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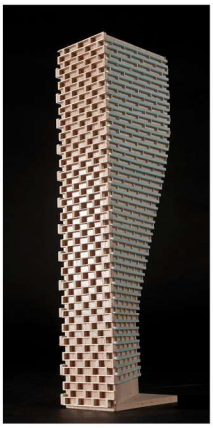
TRAFFIC NOISE ASSESSMENT

1983 Carling Avenue
Ottawa, Ontario

REPORT: GW21-161– Traffic Noise



June 3, 2021

DRAFT

PREPARED FOR

2473493 Ontario Inc.
1983 Carling Avenue
Ottawa, ON K2A 1C

PREPARED BY

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EXECUTIVE SUMMARY

This report describes a traffic noise assessment undertaken in support of a Site Plan Control (SPC) application for a proposed development located at 1983 Carling Avenue in Ottawa, Ontario. For the purposes of this study, the elevation facing Carling Avenue will be referred to as the south elevation. The proposed development comprises a five-storey, 28-unit residential building of trapezoidal planform with an inset on the southwest corner. An outdoor amenity area is provided on the building rooftop. The major source of traffic noise is Carling Avenue, bordering the site to the south. Figure 1 illustrates a complete site plan with the 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 Figurr Architects Collective dated November 11, 2020.

The results of the current analysis indicate that noise levels will range between 60 and 74 dBA during the daytime period (07:00-23:00) and between 61 and 66 dBA during the nighttime period (23:00-07:00). The highest noise level (74 dBA) occurs at the south façade, which is nearest and most exposed to Carling 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 the development will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. A Warning Clause[1] will also be required in all Lease, Purchase and Sale Agreements.

Noise levels at the rooftop outdoor amenity area (Receptor 5) are expected to approach 60 dBA during the daytime period. If this area is to be used as an outdoor living area, noise control measures are required to reduce the L_{eq} to 55 dBA, as is technically and economically feasible. Further analysis investigated the noise mitigating impact of raising the south and west parapets from a standard height of 1.1 m (base case)

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

to 2.2 m above the rooftop surface. Results of the investigation proved that noise levels can only be reduced to 57 dBA. This marginal improvement would not justify the cost of installing such a high wall, and reducing noise levels to 55 dBA would require excessive barrier heights that would not be feasible. If this area is to be used as an outdoor living area, a Warning Clause[2] will be required in all Lease, Purchase and Sale Agreements.

With regards to stationary noise impacts from the building on the surroundings and itself, noise can be controlled by judicious selection of the mechanical equipment and its placement on a high roof or in a mechanical penthouse. Where necessary noise screens, silencers, or acoustic louvers can be incorporated into the design to ensure compliance with the ENCG sound level limits. A stationary noise study will be performed once mechanical plans for the proposed building become available. This study will include recommendations for any noise control measures that may be necessary to ensure noise levels meet ENCG criteria.

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

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1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by 2473493 Ontario Inc. to undertake a traffic noise assessment for a proposed apartment building development located at 1983 Carling 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[3] and Ministry of the Environment, Conservation and Parks (MECP)[4] guidelines. Noise calculations were based on architectural drawings prepared by Figurr Architects Collective dated November 11, 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 traffic noise assessment is a proposed apartment building development at 1983 Carling Avenue in Ottawa, Ontario. For the purposes of this study, the elevation facing Carling Avenue will be referred to as the south elevation. The study site is located at the corner of a rectangular parcel of land containing three other apartment buildings, bounded by Carling Avenue to the south and Bromley Road to the west.

The proposed development comprises a five-storey, 28-unit residential building of trapezoidal planform with an inset on the southwest corner. The building's ground floor comprises residential units, lobby, corridor, and other building support functions. The main building access point is featured on the southwest corner inset. Floors 2 to 5 comprise residential units exclusively with floor plates that set back from the north side on floor 5 to provide terrace space and from north, west, and south sides on the rooftop level, which comprises a rooftop amenity space in addition to a mechanical room. The site is surrounded by low-rise residential buildings in all directions and a high-rise apartment building to the west at 2001 Carling Avenue.

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

The major source of traffic noise is Carling Avenue, bordering the site directly to the south. Highway 417 is located beyond 500 meters from the study site, therefore not included as a source influencing the study site as per ENCG Section 2.1. Figure 1 illustrates a complete site plan with the surrounding context.

3. OBJECTIVES

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

4. METHODOLOGY

4.1 Background

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

4.2 Roadway Traffic Noise

4.2.1 Criteria for Roadway Traffic Noise

For surface roadway traffic noise, the equivalent sound energy level, L_{eq}, provides a measure of the time varying noise levels, which is well correlated with the annoyance of sound. It is defined as the continuous sound level, which has the same energy as a time varying noise level over a period of time. For roadways, the L_{eq} is commonly calculated on the basis of a 16-hour (L_{eq16}) daytime (07:00-23:00) / 8-hour (L_{eq8}) nighttime (23:00-07:00) split to assess its impact on residential buildings. The City of Ottawa's Environmental Noise Control Guidelines (ENCG) specifies that the recommended indoor noise limit range

(that is relevant to this study) is 45 and 40 dBA for living rooms and sleeping quarters respectively for roadway as listed in Table 1. However, to account for deficiencies in building construction and to control peak noise, these levels should be targeted toward 42 and 37 dBA.

TABLE 1: INDOOR SOUND LEVEL CRITERIA (ROAD) [5]

Type of Space	Time Period	Leq (dBA)
General offices, reception areas, retail stores, etc.	07:00 – 23:00	50
Living/dining/den areas of **residences**, hospitals, schools, nursing/retirement homes, day-care centres, theatres, places of worship, libraries, individual or semi-private offices, conference rooms, etc.	07:00 – 23:00	45
Sleeping quarters of hotels/motels	23:00 – 07:00	45
Sleeping quarters of **residences**, hospitals, nursing/retirement homes, etc.	23:00 – 07:00	40

Predicted noise levels at the plane of window (POW) dictate the action required to achieve the recommended sound levels. An open window is considered to provide a 10 dBA reduction in noise, while a standard closed window is capable of providing a minimum 20 dBA noise reduction[6]. A closed window due to a ventilation requirement will bring noise levels down to achieve an acceptable indoor environment[7]. 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[8].

