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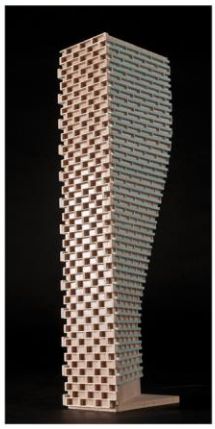
ENGINEERS & SCIENTISTS

ROADWAY TRAFFIC NOISE ASSESSMENT

6001-6005 Renaud Road
Ottawa, Ontario

Report: 21-405-Traffic Noise



January 4, 2022

PREPARED FOR

Landric Homes
63 Montreal Road E.
Gatineau, QC J8M 1K3

PREPARED BY

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EXECUTIVE SUMMARY

This report describes a detailed roadway traffic noise assessment performed for the proposed residential development located at 6001-6005 Renaud Road in Ottawa, Ontario, in support of a Site Plan Control (SPA) application.The proposed development consists of a 32 townhouse units, with a row towards the north of the property and a row to the south of the property. The major source of roadway traffic noise is Renaud Road which is directly south of the study site. Figure 1 illustrates the 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) drawings prepared by Open Plan Architects Inc., dated November 2021.

The results of the current analysis indicate that noise levels will range between 53 and 64 dBA during the daytime period (07:00-23:00) and between 45 and 56 dBA during the nighttime period (23:00-07:00). The highest noise level (64 dBA) occurs at the south façade of the south row of townhouses, which is nearest and most exposed to Renaud Road. Upgraded building components will be not be required since noise levels predicted due to roadway traffic do not exceed 65 dBA during daytime and 60 dBA during nighttime at any façade. Therefore, the building will meet the ENCG criteria for indoor noise level with standard building components in conformance with the Ontario Building Code (2012).

Since noise levels exceed 55 dBA at the Plane of Window (POW) receptors, the south row of townhouses will require forced air heating with provisions for central air-conditioning. Thus the occupant, at their own discretion, can install central air conditioning so that windows can be kept closed and a quiet living environment maintained. Additionally, a Type C Warning Clause will be required on all Lease, Purchase, and Sale Agreements.

Noise levels at the OLA receptor in the outdoor amenity area do not exceed ENCG requirements, therefore no mitigation measures are required.

Since the proposed development consists of small residential buildings, there will be no stationary noise sources of concern within the proposed developement. Additionally, the surrounding of the proposed development consist of small residential buildings, therefore there are no significant off-site stationary noise sources.

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Landric Homes to undertake a detailed roadway traffic noise study for the proposed development located at 6001-6005 Renaud Road in Ottawa, Ontario. This report summarizes the methodology, results, and recommendations related to the assessment of exterior noise levels generated by local roadway traffic.

This assessment is based on theoretical noise calculation methods conforming to the City of Ottawa[1] and the Ministry of the Environment, Conservation and Parks (MECP)[2] guidelines. Noise calculations were based on architectural drawings prepared by Open Plan Architects Inc., dated November 2021, with future traffic volumes corresponding to the City of Ottawa's Official Plan (OP) roadway classifications.

2. TERMS OF REFERENCE

The proposed residential development comprises of 32 townhouse units, with a row towards the north of the property and a row to the south. In between the rows of townhouses thare are parking spaces and an amenity area. The study site is surrounded by low-rise residential buildings. The major source of roadway traffic noise is Renaud Road. Figure 1 illustrates the site plan with the surrounding context.

Given the small size of the development, no major pieces of HVAC equipment are antipated to be located around the building. Any equipment supplied shall comply with the Ministry of Enviorment's NPC-116 - Enviormetnal Noise Guildines for Instlation of Residetnal Air Conditioners.

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 (ENCG) as outlined in Section 4.2 of this report.

[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

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 level 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 sound pressure 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 vehicular traffic, 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 and LRT, 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. Based on Gradient Wind's experience, more comfortable indoor noise levels should be targeted, towards 42 and 37, respectively, to control peak noise and deficiencies in building envelope construction.

