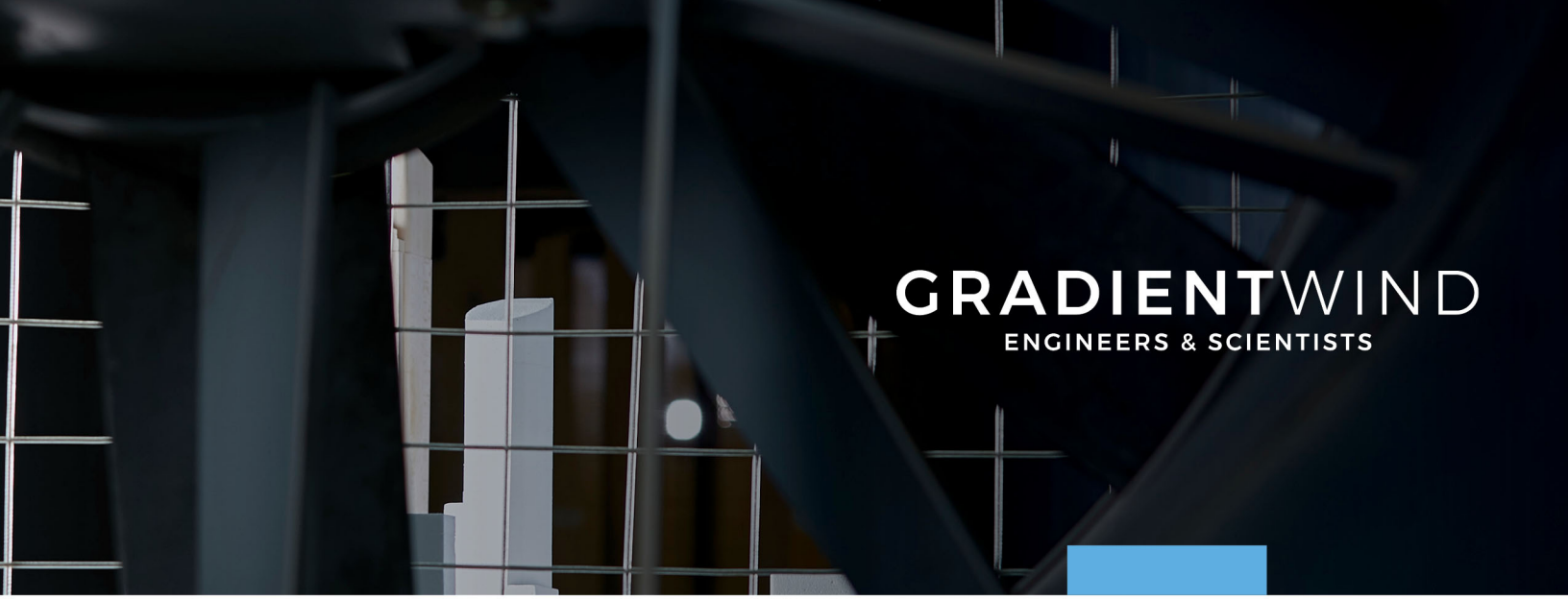

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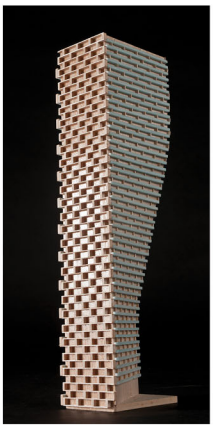
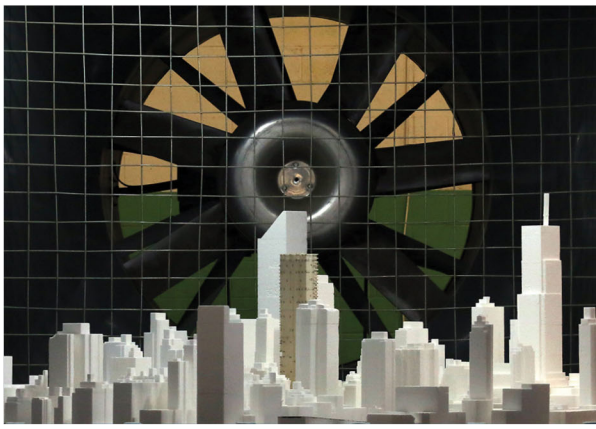
TRAFFIC NOISE FEASIBILITY ASSESSMENT

800 Cedarview Road
Ottawa, Ontario

Report: 19-152–Traffic Noise Feasibility





August 20th , 2024

PREPARED FOR
Mattamy Homes Canada
50 Hines Road, Suite 100
Ottawa, ON K2K 2M5

PREPARED BY
Joshua Foster, P.Eng., Lead Engineer

EXECUTIVE SUMMARY

This report describes a traffic noise feasibility assessment undertaken for a proposed subdivision development located at 800 Cedarview Road, in the Cedarview Community along Highway 416, Ottawa, Ontario. This development comprises of single detached houses and townhomes, as well as various mixed-use blocks and park spaces. The major source of traffic noise impacting this subdivision is Highway 416.

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 Urbantypology in August 2023.

The results of the current analysis indicate that noise levels will range between 75 and 40 dBA during the daytime period (07:00-23:00) and between 68 and 35 dBA during the nighttime period (23:00-07:00). The highest noise level (75 dBA) occurs at the west side of the development site, which is directly exposed to the noise generated by Highway 416. Figures 4-7 illustrate daytime and nighttime noise contours throughout the site at a height of 4.5 m above grade.

Building components with a higher Sound Transmission Class (STC) rating will be required where exterior noise levels exceed 65 dBA. The results of the calculations indicate that the buildings that are directly exposed to the highway will require STC rated building components as well as central air conditioning. For the other blocks, forced air heating with provision for the installation of central air conditioning may be required. Additionally, Warning Clauses will also be required to be placed on all Lease, Purchase and Sale Agreements.

Results of the roadway traffic noise calculations also indicate that the outdoor living areas having direct exposure to traffic noise may require noise control measures, in the form of noise barriers (see Figure 8). Mitigation measures are described in Section 5.1.1, with the aim to reduce the L_{eq} to as close to 55 dBA as technically, economically and administratively feasible. A detailed roadway traffic noise study will be required at the time of subdivision registration to determine specific noise control measures for the development.

Addendum:

Gradient Wind received revised draft plan of subdivision drawings in August 2024. There are minor changes to the fabric layout of the single family lots, however thses changes would not alter the main conclusiongs and findings of this report.

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Mattamy Homes to undertake a traffic noise feasibility assessment for a proposed subdivision development located at 800 Cedarview Road in Ottawa, Ontario. This report summarizes the methodology, results, and recommendations related to the assessment of exterior and interior noise levels generated by local roadway traffic.

Our work is based on theoretical noise calculation methods conforming to the City of Ottawa[1] and Ministry of the Environment, Conservation and Parks (MECP)[2] guidelines. Noise calculations were based on site plan drawings prepared by Urbantypology in August 2023, with future traffic volumes corresponding to the City of Ottawa's Official Plan (OP) roadway classifications.

