Traffic Noise Assessment

333 Montreal Road

Ottawa, Ontario

REPORT: GWE17-045 - Traffic Noise

Prepared For:

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EXECUTIVE SUMMARY

This document describes a roadway traffic noise assessment performed for a proposed community services facility located at 333 Montreal Road in Ottawa, Ontario. The Salvation Army is planning to build a multi-use facility to carry out its mission and commitment to the community. The proposed building will house a shelter, treatment centre, and outreach programs. There is one amenity space considered as an Outdoor Living Areas (OLA) in the form of a sunken terrace on the north side. The major source of transportation noise is Montreal Road and Granville Street. Figure 1 illustrates a complete site plan with surrounding context.

The assessment is based on: (i) theoretical noise prediction methods that conform to the Ministry of the Environment and Climate Change (MOECC) 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 Hobin Architecture Incorporated.

The results of the current analysis indicate that noise levels will range between 34 and 67 dBA during the daytime period (07:00-23:00) and between 27 and 59 dBA during the nighttime period (23:00-07:00). The highest noise level (i.e. 67 dBA) occurs on the south façade of the three-storey building (Receptor 3), which is nearest and most exposed to Montreal Road and Granville Street. Building components with a higher Sound Transmission Class (STC) rating will be required where exterior noise levels exceed 65 dBA, as indicated in Section 5.2 on Figures 3 and 4.

The inherent design of the building will incorporate central air conditioning (or an equivalent system), which will allow building occupants to keep windows closed and thereby meet the ENCG ventilation requirements. Warning Clauses will be required on Purchase and Sale Agreements, as summarized in Section 6; these clauses are for the benefit of the building owner.

Noise levels at the Sunken Terrace north of the development associated with the residential use of the building are expected to fall under 55 dBA; therefore, no mitigation is required for this outdoor living area.

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (GWE) was retained by The Salvation Army to undertake a roadway traffic noise assessment of a proposed multi-use development located at 333 Montreal Road in Ottawa, Ontario. This report summarizes the methodology, results, and recommendations related to a roadway traffic noise assessment. GWE's scope of work involved assessing exterior noise levels generated by local roadway traffic. The assessment was performed based on theoretical noise calculation methods conforming to the City of Ottawa[1] and Ministry of the Environment and Climate Change (MOECC)[2] guidelines. Noise calculations were based on architectural drawings received from Hobin Architecture Incorporated, with future traffic volumes corresponding to the City of Ottawa's Official Plan (OP) roadway classifications.

2. TERMS OF REFERENCE

The focus of this roadway traffic noise assessment is a proposed multi-use development with a footprint in the shape of an 'H', and building heights ranging in height between 1 and 6 stories. The eastern portion is three storeys high, the middle portion two storeys and the western portion six storeys. The proposed building will house a shelter, treatment centre, and outreach programs. The site is located close to the southeast corner of the intersection between Montreal Road and Granville Street. Monfort Street is located north of the site and St. Anne Avenue to the west. Surrounding the site are mixed-residential and commercial areas in all directions. Amenity spaces, associated with residential and overnight stays include a sunken terrace on the north side of the building, which is considered an outdoor living area. The sunken terrace is approximately 4 m lower than grade. The secure courtyard on the south side of the building is associated with the day use programs and functions more as a commercial amenity area, and is therefore not considered an outdoor living area. Balconies on the side of the building are less than 4 m in depth and are therefore not considered an outdoor living area. The major source of transportation noise is Montreal Road and Granville Street. Figure 1 illustrates a complete site plan with surrounding context.

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

[2] Ontario Ministry of the Environment and Climate Change – Environmental Noise Guidelines, Publication NPC-300, Queens Printer for Ontario, Toronto, 2013

3. OBJECTIVES

The principal objective of this work is to calculate the future noise levels on the study building produced by local roadway traffic. The goal of this work is to ensure that interior noise levels do not exceed the allowable limits specified by the City of Ottawa's Environmental Noise Control Guidelines (ENCG) 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 Criteria for Roadway Traffic Noise

For surface transportation, 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 impacts on buildings. Table 1 below describes the applicable indoor noise level limits for roadway sources, as specified in the City of Ottawa's ENCG.

TABLE 1: INDOOR SOUND LEVEL CRITERIA (ROAD) [3]

Type of Space	Time Period	L_{eq} (dBA)
		Road
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]. 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 normally triggers the need for central air conditioning (or similar systems). Where noise levels exceed 65 dBA daytime and 60 dBA nighttime, building components will require higher levels of sound attenuation[5].

4.3 Roadway Noise Assessment

4.3.1 Theoretical Roadway Noise Predictions

Noise predictions were performed with the aid of the MOECC computerized noise assessment program, STAMSON 5.04, for road analysis. Noise receptors were strategically identified at nine locations around the study area, as illustrated in Figure 2. Roadway noise calculations were performed by treating each road segment as separate line sources of noise, and by using existing building locations as noise barriers. In addition to the traffic volumes summarized in Table 2 below, theoretical noise predictions were based on the following parameters:

[3] Adapted from ENCG 2016 – Part 1, Table 2.2c
[4] Burberry, P.B. (2014). Mitchell's Environment and Services. Routledge, Page 125
[5] MOECC, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.1.3

- 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 was taken to be 92% / 8% respectively for all streets.
- Absorptive and reflective intermediate ground surfaces based on specific source-receiver path ground characteristics.
- The study site was treated as having a flat topography.
- Surrounding buildings in some cases used as barrier when the line of sight between the source and receiver is broken by the building.

4.3.2 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[6], 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.

