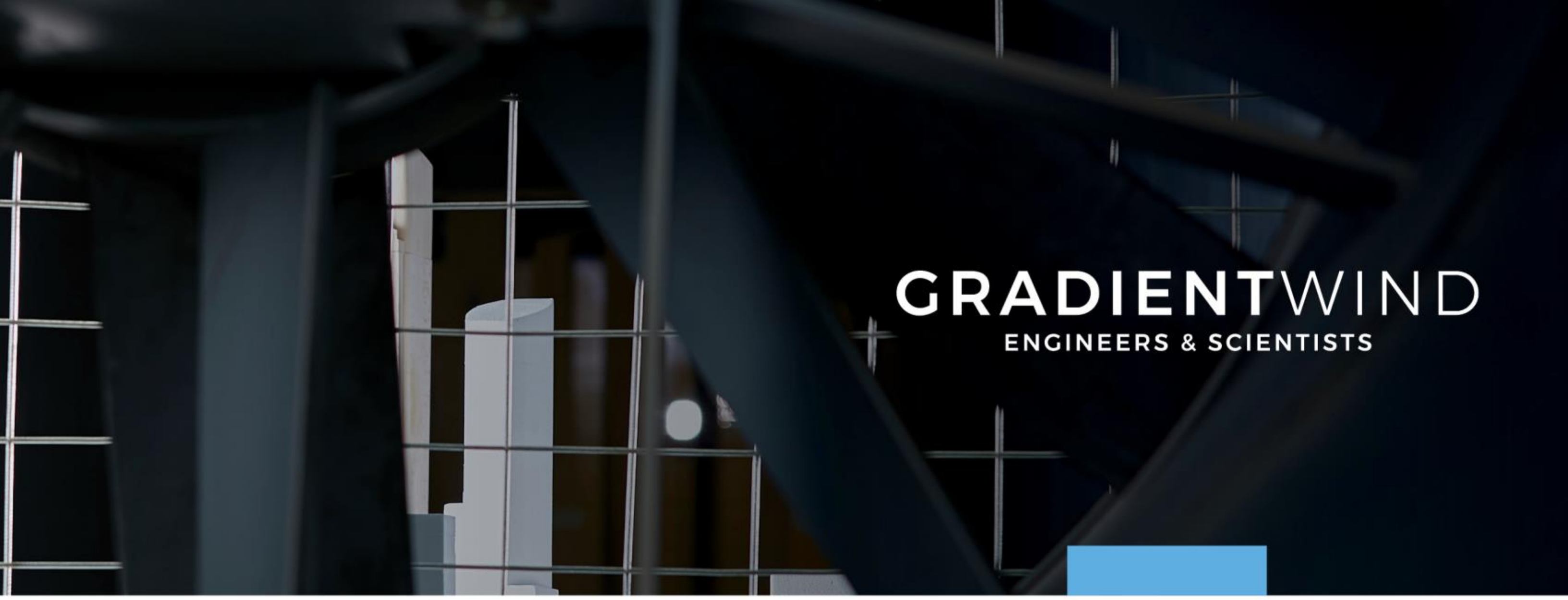

GRADIENTWIND
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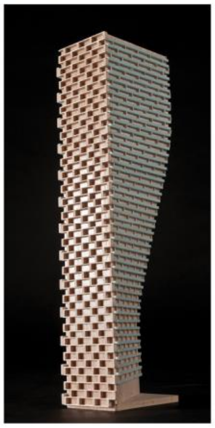
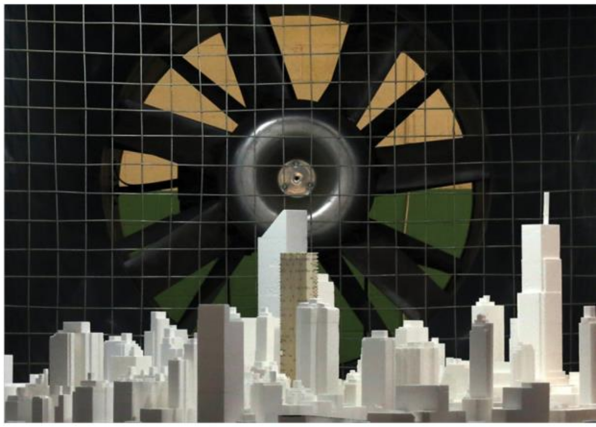
ROADWAY TRAFFIC NOISE FEASIBILITY ASSESSMENT

1640-1660 Carling Ave
Ottawa, Ontario

GRADIENT WIND REPORT: 22-224 – Roadway Traffic Noise





January 20, 2023

PREPARED FOR
RioCan Real Estate Investment Trust
2300 Yonge Street, Suite 500
Toronto ON, M4P 1E4

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 in support of a Zoning-By-law Amendment (ZBA) application for the property located at 1640-1660 Carling Avenue in Ottawa, Ontario. The proposed development comprises a combination of 5 high-rise and 1 mid-rise mixed-use and residential buildings. The major sources of noise include Carling Avenue, the Queensway/Trans-Canada Highway, and Churchill Avenue North. 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 provided by Hobin Architecture, dated November 2022. The site to the south of the proposed development has acquired zoning approval for an 8-building mixed-use development. Due to the uncertain time scales of the development, the massing of the adjacent site was conservatively ignored.

Noise levels at buildings 1 – 6 exceed the 65 dBA criterion; therefore, upgraded building components with higher Sound Transmission Class (STC) ratings will be required at select facades. Furthermore, air conditioning, or a similar mechanical system, will be required to keep a comfortable indoor living environment when windows are open. Warning Clauses will also be required be placed on all Lease, Purchase and Sale Agreements for all buildings. If the podium roofs were to be used as outdoor amenity spaces, noise barriers protecting these areas will be required. Specific noise control measures can be developed once the design of the buildings has progressed sufficiently, typically at the time of the site plan control application.

With regard to stationary noise impacts, a stationary noise study is recommended for the site during the detailed design once mechanical plans for the proposed development becomes available. This study would assess impacts of stationary noise from rooftop mechanical units serving the proposed buildings on surrounding noise sensitive areas. As the mechanical equipment will primarily reside in the mechanical level located on the high roof, noise levels on the surrounding noise sensitive properties are expected to be negligible. Noise impacts can generally be minimized by judicious selection and placement of the equipment.

