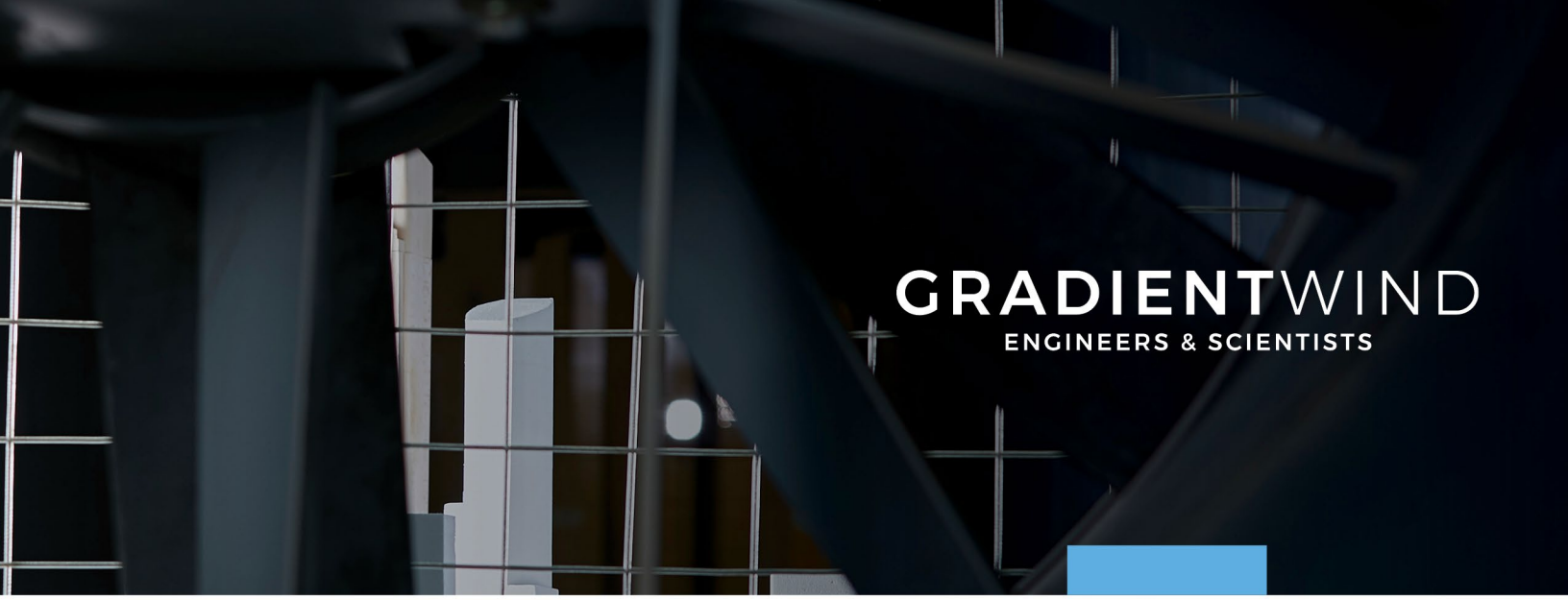

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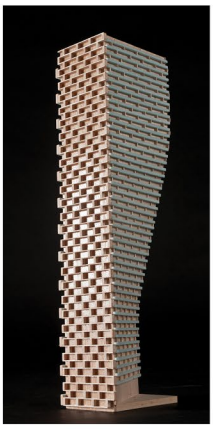
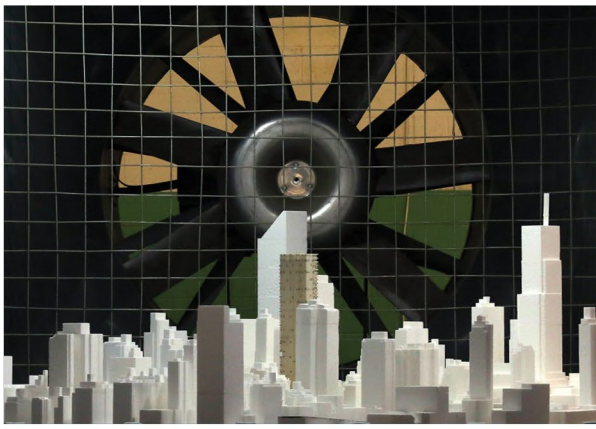
TRANSPORTATION NOISE ASSESSMENT

Rochester & Balsam
246-267 Rochester Street
Ottawa, Ontario

Report: 22-276 – Transportation Noise





September 27, 2022

PREPARED FOR

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1769 St Laurent Boulevard, Suite 247
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PREPARED BY

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EXECUTIVE SUMMARY

This report describes a transportation traffic noise assessment undertaken in support of concurrent Zoning By-law Amendment (ZBA) and Site Plan Control (SPC) application for the proposed mixed-use development, known as Rochester & Balsam, located at 246-267 Rochester Street in Ottawa, Ontario. The proposed development comprises an 'L'-shaped nine-storey building topped with a mechanical penthouse (MPH). The major sources of roadway traffic noise impacting the development include Gladstone Avenue, Booth Street, the Queensway, and the future expansion of the Confederation Line Light Rail Transitway (LRT). As the LRT is 400m away from the study site, ground vibration impacts are considered insignificant. Figure 1 illustrates the site location 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), Ministry of Transportation of Ontario (MTO), and City of Ottawa requirements; (ii) noise level criteria as specified by the City of Ottawa's Environmental Noise Control Guidelines (ENCG); (iii) future vehicular traffic volumes based on the City of Ottawa's Official Plan roadway classifications; and (iv) architectural drawings prepared by Simmonds Architecture, in August 2022.

The results of the current analysis indicated that noise levels will range between 39 and 60 dBA during the daytime period (07:00-23:00) and between 33 and 52 dBA during the nighttime period (23:00-07:00). The highest noise level (60 dBA) occurs at the south façade, which is nearest and most exposed to Gladstone Avenue and the Queensway. Since noise levels are less than 65 dBA at all the building façades, standard building components in compliance with Ontario Building Code standards will be sufficient to attenuate noise levels indoors when windows are closed.

As noise levels at select facades fall between 55-65 dBA, the building will require forced air heating with provisions for central air conditioning as a minimum requirement which, if installed at the owner's discretion, will allow building occupants to keep windows closed and maintain a comfortable living environment. However, given the development layout, the building is expected to include central air conditioning in the dwelling units and communal spaces. Furthermore, a Type D Warning Clause will also be required in all Lease, Purchase and Sale Agreements, as summarized in Section 6. As for the terraces and amenity spaces included in this development, noise levels fall below 55dBA, requiring no mitigation.

Moreover, the stationary noise impacts of the building on the surroundings would be considered at a future stage once the mechanical design has progressed and equipment has been selected. Stationary noise sources associated with the development could include rooftop air handling units, cooling towers or dry coolers, and emergency generators. Should noise levels from these units exceed the criteria established in NPC-300 and ENCG, noise from these sources can be controlled to acceptable limits by judicious selection of the equipment, locating the equipment on a high roof away from nearby residential receptors, and where necessary, installing silencers or noise screens.

