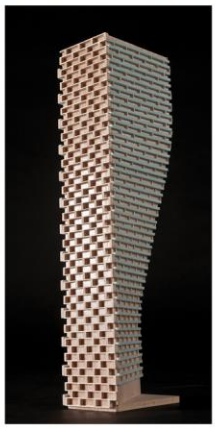
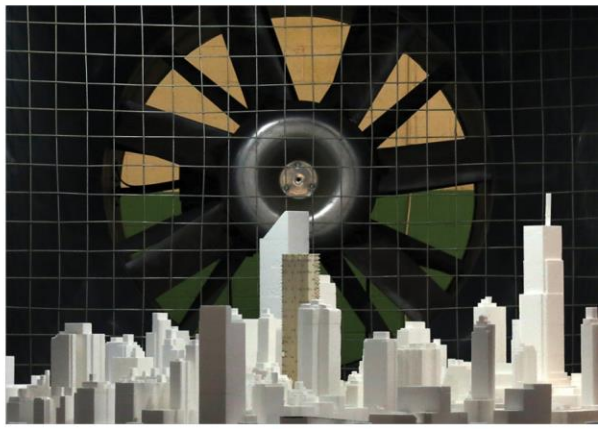
GRADIENTWIND
ENGINEERS & SCIENTISTS

ROADWAY TRAFFIC NOISE FEASIBILITY ASSESSMENT

8 Withrow Avenue – 7 Rossland Avenue
Ottawa, Ontario

Report: 23-135 – Traffic Noise Feasibility





June 7th, 2023

DRAFT

PREPARED FOR
Figurr Architects Collective
190 Somerset St W #206
Ottawa, ON K2P 0J4

PREPARED BY
Essraa Alqassab, BASc., Junior Environmental Scientist
Joshua Foster, P.Eng., Lead Engineer

EXECUTIVE SUMMARY

This report describes a roadway traffic noise feasibility assessment undertaken in support of a Zoning By-Law Amendment (ZBA) application submission for the proposed residential development located at 8 Withrow Avenue / 7 Rossland Avenue in Ottawa, Ontario. The proposed development comprises an 8-storey residential building and two 3-storey stacked townhomes. The primary sources of roadway traffic noise are Withrow Avenue to the north and Merivale Road to the east. Figure 1 illustrates a complete site plan with surrounding context.

The assessment is based on (i) theoretical noise prediction methods that conform to the Ministry of the Environment, Conservation and Parks (MECP); (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) site plan drawings provided by Figurr Architects Collective, in May 2023.

The results of the current analysis indicate that noise levels will range between 60 and 72 dBA during the daytime period (07:00-23:00) and between 52 and 64 dBA during the nighttime period (23:00-07:00). The highest noise level (72 dBA) occurs at the east façade, which is nearest and most exposed to Merivale Road. The noise levels predicted due to roadway traffic exceed the criteria listed in ENCG for building components and upgraded building components will be required for the midrise building and the Withrow Avenue stacked townhomes.

Results of the calculations also indicate that the midrise building and the Withrow Avenue stacked townhomes will require central air conditioning, or a similar ventilation system, due to roadway traffic noise. This will allow occupants to keep windows closed and maintain a comfortable living environment. A Warning Clause Type D will also be required on all Lease, Purchase and Sale Agreements, as summarised in Section 6.

As noise levels are expected to be between 55 dBA and 65 dBA during the daytime period for the Rossland Stacked Townhomes, these units will require forced air heating with provisions for air conditioning, or a similar ventilation system, due to roadway traffic noise. If air conditioning was provided at the owner's discretion, this will allow occupants to keep windows closed and maintain a comfortable living

environment. A Warning Clause Type C will also be required on all Lease, Purchase and Sale Agreements, as summarised in Section 6.

Noise level at the midrise building rooftop terrace is below criteria; therefore, acoustic mitigation for this area is not required. A detailed roadway traffic noise study will be required at the time of site plan approval to determine specific noise control measures for the development.

Stationary noise impacts from the environment onto the proposed development are expected to be minimal. The site is surrounded by low rise residential and small retail buildings and is not in close proximity to any large mechanical equipment. Furthermore, the setback distance from neighbouring midrise buildings is sufficient in attenuating noise from the rooftop units. Therefore, negative noise impacts are not anticipated.

With regards to stationary noise impacts from the site on the surroundings and the development itself, this will be controlled to ensure ENCG sound level limits are maintained. The stacked townhomes are not anticipated to have any significant pieces of equipment and will be serviced with conventional forced air heating systems or internal heat pumps / fan coil units. Equipment associated with the midrise would be placed on the high roof away form noise sensitive areas. Noise impacts can generally be minimized by judicious selection and placement of the equipment. Where necessary, noise screens and silencers can be placed into the design. A review of the proposed equipment and locations should be reviewed by a qualified acoustic consultant prior to the installation of the equipment.

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Figurr Architects Collective to undertake a roadway traffic noise feasibility assessment in support of a Zoning By-Law Amendment (ZBA) application for the proposed residential development located at 8 Withrow Avenue / 7 Rossland Avenue in Ottawa, Ontario. This report summarizes the methodology, results, and recommendations related to a roadway traffic noise feasibility assessment of exterior noise levels generated by local roadway traffic.

The assessment was performed on the basis of theoretical noise calculation methods conforming to the Ministry of the Environment, Conservation and Parks (MECP)[1] guidelines. Noise calculations were based on site plan drawings provided Figurr Architects Collective, in May 2023, 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 8 Withrow Avenue / 7 Rossland Avenue in Ottawa, Ontario; situated at the southwest intersection of Merivale Road and Withrow Avenue. The proposed development features an 8-storey residential building located towards the east of the property parcel, connected to a church fronting Rossland Avenue. A community shed/pavilion can be found north of the church and to the west of the midrise building. The development also includes two 3-storey stacked townhouse buildings. The building fronting Withrow Avenue is referred to as 'Withrow Stacked Townhome' and contains 12 units. The building fronting Rossland Avenue is referred to as 'Rossland Stack Townhomes' and contained 15 units. Above ground parking is provided with access from Rossland Avenue and Withrow Avenue.

The site is surrounded by residential dwellings to the north and west, a gas station towards the south, and various low-rise commercial buildings towards the east, across from Merivale Road. From aerial imagery, no large mechanical equipment is in close proximity to the study site. As such, negative stationary noise impacts onto the study site are not expected.

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

The major sources of roadway traffic noise are Merivale Road to the east and Withrow Avenue to the north. As the site is not within 75 m of any existing or future proposed LRT lines, a ground vibration impact assessment is not required.

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) explore potential noise mitigation where required.

4. METHODOLOGY

4.1 Background

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

4.2 Roadway Traffic Noise

4.2.1 Criteria for Roadway Traffic Noise

For surface roadway traffic noise, the equivalent sound energy level, L_{eq}, provides a measure of the time varying noise levels, which is well correlated with the annoyance of sound. It is defined as the continuous sound level, which has the same energy as a time varying noise level over a period of time. For roadways, the L_{eq} is commonly calculated on the basis of a 16-hour (L_{eq16}) daytime (07:00-23:00) / 8-hour (L_{eq8}) nighttime (23:00-07:00) split to assess its impact on residential buildings. The City of Ottawa's Environmental Noise Control Guidelines (ENCG) specifies that the recommended indoor noise limit range is 50, 45, and 40 dBA for reception/retail, living rooms, and sleeping quarters, respectively, as listed in Table 1. Based on Gradient Wind's experience, more comfortable indoor noise levels should be targeted,

towards 47, 42, and 37 dBA, respectively, to control peak noise and deficiencies in building envelope construction.

