

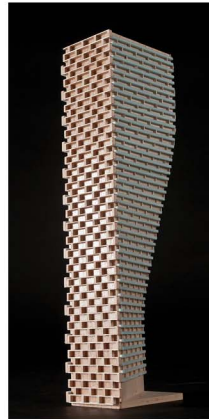
GRADIENTWIND

ENGINEERS & SCIENTISTS

TRAFFIC NOISE ASSESSMENT

Qwest Phase 2- 114 Richmond Road
Ottawa, Ontario

REPORT: GWE19-005 – Traffic Noise



March 12, 2019

PREPARED FOR

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EXECUTIVE SUMMARY

This report describes a traffic noise assessment undertaken in support of site plan application for proposed developments of Qwest Phase 2-A and Phase 2-B located at 114 Richmond Road in Ottawa, Ontario. Phase 2-A consists of a 9-storey, irregular planform residential building, known as Building 'B', attached to an existing building to the north by a 2-storey link. The building will have three levels of underground parking. Outdoor amenity areas in the form of communal terraces are located on the 7th floor and building rooftop, as well as an outdoor pool at grade. Phase 2-B comprises a 4-storey residential condominium building, known as Building 'C' on the east side of the lot and 9-storey residential seniors building, known as Building 'D' on the west side of the lot. An outdoor amenity area is provided on the Building 'C' rooftop. The major sources of traffic noise are Richmond Road to the north of the site, and Byron Avenue to the south. Figure 1 illustrates a complete site plan with surrounding context.

The assessment is based on (i) theoretical noise prediction methods that conform to the Ministry of the Environment, Conservation and Parks (MECP) and City of Ottawa requirements; (ii) noise level criteria as specified by the City of Ottawa's Environmental Noise Control Guidelines (ENCG); (iii) future vehicular traffic volumes based on the City of Ottawa's Official Plan roadway classifications; and (iv) site plan drawings prepared by Roderick Lahey Architect Inc. dated November 28, 2018.

The results of the current analysis indicate that noise levels will range between 51 and 62 dBA during the daytime period (07:00-23:00) and between 49 and 55 dBA during the nighttime period (23:00-07:00). The highest noise level (62 dBA) is at the Building 'D' south façade, which is nearest and most exposed to Byron Avenue. Results of the calculations indicate standard building components for all buildings will be sufficient to achieve the City of Ottawa's indoor sound criteria listed in Table 1. For areas of the site above 55 dBA, ventilation systems should allow the option for residences to keep windows closed, such as a forced air heating system with provision for central air conditioning. Noise levels at the OLAs are not expected to exceed 55 dBA during the daytime period, thus conforming to the ENCG criteria.

During the time of site plan application, the stationary noise impacts of the building on the surroundings would be considered. Stationary noise sources associated with the development could include rooftop air handling units, cooling towers or dry coolers, and emergency generators. Noise from these sources however can be controlled to acceptable limits established by MECP by judicious selection of the



equipment, locating the equipment on high roof away from nearby residential receptors, and where necessary installing silencers or noise screens.

In addition, noise from the nearby industrial facility at 145 Richmond Road (Canadian Bank Note) is not expected to be a concern do to the separation distances, presence of Richmond Road and buffering provided by other buildings.

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1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Ashcroft to undertake a traffic noise assessment in consideration of a zoning by-law amendment application for proposed developments of Qwest Phase 2-A and Phase 2-B located at 114 Richmond 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 Ottawa¹ and Ministry of the Environment, Conservation and Parks (MECP)² guidelines. Noise calculations were based on architectural drawings prepared by Roderick Lahey Architect Inc. dated November 28, 2018, with future traffic volumes corresponding to the City of Ottawa's Official Plan (OP) roadway classifications.

2. TERMS OF REFERENCE

The focus of this traffic noise assessment are the proposed developments of Qwest Phase 2-A and Phase 2-B located at 114 Richmond Road in Ottawa, Ontario. The proposed developments of Phase 2-A and Phase 2-B are featured on the south side of the lot, bound by Phase 1 developments to the north, Byron Avenue to the south, a public school to the west and existing residential properties to the west. The Phase 2-A developments are found to the north of Phase 2-B and to the south of the existing Phase 1 developments. Phase 2-A consists of a 9-storey, irregular planform residential building, known as Building 'B', attached to an existing building to the north by a 2-storey link. Floorplate setbacks occur on Levels 4, 6, 8 and 9. Entrances to a parking garage are found on the east and west sides. The building will have three levels of underground parking. Outdoor amenity areas in the form of communal terraces are located on the 6th and 9th storey, as well as an outdoor pool at grade.

Phase 2-B comprises a 4-storey residential condominium building, known as Building 'C' on the east side of the lot and 9-storey residential seniors building, known as Building 'D' on the west side of the lot. An outdoor amenity area is provided on the Building 'C' rooftop.

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

As previously mentioned, the site is situated south of the Qwest Phase 1 developments which comprise a rectangular planform building which stands nine-storeys above grade. The building possesses two pedestrian archway passages at grade running north and south. The site is bound by an existing church to the north, a public school to the west, and existing low-rise residential buildings to the west, east and south.

The major sources of traffic noise are Richmond Road to the north and Byron Avenue to the south. Although Kirkwood Avenue, located west of the site, is a nearby arterial roadway, it is located beyond 100 metres of the study site and therefore are not included as sources influencing the study site as per ENCG Section 2.1. Other potential sources of noise include industrial facilities which are sources of stationary noise. The only industrial facility in the area is the Canadian Bank Note (CBN) Company, located at 145 Richmond Road. Potential impacts of the facility are discussed in section 4.3. Figure 1 illustrates a complete site plan with surrounding context.

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 as outlined in Section 4.2 of this report.

4. METHODOLOGY

4.1 Background

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



3 dBA increase in measured noise levels and is just perceptible to most people. An increase of 10 dBA is often perceived to be twice as loud.

4.2 Roadway Traffic 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 45 and 40 dBA for living rooms and sleeping quarters respectively for roadway as listed in Table 1.

TABLE 1: INDOOR SOUND LEVEL CRITERIA (ROAD)³

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

Predicted noise levels at the plane of window (POW) dictate the action required to achieve the recommended sound levels. An open window is considered to provide a 10 dBA reduction in noise, while a standard closed window is capable of providing a minimum 20 dBA noise reduction⁴. A closed window due to a ventilation requirement will bring noise levels down to achieve an acceptable indoor

³ Adapted from ENCG 2016 – Tables 2.2b and 2.2c

⁴ Burberry, P.B. (2014). Mitchell's Environment and Services. Routledge, Page 125



environment⁵. 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 attenuation⁶.

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 Theoretical Roadway Noise Predictions

Noise predictions were performed with the aid of the MECF 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 absorptive due to the presence of soft (un-paved) ground.
- Topography was assumed to be a flat/gentle slope surrounding the study building.
- For Building 'B', receptor height was taken to be 1.5 m, 29.5 m, and 40.5 m above grade for the ground floor, 7th floor, and rooftop terrace outdoor living areas (OLA) respectively. For Building 'C', receptor height was taken to 17.5 m above grade for the rooftop terrace outdoor living area (OLA).
- For Building 'B' and 'D', receptor height was taken to be 18.5 m, 25.5 m, and 36.3 m above grade for the 4th floor, 6th floor, and 9th floor for the center of the plane of window (POW) respectively.

