADWAY TRAFFIC NOISE ASSESSMENT

1 Dunbar Court
Ottawa, Ontario

Report: 20-239-Traffic Noise





November 13, 2020

PREPARED FOR

Jane Thompson Architect
404 MacKay Street
Ottawa, ON K1M 2C4

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 assessment undertaken to satisfy the requirements for a Site Plan Control application (SPA) submission for a proposed development located at 1 Dunbar Court in Ottawa, Ontario. The development comprises a 3-storey residential building with a L-shaped floorplan, situated at the centre of the site surrounded by an existing 2-storey townhouse blocks. The major sources of traffic noise are Greenbank Road and Gibbard Avenue. 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 Jane Thompson Architects received in October 2020.

The results of the current analysis indicate that noise levels will range between 49 dBA and 58 dBA during the daytime period (07:00-23:00) and between 42 dBA and 51 dBA during the nighttime period (23:00-07:00). Results of the calculations indicate that the development will require forced air heating with provision for central air conditioning (or similar system), which will allow occupants to keep windows closed and maintain a comfortable living environment. A Warning Clause will also be required be placed on all Lease, Purchase and Sale Agreements.

Noise levels at the grade-level amenity area are expected to approach 58 dBA during the daytime, which exceeds the criteria of 55 dBA specified by the ENCG. The installation of a high wall around the amenity area to reduce the noise levels to 55 dBA is not considered to be architecturally feasible, as the area is intended to provide an open, outdoor space for the residents. Since the noise levels do not exceed 60 dBA, the marginal exceedance of 3 dBA in noise level is acceptable.

The surrounding, on-site townhouse blocks and the 4-storey residential building at 57 Bateman Drive are the nearest noise-sensitive point of receptions to the development. With regard to stationary noise impacts of the development's mechanical equipment, we recommend placing the mechanical equipment (i.e. air handling units, cooling towers, generators) on the rooftop or in a mechanical penthouse to reduce

the line of sight exposure and with the intake/exhaust louvres pointed away from the noise-sensitive areas. As the proposed building is expected to be taller than the adjacent townhouse blocks and of similar height to the residential building at 57 Bateman Drive, the development is expected to be compatible with the surrounding existing land uses. A review of the mechanical equipment and plans by a qualified acoustic engineer is recommended once the proposed equipment and locations are known.

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Jane Thompson Architect to undertake a roadway traffic noise assessment to satisfy the requirements for a Site Plan Control application (SPA) submission for a proposed development located at 1 Dunbar Court 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 Jane Thompson Architect received in October 2020, with future traffic volumes corresponding to the City of Ottawa's Official Plan (OP) roadway classifications.

2. TERMS OF REFERENCE

The focus of this roadway traffic noise assessment is a proposed development located at 1 Dunbar Court in Ottawa, Ontario. The subject site is situated on a parcel of land bounded by Gibbard Avenue to the southeast, Greenbank Road to the west, Bateman Drive to the north, and Atkinson Gate to the northeast.

The development comprises a 3-storey residential building with a L-shaped floorplan, situated at the centre of the development site surrounded by an existing 2-storey townhouse blocks. The ground floor contains residential units, an indoor amenity space, building support facilities. Levels 2 and 3 are reserved for residential occupancy. An outdoor amenity area is provided at the northwest corner of the site and has been considered as an outdoor living area (OLA) in this assessment.

The site is surrounded by low-rise buildings in all directions. Ben Franklin Park, which comprises open recreational areas as well as an indoor recreational centre, is located to the south beyond Gibbard Avenue. The area to the south of West Hunt Club Road is primarily occupied by farmlands. The major sources of traffic noise are Greenbank Road and Gibbard Avenue. Figure 1 illustrates a complete site plan with surrounding context.

