NOISE AND VIBRATION FEASIBILITY STUDY
PROPOSED RESIDENTIAL DEVELOPMENT
42–46 PARK STREET EAST AND 23 ELIZABETH STREET
MISSISSAUGA, ONTARIO

FOR

EDENSHAW ELIZABETH DEVELOPMENTS LIMITED

PREPARED BY

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APRIL 30, 2020

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1.0 INTRODUCTION

At the request of Edenshaw Elizabeth Developments Limited, J.E. COULTER ASSOCIATES LIMITED has completed a noise and vibration feasibility study of the proposed 22-storey (not-including mechanical penthouse) residential development on the northeast corner of Elizabeth Street and Park Street in Mississauga, Ontario. See Figure 1 in Appendix A for an Area Plan.

The purpose of the study is to prepare recommendations to address noise/vibration issues in support of the subject property's rezoning application. This report will show 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 sound from the surrounding transportation sources. Please see Figure 2 in Appendix A for a Site Plan.

This report also briefly reviews the impact of the development on itself and surrounding areas.

The site is surrounded on all sides by existing residential development with Port Credit GO Station located farther north. A review of the area indicates there are no sources of stationary noise that would have the potential to affect the occupants of the future building itself. As a result, stationary noise sources are not considered further within this report. This report focuses on the transportation noise and vibration impacts.

2.0 APPLICABLE CRITERIA

The Ministry of the Environment and Climate Change's (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 subdivision 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 agreement. 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 and ~280m from Hurontario Street (and the associated Hurontario LRT). Traffic noise from these roadways is not expected to be significant at such setbacks and is not considered further. Similarly, Park Street and Elizabeth 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 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 approximately 75m south 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.

3.3 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 2, 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 2: 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	192	46	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 of the proposed development. The calculated sound levels are summarized in Table 3, below.

Table 3: Transportation Noise Summary

Location	Floor	Description	Rail	
			Daytime (dBA $L_{eq,16hr}$)	Nighttime (dBA $L_{eq,8hr}$)
1	6	North Façade, East Side	71	67
2	15[2]	North Façade, Centre	73	70
3	6	West Façade, North Side	69	66
4	6	East Façade, North Side	68	65
5	15	East Façade, North Side	70	67
6	7	7th Floor Amenity Area[1]	62	N/A

1. OLA sound level calculations assume the presence of a 1.1m high safety barrier that would also act as a noise barrier.
2. The 15th floor is the first floor that has clear line-of-sight to the railway. Sound levels at higher floors will be the same or lower.

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.

The 7th floor amenity area sound levels are above the MECP limit of 60 dBA assuming a 1.1m high safety screen or parapet. Table 4 outlines the barrier heights needed to achieve various sound levels.

Table 4: Barrier Heights vs. Sound Levels

Barrier Height (m)	OLA Sound Level (dBA $L_{eq,16hr}$)
1.1	62
2.0	59
2.5	58
3.0	57
4.0	55

As can be seen from Table 4, achieving the target sound level of 55 dBA in the amenity area is challenging and would require a significant noise barrier. The use of a 2.0m tall screen or barrier would result in sound levels within the MECP's upper limit of 60 dBA while also providing a reasonably quiet space for outdoor enjoyment. The specific requirements for noise control should be confirmed prior to the site plan application as the building design progresses.

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."

As the sound levels are 4 dB higher than the target of 55 dB, all units should be provided with Warning Clause B in their *Agreements of Purchase and Sale or Lease*.

Exterior Glazing and Walls/Panels

Spandrel panels on the north, east, and west façades of the development should be constructed to achieve an approximately STC 52 rating to simplify the glazing requirements. An example construction for metal spandrel would be:

- Aluminum panel in aluminum frames
- 50mm rigid batt insulation
- 20 GA. galvanized steel backpan
- 13mm gypsum board or 10mm 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 75% window-to-floor area ratio for living rooms.

Table 5: Window STC Requirements

Façade	Room Type	Window STC
North	Bedroom	39
	Living Room	41
East/West	Bedroom	36
	Living Room	38
South	Bedroom	33
	Living Room	33

The above façade (window and spandrel) STC recommendations are preliminary. As noted in Table 3, sound levels on some of the lower floors are slightly lower due to shielding offered by the intervening buildings. The STC requirements should be confirmed by qualified acoustical consultant based on the final building designs.

5.0 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 vibration levels are summarized in Table 6, below. Sample passby spectrum data are provided in Appendix B. The measurement location is also shown in Appendix B.

