Environmental Noise Assessment

16 Hamilton Avenue

Ottawa, Ontario

DRAFT

REPORT: GWE18-158 - Environmental Noise

Prepared For:

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EXECUTIVE SUMMARY

This document describes an environmental noise assessment performed for a proposed mix-use office, retail, and residential development located at 16 Hamilton Avenue in Ottawa, Ontario. The proposed development will rise approximately 26 meters (m) above local grade. Surrounding the site is low rise urban area with a mix of residential and commercial buildings. The ground floor will house retail, office and parking space. The second floor will contain office and residential dwellings, with the remaining floors occupied by residential dwellings. This study examines the noise impact of the proposed mechanical equipment on the surroundings and impacts of traffic noise on the development. The primary source of stationary noise from the development is rooftop mechanical equipment. Our assessment also considered the traffic noise impacts from nearby roadways of Parkdale Avenue and Wellington Street West. Figure 1 illustrates a 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); and (iii) architectural drawings provided by Project1 Studio Incorporated, dated September 26, 2018.

Based on the assumptions in this report it is expected stationary noise levels from the buildings mechanical equipment will fall below ENCG criteria during all hours of the day. Since noise levels fall below ENCG criteria, the proposed development is expected to be compatible with the existing and future noise sensitive land uses. Sound power data of some equipment was still unknown at the time of this review, resulting in sound calculations to assume sound power levels based on similar mechanical equipment used in Gradient Wind's past experience. As shop drawings and equipment selections become available, these should be forwarded to Gradient Wind for review.

It is recommended that mechanical equipment on the roof, such as the emergency generator and MUA, be placed as far as possible from the roof top terrace in order to improve sound levels within the noise sensitive space..

The results of the current study indicate that noise levels due to roadway traffic will range between 56 and 57 dBA during the daytime period (07:00-23:00) and between 49 and 50 dBA during the nighttime period (23:00-07:00). The highest noise level (ie. 57 dBA) occurs along the building's East façade, which is nearest and most exposed to Parkdale Avenue. Since noise levels exceed the ENCG objective limit of 55 dbA, the development will require forced air heating with provision for air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. The Warning Clause outlined in section 6 will also be placed on all Lease, Purchase and Sale Agreements.

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1. INTRODUCTION

Gradient Wind Engineering Inc. (GWE) was retained by Surface Developments to undertake an environmental noise assessment of a proposed mix- use office, retail, and residential development located at 16 Hamilton Avenue in Ottawa, Ontario. This report summarizes the methodology, results, and recommendations related to a detailed stationary noise assessment. GWE's scope of work involved assessing the noise impacts from rooftop mechanical equipment on nearby residential, noise sensitive areas. The assessment was performed based on theoretical noise calculation methods conforming to the City of Ottawa[1] and Ministry of the Environment, Conservation and Parks (MECP) NPC- 300[2] guidelines. Noise calculations were based on architectural drawings received from Project1 Studio Incorporated, dated September 26, 2018 and surrounding street layouts obtained from the City of Ottawa and recent site imagery. Our assessment also considered the traffic noise impacts from nearby roadways.

2. TERMS OF REFERENCE

The focus of this stationary noise assessment is a proposed mix- use office, retail, and residential development. The proposed development will rise approximately 26 meters (m) above local grade. Surrounding the site is low rise urban area with a mix of residential and commercial uses. The ground floor will house retail, office and parking space. The second floor will contain office and residential dwellings, with the remaining floors occupied by residential dwellings. A common roof top terrace is located on the 9th floor of the complex. The major sources of stationary noise are from rooftop mechanical equipment, including an air handling unit as well as an emergency generator. The site is surrounded on all sides by mixed-use commercial and residential land. Figure 1 illustrates a complete site plan with surrounding context.

3. OBJECTIVES

The main goals of the work are to: (i) calculate the future noise levels on surrounding noise-sensitive properties, as well as the study building, produced by stationary noise sources associated with the development, (ii) ensure interior and exterior noise levels do not exceed the allowable limits specified by

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

[2] Ministry of the Environment, Conservation and Parks (MECP), Environmental Noise Guideline – Publication NPC-300, August 2013

the City of Ottawa's Environmental Noise Control Guidelines as outlined in Section 4 of this report, and (iii) calculate the future noise levels on the study building produced by local roadway traffic.

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 source, the sound pressure depends on the location of the receiver and the path that the noise takes to reach the receiver. Its measurement 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 represents the noise perceived by the human ear. With this scale, a doubling of sound power at the source results in a 3 dBA increase in measured noise levels at the receiver, and is just perceptible to most people. An increase of 10 dBA is often perceived to be twice as loud.

