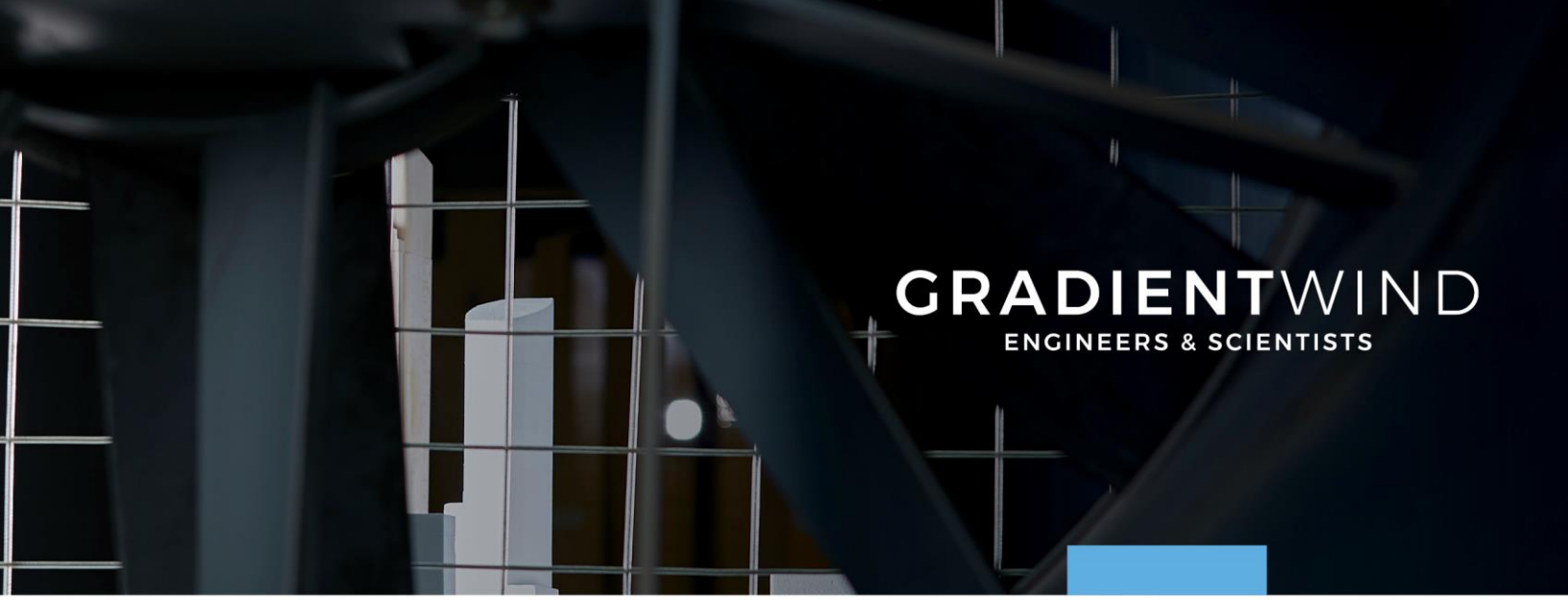
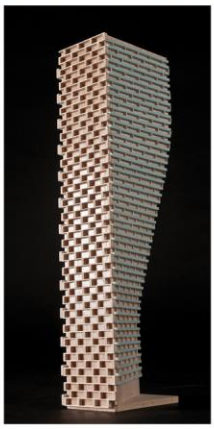


GRADIENTWIND
ENGINEERS & SCIENTISTS

TRANSPORTATION NOISE FEASIBILITY ASSESSMENT

2475 Regina Street
Ottawa, Ontario

Report: 22-068-T.Noise Feasibility



May 13, 2022

PREPARED FOR

Parkway House Development LP
400-300 Richmond Road
Ottawa, ON K1Z 6X6

PREPARED BY

Caleb Alexander, B.Eng., Junior Environmental Scientist
Joshua Foster, P.Eng., Lead Engineer

EXECUTIVE SUMMARY

This report describes a roadway traffic noise feasibility assessment undertaken to satisfy the requirements for a Zoning By-law Amendment (ZBA) application submission for a proposed residential developement located at 2475 Regina Street in Ottawa, Ontario. The development comprises 3 buildings. The major sources of transportation noise are Richmond Road, the Sir John A Macdonald Parkway, and the Confederation Line LRT. 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 LRT volumes based on the theoretical ultimate buildout of the system as detailed in Section 4.2.3; and (iv) architectural drawings prepared by Diamond Schmitt, in March 2022.

The results of the current analysis indicate that noise levels will range between 43 and 63 dBA during the daytime period (07:00-23:00) and between 39 and 59 dBA during the nighttime period (23:00-07:00). The highest noise level (63 dBA) occurs at the east façade of the east tower, which is nearest and most exposed to the Sir John A Macdonald Parkway.

The noise levels predicted due to roadway traffic do not exceed the criteria listed in Section 4.2 for building components. Standard building components will be sufficient to achieve acceptable noise levels within the building. Results of the calculations also indicated that all buildings will be required to supply forced air heating systems with provisions for air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. As the project is being designed to a high degree of sustainability, it is expected that all buildings would be supplied with air conditiong. In addition to ventilation requirements, Warning Clauses will also be required to be placed on all Lease, Purchase and Sale Agreements. Specific noise control measures can be developed once the design of the building has progressed sufficiently, typically at the time of site plan approval. Additionally, Warning Clauses will be required on all Purchase, Lease and Sale Agreements.