Table 6: Measured Vibration Levels

Train Passby	Direction	RMS Vibration (mm/s)
1	Westbound	0.02
2	Eastbound	0.02
3	Westbound	0.02
4	Eastbound	0.03
5	Westbound	0.02
6	Eastbound	0.02

Train Passby	Direction	RMS Vibration (mm/s)
7	Westbound	0.02
8	Eastbound	0.02
9	Westbound	0.02

As can be seen in Table 6, the vibration levels are well below the limit of 0.14 mm/s RMS. This is to be expected due to the setback to the nearest tracks, the soils on site, and the lack of special trackwork (switches). Vibration control measures are not required for the subject site.

6.0 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, 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 that 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.

7.0 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 development 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.

This analysis has been completed to demonstrate the development's feasibility. 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.

Overall, the transportation noise study demonstrates that 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.

8.0 SUMMARY OF RECOMMENDATIONS

To meet the requirements of the Ministry of the Environment, Conservation and Parks, 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.

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. An updated analysis should be completed if there are changes to the floor plans and window elevations that would affect the glazing requirements.

5. The sound levels in the 7th floor outdoor amenity area are expected to exceed the noise guidelines. Noise barriers have been recommended but specific noise control measures will be confirmed prior to site plan application.

6. 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*.

7. Vibration control is not required as the vibration levels were measured to be well below 0.14 mm/s RMS.

8. 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.