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



- For Building 'C', receptor height was taken to be 14.5 m above grade for the 4th floor for the center of the plane of window (POW).
- The mid-rise building constructed for Qwest Phase 1 was conservatively modelled as three separate structures to account for the noise travelling through the pedestrian archways toward the site. The building was modelled as a single row of houses with a density of 86%.
- Noise receptors were strategically placed at 14 locations around the study area (see Figure 2).
- Receptor distances and exposure angles are illustrated in Figures 3-6.

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 Plan⁷ which provide additional details on future roadway expansions. Average Annual Daily Traffic (AADT) volumes are then based on data in Table B1 of the ENCG for each roadway classification. Table 2 (below) summarizes the AADT values used for each roadway included in this assessment.

TABLE 2: ROADWAY TRAFFIC DATA

Segment	Roadway Traffic Data	Speed Limit (km/h)	Traffic Volumes
Richmond Road	4-Lane Urban Arterial Undivided (4-UAU)	50	30,000
Byron Road	2-Lane Urban Collector Undivided (2-UCU)	50	8,000

4.3 Evaluation of Existing Stationary Noise Sources

With regard to existing stationary noise impacting the development, MECP has published the D-series guidelines to assist planners and municipalities in the planning process to minimize the impacts industrial facilities and sensitive land uses will have on one another. In the document D-6 "*Compatibility between industrial facilities and sensitive land uses*"⁸ general areas of influence and minimum separation distance

⁷ City of Ottawa Transportation Master Plan, November 2013

⁸ Ministry of the Environment and Climate Change – Guideline D-6, July 1995



are recommended to minimize the potential for incompatible land uses creating an adverse effect on sensitive land use. Under the guidelines, industrial facilities are characterized into three categories depending on their size and potential output of noise, odour, dust and / or vibration.

The only industrial facility in the area is the Canadian Bank Note (CBN) Company, located at 145 Richmond Road. Under the D-6 guideline, CBN would be defined as a Class II industry for the following reasons:

- (i) They are a medium-scale operation
- (ii) The facility operates 24-hours a day
- (iii) There are frequent truck movements
- (iv) There is a low risk of fugitive emissions

For a Class II industry, the recommended minimum separation distance from sensitive land uses is 70 m and the potential influence zone is 300 m. The D-6 guideline allows for development within the influence zone in cases of infill, provided the appropriate studies are conducted to ensure the potential for an adverse effect is minimized. The actual separation distance between the development and the property line of CBN is approximately 130 m and 165 m to the edge of the CBN building. From satellite imagery it appears the majority of mechanical equipment and other noise sources are located at the middle to rear of the facility in the opposite direction from the development. The two land uses are buffered by Richmond Road and numerous existing buildings which provide blockage between the two land uses. Based on these consideration and Gradient Wind's experience on developments to the west of CBN at 319 McRae we don't expect any significant noise impacts from the CBN facility nor any additional constraints on the CBN's operations and ability to achieve MECP Environmental Compliance Approval.



5. RESULTS AND DISCUSSION

5.1 Roadway Traffic Noise Levels

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

TABLE 3: EXTERIOR NOISE LEVELS DUE TO ROAD TRAFFIC

Receptor Number	Receptor Height Above Grade (m)	Receptor Location	STAMSON 5.04 Noise Level (dBA)	
			Day	Night
1	1.5	OLA – Ground Floor (Phase 2-A)	55	-
2	18.5	POW – 4 th Floor – North Façade (Phase 2-A)	58	50
3	25.5	POW – 6 th Floor – West Façade (Phase 2-A)	58	51
4	29.5	OLA – 7 th Floor – North Terrace (Phase 2-A)	57	-
5	36.3	POW – 9 th Floor – North Façade (Phase 2-A)	60	52
6	40.5	OLA – Rooftop Terrace (Phase 2-A)	55	-
7	36.3	POW – 9 th Floor – North Façade (Phase 2-A)	58	50
8	29.5	OLA – 7 th Floor – East Terrace (Phase 2-A)	54	-
9	14.5	POW – 4 th Floor – East Façade (Phase 2-B)	56	49
10	17.5	OLA – Rooftop Terrace (Phase 2-B)	54	-
11	14.5	POW – 4 th Floor – South Façade (Phase 2-B)	60	53
12	36.3	POW – 9 th Floor – East Façade (Phase 2-B)	58	51
13	36.3	POW – 9 th Floor – South Façade (Phase 2-B)	62	55
14	36.3	POW – 9 th Floor – West Façade (Phase 2-B)	59	51



The results of the current analysis indicate that noise levels will range between 54 and 62 dBA during the daytime period (07:00-23:00) and between 49 and 55 dBA during the nighttime period (23:00-07:00). The highest noise level (62 dBA) occurs at the Building 'D' south façade, which is nearest and most exposed to Byron Avenue.

5.2 Noise Control Measures

The noise levels predicted due to roadway traffic do not exceed the criteria in Section 4.2 for building components. Therefore, standard building components will be sufficient to attenuating indoor sound levels to meet the ENCG criteria as listed in Table 1. Results of the calculations do indicate that all dwellings will require forced air heating with provision for central air conditioning. If installed, air conditioning will allow occupants to keep windows closed and maintain a comfortable living environment during the warmer months. In addition to ventilation requirements, Warning Clauses will also be required to be placed on all Lease, Purchase and Sale Agreements.

6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current analysis indicate that noise levels will range between 51 and 62 dBA during the daytime period (07:00-23:00) and between 49 and 55 dBA during the nighttime period (23:00-07:00). The highest noise level (62 dBA) the Building 'D' south façade, which is nearest and most exposed to Byron Avenue. Results of the calculations indicate standard building components for all buildings will be sufficient to achieve the City of Ottawa's indoor sound criteria listed in Table 1. For areas of the site above 55 dBA, ventilation systems should allow the option for residences to keep windows closed, such as a forced air heating system with provision for central air conditioning. The following Warning Clause⁹ will also be required to be placed on all Lease, Purchase and Sale Agreements, as summarized below:

"Purchasers/tenants are advised that 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, Conservation and Parks.

⁹ City of Ottawa Environmental Noise Control Guidelines, January 2016



This dwelling unit has also been designed with forced air heating with provisions for central air conditioning at the occupant's discretion. These noise measures 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, Conservation and Parks.

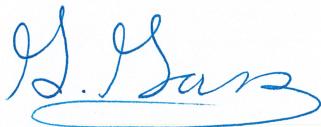
During the time of site plan application, the stationary noise impacts of the building on the surroundings would be considered. Stationary noise sources associated with the development could include rooftop air handling units, cooling towers or dry coolers, and emergency generators. Noise from these sources however can be controlled to acceptable limits established by MECP by judicious selection of the equipment, locating the equipment on high roof away from nearby residential receptors, and where necessary installing silencers or noise screens.