TABLE 2: ROADWAY TRAFFIC DATA

Segment	Roadway / Transit Class	Speed Limit (km/h)	Traffic Volumes
Montreal Road	4-UAU	50	**30,000**
Granville Street	2-UCU	40	**8,000**

4.4 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

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

cladding, thickness and interior finish details. For example, brick veneer walls can achieve STC 50 or more. Standard vinyl or wood sided exterior "2X6" walls have around STC 35[7]. 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) 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.

Based on published research[8], 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).

[7] J.S. Bradley and J.A. Birta. Laboratory Measurements of the Sound Insulation of Building Façade Elements, National Research Council October 2000. TLA-99-033, page 77
[8] CMHC, Road & Rail Noise: Effects on Housing

5. RESULTS AND DISCUSSION

5.1 Roadway Traffic Noise Levels

The results of the roadway noise calculations are summarized in Table 3 below. Appendix A contains the complete set of input and output data from all STAMSON 5.04 calculations.

TABLE 3: EXTERIOR NOISE LEVELS DUE TO ROADWAY TRAFFIC SOURCES

Receptor Number	Plane of Window Receptor Location	Noise Level (dBA)	
		Day	Night
1	Eastern 3-Storey Building – 3rd Floor – North Façade	44	36
2	Eastern 3-Storey Building – 3rd Floor – East Façade	64	56
3	Eastern 3-Storey Building – 3rd Floor – South Façade	67	59
4	Residential Building – 2nd Floor – South Step-in Façade	58	50
5	Western 6-Storey Building – 6th Floor – East Step-in Façade	62	55
6	Western 6-Storey Building – 6th Floor – South Façade	66	58
7	Western 6-Storey Building – 6th Floor – West Façade	64	56
8	OLA – Sunken Terrace	34	27

The results of the current analysis indicate that noise levels will range between 34 and 67 dBA during the daytime period (07:00-23:00) and between 27 and 59 dBA during the nighttime period (23:00-07:00). The highest noise level (i.e. 67 dBA) occurs along the development's south facing façade, which is nearest and most exposed to Montreal Road and Granville Street.

5.2 Noise Control Measures

The noise levels predicted due to traffic sources exceed the criteria listed in Section 4.2 for upgraded building components. As discussed in Section 4.4, 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 and 4):

- **Bedroom Windows**

(i) Windows for sleeping quarters facing south on the wings of the six and three-storey building will require a minimum STC of 30

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

- **Living Room, Dining, and Office Windows**

(iii) Windows for Living Room, Dining and office facing south on the wings of the six and three storey building will require a minimum STC of 25

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

- **Exterior Walls**

(i) Exterior wall components on the south façade of the six-storey building require a minimum STC of 45 which will be achieved with brick cladding or an acoustical equivalent according to NRC test data[9]

The STC requirements would 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 also offer the necessary sound

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

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 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.

The inherent design of the building will incorporate central air conditioning (or an equivalent system), which will allow building occupants to keep windows closed and thereby meet the ENCG ventilation requirements. Warning Clauses for the building owner's benefit will be required on Purchase and Sale Agreements, as summarized in Section 6.

5.2.1 Noise Levels at Outdoor Living Areas

Noise levels at the Sunken Terrace north of the development are expected to fall under 55 dBA; therefore, no mitigation is required for this outdoor living areas.

6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current analysis indicate that noise levels will range between 34 and 67 dBA during the daytime period (07:00-23:00) and between 27 and 59 dBA during the nighttime period (23:00-07:00). The highest noise level (i.e. 67 dBA) occurs on the south façade of the three-storey building (Receptor 3), which is nearest and most exposed to Montreal Road and Granville Street. Building components with a higher Sound Transmission Class (STC) rating will be required where exterior noise levels exceed 65 dBA, as indicated in Section 5.2 on Figures 3 and 4. Noise levels at the Sunken Terrace north of the development are expected to fall under 55 dBA; therefore, no mitigation is required for this outdoor living areas.

The inherent design of the building will incorporate central air conditioning (or and equivalent system), which will allow building occupants to keep windows closed and thereby meet the ENCG ventilation requirements. Warning Clauses for the building owner's benefit will be required on Purchase and Sale Agreements, as summarized below:

> *"Purchasers 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 facility 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 glass glazing elements and spandrel panels on the southern facades of the building, having an STC rating of 30 for sleeping quarters and 25 for living room, dining and offices*
> - *STC rated exterior walls*
>   - *South façades of building: STC 45*
> - *Outdoor living areas orientated away from Montreal Road*
>
> *This facility unit has also been designed with air conditioning (or similar mechanical system). 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.*

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

This concludes our 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.

Yours truly,

Gradient Wind Engineering Inc.