/pt

APPENDIX A: FIGURES

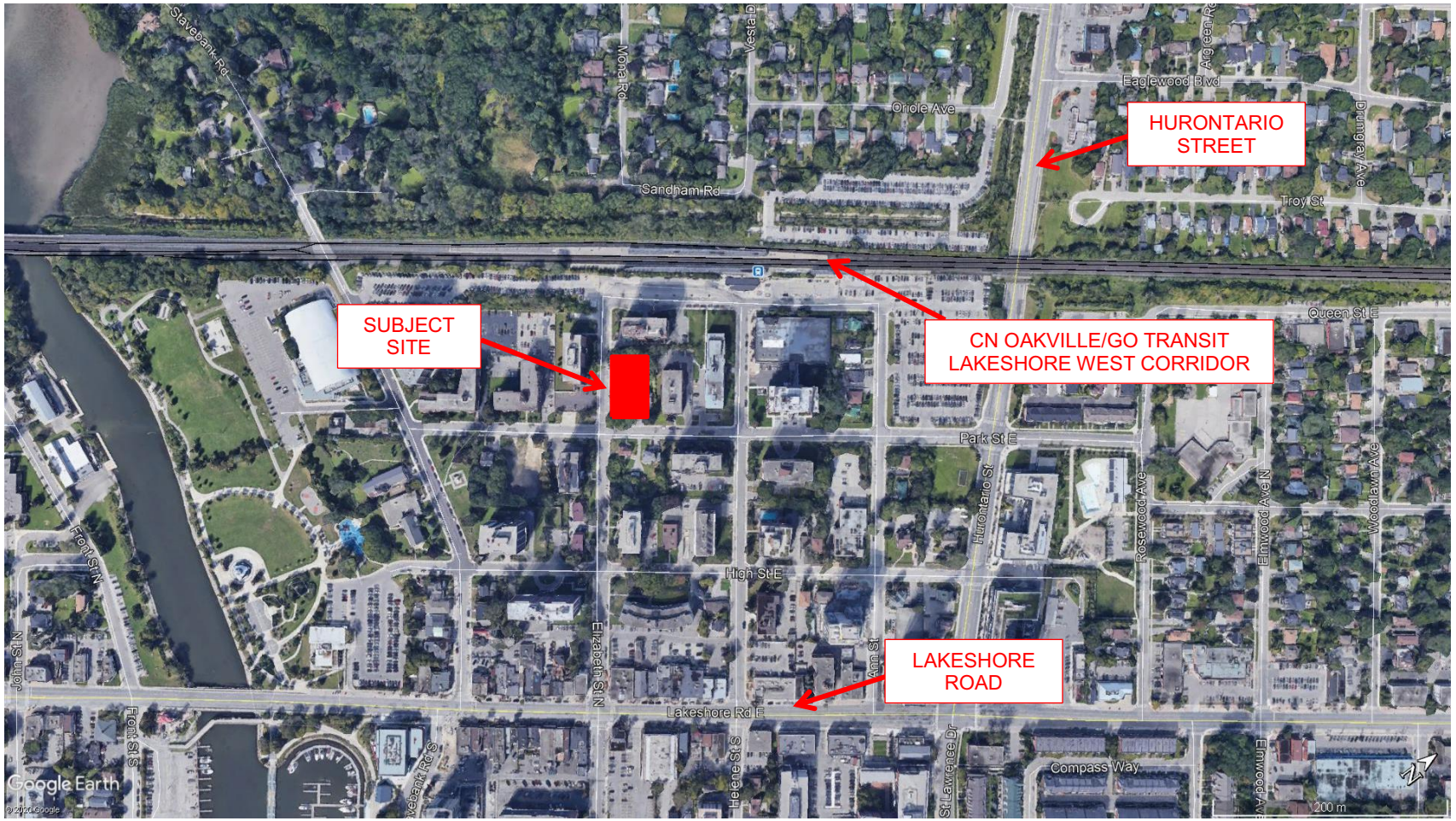


Figure 1: Key Plan

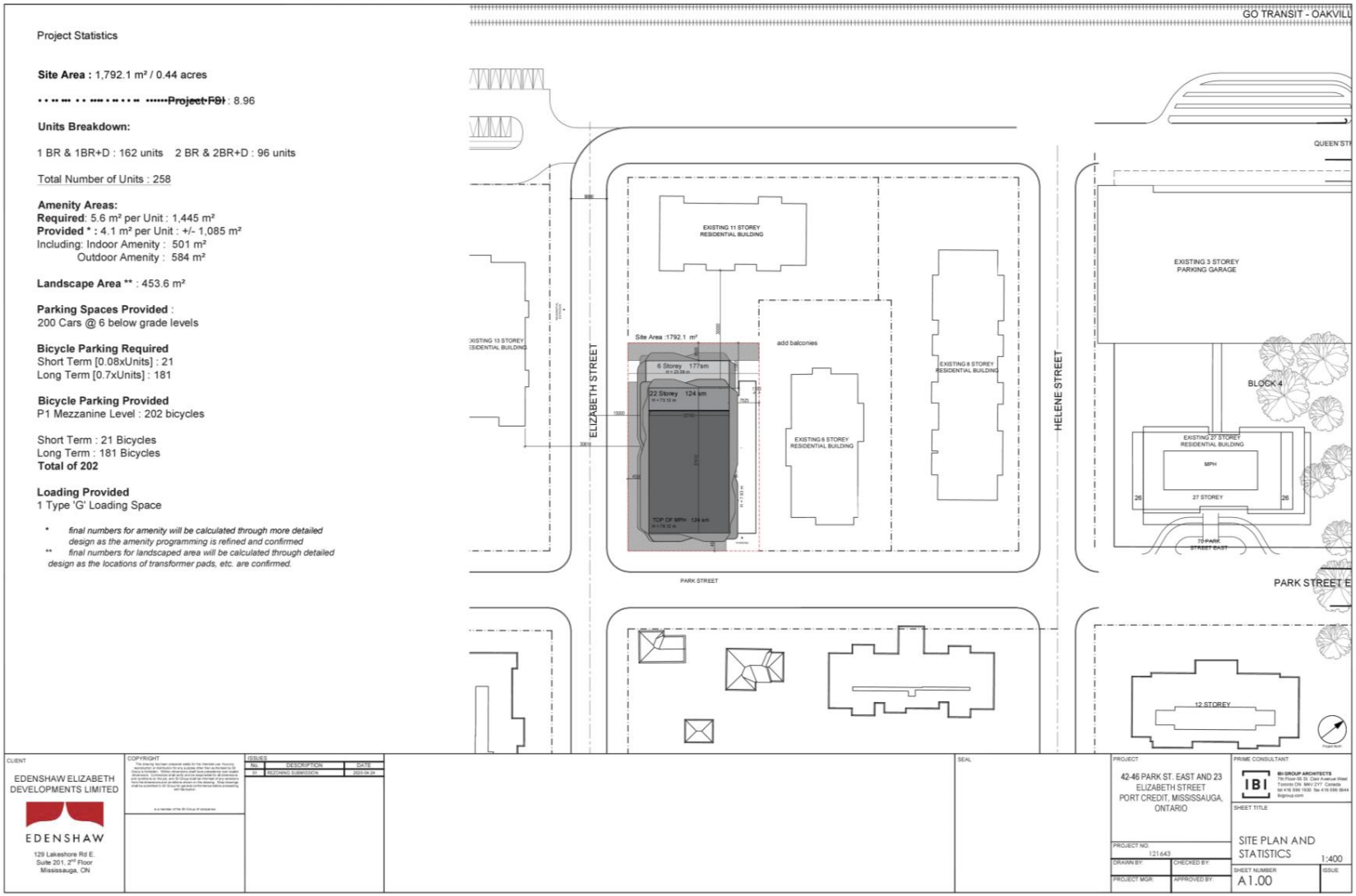


Figure 2: Site Plan

APPENDIX B: DATA AND SAMPLE CALCULATIONS

Subject: 23 Elizabeth Street North, Mississauga - Rail Data Request
From: Rail Data Requests <RailDataRequests@metrolinx.com>
Date: 2020-03-19, 4:42 p.m.
To: Sam Kulendran <skulendran@jecoulterassoc.com>

Good Day Sam,

Further to your request dated March 18, 2020, the subject property (23 Elizabeth Street North, Mississauga) is located in proximity to the Port Credit GO Station on Metrolinx's Oakville Subdivision which carries Lakeshore West GO Train service. We note we do not maintain information pertaining to idling and stationary activities at stations – that would be up to the consultant to collect that information for a typical weekday period.