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.

[5] Adapted from ENCG 2016 – Tables 2.2b and 2.2c
[6] Burberry, P.B. (2014). Mitchell's Environment and Services. Routledge, Page 125
[7] MOECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.8
[8] 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 MOECP computerized noise assessment program, STAMSON 5.04, for road analysis. Appendix A includes the STAMSON 5.04 input and output data.

Roadway traffic noise calculations were performed by treating each roadway segment as separate line sources of noise. In addition to the traffic volumes summarized in Table 2, theoretical noise predictions were based on the following parameters:

- Truck traffic on all roadways was taken to comprise 5% heavy trucks and 7% medium trucks, as per ENCG requirements for noise level predictions.
- The day/night split for all streets was taken to be 92%/8%, respectively.
- Ground surfaces were taken to be reflective due to the presence of hard (paved) ground.
- Topography was assumed to be a flat/gentle slope surrounding the study building.
- Receptor height was taken to be 14.0 metres at Level 5 for the centre of the window (height to the 5th floor slab + 1.5 metres) for POW Receptors 1-4, and 17.2 metres for rooftop OLA Receptor 5.
- A standard 1.1 m tall parapet was assumed to enclose the terrace.
- Noise receptors were strategically placed at 5 locations around the study area (see Figure 2).
- Receptor distances and exposure angles are illustrated in Figures 4 and 5.

4.2.1 Roadway Traffic Volumes

The ENCG dictates that noise calculations should consider future sound levels based on a roadway's classification at the mature state of development. Therefore, traffic volumes are based on the roadway classifications outlined in the City of Ottawa's Official Plan (OP) and Transportation Master Plan[9] 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.

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

TABLE 2: ROADWAY TRAFFIC DATA

Segment	Roadway Traffic Data	Speed Limit (km/h)	Traffic Volumes
Carling Avenue	6 Lane Urban Arterial Divided	60	**50,000**

4.3 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 and rail 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[10] 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

Based on published research[11], 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

[10] Building Practice Note: Controlling Sound Transmission into Buildings by J.D. Quirt, National Research Council of Canada, September 1985
[11] CMHC, Road & Rail Noise: Effects on Housing

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).

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	14.0	POW – 5th Floor – West Façade	69	61
2	14.0	POW – 5th Floor – West Façade - (Southwest corner inset)	70	63
3	14.0	POW – 5th Floor – South Façade	74	66
4	14.0	POW – 5th Floor – East Façade	70	63
5	17.2	OLA – Rooftop Outdoor Amenity Area	60	N/A*

*Nighttime noise levels are not considered at OLA receptors, as per ENCG criteria

The results of the current analysis indicate that noise levels will range between 60 and 74 dBA during the daytime period (07:00-23:00) and between 61 and 66 dBA during the nighttime period (23:00-07:00). The highest noise level (74 dBA) occurs at the south façade, which is nearest and most exposed to Carling Avenue. Noise levels at rooftop amenity area (Receptor 5) are expected to approach 60 dBA during the daytime period.

5.2 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). As per city of Ottawa requirements, detailed STC calculations will be required to be completed prior to building permit application for each unit type. The STC requirements for the windows are summarized below for various units within the development (see Figure 3):

- **Bedroom Windows**

(i) Bedroom windows facing south will require a minimum STC of 37

(ii) Bedroom windows facing east and west will require a minimum STC of 33

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

- **Living Room Windows**

(i) Living room windows facing south will require a minimum STC of 32

(ii) Living room windows facing east and west will require a minimum STC of 28

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

- **Exterior Walls**

(i) Exterior wall components on the south, east and west façades will require a minimum STC of 45, which will be achieved with brick cladding or an acoustical equivalent according to NRC test data[12]

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 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

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

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 the development 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.

5.3 Noise Barrier Investigation

Noise levels at the rooftop outdoor amenity area (Receptor 5) are expected to approach 60 dBA during the daytime period. If this area is to be used as an outdoor living area, noise control measures are required to reduce the L_{eq} to 55 dBA, as is technically and economically feasible. Further analysis investigated the noise mitigating impact of raising the south and west parapets from a standard height of 1.1 m (base case) to 2.2 m above the rooftop surface. Results of the investigation proved that noise levels can only be reduced to 57 dBA. This marginal improvement would not justify the cost of installing such a high wall, and reducing noise levels to 55 dBA would require excessive barrier heights that would not be feasible. Table 4 summarizes the results of the barrier investigation. A Warning Clause will be required in all Lease, Purchase and Sale Agreements, as summarized in Section 6.

TABLE 4: RESULTS OF NOISE BARRIER INVESTIGATION

Receptor Number	Receptor Height	Receptor Location	Daytime Leq Noise Levels (dBA)	
			1.1 Meter Barrier	2.2 Meter Barrier
5	17.2	OLA – Rooftop Outdoor Amenity Area	60	57

6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current analysis indicate that noise levels will range between 60 and 74 dBA during the daytime period (07:00-23:00) and between 61 and 66 dBA during the nighttime period (23:00-07:00). The highest noise level (74 dBA) occurs at the south façade, which is nearest and most exposed to Carling 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 the development will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. The following Warning Clause[13] will also be required to 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 and Climate Change. To help address the need for sound attenuation, this development includes:*
>
> - *STC rated multi-pane glazing elements and spandrel panels*
> - *South façade bedroom/living room: STC 37/32*
> - *East and west façade bedroom/living room: STC 33/28*
> - *STC rated exterior walls*
> - *South, east, and west 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 and Climate Change.*

[13] 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 outdoor amenity area (Receptor 5) are expected to approach 60 dBA during the daytime period. If this area is to be used as an outdoor living area, noise control measures are required to reduce the L_{eq} to 55 dBA, as is technically and economically feasible. Further analysis investigated the noise mitigating impact of raising the south and west parapets from a standard height of 1.1 m (base case) to 2.2 m above the rooftop surface. Results of the investigation proved that noise levels can only be reduced to 57 dBA. This marginal improvement would not justify the cost of installing such a high wall, and reducing noise levels to 55 dBA would require excessive barrier heights that would not be feasible. The following Warning Clause will be required in all Lease, Purchase and Sale Agreements:

"Purchasers/tenants are advised that sound levels due to increasing road traffic will interfere with outdoor activities as the sound levels exceed the sound level limits of the City and the Ministry of the Environment."