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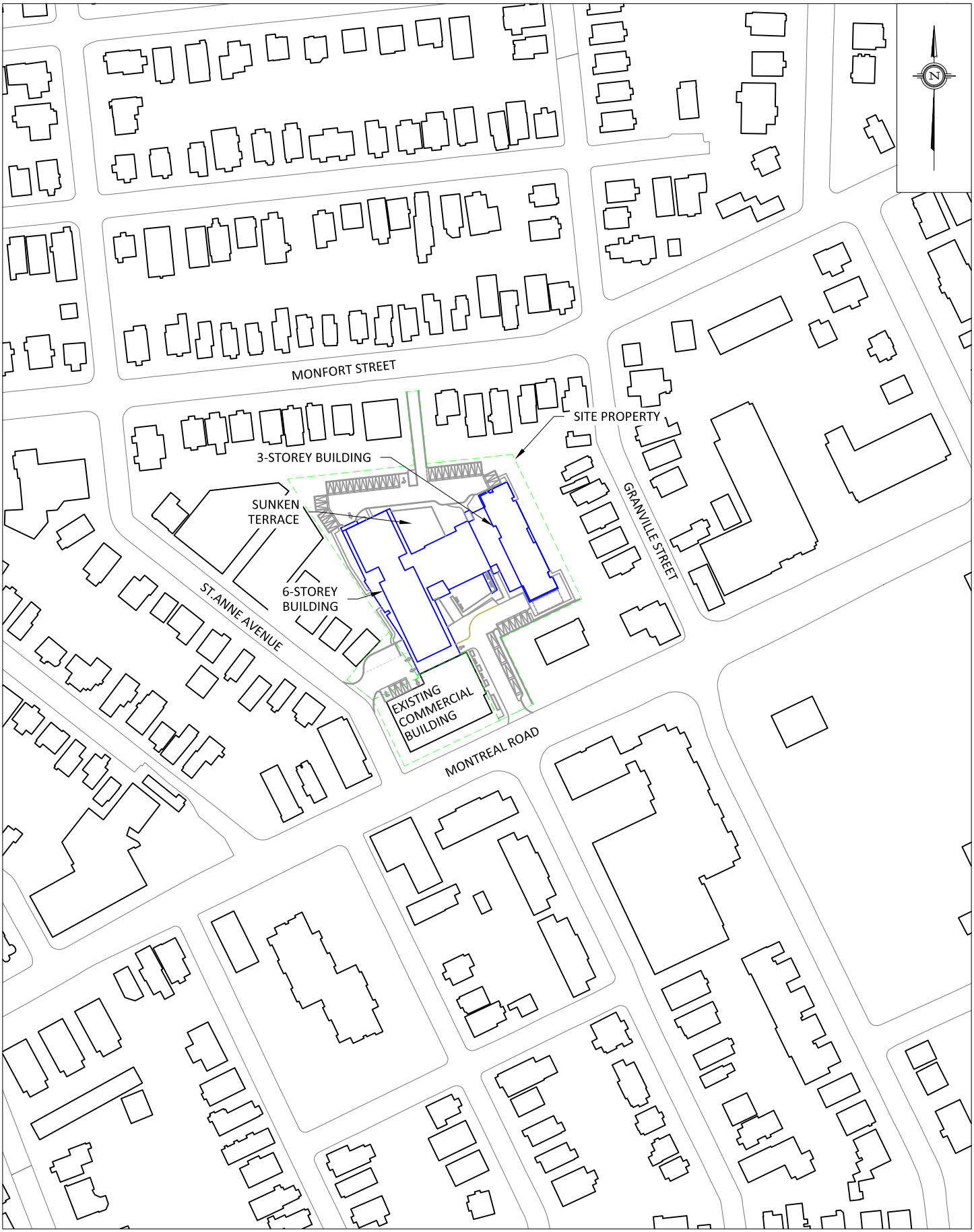
GWE17-045 - Traffic Noise

Joshua Foster, P.Eng.
Partner



GRADIENT WIND ENGINEERING INC
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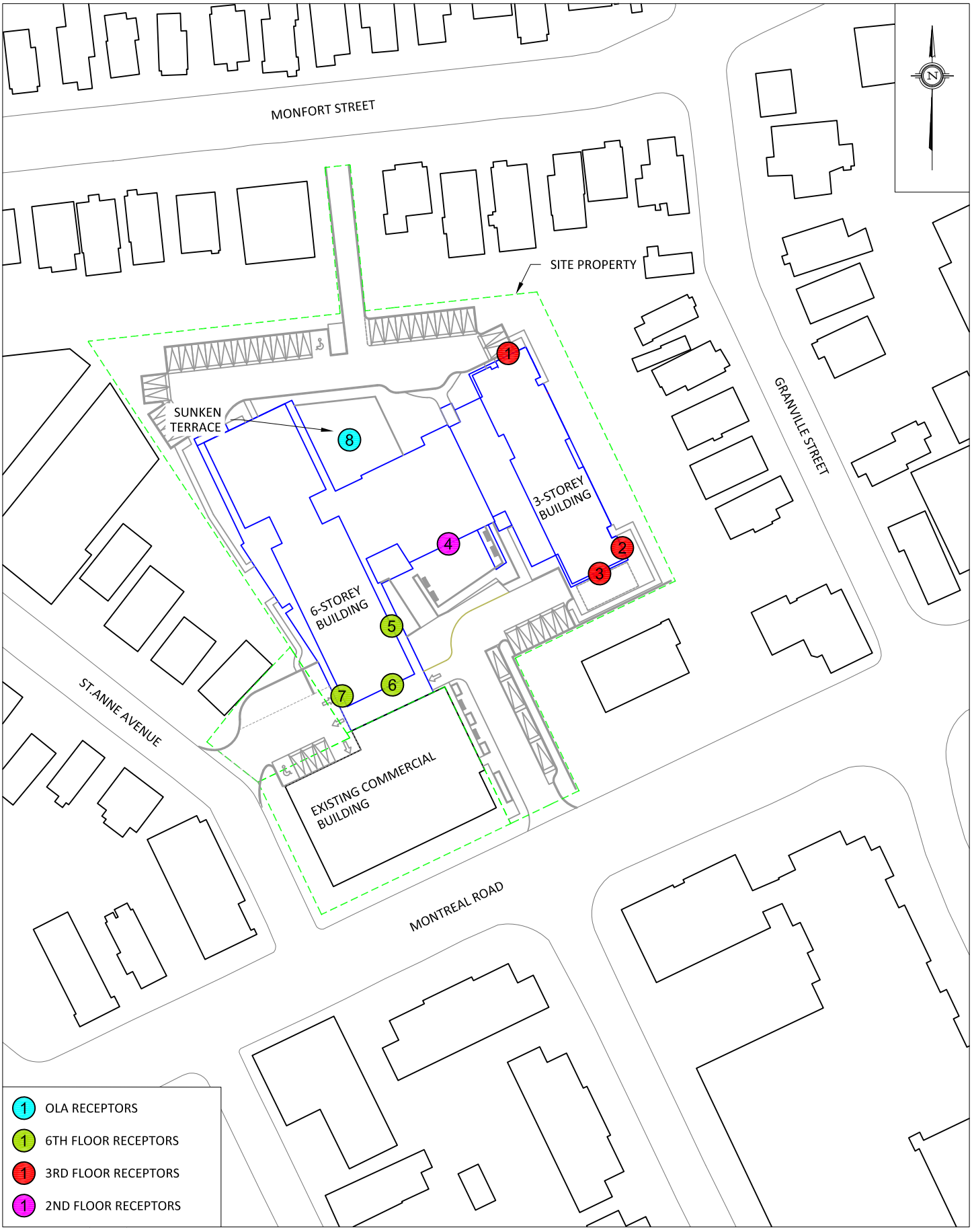
(613) 836 0934

