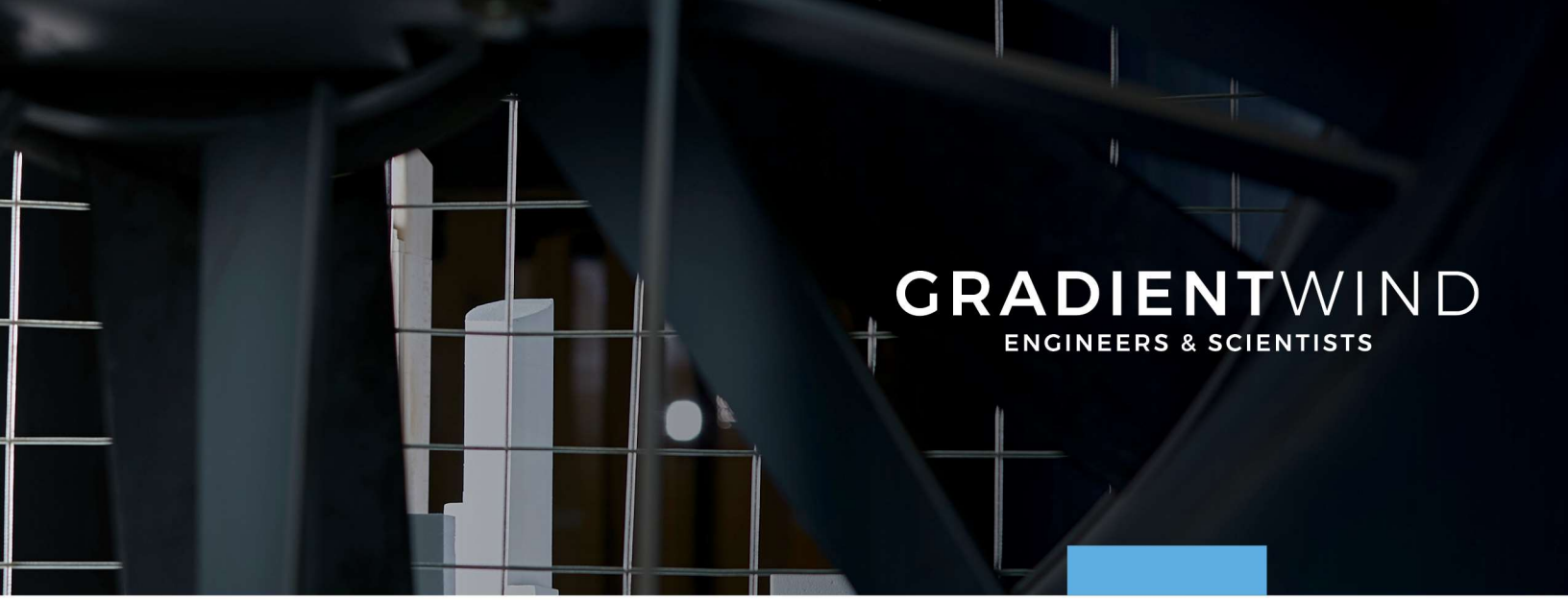
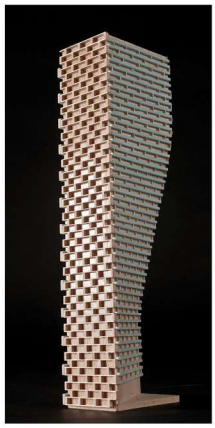


GRADIENTWIND
ENGINEERS & SCIENTISTS

ROADWAY TRAFFIC NOISE ASSESSMENT

229 & 241 Beechwood Avenue
Ottawa, Ontario

REPORT: 20-292 – Traffic Noise



December 23, 2020

PREPARED FOR
Smart Living Properties
226 Argyle Avenue
Ottawa, ON K2P 1B9

PREPARED BY
Giuseppe Garro, MASc., Junior Environmental Scientist
Joshua Foster, P.Eng., Principal

EXECUTIVE SUMMARY

This report describes a roadway traffic noise assessment undertaken to satisfy the requirements for a Site Plan Control (SPA) application submission for a proposed two-building residential development located at 229 & 241 Beechwood Avenue in Ottawa, Ontario. The proposed development comprises a 3-storey and 4-storey residential building, plus a basement level, each with a rectangular planform. The primary sources of roadway traffic noise include Beechwood Avenue and Acacia 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 provided by Woodman Architect and Associates Ltd. in December 2020.

The results of the current analysis indicate that noise levels will range between 53 and 68 dBA during the daytime period (07:00-23:00) and between 46 and 61 dBA during the nighttime period (23:00-07:00). The highest noise level (68 dBA) occurs at the east façade, which is nearest and most exposed to Beechwood Avenue. Building components with a higher Sound Transmission Class (STC) rating will be required where exterior noise levels exceed 65 dBA, as indicated in Figure 3.

Results of the calculations also indicate that both buildings (229 Beechwood Avenue and 241 Beechwood Avenue) will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. Warning Clauses will also be required be placed on all Lease, Purchase and Sale Agreements, as summarized in Section 6.