[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

3. OBJECTIVES

The principal objectives of this study are to (i) calculate the future noise levels on the study building produced by local roadway traffic, and (ii) ensure that interior and exterior noise levels do not exceed the allowable limits specified by the City of Ottawa's Environmental Noise Control Guidelines as outlined in Section 4.2 of this report.

4. METHODOLOGY

4.1 Background

Noise can be defined as any obtrusive sound. It is created at a source, transmitted through a medium, such as air, and intercepted by a receiver. Noise may be characterized in terms of the power of the source or the sound pressure at a specific distance. While the power of a source is characteristic of that particular source, the sound pressure depends on the location of the receiver and the path that the noise takes to reach the receiver. Measurement of noise is based on the decibel unit, dBA, which is a logarithmic ratio referenced to a standard noise level (2×10^{-5} Pascals). The 'A' suffix refers to a weighting scale, which better represents how the noise is perceived by the human ear. With this scale, a doubling of power results in a 3 dBA increase in measured noise levels and is just perceptible to most people. An increase of 10 dBA is often perceived to be twice as loud.

4.2 Roadway Traffic Noise

4.2.1 Criteria for Roadway Traffic Noise

For surface roadway traffic noise, the equivalent sound energy level, L_{eq}, provides a measure of the time varying noise levels, which is well correlated with the annoyance of sound. It is defined as the continuous sound level, which has the same energy as a time varying noise level over a period of time. For roadways, the L_{eq} is commonly calculated on the basis of a 16-hour (L_{eq16}) daytime (07:00-23:00) / 8-hour (L_{eq8}) nighttime (23:00-07:00) split to assess its impact on residential buildings. The City of Ottawa's Environmental Noise Control Guidelines (ENCG) specifies that the recommended indoor noise limit range (that is relevant to this study) is 45 and 40 dBA for living rooms and sleeping quarters, respectively, for roadway traffic, 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] MOECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.8
[6] MOECP, 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 absorptive and reflective based on specific source-receiver path ground characteristics.
- Topography was assumed to be a flat/gentle slope surrounding the study building.
- For select sources where appropriate, the receptors considered the proposed building and existing, surrounding buildings as barriers, partially or fully obstructing exposure to the source as illustrated by exposure angles in Figures 3-4.
- Noise receptors were strategically placed at 5 locations around the study area (see Figure 2).
- Receptor distances and exposure angles are illustrated in Figures 3-4.

4.2.3 Roadway Traffic Volumes

The ENCG dictates that noise calculations should consider future sound levels based on a roadway's classification at the mature state of development. Therefore, traffic volumes are based on the roadway classifications outlined in the City of Ottawa's Official Plan (OP) and Transportation Master Plan[7] which provide additional details on future roadway expansions. Average Annual Daily Traffic (AADT) volumes are then based on data in Table B1 of the ENCG for each roadway classification. Table 2 (below) summarizes the AADT values used for each roadway included in this assessment.

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

TABLE 2: ROADWAY TRAFFIC DATA

Segment	Roadway Classification	Speed Limit (km/h)	Traffic Volumes
Greenbank Road	4-Lane Urban Arterial Divided (4-UAD)	60	**35,000**
Gibbard Avenue	2-Lane Urban Collector (2-UCU)	40	**8,000**

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	7.5	POW – Level 3, West Façade	57	50
2	7.5	POW – Level 3, East Façade	49	42
3	7.5	POW – Level 3, South Façade	57	49
4	7.5	POW – Level 3, West Façade	58	51
5	1.5	OLA – Grade-Level Amenity Area	58	N/A*

*Noise levels at OLAs during the nighttime period are not considered as per the ENCG.

The results of the current analysis indicate that noise levels will range between 49 dBA and 58 dBA during the daytime period (07:00-23:00) and between 42 dBA and 51 dBA during the nighttime period (23:00-07:00). The highest noise level (58 dBA) occurs at the west façade at the southwest corner of the building, which is nearest and most exposed to Greenbank Road. Noise levels at the grade-level amenity area are expected to approach 58 dBA during the daytime.