4.2 Stationary Noise

4.2.1 Stationary Noise Source Assessment and Criteria

The equivalent sound energy level, L_{EQ}, provides a weighted 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 selected period of time. For stationary sources, the L_{EQ} is calculated on an hourly interval, while for roadways, the L_{EQ} is calculated based on a 16-hour daytime / 8-hour nighttime split.

Noise criteria taken from the ENCG apply to points of reception (POR). A POR is defined under the ENCG as "any location on a noise sensitive land use where noise from a stationary source is received", this can be an outdoor point of reception or at the plane of window. A POR can be located on an existing or zoned for future use premises of permanent or seasonal residences, hotels/motels, nursing/retirement homes, rental residences, hospitals, camp grounds, and noise sensitive buildings such as schools, places of worship and daycare facilities. According to the ENCG, the recommended maximum noise level for a

suburban (Class 1) environment at a POR is either the lowest one-hour background noise level due to other sources, or the exclusionary limits outlined in Table 1, whichever is higher.

TABLE 1: EXCLUSIONARY LIMITS FOR CLASS 1 AREA

Time of Day	Outdoor Points of Reception	Plane of Window
07:00 – 19:00	50	50
19:00 – 23:00	50	50
23:00 – 07:00	N/A	45

With regard to emergency equipment, Section B7.3 under NPC-300 states that the sound level limits are 5 dB greater than the sound level limits otherwise applicable to stationary sources[3]. Therefore, since this development is classified as a Class 1 area, with a daytime limit of 50 dBA, the generator limit is 55 dBA.

4.2.2 Determination of Noise Source Power Levels

At the time of our review, sound power data of some equipment was still unknown. As shop drawings and equipment selections become available, these should be forwarded to Gradient Wind for review. With that notion, the sound calculations performed assumed sound power levels based on similar mechanical equipment for this type of application used in Gradient Wind's past experience on similar projects. Table 2 summarizes the sound power levels of each source assumed in our analysis. Figure 2 displays the stationary source locations.

TABLE 2: EQUIPMENT SOUND POWER LEVELS (dBA)

Source ID	Source	Height above roof (m)	Frequency (Hz)								
			63	125	250	500	1000	2000	4000	8000	Total
S1	MUA Radiated	2.00	74	79	85	86	86	81	77	71	92
S2	Emergency Generator	2.00	-	-	-	-	100	-	-	-	100

[3] MECP, Environmental Noise Guidelines, NPC 300 – Part B, Section 7.3

4.2.3 Stationary Source Noise Predictions

The impact of the stationary noise sources on the nearby residential areas was determined by computer modelling. Stationary noise source modelling is based on the software program Predictor-Lima developed from the International Standards Organization (ISO) standard 9613 Parts 1 and 2. This computer program is capable of representing three-dimensional surfaces and first reflections of sound waves over a suitable spectrum for human hearing. The methodology has been used on numerous assignments, and has been accepted by the Ministry of Environment, Conservation and Parks (MECP) as part of Environmental Compliance Approvals applications.

A total of six receptor locations were chosen around the site to measure the noise impact at points of reception (POR) during the daytime and evening period (07:00 – 23:00), as well as the nighttime period (23:00 – 07:00). POR locations included outdoor points of reception (OPOR) and the plane of windows (POW) of the adjacent residential properties. Outdoor Living Areas (OLA) define noise sensitive spaces intended for the quiet enjoyment of the outdoor environment. Sensor locations are described in Table 3. All units were represented as point sources in the Predictor model. Table 4 below contains Predictor-Lima calculation settings. These settings are typical and have been based on ISO 9613 standards and guidance from the MECP.

Ground absorption over the study area was determined based on topographical features (such as water, concrete, grassland, etc.). An absorption value of 0 is representative of hard ground, while a value of 1 represents grass, and similar soft surface conditions. Existing and proposed buildings were added to the model to account for screening and reflection effects from building façades. Further modelling data is available upon request.

TABLE 3: RECEPTOR LOCATIONS

Receptor Number	Location	Height Above Grade (m)
R1	OPOR – Parkdale Park	1.5
R2	OPOR – Rooftop Terrace	27.5
R3	OLA – Rear 2nd Floor Terrace	6.5
R4	OLA – Front 2nd Floor Terrace	6.5

R5	POW – South Building Façade	6.5
R6	POW – West Building Façade	5.5

TABLE 4: CALCULATION SETTINGS

Parameter	Setting
Meteorological correction method	Single value for C0
Value C0	2.0
Default ground attenuation factor	1
Ground attenuation factor for roadways and paved areas	0
Temperature (K)	283.15
Pressure (kPa)	101.33
Air humidity (%)	70

4.3 Roadway Traffic noise

4.3.1 Criteria for Roadway Traffic Noise

For vehicle traffic, the equivalent sound energy level, L_{EQ}, provides a measure of the time varying noise levels, which is well correlated with the annoyance of sound. It is defined as the continuous sound level, which has the same energy as a time varying noise level over a period of time. For roadways, the L_{EQ} is commonly calculated on the basis of a 16-hour ($L_{EQ}16$) daytime (07:00-23:00) / 8-hour ($L_{EQ}8$) nighttime (23:00-07:00) split to assess its impact on residential buildings.