Noise levels at the rooftop terraces (Receptors 7 and 8) are expected to approach 62 dBA during the daytime period without a noise barrier. If this area is to be used as an outdoor living area, noise control measures are required to reduce noise levels as close as possible to 55 dBA where technically and administratively feasible. Further analysis investigated the noise mitigating impact of raising the perimeter guards 1.2 m above the walking surface. Results of the investigation proved that noise levels can be reduced to 55 dBA with a 1.2 m barrier. The barrier must be constructed from materials having a minimum

surface density of 20 kg/m^2 (STC rating of 30) and contain no gaps. Design of the barrier will conform to the requirements outlined in Part 5 of the ENCG and summarized in Section 6. Furthermore, the at-grade amenity areas at the rear of the proposed buildings are favourably positioned such that they are protected from roadway traffic noise. As such, these areas are expected to fall below the 55 dBA noise criterion.

Regarding stationary noise impacts, a stationary noise study may be required if there are large pieces of mechanical equipment on the roof. However, due to the small size of the development no significant pieces of HVAC equipment are expected. If required, the study would assess impacts of stationary noise from rooftop mechanical units serving the proposed buildings 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. Noise impacts can generally be minimized by judicious selection and placement of the equipment.

TABLE OF CONTENTS

INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Smart Living Properties to undertake a roadway traffic noise assessment to satisfy the requirements for a Site Plan Control (SPA) application submission for a proposed two-building residential development located at 229 & 241 Beechwood Avenue 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 provided by Woodman Architect and Associates Ltd. in December 2020, with future traffic volumes corresponding to the City of Ottawa's Official Plan (OP) roadway classifications.

1. TERMS OF REFERENCE

The focus of this roadway traffic noise assessment is a proposed residential development located at 229 & 241 Beechwood Avenue in Ottawa, Ontario. The proposed development fronts onto Beechwood Avenue to the east and comprises two buildings, overlooking residential buildings in all compass directions. At-grade parking off of Carsdale Avenue separates the two buildings. 229 Beechwood Avenue comprises a 3-storey, 47-unit residential building with basement level, rising on a rectangular planform with a rooftop amenity terrace and outdoor amenity area at grade toward the rear of the building. 241 Beechwood Avenue comprises a 4-storey, 55-unit residential building with basement level, rising on a rectangular planform with a rooftop amenity terrace and outdoor amenity area at grade toward the rear of the building.

Balconies serving the residential units are located on the east façade of the buildings. Balconies/terraces extending less than 4 metres (m) in depth from the façade do not require consideration as Outdoor Living Areas (OLA) as mentioned in the ENCG. The primary sources of roadway traffic noise include Beechwood Avenue and Acacia 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

2. 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.

3. METHODOLOGY

3.1 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.

3.2 Roadway Traffic Noise

3.2.1 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 (OLA) is 55 dBA, which applies during the daytime (07:00 to 23:00). When noise levels exceed 55 dBA, mitigation should be provided to reduce noise levels where technically and administratively feasible to acceptable levels at or below the criterion. Furthermore, noise levels at the OLA must not exceed 60 dBA if mitigation can be technically and administratively achieved.

[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

3.2.2 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. For roadway traffic noise along Acacia Avenue, absorptive ground surface was used to account for blockage due to the numerous houses situated between the study site and Acacia Avenue.
- Topography was assumed to be a flat/gentle slope surrounding the study building, with the exception of a portion of Acacia Avenue which was modelled with a grade of 6%.
- For select sources where appropriate, receptors considered the proposed building as a barrier partially or fully obstructing exposure to the source as illustrated by exposure angles in Figures 4 and 5.
- Noise receptors were strategically placed at 8 locations around the study area (see Figure 2).
- Receptor distances and exposure angles are illustrated in Figures 4 and 5.

3.2.3 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
Beechwood Avenue	2-Lane Urban Arterial Undivided (2-UAU)	50	**15,000**
Acacia Avenue	2-Lan Urban Collector (2-UCU)	40	**8,000**

3.3 Indoor Noise Calculations

The difference between outdoor and indoor noise levels is the noise attenuation provided by the building envelope. According to common industry practice, complete walls and individual wall elements are rated according to the Sound Transmission Class (STC). The STC ratings of common residential walls built in conformance with the Ontario Building Code (2012) typically exceed STC 35, depending on exterior cladding, thickness and interior finish details. For example, brick veneer walls can achieve STC 50 or more. Standard commercially sided exterior metal stud walls have around STC 45. Standard good quality double-glazed non-operable windows can have STC ratings ranging from 25 to 40, depending on the window manufacturer, pane thickness and inter-pane spacing. As previously mentioned, the windows are the known weak point in a partition.

As per Section 4.2, when daytime noise levels from road sources at the plane of the window exceed 65 dBA, calculations must be performed to evaluate the sound transmission quality of the building components to ensure acceptable indoor noise levels. The calculation procedure[8] considers:

- Window type and total area as a percentage of total room floor area
- Exterior wall type and total area as a percentage of the total room floor area
- Acoustic absorption characteristics of the room
- Outdoor noise source type and approach geometry
- Indoor sound level criteria, which varies according to the intended use of a space

[8] Building Practice Note: Controlling Sound Transmission into Buildings by J.D. Quirt, National Research Council of Canada, September 1985

Based on published research[9], exterior walls possess specific sound attenuation characteristics that are used as a basis for calculating the required STC ratings of windows in the same partition. Due to the limited information available at the time of the study, which was prepared for site plan approval, detailed floor layouts and building elevations have not been finalized; therefore, detailed STC calculations could not be performed at this time. As a guideline, the anticipated STC requirements for windows have been estimated based on the overall noise reduction required for each intended use of space (STC = outdoor noise level – targeted indoor noise levels).