TABLE 1: INDOOR SOUND LEVEL CRITERIA

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

Predicted noise levels at the plane of window (POW) dictate the action required to achieve the recommended sound levels. An open window is considered to provide a 10 dBA reduction in noise, while a standard closed window is capable of providing a minimum 20 dBA noise reduction[3]. A closed window due to a ventilation requirement will bring noise levels down to achieve an acceptable indoor environment[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 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[5].

The sound level criterion for outdoor living areas (OLA) is 55 dBA, which applies during the daytime (07:00 to 23:00). When noise levels exceed 55 dBA but are less than 60 dBA, mitigation is recommended to reduce noise levels where technically and administratively feasible to acceptable levels at or below the criterion. If these measures are not provided, prospective purchasers or tenants should be informed of potential noise problems by a warning clause. If noise levels at OLAs exceed 60 dBA, mitigation must be provided.

[3] Burberry, P.B. (2014). Mitchell's Environment and Services. Routledge, Page 125
[4] MECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.8
[5] MECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.1.3

4.2.2 Theoretical Roadway Noise Predictions

Noise predictions were performed with the aid of the MECP computerized noise assessment program, STAMSON 5.04, for road analysis. Appendix A includes the STAMSON 5.04 input and output data. Roadway traffic noise calculations were performed by treating each roadway segment as a separate line source of noise. In addition to the traffic volumes summarized in Table 2, theoretical noise predictions were based on the following parameters:

- Truck traffic on all roadways was taken to comprise 5% heavy trucks and 7% medium trucks, as per ENCG requirements for noise level predictions.
- The day/night split for all streets was taken to be 92%/8%, respectively.
- Ground surfaces were taken to be absorptive due to the presence of soft ground.
- Topography was assumed to be a flat/gentle slope surrounding the study building.
- Six (6) receptor locations were chosen at the façades of the study buildings as Plane of Window (POW) receptors and one (1) receptor location was chosen as Outdoor Living Area (OLA) receptor (see Figure 2).
- Receptor heights were taken to be 10.5 metres at level 3 for the centre of the window and 1.5 m for the backyard outdoor living area (OLA) receptor.
- Surrounding buildings were not considered to provide shielding from roadway traffic noise as a conservative measure.
- For select sources, where appropriate, the proposed building was considered as a barrier, partially or fully obstructing exposure to the source.
- Receptor distances and exposure angles are illustrated in Figures 3-6.

4.2.3 Roadway Traffic Volumes

The ENCG dictates that noise calculations should consider future sound levels based on a roadway's classification at the mature state of development. Therefore, traffic volumes are based on the roadway classifications outlined in the City of Ottawa's Official Plan (OP) and Transportation Master Plan[6] which provide additional details on future roadway expansions. Average Annual Daily Traffic (AADT) volumes

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

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 Traffic Data	Speed Limit (km/h)	Traffic Volumes
Renaud Road	2-Lane Urban Collector (2-UCU)	50	**8,000**

5. ROADWAY TRAFFIC NOISE 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	10.5	POW – South Row – East Façade	59	52
2	10.5	POW – South Row – South Façade	64	56
3	10.5	POW – South Row – West Façade	60	52
4	10.5	POW – North Row – East Façade	53	45
5	10.5	POW – North Row – South Façade	54	46
6	10.5	POW – North Row – West Façade	53	45
7	1.5	OLA – Outdoor Amenity	55	N/A*

*OLA noise levels during the nighttime period are not considered as per ENCG.

The results of the current analysis indicate that noise levels will range between 53 and 64 dBA during the daytime period (07:00-23:00) and between 45 and 56 dBA during the nighttime period (23:00-07:00). The highest noise level (64 dBA) occurs at the south façade of the south row of townhouses, which is nearest and most exposed to Renaud Road.

