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Noise and Vibration Feasibility Study
Proposed Residential Development
Hewitt's Gate
Barrie, Ontario

Prepared for:

Pratt Development Inc.
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January 25, 2017

Table of Contents

1 Introduction and Summary

HGC Engineering was retained by Pratt Development Inc. to perform a noise and vibration feasibility study for a proposed residential development (Hewitt's Gate) to be located south of Mapleview Drive East and east of the GO Transit railway in the City of Barrie, Ontario. The lands are currently vacant and are proposed to include single detached dwellings, townhouse blocks, multi-unit blocks, stormwater management ponds, institutional block, open space blocks, and associated roadways. The analysis includes an assessment of road and rail traffic noise on the proposed residential dwellings in accordance with the Ministry of the Environment and Climate Change (MOECC) guidelines. The study is required by the City of Barrie and GO Transit as part of the planning and approvals process.

Rail traffic data was obtained from GO Transit personnel. Road traffic data was obtained from the City of Barrie. The data was used to predict future traffic sound levels at the façades of the proposed residential buildings and in rear yard outdoor living areas. The predicted sound levels were compared to the guidelines of the MOECC and GO Transit.

The sound level predictions indicate that the future road and rail traffic sound levels will exceed MOECC and GO Transit guidelines at the plane of the living/dining room windows during the daytime and at the plane of the bedroom windows during the nighttime at the closest dwellings with exposure to the railway and Mapleview Drive. An acoustic barrier is required for the rear yards of dwellings backing on the railway. Forced air ventilation systems with ductwork sized for the future installation of central air conditioning by the occupant will be required for dwellings with exposure to the railway and/or to Mapleview Drive. Upgraded building constructions including brick exterior wall construction or an acoustical equivalent for the first row of dwellings and upgraded glazing constructions are required for dwellings closest to the railway. For the remaining dwellings further from the railway, any exterior wall, and double glazed window construction meeting the minimum requirements of the Ontario Building Code (OBC) will provide adequate sound insulation for the dwelling units. Warning clauses are also recommended to inform future owners and tenants of the rail traffic noise impacts and to address sound level excesses. A noise study addendum is required when grading information and detailed floor plans and building elevations are available to refine the

acoustic recommendations and verify the exterior wall constructions for those lots closest to the railway line.

Vibration measurements were conducted in September 2016. The measured ground-borne vibration levels do not exceed the GO Transit guidelines at the closest proposed dwellings approximately 30 m from the GO Transit railway right-of-way. No vibration mitigation measures are required.

2 Site Description and Sources of Sound

Figure 1 shows a key plan which identifies the location of the proposed residential development. The subject site is currently vacant. The proposed development will include single detached dwellings, townhouse blocks, multi-unit blocks, stormwater management ponds, open space blocks and associated roadways. The proposed draft plan prepared by Jones Consulting Group Ltd. dated December 14, 2016 is shown as Figure 2. Prediction locations [A] to [E] are also shown on Figure 2 for reference.

The surrounding lands are existing residential and agricultural lands with proposed residential to the east and south. On the west side of the railway is a Simcoe County District School Board Facility Services building, St. Paul's Anglican Church-Innisfil and Paul's Auto Body Shop. Sounds from these sources were not audible during the time of the site visit. An institutional block is proposed to be located at the northeast corner of the site. A noise warning clause is recommended in Section 5.6 to address occasional sounds which may be audible on the subject site. The GO Transit railway is located approximately 30 m to the west of the site, which is a principal main track and operates in the north-south direction. The railway and Mapleview Drive are the primary sources of noise in the area. Secondary sources of noise include Yonge Street to the west of the railway. The roadways are both two lane roadways (one lane in each direction).

3 Criteria for Acceptable Sound Levels

Guidelines for acceptable levels of road and rail traffic noise impacting residential developments are given in the MOECC publication NPC-300, "Environmental Noise Guideline Stationary and Transportation Sources – Approval and Planning", Part C release date October 21, 2013 and are

listed in Table 1 below. The values in Table 1 are energy equivalent (average) sound levels [L_{EQ}] in units of A weighted decibels [dBA].

Table 1: Road and Rail Traffic Noise Criteria

	Daytime $L_{EQ(16\ hour)}$ Road/Rail	**Nighttime $L_{EQ(8\ hour)}$ Road/Rail**
Outside Bedroom Windows	55 dBA / 50 dBA	50 dBA / 45 dBA
Outdoor Living Areas	55 dBA	--
Inside Living/Dining Rooms	45 dBA / 40 dBA	45 dBA / 40 dBA
Inside Bedrooms	45 dBA / 40 dBA	40 dBA / 35 dBA

These criteria apply to road and rail traffic operating on railway rights of way, vehicular traffic, including intercity transit busses operating on Municipal Streets. Daytime refers to the period between 07:00 and 23:00, while nighttime refers to the period between 23:00 and 07:00. The term "Outdoor Living Area" (OLA) is used in reference to an outdoor patio, a backyard, a terrace or other area where passive recreation is expected to occur. Balconies that are less than 4 m in depth are not considered to be outdoor living areas under MOECC guidelines.

The guidelines in the MOECC publication allow the sound level in an Outdoor Living Area to be exceeded by up to 5 dBA, without mitigation, if warning clauses are placed in the property and tenancy agreements and offers of purchase and sale. Where OLA sound levels exceed 60 dBA, physical mitigation is required to reduce the OLA sound level to below 60 dBA and as close to 55 dBA as technically, economically and administratively feasible.

Indoor guidelines are 5 dBA more stringent for rail noise than for road noise, to account for the low frequency (rumbling) character of locomotive sound, and its greater potential to transmit through exterior wall/window assemblies. A central air conditioning system as an alternative means of ventilation to open windows is required for dwellings where future nighttime sound levels outside bedroom windows will exceed 60 dBA. The provision for the future installation of central air conditioning is required when nighttime sound levels at bedroom windows are in the range of 51 to 60 dBA or when daytime sound levels at living room windows are in the range of 56 to 65 dBA. Sound attenuating building constructions and the use of warning clauses to notify future residents of

possible excesses are also required when nighttime sound levels exceed 55 dBA at the plane of the bedroom window due to rail traffic noise and exceed 60 dBA at the plane of the bedroom window due to road traffic noise.

Warning clauses to notify future residents of possible excesses are also required when daytime sound levels exceed 55 dBA in the outdoor living area and at the plane of the window.

MOECC guidelines recommend brick exterior walls from foundation to rafters as a minimum construction for any dwellings which are within 100 m of the right of way of the railway, where the 24 hour L_{EQ} is greater than 60 dBA. GO Transit typically requires brick for the first row of dwellings regardless of setback and sound level.

The railways also provide minimum requirements for safety as well as sound and vibration for proposed residential developments located adjacent to their rights-of-way. These refer to minimum required setbacks, berms, fencing and warning clauses. The reader is referred to a copy of GO Transit requirements for a new development adjacent to a principal main rail line, which is located in Appendix A.

3.1 Ground-borne Vibration from Rail Traffic

GO Transit guidelines require measurements of ground-borne vibration when dwelling units are to be located within 75 metres of a principal mainline.

Vibration is typically measured in terms of oscillatory velocity or acceleration. The limits for acceptable ground-borne vibration are frequency dependent and are presented as a curve of maximum allowable vibratory acceleration versus frequency. The criterion has been overlaid on the graphs of measured vibration for easy reference (Figures 4 to 6).