4. RESULTS AND DISCUSSION

4.1 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
229 Beechwood Avenue				
1	10.55	POW – 3rd Floor – North Façade	65	58
2	10.55	POW – 3rd Floor – East Façade	68	61
3	10.55	POW – 3rd Floor – West Façade	53	46
241 Beechwood Avenue				
4	13.5	POW – 4th Floor – South Façade	64	57
5	13.5	POW – 4th Floor – East Façade	68	61
6	13.5	POW – 4th Floor – West Façade	54	46
Outdoor Living Area				
7	13.75	OLA – Rooftop Terrace	62	N/A
8	15.2	OLA – Rooftop Terrace	62	N/A

*Noise levels at an OLA during the nighttime period are not considered as per ENCG

[9] CMHC, Road & Rail Noise: Effects on Housing

The results of the current analysis indicate that noise levels will range between 53 and 68 dBA during the daytime period (07:00-23:00) and between 46 and 61 dBA during the nighttime period (23:00-07:00). The highest noise level (68 dBA) occurs at the east façade, which is nearest and most exposed to Beechwood Avenue.

4.2 Noise Control Measures

The noise levels predicted due to roadway traffic exceed the criteria listed in Section 4.2 for building components. As discussed in Section 4.3, the anticipated STC requirements for windows have been estimated based on the overall noise reduction required for each intended use of space (STC = outdoor noise level – targeted indoor noise levels). The STC requirements for the windows are summarized below for various units within the development (see Figure 3):

- **Bedroom Windows**

(i) Bedroom windows facing east will require a minimum STC of 31.

(ii) All other bedroom windows are to satisfy Ontario Building Code (OBC 2012) requirements.

- **Living Room Windows**

(i) Living room windows facing east will require a minimum STC of 26.

(ii) All other living room windows are to satisfy Ontario Building Code (OBC 2012) requirements.

- **Exterior Walls**

(i) Exterior wall components on the east façade will require a minimum STC of 45, which will be achieved with brick cladding or an acoustical equivalent according to NRC test data[10].

The STC requirements apply to windows, doors, spandrel panels and curtainwall elements. Exterior wall components on these façades are recommended to have a minimum STC of 45, where a window/wall system is used. A review of window supplier literature indicates that the specified STC ratings can be achieved by a variety of window systems having a combination of glass thickness and inter-pane spacing. We have specified an example window configuration, however several manufacturers and various combinations of window components, such as those proposed, will offer the necessary sound attenuation

[10] J.S. Bradley and J.A. Birta. Laboratory Measurements of the Sound Insulation of Building Façade Elements, National Research Council October 2000.

rating. It is the responsibility of the manufacturer to ensure that the specified window achieves the required STC. This can only be assured by using window configurations that have been certified by laboratory testing. The requirements for STC ratings assume that the remaining components of the building are constructed and installed according to the minimum standards of the Ontario Building Code. The specified STC requirements also apply to swinging and/or sliding patio doors.

Results of the calculations also indicate that both buildings (229 Beechwood Avenue and 241 Beechwood Avenue) will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. In addition to ventilation requirements, Warning Clauses will also be required in all Lease, Purchase and Sale Agreements, as summarized in Section 6.

4.3 Noise Barrier Calculation

Noise levels at the rooftop terraces (Receptors 7 and 8) are expected to approach 62 dBA during the daytime period without a noise barrier. If this area is to be used as an outdoor living area, noise control measures are required to reduce noise levels as close as possible to 55 dBA where technically and administratively feasible. Further analysis investigated the noise mitigating impact of raising the perimeter guards 1.2 m above the walking surface. Results of the investigation proved that noise levels can be reduced to 55 dBA with a 1.2 m barrier. Furthermore, the at-grade amenity areas at the rear of the proposed buildings are favourably positioned such that they are protected from roadway traffic noise. As such, these areas are expected to fall below the 55 dBA noise criterion.

TABLE 4: RESULTS OF NOISE BARRIER INVESTIGATION

Receptor Number	Receptor Height Above Grade (m)	Receptor Location	Daytime L_{eq} Noise Levels (dBA)	
			No Barrier	With 1.2 m Barrier
7	13.75	OLA – Rooftop Terrace	62	54
8	15.2	OLA – Rooftop Terrace	62	55

5. CONCLUSIONS AND RECOMMENDATIONS

The results of the current analysis indicate that noise levels will range between 53 and 68 dBA during the daytime period (07:00-23:00) and between 46 and 61 dBA during the nighttime period (23:00-07:00). The highest noise level (68 dBA) occurs at the east façade, which is nearest and most exposed to Beechwood Avenue. Building components with a higher Sound Transmission Class (STC) rating will be required where exterior noise levels exceed 65 dBA, as indicated in Figure 3.

Results of the calculations also indicate that both buildings (229 Beechwood Avenue and 241 Beechwood Avenue) will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. The following Warning Clause[11] will also be required be placed on all Lease, Purchase and Sale Agreements, as summarized below:

> *"Purchasers/tenants are advised that despite the inclusion of noise control features in the development and within the building units, 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 the Environment, Conservation and Parks. To help address the need for sound attenuation, this development includes:*
>
> - *STC rated multi-pane glazing elements*
> - *East façade bedroom/living room: STC 31/26*
> - *STC rated exterior walls*
> - *East façade: STC 45*
>
> *This dwelling unit has also been designed with air conditioning. Air conditioning 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 the Environment, Conservation and Parks.*

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

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

Noise levels at the rooftop terraces (Receptors 7 and 8) are expected to approach 62 dBA during the daytime period without a noise barrier. If this area is to be used as an outdoor living area, noise control measures are required to reduce noise levels as close as possible to 55 dBA where technically and administratively feasible. Further analysis investigated the noise mitigating impact of raising the perimeter guards 1.2 m above the walking surface. Results of the investigation proved that noise levels can be reduced to 55 dBA with a 1.2 m barrier. Furthermore, the at-grade amenity areas at the rear of the proposed buildings are favourably positioned such that they are protected from roadway traffic noise. As such, these areas are expected to fall below the 55 dBA noise criterion.