TABLE 1: INDOOR SOUND LEVEL CRITERIA (ROAD) [2]

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

Predicted noise levels at the plane of window (POW) dictate the action required to achieve the recommended sound levels. An open window is considered to provide a 10 dBA reduction in noise, while a standard closed window is capable of providing a minimum 20 dBA noise reduction[3]. A closed window due to a ventilation requirement will bring noise levels down to achieve an acceptable indoor environment[4]. Therefore, where noise levels exceed 55 dBA daytime and 50 dBA nighttime, the ventilation for the building should consider the need for having windows and doors closed, which triggers the need for forced air heating with provision for central air conditioning. Where noise levels exceed 65 dBA daytime and 60 dBA nighttime, air conditioning will be required and building components will require higher levels of sound attenuation[5].

The sound level criterion for outdoor living areas is 55 dBA, which applies during the daytime (07:00 to 23:00). When noise levels exceed 55 dBA, mitigation must be provided to reduce noise levels where technically and administratively feasible to acceptable levels at or below the criterion.

[2] Adapted from ENCG 2016 – Tables 2.2b and 2.2c
[3] Burberry, P.B. (2014). Mitchell's Environment and Services. Routledge, Page 125
[4] MOECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.8
[5] MOECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.1.3

4.2.2 Theoretical Roadway Noise Predictions

Noise predictions were performed with the aid of the 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.
- The day/night split for all streets was taken to be 92%/10%, 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.
- For select receptors, the proposed building and surrounding existing buildings were considered as noise barriers partially obstructing exposure to the roadway.
- Noise receptors were strategically placed at 9 locations around the study area (see Figure 2).
- Receptor distances and exposure angles are illustrated in Figures A1-A4.

4.2.3 Roadway Traffic Volumes

The ENCG dictates that noise calculations should consider future sound levels based on a roadway's classification at the mature state of development. Therefore, traffic volumes are based on the roadway classifications outlined in the City of Ottawa's Official Plan (OP) and Transportation Master Plan[6] which provide additional details on future roadway expansions. Average Annual Daily Traffic (AADT) volumes are then based on data in Table B1 of the ENCG for each roadway classification. Table 2 (below) summarizes the AADT values used for each roadway included in this assessment.

TABLE 2: ROADWAY TRAFFIC DATA

Segment	Roadway Traffic Data	Speed Limit (km/h)	Traffic Volume
Merivale Road	4-Lane Urban Arterial Divided (4-UAD)	60	**35,000**
Withrow Avenue	2-Lane Urban Collector (2-UCU)	40	**8,000**

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

5. RESULTS AND DISCUSSION

5.1 Roadway Traffic Noise Levels

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

TABLE 3: EXTERIOR NOISE LEVELS DUE TO ROAD TRAFFIC

Receptor Number	Receptor Height Above Grade/Roof (m)	Receptor Location	STAMSON 5.04 Noise Level (dBA)	
			Day	Night
1	22.5	POW – Midrise Building, 8th Floor – East Façade	72	64
2	22.5	POW – Midrise Building, 8th Floor – South Façade	68	61
3	22.5	POW – Midrise Building, 8th Floor – West Façade	60	52
4	22.5	POW – Midrise Building, 8th Floor – North Façade	70	62
5	7.5	POW – Withrow Stacked Townhomes, 3rd Floor – East Façade	66	59
6	7.5	POW – Withrow Stacked Townhomes, 3rd Floor – South Façade	62	55
7	7.5	POW – Withrow Stacked Townhomes, 3rd Floor – North Façade	66	59
8	7.5	POW – Withrow Stacked Townhomes, 3rd Floor – West Façade	60	53
9	7.5	POW – Rossland Stacked Townhomes, 3rd Floor – East Façade	64	56
10	25.5	OLA – Midrise Building, Potential Rooftop Terrace	55	N/A*

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

The results of the current analysis indicate that noise levels will range between 60 and 72 dBA during the daytime period (07:00-23:00) and between 52 and 64 dBA during the nighttime period (23:00-07:00). The highest noise level (72 dBA) occurs at the east façade, which is nearest and most exposed to Merivale Road.

6. CONCLUSIONS AND RECOMMENDATIONS

The noise levels predicted due to roadway traffic exceed the criteria listed in ENCG for building components, therefore, upgraded building components will be required for select facades of the midrise building and the Withrow Townhomes. Due to the limited information available at the time of the study, which was prepared for a ZBA application, detailed STC calculations could not be performed at this time. A detailed review of the window and wall assemblies should be performed by a qualified engineer with expertise in acoustics during the detailed design stage of the building. For feasibility purposes, windows having an STC rating of 35 will generally be sufficient to attenuate indoor noise levels. This can often be achieved with commercially available glazing elements comprising of 6 mm glass, 13 mm air space, and 6 mm glass.

Results of the calculations also indicate that the midrise building and the Withrow Stacked Townhomes will require central air conditioning, or a similar ventilation system, due to roadway traffic noise. This will allow occupants to keep windows closed and maintain a comfortable living environment. A Warning Clause Type D will also be required on all Lease, Purchase and Sale Agreements, as seen 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."*

As noise levels are expected to be between 55 dBA and 65 dBA during the daytime period for the Rossland Stacked Townhomes, these units will require forced air heating with provisions for air conditioning, or a similar ventilation system, due to roadway traffic noise. This will allow occupants to keep windows closed and maintain a comfortable living environment. A Warning Clause Type C will also be required on all Lease, Purchase and Sale Agreements, as seen below:

Type C:

> *"This dwelling unit has been designed with the provision for adding central air conditioning at the occupant's discretion. Installation of central air conditioning by the occupant in low and medium*

density developments will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment."

The noise level at the midrise building rooftop terrace is below criteria, therefore, acoustic mitigation for this area is not required. A detailed roadway traffic noise study will be required at the time of site plan approval to determine specific noise control measures for the development.

Stationary noise impacts from the environment onto the proposed development are expected to be minimal. The site is surrounded by low rise residential and small retail buildings and is not in close proximity to any large mechanical equipment. Furthermore, the setback distance from neighbouring midrise buildings is sufficient in attenuating noise from the rooftop units. Therefore, negative noise impacts are not anticipated.

With regards to stationary noise impacts from the site on the surroundings and the development itself, this will be controlled to ensure ENCG sound level limits are maintained. The stacked townhomes are not anticipated to have any significant pieces of equipment and will be serviced with conventional forced air heating systems or internal heat pumps / fan coil units. Equipment associated with the midrise would be placed on the high roof away form noise sensitive areas. Noise impacts can generally be minimized by judicious selection and placement of the equipment. Where necessary, noise screens and silencers can be placed into the design. A review of the proposed equipment and locations should be reviewed by a qualified acoustic consultant prior to the installation of the equipment.

This concludes our roadway traffic noise feasibility 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.