Stationary noise impacts from the surrounding environment onto the proposed development are expected to be minimal. The site is surrounded by low-rise commercial properties in all compass directions with residential dwellings further north, none of which support large mechanical equipment. The dominant source of noise across the site is expected to be due to roadway traffic.

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by RioCan REIT to undertake a roadway traffic noise feasibility assessment for the property located at 1640-1660 Carling Avenue in Ottawa, Ontario. This report summarizes the methodology, results, and recommendations related to the assessment of exterior 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 Hobin Architecture, dated November 2022, with future traffic volumes corresponding to the City of Ottawa's Official Plan (OP) roadway classifications.

2. TERMS OF REFERENCE

The subject site is located at 1640-1660 Carling Avenue in Ottawa, Ontario; situated on a parcel of land bounded by Carling Avenue to the North, Clyde Avenue North to the west, and low-rise commercial developments to the east and south. To the south of the study site is a proposed development comprising of three 30-storey residential towers, three 25-storey residential towers, and an 8-storey residential building. While the adjacent development has received zoning approval, given the unknown time scale of development, the massing of the site was conservatively ignored in this study. Once the adjacent site is fully buildout, it would provide a screening benefit for the RioCan site. The relevant sources of roadway noise considered in this study are Carling Avenue, the Queensway/Trans-Canada Highway, and Churchill Avenue North.

The proposed development comprises one mid-rise and 5 high-rise buildings: Buildings 1,2,3,4,5, and 6; oriented northeast clockwise to the north of the subject site. Two public streets are proposed: one connected to Clyde Avenue North from the west, and the second connected to Carling Avenue from the north. Two public parks are proposed: one situated towards the center of the subject site and another between Building 3 and Building 4. A public plaza is located at the northwest corner.

---

[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

Building 1 is a 22-storey residential building, inclusive of a 4-storey podium. For the purposes of this study, the podium roof was considered as a potential outdoor amenity space or terrace, and thus considered as an Outdoor Living Area (OLA). Building 2 is a 30-storey residential building, inclusive of a 4-storey podium. Similarly to Building 1, the podium roof was considered as an OLA. Building 3 is a 9-storey residential building, inclusive of a 4-storey podium. As the podium extends less than 4m in depth, this rooftop was not considered as an OLA. Building 4 is a 20-storey residential condo building, inclusive of a 4-storey podium. Building 5 is a 37-storey mixed-use building, with a 6-storey podium. Finally, Building 6 is a 40-storey mixed-use building, inclusive of a 6-storey podium. Podium rooftops for buildings 4-6 were also considered as potential outdoor amenity areas or terraces, and thus designated as OLAs.

With regard to stationary noise impacts, a stationary noise study is recommended for the site during the detailed design once mechanical plans for the proposed development becomes available. This study would assess impacts of stationary noise from rooftop mechanical units serving the proposed buildings on surrounding noise sensitive areas. As the mechanical equipment will primarily reside in the mechanical level located on the high roof, noise levels on the surrounding noise sensitive properties are expected to be negligible. Noise impacts can generally be minimized by judicious selection and placement of the equipment.

Stationary noise impacts from the surrounding environment onto the proposed development are expected to be minimal. The site is surrounded by low-rise commercial properties in all compass directions with residential dwellings further north, none of which support large mechanical equipment. The dominant source of noise across the site is expected to be due to roadway traffic.

3. OBJECTIVES

The principal objectives of this study are to (i) calculate the future noise levels on the study buildings produced by local roadway traffic, and (ii) ensure that interior noise 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 by 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 (that is relevant to this study) is 50, 45 and 40 dBA for retail space, living rooms and sleeping quarters, respectively, for roadway traffic 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.

4.2.2 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

[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

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.

TABLE 2: ROADWAY TRAFFIC DATA

Segment	Roadway Traffic Class	Speed Limit (km/h)	Traffic Volumes
Carling Avenue	4-Lane Urban Arterial - Divided	60	**35,000**
Queensway/Trans-Canada Highway	6-Lane Highway	100	**109,998**
Churchill Avenue North	2-Lane Urban Collector (2-UCU)	50	**8,000**

4.2.3 Theoretical Roadway Noise Predictions

Noise predictions were determined by computer modelling using two programs: Predictor-Lima and STAMSON 5.04. To provide a general understanding of noise across the site, the employed software program was Predictor-Lima, which incorporates the United States Federal Highway Administration's (FHWA) Transportation Noise Model (TNM) 2.5. This computer program is capable of representing three-dimensional surface and first reflections of sound waves over a suitable spectrum for human hearing. A receptor grid was placed across the subject site, along with a number of discrete receptors at key sensitive areas. Although this program is useful for outputting noise contours, it is not the approved calculation method for roadway predictions by the City of Ottawa. Therefore, the results were confirmed by performing discrete noise calculations with the MECP computerized noise assessment program, STAMSON 5.04, at two sample receptor locations. Appendix A includes the STAMSON 5.04 input and output data.

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

Roadway noise calculations were performed by treating each road segment as a separate line source of noise, and by using existing buildings as noise barriers. In addition to the traffic volumes summarized in Table 1, theoretical noise predictions were based on the following parameters:

- The day/night split was taken to be 92%/8% respectively for all streets.
- Truck traffic on all roadways was taken to comprise 5% heavy trucks and 7% medium trucks, as per ENCG requirements for noise level predictions.
- Ground surfaces were taken to be reflective due to the presence of hard (paved) ground.
- Topography was assumed to be flat/gentle slope surrounding the subject site.
- For select sources where appropriate, the receptors considered the proposed buildings and surrounding, existing buildings as barriers, partially or fully obstructing exposure to the source.

5. RESULTS AND DISCUSSION

5.1 Roadway Traffic Noise Levels

Noise levels at the building facades will range between 48 and 71 dBA during the daytime period (07:00-23:00) and between 40 and 64 dBA during the nighttime period (23:00-07:00). The highest noise level (71 dBA) occurs at the south facade of Building 3, which is nearest and most exposed to the Queensway. Figures 3 and 4 illustrate daytime and nighttime noise contours throughout the site 30 m above grade.

