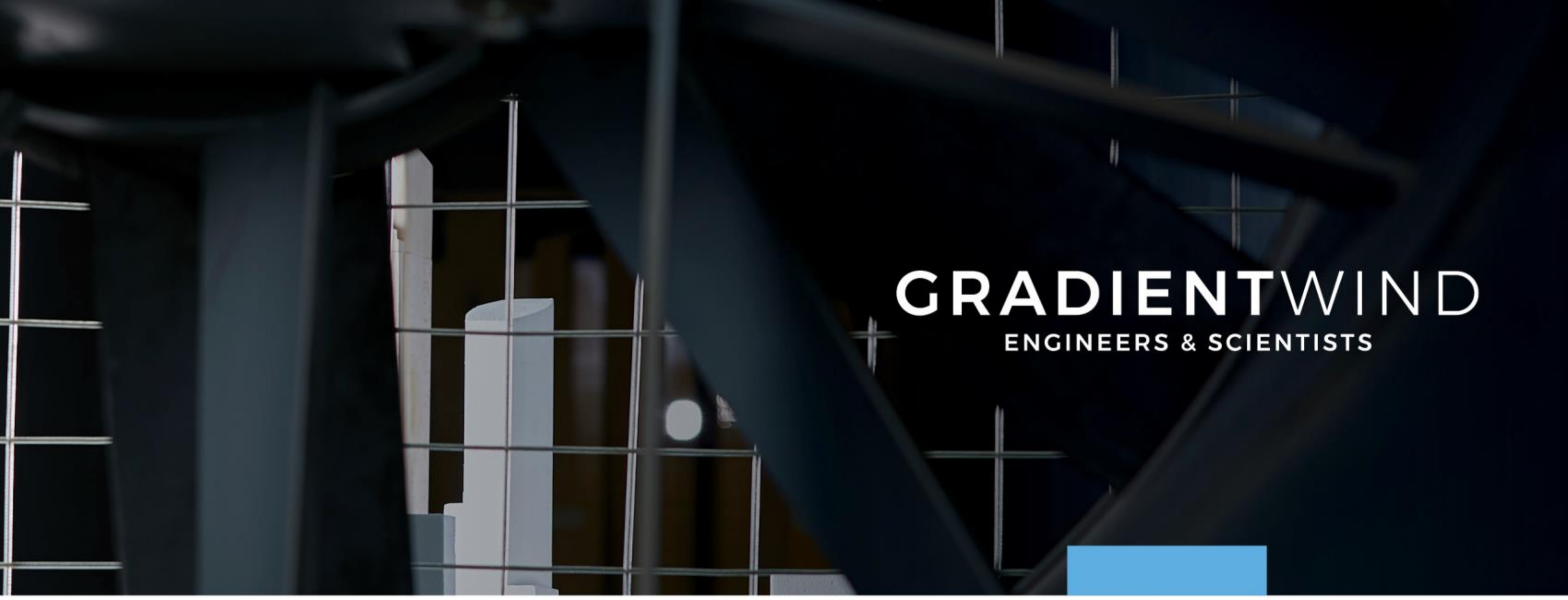
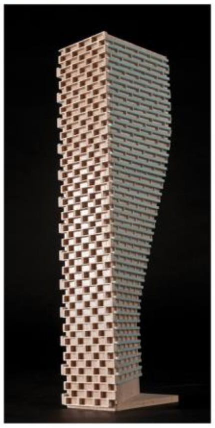
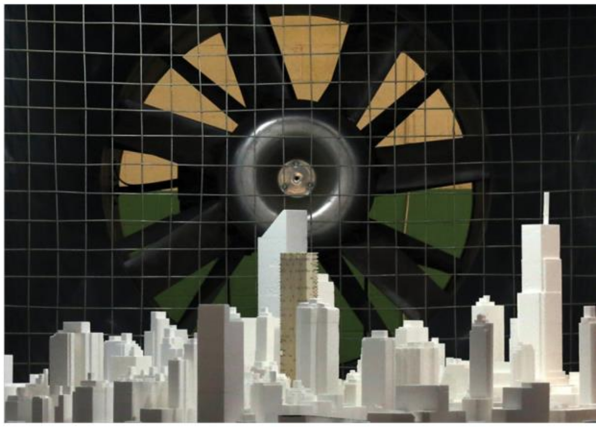