Predicted noise levels at the plane of window (POW) and outdoor living area (OLA) dictate the action required to achieve the recommended indoor and OLA sound levels, as specified in the ENCG. When noise levels at these areas exceed the ENCG objective limit of 55 dBA, specific outdoor, ventilation and Warning Clause requirements may apply. In addition, where noise levels exceed 65 dBA, upgraded building components must be designed to ensure indoor sound level limits can be met.

4.3.2 Roadway Traffic Volumes

The ENCG dictates that noise calculations should consider future sound levels based on a roadway's classification at the mature state of development. Therefore, traffic volumes are based on the roadway classifications outlined in the City of Ottawa's Official Plan (OP) and Transportation Master Plan3 which provides 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 5 (below) summarizes the AADT values used for the roadway included in this assessment.

TABLE 5: ROADWAY TRAFFIC DATA

Roadway	Roadway Class	Speed Limit (km/h)	Official Plan AADT
Parkdale Avenue	2-UAU	50	**15,000**
Wellington Street West	2-UAU	50	**15,000**

4.3.3 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 5, 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 was taken to be 92% / 8% respectively for all streets.
- Reflective ground surface between source and receiver for Wellington Street West, while absorptive ground considered for the surface between source and receiver for Parkdale Avenue.
- Topography assumed to be a flat/gentle slope.
- Receptor height taken to be 6.5 metres at the 2nd floor and 24.5 meters at the 7th floor. This coincides with the plane of window (POW) due to the elevation of the site.

- The cluster of buildings North of Wellington Street were assumed to have a density of 40% and 42% for receptor 1 and receptor 2 respectively, which contributed to a partial barrier effect.

5. RESULTS AND DISCUSSION

5.1 Stationary Noise Levels

As Table 6 and Table 7 summarizes, noise levels fall below ENCG criteria during all hours of the day at all receptor locations. Since the noise levels fall below the ENCG criteria, the proposed development is expected to be compatible with the existing and future noise sensitive lands uses. To reiterate, sound power data of some equipment was still unknown at the time of this review, resulting in sound calculations to assume sound power levels based on similar mechanical equipment used in Gradient Wind's past experience. As shop drawings and equipment selections become available, these should be forwarded to Gradient Wind for review.

TABLE 6: NOISE LEVELS FROM STATIONARY SOURCE: MUA

Receiver Number	Location	1-HR L_{EQ} (dBA)		ENCG Criteria (dBA)		Meets ENCG
		Day	Night	Day	Night	
R1	OPOR – Parkdale Park	26	26	50	50	YES
R2	OPOR – Rooftop Terrace	47	47	50	50	YES
R3	OLA – Rear 2nd Floor Terrace	32	32	50	50	YES
R4	OLA – Front 2nd Floor Terrace	30	30	50	50	YES
R5	POW – South Building Façade	28	28	50	50	YES
R6	POW – West Building Façade	34	34	50	50	YES

TABLE 7: NOISE LEVELS FROM STATIONARY SOURCE: EMERGENCY GENERATOR

Receiver Number	Location	1-HR L_{EQ} (dBA)	ENCG Criteria (dBA)	Meets ENCG
		Day	Day	
R1	OPOR – Parkdale Park	31	55	YES
R2	OPOR – Rooftop Terrace	46	55	YES
R3	OLA – Rear 2nd Floor Terrace	38	55	YES
R4	OLA – Front 2nd Floor Terrace	37	55	YES
R5	POW – South Building Façade	34	55	YES
R6	POW – West Building Façade	41	55	YES

It is recommended that mechanical equipment on the roof, such as the emergency generator and MUA, be placed as far as possible from the roof top terrace in order to improve sound levels within the noise sensitive space. Typically, sound pressure levels from mechanical equipment should be 75 dBA at a distance of 7 m or less

5.2 Transportation Noise Levels

The results of the roadway traffic noise calculations are summarized in Table 8 below. Appendix A includes a complete set of STAMSON 5.04 input and output data and Figure 3 AND 4 illustrates STAMSON 5.04 input data.

