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Noise and Vibration Feasibility Study
Proposed Residential Development
13 – 21 John Street & 36 – 40 South Station Street
Toronto, Ontario

Prepared for:

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VERSION CONTROL

Noise and Vibration Feasibility Study,

13 – 21 John Street and 36 – 40 South Station Street,

Toronto, Ontario.

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0	August 11, 2022	Noise and Vibration Feasibility Study	P. Walsh
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2	September 21, 2022	Addressed Comments	P. Walsh

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1 INTRODUCTION AND SUMMARY

Howe Gastmeier Chapnik Limited (HGC Engineering) was retained by 21 John Dev Inc. to complete a Noise and Vibration Feasibility Study of a proposed residential development to be located at 13 – 21 John Street, 36 – 40 South Station Street, and part of 1919 Weston Road, in Toronto, Ontario. This study is based on a concept plan printed on August 26, 2022, prepared by Turner Fleischer and 3Xn Architects.

The subject property is located on the southeast corner of the intersection of John Street and South Station Street, north of Weston Road, and west of Lawrence Avenue West. The proposed development will consist of one 40-storey tower above an 8-storey podium, with two levels of underground.

Road traffic on Weston Road and Lawrence Avenue West, rail traffic on the Metrolinx rail corridor, and the Canadian Pacific (CP) railway line are the primary sources of noise with potential impact on the proposed development. Road and rail traffic data was used to predict future traffic sound levels at the locations of the proposed building façades and in outdoor living areas. The predicted sound levels were evaluated with respect to the guidelines of the Ministry of the Environment, Conservation and Parks (MECP), railways and the City of Toronto.

Typical daytime and nighttime noise levels from the surrounding traffic sources require that the building envelope components have upgraded sound insulation properties to limit traffic noise transmitted into the residential suites to acceptable levels. Preliminary acoustical specifications for the building envelope are outlined herein.

This assessment also considers the potential impact of ground-borne vibration from trains operating on the Metrolinx rail corridor to the north. Site measurements and analysis of ground-borne vibration from train pass-bys indicate that the associated vibrations impacting the proposed development are expected to be below the target criteria for perceptible vibration and re-radiated noise. Vibration mitigation measures will not be required for the proposed development.

2 SITE DESCRIPTION

The site is located at the southeast corner of the intersection of John Street and South Station Street, north Weston Road, and west of Lawrence Avenue West, in Toronto, Ontario. A key plan is attached as Figure 1, and the site plan is attached as Figure 2.

The proposed development will consist of a 40-storey residential building with an 8-storey podium at its base with two levels of underground parking. The ground floor includes a community centre, daycare, residentially lobby and utility areas. The 2nd floor includes the upper level of the daycare, including a terrace, and the 7th and 9th floors include indoor and outdoor amenity spaces. Residential suites begin on the 2nd floor and comprise the remainder of the building. The outdoor amenity spaces are identified on Figure 3.

A site visit was made by HGC Engineering personnel in July of 2022, to make observations of the acoustical environment, to identify the significant noise sources in the vicinity, and to perform ground-borne vibration measurements from the rail corridor to the north. The closest rail line, which includes traffic from GO Trains, CP Rail, and UP Express, is located approximately 55 m from the north foundation of the podium.

The Lester B. Pearson International Airport is located approximately 7 km to the west of the site. According to the noise exposure forecast (NEF) map obtained from the Greater Toronto Airports Authority (GTAA) website, attached as Figure 4, the development will be located outside the NEF-25 contour line. Air traffic noise is expected to have minimal impact on the proposed development and is therefore not considered in the following analysis.

In terms of the classifications provided for in Ministry of the Environment (MECP) guidelines, this area is considered to be a Class 1 “urban” acoustical environment. The site is currently occupied by existing dwelling units which will be demolished to make way for the proposed development. There is a mix of residential and commercial uses along Weston Street and Lawrence Avenue West. During the site visit, a single ground level air conditioning unit was noted to the south of the proposed development. Noise from the equipment was inaudible during our visit, and a review of the sound data included on the manufacturer’s website indicates compliance with Class 1 sound level criteria. Sounds from the other nearby commercial facilities

were not discernable over surrounding traffic sounds during the site visit, and they have not been considered further.

3 NOISE AND VIBRATION CRITERIA

3.1 Road and Rail Traffic Noise

Criteria for acceptable levels of traffic noise are contained in the Ontario Ministry of Environment, Conservation and Parks' (MECP) publication NPC-300, "Environmental Noise Guideline: Stationary and Transportation Sources - Approval and Planning", October 2013. Sound level limits from road and rail traffic sources are summarized in Table 1 below.

Table 1: Road/Rail Traffic Noise Criteria [dBA]

Area	Daytime L_{EQ} (16 hour)	Night-time L_{EQ} (8 hour)
Outdoor Living Area	**55**	**--**
Living or dining areas of residences	**45 / 40**	**45 / 40**
Sleeping Quarters (bedrooms)	**45 / 40**	**40 / 35**

Daytime refers to the period between 07:00 and 23:00. Night-time refers to the period between 23:00 and 07:00. Living areas include dining rooms, dens, studies, etc. Corridors and washrooms are usually not considered to be noise-sensitive areas.

The term "Outdoor Living Area" (OLA) is used in reference to an outdoor patio, a backyard, a terrace, a playground, or common areas associated with high-rise multi-unit buildings where passive outdoor recreation is expected to occur. Balconies with a depth of less than 4 meters (measured perpendicular to the building façade) are not considered OLAs under MECP guidelines, and accordingly the noise criteria are not applicable there.

In cases where a minor excess (up to 5 dB) over the sound level limit in an OLA is anticipated, MECP guidelines allow the excess to be addressed by including a warning clause in the titles, deeds or tenancy agreements for the affected dwellings. Where OLA sound levels exceed 60 dBA, physical noise control measures, such as an acoustical barrier, are required. Note that not all OLAs necessarily require protection, if there are other protected outdoor areas accessible to the residents.

With respect to the building envelope, no controls are required where levels are under 50 dBA. Where the road traffic noise level (L_{EQ}) at night is greater than 60 dBA, windows must be designed to achieve the indoor sound level criteria listed above. In addition, where the road traffic noise level (L_{EQ}) is greater than 65 dBA during the daytime, windows must be designed to achieve the indoor sound level criteria listed above. Otherwise, any glazing meeting the Ontario Building Code is considered adequate under MECP guidelines. Where the predicted nighttime and/or daytime sound levels exceed these thresholds, central air conditioning is required so that windows can remain closed against the noise.

The indoor sound level limits for rail sources are 5 dB more stringent than for road sources, to account for the additional low-frequency (rumble) components of locomotives, hence the façade sound insulation requirements are calculated separately and then combined.

Where the predicted nighttime and daytime sound levels exceed the criteria, central air conditioning is required so that windows can remain closed against the noise.