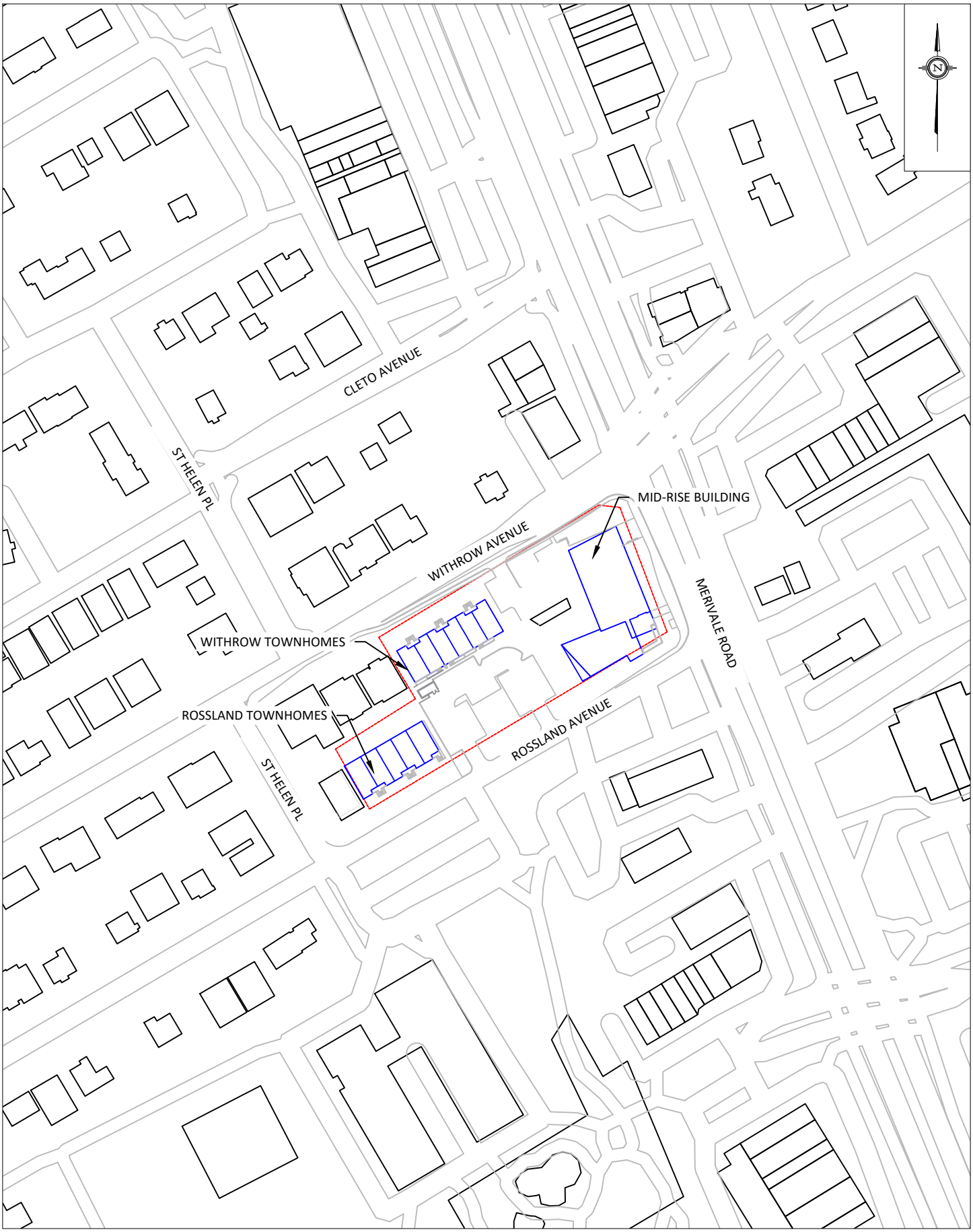
Sincerely,

Gradient Wind Engineering Inc.

Essraa Alqassab, BASc
Junior Environmental Scientist

Joshua Foster, P.Eng.
Lead Engineer

Gradient Wind File 23-135 – Traffic Noise Feasibility



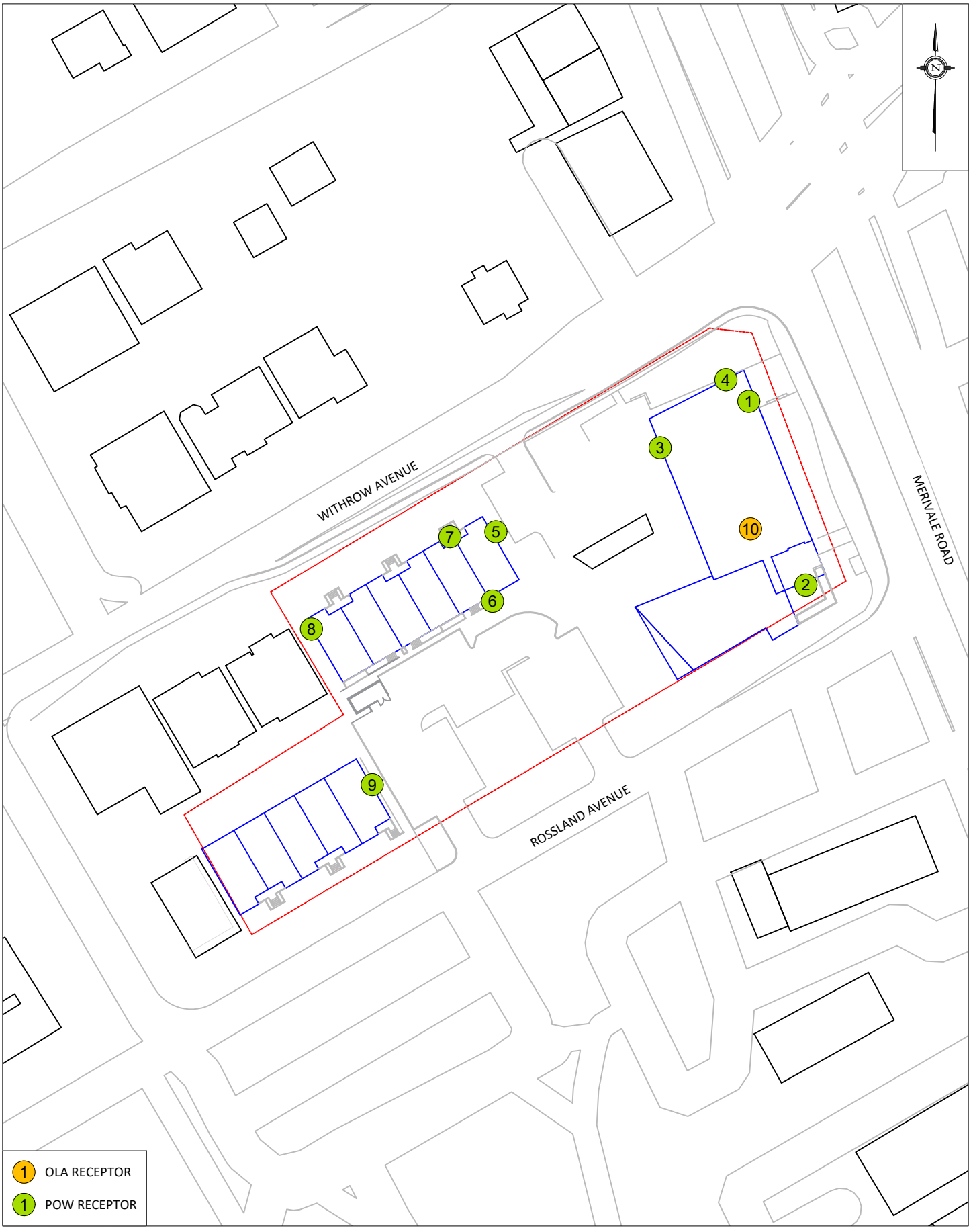
GRADIENTWIND
ENGINEERS & SCIENTISTS

127 WALGREEN ROAD , OTTAWA, ON
613 836 0934 • GRADIENTWIND.COM

PROJECT	8 WITHROW AVENUE / 7 ROSSLAND AVENUE, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		
SCALE	1:2000 (APPROX.)	DRAWING NO.	GW23-135-1
DATE	JUNE 6, 2023	DRAWN BY	E.A.

DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT



GRADIENTWIND
ENGINEERS & SCIENTISTS

127 WALGREEN ROAD , OTTAWA, ON
613 836 0934 • GRADIENTWIND.COM

PROJECT	8 WITHROW AVENUE / 7 ROSSLAND AVENUE, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:1000 (APPROX.)
DRAWING NO.	GW23-135-2
DATE	JUNE 6, 2023
DRAWN BY	E.A.

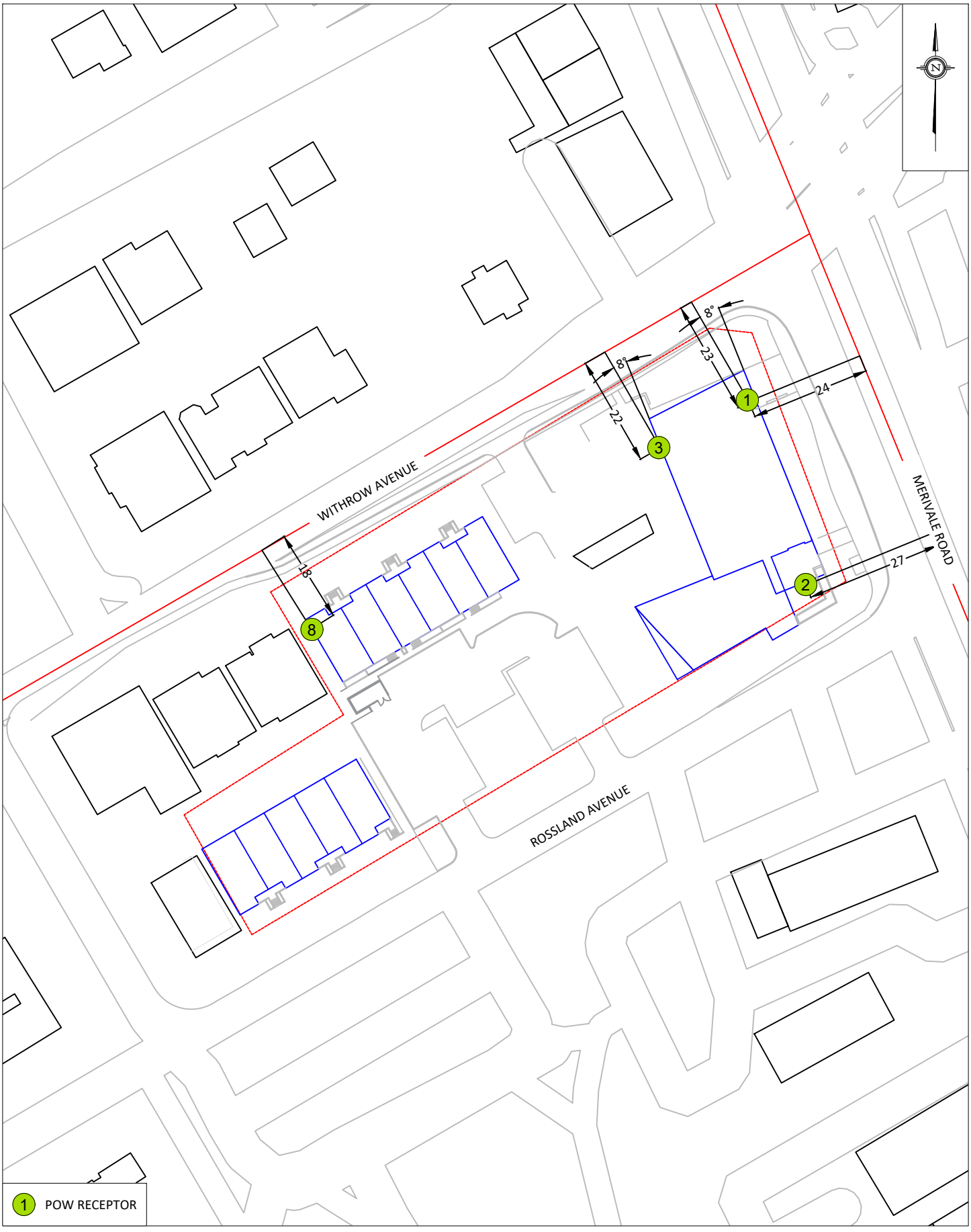
DESCRIPTION

FIGURE 2:
RECEPTOR LOCATIONS

APPENDIX A

STAMSON CALCULATIONS

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



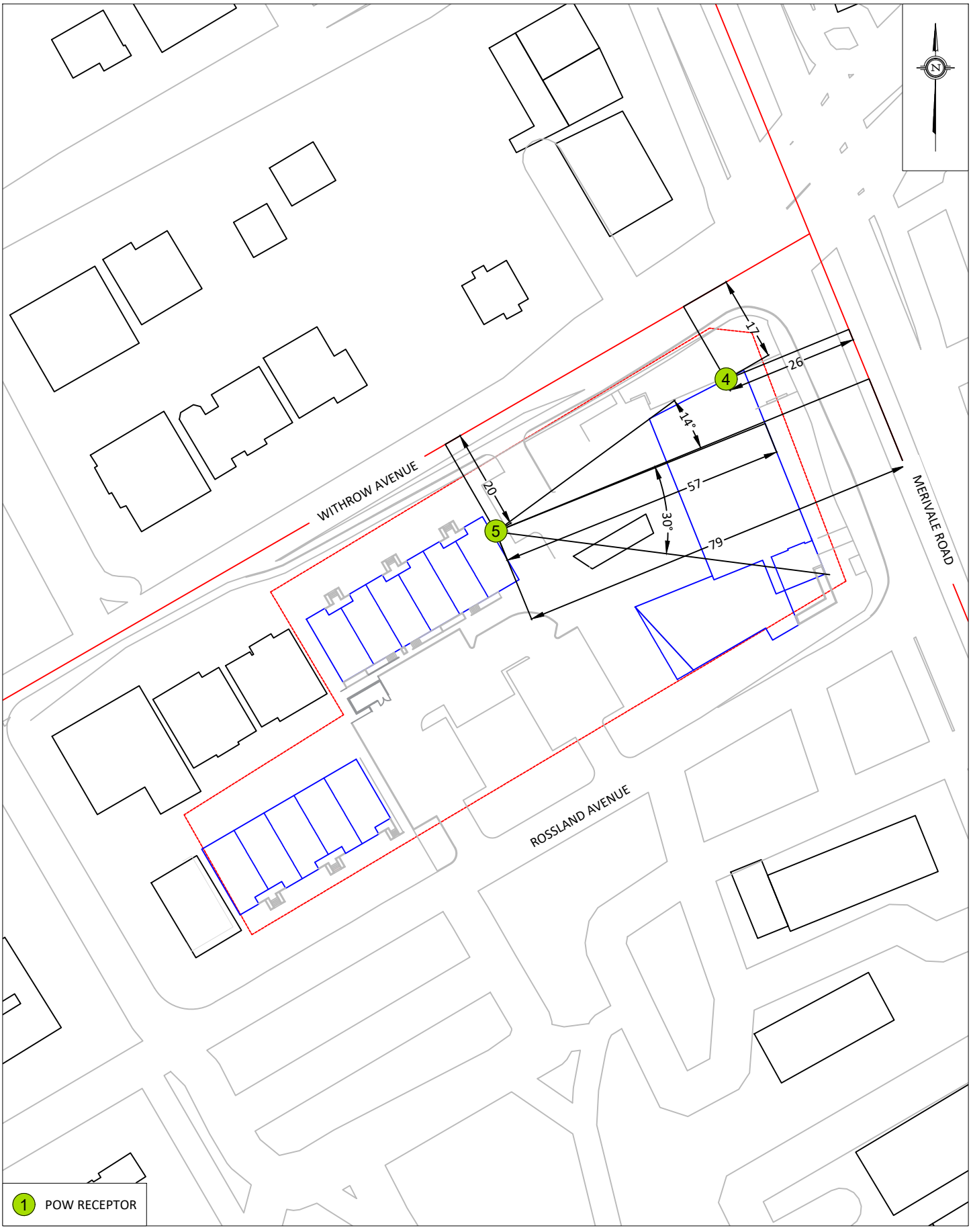
GRADIENTWIND
ENGINEERS & SCIENTISTS

127 WALGREEN ROAD , OTTAWA, ON
613 836 0934 • GRADIENTWIND.COM

PROJECT	8 WITHROW AVENUE / 7 ROSSLAND AVENUE, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:1000 (APPROX.)
DRAWING NO.	GW23-135-A1
DATE	JUNE 6, 2023
DRAWN BY	E.A.