Upgraded building components, including STC rated glazing elements and exterior walls, will be required at selected facades nearest to arterial roadways where noise levels due to roadway traffic exceed 65 dBA, as discussed in Section 4.2.1. Results also indicate that all four buildings will require central air conditioning, or a similar ventilation system, 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 to be placed on all Lease, Purchase, and Sale Agreements. Specific noise control measures can be developed once the design of the buildings has progressed sufficiently, typically at the time of the site plan control application.

The results indicate that noise levels at the potential podium amenity areas are expected to be above 55 dBA. As such, noise mitigation in these areas will be required. Potential noise barrier locations for outdoor amenity areas associated with Building 1 – 6 can be seen in Figure 5.

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

TABLE 3: EXTERIOR ROADWAY NOISE LEVELS

Receptor Number	Absolute Receptor Height (m)	Receptor Location	Noise Level (dBA)	
			Day	Night
BUILDING 6				
R1	16.5	Podium – North Façade	69	61
R2	16.5	Podium – East Façade	66	58
R3	16.5	Podium – South Façade	54	46
R4	16.5	Podium – West Façade	66	58
R5	133.5	Level 40 – North Façade	68	60
R6	133.5	Level 40 – East Façade	67	59
R7	133.5	Level 40 – South Façade	66	59
R8	133.5	Level 40 – West Façade	65	58
BUILDING 1				
R9	10.5	Podium – North Façade	69	61
R10	10.5	Podium – East Façade	68	60
R11	10.5	Podium – South Façade	65	57
R12	10.5	Podium – West Façade	65	58
R13	68.5	Level 22 – North Façade	68	61
R14	68.5	Level 22 – East Façade	69	62
R15	68.5	Level 22 – South Façade	65	57
R16	68.5	Level 22 – West Façade	68	61
BUILDING 2				
R17	10.5	Podium – East Façade	66	59
R18	10.5	Podium – South Façade	66	58
R19	10.5	Podium – West Façade	54	46
R20	94.5	Level 22 – East Façade	68	60
R21	94.5	Level 22 – South Façade	69	61
R22	94.5	Level 22 – West Façade	67	59
BUILDING 3				
R23	10.5	Podium – East Façade	66	59
R24	10.5	Podium – South Façade	65	57
R25	10.5	Podium – West Façade	61	53
R26	30.5	Level 9 – East Façade	70	62
R27	30.5	Level 9 – South Façade	71	64
R28	30.5	Level 9 – West Façade	67	59

TABLE 3: EXTERIOR ROADWAY NOISE LEVELS (CONTINUED)

Receptor Number	Absolute Receptor Height (m)	Receptor Location	Noise Level (dBA)	
			Day	Night
BUILDING 4				
R29	10.5	Podium – South Façade	64	56
R30	10.5	Podium – East Façade	62	55
R31	10.5	Podium – North Façade	48	40
R32	10.5	Podium – West Façade	59	52
R33	70.5	Level 20 – South Façade	70	62
R34	70.5	Level 20 – West Façade	67	59
R35	70.5	Level 20 – East Façade	69	61
R36	70.5	Level 20 – North Façade	64	56
BUILDING 5				
R37	16.5	Podium – North Façade	63	56
R38	16.5	Podium – West Façade	62	55
R39	16.5	Podium – East Façade	60	53
R40	16.5	Podium – South Façade	58	50
R41	125.5	Level 37 – North Façade	63	55
R42	125.5	Level 37 – West Façade	64	57
R43	125.5	Level 37 – East Façade	66	58
R44	125.5	Level 37 – South Façade	68	60
POTENTIAL OUTDOOR LIVING AREAS (OLAs)				
R45	1.5*	Building 1 – Podium Rooftop Amenity *(Potential)*	64	N/A
R46	1.5*	Building 6 – Podium Rooftop Amenity *(Potential)*	62	N/A
R47	1.5*	Building 2 – West Podium Rooftop Amenity *(Potential)*	55	N/A
R48	1.5*	Building 2 – East Podium Rooftop Amenity *(Potential)*	66	N/A
R49	1.5*	Building 4 – Podium Rooftop Amenity *(Potential)*	63	N/A
R50	1.5*	Building 5 – West Podium Rooftop Amenity *(Potential)*	62	N/A
R51	1.5*	Building 5 – East Podium Rooftop Amenity *(Potential)*	59	N/A

*Above rooftop

5.1.1 Correlation Calculations

Table 4 shows a comparison between the calculated noise levels using Predictor-Lima and STAMSON. Noise levels calculated in STAMSON were found to have good correlation with Predictor-Lima and variability between the two programs was within an acceptable level of ±1-3dBA. Appendix A includes the STAMSON 5.04 input and output data. Figures 6 and 7 show the STAMSON input parameters used in the calculations.

TABLE 4: RESULT CORRELATION BETWEEN PREDICTOR AND STAMSON

Receptor Number	Receptor Location	Height above Grade (m)	STAMSON 5.04 Noise Level (dBA)		PREDICTOR-LIMA Noise Level (dBA)	
			Day	Night	Day	Night
R1	Building 6, Podium – North Façade	16.5	72	64	69	61
R4	Building 6, Podium – West Façade	16.5	68	60	66	58
R27	Building 2, Level 9 – South Façade	30.5	74	66	71	64
R29	Building 4, Podium – South Façade	10.5	67	59	64	56

6. CONCLUSIONS AND RECOMMENDATIONS

Noise levels at Building 1 – 6 exceed the 65 dBA criterion; therefore, upgraded building component with higher Sound Transmission Class (STC) ratings will be required at select facades. Air conditioning, or a similar mechanical system, will be required to keep a comfortable indoor living environment when windows are open. Warning Clause Type D will also be required be placed on all Lease, Purchase and Sale Agreements for all buildings, 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."

Since noise levels exceed the 55 dBA OLA requirement at podium roofs, noise barriers will be required if these areas are to be used as outdoor amenity areas or terraces. Locations of potential noise barriers are illustrated in Figure 5.

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. Specific noise control measures will also be recommended at that time.

With regard to stationary noise impacts, a stationary noise study is recommended for the site during the detailed design once mechanical plans for the proposed development become available. This study would assess impacts of stationary noise from rooftop mechanical units serving the proposed block on surrounding noise sensitive areas. As the mechanical equipment will primarily reside in the mechanical level located on the high roof, noise levels on the surrounding noise sensitive properties are expected to be negligible. Noise impacts can generally be minimized by judicious selection and placement of the equipment.