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1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by 3N Group Holdings Inc. to undertake a transportation traffic noise assessment for a proposed mixed-use development, known as Rochester & Balsam, located in Ottawa, Ontario. This report summarizes the methodology, results, and recommendations related to the assessment of exterior and interior noise levels generated by local roadway traffic.

This assessment is based on theoretical noise calculation methods conforming to the Ministry of the Environment, Conservation and Parks (MECP) NPC-300[1], Ministry of Transportation Ontario (MTO)[2], and City of Ottawa Environmental Noise Control Guidelines (ENCG)[3] guidelines. Noise calculations were based on architectural drawings, provided by Simmonds Architecture in August 2022, with future traffic volumes corresponding to the City of Ottawa's Official Plan (OP) roadway classifications.

2. TERMS OF REFERENCE

The subject site is located at 246-267 Rochester Street in Ottawa; situated at the southwest corner of a city block bounded by Willow Street to the north, Booth Street to the east, Balsam Street to the south, and Rochester Street to the west. Throughout this report, Rochester Street is referred to as project west. The proposed development comprises an 'L'-shaped nine-storey building, with its long axis-oriented along Rochester Street, topped with a mechanical penthouse (MPH).

Above below-grade parking, the ground floor of the proposed development is divided into two near rectangular masses by a central north-south walkway. The ground floor of the western massing includes a residential main entrance to the west, residential units from the west clockwise to the northeast, indoor amenity to the east, a residential move-in entrance at the southeast corner, retail space at the southwest corner, central elevator core, and shared building support spaces throughout the remainder of the level. A sitting area, serving the retail space, is situated at the southwest corner of the subject site and a landscaped rear yard, which can be accessed via the central walkway from Balsam Street, is situated at

[1] Ontario Ministry of the Environment and Climate Change – Environmental Noise Guidelines, Publication NPC-300, Queens Printer for Ontario, Toronto, 2013
[2] Ministry of Transportation Ontario, "*Environmental Guide for Noise*", February 2022
[3] City of Ottawa, Environmental Noise Control Guidelines, January 2016

the northeast corner of the subject site. The ground floor of the eastern massing includes a garbage room at the southwest corner and mechanical space at the northwest corner. Access to below-grade parking is provided by a ramp at the southeast corner of the eastern massing via a laneway from Balsam Street. Levels 2-9 are reserved for residential use. At Level 2, the floorplate extends at the southwest corner and includes a canopy covering the seating area below. Floorplate setbacks are situated to the south and west at Level 4 and at the southwest corner at Level 5. Private terraces are situated at the southeast corner at Levels 4 and 6 and amenity terraces are situated to the north at Level 6, to the east at Level 7, and to the west at the MPH level.

The near-field surroundings, defined as an area within 200-metres (m) of the subject site, include a mix of low-rise residential and commercial buildings from the west-southwest clockwise to the southeast, with a mid-rise residential building to the north, rows of townhouses to the northeast, a mid-rise residential building and a school to the east, a nursery and church to the southeast, a school and Piazza Dante Park to the southwest, and a mid-rise residential building and high-rise residential building to the southwest. Notably, a four-storey mixed-use building has been approved (Site Plan Control) at 360 Booth Street, approximately 120 m to the northeast and a residential development comprising a six-storey building and two three-storey stacked townhouses has nearly completed construction at 811 Gladstone Avenue, to the immediate south of the subject site. In addition, a development, referred to as “Rochesterville Phase 1”, comprising two nine-storey mixed-use residential buildings and three four-storey stacked townhouse buildings is proposed (awaiting Site Plan Control approval) at 818 and 822 Gladstone Avenue, approximately 115 m to the south-southeast.

3. OBJECTIVES

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

4. METHODOLOGY

4.1 Background

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

4.2 Roadway Traffic Noise

4.2.1 Criteria for Roadway Traffic Noise

For surface roadway traffic noise, the equivalent sound energy level, L_{eq}, provides a measure of the time-varying noise levels, which is well correlated with the annoyance of sound. It is defined as the continuous sound level, which has the same energy as a time-varying noise level over a period of time. For roadways, the L_{eq} is commonly calculated on the basis of a 16-hour (L_{eq16}) daytime (07:00-23:00) / 8-hour (L_{eq8}) nighttime (23:00-07:00) split to assess its impact on residential buildings. The City of Ottawa's Environmental Noise Control Guidelines (ENCG) specify that the recommended indoor noise limit range (that is relevant to this study) is 45 and 40 dBA for living rooms and sleeping quarters respectively for roadway as listed in Table 1.

TABLE 1: INDOOR SOUND LEVEL CRITERIA (ROAD) [4]

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[5]. A closed window due to a ventilation requirement will bring noise levels down to achieve an acceptable indoor environment[6]. 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[7].

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

[4] Adapted from ENCG 2016 – Tables 2.2b and 2.2c
[5] Burberry, P.B. (2014). Mitchell's Environment and Services. Routledge, Page 125
[6] MECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.8
[7] 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 separate line sources of noise. In addition to the traffic volumes summarized in Table 2, theoretical noise predictions were based on the following parameters:

- Truck traffic on all roadways was taken to comprise 5% heavy trucks and 7% medium trucks, as per ENCG requirements for noise level predictions.
- The day/night split for all streets was taken to be 92%/8%, respectively.
- Ground surfaces were taken to be reflective due to the presence of hard (paved) ground.
- Topography was assumed to be a flat/gentle slope surrounding the study building.
- A difference in elevation for Queensway and the LRT was measured to be approximately 5 meters above grade and 10 meters below grade, respectively.
- Noise receptors were strategically placed at 10 locations around the study area (see Figure 2).
- For select sources where appropriate, receptors considered the existing buildings as a barrier partially or fully obstructing exposure to the source as illustrated by exposure angles in Figures 3-6.
- 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[8] 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.

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

TABLE 2: ROADWAY TRAFFIC DATA

Segment	Roadway Traffic Classification	Speed Limit (km/h)	Traffic Volumes
Booth Street	2-Lane Major Collector	40	**12,000**
Gladstone Avenue	2-Lane Major Collector	40	**12,000**
Queensway	8-Lane Highway	100	**146,664**
LRT Line 2	Light Rail Line	70	**540/60***

*Daytime/Nighttime Volumes

5. RESULTS

5.1 Roadway Traffic Noise Levels

The results of the roadway traffic noise calculations are summarized in Table 3 below.