2. TERMS OF REFERENCE

The focus of this traffic noise feasibility assessment is a proposed subdivision development located at 800 Cedarview Road in Ottawa, Ontario. The north corner of the site plan is dedicated to single detached homes, with two blocks for townhomes to the center, adjacent to a park. Condo Block - 02 is situated towards the northwest, with direct exposure to Highway 416. This block contains stacked, back-to-back townhomes and rear lane townhomes. Directly south of this block is a stormwater management pond. A medium density block is south of the pond, bounded by Highway 416 to the west and a Hydro Pole to the south and east. The eastern part of the site plan is dedicated to wetlands and various park spaces. Condo Block – 01 is located towards the southwest of the site, bounded by a hydro pole to the north, single detached homes and townhomes to the east, Highway 416 to the west, and conservation land and a parkette to the south. Similarly to Condo Block 02, this land comprises of stacked, back-to-back townhomes and rear lane townhomes. Further south of the parkette is a community housing block 01 and mixed-use land. The center of the site plan is dedicated to various residential dwellings, including detached homes and townhomes. A mixed use block is situated to the south of the plan, and a second stormwater pond is situated to the southeast corner. The land to the south and the southwest corner are

[1] City of Ottawa Environmental Noise Control Guidelines, January 2016
[2] Ontario Ministry of the Environment, Conservation and Parks – Environmental Noise Guidelines, Publication NPC-300, Queens Printer for Ontario, Toronto, 2013

conservation land. The massing of buildings in Condo Block-01, Condo Block-02, and Mixed-Use 01 and 02 were considered.

The major sources of traffic noise impacting this subdivision is Highway 416.

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 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 Traffic Noise

4.2.1 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_{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 Outdoor Living Area (OLA) noise limit is 55

dBA during the daytime period. As per the ENCG, OLAs do not need to be considered during the nighttime period.

Predicted noise levels at the outdoor living area dictate the action required to achieve the recommended sound levels. According to the ENCG, if an area is to be used as an OLA, noise control measures are required to reduce the L_{eq} to 55 dBA. This is typically done with noise control measures outlined in Section 5.1.1. When noise levels at these areas exceed the criteria, specific Warning Clause requirements may apply. As this is a preliminary assessment, noise control recommendations are of a general nature. Specific mitigation requirements would be the work of a future detailed noise study.

4.2.2 Theoretical Roadway Noise Predictions

Noise predictions were determined by computer modelling using two programs: Predictor-Lima and STAMSON 5.04. To provide a general sense of noise across the site, the employed software program was *Predictor-Lima (TNM calculation)*, which incorporates the United States Federal Highway Administration's (FHWA) Transportation Noise Model (TNM) 2.5. This computer program is capable of representing three-dimensional surface and first reflections of sound waves over a suitable spectrum for human hearing. A receptor grid was placed across the study site, along with a number of discrete receptors at key sensitive areas. Although this program outputs noise contours, it is not the approved model for roadway predictions by the City of Ottawa. Therefore, the results were confirmed by performing discrete noise calculations with the MECP computerized noise assessment program, STAMSON 5.04, at three sample receptor locations coinciding with the receptor locations in Predictor as shown in Figure 2. Receptor distances and exposure angles are also illustrated in Figures 3. Appendix A includes the STAMSON 5.04 input and output data.

Roadway noise calculations were performed by treating each road segment as separate line sources of noise. In addition to the traffic volumes summarized in Table 1, 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.

- The ground surface was modelled as absorptive where grass and foliage (soft ground) are present).
- The study site was treated as having flat or gently sloping topography.
- The massing of buildings in Condo Block-01, Condo Block-02, and Mixed-Use 01 and 02 were considered.
- Topography associated with Highway 416 was considered. This was obtained through Google Earth.
- Nine (9) receptors were strategically placed throughout the study area.

4.2.3 Roadway Traffic Volumes

The ENCG dictates that noise calculations should consider future sound levels based on a roadway's classification at the mature state of development. Therefore, traffic volumes are based on the roadway classifications outlined in the City of Ottawa's Official Plan (OP) and Transportation Master Plan[3] 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 1 (below) summarizes the AADT values used for each roadway included in this assessment.

TABLE 1: ROADWAY TRAFFIC DATA

Segment	Roadway Traffic Data	Speed Limit (km/h)	Traffic Volumes
Highway 416	4-Lane Freeway	100	**73,332**

5. RESULTS

5.1 Roadway Traffic Noise Levels

The results of the roadway traffic noise calculations are summarized in Table 2. The results of the current analysis indicate that noise levels will range between 75 and 40 dBA during the daytime period (07:00-23:00) and between 68 and 35 dBA during the nighttime period (23:00-07:00). The highest noise level (75 dBA) occurs at the west of the development site, which is directly exposed to the noise generated by

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

Highway 416. Figures 4-7 illustrate daytime and nighttime noise contours throughout the site at a height of 4.5 m above grade.

TABLE 2: EXTERIOR NOISE LEVELS DUE TO ROADWAY TRAFFIC SOURCES

Receptor ID	Receptor Type	Receptor Location	Receptor Height (m)	PREDICTOR-LIMA Noise Level (dBA)	
				Day	Night
R1	POW	Condo Block 02 – Back-to-Back Townhome, West Façade	4.5	74	67
R2	POW	Condo Block 02 – Back-to-Back Townhome, North Façade	4.5	72	64
R3	POW	Condo Block 02 – Back-to-Back Townhome, West Façade	4.5	72	65
R4	POW	Condo Block 01 – Back-to-Back Townhome, West Façade	4.5	75	68
R5	OLA	Single Detached Rear Yard	1.5	68	N/A
R6	OLA	Single Detached Rear Yard	1.5	66	N/A
R7	OLA	Single Detached Rear Yard	1.5	65	N/A
R8	OLA	Single Detached Rear Yard	1.5	64	N/A
R9	OLA	Rear Lane Townhomes Rear Yard	1.5	65	N/A

Table 3 below provides a comparison between Predictor-Lima and STAMSON. Noise levels calculated in STAMSON were found to have good correlation with Predictor-Lima and variability between the two programs was within an acceptable level of ±1-3 dBA.

TABLE 3: RESULT CORRELATION WITH STAMSON

Receptor ID	Receptor Location	Receptor Height (m)	STAMSON 5.04 Noise Level (dBA)		PREDICTOR-LIMA Noise Level (dBA)	
			Day	Night	Day	Night
R1	Condo Block 02 – Back-to-Back Townhome, West Façade	4.5	72	64	74	67
R2	Condo Block 02 – Back-to-Back Townhome, North Façade	4.5	69	61	72	64

5.1.1 Noise Control Measures

The noise levels predicted due to roadway traffic exceed the criteria listed in the ENCG for potential outdoor living areas (OLA). Therefore, noise control measures as described below, subscribing to Table 2.3a in the ENCG and listed in order of preference, will be required to reduce the L_{eq} to 55 dBA at some receptors:

- Distance setback with soft ground
- Insertion of noise insensitive land uses between the source and sensitive points of reception
- Orientation of buildings to provide sheltered zones in rear yards
- Shared outdoor amenity areas
- Earth berms (sound barriers)
- Acoustic barriers

Examining the noise control measures listed above, these conclusions consider the possibility that not all of the proposed buildings will be oriented to provide screening elements for outdoor living areas against roadway traffic sources. Distance setback, insertion of non-noise sensitive land uses, and building orientation to provide sheltered zones in rear yards may not be feasible due to the requirements of the Community Development Plan. It is also not feasible to have shared outdoor amenity areas for this development with respect to rear yards, as this would have a significant impact on marketability. Therefore, the most feasible measures are the insertion of earth berms or acoustic wall barriers between the sensitive rear yards and sources of noise, as mentioned in Section 5.1. The use of earth berms or

acoustic barriers will depend on the grading plan when it becomes available. Both options have the ability to reduce OLA noise levels to below 55 dBA. Potential noise barrier locations can be seen in Figure 8.

