NOISE AND VIBRATION FEASIBILITY STUDY
PROPOSED MIXED-USE DEVELOPMENT
88 PARK STREET EAST
MISSISSAUGA, ONTARIO

FOR

EDENSHAW QUEEN DEVELOPMENTS LIMITED

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1.0 INTRODUCTION

At the request of Edenshaw Queen Developments Limited, J.E. COULTER ASSOCIATES LIMITED has completed a noise and vibration feasibility study of the proposed 40- and 42-storey (not-including mechanical penthouse) mixed-use development at 88 Park Street East in Mississauga, Ontario. See Figure 1 in Appendix A for an Area Plan.

The purpose of the study is to prepare recommendations to address potential noise/vibration issues in support of the subject property's rezoning application. The site is surrounded in all directions by existing residential development with Port Credit GO Station and railway immediately to the north. The future Hurontario LRT's Port Credit Station is located to the east of the site and has also been reviewed for potential noise impacts. A review of the area indicates there are no other sources of stationary noise that would have the potential to affect the occupants of the future building itself. Please see Figure 2 in Appendix A for a Site Plan.

This report concludes that applicable MECP, Metrolinx, CN, and City of Mississauga noise guidelines can be met with modest noise control measures. These recommendations will take into consideration the noise and vibration from the surrounding transportation and stationary noise sources. This report also briefly reviews the impact of the development on itself and surrounding areas.

2.0 APPLICABLE CRITERIA

The Ministry of the Environment, Conservation, and Parks (MECP) applicable criteria to a site such as this are found in its publication *NPC-300* "Environmental Guide for Noise, Stationary and Transportation Sources – Approval and Planning."

As per *NPC-300*, this development would be considered a Class 1 – Urban area.

The MECP and the City of Mississauga do not promulgate vibration limits on new developments. Best practice standards in Ontario are based on the previous versions of the ISO-2631 vibration guidelines, which suggested a maximum limit of 0.14mm/s RMS for vibration in areas where people sleep. MECP and TTC typically target 0.10 mm/s RMS at residences during transit expansions. These standards are reviewed within this study. Vibration control is not a strict requirement but a guideline.

2.1 Transportation Noise Guidelines

Transportation noise sources addressed by *NPC-300* include aircraft, rail traffic, and roadway traffic (which include cars, trucks, buses, etc.).

Where the sound levels exceed 55 dB L_{eq} in private outdoor living areas (OLA), MECP requires noise mitigation measures to be incorporated into the development design (i.e., intervening structures such as acoustic barriers or buildings and/or greater setbacks from the noise source). However, MECP will permit sound levels up to 60 dB L_{eq} daytime (5 dB above the criterion level of 55 dB L_{eq}) in private outdoor living areas (OLA) if it is not technically feasible to achieve 55 dB. Where the criterion levels are marginally exceeded, a warning clause is required in the *Agreement of Purchase and Sale* and the subdivision/development agreement, as applicable. With respect to condominiums or townhouses, balconies are considered OLAs only if they are 4m or greater in depth.

For residential buildings, the Ministry's ventilation requirements are based on the sound level at the exterior building façade. Where the sound levels at the exterior of the building façade exceed 55 dB L_{eq} daytime at the living room window or 50 dB L_{eq} nighttime at the bedroom window, the unit must be provided with forced air heating, with a provision for future air conditioning by the owner. An excess up to 10 dB is permissible, provided a warning clause is given. Where the sound levels exceed this limit (i.e., 65 dB L_{eq} daytime or 60 dB L_{eq} nighttime), air conditioning must be incorporated into the building design prior to occupancy. Warning clauses are applicable as well.

Air-conditioning requirements are applied so that adequate interior sound levels can be maintained with the windows closed.

The MECP also stipulates acceptable indoor sound levels limits, which vary depending on whether they are railway noise sources or roadway noise sources.

The applicable MECP criteria are summarized in Table 1, below.

Table 1: Noise Criteria Summary

Type of Space	Road		Rail	
	Daytime (dB L_{eq}) (0700–2300)	**Nighttime (dB L_{eq}) (2300–0700)**	**Daytime (dB L_{eq}) (0700–2300)**	**Nighttime (dB L_{eq}) (2300–0700)**
Outdoor Living Area (OLA)	55	N/A	55	N/A
Bedrooms	45	40	40	35
Living/Dining	45	45	40	40
Kitchen/Baths	45	45	40	40

Note: OLAs for condominiums are terraces/balconies greater than 4m in depth and common amenity areas such as rooftop patios intended for quiet enjoyment.

The primary source of transportation noise that has the potential to exceed the guidelines is the railway corridor. The Lakeshore West corridor carries GO Train Traffic, VIA traffic, and some freight traffic. The site is located ~250m from Lakeshore Road. Traffic noise from this roadway is not expected to be significant at such setbacks and is not considered further. Similarly, Park Street, Queen Street, and Ann Street are projected to carry very little traffic (~4,000 vehicles per day ultimate) and would not generate sound levels high enough to exceed the guideline levels.

2.2 Stationary Sources

MECP defines stationary noise sources 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." *NPC-300* basically states the average noise of the stationary source should not exceed the average noise of the roadway traffic during the same hourly time period for Class 1 areas or the exclusion limits, whichever is higher. The exclusion limits that apply are 50 dB L_{eq} during the daytime (0700–1900 hours), 50 dB L_{eq} during the evening (1900–2300 hours) and 45 dB L_{eq} nighttime (2300–0700 hours), respectively.

A “stationary noise source,” to which the guideline applies, is defined in the interpretation section of the MECP guideline as being everything on a property, with a series of exceptions. The time period over which the sound is averaged is 1 hour.

Aside from the future Hurontario LRT’s Port Credit Station, there are no other sources of nearby stationary noise that have the potential to affect the subject development.

2.3 Vibration Guidelines

As mentioned, the MECP and the City of Mississauga do not enforce vibration level limits for new developments. Instead, railways such as CP, CN, and Metrolinx request that vibration levels on the nearest residential floor not exceed 0.14mm/s RMS overall between 4 Hz and 200 Hz. These limits are outlined in the Federation of Canadian Municipalities’ Railway Proximity Guidelines and CN’s Principal Main Line Requirements. If an excess above this level is expected, vibration control measures need to be incorporated into the development.

The subject site is located within 75m of the railway right of way. As a result, vibration measurements have been completed.

3.0 TRANSPORATION NOISE SOURCES

The following sections summarize the noise sources surrounding the proposed development.

3.1 Roadway Noise Sources

The site is bounded immediately to the east by the future LRT with Hurontario Street beyond. Nearby streets such as Queen, Ann, and Park carry significantly less traffic based on volumes provided by the City and are not considered further. Traffic volumes for the Hurontario LRT are taken from the 2014 EPR appendices. Ultimate traffic volumes for Hurontario Street were provided by the City of Mississauga. These volumes are summarized in Table 2 below. The speed limit in the area is assumed to be 50 km/hr for the traffic on Hurontario Street and 60 km/hr for the light rail vehicles (LRVs).

Table 2: Future Road Traffic Volumes

Roadway	Daytime Traffic				Nighttime Traffic			
	Cars	Medium	Heavy	LRT Sets	Cars	Medium	Heavy	LRT Sets
Hurontario	21,237	880	743	280	2,360	95	83	44

3.2 Light Rail Transit

The City of Mississauga and Metrolinx are currently building a light rail transit system between Port Credit and Steeles Avenue along Hurontario Street (the Hurontario LRT, which is now called the Hazel McCallion LRT).

An Environmental Assessment of the project was originally completed in 2014. The 2014 plan for the LRT was to run in the centre of Hurontario Street in the area of the subject development.

The 2014 study predicted that the LRT volume would be 280 vehicle sets during the daytime and 44 vehicle sets during the nighttime. Each vehicle was expected to produce a maximum

sound level of 82 dBA at 7.5m while travelling at 60 km/hr. Note that the LRT will be covered between the railway corridor and the terminal station and will not generate significant noise at the future development site.