5.2 Noise Control Measures

The noise levels predicted due to roadway traffic do not exceed the criteria listed in Section 4.2 for building components. Therefore, upgraded building components will not be required. Since noise levels exceed 55 dBA at the Plane of Window (POW) receptors, the south row of townhouses will require forced air heating with provisions for central air-conditioning. Thus the occupant, at their own discretion, can install central air conditioning so that windows can be kept closed and a quiet living environment maintained. Additionally, a Type C Warning Clause will be required on all Lease, Purchase, and Sale Agreements.

6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current analysis indicate that noise levels will range between 53 and 64 dBA during the daytime period (07:00-23:00) and between 45 and 56 dBA during the nighttime period (23:00-07:00). The highest noise level (64 dBA) occurs at the south façade of the south row of townhouses, which is nearest and most exposed to Renaud Road. Upgraded building components will be not be required since noise levels predicted due to roadway traffic do not exceed 65 dBA during daytime and 60 dBA during nighttime at any façade. Therefore, the building will meet the ENCG criteria for indoor noise level with standard building components in conformance with the Ontario Building Code (2012).

Since noise levels exceed 55 dBA at the Plane of Window (POW) receptors, the south row of townhouses will require forced air heating with provisions for central air-conditioning. Thus the occupant, at their own discretion, can install central air conditioning so that windows can be kept closed and a quiet living environment maintained. Additionally, a Type C Warning Clause will be required on all Lease, Purchase, and Sale Agreements:

Type C

> *"This dwelling unit has been designed with the provision for adding central air conditioning at the occupant's discretion. Installation of central air conditioning by the occupant in low and medium density developments will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment."*

Noise levels at the OLA receptor in the outdoor amenity area do not exceed ENCG requirements, therefore no mitigation measures are required.

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.

