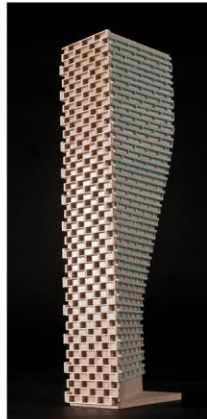


**DETAILED
ENVIRONMENTAL NOISE &
VIBRATION ASSESSMENT**

320 McCowan Road
Scarborough, Ontario

REPORT: GW19-185 – Detailed Noise & Vibration R1



April 18, 2023

PREPARED FOR

Blauson Assets Management Ltd.

#106 BIC Fortune Tower

320 McCowan Road

Toronto, Ontario M1J 3N2

c/o Ling Kee Group

PREPARED BY

Michael Lafortune, C.E.T., Environmental Scientist

Joshua Foster, P.Eng., Lead Engineer

EXECUTIVE SUMMARY

This report describes a detailed environmental noise & vibration assessment performed for a proposed residential development located at 320 McCowan Road in Scarborough, Ontario. The proposed development comprises Tower A (25 storeys) and Tower B (29 storeys), respectively located west to east on the study site. The towers are connected by a five-storey podium, in addition to an indoor amenity between the two towers at Level 6. The major source of roadway traffic noise is McCowan Road to the east of the site. Roadways located more than 100 m from the site are considered to be insignificant sources of roadway traffic noise, however Eglinton Avenue East has been included in the analysis. The Metrolinx Kingston Subdivision corridor is located directly south of the study building, which is a source of transportation noise and ground vibration. The site is surrounded by employment lands to the west, high-rise and mid-rise residential to the north, low-rise residential to the east (south of the rail corridor) and park land to the south beyond the Metrolinx corridor. Figure 1 illustrates the site location 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) requirements; (ii) future vehicular traffic volumes corresponding to roadway classification and theoretical capacities; (iii) train information received from the railway authorities; and (iv) architectural drawings provided by Quadrangle in July 2021. The latest plans show changes to the mechanical penthouse of Tower A, however these do not impact the conclusions and recommendations of the report.

The results of the current analysis indicate that noise levels will range between 62 and 77 dBA during the daytime period (07:00-23:00) and between 54 and 72 dBA during the nighttime period (23:00-07:00). The highest noise level (i.e. 77 dBA) occurs along the development's south facing façades, which are nearest and most exposed to the rail corridor. Building components with a higher Sound Transmission Class (STC) rating will be required where exterior noise levels exceed 65 dBA, as indicated in Figure 5.

Results of the calculations also indicate that the development will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. A Type D Warning Clause will also be required be placed on all Lease, Purchase and Sale Agreements, as



summarized in Section 6. Furthermore, a GO/Metrolinx Warning Clause will be required in all Lease, Purchase and Sale Agreements because the development is within 300 m of the Metrolinx corridor.

Noise levels at the 6th Floor terrace approach 63 dBA during the daytime period (Receptor 6). If this area is to be used as an outdoor living area, noise control measures are required to reduce the L_{eq} to 60 dBA. Further analysis investigated the noise mitigating impact including a 3.5 noise barrier surrounding the terrace (see Figure 5). Results of the investigation proved that noise levels can only be reduced to 60 dBA. This marginal improvement would not justify the cost of installing such a high wall and reducing noise levels to 55 dBA would require excessive barrier heights that would not be feasible. A Type B Warning Clause will be required in all Lease, Purchase and Sale Agreements.

Stationary noise levels from the surrounding commercial/light industrial properties fall below NPC-300 criteria at all receptors in the study site. With consideration of Gradient Wind's recommendations, the proposed development is expected to be compatible with the existing land uses.

The impact of study building sources on the surrounding residences will be determined once mechanical details for the development become available. This study will include recommendations for any noise control measures that may be necessary to ensure noise levels fall below NPC-300 limits.

Results of vibration monitoring found vibration levels from a minimum of 25 train passes at a distance of 30 metres from the rail centreline were a maximum (4 of 25 train passes) 0.19 mm/s RMS or 77.5 dBV. Using Federal Transit Authority's (FTA) Transit Noise and Vibration Impact Assessment protocol to project measured vibration levels to the nearest residential suite on the ground floor (44 m setback), a 4 dBV reduction can be applied, resulting in a vibration level of 0.12 mm/s RMS or 73.5 dBV. The projected vibration levels fall below the criterion of 0.14 mm/s RMS (75 dBV). Typical train passes (21 of 25 train passes) were found to fall below the criterion at the measurement location. As vibration levels are acceptable, correspondingly regenerated noise levels are also expected to be acceptable.

TABLE OF CONTENTS

1. INTRODUCTION 1

2. TERMS OF REFERENCE 1

3. OBJECTIVES 2

4. METHODOLOGY..... 2

4.1 Background.....2

4.2 Transportation Noise.....3

4.2.1 Criteria for Transportation Noise3

4.2.2 Roadway and Railway Traffic Volumes4

4.2.3 Theoretical Roadway Traffic Noise Predictions.....5

4.2.4 Theoretical Railway Traffic Noise Predictions.....5

4.2.5 Indoor Noise Calculations.....6

4.3 Stationary Noise.....7

4.3.1 Stationary Noise Criteria8

4.3.2 Determination of Noise Source Power Levels.....8

4.3.3 Stationary Source Noise Predictions9

4.4 Ground Vibration & Ground-borne Noise10

4.4.1 Background on Vibrations10

4.4.2 Ground Vibration Criteria.....11

4.4.3 Field Measurement Assessment Procedure.....11

4.4.4 Federal Transit Authority Protocol.....12

5. ENVIRONMENTAL NOISE AND VIBRATION RESULTS..... 14

5.1 Transportation Noise Levels14

5.1.1 Noise Control Measures15

5.1.2 Noise Barrier Calculation.....16

5.2 Stationary Noise Levels16

5.3 Ground Vibrations & Ground-Borne Noise Levels18

6. DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS..... 18

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 Blauson Assets Management Ltd. to undertake a detailed environmental noise & vibration assessment for the proposed residential development located at 320 McCowan Road in Scarborough, Ontario. This report summarizes the methodology, results, and recommendations related to the assessment of exterior noise and vibration levels generated by local transportation sources.

This assessment is based on theoretical noise calculation methods conforming to the Ministry of the Environment, Conservation and Parks (MECP)¹ guidelines. Noise calculations were based on architectural drawings provided by Quadrangle in July 2021, with future traffic volumes corresponding to roadway classification and theoretical capacities, and railway information obtained from Metrolinx.

2. TERMS OF REFERENCE

The study site occupies a parcel of land northwest of the intersection of McCowan Road and the Metrolinx corridor. The proposed development comprises Tower A (25 storeys) and Tower B (29 storeys), respectively located west to east on the study site. The towers are connected by a five-storey podium, in addition to an indoor amenity between the two towers at Level 6. The ground floor comprises townhouse units flanked by lobbies along the north elevation, and a mix of indoor parking, storage and building support functions in the remaining space. A loading area and vehicle entrance to indoor parking are located at the northwest corner of the building. Above the ground floor, the podium primarily comprises residential units along the north perimeter and indoor parking in the remaining space. At Level 6, the floorplate sets back from the east, west and south, providing space for an outdoor amenity area to the south of the towers, which may be classified as an outdoor living area. Balconies throughout the development less than 4 m in depth do not meet the definition of an outdoor living area. Above Level 6, the floorplate reduces from the centre of the building to form the typical floor plan for both towers. The tower planforms are triangular in shape with several diagonal walls adding additional faces. Tower A and

¹ Ontario Ministry of the Environment and Climate Change – Environmental Noise Guidelines, Publication NPC-300, Queens Printer for Ontario, Toronto, 2013

Tower B feature cantilevered balconies on various façades and are each topped by a mechanical penthouse. Tower A features blank walls on the west facing façade.

The major source of roadway traffic noise is McCowan Road to the east of the site. Roadways located more than 100 m from the site are considered to be insignificant sources of roadway traffic noise, however Eglinton Avenue East has been included in the analysis. The Eglinton East LRT is still in the planning stage, and details about its operations are not presently known. This source is considered to be insignificant compared to Eglinton Avenue East, due to the low frequency of LRT passes compared to vehicle passes, and is therefore excluded from the study. The Metrolinx Kingston Subdivision corridor is located directly south of the study building, which is a source of transportation noise and ground vibration. The site is surrounded by commercial/light industrial lands to the west, high-rise and mid-rise residential to the north, low-rise residential to the east (south of the rail corridor) and park land to the south beyond the Metrolinx corridor. Figure 1 illustrates the site location with surrounding context.

During detailed design, the stationary noise impacts of the proposed development onto the surroundings would be considered. Stationary noise sources associated with the development could include rooftop air handling units, cooling towers or dry coolers, and emergency generators. Noise from these sources however can be controlled to acceptable limits established by MECP by judicious selection of the equipment, locating the equipment on 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 and vibration levels on the study buildings produced by local transportation sources, (ii) calculate the future noise levels on the study buildings produced by stationary noise sources, and (iii) 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 Transportation Noise

4.2.1 Criteria for Transportation Noise

For vehicle and rail 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 NPC-300 guidelines specify that the recommended indoor noise limit range (that is relevant to this study) is 45, 40, and 35 dBA for retail, residence living rooms and sleeping quarters respectively, as listed in Table 1. However, to account for deficiencies in building construction and to control peak noise, these levels should be targeted toward 42, 37, and 32 dBA. Indoor noise levels due to railway traffic are 5 dB lower. The dominant source of transportation noise for this site is due to railway sources.

TABLE 1: INDOOR SOUND LEVEL CRITERIA (ROAD AND RAIL)²

Type of Space	Time Period	L_{eq} (dBA)	
		Road	Rail
General offices, reception areas, retail stores , etc.	07:00 – 23:00	50	45
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	40

² Adapted from Table C-2, Part C, Section 3.2.3 of NPC-300



Sleeping quarters of hotels/motels	23:00 – 07:00	45	40
Sleeping quarters of residences , hospitals, nursing/retirement homes, etc.	23:00 – 07:00	40	35

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 reduction³. 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 normally triggers the need for central air conditioning (or similar systems). Where noise levels exceed 60 dBA daytime and 55 dBA nighttime building components will require higher levels of sound attenuation⁴.

For designated Outdoor Living Areas (OLAs), the sound level limit is 55 dBA during the daytime period. An excess above the limit is acceptable only in cases where the required noise control measures are not feasible for technical, economic or administrative reasons.

4.2.2 Roadway and Railway Traffic Volumes

NPC-300 dictates that noise calculations should consider future sound levels based on a roadway’s mature state of development. Therefore, traffic volumes have been considered for the mature state of development based on roadway classifications and theoretical capacities, and train count forecast obtained from Metrolinx⁵ (see Appendix A). VIA Rail counts were obtained from publicly available service schedules on the VIA Rail website. Table 2 (below) summarizes the AADT values used for each roadway and rail line included in this assessment.