3.2 Ground-Borne Vibration

Vibration from the passage of the trains may be transmitted via the ground and then transferred up through the structure. Vibration intrusions that are potentially unacceptable in the residential suites could take the form of either vibration which is clearly perceptible to the touch and/or which produces radiated noise levels in excess of the ambient acoustic environment. From a vibration impact perspective, the lower residential suites in the building are the critical receptors.

Vibration levels are typically measured in terms of oscillatory velocity or acceleration. The levels discussed herein are presented in dBG, which refers to decibels of acceleration relative to the acceleration of gravity, as a function of one-third octave band frequencies (Hz). The levels have been plotted against American National Standards Institute (ANSI) and International Standards Organization (ISO) criteria – ANSI-S3.29/ISO-2631-2 – for human perception of tactile vibration while seated. Conformance with these criteria does not guarantee that vibration levels will be imperceptible to all individuals under all conditions, but is nonetheless a reasonable standard for

acceptability. Note that these criteria are for the base structure only and do not account for amplification by lightweight structures, finishes, furniture, etc.

The ANSI/ISO criteria do not address noise; vibrations at frequencies over 20 Hz are also of concern for re-radiated noise, even at levels well below the tactile perceptibility threshold. To illustrate this, the measured vibration levels have been plotted against equivalent Noise Criterion (NC) curves. Experience suggests that while the train pass-bys may be audible in the building to some extent, if the levels are confined to about NC-30 (35 dBA) or lower in the residential towers, the audibility of the pass-bys may be considered reasonable. This criterion level is similar to what is used by the TTC to assess the potential for intrusions from future undertakings (subway expansions), and similar to criteria used by the US Federal Transit Administration to assess ground-borne noise intrusions from subways and trains.

3.4 Railway Conditions for Residential Developments

Notwithstanding the noise and vibration criteria outlined above, Metrolinx publishes a recommended list of generic conditions, including specific setbacks, berm heights, and warning clauses, to reduce the incompatibility of residential development adjacent or in proximity to the railway right-of-way. Some of the items on this list relate to noise and vibration control, and should be taken into account, subject to reasonable application. Copies of these requirements are included in Appendix B.

4 TRANSPORTATION NOISE

4.1 Road Traffic Data

Traffic data summaries for the key roads surrounding the site were obtained from the City of Toronto Traffic Safety Unit (see Appendix A). Traffic data Weston Road and Lawrence Avenue West were provided in the form of 8-hour turning movement counts. In order to obtain 24-hour traffic volumes for surrounding roadways to predict future sound levels during both the 16-hour daytime and 8-hour nighttime periods, the following assumptions were made:

- The 24-hour traffic volumes were assumed to be double the obtained 8-hour daily peak volumes,

- The prediction considered traffic that will exist in 10 years (2032), assuming annual traffic growth of 2.5% on all roadways, as required by the MECP,
- Daytime (7:00 – 23:00) vs nighttime (23:00 – 7:00) road traffic volumes were determined based on an assumed 90% day / 10% night split,
- Where provided, the hourly counts were used to determine total daytime and nighttime traffic volumes.

The resulting future road traffic volumes for the roads considered in this assessment are listed in Table 2, in addition to commercial vehicle (truck) percentages and the posted speed limit for each roadway.

Table 2: 2032 Projected Road Traffic Data

Road Name	AADT	Day / Night Split (% / %)	Commercial Vehicle Percentages		Posted Speed Limit (km/h)
			Medium Truck %	Heavy Truck %	
Weston Road	27 119	90 / 10	3.6	8.3	50
Lawrence Ave W	20 545	90 / 10	4.4	7.3	50

4.2 Rail Traffic Data

Rail traffic data for the CP Mactier Subdivision and the GO Transit Weston Subdivision was obtained from CP and GO Transit personnel, respectively and are provided in Appendix B. The maximum permissible train speed in the area of the site is 56 km/h. The Mactier Subdivision is used for freight trains. The Weston Subdivision located further west is used for GO trains, UP Express and passenger trains. Both railways are considered principal main lines. In conformance with GO and CP assessment requirements, the maximum speeds, maximum number of cars and locomotives per train were used in the traffic noise analysis to yield worse case estimate of train noise. The data was projected to the year 2032. The rail volumes used in the analysis are shown in Table 3.

Table 3: 2032 Forecasted Rail Traffic Data

Type of Train	Number of Trains Day/Night	Number of locomotives	Number of cars	Max Speed (km/h)
UP Express*	256 / 72	1	3	129
GO Train*	92 / 22	1	12	129
GO Train *	36 / 2	2	12	129
CP Freight	7 / 5	4	179	56

* Trains modelled as diesel trains per direction from Metrolinx.

4.3 Prediction Results

To assess the levels of traffic noise that will impact the site, predictions were made using a numerical computer modelling package (*Cadna-A version 2022(32 bit): build 189.5221*). The road noise sources were included in the model as line sources producing equivalent sound pressure levels at a reference distance to those predicted by STAMSON 5.04, a computer algorithm developed by the MECP, based on the daytime and night-time traffic volumes presented in Section 4.1.

The rail line was included in the model as a line source with a sound power level equivalent to that published by the Department of Transportation (United States of America) Federal Transit Administration (FTA) in the publication entitled, "Transit Noise and Vibration Impact Assessment".

Lines sources in *Cadna-A* use the methods from ISO Standard 9613-2.2, "*Acoustics - Attenuation of Sound During Propagation Outdoors*", which accounts for reduction in sound level with distance due to geometrical spreading, air absorption, ground attenuation and acoustical shielding by intervening structures.

The model was used to predict traffic noise levels at each of the residential building facades; the specific critical receptor locations listed in Table 4 below were chosen based on worst-case locations along each façade, and are shown in Figure 5. A breakdown of the maximum sound levels from each traffic source, and the total maximum sound level are included in the table.

Table 4: Road / Rail / Total Traffic Sound Level Predictions, Typical Daytime and Nighttime Hours [dBA]

Tower	Façade	Daytime $L_{EQ\text{-}16hr}$	Nighttime $L_{EQ\text{-}8hr}$
Podium	North	44/70/70	37/67/67
	East	58/65/66	51/63/63
	South	54/47/55	48/44/49
	West	57/62/63	48/60/60
Tower	North	46/70/70	39/67/67
	East	58/67/68	51/65/65
	South	62/51/63	56/48/57
	West	56/67/67	50/64/65

The drawings show three distinct outdoor amenity areas on the 2nd, 7th, and 9th floors of the Podium, represented by prediction locations R1, R2 and R3. Prediction locations are indicated in Figure 3, and the predicted sound levels at each location are summarized in Table 5 below.

Table 5: Predicted Traffic Sound Levels [dBA] at Outdoor Living Areas

Location	Description	Sound Level ($L_{Aeq,16hr}$)
R1	Daycare Terrace – 2nd floor	56
R2	Amenity Terrace – 7th floor	61
R3	Amenity Terrace – 9th Floor	61

* Assuming a standard 1.07 m high parapet or solid guard/railing.