DESCRIPTION

FIGURE A1:
STAMSON PARAMETERS (1)

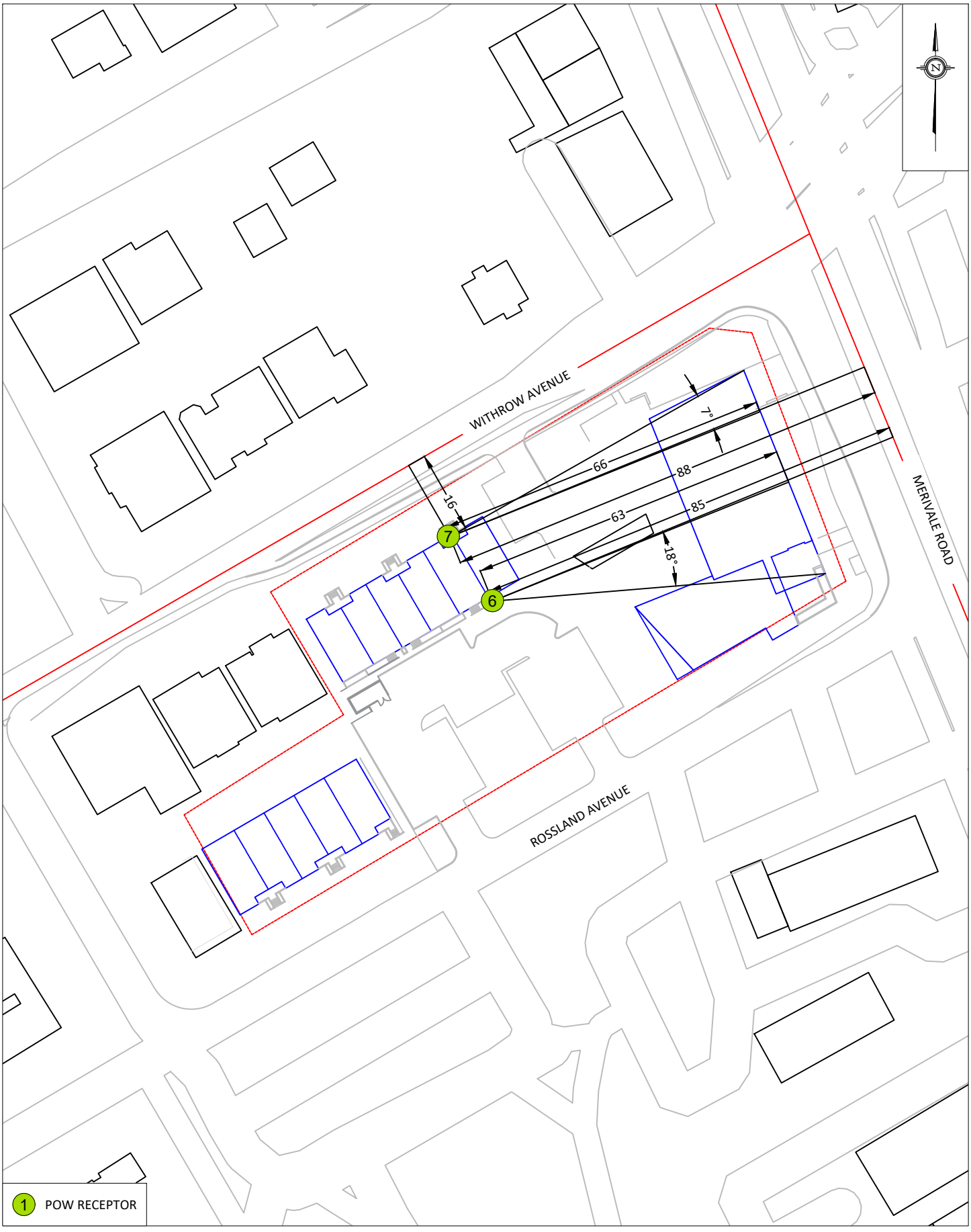


GRADIENTWIND
ENGINEERS & SCIENTISTS

127 WALGREEN ROAD , OTTAWA, ON
613 836 0934 • GRADIENTWIND.COM

PROJECT	8 WITHROW AVENUE / 7 ROSSLAND AVENUE, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		DESCRIPTION
SCALE	1:1000 (APPROX.)	DRAWING NO.	GW23-135-A2
DATE	JUNE 6, 2023	DRAWN BY	E.A.