³ Burberry, P.B. (2014). Mitchell’s Environment and Services. Routledge, Page 125

⁴ MECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.1.3

⁵ Ivan Cheung, Metrolinx

TABLE 2: ROADWAY AND RAILWAY TRAFFIC DATA

Segment	Type	Speed Limit (km/h)	Existing AADT Count	Year of Count	Theoretical Capacity	Forecasted Volumes
McCowan Road	4-Lane Arterial	50	N/A	N/A	30,000	N/A
Eglinton Avenue E	6-Lane Arterial	50	N/A	N/A	50,000	N/A
GO Rail Line	Railway	161	N/A	N/A	N/A	180/28*
VIA Rail Line	Railway	161	29/0	2019	N/A	35/0*

* - Daytime/nighttime volumes

4.2.3 Theoretical Roadway Traffic 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 noise calculations were performed by treating each road 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. This is a conservative assumption where data from municipality was not obtained.
- Reflective intermediate ground surfaces were assumed, based on hard paved surfaces.
- Surrounding buildings were used as noise barriers where applicable.
- The study site was treated as having gently sloping topography. McCowan Road drops below site grade as it passes under the rail corridor.
- Noise receptors were strategically placed at nine locations around the study area, as illustrated in Figure 2.

4.2.4 Theoretical Railway Traffic Noise Predictions

When an area is influenced by road and rail traffic, the criteria requires the outdoor noise impact from each source to be examined for comparison to respective criterion. Calculations were performed for receptors in close proximity to the railway with the assistance of the MECP rail and road noise analysis



program STAMSON 5.04, which incorporates the calculation model '*Sound from Trains Environment Analysis Method*' (STEAM). The impact from railway noise is then combined with roadway predictions using a logarithmic addition at each point of reception and compared to the relevant criteria.

Similar to the roadway traffic noise calculations, the railway line was treated as a single line source of noise, and existing and proposed building locations were used as noise barriers. In addition to the railway volumes summarized in Table 2, theoretical noise predictions were also based on the following parameters, each confirmed by the GO Transit representative:

- For GO Transit, one locomotive was modelled per train, with an average of 12 cars per train (161 km/h). diesel train type.
- For VIA Rail, one locomotive was modelled per train, with an average of 4 cars per train (161 km/h).
- Whistle events were not considered because there are no level crossings in the area.
- Rail lines were conservatively assumed not to be welded.
- Maximum input speed in STAMSON is 150 km/h.

The noise generated from both on-road and railway traffic were combined for the nine receptor locations identified in Figure 2. The combined outdoor noise levels from both road and rail were compared to the appropriate NPC-300 criteria.

4.2.5 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 (2012) typically exceed STC 35, depending on exterior cladding, thickness and interior finish details. For example, concrete and masonry walls can achieve STC 50 or more. Curtainwall systems typically provide around STC 35, depending on the glazing elements. 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.



According to the NPC-300, when daytime noise levels (from road and rail 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. The calculation procedure⁶ considers:

- Window type and total area as a percentage of total room floor area
- 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 research⁷, 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, which was prepared for site plan approval, final detailed floor layouts and building elevations were unavailable and 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).

4.3 Stationary Noise

Stationary sources are defined in NPC-300 as: “a source of sound or combination of sources of sound that are included and normally operated within the property lines of a facility and includes the premises of a person as one stationary source, unless the dominant source of sound on those premises is construction”⁸. Common stationary sources of noise include HVAC equipment, emergency generators, cooling towers and exhaust fans, which are often found on industrial and commercial facilities. As stationary noise can cause an adverse effect, it is important to examine the impact of existing stationary sources on the development. The impact of study building sources on the surrounding residences will be determined at the time of site plan application.

⁶ Building Practice Note: Controlling Sound Transmission into Buildings by J.D. Quirt, National Research Council of Canada, September 1985

⁷ CMHC, Road & Rail Noise: Effects on Housing

⁸ NPC – 300, page 16

4.3.1 Stationary Noise Criteria

The equivalent sound energy level, L_{eq} , provides a weighted measure of the time varying noise levels, which is well correlated with the annoyance of sound. It is defined as the continuous sound level, which has the same energy as a time varying noise level over a selected period of time. For stationary sources, the L_{eq} is commonly calculated on an hourly interval, while for roadways, the L_{eq} is calculated on the basis of a 16-hour daytime/8-hour nighttime split.

Noise criteria taken from NPC-300 apply to points of reception (POR). A POR is defined as “any location on a noise sensitive land use where noise from a stationary source is received”. A POR can be located on an existing or zoned for future use premises of permanent or seasonal residences, hotels/motels, nursing/retirement homes, rental residences, hospitals, campgrounds, and noise sensitive buildings such as schools and places of worship. The recommended maximum noise levels for a Class 1 area in a suburban environment adjacent to arterial roadways at a POR are outlined in Table 3 below. The study site is considered to be in a Class 1 area because it is located at the intersection of two arterial roadways. Furthermore, a bus rapid transit and park-and-ride are planned near the site. These conditions indicate that the sound field is dominated by manmade sources.

TABLE 3: EXCLUSIONARY LIMITS FOR CLASS 1 AREA

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

4.3.2 Determination of Noise Source Power Levels

A review of satellite imagery and a site visit conducted on September 25, 2020 identified the following sources of stationary noise influencing the development. The business located at 90 Barbados Boulevard (G.K. Chemical Specialities Co. Inc.) was determined to not longer operate a baghouse filter, and no other sources of stationary noise associated with the property were observed.

- D Crupi & Sons rock crushing and asphalt plant (477 Brimley Road)
- M&M Plating mechanical equipment (100 Barbados Boulevard)



- RAM Auto Body mechanical equipment (110 Barbados Boulevard)

Gradient Wind determined sound power data for the relevant equipment from a combination of on-site measurements and experience on past projects with similar equipment. Information regarding the sources associated with the D Crupi & Sons facility was taken from the Acoustic Assessment Report prepared by HGC Engineering, dated December 5, 2013. Table 4 summarizes the sound power of each stationary noise source used in the analysis. Figures 3 and 4 illustrate the stationary noise source locations.

TABLE 4: EQUIPMENT SOUND POWER LEVELS

Property	Description	Quantity of Sources	Individual Sound Power (dBA)	Operation Frequency	
				Day (7:00-23:00)	Night (23:00-7:00)
D Crupi & Sons	Loader	3	109	75%	75%
	Aggregate Truck	2	101	4 at 10 km/hr	
	Cement Truck	1	101	1 at 10 km/hr	
	HMA Truck	1	99	10 at 10 km/hr	
	Rock Crusher	1	111	100%	0%
	Screener	1	110	100%	0%
	Stacker	1	107	100%	100%
	Baghouse	1	107	100%	100%
	Bucket Elevator	1	102	100%	100%
	Dryer Burner	1	108	100%	100%
	Silos	1	104	100%	100%
M&M Plating	Roof Fan	14	88	100%	0%
	Garage Door	3	107	100%	0%
RAM Auto Body	Rooftop Unit	2	85	100%	0%

4.3.3 Stationary Source Noise Predictions

The impact of stationary noise sources was determined by computer modelling using the software program Predictor-Lima. This program was developed from the International Standards Organization (ISO) standard 9613 Parts 1 and 2 and is capable of representing three-dimensional surfaces and first reflections of sound waves over a suitable spectrum for human hearing. The methodology has been used on



numerous assignments and has been accepted by the Ministry of the Environment, Conservation and Parks (MECP) as part of Environmental Compliance Approval applications.

A total of five receptor locations were chosen around the site to measure the noise impact at points of reception (POR) during the daytime/evening period (07:00 – 23:00), as well as during the nighttime period (23:00 – 07:00). POR locations include outdoor points of reception (OPOR) and the plane of windows (POW) of the adjacent residential properties. Sensor locations are illustrated in Figure 2. Receptor 8 is located at the plane of window on the west façade of Tower A, which features a stepped façade with windows facing north and blank walls facing west. It is recommended that this feature be maintained to reduce exposure to the industries to the west. All units were represented as point sources in the Predictor model and are assumed to run continuously and concurrently during the daytime period only. Table 4 below contains Predictor-Lima calculation settings. These are typical settings that have been based on ISO 9613 standards and guidance from the MECP.

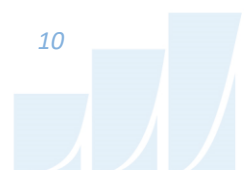
Ground absorption over the study area was determined based on topographical features (such as water, concrete, grassland, etc.). An absorption value of 0 is representative of hard ground, while a value of 1 represents grass and similar soft surface conditions. Existing and proposed buildings were added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

4.4 Ground Vibration & Ground-borne Noise

4.4.1 Background on Vibrations

Transit systems and heavy vehicles on roadways can produce perceptible levels of ground vibrations, especially when they are in close proximity to residential neighbourhoods or vibration-sensitive buildings. Similar to sound waves in air, vibrations in solids are generated at a source, propagated through a medium, and intercepted by a receiver. In the case of ground vibrations, the medium can be uniform, or more often, a complex layering of soils and rock strata.

Similar to sound waves in air, ground vibrations also produce perceptible motions and regenerated noise known as ‘ground-borne noise’ when the vibrations encounter a hollow structure such as a building. Ground-borne noise and vibrations are generated when there is excitation of the ground, such as from a train. The repetitive motion of steel wheels on the track or rubber tires passing over an uneven surface



causes vibration to propagate through the soil. When they encounter a building, vibrations pass along the structure of the building beginning at the foundation and propagating to all floors. Air inside the building excited by the vibrating walls and floors represents regenerated airborne noise. Characteristics of the soil and the building are imparted to the noise, thereby creating a noise signature that is unique to that structure and soil combination.

Human response to ground vibrations is dependent on the magnitude of the vibrations, which is measured by the root mean square (RMS) of the movement of a particle on a surface. Typical measurement units of ground vibration are millimeters per second (mm/s) or inches per second (in/s). Since vibrations can vary over a wide range, it is also convenient to represent them in decibel units, or dBV. In North America, it is common practice to use the reference value of one micro-inch per second ($\mu\text{in/s}$) to represent vibration levels for this purpose. The threshold level of human perception to vibrations is about 0.10 mm/s RMS or about 72 dBV. Although somewhat variable, the threshold of annoyance for continuous vibrations is 0.5 mm/s RMS (or 85 dBV), five times higher than the perception threshold, whereas the threshold for significant structural damage is 10 mm/s RMS (or 112 dBV), at least one hundred times higher than the perception threshold level.

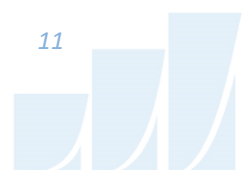
4.4.2 Ground Vibration Criteria

The Canadian Railway Association and Canadian Association of Municipalities have set standards for new sensitive land developments within 300 metres of a railway right-of-way, as published in their document *Guidelines for New Development in Proximity to Railway Operations*⁹, which indicate that vibration conditions should not exceed 0.14 mm/s RMS averaged over a one second time-period at the first floor and above of the proposed building.