TRANSPORTATION NOISE ASSESSMENT

600 March Road
Ottawa, Ontario

REPORT: 24-158 – Traffic Noise





September 5, 2024

PREPARED FOR
Nokia Canada
600 March Road,
Kanata, ON K2K 2T6

PREPARED BY
Joshua Foster, P.Eng., Lead Engineer

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EXECUTIVE SUMMARY

This report describes a roadway traffic noise assessment undertaken to satisfy the requirements for a Site Plan Control (SPC) application submission for a proposed commercial development located at 600 March Road in Ottawa, Ontario. The proposed campus development comprises an eight-storey office building with a three-storey parking garage linked to one-storey of retail space, a two-storey social café, amenity space, and a five-storey data centre building. The primary sources of noise include March Road and Legget Drive. 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) architectural drawings provided by Gensler in August 2024.

The results of the current analysis indicate that noise levels will range between 58 and 72 dBA during the daytime period (07:00-23:00) and between 50 and 65 dBA during the nighttime period (23:00-07:00). The highest noise level (72 dBA) occurs at the south façade, which is nearest and most exposed to March Road. Building components with a higher Sound Transmission Class (STC) rating will be required where exterior noise levels exceed 65 dBA, as indicated in Figure 4.

Results of the calculations also indicate that the development will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. As noise levels at the sensitive rear amenity area are below 55 dBA, noise mitigation is not required. Warning clauses will also be required to be placed on all Lease, Purchase and Sale Agreements, as summarized in Section 6 of this report.

With regard to stationary noise impacts, there are no significant existing sources of noise surrounding the development. The surrounding area comprises a business park with buildings well spaced from each other. Regarding the impact of the building on the surroundings, the closest noise-sensitive area, the Brook Street Hotel, is more than 100 m away from the site. As such, minimal stationary noise impacts are expected from the development.

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Nokia Canada to undertake a transportation noise assessment to satisfy the requirements for a Site Plan Control (SPC) application submission for a proposed development located at 600 March Road 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 provided by Gensler in August 2024, with future traffic volumes corresponding to the City of Ottawa's Official Plan (OP) roadway classifications.

2. TERMS OF REFERENCE

The proposed campus development comprises an eight-storey office building with a three-storey parking garage linked to one-storey of retail space, a two-storey social café, amenity space, and a five-storey data centre building. The buildings will house offices, retail, and research laboratories, which can be noise-sensitive. The major sources of noise impacting the study site are March Road (Arterial), Legget Drive (Collector), and Terry Fox Road (Major Collector). Figure 1 illustrates the site plan and surrounding context.

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.

---

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

4. METHODOLOGY

4.1 Background

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

4.2 Roadway Traffic Noise

4.2.1 Criteria for Roadway Traffic Noise

For surface roadway traffic noise, the equivalent sound energy level, L_{eq}, provides a measure of the time-varying noise levels, which is well correlated with the annoyance of sound. It is defined as the continuous sound level, which has the same energy as a time-varying noise level over a period of time. For roadways, the L_{eq} is commonly calculated on the basis of a 16-hour (L_{eq16}) daytime (07:00-23:00) / 8-hour (L_{eq8}) nighttime (23:00-07:00) split to assess its impact on residential buildings. The City of Ottawa's Environmental Noise Control Guidelines (ENCG) specify that the recommended indoor noise limit range (that is relevant to this study) is 50, 45, and 40 dBA for retail, office, and private offices, 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 (OLA) is 55 dBA, which applies during the daytime (07:00 to 23:00). When noise levels exceed 55 dBA, mitigation should be provided to reduce noise levels where technically and administratively feasible to acceptable levels at or below the criterion. Furthermore, noise levels at the OLA must not exceed 60 dBA if mitigation can be technically and administratively achieved. For commercial developments, OLAs are not considered.

[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] MOECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.8
[6] 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, as per ENCG requirements for noise level predictions.
- The day/night split for all streets was taken to be 92%/8%, respectively.
- Ground surfaces were taken to be reflective due to the presence of hard (paved) ground.
- Topography was assumed to be a flat/gentle slope surrounding the study building.
- Noise receptors were strategically placed at 6 locations around the study area (see Figure 2).
- For select sources where appropriate, receptors considered the proposed buildings as a barrier partially or fully obstructing exposure to the source, as illustrated by exposure angles in Figure 3.