FIGURE A2:
RECEPTOR LOCATIONS



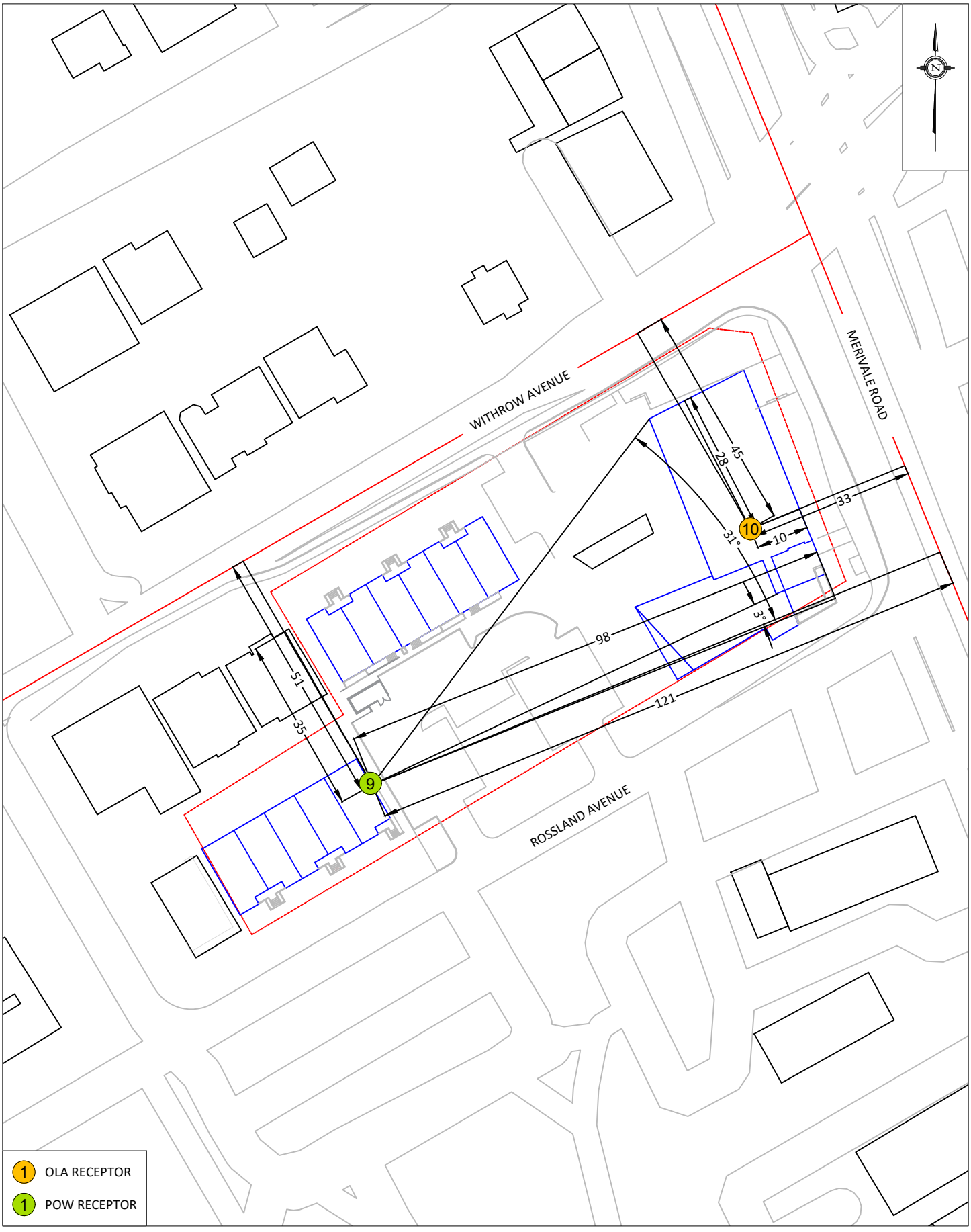
GRADIENTWIND
ENGINEERS & SCIENTISTS

127 WALGREEN ROAD , OTTAWA, ON
613 836 0934 • GRADIENTWIND.COM

PROJECT	8 WITHROW AVENUE / 7 ROSSLAND AVENUE, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:1000 (APPROX.)
DRAWING NO.	GW23-135-3
DATE	JUNE 6, 2023
DRAWN BY	E.A.

DESCRIPTION

FIGURE A3:
RECEPTOR LOCATIONS



GRADIENTWIND
ENGINEERS & SCIENTISTS

127 WALGREEN ROAD , OTTAWA, ON
613 836 0934 • GRADIENTWIND.COM

PROJECT	8 WITHROW AVENUE / 7 ROSSLAND AVENUE, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:1000 (APPROX.)
DRAWING NO.	GW23-135-A4
DATE	JUNE 6, 2023
DRAWN BY	E.A.

DESCRIPTION

FIGURE A4:
STAMSON PARAMETERS (4)

```
STAMSON 5.0        NORMAL REPORT        Date: 06-06-2023 13:26:53
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Merivale (day/night)
----------------------------------------------
Car traffic volume  : 28336/2464  veh/TimePeriod  *
Medium truck volume :  2254/196   veh/TimePeriod  *
Heavy truck volume  :  1610/140   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  35000
    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: Merivale (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  :  24.00 / 24.00  m
Receiver height           :  22.50 / 22.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


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

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

    24 hr Traffic Volume (AADT or SADT):   8000
```

```
    Percentage of Annual Growth         :    0.00
    Number of Years of Growth           :    0.00
    Medium Truck % of Total Volume      :    7.00
    Heavy Truck  % of Total Volume      :    5.00
    Day (16 hrs) % of Total Volume      :   92.00

Data for Segment # 2: Withrow (day/night)
-----------------------------------------
Angle1   Angle2           :    8.00 deg    90.00 deg
Wood depth                :       0        (No woods.)
No of house rows          :       0 / 0
Surface                   :       2        (Reflective ground surface)
Receiver source distance  :   23.00 / 23.00  m
Receiver height           :   22.50 / 23.00  m
Topography                :       1        (Flat/gentle slope; no barrier)
Reference angle           :    0.00


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

Source height = 1.50 m

ROAD (0.00 + 71.63 + 0.00) = 71.63 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     90    0.00  73.68   0.00  -2.04   0.00   0.00   0.00   0.00
71.63
-------------------------------------------------------------------------------
--

Segment Leq : 71.63 dBA


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

Source height = 1.50 m

ROAD (0.00 + 58.68 + 0.00) = 58.68 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
     8     90    0.00  63.96   0.00  -1.86  -3.41   0.00   0.00   0.00
58.68
-------------------------------------------------------------------------------
--
```

```
Segment Leq : 58.68 dBA

Total Leq All Segments: 71.84 dBA


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

Source height = 1.50 m

ROAD (0.00 + 64.04 + 0.00) = 64.04 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  66.08   0.00  -2.04   0.00   0.00   0.00   0.00
64.04
-------------------------------------------------------------------------
--

Segment Leq : 64.04 dBA


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

Source height = 1.50 m

ROAD (0.00 + 51.09 + 0.00) = 51.09 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
     8     90   0.00  56.36   0.00  -1.86  -3.41   0.00   0.00   0.00
51.09
-------------------------------------------------------------------------
--

Segment Leq : 51.09 dBA

Total Leq All Segments: 64.25 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 71.84
                           (NIGHT): 64.25
```

```
STAMSON 5.0        NORMAL REPORT        Date: 06-06-2023 13:27:12
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Merivale (day/night)
----------------------------------------------
Car traffic volume  : 28336/2464  veh/TimePeriod  *
Medium truck volume :  2254/196   veh/TimePeriod  *
Heavy truck volume  :  1610/140   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  35000
    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: Merivale (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  :  27.00 / 27.00  m
Receiver height           :  22.50 / 22.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


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

Source height = 1.50 m

ROAD (0.00 + 68.11 + 0.00) = 68.11 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
     0     90    0.00  73.68   0.00  -2.55  -3.01   0.00   0.00   0.00
68.11
```

```
-------------------------------------------------------------------------------
--

Segment Leq : 68.11 dBA

Total Leq All Segments: 68.11 dBA


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

Source height = 1.50 m

ROAD (0.00 + 60.52 + 0.00) = 60.52 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
     0     90   0.00  66.08   0.00  -2.55  -3.01   0.00   0.00   0.00
60.52
-------------------------------------------------------------------------------
--

Segment Leq : 60.52 dBA

Total Leq All Segments: 60.52 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 68.11
                           (NIGHT): 60.52
```

```
STAMSON 5.0        NORMAL REPORT        Date: 06-06-2023 13:37:25
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


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

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

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

Data for Segment # 1: Withrow (day/night)
----------------------------------------
Angle1   Angle2           : -90.00 deg   8.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  22.00 / 22.00  m
Receiver height           :  22.50 / 22.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


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

Source height = 1.50 m

ROAD (0.00 + 59.65 + 0.00) = 59.65 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90      8    0.00  63.96   0.00  -1.66  -2.64   0.00   0.00   0.00
59.65
```

```
-------------------------------------------------------------------------------
--

Segment Leq : 59.65 dBA

Total Leq All Segments: 59.65 dBA


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

Source height = 1.50 m

ROAD (0.00 + 52.06 + 0.00) = 52.06 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90      8    0.00  56.36   0.00  -1.66  -2.64   0.00   0.00   0.00
52.06
-------------------------------------------------------------------------------
--

Segment Leq : 52.06 dBA

Total Leq All Segments: 52.06 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 59.65
                           (NIGHT): 52.06
```

```
STAMSON 5.0        NORMAL REPORT        Date: 06-06-2023 13:37:48
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


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

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

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

Data for Segment # 1: Withrow (day/night)
----------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  17.00 / 17.00  m
Receiver height           :  22.50 / 22.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Road data, segment # 2: Merivale (day/night)
----------------------------------------
Car traffic volume  : 28336/2464  veh/TimePeriod  *
Medium truck volume :  2254/196   veh/TimePeriod  *
Heavy truck volume  :  1610/140   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  35000
    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: Merivale (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  :  26.00 / 26.00  m
Receiver height           :  22.50 / 22.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


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

Source height = 1.50 m

ROAD (0.00 + 63.41 + 0.00) = 63.41 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  63.96   0.00  -0.54   0.00   0.00   0.00   0.00
63.41
-------------------------------------------------------------------------
--

Segment Leq : 63.41 dBA


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

Source height = 1.50 m

ROAD (0.00 + 68.28 + 0.00) = 68.28 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90      0   0.00  73.68   0.00  -2.39  -3.01   0.00   0.00   0.00
68.28
-------------------------------------------------------------------------
--

Segment Leq : 68.28 dBA
```

```
Total Leq All Segments: 69.50 dBA


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

Source height = 1.50 m

ROAD (0.00 + 55.82 + 0.00) = 55.82 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  56.36   0.00  -0.54   0.00   0.00   0.00   0.00
55.82
-------------------------------------------------------------------------
--

Segment Leq : 55.82 dBA

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

Source height = 1.50 m

ROAD (0.00 + 60.68 + 0.00) = 60.68 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90      0   0.00  66.08   0.00  -2.39  -3.01   0.00   0.00   0.00
60.68
-------------------------------------------------------------------------
--

Segment Leq : 60.68 dBA

Total Leq All Segments: 61.91 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 69.50
                           (NIGHT): 61.91
```

```
STAMSON 5.0        NORMAL REPORT        Date: 06-06-2023 15:57:47
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Merivale (day/night)
----------------------------------------------
Car traffic volume  : 28336/2464  veh/TimePeriod  *
Medium truck volume :  2254/196   veh/TimePeriod  *
Heavy truck volume  :  1610/140   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  35000
    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: Merivale (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  :  79.00 / 79.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -14.00 deg   Angle2 : 30.00 deg
Barrier height            :  24.00 m
Barrier receiver distance :  57.00 / 57.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


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

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

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

Data for Segment # 2: Withrow (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  :  20.00 / 20.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !        7.50 !        3.17 !         3.17

ROAD (62.72 + 40.34 + 61.69) = 65.26 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90    -14   0.00  73.68   0.00  -7.22  -3.74   0.00   0.00   0.00
62.72
-------------------------------------------------------------------------------
--
   -14     30   0.00  73.68   0.00  -7.22  -6.12   0.00   0.00 -20.00
40.34
-------------------------------------------------------------------------------
--
    30     90   0.00  73.68   0.00  -7.22  -4.77   0.00   0.00   0.00
61.69
-------------------------------------------------------------------------------
--
```

```
Segment Leq : 65.26 dBA


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

Source height = 1.50 m

ROAD (0.00 + 59.70 + 0.00) = 59.70 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
     0     90   0.00  63.96   0.00  -1.25  -3.01   0.00   0.00   0.00
59.70
-------------------------------------------------------------------------
--

Segment Leq : 59.70 dBA

Total Leq All Segments: 66.33 dBA


Barrier table for segment # 1: Merivale (day)
---------------------------------------------

Barrier ! Elev of !  Road   ! Tot Leq !
Height  ! Barr Top!  dBA    !   dBA   !
--------+---------+---------+---------+
  25.50 !   25.50 !   65.26 !   65.26 !
  26.00 !   26.00 !   65.26 !   65.26 !
  26.50 !   26.50 !   65.26 !   65.26 !
  27.00 !   27.00 !   65.26 !   65.26 !
  27.50 !   27.50 !   65.26 !   65.26 !
  28.00 !   28.00 !   65.26 !   65.26 !
  28.50 !   28.50 !   65.26 !   65.26 !
  29.00 !   29.00 !   65.26 !   65.26 !
  29.50 !   29.50 !   65.26 !   65.26 !
  30.00 !   30.00 !   65.26 !   65.26 !


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

Source height = 1.50 m

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