TABLE 3: EXTERIOR NOISE LEVELS DUE TO ROADWAY TRAFFIC

Receptor Number	Receptor Height Above Grade (m)	Receptor Location	STAMSON 5.04 Noise Level (dBA)	
			Day	Night
R1	33	POW – West Façade – Level 11	56	49
R2	33	POW – East Façade – Level 11	55	47
R3	24	POW – East Façade – Level 8	56	48
R4	33	POW – North Façade – Level 11	41	33
R5	33	POW – West façade – Level 11	43	35
R6	33	POW – North Façade – Level 11	43	35
R7	33	POW – South façade – Level 11	60	52
R8	24	OLA – Level 8 Terrace	53	N/A*
R9	21	OLA – Level 7 Terrace	39	N/A*
R10	1.5	OLA – Ground Floor Amenity	54	N/A*

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

The results of the current analysis indicated that noise levels will range between 39 and 60 dBA during the daytime period (07:00-23:00) and between 33 and 52 dBA during the nighttime period (23:00-07:00). The highest noise level (60 dBA) occurs at the south façade, which is nearest and most exposed to Gladstone Avenue and the Queensway.

5.2 Noise Control Measures

Since noise levels do not exceed 65 dBA at all the building façades, standard building components in compliance with Ontario Building Code standards will be sufficient to attenuate noise levels indoors when windows are closed this study site. The development will require forced air heating with provisions for central air conditioning as a minimum requirement which, if installed at the owner's discretion, will allow building occupants to keep windows closed and maintain a comfortable living environment. However, given the development layout, the building is expected to include central air conditioning in the dwelling units and communal spaces. In addition to ventilation requirements, a Type D Warning Clause will also be required in all Lease, Purchase and Sale Agreements, as summarized in Section 6. As for the terraces and amenity spaces, noise levels are expected to fall below the noise level criteria for OLAs. Therefore, no acoustic mitigation is required.

6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current analysis indicated that noise levels will range between 39 and 60 dBA during the daytime period (07:00-23:00) and between 33 and 52 dBA during the nighttime period (23:00-07:00). The highest noise level (60 dBA) occurs at the south façade, which is nearest and most exposed to Gladstone Avenue and the Queensway. Since noise levels are less than 65 dBA at all the building façades, standard building components in compliance with Ontario Building Code standards will be sufficient to attenuate noise levels indoors when windows are closed. As for the OLAs in this development, noise levels are expected to fall below the noise level criteria. As such, no acoustic mitigation is required.

Since noise levels at select facades fall between 55-65 dBA, the building will need forced air heating with provisions for central air conditioning as a minimum requirement which, if installed at the owner's discretion, will allow building occupants to keep windows closed and maintain a comfortable living environment. However, given the development layout, the building is expected to include central air conditioning in the dwelling units and communal spaces. A Type D Warning Clause will also be required in all Lease, Purchase and Sale Agreements, as summarized below:

Type D:

> *"This dwelling unit has been supplied with a central air conditioning system which 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."*

Moreover, the stationary noise impacts of the building on the surroundings would be considered at a future stage once the mechanical design has progressed and equipment has been selected. Stationary noise sources associated with the development could include rooftop air handling units, cooling towers or dry coolers, and emergency generators. Should noise levels from these units exceed the criteria established in NPC-300 and ENCG, noise from these sources can be controlled to acceptable limits by judicious selection of the equipment, locating the equipment on a high roof away from nearby residential receptors, and where necessary, installing silencers or noise screens.

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

Sincerely,

Gradient Wind Engineering Inc.

Essraa Alqassab, BASc.
Junior Environmental Scientist

Joshua Foster, P.Eng.
Lead Engineer

Gradient Wind File #22-276

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PROJECT	ROCHESTER & BALSAM, OTTAWA TRANSPORTATION TRAFFIC NOISE ASSESSMENT
SCALE	1:3000 (APPROX.)
DRAWING NO.	GW22-276-1
DATE	SEPTEMBER 22, 2022
DRAWN BY	E.A.

DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT

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SCALE	1:3000 (APPROX.)	DRAWING NO.	GW22-276-2
DATE	SEPTEMBER 22, 2022	DRAWN BY	E.A.

FIGURE 2:
RECEPTOR LOCATIONS

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SCALE	1:2000 (APPROX.)
DRAWING NO.	GW22-276-3
DATE	SEPTEMBER 22, 2022
DRAWN BY	E.A.

DESCRIPTION

FIGURE 3:
STAMSON PARAMETERS (1)

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PROJECT	ROCHESTER & BALSAM, OTTAWA TRANSPORTATION TRAFFIC NOISE ASSESSMENT		DESCRIPTION
SCALE	1:2000 (APPROX.)	DRAWING NO.	GW22-276-4
DATE	SEPTEMBER 22, 2022	DRAWN BY	E.A.

FIGURE 4:
STAMSON PARAMETERS (2)

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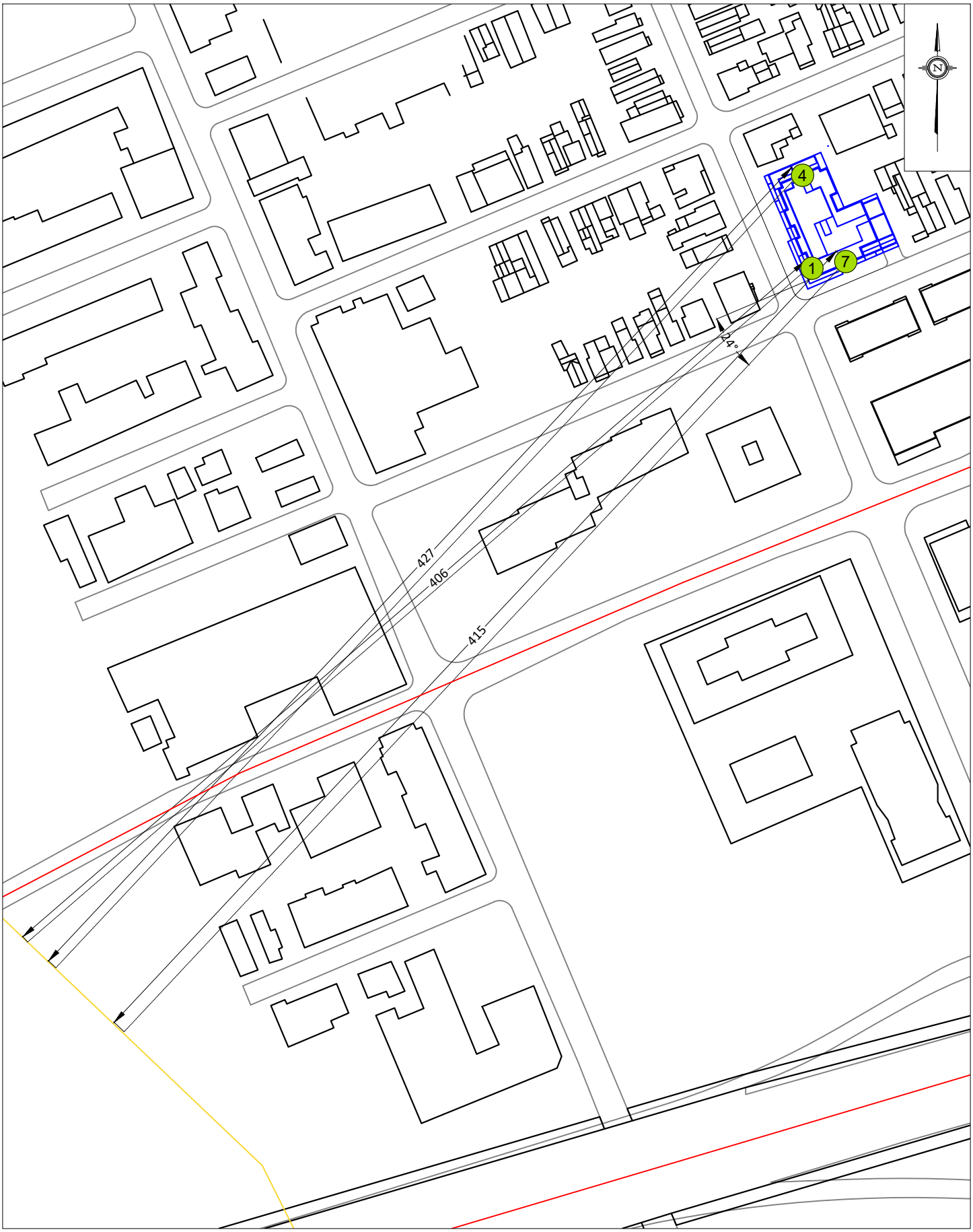
SCALE	1:2000 (APPROX.)	DRAWING NO.	GW22-276-5
DATE	SEPTEMBER 22, 2022	DRAWN BY	E.A.

