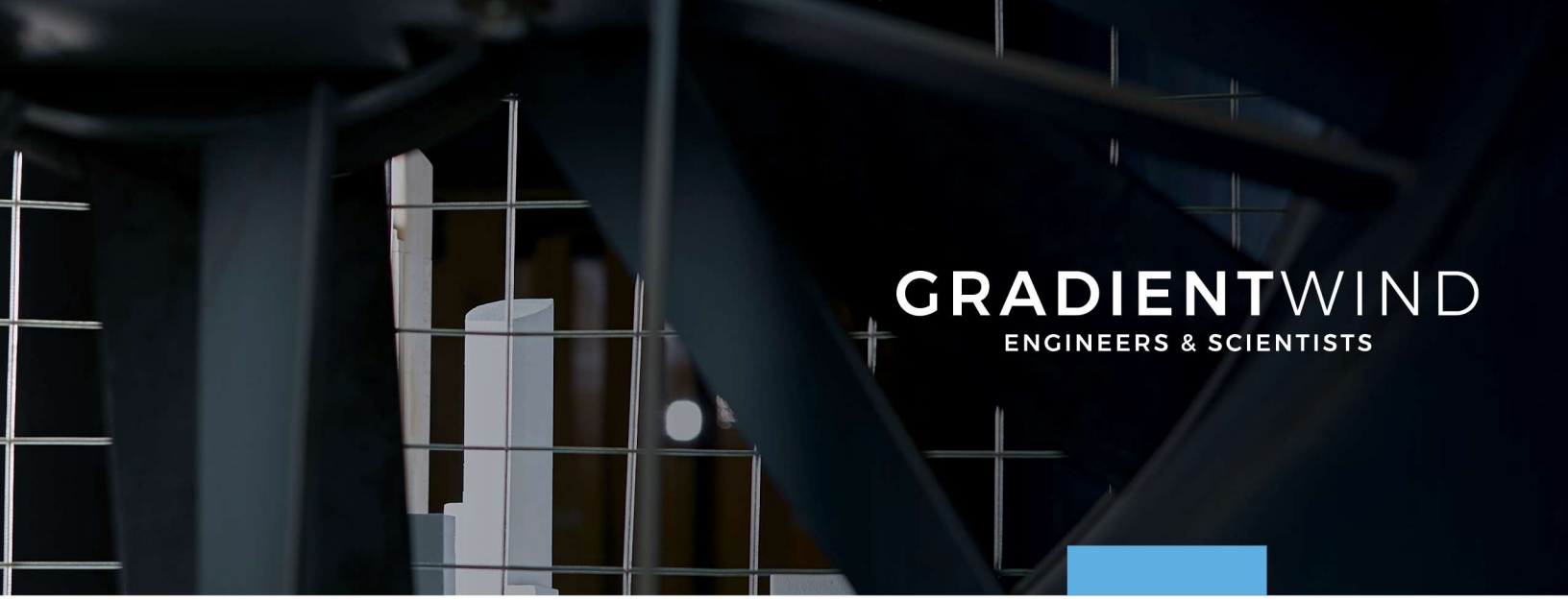

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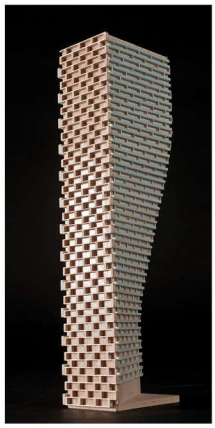
ENGINEERS & SCIENTISTS

ROADWAY TRAFFIC NOISE ASSESSMENT

15 Larch Street
Ottawa, Ontario

REPORT: GW21-386 – Traffic Noise



December 10, 2021

PREPARED FOR

Avenyn Capital Partners
359 Kent Street, Unit 503
Ottawa ON K2P 0R6

PREPARED BY

Tanyon Matheson-Fitchett, B.Eng., Junior Environmental Scientist
Joshua Foster, P.Eng., Principal

EXECUTIVE SUMMARY

This report describes a roadway traffic noise assessment for a proposed 3.5-storey residential apartment building located at 15 Larch Street in Ottawa, Ontario. The study site is located on the north side of Larch Street near the cul-de-sac. The major source roadway traffic noise is Preston Street, a 2-lane arterial roadway. Impacts from the O-Train Line 2 were also analyzed, however roadway traffic along Preston Street is the dominant noise source. Roadways beyond 100 metres of the study site are not included as sources influencing the study site as per ENCG Section 2.1. 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) 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) site plan drawings prepared by Hobin Architecture Inc. in September 2021.

The results of the current analysis indicate that noise levels will range between 41 and 55 dBA during the daytime period (07:00-23:00) and between 35 and 53 dBA during the nighttime period (23:00-07:00). The highest noise level (55 dBA) occurs at the east façade, which is nearest and most exposed to Preston Street. As noise levels do not exceed 65 dBA at the building façades, standard building components in conformance with the Ontario Building Code (OBC 2020) will provide sufficient attenuation and upgraded building components will not be required. Furthermore, as noise levels do not exceed 55 dBA, noise control measures such as ventilation requirements, warning clauses and mitigation will not be required.