3.3 Railway Traffic

The nearby rail corridor is one of the busier corridors and carries CN freight traffic as well as Metrolinx/GO Transit and VIA Rail. Traffic volumes have been provided by CN and Metrolinx for the corridor. The volumes are summarized in Table 3, below. Except for the GO Transit traffic, which is already projected to the future, the VIA and CN rail volumes are escalated by 10 years using a 2.5% per annum growth rate (approximately 1 dB increase over current traffic volumes).

Table 3: Railway Traffic Summary

Service	Daytime Volume	Nighttime Volume	Locomotives Per Train	Rail Cars Per Train	Speed (km/h)
VIA	12	0	2	10	152
CN Freight	1	0	4	140	96
CN Way Freight	1	4	2	25	96
GO Transit	354	54	1	12	137

Metrolinx has indicated that the future traffic will consist of a mix of diesel and electric trains, but have indicated that differences in sound levels should not be assumed. As such, all trains are treated as diesel trains for this review.

4.0 TRANSPORTATION NOISE ASSESSMENT

Based on the volumes provided in Section 3.0, the sound levels have been calculated at several locations shown in Figure 3 of the proposed development. The roadway sound levels including the contribution from the LRT were calculated in STAMSON 5.04 in accordance with the City of Mississauga's terms of reference for noise and vibration studies. The railway sound levels were calculated in CadnaA using the Federal Railroad Administration (FRA) module in accordance with provincial and Metrolinx standards noted in *NPC-306*. The calculated sound levels are summarized in Table 4, below.

Table 4: Transportation Noise Summary

Location	Tower	Description	Rail		Road		Combined	
			Daytime (dBA $L_{eq,16hr}$)	Nighttime (dBA $L_{eq,8hr}$)	Daytime (dBA $L_{eq,16hr}$)	Nighttime (dBA $L_{eq,8hr}$)	Daytime (dBA $L_{eq,16hr}$)	Nighttime (dBA $L_{eq,8hr}$)
1	North	North Façade	73	68	63	57	73	68
2	North	East Façade, North Side	70	65	66	60	71	67
3	North	West Façade, North Side	71	67	N/A	N/A	71	67
4	North	South Façade, East Side	54	50	63	57	63	58
5	North	2nd Floor Amenity	71	N/A	60	N/A	71	N/A

Location	Tower	Description	Rail		Road		Combined	
			Daytime (dBA $L_{eq,16hr}$)	Nighttime (dBA $L_{eq,8hr}$)	Daytime (dBA $L_{eq,16hr}$)	Nighttime (dBA $L_{eq,8hr}$)	Daytime (dBA $L_{eq,16hr}$)	Nighttime (dBA $L_{eq,8hr}$)
6	North	3rd Floor Amenity	71	N/A	59	N/A	71	N/A
7	North	16th Floor Amenity	54	N/A	46	N/A	54	N/A
8	South	North Façade, West Side	66	60	N/A	N/A	66	60
9	South	East Façade	63	58	65	59	67	61
10	South	South Façade, East Side	52	47	62	56	62	56
11	South	West Façade, North Side	64	58	N/A	N/A	64	58
12	South	16th Floor Amenity	53	N/A	47	N/A	54	N/A

Note: OLA sound level calculations assume the presence of a 1.1m high safety barrier that acts as a noise barrier.

Please see Appendix B for sample calculations.

4.1 Noise Control Recommendations

The calculated sound levels exceed the MECP guidelines. As a result, noise control measures will be required.

Ventilation Upgrades

As the sound levels exceed 65 dBA L_{eq} during the daytime and 60 dBA L_{eq} during the nighttime, the entire development should be provided with central air conditioning. All of the affected units will need to be supplied with Warning Clause D (see Appendix C) in their *Agreements of Purchase and Sale or Lease*. The use of central air conditioning is fairly standard for new residential developments.

Noise Barriers

It is recommended that all private terraces/balconies be limited in depth to less than 4m. Otherwise, these terraces may require noise barriers.

There are proposed outdoor amenity areas on the 16th floors of the north and south towers. Assuming the presence of a 1.1m tall safety screen that would also act as a noise barrier, the sound levels at these amenity areas during the daytime are approximately 54 dBA $L_{eq,16hr}$. The sound levels are lower than the MECP guidelines' limit of 55 dBA $L_{eq,16hr}$ and further noise control is not recommended for these amenity areas.

Additionally, there are proposed outdoor amenity areas on the 2nd and 3rd floor of the north tower. These amenity areas are located on the north side of the tower and face the railway. As

can be seen in the table above, the sound levels at these amenity areas are predicted to be 71 dBA $L_{eq,16hr}$. Table 5 outlines the barrier heights needed to achieve various sound levels at the 2nd level amenity of the north tower.

Table 5: Barrier Heights vs. Sound Levels for 2nd Floor Amenity of the North Tower

Barrier Height (m)	OLA Sound Level (dBA $L_{eq,16hr}$)
1.1	70
2.0	62
2.7	60
6.9	55

Table 6 outlines the barrier heights needed to achieve various sound levels at the 3rd level amenity of the north tower.

Table 6: Barrier Heights vs. Sound Levels for 3rd Floor Amenity of the North Tower

Barrier Height (m)	OLA Sound Level (dBA $L_{eq,16hr}$)
1.1	68
2.0	61
2.5	60
6.4	55

MECP will allow up to 5 dBA excess provided a warning clause is inserted in the *Agreement of Purchase and Sale or Lease* and the subdivision/development agreement as applicable. As a result, sound levels of 60 dBA are permissible in outdoor areas. As can be seen in the table above, it is not practical to achieve the target sound level of 55 dBA at the north tower's 2nd and 3rd floor outdoor amenity areas without significant noise control measures. Meeting the upper limit of 60 dBA would require noise barriers 2.7m tall and 2.5m tall for the 2nd and 3rd floor amenity areas, respectively.

Given the excessive sound levels and the significant noise barriers needed, these outdoor amenity areas should not be designated as intended for quiet enjoyment of the outdoors. As noted in *NPC-300*, the MECP only considers outdoor amenity areas as noise sensitive if they are:

- intended and designed for the quiet enjoyment of the outdoor environment; and
- readily accessible from the building.

The 2nd and 3rd floor amenity areas of the north towers should not be designated or marketed for such uses. Each building instead provides access to quieter amenity spaces on the 16th floors, which readily meet the 55 dBA criteria. These other spaces can be designated for quiet enjoyment of the outdoor environment.

For rooftops, noise barriers can be constructed from a variety of materials including glass, concrete, masonry, metal, or plastic. As per *NPC-300*, such a rooftop noise barrier may have surface densities as low as 10 kg/m^2 and "should be structurally sound, appropriately designed to withstand wind and snow load, and constructed without cracks or surface gaps. Any gaps under the barrier that are necessary for drainage purposes should be minimized and localized, so that the acoustical performance of the barrier is maintained."

All units should be provided with Warning Clause B in their *Agreements of Purchase and Sale or Lease*.

Exterior Glazing and Walls/Panels

All exterior wall assemblies on the north, east, and west façades of the north and south tower should be constructed with brick veneer or masonry equivalent. Where spandrel panels are used in these, they should be constructed to achieve STC 55 in order to achieve an acoustical equivalent. An example construction for metal spandrel would be:

- Aluminum panel in aluminum frames
- 50mm rigid batt insulation
- 20 GA. galvanized steel backpan
- 16mm gypsum board or 13mm cement board laminated to backpan
- 12mm air space
- 64mm batt insulation
- 64mm steel studs @ 600mm o/c
- 2x16mm gypsum board (Fire Code C or Type X).

The suite layouts for the proposed development have not been detailed. Preliminary sound levels have been calculated using the National Research Council's BPN-56 prediction procedure using the most current plans. The preliminary calculations assume a 50% window-to-floor area ratio for bedrooms and a 70% window-to-floor area ratio for living rooms.

Table 7: Window STC Requirements

Tower	Façade	Room Type	Window STC
North	North	Bedroom	39
		Living Room	41
	East/West	Bedroom	37
		Living Room	39
	South	Bedroom	35
		Living Room	35
South	North/South/East/West	Bedroom	35
		Living Room	35

The above glazing and spandrel recommendations are preliminary. It is recommended the final design and floor plans be reviewed by a qualified acoustical engineer prior to building permit, to ensure appropriate façade upgrades have been incorporated. Minor modifications to the STC ratings may be needed in the case of higher or lower window-to-floor area ratios.

