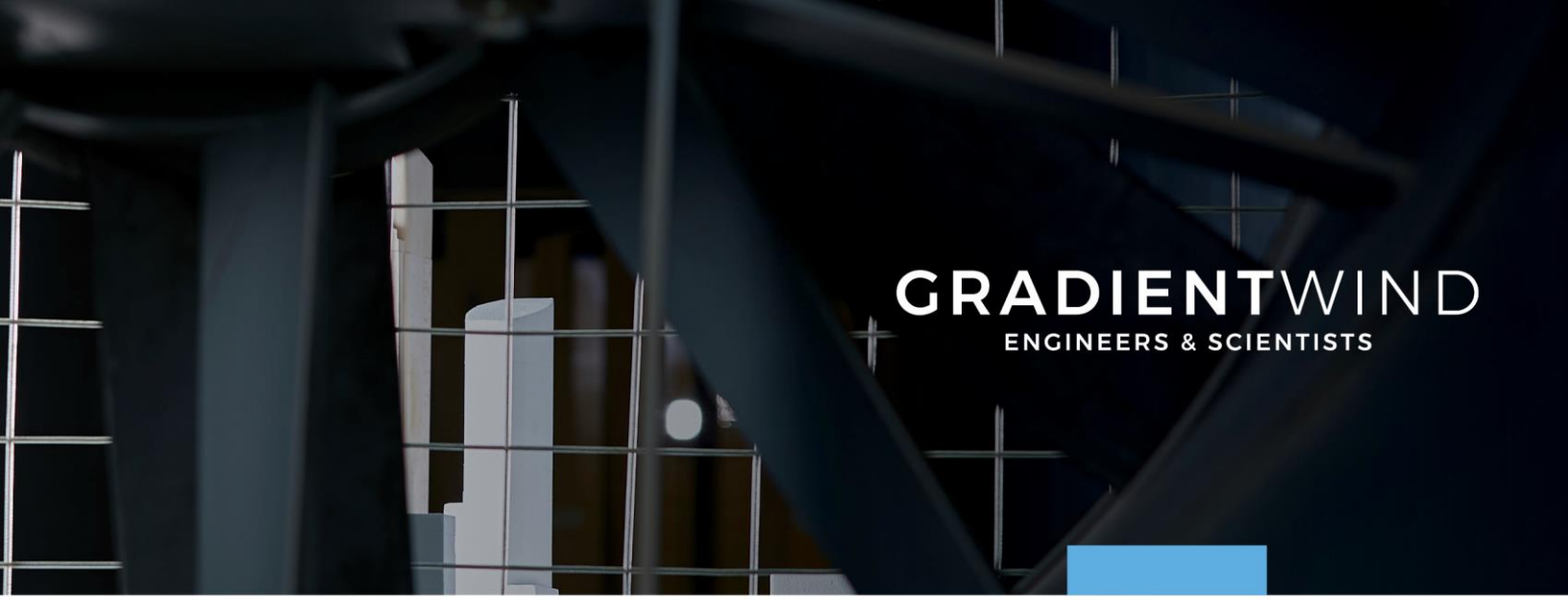
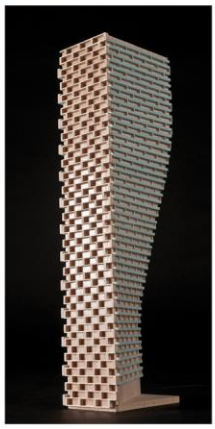