Regarding stationary noise, impacts from the surroundings on the study building are expected to be minimal. Sources associated with commercial buildings to the east are at a sufficient setback distance, and smaller units associated with adjacent residential are expected to be in compliance with the MECP's noise guideline NPC-216 - Residential Air Conditioning and City of Ottawa Noise By-Law No. 2017-255. Impacts from the development on the surroundings can be minimized by judicious placement of mechanical equipment such as its placement on a roof or in a mechanical penthouse, or the incorporation of silencers and noise screens as necessary. It is recommended that any large pieces of HVAC equipment be placed in the middle of the roof, avoiding line of site with the surrounding residential dwellings.

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Appendix A – STAMSON 5.04 Input and Output Data and Supporting Information

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Avenyn Capital Partners to undertake a roadway traffic noise assessment for a proposed 3.5-storey residential apartment building located at 15 Larch Street in Ottawa, Ontario. This report summarizes the methodology, results, and recommendations related to the assessment of exterior and interior noise levels generated by local roadway traffic.

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

2. TERMS OF REFERENCE

The focus of this roadway traffic noise assessment is a proposed 3.5-storey residential apartment building located at 15 Larch Street in Ottawa, Ontario. The study site is located on the north side of Larch Street in the middle of a nearly rectangular parcel of land at the end of a row of houses. Surroundings to the proposed development include low-rise residential buildings to the north, east and south, with low rise commercial buildings along Preston Street to the east. To the west of the proposed development is an open field, with the O-Train Line 2 LRT farther to the west. As the train is beyond 75 meters from the study site, a vibration study is not required. Preston Street is located approximately 90 meters to the east of the site. Balconies and terraces extending less than 4 meters from the building façade are not considered as Outdoor Living Areas (OLA) in this assessment as per MECP guidelines, therefore no OLAs are included in the analysis.

The major source roadway traffic noise is Preston Street, a 2-lane arterial roadway. Impacts from the O-Train Line 2 LRT were also analyzed, however roadway traffic along Preston Street is the dominant noise source. Roadways beyond 100 metres of the study site are not included as sources influencing the study site as per ENCG Section 2.1. Figure 1 illustrates a complete site plan with surrounding context.

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

3. OBJECTIVES

The principal objectives of this study are to (i) calculate the future noise levels on the study building 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 and LRT Noise

4.2.1 Criteria for Roadway Traffic and LRT Noise

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

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

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

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.

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

4.2.2 Theoretical Roadway Traffic and LRT 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 or absorptive based on the source-receiver path for each individual receiver.
- Topography was assumed to be a flat/gentle slope surrounding the study building.
- Receptor height was taken to be 10.5 metres at Level 4 for the centre of the window.
- Existing houses and buildings were modelled as barriers, partially obstructing receiver exposure to noise sources.
- Noise receptors were strategically placed at 4 locations around the study area (see Figure 2).
- The O-Train LRT was modelled as a 4-car SRT type in STAMSON.
- Receptor distances and exposure angles are illustrated in Figures 3 and 4.

4.2.1 Roadway Traffic and LRT 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[7] 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. Traffic volumes for the O-Train are based on Gradient Wind's experience on past projects. Table 2 (below) summarizes the AADT values used for each roadway included in this assessment.

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

TABLE 2: ROADWAY TRAFFIC DATA

Segment	Roadway Traffic Data	Speed Limit (km/h)	Traffic Volumes
Preston Street	2-Lane Arterial	50	**15,000**
O-Train Line 2	Light Rail Transit	50	**192/24***

*Daytime/Nighttime volume

5. RESULTS AND DISCUSSION

5.1 Roadway Traffic and LRT Noise Levels

The results of the 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 ROADWAY TRAFFIC AND LRT

Receptor Number	Receptor Height Above Grade (m)	Receptor Location	STAMSON 5.04 Noise Level (dBA)	
			Day	Night
1	10.5	POW – 4th Floor – West Façade	41	35
2	10.5	POW – 4th Floor – South Façade	53	45
3	10.5	POW – 4th Floor – East Façade	55	48
4	10.5	POW – 4th Floor – North Façade	51	53

The results of the current analysis indicate that noise levels will range between 41 and 55 dBA during the daytime period (07:00-23:00) and between 35 and 53 dBA during the nighttime period (23:00-07:00). The highest noise level (55 dBA) occurs at the east façade, which is nearest and most exposed to Preston Street.

6. CONCLUSIONS AND RECOMMENDATIONS

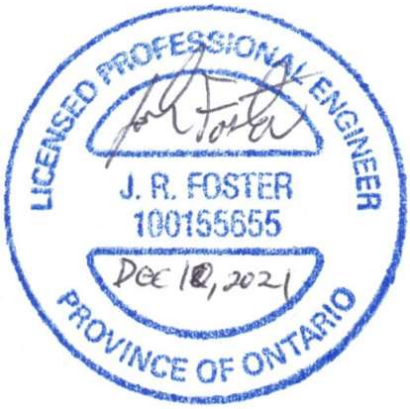
The results of the current analysis indicate that noise levels will range between 41 and 55 dBA during the daytime period (07:00-23:00) and between 35 and 53 dBA during the nighttime period (23:00-07:00). The highest noise level (55 dBA) occurs at the east façade, which is nearest and most exposed to Preston Street. As noise levels do not exceed 65 dBA at the building façades, standard building components in conformance with the Ontario Building Code (OBC 2020) will provide sufficient attenuation and upgraded building components will not be required. Furthermore, as noise levels do not exceed 55 dBA, noise control measures such as ventilation requirements, warning clauses and mitigation will not be required.