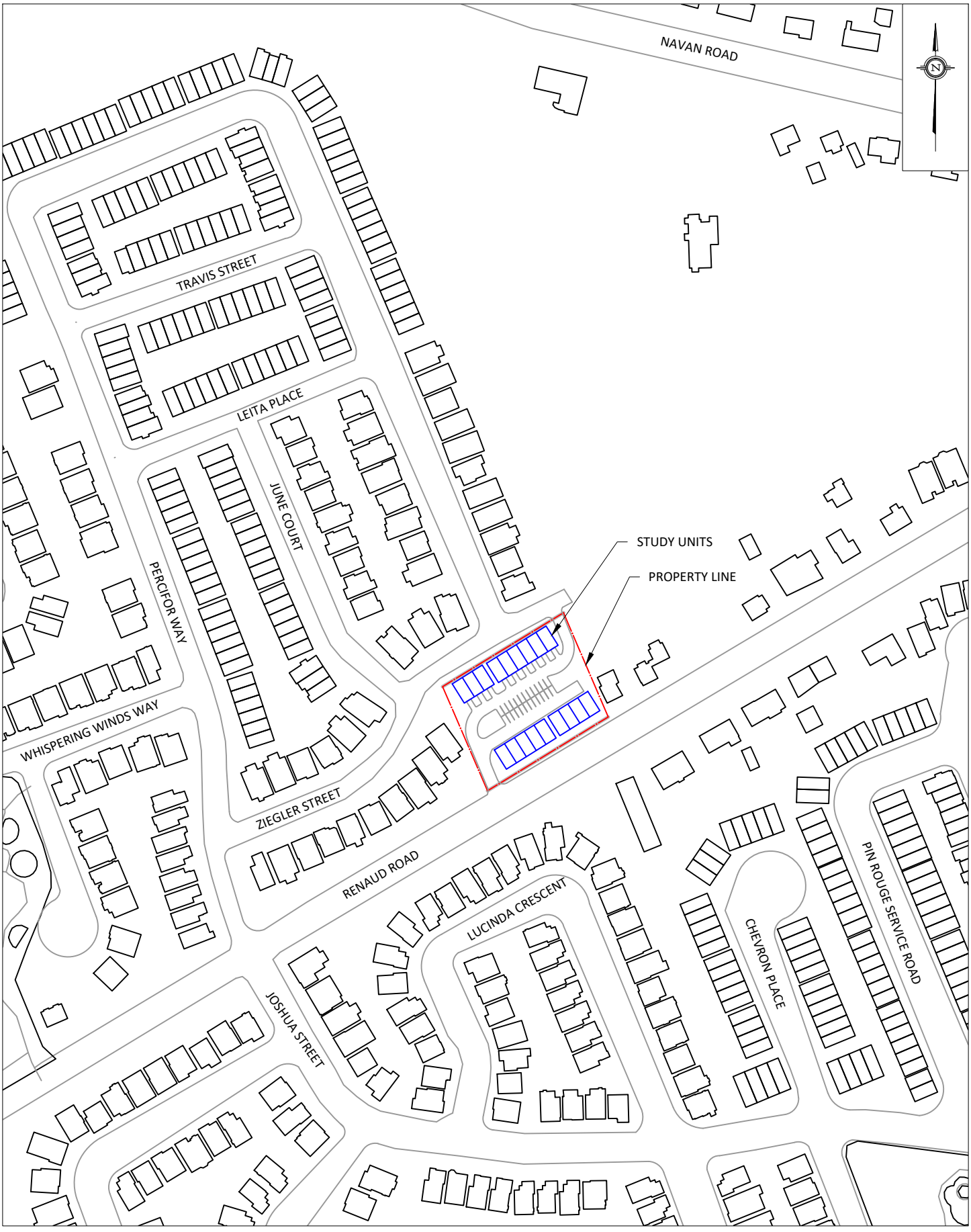
Sincerely,

Gradient Wind Engineering Inc.

Caleb Alexander, B.Eng.,
Junior Environmental Scientist

Joshua Foster, P.Eng.
Principal

Gradient Wind File 21-405-Traffic Noise



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127 WALGREEN ROAD , OTTAWA, ON
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PROJECT	6001-6005 RENAUD ROAD, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:2000 (APPROX.)
DRAWING NO.	GWE21-405-1
DATE	DECEMBER 17, 2021
DRAWN BY	C.A.

DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT

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PROJECT	6001-6005 RENAUD ROAD, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		DESCRIPTION
SCALE	1:650 (APPROX.)	DRAWING NO.	GWE21-405-2
DATE	DECEMBER 17, 2021	DRAWN BY	C.A.

FIGURE 2:
STAMSON RECEPTOR LOCATIONS

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PROJECT	6001-6005 RENAUD ROAD, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		DESCRIPTION
SCALE	1:650 (APPROX.)	DRAWING NO.	GWE21-405-3
DATE	DECEMBER 17, 2021	DRAWN BY	C.A.

FIGURE 3:
RECEPTORS 1-3 STAMSON INPUT PARAMATERS

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SCALE	1:650 (APPROX.)
DRAWING NO.	GWE21-405-4
DATE	DECEMBER 17, 2021
DRAWN BY	C.A.

DESCRIPTION

FIGURE 4:
RECEPTORS 4 & 6 STAMSON INPUT PARAMETERS

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PROJECT	6001-6005 RENAUD ROAD, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:650 (APPROX.)
DRAWING NO.	GWE21-405-5
DATE	DECEMBER 17, 2021
DRAWN BY	C.A.

DESCRIPTION

FIGURE 5:
RECEPTOR 5 STAMSON INPUT PARAMETERS

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PROJECT	6001-6005 RENAUD ROAD, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		DESCRIPTION
SCALE	1:650 (APPROX.)	DRAWING NO.	GWE21-405-6
DATE	DECEMBER 17, 2021	DRAWN BY	C.A.

