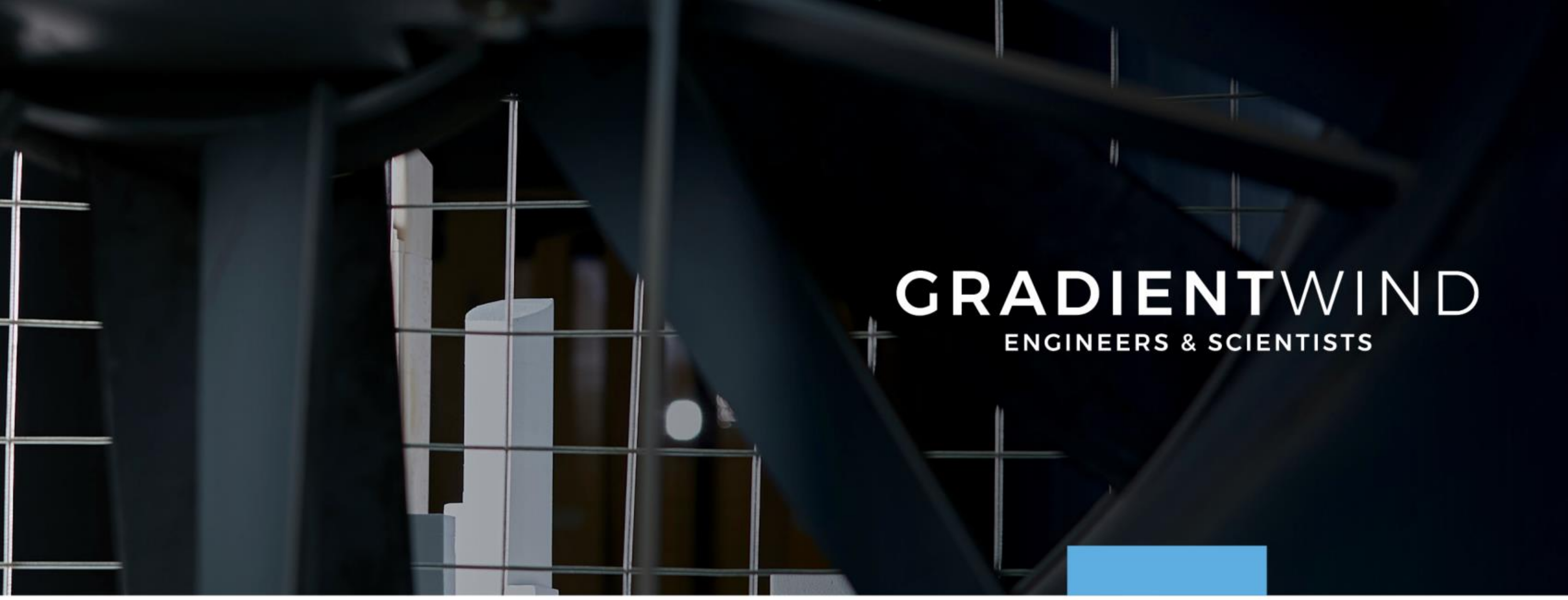
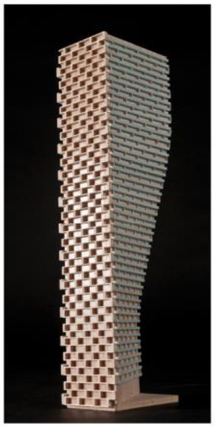
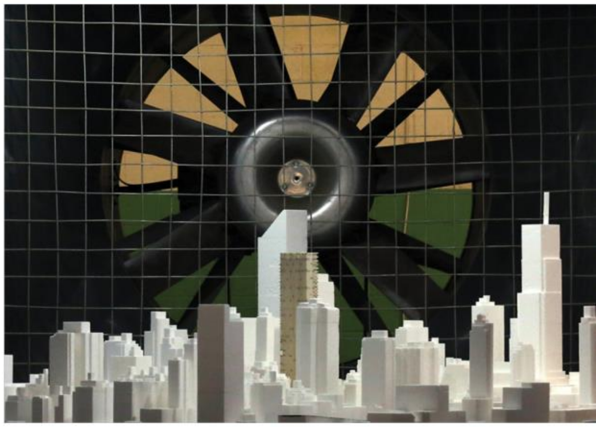