Regarding stationary noise, impacts from the surroundings on the study building are expected to be minimal. Sources associated with commercial buildings to the east are at a sufficient setback distance, and smaller units associated with adjacent residential are expected to be in compliance with the MECP's noise guideline NPC-216 - Residential Air Conditioning and City of Ottawa Noise By-Law No. 2017-255. Impacts from the development on the surroundings can be minimized by judicious placement mechanical equipment such as its placement on a roof or in a mechanical penthouse, or the incorporation of silencers and noise screens as necessary. It is recommended that any large pieces of HVAC equipment be placed in the middle of the roof, avoiding line of site with the surrounding residential dwellings.

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.



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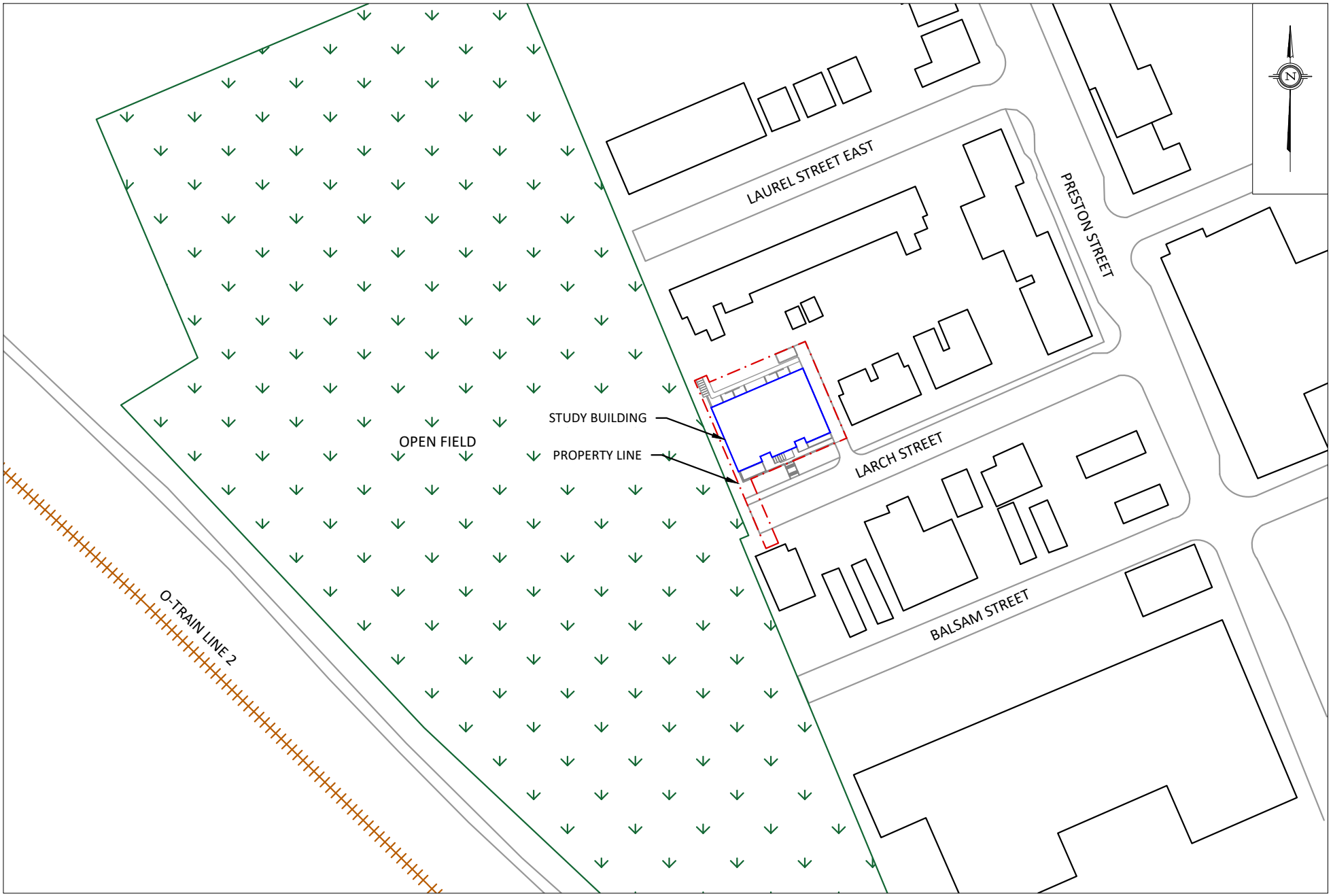
Junior Environmental Scientist