Certain OLA's had noise levels exceeding 55 dBA. It is recommended, if administratively, technically, and economically feasible to provide mitigation to these areas to reduce noise levels to equal to, or below 55 dBA. Mitigation is commonly provided in the form of an acoustic barrier at the perimeter of the OLA, however, specific details of mitigations measures will be discussed at the time of Site Plan Approval (SPA).

With regard to stationary noise impacts, a stationary noise study is recommended for the site during the detailed design stage once mechanical plans for the proposed building become available. This study would assess impacts of stationary noise from rooftop mechanical units serving the proposed building on surrounding noise-sensitive areas. This study will include recommendations for any noise control measures that may be necessary to ensure noise levels fall below ENCG limits. Noise impacts can generally be minimized by judicious selection and placement of the equipment. Where necessary noise screens and silencers can be incorporated into the design.

The surroundings comprise residential buildings which coincides with insignificant stationary noise emissions.

A detailed transportation noise study will be required at the time of Site Plan Control application, to determine specific noise control measures for the development.

TABLE OF CONTENTS

1. INTRODUCTION 1

2. TERMS OF REFERENCE 1

3. OBJECTIVES 2

4. METHODOLOGY 2

4.1 Background 2

4.2 Roadway/LRT Traffic Noise 3

4.2.1 Criteria for Roadway Traffic Noise 3

4.2.2 Theoretical Roadway/LRT Noise Predictions 4

4.2.3 Roadway/LRT Traffic Volumes 5

5. RESULTS AND DISCUSSION 6

5.1 Roadway/LRT Traffic Noise Levels 6

6. CONCLUSIONS AND RECOMMENDATIONS 7

FIGURES

APPENDICES

Appendix A – STAMSON 5.04 Input and Output Data and Supporting Information

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Parkway House Development LP to undertake a transportation noise feasibility study to satisfy Zoning By-law Amendment application requirements for the proposed multi-building residential development located at 2475 Regina Street in Ottawa, Ontario (hereinafter referred to as "subject site" or "proposed development"). This report summarizes the methodology, results, and recommendations related to the assessment of exterior noise levels generated by local transportation.

The assessment was performed on the basis of theoretical noise calculation methods conforming to the City of Ottawa[1] and Ministry of the Environment, Conservation and Parks (MECP)[2] guidelines. Noise calculations were based on site plan drawings prepared by Diamond Schmitt, in March 2022.

2. TERMS OF REFERENCE

The subject site is located at 2475 Regina Street in Ottawa; situated on a parcel of land bounded by Regina Street to the south, Lincoln Heights Road to the west, and Pinecrest Creek Pathway to the north and east. The proposed development comprises three buildings; an "L"-shaped 7-storey building situated to the northwest, a near rectangular 25-storey building to the east, and a near rectangular 19-storey building to the south, referred to as the "Parkway House", "East Tower", and "West Tower", respectively, throughout this report. All three buildings are served by two shared below-grade parking levels and include mechanical penthouse (MPH) levels with green roofs.

Above below-grade parking, the ground floor of the Parkway House includes a main entrance at the southeast corner, a waste room and loading space to the southwest, and the Parking House throughout the remainder of the level. Surface parking is situated to the south of the Parkway House. All upper levels include residential use. Level 2 is served by indoor amenity at the northwest corner and an outdoor amenity terrace to the south. Floorplate setbacks are situated to the west from Levels 4-7.

[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

Above below-grade parking, the ground floor of the East Tower includes a main entrance and an office to the west, residential units from the northwest clockwise southeast, a waste room and loading space at the southwest corner, and shared building support spaces throughout the remainder of the level. Community green spaces are situated along the west elevation of the East Tower. Multi-use pathways extend from the north to south and from the south to the southeast of the subject site. All upper levels include residential use. Level 7 is served by indoor and outdoor amenities to the north. Private terraces are located to the north at Level 8 and 9.

Above below-grade parking, the ground floor of the West Tower includes a main entrance at the northeast corner, an office, waste room, and loading space to the east, shared building support spaces to the east and at the southeast corner, and residential units throughout the remainder of the level. Access to below-grade parking is provided by a ramp to the west of the West Tower via a laneway from Regina Street. All upper levels include residential use. Level 7 is served by indoor amenity to the south.

Any private terraces with a depth less than 4 m are not considered as OLA's per ENCG guidelines.

The major sources of roadway noise are Richmond Road and the Sir John A Macdonald Parkway. The LRT noise source is the O-Train Confederation Line that is east of the proposed development. Since the LRT railway is greater than 75m from the proposed development a vibration assessment is not required. Collector and arterial roadways located more than 100 m from the site are considered to be insignificant sources of roadway traffic noise as per ENCG. The site is surrounded by low-high rise residential buildings and commercial buildings to the west. Figure 1 illustrates the site location 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) explore potential noise mitigation options, where required.

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/LRT 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 traffic, as listed in Table 1.

TABLE 1: INDOOR SOUND LEVEL CRITERIA (ROAD AND LRT)[3]

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

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

Predicted noise levels at the plane of window (POW) dictate the action required to achieve the recommended sound levels. An open window is considered to provide a 10 dBA reduction in noise, while a standard closed window is capable of providing a minimum 20 dBA noise reduction[4]. A closed window due to a ventilation requirement will bring noise levels down to achieve an acceptable indoor environment[5]. Therefore, where noise levels exceed 55 dBA daytime and 50 dBA nighttime, the ventilation for the building should consider the need for having windows and doors closed, which triggers the need for forced air heating with provision for central air conditioning. Where noise levels exceed 65 dBA daytime and 60 dBA nighttime, air conditioning will be required and building components will require higher levels of sound attenuation[6].