With regards to stationary noise impacts from the building on the surroundings and itself, noise can be controlled by judicious selection of the mechanical equipment and its placement on a high roof or in a mechanical penthouse. Where necessary noise screens, silencers, or acoustic louvers can be incorporated into the design to ensure compliance with the NPC-300 sound level limits. A stationary noise study will be performed once mechanical plans for the proposed building become available. This study will include recommendations for any noise control measures that may be necessary to ensure noise levels meet ENCG criteria.

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.

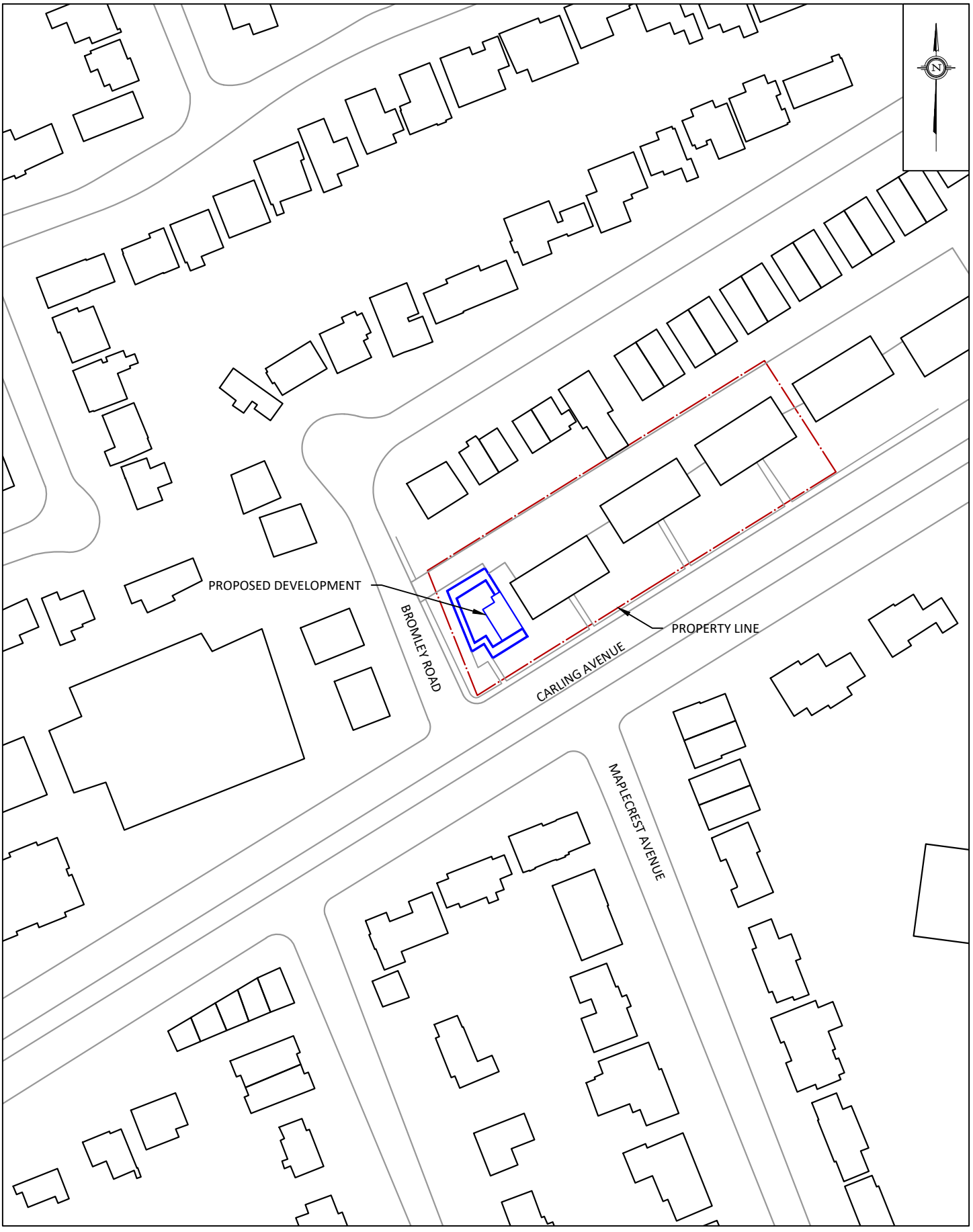
Sincerely,

Gradient Wind Engineering Inc.

