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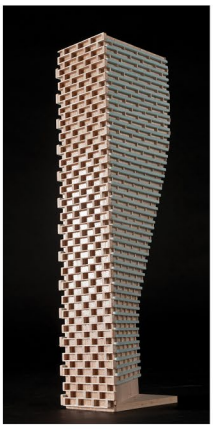
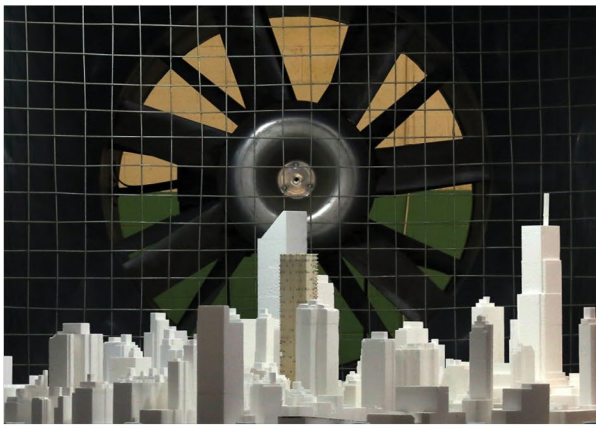
ROADWAY TRAFFIC NOISE ASSESSMENT

2666 Tenth Line Road
Ottawa, Ontario

Report: 22-386 –Traffic Noise





June 7, 2023

Conseil des Écoles Catholiques du Centre-Est
4000 Labelle Street
Ottawa, ON K1J 1A1

PREPARED BY
Giuseppe Garro, MASc., Environmental Scientist
Joshua Foster, P.Eng., Lead Engineer

EXECUTIVE SUMMARY

This report describes a roadway traffic noise assessment undertaken for a proposed new elementary school located at 2666 Tenth Line Road in Ottawa, Ontario. The proposed school comprises a two-storey 'L' shaped building with room for eight future portables to the south, parking to the west, and a sports field to the southwest. The major source of roadway traffic noise impacting the school is Tenth Line Road. Figure 1 illustrates the site location with the surrounding context.

The assessment is based on (i) theoretical noise prediction methods that conform to the Ministry of the Environment, Conservation and Parks (MECP), and City of Ottawa requirements; (ii) noise level criteria as specified by the City of Ottawa's Environmental Noise Control Guidelines (ENCG); (iii) future vehicular traffic volumes based on the City of Ottawa's Official Plan roadway classifications; and (iv) site plan drawings provided by Edward J. Cuhaci & Associates Architects Inc. in February 2023.

The results of the current analysis indicated that noise levels will range between 66 and 71 dBA during the daytime period (07:00-23:00) and between 59 and 63 dBA during the nighttime period (23:00-07:00). The highest noise level (71 dBA) occurs at the east facade, nearest and most exposed to Tenth Line Road. The noise levels predicted due to roadway traffic exceed the criteria listed in Section 4.2 for building components. Upgraded building components, including STC rated glazing elements and exterior walls, will be required as described in Section 5.2 and indicated in Figure 3. Results of the calculations also indicate the development will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment.

Stationary noise impacts of the building on the surroundings would be considered at a future stage once the mechanical design has progressed and equipment has been selected. Stationary noise sources associated with the development will likely include rooftop air handling units. Should noise levels from these units exceed the criteria established in NPC-300 and ENCG, noise from these sources can be controlled to acceptable limits by judicious selection of the equipment, locating the equipment on a high roof away from nearby residential receptors, and where necessary, installing silencers or noise screens.

Gradient Wind conducted a survey of the study site, using the satellite view of the area, and did not identify any significant existing sources of stationary noise impacting the development. Therefore, on-site stationary noise impacts from existing surrounding properties are considered insignificant.

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Conseil des Écoles Catholiques du Centre-Est (CECCE) to undertake a roadway traffic noise assessment for a proposed new elementary school located at 2666 Tenth Line 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.

This assessment is based on theoretical noise calculation methods conforming to the Ministry of the Environment, Conservation and Parks (MECP) NPC-300[1], and City of Ottawa Environmental Noise Control Guidelines (ENCG)[2] guidelines. Noise calculations were based on site plan drawings provided by Edward J. Cuhaci & Associates Architects Inc. in February 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 roadway traffic noise assessment is a proposed new elementary school located at 2666 Tenth Line Road in Ottawa, Ontario. The proposed school comprises a two-storey 'L' shaped building with room for eight future portables to the south, parking to the west, and a sports field to the southwest.

The development is surrounded by vacant land to the west, low-rise residential buildings to the north, east, and south. The study site is bounded by Sweetvalley Drive to the north, Tenth Line Road to the east, low-rise residential buildings to the south, and vacant land to the west. The major source of traffic noise impacting the study site is Tenth Line Road. The ultimate design of Tenth Line Road will comprise of a 4-Lane Undivided Urban Arterial as per the City of Ottawa Transportation Master Plan[3].