The guard must be constructed from materials having a minimum surface density of 20 kg/m^2 (STC rating of 30) and contain no gaps. Design of the barrier will conform to the requirements outlined in Part 5 of the ENCG. The following information will be required by the City for review prior to installation of the barrier:

1. Shop drawings, signed and sealed by a qualified Professional Engineer licenced by the Professional Engineers of Ontario, showing the details of the acoustic barrier systems components, including material specifications.
2. Structural drawing(s), signed by a qualified Professional Engineer licenced by the Professional Engineers of Ontario, showing foundation details, and specifying design criteria, climatic design loads, as well as applicable geotechnical data used in the design.
3. Layout plan, and wall elevations, showing proposed colours and patterns.

Regarding stationary noise impacts, a stationary noise study may be required if there are large pieces of mechanical equipment on the roof. However, due to the small size of the development no significant pieces of HVAC equipment are expected. If required, the study would assess impacts of stationary noise from rooftop mechanical units serving the proposed buildings 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. Noise impacts can generally be minimized by judicious selection and placement of the equipment.

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

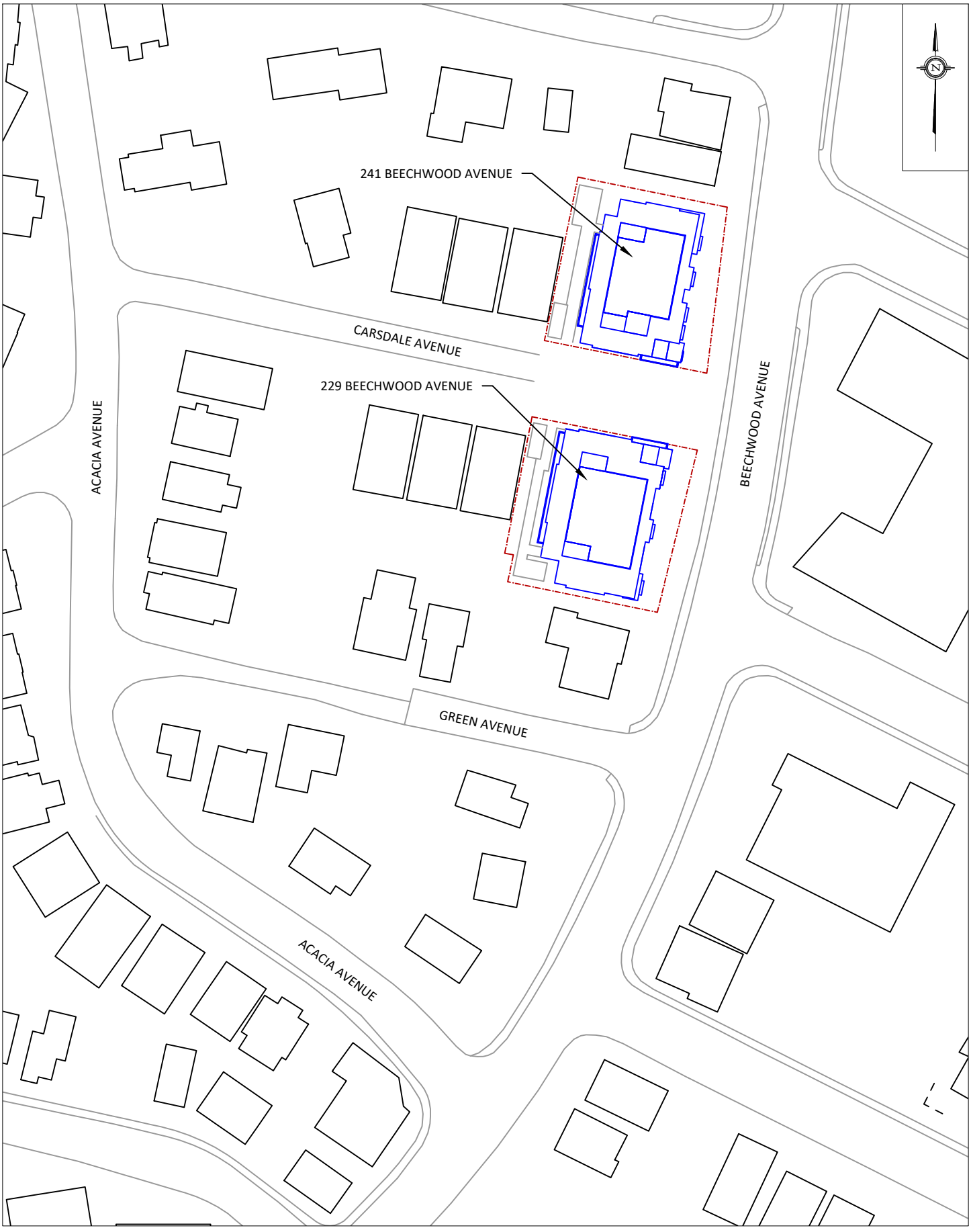
Sincerely,

Gradient Wind Engineering Inc.