5.0 STATIONARY NOISE ASSESSMENT

As noted, the only nearby stationary noise source that has the potential to exceed the criteria at the subject development is the future Port Credit LRT station to the east.

5.1 Guideline/Ambient Sound Levels

As per *NPC-300*, the higher of the ambient or minimum exclusion criteria form the guideline sound levels for stationary sources. In *NPC-300*, railway noise can be included in calculating the ambient sound levels of the quietest hour, provided there are at least 40 trains during the

daytime or 20 trains during the nighttime. The calculated railway noise is adjusted 10 dB downwards, to reflect the infrequent nature of this kind of ambient noise source. For road traffic, the traffic volumes during the quietest hour are usually half the average volume for that period. This typically represents a 3 dB downward adjustment to the daytime or nighttime sound levels. As ultimate traffic volumes were used, a 6 dB adjustment was made to the road traffic sound levels, to be conservative.

Considering the above adjustments, the guideline sound levels have been calculated and are summarized in Table 8, below.

Table 8: Daytime and Nighttime Guideline Sound Levels

Location	Tower	Description	Rail		Road		Combined	
			Daytime (dBA $L_{eq,16hr}$)	Nighttime (dBA $L_{eq,8hr}$)	Daytime (dBA $L_{eq,16hr}$)	Nighttime (dBA $L_{eq,8hr}$)	Daytime (dBA $L_{eq,16hr}$)	Nighttime (dBA $L_{eq,8hr}$)
1	North	North Façade, Central	63	58	57	51	64	59
2	North	East Façade, North Side	60	55	60	54	63	57
4	North	South Façade, East Side	44	39	57	51	57	51
5	North	2nd Floor Amenity	61	N/A	54	N/A	62	N/A
7	North	16th Floor Amenity	44	N/A	40	N/A	45	N/A
8	South	North Façade, East Side	53	47	56	50	56	50
9	South	East Façade	53	48	59	53	60	54
10	South	South Façade, East Side	42	37	56	50	56	50
12	South	16th Floor Amenity	43	N/A	41	N/A	45	N/A

The quietest sound levels at the 16th floor amenity areas of the north and south tower are lower than the Class 1 minimum daytime exclusion criteria. As such the exclusion limits of 50 dB L_{eq} will be used for these amenity areas.

5.2 Stationary Sources

The future Hurontario LRT's Port Credit Station is located immediately east of the subject development. The station is currently under construction. Details regarding the environmental noise impact of the future Hurontario LRT's Port Credit Station were provided by Metrolinx. The station includes various equipment such as a tunnel ventilation system (TVS), exhaust fans, etc.

There are no other major stationary noise sources near the subject development that have the potential to exceed the noise criteria.

5.3 Predicted Stationary Source Sound Levels

The noise impact from the station's mechanical equipment has been modelled using the ISO-9613 procedure in CadnaA. Conservatively, all the equipment (including the tunnel ventilation fans) was assumed to run at 100% load during the daytime and nighttime period, similar to the approach used in the noise impact assessment completed for the station by Metrolinx. The results, as compared to the ambient sound levels, are summarized in Table 9, below.

Table 9: Predicted Stationary Source Sound Levels

Location	Tower	Description	Ambient/Guideline		Predicted Sound Levels	
			Daytime (dBA $L_{eq,16hr}$)	Nighttime (dBA $L_{eq,8hr}$)	Daytime (dBA $L_{eq,16hr}$)	Nighttime (dBA $L_{eq,8hr}$)
1	North	North Façade, Central	64	59	44	44
2	North	East Façade, North Side	63	57	49	49
4	North	South Façade, East Side	57	51	41	41
5	North	2nd Floor Amenity	62	N/A	40	N/A
7	North	16th Floor Amenity	50	N/A	32	N/A
8	South	North Façade, East Side	56	50	40	40
9	South	East Façade	60	54	48	48
10	South	South Façade, East Side	56	50	36	36
12	South	16th Floor Amenity	50	N/A	33	N/A

The above analysis indicates that the predicted sound levels at the proposed development are below the guideline sound levels at all locations and further noise control is not required. In fact, the predicted sound levels are also below the exclusionary criteria from the MECP at a majority of receptors, indicating the Port Credit station is predicted to meet the criteria even in the absence of any ambient noise sources.

The emergency equipment associated with the station are the tunnel ventilation system (TVS) fans. As per *NPC-300*, the sound level limit during periodic testing of emergency equipment is 5 dBA higher than the sound level limits indicated in Table 9, above. In addition, the testing of the emergency equipment can be assessed separately from the balance of the noise sources. The sound levels in Table 9 include the noise from the TVS fans are shown meet the guideline limits. As such, the sound levels of the TVS fans in isolation would also meet the higher guideline limits for emergency equipment. Further noise control is not required for the TVS fans.

The standard Metrolinx warning clause should be provided in all *Agreements of Purchase and Sale or Lease*.

While the predicted sound levels from the station are well below the criteria, Warning Clause E should still be provided in all *Agreements of Purchase and Sale or Lease*.

6.0 VIBRATION ASSESSMENT

CN and Metrolinx typically require vibration measurements for developments 75m or closer to their railway rights-of-way. Vibration measurements were conducted along the northern property line of the future development. The four highest vibration levels are summarized in Table 10, below. Sample passby spectrum data are provided in Appendix B. The measurement location is also shown in Appendix B.

Table 10: Measured Vibration Levels

Train Passby	Direction	RMS Vibration (mm/s)
1	Eastbound	0.03
2	Westbound	0.04
3	Eastbound	0.03
4	Westbound	0.04

As can be seen in Table 10, the vibration levels are well below the limit of 0.14 mm/s RMS, as expected, due to the low speed of the trains near the stations. Vibration control measures are not required for the subject site.

The vibration levels from the LRT could not be confirmed as the LRT is not yet operational. Given the very low speeds at the terminus station, it is not expected the LRT will generate vibration levels that exceed the limit of 0.14 mm/s RMS, especially considering residential units do not start until the 5th floor of the north tower.

7.0 IMPACT OF THE DEVELOPMENT ON ITSELF AND THE SURROUNDING AREA

The City requests that new developments consider the noise impact of the development both on itself and the surrounding area.

There is residential development around the entire subject site. Typically, for a development such as this, parking level exhaust fans and mechanical equipment located on the rooftop are the major noise generators.

In terms of the impact of the development on itself, the development's own mechanical/electrical equipment needs to be considered.

The mechanical design of the development has not yet progressed to the point where the impact of the development on itself or its surroundings can be accurately quantified. As plans mature, a review of the impacts of the development on itself as well as on the surrounding area can be completed. In most cases, the most critical receptors are often the building's own future occupants.

Noise control measures for the development's mechanical equipment can be readily incorporated into the design. In many cases, equipment can also be selected to avoid a noise impact entirely. It is recommended a review of the outdoor noise impact of the development be completed at such a time when the mechanical design is completed, prior to the building permit application. Given the high ambient sound levels, there are not expected to be any issues from the development that cannot be addressed.

8.0 CONCLUSIONS

The proposed development is located in an area with a modest amount of transportation noise. The transportation sound levels exceed the MECP guidelines, and noise control measures in the form of ventilation upgrades, noise barriers, and façade elements have been recommended. The extent and nature of these upgrades is similar to those required for residential developments built nearby busy railways. These recommendations will be confirmed and detailed as part of the site plan application for the proposed development as the building design is finalized. The glazing recommendations may need to be revisited should there be changes to the layouts that affect the noise control measures noted in this report.

An analysis of the Port Credit LRT station indicates that the sound levels do not exceed the guidelines at the proposed development. Further noise control is not required.

Overall, the study demonstrates the proposed development is technically feasible from a noise and vibration perspective. There are no major noise and/or vibration issues that would prove challenging to address at later stages of the design.