4.4 Traffic Noise Recommendations

The sound levels from traffic noise at the residential façades of the proposed development were predicted to be up to 70 dBA during daytime hours, and up to 68 dBA during nighttime hours. The following discussion outlines recommendations for air conditioning, upgraded building façade constructions, and warning clauses to achieve the noise criteria stated in Table 1.

4.4.1 Building Constructions

Given the projected future sound levels at the most impacted building facades, MECP guidelines recommend that the building envelope be designed so that indoor sound levels comply with the MECP noise criteria.

Preliminary calculations have been performed to determine the building envelope constructions likely to be required to maintain indoor sound levels within MECP guidelines. The calculation methods were developed by the National Research Council (NRC). They are based on the maximum predicted future sound levels at the building façades, and the anticipated areas of the façade components (walls, doors and windows) relative to the floor area of the adjacent room.

Exterior Wall Constructions

These calculations assume insignificant sound transmission through the walls in comparison with the windows. Exterior walls that are not glazed should have sufficient acoustical insulation value such that the noise transmitted through is negligible in comparison with the windows; to achieve this, exterior wall assemblies with a rating of at least 5-10 STC points above the surrounding window STC requirements are typically required, depending on the amount of wall area relative to window. In most cases, the wall sound insulation is much higher than this; sections of poured or pre-cast concrete will typically have a sound insulation rating of STC-55 or more, and can be discounted. Insulated spandrel or metal panels backed by an insulated drywall assembly generally have sound insulation ratings in the range of STC-50 to STC-60.

Acoustical Requirements for Glazing

The minimum building façade constructions to address transportation noise are calculated independently for road, and rail traffic, and subsequently combined logarithmically to determine the overall building construction. Road and rail traffic noise affects the building envelope to varying degrees.

At the time of this study, the floor plans and elevations are in development. The preliminary façade concepts included in the design package suggest window-to-floor areas in the range of 22% (half fixed and half operable) for bedrooms and 35% (all operable) for living rooms. Based on this and the maximum predicted sound levels at the associated facades, it was determined that

the sliding patio doors on the north façade (i.e., glazing for the living rooms) must achieve a sound transmission class (STC) rating of at least 37 in order to achieve the target indoor sound level criteria identified in Table 1. The fixed glazing on this façade must achieve an installed performance of STC-36, with operable elements (i.e., awning windows) having a performance up to 2-3 points lower, to achieve the criteria. The other facades are somewhat less impacted, however, in an urban environment such as this, we do not typically recommend less than STC-33, which can be achieved using standard glazing assemblies. A summary of the recommended glazing performance is listed in Table 6 below.

Table 6: Preliminary Required Minimum Sound Transmission Class of the Proposed Buildings (STC)

Façade	Preliminary Minimum Glazing STC[1,2,3]	
	Living rooms (sliding patio doors)	Bedrooms (fixed glazing)
North	37	36
East	33	33
South	33	33
West	33	33

Note:
[1] STC requirement refers to installed performance, including sound transmitted through mullions in window-wall systems and seals on operable windows and doors. Test data should be provided where available.
[2] The calculated STC requirements assume insignificant sound transmission through the walls in comparison with the windows. No guidelines on glazing type are provided.
[3] A minimum of STC-33 glazing construction is recommended for urban areas.

Note that the STC ratings stated above are minimums for the entire assembly (including mullions) and that test data should be provided to verify. If more glazing is incorporated, higher STC requirements may apply. Acoustical criteria for the building façades can be optimized as part of the detailed design of the building envelope once floor plans and elevations have been finalized, if required. Additionally, these requirements apply to residential suites only; indoor amenity and other areas can be considered separately, if required.

4.4.2 Ventilation Requirements

Predicted sound levels at the façade of the proposed buildings exceed 65 dBA during the daytime and 60 dBA during the nighttime. Central air conditioning is required and is expected to be included in any event.

4.4.3 Outdoor Amenity Areas

The plans show outdoor a terrace for the daycare on the 2nd floor and an amenity terrace on the 6th floor. Some of the residential terraces on the 2nd, 4th, 5th, 6th, and 7th floors are deeper than 4 m; however, since the common outdoor amenity terrace is provided for the use of all residents, private terraces and balconies in the development do not require assessment.

Assuming a standard 1.07 m tall solid guard or parapet around the 2nd, 7th, and 9th floor spaces, predicted sound levels are expected to be 56 dBA in 2nd floor terrace, and 61 dBA in the 7th and 9th floor terrace. An acoustic barrier 1.3 m in height for the 7th floor terrace and 1.4 m in height for the 9th floor terrace would be required to reduce sound levels to 60 dBA. Note that the barriers must have a surface density of at least 20 kg/m^2 and be gap free in order to be acoustically effective. According to MECP guidelines, these minor excesses (up to 5 dB) may be addressed by including a warning clause in sale and lease agreements for the development.

5 VIBRATION ASSESSMENT

5.1 Site Measurements

The potential ground-borne vibration impact on the proposed development due to rail traffic on the Metrolinx rail corridor to the north was assessed based on vibration measurements conducted at the site in July of 2022. The closest track is located approximately 55 m from the north foundation wall of the building. Vibration measurement locations are indicated in Figure 2.

Vibration levels were measured using two PCB type J353B52 accelerometers and recorded using two Norsonic N140 analyzers. The instrumentation was verified to be in calibration before the measurements were conducted. From the measured data, the maximum vibration levels, as a function of one-third octave frequency (Hz), were extracted for each pass-by measurement. The measured levels are presented in dBG, which refers to decibels of acceleration relative to the acceleration of gravity, as a function of one-third octave band frequencies (Hz). A curve is plotted on the figures representing the ANSI criteria for human perception of vibration in structures up to a frequency of 80 Hz. Conservatively estimated Noise Criterion (NC) curves resulting from structural vibration are also included to provide an assessment of potential re-radiated noise from subway pass-bys at frequencies above 63 Hz. It is important to note that the

plotted NC curves are not part of the ANSI/ISO criteria, and are only presented to define a cursory metric for re-radiated noise.

From the measured data, maximum vibration levels, as a function of one-third octave frequency bands (Hz), were extracted for each pass-by measurement, and the maximum of those events are shown for each measurement location in Figure 6. A summary of the measurements is shown in Figure 7. Vibration produced by the pass-bys was dominated by energy at 40 Hz; vibration measured at higher frequencies (i.e., 200 Hz and higher) was not associated with the pass-bys. The measured vibration levels from the pass-bys were below the ANSI/ISO tactile perceptibility threshold at each of the measurement locations, and the NC-30 criteria. It is noted that the structure of the proposed development will be substantial, and is expected to further reduce vibration levels. Regardless, control measures to address ground-borne vibration are not expected to be required.

As outlined above, the criteria for both sound and vibration are considered to be reasonable standards for acceptability. However, conformance with these standards does not imply that vibration levels will be imperceptible and/or sound levels will be inaudible. Therefore, appropriate warning clauses should be included in all purchase or lease agreements, and/or in Development Agreements with the municipality.