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[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. 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
March Road	4-Lane Urban Arterial Divided (4-UAD)	80	**35,000**
Legget Drive	2-Lane Urban Collector (2-UCU)	50	**8,000**

4.3 Indoor Noise Calculations

The difference between outdoor and indoor noise levels is the noise attenuation provided by the building envelope. According to common industry practice, complete walls and individual wall elements are rated according to the Sound Transmission Class (STC). The STC ratings of common residential walls built in conformance with the Ontario Building Code (2012) typically exceed STC 35, depending on exterior cladding, thickness, and interior finish details. For example, brick veneer walls can achieve STC 50 or more. Standard commercially sided exterior metal stud walls have around STC 45. Standard, good-quality double-glazed non-operable windows can have STC ratings ranging from 25 to 40, depending on the window manufacturer, pane thickness, and inter-pane spacing. As previously mentioned, the windows are the known weak point in a partition.

As per Section 4.2, when daytime noise levels from road sources at the plane of the window exceed 65 dBA, calculations must be performed to evaluate the sound transmission quality of the building components to ensure acceptable indoor noise levels. The calculation procedure[8] considers:

- Window type and total area as a percentage of total room floor area
- Exterior wall type and total area as a percentage of the total room floor area
- Acoustic absorption characteristics of the room
- Outdoor noise source type and approach geometry
- Indoor sound level criteria, which varies according to the intended use of a space

[8] Building Practice Note: Controlling Sound Transmission into Buildings by J.D. Quirt, National Research Council of Canada, September 1985

Based on published research[9], exterior walls possess specific sound attenuation characteristics that are used as a basis for calculating the required STC ratings of windows in the same partition. Due to the limited information available at the time of the study, which was prepared for site plan approval, detailed floor layouts and building elevations have not been finalized; therefore, detailed STC calculations could not be performed at this time. As a guideline, the anticipated STC requirements for windows have been estimated based on the overall noise reduction required for each intended use of space (STC = outdoor noise level – targeted indoor noise levels + safety factor).

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 is available in Appendix A.

TABLE 3: EXTERIOR NOISE LEVELS DUE TO ROAD TRAFFIC

Receptor Number	Receptor Height Above Grade (m)	Receptor Location	STAMSON 5.04 Noise Level (dBA)	
			Day	Night
1	40	POW – 8th Floor Office– South Façade	72	65
2	40	POW – 8th Floor Office – East Façade	68	61
3	40	POW – 8th Floor Office – West Façade	66	59
4	40	POW – 8th Floor Office – North Façade	58	50
5	20	POW – 4th Floor Data Centre – West Façade	62	54
6	20	POW – 4th Floor Data Centre – North Façade	65	50

The results of the current analysis indicate that noise levels will range between 58 and 72 dBA during the daytime period (07:00-23:00) and between 50 and 65 dBA during the nighttime period (23:00-07:00). The highest noise level (72 dBA) occurs at the south façade, which is nearest and most exposed to March Road.

[9] CMHC, Road & Rail Noise: Effects on Housing

5.2 Noise Control Measures

The noise levels predicted due to roadway traffic exceed the criteria listed in Section 4.2 for building components. As discussed in Section 4.3, the anticipated STC requirements for windows have been estimated based on the overall noise reduction required for each intended use of space (STC = outdoor noise level – targeted indoor noise levels + safety factor). The STC requirements for the windows are summarized below for various units within the development (see Figure 4):

- **Office/Retail Windows**

(i) Office/retail area windows facing east, west, and south will require a minimum STC of 30, including spandrel panels, window walls and curtainwall elements.

(ii) All other office/reception area windows are to satisfy Ontario Building Code (OBC 2012) requirements, including the data centre.

The STC requirements apply to windows, doors, spandrel panels, and curtainwall elements. Exterior wall components on these façades are recommended to have a minimum STC of 45, where a punch window and stud wall system may be used. A review of window supplier literature indicates that the specified STC ratings can be achieved by a variety of window systems having a combination of glass thickness and inter-pane spacing. We have specified an example window configuration; however, several manufacturers and various combinations of window components, such as those proposed, will offer the necessary sound attenuation rating. It is the responsibility of the manufacturer to ensure that the specified window achieves the required STC. This can only be assured by using window configurations that have been certified by laboratory testing. The requirements for STC ratings assume that the remaining components of the building are constructed and installed according to the minimum standards of the Ontario Building Code. The specified STC requirements also apply to swinging and/or sliding patio doors.