9.0 SUMMARY OF RECOMMENDATIONS

To meet the requirements of the MECP, the City of Mississauga, Metrolinx, and CN, the following noise control measures will be required:

1. All units will be supplied with central air conditioning. Warning Clause Type D will be inserted into the *Agreements of Purchase and Sale or Lease* for all units.

2. Terraces and private balconies greater than 4m in depth are currently not proposed. If included, such areas should be reviewed for noise control measures, where required. Given the significant ambient sound levels, such private terraces should be avoided.

3. All units within the development need to be supplied with Warning Clause Type B in their *Agreements of Purchase and Sale or Lease*.

4. General glazing and spandrel panel recommendations have been provided based on current suite layouts. It is recommended the final design and floor plans be reviewed by a qualified acoustical engineer prior to building permit, to ensure appropriate façade upgrades have been incorporated.

5. The north tower's 2nd and 3rd floor amenity areas should not be designated or planned for quiet use, given the high sound ambient levels.

6. The north and south towers' 16th floor amenity areas are predicted to meet the MECP guidelines assuming a standard 1.1m tall noise barrier along the perimeter.

7. As the development is located within 300m of the railway corridor, all units should be provided with the standard CN and Metrolinx Warning Clauses in any case. The warning clauses are to be inserted into the *Agreements of Purchase and Sale or Lease*.

8. Vibration control is not required as the vibration levels were measured to be well below 0.14 mm/s RMS. The LRT vibration levels are similarly expected to be well below the limit.

9. Prior to the building permit application, or at such a time when the final design is completed, a review of the proposed development's mechanical and electrical equipment should be completed to ensure that applicable noise guidelines are met at the surrounding areas as well as at the future development itself.

10. The future Hurontario LRT's Port Credit Station is located to the east of the site. An analysis of the stationary noise sources indicates that the sound levels do not exceed the guideline sound levels at the proposed development. Warning Clause E should still be provided in all *Agreements of Purchase and Sale or Lease.*