It's anticipated that GO service on this lines will be comprised of a mix of both diesel and electric trains within (at least) a 10-year time horizon. The combined preliminary midterm weekday train volume forecast at this location, including both revenue and equipment trips is in the order of 238 trains – (54 diesel: 45 day, 9 night; 184 electric: 147 day, 37 night). Trains will be comprised of a single locomotive and up to 12 passenger cars.

The maximum track design speed at this location on this corridor is 85 mph (137 km/h).

Currently, anti-whistling is in effect at the Stavebank Road at-grade crossing.

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.

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 is only as it pertains to Metrolinx trains. It would be prudent to contact other rail operators in the area directly for their rail traffic information.

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

Best Regards,

Terri Cowan
Third Party Projects Officer
Third Party Projects Review| Capital Projects Group
Metrolinx | 20 Bay Street, Suite 600 |Toronto, Ontario|M5J 2W3
T: 416-202-3903 C: 416-358-1595

Date: 2020/03/31 Project Number: OAK – 13.0- 23 Elizabeth Street N Mississauga ON

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

STAMSON 5.0 NORMAL REPORT Date: 23-04-2020 13:15:11
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: edepar2.te Time Period: Day/Night 16/8 hours
Description: North Facade Sound Levels - 15th Floor

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
* 1. VIA	15.4/0.0	150.0	2.0	10.0	Diesel	Yes
* 2. Freight	1.3/0.0	96.0	4.0	140.0	Diesel	Yes
* 3. WayFreight	1.3/5.1	96.0	2.0	25.0	Diesel	Yes
* 4. GOTransit	192.0/46.0	137.0	1.0	12.0	Diesel	Yes

* The identified number of trains have been adjusted for
future growth using the following parameters:

No	Train type: Name	Unadj. Trains	Annual % Increase	Years of Growth
1.	VIA	12.0/0.0	2.50	10.00
2.	Freight	1.0/0.0	2.50	10.00
3.	WayFreight	1.0/4.0	2.50	10.00
4.	GOTransit	192.0/46.0	2.50	0.00

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

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 96.00 / 96.00 m
Receiver height : 45.00 / 45.00 m
Topography : 1 (Flat/gentle slope; no barrier)
No Whistle
Reference angle : 0.00

Results segment # 1: Lakeshore (day)

LOCOMOTIVE (0.00 + 72.13 + 0.00) = 72.13 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	80.19	-8.06	0.00	0.00	0.00	0.00	72.13

WHEEL (0.00 + 64.87 + 0.00) = 64.87 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	72.93	-8.06	0.00	0.00	0.00	0.00	64.87

Segment Leq : 72.88 dBA

Total Leq All Segments: 72.88 dBA

Results segment # 1: Lakeshore (night)

LOCOMOTIVE (0.00 + 68.75 + 0.00) = 68.75 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	76.81	-8.06	0.00	0.00	0.00	0.00	68.75

WHEEL (0.00 + 61.66 + 0.00) = 61.66 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	69.72	-8.06	0.00	0.00	0.00	0.00	61.66

Segment Leq : 69.53 dBA

Total Leq All Segments: 69.53 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 72.88
(NIGHT): 69.53

STAMSON 5.0 NORMAL REPORT Date: 23-04-2020 13:16:20
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: edepar3.te Time Period: Day/Night 16/8 hours
Description: West Facade Sound Levels

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
* 1. VIA	15.4/0.0	150.0	2.0	10.0	Diesel	Yes
* 2. Freight	1.3/0.0	96.0	4.0	140.0	Diesel	Yes
* 3. WayFreight	1.3/5.1	96.0	2.0	25.0	Diesel	Yes
* 4. GOTransit	192.0/46.0	137.0	1.0	12.0	Diesel	Yes

* The identified number of trains have been adjusted for
future growth using the following parameters:

Train type: No	Name	Unadj. Trains	Annual % Increase	Years of Growth
1.	VIA	12.0/0.0	2.50	10.00
2.	Freight	1.0/0.0	2.50	10.00
3.	WayFreight	1.0/4.0	2.50	10.00
4.	GOTransit	192.0/46.0	2.50	0.00