Tanyon Matheson-Fitchett, B.Eng.
Junior Environmental Scientist

Joshua Foster, P.Eng.
Principal

Gradient Wind File # 21-161



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PROJECT	1983 CARLING AVENUE, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:1500 (APPROX.)
DRAWING NO.	21-161- 1
DATE	MAY 25, 2021
DRAWN BY	N.M.P.
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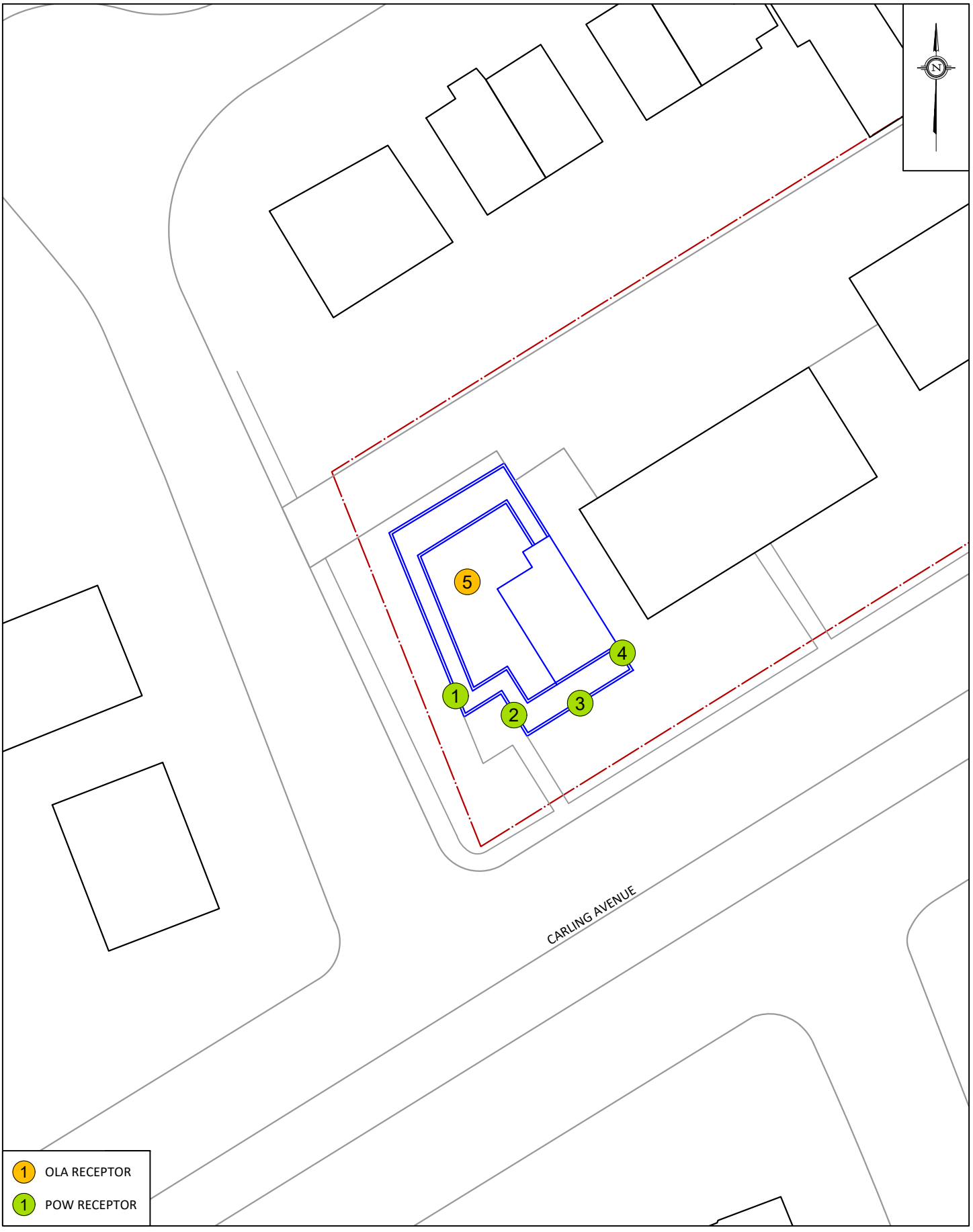

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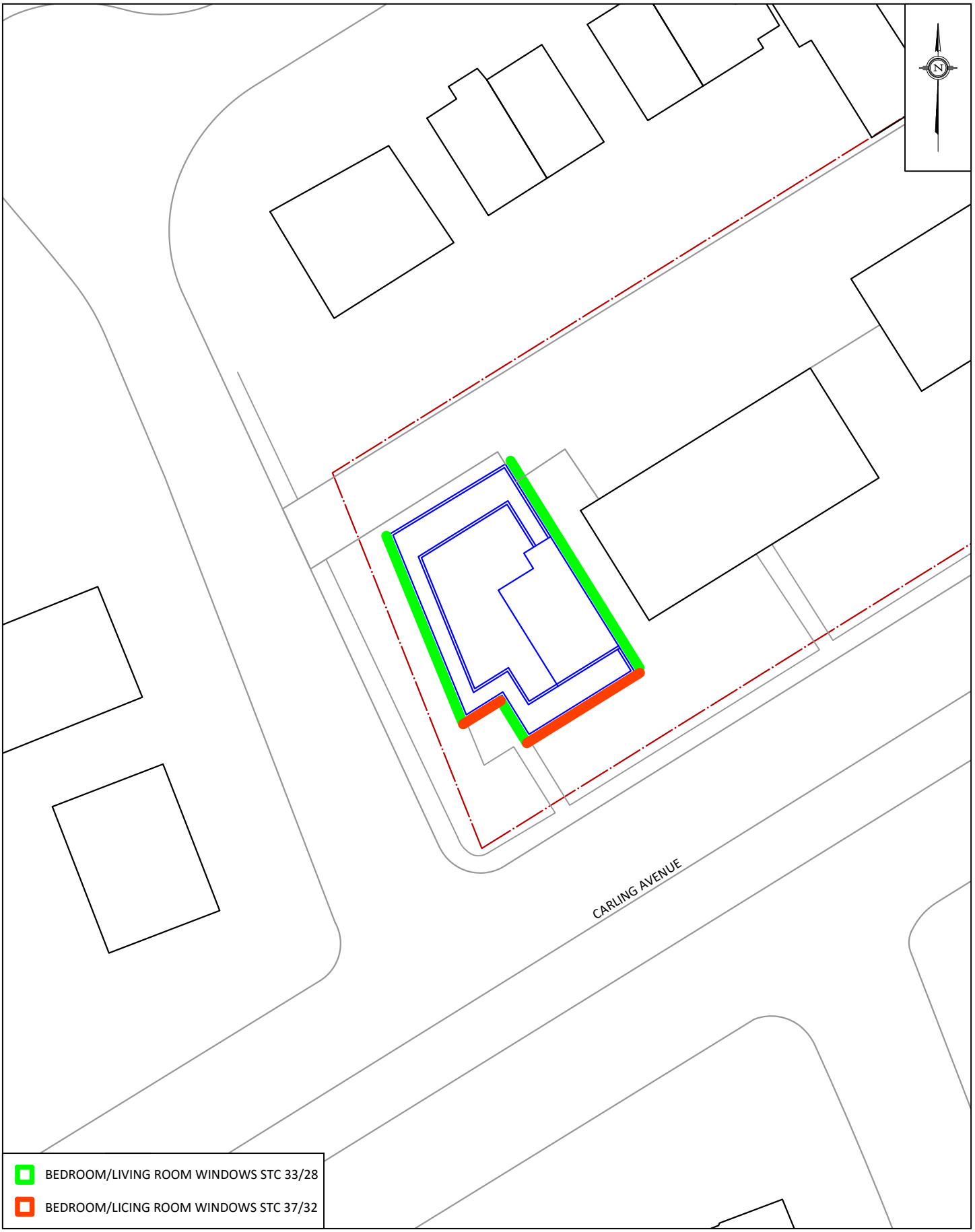
PROJECT	1983 CARLING AVENUE, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:500 (APPROX.)
DRAWING NO.	GW21-161-2
DATE	JUNE 1, 2020
DRAWN BY	T.M.F.
DESCRIPTION	FIGURE 2: RECEPTOR LOCATIONS