6 IMPACT OF THE DEVELOPMENT ON THE ENVIRONMENT

Sound levels from stationary (non-traffic) sources of noise such as rooftop air-conditioners, cooling towers, exhaust fans, etc. should not exceed the minimum one-hour L_{EQ} ambient (background) sound level from road traffic, at any potentially impacted residential point of reception (on or off site), to comply with City of Toronto Municipal Code 591. Typical minimum ambient sound levels in the area are expected to be in the range of 50-60 dBA during the day and about 5 dB less at night, at nearby residential receptors, depending on the level of exposure to the traffic noise sources. Thus, any electro-mechanical equipment associated with this development (e.g., cooling towers, fresh-air handling equipment, etc.) should be designed such that they do not result in noise impact beyond these ranges. The proposed building will be higher than the existing

neighbouring buildings, thus noise from the mechanical equipment on the roof of this building are not expected to substantially impact the neighbouring buildings, provided that reasonable typical control measures are included.

7 IMPACT OF THE DEVELOPMENT ON ITSELF

Section 5.8.1.1 of the Ontario Building Code (OBC), released on January 1, 2020, specifies the minimum required sound insulation characteristics for demising partitions of dwelling units, in terms of Sound Transmission Class (STC) or Apparent Sound Transmission Class (ASTC) values. In order to maintain adequate acoustical privacy between separate suites in a multi-tenant building, inter-suite walls must meet or exceed STC-50 or ASTC-47. Suite separation from a refuse chute, or elevator shaft, must meet or exceed STC-55. In addition, it is recommended that the floor/ceiling constructions separating suites from any amenity, commercial or other mechanical spaces also meet or exceed STC-55. Tables 1 and 2 in Section SB-3 of the Supplementary Guideline to the OBC provide a comprehensive list of constructions that will meet the above requirements.

The drawings show an outdoor loading area beside the garbage room on the ground floor, facing the commercial buildings to the south. It is expected that the loading area will be used for infrequent residential garbage pick-up and is therefore not expected to be a significant noise concern. Tarion's Builder Bulletin B19R requires the internal design of condominium projects to integrate suitable acoustic features to insulate the suites from noise from each other and amenities in accordance with the OBC, and limit the potential intrusions of mechanical and electrical services in the development on its residents. If B19R certification is needed, an acoustical consultant is required to review the mechanical and electrical drawings and details of demising constructions and mechanical/electrical equipment, when available, to help ensure that the noise impact of the development on itself is maintained within acceptable levels.

8 WARNING CLAUSES

MECP guidelines recommend that appropriate warning clauses be used in the Development Agreements and in purchase, sale and lease agreements (typically by reference to the

Development Agreements), to inform future owners and occupants about potential noise concerns from sources in the area. The following clauses are recommended:

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

(b) 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 Ministry of Environment, Conservation and Parks.

(c) Purchasers/tenants are advised that due to the proximity of this development to nearby retail/commercial facilities, sound levels from these facilities may at times be audible.

(d) Warning: 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.

(e) Warning: Canadian Pacific Railways Company or its assigns or successors in interest has or have a right-of-way within 300 metres from the land subject hereof. There may be alteration to or expansions of the railway facilities on such rights-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 dwellings. CPR will not be responsible for any complaints or claims arising from use of such facilities and/or operations on, over or under the aforesaid rights-of-way.

These sample clauses are provided only as examples, and can be modified by the owner's legal representative, in consultation with the Municipality, in order to suit site-specific requirements.

9 SUMMARY OF RECOMMENDATIONS

The following list summarizes the conclusions and recommendations made in this report. The reader is referred to the previous sections of the report where these recommendations are discussed in more detail:

1. Upgraded glazing elements for the building envelope are required, to ensure adequate indoor sound levels from transportation sources and other noises in the surrounding environment, as outlined in Section 4.4.1. When architectural drawings are available for the building, an acoustical consultant should review the drawings and provide revised glazing recommendations based on actual window-to-floor area ratios and the exterior wall construction.

2. Central air conditioning systems are recommended, and assumed to be provided in any event, as outlined in Section 4.4.2.

3. A perimeter barrier is required to achieve MECP criteria in the outdoor amenity terraces on the 7th and 9th floors, which are exposed to the rail line. Details regarding outdoor amenity spaces are outlined in Section 4.4.3.

4. Vibration levels from train pass-bys are expected to be below the tactile vibration threshold and below the suggested design criteria for re-radiated noise on the nearest residential floors. Vibration control measures are therefore not required for the proposed development.
5. Warning clauses should be included in the property and tenancy agreements. Recommended wording for these clauses is provided in Section 8. Such clauses are often included by reference to the Development Agreements in which they are contained.
6. Demising assemblies must be selected to meet the minimum requirements of the Ontario Building Code (OBC). Where B19R certification is needed, an acoustical consultant is required to review details of demising constructions and mechanical/electrical equipment, when available, to help ensure that the noise impact of the development on itself are maintained within acceptable levels. Outdoor sound emissions should also be checked to ensure that any potential impacts on adjacent properties are suitably minimized and comply with the requirements of the City of Toronto noise by-law (Chapter 591).

10 CONCLUSIONS

The results of this study indicate that the proposed development at 13 – 21 John Street and 36 – 40 South Station Street is feasible on this site from a noise and vibration impact perspective, with the inclusion of some upgraded acoustical features.

Acoustic modelling has been undertaken to assess the noise impact of surrounding transportation sources on the proposed development. Preliminary recommendations for appropriate building envelope sound insulation values are provided. Vibration impacts from the nearby existing rail line are not expected to be significant. In any case, warning clauses are recommended to advise residents of road and rail traffic noise and vibration.

11 References

1. Ontario Ministry of the Environment, Conservation and Parks Publication NPC-300, *Environmental Noise Guideline, Stationary and Transportation Sources - Approval and Planning*, August, 2013.

2. International Organization for Standardization, *Acoustics – Attenuation of Sound during Propagation Outdoors – Part 2: General Method of Calculation*, ISO-9613-2, Switzerland, 1996.