4 Traffic Sound Level Assessment

4.1 Road Traffic Data

Traffic data for Mapleview Drive East and Yonge Street were obtained from the City of Barrie in the form of annual average daily traffic (AADT) projected to the year 2031 and is provided in Appendix B. Both roadways have a posted speed limit of 60 km/h. A commercial vehicle

percentage of 4% split into 1% medium trucks and 3% heavy trucks for Mapleview Drive East; and 3%, split into 1% medium trucks and 2.4% heavy trucks for Yonge Street was used in the analysis. A day/night split of 90%/10% was assumed for both roadways. Table 2 summarizes the traffic volume data used in this study.

Table 2: Projected Road Traffic Data to 2031

Road Name		Cars	Medium Trucks	Heavy Trucks	Total
Mapleview Drive East	Daytime	5 184	54	162	5 400
	Nighttime	576	6	18	600
	Total	**5 760**	**60**	**180**	**6 000**
Yonge Street	Daytime	9 603	99	198	9 900
	Nighttime	1 067	11	22	1 100
	Total	**10 670**	**110**	**220**	**11 000**

4.2 Rail Traffic Data

Rail traffic data for typical operations of the railway were obtained from GO Transit personnel along with the speed and are provided in Appendix C. This rail line is used for passenger operations only. The maximum permissible train speed in the area of the site is 80 km/h for passenger trains. This maximum speed, as well as the maximum number of cars and locomotives per train were used in the traffic noise analysis to yield a worst cast estimate of train noise. The data was projected to the year 2027 using a 2.5% per year growth rate. Table 3 summarises the rail traffic data used in the analysis.

Table 3: GO Transit Rail Traffic Data Projected to Year 2027

Type of Train	Number of Trains Day/ Night	Number of locomotives	Number of cars	Max Speed (KPH)
Passenger (GO) Electric trains	33.8 / 11.3	1	12	80

4.3 Traffic Noise Predictions

To assess the levels of road and rail traffic noise which will impact the site in the future, predictions were made using STAMSON version 5.04, a computer algorithm developed by the MOECC. Sample STAMSON output is included in Appendix D. Train whistle noise was not included in the predictions at the building façades since these were not heard during the site visit and there are crossing arms at Mapleview Drive.

Predictions of the traffic sound levels were made at the future residential dwellings. Sound levels were predicted at the plane of the bedroom windows during nighttime hours and at the plane of the living/dining room windows during the daytime to investigate ventilation requirements. The results of these predictions are summarized in Tables 4 and 5. The acoustic requirements may be subject to modifications if the site plan is changed significantly.

Table 4: Daytime Future Road and Rail Traffic Sound Levels, [dBA]

Prediction Location	Description	Daytime at Façade $L_{EQ-16\ hr}$		Daytime at Façade $L_{EQ-16\ hr}$	Daytime in OLA $L_{EQ-16\ hr}$
		Road	Rail		
[A]	Dwellings backing onto railway	<55	62	62	62
[B]	Dwellings in second row from railway	<55	<55	<55	<55
[C]	Dwellings with some exposure to railway	<55	53	53	59
[D]	Dual fronting dwellings with exposure Mapleview Dr	57	<55	57	58
[E]	Dwellings flanking onto Mapleview Dr	59	<55	59	57

Table 5: Nighttime Future Road and Rail Traffic Sound Levels, [dBA]

Prediction Location	Description	Nighttime at Façade $L_{EQ-8\ hr}$		Nighttime at Façade $L_{EQ-8\ hr}$
		Road	Rail	
[A]	Dwellings backing onto railway	<50	60	60
[B]	Dwellings in second row from railway	<50	51	51
[C]	Dwellings with some exposure to railway	<50	57	57
[D]	Dual fronting dwellings with exposure Mapleview Dr	51	<50	51
[E]	Dwellings flanking onto Mapleview Dr	53	<50	53

5 Traffic Noise Recommendations

The predictions indicate that the future traffic sound levels will exceed MOECC and GO Transit guidelines at the dwellings closest to the railway line and Mapleview Drive. Recommendations to address these excesses are discussed below.

5.1 Outdoor Living Areas

Typically for residential developments adjacent to a principal mainline, an acoustic barrier totalling 5.5 m in height is required, comprising of a 2.5 m high safety berm with a 3.0 m high acoustic wall on top.

Sound levels in the OLA's of the lots with backing exposure to the railway will be up to 62 dBA, 7 dBA in excess of the MOECC and GO Transit limit of 55 dBA. Physical mitigation is required for these lots. An acoustic barrier 4.7 m in height will reduce sound levels in the OLAs to 55 dBA. The acoustic barrier should extend north from the development to the south (PGC lands) and extend a sufficient distance north or wrap eastward to shield the end rear yard at the north. Figure 3 indicates the approximate location and extent of the acoustic barrier. When grading information is available, the acoustic barrier height should be refined.

Sound levels of the OLA's with flanking exposure onto Mapleview Drive (prediction location E) will be up to 57 dBA, 2 dBA in excess of the MOECC limit of 55 dBA. An acoustic barrier is not required. A 2 dBA sound level excess is acceptable to the MOECC if it is acceptable to the municipality. A noise warning clause will also be required.

An acoustic barrier may be any combination of an earthen berm with an acoustic wall on top for example, a 2.5 m high earth safety berm with a 2.0 m high acoustic wall on top to achieve a total height of 4.7 m. The wall component of the barrier should be of a solid construction with a surface density of no less than 20 kg/m^2. If acoustic walls are to be used, the walls may be constructed from a variety of materials such as wood, brick, pre-cast concrete or other concrete/wood composite systems provided that it is free of gaps or cracks. All barrier heights are stated relative to the top of rail elevation in the area. The heights and extents of the barriers should be chosen to reduce the sound levels in the OLA's to as close to 55 dBA as is technically, administratively and economically feasible, subject to the approval of the municipality respecting any applicable fence height by-laws.

High Density Blocks

The multi-unit blocks with direct exposure to Mapleview Drive East and the railway have not been considered in this analysis, because the land use including building envelope has not been specified. A noise study addendum should be prepared to determine the acoustic requirements such as acoustic barriers, ventilation requirements and to specify building components when the siting, grading and potential land use has been finalized. If large commercial establishments such as grocery stores or large hardware stores, car washes or auto maintenance garages are proposed, particularly those involving significant trucking activity or mechanical equipment such as refrigeration condensing units or rooftop cooling towers, individual noise studies should be required to ensure that the noise emissions from these facilities complies with MOECC guideline limits contained in NPC-300.

Proposed Institutional Block (Block 619)

An institutional block is proposed to the east of the subject site. At this time, the location of the institutional building is not known. Some dwellings near this block may be impacted by the activities of the institutional block. A noise study should be conducted when siting information is available to determine the impact of its activities on the existing and future residential uses nearby. Typically, noisy sources such as rooftop mechanical equipment or trucking activities will need to be considered. A noise study is required to ensure that the noise emissions from the facilities complies with MOECC guidelines limits contained in NPC-300.

5.2 Minimum Distance Setbacks

For noise control and safety reasons, GO Transit policies stipulate that the minimum required setback between a new dwelling and a principal main line is to be a minimum of 30 metres. The proposed residential buildings will be located 30 metres or more from the railway, thereby, meeting the requirement.