ROADWAY TRAFFIC NOISE FEASIBILITY ASSESSMENT

375 Kingston Road
Pickering, Ontario

Report: 21-243-Traffic Noise Feasibility





December 9, 2021

PREPARED FOR
375 Kingston Road Corporation
1806 Avenue Road, Suite 2
Toronto, ON M5M 3Z1

PREPARED BY
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EXECUTIVE SUMMARY

This report describes a roadway traffic noise assessment undertaken in support of an Official Plan Amendment (OPA) and a Zoning By-Law Amendment (ZBA) application submission for a proposed development located at the intersection of Kingston Road and Rougemount Drive. The property is bounded by Kingston Road to the north, Rougemeount Drive to the west, and Highway 401 to the south. The proposed building is on a trapezoidal shaped property. The proposed building itself has an L-shaped podium with 2 towers rising from it. The northeast tower will herein be referred to as 'Tower A', and the southwest tower will herein be referred to as 'Tower B'.

The assessment is based on (i) theoretical noise prediction methods that conform to the Ministry of the Environment, Conservation and Parks (MECP); (ii) noise level criteria as specified by the MECP NPC-300 guidelines; (iii) future vehicular traffic volumes corresponding to traffic volumes obtained from MTO and the City of Pickering; and (iv) architectural drawings provided by Richmond Architects Ltd. in August 2021.

The results of the current analysis indicate that noise levels will range between 62 and 74 dBA during the daytime period (07:00-23:00) and between 56 and 66 dBA during the nighttime period (23:00-07:00). The highest noise level (i.e. 74 dBA) occurs at the public green space along the south property line, which is nearest to Highway 401. 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 where noise levels exceed 65 dBA during the daytime and 60 dBA during the nighttime.

Results of the calculations also indicate that the building will require central air conditioning, or a similar ventilation system, which will allow occupants to keep windows closed and maintain a comfortable living environment. Additionally, Warning Clauses will also be required in all Lease, Purchase and Sale Agreements.

Noise levels at the OLA's (Outdoor Living Areas) exceed 60 dBA in every case. This surpasses the limits as defined by NPC-300 and mitigation will be required to bring noise levels to or below 60 dBA. Mitigation for OLA's is most commonly in the form of an acoustic barrier, however, details of the mitigation will be discussed at the time of Site Plan Control application (SPA).

With respect to noise impacts from the building on the surroundings and the building itself, noise from HVAC equipment can generally be minimized by judicious selection and placement of the equipment. Locating large pieces of equipment, such as cooling towers, generators, and air handling units, on a high roof, allows the building to shield nearby sensitive areas from noise exposure. Where necessary noise levels can be controlled by adding silencers, acoustic barriers, or noise screens. A stationary noise study should be conducted for the site during the detailed design once mechanical plans for the proposed building 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.

The surrounding the site includes a mix of residential and retails buildings. As such, there are no significant existing stationary noise sources surrounding the site.

A detailed roadway traffic noise assessment will be required at the time of site plan approval to determine specific noise control measures for the development.

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by 375 Kingston Road Corporation to undertake a roadway traffic noise feasibility assessment in support of an Official Plan Amendment (OPA) and a Zoning By-Law Amendment (ZBA) application for the proposed residential development located at 375 Kingston Road in Pickering, Ontario. This report summarizes the methodology, results, and recommendations related to the assessment of exterior 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)[1] guidelines. Noise calculations were based on architectural drawings provided by Richmond Architects Ltd. in August 2021, with future traffic volumes corresponding to traffic volumes obtained from MTO and the City of Pickering.