TABLE 8: EXTERIOR NOISE LEVELS DUE TO ROADWAY TRAFFIC SOURCES

Receptor Number	Receptor Height (m)	Plane of Window/Outdoor Living Area Receptor Location	Noise Level (dBA)	
			Day	Night
1	6.5	2nd Level – Front Terrace (OLA)	56	50
2	24.5	8th Storey – East Façade (POW)	57	49

The results of the current study indicate that noise levels will range between 56 and 57 dBA during the daytime period (07:00-23:00) and between 49 and 50 dBA during the nighttime period (23:00-07:00). The

highest noise level (ie. 57 dBA) occurs along the building's East façade, which is nearest and most exposed to Parkdale Avenue. Standard building construction will be sufficient for this development, however a ventilation system incorporating forced air heating with provisions for central air conditioning will be required, so if the tenant chooses they can readily install air conditioning to be able to keep windows and doors closed maintain a comfortable living environment.

6. CONCLUSIONS AND RECOMMENDATIONS

Based on the assumptions in this report it is expected stationary noise levels from the buildings mechanical equipment will fall below ENCG criteria during all hours of the day. Since noise levels fall below ENCG criteria, the proposed development is expected to be compatible with the existing and future noise sensitive land uses. To reiterate, sound power data of some equipment was still unknown at the time of this review, resulting in sound calculations to assume sound power levels based on similar mechanical equipment used in Gradient Wind's past experience. As shop drawings and equipment selections become available, these should be forwarded to Gradient Wind for review.

It is recommended that mechanical equipment on the roof, such as the emergency generator and MUA, be placed as far as possible from the roof top terrace in order to improve sound levels within the noise sensitive space. Typically, sound pressure levels from mechanical equipment should be less than 75 dBA at a distance of 7 m.

The results of the current study indicate that noise levels due to roadway traffic will range between 56 and 57 dBA during the daytime period (07:00-23:00) and between 49 and 50 dBA during the nighttime period (23:00-07:00). The highest noise level (ie. 57 dBA) occurs along the building's East façade, which is nearest and most exposed to Parkdale Avenue. Since noise levels exceed the ENCG objective limit of 55 dBA, the development will require force air heating with provision for air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. The following Warning Clause[4] will also be placed on all Lease, Purchase and Sale Agreements, as summarized below:

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

"Purchasers/tenants are advised that sound levels due to increasing road traffic may occasionally interfere with some outdoor activates as the sound levels may exceed the sound level limits of the City of Ottawa and the Ministry of Environment

This dwelling unit has been designed with the provisions for adding central air conditioning at the occupant's discretion. . Installation of central air conditioning will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the City and the Ministry of the Environment.

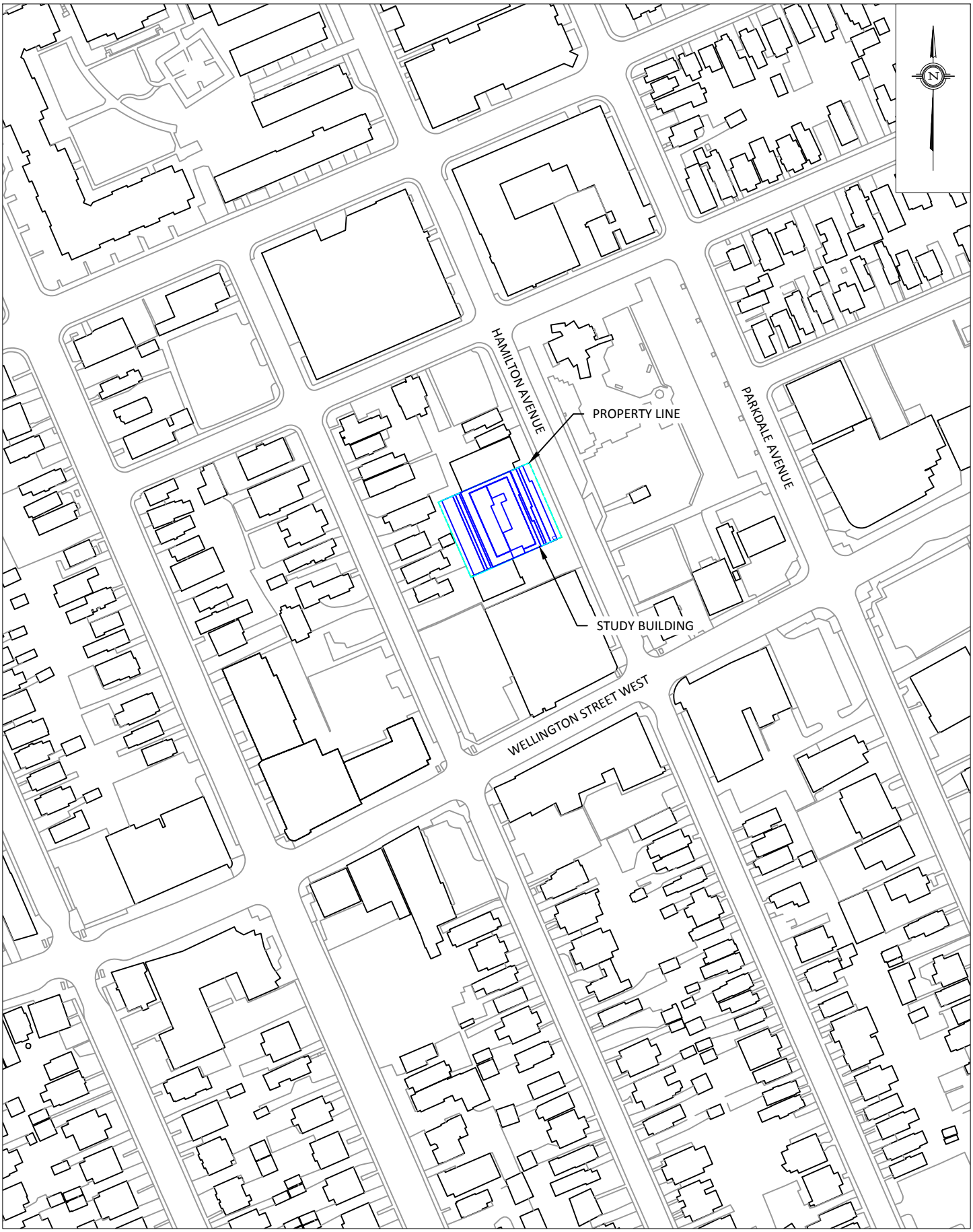
This concludes our assessment and report. If you have any questions or wish to discuss our findings, please advise us. In the interim, we thank you for the opportunity to be of service.