5.3 Indoor Living Areas

Provision for the Future Installation of Air Conditioning

For the dwellings adjacent to and with exposure to the railway and Mapleview Drive, the predicted daytime sound levels are in the range of 56 dBA to 65 dBA and nighttime sound levels are in the range of 51 to 60 dBA (prediction locations [A] to [E]). These dwellings will require forced air ventilation systems with ducts sized to accommodate the future installation of central air conditioning by the occupant. The location, installation and sound ratings of the outdoor air conditioning devices should minimize noise impacts and comply with criteria of MOECC publication NPC-300, as applicable.

Ventilation requirements for the proposed development are shown in Figure 3.

5.4 Building Façade Constructions

Future traffic sound levels at some of the dwellings (prediction location [A]) will exceed 60 dBA during the day and 55 dBA at night due to rail traffic and will require upgraded building components. MOECC guidelines recommend that the windows, walls and doors be designed so that the indoor sound levels comply with MOECC noise criteria.

The building components need to be selected based on the Acoustic Insulation Factor (AIF) value required for rail traffic. To do so, calculations were performed to determine the AIF required to maintain indoor sound levels within MOECC guidelines. The calculation methods were developed by the National Research Council (NRC). They are based on the predicted future sound levels at the building facades, and the anticipated area ratios of the facade components (walls, windows and doors) and the floor area of the adjacent room.

Exterior Wall Construction

Railway guidelines recommend brick exterior walls or an acoustical equivalent from foundation to rafters as a minimum construction for any dwellings with a 24 hour L_{EQ} that is greater than 60 dBA which are within 100 m of the right of way of the railway. This applies to all of the dwellings in the first row adjacent to the railway (prediction location [A]).

Exterior Doors

Any insulated metal exterior door meeting OBC requirements will be sufficient to provide noise insulation. If sliding patio doors are to be used in the dwellings, they must be included in the window area.

Acoustical Requirements for Glazing

Assuming a typical window to floor area of 50% for the living/dining rooms (40% fixed and 10% operable) and 25% for the bedrooms (20% fixed and 5% operable), the minimum acoustical requirement for the basic window glazing, including glass in fixed sections, sliding doors, and operable windows, is shown in Table 6 for the proposed residential buildings.

Table 6: Minimum STC Requirements for Glazing at Specific Facades

Prediction Location	Description	Space	Glazing STC[1, 2]
[A]	Dwellings backing onto railway	Living/Dining	STC-30*
		Bedroom	STC-30*
[B]	Dwellings in second row from railway	Living/Dining	OBC+
		Bedroom	OBC+
[C]	Dwellings with some exposure to railway	Living/Dining	OBC+
		Bedroom	OBC+
[D]	Dual fronting dwellings with exposure Mapleview Dr	Living/Dining	OBC+
		Bedroom	OBC+
[E]	Dwellings flanking onto Mapleview Drive	Living/Dining	OBC+
		Bedroom	OBC+

Note:

OBC – any construction meeting the minimum requirements of the Ontario Building Code
[1] Based on 50% window to floor area ratio for living/dining rooms and 25% window to floor area ratio for bedrooms.
[2] 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.
* Based on sound through windows only, since the exterior wall is required to be brick.
+ Based on sound through windows and walls

The calculated STC requirements assume insignificant sound transmission through the walls. These glazing requirements can be met using fairly standard sealed units.

Sample window assemblies which may achieve the STC requirements are summarized in Table 7 below. Note that acoustic performance varies with manufacturer's construction details, and these are only guidelines to provide some indication of the type of glazing likely to be required. Acoustical test data for the selected assemblies should be requested from the supplier, to ensure that the stated acoustic performance levels will be achieved by their assemblies.

Table 7: Window Constructions Satisfying STC Requirements

STC Requirement	Sample Glazing Configuration (STC)
28 – 29	Any double glazed unit
30 – 31	3(13)3

In Table 7, the numbers outside the parentheses indicate minimum pane thicknesses in millimetres and the number in parentheses indicates the minimum inter-pane gap in millimetres. OBC indicates any glazing construction meeting the minimum requirements of the Ontario Building Code.

Operable sections include sliding glass doors and operable windows, and provided that they include a good seal, will not significantly affect overall performance. Operable windows and sliding glass doors must be well-fitted and weather-stripped.

When detailed floor plans and elevations are available for dwellings closest to the railway, the required glazing constructions should be refined based on actual window to floor area ratios.

For the remaining dwellings further from the railway, any exterior wall, and double glazed window construction meeting the minimum requirements of the Ontario Building Code (OBC) will provide adequate sound insulation for the dwelling units. For any ancillary spaces (other than bedrooms, living and dining rooms), any window meeting the minimum requirements of the OBC will be sufficient.

5.5 Ground-borne Vibration Measurements

GO Transit requires an assessment of ground-borne vibration through measurement if building foundations are to be located within 75 metres of the right-of-way. Measurements were performed at the location of the closest dwelling façade on the site at 30 m from the railway right of way. The results of the measurements are presented in Figures 4 to 6. Table 8 shows the maximum RMS vibration velocity measurements during each of the train pass-bys.

Table 8: Maximum RMS Vibration Velocity Measurements of Train Pass-bys at 30 m from Right-of-Way

Train Pass-by	Type of Train	Measured Vibration Level (mm/s)	Criteria (mm/s)
1	GO	0.11	0.14
2	GO	0.10	0.14
3	GO	0.10	0.14

Vibration levels are below the GO Transit limit of 0.14 mm/s. Vibration mitigation measures are not required for the proposed residential dwellings.

5.6 Warning Clauses

The MOECC guidelines recommend that warning clauses be included in the property and tenancy agreements for all units with anticipated traffic sound level and vibration excesses.

Suggested wording for the proposed residential building with sound level excesses of the MOECC criteria for which physical mitigation has not been provided is given below.

Type A:

> Purchasers/tenants are advised that sound levels due to increasing road and rail may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the noise criteria of the Municipality and the Ministry of the Environment and Climate Change.

Suggested wording for future dwellings with daytime OLA sound levels exceeding the MOECC criteria by 6 dB or more, for which physical mitigation has been provided is given below.

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 rail traffic may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the City's and the Ministry of the Environment and Climate Change's noise criteria. The acoustical barrier as installed shall be maintained, repaired or replaced by the owner. Any maintenance, repair or replacement shall be with the same material, to the same standards and having the same colour and appearance of the original.

Suitable wording for future dwellings requiring forced air ventilation systems is given below.

Type C:

> This dwelling unit has been fitted with a forced air heating system and the ducting etc., was sized to accommodate central air conditioning. Installation of central air conditioning will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the noise criteria of the Municipality and the Ministry of the Environment and Climate Change. (Note: The location and installation of the outdoor air conditioning

device should be done so as to minimize the noise impacts and comply with criteria of MOECC publication NPC-300, as applicable.)

Suitable wording for future dwellings near the future commercial and institutional facilities is given below.

Type D:

> Purchasers are advised that due to the proximity of future commercial and institutional facilities, sound levels from the facilities may at time be audible.

GO Transit standard warning clause which is required for all residential developments located within 300 m of their mainline is given below.

Type E:

> Warning: Metrolinx, carrying on business as GO Transit, and its assigns and successors in interest are the owners of lands within 300 metres from the land which is the subject hereof. In addition to the current use of the lands owned by Metrolinx, there may be alterations to or expansions of the rail and other facilities on such lands in the future including the possibility that GO Transit or any railway entering into an agreement with GO Transit to use the Metrolinx lands or Metrolinx and their respective 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 dwellings. Metrolinx will not be responsible for any complaints or claims arising from use of such facilities and/or operations on, over or under its lands. These sample clauses are provided by the MOECC as examples and can be modified by the Municipality as required.