2. TERMS OF REFERENCE

The focus of this traffic noise feasibility assessment is a proposed mixed-use building located at 375 Kingston Road in Pickering, Ontario. The proposed development is located on a nominally rectangular shaped parcel of land and will comprise a 30- and a 35-storey building connected through a 6-storey podium. The 35-storey building rises from the northeast of the property, while the 30-storey building rises from the southwest. Above five levels of underground parking, the grade level for the shared podium includes retail space along the north elevation, residential and indoor amenity space at the southeast corner, indoor amenity and common lobby space at the center of the south elevation, garbage room area at the southeast corner of both buildings, and common area throughout the remainder of the level. Levels 2 through 5 comprise residential units. At Level 6, the podium steps back from the north elevation of the 30-storey building, and from the west elevation of the 35-storey building to provide a landscaped terrace. Levels 6 through 35 comprise residential units.

The major sources of roadway noise are Highway 401 to the south and Kingston Road to the north. Collector and arterial roadways located more than 100 m away from the site are considered to be insignificant as well as local roadways such as Rougemount Avenue Drive. The site is surrounded by a

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

mixture of residential and commercial buildings in all directions. Due to setback from these buildings, there are no existing significant sources of stationary noise.

3. OBJECTIVES

The principal objectives of this study are to (i) calculate the future noise levels on the study building produced by local roadway traffic, and (ii) determine whether exterior noise levels exceed the allowable limits specified by the MECP Noise Control Guidelines – NPC-300 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 vehicular 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 ranges (that are relevant to this study) are 50, 45 and 40 dBA for retail space, living rooms, and sleeping quarters, respectively, as listed in Table 1.

TABLE 1: INDOOR SOUND LEVEL CRITERIA

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[2]. A closed window due to a ventilation requirement will bring noise levels down to achieve an acceptable indoor environment[3]. 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. Where noise levels exceed 65 dBA daytime and 60 dBA nighttime, building components will require higher levels of sound attenuation[4].

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 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.

[2] Burberry, P.B. (2014). Mitchell's Environment and Services. Routledge, Page 125
[3] MECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.8
[4] MECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.1.3

4.2.2 Theoretical Roadway Noise Predictions

The impact of transportation noise sources on the development was determined by computer modelling. Transportation noise source modelling is based on the software program Predictor-Lima which utilizes the United States Federal Highway Administration's Traffic Noise Model (TNM) to represent the roadway line sources. This computer program can represent three-dimensional surfaces and first reflections of sound waves over a suitable spectrum for human hearing.

Roadway traffic noise calculations were performed by treating each roadway segment as a separate line source of noise, and by using existing building locations as noise barriers. In addition to the traffic volumes summarized in Table 2, theoretical noise predictions were based on the following parameters:

- Truck traffic on all roadways was taken to comprise 5% heavy trucks and 7% medium trucks.
- The day/night split was taken to be 90%/10% respectively for all streets.
- Ground surfaces were taken to be absorptive due to the presence of grass, however, reflective surfaces such as roads and parking lots were included in the calculation model.
- Topography was assumed to be a flat/gentle slope.
- Noise receptors were strategically placed at 12 locations around the study area (see Figure 2).

4.2.3 Roadway Traffic Volumes

The NPC-300 guidelines dictate 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 AADT values provided by the City of Pickering from previous years. These AADT. Values are then projected 10 years into the future from the year of this report with an assumed growth rate of 2%. 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
Kingston Road	4-Lane Major Arterial Undivided	60	**25,365**
Highway 401	Freeway	100	**300,129**