4.4.3 Field Measurement Assessment Procedure

Existing levels of ground vibrations due to the Metrolinx corridor were determined by field measurements using InstanTel model MiniMate Plus and MicroMate seismographs capable of recording three components of ground velocity: one vertical and two horizontal. Two measurement sites were selected along the east property line of the development adjacent to the Trillium Line, as identified in Table 5. At

⁹ Dialog and J.E. Coulter Associates Limited, prepared for The Federation of Canadian Municipalities and The Railway Association of Canada, May 2013



the measurement locations, the seismograph was installed approximately 50 metres from the Metrolinx railway centerline. Seismograph measurements were set to a minimum trigger level of 0.14 mm/s Peak Particle Velocity (PPV). Measured PPV vibration levels are converted to RMS by first calculating the square root of the rolling 1-second average PPV for the transverse, vertical and longitudinal axes. The RMS level is then determined by calculating the mean square of the maximum for each axis.

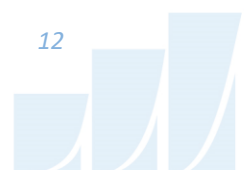
TABLE 5: VIBRATION MEASUREMENT LOCATIONS

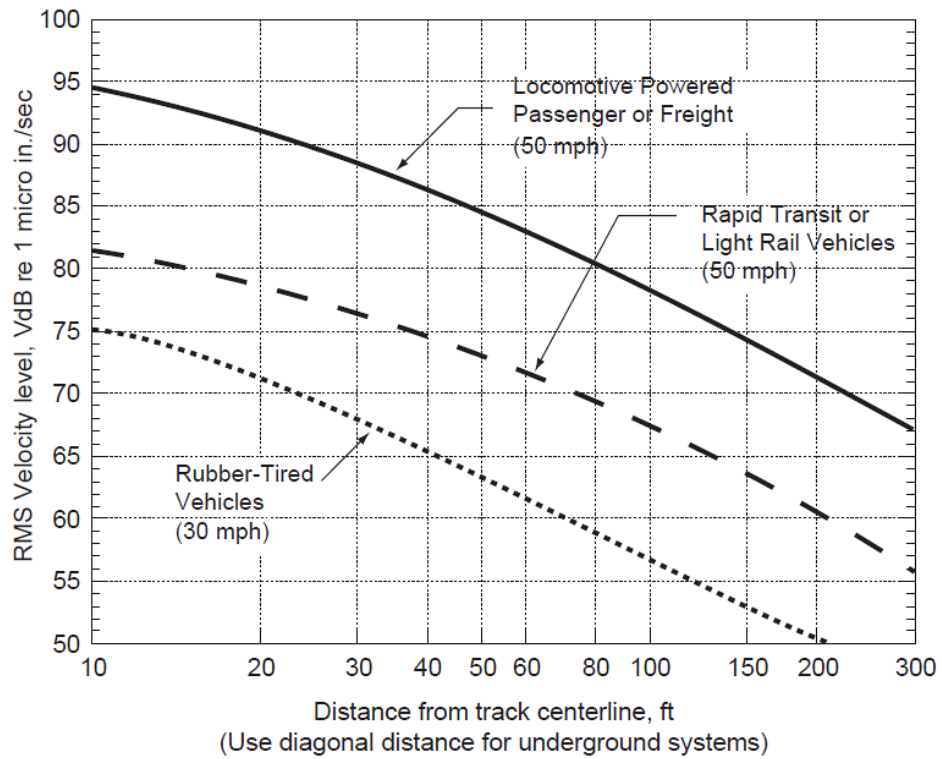
Receptor	Location Description	Placement of Seismographs from the Rail centerline (m)
V1	South Property Line	30
V2	South Property Line	30

4.4.4 Federal Transit Authority Protocol

Potential vibration impacts of the trains at the nearest noise-sensitive suite to the corridor was predicted using the Federal Transit Authority’s (FTA) Transit Noise and Vibration Impact Assessment¹⁰ protocol to project measured vibration levels. The FTA general vibration assessment is based on an upper bound generic set of curves that show vibration level attenuation with distance. These curves, illustrated in the figure on the following page, are based on ground vibration measurements at various transit systems throughout North America. Vibration levels at points of reception can also be adjusted by various factors to incorporate known characteristics of the system being analyzed, such as structure type of the impacted building structures.

¹⁰ C. E. Hanson; D. A. Towers; and L. D. Meister, Transit Noise and Vibration Impact Assessment, Federal Transit Administration, May 2006





**FTA GENERALIZED CURVES OF VIBRATION LEVELS VERSUS DISTANCE
(ADOPTED FROM FIGURE 10-1, FTA TRANSIT NOISE AND VIBRATION
IMPACT ASSESSMENT)**



5. ENVIRONMENTAL NOISE AND VIBRATION RESULTS

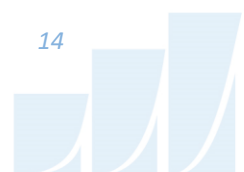
5.1 Transportation Noise Levels

The results of the roadway traffic noise calculations are summarized in Table 6 below. A complete set of input and output data from all STAMSON 5.04 calculations are available in Appendix A.

TABLE 6: EXTERIOR NOISE LEVELS DUE TO TRANSPORTATION SOURCES

Receptor Number	Receptor Height (m)	Receptor Location	Roadway Noise Level (dBA)		Railway Noise Level (dBA)		Total Noise Level (dBA)	
			Day	Night	Day	Night	Day	Night
1	14.4	5 th Floor Podium – North Façade	62	54	N/A	N/A	62	54
2	14.4	5 th Floor Podium – East Façade	64	56	74	69	75	69
3	82.3	27 th Floor Tower B – North Façade	64	56			64	56
4	82.3	27 th Floor Tower B – South Façade	60	52	77	72	77	72
5	82.3	27 th Floor Tower B – West Façade	N/A	N/A	74	68	74	68
6	20	6 th Floor Podium Terrace	48	N/A	63	N/A	63	N/A
7	79	25 th Floor Tower A – North Façade	60	52	N/A	N/A	60	52
8	79	25 th Floor Tower A – West Façade	60	52	N/A	N/A	60	52
9	79	25 th Floor Tower A – South Façade	N/A	N/A	77	72	77	72

The results of the current analysis indicate that noise levels will range between 62 and 77 dBA during the daytime period (07:00-23:00) and between 54 and 72 dBA during the nighttime period (23:00-07:00). The highest noise level (i.e. 77 dBA) occurs along the development’s south facing façades, which are nearest and most exposed to the rail corridor.



5.1.1 Noise Control Measures

The noise levels predicted due to transportation sources exceed the criteria listed in NPC-300 for building components. As discussed in Section 4.2.5, 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). Detailed STC calculations should be completed prior to building permit application for each unit type. The STC requirements for the windows are summarized below for various units within the development (see Figure 5):

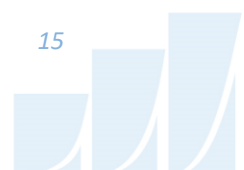
- **Bedroom Windows**
 - (i) Bedroom windows facing south on Tower A and Tower B will require a minimum STC of 42
 - (ii) Bedroom windows facing east on Tower A and the podium, and facing west on Tower B will require a minimum STC of 39
 - (iii) All other bedroom windows are to satisfy Ontario Building Code (OBC 2012) requirements

- **Living Room Windows**
 - Living room windows facing south on Tower A and Tower B will require a minimum STC of 37
 - Living room windows facing east on Tower A and the podium, and facing west on Tower B will require a minimum STC of 34
 - (i) All other living room windows are to satisfy Ontario Building Code (OBC 2012) requirements

- **Exterior Walls**
 - (i) Exterior wall components on the east, south and west façades will require a minimum STC of 45, which will be achieved with brick cladding or an acoustical equivalent according to NRC test data¹¹

A review of window supplier literature indicates that the specified STC ratings can be achieved by a variety of window systems having a combination of glass thickness and inter-pane spacing. We have not specified any particular window configurations, as there are several manufacturers and various combinations of window components that will offer the necessary sound attenuation rating. However, it is the responsibility of the manufacturer to ensure that the specified window achieves the required STC. This

¹¹ J.S. Bradley and J.A. Birta. Laboratory Measurements of the Sound Insulation of Building Façade Elements, National Research Council October 2000.



can only be assured by using window configurations that have been certified by laboratory testing. The requirements for STC ratings assume that the remaining components of the building are constructed and installed according to the minimum standards of the Ontario Building Code. The specified STC requirements also apply to swinging and/or sliding patio doors. All specified building components will require review by a qualified acoustical engineer for conformance to the recommendations of this report prior to building permit application.

Results of the calculations also indicate that all units in the development will require air conditioning (or similar mechanical system), which will allow occupants to keep windows closed and maintain a comfortable living environment. In addition to ventilation requirements, Warning Clauses will also be required be placed on all Lease, Purchase and Sale Agreements.

5.1.2 Noise Barrier Calculation

Noise levels at the 6th Floor terrace approach 63 dBA during the daytime period (Receptor 6). If this area is to be used as an outdoor living area, noise control measures are required to reduce the L_{eq} to 60 dBA. Further analysis investigated the noise mitigating impact including a 3.5 noise barrier surrounding the terrace (see Figure 5). In order for the noise barrier to be acoustically effective, it should be constructed without cracks or surface gaps and meet the minimum surface density of 20 kg/m² or minimum STC 30 rating. Results of the investigation proved that noise levels can only be reduced to 60 dBA. This marginal improvement would not justify the cost of installing such a high wall and reducing noise levels to 55 dBA would require excessive barrier heights that would not be feasible. A Warning Clause will be required in all Lease, Purchase and Sale Agreements.

5.2 Stationary Noise Levels

Noise levels at the study site fall below NPC-300 criteria for stationary noise, as summarized in Table 7 and 8 below. The sound levels listed in Table 7 and 8 are based on the assumptions outlined in Section 4.3.2. Stationary noise levels from the surrounding commercial/light industrial properties fall below NPC-300 criteria at all receptors in the study site. With consideration of Gradient Wind's recommendations, the proposed development is expected to be compatible with the existing land uses.