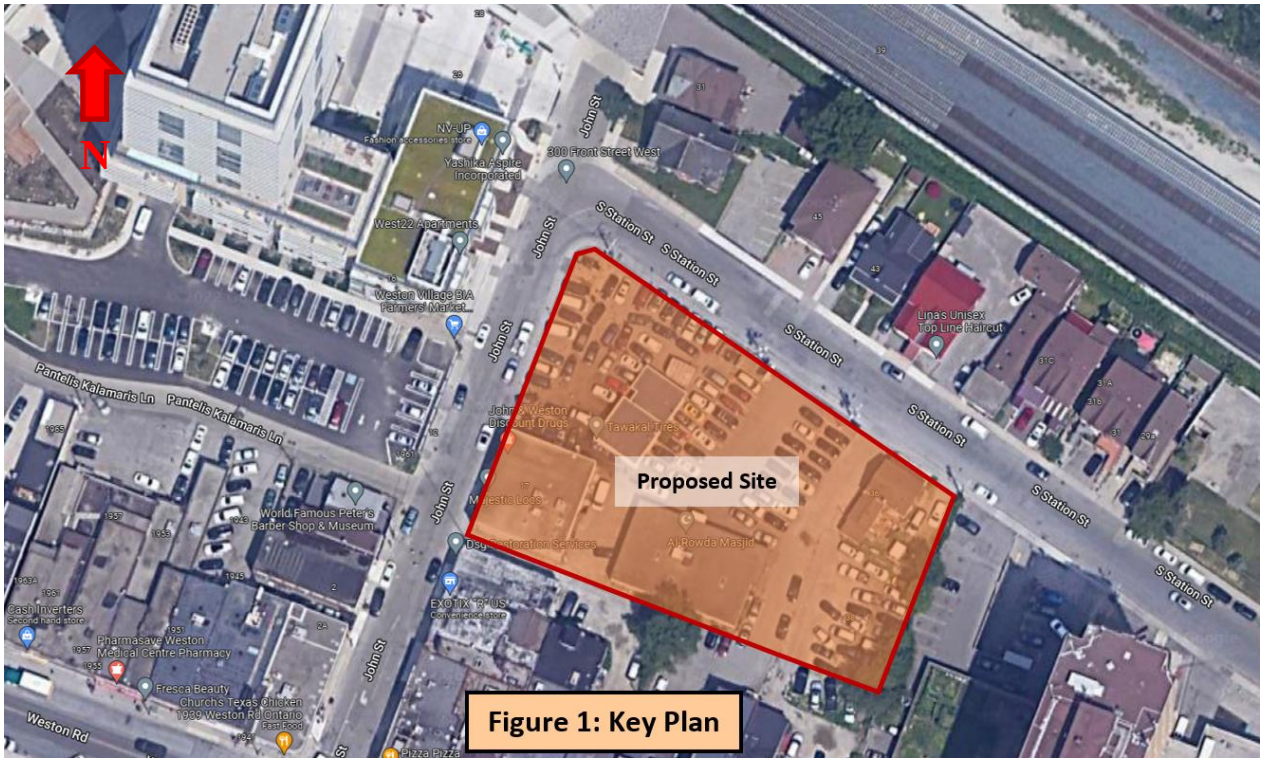

Figure 1: Key Plan

Figure 2: Site plan

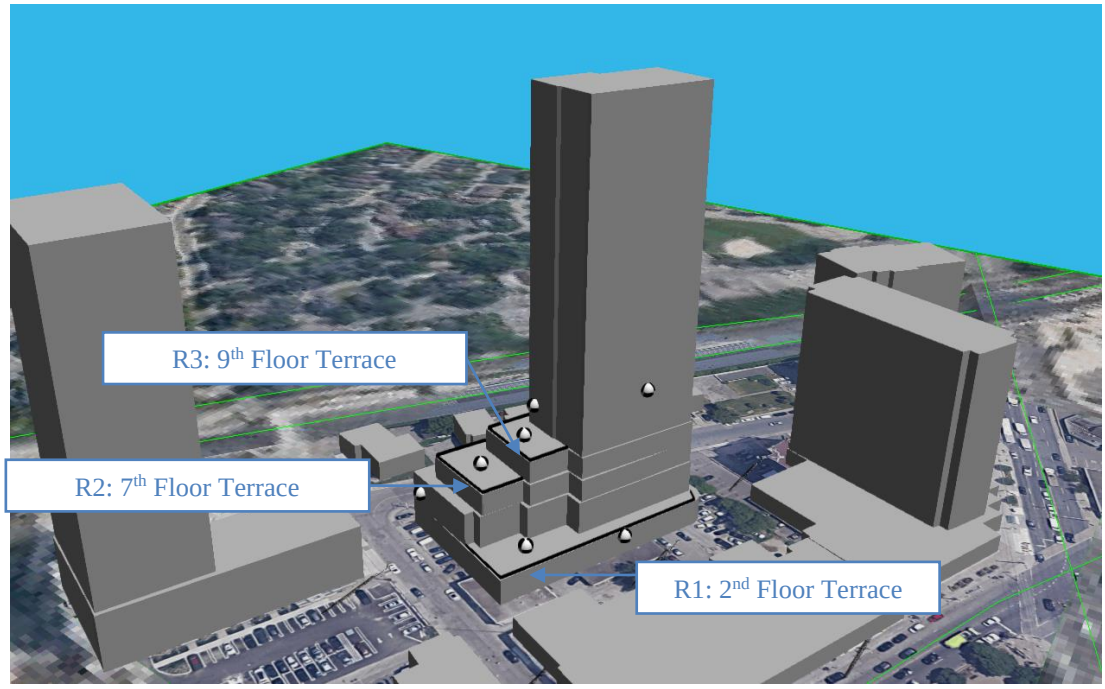

Figure 3: Receptor Locations for Outdoor Living Areas

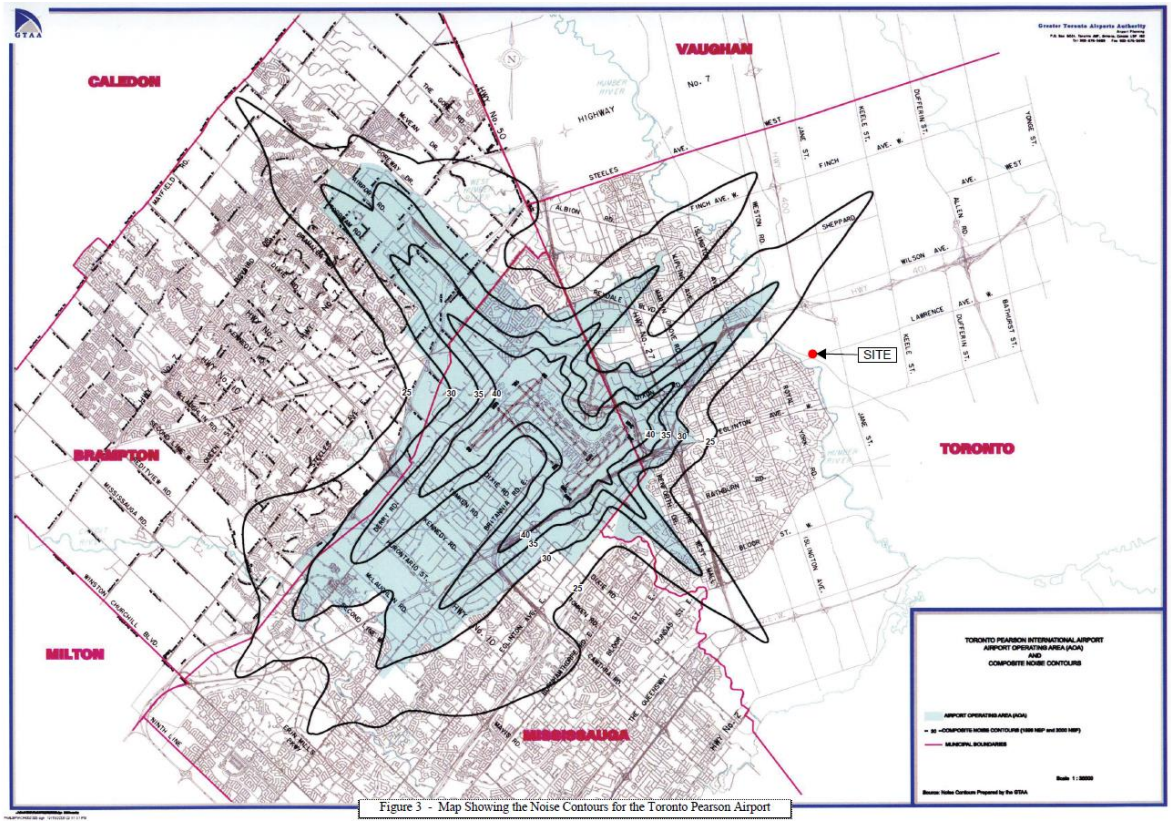

Figure 4: NEF Contour Lines for Toronto Pearson Airport

Figure 5: Sound Level Predictions from All Transportation Noise Sources (Day)

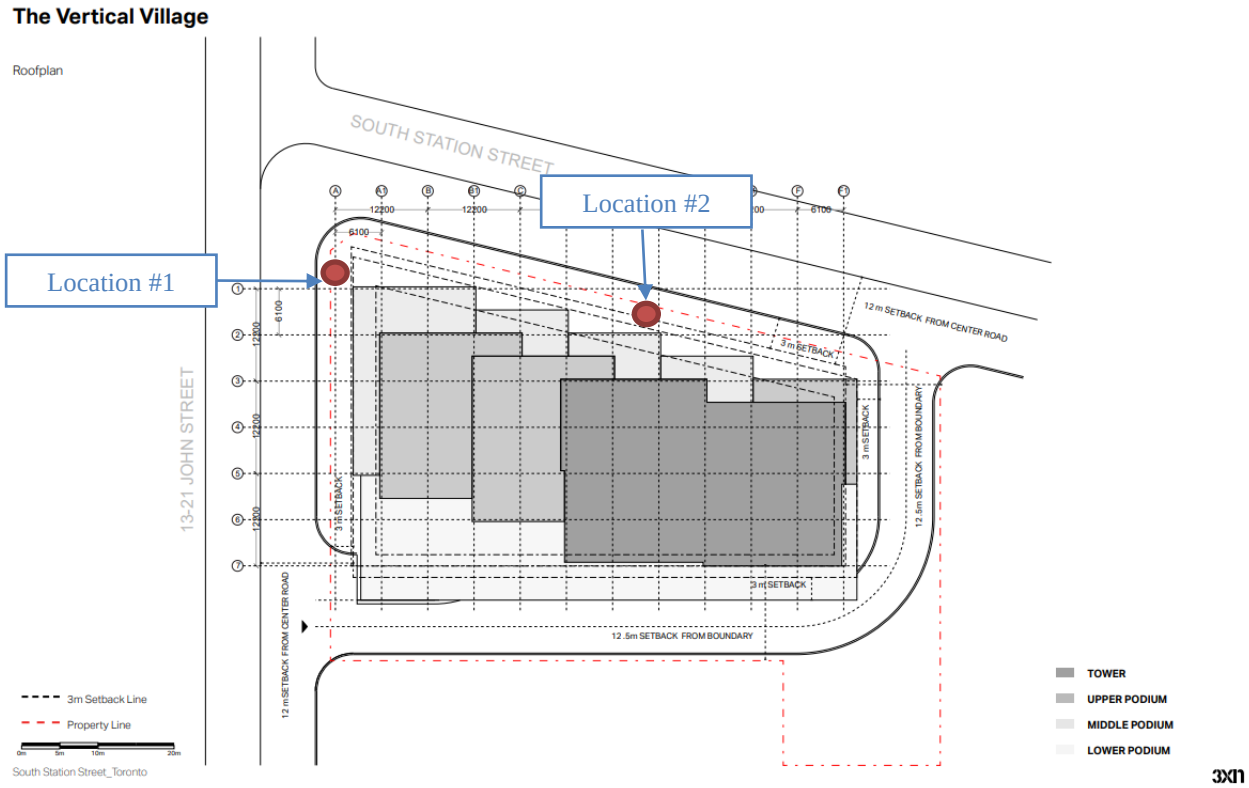