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

Angle1 Angle2	: -90.00 deg	0.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 88.00 / 88.00	m
Receiver height	: 18.00 / 18.00	m
Topography	: 1	(Flat/gentle slope; no barrier)
No Whistle		
Reference angle	: 0.00	

Results segment # 1: Lakeshore (day)

LOCOMOTIVE (0.00 + 68.55 + 0.00) = 68.55 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.09	80.19	-8.38	-3.27	0.00	0.00	0.00	68.55

WHEEL (0.00 + 60.22 + 0.00) = 60.22 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.19	72.93	-9.18	-3.54	0.00	0.00	0.00	60.22

Segment Leq : 69.15 dBA

Total Leq All Segments: 69.15 dBA

Results segment # 1: Lakeshore (night)

LOCOMOTIVE (0.00 + 65.17 + 0.00) = 65.17 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.09	76.81	-8.38	-3.27	0.00	0.00	0.00	65.17

WHEEL (0.00 + 57.00 + 0.00) = 57.00 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.19	69.72	-9.18	-3.54	0.00	0.00	0.00	57.00

Segment Leq : 65.79 dBA

Total Leq All Segments: 65.79 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 69.15
(NIGHT): 65.79

STAMSON 5.0 NORMAL REPORT Date: 23-04-2020 13:14:28
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: edepar6.te Time Period: Day/Night 16/8 hours
Description: 7th Floor Outdoor Amenity Area - With Barrier

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
* 1. VIA	15.4/0.0	150.0	2.0	10.0	Diesel	Yes
* 2. Freight	1.3/0.0	96.0	4.0	140.0	Diesel	Yes
* 3. WayFreight	1.3/5.1	96.0	2.0	25.0	Diesel	Yes
* 4. GOTransit	192.0/46.0	137.0	1.0	12.0	Diesel	Yes

* The identified number of trains have been adjusted for
future growth using the following parameters:

No	Train type: Name	Unadj. Trains	Annual % Increase	Years of Growth
1.	VIA	12.0/0.0	2.50	10.00
2.	Freight	1.0/0.0	2.50	10.00
3.	WayFreight	1.0/4.0	2.50	10.00
4.	GOTransit	192.0/46.0	2.50	0.00

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

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 92.00 / 88.00 m
Receiver height : 1.50 / 20.00 m
Topography : 2 (Flat/gentle slope; with barrier)
No Whistle
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 2.00 m
Barrier receiver distance : 4.00 / 5.00 m
Source elevation : 0.00 m
Receiver elevation : 18.00 m
Barrier elevation : 18.00 m
Reference angle : 0.00

Results segment # 1: Lakeshore (day)

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	1.50	0.83	18.83
0.50	1.50	0.67	18.67

LOCOMOTIVE (0.00 + 58.94 + 0.00) = 58.94 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.47	80.19	-11.54	-1.11	0.00	0.00	-8.60	58.94

WHEEL (0.00 + 50.10 + 0.00) = 50.10 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.57	72.93	-12.37	-1.30	0.00	0.00	-9.17	50.10

Segment Leq : 59.47 dBA

Total Leq All Segments: 59.47 dBA

Results segment # 1: Lakeshore (night)

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	20.00	18.07	36.07
0.50	20.00	17.87	35.87

LOCOMOTIVE (0.00 + 68.81 + 0.00) = 68.81 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	76.81	-7.68	0.00	0.00	0.00	-0.01	69.12*
-90	90	0.03	76.81	-7.91	-0.09	0.00	0.00	0.00	68.81

* Bright Zone !

WHEEL (0.00 + 60.63 + 0.00) = 60.63 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.01	69.72	-7.80	-0.04	0.00	0.00	-0.01	61.87*
-90	90	0.14	69.72	-8.72	-0.37	0.00	0.00	0.00	60.63