6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current analysis indicate that noise levels will range between 49 dBA and 58 dBA during the daytime period (07:00-23:00) and between 42 dBA and 51 dBA during the nighttime period (23:00-07:00). Results of the calculations indicate that the development will require forced air heating with provision for central air conditioning (or similar system), which will allow occupants to keep windows closed and maintain a comfortable living environment. The following Warning Clause[8] will also be required be placed on all Lease, Purchase and Sale Agreements, as summarized below:

> *"Purchasers/tenants are advised that sound levels due to increasing roadway traffic may, on occasion, interfere with some activities of the dwelling occupants, as the sound levels exceed the sound level limits of the City and the Ministry of Environment, Conservation and Parks.*
>
> *This dwelling unit has been designed with the provision for adding central air conditioning at the occupant's discretion. Installation of central air conditioning (or similar system) will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the City and the Ministry of Environment, Conservation and Parks.*
>
> *To ensure that provincial sound level limits are not exceeded, it is important to maintain these sound attenuation features."*

Noise levels at the grade-level amenity area (Receptor 5) are expected to approach 58 dBA during the daytime, which exceeds the criteria of 55 dBA specified by the ENCG. The installation of a high wall around the amenity area to reduce the noise levels to 55 dBA is not considered to be architecturally feasible, as the area is intended to provide an open, outdoor space for the residents. Since the noise levels do not exceed 60 dBA, the marginal exceedance of 3 dBA in noise level is acceptable.

The surrounding, on-site townhouse blocks and the 4-storey residential building at 57 Bateman Drive are the nearest noise-sensitive point of receptions to the development. With regard to stationary noise

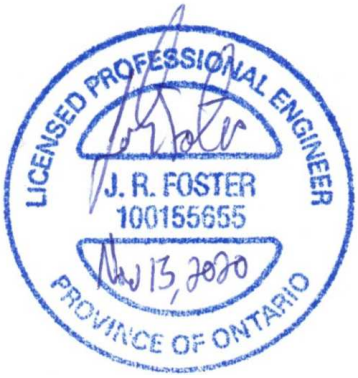
[8] City of Ottawa Environmental Noise Control Guidelines, January 2016

impacts of the development's mechanical equipment, we recommend placing the mechanical equipment (i.e. air handling units, cooling towers, generators) on the rooftop or in a mechanical penthouse to reduce the line of sight exposure and with the intake/exhaust louvres pointed away from the noise-sensitive areas. As the proposed building is expected to be taller than the adjacent townhouse blocks and of similar height to the residential building at 57 Bateman Drive, the development is expected to be compatible with the surrounding existing land uses. A review of the mechanical equipment and plans by a qualified acoustic engineer is recommended once the proposed equipment and locations are known.

This concludes our roadway traffic noise assessment and report. If you have any questions or wish to discuss our findings, please advise us. In the interim, we thank you for the opportunity to be of service.