Figure 6: Vibration Measurement Locations

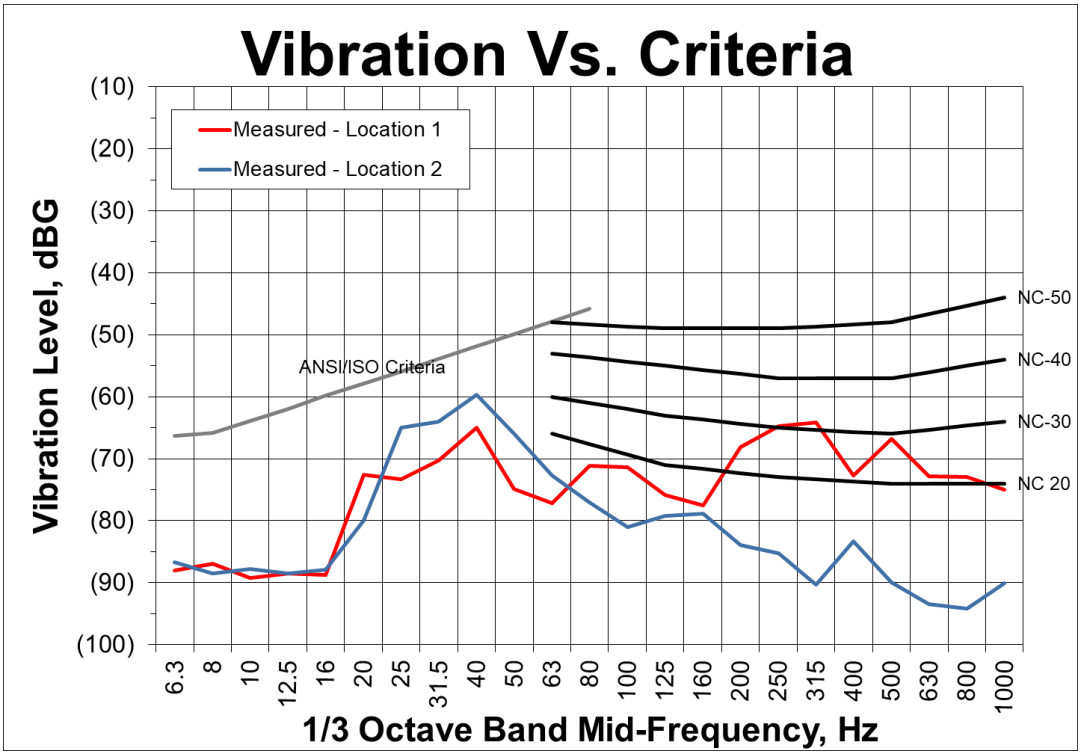

Figure 7: Maximum Measured Vibration vs. Criteria

APPENDIX A

TRAFFIC DATA

Transportation Services

TMC Summary Report

LAWRENCE AVE AT WESTON RD (PX 431)
2020-03-10

Date	Study Hours	Traffic Signal Number	
2020-03-10 (Tue)	Routine	431	
Total Volume	**Total Vehicles**	**Total Cyclists**	**Total Pedestrians**
21,101	16,733	16	4,352