In Figure 9, the area(s) indicated with blue (potential noise levels between 55 and 65 dBA) may require forced air heating with provision for central air conditioning; the area(s) indicated with pink (potential noise levels greater than 65 dBA) will require central air conditioning and upgraded building components.

6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current analysis indicate that noise levels will range between 75 and 40 dBA during the daytime period (07:00-23:00) and between 68 and 35 dBA during the nighttime period (23:00-07:00). The highest noise level (75 dBA) occurs at the west side of the development site, which is directly exposed to the noise generated by Highway 416. Figures 4-7 illustrate daytime and nighttime noise contours throughout the site at a height of 4.5 m above grade.

Building components with a higher Sound Transmission Class (STC) rating will be required where exterior noise levels exceed 65 dBA. The results of the calculations indicate that the buildings that are directly exposed to the highway will require STC rated building components as well as central air conditioning. For the other blocks, forced air heating with provision for the installation of central air conditioning may be required.

In Figure 9, the areas indicated with blue (potential noise levels between 55 and 65 dBA) may require forced air heating with provision for central air conditioning, as well as a Warning Clause Type C on all Lease, Purchase and Sale Agreements; the area(s) indicated with pink (potential noise levels greater than 65 dBA) will require central air conditioning and upgraded building components, as well as a Warning Clause Type D on all Lease, Purchase and Sale Agreements .

Type C:

> *"This dwelling unit has been designed with the provision for adding central air conditioning at the occupant's discretion. Installation of central air conditioning by the occupant in low and medium density developments will allow windows and exterior doors to remain closed, thereby ensuring*

that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment."

Type D:

"This dwelling unit has been supplied with a central air conditioning system which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment."

Results of the roadway traffic noise calculations also indicate that the outdoor living areas having direct exposure to traffic noise may require noise control measures (see Figure 8). Mitigation measures are described in Section 5.1.1, with the aim to reduce the L_{eq} to as close to 55 dBA as technically, economically and administratively feasible. A detailed roadway traffic noise study will be required to determine specific noise control measures for the development.

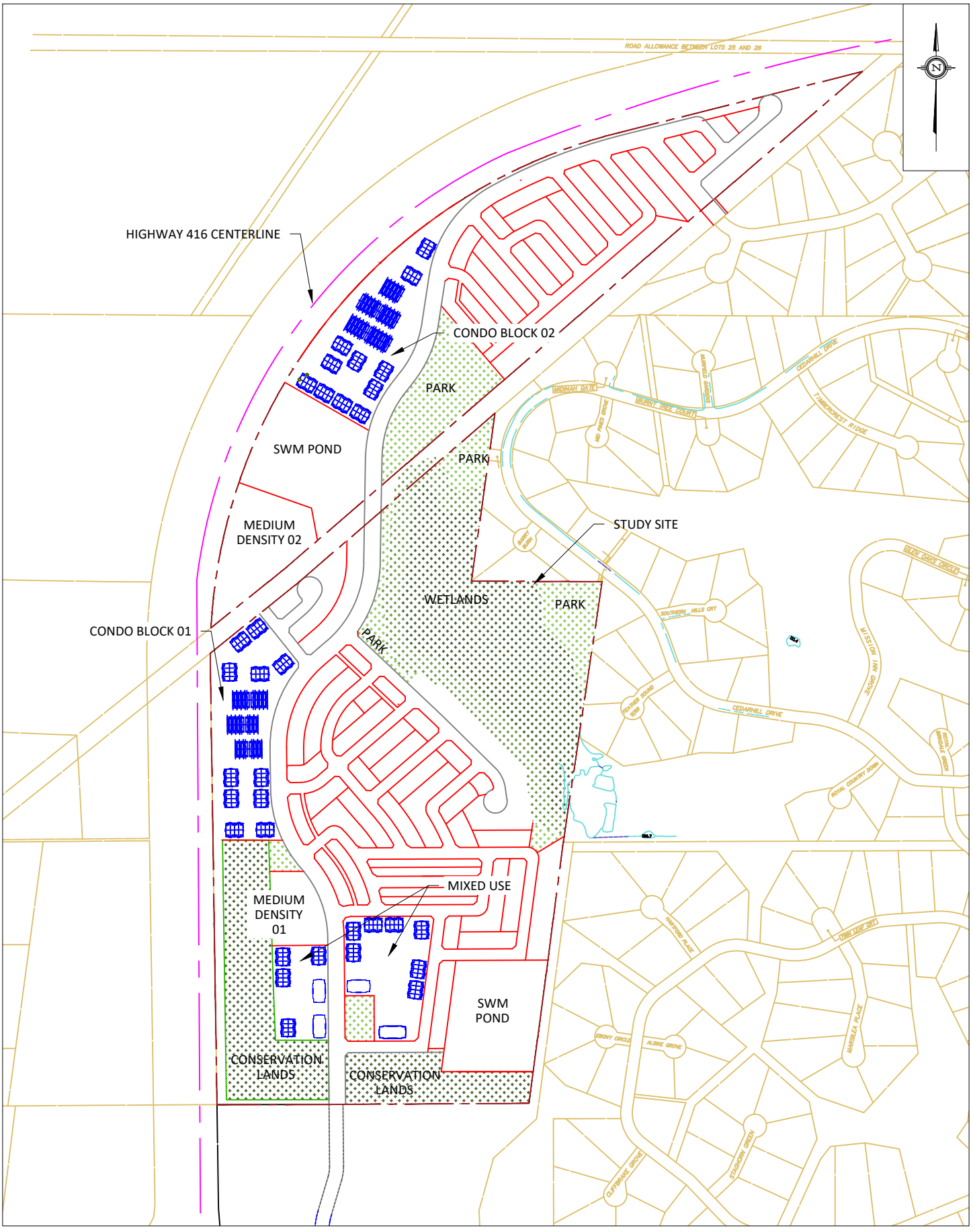
This concludes our traffic noise feasibility assessment and report. If you have any questions or wish to discuss our findings, please advise us. In the interim, we thank you for the opportunity to be of service.

Sincerely,

Gradient Wind Engineering Inc.