Stationary noise impacts from the surrounding environment onto the proposed development are expected to be minimal. The site is surrounded by low-rise commercial properties in all compass directions with residential dwellings further north, none of which support large mechanical equipment. The dominant source of noise across the site is expected to be due to roadway traffic.

This concludes our noise assessment. 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.

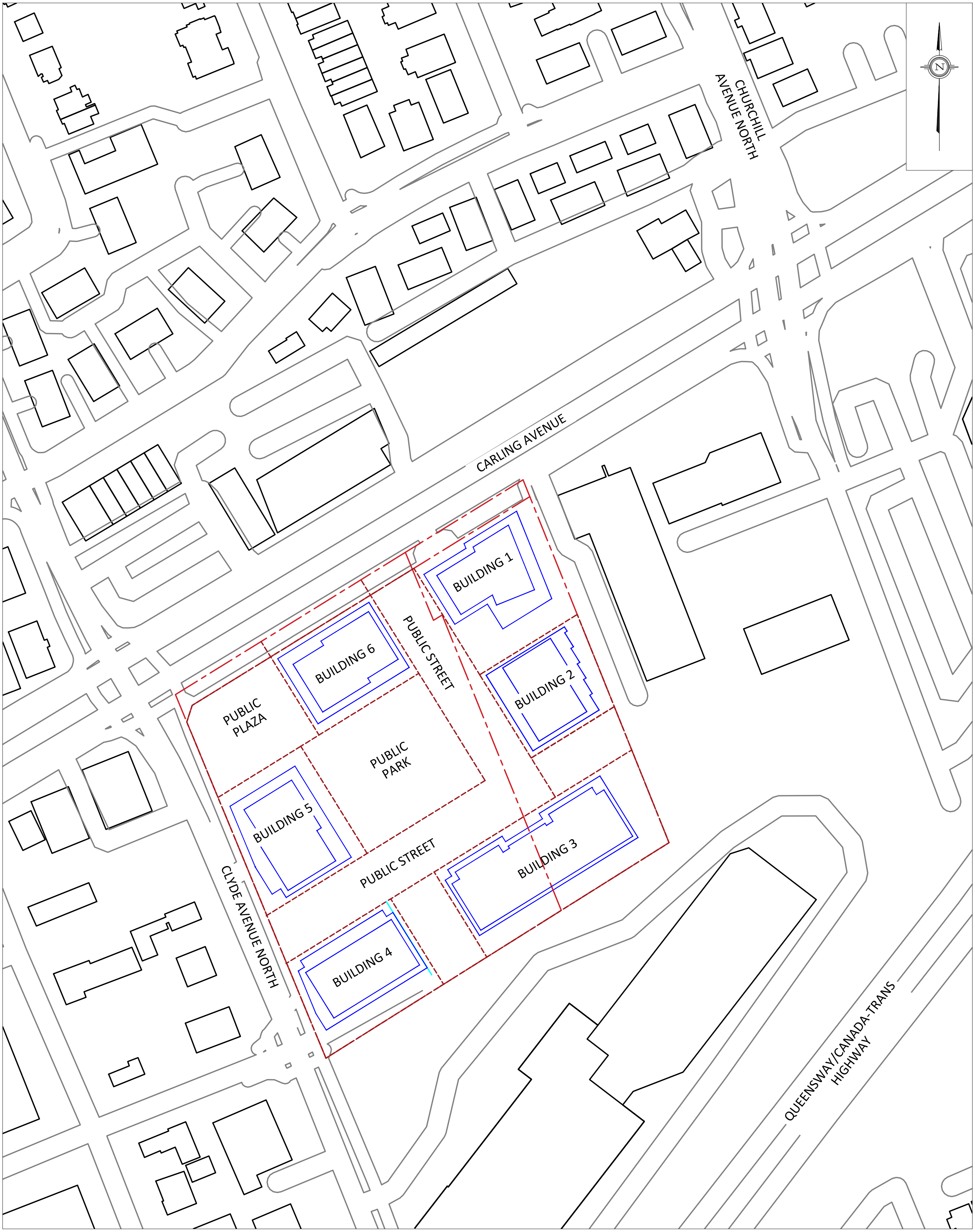
Sincerely,

Gradient Wind Engineering Inc.

Essraa Alqassab, BASc
Junior Environmental Scientist

Joshua Foster, P.Eng.
Lead Engineer

GW22-224 -Traffic Noise



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PROJECT	1640-1660 CARLING AVENUE, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		DESCRIPTION
SCALE 1:2000 (APPROX.)	DRAWING NO. GW22-224-1		FIGURE 1: SITE PLAN AND SURROUNDING CONTEXT
DATE JANUARY 20, 2023	DRAWN BY E.A.		

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SCALE	1:1000 (APPROX.)	DRAWING NO.	GW22-224-2
DATE	JANUARY 20, 2023	DRAWN BY	E.A.