The sound level criterion for outdoor living areas is 55 dBA, which applies during the daytime (07:00 to 23:00). When noise levels exceed 55 dBA, mitigation is recommended to reduce noise levels where technically and administratively feasible to acceptable levels at or below the criterion. Where noise levels exceed 60 dBA, mitigation must be provided.

4.2.2 Theoretical Roadway/LRT Noise Predictions

The impact of roadway traffic noise sources on the development was determined by computer modelling. Traffic noise source modelling is based on the software program *Predictor-Lima* which utilizes the United States Federal Highway Administration's Traffic Noise Model (TNM) to represent the roadway line sources. The TNM analysis model as been recognised by the Ministry of Transportation Ontario (MTO) as the recommend noise model for transportation projects (ref. Environmental Guide for Noise, dated August 2021[7]). The Ministry of Environment, Conservation and Parks has also adopted the TMN model as per their "Draft Guideline Noise Pollution Control Publications 306 (NPC-306)[8] This computer program can represent three-dimensional surfaces and first reflections of sound waves over a suitable spectrum for human hearing. A set of comparative calculations were performed in the free field environment for comparisons to the current Ontario traffic noise prediction model STAMSON. The STAMSON model is

[4] Burberry, P.B. (2014). Mitchell's Environment and Services. Routledge, Page 125
[5] MECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.8
[6] MECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.1.3
[7] Ministry of Transportation Ontario, "*Environmental Guide for Noise*", August 2021, pg. 16
[8] Ministry of Environment, Conservation and Parks, Ontario, "Methods to determine Sound Levels Due to Road and Rail Traffic", Draft February 12, 2020

however older and requires each receptor to be calculated separately. STAMSON also does not accurately account for building reflections and multiple screening elements, and curved road geometry. Noise levels were found to be within an imperceptible level of 0-3 dBA of those predicted in Predictor, as seen in Table 4.

Roadway traffic and LRT noise calculations were performed by treating each roadway segment as a separate line source of noise, and by using existing building locations as noise barriers. 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 buildings.
- Noise receptors were strategically placed at four (16) locations around the study area, see Figure 2.
- Proposed and existing buildings were considered to provide shielding to noise receptors.
- Noise from the LRT was modelled using equivalent noise levels produced from the 4-car Scarbourough Rapid Transit (SRT).

4.2.3 Roadway/LRT Traffic Volumes

The ENCG dictates that noise calculations should consider future sound levels based on a roadway's classification at the mature state of development. Therefore, traffic volumes are based on the roadway classifications outlined in the City of Ottawa's Official Plan (OP) and Transportation Master Plan[9] 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.The LRT traffic volumes are based on the environmental assessment performed by Gradient Wind for Phase 2 of the O-Train Confederation Line which considered train volumes for the ultimate buildout of the system.

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

TABLE 2: ROADWAY TRAFFIC DATA

Segment	Roadway Traffic Data	Speed Limit (km/h)	Traffic Volumes
Sir John A. Macdonald Parkway	4-Lane Arterial Divided	60	**35,000**
Richmond Road	2-Lane Arterial	50	**15,000**
O-Train Confederation Line	LRT	70	**485/76***

*Daytime/Nighttime traffic volumes

5. RESULTS AND DISCUSSION

5.1 Roadway/LRT Traffic Noise Levels

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

TABLE 3: EXTERIOR NOISE LEVELS DUE TO ROAD TRAFFIC

Receptor Number	Receptor Height Above Grade (m)	Receptor Location	Noise Level (dBA)	
			Day	Night
1	19.5	POW – Parkway House – West Façade	48	41
2	19.5	POW – Parkway House – North Façade	58	50
3	19.5	POW – Parkway House – East Façade	57	50
4	19.5	POW – Parkway House – South Façade	46	39
5	55.5	POW – West Tower – West Façade	53	47
6	55.5	POW – West Tower – North Façade	57	49
7	55.5	POW – West Tower – East Façade	56	49
8	55.5	POW – West Tower – South Façade	56	49
9	73.5	POW – East Tower – West Façade	55	48
10	73.5	POW – East Tower – North Façade	59	52
11	73.5	POW – East Tower – East Façade	63	56
12	73.5	POW – East Tower – South Façade	62	55
13	7.5	OLA – Parkway House – Terrace	51	N/A*
14	22.5	OLA – East Tower – Terrace	58	N/A*
15	1.5	OLA – Grade Level Outdoor Amenity	57	N/A*
16	1.5	OLA – Grade Level Outdoor Amenity	43	N/A*

*Noise levels at OLAs during the nighttime are not considered, as per the ENCG.

The results of the current analysis indicate that noise levels will range between 43 and 63 dBA during the daytime period (07:00-23:00) and between 39 and 59 dBA during the nighttime period (23:00-07:00). The highest noise level (63 dBA) occurs at the east façade of the east tower, which is nearest and most exposed to the Sir John A Macdonald Parkway. A results comparison between the Predictor and Stamson calculations are shown in Table 4. The difference between calculation methods was within 0-3 dBA which is imperceptible to the human ear.