Gradient Wind conducted a survey of the study site, using the satellite view of the area, and did not identify any significant existing sources of stationary noise impacting the development. Therefore, on-site stationary noise impacts from existing surrounding properties are considered insignificant.

[1] Ontario Ministry of the Environment and Climate Change – Environmental Noise Guidelines, Publication NPC-300, Queens Printer for Ontario, Toronto, 2013
[2] City of Ottawa, Environmental Noise Control Guidelines, January 2016
[3] City of Ottawa, Transportation Master Plan, *Map 11 - Roadway Network (2031 Affordable Network)*, 2015

Moreover, the stationary noise impacts of the building on the surroundings would be considered at a future stage once the mechanical design has progressed and equipment has been selected. Stationary noise sources associated with the development will likely include rooftop air handling units. Should noise levels from these units exceed the criteria established in NPC-300 and ENCG, noise from these sources can be controlled to acceptable limits by judicious selection of the equipment, locating the equipment on a high roof away from nearby residential receptors, and where necessary, installing silencers or noise screens.

3. OBJECTIVES

The principal objectives of this study are to (i) calculate the future noise levels on the study buildings produced by local roadway traffic, and (ii) ensure that interior and exterior noise levels do not exceed the allowable limits specified by the City of Ottawa's Environmental Noise Control Guidelines as outlined in Section 4.2 of this report.

4. METHODOLOGY

4.1 Background

Noise can be defined as any obtrusive sound. It is created at a source, transmitted through a medium, such as air, and intercepted by a receiver. Noise may be characterized in terms of the power of the source or the sound pressure at a specific distance. While the power of a source is characteristic of that particular source, the sound pressure depends on the location of the receiver and the path that the noise takes to reach the receiver. Measurement of noise is based on the decibel unit, dBA, which is a logarithmic ratio referenced to a standard noise level (2×10^{-5} Pascals). The 'A' suffix refers to a weighting scale, which better represents how the noise is perceived by the human ear. With this scale, a doubling of power results in a 3 dBA increase in measured noise levels and is just perceptible to most people. An increase of 10 dBA is often perceived to be twice as loud.

4.2 Roadway Traffic Noise

4.2.1 Criteria for Roadway Traffic Noise

For surface roadway traffic noise, the equivalent sound energy level, L_{eq}, provides a measure of the time-varying noise levels, which is well correlated with the annoyance of sound. It is defined as the continuous sound level, which has the same energy as a time-varying noise level over a period of time. For roadways,

the L_{eq} is commonly calculated on the basis of a 16-hour (L_{eq16}) daytime (07:00-23:00) / 8-hour (L_{eq8}) nighttime (23:00-07:00) split to assess its impact on residential buildings. The City of Ottawa's Environmental Noise Control Guidelines (ENCG) specify that the recommended indoor noise limit range (that is relevant to this study) is 45 for schools for roadway as listed in Table 1.

TABLE 1: INDOOR SOUND LEVEL CRITERIA (ROAD) [4]

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

Predicted noise levels at the plane of window (POW) dictate the action required to achieve the recommended sound levels. An open window is considered to provide a 10 dBA reduction in noise, while a standard closed window is capable of providing a minimum 20 dBA noise reduction[5]. A closed window due to a ventilation requirement will bring noise levels down to achieve an acceptable indoor environment[6]. 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[7].

The sound level criterion for outdoor living areas (OLA) is 55 dBA, which applies during the daytime (07:00 to 23:00). When noise levels exceed 55 dBA, mitigation should be provided to reduce noise levels where

[4] Adapted from ENCG 2016 – Tables 2.2b and 2.2c
[5] Burberry, P.B. (2014). Mitchell's Environment and Services. Routledge, Page 125
[6] MECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.8
[7] MECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.1.3

technically and administratively feasible to acceptable levels at or below the criterion. Furthermore, noise levels at the OLA must not exceed 60 dBA if mitigation can be technically and administratively achieved. As the school playgrounds and sports field is not "intended and designed for the quiet enjoyment of the outdoor environment"[8], no Outdoor Living Areas were considered.

4.2.2 Theoretical Roadway Noise Predictions

Noise predictions were performed with the aid of the MECP computerized noise assessment program, STAMSON 5.04, for road analysis. Appendix A includes the STAMSON 5.04 input and output data.

Roadway traffic noise calculations were performed by treating each roadway segment as a separate line source of noise, and by using proposed and 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 was taken to be 92% / 8% respectively for all streets.
- The ground surface was modelled as hard (reflective) ground to account for the hard, packed soil present at the site.
- Receptor heights were taken to be 4.5m and 1.5m above grade for the Plane of Window (POW).
- The study site was treated as having flat or gently sloping topography.
- Massing associated with the study site and surrounding buildings were included as potential noise screening elements.
- 5 receptors were strategically placed throughout the study area, as shown in Figure 2. STAMSON parameters are noted in Appendix A.