FIGURE 6:
RECEPTOR 7 STAMSON INPUT PARAMETERS

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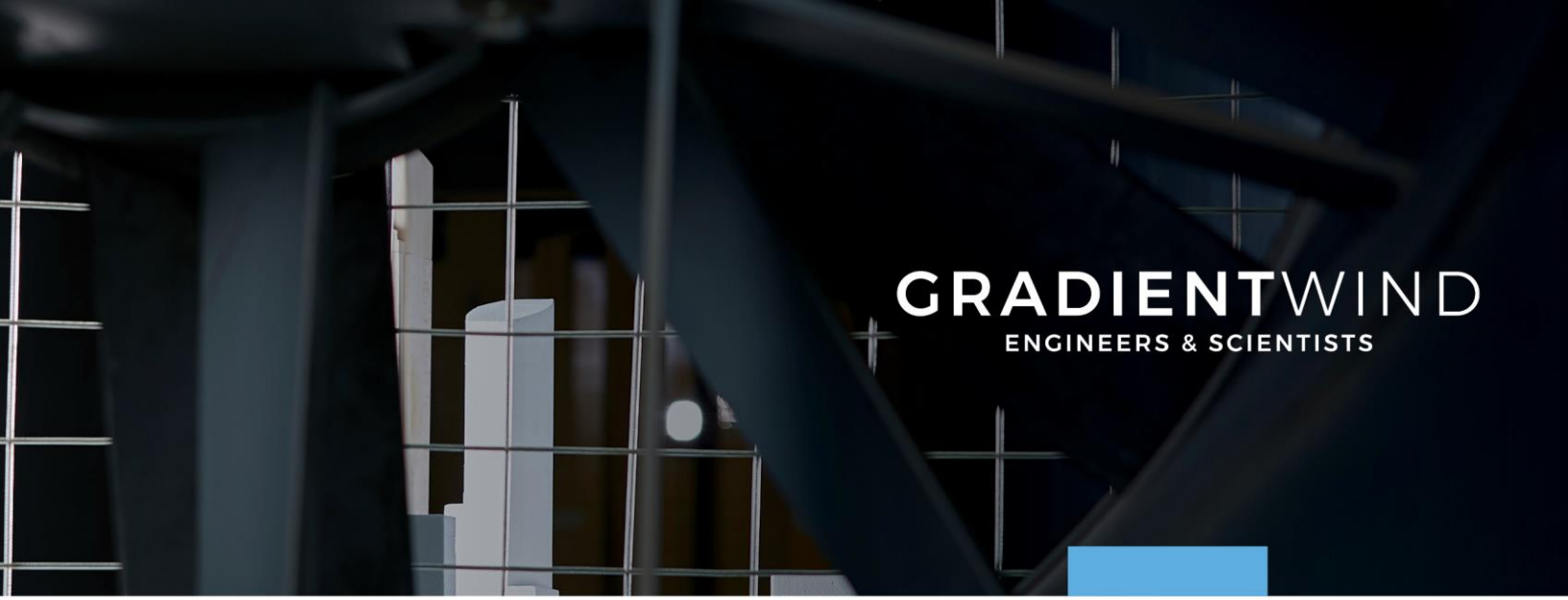
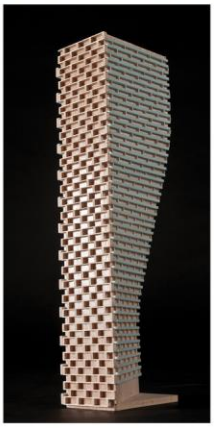
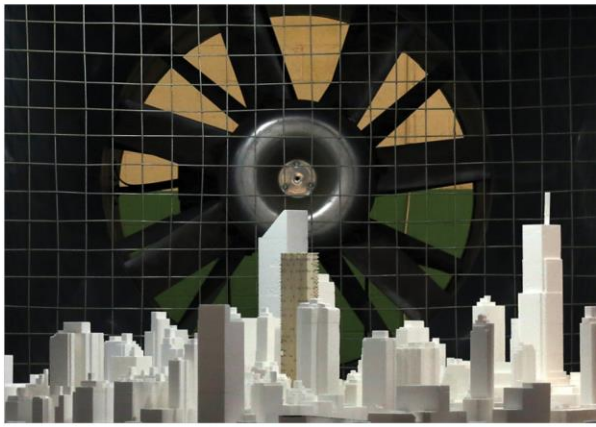
PROJECT	6001-6005 RENAUD ROAD, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:650 (APPROX.)
DRAWING NO.	GWE21-405-7
DATE	DECEMBER 17, 2021
DRAWN BY	C.A.