Joshua Foster, P.Eng.
Principal

Gradient Wind File No.: 21-386 - Traffic Noise



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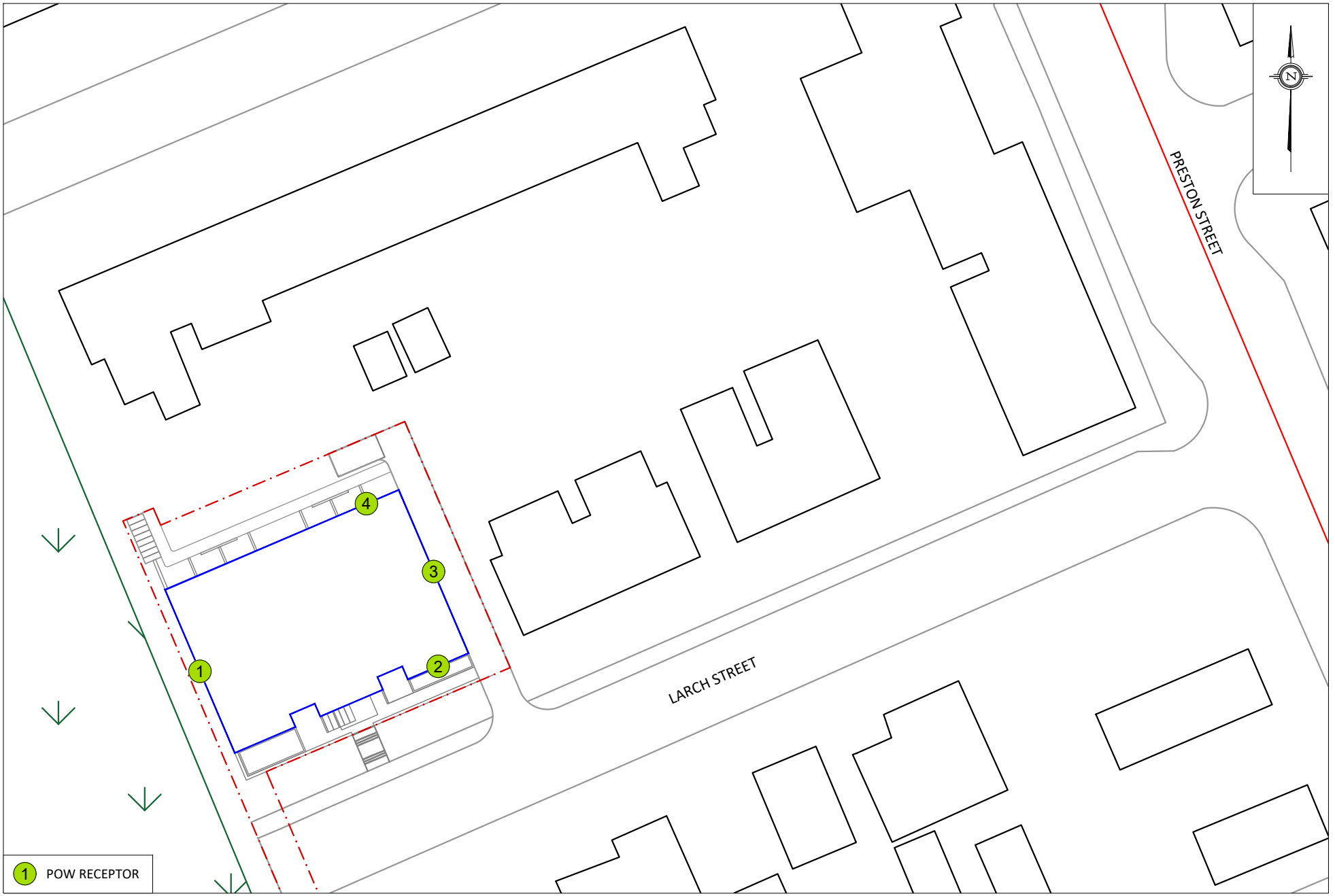
PROJECT	15 LARCH STREET, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:1300 (APPROX.)
DRAWING NO.	GW21-386-1
DATE	DECEMBER 1, 2021
DRAWN BY	T.M.F.

DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT



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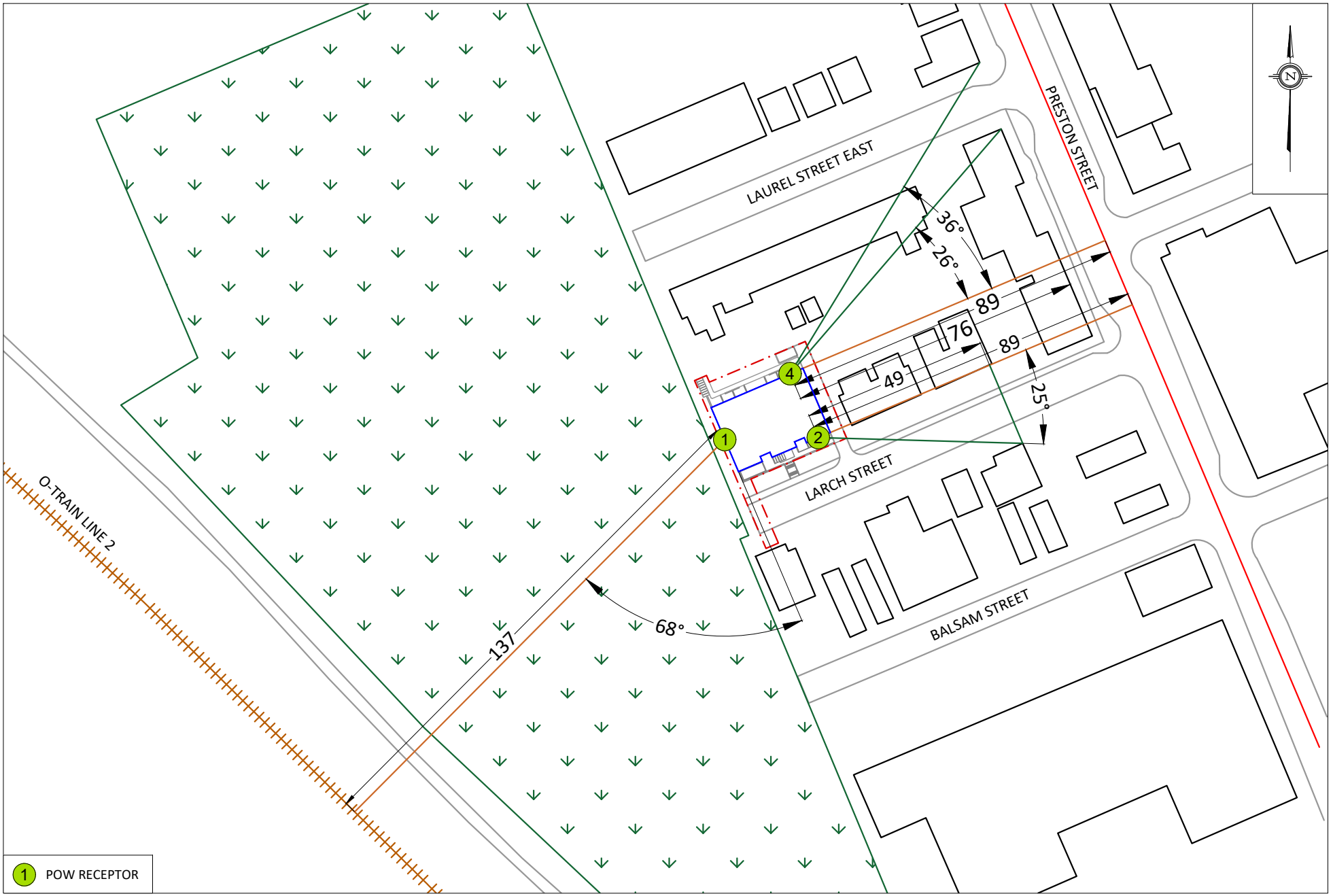
PROJECT	15 LARCH STREET, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		
SCALE	1:500 (APPROX.)	DRAWING NO.	GW21-386-2
DATE	DECEMBER 1, 2021	DRAWN BY	T.M.F.