Giuseppe Garro, MASc.
Junior Environmental Scientist

Joshua Foster, P.Eng.
Principal

Gradient Wind File #20-292-Traffic Noise



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PROJECT	229-247 BEECHWOOD, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		
SCALE	1:1000 (APPROX.)	DRAWING NO.	GW20-292-1
DATE	DECEMBER 16, 2020	DRAWN BY	G.G.

DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT

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SCALE	1:2000 (APPROX.)
DRAWING NO.	GW20-292-2
DATE	DECEMBER 16, 2020
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DESCRIPTION

FIGURE 2:
RECEPTOR LOCATIONS

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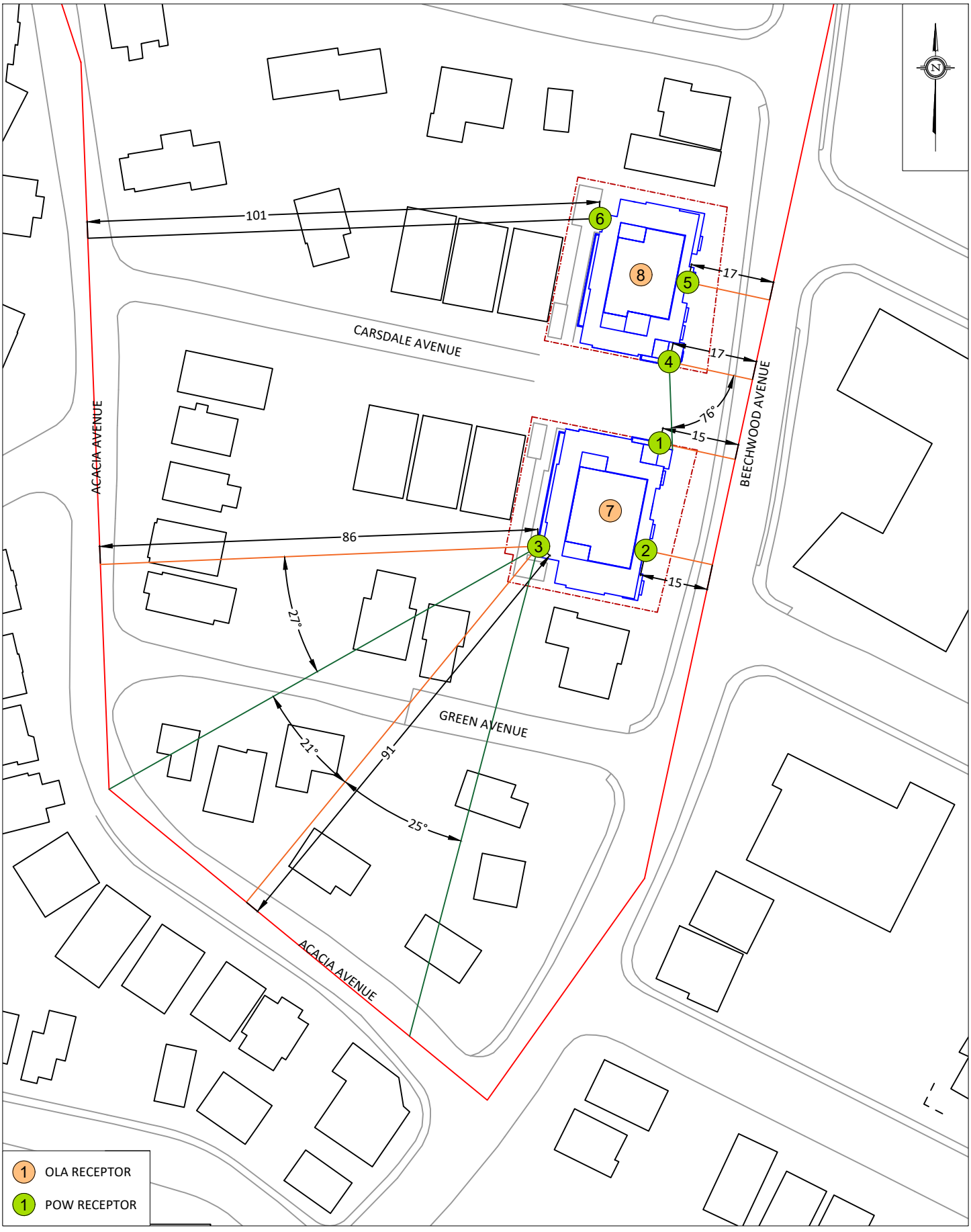
SCALE	1:2000 (APPROX.)	DRAWING NO.	GW20-292-3
DATE	DECEMBER 16, 2020	DRAWN BY	G.G.