6 Summary and Recommendations

In summary, HGC Engineering has reviewed the draft plan, performed calculations to determine the potential road and rail traffic noise impact on the proposed dwellings and performed vibration measurements with respect to MOECC and GO Transit guidelines. The following are the recommendations. Please refer to Figure 3 and Table 9.

1. An acoustic barrier, comprised of a safety berm with an acoustic wall on top, is required for the rear yards of dwellings backing onto the railway.

2. Forced air ventilation systems with ductwork sized for the future installation of air conditioning by the occupant is required for the dwellings with exposure to the railway and Mapleview Drive. The location, installation and sound ratings of the air conditioning devices should comply with NPC-300, as applicable.

3. Brick exterior construction or an acoustical equivalent is required for the dwellings in the first row from the railway. For the remaining dwellings further from the railway, any exterior wall, and double glazed window construction meeting the minimum requirements of the Ontario Building Code (OBC) will provide adequate sound insulation for the dwelling units.

4. Warning clauses should be used to inform future residents of the road and rail traffic noise impact.

5. A noise study addendum should be prepared when grading information, detailed floor plans and building elevations are available for the lots closest to the railway.

6. When siting information is available for the High Density Blocks, a noise study addendum should be prepared to determine the acoustic recommendations.

7. When siting information is available for the proposed institutional block, a noise study should be conducted to determine the impact of its activities on the existing and future residential uses nearby in accordance with NPC-300.

The following table summarizes the noise control recommendations and noise warning clauses for the residential dwellings.

Table 9: Summary of Noise Control Requirements and Noise Warning Clauses

Lot No.	Acoustic Barrier	Ventilation Requirements	Type of Warning Clause	[1]Upgraded Glazing Constructions	Exterior Brick Construction
3 – 16, Blk 550, 551	✓	Forced Air	B, C, D, E	LRDR: STC-30 BR: STC-30	✓
17 – 23, Blk 552, 553	--	Forced Air	A, C, D, E	OBC	--
1 – 2, Blk 549	--	Forced Air	A, C, D, E	OBC	--
328 – 338, 547, 548, Blk 605 – 607, 586, 587	--	Forced Air	A, C, D	OBC	--
24 – 98	--	--	E	OBC	--
Remaining Dwellings	--	--	--	OBC	--

Notes:
-- no specific requirement
1 Based on 50% window to floor area ratio for living/dining rooms and 25% window to floor area ratio for bedrooms.
The location, installation and sound rating of the air conditioning condensers must be compliant with MOECC Guideline NPC-300, as applicable.
Windows, walls and doors to be specified to meet these minimum AIF requirements.
LRDR – Living Room/Dining Room
BR – Bedroom
OBC – Ontario Building Code

6.1 Implementation

To ensure that the noise control recommendations outlined above are fully implemented, it is recommended that:

1. A noise study addendum should be prepared when grading information, detailed floor plans and building elevations are available for the lots closest to the railway.

2. Prior to the issuance of building permits for this development, the Municipality's building inspector or a Professional Engineer qualified to perform acoustical engineering services in the Province of Ontario should certify that the noise control measures have been properly incorporated.

3. When siting information is available for the High Density Blocks and the proposed institutional block, a A noise study addendum should be prepared to determine the acoustic requirements for the site and to determine their impact on the proposed residences.

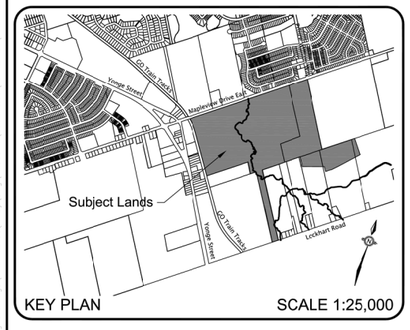
4. Prior to assumption of the subdivision, the Municipality's building inspector or a Professional Engineer qualified to perform acoustical engineering services in the Province of Ontario should certify that the noise control measures have been properly installed and constructed.

Figure 1 - Key Plan

Figure 2 - Proposed Draft Plan Showing Prediction Locations

Draft Plan of Subdivision

Part of Lots 16, 17, and 18, Concession 11
Former Town of Innisfil,
Now in the
City of Barrie
2017



STATISTICS

RESIDENTIAL LOT BREAKDOWN

★ 13.7m SINGLES		101 units
■ 11.0m SINGLES		205 units
○ 10.4m SINGLES		156 units
▼ 9.0m SINGLES (LOTS 1 - 546)		86 units
SUB TOTAL	19.47 ha.	548 units
STREET TOWNHOMES (6.7m) (BLOCKS 549 - 570)	2.89 ha.	139 units
STREET TOWNHOMES (6.0m) (BLOCKS 571 - 576)	0.75 ha.	
STREET TOWNHOMES (4.5m) (BLOCKS 577 - 588)	1.23 ha.	
BACK TO BACK TOWNHOMES (7.0m) (BLOCKS 589 - 596)	1.09 ha.	100 units
MULTI UNIT RESIDENTIAL (BLOCKS 597 - 608)	0.63 ha.	72 units
HIGH DENSITY RESIDENTIAL (BLOCKS 609 & 610)	7.46 ha.	746 units
FUTURE LOT BLOCKS (BLOCKS 611 - 617)	0.08 ha.	
INSTITUTIONAL (BLOCKS 618 & 619)	3.32 ha.	
STORM WATER MANAGEMENT & DRAINAGE BLOCKS (BLOCK 620 - 628)	7.97 ha.	
OPEN SPACE & PEDESTRIAN CONNECTIONS (BLOCKS 627 - 636)	3.67 ha.	
ENVIRONMENTAL PROTECTION (BLOCK 637 & 638)	17.21 ha.	
WIDENING & RESERVES (BLOCK 639 - 647)	1.04 ha.	
ROADS (COLLECTORS STREETS 'A-O') (LOCALS (11.0m ROW) STREETS 'E-'S') (LOCALS (11.0m ROW) STREETS 'T-'V')	13.53 ha.	
TOTAL	80.34 ha.	1725 units

CRISDAWN - MAPLEVIEW DRIVE EAST - PHASE 1
CITY OF BARRIE

OWNER'S CERTIFICATE

I, THE UNDERSIGNED, BEING THE REGISTERED OWNER OF THE SUBJECT LANDS, HEREBY AUTHORIZE THE JONES CONSULTING GROUP LTD., TO PREPARE THIS DRAFT PLAN OF SUBDIVISION AND TO SUBMIT SAME TO THE CITY OF BARRIE FOR APPROVAL.

DATE — CRISDAWN CONSTRUCTION INC.

SURVEYOR'S CERTIFICATE

I CERTIFY THAT THE BOUNDARIES OF THE LANDS TO BE SUBDIVIDED AND THEIR RELATIONSHIP TO ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN.