PROJECT	333 MONTREAL ROAD - ROADWAY TRAFFIC NOISE STUDY		DESCRIPTION
SCALE	1:2000 (APPROX.)	DRAWING NO.	GWE17-045-1
DATE	JUNE 6, 2017	DRAWN BY	O.D.

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT



127 Walgreen Road
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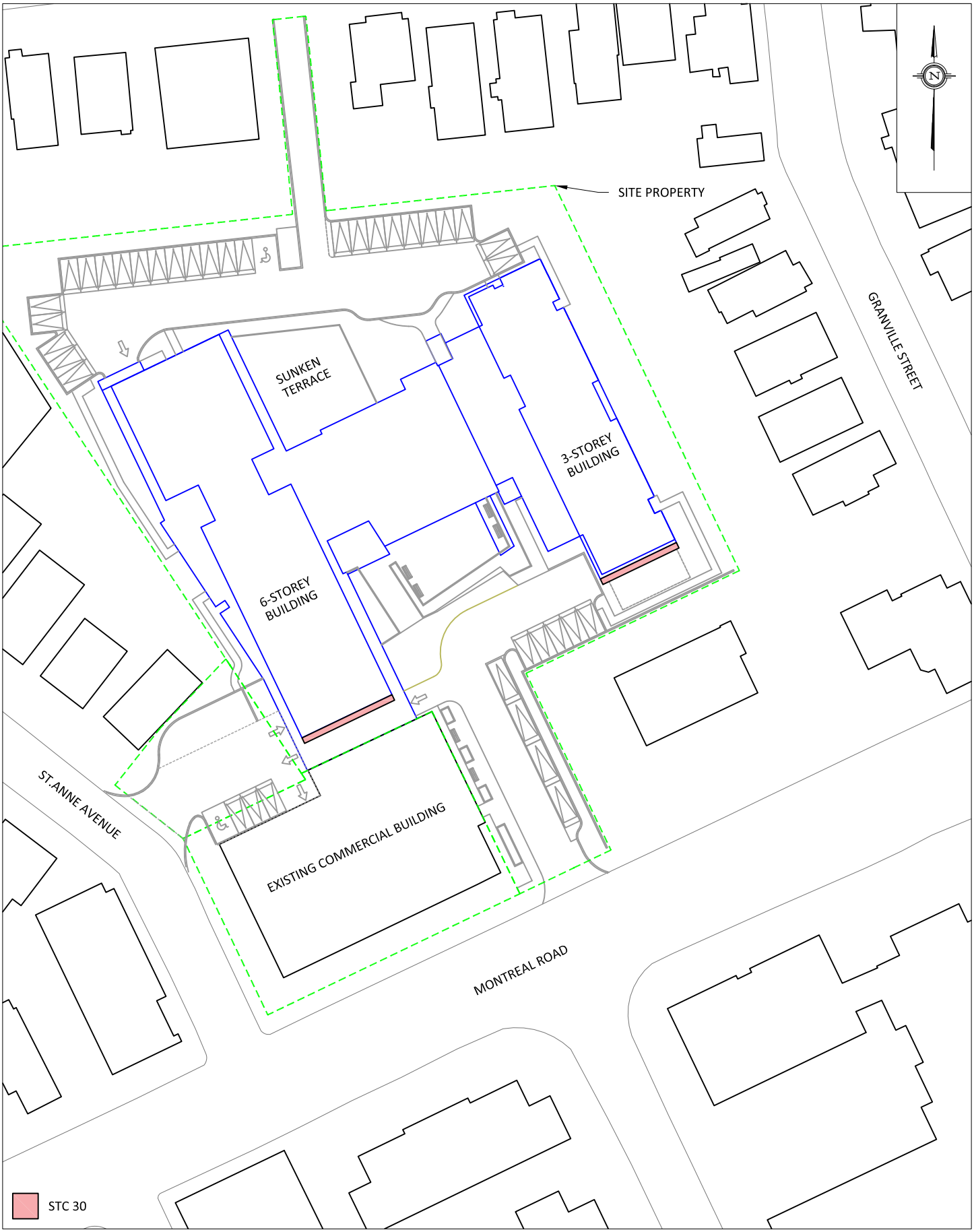
GRADIENT WIND ENGINEERING INC

PROJECT	333 MONTREAL ROAD - ROADWAY TRAFFIC NOISE STUDY
SCALE	1:1000 (APPROX.)
DRAWING NO.	GWE17-045-2
DATE	JUNE 6, 2017
DRAWN BY	O.D.