DESCRIPTION

FIGURE 3:
WINDOW STC REQUIREMENTS



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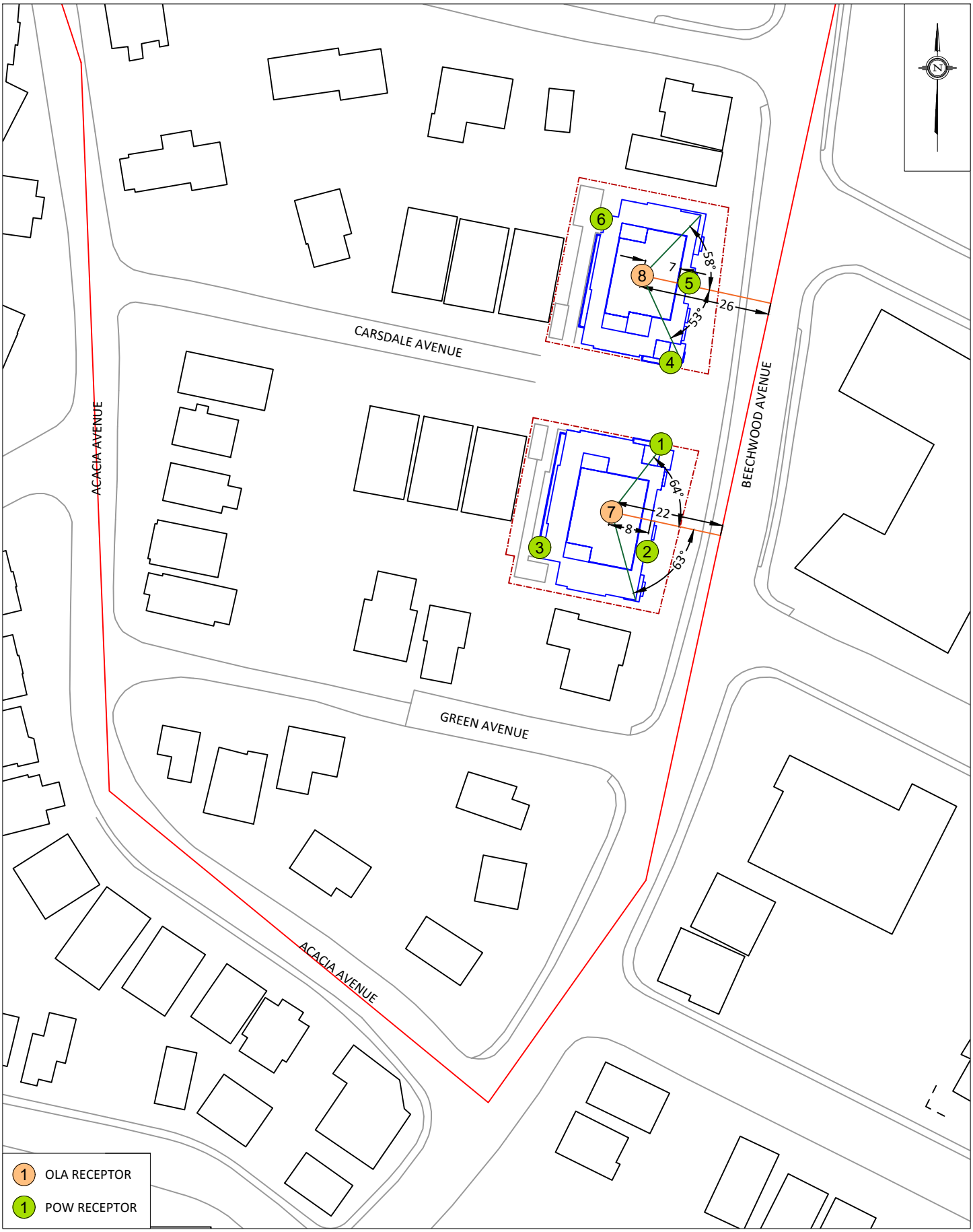
PROJECT	229-247 BEECHWOOD, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:1000 (APPROX.)
DRAWING NO.	GW20-292-4
DATE	DECEMBER 16, 2020
DRAWN BY	G.G.

DESCRIPTION

FIGURE 4:
RECEPTOR 1-6 STAMSON INPUT PARAMETERS



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PROJECT	229-247 BEECHWOOD, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:1000 (APPROX.)
DRAWING NO.	GW20-292-5
DATE	DECEMBER 16, 2020
DRAWN BY	G.G.

DESCRIPTION

FIGURE 5:
RECEPTOR 7 & 8 STAMSON INPUT PARAMETERS

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: 17-12-2020 20:03:31
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


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

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

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

Data for Segment # 1: BEECHWOOD (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  :  15.00 / 15.00  m
Receiver height           :  10.55 / 10.55  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: BEECHWOOD (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
-------------------------------------------------------------------------------
--
   -90      0   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: 65.47 dBA

Results segment # 1: BEECHWOOD (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
-------------------------------------------------------------------------
--
   -90      0   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: 57.87 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.47
                           (NIGHT): 57.87
```

```
STAMSON 5.0        NORMAL REPORT        Date: 17-12-2020 20:03:39
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


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

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

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

Data for Segment # 1: BEECHWOOD (day/night)
--------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  15.00 / 15.00  m
Receiver height           :  10.55 / 10.55  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

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

Source height = 1.50 m

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

```
Segment Leq : 68.48 dBA

Total Leq All Segments: 68.48 dBA

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

Source height = 1.50 m

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

Segment Leq : 60.88 dBA

Total Leq All Segments: 60.88 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 68.48
                           (NIGHT): 60.88
```

```
STAMSON 5.0        NORMAL REPORT        Date: 17-12-2020 20:03:47
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: ACADIA 1 (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: ACADIA 1 (day/night)
----------------------------------------------
Angle1   Angle2           : -25.00 deg   21.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  91.00 / 91.00  m
Receiver height           :  10.55 / 10.55  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Road data, segment # 2: ACADIA 2 (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       :     6 %
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: ACADIA 2 (day/night)
-------------------------------------------
Angle1   Angle2           : -27.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  86.00 / 86.00  m
Receiver height           :  10.55 / 10.55  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

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

Source height = 1.50 m

ROAD (0.00 + 47.11 + 0.00) = 47.11 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -25     21   0.39  63.96   0.00 -10.87  -5.97   0.00   0.00   0.00
47.11
-------------------------------------------------------------------------------
--

Segment Leq : 47.11 dBA

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

Source height = 1.50 m

ROAD (0.00 + 52.09 + 0.00) = 52.09 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -27     90   0.39  65.22   0.00 -10.53  -2.61   0.00   0.00   0.00
52.09
-------------------------------------------------------------------------------
--

Segment Leq : 52.09 dBA

Total Leq All Segments: 53.29 dBA
```