Results of the calculations also indicate that the development will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. In addition to ventilation requirements, warning clauses will also be required in all Lease, Purchase and Sale Agreements, as summarized in Section 6.

6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current analysis indicate that noise levels will range between 58 and 72 dBA during the daytime period (07:00-23:00) and between 50 and 65 dBA during the nighttime period (23:00-07:00). The highest noise level (72 dBA) occurs at the south façade, which is nearest and most exposed to March Road. Building components with a higher Sound Transmission Class (STC) rating will be required where exterior noise levels exceed 65 dBA, as indicated in Figure 4.

Results of the calculations also indicate that the development will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. The following Type D Warning Clause[10] will also be required to be placed on all Lease, Purchase and Sale Agreements, as summarized below:

> *"This office 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."*

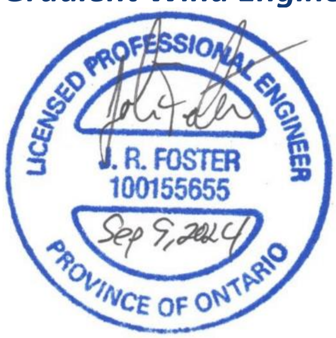
With regard to stationary noise impacts, there are no significant existing sources of noise surrounding the development. The surrounding area comprises a business park with buildings well spaced from each other. Regarding the impact of the building on surroundings, the closest noise-sensitive area, the Brook Street Hotel, is more than 100 m away from the site. As such, minimal stationary noise impacts are expected from the development.