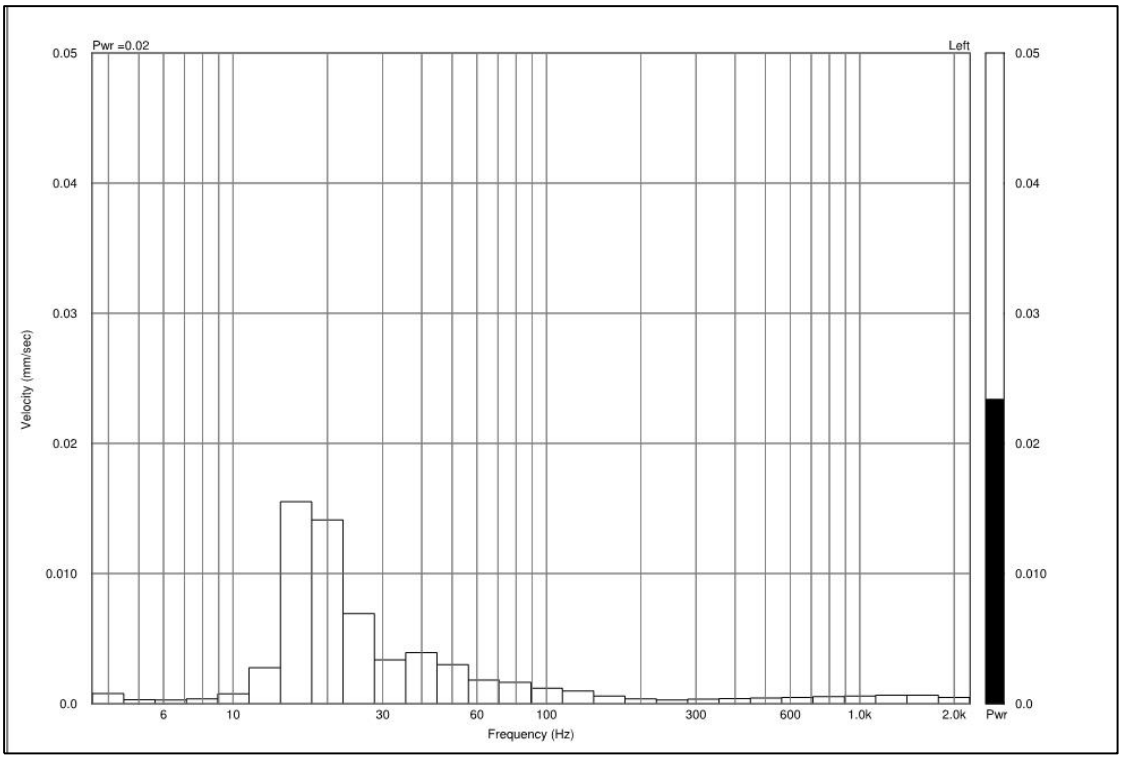
* Bright Zone !