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

Source height = 1.50 m

ROAD (0.00 + 39.52 + 0.00) = 39.52 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -25     21   0.39  56.36   0.00 -10.87  -5.97   0.00   0.00   0.00
39.52
-------------------------------------------------------------------------------
--

Segment Leq : 39.52 dBA

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

Source height = 1.50 m

ROAD (0.00 + 44.49 + 0.00) = 44.49 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -27     90   0.39  57.63   0.00 -10.53  -2.61   0.00   0.00   0.00
44.49
-------------------------------------------------------------------------------
--

Segment Leq : 44.49 dBA

Total Leq All Segments: 45.69 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 53.29
                           (NIGHT): 45.69
```

```
STAMSON 5.0        NORMAL REPORT        Date: 17-12-2020 20:03:57
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


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

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

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

Data for Segment # 1: BEECHWOOD (day/night)
--------------------------------------------
Angle1   Angle2           :   0.00 deg   76.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  17.00 / 17.00  m
Receiver height           :  13.50 / 13.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

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

Source height = 1.50 m

ROAD (0.00 + 64.19 + 0.00) = 64.19 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
     0     76   0.00  68.48   0.00  -0.54  -3.74   0.00   0.00   0.00
64.19
-------------------------------------------------------------------------------
--
```

```
Segment Leq : 64.19 dBA

Total Leq All Segments: 64.19 dBA

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

Source height = 1.50 m

ROAD (0.00 + 56.60 + 0.00) = 56.60 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
     0     76   0.00  60.88   0.00  -0.54  -3.74   0.00   0.00   0.00
56.60
-------------------------------------------------------------------------
--

Segment Leq : 56.60 dBA

Total Leq All Segments: 56.60 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 64.19
                           (NIGHT): 56.60
```

```
STAMSON 5.0        NORMAL REPORT        Date: 17-12-2020 20:04:07
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


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

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

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

Data for Segment # 1: BEECHWOOD (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  :  17.00 / 17.00  m
Receiver height           :  13.50 / 13.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

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

Source height = 1.50 m

ROAD (0.00 + 67.94 + 0.00) = 67.94 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     90    0.00  68.48   0.00  -0.54   0.00   0.00   0.00   0.00
67.94
-------------------------------------------------------------------------------
--
```

```
Segment Leq : 67.94 dBA

Total Leq All Segments: 67.94 dBA

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

Source height = 1.50 m

ROAD (0.00 + 60.34 + 0.00) = 60.34 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     90   0.00  60.88   0.00  -0.54   0.00   0.00   0.00   0.00
60.34
-------------------------------------------------------------------------------
--

Segment Leq : 60.34 dBA

Total Leq All Segments: 60.34 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 67.94
                           (NIGHT): 60.34
```

```
STAMSON 5.0        NORMAL REPORT        Date: 17-12-2020 20:04:16
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r6.te                Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: ACADIA 2 (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       :     6 %
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: ACADIA 2 (day/night)
-------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 101.00 / 101.00 m
Receiver height           :  13.50 / 13.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: ACADIA 2 (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 53.69 + 0.00) = 53.69 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     90    0.30  65.22   0.00 -10.77  -0.77   0.00   0.00   0.00
53.69
-------------------------------------------------------------------------------
--
```

```
Segment Leq : 53.69 dBA

Total Leq All Segments: 53.69 dBA

Results segment # 1: ACADIA 2 (night)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 46.09 + 0.00) = 46.09 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.30  57.63   0.00 -10.77  -0.77   0.00   0.00   0.00
46.09
-------------------------------------------------------------------------
--

Segment Leq : 46.09 dBA

Total Leq All Segments: 46.09 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 53.69
                           (NIGHT): 46.09
```

```
STAMSON 5.0        NORMAL REPORT        Date: 17-12-2020 20:04:25
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r7.te                Time Period: Day/Night 16/8 hours
Description:


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

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

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

Data for Segment # 1: BEECHWOOD (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  :  22.00 / 22.00  m
Receiver height           :  13.75 / 13.75  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -64.00 deg   Angle2 : 63.00 deg
Barrier height            :  12.25 m
Barrier receiver distance :   8.00 / 8.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Results segment # 1: BEECHWOOD (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 !       13.75 !        9.29 !         9.29

ROAD (58.41 + 50.91 + 58.58) = 61.87 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90    -64   0.00  68.48   0.00  -1.66  -8.40   0.00   0.00   0.00
58.41
-------------------------------------------------------------------------
--
   -64     63   0.00  68.48   0.00  -1.66  -1.51   0.00   0.00 -14.40
50.91
-------------------------------------------------------------------------
--
    63     90   0.00  68.48   0.00  -1.66  -8.24   0.00   0.00   0.00
58.58
-------------------------------------------------------------------------
--