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APPENDIX A: FIGURES

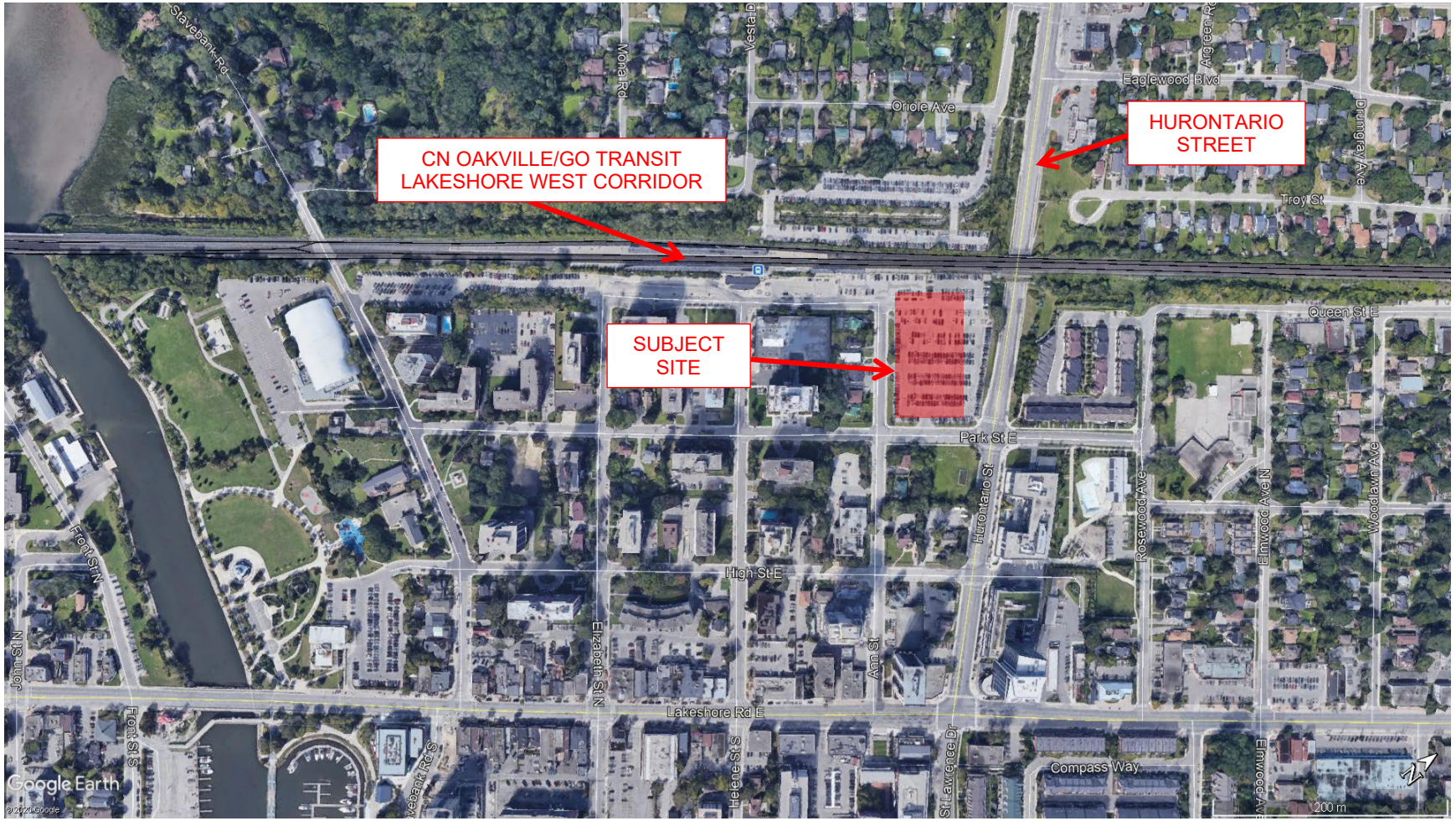


Figure 1: Key Plan

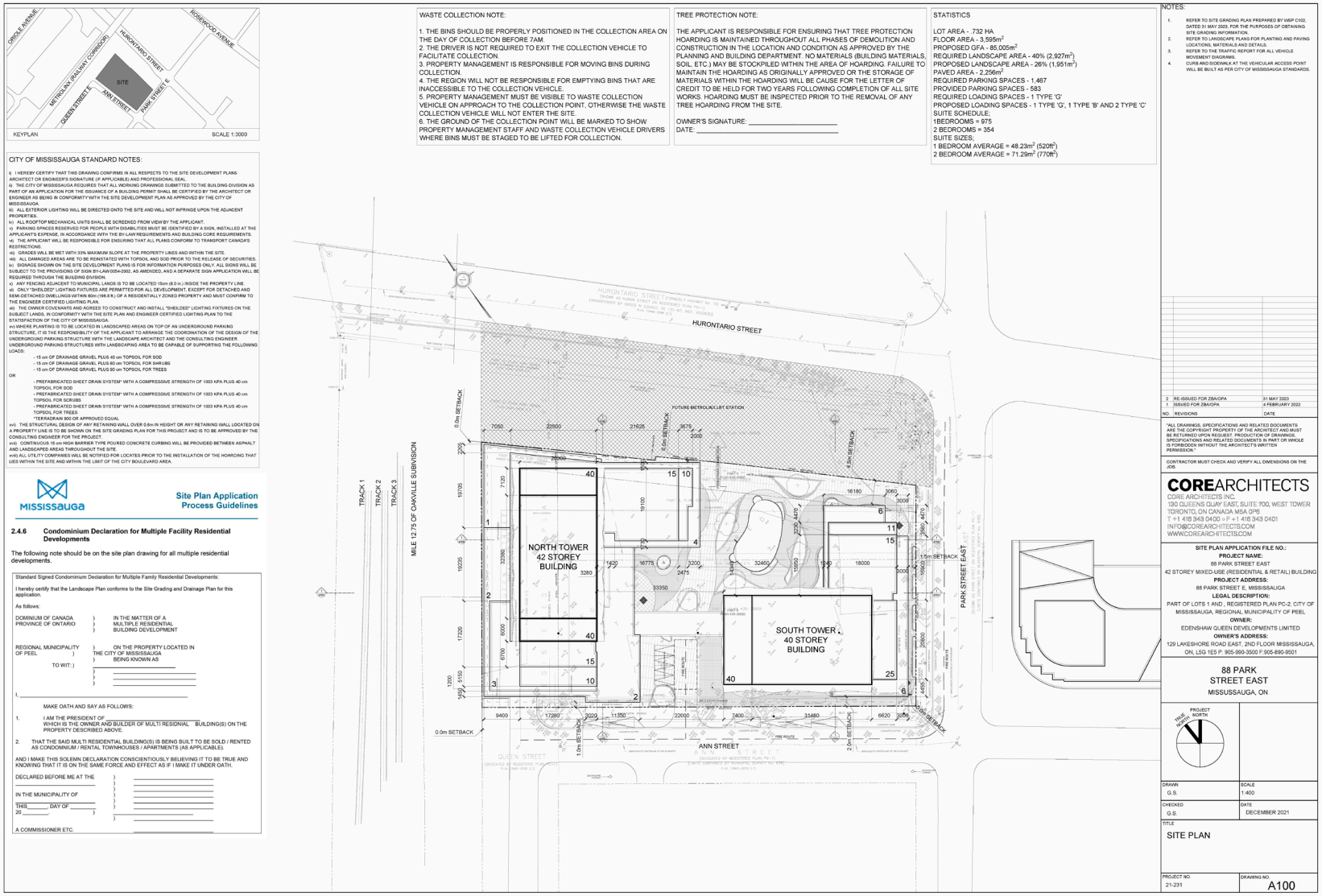


Figure 2: Site Plan

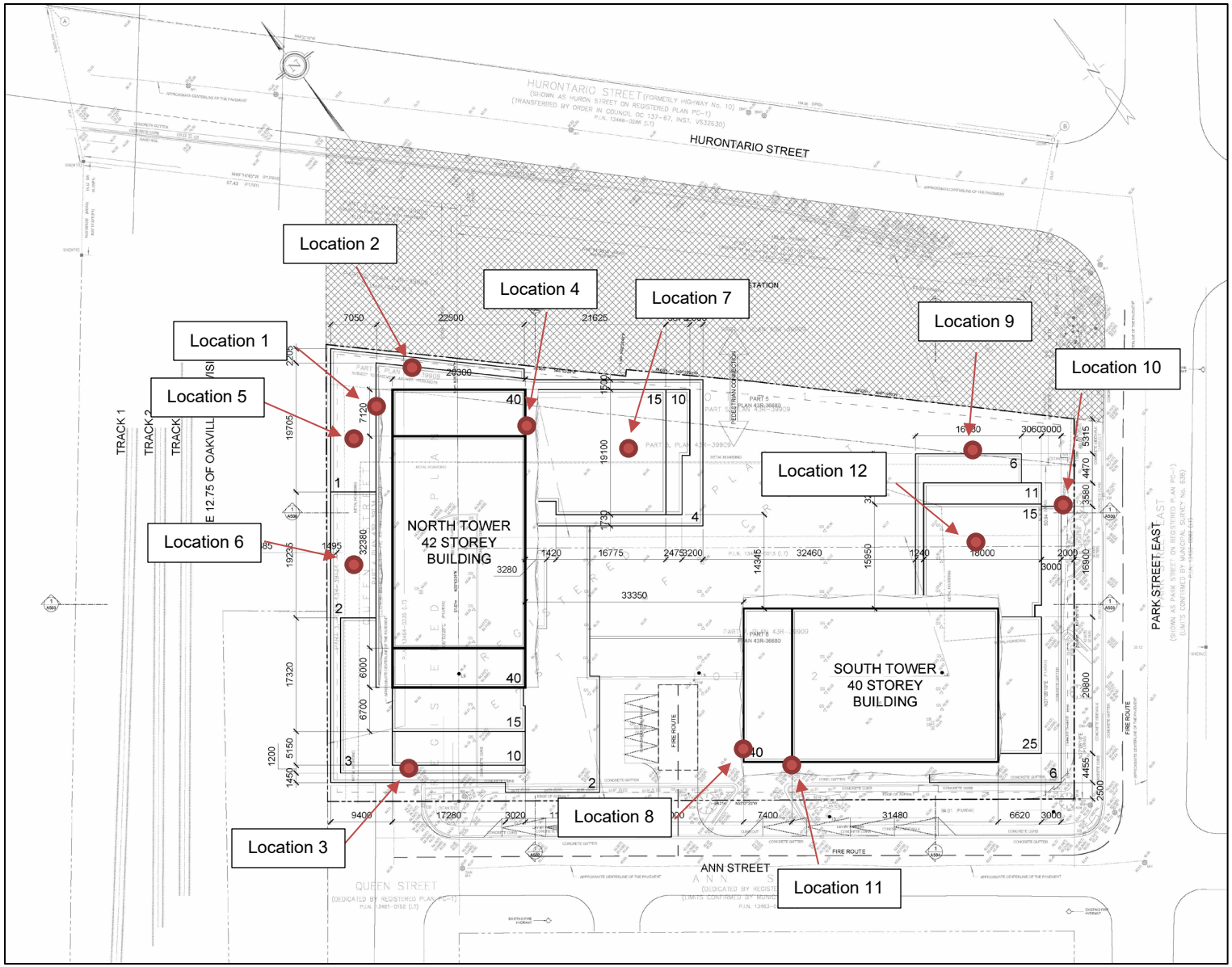


Figure 3: Locations for Transportation and Stationary Noise Analysis

APPENDIX B: DATA AND SAMPLE CALCULATIONS

Subject:RE: 23 Elizabeth Street North, Mississauga - Rail Data Request
Date: Fri, 3 Feb 2023 21:01:05 +0000
From: Rail Data Requests <RailDataRequests@metrolinx.com>
To:SAM KULENDRAN <skulendran@jecoulterassoc.com>

Hi Sam,

Further to your request dated February 2, 2023, the subject lands (23 Elizabeth Street North, Mississauga) are located within 300 metres of the Metrolinx Oakville Subdivision (which carries Lakeshore West GO rail service).

It's anticipated that GO rail service on this Subdivision will be comprised of diesel and electric trains. The GO rail fleet combination on this Subdivision will consist of up to 2 locomotives and 12 passenger cars. The typical GO rail weekday train volume forecast near the subject lands, including both revenue and equipment trips is in the order of 408 trains. The planned detailed trip breakdown is listed below:

	1 Diesel Locomotive	2 Diesel Locomotives	1 Electric Locomotive	2 Electric Locomotives		1 Diesel Locomotive	2 Diesel Locomotives	1 Electric Locomotive	2 Electric Locomotives
Day (0700-2300)	132	0	222	0	Night (2300-0700)	20	0	34	0

The current track design speed near the subject lands is 85 mph (137 km/h).

There are *anti-whistling by-laws* in affect near the subject lands at Stavebank Rd.
With respect to future electrified rail service, Metrolinx is committed to finding the most sustainable solution for electrifying the GO rail network and we are currently working towards the next phase.
Options have been studied as part of the Transit Project Assessment Process (TPAP) for the GO Expansion program, currently in the procurement phase. The successful proponent team will be responsible for selecting and delivering the right trains and infrastructure to unlock the benefits of GO Expansion. The contract is in a multi-year procurement process and teams have submitted their bids to Infrastructure Ontario and Metrolinx for evaluation and contract award. GO Expansion construction will get underway in late 2022 or 2023.
However, we can advise that train noise is dominated by the powertrain at lower speeds and by the wheel- track interaction at higher speeds. Hence, the noise level and spectrum of electric trains is expected to be very similar at higher speeds, if not identical, to those of equivalent diesel trains.
Given the above considerations, it would be prudent at this time, for the purposes of acoustical analyses for development in proximity to Metrolinx corridors, 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 once the proponent team is selected.
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 be noted that this information only pertains to Metrolinx rail service. It would be prudent to contact other rail operators in the area directly for rail traffic information pertaining to non-Metrolinx rail service.