DESCRIPTION

FIGURE 2:
RECEPTOR LOCATIONS



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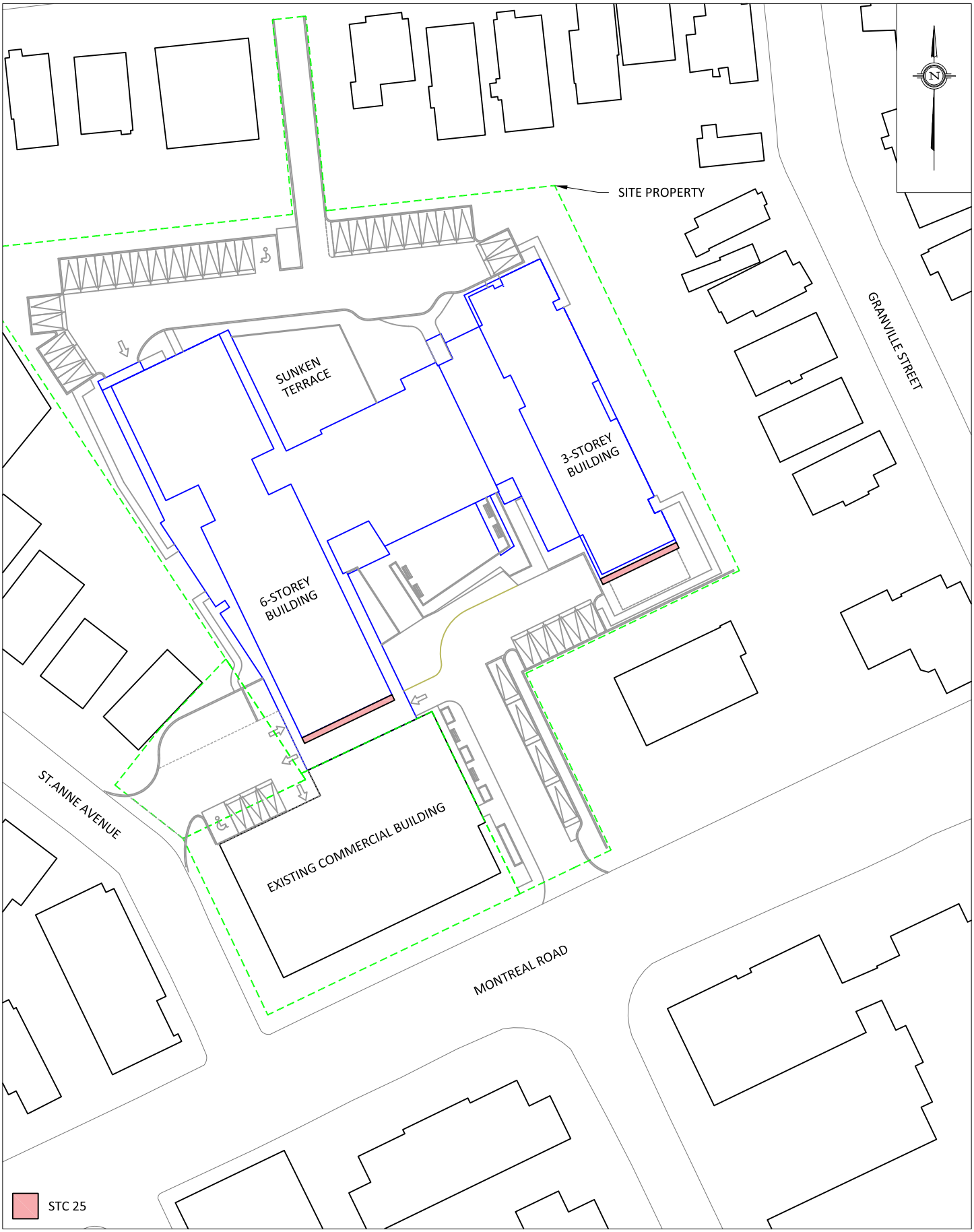
GRADIENT WIND ENGINEERING INC

PROJECT	333 MONTREAL ROAD - ROADWAY TRAFFIC NOISE STUDY		
SCALE	1:750 (APPROX.)	DRAWING NO.	GWE17-045-3
DATE	JUNE 6, 2017	DRAWN BY	O.D.

DESCRIPTION

FIGURE 3:
BEDROOM STC WINDOW REQUIREMENTS



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GRADIENT WIND ENGINEERING INC

PROJECT	333 MONTREAL ROAD - ROADWAY TRAFFIC NOISE STUDY
SCALE	1:750 (APPROX.)
DRAWING NO.	GWE17-045-4
DATE	JUNE 6, 2017
DRAWN BY	O.D.