Sincerely,

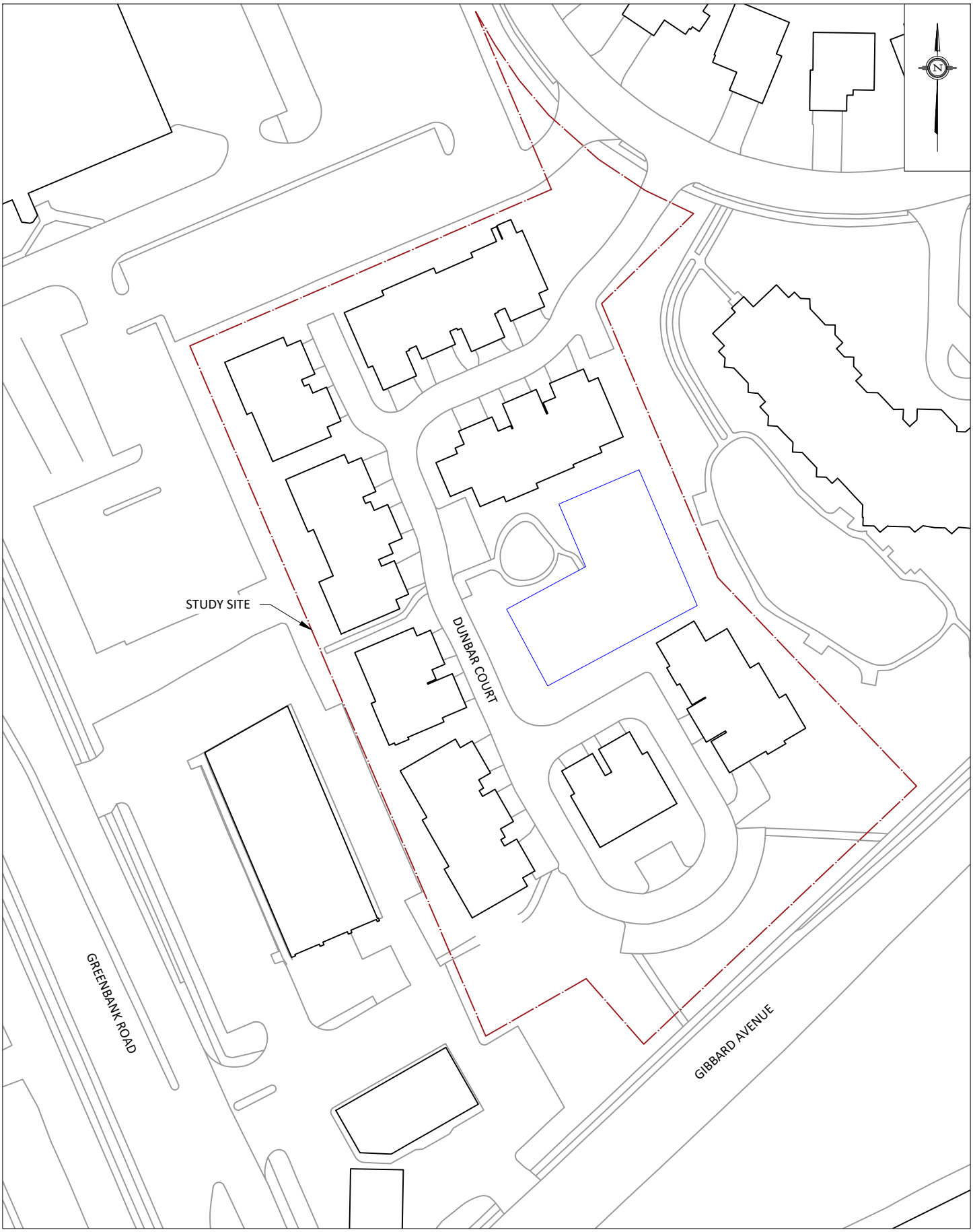
Gradient Wind Engineering Inc.