I trust this information is useful. Should you have any questions or concerns, please do not hesitate to contact me.
Regards,
Tara

Tara Kamal Ahmadi
Junior Analyst
Third Party Projects Review, Capital Projects Group
Metrolinx | 20 Bay Street | Suite 600 | Toronto | Ontario | M5J 2W3

METROLINX

Dear Sam:

Re: Train Traffic Data – CN Oakville Subdivision near 23 Elizabeth Street N, Mississauga ON

The following is provided in response to Sam's 2020/03/18 request for information regarding rail traffic in the vicinity of 23 Elizabeth Street North, in Mississauga ON at approximately Mile 13.01 on CN's Oakville Subdivision.

Typical daily traffic volumes are recorded below. However, traffic volumes may fluctuate due to overall economic conditions, varying traffic demands, weather conditions, track maintenance programs, statutory holidays and traffic detours that when required may be heavy although temporary. For the purpose of noise and vibration reports, train volumes must be escalated by 2.5% per annum for a 10-year period.

Typical daily traffic volumes at this site location are as follows:

***Maximum train speed is given in Miles per Hour**

	0700-2300			
Type of Train	Volumes	Max.Consist	Max. Speed	Max. Power
Freight	1	140	60	4
Way Freight	1	25	60	4
Passenger	12	10	95	2

	2300-0700			
Type of Train	Volumes	Max.Consist	Max. Speed	Max. Power
Freight	0	140	60	4
Way Freight	4	25	60	4
Passenger	0	10	95	2

The volumes recorded reflect westbound and eastbound freight and passenger operations on CN's Oakville Subdivision.

Except where anti-whistling bylaws are in effect, engine-warning whistles and bells are normally sounded at all at-grade crossings. There are two (2) at-grade crossing in the immediate vicinity of the study area at Mile 12.02 Revus Ave, and Mile 13.11 Stavebank Rd Xing. Anti-whistling bylaws are in effect at both Mile 12.02 Revus Ave and Mile 13.11 Stavebank Rd. Please note that engine warning whistles may be sounded in cases of emergency, as a safety and or warning precaution at station locations and pedestrian crossings and occasionally for operating requirements.

With respect to equipment restrictions, the gross weight of the heaviest permissible car is 286,000 lbs.

The double mainline track is considered to be continuously welded rail throughout the study area.

The Canadian National Railway continues to be strongly opposed to locating developments near railway facilities and rights-of-way due to potential safety and environmental conflicts. Development adjacent to the Railway Right-of-Way is not appropriate without sound impact mitigation measures to reduce the incompatibility. For confirmation of the applicable rail noise, vibration and safety standards, **Adjacent Development**, Canadian National Railway Properties at Proximity@cn.ca should be contacted directly.

I trust the above information will satisfy your current request.

Sincerely,

Michael Vallins P.Eng
Manager, Public Works- Eastern Canada

NOISE REPORT FOR PROPOSED DEVELOPMENT

Date:	22-Dec-21

REQUESTED BY:

Name:	Sam Kulendran, B.A.Sc., P.Eng.
Company:	J.E. Coulter Associates Ltd.

PREPARED BY:

Nam	Steven Guan
Tel#:	905-615-3200 ext. 5933

MISSISSAUGA

Location:	Park Street E - Stavebank Rd to Hurontario St Ann Street - Lakeshore Rd E to Queen St E Queen Street E - Elizabeth St N to Ann St Hurontario Street (1) - Lakeshore Rd E to Park St E Hurontario Street (2) - north of Park St E
ID	528

ON SITE TRAFFIC DATA

Specific	*Street Names*				
	Park St E	Ann St	Queen St E	Hurontario St (1)	Hurontario St (2)
AADT:	4,000	2,000	2,000	21,300	25,400
# of Lanes:	2 Lanes	2 Lanes	1 Lane	4 Lanes	4 Lanes
% Trucks:	4%	2%	2%	7%	7%
Medium/Heavy Trucks Ratio:	55/45	55/45	55/45	55/45	55/45
Day/Night Split:	90/10	90/10	90/10	90/10	90/10
Posted Speed Limit:	50 km/h	50 km/h	50 km/h	50 km/h	50 km/h
Gradient Of Road:	<2%	<2%	<2%	<2%	4%
Ultimate R.O.W:	20 m	20 m	20 m	30 m	30 m

Comments: Ultimate traffic data only (2041).

STAMSON 5.0 NORMAL REPORT Date: 23-05-2023 13:03:37
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: edeeastn.te Time Period: Day/Night 16/8 hours
Description: East Facade

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

Car traffic volume : 21237/2360 veh/TimePeriod *
Medium truck volume : 880/98 veh/TimePeriod *
Heavy truck volume : 743/83 veh/TimePeriod *
Posted speed limit : 50 km/h
Road gradient : 4 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 25400
Percentage of Annual Growth : 0.00
Number of Years of Growth : 2.00
Medium Truck % of Total Volume : 3.85
Heavy Truck % of Total Volume : 3.25
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Hurontario (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 : 24.50 / 24.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Hurontario (day)

Source height = 1.34 m

ROAD (0.00 + 65.45 + 0.00) = 65.45 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	69.71	0.00	-4.26	0.00	0.00	0.00	0.00	65.45

Segment Leq : 65.45 dBA

Total Leq All Segments: 65.45 dBA

Results segment # 1: Hurontario (night)

Source height = 1.34 m

ROAD (0.00 + 59.52 + 0.00) = 59.52 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	63.20	0.00	-3.68	0.00	0.00	0.00	0.00	59.52

Segment Leq : 59.52 dBA

Total Leq All Segments: 59.52 dBA

RT/Custom data, segment # 1: LRT (day/night)
---
1 - Custom (76.0 dBA):
Traffic volume : 560/88 veh/TimePeriod
Speed : 60 km/h

Data for Segment # 1: LRT (day/night)

Angle1 Angle2	: 13.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 2	(Reflective ground surface)
Receiver source distance	: 45.00 / 45.00	m
Receiver height	: 24.50 / 24.50	m
Topography	: 1	(Flat/gentle slope; no barrier)
Reference angle	: 0.00	

Results segment # 1: LRT (day)

Source height = 0.50 m

RT/Custom (0.00 + 51.96 + 0.00) = 51.96 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
13	90	0.00	60.42	-4.77	-3.69	0.00	0.00	0.00	51.96

Segment Leq : 51.96 dBA
Total Leq All Segments: 51.96 dBA

Results segment # 1: LRT (night)

Source height = 0.50 m

RT/Custom (0.00 + 46.93 + 0.00) = 46.93 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
13	90	0.00	55.39	-4.77	-3.69	0.00	0.00	0.00	46.93

Segment Leq : 46.93 dBA

Total Leq All Segments: 46.93 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.64
(NIGHT): 59.75

STAMSON 5.0 NORMAL REPORT Date: 23-05-2023 12:54:37
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: edeolan.te Time Period: Day/Night 16/8 hours
Description: North Tower 16th Floor Amenity

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

Car traffic volume : 21237/2360 veh/TimePeriod *
Medium truck volume : 880/98 veh/TimePeriod *
Heavy truck volume : 743/83 veh/TimePeriod *
Posted speed limit : 50 km/h
Road gradient : 4 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 25400
Percentage of Annual Growth : 0.00
Number of Years of Growth : 2.00
Medium Truck % of Total Volume : 3.85
Heavy Truck % of Total Volume : 3.25
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Hurontario (day/night)

Angle1 Angle2 : -50.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 45.00 /
Receiver height : 1.50 /
Topography : 4 (Elevated; with barrier)
Barrier angle1 : -50.00 deg Angle2 : 90.00 deg
Barrier height : 1.10 m
Elevation : 56.00 m
Barrier receiver distance : 9.00 /
Source elevation : 0.00 m
Receiver elevation : 56.00 m
Barrier elevation : 56.00 m
Reference angle : 0.00

Results segment # 1: Hurontario (day)