Joshua Foster, P.Eng.
Lead Engineer

Gradient Wind File #19-152-Traffic Noise Feasibility



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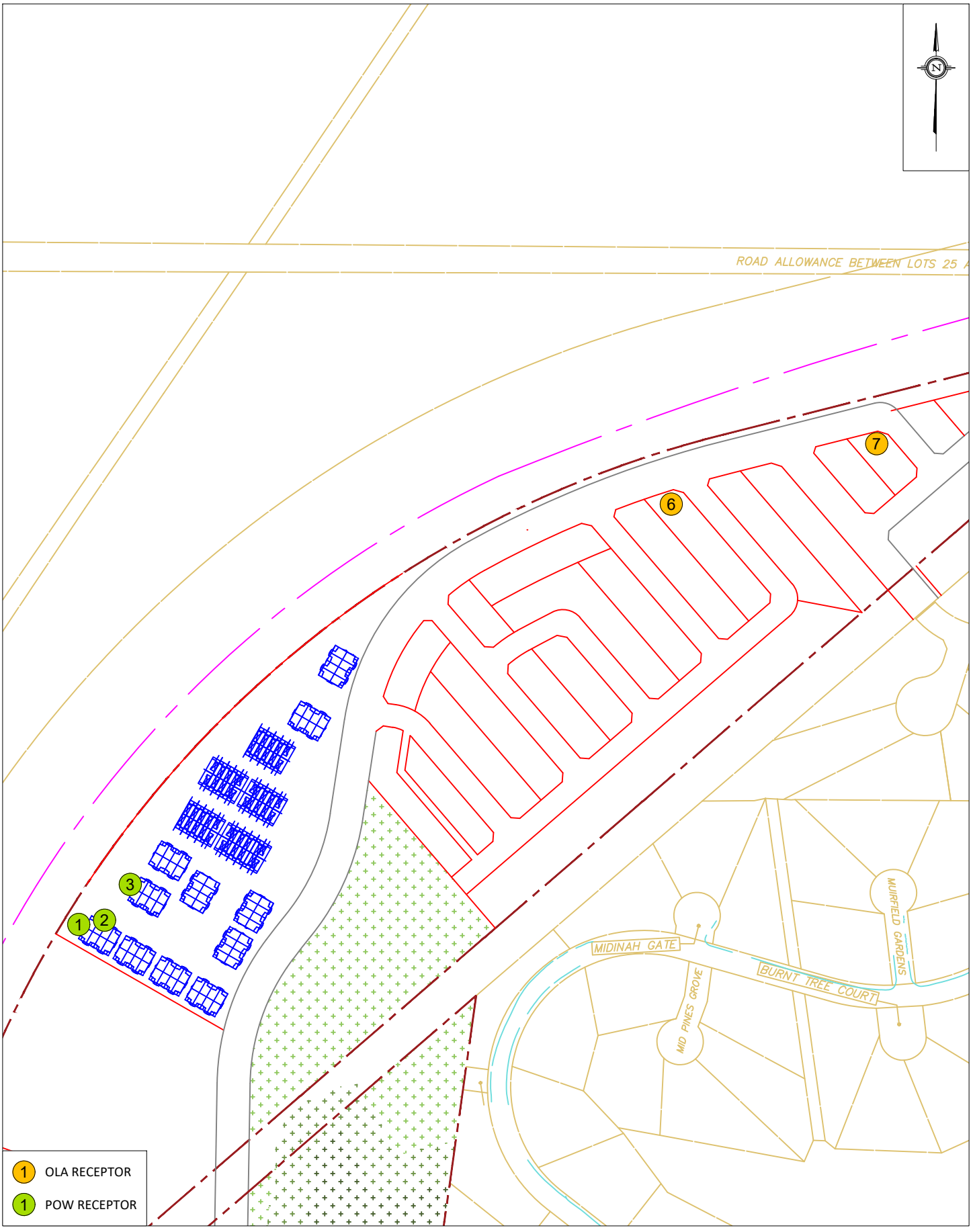
PROJECT	CEDRAVIEW COMMUNITY, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		
SCALE	1:8,000 (APPROX.)	DRAWING NO.	GW19-152-1
DATE	AUGUST 21, 2023	DRAWN BY	E.A.

DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT



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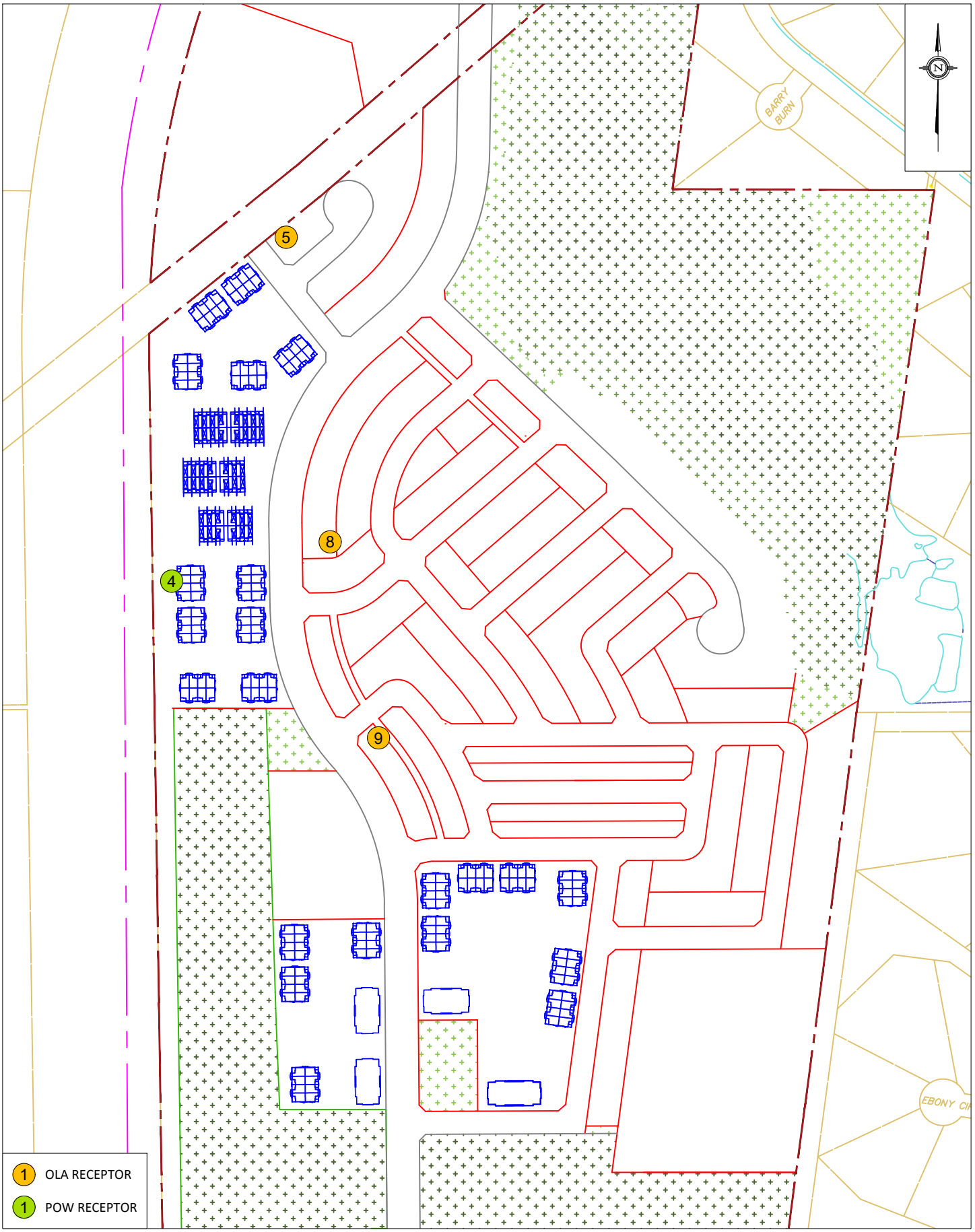
SCALE	1:4,000 (APPROX.)	DRAWING NO.	GW19-152-2
DATE	AUGUST 21, 2023	DRAWN BY	E.A.