Michael Lafortune, C.E.T.
Environmental Scientist

Joshua Foster, P.Eng.
Principal

Gradient Wind File 20-239-Traffic Noise



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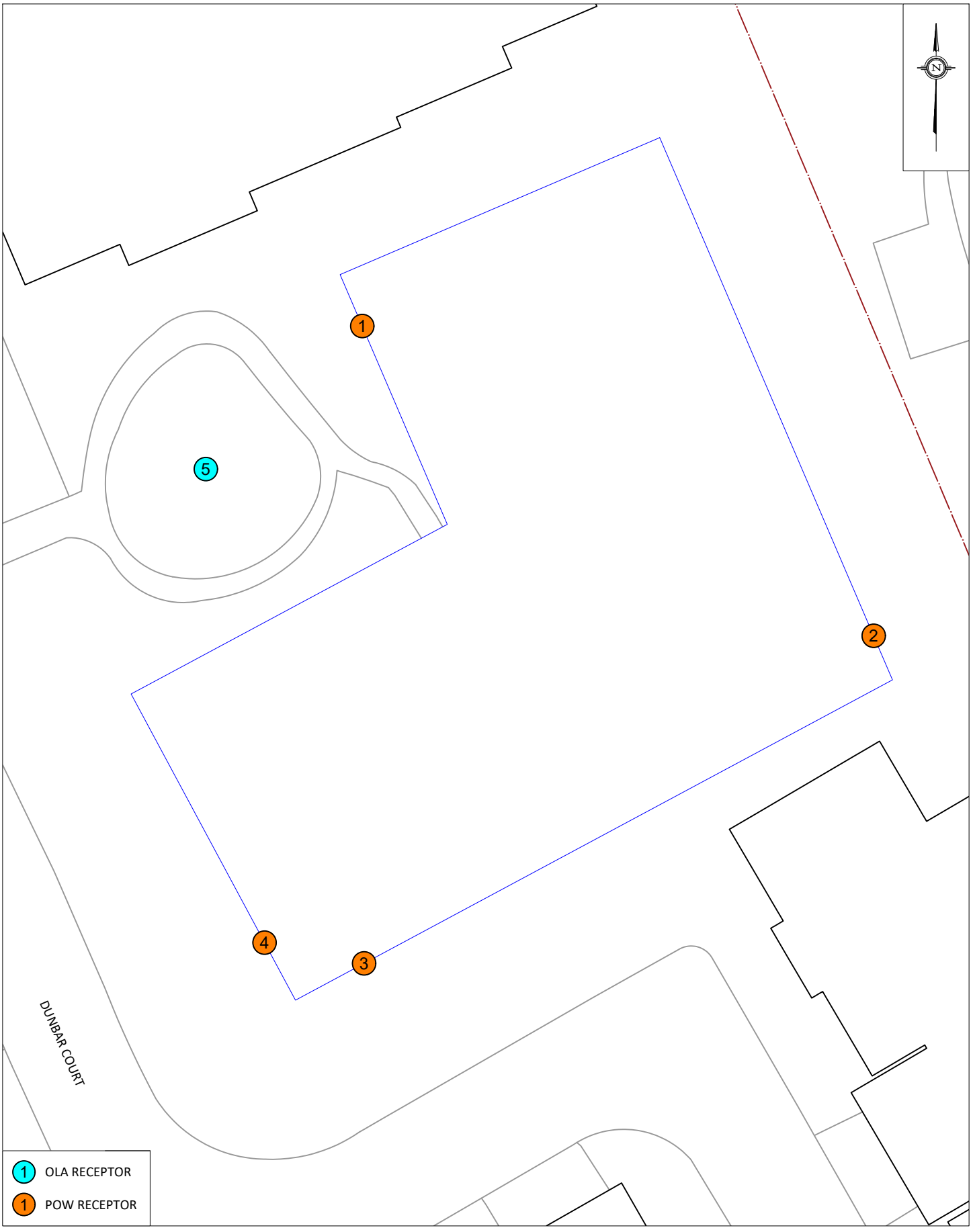
PROJECT	1 DUNBAR COURT, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		DESCRIPTION
SCALE	1:1000 (APPROX.)	DRAWING NO.	GW20-239-1
DATE	NOVEMBER 9, 2020	DRAWN BY	M.L.

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT



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PROJECT	1 DUNBAR COURT, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:250 (APPROX.)
DRAWING NO.	GW20-239-2
DATE	NOVEMBER 9, 2020
DRAWN BY	M.L.