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

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

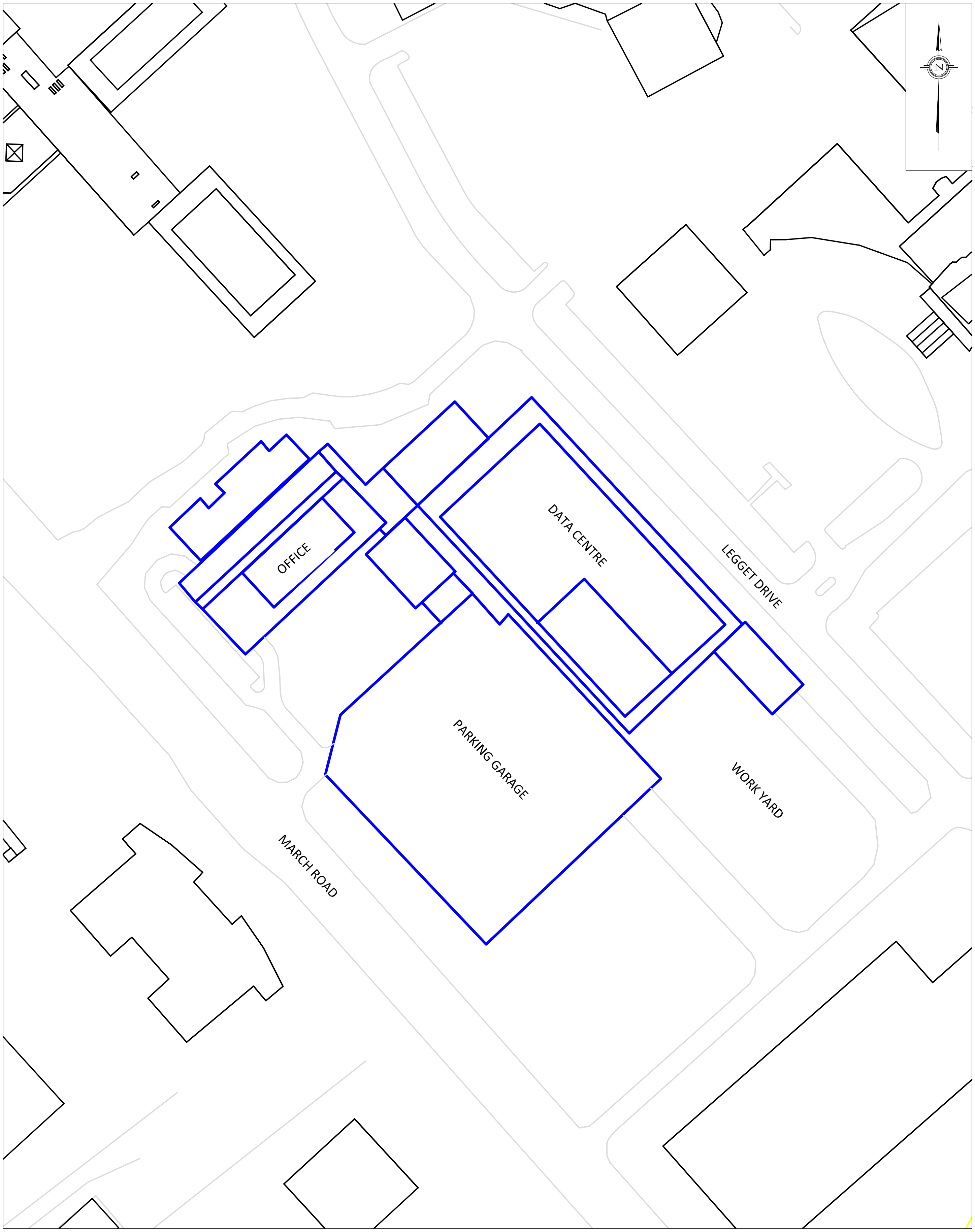
Sincerely,

Gradient Wind Engineering Inc.



Joshua Foster, P.Eng.
Lead Engineer

Gradient Wind File #24-158-Traffic Noise



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ENGINEERS & SCIENTISTS

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PROJECT	600 MARCH ROAD, OTTAWA TRANSPORTATION NOISE ASSESSMENT		DESCRIPTION
SCALE	1:2,000 (APPROX.)	DRAWING NO. GW24-158-1	FIGURE 1: SITE PLAN AND SURROUNDING CONTEXT
DATE	SEPTEMBER 3,2024	DRAWN BY J.F.	

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PROJECT	600 MARCH ROAD, OTTAWA TRANSPORTATION NOISE ASSESSMENT		
SCALE	1:2,000 (APPROX.)	DRAWING NO.	GW24-158-2
DATE	SEPTEMBER 3, 2024	DRAWN BY	J.F.