FIGURE 2:
RECEPTOR LOCATIONS



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SCALE	1:4,000 (APPROX.)
DRAWING NO.	GW19-152-2
DATE	AUGUST 21, 2023
DRAWN BY	E.A.

DESCRIPTION

FIGURE 3:
RECEPTOR LOCATIONS

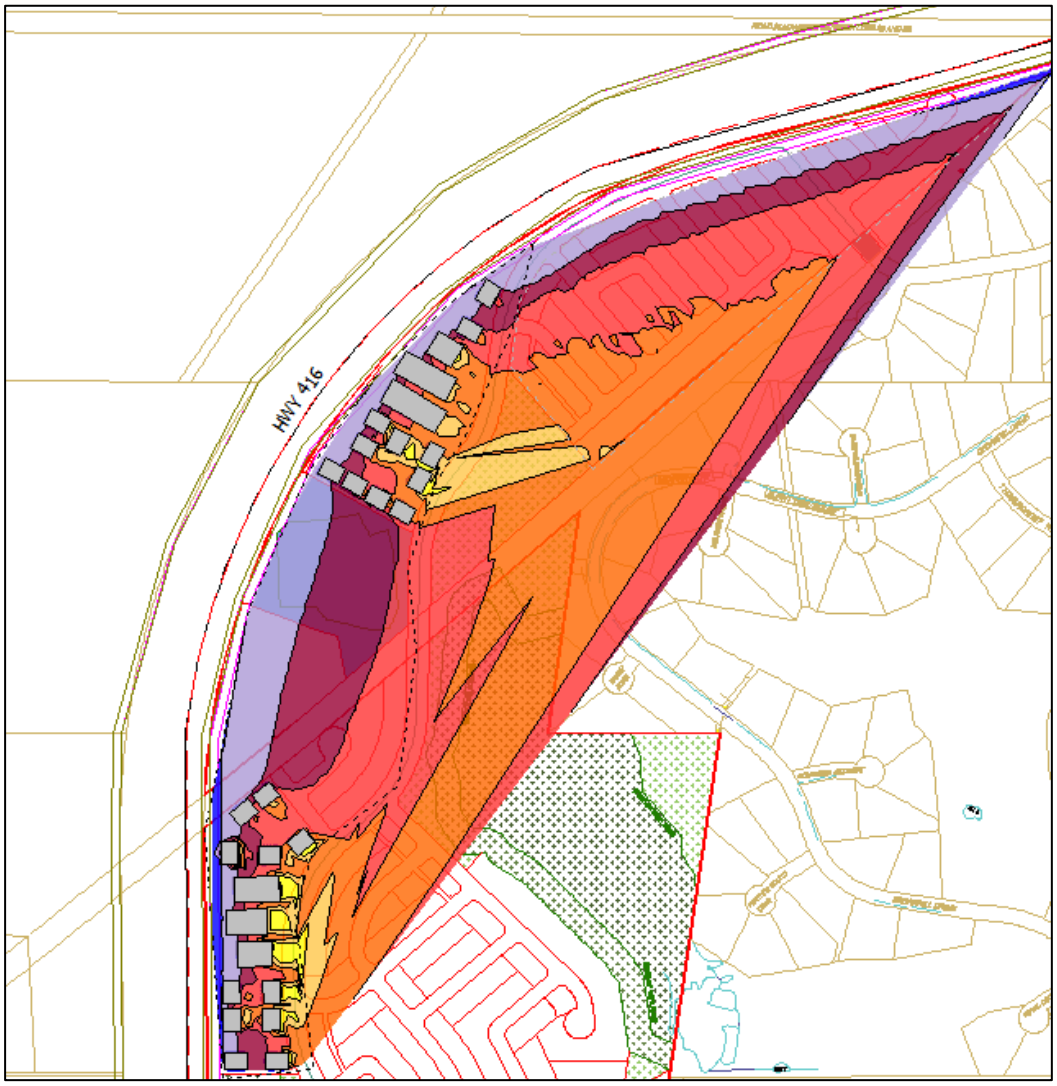


FIGURE 4: NORTH/NORTHWEST CONERNERS OF STUDY SITE, DAYTIME TRAFFIC NOISE CONTOURS (4.5 M ABOVE GRADE)

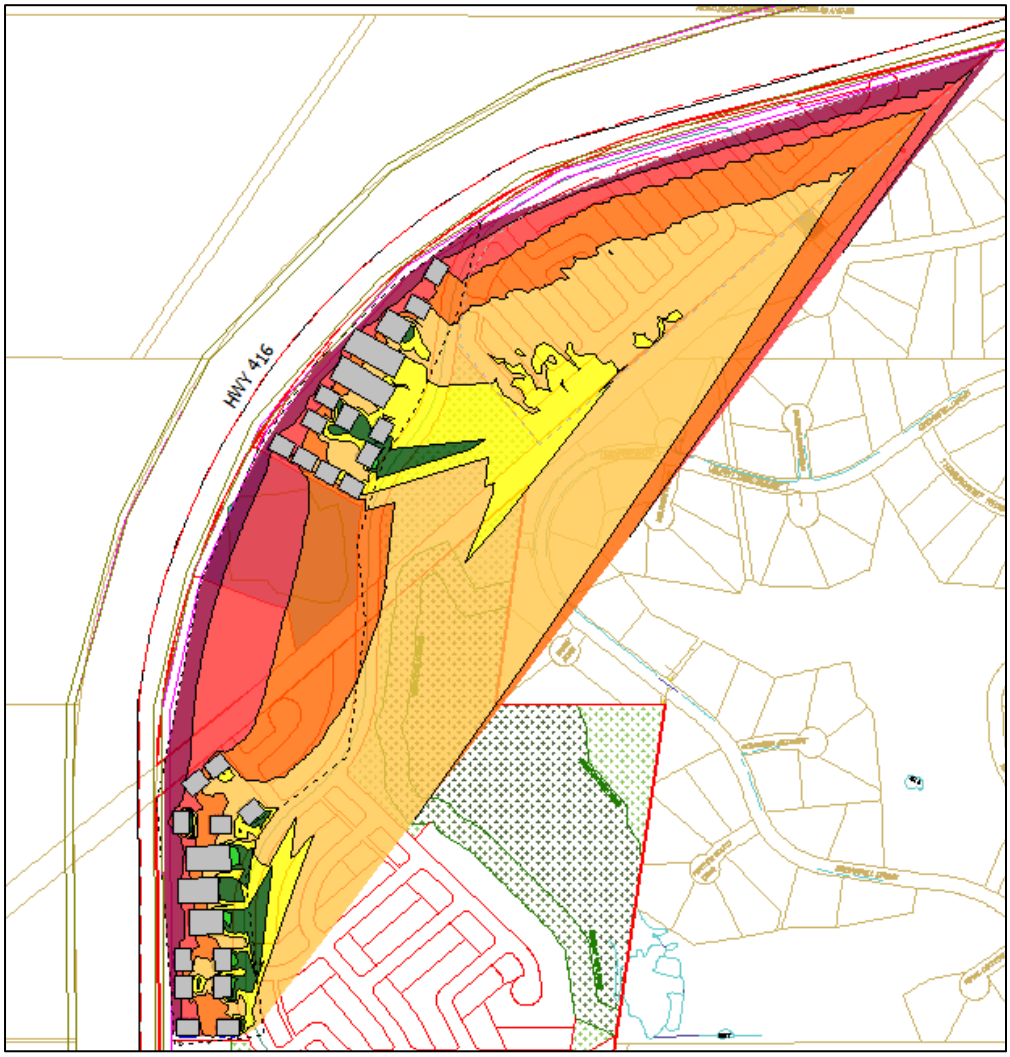


FIGURE 5: NORTH/NORTHWEST CONERNERS OF STUDY SITE, NIGHTTIME TRAFFIC NOISE CONTOURS (4.5 M ABOVE GRADE)