TABLE 7: NOISE LEVELS FROM D. CRUPI & SONS STATIONARY NOISE SOURCES

Receptor Number	Receptor Height (m)	Plane of Window Receptor Location	Noise Level (dBA)		Sound Level Limits		Meets NPC-300 Class 1 Criteria	
			Day	Night	Day	Night	Day	Night
R5	40	27 th Floor Tower B – West Façade	34	27	50	45	Yes	Yes
R6	20	6 th Floor Podium Terrace	44	35	50	45	Yes	Yes
R7	40	25 th Floor Tower A – North Façade	37	33	50	45	Yes	Yes
R8	30	25 th Floor Tower A – West Façade	35	30	50	45	Yes	Yes
R9	40	25 th Floor Tower A – South Façade	50	45	50	45	Yes	Yes

TABLE 8: NOISE LEVELS FROM M&M PLATING AND RAM AUTO BODY STATIONARY NOISE SOURCES

Receptor Number	Receptor Height (m)	Plane of Window Receptor Location	Noise Level (dBA)		Sound Level Limits		Meets NPC-300 Class 1 Criteria	
			Day	Night	Day	Night	Day	Night
R5	40	27 th Floor Tower B – West Façade	37	N/A	50	45	Yes	Yes
R6	20	6 th Floor Podium Terrace	39	N/A	50	45	Yes	Yes
R7	40	25 th Floor Tower A – North Façade	49	N/A	50	45	Yes	Yes
R8	30	25 th Floor Tower A – West Façade	49	N/A	50	45	Yes	Yes
R9	40	25 th Floor Tower A – South Façade	49	N/A	50	45	Yes	Yes



5.3 Ground Vibrations & Ground-Borne Noise Levels

Results of vibration monitoring found vibration levels from a minimum of 25 train passes at a distance of 30 metres from the rail centreline were a maximum (4 of 25 train passes) 0.19 mm/s RMS or 77.5 dBV. Using Federal Transit Authority's (FTA) Transit Noise and Vibration Impact Assessment¹² protocol to project measured vibration levels to the nearest residential suite on the ground floor (44 m setback), a 4 dBV reduction can be applied, resulting in a vibration level of 0.12 mm/s RMS or 73.5 dBV. The projected vibration levels fall below the criterion of 0.14 mm/s RMS (75 dBV). Typical train passes (21 of 25 train passes) were found to fall below the criterion at the measurement location. As vibration levels are acceptable, correspondingly regenerated noise levels are also expected to be acceptable.

6. DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

The results of the current analysis indicate that noise levels will range between 62 and 77 dBA during the daytime period (07:00-23:00) and between 54 and 72 dBA during the nighttime period (23:00-07:00). The highest noise level (i.e. 77 dBA) occurs along the development's south facing façades, which are nearest and most exposed to the rail corridor. Building components with a higher Sound Transmission Class (STC) rating will be required where exterior noise levels exceed 65 dBA, as indicated in Figure 5.

Results of the calculations also indicate that the development will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. The following Type D Warning Clause will also be required be placed on all Lease, Purchase and Sale Agreements, as summarized below. Furthermore, a GO/Metrolinx Warning Clause will be required in all Lease, Purchase and Sale Agreements because the development is with 300 m of the Metrolinx corridor.

Type D Warning Clause:

"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."

¹² C. E. Hanson; D. A. Towers; and L. D. Meister, Transit Noise and Vibration Impact Assessment, Federal Transit Administration, May 2006



GO/Metrolinx Warning Clause:

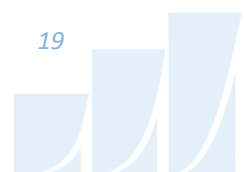
“Metrolinx, carrying on business as GO Transit, and its assigns and successors in interest has or have a right-of-way within 300 metres from the land the subject hereof. There may be alterations to or expansions of the rail facilities on such right-of way in the future including the possibility that GO Transit or any railway entering into an agreement with GO Transit to use the right-of-way or their assigns or successors as aforesaid may expand their operations, which expansion may affect the living environment of the residents in the vicinity, notwithstanding the inclusion of any noise and vibration attenuating measures in the design of the development and individual dwelling(s). Metrolinx will not be responsible for any complaints or claims arising from use of such facilities and/or operations on, over or under the aforesaid right-of-way.”

Noise levels at the 6th Floor terrace approach 63 dBA during the daytime period (Receptor 6). If this area is to be used as an outdoor living area, noise control measures are required to reduce the L_{eq} to 60 dBA. Further analysis investigated the noise mitigating impact including a 3.5 noise barrier surrounding the terrace (see Figure 5). Results of the investigation proved that noise levels can only be reduced to 60 dBA. This marginal improvement would not justify the cost of installing such a high wall and reducing noise levels to 55 dBA would require excessive barrier heights that would not be feasible. A Type B Warning Clause will be required in all Lease, Purchase and Sale Agreements.

Type B Warning Clause:

"Purchasers/tenants are advised that despite the inclusion of noise control features in the development and within the building units, sound levels due to increasing road and rail traffic may on occasions interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the Municipality and the Ministry of the Environment."

Stationary noise levels from the surrounding commercial/light industrial properties fall below NPC-300 criteria at all receptors in the study site. With consideration of Gradient Wind's recommendations, the proposed development is expected to be compatible with the existing land uses.



The impact of study building sources on the surrounding residences will be determined once mechanical details for the development become available. This study will include recommendations for any noise control measures that may be necessary to ensure noise levels fall below NPC-300 limits.

Results of vibration monitoring found vibration levels from a minimum of 25 train passes at a distance of 30 metres from the rail centreline were a maximum (4 of 25 train passes) 0.19 mm/s RMS or 77.5 dBV. Using Federal Transit Authority's (FTA) Transit Noise and Vibration Impact Assessment protocol to project measured vibration levels to the nearest residential suite on the ground floor (44 m setback), a 4 dBV reduction can be applied, resulting in a vibration level of 0.12 mm/s RMS or 73.5 dBV. The projected vibration levels fall below the criterion of 0.14 mm/s RMS (75 dBV). Typical train passes (21 of 25 train passes) were found to fall below the criterion at the measurement location. As vibration levels are acceptable, correspondingly regenerated noise levels are also expected to be acceptable.

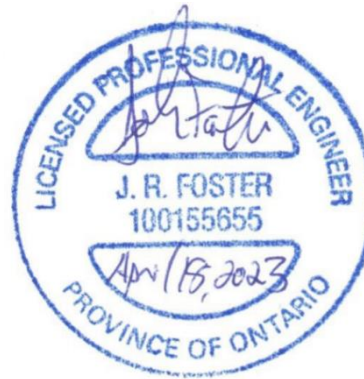
This concludes our traffic noise assessment and report. If you have any questions or wish to discuss our findings, please advise us. In the interim, we thank you for the opportunity to be of service.

Sincerely,

Gradient Wind Engineering Inc.



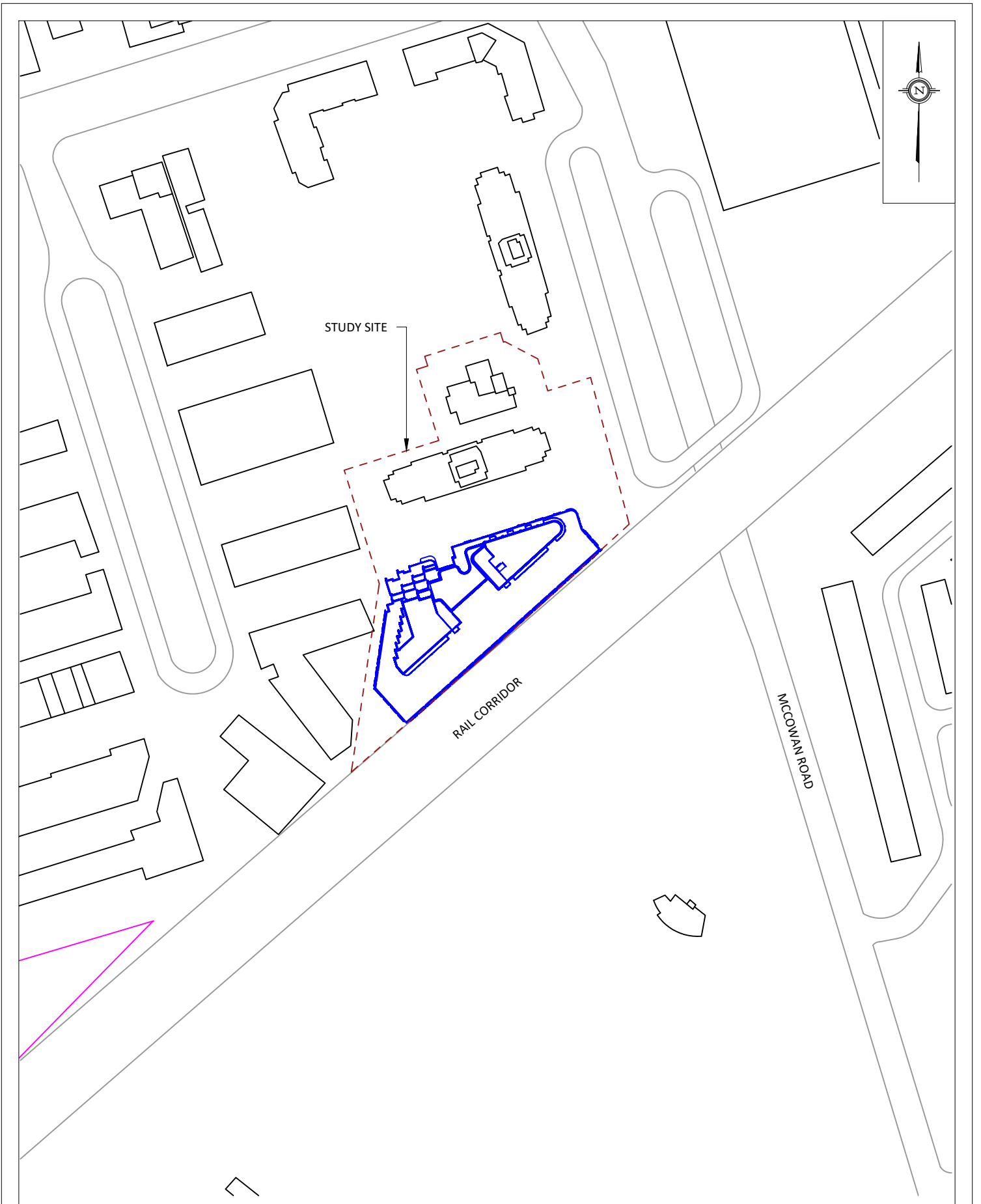
Michael Lafortune, C.E.T.
Environmental Scientist