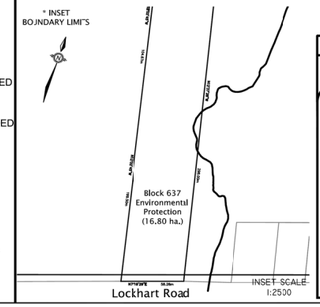
DATE — RUDY MAK, O.L.S.
ONTARIO LAND SURVEYORS

ADDITIONAL INFORMATION REQUIRED UNDER SECTION 51(17) OF THE PLANNING ACT

a) SHOWN ON DRAFT PLAN
b) SHOWN ON DRAFT PLAN
c) SHOWN ON KEY PLAN
d) RESIDENTIAL, SWM, MIXED USE, OPEN SPACE, INSTITUTIONAL & EP
e) SHOWN ON DRAFT PLAN
f) SHOWN ON DRAFT PLAN
g) SHOWN ON DRAFT PLAN
h) MUNICIPAL PIPED WATER TO BE PROVIDED
i) SANDY/CLAY LOAM
j) SHOWN ON DRAFT PLAN
k) ALL MUNICIPAL SERVICES TO BE PROVIDED
l) SHOWN ON DRAFT PLAN

10 0 10 20 30 40 50 METRES
DRAFT PLAN SCALE = 1:2000 (A1)

* INSET BOUNDARY LIMITS



*SEE INSET FOR BOUNDARY LIMITS

CRISDAWN - MAPLEVIEW DRIVE EAST - PHASE 1
DRAFT PLAN OF SUBDIVISION

Raymond J. Duhamel — REGISTERED PROFESSIONAL PLANNER — R.P.P.

Date Issued:	December 14, 2016
Checked By:	RD
Project No.:	PRA-12160
Drawn By:	m.c.r.
Drawing Name:	PRA-12160-N-DP-1.dwg

JONES CONSULTING GROUP LTD.
PLANNERS & ENGINEERS
229 Mapleview Drive East, Unit 1, Barrie, Ontario, L4N 0W5
Phone: 705-734-2538 Fax: 705-734-1056
www.jonesconsulting.com

LEGEND

Forced air heating with ducts sized for the future installation of air conditioning by the occupant is required

Acoustic barrier required

MAPLEVIEW DRIVE EAST

Yonge Street

Street 'A' Street 'B' Street 'C' Street 'D' Street 'E' Street 'F' Street 'G' Street 'H' Street 'I' Street 'J' Street 'K' Street 'L' Street 'M' Street 'N' Street 'O' Street 'P' Street 'Q' Street 'R' Street 'S' Street 'T' Street 'U' Street 'V' Street 'W' Street 'X' Street 'Y'

Block 621 Stormwater Management (1.91 ha.)

Block 620 Stormwater Management (2.82 ha.)

Block 637 Environmental Protection (16.80 ha.)

Block 635 Open Space (0.09 ha.)

Block 633 Open Space (0.50 ha.)

Block 630 Open Space (.30 ha.)

Block 623 Stormwater Management (1.16 ha.)

Block 622 Stormwater Management (1.93 ha.)

Block 618 Institutional (2.56 ha.)

Block 636 Open Space (2.04 ha.)

Block 619 Institutional (0.81 ha.)

Block 638 Environmental Protection (0.41 ha.)

Block 639 Road Widening (1.03 ha.)

Block 640 0.3 Reserve

Block 641 0.3 Reserve

Block 631 Pedestrian Connection (0.02 ha.)

Block 632 Pedestrian Connection (0.02 ha.)

Block 634 Pedestrian Connection (0.03 ha.)

Block 642 0.3m Reserve

Block 643 0.3m Reserve

Block 644 0.3m Reserve

Block 645 0.3m Reserve

Block 646 0.3m Reserve

Block 647 0.3m Reserve

Block 609 High Density (4.41 ha.)

Block 627 25.0m Railway Berm (0.15 ha.)

Block 624 Servicing (0.03 ha.)

Block 625 Servicing (0.09 ha.)

Block 628 25.0m Railway Berm (0.35 ha.)

Block 626 Servicing (0.03 ha.)

Block 629 25.0m Railway Berm (0.17 ha.)

Block 612 Future Lot

Block 613 Future Lot

Block 614 Future Lot

Block 615 Future Lot

Block 616 Future Lot

Block 617 Future Lot

FUTURE STORMWATER MANAGEMENT

FUTURE RESIDENTIAL

EXISTING RESIDENTIAL

EXISTING LIGHT INDUSTRIAL

EXISTING GO TRAIN R.O.W.

25.0m Rail Buffer

ENVIRONMENTAL PROTECTION

FUTURE SECONDARY SCHOOL

Approximate access and width of Future School Entrance

Schedule 9E Development Phase Boundary Hewitt's Secondary Plan (November 2016)

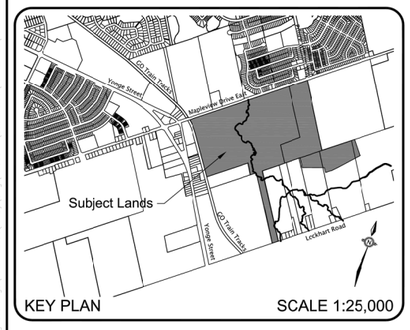
Temporary Residential Cul-De-Sac RSD-10

OTHER LANDS OWNED BY APPLICANT

Figure 3 - Proposed Draft Plan Showing Barrier and Ventilation Requirements

Draft Plan of Subdivision

Part of Lots 16, 17, and 18, Concession 11
Former Town of Innisfil,
Now in the
City of Barrie
2017



STATISTICS

RESIDENTIAL LOT BREAKDOWN

★	13.7m SINGLES		101 units
■	11.0m SINGLES		205 units
✡	10.4m SINGLES		156 units
▼	9.0m SINGLES (LOTS 1 - 548)		86 units
	SUB TOTAL	19.47 ha.	548 units
	STREET TOWNHOMES (6.7m) (BLOCKS 549 - 570)	2.89 ha.	139 units
	STREET TOWNHOMES (6.0m) (BLOCKS 571 - 576)	0.75 ha.	
	STREET TOWNHOMES (4.5m) (BLOCKS 577 - 588)	1.23 ha.	
	BACK TO BACK TOWNHOMES (7.0m) (BLOCKS 589 - 596)	1.09 ha.	100 units
	MULTI UNIT RESIDENTIAL (BLOCKS 597 - 608)	0.63 ha.	72 units
	HIGH DENSITY RESIDENTIAL (BLOCKS 609 & 610)	7.46 ha.	746 units
	FUTURE LOT BLOCKS (BLOCKS 611 - 617)	0.08 ha.	
	INSTITUTIONAL (BLOCKS 618 & 619)	3.32 ha.	
	STORM WATER MANAGEMENT & DRAINAGE BLOCKS (BLOCK 620 - 626)	7.97 ha.	
	OPEN SPACE & PEDESTRIAN CONNECTIONS (BLOCKS 627 - 636)	3.67 ha.	
	ENVIRONMENTAL PROTECTION (BLOCK 637 & 638)	17.21 ha.	
	WIDENING & RESERVES (BLOCK 639 - 647)	1.04 ha.	
	ROADS (COLLECTORS STREETS 'A-O') (LOCALS (13.0m ROW) STREETS 'E-'S') (LOCALS (11.0m ROW) STREETS 'T-'Y')	13.53 ha.	
	TOTAL	80.34 ha.	1725 units

CRISDAWN - MAPLEVIEW DRIVE EAST - PHASE 1

CITY OF BARRIE

*SEE INSET FOR BOUNDARY LIMITS

OWNER'S CERTIFICATE

I, THE UNDERSIGNED, BEING THE REGISTERED OWNER OF THE SUBJECT LANDS, HEREBY AUTHORIZE THE JONES CONSULTING GROUP LTD., TO PREPARE THIS DRAFT PLAN OF SUBDIVISION AND TO SUBMIT SAME TO THE CITY OF BARRIE FOR APPROVAL.