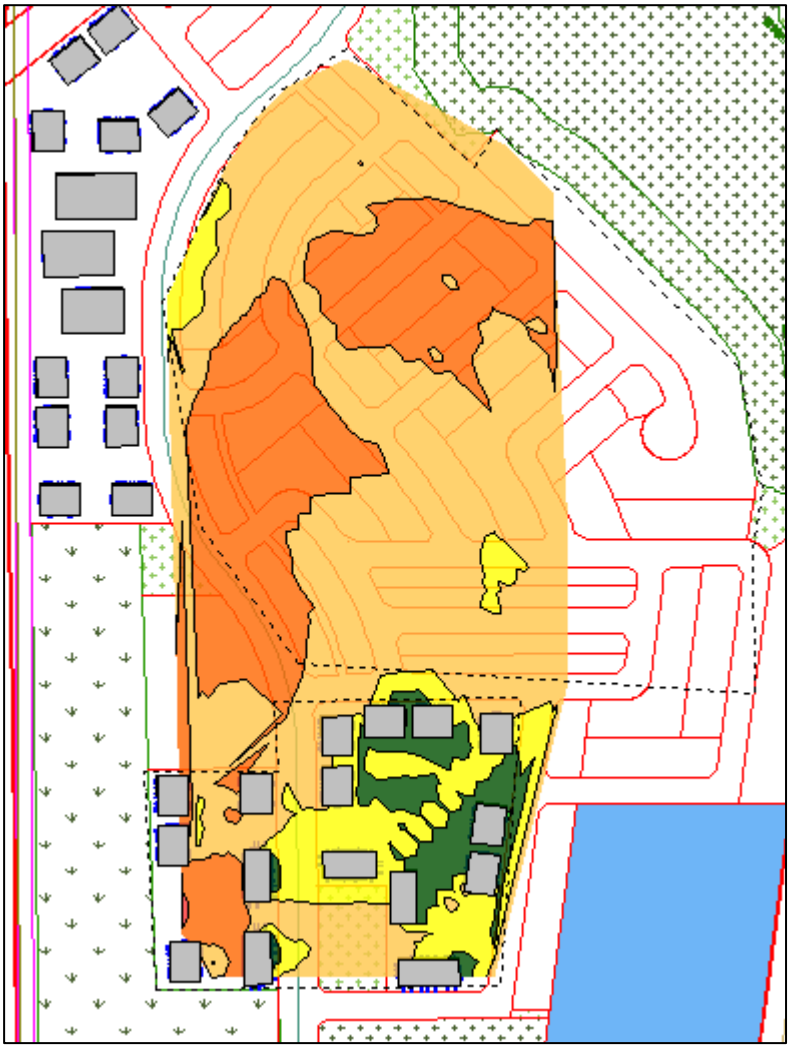
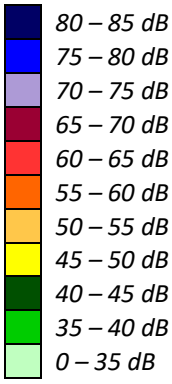


FIGURE 6: SOUTH CORNER OF STUDY SITE, DAYTIME TRAFFIC NOISE CONTOURS (4.5 M ABOVE GRADE)



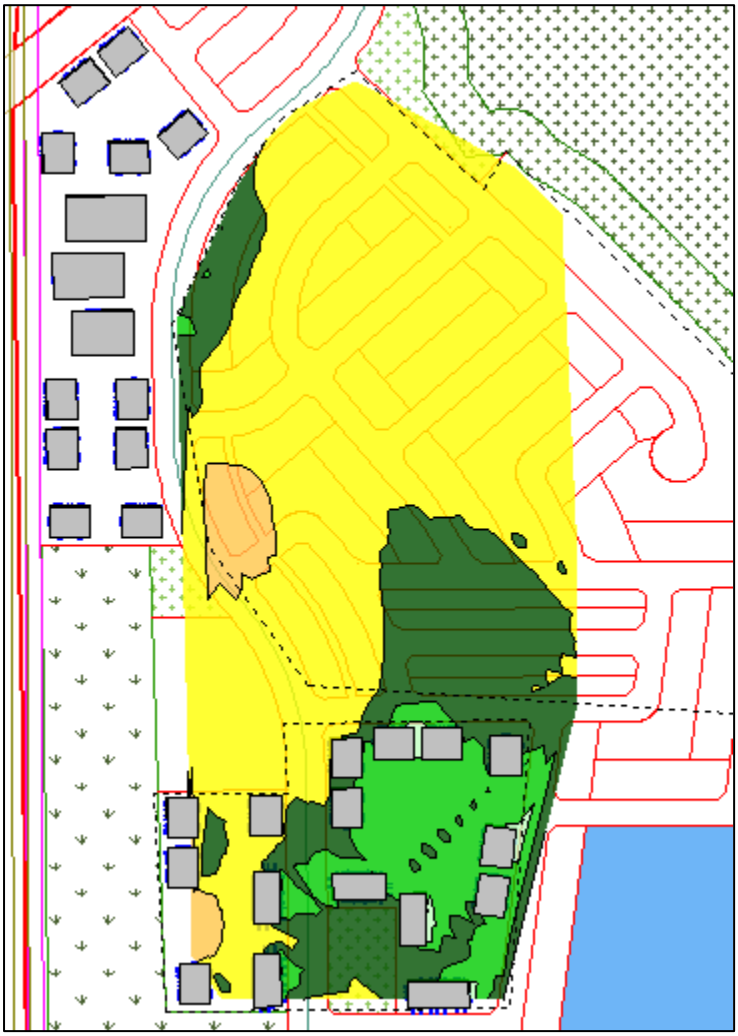
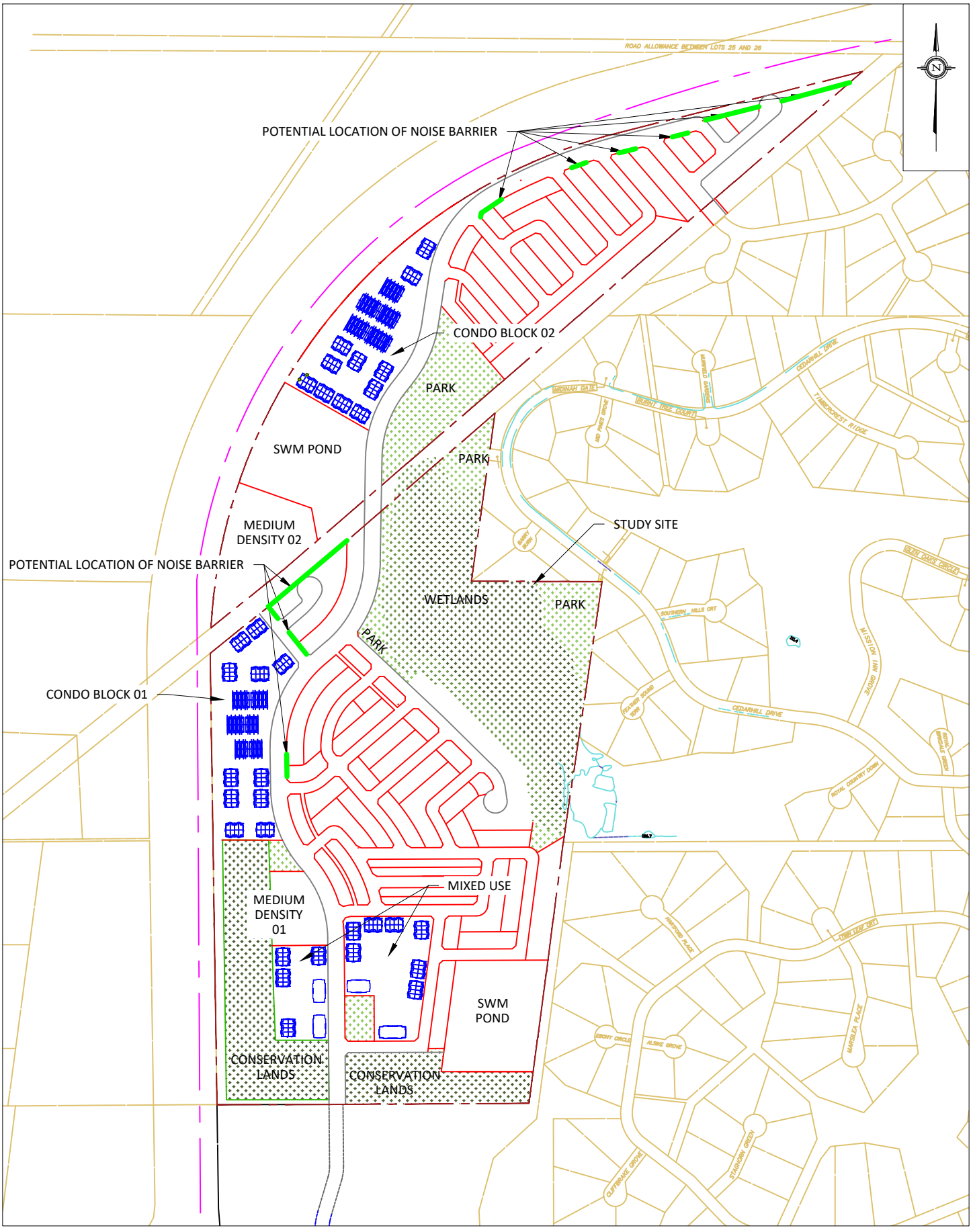