DESCRIPTION

FIGURE 2:
POINTS OF RECEPTION



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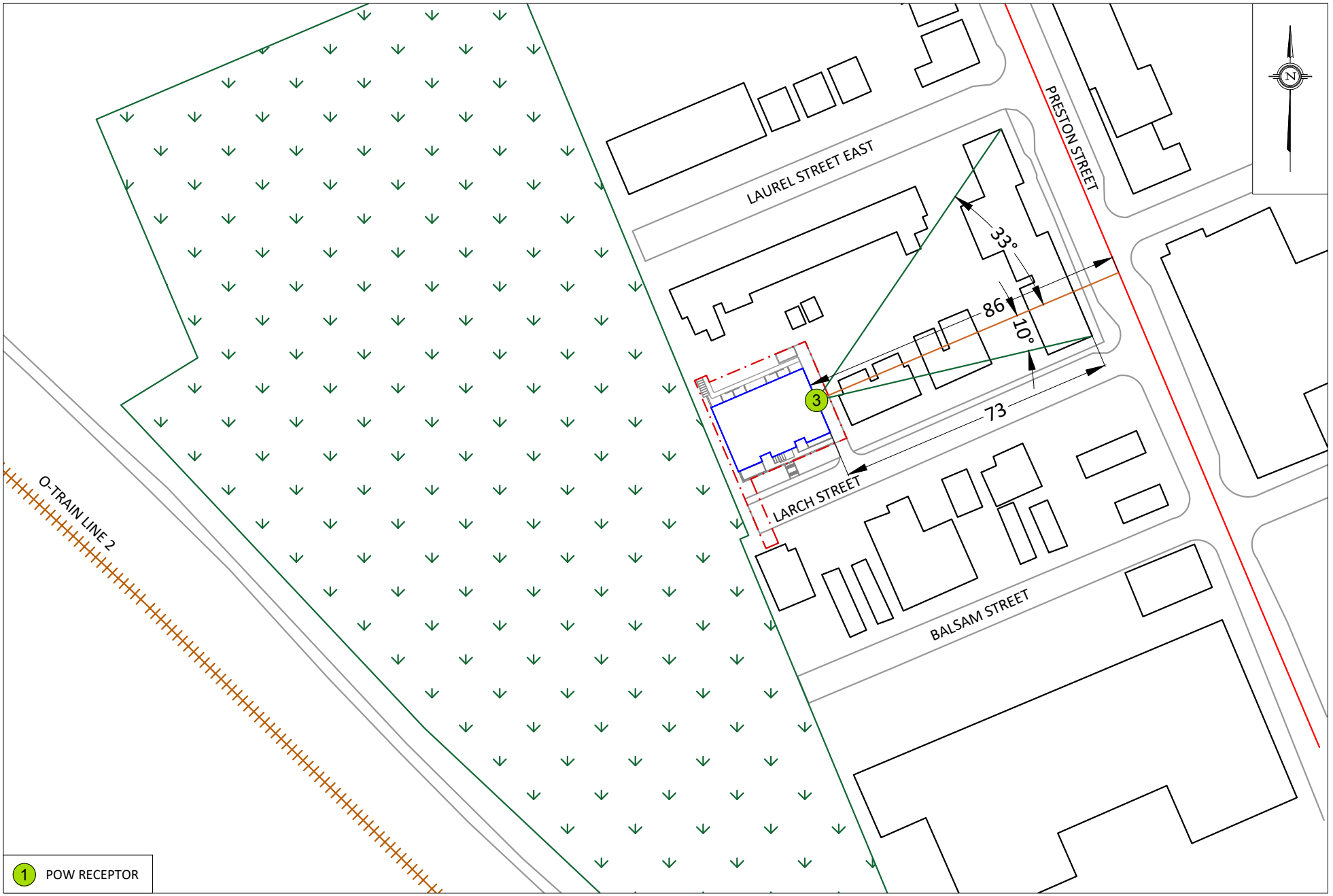
PROJECT	15 LARCH STREET, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:1300 (APPROX.)
DRAWING NO.	GW21-386-3
DATE	DECEMBER 1, 2021
DRAWN BY	T.M.F.

DESCRIPTION

FIGURE 3:
RECEPTORS 1, 2, AND 4 STAMSON INPUT PARAMETERS



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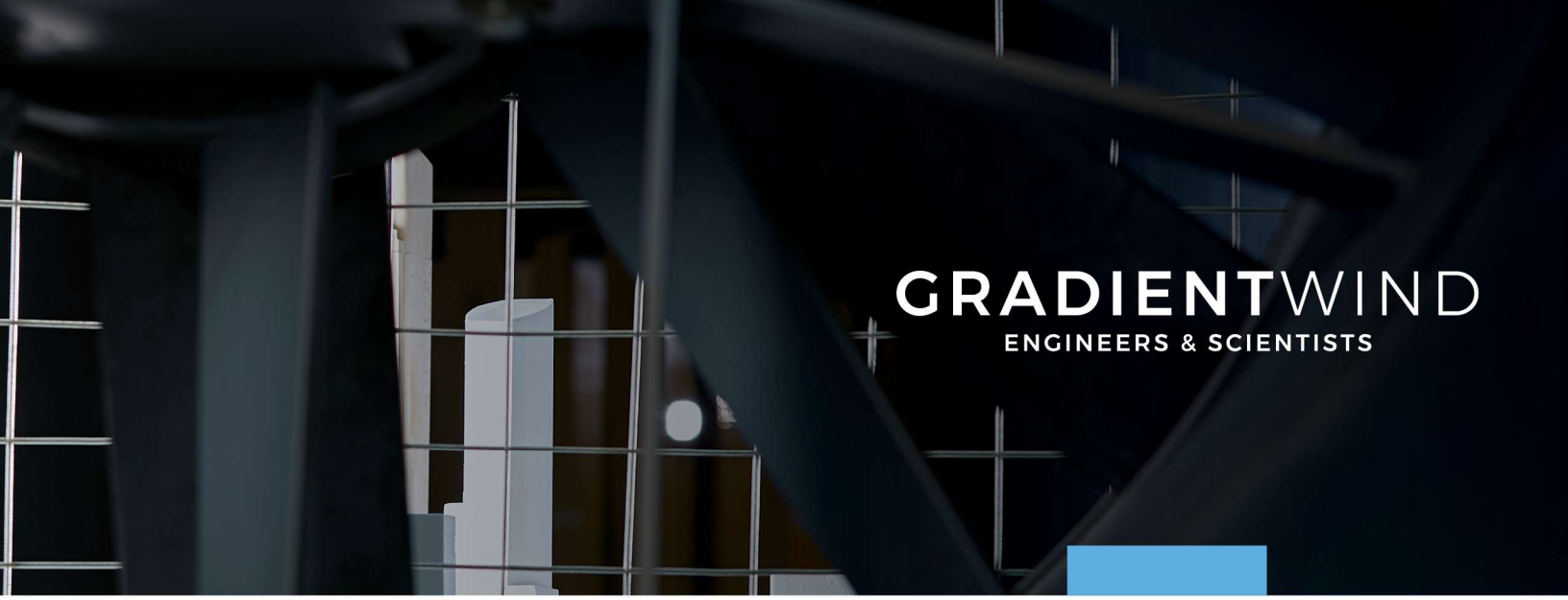
PROJECT	15 LARCH STREET, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:1300 (APPROX.)
DRAWING NO.	GW21-386-4
DATE	DECEMBER 1, 2021
DRAWN BY	T.M.F.