TABLE 4: RESULT CORRELATION WITH STAMSON

Receptor Number	Receptor Location	Receptor Height (m)	STAMSON 5.04 Noise Level (dBA)		PREDICTOR-LIMA Noise Level (dBA)	
			Day	Night	Day	Night
R5	POW – West Tower – West Façade	55.5	54	47	53	47
R10	POW – East Tower – North Façade	73.5	60	53	59	52
R11	POW – East Tower – South Façade	73.5	66	58	63	56

6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current analysis indicate that noise levels will range between 43 and 63 dBA during the daytime period (07:00-23:00) and between 39 and 59 dBA during the nighttime period (23:00-07:00). The highest noise level (63 dBA) occurs at the east façade of the east tower, which is nearest and most exposed to the Sir John A Macdonald Parkway.The noise levels predicted due to roadway traffic do not exceed the criteria listed in Section 4.2 for building components. Standard building components will be sufficient to achieve acceptable noise levels within the building

Results of the calculations also indicated that all buildings will be required to supply forced air heating systems with provisions for air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. . As the project is being designed to a high degree of sustainability, it is expected that all buildings would be supplied with air conditiong. In addition to ventilation requirements, Warning Clauses will also be required to be placed on all Lease, Purchase and Sale Agreements. Specific noise control measures can be developed once the design of the building has progressed sufficiently, typically at the time of site plan approval.

Certain OLA's had noise levels exceeding 55 dBA. It is recommended, if administratively, technically, and economically feasible to provide mitigation to these areas to reduce noise levels to equal to, or below 55 dBA. Mitigation is commonly provided in the form of an acoustic barrier at the perimeter of the OLA, however, specific details of mitigations measures will be discussed at the time of Site Plan Approval (SPA).

With regard to stationary noise impacts, a stationary noise study is recommended for the site during the detailed design stage once mechanical plans for the proposed building become available. This study would assess the impacts of stationary noise from rooftop mechanical units serving the proposed building on surrounding noise-sensitive areas. This study will include recommendations for any noise control measures that may be necessary to ensure noise levels fall below ENCG limits. Noise impacts can generally be minimized by judicious selection and placement of the equipment. Where necessary noise screens and silencers can be incorporated into the design.

A detailed transportation noise study will be required at the time of Site Plan Control application, to determine specific noise control measures for the development.

This concludes our transportation noise feasibility 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.

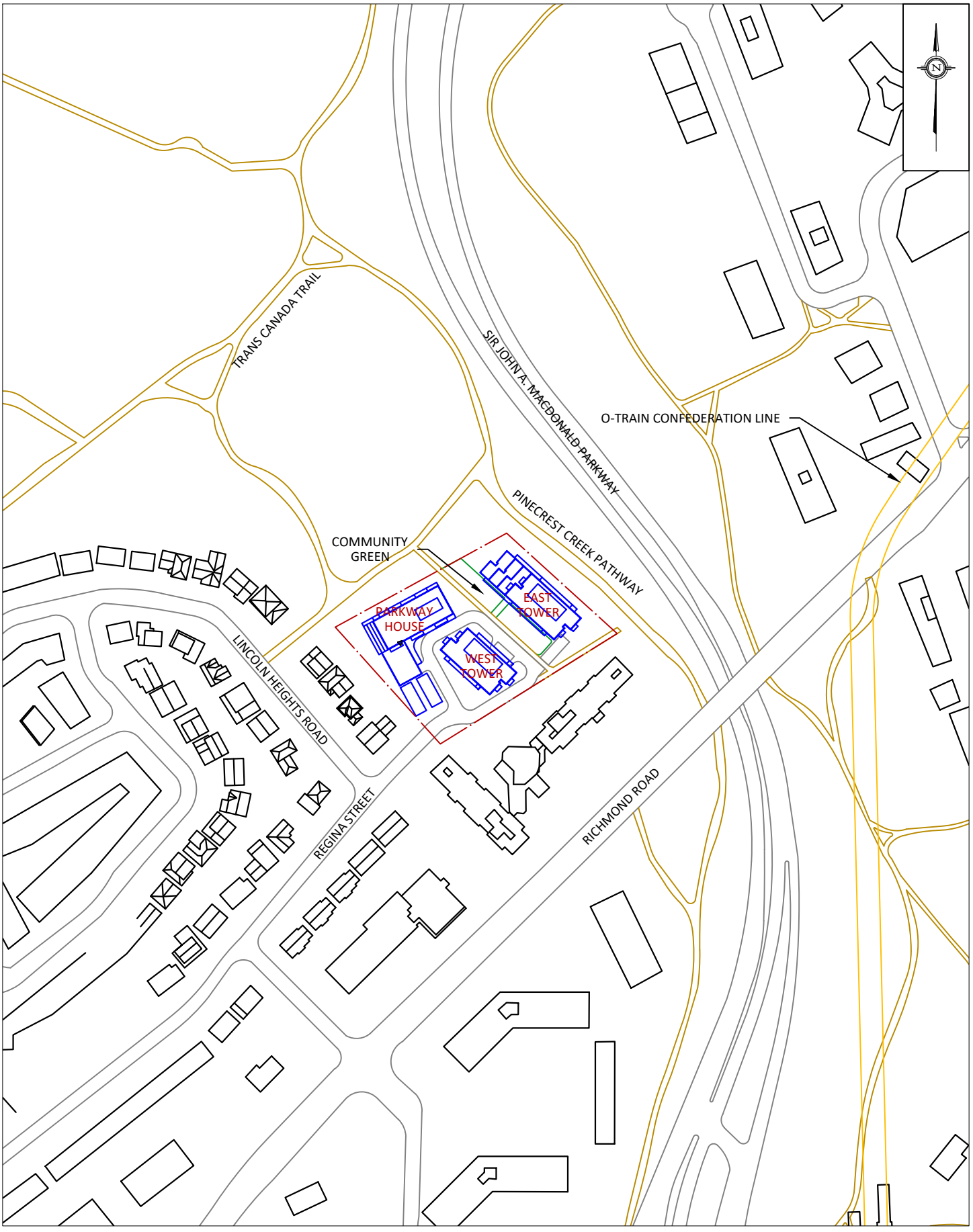
Sincerely,

Gradient Wind Engineering Inc.