[8] MECP, Environmental Noise Guidelines, NPC 300 – Part A, Section 5

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[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.

TABLE 2: ROADWAY TRAFFIC DATA

Segment	Roadway Traffic Data	Speed Limit (km/h)	Traffic Volumes
Tenth Line Road	4-Lane Urban Arterial-Undivided	60	**30,000**

4.3 Indoor Noise Calculations

The difference between outdoor and indoor noise levels is the noise attenuation provided by the building envelope. According to common industry practice, complete walls and individual wall elements are rated according to the Sound Transmission Class (STC). The STC ratings of common residential walls built in conformance with the Ontario Building Code (2020) typically exceed STC 35, depending on exterior cladding, thickness and interior finish details. For example, brick veneer walls can achieve STC 50 or more. Standard commercially sided exterior metal stud walls have around STC 45. Standard good quality double-glazed non-operable windows can have STC ratings ranging from 25 to 40, depending on the window manufacturer, pane thickness and inter-pane spacing. As previously mentioned, the windows are the known weak point in a partition.

As per Section 4.2, when daytime noise levels from road sources at the plane of the window exceed 65 dBA, calculations must be performed to evaluate the sound transmission quality of the building components to ensure acceptable indoor noise levels are achieved. The calculation procedure[10] considers:

- Window type and total area as a percentage of total room floor area

[9] City of Ottawa Transportation Master Plan, November 2013
[10] Building Practice Note: Controlling Sound Transmission into Buildings by J.D. Quirt, National Research Council of Canada, September 1985

- Exterior wall type and total area as a percentage of the total room floor area
- Acoustic absorption characteristics of the room
- Outdoor noise source type and approach geometry
- Indoor sound level criteria, which varies according to the intended use of a space

Based on published research[11], exterior walls possess specific sound attenuation characteristics that are used as a basis for calculating the required STC ratings of windows in the same partition. Due to the limited information available at the time of the study, detailed floor layouts have not been finalized; therefore, detailed STC calculations could not be performed at this time. As a guideline, the anticipated STC requirements for windows have been estimated based on the overall noise reduction required for each intended use of space (STC = Outdoor Noise Level – Targeted Indoor Noise Levels).

5. RESULTS

5.1 Roadway Traffic Noise Levels

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

TABLE 3: EXTERIOR NOISE LEVELS DUE TO ROADWAY TRAFFIC

Receptor Number	Receptor Height Above Grade (m)	Receptor Location	STAMSON 5.04 Noise Level (dBA)	
			Day	Night
R1	4.5	POW – Main Building - North Façade	67	60
R2	4.5	POW – Main Building - East Façade	71	63
R3	4.5	POW – Main Building - South Façade	67	60
R4	1.5	POW – Portable - East Façade	71	63
R5	1.5	POW – Portable - South Façade	66	59

The results of the current analysis indicated that noise levels will range between 66 and 71 dBA during the daytime period (07:00-23:00) and between 59 and 63 dBA during the nighttime period (23:00-07:00). The highest noise level (71 dBA) occurs at the east facade, nearest and most exposed to Tenth Line Road.

[11] CMHC, Road & Rail Noise: Effects on Housing

5.2 Noise Control Measures

The noise levels predicted due to roadway traffic exceed the criteria listed in Section 4 for building components. The anticipated STC requirements for windows have been estimated based on the overall noise reduction required for each intended use of space (STC equal to outdoor noise level minus targeted indoor noise levels). The estimated STC requirements for the windows are summarized in Table 4 below for the study site (see Figure 3). Where specific updated building components are not identified, standard double-pane glazing elements are considered sufficient.

TABLE 4: WINDOW STC REQUIREMENTS

Building	Façade	Window STC	Exterior Wall STC
Main	North, East, South	29	45
Portables (six nearest to Tenth Line Road)	North, East, South	29	45

Results of the calculations also indicate the development will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment.

6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current analysis indicated that noise levels will range between 66 and 71 dBA during the daytime period (07:00-23:00) and between 59 and 63 dBA during the nighttime period (23:00-07:00). The highest noise level (71 dBA) occurs at the east facade, nearest and most exposed to Tenth Line Road. The noise levels predicted due to roadway traffic exceed the criteria listed in Section 4.2 for building components. Upgraded building components, including STC rated glazing elements and exterior walls, will be required as described in Section 5.2 and indicated in Figure 3.

Results of the calculations also indicate the development will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment.

Stationary noise impacts of the building on the surroundings would be considered at a future stage once the mechanical design has progressed and equipment has been selected. Stationary noise sources associated with the development will likely include rooftop air handling units. Should noise levels from these units exceed the criteria established in NPC-300 and ENCG, noise from these sources can be controlled to acceptable limits by judicious selection of the equipment, locating the equipment on a high roof away from nearby residential receptors, and where necessary, installing silencers or noise screens.

