

**ROADWAY TRAFFIC NOISE
ASSESSMENT**

341 Gloucester Street
Ottawa, Ontario

REPORT: GWE18-171 – Traffic Noise



June 18, 2019

PREPARED FOR

Upscale Homes
324 Donald Street
Ottawa, ON K1K 1M5

c/o Rob Verch
RLA Architecture

PREPARED BY

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EXECUTIVE SUMMARY

This report describes a traffic noise assessment undertaken in support of site plan application for a proposed residential development located at 341 Gloucester Street in Ottawa, Ontario. The proposed development is a 23-storey building with lobby and indoor amenity area at grade and rental units above. The building planform is rectangular with the short axis oriented along Gloucester Street. Outdoor amenity space is provided at grade to the rear of the development, as well as atop the 22nd and 23rd Floor terraces. The major sources of traffic noise are Lyon Street North and Laurier. 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 RLA Architecture.

The results of the current analysis indicate that noise levels will range between 52 and 57 dBA during the daytime period (07:00-23:00) and between 45 and 50 dBA during the nighttime period (23:00-07:00). The highest noise level (57 dBA) occurs at the east façade, which is nearest and most exposed to Lyon Street North.

The noise levels predicted due to roadway traffic fall below the criteria listed in Section 4.2 for building components and outdoor living areas. Results of the calculations also indicate that the development will require forced air heating with provision for air conditioning. Air conditioning will allow occupants to keep windows closed and maintain a comfortable living environment. A Warning Clause¹ will also be required to be placed on all Lease, Purchase and Sale Agreements, as summarized in Section 6.

¹ City of Ottawa Environmental Noise Control Guidelines, January 2016



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1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by RLA Architecture on behalf of Upscale Homes to undertake a traffic noise assessment in support of site plan application for a proposed residential development at 341 Gloucester Street in Ottawa, Ontario. This report summarizes the methodology, results, and recommendations related to the assessment of exterior and interior noise levels generated by local roadway traffic.

Our work is based on theoretical noise calculation methods conforming to the City of Ottawa² and Ministry of the Environment, Conservation and Parks (MECP)³ guidelines. Noise calculations were based on architectural drawings prepared by RLA Architecture, with future traffic volumes corresponding to the City of Ottawa's Official Plan (OP) roadway classifications.

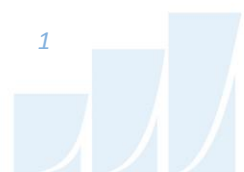
2. TERMS OF REFERENCE

The study site is located north of Gloucester Street, between Bay Street and Lyon Street North. The proposed development is a 23-storey building with lobby and indoor amenity area at grade, residential use in Levels 2 through 21, and mechanical floors at Levels 22 and 23. The building planform is rectangular with the short axis oriented along Gloucester Street. A ramp at the southeast corner of the building provides access to underground parking. Outdoor amenity space is provided at grade to the rear of the development, as well as atop the 22nd and 23rd Floor terraces. An outdoor amenity space is also provided on Floor 6 toward the southeast corner of the building. Given the blockage from the proposed building, as well as the relative distance to the nearby arterial roadways, noise levels are not expected to exceed the ENCG noise criterion.

The site is located in the downtown core, surrounded by low to high-rise residential and commercial buildings. The major sources of traffic noise are Lyon Street North and Laurier. Figure 1 illustrates a complete site plan with surrounding context.

² City of Ottawa Environmental Noise Control Guidelines, January 2016

³ 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 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)⁴

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 reduction⁵. A closed window due to a ventilation requirement will bring noise levels down to achieve an acceptable indoor environment⁶. 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 attenuation⁷.

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 Adapted from ENCG 2016 – Tables 2.2b and 2.2c

⁵ Burberry, P.B. (2014). Mitchell's Environment and Services. Routledge, Page 125

⁶ MECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.8

⁷ 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 MECP computerized noise assessment program, STAMSON 5.04, for road analysis. Appendix A includes the STAMSON 5.04 input and output data. Roadway traffic noise calculations were performed by treating each roadway segment as separate line sources of noise. In addition to the traffic volumes summarized in Table 2, theoretical noise predictions were based on the following parameters:

- Truck traffic on all roadways was taken to comprise 5% heavy trucks and 7% medium trucks, as per ENCG requirements for noise level predictions.
- The day/night split for all streets was taken to be 92%/8%, respectively.
- Ground surfaces were taken to be reflective due to the presence of hard (paved) ground.
- Topography was assumed to be a flat/gentle slope surrounding the study building.
- Noise receptors were strategically placed at 7 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 Plan⁸ 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
Lyon Street North	2-UAU	50	15,000
Laurier Avenue West	2-UAU	50	15,000

⁸ City of Ottawa Transportation Master Plan, November 2013



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/Roof (m)	Receptor Location	STAMSON 5.04 Noise Level (dBA)	
			Day	Night
1	1.5	OLA - Ground Level	53	45
2	65.5	OLA - 22nd Floor Terrace	52	45
3	70	OLA - 23rd Floor Terrace	55	47
4	62	POW - 21st Floor North Façade	53	46
5	62	POW - 21st Floor East Façade	57	50
6	62	POW - 21st Floor South Façade	56	49
7	62	POW - 21st Floor West Façade	54	46

The results of the current analysis indicate that noise levels will range between 52 and 57 dBA during the daytime period (07:00-23:00) and between 45 and 50 dBA during the nighttime period (23:00-07:00). The highest noise level (57 dBA) occurs at the east façade, which is nearest and most exposed to Lyon Street North.