5. ROADWAY TRAFFIC NOISE 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 SOURCES

Receptor Number	Receiver Height Above Grade (m)	Receptor Location	Predictor Noise Level (dBA)	
			Day	Night
1	85.5	POW –North Façade – Tower B - Level 29	66	60
2	85.5	POW – East Façade – Tower B - Level 29	70	64
3	85.5	POW – South Façade – Tower B - Level 29	72	65
4	85.5	POW – West Façade – Tower B - Level 29	67	60
5	103.5	POW –North Façade – Tower A - Level 35	62	56
6	103.5	POW – East Façade – Tower A - Level 35	70	63
7	103.5	POW – South Façade – Tower A - Level 35	73	66
8	103.5	POW – West Façade – Tower A - Level 35	68	62
9	4.5	OLA – North Side – 2nd Level Terrace	69	N/A*
10	16.5	OLA – Middle – 6th Level Terrace	69	N/A*
11	4.5	OLA – South Side – 2nd Level Terrace	70	N/A*
12	1.5	OLA – Southeast Corner – Public Green Space	74	N/A*

*Nighttime noise levels are not considered as per NPC-300

The results of the current analysis indicate that noise levels will range between 62 and 74 dBA during the daytime period (07:00-23:00) and between 56 and 66 dBA during the nighttime period (23:00-07:00). The highest noise level (i.e. 74 dBA) occurs at the public green space along the south property line, which is nearest to Highway 401.

5.2 Noise Control Measures

The noise levels predicted due to roadway traffic exceed the criteria listed in Section 4.2 for building components. As discussed in Section 4.3, 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). The STC requirements for the windows are summarized below for various units within the development (see Figure 3):

- **Bedroom Windows**

(i) Bedroom windows on the south façade of Tower A and Tower B and the podium will require a minimum STC of 36

(ii) Bedroom windows on the east façade of Tower A and Tower B and the podium will require a minimum STC of 33

(iii) Bedroom windows on the west and north façades of Tower A and the podium and the west façade of Tower B will require a minimum STC of 31

- **Living Room Windows**

(i) Living room windows on the south façade of Tower A and Tower B and the podium will require a minimum STC of 30

(ii) Living room windows on the east façade of Tower A and Tower B and the podium will require a minimum STC of 28

(iii) Living room windows on the west and north façades of Tower A and the podium and the west façade of Tower B will require a minimum STC of 25

- **Retail Windows**

(i) Retail windows on the south façade of Tower A and Tower B and the podium will require a minimum STC of 25

(ii) Retail windows on the east façade of Tower A and Tower B and the podium will require a minimum STC of 23

(iii) Retail windows on the west and north façades of Tower A and the podium and the west façade of Tower B will require a minimum STC of 20

- **Exterior Walls**

(i) Exterior wall components on the south façade will require a minimum STC of 45, which will be achieved with brick cladding or an acoustical equivalent according to NRC test data[5]

The STC requirements apply to windows, doors, spandrel panels and curtainwall elements. Exterior wall components on these façades are recommended to have a minimum STC of 45 for the wall component, where a punch window and wall system is used. 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. Several manufacturers and various combinations of window components will offer the necessary sound attenuation rating. It is the responsibility of the manufacturer to ensure that the specified window achieves the required STC. This 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.

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. In addition to ventilation requirements, Warning Clauses will also be required in all Lease, Purchase and Sale Agreements.

6. CONCLUSIONS AND RECOMMENDATIONS

The noise levels predicted due to roadway traffic exceed the criteria listed in NPC-300. Therefore, building components with a higher Sound Transmission Class (STC) rating will be required where exterior noise levels exceed 65 dBA. Due to the limited information available at the time of the study, which was prepared for an Official Plan Amendment (OPA) and a ZBA application, detailed STC calculations could not be performed at this time. A detailed review of the window and wall assemblies should be performed by a qualified engineer with expertise in acoustics during the detailed design stage of the building.

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

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

Noise levels at the OLA's (Outdoor Living Areas) exceed 60 dBA in every case. This surpasses the limits as defined by NPC-300 and mitigation will be required to bring noise levels to or below 60 dBA. Mitigation is most commonly in the form of an acoustic barrier at the peimiter of the OLA, however, details of the mitigation will be discussed at the time of Site Plan Control application (SPA). These noise levels present at OLA's will also trigger the need for a Warning Clause on all Lease, Purchase and Sale Agreements.