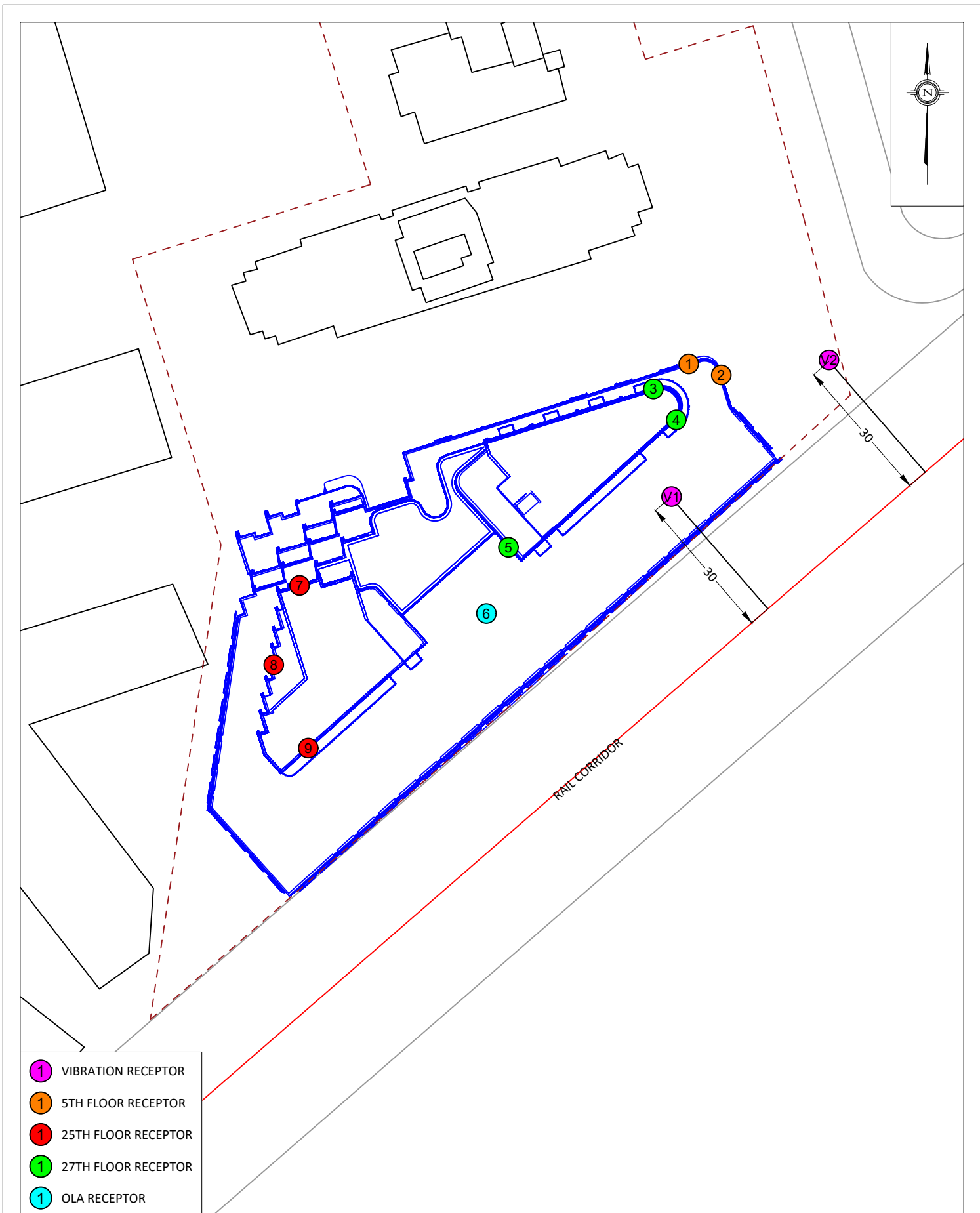
Joshua Foster, P.Eng.
Lead Engineer

Gradient Wind File #19-185 – Detailed Noise & Vibration R1



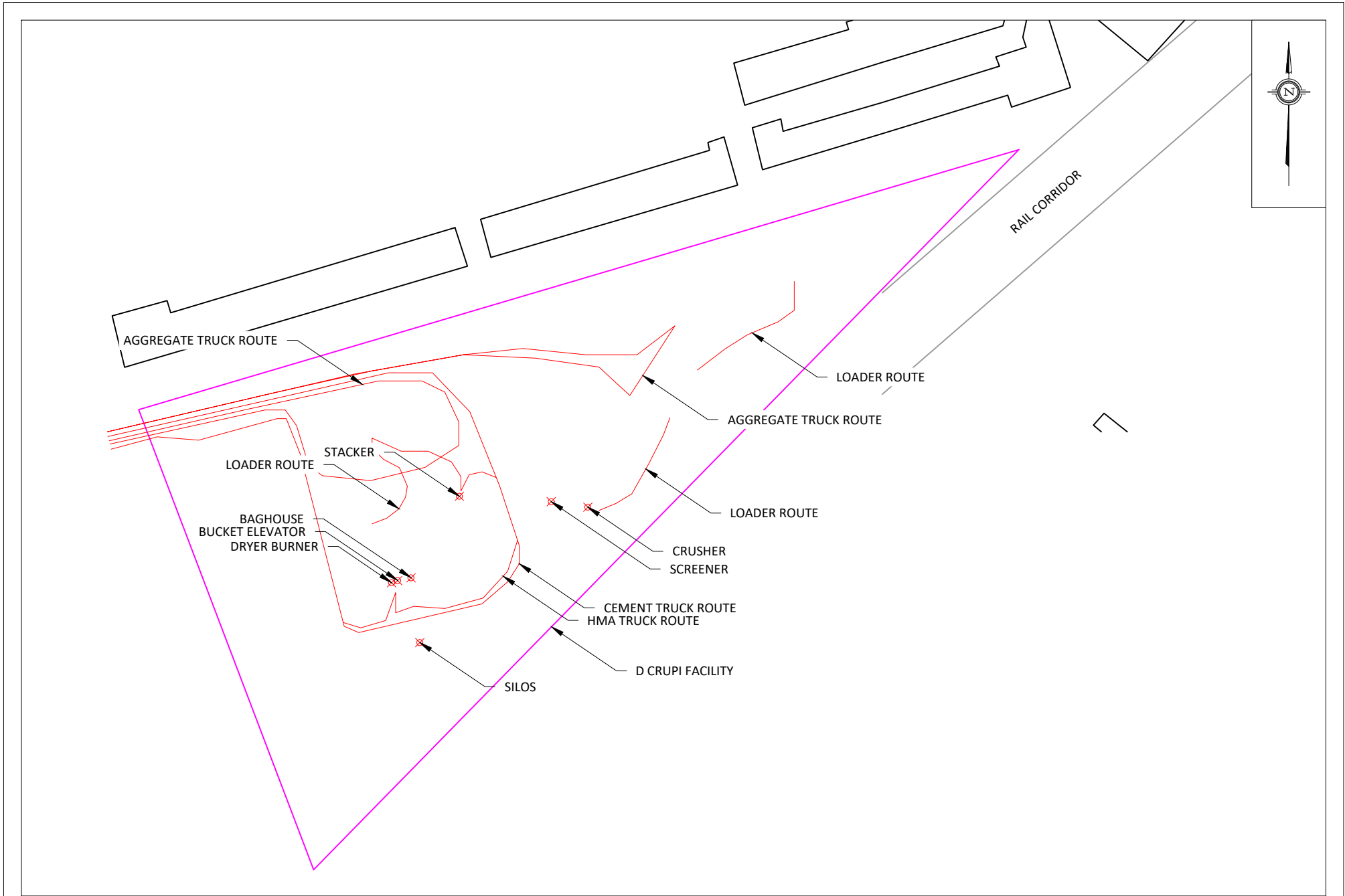


GRADIENTWIND ENGINEERS & SCIENTISTS 127 WALGREEN ROAD, OTTAWA, ON 613 836 0934 • GRADIENTWIND.COM	PROJECT	320 MCCOWAN ROAD, TORONTO	DESCRIPTION	FIGURE 1: SITE PLAN AND SURROUNDING CONTEXT		
	SCALE	1:2500 (APPROX.)			DRAWING NO.	GW19-185-1
	DATE	JUNE 21, 2021			DRAWN BY	M.L.



- 1 VIBRATION RECEPTOR
- 1 5TH FLOOR RECEPTOR
- 1 25TH FLOOR RECEPTOR
- 1 27TH FLOOR RECEPTOR
- 1 OLA RECEPTOR

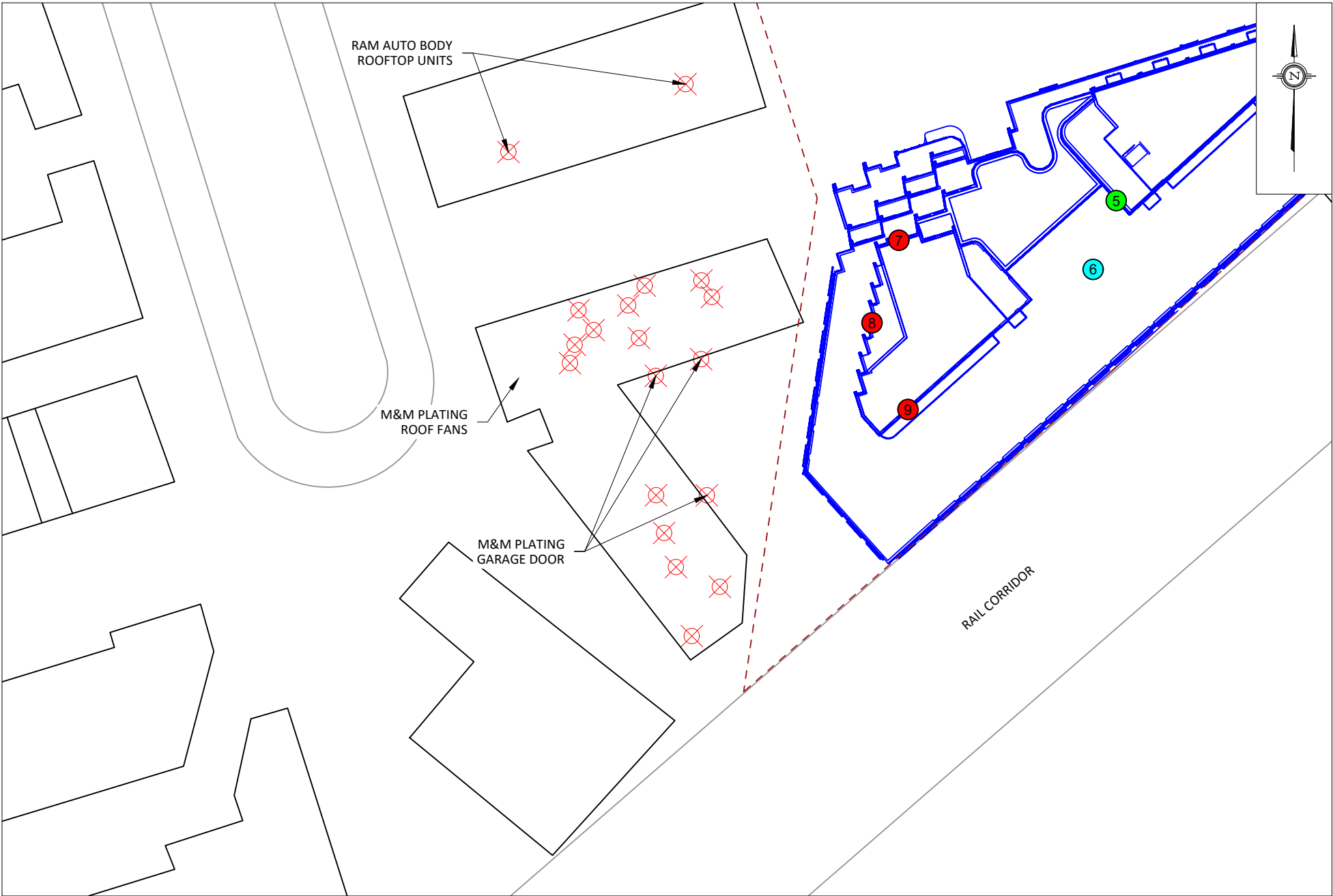
GRADIENTWIND ENGINEERS & SCIENTISTS 127 WALGREEN ROAD, OTTAWA, ON 613 836 0934 • GRADIENTWIND.COM	PROJECT 320 MCCOWAN ROAD, TORONTO DETAILED ENVIRONMENTAL NOISE & VIBRATION ASSESSMENT	DESCRIPTION	
	SCALE 1:1000 (APPROX.)	DRAWING NO. GW19-185-2	FIGURE 2: RECEPTOR LOCATIONS
	DATE JUNE 21, 2021	DRAWN BY M.L.	