Yours truly,

Gradient Wind Engineering Inc.

Giuseppe Garro, BASc.
Junior Environmental Scientist
GWE18-158 - Environmental Noise

Joshua Foster, P.Eng.
Partner



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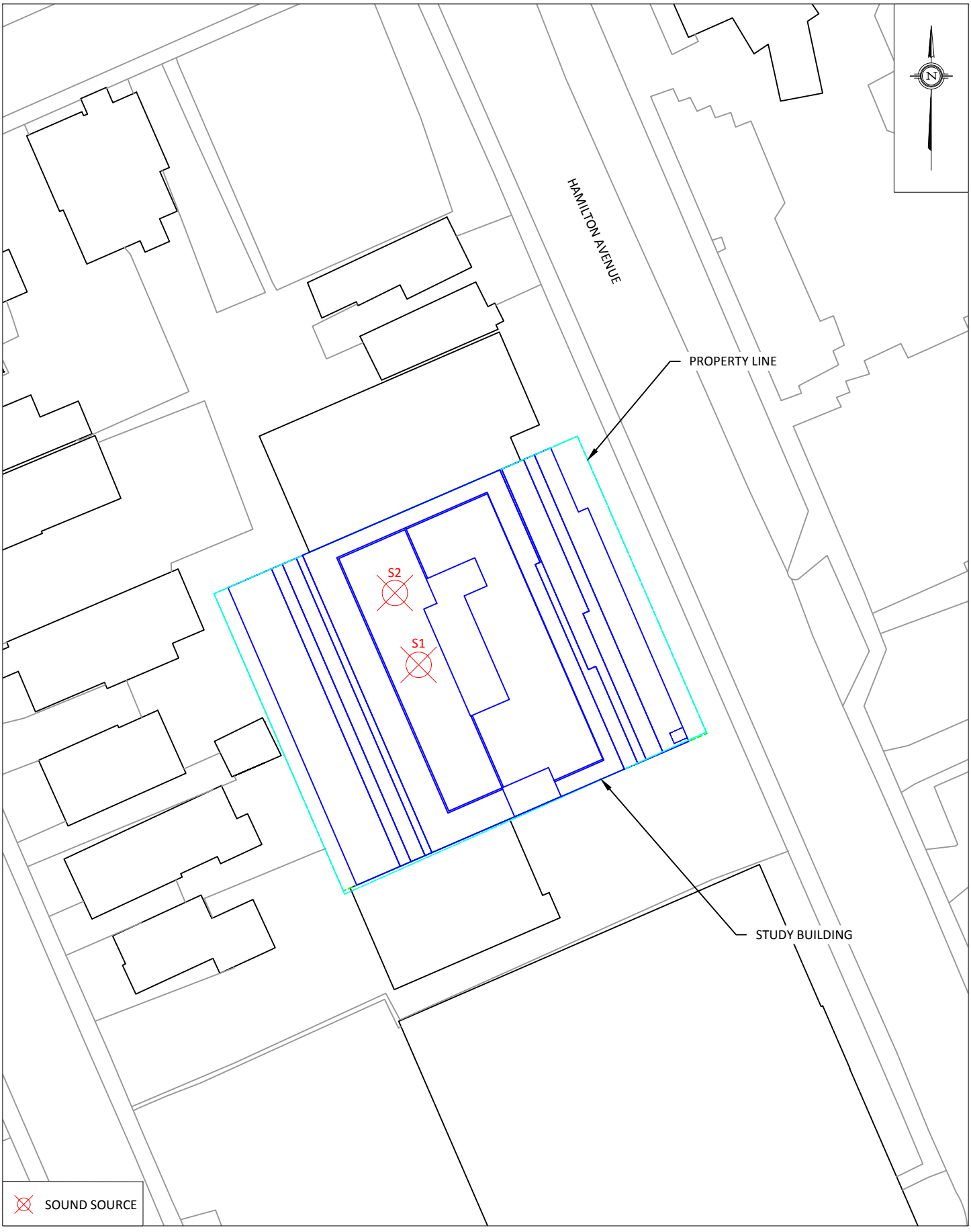
GRADIENT WIND ENGINEERING INC