DESCRIPTION

FIGURE 2:
RECEPTOR LOCATIONS

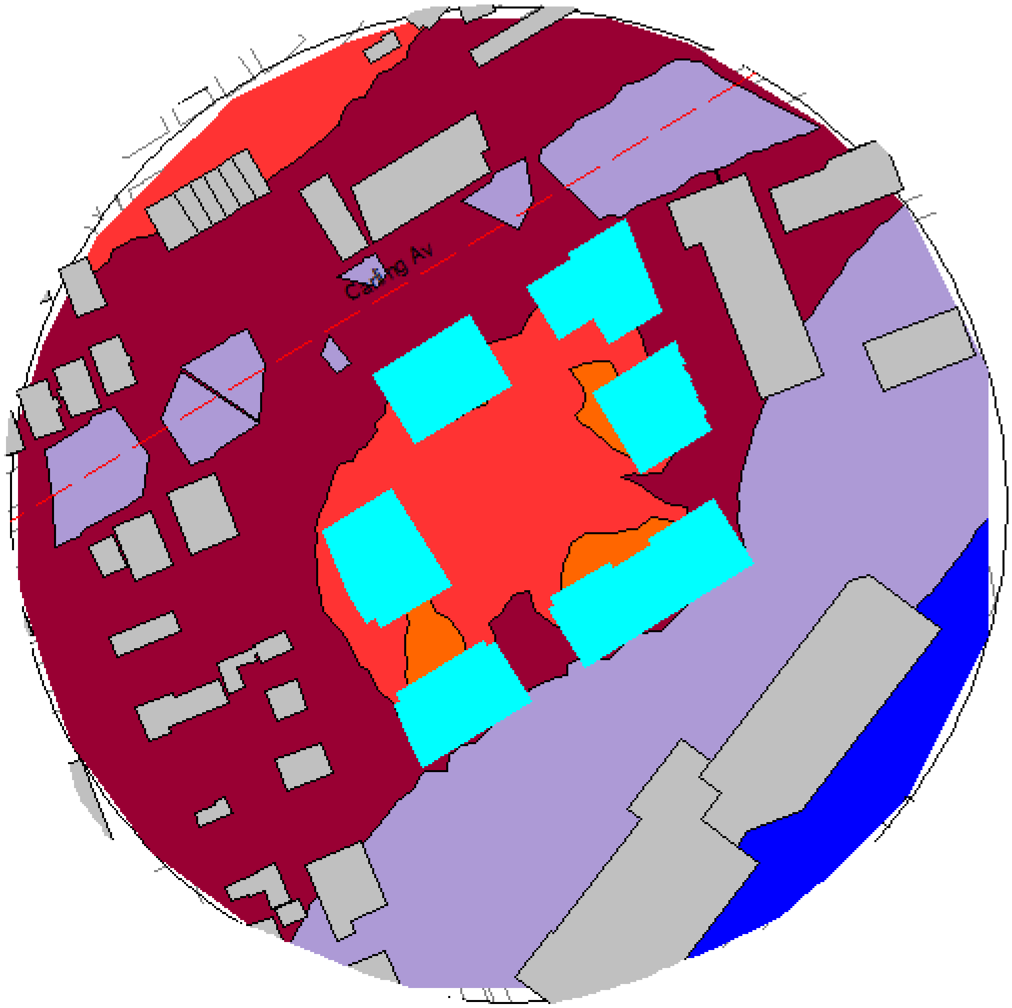


FIGURE 3: DAYTIME TRAFFIC NOISE CONTOURS (30 M ABOVE GRADE)

	80 – 85 dB
	75 – 80 dB
	70 – 75 dB