In addition, noise from the nearby industrial facility at 145 Richmond Road is not expected to be a concern do to the separation distances, presence of Richmond Road and buffering provided by other buildings.

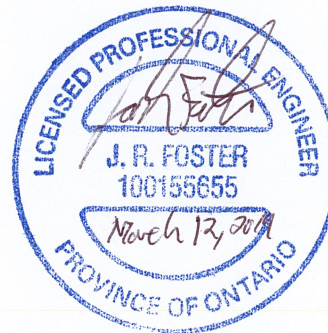
This concludes our traffic noise assessment and report. If you have any questions or wish to discuss our findings please advise us. In the interim, we thank you for the opportunity to be of service.

Sincerely,

Gradient Wind Engineering Inc.

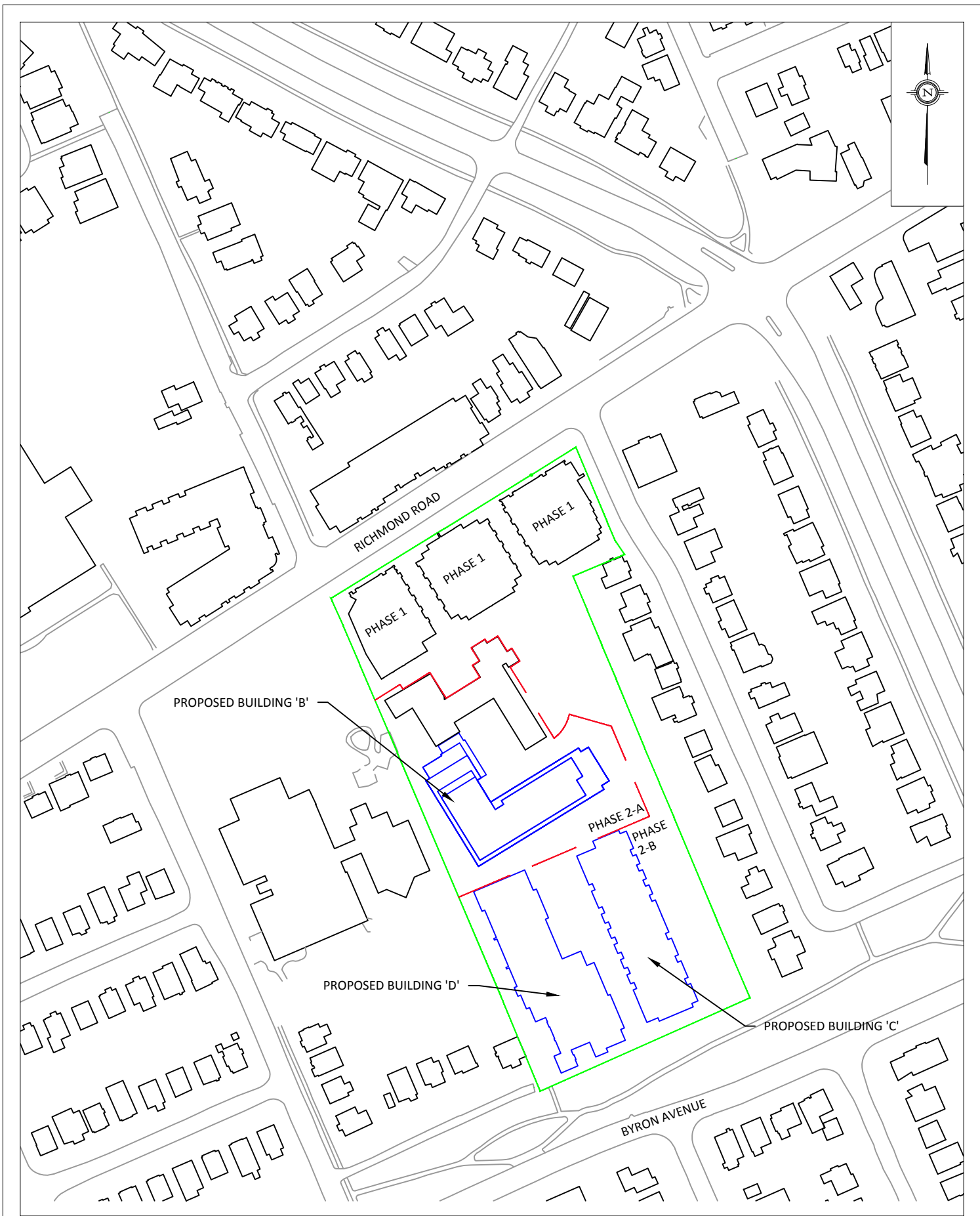


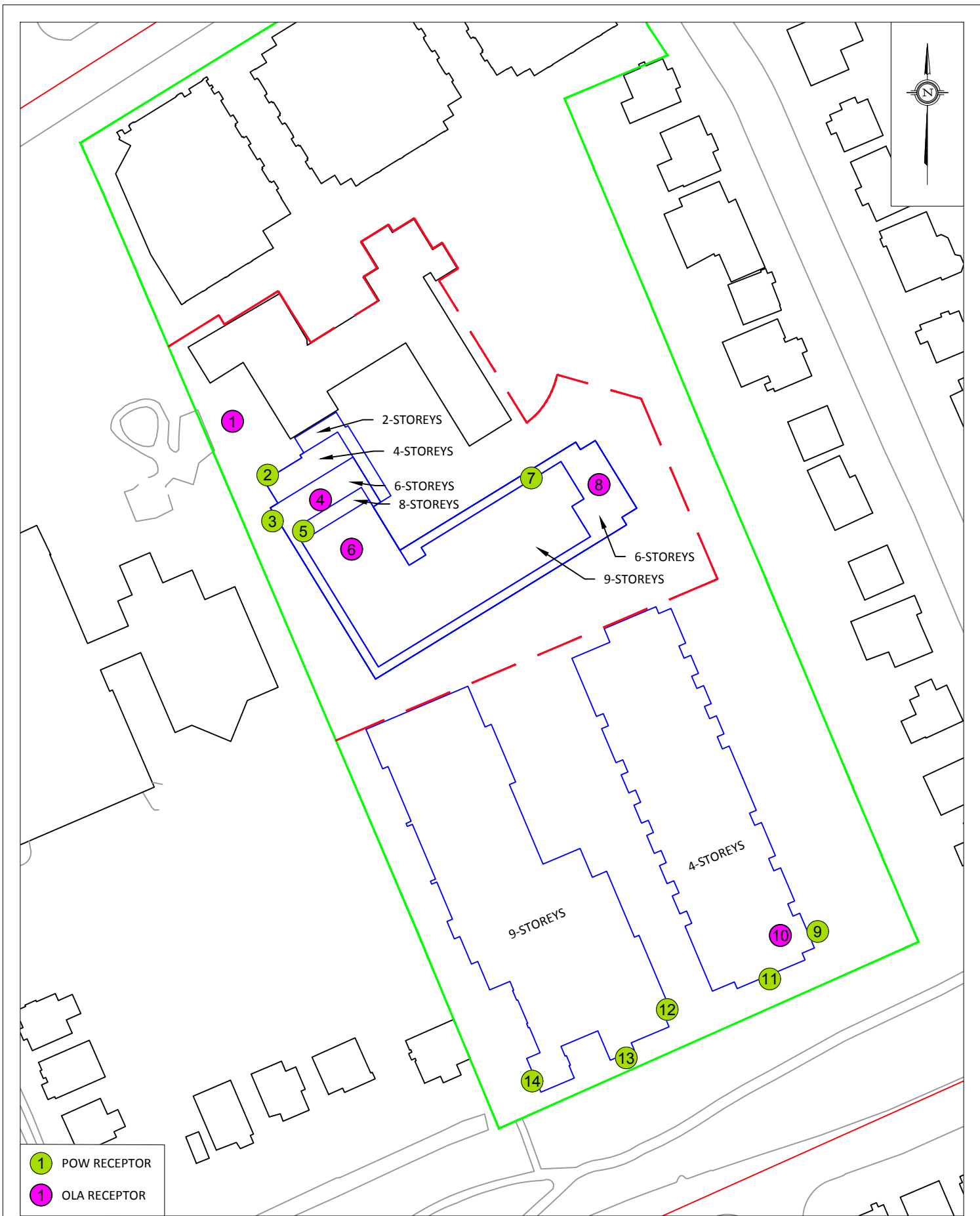
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GWE19-005