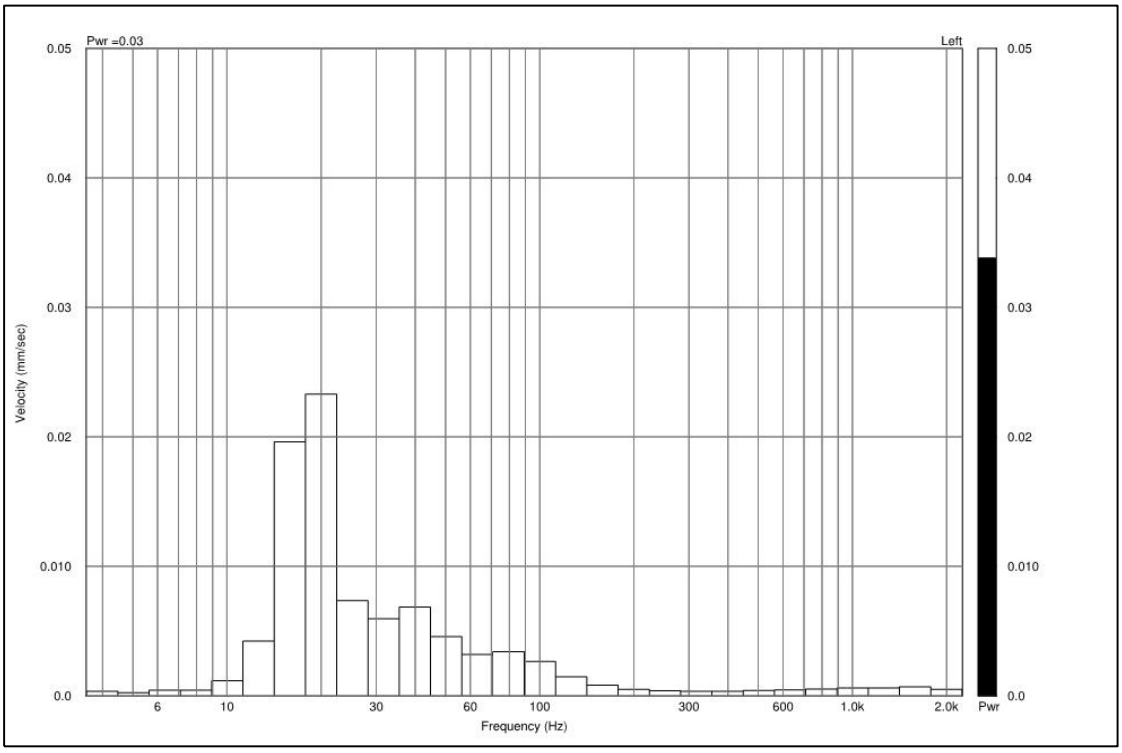
Segment Leq : 69.42 dBA

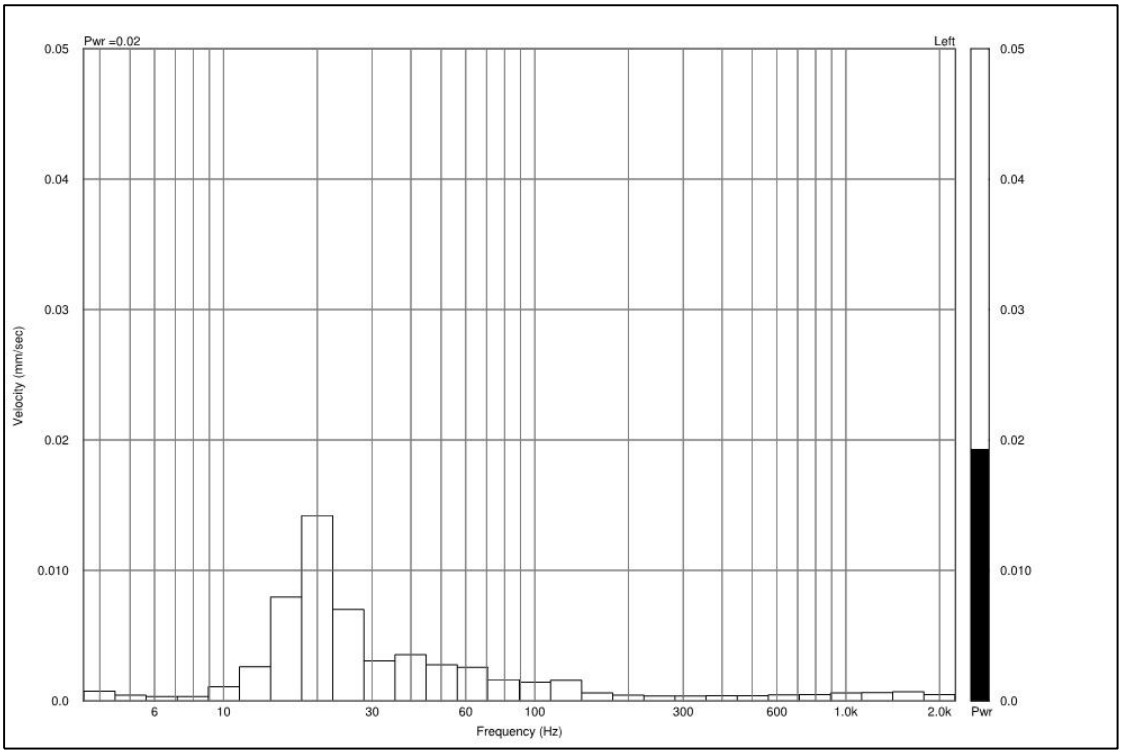
Total Leq All Segments: 69.42 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.47
(NIGHT): 69.42