	65 – 70 dB
	60 – 65 dB
	55 – 60 dB
	50 – 55 dB
	45 – 50 dB
	40 – 45 dB
	35 – 40 dB
	0 – 35 dB

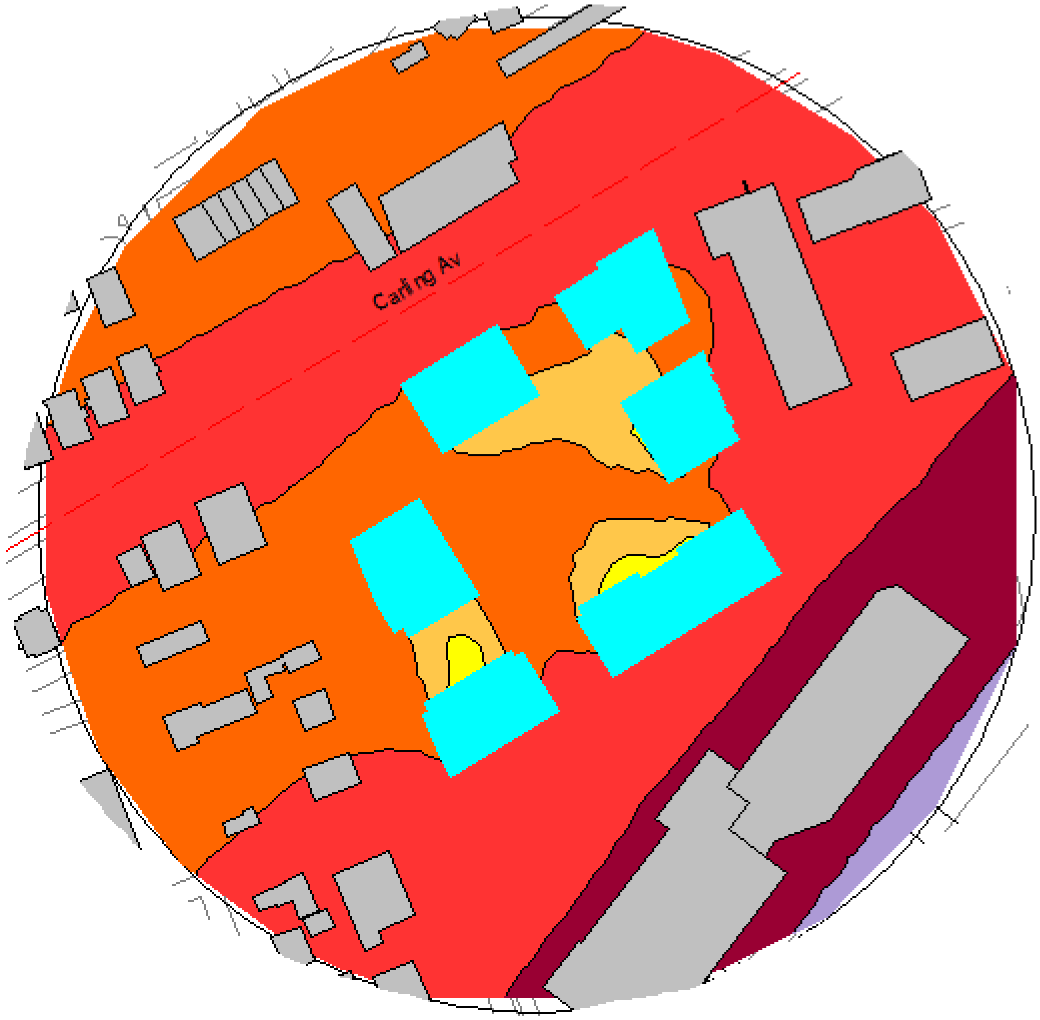
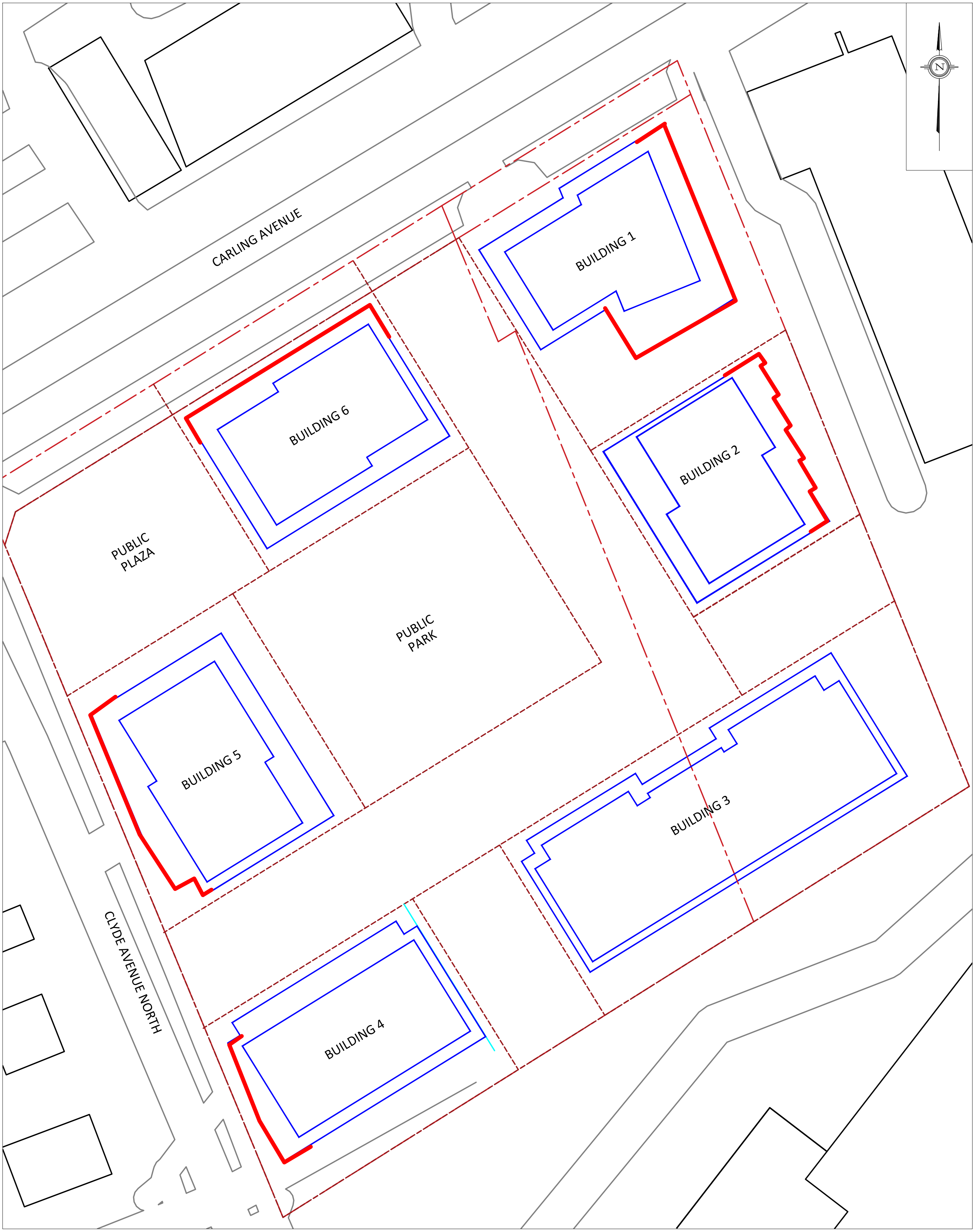