Segment Leq : 61.87 dBA

Total Leq All Segments: 61.87 dBA

Results segment # 1: BEECHWOOD (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 !       13.75 !        9.29 !         9.29

ROAD (50.82 + 43.31 + 50.98) = 54.27 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90    -64   0.00  60.88   0.00  -1.66  -8.40   0.00   0.00   0.00
50.82
-------------------------------------------------------------------------
--
   -64     63   0.00  60.88   0.00  -1.66  -1.51   0.00   0.00 -14.40
43.31
-------------------------------------------------------------------------
--
```

```
    63      90    0.00   60.88    0.00   -1.66   -8.24    0.00    0.00    0.00
50.98
-------------------------------------------------------------------------------
--

Segment Leq : 54.27 dBA

Total Leq All Segments: 54.27 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.87
                           (NIGHT): 54.27
```

```
STAMSON 5.0        NORMAL REPORT        Date: 17-12-2020 20:04:37
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r7b.te               Time Period: Day/Night 16/8 hours
Description:


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

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

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

Data for Segment # 1: BEECHWOOD (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  :  22.00 / 22.00  m
Receiver height           :  13.75 / 13.75  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :  13.45 m
Barrier receiver distance :   6.00 / 6.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Results segment # 1: BEECHWOOD (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 !       13.75 !       10.41 !        10.41

ROAD (0.00 + 53.97 + 0.00) = 53.97 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  68.48   0.00  -1.66   0.00   0.00   0.00 -12.84
53.97
-------------------------------------------------------------------------
--

Segment Leq : 53.97 dBA

Total Leq All Segments: 53.97 dBA

Results segment # 1: BEECHWOOD (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 !       13.75 !       10.41 !        10.41

ROAD (0.00 + 46.38 + 0.00) = 46.38 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  60.88   0.00  -1.66   0.00   0.00   0.00 -12.84
46.38
-------------------------------------------------------------------------
--

Segment Leq : 46.38 dBA

Total Leq All Segments: 46.38 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 53.97
                           (NIGHT): 46.38
```

```
STAMSON 5.0        NORMAL REPORT        Date: 17-12-2020 20:04:46
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r8.te                Time Period: Day/Night 16/8 hours
Description:


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

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

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

Data for Segment # 1: BEECHWOOD (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  :  26.00 / 26.00  m
Receiver height           :  15.20 / 15.20  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -58.00 deg   Angle2 : 53.00 deg
Barrier height            :  13.70 m
Barrier receiver distance :   9.00 / 9.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Results segment # 1: BEECHWOOD (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 !       15.20 !       10.46 !        10.46

ROAD (58.59 + 48.95 + 59.22) = 62.14 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90    -58   0.00  68.48   0.00  -2.39  -7.50   0.00   0.00   0.00
58.59
-------------------------------------------------------------------------
--
   -58     53   0.00  68.48   0.00  -2.39  -2.10   0.00   0.00 -15.04
48.95
-------------------------------------------------------------------------
--
    53     90   0.00  68.48   0.00  -2.39  -6.87   0.00   0.00   0.00
59.22
-------------------------------------------------------------------------
--

Segment Leq : 62.14 dBA

Total Leq All Segments: 62.14 dBA

Results segment # 1: BEECHWOOD (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 !       15.20 !       10.46 !        10.46

ROAD (50.99 + 41.36 + 51.62) = 54.54 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90    -58   0.00  60.88   0.00  -2.39  -7.50   0.00   0.00   0.00
50.99
-------------------------------------------------------------------------
--
   -58     53   0.00  60.88   0.00  -2.39  -2.10   0.00   0.00 -15.04
41.36
-------------------------------------------------------------------------
--
```

```
    53      90    0.00   60.88    0.00   -2.39   -6.87    0.00    0.00    0.00
51.62
-------------------------------------------------------------------------------
--

Segment Leq : 54.54 dBA

Total Leq All Segments: 54.54 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 62.14
                           (NIGHT): 54.54
```

```
STAMSON 5.0        NORMAL REPORT        Date: 17-12-2020 20:04:56
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r8b.te               Time Period: Day/Night 16/8 hours
Description:


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

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

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

Data for Segment # 1: BEECHWOOD (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  :  26.00 / 26.00  m
Receiver height           :  15.20 / 15.20  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -83.00 deg   Angle2 : 90.00 deg
Barrier height            :  14.90 m
Barrier receiver distance :   7.00 / 7.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Results segment # 1: BEECHWOOD (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 !       15.20 !       11.51 !        11.51

ROAD (51.99 + 52.24 + 0.00) = 55.13 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90    -83   0.00  68.48   0.00  -2.39 -14.10   0.00   0.00   0.00
51.99
-------------------------------------------------------------------------
--
   -83     90   0.00  68.48   0.00  -2.39  -0.17   0.00   0.00 -13.68
52.24
-------------------------------------------------------------------------
--

Segment Leq : 55.13 dBA

Total Leq All Segments: 55.13 dBA

Results segment # 1: BEECHWOOD (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 !       15.20 !       11.51 !        11.51

ROAD (44.39 + 44.65 + 0.00) = 47.53 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90    -83   0.00  60.88   0.00  -2.39 -14.10   0.00   0.00   0.00
44.39
-------------------------------------------------------------------------
--
   -83     90   0.00  60.88   0.00  -2.39  -0.17   0.00   0.00 -13.68
44.65
-------------------------------------------------------------------------
Segment Leq : 47.53 dBA

Total Leq All Segments: 47.53 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 55.13
                           (NIGHT): 47.53
```