With respect to noise impacts from the building on the surroundings and the building itself, noise from HVAC equipment can generally be minimized by judicious selection and placement of the equipment. Locating large pieces of equipment, such as cooling towers, generators, and air handling units, on a high roof, allows the building to shield nearby sensitive areas from noise exposure. Where necessary noise levels can be controlled by adding silencers, acoustic barriers, or noise screens. A stationary noise study should be conducted for the site during the detailed design once mechanical plans for the proposed building 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.

The surrounding the site includes a mix of residential and retails buildings. As such, there are no significant existing stationary noise sources surrounding the site.

A detailed roadway traffic noise assessment will be required at the time of site plan approval to determine specific noise control measures for the development.

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

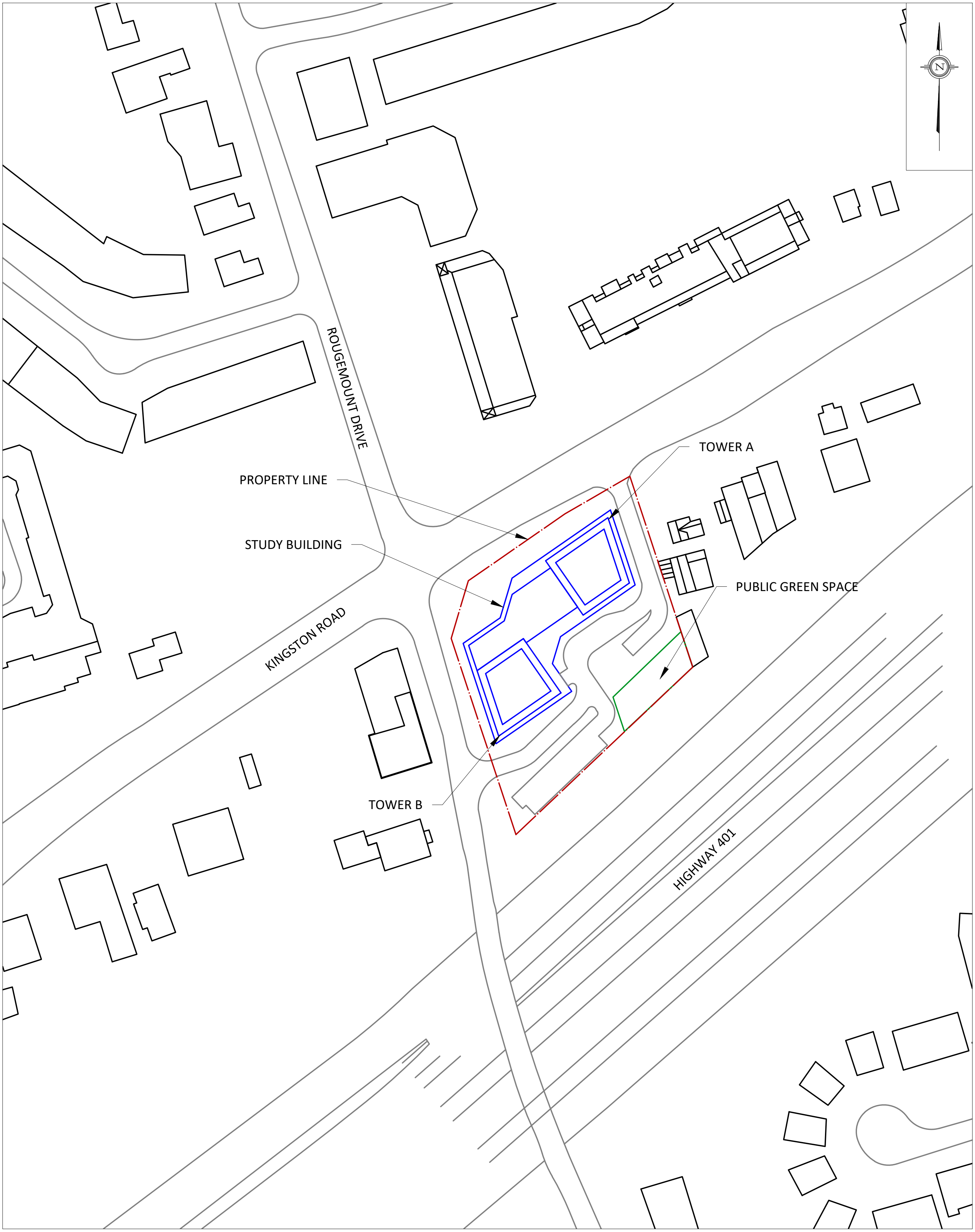
Sincerely,

Gradient Wind Engineering Inc.

Caleb Alexander, B.Eng.
Junior Environmental Scientist

Joshua Foster, P.Eng.
Principal

Gradient Wind File 21-243-Traffic Noise



GRADIENTWIND ENGINEERS & SCIENTISTS 127 WALGREEN ROAD , OTTAWA, ON 613 836 0934 • GRADIENTWIND.COM	PROJECT 375 KINGSTON ROAD, PICKERING ROADWAY TRAFFIC NOISE FEASIBILITY ASSESSMENT		DESCRIPTION FIGURE 1: SITE PLAN AND SURROUNDING CONTEXT
	SCALE 1:2000 (APPROX.)	DRAWING NO. GWE21-243-1	
	DATE SEPTEMBER 24, 2021	DRAWN BY C.A.	

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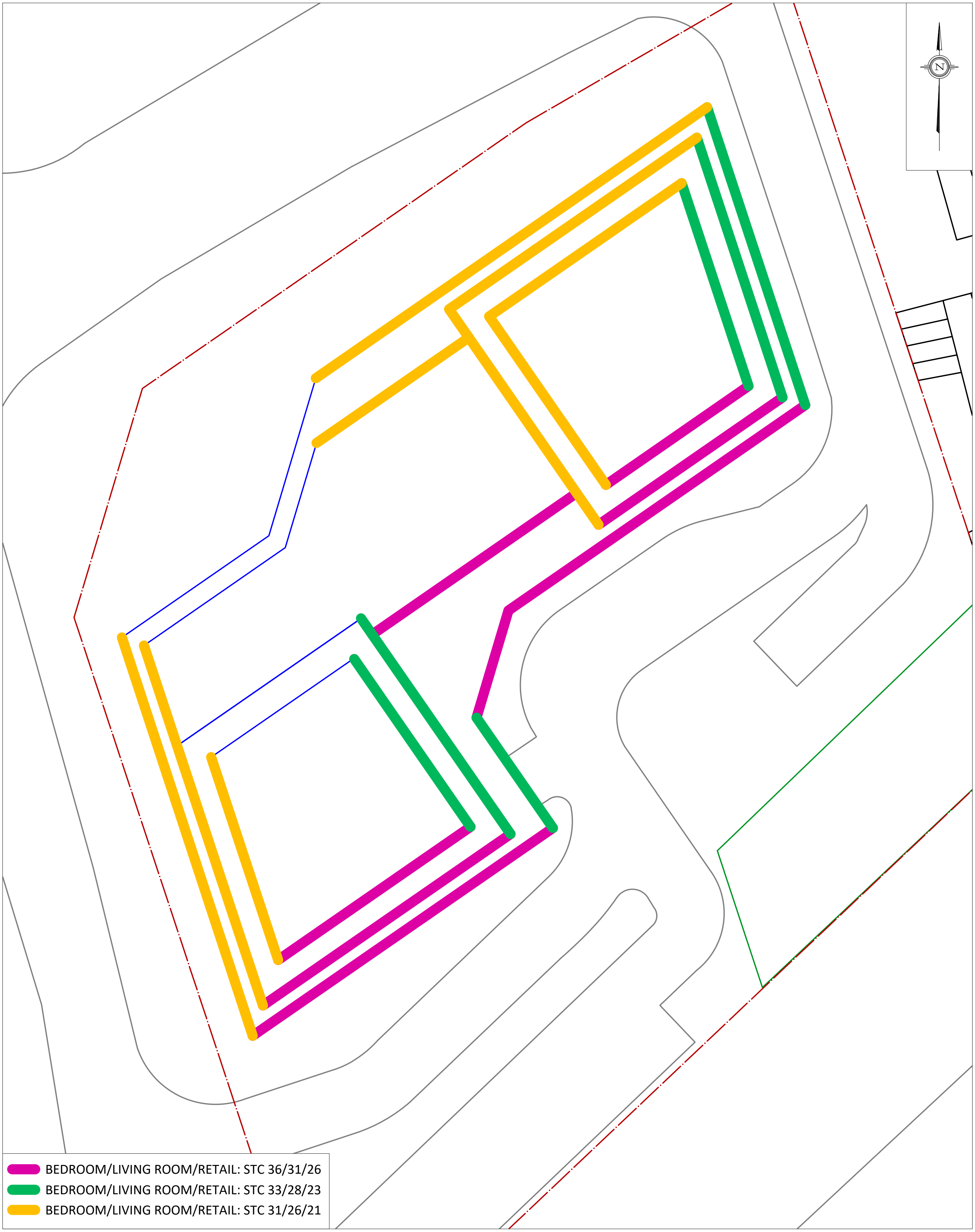
SCALE	1:1000 (APPROX.)	DRAWING NO.	GWE21-243-2
DATE	SEPTEMBER 24, 2021	DRAWN BY	C.A.