Caleb Alexander, B.Eng.
Junior Environmental Scientist

Joshua Foster, P.Eng.
Lead Engineer

Gradient Wind File 22-068-T.Noise Feasibility



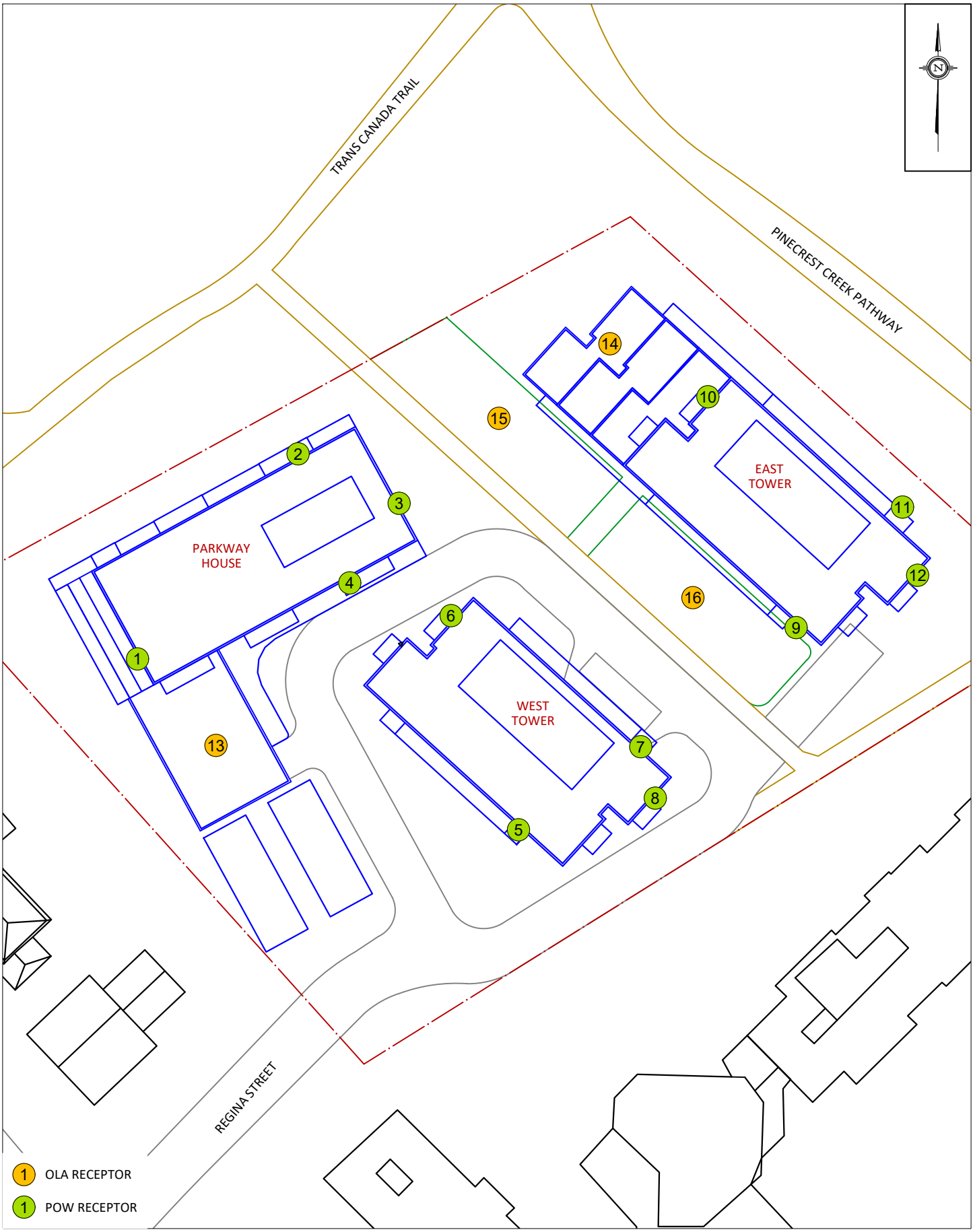
GRADIENTWIND
ENGINEERS & SCIENTISTS

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

PROJECT	2475 REGINA STREET, OTTAWA TRANSPORTATION NOISE STUDY
SCALE	1:3000
DRAWING NO.	22-068-1
DATE	APRIL 11, 2022
DRAWN BY	C.A.

DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT



GRADIENTWIND
ENGINEERS & SCIENTISTS

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

PROJECT	2475 REGINA STREET, OTTAWA TRANSPORTATION NOISE STUDY
SCALE	1:750
DRAWING NO.	22-068-2
DATE	APRIL 11, 2022
DRAWN BY	C.A.
DESCRIPTION	FIGURE 2: RECEPTOR LOCATION