Gradient Wind conducted a survey of the study site, using the satellite view of the area, and did not identify any significant existing sources of stationary noise impacting the development. Therefore, on-site stationary noise impacts from existing surrounding properties are considered insignificant.

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

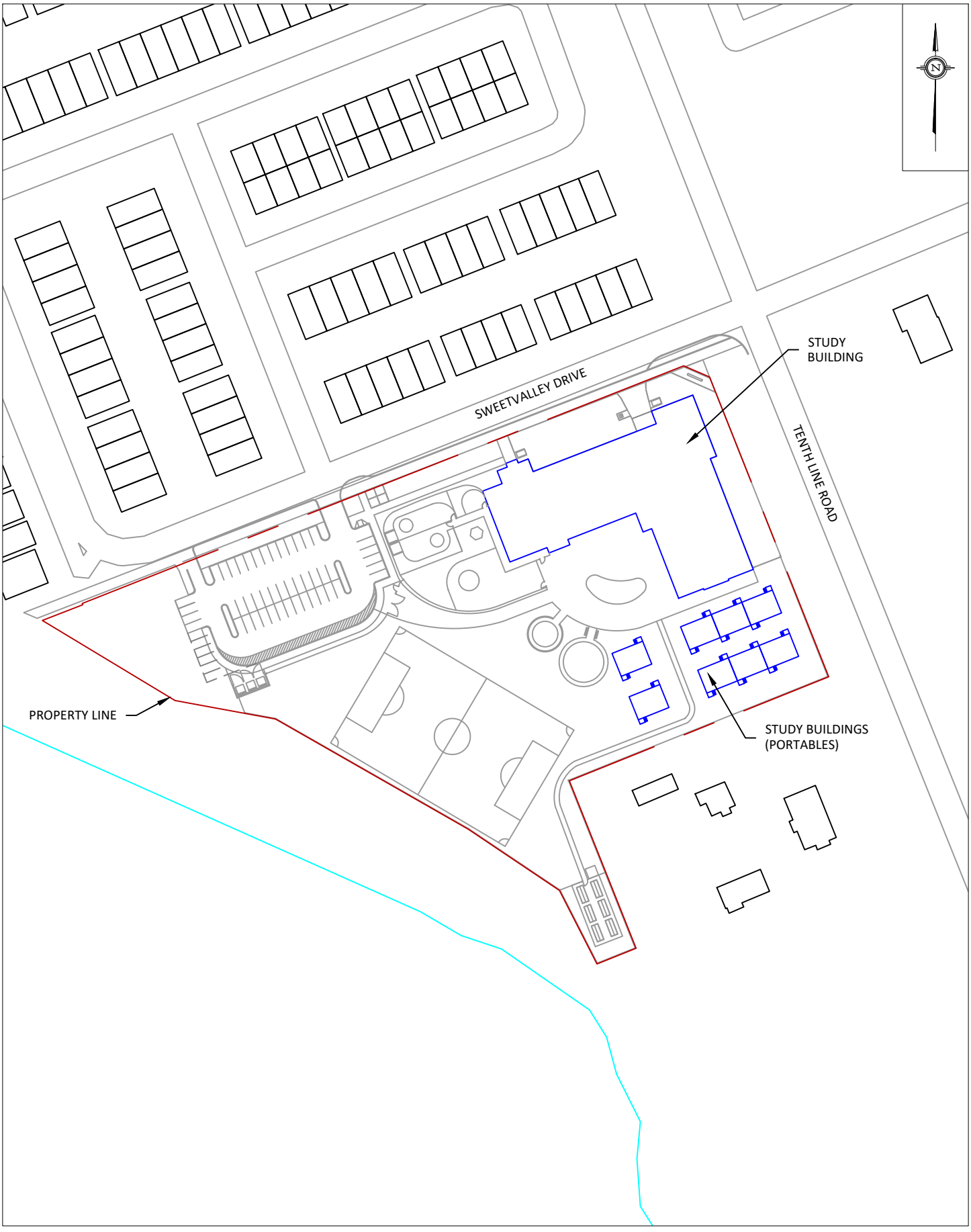
Sincerely,

Gradient Wind Engineering Inc.