DESCRIPTION

FIGURE 7:
FORCED AIR HEATING







APPENDIX A

STAMSON INPUT-OUTPUT DATA

127 WALGREEN ROAD, OTTAWA, ON, CANADA K0A 1L0 | 613 836 0934
GRADIENTWIND.COM

```
STAMSON 5.0        NORMAL REPORT        Date: 17-12-2021 08:11:02
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1:  (day/night)
-----------------------------------
Car traffic volume  :  6477/563   veh/TimePeriod  *
Medium truck volume :   515/45    veh/TimePeriod  *
Heavy truck volume  :   368/32    veh/TimePeriod  *
Posted speed limit  :    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):   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:  (day/night)
----------------------------------
Angle1   Angle2           : -90.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  23.00 / 23.00  m
Receiver height           :  10.50 / 10.50  m
Topography                :      1       (Flat/gentle slope; no
barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 59.20 + 0.00) = 59.20 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
------
   -90      0   0.39  65.75   0.00  -2.58  -3.97   0.00   0.00   0.00
59.20
-------------------------------------------------------------------------
------

Segment Leq : 59.20 dBA

Total Leq All Segments: 59.20 dBA


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

Source height = 1.50 m

ROAD (0.00 + 51.60 + 0.00) = 51.60 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
------
   -90      0   0.39  58.16   0.00  -2.58  -3.97   0.00   0.00   0.00
51.60
-------------------------------------------------------------------------
------

Segment Leq : 51.60 dBA

Total Leq All Segments: 51.60 dBA
```

TOTAL Leq FROM ALL SOURCES (DAY): 59.20
(NIGHT): 51.60

```
STAMSON 5.0        NORMAL REPORT        Date: 17-12-2021 08:11:12
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1:  (day/night)
-----------------------------------
Car traffic volume  :  6477/563   veh/TimePeriod  *
Medium truck volume :   515/45    veh/TimePeriod  *
Heavy truck volume  :   368/32    veh/TimePeriod  *
Posted speed limit  :    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):   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:  (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  :  16.00 / 16.00  m
Receiver height           :  10.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no
barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 64.40 + 0.00) = 64.40 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
------
   -90     90   0.39  65.75   0.00  -0.39  -0.96   0.00   0.00   0.00
64.40
-------------------------------------------------------------------------
------

Segment Leq : 64.40 dBA

Total Leq All Segments: 64.40 dBA


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

Source height = 1.50 m

ROAD (0.00 + 56.41 + 0.00) = 56.41 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
------
   -90     90   0.57  58.16   0.00  -0.44  -1.30   0.00   0.00   0.00
56.41
-------------------------------------------------------------------------
------

Segment Leq : 56.41 dBA

Total Leq All Segments: 56.41 dBA
```