FIGURE 7: SOUTH CORNER OF STUDY SITE, NIGHTTIME TRAFFIC NOISE CONTOURS (4.5 M ABOVE GRADE)



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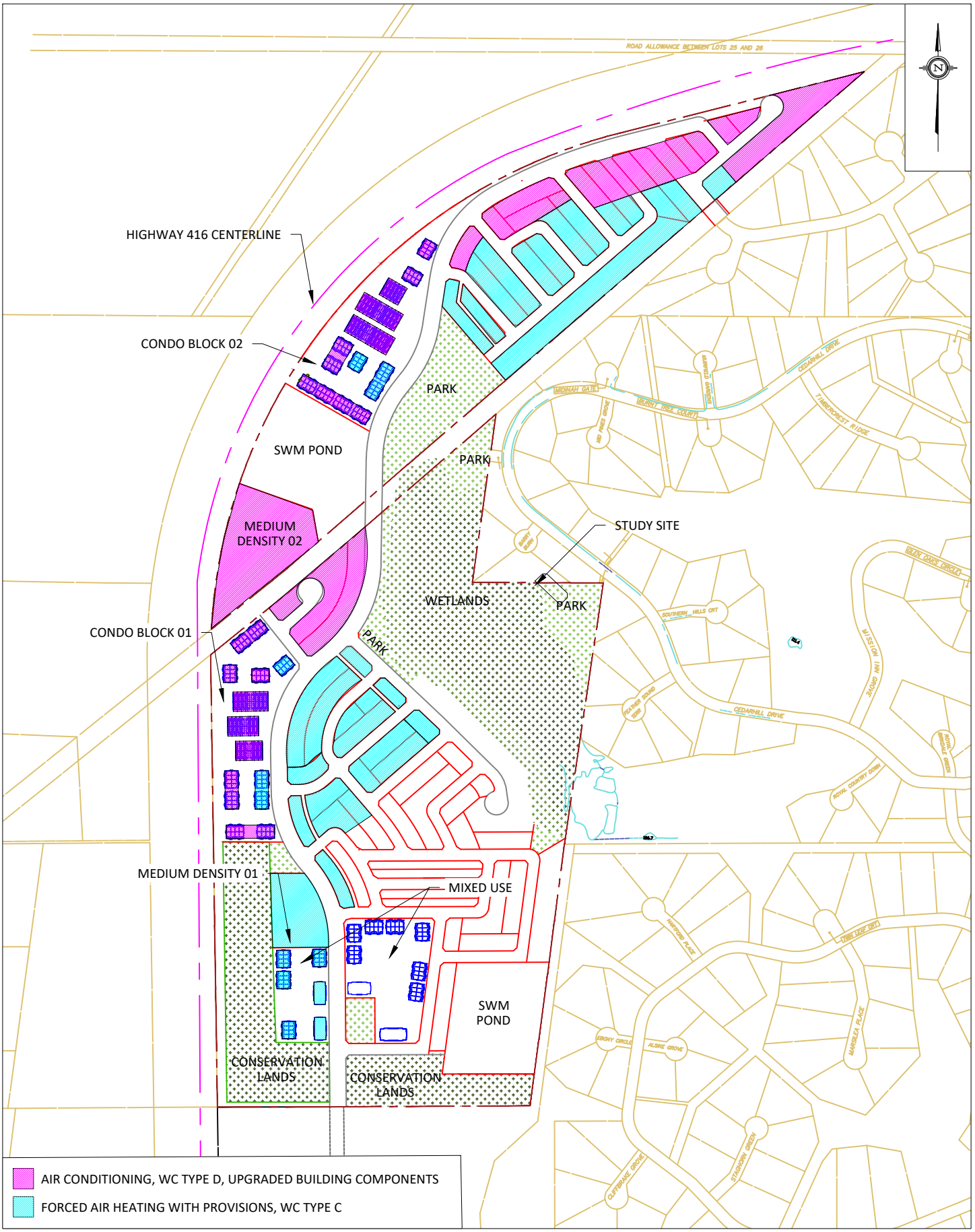
SCALE	1:8,000 (APPROX.)
DRAWING NO.	GW19-152-8
DATE	AUGUST 21, 2023
DRAWN BY	E.A.