Source height = 1.34 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)

```
       1.34 !        1.50 !       -9.73 !        46.27

ROAD (0.00 + 45.88 + 0.00) = 45.88 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -50     90   0.00  69.71   0.00  -4.77  -1.09   0.00   0.00 -17.96
45.88
-------------------------------------------------------------------------
--

Segment Leq : 45.88 dBA

Total Leq All Segments: 45.88 dBA

RT/Custom data, segment # 1: LRT (day/night)
-----------------------------------------
1 - Custom (76.0 dBA):
Traffic volume    :   560/88    veh/TimePeriod
Speed             :    60 km/h

Data for Segment # 1: LRT (day/night)
-------------------------------------
Angle1   Angle2           : -13.00 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 /
Receiver height           :   1.50 /
Topography                :      4       (Elevated; with barrier)
Barrier angle1            : -13.00 deg   Angle2 : 90.00 deg
Barrier height            :   1.10 m
Elevation                 :  56.00 m
Barrier receiver distance :   9.00 /
Source elevation          :   0.00 m
Receiver elevation        :  56.00 m
Barrier elevation         :  56.00 m
Reference angle           :   0.00


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

Source height = 0.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       0.50 !        1.50 !      -11.32 !        44.67

RT/Custom (0.00 + 36.06 + 0.00) = 36.06 dBA
```

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-13	90	0.00	60.42	-4.26	-2.42	0.00	0.00	-17.67	36.06

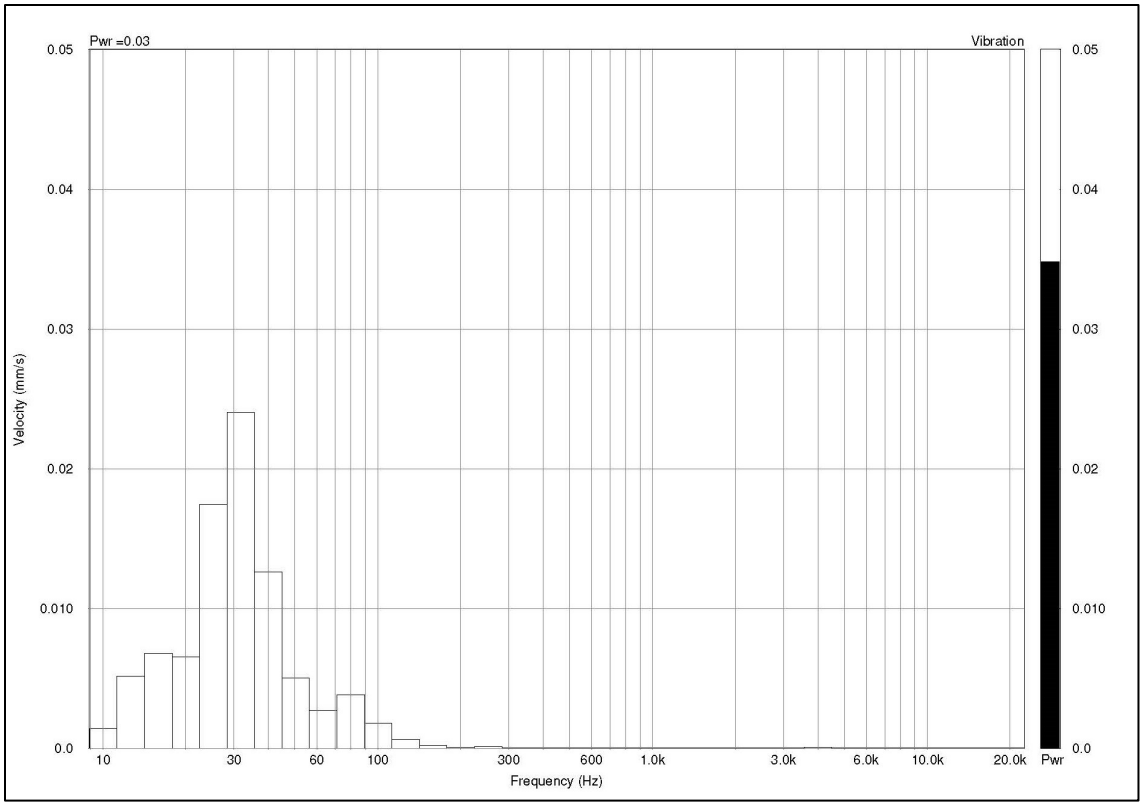
Segment Leq : 36.06 dBA

Total Leq All Segments: 36.06 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 46.31