FIGURE 5:
STAMSON PARAMETERS (3)



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PROJECT	ROCHESTER & BALSAM, OTTAWA TRANSPORTATION TRAFFIC NOISE ASSESSMENT		DESCRIPTION
SCALE	1:2000 (APPROX.)	DRAWING NO.	GW22-276-6
DATE	SEPTEMBER 22, 2022	DRAWN BY	E.A.

FIGURE 6:
STAMSON PARAMETERS (4)

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APPENDIX A

STAMSON 5.04 – INPUT AND OUTPUT DATA

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```
STAMSON 5.0        NORMAL REPORT        Date: 22-09-2022 18:03:00
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Gladstone (day/night)
----------------------------------------------
Car traffic volume  :  9715/845   veh/TimePeriod  *
Medium truck volume :   773/67    veh/TimePeriod  *
Heavy truck volume  :   552/48    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):  12000
    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: Gladstone (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  :  97.00 / 97.00  m
Receiver height           :  33.00 / 33.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :   0.00 deg   Angle2 : 90.00 deg
Barrier height            :  29.00 m
Barrier receiver distance :  79.00 / 79.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Road data, segment # 2: Queensway (day/night)
----------------------------------------------
Car traffic volume  : 111993/9738  veh/TimePeriod  *
Medium truck volume :  9445/821   veh/TimePeriod  *
Heavy truck volume  : 13493/1173  veh/TimePeriod  *
Posted speed limit  :   100 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): 146664
    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     :  10.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 2: Queensway (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  : 322.00 / 322.00 m
Receiver height           :  33.00 / 33.00  m
Topography                :      4       (Elevated; with barrier)
Barrier angle1            :   0.00 deg   Angle2 : 90.00 deg
Barrier height            :  29.00 m
Elevation                 :   0.00 m
Barrier receiver distance : 214.00 / 214.00 m
Source elevation          :   5.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Results segment # 1: Gladstone (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 !       33.00 !        7.34 !         7.34

ROAD (0.00 + 35.79 + 0.00) = 35.79 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
     0     90   0.00  65.72   0.00  -8.11  -3.01   0.00   0.00 -18.81
35.79
-------------------------------------------------------------------------------
--
```

```
Segment Leq : 35.79 dBA


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

Source height = 1.78 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.78 !       33.00 !       15.57 !        15.57

ROAD (0.00 + 55.32 + 0.00) = 55.32 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
     0     90   0.00  85.90   0.00 -13.32  -3.01   0.00   0.00 -14.25
55.32
-------------------------------------------------------------------------------
--

Segment Leq : 55.32 dBA

Total Leq All Segments: 55.37 dBA


Results segment # 1: Gladstone (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 !       33.00 !        7.34 !         7.34

ROAD (0.00 + 28.19 + 0.00) = 28.19 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
     0     90   0.00  58.12   0.00  -8.11  -3.01   0.00   0.00 -18.81
28.19
-------------------------------------------------------------------------------
--
```

```
Segment Leq : 28.19 dBA


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

Source height = 1.78 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.78 !       33.00 !       15.57 !        15.57

ROAD (0.00 + 47.72 + 0.00) = 47.72 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
     0     90   0.00  78.30   0.00 -13.32  -3.01   0.00   0.00 -14.25
47.72
-------------------------------------------------------------------------------
--

Segment Leq : 47.72 dBA

Total Leq All Segments: 47.77 dBA


RT/Custom data, segment # 1: LRT (day/night)
--------------------------------------------
1 - 4-car SRT:
Traffic volume    :   540/60    veh/TimePeriod
Speed             :    70 km/h

Data for Segment # 1: LRT (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  : 406.00 / 406.00 m
Receiver height           :  33.00 / 33.00  m
Topography                :      4       (Elevated; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :  24.00 m
Elevation                 :   0.00 m
Barrier receiver distance :  10.00 / 10.00  m
Source elevation          : -10.00 m
```

```
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


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

Source height = 0.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       0.50 !       33.00 !       31.95 !        31.95

RT/Custom (0.00 + 49.11 + 0.00) = 49.11 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.00  63.44 -14.32   0.00   0.00   0.00  -0.03  49.08*
   -90     90   0.00  63.44 -14.32   0.00   0.00   0.00   0.00  49.11
-------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 49.11 dBA

Total Leq All Segments: 49.11 dBA


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

Source height = 0.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       0.50 !       33.00 !       31.95 !        31.95

RT/Custom (0.00 + 42.58 + 0.00) = 42.58 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.00  56.91 -14.32   0.00   0.00   0.00  -0.03  42.55*
   -90     90   0.00  56.91 -14.32   0.00   0.00   0.00   0.00  42.58
-------------------------------------------------------------------------

 * Bright Zone !
```

```
Segment Leq : 42.58 dBA

Total Leq All Segments: 42.58 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 56.29
                           (NIGHT): 48.92
```