Giuseppe Garro, MASc.
Environmental Scientist

Joshua Foster, P.Eng.
Lead Engineer

Gradient Wind File #22-386



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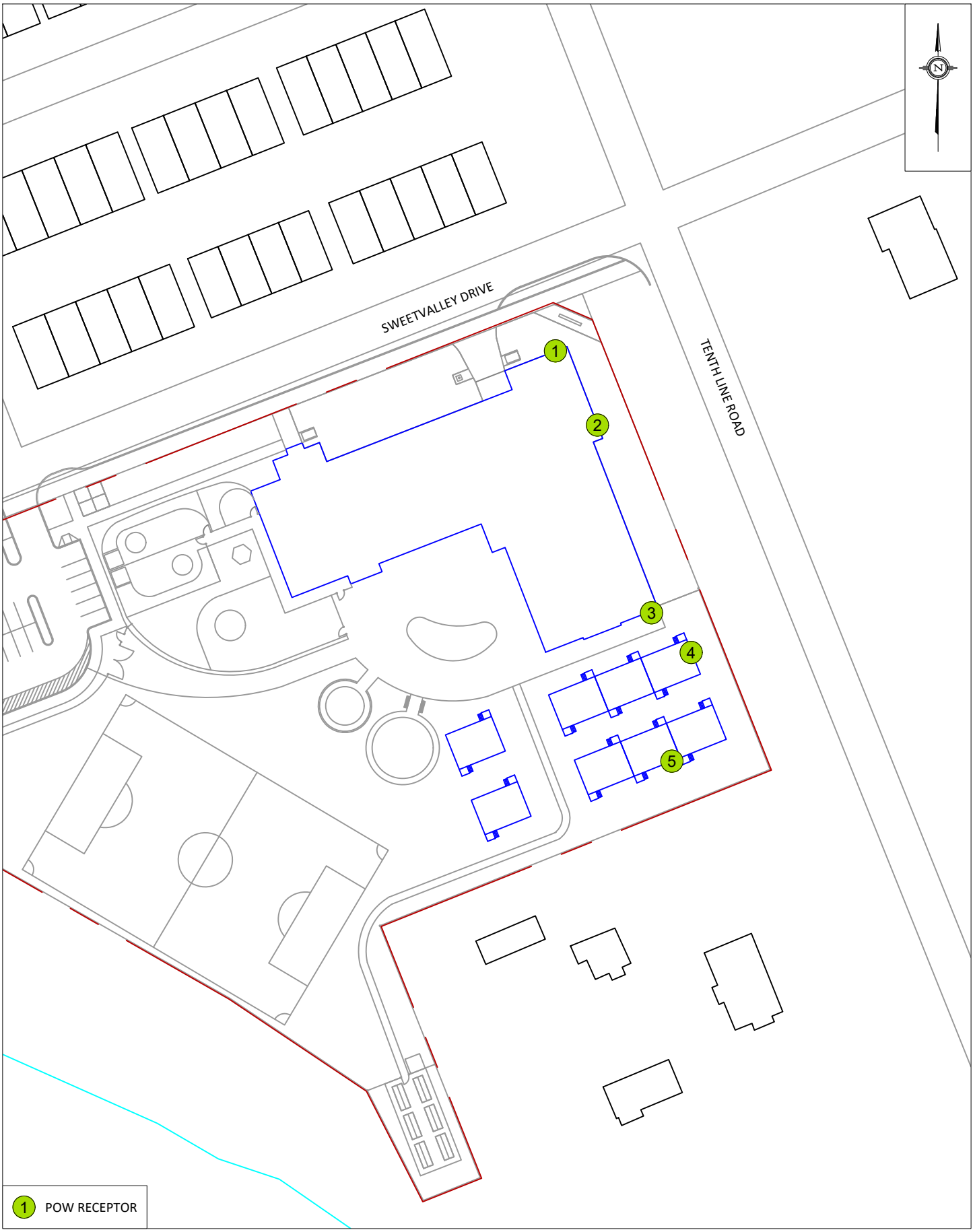
PROJECT	2666 TENTH LINE ROAD, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		
SCALE	1:1500 (APPROX.)	DRAWING NO.	GW22-386-1
DATE	FEBRUARY 22, 2023	DRAWN BY	G.G.

DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT



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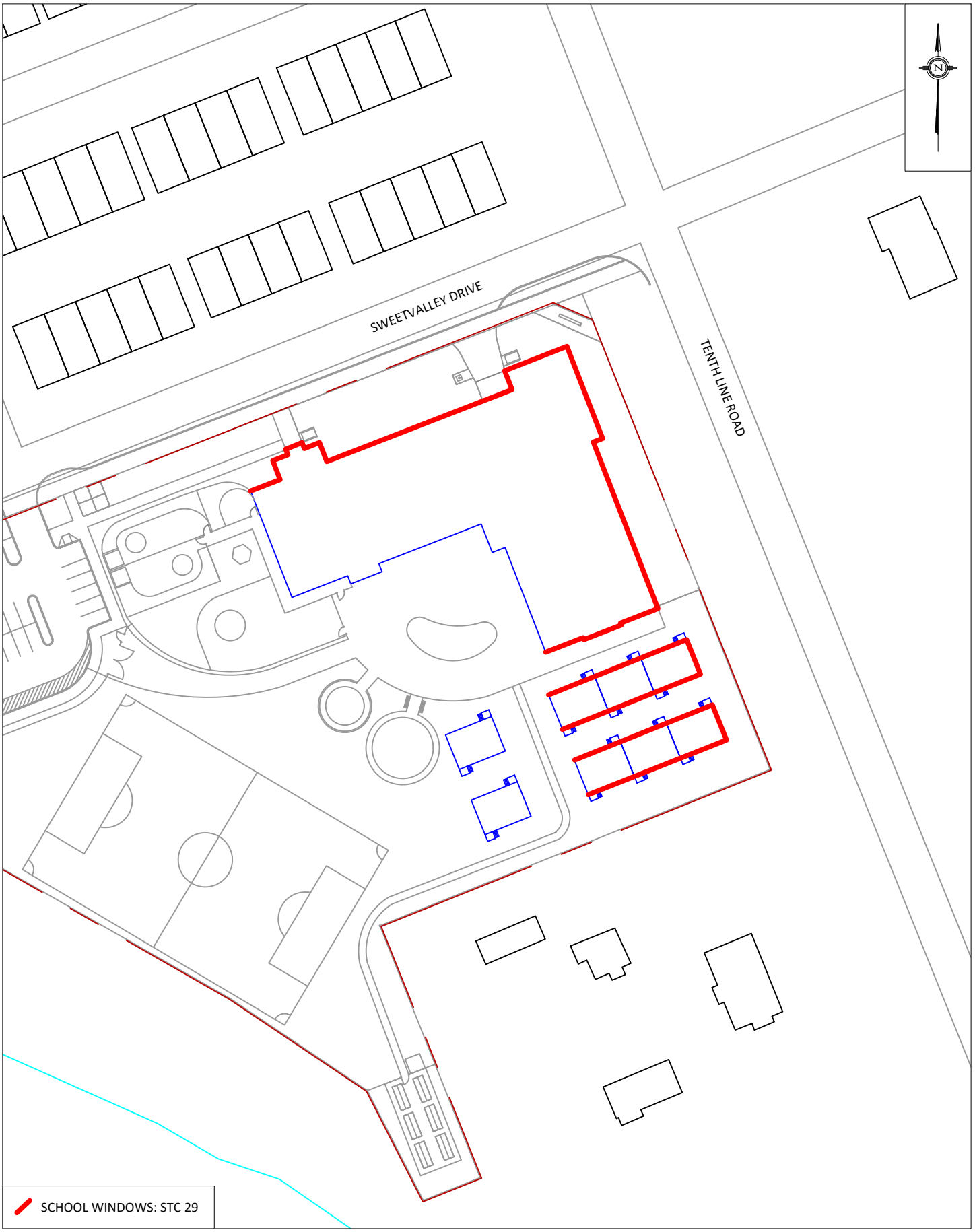
PROJECT	2666 TENTH LINE ROAD, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		DESCRIPTION
SCALE	1:1000 (APPROX.)	DRAWING NO. GW22-386-2	FIGURE 2: RECEPTOR LOCATIONS
DATE	FEBRUARY 22, 2023	DRAWN BY G.G.	



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PROJECT	2666 TENTH LINE ROAD, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		DESCRIPTION
SCALE	1:1000 (APPROX.)	DRAWING NO.	GW22-386-3
DATE	FEBRUARY 22, 2023	DRAWN BY	G.G.