VIBRATION MEASUREMENT LOCATION AND DATA


Vesta D
Argreen Rd
Eaglewood Blvd
Oriole Ave
Sandham Rd
Vibration Measurement Location
Park St E
Ontario St
Ave N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0.04
0.03
0.02
0.010
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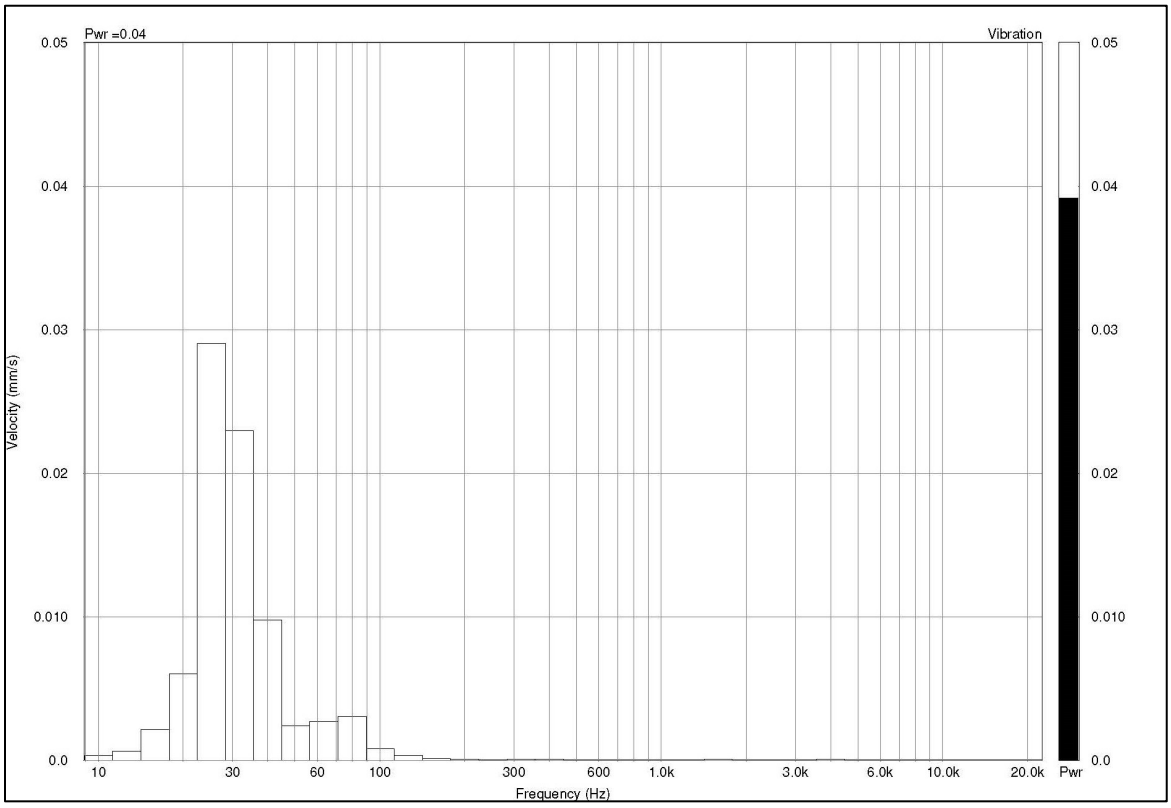
60
100
300
600
1.0k
3.0k
6.0k
10.0k
20.0k
Frequency (Hz)
Pwr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Vibration
Velocity (mm/s)
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0.02
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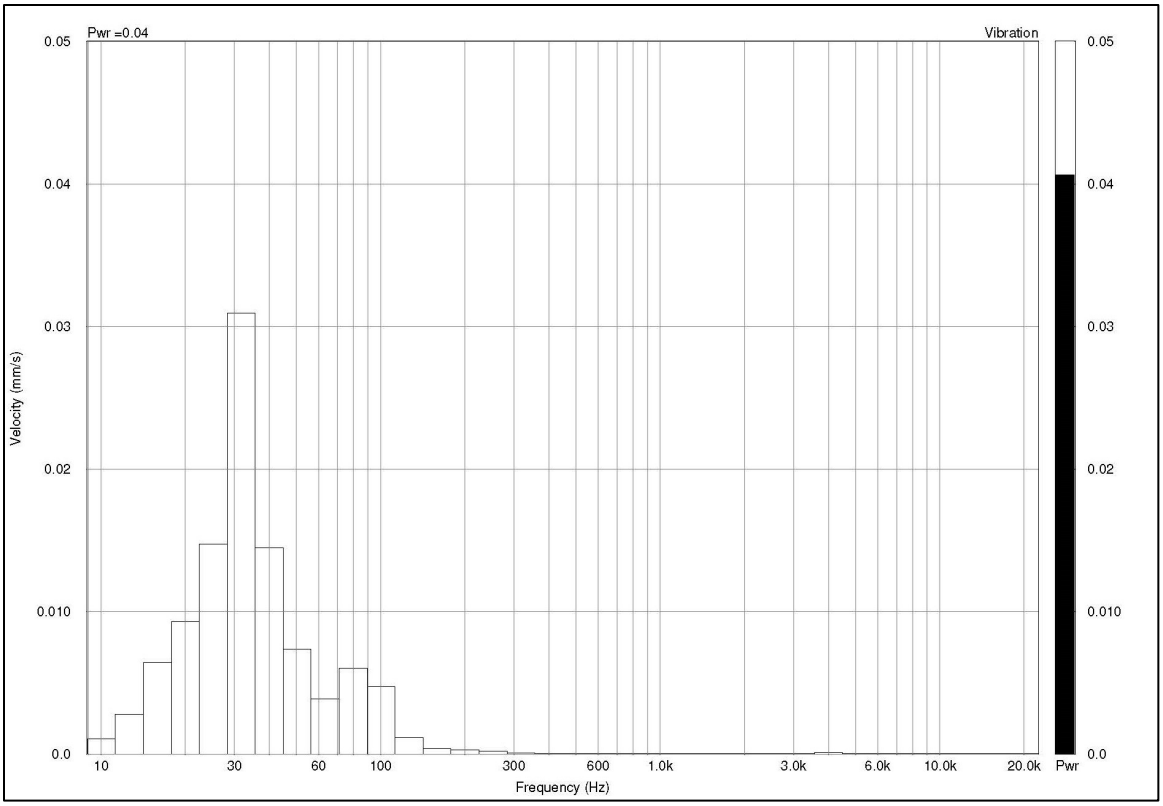
1.0k
3.0k
6.0k
10.0k
20.0k
Frequency (Hz)
Pwr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Vibration
0.05
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Velocity (mm/s)
10
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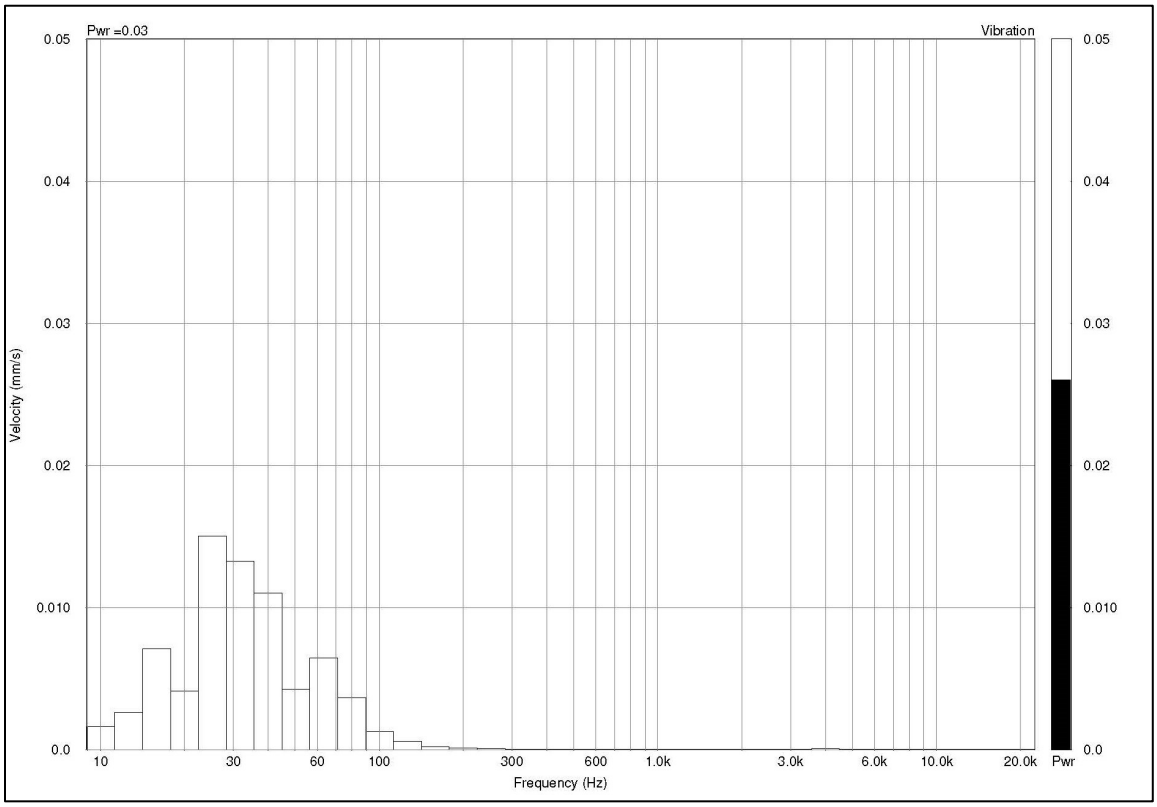
6.0k
10.0k
20.0k
Frequency (Hz)
Pwr


Pwr =0.03
Vibration
0.05
0.04
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0.02
0.010
0.0
Velocity (mm/s)
10
30
60
100
300
600
1.0k
3.0k
6.0k
10.0k
20.0k
Frequency (Hz)
Pwr

APPENDIX C: WARNING CLAUSES

TYPE A: "Purchasers/tenants are advised that sound levels due to increasing road traffic and rail traffic may occasionally 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, Conservation and Parks."

TYPE B: "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 traffic 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, Conservation and Parks."

TYPE C: "This dwelling unit has been designed with the provision for adding central air conditioning at the occupant's discretion. Installation of central air conditioning by the occupant in low and medium density developments will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment, Conservation and Parks."

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

TYPE E: "Purchasers/tenants are advised that due to the proximity of the adjacent industry (specifically the transit station), noise from the industry may at times be audible."

CN: "Warning: Canadian National Railway Company or its assigns or successors in interest has or have a right-of-way within 300 metres from the land the subject thereof. There may be alterations to or expansions of the rail facilities on such right-of-way in the future including the possibility that the railway or its assigns or successors as aforesaid may expand its 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). CNR 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."

Metrolinx: "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."

APPENDIX D: REFERENCES

1. Ministry of the Environment, “Model Municipal Noise Control By-Law, Final Report,” August 1978.

2. Ontario Ministry of the Environment, Environmental Approvals and Land Use Planning Branch, “Guidelines for Road Traffic Noise Assessment,” July 1986.

3. Ministry of the Environment’s *STAMSON* Computer Programme (Version 5.03) for the IBM PC.

4. Ministry of the Environment, *ORNAMENT*, “Ontario Road Noise Analysis Method for Environment and Transportation,” November 1988.

5. Quirt, D.J., “Controlling Sound Transmission into Buildings,” National Research Council, Building Practice Note 56, Update 1.1.

6. Ministry of the Environment, *STEAM* “Sound from Trains Environmental Analysis Method,” July 1990.

7. Ministry of the Environment, “Environmental Noise Guideline: Stationary and Transportation Sources – Approval and Planning,” Publication *NPC-300*, August 2013.

8. J.E. Coulter Associates Limited, “Noise and Vibration Impact Assessment, Hurontario-Main Light Rail Transit,” June 2014.

9. Mobilinx, “Noise Impact Assessment Report for Port Credit Station (WZP01)”, Hurontario LRT, April 29, 2022.