FIGURE 4: NIGHTTIME TRAFFIC NOISE CONTOURS (30 M ABOVE GRADE)

	80 – 85 dB
	75 – 80 dB
	70 – 75 dB
	65 – 70 dB
	60 – 65 dB
	55 – 60 dB
	50 – 55 dB
	45 – 50 dB
	40 – 45 dB
	35 – 40 dB
	0 – 35 dB



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SCALE	1:1000 (APPROX.)	DRAWING NO.	GW22-224-5
DATE	JANUARY 20, 2023	DRAWN BY	E.A.

DESCRIPTION

FIGURE 5:
POTENTIAL NOISE BARRIER LOCATIONS

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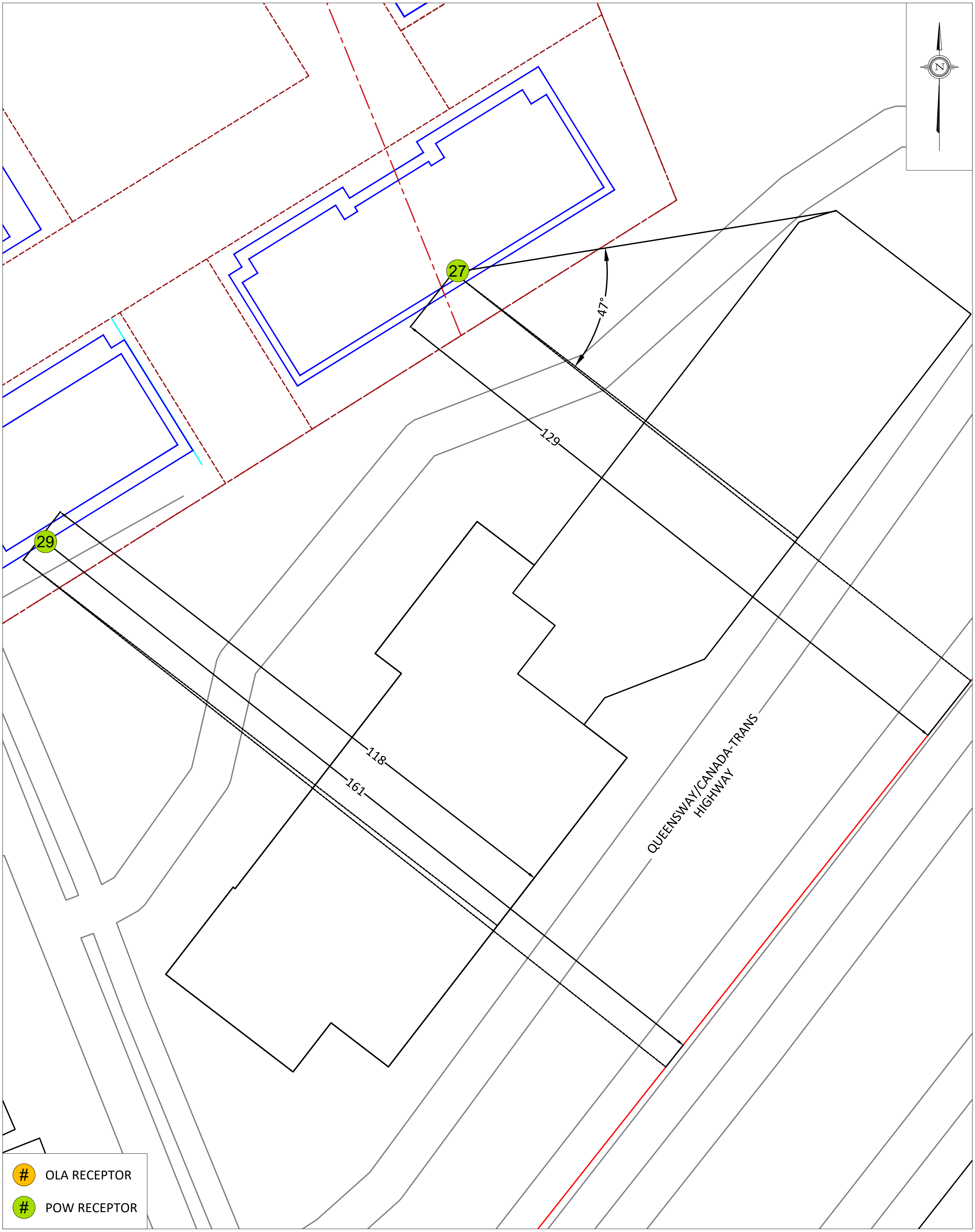
SCALE	1:1000 (APPROX.)	DRAWING NO.	GW22-224-6
DATE	JANUARY 20, 2023	DRAWN BY	E.A.

DESCRIPTION

FIGURE 6:
STAMSON PARAMETERS



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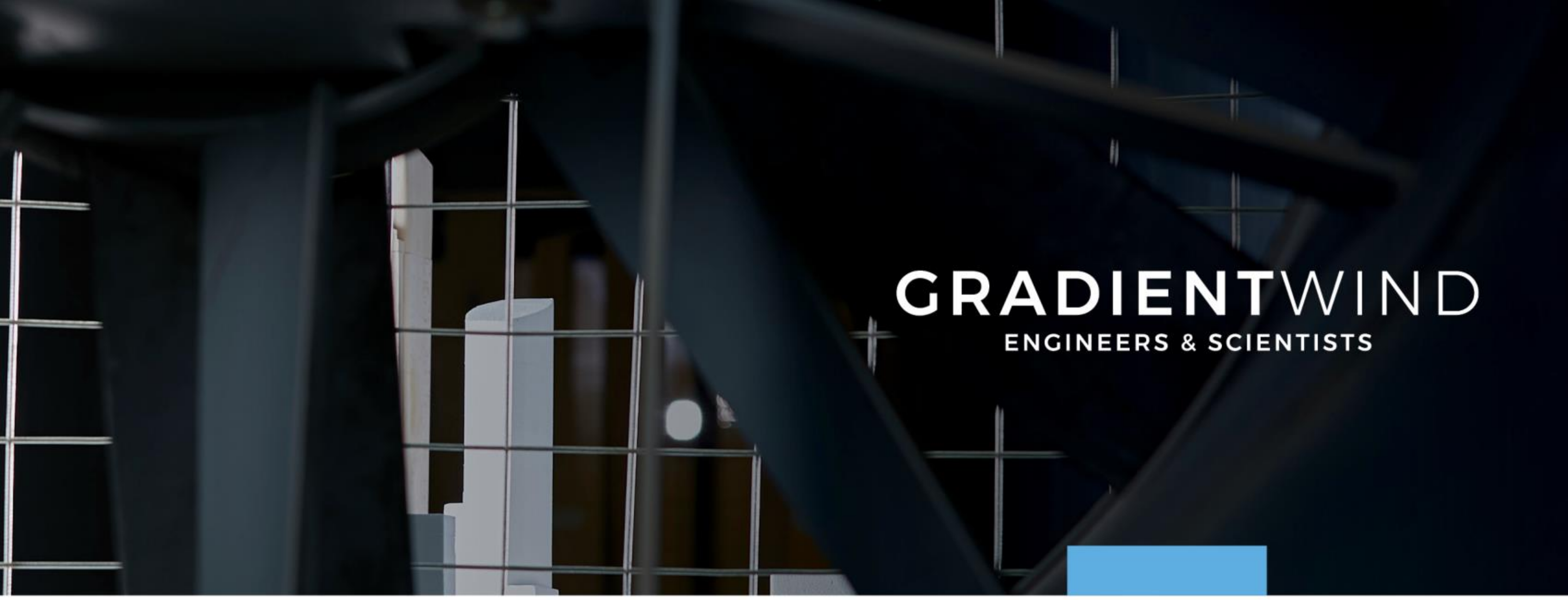
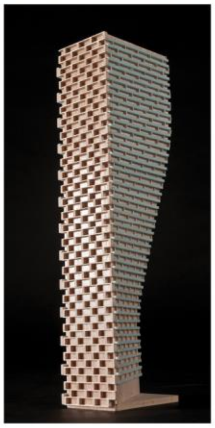
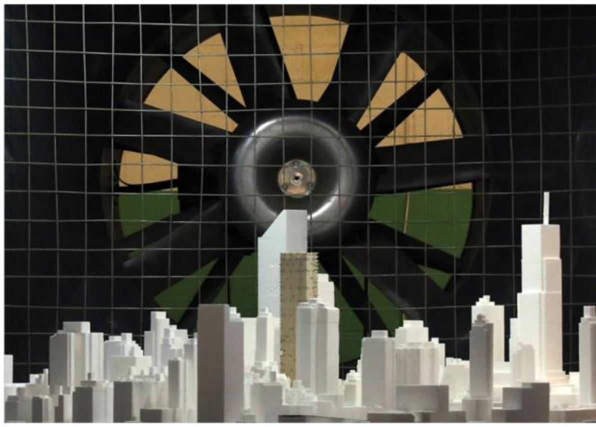
PROJECT: 1640-1660 CARLING AVENUE, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		DESCRIPTION: FIGURE 7: STAMSON PARAMETERS (2)
SCALE: 1:1000 (APPROX.)	DRAWING NO.: GW22-224-7	
DATE: JANUARY 20, 2023	DRAWN BY: E.A.	