6. CONCLUSIONS AND RECOMMENDATIONS

The noise levels predicted due to roadway traffic fall below the criteria listed in Section 4.2 for building components and outdoor living areas. Results of the calculations also indicate that the development will require forced air heating with provision for air conditioning. Air conditioning will allow occupants to keep windows closed and maintain a comfortable living environment. The following Warning Clause⁹ will also be required be placed on all Lease, Purchase and Sale Agreements, as summarized below:

⁹ City of Ottawa Environmental Noise Control Guidelines, January 2016



"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 roadway 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 and Climate Change. To help address the need for sound attenuation, this development has also been designed with forced air heating with provision for air conditioning. 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 and Climate Change.

To ensure that provincial sound level limits are not exceeded, it is important to maintain these sound attenuation features."

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.



Michael Lafortune, C.E.T.
Environmental Scientist

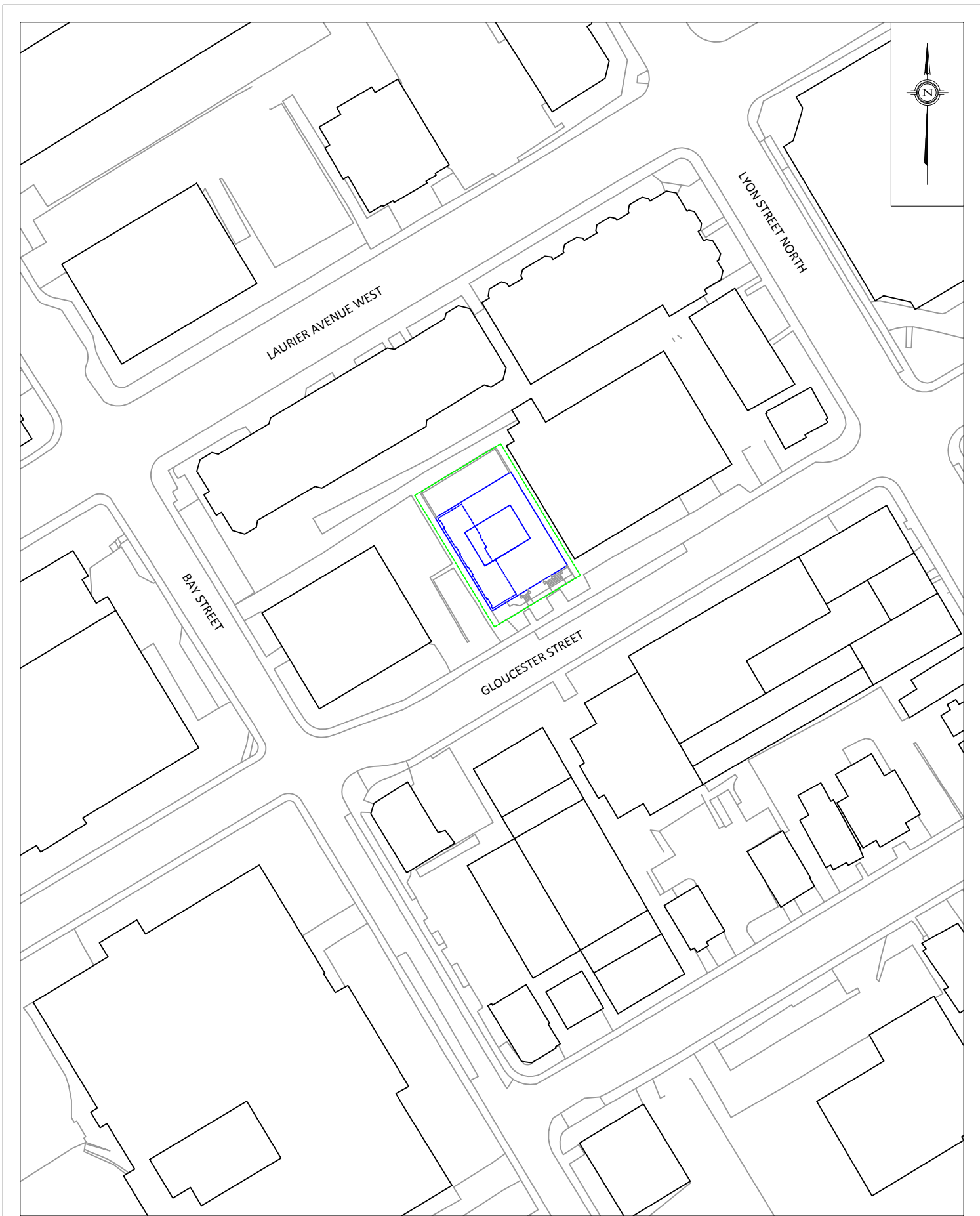
Joshua Foster, P.Eng.
Principal

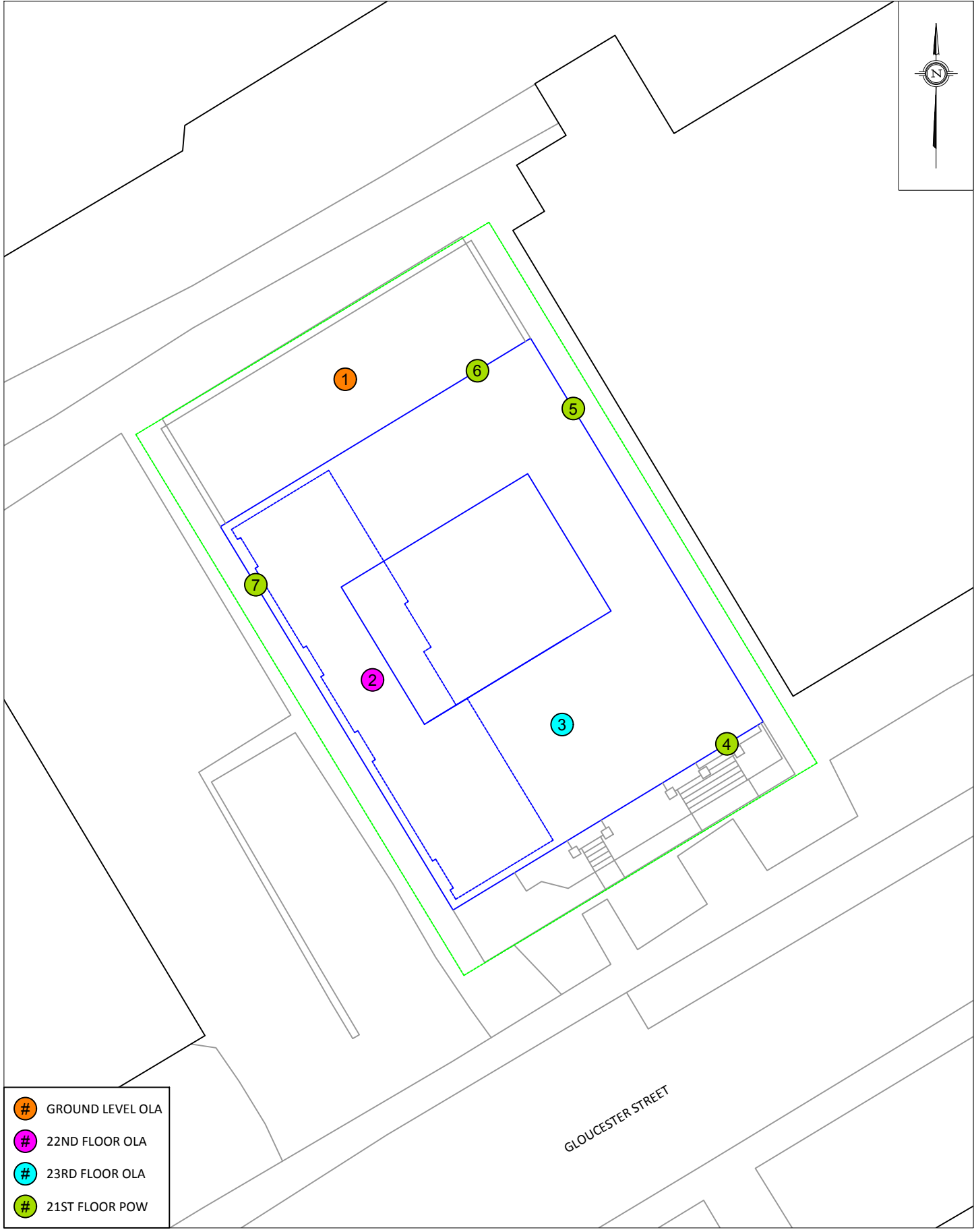
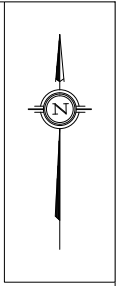