DESCRIPTION

FIGURE 4:
RECEPTOR 3 STAMSON INPUT PARAMETERS



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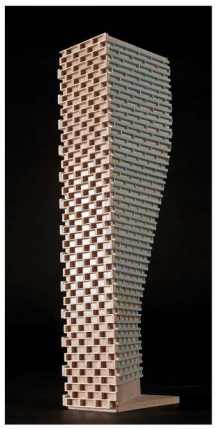

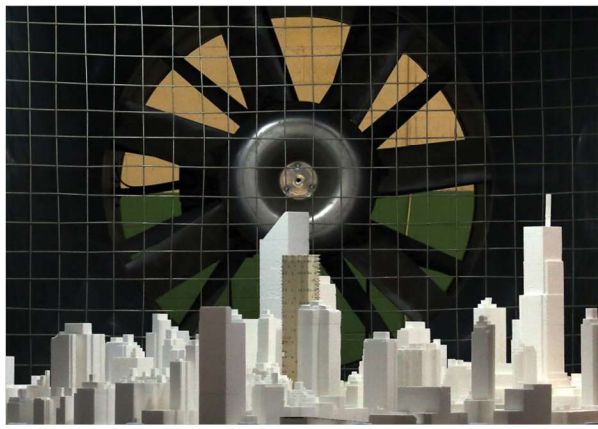

APPENDIX A

STAMSON 5.04 – INPUT AND OUTPUT DATA

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

```
STAMSON 5.0        NORMAL REPORT        Date: 30-11-2021 16:19:58
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


RT/Custom data, segment # 1: LRT Line2 (day/night)
-------------------------------------------------
1 - 4-car SRT:
Traffic volume    :   192/24    veh/TimePeriod
Speed             :    50 km/h

Data for Segment # 1: LRT Line2 (day/night)
-------------------------------------------
Angle1   Angle2           : -68.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 137.00 / 137.00 m
Receiver height           :  10.50 / 10.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Results segment # 1: LRT Line2 (day)
-----------------------------------

Source height = 0.50 m

RT/Custom (0.00 + 41.03 + 0.00) = 41.03 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -68     90   0.42  56.02 -13.64  -1.35   0.00   0.00   0.00  41.03
-------------------------------------------------------------------------

Segment Leq : 41.03 dBA

Total Leq All Segments: 41.03 dBA

Results segment # 1: LRT Line2 (night)
-------------------------------------

Source height = 0.50 m

RT/Custom (0.00 + 35.01 + 0.00) = 35.01 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -68     90   0.42  50.00 -13.64  -1.35   0.00   0.00   0.00  35.01
-------------------------------------------------------------------------

Segment Leq : 35.01 dBA

Total Leq All Segments: 35.01 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 41.03
                           (NIGHT): 35.01
```

```
STAMSON 5.0        NORMAL REPORT        Date: 30-11-2021 16:39:49
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Preston (day/night)
-------------------------------------------
Car traffic volume  : 12144/1056  veh/TimePeriod  *
Medium truck volume :   966/84    veh/TimePeriod  *
Heavy truck volume  :   690/60    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  15000
    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: Preston (day/night)
-----------------------------------------
Angle1   Angle2           :   0.00 deg   25.00 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           :  10.50 / 10.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 2: Preston2 (day/night)
----------------------------------------
Car traffic volume  : 12144/1056  veh/TimePeriod  *
Medium truck volume :   966/84    veh/TimePeriod  *
Heavy truck volume  :   690/60    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  15000
    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: Preston2 (day/night)
----------------------------------------
Angle1   Angle2           :  25.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      2 / 2
House density             :     55 %
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  89.00 / 89.00  m
Receiver height           :  10.50 / 10.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 52.17 + 0.00) = 52.17 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     25   0.00  68.48   0.00  -7.73  -8.57   0.00   0.00   0.00  52.17
-------------------------------------------------------------------------------

Segment Leq : 52.17 dBA

Results segment # 2: Preston2 (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 47.39 + 0.00) = 47.39 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    25     90   0.39  68.48   0.00 -10.75  -5.79   0.00  -4.55   0.00  47.39
-------------------------------------------------------------------------------

Segment Leq : 47.39 dBA

Total Leq All Segments: 53.42 dBA
```

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

Source height = 1.50 m

ROAD (0.00 + 44.58 + 0.00) = 44.58 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     25   0.00  60.88   0.00  -7.73  -8.57   0.00   0.00   0.00  44.58
-------------------------------------------------------------------------------

Segment Leq : 44.58 dBA

Results segment # 2: Preston2 (night)
------------------------------------

Source height = 1.50 m

ROAD (0.00 + 39.79 + 0.00) = 39.79 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    25     90   0.39  60.88   0.00 -10.75  -5.79   0.00  -4.55   0.00  39.79
-------------------------------------------------------------------------------