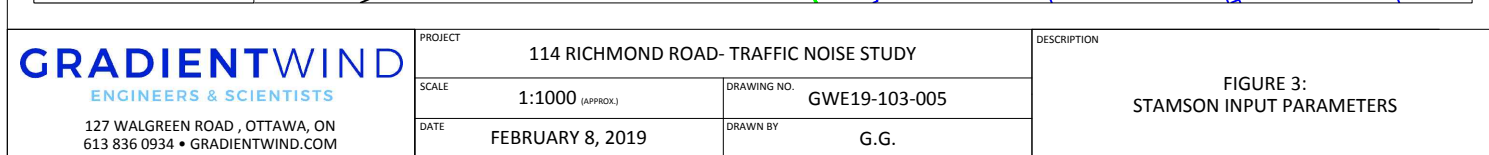


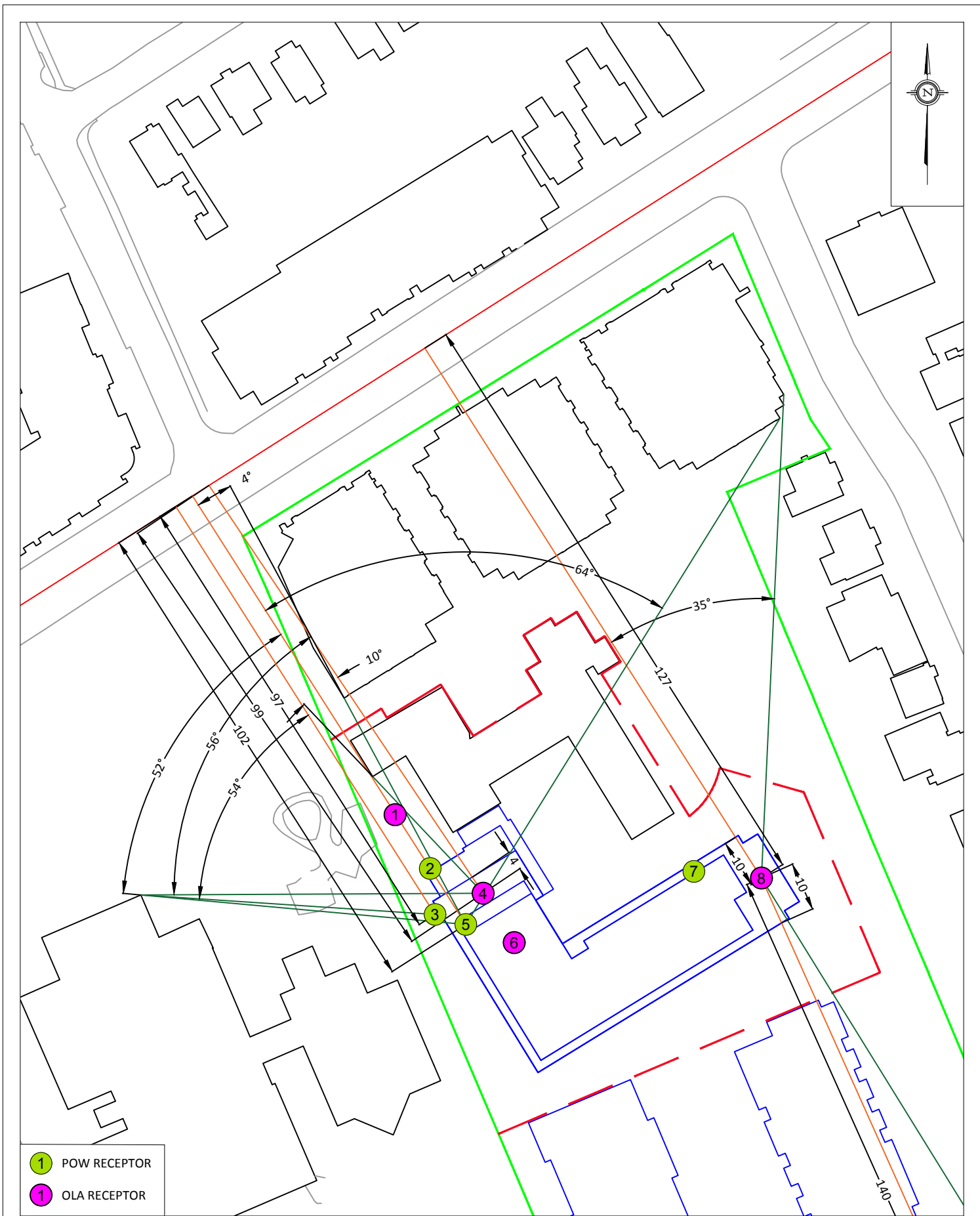
Joshua Foster, P.Eng.
Principal

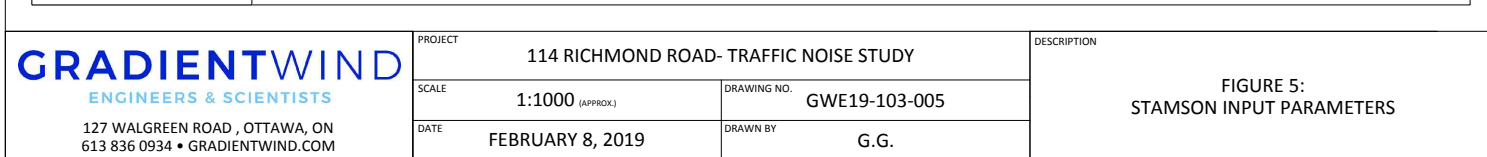








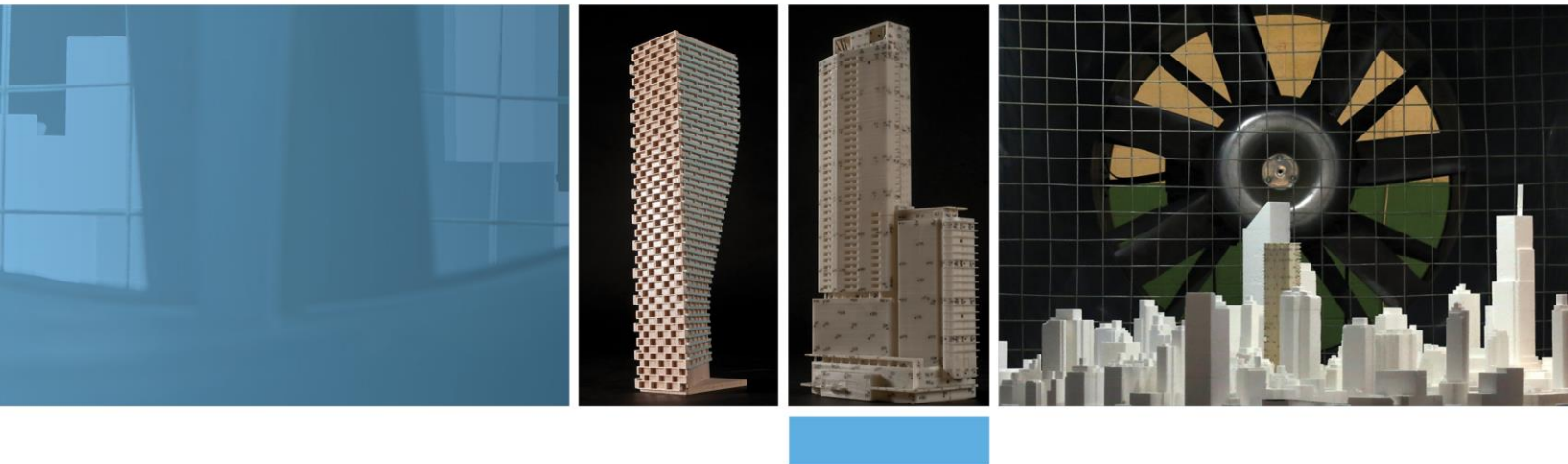






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APPENDIX A

STAMSON 5.04 – INPUT AND OUTPUT DATA

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STAMSON 5.0 NORMAL REPORT Date: 08-02-2019 08:51:07
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

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

Car traffic volume : 24288/2112 veh/TimePeriod *
Medium truck volume : 1932/168 veh/TimePeriod *
Heavy truck volume : 1380/120 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): 30000
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: Richmond Rd (day/night)

Angle1 Angle2 : -61.00 deg 0.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 76.00 / 76.00 m
Receiver height : 1.50 / 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00



Results segment # 1: Richmond Rd (day)

Source height = 1.50 m

ROAD (0.00 + 54.51 + 0.00) = 54.51 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-61	0	0.66	71.49	0.00	-11.70	-5.28	0.00	0.00	0.00
54.51									

Segment Leq : 54.51 dBA

Total Leq All Segments: 54.51 dBA

Results segment # 1: Richmond Rd (night)

Source height = 1.50 m

ROAD (0.00 + 46.91 + 0.00) = 46.91 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-61	0	0.66	63.89	0.00	-11.70	-5.28	0.00	0.00	0.00
46.91									

Segment Leq : 46.91 dBA

Total Leq All Segments: 46.91 dBA

TOTAL Leq FROM ALL SOURCES (DAY) : 54.51
(NIGHT) : 46.91



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STAMSON 5.0 NORMAL REPORT Date: 08-02-2019 08:51:24
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Road data, segment # 1: Richmond rd (day/night)

Car traffic volume : 24288/2112 veh/TimePeriod *
Medium truck volume : 1932/168 veh/TimePeriod *
Heavy truck volume : 1380/120 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): 30000
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: Richmond rd (day/night)

Angle1 Angle2 : -63.00 deg 0.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 89.00 / 89.00 m
Receiver height : 18.50 / 18.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00



Results segment # 1: Richmond rd (day)

Source height = 1.50 m

ROAD (0.00 + 57.89 + 0.00) = 57.89 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

--	-63	0	0.15	71.49	0.00	-8.89	-4.71	0.00	0.00	0.00
57.89										

Segment Leq : 57.89 dBA

Total Leq All Segments: 57.89 dBA

Results segment # 1: Richmond rd (night)

Source height = 1.50 m

ROAD (0.00 + 50.29 + 0.00) = 50.29 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