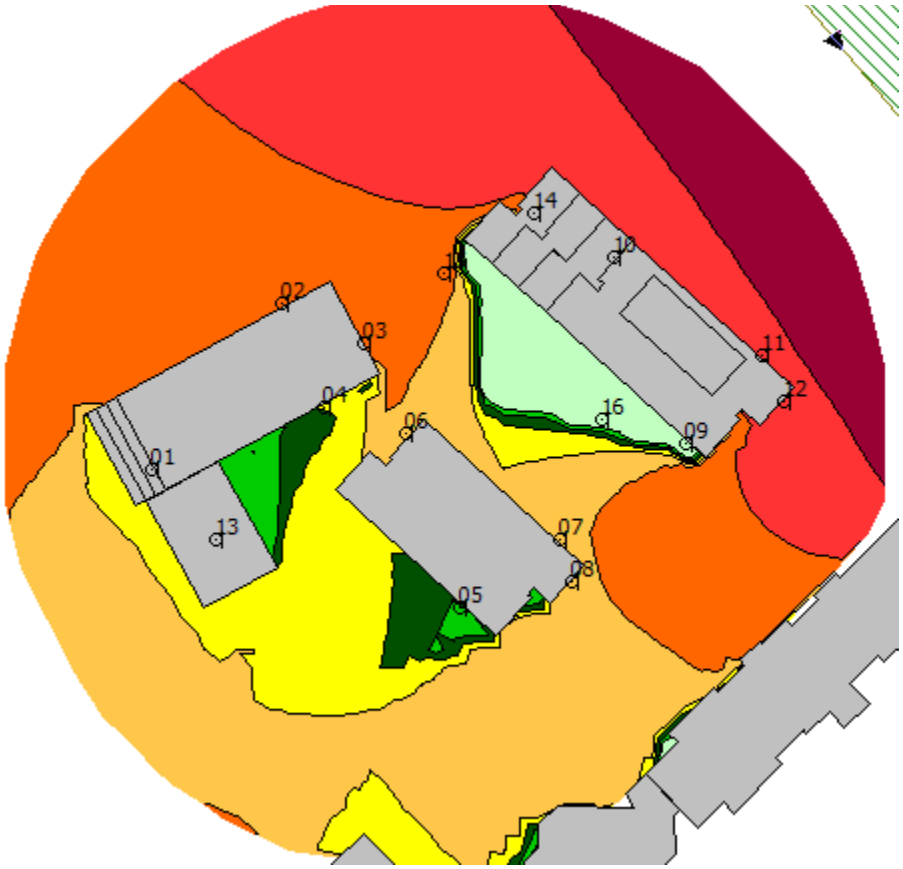


FIGURE 3: DAYTIME ROADWAY TRAFFIC NOISE LEVELS (30 METERS