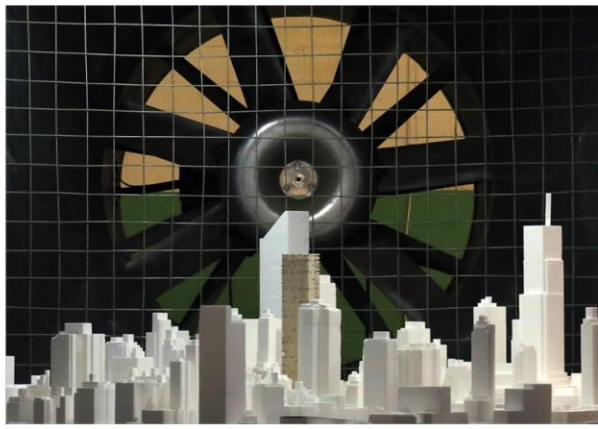
GRADIENTWIND
ENGINEERS & SCIENTISTS

ROADWAY TRAFFIC NOISE ASSESSMENT

3865 Old Richmond Road
Ottawa, Ontario

Report: 20-046-Traffic Noise





April 27, 2020

PREPARED FOR

Hobin Architecture Incorporated
63 Pamilla Street
Ottawa, ON K1S 3K7

Alison Michelin, Licensed Technologist OAA
michelin@hobinarc.com

PREPARED BY

Efser Kara, MSc, LEED GA, Acoustic Scientist
Joshua Foster, P.Eng., Principal

EXECUTIVE SUMMARY

This report describes a detailed roadway traffic noise assessment performed for the proposed development located at 3865 Old Richmond Road in Ottawa, Ontario. The development is a 3-storey, rectangular form mixed-use building. The major source of roadway traffic noise is the Old Richmond Road running along the east perimeter of the site. The site is surrounded by midrise and lowrise residential buildings and is adjacent to the Christ Church Bell's Corners. Christ Church Bell's Corners lies to the north and Our Lady of Peace School to the south of the building. Figure 1 illustrates the site plan with the surrounding context.

The assessment is based on (i) theoretical noise prediction methods that conform to the Ministry of the Environment, Conservation and Parks (MECP) and City of Ottawa requirements; (ii) noise level criteria as specified by the City of Ottawa's Environmental Noise Control Guidelines (ENCG); (iii) future vehicular traffic volumes based on the City of Ottawa's Official Plan roadway classifications; and (iv) architectural drawings prepared by Hobin Architecture Inc.

The results of the current analysis indicate that noise levels will range between 59 and 64 dBA at Plane of Window (POW) receptors during the daytime period (07:00-23:00) and 52 and 56 dBA during the nighttime period (23:00-07:00). The highest noise level occurs along the east façade, which is nearest and most exposed to Old Richmond Road.

As the noise levels at plane of window (POW) receptors don't exceed 65 dBA during daytime period and 60 dBA during nighttime period, standard building components will be sufficient to attenuate indoor noise levels when windows are closed.

The results of the calculations indicate that the development will require provision for the installation of 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.

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Hobin Architecture Inc. to undertake a roadway traffic noise assessment study for the proposed mixed-use development located at 3865 Old Richmond Road in Ottawa, Ontario. This report summarizes the methodology, results, and recommendations related to the assessment of exterior noise levels generated by local roadway traffic.

This assessment is based on theoretical noise calculation methods conforming to the City of Ottawa[1] and the Ministry of the Environment, Conservation and Parks (MECP)[2] guidelines. Noise calculations were based on architectural drawings prepared by Hobin Architecture Inc., dated March 20th, 2020, with future traffic volumes corresponding to roadway classification and theoretical roadway capacities.

2. TERMS OF REFERENCE

The subject site is located at 3865 Old Richmond Road in Ottawa, Ontario and is adjacent to the Christ Church Bell's Corners. Christ Church Bell's Corners lies to the north and Our Lady of Peace School to the south of the study building. The site is bordered by Old Richmond Road to the east.

The subject site features a 3-storey (4 levels) mixed-use building fronting Old Richmond Road. The building rises to a height of 12 metres and the gross area of the building is 3,084m². Entrances are located on the north, east and west sides. The ground floor comprises two residential units at the southwest corner of the floor, a FAMSAC on the northwest corner, and a garbage facility on the west side. The building also features a WOCRC facility on the northeast side, a community room on the southeast side, and a laundry and bicycle storage on the south side. All levels above grade are reserved for residential occupancy. Protruding and non-protruding balconies are featured at all elevations serving the residential units. Vehicular parking is provided at grade through the northwest of the site.

The major source of traffic noise is Old Richmond Road which is bordering the site to the east. Old Richmond Road is an Urban Collector as indicated in the City of Ottawa's Official Plan roadway classifications. This report is based on drawings provided by Hobin Architecture Incorporated, dated March 20, 2020. Figure 1 illustrates the site plan with the 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 buildings produced by local roadway traffic, and (ii) ensure that interior and exterior noise levels do not exceed the allowable limits specified by the City of Ottawa's Environmental Noise Control Guidelines (ENCG) 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 level 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 sound pressure 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 vehicular traffic, 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 and LRT, 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. Based on Gradient Wind's experience, more comfortable indoor noise levels should be targeted, towards 42 and 37, respectively, to control peak noise and deficiencies in building envelope construction.