DESCRIPTION

FIGURE 2:
RECEPTOR LOCATIONS

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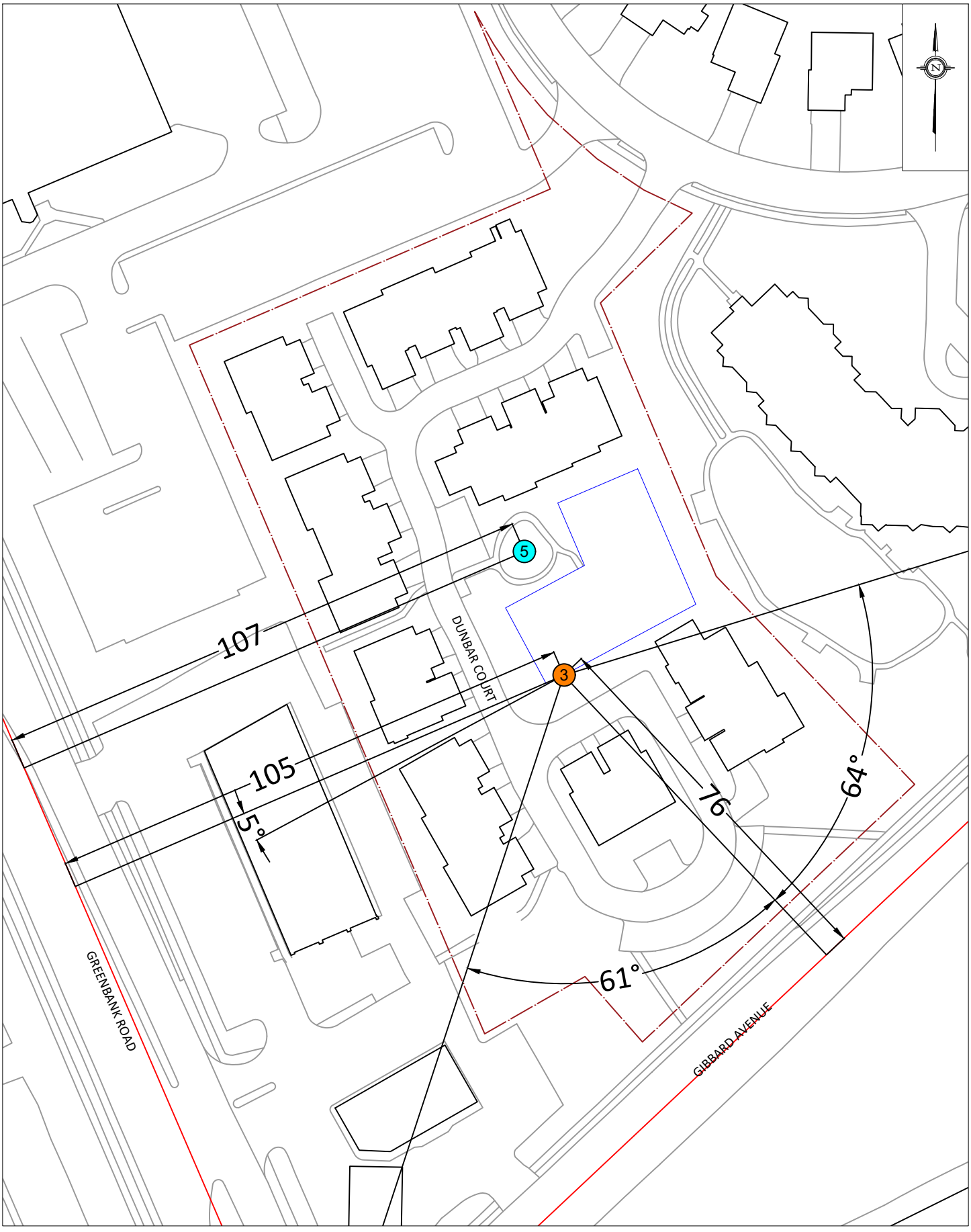
PROJECT	1 DUNBAR COURT, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		
SCALE	1:1000 (APPROX.)	DRAWING NO.	GW20-239-3
DATE	NOVEMBER 9, 2020	DRAWN BY	M.L.