```
STAMSON 5.0        NORMAL REPORT        Date: 22-09-2022 15:28:33
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Booth (day/night)
----------------------------------------
Car traffic volume  :  9715/845   veh/TimePeriod  *
Medium truck volume :   773/67    veh/TimePeriod  *
Heavy truck volume  :   552/48    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):  12000
    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: Booth (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  :  81.00 / 81.00  m
Receiver height           :  33.00 / 33.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :  10.00 m
Barrier receiver distance :  70.00 / 70.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Road data, segment # 2: Gladstone (day/night)
---------------------------------------------
Car traffic volume  :  9715/845   veh/TimePeriod  *
Medium truck volume :   773/67    veh/TimePeriod  *
Heavy truck volume  :   552/48    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):  12000
    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: Gladstone (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  :  97.00 / 97.00  m
Receiver height           :  33.00 / 33.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 0.00 deg
Barrier height            :  29.00 m
Barrier receiver distance :  80.00 / 80.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Road data, segment # 3: Queensway (day/night)
---------------------------------------------
Car traffic volume  : 118739/10325 veh/TimePeriod  *
Medium truck volume :  9445/821   veh/TimePeriod  *
Heavy truck volume  :  6747/587   veh/TimePeriod  *
Posted speed limit  :   100 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): 146664
    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: Queensway (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   : 327.00 / 327.00 m
Receiver height            :  33.00 / 33.00  m
Topography                 :      4       (Elevated; with barrier)
Barrier angle1             : -90.00 deg   Angle2 : 0.00 deg
Barrier height             :  29.00 m
Elevation                  :   0.00 m
Barrier receiver distance  : 215.00 / 215.00 m
Source elevation           :   5.00 m
Receiver elevation         :   0.00 m
Barrier elevation          :   0.00 m
Reference angle            :   0.00


Results segment # 1: Booth (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 !       33.00 !        5.77 !         5.77

ROAD (0.00 + 46.08 + 0.00) = 46.08 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     90   0.00  65.72   0.00  -7.32   0.00   0.00   0.00 -12.31
46.08
-------------------------------------------------------------------------------
--

Segment Leq : 46.08 dBA


Results segment # 2: Gladstone (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 !       33.00 !        7.02 !         7.02
```

```
ROAD (0.00 + 35.75 + 0.00) = 35.75 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90      0   0.00  65.72   0.00  -8.11  -3.01   0.00   0.00 -18.85
35.75
-------------------------------------------------------------------------
--

Segment Leq : 35.75 dBA


Results segment # 3: Queensway (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 !       33.00 !       15.57 !        15.57

ROAD (0.00 + 53.85 + 0.00) = 53.85 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90      0   0.00  84.41   0.00 -13.38  -3.01   0.00   0.00 -14.17
53.85
-------------------------------------------------------------------------
--

Segment Leq : 53.85 dBA

Total Leq All Segments: 54.58 dBA


Results segment # 1: Booth (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 !       33.00 !        5.77 !         5.77
```

```
ROAD (0.00 + 38.48 + 0.00) = 38.48 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  58.12   0.00  -7.32   0.00   0.00   0.00 -12.31
38.48
-------------------------------------------------------------------------
--

Segment Leq : 38.48 dBA


Results segment # 2: Gladstone (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 !       33.00 !        7.02 !         7.02

ROAD (0.00 + 28.15 + 0.00) = 28.15 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90      0   0.00  58.12   0.00  -8.11  -3.01   0.00   0.00 -18.85
28.15
-------------------------------------------------------------------------
--

Segment Leq : 28.15 dBA


Results segment # 3: Queensway (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 !       33.00 !       15.57 !        15.57
```

```
ROAD (0.00 + 46.25 + 0.00) = 46.25 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90      0   0.00  76.81   0.00 -13.38  -3.01   0.00   0.00 -14.16
46.25
-------------------------------------------------------------------------
--

Segment Leq : 46.25 dBA

Total Leq All Segments: 46.98 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 54.58
                           (NIGHT): 46.98
```

```
STAMSON 5.0        NORMAL REPORT        Date: 22-09-2022 15:28:53
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Gladstone (day/night)
----------------------------------------------
Car traffic volume  :  9715/845   veh/TimePeriod  *
Medium truck volume :   773/67    veh/TimePeriod  *
Heavy truck volume  :   552/48    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):  12000
    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: Gladstone (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  :  99.00 / 99.00  m
Receiver height           :  24.00 / 24.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 0.00 deg
Barrier height            :  29.00 m
Barrier receiver distance :  81.00 / 81.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Road data, segment # 2: Queensway (day/night)
----------------------------------------------
Car traffic volume  : 118739/10325 veh/TimePeriod  *
Medium truck volume :  9445/821   veh/TimePeriod  *
Heavy truck volume  :  6747/587   veh/TimePeriod  *
Posted speed limit  :   100 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): 146664
    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: Queensway (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  : 329.00 / 329.00 m
Receiver height           :  24.00 / 24.00  m
Topography                :      4       (Elevated; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :  29.00 m
Elevation                 :   0.00 m
Barrier receiver distance : 216.00 / 216.00 m
Source elevation          :   5.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Road data, segment # 3: Booth (day/night)
-----------------------------------------
Car traffic volume  :  9715/845   veh/TimePeriod  *
Medium truck volume :   773/67    veh/TimePeriod  *
Heavy truck volume  :   552/48    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):  12000
    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: Booth (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   :  75.00 / 75.00  m
Receiver height            :  24.00 / 24.00  m
Topography                 :      2       (Flat/gentle slope; with barrier)
Barrier angle1             : -90.00 deg   Angle2 : 90.00 deg
Barrier height             :  10.00 m
Barrier receiver distance  :  64.00 / 64.00  m
Source elevation           :   0.00 m
Receiver elevation         :   0.00 m
Barrier elevation          :   0.00 m
Reference angle            :   0.00


Results segment # 1: Gladstone (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 !       24.00 !        5.59 !         5.59

ROAD (0.00 + 35.49 + 0.00) = 35.49 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90      0   0.00  65.72   0.00  -8.20  -3.01   0.00   0.00 -19.02
35.49
-------------------------------------------------------------------------
--

Segment Leq : 35.49 dBA


Results segment # 2: Queensway (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 !       24.00 !       12.51 !        12.51

ROAD (0.00 + 55.46 + 0.00) = 55.46 dBA
```

```
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  84.41   0.00 -13.41   0.00   0.00   0.00 -15.53
55.46
-------------------------------------------------------------------------
--

Segment Leq : 55.46 dBA


Results segment # 3: Booth (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 !       24.00 !        4.80 !         4.80

ROAD (0.00 + 44.77 + 0.00) = 44.77 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  65.72   0.00  -6.99   0.00   0.00   0.00 -13.95
44.77
-------------------------------------------------------------------------
--

Segment Leq : 44.77 dBA

Total Leq All Segments: 55.86 dBA


Results segment # 1: Gladstone (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 !       24.00 !        5.59 !         5.59
```

```
ROAD (0.00 + 27.89 + 0.00) = 27.89 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90      0   0.00  58.12   0.00  -8.20  -3.01   0.00   0.00 -19.02
27.89
-------------------------------------------------------------------------
--

Segment Leq : 27.89 dBA


Results segment # 2: Queensway (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 !       24.00 !       12.51 !        12.51

ROAD (0.00 + 47.87 + 0.00) = 47.87 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  76.81   0.00 -13.41   0.00   0.00   0.00 -15.53
47.87
-------------------------------------------------------------------------
--