TABLE 1: INDOOR SOUND LEVEL CRITERIA

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

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

The sound level criterion for outdoor living areas is 55 dBA, which applies during the daytime (07:00 to 23:00). When noise levels exceed 55 dBA, mitigation must be provided to reduce noise levels where technically and administratively feasible to acceptable levels at or below the criterion. If these measures are not provided, prospective purchasers or tenants should be informed of potential noise problems by a warning clause.

[3] Burberry, P.B. (2014). Mitchell's Environment and Services. Routledge, Page 125
[4] MECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.8
[5] MECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.1.3

4.2.2 Theoretical Roadway Noise Predictions

Noise predictions were performed with the aid of the Ministry of the Environment, Conservations and Parks' (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 roads 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.
- Four (4) receptor locations were chosen at the façade of the building closer to Old Richmond Road traffic noise.
- Receptor heights were taken to be 10.5 m above grade at the centre of the window of the highest level of the building. The receptor distances to roadway traffic and exposure angles are illustrated 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[6] which provide additional details on future roadway expansions. Average Annual Daily Traffic (AADT) volumes are then based on data in Table B1 of the ENCG for each roadway classification. Table 2 (below) summarizes the AADT values used for each roadway included in this assessment.

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

TABLE 2: ROADWAY TRAFFIC DATA

Segment	Roadway Traffic Data	Speed Limit (km/h)	Traffic Volumes
Old Richmond Road	2-Lane Urban Collector (2-UCU)	40	**8,000**

5. ROADWAY TRAFFIC NOISE RESULTS AND DISCUSSION

5.1 Roadway Traffic Noise Levels

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

TABLE 3: EXTERIOR NOISE LEVELS DUE TO ROAD TRAFFIC

Receptor Number	Receptor Height Above Grade (m)	Receptor Location	STAMSON 5.04 Noise Level (dBA)	
			Day	Night
1	10.5	POW North Façade	59	52
2	10.5	POW East Façade	64	56
3	10.5	POW East Façade	64	56
4	10.5	POW South Façade	61	54

The results of the current analysis indicate that noise levels will range between 59 and 64 dBA at Plane of Window (POW) receptors during the daytime period (07:00-23:00) and 52 and 56 dBA during the nighttime period (23:00-07:00). The highest noise level occurs along the east façade, which is nearest and most exposed to Old Richmond Road.

The results of the calculations indicate that the development will require provision for the installation of central air conditioning which will allow occupants to keep windows closed and maintain a comfortable living environment. Standard building components will be sufficient to attenuate indoor noise levels to acceptable criteria. 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 59 and 64 dBA at Plane of Window (POW) receptors during the daytime period (07:00-23:00) and 52 and 56 dBA during the nighttime period (23:00-07:00). The highest noise level occurs along the east façade, which is nearest and most exposed to Old Richmond Road.

As the noise levels at plane of window (POW) receptors don't exceed 65 dBA during daytime period and 60 dBA during nighttime period building elements conforming to Ontario Building Code will be sufficient to attenuate indoor noise levels to acceptable criteria.

The results of the calculations indicate that the development will require provision for the installation of central air conditioning which will allow occupants to keep windows closed and maintain a comfortable living environment. Warning clauses will also be required in all Lease, Purchase and Sale Agreements:

> *"Purchasers/tenants are advised that despite the inclusion of noise control features in the development and within the building units, sound levels due to increasing road traffic may, on occasion, interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the City and the Ministry of the Environment.*
>
> *This dwelling unit has been designed with the provision for adding central air conditioning at the occupant's discretion. Installation of central air conditioning will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the City and the Ministry of the Environment."*