--	-63	0	0.15	63.89	0.00	-8.89	-4.71	0.00	0.00	0.00
50.29										

Segment Leq : 50.29 dBA

Total Leq All Segments: 50.29 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 57.89
(NIGHT): 50.29



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STAMSON 5.0 NORMAL REPORT Date: 08-02-2019 08:51:40
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

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

Car traffic volume : 24288/2112 veh/TimePeriod *
Medium truck volume : 1932/168 veh/TimePeriod *
Heavy truck volume : 1380/120 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): 30000
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: Richmond Rd (day/night)

Angle1 Angle2 : -54.00 deg 0.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 97.00 / 97.00 m
Receiver height : 25.50 / 25.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00



Results segment # 1: Richmond Rd (day)

Source height = 1.50 m

ROAD (0.00 + 58.15 + 0.00) = 58.15 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-54	0	0.00	71.49	0.00	-8.11	-5.23	0.00	0.00	0.00
58.15									

Segment Leq : 58.15 dBA

Total Leq All Segments: 58.15 dBA

Results segment # 1: Richmond Rd (night)

Source height = 1.50 m

ROAD (0.00 + 50.56 + 0.00) = 50.56 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-54	0	0.00	63.89	0.00	-8.11	-5.23	0.00	0.00	0.00
50.56									

Segment Leq : 50.56 dBA

Total Leq All Segments: 50.56 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 58.15
(NIGHT): 50.56



GRADIENTWIND

ENGINEERS & SCIENTISTS

STAMSON 5.0 NORMAL REPORT Date: 08-02-2019 08:51:57
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

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

Car traffic volume : 24288/2112 veh/TimePeriod *
Medium truck volume : 1932/168 veh/TimePeriod *
Heavy truck volume : 1380/120 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): 30000
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: Richmond Rd (day/night)

Angle1 Angle2 : -56.00 deg -10.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 99.00 / 99.00 m
Receiver height : 29.50 / 29.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -56.00 deg Angle2 : -10.00 deg
Barrier height : 28.00 m
Barrier receiver distance : 4.00 / 4.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00



Results segment # 1: Richmond Rd (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	29.50	28.37	28.37

ROAD (0.00 + 57.37 + 0.00) = 57.37 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-56	-10	0.00	71.49	0.00	-8.20	-5.93	0.00	0.00	-4.29
53.08*									
-56	-10	0.00	71.49	0.00	-8.20	-5.93	0.00	0.00	0.00
57.37									

* Bright Zone !