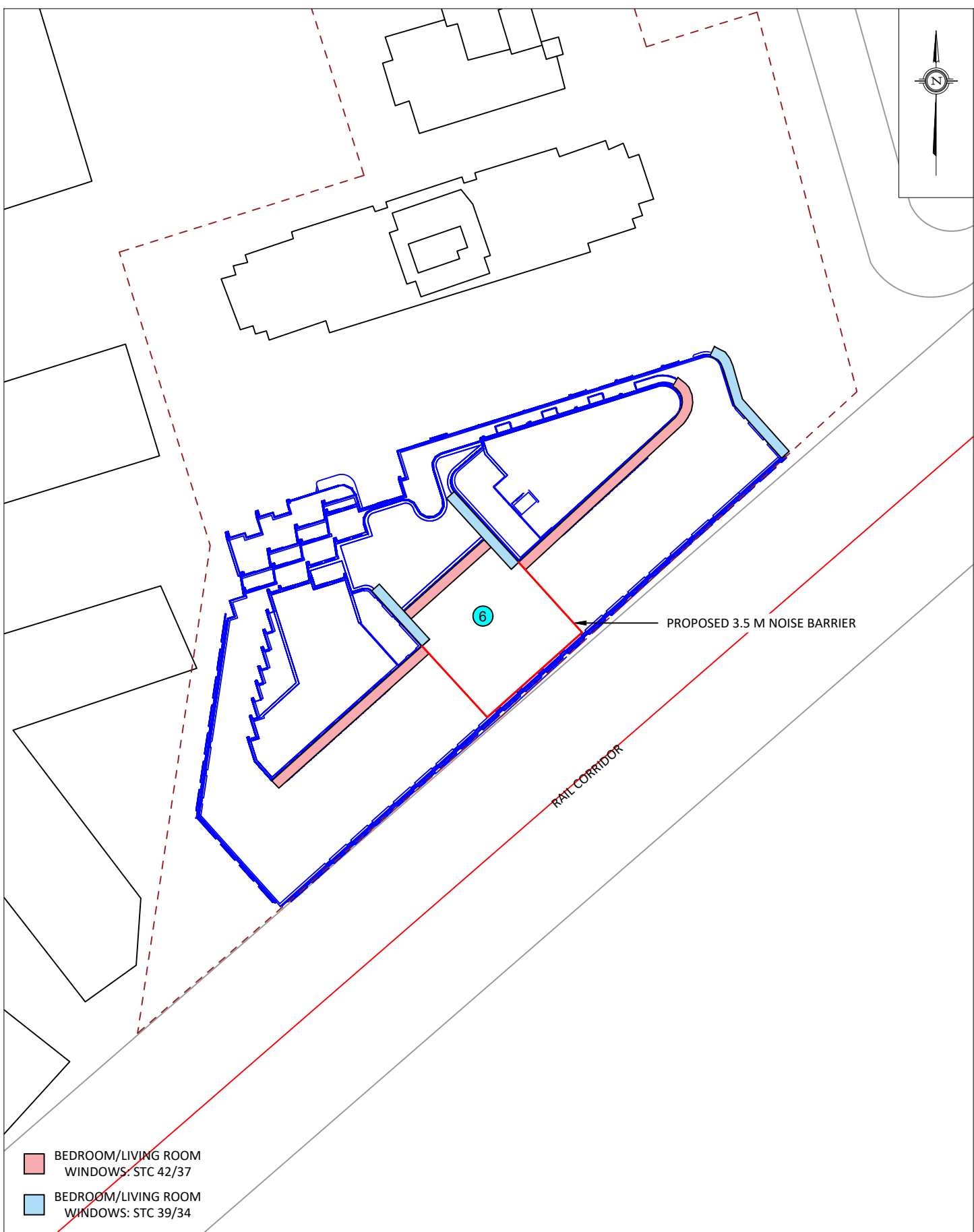
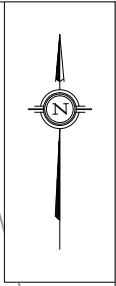


PROJECT	320 MCCOWAN ROAD, TORONTO DETAILED ENVIRONMENTAL NOISE & VIBRATION ASSESSMENT	
SCALE	1:2500 (APPROX.)	DRAWING NO. GW19-185-3
DATE	JUNE 21, 2021	DRAWN BY M.L.

DESCRIPTION

FIGURE 3:
STATIONARY NOISE SOURCE LOCATIONS
D. CRUPI & SONS FACILITY





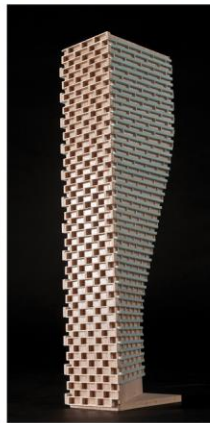
- BEDROOM/LIVING ROOM
WINDOWS: STC 42/37
- BEDROOM/LIVING ROOM
WINDOWS: STC 39/34

PROJECT	320 MCCOWAN ROAD, TORONTO DETAILED ENVIRONMENTAL NOISE & VIBRATION ASSESSMENT	
SCALE	1:1000 (APPROX.)	DRAWING NO. GW19-185-5
DATE	JUNE 21, 2021	DRAWN BY M.L.

DESCRIPTION	FIGURE 5: WINDOW STC AND NOISE BARRIER REQUIREMENTS
-------------	--

GRADIENTWIND

ENGINEERS & SCIENTISTS



APPENDIX A

STAMSON 5.04 – INPUT AND OUTPUT DATA

GRADIENTWIND

ENGINEERS & SCIENTISTS

Results segment # 1: McCowan (day)

Source height = 1.50 m

ROAD (0.00 + 61.55 + 0.00) = 61.55 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.00	71.49	0.00	-6.93	-3.01	0.00	0.00	0.00	61.55

Segment Leq : 61.55 dBA

Total Leq All Segments: 61.55 dBA

Results segment # 1: McCowan (night)

Source height = 1.50 m

ROAD (0.00 + 53.95 + 0.00) = 53.95 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.00	63.89	0.00	-6.93	-3.01	0.00	0.00	0.00	53.95

Segment Leq : 53.95 dBA

Total Leq All Segments: 53.95 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.55
(NIGHT): 53.95



GRADIENTWIND

ENGINEERS & SCIENTISTS

Results segment # 1: GO/VIA (day)

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	14.40	8.85	8.85
0.50	14.40	6.99	6.99

LOCOMOTIVE (73.05 + 43.76 + 0.00) = 73.06 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	12	0.00	80.29	-4.77	-2.47	0.00	0.00	0.00	73.05
12	24	0.00	80.29	-4.77	-11.76	0.00	0.00	-20.00	43.76

WHEEL (68.79 + 39.50 + 0.00) = 68.80 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	12	0.00	76.03	-4.77	-2.47	0.00	0.00	0.00	68.79
12	24	0.00	76.03	-4.77	-11.76	0.00	0.00	-20.00	39.50

Segment Leq : 74.44 dBA

Total Leq All Segments: 74.44 dBA



GRADIENTWIND

ENGINEERS & SCIENTISTS

Results segment # 1: GO/VIA (night)

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	14.40	8.85	8.85
0.50	14.40	6.99	6.99

LOCOMOTIVE (67.38 + 38.09 + 0.00) = 67.39 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	12	0.00	74.62	-4.77	-2.47	0.00	0.00	0.00	67.38
12	24	0.00	74.62	-4.77	-11.76	0.00	0.00	-20.00	38.09

WHEEL (63.41 + 34.11 + 0.00) = 63.41 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	12	0.00	70.65	-4.77	-2.47	0.00	0.00	0.00	63.41
12	24	0.00	70.65	-4.77	-11.76	0.00	0.00	-20.00	34.11

Segment Leq : 68.85 dBA

Total Leq All Segments: 68.85 dBA



GRADIENTWIND

ENGINEERS & SCIENTISTS

Road data, segment # 1: McCowan1 (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 : 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): 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: McCowan1 (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 : 71.00 / 71.00 m
Receiver height : 14.40 / 14.40 m
Topography : 3 (Elevated; no barrier)
Elevation : 4.00 m
Reference angle : 0.00



GRADIENTWIND

ENGINEERS & SCIENTISTS

Road data, segment # 2: McCowan2 (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 : 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): 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 # 2: McCowan2 (day/night)

Angle1 Angle2 : 34.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 71.00 / 71.00 m
Receiver height : 14.40 / 14.40 m
Topography : 3 (Elevated; no barrier)
Elevation : 4.00 m
Reference angle : 0.00



Results segment # 1: McCowan1 (day)

Source height = 1.50 m

ROAD (0.00 + 61.73 + 0.00) = 61.73 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.00	71.49	0.00	-6.75	-3.01	0.00	0.00	0.00	61.73

Segment Leq : 61.73 dBA

Results segment # 2: McCowan2 (day)

Source height = 1.50 m

ROAD (0.00 + 59.67 + 0.00) = 59.67 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
34	90	0.00	71.49	0.00	-6.75	-5.07	0.00	0.00	0.00	59.67

Segment Leq : 59.67 dBA

Total Leq All Segments: 63.83 dBA

Results segment # 1: McCowan1 (night)

Source height = 1.50 m

ROAD (0.00 + 54.13 + 0.00) = 54.13 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.00	63.89	0.00	-6.75	-3.01	0.00	0.00	0.00	54.13

Segment Leq : 54.13 dBA

Results segment # 2: McCowan2 (night)

Source height = 1.50 m

ROAD (0.00 + 52.07 + 0.00) = 52.07 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
34	90	0.00	63.89	0.00	-6.75	-5.07	0.00	0.00	0.00	52.07

Segment Leq : 52.07 dBA

Total Leq All Segments: 56.23 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 74.80
(NIGHT): 69.08



GRADIENTWIND

ENGINEERS & SCIENTISTS

Road data, segment # 2: Eglinton (day/night)

Car traffic volume : 40480/3520 veh/TimePeriod *
Medium truck volume : 3220/280 veh/TimePeriod *
Heavy truck volume : 2300/200 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): 50000
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: Eglinton (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 : 273.00 / 273.00 m
Receiver height : 82.30 / 82.30 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -19.00 deg Angle2 : 17.00 deg
Barrier height : 21.00 m
Barrier receiver distance : 251.00 / 251.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00