FIGURE 3:
WINDOW STC REQUIREMENTS

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APPENDIX A

STAMSON 5.04 – INPUT AND OUTPUT DATA

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GRADIENTWIND.COM

```
STAMSON 5.0        NORMAL REPORT        Date: 22-02-2023 14:03:50
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: 10th Line (day/night)
----------------------------------------------
Car traffic volume  : 24288/2112  veh/TimePeriod  *
Medium truck volume :  1932/168   veh/TimePeriod  *
Heavy truck volume  :  1380/120   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  30000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: 10th Line (day/night)
--------------------------------------------
Angle1   Angle2           : -90.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  28.00 / 28.00  m
Receiver height           :   4.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Results segment # 1: 10th Line (day)
-------------------------------------

Source height = 1.50 m

ROAD (0.00 + 67.29 + 0.00) = 67.29 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90      0   0.00  73.01   0.00  -2.71  -3.01   0.00   0.00   0.00
67.29
-------------------------------------------------------------------------------
--
```

```
Segment Leq : 67.29 dBA

Total Leq All Segments: 67.29 dBA


Results segment # 1: 10th Line (night)
--------------------------------------

Source height = 1.50 m

ROAD (0.00 + 59.69 + 0.00) = 59.69 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90      0   0.00  65.41   0.00  -2.71  -3.01   0.00   0.00   0.00
59.69
-------------------------------------------------------------------------------
--

Segment Leq : 59.69 dBA

Total Leq All Segments: 59.69 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 67.29
                           (NIGHT): 59.69
```

```
STAMSON 5.0         NORMAL REPORT         Date: 22-02-2023 14:03:57
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: 10th Line (day/night)
----------------------------------------------
Car traffic volume  : 24288/2112  veh/TimePeriod  *
Medium truck volume :  1932/168   veh/TimePeriod  *
Heavy truck volume  :  1380/120   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  30000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: 10th Line (day/night)
--------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  25.00 / 25.00  m
Receiver height           :   4.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Results segment # 1: 10th Line (day)
-------------------------------------

Source height = 1.50 m

ROAD (0.00 + 70.79 + 0.00) = 70.79 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     90    0.00  73.01   0.00  -2.22   0.00   0.00   0.00   0.00
70.79
-------------------------------------------------------------------------------
--
```

```
Segment Leq : 70.79 dBA

Total Leq All Segments: 70.79 dBA

Results segment # 1: 10th Line (night)
---------------------------------------

Source height = 1.50 m

ROAD (0.00 + 63.19 + 0.00) = 63.19 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  65.41   0.00  -2.22   0.00   0.00   0.00   0.00
63.19
-------------------------------------------------------------------------
--

Segment Leq : 63.19 dBA

Total Leq All Segments: 63.19 dBA


TOTAL Leq FROM ALL SOURCES (DAY): 70.79
                           (NIGHT): 63.19
```

```
STAMSON 5.0        NORMAL REPORT        Date: 22-02-2023 14:04:03
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: 10th Line (day/night)
----------------------------------------------
Car traffic volume  : 24288/2112  veh/TimePeriod  *
Medium truck volume :  1932/168   veh/TimePeriod  *
Heavy truck volume  :  1380/120   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  30000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: 10th Line (day/night)
--------------------------------------------
Angle1   Angle2           :   0.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  29.00 / 29.00  m
Receiver height           :   4.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Results segment # 1: 10th Line (day)
-------------------------------------

Source height = 1.50 m

ROAD (0.00 + 67.13 + 0.00) = 67.13 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
     0     90    0.00  73.01   0.00  -2.86  -3.01   0.00   0.00   0.00
67.13
-------------------------------------------------------------------------------
--
```