DESCRIPTION

FIGURE 8:
POTENTIAL NOISE BARRIER RECOMMENDATIONS



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SCALE	1:8,000 (APPROX.)	DRAWING NO.	GW19-152-9
DATE	AUGUST 21, 2023	DRAWN BY	E.A.

DESCRIPTION

FIGURE 9:
VENTILATION REQUIREMENTS, WARNING CLAUSES, AND UPGRADED BUILDING COMPONENTS

APPENDIX A

STAMSON CALCULATIONS

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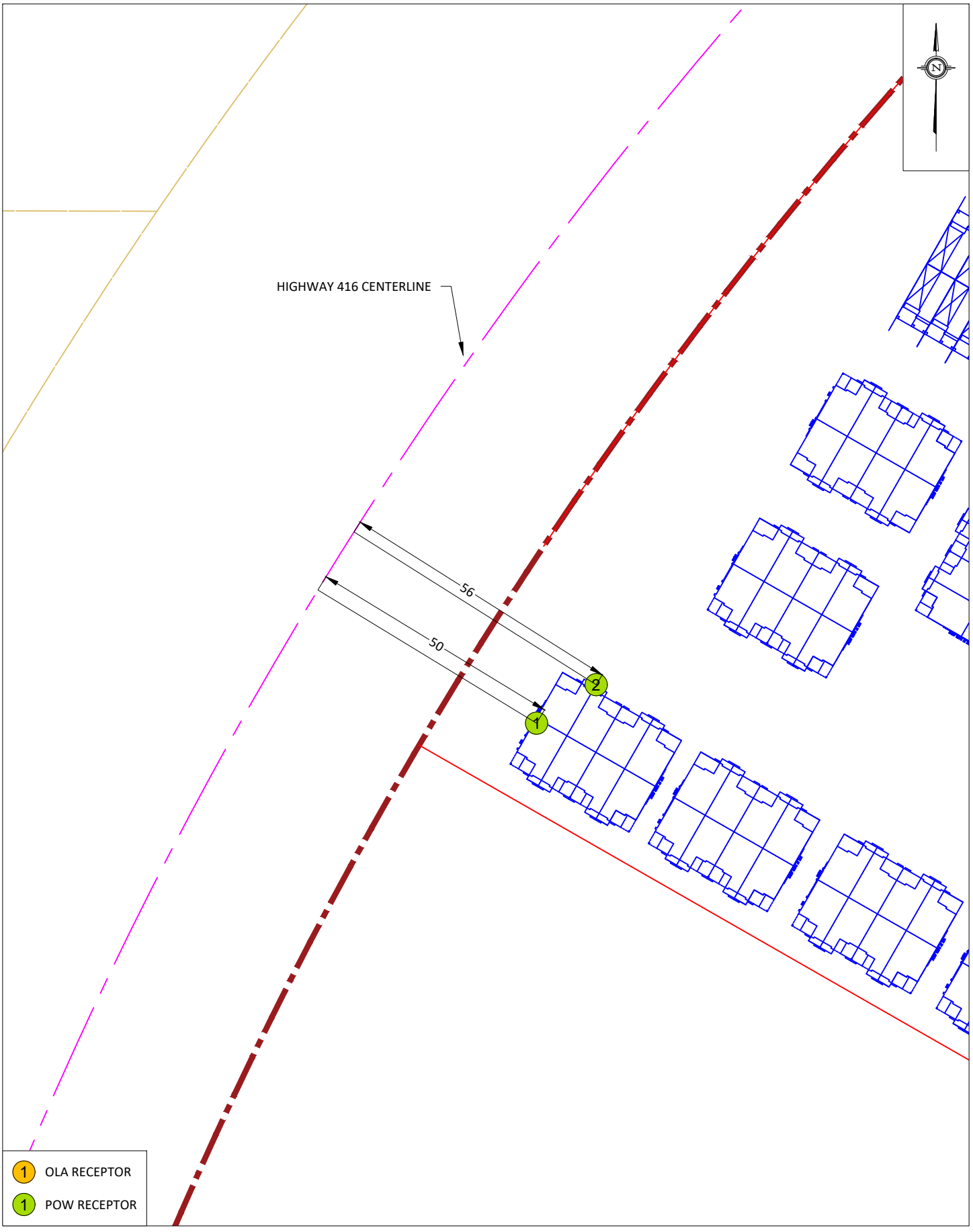

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PROJECT	CEDRAVIEW COMMUNITY, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:4,000 (APPROX.)
DRAWING NO.	GW19-152-A1
DATE	AUGUST 21, 2023
DRAWN BY	E.A.

DESCRIPTION

FIGURE A1:
CONDO BLOCK 02 - STAMSON PARAMETERS

```
STAMSON 5.0        NORMAL REPORT        Date: 21-08-2023 16:53:53
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: 416 (day/night)
---------------------------------------
Car traffic volume  : 59370/5163  veh/TimePeriod  *
Medium truck volume :  4723/411   veh/TimePeriod  *
Heavy truck volume  :  3373/293   veh/TimePeriod  *
Posted speed limit  :   100 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):  73332
    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: 416 (day/night)
---------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  50.00 / 50.00  m
Receiver height           :   4.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Results segment # 1: 416 (day)
------------------------------

Source height = 1.50 m

ROAD (0.00 + 71.88 + 0.00) = 71.88 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     90    0.57  81.40   0.00  -8.21  -1.30   0.00   0.00   0.00
71.88
```

```
--------------------------------------------------------------------------------
--

Segment Leq : 71.88 dBA

Total Leq All Segments: 71.88 dBA


Results segment # 1: 416 (night)
--------------------------------

Source height = 1.49 m

ROAD (0.00 + 64.29 + 0.00) = 64.29 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
--------------------------------------------------------------------------------
--
   -90     90   0.57  73.80   0.00  -8.21  -1.30   0.00   0.00   0.00
64.29
--------------------------------------------------------------------------------
--

Segment Leq : 64.29 dBA

Total Leq All Segments: 64.29 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 71.88
                           (NIGHT): 64.29
```

```
STAMSON 5.0        NORMAL REPORT        Date: 21-08-2023 16:53:46
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: R2.te                Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: 416 (day/night)
---------------------------------------
Car traffic volume  : 59370/5163  veh/TimePeriod  *
Medium truck volume :  4723/411   veh/TimePeriod  *
Heavy truck volume  :  3373/293   veh/TimePeriod  *
Posted speed limit  :   100 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):  73332
    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: 416 (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  :  50.00 / 50.00  m
Receiver height           :   4.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Results segment # 1: 416 (day)
------------------------------

Source height = 1.50 m

ROAD (0.00 + 68.87 + 0.00) = 68.87 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
     0     90   0.57  81.40   0.00  -8.21  -4.31   0.00   0.00   0.00
68.87
```

```
-------------------------------------------------------------------------------
--

Segment Leq : 68.87 dBA

Total Leq All Segments: 68.87 dBA


Results segment # 1: 416 (night)
--------------------------------

Source height = 1.49 m

ROAD (0.00 + 61.28 + 0.00) = 61.28 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
     0     90   0.57  73.80   0.00  -8.21  -4.31   0.00   0.00   0.00
61.28
-------------------------------------------------------------------------------
--

Segment Leq : 61.28 dBA

Total Leq All Segments: 61.28 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 68.87
                           (NIGHT): 61.28
```