Giuseppe Garro, MAsc.
Junior Environmental Scientist

Gradient Wind File #18-171 - Traffic Noise

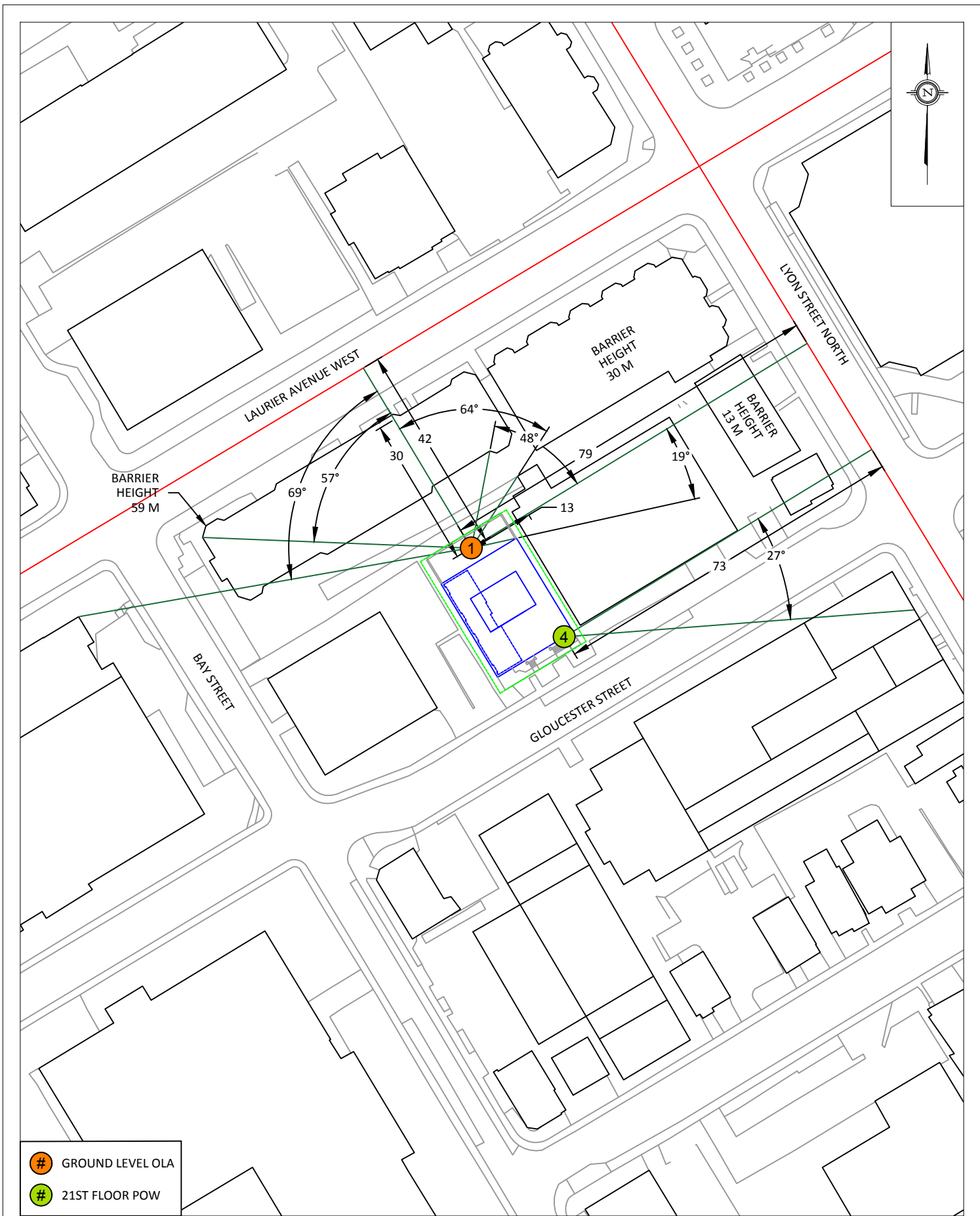


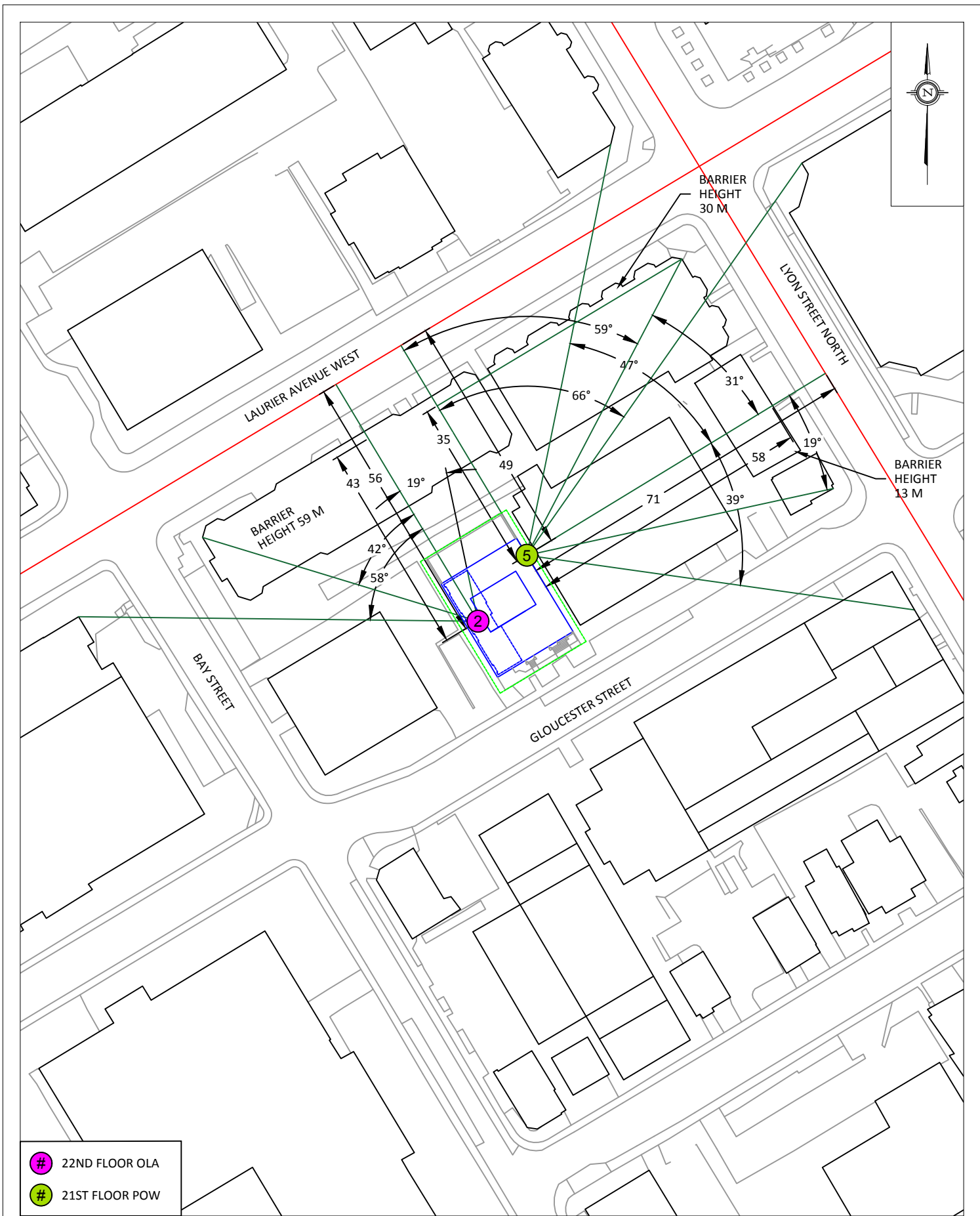


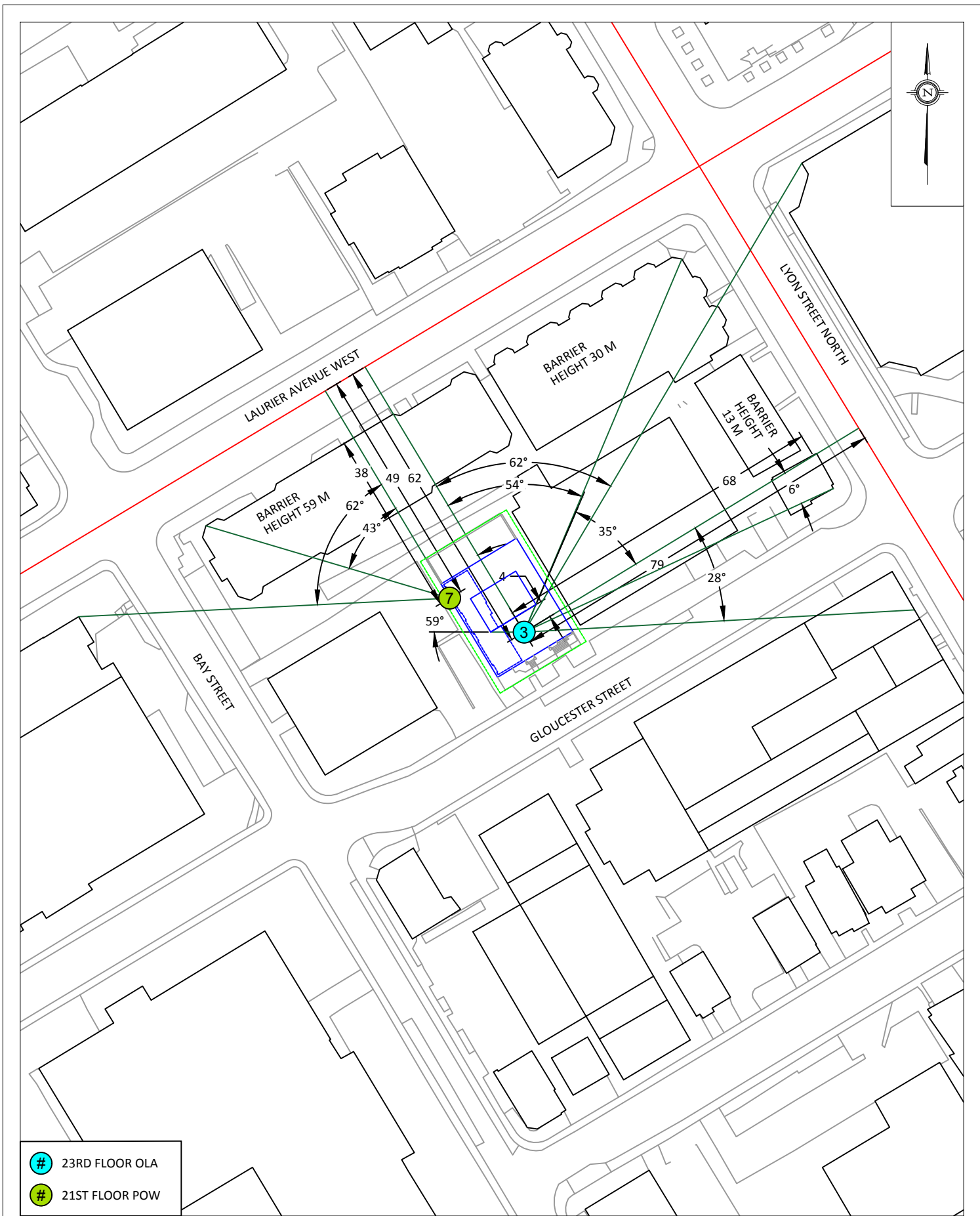


- GROUND LEVEL OLA
- 22ND FLOOR OLA
- 23RD FLOOR OLA
- 21ST FLOOR POW

PROJECT	341 GLOUCESTER STREET- ENVIRONMENTAL NOISE STUDY	
SCALE	1:250 (APPROX.)	DRAWING NO. GWE18-171
DATE	JUNE 17, 2019	DRAWN BY G.G.