DESCRIPTION

FIGURE 2:
RECEPTOR LOCATIONS

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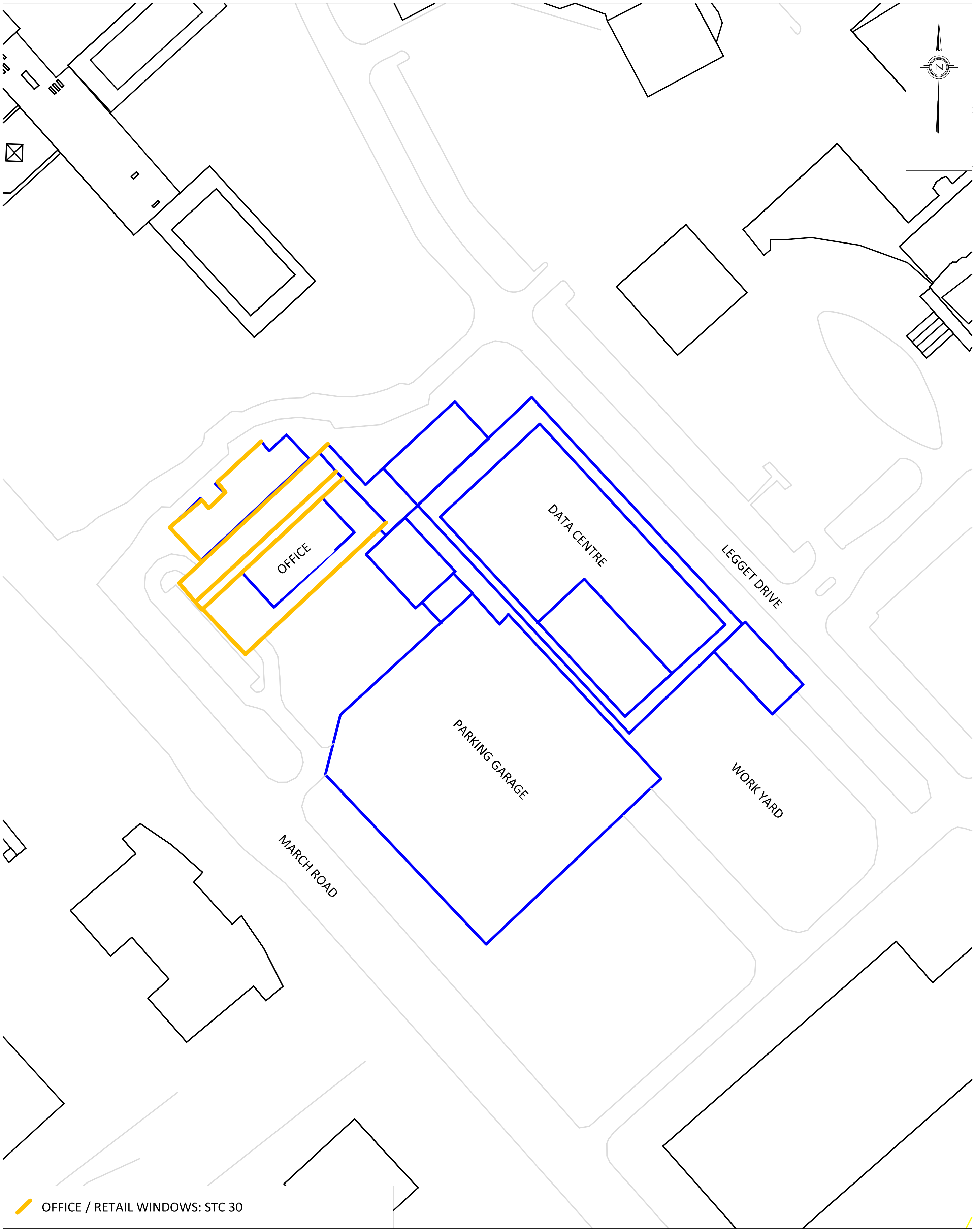
PROJECT	600 MARCH ROAD, OTTAWA TRANSPORTATION NOISE ASSESSMENT
SCALE	1:2,000 (APPROX.)
DRAWING NO.	GW24-158-3
DATE	SEPTEMBER 3, 2024
DRAWN BY	J.F.
DESCRIPTION	FIGURE 3: STAMSON - DISTANCES AND EXPOSURE ANGLES



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PROJECT		DESCRIPTION
600 MARCH ROAD, OTTAWA TRANSPORTATION NOISE ASSESSMENT		FIGURE 4: WINDOW STC REQUIRMENTS
SCALE 1:2,000 (APPROX.)	DRAWING NO. GW24-158-1	
DATE SEPTEMBER 3,2024	DRAWN BY J.F.	

APPENDIX A

STAMSON 5.04 – INPUT AND OUTPUT DATA

127 WALGREEN ROAD, OTTAWA, ON, CANADA K0A 1L0 | 613 836 0934
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```
STAMSON 5.0         NORMAL REPORT        Date: 30-08-2024 14:56:54
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: R1                         Time Period: Day/Night 16/8 hours
Description: POW South Facade

Road data, segment # 1: March 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    :    80 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: March 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  :  37.00 / 37.00  m
Receiver height           :  40.00 / 40.00  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: March Rd (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 72.25 + 0.00) = 72.25 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -90     90   0.00  76.17   0.00  -3.92   0.00   0.00   0.00   0.00  72.25
----------------------------------------------------------------------------

Segment Leq : 72.25 dBA

Total Leq All Segments: 72.25 dBA
```

```
Results segment # 1: March Rd (night)
-------------------------------------

Source height = 1.50 m

ROAD (0.00 + 64.65 + 0.00) = 64.65 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -90     90   0.00  68.57   0.00  -3.92   0.00   0.00   0.00   0.00  64.65
--------------------------------------------------------------------------------

Segment Leq : 64.65 dBA

Total Leq All Segments: 64.65 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 72.25
                         (NIGHT): 64.65
```

```
STAMSON 5.0        NORMAL REPORT        Date: 30-08-2024 15:00:51
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: R2                      Time Period: Day/Night 16/8 hours
Description: POW South Facade