DESCRIPTION

FIGURE 4:
LIVING ROOM, DINING ROOM AND OFFICE STC WINDOW REQUIREMENTS

APPENDIX A

TRAFFIC MODELLING INPUT AND OUTPUT DATA

```
STAMSON 5.0        NORMAL REPORT        Date: 19-05-2017 15:26:33
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Granville (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: Granville (day/night)
--------------------------------------------
Angle1   Angle2           : -90.00 deg   -17.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  45.00 / 45.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : -17.00 deg
Barrier height            :   7.00 m
Barrier receiver distance :  38.00 / 38.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Road data, segment # 2: Granville (day/night)
-----------------------------------------
Car traffic volume  :  6477/563   veh/TimePeriod  *
Medium truck volume :   515/45    veh/TimePeriod  *
Heavy truck volume  :   368/32    veh/TimePeriod  *
Posted speed limit  :    40 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):   8000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 2: Granville (day/night)
-------------------------------------------
Angle1   Angle2           : -17.00 deg   -12.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  45.00 / 45.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

Results segment # 1: Granville (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	7.50	2.43	2.43

ROAD (0.00 + 40.45 + 0.00) = 40.45 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-17	0.06	63.96	0.00	-5.06	-4.13	0.00	0.00	-14.32	40.45

Segment Leq : 40.45 dBA

Results segment # 2: Granville (day)

Source height = 1.50 m

ROAD (0.00 + 41.26 + 0.00) = 41.26 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-17	-12	0.48	63.96	0.00	-7.06	-15.63	0.00	0.00	0.00	41.26

Segment Leq : 41.26 dBA

Total Leq All Segments: 43.88 dBA

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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !        7.50 !        2.43 !         2.43

ROAD (0.00 + 32.85 + 0.00) = 32.85 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -17   0.06  56.36   0.00  -5.06  -4.13   0.00   0.00 -14.32  32.85
-------------------------------------------------------------------------------

Segment Leq : 32.85 dBA

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

Source height = 1.50 m

ROAD (0.00 + 33.67 + 0.00) = 33.67 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -17    -12   0.48  56.36   0.00  -7.06 -15.63   0.00   0.00   0.00  33.67
-------------------------------------------------------------------------------

Segment Leq : 33.67 dBA

Total Leq All Segments: 36.29 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 43.88
                           (NIGHT): 36.29
```

```
STAMSON 5.0        NORMAL REPORT        Date: 19-05-2017 15:56:57
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Granville (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: Granville (day/night)
--------------------------------------------
Angle1   Angle2           : -74.00 deg   -63.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  27.00 / 27.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -74.00 deg   Angle2 : -63.00 deg
Barrier height            :   7.00 m
Barrier receiver distance :  20.00 / 20.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Road data, segment # 2: Granville 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       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):   8000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 2: Granville 2 (day/night)
---------------------------------------------
Angle1   Angle2           : -44.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  42.00 / 42.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 3: Montreal (day/night)
-------------------------------------------
Car traffic volume  : 24288/2112  veh/TimePeriod  *
Medium truck volume :  1932/168   veh/TimePeriod  *
Heavy truck volume  :  1380/120   veh/TimePeriod  *
Posted speed limit  :    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):  30000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 3: Montreal (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  :  50.00 / 50.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

Barrier height for grazing incidence
-----------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !        7.50 !        3.05 !         3.05

ROAD (0.00 + 34.63 + 0.00) = 34.63 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -74    -63   0.06  63.96   0.00  -2.71 -12.40   0.00   0.00 -14.21  34.63
-------------------------------------------------------------------------------

Segment Leq : 34.63 dBA

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

Source height = 1.50 m

ROAD (0.00 + 55.24 + 0.00) = 55.24 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -44     90   0.48  63.96   0.00  -6.62  -2.09   0.00   0.00   0.00  55.24
-------------------------------------------------------------------------------

Segment Leq : 55.24 dBA
```

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

Source height = 1.50 m

ROAD (0.00 + 63.25 + 0.00) = 63.25 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90      0   0.00  71.49   0.00  -5.23  -3.01   0.00   0.00   0.00  63.25
-------------------------------------------------------------------------------

Segment Leq : 63.25 dBA

Total Leq All Segments: 63.89 dBA

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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !        7.50 !        3.05 !         3.05

ROAD (0.00 + 27.04 + 0.00) = 27.04 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -74    -63   0.06  56.36   0.00  -2.71 -12.40   0.00   0.00 -14.21  27.04
-------------------------------------------------------------------------------

Segment Leq : 27.04 dBA
```

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

Source height = 1.50 m

ROAD (0.00 + 47.65 + 0.00) = 47.65 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -44     90   0.48  56.36   0.00  -6.62  -2.09   0.00   0.00   0.00  47.65
--------------------------------------------------------------------------------

Segment Leq : 47.65 dBA

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

Source height = 1.50 m

ROAD (0.00 + 55.65 + 0.00) = 55.65 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -90      0   0.00  63.89   0.00  -5.23  -3.01   0.00   0.00   0.00  55.65
--------------------------------------------------------------------------------

Segment Leq : 55.65 dBA

Total Leq All Segments: 56.29 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 63.89
                           (NIGHT): 56.29
```

```
STAMSON 5.0        NORMAL REPORT        Date: 19-05-2017 15:33:40
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Montreal (day/night)
----------------------------------------------
Car traffic volume  : 24288/2112  veh/TimePeriod  *
Medium truck volume :  1932/168   veh/TimePeriod  *
Heavy truck volume  :  1380/120   veh/TimePeriod  *
Posted speed limit  :    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):  30000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: Montreal (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  :  47.00 / 47.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 2: Granville (day/night)
-----------------------------------------
Car traffic volume  :  6477/563   veh/TimePeriod  *
Medium truck volume :   515/45    veh/TimePeriod  *
Heavy truck volume  :   368/32    veh/TimePeriod  *
Posted speed limit  :    40 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):   8000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 2: Granville (day/night)
-------------------------------------------
Angle1   Angle2           :   0.00 deg   70.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  49.00 / 49.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

Results segment # 1: Montreal (day)

Source height = 1.50 m

ROAD (0.00 + 66.53 + 0.00) = 66.53 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	71.49	0.00	-4.96	0.00	0.00	0.00	0.00	66.53

Segment Leq : 66.53 dBA

Results segment # 2: Granville (day)

Source height = 1.50 m

ROAD (0.00 + 54.71 + 0.00) = 54.71 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	70	0.00	63.96	0.00	-5.14	-4.10	0.00	0.00	0.00	54.71

Segment Leq : 54.71 dBA

Total Leq All Segments: 66.81 dBA

Results segment # 1: Montreal (night)

Source height = 1.50 m

ROAD (0.00 + 58.93 + 0.00) = 58.93 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	63.89	0.00	-4.96	0.00	0.00	0.00	0.00	58.93

Segment Leq : 58.93 dBA

Results segment # 2: Granville (night)

Source height = 1.50 m

ROAD (0.00 + 47.12 + 0.00) = 47.12 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	70	0.00	56.36	0.00	-5.14	-4.10	0.00	0.00	0.00	47.12

Segment Leq : 47.12 dBA

Total Leq All Segments: 59.21 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 66.81
(NIGHT): 59.21