PROJECT	16 HAMILTION AVENUE - STATIONARY NOISE STUDY		DESCRIPTION
SCALE	1:2000 (APPROX.)	DRAWING NO.	GWE18-158
DATE	OCTOBER 19, 2018	DRAWN BY	G.G.

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT



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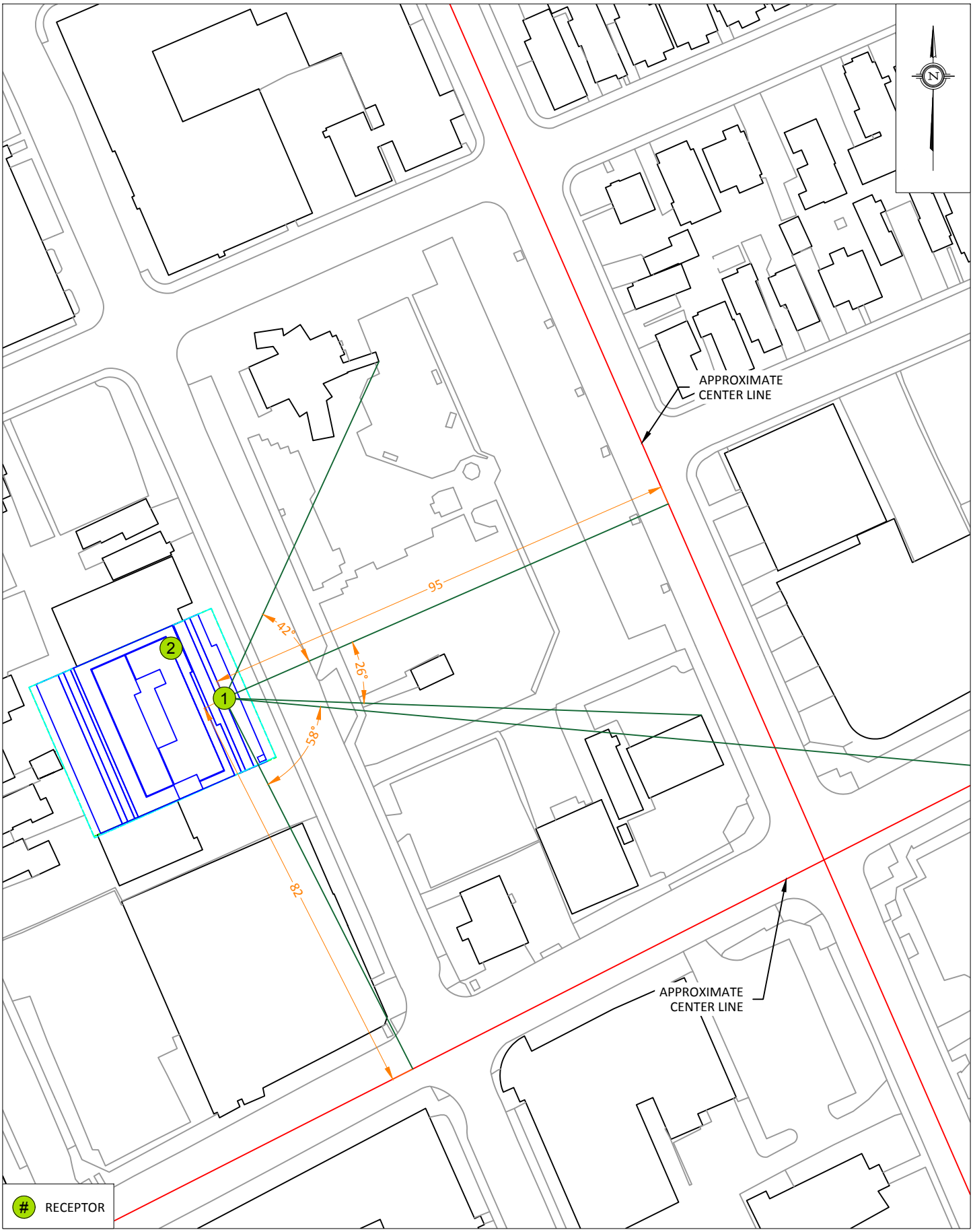
GRADIENT WIND ENGINEERING INC

PROJECT	16 HAMILTION AVENUE - STATIONARY NOISE STUDY		DESCRIPTION
SCALE	1:500 (APPROX.)	DRAWING NO. GWE18-158	FIGURE 2: STATIONARY SOUND SOURCES
DATE	OCTOBER 19, 2018	DRAWN BY G.G.	