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,

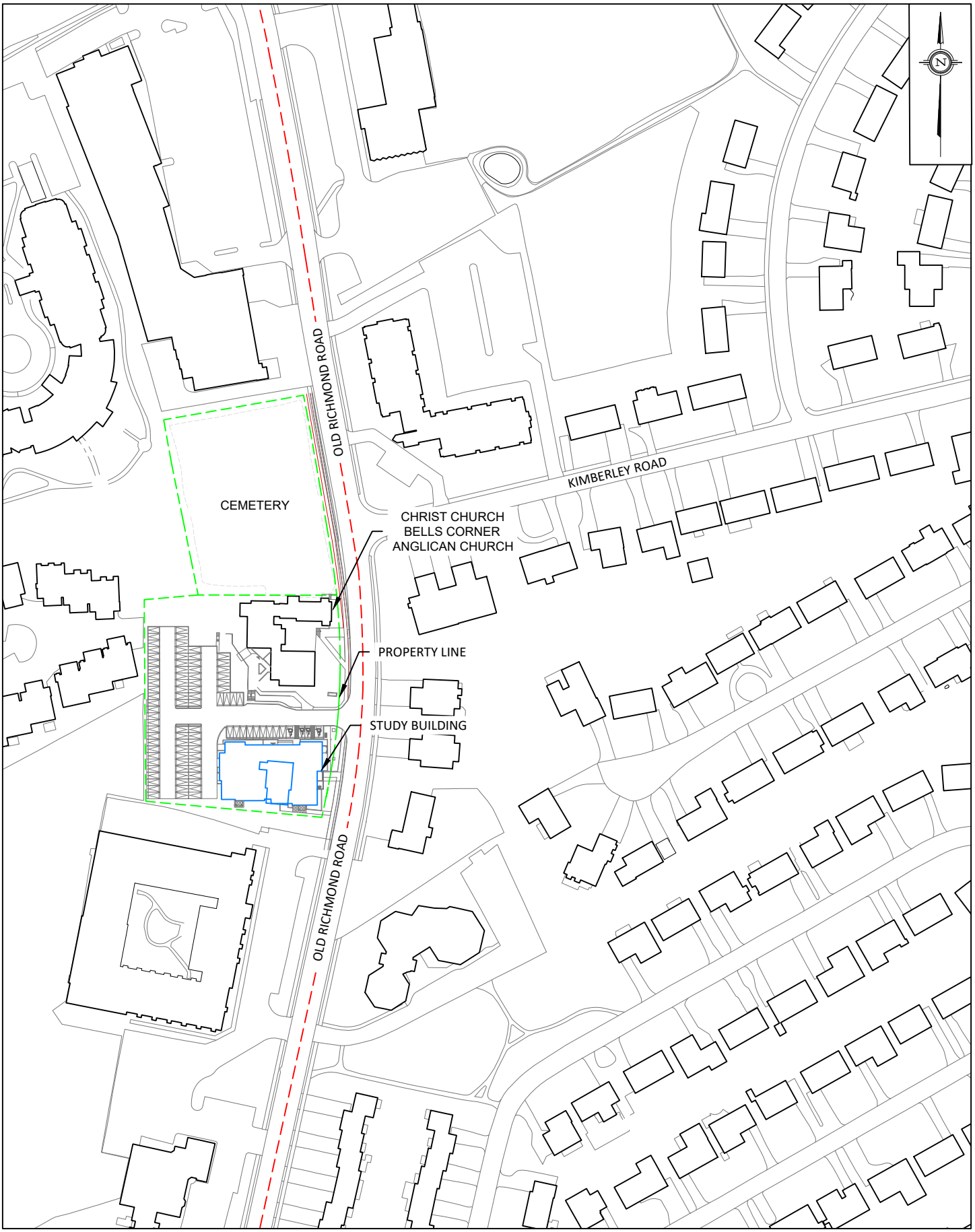
Gradient Wind Engineering Inc.