TOTAL Leq FROM ALL SOURCES (DAY): 64.40
(NIGHT): 56.41

```
STAMSON 5.0        NORMAL REPORT        Date: 17-12-2021 08:11:23
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1:  (day/night)
-----------------------------------
Car traffic volume  :  6477/563   veh/TimePeriod  *
Medium truck volume :   515/45    veh/TimePeriod  *
Heavy truck volume  :   368/32    veh/TimePeriod  *
Posted speed limit  :    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):   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:  (day/night)
---------------------------------
Angle1   Angle2           :   0.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  21.00 / 21.00  m
Receiver height           :  10.50 / 10.50  m
Topography                :      1       (Flat/gentle slope; no
barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 59.75 + 0.00) = 59.75 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
------
     0     90   0.39  65.75   0.00  -2.03  -3.97   0.00   0.00   0.00
59.75
-------------------------------------------------------------------------
------

Segment Leq : 59.75 dBA

Total Leq All Segments: 59.75 dBA


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

Source height = 1.50 m

ROAD (0.00 + 52.15 + 0.00) = 52.15 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
------
     0     90   0.39  58.16   0.00  -2.03  -3.97   0.00   0.00   0.00
52.15
-------------------------------------------------------------------------
------

Segment Leq : 52.15 dBA

Total Leq All Segments: 52.15 dBA
```

TOTAL Leq FROM ALL SOURCES (DAY): 59.75
(NIGHT): 52.15

```
STAMSON 5.0        NORMAL REPORT        Date: 17-12-2021 08:11:33
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1:  (day/night)
-----------------------------------
Car traffic volume  :  6477/563   veh/TimePeriod  *
Medium truck volume :   515/45    veh/TimePeriod  *
Heavy truck volume  :   368/32    veh/TimePeriod  *
Posted speed limit  :    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):   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:  (day/night)
----------------------------------
Angle1   Angle2           : -90.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  66.00 / 66.00  m
Receiver height           :  10.50 / 10.50  m
Topography                :      1       (Flat/gentle slope; no
barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 52.83 + 0.00) = 52.83 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
------
   -90      0   0.39  65.75   0.00  -8.94  -3.97   0.00   0.00   0.00
52.83
-------------------------------------------------------------------------
------

Segment Leq : 52.83 dBA

Total Leq All Segments: 52.83 dBA


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

Source height = 1.50 m

ROAD (0.00 + 45.24 + 0.00) = 45.24 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
------
   -90      0   0.39  58.16   0.00  -8.94  -3.97   0.00   0.00   0.00
45.24
-------------------------------------------------------------------------
------

Segment Leq : 45.24 dBA

Total Leq All Segments: 45.24 dBA
```

TOTAL Leq FROM ALL SOURCES (DAY): 52.83
(NIGHT): 45.24

```
STAMSON 5.0        NORMAL REPORT        Date: 17-12-2021 08:11:45
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1:  (day/night)
-----------------------------------
Car traffic volume  :  6477/563   veh/TimePeriod  *
Medium truck volume :   515/45    veh/TimePeriod  *
Heavy truck volume  :   368/32    veh/TimePeriod  *
Posted speed limit  :    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):   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:  (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  :  59.00 / 59.00  m
Receiver height           :  10.50 / 10.50  m
Topography                :      2       (Flat/gentle slope; with
barrier)
Barrier angle1            :  -8.00 deg   Angle2 : 62.00 deg
Barrier height            :  14.00 m
Barrier receiver distance :  29.00 / 29.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Results segment # 1:  (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 !       10.50 !        6.07 !          6.07

ROAD (53.00 + 36.22 + 46.73) = 53.99 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
------
   -90     -8   0.39  65.75   0.00  -8.27  -4.48   0.00   0.00   0.00
53.00
-------------------------------------------------------------------------
------
    -8     62   0.00  65.75   0.00  -5.95  -4.10   0.00   0.00 -19.48
36.22
-------------------------------------------------------------------------
------
    62     90   0.39  65.75   0.00  -8.27 -10.75   0.00   0.00   0.00
46.73
-------------------------------------------------------------------------
------

Segment Leq : 53.99 dBA

Total Leq All Segments: 53.99 dBA
```

```
Results segment # 1:  (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 !       10.50 !        6.07 !         6.07

ROAD (45.41 + 28.63 + 39.14) = 46.40 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
------
   -90     -8   0.39  58.16   0.00  -8.27  -4.48   0.00   0.00   0.00
45.41
-------------------------------------------------------------------------
------
    -8     62   0.00  58.16   0.00  -5.95  -4.10   0.00   0.00 -19.48
28.63
-------------------------------------------------------------------------
------
    62     90   0.39  58.16   0.00  -8.27 -10.75   0.00   0.00   0.00
39.14
-------------------------------------------------------------------------
------

Segment Leq : 46.40 dBA

Total Leq All Segments: 46.40 dBA
```