GRADIENTWIND

ENGINEERS & SCIENTISTS

Results segment # 1: McCowan (day)

Source height = 1.50 m

ROAD (0.00 + 60.90 + 0.00) = 60.90 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.00	71.49	0.00	-7.58	-3.01	0.00	0.00	0.00	60.90

Segment Leq : 60.90 dBA

Results segment # 2: Eglinton (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	82.30	8.01	8.01

ROAD (57.07 + 34.12 + 57.19) = 60.15 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-19	0.00	73.71	0.00	-12.60	-4.04	0.00	0.00	0.00	57.07
-19	17	0.00	73.71	0.00	-12.60	-6.99	0.00	0.00	-20.00	34.12
17	90	0.00	73.71	0.00	-12.60	-3.92	0.00	0.00	0.00	57.19

Segment Leq : 60.15 dBA

Total Leq All Segments: 63.55 dBA



GRADIENTWIND

ENGINEERS & SCIENTISTS

Results segment # 1: McCowan (night)

Source height = 1.50 m

ROAD (0.00 + 53.30 + 0.00) = 53.30 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.00	63.89	0.00	-7.58	-3.01	0.00	0.00	0.00	53.30

Segment Leq : 53.30 dBA

Results segment # 2: Eglinton (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	82.30	8.01	8.01

ROAD (49.47 + 26.52 + 49.59) = 52.55 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-19	0.00	66.11	0.00	-12.60	-4.04	0.00	0.00	0.00	49.47
-19	17	0.00	66.11	0.00	-12.60	-6.99	0.00	0.00	-20.00	26.52
17	90	0.00	66.11	0.00	-12.60	-3.92	0.00	0.00	0.00	49.59

Segment Leq : 52.55 dBA

Total Leq All Segments: 55.95 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 63.55
(NIGHT): 55.95



GRADIENTWIND

ENGINEERS & SCIENTISTS

STAMSON 5.0 NORMAL REPORT Date: 25-11-2019 11:29:37
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Rail data, segment # 1: GO/VIA (day/night)

```
-----  
Train            ! Trains        ! Speed !# loc !# Cars! Eng !Cont  
Type            !                ! (km/h) !/Train!/Train! type !weld  
-----+-----+-----+-----+-----+-----  
  1. GO            ! 180.0/28.0 ! 150.0 !  1.0 ! 12.0 !Diesel! No  
  2. VIA            !  35.0/0.0  ! 150.0 !  1.0 !  4.0 !Diesel! No
```

Data for Segment # 1: GO/VIA (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 : 42.00 / 42.00 m  
Receiver height          : 82.30 / 82.30 m  
Topography                :            1    (Flat/gentle slope; no barrier)  
No Whistle                :  
Reference angle          :            0.00
```



GRADIENTWIND

ENGINEERS & SCIENTISTS

Results segment # 1: GO/VIA (day)

LOCOMOTIVE (0.00 + 75.82 + 0.00) = 75.82 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	80.29	-4.47	0.00	0.00	0.00	0.00	75.82

WHEEL (0.00 + 71.56 + 0.00) = 71.56 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	76.03	-4.47	0.00	0.00	0.00	0.00	71.56

Segment Leq : 77.20 dBA

Total Leq All Segments: 77.20 dBA

Results segment # 1: GO/VIA (night)

LOCOMOTIVE (0.00 + 70.15 + 0.00) = 70.15 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	74.62	-4.47	0.00	0.00	0.00	0.00	70.15

WHEEL (0.00 + 66.18 + 0.00) = 66.18 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	70.65	-4.47	0.00	0.00	0.00	0.00	66.18

Segment Leq : 71.61 dBA

Total Leq All Segments: 71.61 dBA



GRADIENTWIND

ENGINEERS & SCIENTISTS

Road data, segment # 1: McCowan (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 : 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): 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: McCowan (day/night)

Angle1 Angle2 : 21.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 89.00 / 89.00 m
Receiver height : 82.30 / 82.30 m
Topography : 3 (Elevated; no barrier)
Elevation : 4.00 m
Reference angle : 0.00



GRADIENTWIND

ENGINEERS & SCIENTISTS

Results segment # 1: McCowan (day)

Source height = 1.50 m

ROAD (0.00 + 59.59 + 0.00) = 59.59 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
21	90	0.00	71.49	0.00	-7.73	-4.16	0.00	0.00	0.00	59.59

Segment Leq : 59.59 dBA

Total Leq All Segments: 59.59 dBA

Results segment # 1: McCowan (night)

Source height = 1.50 m

ROAD (0.00 + 52.00 + 0.00) = 52.00 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
21	90	0.00	63.89	0.00	-7.73	-4.16	0.00	0.00	0.00	52.00

Segment Leq : 52.00 dBA

Total Leq All Segments: 52.00 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 77.27
(NIGHT): 71.66



GRADIENTWIND

ENGINEERS & SCIENTISTS

STAMSON 5.0 NORMAL REPORT Date: 25-11-2019 11:29:43
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Rail data, segment # 1: GO/VIA (day/night)

Train Type	! Trains	! Speed ! (km/h)	!# loc !/Train	!# Cars !/Train	! Eng type	!Cont !weld
1. GO	! 180.0/28.0	! 150.0	! 1.0	! 12.0	!Diesel!	No
2. VIA	! 35.0/0.0	! 150.0	! 1.0	! 4.0	!Diesel!	No

Data for Segment # 1: GO/VIA (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		:	44.00 / 44.00	m
Receiver height		:	82.30 / 82.30	m
Topography		:	1	(Flat/gentle slope; no barrier)
No Whistle		:		
Reference angle		:	0.00	



GRADIENTWIND

ENGINEERS & SCIENTISTS

Results segment # 1: GO/VIA (day)

LOCOMOTIVE (0.00 + 72.60 + 0.00) = 72.60 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	80.29	-4.67	-3.01	0.00	0.00	0.00	72.60

WHEEL (0.00 + 68.35 + 0.00) = 68.35 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	76.03	-4.67	-3.01	0.00	0.00	0.00	68.35

Segment Leq : 73.99 dBA

Total Leq All Segments: 73.99 dBA

Results segment # 1: GO/VIA (night)

LOCOMOTIVE (0.00 + 66.94 + 0.00) = 66.94 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	74.62	-4.67	-3.01	0.00	0.00	0.00	66.94

WHEEL (0.00 + 62.96 + 0.00) = 62.96 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	70.65	-4.67	-3.01	0.00	0.00	0.00	62.96

Segment Leq : 68.40 dBA

Total Leq All Segments: 68.40 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 73.99
(NIGHT): 68.40



GRADIENTWIND

ENGINEERS & SCIENTISTS

Results segment # 1: GO/VIA (day)

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	20.00	12.65	12.65
0.50	20.00	11.04	11.04

LOCOMOTIVE (0.00 + 61.48 + 0.00) = 61.48 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	80.29	-3.92	0.00	0.00	0.00	-14.89	61.48

WHEEL (0.00 + 56.09 + 0.00) = 56.09 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	76.03	-3.92	0.00	0.00	0.00	-16.02	56.09

Segment Leq : 62.58 dBA

Total Leq All Segments: 62.58 dBA



GRADIENTWIND

ENGINEERS & SCIENTISTS

Results segment # 1: GO/VIA (night)

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	20.00	12.65	12.65
0.50	20.00	11.04	11.04

LOCOMOTIVE (0.00 + 55.81 + 0.00) = 55.81 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	74.62	-3.92	0.00	0.00	0.00	-14.89	55.81

WHEEL (0.00 + 50.70 + 0.00) = 50.70 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	70.65	-3.92	0.00	0.00	0.00	-16.02	50.70

Segment Leq : 56.98 dBA

Total Leq All Segments: 56.98 dBA



GRADIENTWIND

ENGINEERS & SCIENTISTS

Road data, segment # 1: McCowan1 (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 : 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): 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: McCowan1 (day/night)

Angle1 Angle2 : -29.00 deg -17.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 131.00 / 131.00 m
Receiver height : 20.00 / 20.00 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -29.00 deg Angle2 : -17.00 deg
Barrier height : 18.50 m
Barrier receiver distance : 41.00 / 41.00 m
Source elevation : -4.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00



GRADIENTWIND

ENGINEERS & SCIENTISTS

Road data, segment # 2: McCowan2 (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 : 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): 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 # 2: McCowan2 (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 : 131.00 / 131.00 m
Receiver height : 20.00 / 20.00 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : 0.00 deg Angle2 : 90.00 deg
Barrier height : 18.50 m
Barrier receiver distance : 41.00 / 41.00 m
Source elevation : -4.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00



GRADIENTWIND

ENGINEERS & SCIENTISTS

Results segment # 1: McCowan1 (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	20.00	12.96	12.96

ROAD (0.00 + 35.80 + 0.00) = 35.80 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-29	-17	0.00	71.49	0.00	-9.41	-11.76	0.00	0.00	-14.52	35.80

Segment Leq : 35.80 dBA

Results segment # 2: McCowan2 (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	20.00	12.96	12.96

ROAD (0.00 + 47.53 + 0.00) = 47.53 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	71.49	0.00	-9.41	-3.01	0.00	0.00	-11.54	47.53

Segment Leq : 47.53 dBA

Total Leq All Segments: 47.81 dBA



GRADIENTWIND

ENGINEERS & SCIENTISTS

Results segment # 1: McCowan1 (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	20.00	12.96	12.96

ROAD (0.00 + 28.20 + 0.00) = 28.20 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-29	-17	0.00	63.89	0.00	-9.41	-11.76	0.00	0.00	-14.52	28.20

Segment Leq : 28.20 dBA

Results segment # 2: McCowan2 (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	20.00	12.96	12.96

ROAD (0.00 + 39.93 + 0.00) = 39.93 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	63.89	0.00	-9.41	-3.01	0.00	0.00	-11.54	39.93

Segment Leq : 39.93 dBA

Total Leq All Segments: 40.21 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 62.72
(NIGHT): 57.07



GRADIENTWIND

ENGINEERS & SCIENTISTS

STAMSON 5.0 NORMAL REPORT Date: 26-04-2021 33:14:02
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r6b.te Time Period: Day/Night 16/8 hours
Description:

Rail data, segment # 1: GO/VIA (day/night)

Train Type	! Trains !	! Speed ! (km/h)	!# loc !/Train!	!# Cars !/Train!	! Eng type !	!Cont !weld
1. GO	! 180.0/28.0	! 150.0	! 1.0	! 12.0	!Diesel!	No
2. VIA	! 35.0/0.0	! 150.0	! 1.0	! 4.0	!Diesel!	No

Data for Segment # 1: GO/VIA (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	:	37.00 / 37.00	m
Receiver height	:	20.00 / 20.00	m
Topography	:	2	(Flat/gentle slope; with barrier)
No Whistle	:		
Barrier angle1	:	-90.00 deg	Angle2 : 90.00 deg
Barrier height	:	22.00	m
Barrier receiver distance	:	17.00 / 17.00	m
Source elevation	:	0.00	m
Receiver elevation	:	0.00	m
Barrier elevation	:	0.00	m
Reference angle	:	0.00	



GRADIENTWIND

ENGINEERS & SCIENTISTS

Results segment # 1: GO/VIA (day)

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	20.00	12.65	12.65
0.50	20.00	11.04	11.04

LOCOMOTIVE (0.00 + 59.05 + 0.00) = 59.05 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	80.29	-3.92	0.00	0.00	0.00	-17.32	59.05

WHEEL (0.00 + 54.36 + 0.00) = 54.36 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	76.03	-3.92	0.00	0.00	0.00	-17.75	54.36

Segment Leq : 60.32 dBA

Total Leq All Segments: 60.32 dBA

Results segment # 1: GO/VIA (night)

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	20.00	12.65	12.65
0.50	20.00	11.04	11.04

LOCOMOTIVE (0.00 + 53.38 + 0.00) = 53.38 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	74.62	-3.92	0.00	0.00	0.00	-17.32	53.38

WHEEL (0.00 + 48.98 + 0.00) = 48.98 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	70.65	-3.92	0.00	0.00	0.00	-17.75	48.98

Segment Leq : 54.73 dBA

Total Leq All Segments: 54.73 dBA



GRADIENTWIND

ENGINEERS & SCIENTISTS

Road data, segment # 1: McCowan1 (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 : 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): 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: McCowan1 (day/night)

Angle1 Angle2 : -29.00 deg -17.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 131.00 / 131.00 m
Receiver height : 20.00 / 20.00 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -29.00 deg Angle2 : -17.00 deg
Barrier height : 18.50 m
Barrier receiver distance : 41.00 / 41.00 m
Source elevation : -4.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00



GRADIENTWIND

ENGINEERS & SCIENTISTS

Road data, segment # 2: McCowan2 (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 : 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): 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 # 2: McCowan2 (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 : 131.00 / 131.00 m
Receiver height : 20.00 / 20.00 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : 0.00 deg Angle2 : 90.00 deg
Barrier height : 22.00 m
Barrier receiver distance : 41.00 / 41.00 m
Source elevation : -4.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00



GRADIENTWIND

ENGINEERS & SCIENTISTS

Results segment # 1: McCowan1 (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	20.00	12.96	12.96

ROAD (0.00 + 35.80 + 0.00) = 35.80 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-29	-17	0.00	71.49	0.00	-9.41	-11.76	0.00	0.00	-14.52	35.80

Segment Leq : 35.80 dBA

Results segment # 2: McCowan2 (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	20.00	12.96	12.96

ROAD (0.00 + 44.38 + 0.00) = 44.38 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	71.49	0.00	-9.41	-3.01	0.00	0.00	-14.69	44.38

Segment Leq : 44.38 dBA

Total Leq All Segments: 44.94 dBA



GRADIENTWIND

ENGINEERS & SCIENTISTS

Results segment # 1: McCowan1 (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	20.00	12.96	12.96

ROAD (0.00 + 28.20 + 0.00) = 28.20 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-29	-17	0.00	63.89	0.00	-9.41	-11.76	0.00	0.00	-14.52	28.20

Segment Leq : 28.20 dBA

Results segment # 2: McCowan2 (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	20.00	12.96	12.96

ROAD (0.00 + 36.78 + 0.00) = 36.78 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	63.89	0.00	-9.41	-3.01	0.00	0.00	-14.69	36.78

Segment Leq : 36.78 dBA

Total Leq All Segments: 37.34 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.44
(NIGHT): 54.81



Results segment # 1: Eglinton (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	79.00	7.13	7.13

ROAD (57.95 + 33.22 + 55.87) = 60.05 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	2	0.00	73.71	0.00	-12.85	-2.91	0.00	0.00	0.00	57.95
2	33	0.00	73.71	0.00	-12.85	-7.64	0.00	0.00	-20.00	33.22
33	90	0.00	73.71	0.00	-12.85	-4.99	0.00	0.00	0.00	55.87

Segment Leq : 60.05 dBA

Total Leq All Segments: 60.05 dBA

Results segment # 1: Eglinton (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	79.00	7.13	7.13

ROAD (50.35 + 25.62 + 48.27) = 52.45 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	2	0.00	66.11	0.00	-12.85	-2.91	0.00	0.00	0.00	50.35
2	33	0.00	66.11	0.00	-12.85	-7.64	0.00	0.00	-20.00	25.62
33	90	0.00	66.11	0.00	-12.85	-4.99	0.00	0.00	0.00	48.27

Segment Leq : 52.45 dBA

Total Leq All Segments: 52.45 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.05
(NIGHT): 52.45



GRADIENTWIND

ENGINEERS & SCIENTISTS

Results segment # 1: Eglinton (day)

Source height = 1.50 m

ROAD (0.00 + 55.00 + 0.00) = 55.00 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-41	8	0.00	73.71	0.00	-13.05	-5.65	0.00	0.00	0.00	55.00

Segment Leq : 55.00 dBA

Total Leq All Segments: 55.00 dBA

Results segment # 1: Eglinton (night)

Source height = 1.50 m

ROAD (0.00 + 47.41 + 0.00) = 47.41 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-41	8	0.00	66.11	0.00	-13.05	-5.65	0.00	0.00	0.00	47.41

Segment Leq : 47.41 dBA

Total Leq All Segments: 47.41 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 55.00
(NIGHT): 47.41



GRADIENTWIND

ENGINEERS & SCIENTISTS

STAMSON 5.0 NORMAL REPORT Date: 26-04-2021 33:47:16
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r9.te Time Period: Day/Night 16/8 hours
Description:

Rail data, segment # 1: GO/VIA (day/night)