Segment Leq : 57.37 dBA

Total Leq All Segments: 57.37 dBA



Results segment # 1: Richmond Rd (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	29.50	28.37	28.37

ROAD (0.00 + 49.77 + 0.00) = 49.77 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-56	-10	0.00	63.89	0.00	-8.20	-5.93	0.00	0.00	-4.29
45.48*									
-56	-10	0.00	63.89	0.00	-8.20	-5.93	0.00	0.00	0.00
49.77									

* Bright Zone !

Segment Leq : 49.77 dBA

Total Leq All Segments: 49.77 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 57.37
(NIGHT): 49.77



GRADIENTWIND

ENGINEERS & SCIENTISTS

STAMSON 5.0 NORMAL REPORT Date: 08-02-2019 08:52:50
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

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

Car traffic volume : 24288/2112 veh/TimePeriod *
Medium truck volume : 1932/168 veh/TimePeriod *
Heavy truck volume : 1380/120 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): 30000
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: Richmond Rd (day/night)

Angle1 Angle2 : -52.00 deg 4.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 102.00 / 102.00 m
Receiver height : 36.30 / 36.30 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00



Road data, segment # 2: Richmond Rd (day/night)

Car traffic volume : 24288/2112 veh/TimePeriod *
Medium truck volume : 1932/168 veh/TimePeriod *
Heavy truck volume : 1380/120 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): 30000
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: Richmond Rd (day/night)

Angle1 Angle2 : 4.00 deg 64.00 deg
Wood depth : 0 (No woods.)
No of house rows : 1 / 1
House density : 86 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 102.00 / 102.00 m
Receiver height : 36.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00



Road data, segment # 3: Richmond Rd (day/night)

```
-----
Car traffic volume : 24288/2112   veh/TimePeriod  *
Medium truck volume : 1932/168    veh/TimePeriod  *
Heavy truck volume  : 1380/120    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): 30000
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 # 3: Richmond Rd (day/night)

```
-----
Angle1  Angle2      : 64.00 deg  90.00 deg
Wood depth          : 0          (No woods.)
No of house rows    : 0 / 0
Surface             : 1          (Absorptive ground surface)
Receiver source distance : 102.00 / 102.00 m
Receiver height      : 36.30 / 36.30 m
Topography          : 1          (Flat/gentle slope; no barrier)
Reference angle      : 0.00
```

Results segment # 1: Richmond Rd (day)

Source height = 1.50 m

ROAD (0.00 + 58.09 + 0.00) = 58.09 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
--------	--------	-------	--------	-------	-------	-------	-------	-------	-------

SubLeq