Road data, segment # 1: March 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  :    80 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: March Rd (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  :  48.00 / 48.00  m
Receiver height           :  40.00 / 40.00  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: March Rd (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 68.10 + 0.00) = 68.10 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -90      0   0.00  76.17   0.00  -5.05  -3.01   0.00   0.00   0.00  68.10
----------------------------------------------------------------------------

Segment Leq : 68.10 dBA

Total Leq All Segments: 68.10 dBA
```

```
Results segment # 1: March Rd (night)
-------------------------------------

Source height = 1.50 m

ROAD (0.00 + 60.51 + 0.00) = 60.51 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -90      0   0.00  68.57   0.00  -5.05  -3.01   0.00   0.00   0.00  60.51
----------------------------------------------------------------------------

Segment Leq : 60.51 dBA

Total Leq All Segments: 60.51 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 68.10
                         (NIGHT): 60.51
```

```
STAMSON 5.0          NORMAL REPORT          Date: 30-08-2024 15:33:23
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: R3                          Time Period: Day/Night 16/8 hours
Description: POW West Facade

Road data, segment # 1: March 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  :    80 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: March Rd (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  :  74.00 / 74.00  m
Receiver height           :  40.00 / 40.00  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Road data, segment # 2: Legget Dr (day/night)
---------------------------------------------
Car traffic volume  :  6477/563   veh/TimePeriod  *
Medium truck volume :   515/45    veh/TimePeriod  *
Heavy truck volume  :   368/32    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

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

```
Data for Segment # 2: Legget Dr (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  : 128.00 / 128.00 m
Receiver height           :  40.00 / 40.00  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: March Rd (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 66.22 + 0.00) = 66.22 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
     0     90   0.00  76.17   0.00  -6.93  -3.01   0.00   0.00   0.00  66.22
----------------------------------------------------------------------------

Segment Leq : 66.22 dBA

Results segment # 2: Legget Dr (day)
------------------------------------

Source height = 1.50 m

ROAD (0.00 + 53.43 + 0.00) = 53.43 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -90      0   0.00  65.75   0.00  -9.31  -3.01   0.00   0.00   0.00  53.43
----------------------------------------------------------------------------

Segment Leq : 53.43 dBA

Total Leq All Segments: 66.44 dBA

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

Source height = 1.50 m

ROAD (0.00 + 58.63 + 0.00) = 58.63 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
     0     90   0.00  68.57   0.00  -6.93  -3.01   0.00   0.00   0.00  58.63
----------------------------------------------------------------------------

Segment Leq : 58.63 dBA
```

```
Results segment # 2: Legget Dr (night)
--------------------------------------

Source height = 1.50 m

ROAD (0.00 + 45.84 + 0.00) = 45.84 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -90      0   0.00  58.16   0.00  -9.31  -3.01   0.00   0.00   0.00  45.84
----------------------------------------------------------------------------

Segment Leq : 45.84 dBA

Total Leq All Segments: 58.85 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 66.44
                         (NIGHT): 58.85
```

```
STAMSON 5.0        NORMAL REPORT        Date: 30-08-2024 15:56:25
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: R4                         Time Period: Day/Night 16/8 hours
Description: POW North Facade Data Centre

Road data, segment # 1: Legget (day/night)
------------------------------------------
Car traffic volume  :  6477/563   veh/TimePeriod  *
Medium truck volume :   515/45    veh/TimePeriod  *
Heavy truck volume  :   368/32    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

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

Data for Segment # 1: Legget (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  :  91.00 / 91.00  m
Receiver height           :  40.00 / 40.00  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

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

Source height = 1.50 m

ROAD (0.00 + 57.92 + 0.00) = 57.92 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -90     90   0.00  65.75   0.00  -7.83   0.00   0.00   0.00   0.00  57.92
----------------------------------------------------------------------------

Segment Leq : 57.92 dBA

Total Leq All Segments: 57.92 dBA
```

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

Source height = 1.50 m

ROAD (0.00 + 50.33 + 0.00) = 50.33 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -90     90   0.00  58.16   0.00  -7.83   0.00   0.00   0.00   0.00  50.33
----------------------------------------------------------------------------