DESCRIPTION

FIGURE 2:
RECEPTOR LOCATIONS



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SCALE	1:1000 (APPROX.)
DRAWING NO.	GWE21-243-3
DATE	NOVEMBER 15, 2021
DRAWN BY	C.A.
DESCRIPTION	FIGURE 3: STC RATINGS

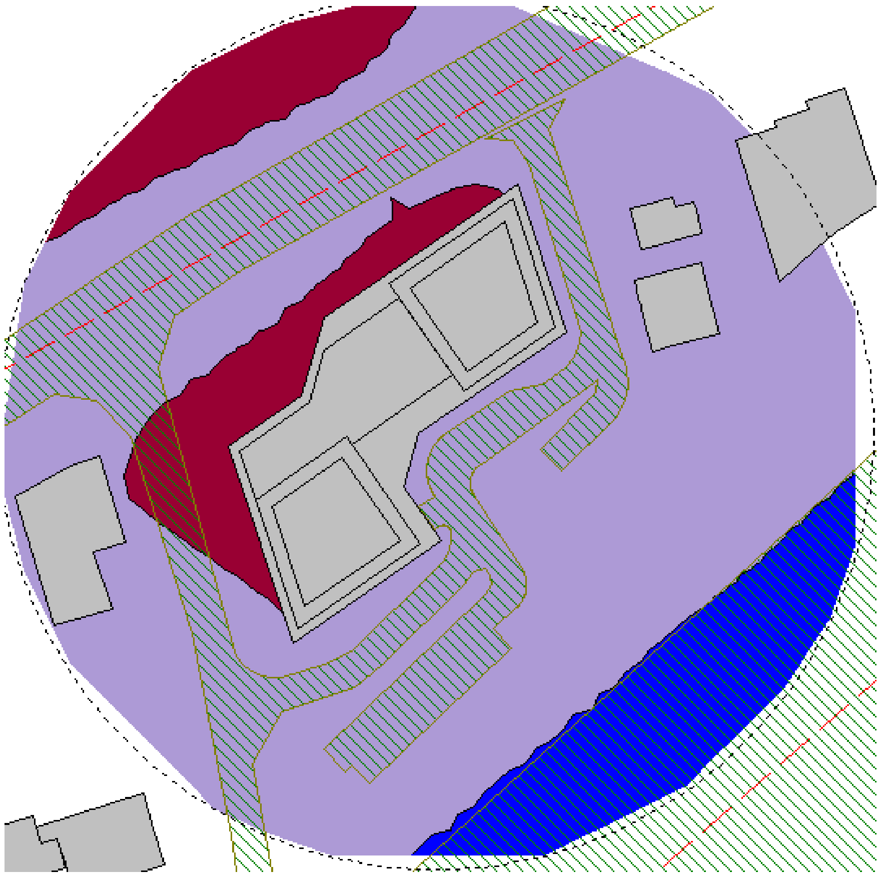

FIGURE 4: DAYTIME NOISE CONTOURS (30 M ABOVE GRADE)