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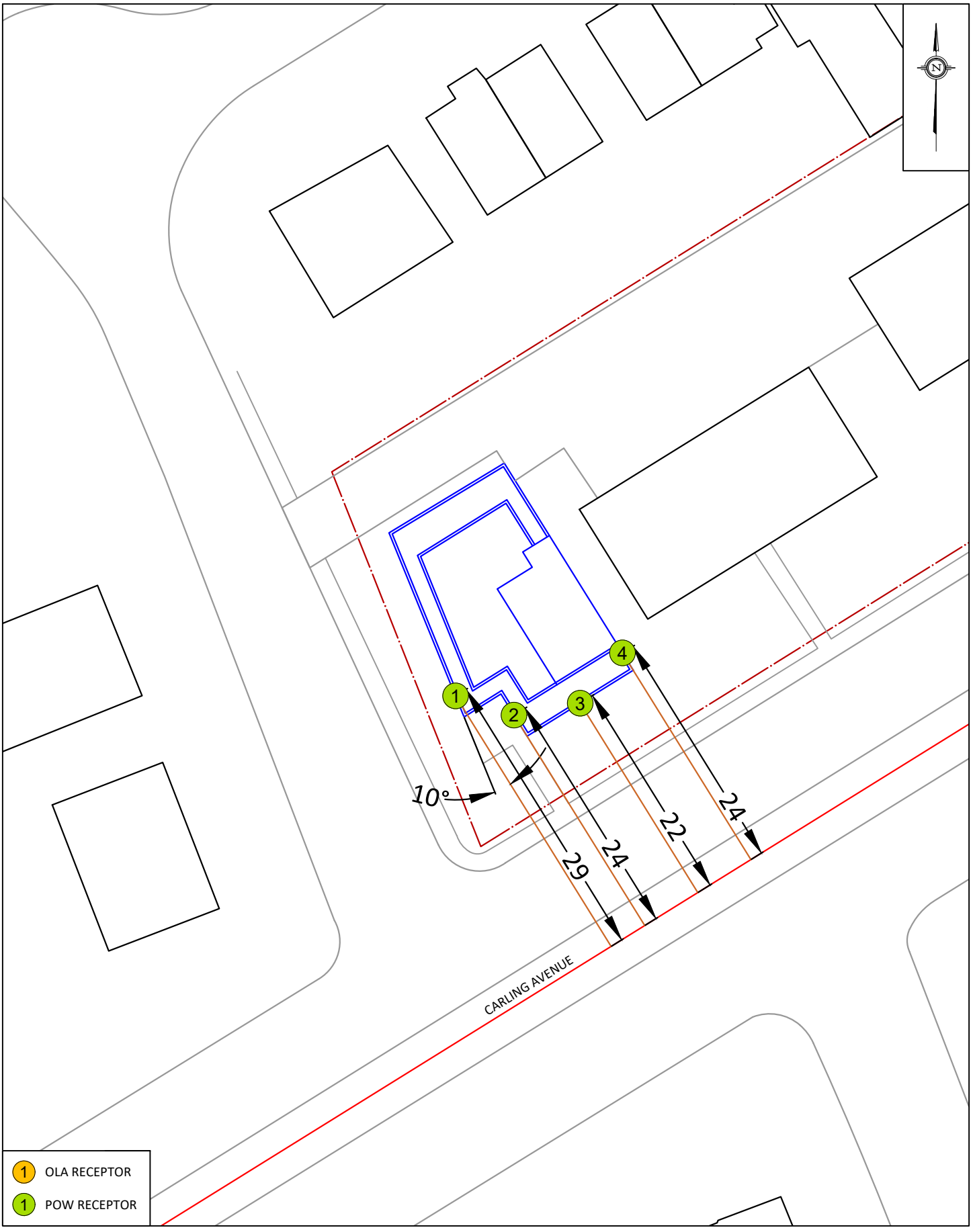
PROJECT	1983 CARLING AVENUE, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		DESCRIPTION
SCALE	1:500 (APPROX.)	DRAWING NO.	GW21-161-3
DATE	JUNE 1, 2020	DRAWN BY	T.M.F.