LICENSED PROFESSIONAL ENGINEER
J. R. FOSTER
100155655
JAN 15, 2020
PROVINCE OF ONTARIO

Efser Kara, MSc, LEED GA
Acoustic Scientist

Joshua Foster, P.Eng.
Principal

Gradient Wind File #20-046-Traffic Noise



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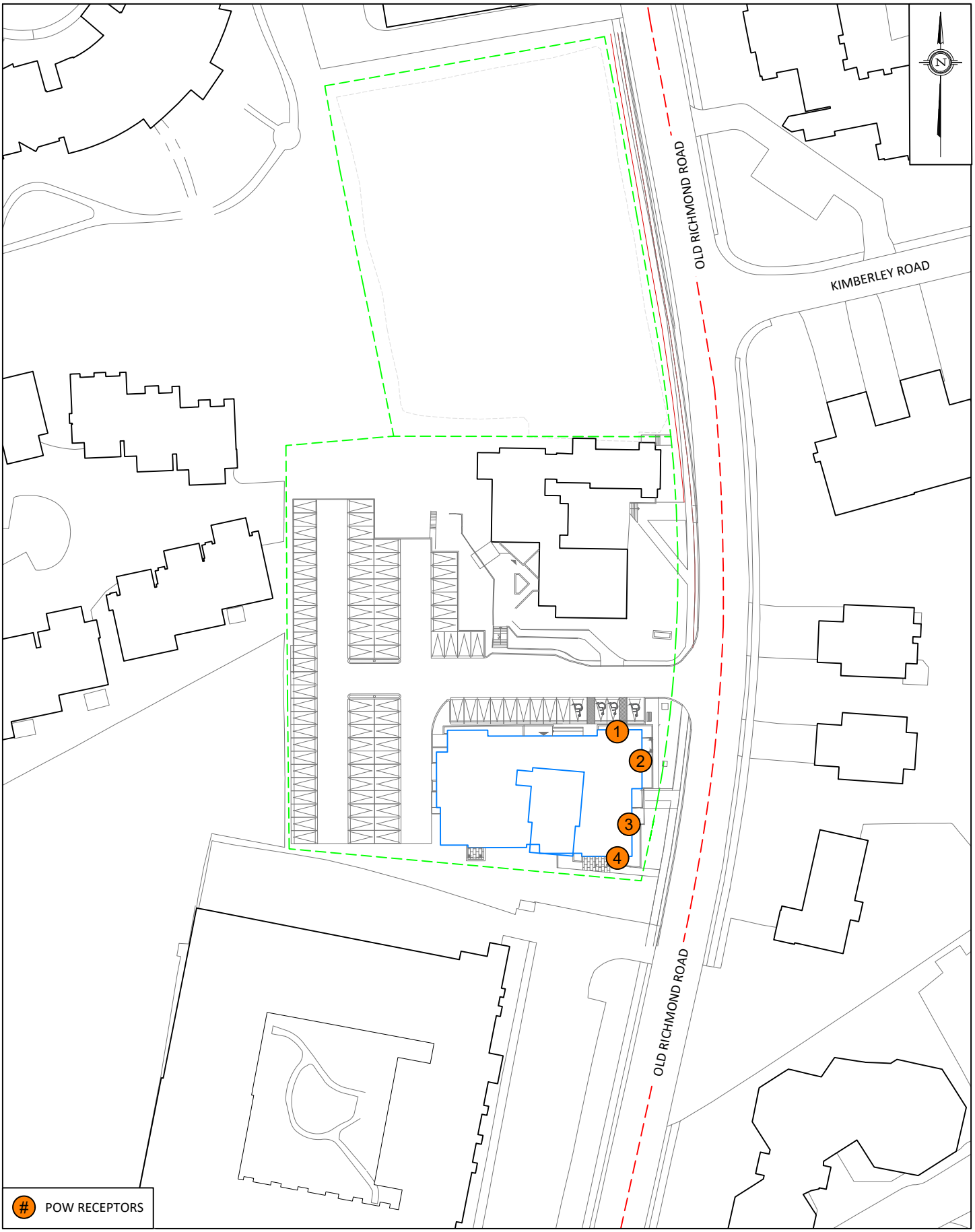
127 WALGREEN ROAD , OTTAWA, ON
613 836 0934 • GRADIENTWIND.COM

PROJECT	3865 OLD RICHMOND ROAD DETAILED ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:2000 (APPROX.)
DRAWING NO.	GWE20-046-1
DATE	APRIL 27, 2020
DRAWN BY	E.K.

DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT



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PROJECT	3865 OLD RICHMOND ROAD DETAILED ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:1000 (APPROX.)
DRAWING NO.	GWE20-046-2
DATE	APRIL 27, 2020
DRAWN BY	E.K.