- *80 – 85 dB*
- *75 – 80 dB*
- *70 – 75 dB*
- *65 – 70 dB*
- *60 – 65 dB*
- *55 – 60 dB*
- *50 – 55 dB*
- *45 – 50 dB*
- *40 – 45 dB*
- *35 – 40 dB*
- *0 – 35 dB*

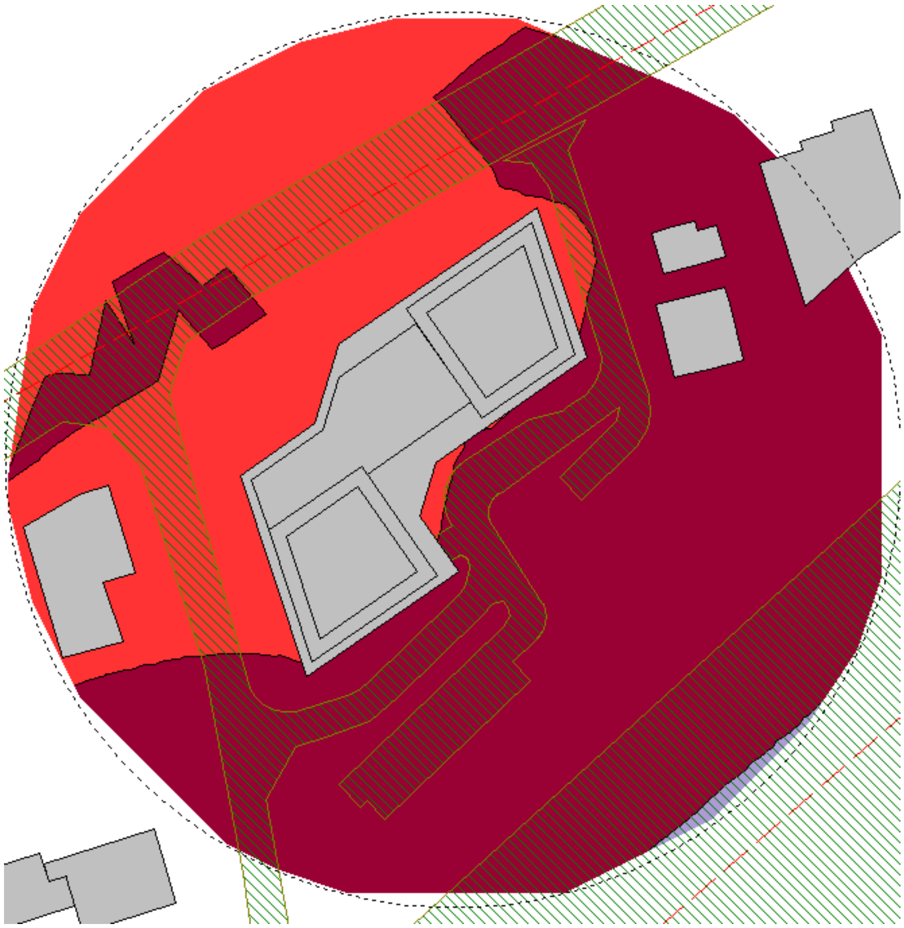

FIGURE 5: NIGHTTIME NOISE CONTOURS (30 M ABOVE GRADE)