ABOVE GRADE)

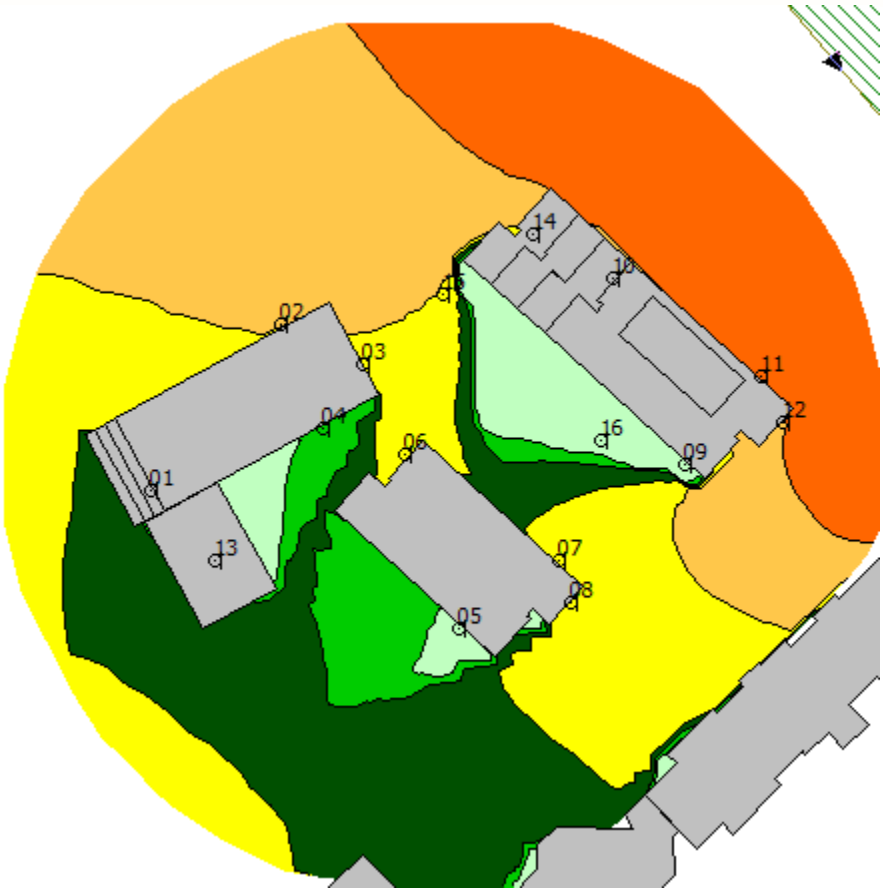
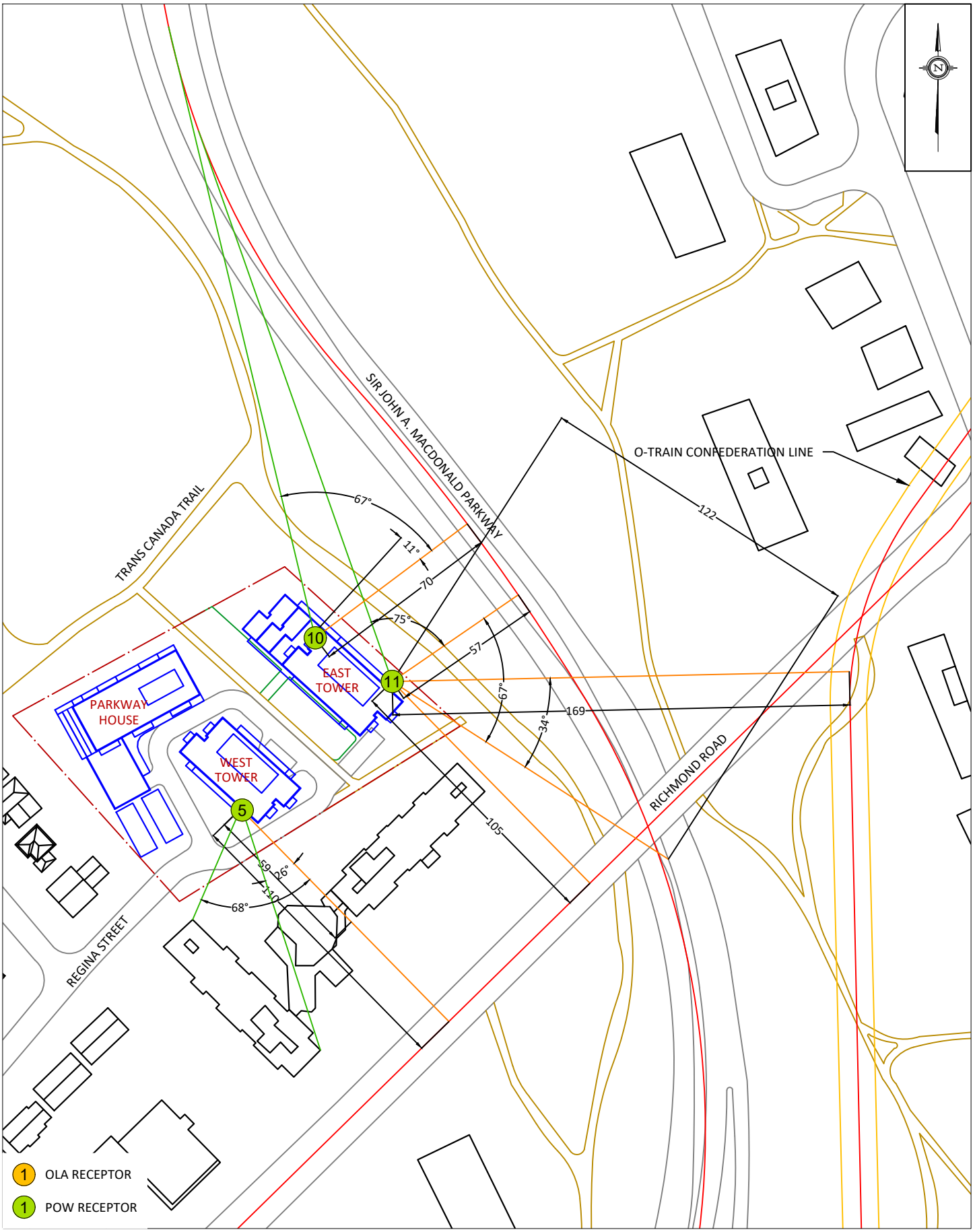