Time Period	Vehicle Type	NORTHBOUND					EASTBOUND					SOUTHBOUND					WESTBOUND										
		Exits	Left	Thru	Right	Total	Exits	Left	Thru	Right	Total	Exits	Left	Thru	Right	Total	Exits	Left	Thru	Right	Total		N	E	S	W	Total
07:30–18:00	CAR	2,726	440	2,178	693	3,311	4,684	59	3,534	438	4,031	3,438	457	2,444	285	3,186	3,878	556	3,153	489	4,198	PED	685	1,292	1,112	1,263	4,352
TOTAL SUM	TRUCK	309	45	263	42	350	323	2	236	35	273	319	45	239	10	294	362	45	307	44	396	BIKE	4	0	12	0	16
	BUS	103	13	94	4	111	243	1	235	6	242	109	4	98	4	106	239	5	222	8	235	OTHER	0	0	0	0	0
21,101	TOTAL	3,138	498	2,535	739	3,772	5,250	62	4,005	479	4,546	3,866	506	2,781	299	3,586	4,479	606	3,682	541	4,829	16,733					
08:15–09:15	CAR	318	69	260	98	427	703	5	546	48	599	493	59	379	34	472	612	66	509	53	628	PED	82	163	174	146	565
AM PEAK	TRUCK	29	13	23	9	45	61	1	46	5	52	42	6	31	1	38	54	6	40	5	51	BIKE	0	0	2	0	2
	BUS	25	3	20	1	24	39	0	37	1	38	26	1	24	1	26	39	1	35	5	41	OTHER	0	0	0	0	0
3,008	TOTAL	372	85	303	108	496	803	6	629	54	689	561	66	434	36	536	705	73	584	63	720	2,441					
16:30–17:30	CAR	457	63	402	117	582	737	2	566	66	634	544	54	372	46	472	601	106	492	53	651	PED	99	228	212	216	755
PM PEAK	TRUCK	42	5	36	8	49	43	0	30	3	33	45	5	32	2	39	57	10	50	6	66	BIKE	0	0	0	0	0
	BUS	11	1	11	0	12	31	0	31	0	31	12	0	12	1	13	31	0	29	0	29	OTHER	0	0	0	0	0
3,366	TOTAL	510	69	449	125	643	811	2	627	69	698	601	59	416	49	524	689	116	571	59	746	2,611					
10:00–15:00	CAR	312	43	230	74	346	479	11	345	51	407	354	61	249	30	339	387	54	314	70	439	PED	81	135	100	146	461
OFF HOUR	TRUCK	41	5	36	3	43	36	0	26	5	31	40	7	31	2	39	41	4	35	5	44	BIKE	1	0	2	0	3
	BUS	7	1	7	1	8	25	0	24	1	25	9	0	7	0	7	24	1	23	0	24	OTHER	0	0	0	0	0
2,216	TOTAL	359	48	272	78	398	539	12	394	56	462	402	67	287	31	385	452	59	372	75	507	1,751					
07:30–09:30	CAR	583	136	471	180	787	1,370	9	1,080	99	1,188	951	110	719	65	894	1,102	133	901	103	1,137	PED	143	276	305	259	983
2 HOUR AM	TRUCK	55	20	41	17	78	115	1	88	8	97	69	10	51	1	62	86	10	65	13	88	BIKE	0	0	2	0	2
	BUS	47	6	39	1	46	82	1	77	4	82	51	4	45	3	52	81	2	72	7	81	OTHER	0	0	0	0	0
5,577	TOTAL	685	162	551	198	911	1,567	11	1,245	111	1,367	1,071	124	815	69	1,008	1,269	145	1,038	123	1,306	4,592					
16:00–18:00	CAR	897	134	787	218	1,139	1,398	5	1,076	135	1,216	1,072	104	731	101	936	1,230	206	995	105	1,306	PED	219	475	408	422	1,524
2 HOUR PM	TRUCK	91	7	80	12	99	66	0	45	8	53	92	9	65	3	77	113	19	103	11	133	BIKE	0	0	1	0	1
	BUS	29	3	28	1	32	63	0	62	0	62	24	0	24	1	25	61	0	57	1	58	OTHER	0	0	0	0	0
6,661	TOTAL	1,017	144	895	231	1,270	1,527	5	1,183	143	1,331	1,188	113	820	105	1,038	1,404	225	1,155	117	1,497	5,136					

Generated at: 2022-07-06 09:08

800 - 1290 Central Parkway West
Mississauga, Ontario
Canada L5C 4R3

T 905 803 3201
E simon_deschamps@cpr.ca

April 7, 2020

Via email: ylo@hgcengineering.com

Yvonne Lo
HGC Engineering
2000 Argentia Road
Plaza One, Suite 203
Mississauga, ON L5N 1P7

Dear Sir/Madam:

Re: Rail Traffic Volumes, CP Mileage 1.00, Mactier Subdivision, Eglinton Avenue West at CP Track, Toronto

This is in reference to your request for rail traffic data in the vicinity of Eglinton Avenue West at CP Track in the City of Toronto. The study area is located at mile 1.00 of our Mactier Subdivision, which is classified as a Principal Main line.

The information requested is as follows:

1. Number of freight trains between 0700 & 2300: 8
   Number of freight trains between 2300 & 0700: 6

2. Maximum cars per train freight: 179

3. Number of locomotives per train: 2 to 4

4. Maximum permissible train speed: 35 mph

5. There are no grade crossings through the study area, however, the whistle may be sounded if deemed necessary by the train crew for safety reasons at any time.

6. 1 mainline track with continuously welded rail and 1 siding track, with jointed rail.

7. Metrolinx and CN operate on the adjacent tracks. Rail Traffic Data should be obtained directly from them.

The information provided is based on recent rail traffic. Variations of the above may exist on a day-to-day basis. Specific measurements may also vary significantly depending on customer needs.