Segment Leq : 39.79 dBA

Total Leq All Segments: 45.82 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 53.42
                           (NIGHT): 45.82
```

```
STAMSON 5.0        NORMAL REPORT        Date: 30-11-2021 16:39:17
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Preston (day/night)
-------------------------------------------
Car traffic volume  : 12144/1056  veh/TimePeriod  *
Medium truck volume :   966/84    veh/TimePeriod  *
Heavy truck volume  :   690/60    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  15000
    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: Preston (day/night)
-----------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      2 / 2
House density             :     55 %
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  86.00 / 86.00  m
Receiver height           :  10.50 / 10.50  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -33.00 deg   Angle2 : 10.00 deg
Barrier height            :   7.00 m
Barrier receiver distance :  73.00 / 73.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       10.50 !        2.86 !         2.86

ROAD (51.35 + 38.60 + 52.82) = 55.25 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -33   0.00  68.48   0.00  -7.58  -4.99   0.00  -4.56   0.00  51.35
-------------------------------------------------------------------------------
   -33     10   0.00  68.48   0.00  -7.58  -6.22   0.00  -4.56   0.00  50.12
   -33     10   0.00  68.48   0.00  -7.58  -6.22   0.00   0.00 -16.08  38.60
-------------------------------------------------------------------------------
    10     90   0.00  68.48   0.00  -7.58  -3.52   0.00  -4.56   0.00  52.82
-------------------------------------------------------------------------------

Segment Leq : 55.25 dBA

Total Leq All Segments: 55.25 dBA
```

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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       10.50 !        2.86 !         2.86

ROAD (43.75 + 31.00 + 45.22) = 47.65 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -33   0.00  60.88   0.00  -7.58  -4.99   0.00  -4.56   0.00  43.75
-------------------------------------------------------------------------------
   -33     10   0.00  60.88   0.00  -7.58  -6.22   0.00  -4.56   0.00  42.52
   -33     10   0.00  60.88   0.00  -7.58  -6.22   0.00   0.00 -16.08  31.00
-------------------------------------------------------------------------------
    10     90   0.00  60.88   0.00  -7.58  -3.52   0.00  -4.56   0.00  45.22
-------------------------------------------------------------------------------

Segment Leq : 47.65 dBA

Total Leq All Segments: 47.65 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 55.25
                           (NIGHT): 47.65
```

```
STAMSON 5.0        NORMAL REPORT        Date: 30-11-2021 16:42:50
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Preston (day/night)
-------------------------------------------
Car traffic volume  : 12144/1056  veh/TimePeriod  *
Medium truck volume :   966/84    veh/TimePeriod  *
Heavy truck volume  :   690/60    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  15000
    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: Preston (day/night)
-----------------------------------------
Angle1   Angle2           : -36.00 deg   0.00 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           :  10.50 / 10.50  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -26.00 deg   Angle2 : 0.00 deg
Barrier height            :   7.00 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 # 2: Preston2 (day/night)
----------------------------------------------
Car traffic volume  : 12144/1056  veh/TimePeriod  *
Medium truck volume :   966/84    veh/TimePeriod  *
Heavy truck volume  :   690/60    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  15000
    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: Preston2 (day/night)
------------------------------------------
Angle1   Angle2           : -90.00 deg   -36.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      2 / 2
House density             :     55 %
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  89.00 / 89.00  m
Receiver height           :  10.50 / 10.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       10.50 !        2.81 !         2.81

ROAD (48.19 + 36.14 + 0.00) = 48.46 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -36    -26   0.00  68.48   0.00  -7.73 -12.55   0.00   0.00   0.00  48.19
-------------------------------------------------------------------------------
   -26      0   0.00  68.48   0.00  -7.73  -8.40   0.00   0.00 -16.20  36.14
-------------------------------------------------------------------------------

Segment Leq : 48.46 dBA

Results segment # 2: Preston2 (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 46.32 + 0.00) = 46.32 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -36   0.39  68.48   0.00 -10.75  -6.86   0.00  -4.55   0.00  46.32
-------------------------------------------------------------------------------

Segment Leq : 46.32 dBA

Total Leq All Segments: 50.53 dBA
```

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

Source height = 1.50 m

Barrier height for grazing incidence
-----------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       10.50 !        2.81 !         2.81

ROAD (40.60 + 28.55 + 0.00) = 40.86 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -36    -26   0.00  60.88   0.00  -7.73 -12.55   0.00   0.00   0.00  40.60
-------------------------------------------------------------------------------
   -26      0   0.00  60.88   0.00  -7.73  -8.40   0.00   0.00 -16.20  28.55
-------------------------------------------------------------------------------

Segment Leq : 40.86 dBA

Results segment # 2: Preston2 (night)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 38.72 + 0.00) = 38.72 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -36   0.39  60.88   0.00 -10.75  -6.86   0.00  -4.55   0.00  38.72
-------------------------------------------------------------------------------

Segment Leq : 38.72 dBA

Total Leq All Segments: 42.93 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 50.53
                           (NIGHT): 42.93
```