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: 03-01-2023 15:26:54
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Carling (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: Carling (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   :  22.00 / 22.00  m
Receiver height            :  16.50 / 16.50  m
Topography                 :      1       (Flat/gentle slope; no barrier)
Reference angle            :   0.00


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

Source height = 1.50 m

ROAD (0.00 + 72.01 + 0.00) = 72.01 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  -1.66   0.00   0.00   0.00   0.00
72.01
--------------------------------------------------------------------------
--
```

```
Segment Leq : 72.01 dBA

Total Leq All Segments: 72.01 dBA


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

Source height = 1.50 m

ROAD (0.00 + 64.42 + 0.00) = 64.42 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  -1.66   0.00   0.00   0.00   0.00
64.42
--------------------------------------------------------------------------
--

Segment Leq : 64.42 dBA

Total Leq All Segments: 64.42 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 72.01
                         (NIGHT): 64.42
```

```
STAMSON 5.0        NORMAL REPORT        Date: 03-01-2023 15:19:34
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Carling (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: Carling (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  :  28.00 / 28.00  m
Receiver height           :  16.50 / 16.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


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

Source height = 1.50 m

ROAD (0.00 + 67.96 + 0.00) = 67.96 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  -2.71  -3.01   0.00   0.00   0.00
67.96
--------------------------------------------------------------------------
--
```

```
Segment Leq : 67.96 dBA

Total Leq All Segments: 67.96 dBA


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

Source height = 1.50 m

ROAD (0.00 + 60.36 + 0.00) = 60.36 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  -2.71  -3.01   0.00   0.00   0.00
60.36
--------------------------------------------------------------------------
--

Segment Leq : 60.36 dBA

Total Leq All Segments: 60.36 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 67.96
                         (NIGHT): 60.36
```

```
STAMSON 5.0        NORMAL REPORT        Date: 03-01-2023 15:27:12
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r27.te                Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: Queensway (day/night)
---------------------------------------------
Car traffic volume  : 89054/7744  veh/TimePeriod  *
Medium truck volume :  7084/616   veh/TimePeriod  *
Heavy truck volume  :  5060/440   veh/TimePeriod  *
Posted speed limit  :   100 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT): 109998
    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: Queensway (day/night)
-------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  : 129.00 / 129.00 m
Receiver height           :  30.50 / 30.50  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -47.00 deg   Angle2 : 90.00 deg
Barrier height            :   5.00 m
Barrier receiver distance :  85.00 / 85.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
```

```
Height   (m) ! Height   (m) ! Height   (m) ! Barrier Top  (m)
-------------+--------------+--------------+---------------
       1.50 !       30.50 !       11.39 !        11.39

ROAD (67.59 + 72.63 + 0.00) = 73.81 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
--------------------------------------------------------------------------
--
   -90    -47   0.00  83.16   0.00  -9.34  -6.22   0.00   0.00   0.00
67.59
--------------------------------------------------------------------------
--
   -47     90   0.00  83.16   0.00  -9.34  -1.19   0.00   0.00  -0.08
72.55*
   -47     90   0.00  83.16   0.00  -9.34  -1.19   0.00   0.00   0.00
72.63
--------------------------------------------------------------------------
--

 * Bright Zone !

Segment Leq : 73.81 dBA

Total Leq All Segments: 73.81 dBA


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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source       ! Receiver     ! Barrier      ! Elevation of
Height   (m) ! Height   (m) ! Height   (m) ! Barrier Top  (m)
-------------+--------------+--------------+---------------
       1.50 !       30.50 !       11.39 !        11.39

ROAD (60.00 + 65.03 + 0.00) = 66.22 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
--------------------------------------------------------------------------
--
   -90    -47   0.00  75.56   0.00  -9.34  -6.22   0.00   0.00   0.00
60.00
--------------------------------------------------------------------------
--
   -47     90   0.00  75.56   0.00  -9.34  -1.19   0.00   0.00  -0.08
64.95*
```

```
   -47     90   0.00  75.56   0.00  -9.34  -1.19   0.00   0.00   0.00
65.03
--------------------------------------------------------------------------
--

 * Bright Zone !

Segment Leq : 66.22 dBA

Total Leq All Segments: 66.22 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 73.81
                         (NIGHT): 66.22
```

```
STAMSON 5.0        NORMAL REPORT        Date: 03-01-2023 15:28:56
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r29.te              Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: Queensway (day/night)
---------------------------------------------
Car traffic volume  : 89054/7744  veh/TimePeriod  *
Medium truck volume :  7084/616   veh/TimePeriod  *
Heavy truck volume  :  5060/440   veh/TimePeriod  *
Posted speed limit  :   100 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT): 109998
    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: Queensway (day/night)
-------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  : 161.00 / 161.00 m
Receiver height           :  10.50 / 10.50  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :   5.00 m
Barrier receiver distance : 118.00 / 118.00 m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+---------------
       1.50 !       10.50 !        3.90 !         3.90

ROAD (0.00 + 67.25 + 0.00) = 67.25 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
--------------------------------------------------------------------------
--
   -90     90   0.00  83.16   0.00 -10.31   0.00   0.00   0.00  -5.60
67.25
--------------------------------------------------------------------------
--

Segment Leq : 67.25 dBA

Total Leq All Segments: 67.25 dBA


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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+---------------
       1.50 !       10.50 !        3.90 !         3.90

ROAD (0.00 + 59.66 + 0.00) = 59.66 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
--------------------------------------------------------------------------
--
   -90     90   0.00  75.56   0.00 -10.31   0.00   0.00   0.00  -5.60
59.66
--------------------------------------------------------------------------
--

Segment Leq : 59.66 dBA
```

```
Total Leq All Segments: 59.66 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 67.25
                         (NIGHT): 59.66
```