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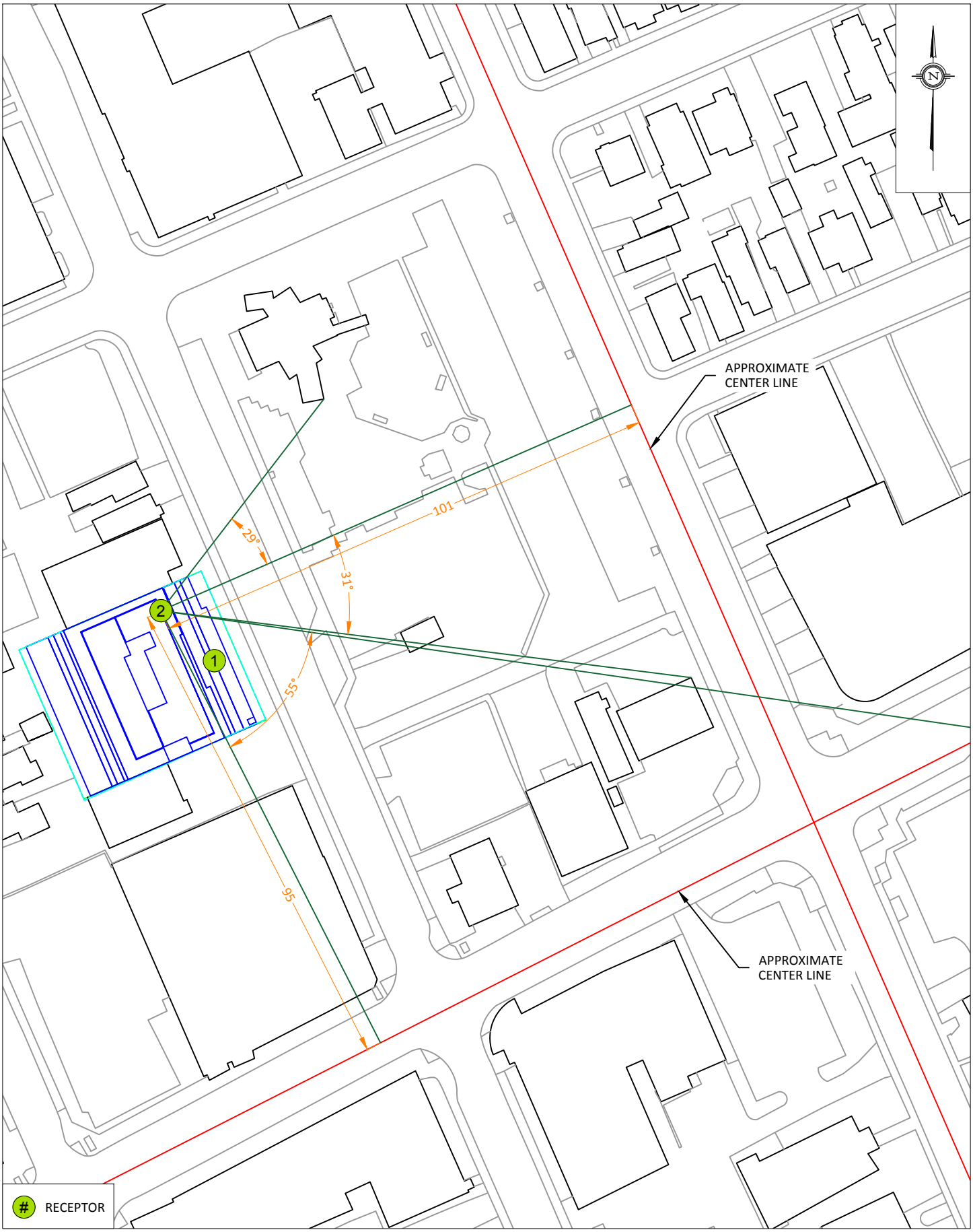
GRADIENT WIND ENGINEERING INC

PROJECT	16 HAMILTION AVENUE - STATIONARY NOISE STUDY
SCALE	1:1000 (APPROX.)
DRAWING NO.	GWE18-158
DATE	OCTOBER 19, 2018
DRAWN BY	G.G.