```
-----------+-------------+-------------+--------------
       1.50 !        7.50 !        3.17 !         3.17

ROAD (55.12 + 32.75 + 54.09) = 57.66 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90    -14   0.00  66.08   0.00  -7.22  -3.74   0.00   0.00   0.00
55.12
-------------------------------------------------------------------------
--
   -14     30   0.00  66.08   0.00  -7.22  -6.12   0.00   0.00 -20.00
32.75
-------------------------------------------------------------------------
--
    30     90   0.00  66.08   0.00  -7.22  -4.77   0.00   0.00   0.00
54.09
-------------------------------------------------------------------------
--

Segment Leq : 57.66 dBA


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

Source height = 1.50 m

ROAD (0.00 + 52.10 + 0.00) = 52.10 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
     0     90   0.00  56.36   0.00  -1.25  -3.01   0.00   0.00   0.00
52.10
-------------------------------------------------------------------------
--

Segment Leq : 52.10 dBA

Total Leq All Segments: 58.73 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 66.33
                           (NIGHT): 58.73
```

```
STAMSON 5.0        NORMAL REPORT        Date: 06-06-2023 13:40:39
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Merivale (day/night)
----------------------------------------------
Car traffic volume  : 28336/2464  veh/TimePeriod  *
Medium truck volume :  2254/196   veh/TimePeriod  *
Heavy truck volume  :  1610/140   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  35000
    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: Merivale (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  :  85.00 / 85.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :   0.00 deg   Angle2 : 18.00 deg
Barrier height            :  24.00 m
Barrier receiver distance :  63.00 / 63.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


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

Source height = 1.50 m

Barrier height for grazing incidence
-----------------------------------
```

```
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !        7.50 !        3.05 !         3.05

ROAD (0.00 + 36.14 + 62.16) = 62.17 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
     0     18   0.00  73.68   0.00  -7.53 -10.00   0.00   0.00 -20.00
36.14
-------------------------------------------------------------------------
--
    18     90   0.00  73.68   0.00  -7.53  -3.98   0.00   0.00   0.00
62.16
-------------------------------------------------------------------------
--

Segment Leq : 62.17 dBA

Total Leq All Segments: 62.17 dBA


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

Source height = 1.50 m

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

ROAD (0.00 + 28.55 + 54.57) = 54.58 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
     0     18   0.00  66.08   0.00  -7.53 -10.00   0.00   0.00 -20.00
28.55
-------------------------------------------------------------------------
--
    18     90   0.00  66.08   0.00  -7.53  -3.98   0.00   0.00   0.00
54.57
-------------------------------------------------------------------------
--

Segment Leq : 54.58 dBA
```

```
Total Leq All Segments: 54.58 dBA


TOTAL Leq FROM ALL SOURCES (DAY): 62.17
                           (NIGHT): 54.58
```

```
STAMSON 5.0        NORMAL REPORT        Date: 06-06-2023 15:57:12
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Merivale (day/night)
----------------------------------------------
Car traffic volume  : 28336/2464  veh/TimePeriod  *
Medium truck volume :  2254/196   veh/TimePeriod  *
Heavy truck volume  :  1610/140   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  35000
    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: Merivale (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  :  88.00 / 88.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :  -7.00 deg   Angle2 : 0.00 deg
Barrier height            :  24.00 m
Barrier receiver distance :  66.00 / 66.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