DATE — CRISDAWN CONSTRUCTION INC.

SURVEYOR'S CERTIFICATE

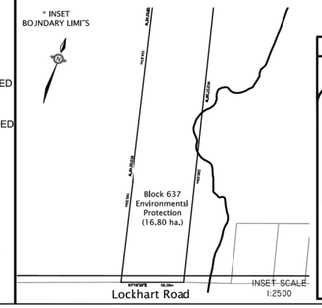
I CERTIFY THAT THE BOUNDARIES OF THE LANDS TO BE SUBDIVIDED AND THEIR RELATIONSHIP TO ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN.

DATE — RUDY MAK, O.L.S.
ONTARIO LAND SURVEYORS

ADDITIONAL INFORMATION REQUIRED UNDER SECTION 51(17) OF THE PLANNING ACT

a) SHOWN ON DRAFT PLAN
b) SHOWN ON DRAFT PLAN OF SUBDIVISION
c) SHOWN ON KEY PLAN
d) RESIDENTIAL, SWM, MIXED USE, OPEN SPACE, INSTITUTIONAL & EP
e) SHOWN ON DRAFT PLAN
f) SHOWN ON DRAFT PLAN
g) SHOWN ON DRAFT PLAN
h) MUNICIPAL PIPED WATER TO BE PROVIDED
i) SANDY/CLAY LOAM
j) SHOWN ON DRAFT PLAN
k) ALL MUNICIPAL SERVICES TO BE PROVIDED
l) SHOWN ON DRAFT PLAN

10 0 10 20 30 40 50 METRES
DRAFT PLAN SCALE = 1:2000 (A1)



CRISDAWN - MAPLEVIEW DRIVE EAST - PHASE 1

DRAFT PLAN OF SUBDIVISION

Raymond J. Duhamel REGISTERED PROFESSIONAL PLANNER R.P.P.

Date Issued:	December 14, 2016
Checked By:	RD
Project No.:	PRA-12160
Drawn By:	m.c.r.
Drawing Name:	PRA-12160-N-DP-1.dwg

JONES CONSULTING GROUP LTD.
PLANNERS & ENGINEERS
229 Mapleview Drive East, Unit 1, Barrie, Ontario, L4N 0W5
Phone: 705-734-2538 Fax: 705-734-1056
www.jonesconsulting.com

Figure 4a: Pass-by 1
Measured Vibratory Velocity Level

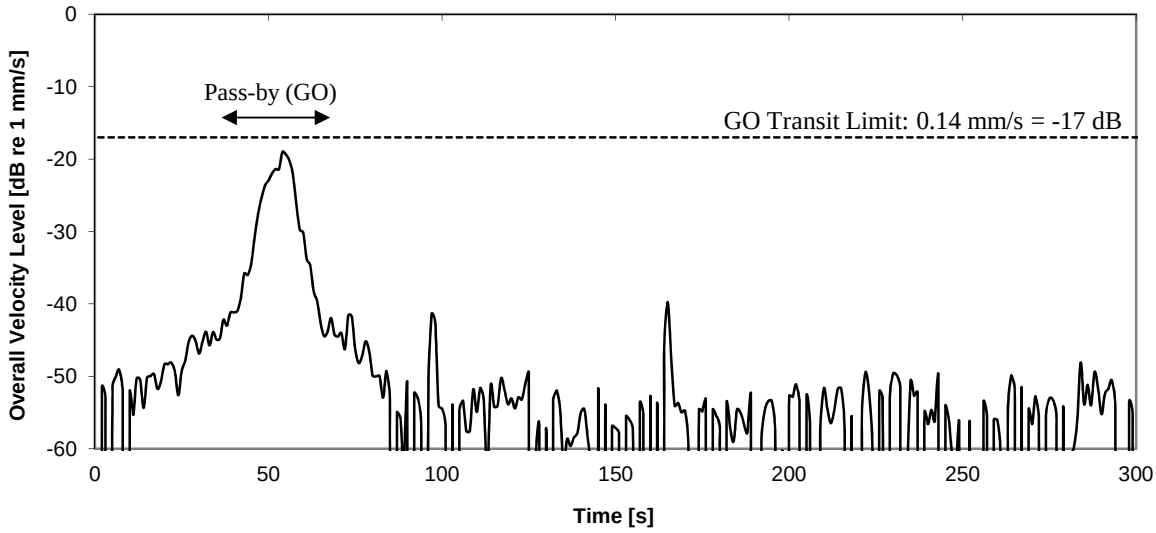


Figure 4b: Pass-by 1
Acceleration Spectrum @ Peak Level (1 sec. Duration)