```
-----
--
-52      4    0.00  71.49   0.00  -8.33  -5.07   0.00   0.00   0.00
58.09
-----
--
```

Segment Leq : 58.09 dBA



Results segment # 2: Richmond Rd (day)

Source height = 1.50 m

ROAD (0.00 + 51.67 + 0.00) = 51.67 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

4	64	0.00	71.49	0.00	-8.33	-4.77	0.00	-6.73	0.00
51.67									

Segment Leq : 51.67 dBA

Results segment # 3: Richmond Rd (day)

Source height = 1.50 m

ROAD (0.00 + 54.76 + 0.00) = 54.76 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

64	90	0.00	71.49	0.00	-8.33	-8.40	0.00	0.00	0.00
54.76									

Segment Leq : 54.76 dBA

Total Leq All Segments: 60.38 dBA



Results segment # 1: Richmond Rd (night)

Source height = 1.50 m

ROAD (0.00 + 50.50 + 0.00) = 50.50 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

--									
-52	4	0.00	63.89	0.00	-8.33	-5.07	0.00	0.00	0.00
50.50									

Segment Leq : 50.50 dBA

Results segment # 2: Richmond Rd (night)

Source height = 1.50 m

ROAD (0.00 + 38.72 + 0.00) = 38.72 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

--									
4	64	0.57	63.89	0.00	-13.07	-5.38	0.00	-6.73	0.00
38.72									

Segment Leq : 38.72 dBA



Results segment # 3: Richmond Rd (night)

Source height = 1.50 m

ROAD (0.00 + 47.17 + 0.00) = 47.17 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

64	90	0.00	63.89	0.00	-8.33	-8.40	0.00	0.00	0.00
47.17									

Segment Leq : 47.17 dBA

Total Leq All Segments: 52.35 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.38
(NIGHT): 52.35



GRADIENTWIND

ENGINEERS & SCIENTISTS

STAMSON 5.0 NORMAL REPORT Date: 08-02-2019 08:53:06
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

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

Car traffic volume : 24288/2112 veh/TimePeriod *
Medium truck volume : 1932/168 veh/TimePeriod *
Heavy truck volume : 1380/120 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): 30000
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: Richmond Rd (day/night)

Angle1 Angle2 : -50.00 deg 0.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 111.00 / 111.00 m
Receiver height : 40.50 / 40.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -50.00 deg Angle2 : 0.00 deg
Barrier height : 39.00 m
Barrier receiver distance : 7.00 / 7.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00



Road data, segment # 2: Richmond Rd (day/night)

Car traffic volume : 24288/2112 veh/TimePeriod *
Medium truck volume : 1932/168 veh/TimePeriod *
Heavy truck volume : 1380/120 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): 30000
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: Richmond Rd (day/night)

Angle1 Angle2 : 0.00 deg 59.00 deg
Wood depth : 0 (No woods.)
No of house rows : 1 / 1
House density : 86 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 111.00 / 111.00 m
Receiver height : 40.50 / 40.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : 0.00 deg Angle2 : 59.00 deg
Barrier height : 39.00 m
Barrier receiver distance : 7.00 / 7.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00



Road data, segment # 3: Richmond Rd (day/night)

Car traffic volume : 24288/2112 veh/TimePeriod *
Medium truck volume : 1932/168 veh/TimePeriod *
Heavy truck volume : 1380/120 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): 30000
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 # 3: Richmond Rd (day/night)

Angle1 Angle2 : 59.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 111.00 / 111.00 m
Receiver height : 40.50 / 40.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : 59.00 deg Angle2 : 90.00 deg
Barrier height : 39.00 m
Barrier receiver distance : 7.00 / 7.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00



Results segment # 1: Richmond Rd (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	40.50	38.04	38.04

ROAD (0.00 + 49.91 + 0.00) = 49.91 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-50	0	0.00	71.49	0.00	-8.69	-5.56	0.00	0.00	-7.32
49.91									

Segment Leq : 49.91 dBA

Results segment # 2: Richmond Rd (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	40.50	38.04	38.04

ROAD (0.00 + 50.74 + 0.00) = 50.74 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

0	59	0.00	71.49	0.00	-8.69	-4.84	0.00	-6.66	0.00
51.29									
0	59	0.00	71.49	0.00	-8.69	-4.84	0.00	0.00	-7.21
50.74									

Segment Leq : 50.74 dBA



Results segment # 3: Richmond Rd (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	40.50	38.04	38.04

ROAD (0.00 + 49.39 + 0.00) = 49.39 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

59	90	0.00	71.49	0.00	-8.69	-7.64	0.00	0.00	-5.77
49.39									

Segment Leq : 49.39 dBA

Total Leq All Segments: 54.82 dBA

Results segment # 1: Richmond Rd (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	40.50	38.04	38.04

ROAD (0.00 + 42.32 + 0.00) = 42.32 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-50	0	0.00	63.89	0.00	-8.69	-5.56	0.00	0.00	-7.32
42.32									

Segment Leq : 42.32 dBA



Results segment # 2: Richmond Rd (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	40.50	38.04	38.04

ROAD (0.00 + 43.15 + 0.00) = 43.15 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
0	59	0.00	63.89	0.00	-8.69	-4.84	0.00	-6.66	0.00
0	59	0.00	63.89	0.00	-8.69	-4.84	0.00	0.00	-7.21

SubLeq

43.69

43.15

Segment Leq : 43.15 dBA



Results segment # 3: Richmond Rd (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	40.50	38.04	38.04

ROAD (0.00 + 41.80 + 0.00) = 41.80 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
59	90	0.00	63.89	0.00	-8.69	-7.64	0.00	0.00	-5.77

SubLeq

41.80

Segment Leq : 41.80 dBA

Total Leq All Segments: 47.23 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 54.82
(NIGHT): 47.23



GRADIENTWIND

ENGINEERS & SCIENTISTS

STAMSON 5.0 NORMAL REPORT Date: 08-02-2019 08:53:19
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Road data, segment # 1: Richmond rd (day/night)

Car traffic volume : 24288/2112 veh/TimePeriod *
Medium truck volume : 1932/168 veh/TimePeriod *
Heavy truck volume : 1380/120 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): 30000
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: Richmond rd (day/night)

Angle1 Angle2 : -31.00 deg 43.00 deg
Wood depth : 0 (No woods.)
No of house rows : 1 / 1
House density : 86 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 118.00 / 118.00 m
Receiver height : 36.30 / 36.30 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00



GRADIENTWIND

ENGINEERS & SCIENTISTS

Road data, segment # 2: Richmond Rd (day/night)

Car traffic volume : 24288/2112 veh/TimePeriod *
Medium truck volume : 1932/168 veh/TimePeriod *
Heavy truck volume : 1380/120 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): 30000
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: Richmond Rd (day/night)

Angle1 Angle2 : 43.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 118.00 / 118.00 m
Receiver height : 36.30 / 36.30 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Richmond rd (day)

Source height = 1.50 m

ROAD (0.00 + 52.06 + 0.00) = 52.06 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
--------	--------	-------	--------	-------	-------	-------	-------	-------	-------

SubLeq

--
-31 43 0.00 71.49 0.00 -8.96 -3.86 0.00 -6.61 0.00
52.06

--

Segment Leq : 52.06 dBA



Results segment # 2: Richmond Rd (day)

Source height = 1.50 m

ROAD (0.00 + 56.70 + 0.00) = 56.70 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

43	90	0.00	71.49	0.00	-8.96	-5.83	0.00	0.00	0.00
56.70									

Segment Leq : 56.70 dBA

Total Leq All Segments: 57.98 dBA

Results segment # 1: Richmond rd (night)

Source height = 1.50 m

ROAD (0.00 + 44.46 + 0.00) = 44.46 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-31	43	0.00	63.89	0.00	-8.96	-3.86	0.00	-6.61	0.00
44.46									

Segment Leq : 44.46 dBA



Results segment # 2: Richmond Rd (night)

Source height = 1.50 m

ROAD (0.00 + 49.10 + 0.00) = 49.10 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

43	90	0.00	63.89	0.00	-8.96	-5.83	0.00	0.00	0.00
49.10									

Segment Leq : 49.10 dBA

Total Leq All Segments: 50.38 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 57.98
(NIGHT): 50.38



GRADIENTWIND

ENGINEERS & SCIENTISTS

STAMSON 5.0 NORMAL REPORT Date: 08-02-2019 08:53:30
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Road data, segment # 1: Richmond rd (day/night)

Car traffic volume : 24288/2112 veh/TimePeriod *
Medium truck volume : 1932/168 veh/TimePeriod *
Heavy truck volume : 1380/120 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): 30000
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: Richmond rd (day/night)

Angle1 Angle2 : 0.00 deg 35.00 deg
Wood depth : 0 (No woods.)
No of house rows : 1 / 1
House density : 86 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 127.00 / 127.00 m
Receiver height : 29.50 / 29.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : 0.00 deg Angle2 : 35.00 deg
Barrier height : 28.00 m
Barrier receiver distance : 10.00 / 10.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00



Road data, segment # 2: Richmond rd (day/night)

Car traffic volume : 24288/2112 veh/TimePeriod *
Medium truck volume : 1932/168 veh/TimePeriod *
Heavy truck volume : 1380/120 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): 30000
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: Richmond rd (day/night)

Angle1 Angle2 : 35.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 127.00 / 127.00 m
Receiver height : 29.50 / 29.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : 35.00 deg Angle2 : 90.00 deg
Barrier height : 28.00 m
Barrier receiver distance : 10.00 / 10.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00