Segment Leq : 50.33 dBA

Total Leq All Segments: 50.33 dBA

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

```
STAMSON 5.0        NORMAL REPORT       Date: 30-08-2024 15:50:06
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: R5                         Time Period: Day/Night 16/8 hours
Description: POW West Facade Data Centre

Road data, segment # 1: March 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  :    80 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: March Rd (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  : 157.00 / 157.00 m
Receiver height           :  20.00 / 20.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :   5.00 deg   Angle2 : 51.00 deg
Barrier height            :  40.00 m
Barrier receiver distance : 122.00 / 122.00 m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Road data, segment # 2: Legget Dr (day/night)
---------------------------------------------
Car traffic volume  :  6477/563   veh/TimePeriod  *
Medium truck volume :   515/45    veh/TimePeriod  *
Heavy truck volume  :   368/32    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

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

```
Data for Segment # 2: Legget Dr (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  :  47.00 / 47.00  m
Receiver height           :  20.00 / 20.00  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: March 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 !        20.00 !         5.62 !          5.62

ROAD (50.41 + 40.04 + 59.33) = 59.90 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
     0      5   0.00  76.17   0.00 -10.20 -15.56   0.00   0.00   0.00  50.41
----------------------------------------------------------------------------
     5     51   0.00  76.17   0.00 -10.20  -5.93   0.00   0.00 -20.00  40.04
----------------------------------------------------------------------------
    51     90   0.00  76.17   0.00 -10.20  -6.64   0.00   0.00   0.00  59.33
----------------------------------------------------------------------------

Segment Leq : 59.90 dBA

Results segment # 2: Legget Dr (day)
------------------------------------

Source height = 1.50 m

ROAD (0.00 + 57.78 + 0.00) = 57.78 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -90      0   0.00  65.75   0.00  -4.96  -3.01   0.00   0.00   0.00  57.78
----------------------------------------------------------------------------

Segment Leq : 57.78 dBA

Total Leq All Segments: 61.98 dBA
```

```
Results segment # 1: March 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 !       20.00 !        5.62 !         5.62

ROAD (42.81 + 32.45 + 51.73) = 52.30 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------------
     0      5   0.00  68.57   0.00 -10.20 -15.56   0.00   0.00   0.00  42.81
-----------------------------------------------------------------------------
     5     51   0.00  68.57   0.00 -10.20  -5.93   0.00   0.00 -20.00  32.45
-----------------------------------------------------------------------------
    51     90   0.00  68.57   0.00 -10.20  -6.64   0.00   0.00   0.00  51.73
-----------------------------------------------------------------------------

Segment Leq : 52.30 dBA

Results segment # 2: Legget Dr (night)
--------------------------------------

Source height = 1.50 m

ROAD (0.00 + 50.19 + 0.00) = 50.19 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------------
   -90      0   0.00  58.16   0.00  -4.96  -3.01   0.00   0.00   0.00  50.19
-----------------------------------------------------------------------------

Segment Leq : 50.19 dBA

Total Leq All Segments: 54.38 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.98
                         (NIGHT): 54.38
```

```
STAMSON 5.0        NORMAL REPORT        Date: 30-08-2024 16:00:11
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: R6                       Time Period: Day/Night 16/8 hours
Description: POW North Facade gData Centre

Road data, segment # 1: Legget (day/night)
------------------------------------------
Car traffic volume  :  6477/563   veh/TimePeriod  *
Medium truck volume :   515/45    veh/TimePeriod  *
Heavy truck volume  :   368/32    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

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

Data for Segment # 1: Legget (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  :  20.00 / 91.00  m
Receiver height           :  20.00 / 40.00  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

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

Source height = 1.50 m

ROAD (0.00 + 64.50 + 0.00) = 64.50 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -90     90   0.00  65.75   0.00  -1.25   0.00   0.00   0.00   0.00  64.50
----------------------------------------------------------------------------

Segment Leq : 64.50 dBA

Total Leq All Segments: 64.50 dBA
```

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

Source height = 1.50 m

ROAD (0.00 + 50.33 + 0.00) = 50.33 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -90     90   0.00  58.16   0.00  -7.83   0.00   0.00   0.00   0.00  50.33
----------------------------------------------------------------------------

Segment Leq : 50.33 dBA

Total Leq All Segments: 50.33 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 64.50
                         (NIGHT): 50.33
```