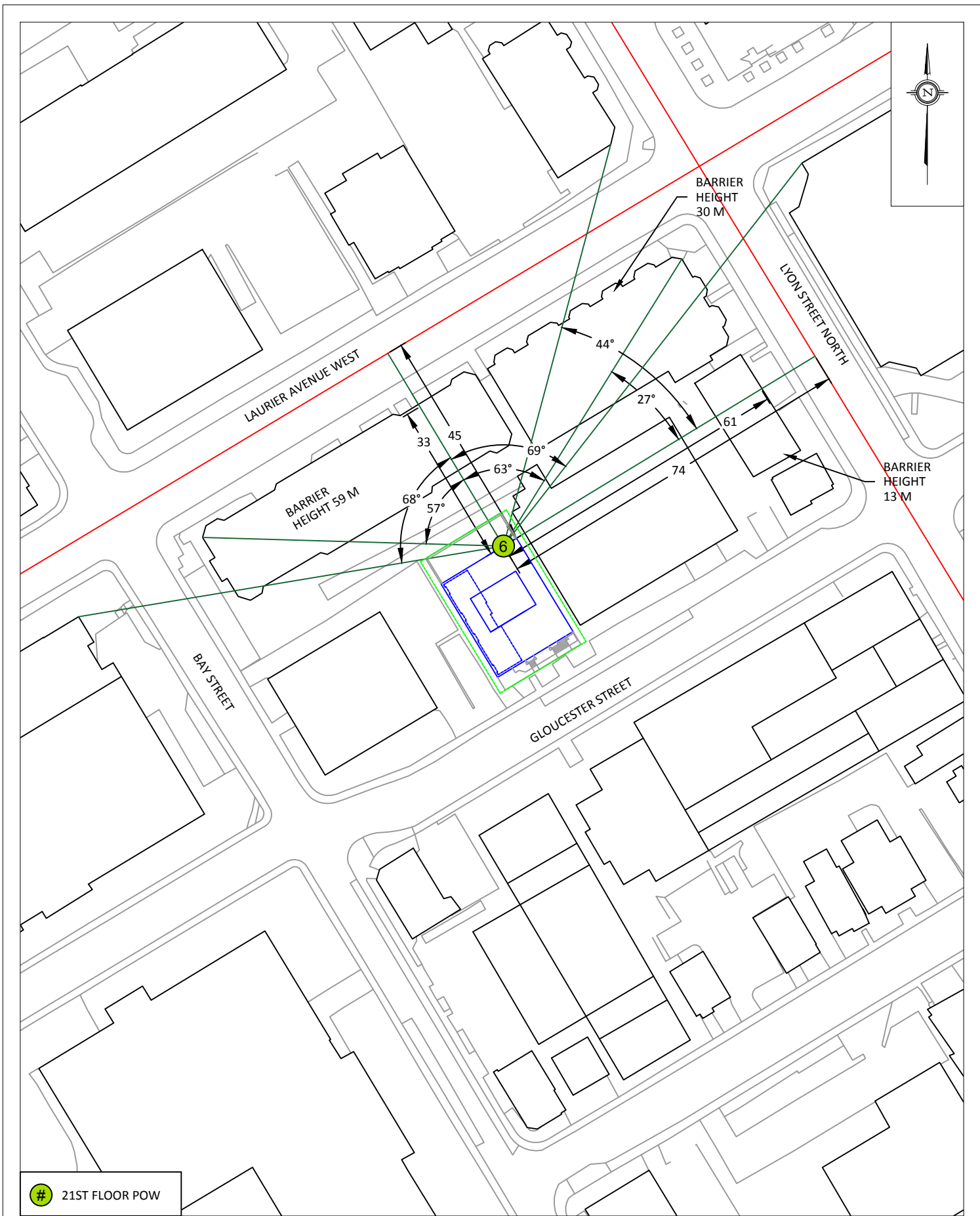






- # 23RD FLOOR OLA
- # 21ST FLOOR POW

GRADIENTWIND ENGINEERS & SCIENTISTS 127 WALGREEN ROAD, OTTAWA, ON 613 836 0934 • GRADIENTWIND.COM	PROJECT 341 GLOUCESTER STREET- ENVIRONMENTAL NOISE STUDY		DESCRIPTION	
	SCALE	1:1000 (APPROX.)	DRAWING NO.	GWE18-171
	DATE	JUNE 17, 2019	DRAWN BY	G.G.
	FIGURE 5: RECEPTOR 3 AND 7 STAMSON INPUT			



21ST FLOOR POW

PROJECT	341 GLOUCESTER STREET- ENVIRONMENTAL NOISE STUDY	
SCALE	1:1000 (APPROX.)	DRAWING NO. GWE18-171
DATE	JUNE 17, 2019	DRAWN BY G.G.

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ENGINEERS & SCIENTISTS



APPENDIX A

STAMSON 5.04 – INPUT AND OUTPUT DATA

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STAMSON 5.0 NORMAL REPORT Date: 17-06-2019 09:58:11
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Road data, segment # 1: Laurier Av W (day/night)

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

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

24 hr Traffic Volume (AADT or SADT): 15000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Laurier Av W (day/night)

Angle1 Angle2 : -69.00 deg 64.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 42.00 / 42.00 m
Receiver height : 1.50 / 1.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -57.00 deg Angle2 : 64.00 deg
Barrier height : 59.00 m
Barrier receiver distance : 30.00 / 30.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00



Road data, segment # 2: Lyon St N (day/night)

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

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

24 hr Traffic Volume (AADT or SADT): 15000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 2: Lyon St N (day/night)

Angle1 Angle2 : -48.00 deg 19.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 79.00 / 79.00 m
Receiver height : 1.50 / 1.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -48.00 deg Angle2 : 19.00 deg
Barrier height : 13.00 m
Barrier receiver distance : 13.00 / 13.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00



Results segment # 1: Laurier Av W (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	1.50	1.50	1.50

ROAD (52.25 + 42.28 + 0.00) = 52.66 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-69	-57	0.00	68.48	0.00	-4.47	-11.76	0.00	0.00	0.00	52.25
-57	64	0.00	68.48	0.00	-4.47	-1.72	0.00	0.00	-20.00	42.28

Segment Leq : 52.66 dBA

Results segment # 2: Lyon St N (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	1.50	1.50	1.50

ROAD (0.00 + 36.97 + 0.00) = 36.97 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-48	19	0.00	68.48	0.00	-7.22	-4.29	0.00	0.00	-20.00	36.97

Segment Leq : 36.97 dBA

Total Leq All Segments: 52.78 dBA



Results segment # 1: Laurier Av W (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	1.50	1.50	1.50

ROAD (44.65 + 34.69 + 0.00) = 45.07 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-69	-57	0.00	60.88	0.00	-4.47	-11.76	0.00	0.00	0.00	44.65
-57	64	0.00	60.88	0.00	-4.47	-1.72	0.00	0.00	-20.00	34.69

Segment Leq : 45.07 dBA

Results segment # 2: Lyon St N (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	1.50	1.50	1.50

ROAD (0.00 + 29.38 + 0.00) = 29.38 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-48	19	0.00	60.88	0.00	-7.22	-4.29	0.00	0.00	-20.00	29.38

Segment Leq : 29.38 dBA

Total Leq All Segments: 45.19 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 52.78
(NIGHT): 45.19



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STAMSON 5.0 NORMAL REPORT Date: 17-06-2019 09:58:16
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Road data, segment # 1: Laurier Av W (day/night)

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

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

24 hr Traffic Volume (AADT or SADT): 15000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Laurier Av W (day/night)

Angle1 Angle2 : -58.00 deg 19.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 56.00 / 56.00 m
Receiver height : 65.50 / 65.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -42.00 deg Angle2 : 19.00 deg
Barrier height : 59.00 m
Barrier receiver distance : 43.00 / 43.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00



Results segment # 1: Laurier Av W (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	64.50	16.12	16.12

ROAD (52.25 + 38.06 + 0.00) = 52.41 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-58	-42	0.00	68.48	0.00	-5.72	-10.51	0.00	0.00	0.00	52.25
-42	19	0.00	68.48	0.00	-5.72	-4.70	0.00	0.00	-20.00	38.06

Segment Leq : 52.41 dBA

Total Leq All Segments: 52.41 dBA

Results segment # 1: Laurier Av W (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	65.50	16.12	16.12