DESCRIPTION

FIGURE 2:
RECEPTOR & SOURCE LOCATIONS

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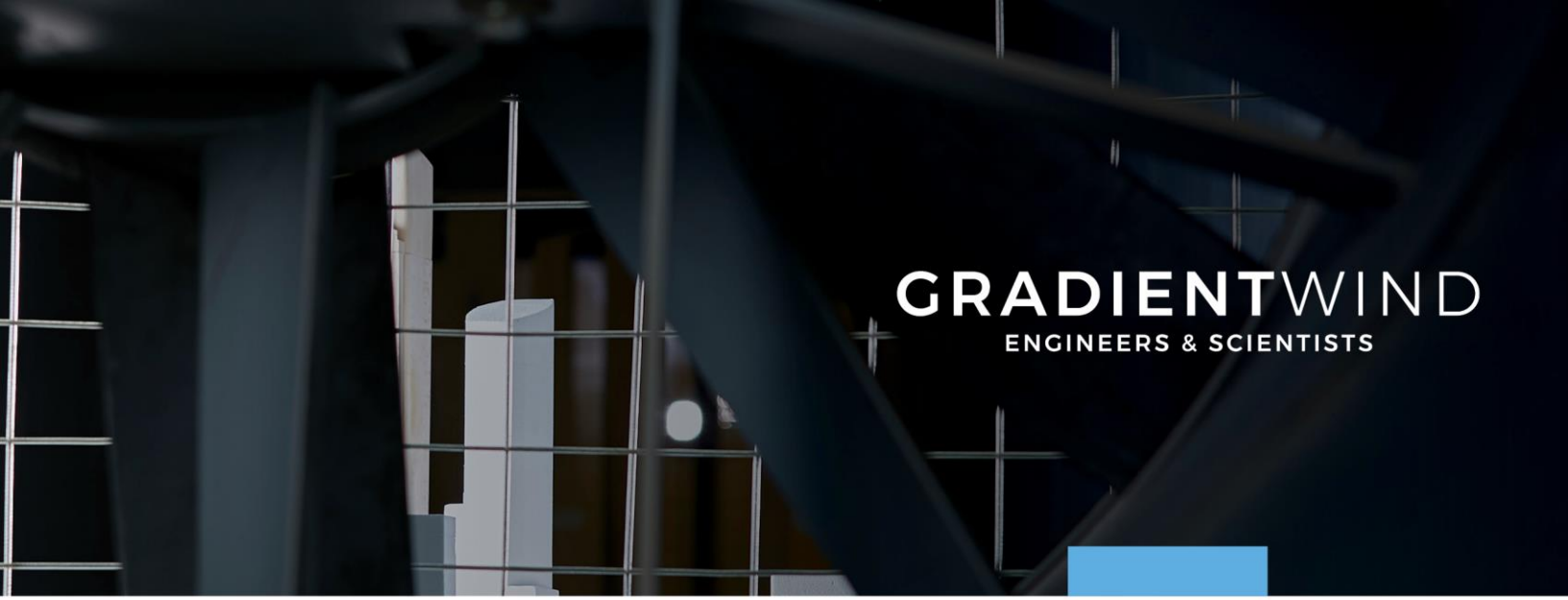
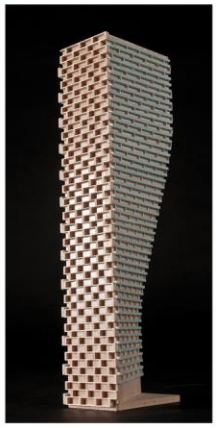
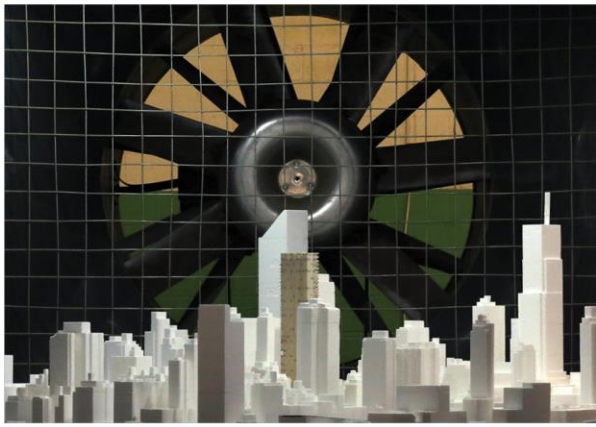
PROJECT	3865 OLD RICHMOND ROAD DETAILED ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:500 (APPROX.)
DRAWING NO.	GWE20-046-3
DATE	APRIL 27, 2020
DRAWN BY	E.K.