FIGURE 3:
WINDOW STC REQUIREMENTS



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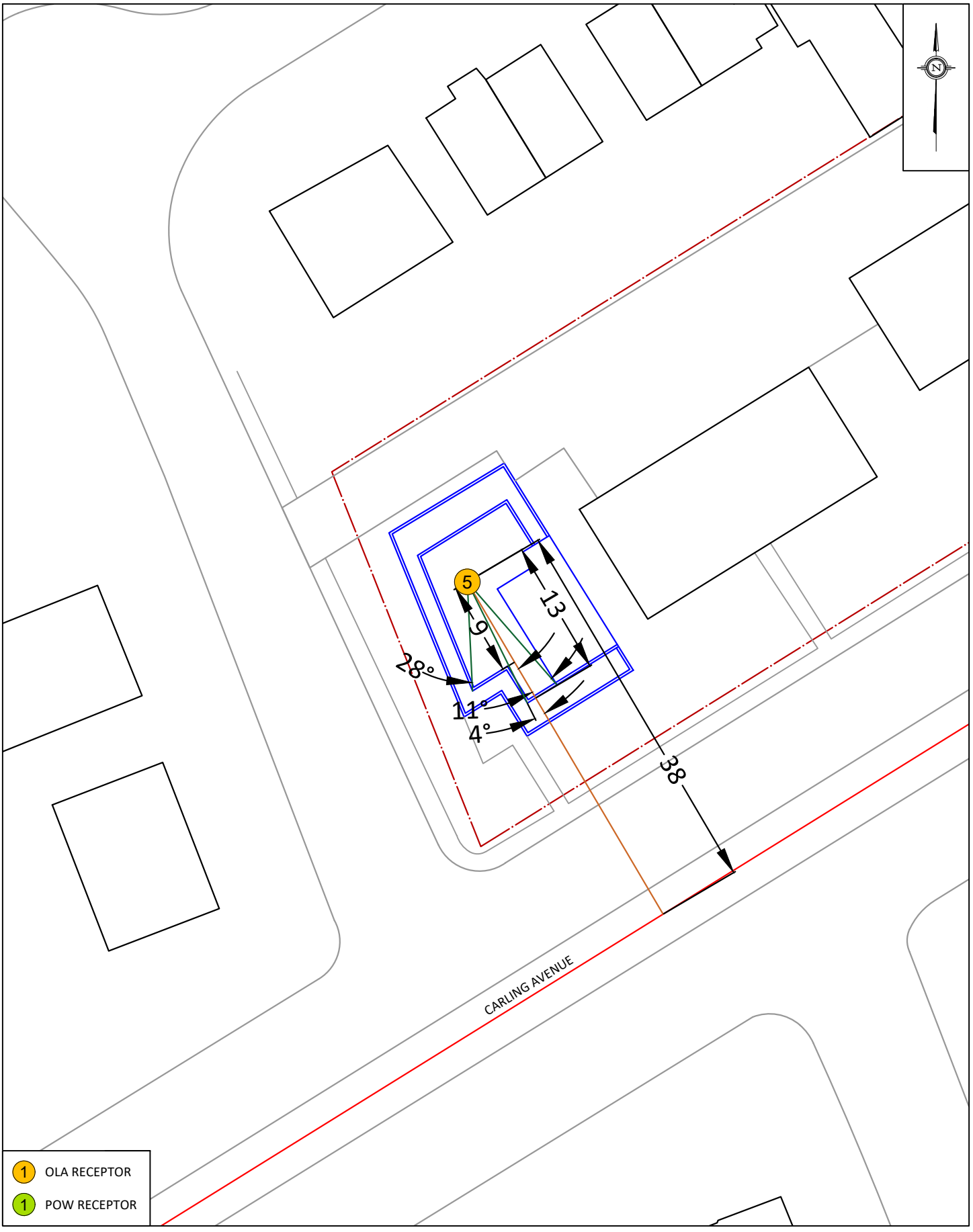
PROJECT	1983 CARLING AVENUE, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:500 (APPROX.)
DRAWING NO.	GW21-161-4
DATE	JUNE 1, 2020
DRAWN BY	T.M.F.

DESCRIPTION

FIGURE 4:
RECEPTOR 1-4 STAMSON INPUT PARAMETERS



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PROJECT	1983 CARLING AVENUE, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		DESCRIPTION
SCALE	1:500 (APPROX.)	DRAWING NO.	GW21-161-5
DATE	JUNE 1, 2020	DRAWN BY	T.M.F.

FIGURE 5:
RECEPTOR 5 STAMSON INPUT PARAMETERS

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APPENDIX A

STAMSON 5.04 – INPUT AND OUTPUT DATA

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```
STAMSON 5.0        NORMAL REPORT        Date: 01-06-2021 12:21:48
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: R1.te                Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: Carling (day/night)
-------------------------------------------
Car traffic volume  : 40480/3520  veh/TimePeriod  *
Medium truck volume :  3220/280   veh/TimePeriod  *
Heavy truck volume  :  2300/200   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):  50000
    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: Carling (day/night)
-----------------------------------------
Angle1   Angle2           :  10.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  29.00 / 29.00  m
Receiver height           :  14.00 / 14.00  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 68.84 + 0.00) = 68.84 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    10     90   0.00  75.22   0.00  -2.86  -3.52   0.00   0.00   0.00  68.84
-------------------------------------------------------------------------------

Segment Leq : 68.84 dBA

Total Leq All Segments: 68.84 dBA

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

Source height = 1.50 m

ROAD (0.00 + 61.24 + 0.00) = 61.24 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    10     90   0.00  67.63   0.00  -2.86  -3.52   0.00   0.00   0.00  61.24
-------------------------------------------------------------------------------

Segment Leq : 61.24 dBA

Total Leq All Segments: 61.24 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 68.84
                           (NIGHT): 61.24
```

```
STAMSON 5.0        NORMAL REPORT        Date: 01-06-2021 12:24:09
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: R2.te                Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: Carling (day/night)
-------------------------------------------
Car traffic volume  : 40480/3520  veh/TimePeriod  *
Medium truck volume :  3220/280   veh/TimePeriod  *
Heavy truck volume  :  2300/200   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):  50000
    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: Carling (day/night)
-----------------------------------------
Angle1   Angle2           :   0.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  24.00 / 24.00  m
Receiver height           :  14.00 / 14.00  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 70.17 + 0.00) = 70.17 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     90   0.00  75.22   0.00  -2.04  -3.01   0.00   0.00   0.00  70.17
-------------------------------------------------------------------------------

Segment Leq : 70.17 dBA

Total Leq All Segments: 70.17 dBA

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

Source height = 1.50 m

ROAD (0.00 + 62.58 + 0.00) = 62.58 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     90   0.00  67.63   0.00  -2.04  -3.01   0.00   0.00   0.00  62.58
-------------------------------------------------------------------------------

Segment Leq : 62.58 dBA

Total Leq All Segments: 62.58 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 70.17
                           (NIGHT): 62.58
```

```
STAMSON 5.0        NORMAL REPORT        Date: 01-06-2021 12:26:05
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: R3.te                Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: Carling (day/night)
-------------------------------------------
Car traffic volume  : 40480/3520  veh/TimePeriod  *
Medium truck volume :  3220/280   veh/TimePeriod  *
Heavy truck volume  :  2300/200   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):  50000
    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: Carling (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           :  14.00 / 14.00  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 73.56 + 0.00) = 73.56 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  75.22   0.00  -1.66   0.00   0.00   0.00   0.00  73.56
-------------------------------------------------------------------------------