Road data, segment # 3: Byron Ave (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 # 3: Byron Ave (day/night)

Angle1 Angle2 : -90.00 deg -8.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 140.00 / 140.00 m
Receiver height : 29.50 / 29.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : -8.00 deg
Barrier height : 28.00 m
Barrier receiver distance : 10.00 / 10.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00



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Results segment # 1: Richmond rd (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	! Receiver ! Height (m)	! Barrier ! Height (m)	! Elevation of ! Barrier Top (m)
1.50	!	29.50	!
		27.29	!
			27.29

ROAD (0.00 + 48.53 + 0.00) = 48.53 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

0	35	0.00	71.49	0.00	-9.28	-7.11	0.00	-6.57	0.00
48.53									
0	35	0.00	71.49	0.00	-9.28	-7.11	0.00	0.00	-6.15
48.95									

Segment Leq : 48.53 dBA

Results segment # 2: Richmond rd (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	! Receiver ! Height (m)	! Barrier ! Height (m)	! Elevation of ! Barrier Top (m)
1.50	!	29.50	!
		27.29	!
			27.29

ROAD (0.00 + 51.51 + 0.00) = 51.51 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

35	90	0.00	71.49	0.00	-9.28	-5.15	0.00	0.00	-5.55
51.51									

Segment Leq : 51.51 dBA



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Results segment # 3: Byron Ave (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	! Receiver ! Height (m)	! Barrier ! Height (m)	! Elevation of ! Barrier Top (m)
1.50	!	29.50	!
		27.50	!
			27.50

ROAD (0.00 + 47.25 + 0.00) = 47.25 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-90	-8	0.00	65.75	0.00	-9.70	-3.41	0.00	0.00	-5.39
47.25									

Segment Leq : 47.25 dBA

Total Leq All Segments: 54.25 dBA

Results segment # 1: Richmond rd (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	! Receiver ! Height (m)	! Barrier ! Height (m)	! Elevation of ! Barrier Top (m)
1.50	!	29.50	!
		27.29	!
			27.29

ROAD (0.00 + 40.93 + 0.00) = 40.93 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

0	35	0.00	63.89	0.00	-9.28	-7.11	0.00	-6.57	0.00
40.93									
0	35	0.00	63.89	0.00	-9.28	-7.11	0.00	0.00	-6.15
41.35									

Segment Leq : 40.93 dBA



Results segment # 2: Richmond rd (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	29.50	27.29	27.29

ROAD (0.00 + 43.91 + 0.00) = 43.91 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
35	90	0.00	63.89	0.00	-9.28	-5.15	0.00	0.00	-5.55

SubLeq

Segment Leq : 43.91 dBA



Results segment # 3: Byron Ave (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	29.50	27.50	27.50

ROAD (0.00 + 39.65 + 0.00) = 39.65 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
-90	-8	0.00	58.16	0.00	-9.70	-3.41	0.00	0.00	-5.39

SubLeq

39.65

Segment Leq : 39.65 dBA

Total Leq All Segments: 46.65 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 54.25
(NIGHT): 46.65



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STAMSON 5.0 NORMAL REPORT Date: 08-02-2019 08:53:48
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Road data, segment # 1: Byron Ave (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: Byron Ave (day/night)

Angle1 Angle2 : -77.00 deg 0.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 40.00 / 40.00 m
Receiver height : 14.50 / 14.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00



Results segment # 1: Byron Ave (day)

Source height = 1.50 m

ROAD (0.00 + 56.22 + 0.00) = 56.22 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-77	0	0.27	65.75	0.00	-5.41	-4.12	0.00	0.00	0.00
56.22									

Segment Leq : 56.22 dBA

Total Leq All Segments: 56.22 dBA

Results segment # 1: Byron Ave (night)

Source height = 1.50 m

ROAD (0.00 + 48.63 + 0.00) = 48.63 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-77	0	0.27	58.16	0.00	-5.41	-4.12	0.00	0.00	0.00
48.63									

Segment Leq : 48.63 dBA

Total Leq All Segments: 48.63 dBA

TOTAL Leq FROM ALL SOURCES (DAY) : 56.22
(NIGHT) : 48.63



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STAMSON 5.0 NORMAL REPORT Date: 08-02-2019 08:54:05
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Road data, segment # 1: Byron Ave (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: Byron Ave (day/night)

Angle1 Angle2 : -90.00 deg 75.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 42.00 / 42.00 m
Receiver height : 17.50 / 17.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 75.00 deg
Barrier height : 16.00 m
Barrier receiver distance : 6.00 / 6.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00



Results segment # 1: Byron Ave (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	17.50	15.21	15.21

ROAD (0.00 + 54.37 + 0.00) = 54.37 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
-90	75	0.00	65.75	0.00	-4.47	-0.38	0.00	0.00	-6.53

SubLeq

Segment Leq : 54.37 dBA

Total Leq All Segments: 54.37 dBA



Results segment # 1: Byron Ave (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	17.50	15.21	15.21

ROAD (0.00 + 46.77 + 0.00) = 46.77 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
-90	75	0.00	58.16	0.00	-4.47	-0.38	0.00	0.00	-6.53

SubLeq

46.77

Segment Leq : 46.77 dBA

Total Leq All Segments: 46.77 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 54.37
(NIGHT): 46.77



GRADIENTWIND

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STAMSON 5.0 NORMAL REPORT Date: 08-02-2019 08:54:15
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r11.te Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Byron Ave (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: Byron Ave (day/night)

Angle1 Angle2 : -90.00 deg 86.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 35.00 / 35.00 m
Receiver height : 14.50 / 14.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00



Results segment # 1: Byron Ave (day)

Source height = 1.50 m

ROAD (0.00 + 60.33 + 0.00) = 60.33 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-90	86	0.27	65.75	0.00	-4.67	-0.75	0.00	0.00	0.00
60.33									

Segment Leq : 60.33 dBA

Total Leq All Segments: 60.33 dBA

Results segment # 1: Byron Ave (night)

Source height = 1.50 m

ROAD (0.00 + 52.74 + 0.00) = 52.74 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-90	86	0.27	58.16	0.00	-4.67	-0.75	0.00	0.00	0.00
52.74									

Segment Leq : 52.74 dBA

Total Leq All Segments: 52.74 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.33
(NIGHT): 52.74



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STAMSON 5.0 NORMAL REPORT Date: 08-02-2019 08:54:25
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r12.te Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Byron Ave (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: Byron Ave (day/night)

Angle1 Angle2 : -82.00 deg 0.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 38.00 / 38.00 m
Receiver height : 36.30 / 36.30 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00



Results segment # 1: Byron Ave (day)

Source height = 1.50 m

ROAD (0.00 + 58.30 + 0.00) = 58.30 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-82	0	0.00	65.75	0.00	-4.04	-3.41	0.00	0.00	0.00
58.30									

Segment Leq : 58.30 dBA

Total Leq All Segments: 58.30 dBA

Results segment # 1: Byron Ave (night)

Source height = 1.50 m

ROAD (0.00 + 50.71 + 0.00) = 50.71 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-82	0	0.00	58.16	0.00	-4.04	-3.41	0.00	0.00	0.00
50.71									

Segment Leq : 50.71 dBA

Total Leq All Segments: 50.71 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 58.30
(NIGHT): 50.71



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STAMSON 5.0 NORMAL REPORT Date: 08-02-2019 08:54:34
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r13.te Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Byron Ave (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: Byron Ave (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 32.00 / 32.00 m
Receiver height : 36.30 / 36.30 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00



Results segment # 1: Byron Ave (day)

Source height = 1.50 m

ROAD (0.00 + 62.46 + 0.00) = 62.46 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	-3.29	0.00	0.00	0.00	0.00
62.46									

Segment Leq : 62.46 dBA

Total Leq All Segments: 62.46 dBA

Results segment # 1: Byron Ave (night)

Source height = 1.50 m

ROAD (0.00 + 54.87 + 0.00) = 54.87 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	-3.29	0.00	0.00	0.00	0.00
54.87									

Segment Leq : 54.87 dBA

Total Leq All Segments: 54.87 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 62.46
(NIGHT): 54.87



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STAMSON 5.0 NORMAL REPORT Date: 08-02-2019 08:54:47
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: rl4.te Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Byron Ave (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: Byron Ave (day/night)

Angle1 Angle2 : 0.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 36.00 / 36.00 m
Receiver height : 36.30 / 36.30 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00



Results segment # 1: Byron Ave (day)

Source height = 1.50 m

ROAD (0.00 + 58.94 + 0.00) = 58.94 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

0	90	0.00	65.75	0.00	-3.80	-3.01	0.00	0.00	0.00
58.94									

Segment Leq : 58.94 dBA

Total Leq All Segments: 58.94 dBA

Results segment # 1: Byron Ave (night)

Source height = 1.50 m

ROAD (0.00 + 51.34 + 0.00) = 51.34 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

0	90	0.00	58.16	0.00	-3.80	-3.01	0.00	0.00	0.00
51.34									

Segment Leq : 51.34 dBA

Total Leq All Segments: 51.34 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 58.94
(NIGHT): 51.34