Segment Leq : 47.87 dBA

Results segment # 3: Booth (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 !       24.00 !        4.80 !         4.80

ROAD (0.00 + 37.17 + 0.00) = 37.17 dBA
```

```
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  58.12   0.00  -6.99   0.00   0.00   0.00 -13.95
37.17
-------------------------------------------------------------------------
--

Segment Leq : 37.17 dBA

Total Leq All Segments: 48.26 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 55.86
                           (NIGHT): 48.26


STAMSON 5.0        NORMAL REPORT        Date: 22-09-2022 15:29:09
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Booth (day/night)
-----------------------------------------
Car traffic volume  :  9715/845   veh/TimePeriod  *
Medium truck volume :   773/67    veh/TimePeriod  *
Heavy truck volume  :   552/48    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):  12000
    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: Booth (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   : 100.00 / 100.00 m
Receiver height            :  33.00 / 33.00  m
Topography                 :      2       (Flat/gentle slope; with barrier)
Barrier angle1             : -90.00 deg   Angle2 : 0.00 deg
Barrier height             :  10.00 m
Barrier receiver distance  :  90.00 / 90.00  m
Source elevation           :   0.00 m
Receiver elevation         :   0.00 m
Barrier elevation          :   0.00 m
Reference angle            :   0.00


Results segment # 1: Booth (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 !       33.00 !        4.65 !         4.65

ROAD (0.00 + 40.38 + 0.00) = 40.38 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90      0   0.00  65.72   0.00  -8.24  -3.01   0.00   0.00 -14.08
40.38
-------------------------------------------------------------------------
--

Segment Leq : 40.38 dBA

Total Leq All Segments: 40.38 dBA


Results segment # 1: Booth (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 !       33.00 !        4.65 !         4.65
```

```
ROAD (0.00 + 32.78 + 0.00) = 32.78 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90      0   0.00  58.12   0.00  -8.24  -3.01   0.00   0.00 -14.08
32.78
-------------------------------------------------------------------------
--

Segment Leq : 32.78 dBA

Total Leq All Segments: 32.78 dBA


RT/Custom data, segment # 1: LRT (day/night)
-----------------------------------------
1 - 4-car SRT:
Traffic volume    :   540/60    veh/TimePeriod
Speed             :    70 km/h

Data for Segment # 1: LRT (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  : 427.00 / 427.00 m
Receiver height           :  33.00 / 33.00  m
Topography                :      4       (Elevated; with barrier)
Barrier angle1            :   0.00 deg   Angle2 : 90.00 deg
Barrier height            :  24.00 m
Elevation                 :   0.00 m
Barrier receiver distance : 328.00 / 328.00 m
Source elevation          : -10.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