Segment Leq : 73.56 dBA

Total Leq All Segments: 73.56 dBA

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

Source height = 1.50 m

ROAD (0.00 + 65.97 + 0.00) = 65.97 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  67.63   0.00  -1.66   0.00   0.00   0.00   0.00  65.97
-------------------------------------------------------------------------------

Segment Leq : 65.97 dBA

Total Leq All Segments: 65.97 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 73.56
                           (NIGHT): 65.97
```

```
STAMSON 5.0        NORMAL REPORT        Date: 01-06-2021 12:27:54
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: R4.te                Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: Carling (day/night)
-------------------------------------------
Car traffic volume  : 40480/3520  veh/TimePeriod  *
Medium truck volume :  3220/280   veh/TimePeriod  *
Heavy truck volume  :  2300/200   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):  50000
    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: Carling (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  :  24.00 / 24.00  m
Receiver height           :  14.00 / 14.00  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 70.17 + 0.00) = 70.17 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90      0   0.00  75.22   0.00  -2.04  -3.01   0.00   0.00   0.00  70.17
-------------------------------------------------------------------------------

Segment Leq : 70.17 dBA

Total Leq All Segments: 70.17 dBA

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

Source height = 1.50 m

ROAD (0.00 + 62.58 + 0.00) = 62.58 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90      0   0.00  67.63   0.00  -2.04  -3.01   0.00   0.00   0.00  62.58
-------------------------------------------------------------------------------

Segment Leq : 62.58 dBA

Total Leq All Segments: 62.58 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 70.17
                           (NIGHT): 62.58
```

```
STAMSON 5.0        NORMAL REPORT        Date: 02-06-2021 10:17:38
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Road data, segment # 1: Carling1 (day/night)
-------------------------------------------
Car traffic volume  : 40480/3520  veh/TimePeriod  *
Medium truck volume :  3220/280   veh/TimePeriod  *
Heavy truck volume  :  2300/200   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):  50000
    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: Carling1 (day/night)
-------------------------------------------
Angle1   Angle2           : -90.00 deg   -11.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  38.00 / 38.00  m
Receiver height           :  17.20 / 17.20  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : -11.00 deg
Barrier height            :  18.90 m
Barrier receiver distance :  13.00 / 13.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Road data, segment # 2: Carling2 (day/night)
----------------------------------------
Car traffic volume  : 40480/3520  veh/TimePeriod  *
Medium truck volume :  3220/280   veh/TimePeriod  *
Heavy truck volume  :  2300/200   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):  50000
    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: Carling2 (day/night)
----------------------------------------
Angle1   Angle2           : -11.00 deg   4.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  38.00 / 38.00  m
Receiver height           :  17.20 / 17.20  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -11.00 deg   Angle2 : 4.00 deg
Barrier height            :  16.70 m
Barrier receiver distance :  13.00 / 13.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Road data, segment # 3: Carling3 (day/night)
-------------------------------------------
Car traffic volume  : 40480/3520  veh/TimePeriod  *
Medium truck volume :  3220/280   veh/TimePeriod  *
Heavy truck volume  :  2300/200   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):  50000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 3: Carling3 (day/night)
------------------------------------------
Angle1   Angle2           :   4.00 deg   28.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  38.00 / 38.00  m
Receiver height           :  17.20 / 17.20  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :   4.00 deg   Angle2 : 28.00 deg
Barrier height            :  16.70 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
```

```
Road data, segment # 4: Carling4 (day/night)
-------------------------------------------
Car traffic volume  : 40480/3520  veh/TimePeriod  *
Medium truck volume :  3220/280   veh/TimePeriod  *
Heavy truck volume  :  2300/200   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):  50000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 4: Carling4 (day/night)
-----------------------------------------
Angle1   Angle2           :  28.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  38.00 / 38.00  m
Receiver height           :  17.20 / 17.20  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :  28.00 deg   Angle2 : 90.00 deg
Barrier height            :  16.70 m
Barrier receiver distance :   4.50 / 4.50   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Results segment # 1: Carling1 (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 !       17.20 !       11.83 !        11.83

ROAD (0.00 + 51.57 + 0.00) = 51.57 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -11   0.00  75.22   0.00  -4.04  -3.58   0.00   0.00 -16.05  51.57
-------------------------------------------------------------------------------

Segment Leq : 51.57 dBA

Results segment # 2: Carling2 (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 !       17.20 !       11.83 !        11.83

ROAD (0.00 + 42.17 + 0.00) = 42.17 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -11      4   0.00  75.22   0.00  -4.04 -10.79   0.00   0.00 -18.23  42.17
-------------------------------------------------------------------------------

Segment Leq : 42.17 dBA
```

```
Results segment # 3: Carling3 (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 !       17.20 !       13.48 !        13.48

ROAD (0.00 + 46.93 + 0.00) = 46.93 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     4     28   0.00  75.22   0.00  -4.04  -8.75   0.00   0.00 -15.51  46.93
-------------------------------------------------------------------------------

Segment Leq : 46.93 dBA

Results segment # 4: Carling4 (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 !       17.20 !       15.34 !        15.34

ROAD (0.00 + 58.35 + 0.00) = 58.35 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    28     90   0.00  75.22   0.00  -4.04  -4.63   0.00   0.00  -8.21  58.35
-------------------------------------------------------------------------------

Segment Leq : 58.35 dBA

Total Leq All Segments: 59.51 dBA
```

```
Results segment # 1: Carling1 (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 !       17.20 !       11.83 !        11.83

ROAD (0.00 + 43.97 + 0.00) = 43.97 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -11   0.00  67.63   0.00  -4.04  -3.58   0.00   0.00 -16.05  43.97
-------------------------------------------------------------------------------

Segment Leq : 43.97 dBA

Results segment # 2: Carling2 (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 !       17.20 !       11.83 !        11.83

ROAD (0.00 + 34.57 + 0.00) = 34.57 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -11      4   0.00  67.63   0.00  -4.04 -10.79   0.00   0.00 -18.23  34.57
-------------------------------------------------------------------------------

Segment Leq : 34.57 dBA
```

```
Results segment # 3: Carling3 (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 !       17.20 !       13.48 !        13.48