```
-----  
Train            ! Trains        ! Speed !# loc !# Cars! Eng !Cont  
Type            !                ! (km/h) !/Train!/Train! type !weld  
-----+-----+-----+-----+-----+-----  
  1. GO            ! 180.0/28.0 ! 150.0 !  1.0 ! 12.0 !Diesel! No  
  2. VIA            !  35.0/0.0  ! 150.0 !  1.0 !  4.0 !Diesel! No
```

Data for Segment # 1: GO/VIA (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 :  40.00 / 40.00 m  
Receiver height          :  79.00 / 79.00 m  
Topography                :            1    (Flat/gentle slope; no barrier)  
No Whistle                :  
Reference angle           :            0.00
```



GRADIENTWIND

ENGINEERS & SCIENTISTS

Results segment # 1: GO/VIA (day)

LOCOMOTIVE (0.00 + 76.03 + 0.00) = 76.03 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	80.29	-4.26	0.00	0.00	0.00	0.00	76.03

WHEEL (0.00 + 71.77 + 0.00) = 71.77 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	76.03	-4.26	0.00	0.00	0.00	0.00	71.77

Segment Leq : 77.41 dBA

Total Leq All Segments: 77.41 dBA

Results segment # 1: GO/VIA (night)

LOCOMOTIVE (0.00 + 70.36 + 0.00) = 70.36 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	74.62	-4.26	0.00	0.00	0.00	0.00	70.36

WHEEL (0.00 + 66.39 + 0.00) = 66.39 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	70.65	-4.26	0.00	0.00	0.00	0.00	66.39

Segment Leq : 71.82 dBA

Total Leq All Segments: 71.82 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 77.41
(NIGHT): 71.82



Michael Lafortune

From: Alexandra Goldstein <Alexandra.Goldstein@metrolinx.com>
Sent: Friday, November 1, 2019 2:18 PM
To: Michael Lafortune
Cc: Rail Data Requests; Brandon Gaffoor; Ivan Cheung
Subject: RE: 320 McCowan Road, Scarborough - Rail Data Request

Michael,

Further to your request dated October 21, 2019, the subject site (320 McCowan Road) is located within 300m of Metrolinx's Kingston Subdivision which carries Lakeshore East GO train service.

It's anticipated that GO service on this line will be comprised of a mix of both diesel and electric trains within (at least) a 10-year time horizon. The preliminary midterm weekday train volume forecast at this location, including both revenue and equipment trips, is in the order of 208 trains (8 diesel: 8 day, 0 night and 200 electric: 172 day, 28 night). Trains will be comprised of a single locomotive and up to 12 passenger cars.

The maximum track design speed at this location of the corridor is 100mph (161km/hr).

There is no anti-whistle by-law in effect at this location.

With respect to future electrified rail service, Metrolinx is committed to finding the most sustainable solution for electrifying the GO and UP Express rail network and we are currently working towards the next phase. Metrolinx has not made a final decision regarding the electric train technology or technologies to be deployed. We can, however, provide the following interim information which may be helpful;

1. At lower speeds, train noise is dominated by the powertrain. At higher speeds, train noise is dominated by the wheel-track interaction. Hence, at higher speeds, the noise level and spectrum of electric trains is expected to be very similar, if not identical, to those of equivalent diesel trains.
2. Along with electrification, Metrolinx will intensify service levels along all of its corridors to deliver the promised GO Expansion service. Everything else being equal, this will likely result in an overall increase in train noise emissions.

Given the above considerations, it would be prudent, for the purposes of acoustical analyses, to assume that the acoustical characteristics of electrified and diesel trains are equivalent. In light of the aforementioned information, acoustical models should employ diesel train parameters as the basis for analyses. We anticipate that additional information regarding specific operational parameters for electrified trains will become available in the future.

Please note that operational information is subject to change and may be influenced by, among other factors, service planning priorities, operational considerations, funding availability, and passenger demand.

It should also be noted that this information is only as it relates to Metrolinx train operations. It would be prudent to contact any other train operators in the area directly for rail traffic information.

I trust this information is useful. Should you have any questions or concerns, please do not hesitate to contact me through the Rail Data Requests email portal (RailDataRequests@metrolinx.com).

Regards,

Alexandra Goldstein

Third Party Projects Officer
Third Party Projects Review, Capital Projects Group
Metrolinx | 10 Bay Street | Toronto | Ontario | M5J 2W3

From: Michael Lafortune [mailto:michael.lafortune@gradientwind.com]
Sent: October-21-19 9:15 AM
To: Ivan Cheung
Cc: Brandon Gaffoor; Adam Snow; Joshua Foster
Subject: 320 McCowan Road, Scarborough - Rail Data Request

Hi Ivan,

Hope you are doing well. We are doing a transportation noise assessment at the address of 320 McCowan Road in Scarborough. I was wondering if it would be possible to receive train information (number of trains, number of locomotives/cars per train, speed, welded or jointed tracks) for the line located south of our site? Much appreciated!

Regards,

MICHAEL LAFORTUNE, C.E.T.

ENVIRONMENTAL SCIENTIST

michael.lafortune@gradientwind.com

T 613 836 0934 x115

127 Walgreen Road, Ottawa, ON, Canada K0A 1L0

GRADIENTWIND.COM

GRADIENTWIND
ENGINEERS & SCIENTISTS

This e-mail is intended only for the person or entity to which it is addressed. If you received this in error, please contact the sender and delete all copies of the e-mail together with any attachments.