```
STAMSON 5.0        NORMAL REPORT        Date: 19-05-2017 15:58:26
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Montreal (day/night)
----------------------------------------------
Car traffic volume  : 24288/2112  veh/TimePeriod  *
Medium truck volume :  1932/168   veh/TimePeriod  *
Heavy truck volume  :  1380/120   veh/TimePeriod  *
Posted speed limit  :    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):  30000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: Montreal (day/night)
------------------------------------------
Angle1   Angle2           : -33.00 deg   15.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  65.00 / 65.00  m
Receiver height           :   4.50 / 4.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -33.00 deg   Angle2 : -18.00 deg
Barrier height            :   5.00 m
Barrier receiver distance :  43.00 / 43.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Road data, segment # 2: Montreal 2 (day/night)
-----------------------------------------------
Car traffic volume  : 24288/2112  veh/TimePeriod  *
Medium truck volume :  1932/168   veh/TimePeriod  *
Heavy truck volume  :  1380/120   veh/TimePeriod  *
Posted speed limit  :    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):  30000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 2: Montreal 2 (day/night)
---------------------------------------------
Angle1   Angle2           :  15.00 deg   17.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  65.00 / 65.00  m
Receiver height           :   4.50 / 4.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :  15.00 deg   Angle2 : 17.00 deg
Barrier height            :   5.00 m
Barrier receiver distance :  51.00 / 51.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

Results segment # 1: Montreal (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	4.50	2.51	2.51

ROAD (0.00 + 43.51 + 57.75) = 57.91 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-33	-18	0.00	71.49	0.00	-6.37	-10.79	0.00	0.00	-10.83	43.51
-18	15	0.00	71.49	0.00	-6.37	-7.37	0.00	0.00	0.00	57.75

Segment Leq : 57.91 dBA

Results segment # 2: Montreal 2 (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	4.50	2.14	2.14

ROAD (0.00 + 32.39 + 0.00) = 32.39 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
15	17	0.00	71.49	0.00	-6.37	-19.54	0.00	0.00	-13.19	32.39

Segment Leq : 32.39 dBA

Total Leq All Segments: 57.92 dBA

```
Results segment # 1: Montreal (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 !        4.50 !        2.51 !         2.51

ROAD (0.00 + 35.91 + 50.16) = 50.32 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -33    -18   0.00  63.89   0.00  -6.37 -10.79   0.00   0.00 -10.83  35.91
-------------------------------------------------------------------------------
   -18     15   0.00  63.89   0.00  -6.37  -7.37   0.00   0.00   0.00  50.16
-------------------------------------------------------------------------------

Segment Leq : 50.32 dBA

Results segment # 2: Montreal 2 (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 !        4.50 !        2.14 !         2.14

ROAD (0.00 + 24.79 + 0.00) = 24.79 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    15     17   0.00  63.89   0.00  -6.37 -19.54   0.00   0.00 -13.19  24.79
-------------------------------------------------------------------------------

Segment Leq : 24.79 dBA

Total Leq All Segments: 50.33 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 57.92
                           (NIGHT): 50.33
```

```
STAMSON 5.0        NORMAL REPORT        Date: 19-05-2017 15:46:26
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Montreal (day/night)
----------------------------------------------
Car traffic volume  : 24288/2112  veh/TimePeriod  *
Medium truck volume :  1932/168   veh/TimePeriod  *
Heavy truck volume  :  1380/120   veh/TimePeriod  *
Posted speed limit  :    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):  30000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: Montreal (day/night)
----------------------------------------------
Angle1   Angle2           : -77.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  55.00 / 55.00  m
Receiver height           :  16.50 / 16.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 2: Granville (day/night)
-----------------------------------------
Car traffic volume  :  6477/563   veh/TimePeriod  *
Medium truck volume :   515/45    veh/TimePeriod  *
Heavy truck volume  :   368/32    veh/TimePeriod  *
Posted speed limit  :    40 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):   8000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 2: Granville (day/night)
-------------------------------------------
Angle1   Angle2           : -48.00 deg   13.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  90.00 / 90.00  m
Receiver height           :  16.50 / 16.50  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -48.00 deg   Angle2 : 13.00 deg
Barrier height            :   9.00 m
Barrier receiver distance :  47.00 / 47.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Road data, segment # 3: Granville 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       :     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 # 3: Granville 2 (day/night)
---------------------------------------------
Angle1   Angle2           :  13.00 deg   49.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  90.00 / 90.00  m
Receiver height           :  16.50 / 16.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 62.16 + 0.00) = 62.16 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -77      0   0.00  71.49   0.00  -5.64  -3.69   0.00   0.00   0.00  62.16
-------------------------------------------------------------------------------

Segment Leq : 62.16 dBA

Results segment # 2: Granville (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 !       16.50 !        8.66 !         8.66

ROAD (0.00 + 46.36 + 0.00) = 46.36 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -48     13   0.00  63.96   0.00  -7.78  -4.70   0.00   0.00  -5.11  46.36
-------------------------------------------------------------------------------

Segment Leq : 46.36 dBA

Results segment # 3: Granville 2 (day)
-------------------------------------

Source height = 1.50 m

ROAD (0.00 + 49.18 + 0.00) = 49.18 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    13     49   0.00  63.96   0.00  -7.78  -6.99   0.00   0.00   0.00  49.18
-------------------------------------------------------------------------------

Segment Leq : 49.18 dBA

Total Leq All Segments: 62.48 dBA
```