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

Source height = 0.50 m

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

```
       0.50 !       33.00 !        0.35 !         0.35

RT/Custom (0.00 + 28.67 + 0.00) = 28.67 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
     0     90   0.00  63.44 -14.54  -3.01   0.00   0.00 -17.21  28.67
-------------------------------------------------------------------------

Segment Leq : 28.67 dBA

Total Leq All Segments: 28.67 dBA


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

Source height = 0.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       0.50 !       33.00 !        0.35 !         0.35

RT/Custom (0.00 + 22.14 + 0.00) = 22.14 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
     0     90   0.00  56.91 -14.54  -3.01   0.00   0.00 -17.21  22.14
-------------------------------------------------------------------------

Segment Leq : 22.14 dBA

Total Leq All Segments: 22.14 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 40.66
                           (NIGHT): 33.14
```

```
STAMSON 5.0        NORMAL REPORT        Date: 22-09-2022 15:29:49
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Booth (day/night)
----------------------------------------
Car traffic volume  :  9715/845   veh/TimePeriod  *
Medium truck volume :   773/67    veh/TimePeriod  *
Heavy truck volume  :   552/48    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):  12000
    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: Booth (day/night)
----------------------------------------
Angle1   Angle2           : -90.00 deg   28.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  89.00 / 89.00  m
Receiver height           :  33.00 / 33.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 28.00 deg
Barrier height            :  10.00 m
Barrier receiver distance :  78.00 / 78.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Results segment # 1: Booth (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 !       33.00 !        5.39 !         5.39

ROAD (0.00 + 42.63 + 0.00) = 42.63 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     28   0.00  65.72   0.00  -7.73  -1.83   0.00   0.00 -13.52
42.63
-------------------------------------------------------------------------------
--

Segment Leq : 42.63 dBA

Total Leq All Segments: 42.63 dBA


Results segment # 1: Booth (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 !       33.00 !        5.39 !         5.39

ROAD (0.00 + 35.03 + 0.00) = 35.03 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     28   0.00  58.12   0.00  -7.73  -1.83   0.00   0.00 -13.52
35.03
-------------------------------------------------------------------------------
--

Segment Leq : 35.03 dBA

Total Leq All Segments: 35.03 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 42.63
                           (NIGHT): 35.03
```

```
STAMSON 5.0        NORMAL REPORT        Date: 22-09-2022 15:31:03
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Booth (day/night)
----------------------------------------
Car traffic volume  :  9715/845   veh/TimePeriod  *
Medium truck volume :   773/67    veh/TimePeriod  *
Heavy truck volume  :   552/48    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):  12000
    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: Booth (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  :  85.00 / 85.00  m
Receiver height           :  33.00 / 33.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 0.00 deg
Barrier height            :  10.00 m
Barrier receiver distance :  74.00 / 74.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Results segment # 1: Booth (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 !       33.00 !        5.57 !         5.57

ROAD (0.00 + 42.56 + 0.00) = 42.56 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90      0   0.00  65.72   0.00  -7.53  -3.01   0.00   0.00 -12.61
42.56
-------------------------------------------------------------------------------
--

Segment Leq : 42.56 dBA

Total Leq All Segments: 42.56 dBA


Results segment # 1: Booth (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 !       33.00 !        5.57 !         5.57

ROAD (0.00 + 34.96 + 0.00) = 34.96 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90      0   0.00  58.12   0.00  -7.53  -3.01   0.00   0.00 -12.61
34.96
-------------------------------------------------------------------------------
--

Segment Leq : 34.96 dBA

Total Leq All Segments: 34.96 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 42.56
                           (NIGHT): 34.96
```

```
STAMSON 5.0        NORMAL REPORT        Date: 22-09-2022 15:31:26
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Booth (day/night)
----------------------------------------
Car traffic volume  :  9715/845   veh/TimePeriod  *
Medium truck volume :   773/67    veh/TimePeriod  *
Heavy truck volume  :   552/48    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):  12000
    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: Booth (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  :  96.00 / 96.00  m
Receiver height           :  33.00 / 33.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :   0.00 deg   Angle2 : 90.00 deg
Barrier height            :  10.00 m
Barrier receiver distance :  85.00 / 85.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Road data, segment # 2: Gladstone (day/night)
---------------------------------------------
Car traffic volume  :  9715/845   veh/TimePeriod  *
Medium truck volume :   773/67    veh/TimePeriod  *
Heavy truck volume  :   552/48    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):  12000
    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: Gladstone (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  :  93.00 / 93.00  m
Receiver height           :  33.00 / 33.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :  24.00 m
Barrier receiver distance :  76.00 / 76.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Road data, segment # 3: Queensway (day/night)
---------------------------------------------
Car traffic volume  : 118739/10325 veh/TimePeriod  *
Medium truck volume :  9445/821   veh/TimePeriod  *
Heavy truck volume  :  6747/587   veh/TimePeriod  *
Posted speed limit  :   100 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): 146664
    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: Queensway (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   : 321.00 / 321.00 m
Receiver height            :  33.00 / 33.00  m
Topography                 :      4       (Elevated; with barrier)
Barrier angle1             : -90.00 deg   Angle2 : 90.00 deg
Barrier height             :  24.00 m
Elevation                  :   0.00 m
Barrier receiver distance  : 210.00 / 210.00 m
Source elevation           :   5.00 m
Receiver elevation         :   0.00 m
Barrier elevation          :   0.00 m
Reference angle            :   0.00


Results segment # 1: Booth (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 !       33.00 !        5.11 !         5.11

ROAD (0.00 + 41.35 + 0.00) = 41.35 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
     0     90   0.00  65.72   0.00  -8.06  -3.01   0.00   0.00 -13.30
41.35
-------------------------------------------------------------------------------
--

Segment Leq : 41.35 dBA


Results segment # 2: Gladstone (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 !       33.00 !        7.25 !         7.25
```

```
ROAD (0.00 + 39.50 + 0.00) = 39.50 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  65.72   0.00  -7.92   0.00   0.00   0.00 -18.29
39.50
-------------------------------------------------------------------------
--

Segment Leq : 39.50 dBA


Results segment # 3: Queensway (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 !       33.00 !       15.66 !        15.66

ROAD (0.00 + 59.89 + 0.00) = 59.89 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  84.41   0.00 -13.30   0.00   0.00   0.00 -11.21
59.89
-------------------------------------------------------------------------
--

Segment Leq : 59.89 dBA

Total Leq All Segments: 59.99 dBA


Results segment # 1: Booth (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 !       33.00 !        5.11 !         5.11
```

```
ROAD (0.00 + 33.75 + 0.00) = 33.75 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
     0     90   0.00  58.12   0.00  -8.06  -3.01   0.00   0.00 -13.30
33.75
-------------------------------------------------------------------------
--

Segment Leq : 33.75 dBA


Results segment # 2: Gladstone (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 !       33.00 !        7.25 !         7.25

ROAD (0.00 + 31.90 + 0.00) = 31.90 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  58.12   0.00  -7.92   0.00   0.00   0.00 -18.29
31.90
-------------------------------------------------------------------------
--

Segment Leq : 31.90 dBA


Results segment # 3: Queensway (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 !       33.00 !       15.66 !        15.66
```

```
ROAD (0.00 + 52.29 + 0.00) = 52.29 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  76.81   0.00 -13.30   0.00   0.00   0.00 -11.21
52.29
-------------------------------------------------------------------------
--

Segment Leq : 52.29 dBA

Total Leq All Segments: 52.39 dBA


RT/Custom data, segment # 1: LRT (day/night)
-----------------------------------------
1 - 4-car SRT:
Traffic volume    :   540/60    veh/TimePeriod
Speed             :    70 km/h

Data for Segment # 1: LRT (day/night)
-------------------------------------
Angle1   Angle2           : -90.00 deg   24.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  : 415.00 / 415.00 m
Receiver height           :  33.00 / 33.00  m
Topography                :      4       (Elevated; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 24.00 deg
Barrier height            :  24.00 m
Elevation                 :   0.00 m
Barrier receiver distance : 332.00 / 332.00 m
Source elevation          : -10.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


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

Source height = 0.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       0.50 !       33.00 !       -1.00 !        -1.00
```

```
RT/Custom (0.00 + 28.97 + 0.00) = 28.97 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     24   0.00  63.44 -14.42  -1.98   0.00   0.00 -18.07  28.97
-------------------------------------------------------------------------

Segment Leq : 28.97 dBA

Total Leq All Segments: 28.97 dBA


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

Source height = 0.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       0.50 !       33.00 !       -1.00 !        -1.00

RT/Custom (0.00 + 22.44 + 0.00) = 22.44 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     24   0.00  56.91 -14.42  -1.98   0.00   0.00 -18.07  22.44
-------------------------------------------------------------------------

Segment Leq : 22.44 dBA

Total Leq All Segments: 22.44 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 59.99
                           (NIGHT): 52.39
```

```
STAMSON 5.0        NORMAL REPORT        Date: 22-09-2022 15:31:40
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Booth (day/night)
----------------------------------------
Car traffic volume  :  9715/845   veh/TimePeriod  *
Medium truck volume :   773/67    veh/TimePeriod  *
Heavy truck volume  :   552/48    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):  12000
    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: Booth (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  :  78.00 / 78.00  m
Receiver height           :  24.00 / 24.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :  10.00 m
Barrier receiver distance :  68.00 / 68.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Road data, segment # 2: Gladstone (day/night)
---------------------------------------------
Car traffic volume  :  9715/845   veh/TimePeriod  *
Medium truck volume :   773/67    veh/TimePeriod  *
Heavy truck volume  :   552/48    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):  12000
    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: Gladstone (day/night)
-------------------------------------------
Angle1   Angle2           : -90.00 deg   19.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  : 105.00 / 105.00 m
Receiver height           :  24.00 / 24.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 19.00 deg
Barrier height            :  29.00 m
Barrier receiver distance :  87.00 / 87.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Road data, segment # 3: Queensway (day/night)
---------------------------------------------
Car traffic volume  : 118739/10325 veh/TimePeriod  *
Medium truck volume :  9445/821   veh/TimePeriod  *
Heavy truck volume  :  6747/587   veh/TimePeriod  *
Posted speed limit  :   100 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): 146664
    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: Queensway (day/night)
-------------------------------------------
Angle1   Angle2           : -90.00 deg   19.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
```

```
Surface                    :      2       (Reflective ground surface)
Receiver source distance   : 334.00 / 334.00 m
Receiver height            :  24.00 / 24.00  m
Topography                 :      4       (Elevated; with barrier)
Barrier angle1             : -90.00 deg   Angle2 : 19.00 deg
Barrier height             :  29.00 m
Elevation                  :   0.00 m
Barrier receiver distance  : 222.00 / 222.00 m
Source elevation           :   5.00 m
Receiver elevation         :   0.00 m
Barrier elevation          :   0.00 m
Reference angle            :   0.00


Results segment # 1: Booth (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 !       24.00 !        4.38 !         4.38

ROAD (0.00 + 43.88 + 0.00) = 43.88 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     90   0.00  65.72   0.00  -7.16   0.00   0.00   0.00 -14.68
43.88
-------------------------------------------------------------------------------
--

Segment Leq : 43.88 dBA


Results segment # 2: Gladstone (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 !       24.00 !        5.35 !         5.35
```

```
ROAD (0.00 + 35.90 + 0.00) = 35.90 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     19   0.00  65.72   0.00  -8.45  -2.18   0.00   0.00 -19.19
35.90
-------------------------------------------------------------------------
--

Segment Leq : 35.90 dBA


Results segment # 3: Queensway (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 !       24.00 !       12.37 !        12.37

ROAD (0.00 + 52.67 + 0.00) = 52.67 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     19   0.00  84.41   0.00 -13.48  -2.18   0.00   0.00 -16.09
52.67
-------------------------------------------------------------------------
--

Segment Leq : 52.67 dBA

Total Leq All Segments: 53.29 dBA


Results segment # 1: Booth (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 !       24.00 !        4.38 !         4.38
```

```
ROAD (0.00 + 36.28 + 0.00) = 36.28 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  58.12   0.00  -7.16   0.00   0.00   0.00 -14.68
36.28
-------------------------------------------------------------------------
--

Segment Leq : 36.28 dBA


Results segment # 2: Gladstone (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 !       24.00 !        5.35 !         5.35

ROAD (0.00 + 28.30 + 0.00) = 28.30 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     19   0.00  58.12   0.00  -8.45  -2.18   0.00   0.00 -19.19
28.30
-------------------------------------------------------------------------
--

Segment Leq : 28.30 dBA


Results segment # 3: Queensway (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 !       24.00 !       12.37 !        12.37
```

```
ROAD (0.00 + 45.07 + 0.00) = 45.07 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     19   0.00  76.81   0.00 -13.48  -2.18   0.00   0.00 -16.09
45.07
-------------------------------------------------------------------------
--

Segment Leq : 45.07 dBA

Total Leq All Segments: 45.69 dBA



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