DESCRIPTION

FIGURE 3:
STAMSON INPUT DATA - RECEPTORS 1-4







APPENDIX A

STAMSON INPUT-OUTPUT DATA

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

STAMSON 5.0 NORMAL REPORT Date: 08-04-2020 09:00:43
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r01.te Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Old Rich-1 (day/night)

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

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

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

Data for Segment # 1: Old Rich-1 (day/night)

Angle1 Angle2 : -86.00 deg -6.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 19.00 / 19.00 m
Receiver height : 10.50 / 10.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Old Rich-1 (day)

Source height = 1.50 m

ROAD (0.00 + 59.41 + 0.00) = 59.41 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-86	-6	0.00	63.96	0.00	-1.03	-3.52	0.00	0.00	0.00	59.41

Segment Leq : 59.41 dBA

Total Leq All Segments: 59.41 dBA

Results segment # 1: Old Rich-1 (night)

Source height = 1.50 m

ROAD (0.00 + 51.81 + 0.00) = 51.81 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-86	-6	0.00	56.36	0.00	-1.03	-3.52	0.00	0.00	0.00	51.81

Segment Leq : 51.81 dBA

Total Leq All Segments: 51.81 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.41
(NIGHT): 51.81

STAMSON 5.0 NORMAL REPORT Date: 08-04-2020 08:46:45
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r02.te Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Old Rich Rd (day/night)

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

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

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

Data for Segment # 1: Old Rich 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 : 15.00 / 15.00 m
Receiver height : 10.50 / 10.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Old Rich Rd (day)

Source height = 1.50 m

ROAD (0.00 + 63.96 + 0.00) = 63.96 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	63.96	0.00	0.00	0.00	0.00	0.00	0.00	63.96

Segment Leq : 63.96 dBA

Total Leq All Segments: 63.96 dBA

Results segment # 1: Old Rich Rd (night)

Source height = 1.50 m

ROAD (0.00 + 56.36 + 0.00) = 56.36 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	56.36	0.00	0.00	0.00	0.00	0.00	0.00	56.36

Segment Leq : 56.36 dBA

Total Leq All Segments: 56.36 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 63.96
(NIGHT): 56.36

STAMSON 5.0 NORMAL REPORT Date: 08-04-2020 08:49:12
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r03.te Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Pld Rich Rd (day/night)

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

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

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

Data for Segment # 1: Pld Rich Rd (day/night)

Angle1 Angle2 : -81.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 15.00 / 15.00 m
Receiver height : 10.50 / 10.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Pld Rich Rd (day)

Source height = 1.50 m

ROAD (0.00 + 63.73 + 0.00) = 63.73 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-81	90	0.00	63.96	0.00	0.00	-0.22	0.00	0.00	0.00	63.73

Segment Leq : 63.73 dBA

Total Leq All Segments: 63.73 dBA

Results segment # 1: Pld Rich Rd (night)

Source height = 1.50 m

ROAD (0.00 + 56.14 + 0.00) = 56.14 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-81	90	0.00	56.36	0.00	0.00	-0.22	0.00	0.00	0.00	56.14

Segment Leq : 56.14 dBA

Total Leq All Segments: 56.14 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 63.73
(NIGHT): 56.14

STAMSON 5.0 NORMAL REPORT Date: 08-04-2020 08:50:04
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r04.te Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Old Rich Rd (day/night)

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

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

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

Data for Segment # 1: Old Rich Rd (day/night)

Angle1 Angle2 : -10.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 16.00 / 16.00 m
Receiver height : 10.50 / 10.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Old Rich Rd (day)

Source height = 1.50 m

ROAD (0.00 + 61.12 + 0.00) = 61.12 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-10	90	0.00	63.96	0.00	-0.28	-2.55	0.00	0.00	0.00	61.12

Segment Leq : 61.12 dBA

Total Leq All Segments: 61.12 dBA

Results segment # 1: Old Rich Rd (night)

Source height = 1.50 m

ROAD (0.00 + 53.53 + 0.00) = 53.53 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-10	90	0.00	56.36	0.00	-0.28	-2.55	0.00	0.00	0.00	53.53

Segment Leq : 53.53 dBA

Total Leq All Segments: 53.53 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.12
(NIGHT): 53.53