DESCRIPTION

FIGURE 3:
STAMSON INPUT PARAMETERS - RECEPTOR 1,2,4



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PROJECT	1 DUNBAR COURT, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		DESCRIPTION
SCALE	1:1000 (APPROX.)	DRAWING NO.	GW20-239-4
DATE	NOVEMBER 9, 2020	DRAWN BY	M.L.

FIGURE 4:
STAMSON INPUT PARAMETERS - RECEPTOR 3,5

APPENDIX A

STAMSON 5.04 – INPUT AND OUTPUT DATA

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```
STAMSON 5.0        NORMAL REPORT        Date: 09-11-2020 14:59:25
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Greenbank (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  :    60 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 # 1: Greenbank (day/night)
--------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1 / 1
House density             :     90 %
Surface                   :      2       (Reflective ground surface)
Receiver source distance  : 117.00 / 117.00 m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 57.33 + 0.00) = 57.33 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  73.68   0.00  -8.92   0.00   0.00  -7.43   0.00
57.33
-------------------------------------------------------------------------
--

Segment Leq : 57.33 dBA

Total Leq All Segments: 57.33 dBA


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

Source height = 1.50 m

ROAD (0.00 + 49.73 + 0.00) = 49.73 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  66.08   0.00  -8.92   0.00   0.00  -7.43   0.00
49.73
-------------------------------------------------------------------------
--

Segment Leq : 49.73 dBA

Total Leq All Segments: 49.73 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 57.33
                           (NIGHT): 49.73
```

```
STAMSON 5.0        NORMAL REPORT        Date: 09-11-2020 14:43:29
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Gibbard (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  :    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):   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: Gibbard (day/night)
----------------------------------------
Angle1   Angle2           : -59.00 deg   20.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  70.00 / 70.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :   0.00 deg   Angle2 : 20.00 deg
Barrier height            :   7.00 m
Barrier receiver distance :  34.00 / 34.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Results segment # 1: Gibbard (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 !        4.58 !         4.58

ROAD (48.81 + 37.04 + 0.00) = 49.09 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -59      0   0.48  63.96   0.00  -9.90  -5.24   0.00   0.00   0.00
48.81
-------------------------------------------------------------------------------
--
     0     20   0.06  63.96   0.00  -7.09  -9.55   0.00   0.00 -10.27
37.04
-------------------------------------------------------------------------------
--

Segment Leq : 49.09 dBA

Total Leq All Segments: 49.09 dBA
```

```
Results segment # 1: Gibbard (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 !        4.58 !         4.58

ROAD (41.22 + 29.45 + 0.00) = 41.50 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -59      0   0.48  56.36   0.00  -9.90  -5.24   0.00   0.00   0.00
41.22
-------------------------------------------------------------------------------
--
     0     20   0.06  56.36   0.00  -7.09  -9.55   0.00   0.00 -10.27
29.45
-------------------------------------------------------------------------------
--

Segment Leq : 41.50 dBA

Total Leq All Segments: 41.50 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 49.09
                           (NIGHT): 41.50
```

```
STAMSON 5.0        NORMAL REPORT        Date: 09-11-2020 15:09:50
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Greenbank (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  :    60 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 # 1: Greenbank (day/night)
--------------------------------------------
Angle1   Angle2           : -90.00 deg   -5.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1 / 1
House density             :     90 %
Surface                   :      2       (Reflective ground surface)
Receiver source distance  : 105.00 / 105.00 m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 2: Gibbard (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  :    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):   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 # 2: Gibbard (day/night)
-----------------------------------------
Angle1   Angle2           : -64.00 deg   61.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1 / 1
House density             :     50 %
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  76.00 / 76.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 54.44 + 0.00) = 54.44 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     -5   0.00  73.68   0.00  -8.45  -3.26   0.00  -7.53   0.00
54.44
-------------------------------------------------------------------------
--