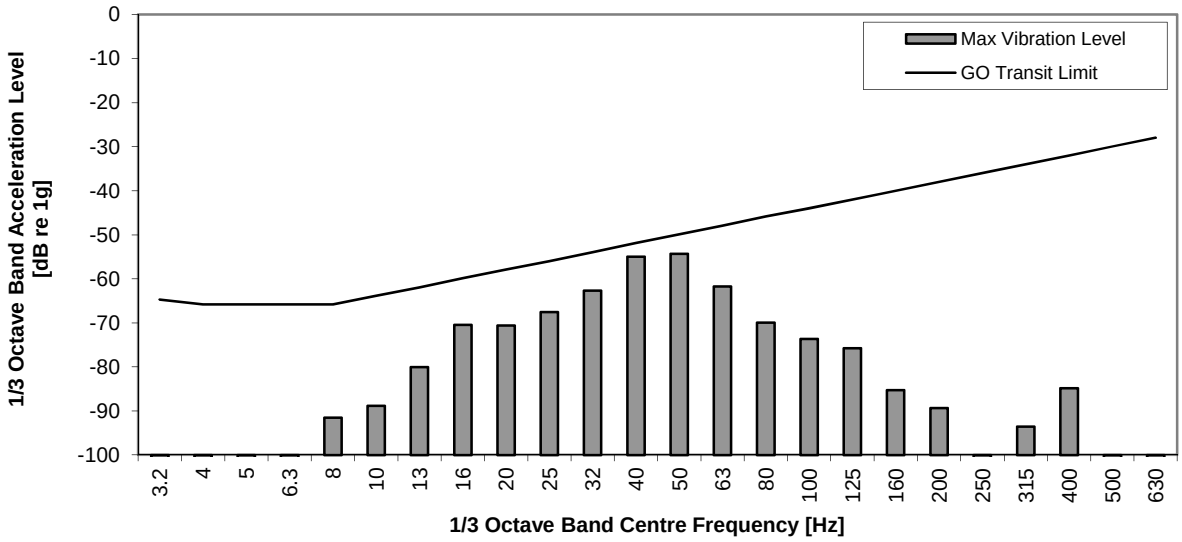


Figure 5a: Pass-by 2
Measured Vibratory Velocity Level

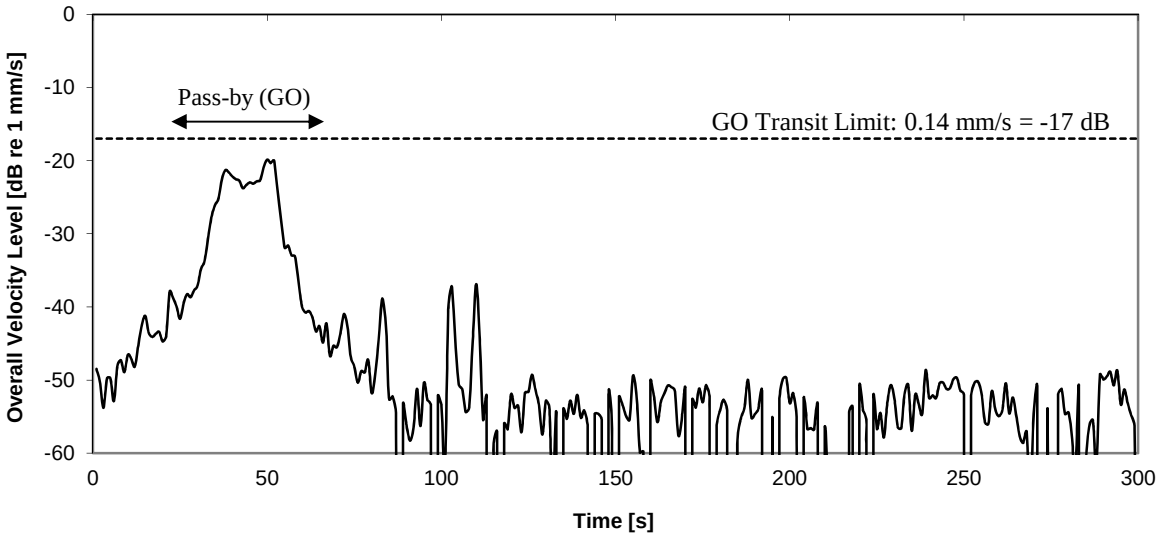


Figure 5b: Pass-by 2
Acceleration Spectrum @ Peak Level (1 sec. Duration)

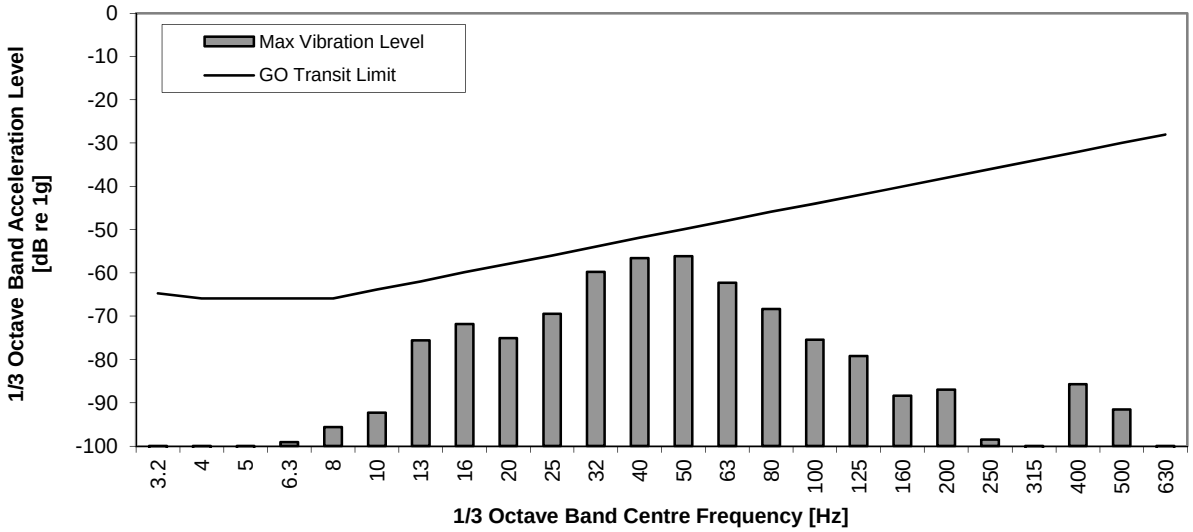


Figure 6a: Pass-by 3
Measured Vibratory Velocity Level

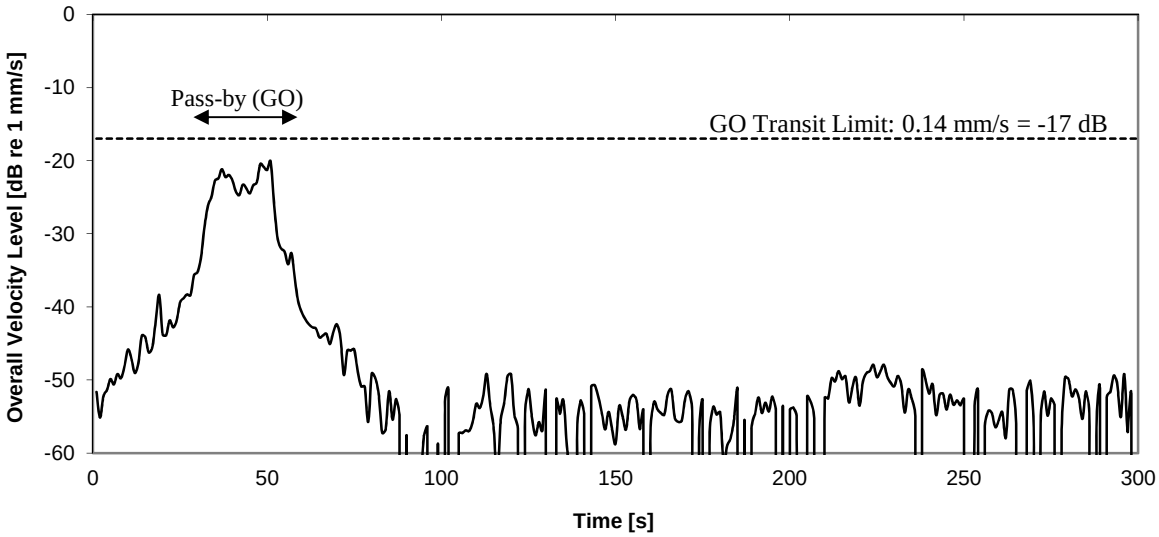
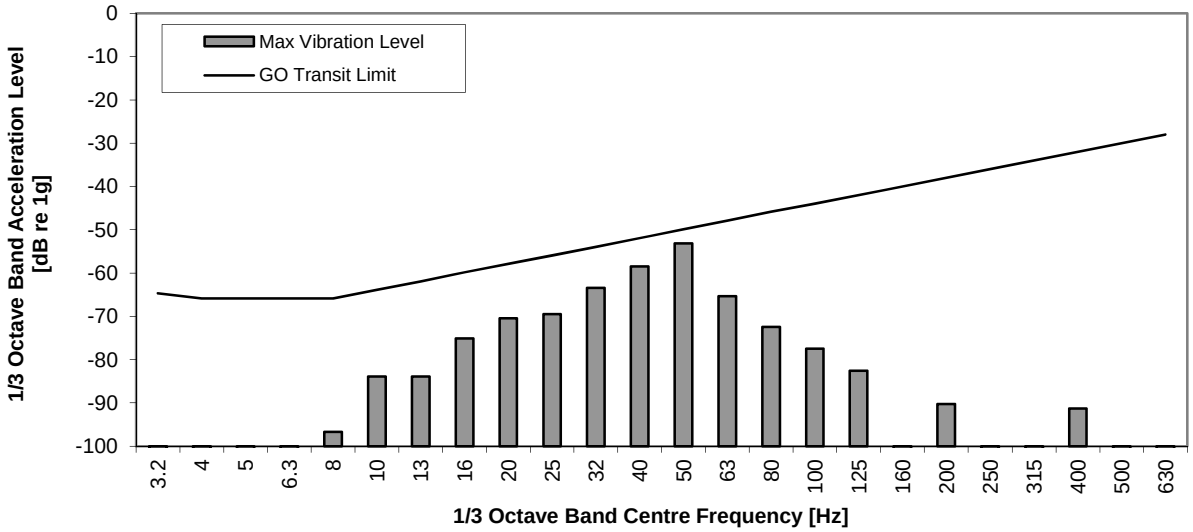


Figure 6b: Pass-by 3
Acceleration Spectrum @ Peak Level (1 sec. Duration)



APPENDIX A

GO Transit Principal Mainline Requirements

PRINCIPAL MAIN LINE REQUIREMENTS

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:** The Greater Toronto Transit Authority, 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). GO Transit 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.