TOTAL Leq FROM ALL SOURCES (DAY): 53.99
(NIGHT): 46.40

```
STAMSON 5.0        NORMAL REPORT        Date: 17-12-2021 08:11:56
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1:  (day/night)
-----------------------------------
Car traffic volume  :  6477/563   veh/TimePeriod  *
Medium truck volume :   515/45    veh/TimePeriod  *
Heavy truck volume  :   368/32    veh/TimePeriod  *
Posted speed limit  :    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):   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:  (day/night)
----------------------------------
Angle1   Angle2           :   0.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  65.00 / 65.00  m
Receiver height           :  10.50 / 10.50  m
Topography                :      1       (Flat/gentle slope; no
barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 52.93 + 0.00) = 52.93 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
------
     0     90   0.39  65.75   0.00  -8.85  -3.97   0.00   0.00   0.00
52.93
-------------------------------------------------------------------------
------

Segment Leq : 52.93 dBA

Total Leq All Segments: 52.93 dBA


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

Source height = 1.50 m

ROAD (0.00 + 45.33 + 0.00) = 45.33 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
------
     0     90   0.39  58.16   0.00  -8.85  -3.97   0.00   0.00   0.00
45.33
-------------------------------------------------------------------------
------

Segment Leq : 45.33 dBA

Total Leq All Segments: 45.33 dBA
```

TOTAL Leq FROM ALL SOURCES (DAY): 52.93
(NIGHT): 45.33

```
STAMSON 5.0         NORMAL REPORT         Date: 17-12-2021 08:12:06
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1:  (day/night)
-----------------------------------
Car traffic volume  :  6477/563   veh/TimePeriod  *
Medium truck volume :   515/45    veh/TimePeriod  *
Heavy truck volume  :   368/32    veh/TimePeriod  *
Posted speed limit  :    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):   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:  (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           :  10.50 / 10.50  m
Topography                :      2       (Flat/gentle slope; with
barrier)
Barrier angle1            :  -9.00 deg   Angle2 : 76.00 deg
Barrier height            :  14.00 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
```

```
Results segment # 1:  (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 !       10.50 !        7.78 !         7.78

ROAD (54.84 + 39.20 + 44.48) = 55.33 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
------
   -90     -9   0.39  65.75   0.00  -6.36  -4.55   0.00   0.00   0.00
54.84
-------------------------------------------------------------------------
------
    -9     76   0.00  65.75   0.00  -4.57  -3.26   0.00   0.00 -18.72
39.20
-------------------------------------------------------------------------
------
    76     90   0.39  65.75   0.00  -6.36 -14.92   0.00   0.00   0.00
44.48
-------------------------------------------------------------------------
------

Segment Leq : 55.33 dBA

Total Leq All Segments: 55.33 dBA
```

```
Results segment # 1:  (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 !       10.50 !        7.78 !         7.78

ROAD (47.25 + 31.61 + 36.88) = 47.74 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
------
   -90     -9   0.39  58.16   0.00  -6.36  -4.55   0.00   0.00   0.00
47.25
-------------------------------------------------------------------------
------
    -9     76   0.00  58.16   0.00  -4.57  -3.26   0.00   0.00 -18.72
31.61
-------------------------------------------------------------------------
------
    76     90   0.39  58.16   0.00  -6.36 -14.92   0.00   0.00   0.00
36.88
-------------------------------------------------------------------------
------

Segment Leq : 47.74 dBA

Total Leq All Segments: 47.74 dBA
```

TOTAL Leq FROM ALL SOURCES (DAY): 55.33
(NIGHT): 47.74