ROAD (44.65 + 30.46 + 0.00) = 44.81 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-58	-42	0.00	60.88	0.00	-5.72	-10.51	0.00	0.00	0.00	44.65
-42	19	0.00	60.88	0.00	-5.72	-4.70	0.00	0.00	-20.00	30.46

Segment Leq : 44.81 dBA

Total Leq All Segments: 44.81 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 52.41
(NIGHT): 44.81



GRADIENTWIND

ENGINEERS & SCIENTISTS

STAMSON 5.0 NORMAL REPORT Date: 17-06-2019 09:58:22
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Road data, segment # 1: Laurier Av W (day/night)

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

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

24 hr Traffic Volume (AADT or SADT): 15000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Laurier Av W (day/night)

Angle1 Angle2 : -59.00 deg 62.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 62.00 / 62.00 m
Receiver height : 70.0 / 70.0 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -59.00 deg Angle2 : 54.00 deg
Barrier height : 69.00 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



Road data, segment # 2: Lyon St N (day/night)

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

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

24 hr Traffic Volume (AADT or SADT): 15000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 2: Lyon St N (day/night)

Angle1 Angle2 : -35.00 deg 28.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 79.00 / 79.00 m
Receiver height : 70.0 / 70.0 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -35.00 deg Angle2 : 6.00 deg
Barrier height : 13.00 m
Barrier receiver distance : 68.00 / 68.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00



Results segment # 1: Laurier Av W (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	70.0	63.24	63.24

ROAD (0.00 + 40.34 + 48.80) = 49.37 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-59	54	0.00	68.48	0.00	-6.16	-2.02	0.00	0.00	-19.96	40.34
54	62	0.00	68.48	0.00	-6.16	-13.52	0.00	0.00	0.00	48.80

Segment Leq : 49.37 dBA

Results segment # 2: Lyon St N (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	70.0	10.69	10.69

ROAD (0.00 + 45.75 + 52.14) = 53.03 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-35	6	0.00	68.48	0.00	-7.22	-6.42	0.00	0.00	-9.09	45.75
6	28	0.00	68.48	0.00	-7.22	-9.13	0.00	0.00	0.00	52.14

Segment Leq : 53.03 dBA

Total Leq All Segments: 54.58 dBA



Results segment # 1: Laurier Av W (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	70.0	63.24	63.24

ROAD (0.00 + 32.74 + 41.20) = 41.78 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-59	54	0.00	60.88	0.00	-6.16	-2.02	0.00	0.00	-19.96	32.74
54	62	0.00	60.88	0.00	-6.16	-13.52	0.00	0.00	0.00	41.20

Segment Leq : 41.78 dBA

Results segment # 2: Lyon St N (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	70.0	10.69	10.69

ROAD (0.00 + 38.15 + 44.54) = 45.44 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-35	6	0.00	60.88	0.00	-7.22	-6.42	0.00	0.00	-9.09	38.15
6	28	0.00	60.88	0.00	-7.22	-9.13	0.00	0.00	0.00	44.54

Segment Leq : 45.44 dBA

Total Leq All Segments: 46.99 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 54.58
(NIGHT): 46.99



GRADIENTWIND

ENGINEERS & SCIENTISTS

STAMSON 5.0 NORMAL REPORT Date: 17-06-2019 09:58:28
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Road data, segment # 1: Lyon St N (day/night)

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

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

24 hr Traffic Volume (AADT or SADT): 15000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Lyon St N (day/night)

Angle1 Angle2 : 0.00 deg 27.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 73.00 / 73.00 m
Receiver height : 61.50 / 61.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00



Results segment # 1: Lyon St N (day)

Source height = 1.50 m

ROAD (0.00 + 53.37 + 0.00) = 53.37 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	27	0.00	68.48	0.00	-6.87	-8.24	0.00	0.00	0.00	53.37

Segment Leq : 53.37 dBA

Total Leq All Segments: 53.37 dBA

Results segment # 1: Lyon St N (night)

Source height = 1.50 m

ROAD (0.00 + 45.77 + 0.00) = 45.77 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	27	0.00	60.88	0.00	-6.87	-8.24	0.00	0.00	0.00	45.77

Segment Leq : 45.77 dBA

Total Leq All Segments: 45.77 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 53.37
(NIGHT): 45.77



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ENGINEERS & SCIENTISTS

STAMSON 5.0 NORMAL REPORT Date: 17-06-2019 09:58:33
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Road data, segment # 1: Laurier Av W (day/night)

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

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

24 hr Traffic Volume (AADT or SADT): 15000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Laurier Av W (day/night)

Angle1 Angle2 : 0.00 deg 66.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 49.00 / 49.00 m
Receiver height : 61.50 / 61.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : 0.00 deg Angle2 : 59.00 deg
Barrier height : 30.00 m
Barrier receiver distance : 35.00 / 35.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00



Road data, segment # 2: Lyon St N (day/night)

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

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

24 hr Traffic Volume (AADT or SADT): 15000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 2: Lyon St N (day/night)

Angle1 Angle2 : -47.00 deg 39.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 71.00 / 71.00 m
Receiver height : 61.50 / 61.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -31.00 deg Angle2 : 19.00 deg
Barrier height : 13.00 m
Barrier receiver distance : 58.00 / 58.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00



Results segment # 1: Laurier Av W (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	61.50	18.64	18.64

ROAD (0.00 + 40.43 + 49.24) = 49.77 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	59	0.00	68.48	0.00	-5.14	-4.84	0.00	0.00	-18.06	40.43
59	66	0.00	68.48	0.00	-5.14	-14.10	0.00	0.00	0.00	49.24

Segment Leq : 49.77 dBA

Results segment # 2: Lyon St N (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	61.50	12.48	12.48