DESCRIPTION

FIGURE 3:
RECEPTOR 1 LOCATION AND STAMSON INPUT PARAMETERS



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SCALE	1:1000 (APPROX.)
DRAWING NO.	GWE18-158
DATE	OCTOBER 19, 2018
DRAWN BY	G.G.

DESCRIPTION

FIGURE 4:
RECEPTOR 2 LOCATION AND STAMSON INPUT PARAMETERS

APPENDIX A

STAMSON 5.04 - INPUT AND OUTPUT DATA

```
STAMSON 5.0         NORMAL REPORT         Date: 24-10-2018 10:28:05
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Parkdale Av (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: Parkdale Av (day/night)
---------------------------------------------
Angle1   Angle2           : -42.00 deg   26.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  95.00 / 95.00  m
Receiver height           :   6.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

#                     #
```

```
Road data, segment # 2: Wellington 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 # 2: Wellington W (day/night)
------------------------------------------------
Angle1   Angle2           : -58.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  82.00 / 82.00  m
Receiver height           :   6.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: Parkdale Av (day)
--------------------------------------

Source height = 1.50 m

ROAD (0.00 + 51.99 + 0.00) = 51.99 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -42     26   0.51  68.48   0.00 -12.11  -4.38   0.00   0.00   0.00
51.99
-------------------------------------------------------------------------------
--

Segment Leq : 51.99 dBA

#                     #
```

```
Results segment # 2: Wellington W (day)
---------------------------------------

Source height = 1.50 m

ROAD (0.00 + 54.18 + 0.00) = 54.18 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -58      0   0.00  68.48   0.00  -7.38  -4.92   0.00  -2.00   0.00
54.18
-------------------------------------------------------------------------
--

Segment Leq : 54.18 dBA

Total Leq All Segments: 56.23 dBA

Results segment # 1: Parkdale Av (night)
----------------------------------------

Source height = 1.50 m

ROAD (0.00 + 43.89 + 0.00) = 43.89 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -42     26   0.57  60.88   0.00 -12.59  -4.40   0.00   0.00   0.00
43.89
-------------------------------------------------------------------------
--

Segment Leq : 43.89 dBA

#                       #
```

```
Results segment # 2: Wellington W (night)
-----------------------------------------

Source height = 1.50 m

ROAD (0.00 + 48.59 + 0.00) = 48.59 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -58      0   0.00  60.88   0.00  -7.38  -4.92   0.00   0.00   0.00
48.59
-------------------------------------------------------------------------
--

Segment Leq : 48.59 dBA

Total Leq All Segments: 49.86 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 56.23
                           (NIGHT): 49.86
#                       #
```

```
STAMSON 5.0         NORMAL REPORT         Date: 24-10-2018 10:28:34
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Parkdale Av (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: Parkdale Av (day/night)
---------------------------------------------
Angle1   Angle2           : -29.00 deg   31.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 101.00 / 101.00 m
Receiver height           :  24.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

#                     #
```

```
Road data, segment # 2: Wellington 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 # 2: Wellington W (day/night)
------------------------------------------------
Angle1   Angle2           : -55.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  95.00 / 95.00  m
Receiver height           :  24.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: Parkdale Av (day)
--------------------------------------

Source height = 1.50 m

ROAD (0.00 + 55.43 + 0.00) = 55.43 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -29     31   0.00  68.48   0.00  -8.28  -4.77   0.00   0.00   0.00
55.43
-------------------------------------------------------------------------------
--

Segment Leq : 55.43 dBA

#                     #
```

```
Results segment # 2: Wellington W (day)
---------------------------------------

Source height = 1.50 m

ROAD (0.00 + 53.18 + 0.00) = 53.18 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -55      0   0.00  68.48   0.00  -8.02  -5.15   0.00  -2.14   0.00
53.18
-------------------------------------------------------------------------
--

Segment Leq : 53.18 dBA

Total Leq All Segments: 57.46 dBA

Results segment # 1: Parkdale Av (night)
----------------------------------------

Source height = 1.50 m

ROAD (0.00 + 42.99 + 0.00) = 42.99 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -29     31   0.57  60.88   0.00 -13.00  -4.89   0.00   0.00   0.00
42.99
-------------------------------------------------------------------------
--

Segment Leq : 42.99 dBA

#                       #
```

```
Results segment # 2: Wellington W (night)
------------------------------------

Source height = 1.50 m

ROAD (0.00 + 47.72 + 0.00) = 47.72 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -55      0   0.00  60.88   0.00  -8.02  -5.15   0.00   0.00   0.00
47.72
-------------------------------------------------------------------------
--

Segment Leq : 47.72 dBA

Total Leq All Segments: 48.98 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 57.46
                           (NIGHT): 48.98
```