FIGURE 4: NIGHTTIME ROADWAY TRAFFIC NOISE LEVELS (30 METERS ABOVE GRADE)

APPENDIX A

STAMSON 5.04 – INPUT AND OUTPUT DATA

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



GRADIENTWIND
ENGINEERS & SCIENTISTS

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

PROJECT	2475 REGINA STREET, OTTAWA TRANSPORTATION NOISE STUDY
SCALE	1:2000
DRAWING NO.	22-068-A1
DATE	APRIL 11, 2022
DRAWN BY	C.A.

DESCRIPTION

FIGURE A1:
STAMSON INPUT PARAMETERS

```
STAMSON 5.0         NORMAL REPORT         Date: 14-04-2022 15:18:34
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Richmond (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: Richmond (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  : 110.00 / 110.00 m
Receiver height           :  55.50 / 73.50  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :  26.00 deg   Angle2 : 68.00 deg
Barrier height            :  60.00 m
Barrier receiver distance :  59.00 / 59.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

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

Source height = 1.50 m

Barrier height for grazing incidence
-----------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       55.50 !       26.53 !        26.53

ROAD (51.42 + 33.51 + 50.70) = 54.12 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     26   0.00  68.48   0.00  -8.65  -8.40   0.00   0.00   0.00  51.42
-------------------------------------------------------------------------------
    26     68   0.00  68.48   0.00  -8.65  -6.32   0.00   0.00 -20.00  33.51
-------------------------------------------------------------------------------
    68     90   0.00  68.48   0.00  -8.65  -9.13   0.00   0.00   0.00  50.70
-------------------------------------------------------------------------------

Segment Leq : 54.12 dBA

Total Leq All Segments: 54.12 dBA
```

```
Results segment # 1: Richmond (night)
-------------------------------------

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       73.50 !       34.88 !        34.88

ROAD (43.83 + 25.91 + 43.10) = 46.53 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     26   0.00  60.88   0.00  -8.65  -8.40   0.00   0.00   0.00  43.83
-------------------------------------------------------------------------------
    26     68   0.00  60.88   0.00  -8.65  -6.32   0.00   0.00 -20.00  25.91
-------------------------------------------------------------------------------
    68     90   0.00  60.88   0.00  -8.65  -9.13   0.00   0.00   0.00  43.10
-------------------------------------------------------------------------------

Segment Leq : 46.53 dBA

Total Leq All Segments: 46.53 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 54.12
                           (NIGHT): 46.53
```

```
STAMSON 5.0        NORMAL REPORT        Date: 14-04-2022 15:16:26
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Pkwy (day/night)
----------------------------------------
Car traffic volume  : 28336/2464  veh/TimePeriod  *
Medium truck volume :  2254/196   veh/TimePeriod  *
Heavy truck volume  :  1610/140   veh/TimePeriod  *
Posted speed limit  :    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):  35000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: Pkwy (day/night)
---------------------------------------
Angle1   Angle2           : -67.00 deg   -11.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  70.00 / 70.00  m
Receiver height           :  73.50 / 73.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 60.40 + 0.00) = 60.40 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -67    -11   0.00  72.16   0.00  -6.69  -5.07   0.00   0.00   0.00  60.40
-------------------------------------------------------------------------------

Segment Leq : 60.40 dBA

Total Leq All Segments: 60.40 dBA


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

Source height = 1.50 m

ROAD (0.00 + 52.80 + 0.00) = 52.80 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -67    -11   0.00  64.56   0.00  -6.69  -5.07   0.00   0.00   0.00  52.80
-------------------------------------------------------------------------------

Segment Leq : 52.80 dBA

Total Leq All Segments: 52.80 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 60.40
                           (NIGHT): 52.80
```

```
STAMSON 5.0        NORMAL REPORT        Date: 14-04-2022 15:16:45
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Pkwy (day/night)
----------------------------------------
Car traffic volume  : 28336/2464  veh/TimePeriod  *
Medium truck volume :  2254/196   veh/TimePeriod  *
Heavy truck volume  :  1610/140   veh/TimePeriod  *
Posted speed limit  :    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):  35000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: Pkwy (day/night)
---------------------------------------
Angle1   Angle2           : -75.00 deg   67.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  57.00 / 57.00  m
Receiver height           :  73.50 / 73.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 2: Richmond (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: Richmond (day/night)
-----------------------------------------
Angle1   Angle2           : -70.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 105.00 / 105.00 m
Receiver height           :  73.50 / 73.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


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

Source height = 1.50 m

ROAD (0.00 + 65.33 + 0.00) = 65.33 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -75     67   0.00  72.16   0.00  -5.80  -1.03   0.00   0.00   0.00  65.33
-------------------------------------------------------------------------------

Segment Leq : 65.33 dBA
```

```
Results segment # 2: Richmond (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 55.93 + 0.00) = 55.93 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -70      0   0.00  68.48   0.00  -8.45  -4.10   0.00   0.00   0.00  55.93
-------------------------------------------------------------------------------

Segment Leq : 55.93 dBA

Total Leq All Segments: 65.80 dBA


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

Source height = 1.50 m

ROAD (0.00 + 57.74 + 0.00) = 57.74 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -75     67   0.00  64.56   0.00  -5.80  -1.03   0.00   0.00   0.00  57.74
-------------------------------------------------------------------------------

Segment Leq : 57.74 dBA
```

```
Results segment # 2: Richmond (night)
-------------------------------------

Source height = 1.50 m

ROAD (0.00 + 48.33 + 0.00) = 48.33 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -70      0   0.00  60.88   0.00  -8.45  -4.10   0.00   0.00   0.00  48.33
-------------------------------------------------------------------------------

Segment Leq : 48.33 dBA

Total Leq All Segments: 58.21 dBA


RT/Custom data, segment # 1: LRT (day/night)
--------------------------------------------
1 - 4-car SRT:
Traffic volume    :   485/76    veh/TimePeriod
Speed             :    70 km/h

Data for Segment # 1: LRT (day/night)
-------------------------------------
Angle1   Angle2           :   0.00 deg   44.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 169.00 / 169.00 m
Receiver height           :  73.50 / 73.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
RT/Custom data, segment # 2: LRT_2 (day/night)
-----------------------------------------------
1 - 4-car SRT:
Traffic volume    :   485/76    veh/TimePeriod
Speed             :    50 km/h

Data for Segment # 2: LRT_2 (day/night)
---------------------------------------
Angle1   Angle2           : -90.00 deg   -34.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  : 122.00 / 122.00 m
Receiver height           :  73.50 / 73.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


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

Source height = 0.50 m

RT/Custom (0.00 + 46.33 + 0.00) = 46.33 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
     0     44   0.00  62.97 -10.52  -6.12   0.00   0.00   0.00  46.33
-------------------------------------------------------------------------

Segment Leq : 46.33 dBA
```

```
Results segment # 2: LRT_2 (day)
--------------------------------

Source height = 0.50 m

RT/Custom (0.00 + 45.87 + 0.00) = 45.87 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -34   0.00  60.05  -9.10  -5.07   0.00   0.00   0.00  45.87
-------------------------------------------------------------------------

Segment Leq : 45.87 dBA

Total Leq All Segments: 49.12 dBA


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

Source height = 0.50 m

RT/Custom (0.00 + 41.30 + 0.00) = 41.30 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
     0     44   0.00  57.93 -10.52  -6.12   0.00   0.00   0.00  41.30
-------------------------------------------------------------------------

Segment Leq : 41.30 dBA
```

```
Results segment # 2: LRT_2 (night)
----------------------------------

Source height = 0.50 m

RT/Custom (0.00 + 40.84 + 0.00) = 40.84 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -34   0.00  55.01  -9.10  -5.07   0.00   0.00   0.00  40.84
-------------------------------------------------------------------------

Segment Leq : 40.84 dBA

Total Leq All Segments: 44.09 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 65.89
                           (NIGHT): 58.38
```