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

```
Road pavement       :     1 (Typical asphalt or concrete)

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

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

Data for Segment # 2: Withrow (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  :  16.00 / 16.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !        7.50 !        3.00 !         3.00

ROAD (62.63 + 31.89 + 0.00) = 62.63 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     -7   0.00  73.68   0.00  -7.68  -3.36   0.00   0.00   0.00
62.63
-------------------------------------------------------------------------------
--
    -7      0   0.00  73.68   0.00  -7.68 -14.10   0.00   0.00 -20.00
31.89
-------------------------------------------------------------------------------
--

Segment Leq : 62.63 dBA
```

```
Results segment # 2: Withrow (day)
----------------------------------

Source height = 1.50 m

ROAD (0.00 + 63.68 + 0.00) = 63.68 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  63.96   0.00  -0.28   0.00   0.00   0.00   0.00
63.68
-------------------------------------------------------------------------
--

Segment Leq : 63.68 dBA

Total Leq All Segments: 66.20 dBA


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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !        7.50 !        3.00 !         3.00

ROAD (55.03 + 24.29 + 0.00) = 55.04 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     -7   0.00  66.08   0.00  -7.68  -3.36   0.00   0.00   0.00
55.03
-------------------------------------------------------------------------
--
    -7      0   0.00  66.08   0.00  -7.68 -14.10   0.00   0.00 -20.00
24.29
-------------------------------------------------------------------------
--

Segment Leq : 55.04 dBA


Results segment # 2: Withrow (night)
```

```
-------------------------------------

Source height = 1.50 m

ROAD (0.00 + 56.08 + 0.00) = 56.08 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     90   0.00  56.36   0.00  -0.28   0.00   0.00   0.00   0.00
56.08
-------------------------------------------------------------------------------
--

Segment Leq : 56.08 dBA

Total Leq All Segments: 58.60 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 66.20
                           (NIGHT): 58.60
```

```
STAMSON 5.0        NORMAL REPORT        Date: 06-06-2023 13:41:43
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


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

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

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

Data for Segment # 1: Withrow (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  :  18.00 / 18.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


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

Source height = 1.50 m

ROAD (0.00 + 60.15 + 0.00) = 60.15 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90      0   0.00  63.96   0.00  -0.79  -3.01   0.00   0.00   0.00
60.15
```

```
-------------------------------------------------------------------------------
--

Segment Leq : 60.15 dBA

Total Leq All Segments: 60.15 dBA


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

Source height = 1.50 m

ROAD (0.00 + 52.56 + 0.00) = 52.56 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90      0   0.00  56.36   0.00  -0.79  -3.01   0.00   0.00   0.00
52.56
-------------------------------------------------------------------------------
--

Segment Leq : 52.56 dBA

Total Leq All Segments: 52.56 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 60.15
                           (NIGHT): 52.56
```

```
STAMSON 5.0        NORMAL REPORT        Date: 06-06-2023 13:43:25
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Merivale (day/night)
----------------------------------------------
Car traffic volume  : 28336/2464  veh/TimePeriod  *
Medium truck volume :  2254/196   veh/TimePeriod  *
Heavy truck volume  :  1610/140   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  35000
    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: Merivale (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  : 121.00 / 121.00 m
Receiver height           :   7.50 / 7.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -31.00 deg   Angle2 : -3.00 deg
Barrier height            :  24.00 m
Barrier receiver distance :  98.00 / 98.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


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

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

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

Data for Segment # 2: Withrow (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  :  51.00 / 51.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :   0.00 deg   Angle2 : 90.00 deg
Barrier height            :   9.00 m
Barrier receiver distance :  35.00 / 35.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !        7.50 !        2.64 !         2.64

ROAD (59.76 + 36.53 + 61.74) = 63.88 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90    -31   0.00  73.68   0.00  -9.07  -4.84   0.00   0.00   0.00
59.76
-------------------------------------------------------------------------------
--
   -31     -3   0.00  73.68   0.00  -9.07  -8.08   0.00   0.00 -20.00
36.53
```

```
-------------------------------------------------------------------------------
--
    -3     90    0.00   73.68    0.00   -9.07   -2.87    0.00    0.00    0.00
61.74
-------------------------------------------------------------------------------
--

Segment Leq : 63.88 dBA


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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !        7.50 !        3.38 !         3.38

ROAD (0.00 + 41.07 + 0.00) = 41.07 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
     0     90    0.00   63.96    0.00   -5.31   -3.01    0.00    0.00 -14.56
41.07
-------------------------------------------------------------------------------
--

Segment Leq : 41.07 dBA

Total Leq All Segments: 63.90 dBA


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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !        7.50 !        2.64 !         2.64

ROAD (52.17 + 28.93 + 54.14) = 56.29 dBA
```

```
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90    -31   0.00  66.08   0.00  -9.07  -4.84   0.00   0.00   0.00
52.17
-------------------------------------------------------------------------
--
   -31     -3   0.00  66.08   0.00  -9.07  -8.08   0.00   0.00 -20.00
28.93
-------------------------------------------------------------------------
--
    -3     90   0.00  66.08   0.00  -9.07  -2.87   0.00   0.00   0.00
54.14
-------------------------------------------------------------------------
--

Segment Leq : 56.29 dBA


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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !        7.50 !        3.38 !         3.38

ROAD (0.00 + 33.48 + 0.00) = 33.48 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
     0     90   0.00  56.36   0.00  -5.31  -3.01   0.00   0.00 -14.56
33.48
-------------------------------------------------------------------------
--

Segment Leq : 33.48 dBA

Total Leq All Segments: 56.31 dBA


TOTAL Leq FROM ALL SOURCES (DAY): 63.90
                           (NIGHT): 56.31
```

```
STAMSON 5.0        NORMAL REPORT        Date: 07-06-2023 12:05:28
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Merivale Rd (day/night)
----------------------------------------------
Car traffic volume  : 28336/2464  veh/TimePeriod  *
Medium truck volume :  2254/196   veh/TimePeriod  *
Heavy truck volume  :  1610/140   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  35000
    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: Merivale Rd (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  :  33.00 / 33.00  m
Receiver height           :  25.50 / 25.50  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 :  10.00 / 10.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


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

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

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

Data for Segment # 2: Withrow (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  :  45.00 / 45.00  m
Receiver height           :  25.50 / 25.50  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 :  28.00 / 28.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Results segment # 1: Merivale Rd (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 !       25.50 !       18.23 !        18.23

ROAD (0.00 + 55.30 + 0.00) = 55.30 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     90   0.00  73.68   0.00  -3.42   0.00   0.00   0.00 -14.95
55.30
-------------------------------------------------------------------------------
--

Segment Leq : 55.30 dBA
```

```
Results segment # 2: Withrow (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 !       25.50 !       10.56 !        10.56

ROAD (0.00 + 41.23 + 0.00) = 41.23 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  63.96   0.00  -4.77   0.00   0.00   0.00 -17.95
41.23
-------------------------------------------------------------------------
--

Segment Leq : 41.23 dBA

Total Leq All Segments: 55.47 dBA


Results segment # 1: Merivale Rd (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 !       25.50 !       18.23 !        18.23

ROAD (0.00 + 47.70 + 0.00) = 47.70 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  66.08   0.00  -3.42   0.00   0.00   0.00 -14.95
47.70
-------------------------------------------------------------------------
--
```

```
Segment Leq : 47.70 dBA


Results segment # 2: Withrow (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 !       25.50 !       10.56 !        10.56

ROAD (0.00 + 33.64 + 0.00) = 33.64 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     90   0.00  56.36   0.00  -4.77   0.00   0.00   0.00 -17.95
33.64
-------------------------------------------------------------------------------
--

Segment Leq : 33.64 dBA

Total Leq All Segments: 47.87 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 55.47
                           (NIGHT): 47.87
```