```
STAMSON 5.0        NORMAL REPORT        Date: 22-09-2022 15:31:58
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r9.te                Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: Booth (day/night)
----------------------------------------
Car traffic volume  :  9715/845   veh/TimePeriod  *
Medium truck volume :   773/67    veh/TimePeriod  *
Heavy truck volume  :   552/48    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):  12000
    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: Booth (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  : 102.00 / 102.00 m
Receiver height           :  21.00 / 21.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 0.00 deg
Barrier height            :  10.00 m
Barrier receiver distance :  91.00 / 91.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Results segment # 1: Booth (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 !       21.00 !        3.60 !         3.60

ROAD (0.00 + 39.01 + 0.00) = 39.01 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90      0   0.00  65.72   0.00  -8.33  -3.01   0.00   0.00 -15.37
39.01
-------------------------------------------------------------------------
--

Segment Leq : 39.01 dBA

Total Leq All Segments: 39.01 dBA


Results segment # 1: Booth (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 !       21.00 !        3.60 !         3.60

ROAD (0.00 + 31.41 + 0.00) = 31.41 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90      0   0.00  58.12   0.00  -8.33  -3.01   0.00   0.00 -15.37
31.41
-------------------------------------------------------------------------
--

Segment Leq : 31.41 dBA

Total Leq All Segments: 31.41 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 39.01
                           (NIGHT): 31.41
```

```
STAMSON 5.0        NORMAL REPORT        Date: 22-09-2022 20:29:52
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r10.te               Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: Booth (day/night)
----------------------------------------
Car traffic volume  :  9715/845   veh/TimePeriod  *
Medium truck volume :   773/67    veh/TimePeriod  *
Heavy truck volume  :   552/48    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):  12000
    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: Booth (day/night)
----------------------------------------
Angle1   Angle2           : -90.00 deg   31.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  83.00 / 83.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 31.00 deg
Barrier height            :  10.00 m
Barrier receiver distance :  78.00 / 78.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Road data, segment # 2: Queensway (day/night)
----------------------------------------
Car traffic volume  : 118739/10325 veh/TimePeriod  *
Medium truck volume :  9445/821   veh/TimePeriod  *
Heavy truck volume  :  6747/587   veh/TimePeriod  *
Posted speed limit  :   100 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): 146664
    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: Queensway (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  : 346.00 / 346.00 m
Receiver height           :   1.50 / 1.50   m
Topography                :      4       (Elevated; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :  29.00 m
Elevation                 :   0.00 m
Barrier receiver distance : 235.00 / 235.00 m
Source elevation          :   5.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Road data, segment # 3: Gladstone (day/night)
---------------------------------------------
Car traffic volume  :  9715/845   veh/TimePeriod  *
Medium truck volume :   773/67    veh/TimePeriod  *
Heavy truck volume  :   552/48    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):  12000
    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: Gladstone (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  : 118.00 / 118.00 m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :  29.00 m
Barrier receiver distance : 100.00 / 100.00 m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Results segment # 1: Booth (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 !        1.50 !         1.50

ROAD (0.00 + 38.15 + 0.00) = 38.15 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     31   0.00  65.72   0.00  -7.43  -1.72   0.00   0.00 -18.41
38.15
-------------------------------------------------------------------------------
--

Segment Leq : 38.15 dBA


Results segment # 2: Queensway (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 !        4.89 !         4.89
```

```
ROAD (0.00 + 53.40 + 0.00) = 53.40 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  84.41   0.00 -13.63   0.00   0.00   0.00 -17.38
53.40
-------------------------------------------------------------------------
--

Segment Leq : 53.40 dBA


Results segment # 3: Gladstone (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 !        1.50 !         1.50

ROAD (0.00 + 37.44 + 0.00) = 37.44 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  65.72   0.00  -8.96   0.00   0.00   0.00 -19.32
37.44
-------------------------------------------------------------------------
--

Segment Leq : 37.44 dBA

Total Leq All Segments: 53.63 dBA


Results segment # 1: Booth (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 !        1.50 !         1.50
```

```
ROAD (0.00 + 30.55 + 0.00) = 30.55 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     31   0.00  58.12   0.00  -7.43  -1.72   0.00   0.00 -18.41
30.55
-------------------------------------------------------------------------
--

Segment Leq : 30.55 dBA


Results segment # 2: Queensway (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 !        4.89 !         4.89

ROAD (0.00 + 45.80 + 0.00) = 45.80 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  76.81   0.00 -13.63   0.00   0.00   0.00 -17.38
45.80
-------------------------------------------------------------------------
--

Segment Leq : 45.80 dBA


Results segment # 3: Gladstone (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 !        1.50 !         1.50
```

```
ROAD (0.00 + 29.84 + 0.00) = 29.84 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  58.12   0.00  -8.96   0.00   0.00   0.00 -19.32
29.84
-------------------------------------------------------------------------
--

Segment Leq : 29.84 dBA

Total Leq All Segments: 46.03 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 53.63
                           (NIGHT): 46.03
```