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

Source height = 1.50 m

ROAD (0.00 + 54.56 + 0.00) = 54.56 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -77      0   0.00  63.89   0.00  -5.64  -3.69   0.00   0.00   0.00  54.56
-------------------------------------------------------------------------------

Segment Leq : 54.56 dBA

Results segment # 2: Granville (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 !       16.50 !        8.66 !         8.66

ROAD (0.00 + 38.77 + 0.00) = 38.77 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -48     13   0.00  56.36   0.00  -7.78  -4.70   0.00   0.00  -5.11  38.77
-------------------------------------------------------------------------------

Segment Leq : 38.77 dBA

Results segment # 3: Granville 2 (night)
----------------------------------------

Source height = 1.50 m

ROAD (0.00 + 41.59 + 0.00) = 41.59 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    13     49   0.00  56.36   0.00  -7.78  -6.99   0.00   0.00   0.00  41.59
-------------------------------------------------------------------------------

Segment Leq : 41.59 dBA

Total Leq All Segments: 54.88 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 62.48
                           (NIGHT): 54.88
```

```
STAMSON 5.0        NORMAL REPORT        Date: 19-05-2017 15:51:18
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Montreal (day/night)
----------------------------------------------
Car traffic volume  : 24288/2112  veh/TimePeriod  *
Medium truck volume :  1932/168   veh/TimePeriod  *
Heavy truck volume  :  1380/120   veh/TimePeriod  *
Posted speed limit  :    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):  30000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: Montreal (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  :  43.00 / 43.00  m
Receiver height           :  16.50 / 16.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 2: Granville (day/night)
----------------------------------------------
Car traffic volume  :  6477/563   veh/TimePeriod  *
Medium truck volume :   515/45    veh/TimePeriod  *
Heavy truck volume  :   368/32    veh/TimePeriod  *
Posted speed limit  :    40 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):   8000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 2: Granville (day/night)
-------------------------------------------
Angle1   Angle2           :   0.00 deg   43.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  95.00 / 95.00  m
Receiver height           :  16.50 / 16.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

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

Source height = 1.50 m

ROAD (0.00 + 65.39 + 0.00) = 65.39 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.21  71.49   0.00  -5.53  -0.56   0.00   0.00   0.00  65.39
-------------------------------------------------------------------------------

Segment Leq : 65.39 dBA
```

Results segment # 2: Granville (day)

Source height = 1.50 m

ROAD (0.00 + 49.72 + 0.00) = 49.72 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	43	0.00	63.96	0.00	-8.02	-6.22	0.00	0.00	0.00	49.72

Segment Leq : 49.72 dBA

Total Leq All Segments: 65.51 dBA

Results segment # 1: Montreal (night)

Source height = 1.50 m

ROAD (0.00 + 57.80 + 0.00) = 57.80 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.21	63.89	0.00	-5.53	-0.56	0.00	0.00	0.00	57.80

Segment Leq : 57.80 dBA

Results segment # 2: Granville (night)

Source height = 1.50 m

ROAD (0.00 + 42.13 + 0.00) = 42.13 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	43	0.00	56.36	0.00	-8.02	-6.22	0.00	0.00	0.00	42.13

Segment Leq : 42.13 dBA

Total Leq All Segments: 57.92 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.51
(NIGHT): 57.92

```
STAMSON 5.0        NORMAL REPORT        Date: 19-05-2017 15:52:03
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Montreal (day/night)
----------------------------------------------
Car traffic volume  : 24288/2112  veh/TimePeriod  *
Medium truck volume :  1932/168   veh/TimePeriod  *
Heavy truck volume  :  1380/120   veh/TimePeriod  *
Posted speed limit  :    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):  30000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: Montreal (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  :  47.00 / 47.00  m
Receiver height           :  16.50 / 16.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 63.52 + 0.00) = 63.52 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     90   0.00  71.49   0.00  -4.96  -3.01   0.00   0.00   0.00  63.52
-------------------------------------------------------------------------------

Segment Leq : 63.52 dBA

Total Leq All Segments: 63.52 dBA

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

Source height = 1.50 m

ROAD (0.00 + 55.92 + 0.00) = 55.92 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     90   0.00  63.89   0.00  -4.96  -3.01   0.00   0.00   0.00  55.92
-------------------------------------------------------------------------------

Segment Leq : 55.92 dBA

Total Leq All Segments: 55.92 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 63.52
                           (NIGHT): 55.92
```

```
STAMSON 5.0        NORMAL REPORT        Date: 19-05-2017 15:52:50
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Granville (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: Granville (day/night)
--------------------------------------------
Angle1   Angle2           : -90.00 deg   -22.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  78.00 / 78.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : -22.00 deg
Barrier height            :   7.00 m
Barrier receiver distance :  71.00 / 71.00  m
Source elevation          :  61.00 m
Receiver elevation        :  56.00 m
Barrier elevation         :  61.00 m
Reference angle           :   0.00
```

```
Results segment # 1: Granville (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 !        1.50 !        1.05 !        62.05

ROAD (0.00 + 34.28 + 0.00) = 34.28 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -22   0.24  63.96   0.00  -8.88  -5.08   0.00   0.00 -15.72  34.28
-------------------------------------------------------------------------------

Segment Leq : 34.28 dBA

Total Leq All Segments: 34.28 dBA

Results segment # 1: Granville (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 !        1.50 !        1.05 !        62.05

ROAD (0.00 + 26.69 + 0.00) = 26.69 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -22   0.24  56.36   0.00  -8.88  -5.08   0.00   0.00 -15.72  26.69
-------------------------------------------------------------------------------

Segment Leq : 26.69 dBA

Total Leq All Segments: 26.69 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 34.28
                           (NIGHT): 26.69
```