Yours truly,

Simon Deschamps
Specialist Real Estate

Rank	TC Number	Railway	Region	Province	Access	Regulator	Mile	Subdivision	Spur Mile I	Spur Name	Location	Latitude	Longitude	ıad	Author	Protection	Accident	Fatality	Injury	Trains Daily	ehicles Dai	Max Speed	Max Speed	Lanes	Tracks	IsUrban
599	17561	CN	PAC	BC	Public	F	66.32	Yale			Annis Rd	49.16885	-121.83		Chilliwack (	Active - FLE	0	0	0	39.86	1002	60	60	2	2	N
600	24919	CP	ONT	ON	Public	F	0.23	Mactier			Old Weston R	43.6695	-79.4619		Toronto (O	Active - FLE	1	1	0	9	12000	25	50	2	1	Y
601	47328	GO	ONT	ON	Private	P	10.5	Newmarket - GO			Carlhall Rd	43.7475	-79.4771		Private Roa	Active - FLE	0	0	0	10	1000	60	50	2	1	N

From: Darryl McCumber
To: Bryan Kurzman
Subject: FW: Traffic Data Request
Date: January 21, 2022 11:20:37 AM
Attachments: image001.png

Darryl McCumber, BASc, PEng
HGC Engineering **NOISE | VIBRATION | ACOUSTICS**
Howe Gastmeier Chapnik Limited
t: 905.826.4044

From: Rail Data Requests <RailDataRequests@metrolinx.com>
Sent: January 21, 2022 11:04 AM
To: Darryl McCumber <dmccumber@hgcengineering.com>
Subject: RE: Traffic Data Request

Thanks Darryl,

Further to your request dated January 6, 2022, the subject lands (south of the intersection of 401 and Islington Avenue, Toronto) are located within 300 metres of the Metrolinx Weston Subdivision (which carries Kitchener GO and UP Express rail service).

It's anticipated that GO rail service on this Subdivision will be comprised of diesel and 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 480 trains. The planned detailed trip breakdown is listed below:

Weston Subdivision (which carries Kitchener GO Rail Service)

	1 Diesel Locomotive	2 Diesel Locomotives		1 Diesel Locomotive	2 Diesel Locomotives
Day (0700-2300)	92	36	Night (2300-0700)	22	2

It's anticipated that UP Express rail service at this location will be electrified and comprised of up to three (3) passenger cars. The planned detailed trip breakdown is listed below:

UP Express

	1 Electric Locomotive		1 Electric Locomotive
Day (0700-2300)	256	Night (2300-0700)	72

The current track design speed near the subject lands is 80 mph (129 km/h).

There are no *anti-whistling by-laws* in affect near the subject lands

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.

Best regards,

Harrison Rong
Project Coordinator, Third Party Projects Review
Metrolinx
20 Bay Street | Suite 600 | Toronto | Ontario | M5J 2W3

From: Darryl McCumber <dmccumber@hgcengineering.com>
Sent: January 20, 2022 1:22 PM
To: Rail Data Requests <RailDataRequests@metrolinx.com>
Subject: RE: Traffic Data Request

The site is located at 401 and Islington; I guess that's the location of the nearest station. It shouldn't make too much of a difference; it's the same rail line.

Best regards,

Darryl McCumber, BASc, PEng
HGC Engineering **NOISE | VIBRATION | ACOUSTICS**
Howe Gastmeier Chapnik Limited
t: 905.826.4044

From: Rail Data Requests <RailDataRequests@metrolinx.com>
Sent: January 20, 2022 11:50 AM
To: Darryl McCumber <dmccumber@hgcengineering.com>
Subject: RE: Traffic Data Request

Good morning Darryl,

Can you please provide an address or confirm that the location is 401 and Islington Ave? The link you provided showed Kipling.

Best regards,
Harrison Rong
Project Coordinator, Third Party Projects Review
Metrolinx
20 Bay Street | Suite 600 | Toronto | Ontario | M5J 2W3

From: Darryl McCumber <dmccumber@hgcengineering.com>
Sent: January 6, 2022 11:47 AM
To: Rail Data Requests <RailDataRequests@metrolinx.com>
Cc: Bryan Kurzman <bkurzman@hgcengineering.com>
Subject: Traffic Data Request

We are looking for rail traffic data for the rail line just south of the intersection of the 401 and Islington Avenue in Toronto (link to approximate location: https://goo.gl/maps/NPXaBDZRfEPpkYQa7). Can you provide us with the latest traffic data?

Thanks,
Darryl McCumber, BASc, PEng
Associate

HGC Engineering **NOISE | VIBRATION | ACOUSTICS**
Howe Gastmeier Chapnik Limited
2000 Argentia Road, Plaza One, Suite 203, Mississauga, Ontario, Canada L5N 1P7
t: 905.826.4044 **e**: dmccumber@hgcengineering.com
Visit our website: www.hgcengineering.com **Follow Us** – LinkedIn | Twitter | YouTube

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APPENDIX B

RAIL GUIDELINES

PRINCIPAL MAIN LINE REQUIREMENTS FOR NEW DEVELOPMENT

A. Safety setback of dwellings from the railway rights-of-way to be a minimum of 30 metres in conjunction with a safety berm. The safety berm shall be adjoining and parallel to the railway rights-of-way with returns at the ends, 2.5 metres above grade at the property line, with side slopes not steeper than 2.5 to 1.

B. Noise attenuation barrier shall be adjoining and parallel to the railway rights-of-way, having returns at the ends, and a minimum total height of 5.5 metres above top-of-rail. Acoustic fence to be constructed without openings and of a durable material weighing not less than 20 kg. per square metre of surface area. Subject to the review of the noise report, GO Transit may consider other measures recommended by an approved Noise Consultant.

C. Ground-borne vibration transmission to be evaluated in a report through site testing to determine if dwellings within 75 metres of the railway rights-of-way will be impacted by vibration conditions in excess of 0.14 mm/sec RMS between 4 Hz and 200 Hz. The monitoring system should be capable of measuring frequencies between 4 Hz and 200 Hz, $\pm$ 3 dB with an RMS averaging time constant of 1 second. If in excess, isolation measures will be required to ensure living areas do not exceed 0.14 mm/sec RMS on and above the first floor of the dwelling.

D. The Owner shall install and maintain a chain link fence of minimum 1.83 metre height along the mutual property line.

E. The following clause should be inserted in all development agreements, offers to purchase, and agreements of Purchase and Sale or Lease of each dwelling unit within 300m of the railway right-of-way.

> **Warning:** 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.

F. Any proposed alterations to the existing drainage pattern affecting the railway right-of-way must receive prior concurrence from GO Transit and be substantiated by a drainage report to the satisfaction of GO Transit.

G. The Owner shall through restrictive covenants to be registered on title and all agreements of purchase and sale or lease provide notice to the public that the safety berm, fencing and vibration isolation measures implemented are not to be tampered with or altered and further that the Owner shall have sole responsibility for and shall maintain these measures to the satisfaction of GO Transit.

H. The Owner enter into an Agreement stipulating how GO Transit's concerns will be resolved and will pay GO Transit's reasonable costs in preparing and negotiating the agreement.

I. The Owner may be required to grant GO Transit an environmental easement for operational emissions, registered on title against the subject property in favour of GO.