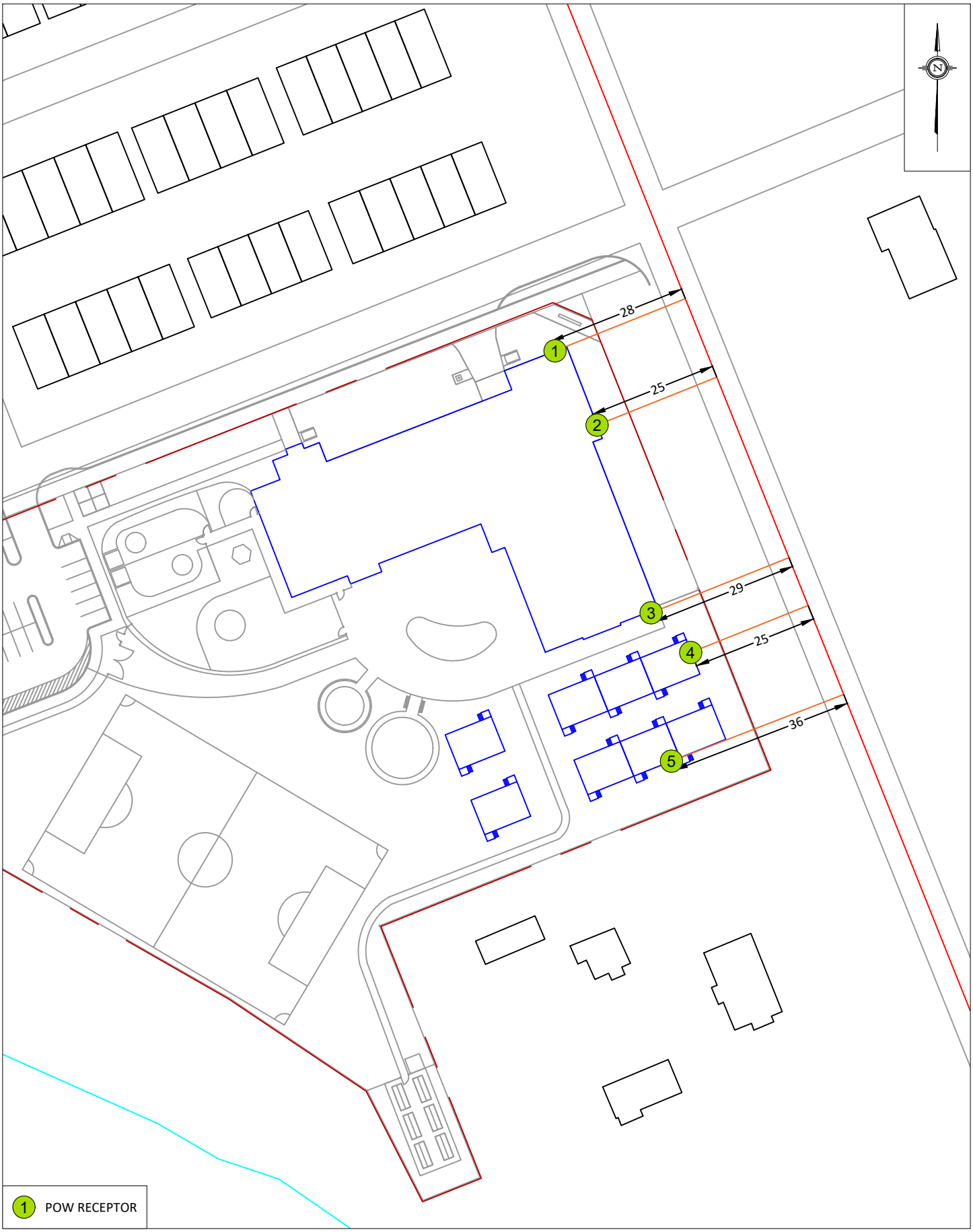
```
Segment Leq : 67.13 dBA

Total Leq All Segments: 67.13 dBA

Results segment # 1: 10th Line (night)
---------------------------------------

Source height = 1.50 m

ROAD (0.00 + 59.54 + 0.00) = 59.54 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
     0     90   0.00  65.41   0.00  -2.86  -3.01   0.00   0.00   0.00
59.54
-------------------------------------------------------------------------
--

Segment Leq : 59.54 dBA

Total Leq All Segments: 59.54 dBA


TOTAL Leq FROM ALL SOURCES (DAY): 67.13
                           (NIGHT): 59.54
```

```
STAMSON 5.0        NORMAL REPORT        Date: 22-02-2023 14:04:09
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: 10th Line (day/night)
----------------------------------------------
Car traffic volume  : 24288/2112  veh/TimePeriod  *
Medium truck volume :  1932/168   veh/TimePeriod  *
Heavy truck volume  :  1380/120   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  30000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: 10th Line (day/night)
--------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  25.00 / 25.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: 10th Line (day)
-------------------------------------

Source height = 1.50 m

ROAD (0.00 + 70.79 + 0.00) = 70.79 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     90   0.00  73.01   0.00  -2.22   0.00   0.00   0.00   0.00
70.79
-------------------------------------------------------------------------------
--
```

```
Segment Leq : 70.79 dBA

Total Leq All Segments: 70.79 dBA

Results segment # 1: 10th Line (night)
---------------------------------------

Source height = 1.50 m

ROAD (0.00 + 63.19 + 0.00) = 63.19 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     90   0.00  65.41   0.00  -2.22   0.00   0.00   0.00   0.00
63.19
-------------------------------------------------------------------------------
--

Segment Leq : 63.19 dBA

Total Leq All Segments: 63.19 dBA


TOTAL Leq FROM ALL SOURCES (DAY): 70.79
                           (NIGHT): 63.19
```

```
STAMSON 5.0         NORMAL REPORT         Date: 22-02-2023 14:04:15
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: 10th Line (day/night)
----------------------------------------------
Car traffic volume  : 24288/2112  veh/TimePeriod  *
Medium truck volume :  1932/168   veh/TimePeriod  *
Heavy truck volume  :  1380/120   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  30000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: 10th Line (day/night)
--------------------------------------------
Angle1   Angle2           :   0.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  36.00 / 36.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Results segment # 1: 10th Line (day)
-------------------------------------

Source height = 1.50 m

ROAD (0.00 + 66.19 + 0.00) = 66.19 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
     0     90    0.00  73.01   0.00  -3.80  -3.01   0.00   0.00   0.00
66.19
-------------------------------------------------------------------------------
--
```

```
Segment Leq : 66.19 dBA

Total Leq All Segments: 66.19 dBA

Results segment # 1: 10th Line (night)
---------------------------------------

Source height = 1.50 m

ROAD (0.00 + 58.60 + 0.00) = 58.60 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
     0     90   0.00  65.41   0.00  -3.80  -3.01   0.00   0.00   0.00
58.60
-------------------------------------------------------------------------
--

Segment Leq : 58.60 dBA

Total Leq All Segments: 58.60 dBA


TOTAL Leq FROM ALL SOURCES (DAY): 66.19
                           (NIGHT): 58.60
```



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PROJECT	2666 TENTH LINE ROAD, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		DESCRIPTION
SCALE	1:1000 (APPROX.)	DRAWING NO.	GW22-386-A1
DATE	FEBRUARY 22, 2023	DRAWN BY	G.G.

FIGURE A1:
STAMSON INPUT PARAMETERS