ROAD (51.22 + 50.89 + 52.19) = 56.24 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-47	-31	0.00	68.48	0.00	-6.75	-10.51	0.00	0.00	0.00	51.22
-31	19	0.00	68.48	0.00	-6.75	-5.56	0.00	0.00	-5.28	50.89
19	39	0.00	68.48	0.00	-6.75	-9.54	0.00	0.00	0.00	52.19

Segment Leq : 56.24 dBA

Total Leq All Segments: 57.12 dBA



Results segment # 1: Laurier Av W (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	61.50	18.64	18.64

ROAD (0.00 + 32.84 + 41.64) = 42.18 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	59	0.00	60.88	0.00	-5.14	-4.84	0.00	0.00	-18.06	32.84
59	66	0.00	60.88	0.00	-5.14	-14.10	0.00	0.00	0.00	41.64

Segment Leq : 42.18 dBA

Results segment # 2: Lyon St N (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	61.50	12.48	12.48

ROAD (43.62 + 43.29 + 44.59) = 48.64 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-47	-31	0.00	60.88	0.00	-6.75	-10.51	0.00	0.00	0.00	43.62
-31	19	0.00	60.88	0.00	-6.75	-5.56	0.00	0.00	-5.28	43.29
19	39	0.00	60.88	0.00	-6.75	-9.54	0.00	0.00	0.00	44.59

Segment Leq : 48.64 dBA

Total Leq All Segments: 49.52 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 57.12
(NIGHT): 49.52



GRADIENTWIND

ENGINEERS & SCIENTISTS

STAMSON 5.0 NORMAL REPORT Date: 17-06-2019 09:58:46
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Road data, segment # 1: Laurier Av W (day/night)

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

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

24 hr Traffic Volume (AADT or SADT): 15000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Laurier Av W (day/night)

Angle1 Angle2 : -68.00 deg 69.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 45.00 / 45.00 m
Receiver height : 61.50 / 61.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -57.00 deg Angle2 : 63.00 deg
Barrier height : 30.00 m
Barrier receiver distance : 33.00 / 33.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00



Road data, segment # 2: Lyon St N (day/night)

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

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

24 hr Traffic Volume (AADT or SADT): 15000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 2: Lyon St N (day/night)

Angle1 Angle2 : -44.00 deg 0.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 74.00 / 74.00 m
Receiver height : 61.50 / 61.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -27.00 deg Angle2 : 0.00 deg
Barrier height : 13.00 m
Barrier receiver distance : 61.00 / 61.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00



Results segment # 1: Laurier Av W (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	61.50	17.50	17.50

ROAD (51.57 + 43.44 + 48.94) = 53.87 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-68	-57	0.00	68.48	0.00	-4.77	-12.14	0.00	0.00	0.00	51.57
-57	63	0.00	68.48	0.00	-4.77	-1.76	0.00	0.00	-18.51	43.44
63	69	0.00	68.48	0.00	-4.77	-14.77	0.00	0.00	0.00	48.94

Segment Leq : 53.87 dBA

Results segment # 2: Lyon St N (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	61.50	12.04	12.04

ROAD (51.30 + 47.38 + 0.00) = 52.78 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-44	-27	0.00	68.48	0.00	-6.93	-10.25	0.00	0.00	0.00	51.30
-27	0	0.00	68.48	0.00	-6.93	-8.24	0.00	0.00	-5.93	47.38

Segment Leq : 52.78 dBA

Total Leq All Segments: 56.37 dBA



Results segment # 1: Laurier Av W (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	61.50	17.50	17.50

ROAD (43.97 + 35.84 + 41.34) = 46.28 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-68	-57	0.00	60.88	0.00	-4.77	-12.14	0.00	0.00	0.00	43.97
-57	63	0.00	60.88	0.00	-4.77	-1.76	0.00	0.00	-18.51	35.84
63	69	0.00	60.88	0.00	-4.77	-14.77	0.00	0.00	0.00	41.34

Segment Leq : 46.28 dBA

Results segment # 2: Lyon St N (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	61.50	12.04	12.04

ROAD (43.70 + 39.78 + 0.00) = 45.18 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-44	-27	0.00	60.88	0.00	-6.93	-10.25	0.00	0.00	0.00	43.70
-27	0	0.00	60.88	0.00	-6.93	-8.24	0.00	0.00	-5.93	39.78

Segment Leq : 45.18 dBA

Total Leq All Segments: 48.78 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 56.37
(NIGHT): 48.78



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ENGINEERS & SCIENTISTS

STAMSON 5.0 NORMAL REPORT Date: 17-06-2019 09:58:53
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Road data, segment # 1: Laurier Av W (day/night)

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

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

24 hr Traffic Volume (AADT or SADT): 15000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Laurier Av W (day/night)

Angle1 Angle2 : -62.00 deg 0.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 49.00 / 49.00 m
Receiver height : 61.50 / 61.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -43.00 deg Angle2 : 0.00 deg
Barrier height : 59.00 m
Barrier receiver distance : 38.00 / 38.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00



Results segment # 1: Laurier Av W (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	61.50	14.97	14.97

ROAD (53.57 + 37.12 + 0.00) = 53.67 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-62	-43	0.00	68.48	0.00	-5.14	-9.77	0.00	0.00	0.00	53.57
-43	0	0.00	68.48	0.00	-5.14	-6.22	0.00	0.00	-20.00	37.12

Segment Leq : 53.67 dBA

Total Leq All Segments: 53.67 dBA

Results segment # 1: Laurier Av W (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	61.50	14.97	14.97

ROAD (45.98 + 29.52 + 0.00) = 46.07 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-62	-43	0.00	60.88	0.00	-5.14	-9.77	0.00	0.00	0.00	45.98
-43	0	0.00	60.88	0.00	-5.14	-6.22	0.00	0.00	-20.00	29.52

Segment Leq : 46.07 dBA

Total Leq All Segments: 46.07 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 53.67
(NIGHT): 46.07