VIBRATION MEASUREMENT LOCATION AND DATA



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60
100
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600
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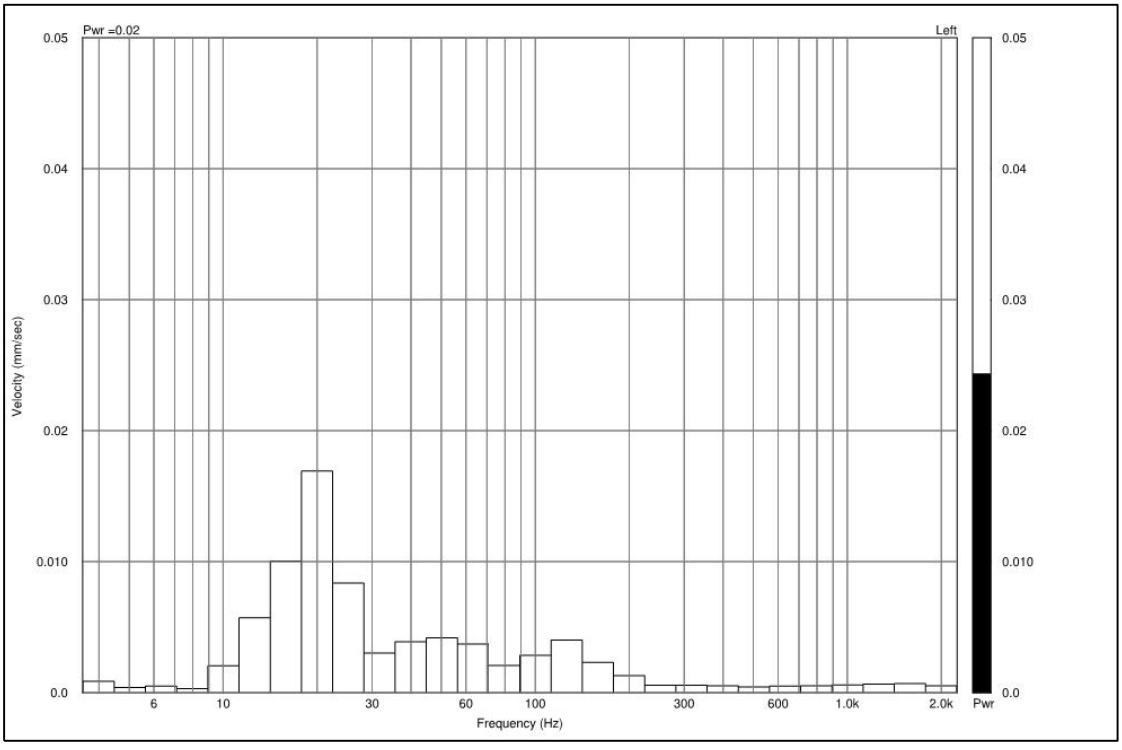
2.0k
Frequency (Hz)
Pwr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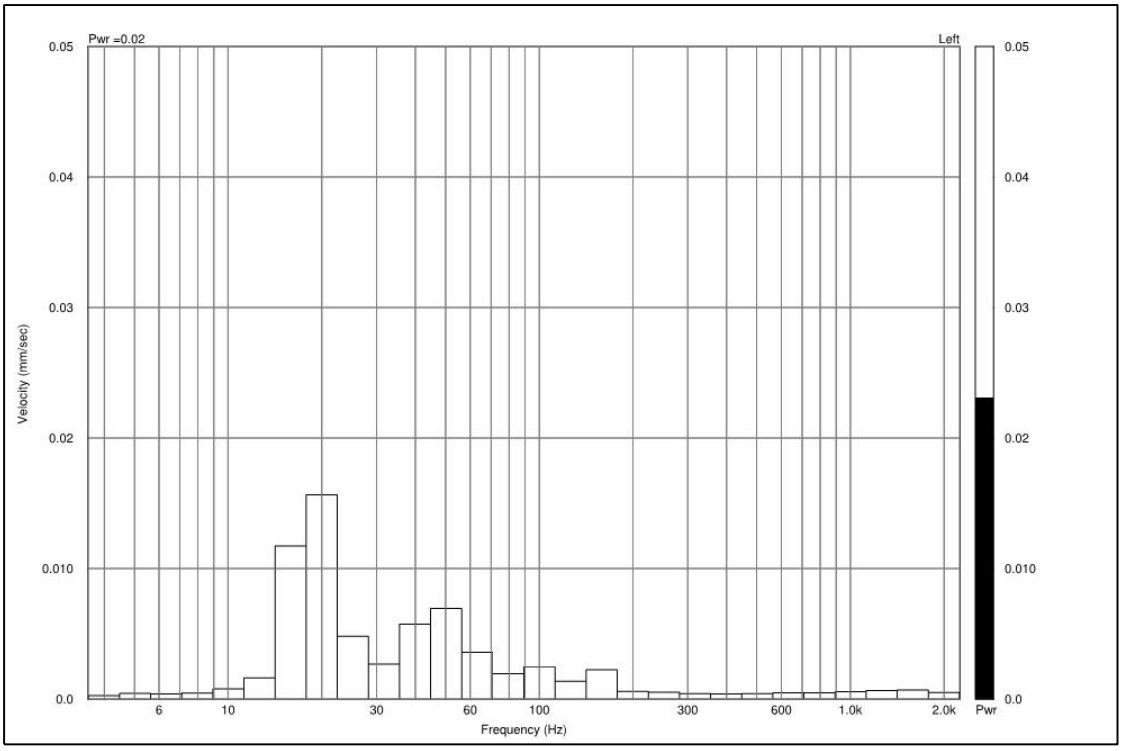
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Velocity (mm/sec)
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10
30
60
100
300
600
1.0k
2.0k
Frequency (Hz)
Pwr


Queen St E
Vibration
Measurements
N Sherman
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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, 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."

CP: "All persons intending to acquire an interest in the real property by purchase or lease are advised of the existence of the right-of-way of the Canadian Pacific Railway. In future, it is possible that such rail facilities and operations may be altered or expanded, which expansion or alteration may affect the living environment of residents despite the inclusion of noise and vibration attenuating measures in the design of the subdivision and individual units and that the Canadian Pacific Railway will not be responsible for complaints or claims arising from its use of its facilities and/or arising from its operations."

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.

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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.