Segment Leq : 54.44 dBA


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

Source height = 1.50 m

ROAD (0.00 + 52.65 + 0.00) = 52.65 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -64     61   0.00  63.96   0.00  -7.05  -1.58   0.00  -2.67   0.00
52.65
-------------------------------------------------------------------------
--

Segment Leq : 52.65 dBA

Total Leq All Segments: 56.65 dBA
```

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

Source height = 1.50 m

ROAD (0.00 + 46.84 + 0.00) = 46.84 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     -5   0.00  66.08   0.00  -8.45  -3.26   0.00  -7.53   0.00
46.84
-------------------------------------------------------------------------
--

Segment Leq : 46.84 dBA


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

Source height = 1.50 m

ROAD (0.00 + 45.06 + 0.00) = 45.06 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -64     61   0.00  56.36   0.00  -7.05  -1.58   0.00  -2.67   0.00
45.06
-------------------------------------------------------------------------
--

Segment Leq : 45.06 dBA

Total Leq All Segments: 49.05 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 56.65
                           (NIGHT): 49.05
```

```
STAMSON 5.0        NORMAL REPORT        Date: 09-11-2020 15:09:25
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Greenbank (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  :    60 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 # 1: Greenbank (day/night)
--------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1 / 1
House density             :     90 %
Surface                   :      2       (Reflective ground surface)
Receiver source distance  : 101.00 / 101.00 m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 2: Gibbard (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  :    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):   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 # 2: Gibbard (day/night)
-----------------------------------------
Angle1   Angle2           :  15.00 deg   60.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1 / 1
House density             :     50 %
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  80.00 / 80.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 57.84 + 0.00) = 57.84 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  73.68   0.00  -8.28   0.00   0.00  -7.56   0.00
57.84
-------------------------------------------------------------------------
--

Segment Leq : 57.84 dBA


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

Source height = 1.50 m

ROAD (0.00 + 48.00 + 0.00) = 48.00 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    15     60   0.00  63.96   0.00  -7.27  -6.02   0.00  -2.67   0.00
48.00
-------------------------------------------------------------------------
--

Segment Leq : 48.00 dBA

Total Leq All Segments: 58.27 dBA
```

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

Source height = 1.50 m

ROAD (0.00 + 50.24 + 0.00) = 50.24 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     90   0.00  66.08   0.00  -8.28   0.00   0.00  -7.56   0.00
50.24
-------------------------------------------------------------------------------
--

Segment Leq : 50.24 dBA


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

Source height = 1.50 m

ROAD (0.00 + 40.41 + 0.00) = 40.41 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
    15     60   0.00  56.36   0.00  -7.27  -6.02   0.00  -2.67   0.00
40.41
-------------------------------------------------------------------------------
--

Segment Leq : 40.41 dBA

Total Leq All Segments: 50.67 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 58.27
                           (NIGHT): 50.67
```

```
STAMSON 5.0        NORMAL REPORT        Date: 09-11-2020 15:01:14
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Greenbank (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  :    60 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 # 1: Greenbank (day/night)
--------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1 / 1
House density             :     90 %
Surface                   :      2       (Reflective ground surface)
Receiver source distance  : 107.00 / 107.00 m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 57.63 + 0.00) = 57.63 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  73.68   0.00  -8.53   0.00   0.00  -7.51   0.00
57.63
-------------------------------------------------------------------------
--

Segment Leq : 57.63 dBA

Total Leq All Segments: 57.63 dBA


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

Source height = 1.50 m

ROAD (0.00 + 50.04 + 0.00) = 50.04 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  66.08   0.00  -8.53   0.00   0.00  -7.51   0.00
50.04
-------------------------------------------------------------------------
--

Segment Leq : 50.04 dBA

Total Leq All Segments: 50.04 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 57.63
                           (NIGHT): 50.04
```