ROAD (0.00 + 39.33 + 0.00) = 39.33 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     4     28   0.00  67.63   0.00  -4.04  -8.75   0.00   0.00 -15.51  39.33
-------------------------------------------------------------------------------

Segment Leq : 39.33 dBA

Results segment # 4: Carling4 (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 !       17.20 !       15.34 !        15.34

ROAD (0.00 + 50.75 + 0.00) = 50.75 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    28     90   0.00  67.63   0.00  -4.04  -4.63   0.00   0.00  -8.21  50.75
-------------------------------------------------------------------------------

Segment Leq : 50.75 dBA

Total Leq All Segments: 51.91 dBA
TOTAL Leq FROM ALL SOURCES (DAY): 59.51
                           (NIGHT): 51.91
```

```
STAMSON 5.0        NORMAL REPORT        Date: 02-06-2021 10:19:38
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r5b.te               Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: Carling1 (day/night)
---------------------------------------------
Car traffic volume  : 40480/3520  veh/TimePeriod  *
Medium truck volume :  3220/280   veh/TimePeriod  *
Heavy truck volume  :  2300/200   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):  50000
    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: Carling1 (day/night)
-------------------------------------------
Angle1   Angle2           : -90.00 deg   -11.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  38.00 / 38.00  m
Receiver height           :  17.20 / 17.20  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : -11.00 deg
Barrier height            :  18.90 m
Barrier receiver distance :  13.00 / 13.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Road data, segment # 2: Carling2 (day/night)
---------------------------------------------
Car traffic volume  : 40480/3520  veh/TimePeriod  *
Medium truck volume :  3220/280   veh/TimePeriod  *
Heavy truck volume  :  2300/200   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):  50000
    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: Carling2 (day/night)
-----------------------------------------
Angle1   Angle2           : -11.00 deg   4.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  38.00 / 38.00  m
Receiver height           :  17.20 / 17.20  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -11.00 deg   Angle2 : 4.00 deg
Barrier height            :  17.80 m
Barrier receiver distance :  13.00 / 13.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Road data, segment # 3: Carling3 (day/night)
-------------------------------------------
Car traffic volume  : 40480/3520  veh/TimePeriod  *
Medium truck volume :  3220/280   veh/TimePeriod  *
Heavy truck volume  :  2300/200   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):  50000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 3: Carling3 (day/night)
------------------------------------------
Angle1   Angle2           :   4.00 deg   28.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  38.00 / 38.00  m
Receiver height           :  17.20 / 17.20  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :   4.00 deg   Angle2 : 28.00 deg
Barrier height            :  17.80 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
```

```
Road data, segment # 4: Carling4 (day/night)
------------------------------------------
Car traffic volume  : 40480/3520  veh/TimePeriod  *
Medium truck volume :  3220/280   veh/TimePeriod  *
Heavy truck volume  :  2300/200   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):  50000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 4: Carling4 (day/night)
------------------------------------------
Angle1   Angle2           :  28.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  38.00 / 38.00  m
Receiver height           :  17.20 / 17.20  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :  28.00 deg   Angle2 : 90.00 deg
Barrier height            :  17.80 m
Barrier receiver distance :   4.50 / 4.50   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Results segment # 1: Carling1 (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 !       17.20 !       11.83 !        11.83

ROAD (0.00 + 51.57 + 0.00) = 51.57 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -11   0.00  75.22   0.00  -4.04  -3.58   0.00   0.00 -16.05  51.57
-------------------------------------------------------------------------------

Segment Leq : 51.57 dBA

Results segment # 2: Carling2 (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 !       17.20 !       11.83 !        11.83

ROAD (0.00 + 40.40 + 0.00) = 40.40 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -11      4   0.00  75.22   0.00  -4.04 -10.79   0.00   0.00 -20.00  40.40
-------------------------------------------------------------------------------

Segment Leq : 40.40 dBA
```

```
Results segment # 3: Carling3 (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 !       17.20 !       13.48 !        13.48

ROAD (0.00 + 44.33 + 0.00) = 44.33 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     4     28   0.00  75.22   0.00  -4.04  -8.75   0.00   0.00 -18.11  44.33
-------------------------------------------------------------------------------

Segment Leq : 44.33 dBA

Results segment # 4: Carling4 (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 !       17.20 !       15.34 !        15.34

ROAD (0.00 + 55.20 + 0.00) = 55.20 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    28     90   0.00  75.22   0.00  -4.04  -4.63   0.00   0.00 -11.36  55.20
-------------------------------------------------------------------------------

Segment Leq : 55.20 dBA

Total Leq All Segments: 57.10 dBA
```

```
Results segment # 1: Carling1 (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 !       17.20 !       11.83 !        11.83

ROAD (0.00 + 43.97 + 0.00) = 43.97 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -11   0.00  67.63   0.00  -4.04  -3.58   0.00   0.00 -16.05  43.97
-------------------------------------------------------------------------------

Segment Leq : 43.97 dBA

Results segment # 2: Carling2 (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 !       17.20 !       11.83 !        11.83

ROAD (0.00 + 32.80 + 0.00) = 32.80 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -11      4   0.00  67.63   0.00  -4.04 -10.79   0.00   0.00 -20.00  32.80
-------------------------------------------------------------------------------

Segment Leq : 32.80 dBA
```

```
Results segment # 3: Carling3 (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 !       17.20 !       13.48 !        13.48

ROAD (0.00 + 36.73 + 0.00) = 36.73 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     4     28   0.00  67.63   0.00  -4.04  -8.75   0.00   0.00 -18.11  36.73
-------------------------------------------------------------------------------

Segment Leq : 36.73 dBA

Results segment # 4: Carling4 (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 !       17.20 !       15.34 !        15.34

ROAD (0.00 + 47.61 + 0.00) = 47.61 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    28     90   0.00  67.63   0.00  -4.04  -4.63   0.00   0.00 -11.36  47.61
-------------------------------------------------------------------------------

Segment Leq : 47.61 dBA

Total Leq All Segments: 49.51 dBA
TOTAL Leq FROM ALL SOURCES (DAY): 57.10
                           (NIGHT): 49.51
```