APPENDIX B

Road Traffic Data

Victor Garcia

From: Justin MacDonald <Justin.MacDonald@barrie.ca>
Sent: August-31-16 11:25 AM
To: Victor Garcia
Subject: RE: Road Traffic Data Request - Mapleview Drive East & Yonge Street

Good morning Victor,

Sorry for the delay I was collecting the required information.

Yonge Street 11,000 vehicles per day with 3% commercial and 2% heavy; with a growth of 4% per year compounded annually to a horizon year of 2031.

Mapleview Drive 6,000 vehicles per day with 4% commercial and 3; ; with a growth of 4% per year compounded annually to a horizon year of 2031.

Hopefully this helps, should you have any questions please let me know.

Thanks,

Justin MacDonald, C.E.T.
Transportation Technologist
(705) 739-4220 ext. 5178

From: Victor Garcia [mailto:vgarcia@hgcengineering.com]
Sent: Wednesday, August 31, 2016 8:55 AM
To: Justin MacDonald
Subject: FW: Road Traffic Data Request - Mapleview Drive East & Yonge Street

Can you please give me an update on the request below?

Thanks,

Victor Garcia, P.Eng
HGC Engineering NOISE | VIBRATION | ACOUSTICS
Howe Gastmeier Chapnik Limited
t: 905.826.4044

From: Victor Garcia
Sent: August-22-16 12:30 PM
To: 'justin.macdonald@barrie.ca' <justin.macdonald@barrie.ca>
Subject: Road Traffic Data Request - Mapleview Drive East & Yonge Street

Good afternoon,

We are conducting a noise feasibility study for a proposed residential development located on Mapleview Drive East, on the east side of the railway in Barrie, Ontario. A google link is included in your reference:

https://www.google.com/maps/place/Yonge+St+%26+Mapleview+Dr+E,+Barrie,+ON,+Canada/@44.3482655,-79.6256528,18z/data=!3m1!1e3!4m2!3m1!1s0x882abb0d2eca50eb:0xbaf222aad43551fc

APPENDIX C

Rail Traffic Data

Victor Garcia

From: Adam Snow <Adam.Snow@gotransit.com>
Sent: November-18-16 10:58 AM
To: Sheeba Paul
Subject: RE: GO Transit/Metrolinx rail data, Barrie, ON

Hi Sheeba – The data provided by Brandon and the site you mention (Mapleview Drive) are two different places. At Mapleview the speed limit through the station area is 80 kph (50 mph). Does that help?

Adam

Adam Snow
Third Party Projects Officer, Rail Corridor Management Office, Rail Corridors, GO Transit
Metrolinx I 335 Judson Street I Toronto I Ontario I M8Z 1B2
***NEW* T: 416-202-0134** C: 416-528-4864 F: 416-354-7731

From: Sheeba Paul [mailto:spaul@hgcengineering.com]
Sent: October-10-16 3:56 PM
To: Adam Snow
Cc: zdep_Brandon Gaffoor
Subject: RE: GO Transit/Metrolinx rail data, Barrie, ON

Hello Adam

Our client on this project (Mapleview Drive, east of Yonge Street and the GO railway line in Barrie, Ontario) is objecting to the extent of the recommended noise mitigation measures based on their understanding that the train will never be able to achieve 128 kph in practice due to the proximity of the stations.

Could you please review the data for this section of the railway line and let us know if we can utilize lower speeds in our modelling due to the proximity of the stations?

Thank you.

Ms. Sheeba Paul, MEng, PEng
Senior 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**: spaul@hgcengineering.com
Visit our website – www.hgcengineering.com **Follow Us** – LinkedIn | Twitter | YouTube

---

From: Brandon Gaffoor [mailto:Brandon.Gaffoor@gotransit.com]
Sent: June-16-16 10:07 AM

To: Sheeba Paul <spaul@hgcengineering.com>
Cc: Adam Snow <Adam.Snow@gotransit.com>
Subject: RE: GO Transit/Metrolinx rail data, Innisfil, ON

Hello Sheeba,

Further to your request of June 3, 2016, it's anticipated that GO Service on the adjacent Barrie Line will be comprised of electric trains (with power supplied by overhead catenaries) within (at least) a 10 year time horizon. The preliminary midterm (2025) weekday train volume forecast at this location, including both revenue and equipment trips, is in the order of 44 trains (Electric: 33 day, 11 night). Trains will be comprised of a single locomotive and up to 12 passenger cars.

The maximum design speed on the Barrie line, adjacent to the subject site, is 128 kph (80 mph).

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

With respect to future electrified rail service, it should be noted that Metrolinx has not made a final decision regarding the electric train technology or technologies to be deployed. Similarly, we are only beginning to understand potential noise and vibration implications associated with electrification. 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 Regional Express Rail (RER) 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, at this time, to not expect any improvement in noise impacts due to electrification. Additional information regarding specific operational parameters will become available in the near future. General information about the program can be found here: http://www.gotransit.com/electrification/en/info/fact_sheets.aspx.

I trust that this information is useful. Please feel free to contact me should you have any additional questions. Please keep us informed as this process moves forward.

Kind Regards,

Brandon Gaffoor
Co-op Student | Rail Corridor Management Office | Rail Corridors
Metrolinx | 335 Judson Street | Toronto | Ontario | M8Z 1B2
✉ | Brandon.Gaffoor@**Go**Transit.com
☎ | 416.354.7739

From: Sheeba Paul [mailto:spaul@hgcengineering.com]
Sent: June-03-16 11:21 AM
To: Adam Snow
Cc: Zdor_Vasya Jeyakanthan; Christine Fandrich; Brandon Gaffoor
Subject: RE: GO Transit/Metrolinx rail data, Innisfil, ON

Hello Adam,

HGC Engineering is performing a noise study update for a proposed residential development in Innisfil, Ontario. The site is located on the south side of Killarney Beach Road and east of the railway line.

Please find attached a Google link for your reference.

https://www.google.ca/maps/place/Killarney+Beach+Rd+%26+Corner+Ave,+Innisfil,+ON+L0L+1W0/@44.2622938,-79.5562897,17z/data=!3m1!4b1!4m5!3m4!1s0x882ab7792f95cfa5:0x7140046944237c3b!8m2!3d44.26229!4d-79.554101

We would like to request rail traffic data for the railway line that runs north/south. The client also asked if the tracks are going to be twinned in this area.

Thank you.

Ms. Sheeba Paul, MEng, PEng
Senior 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**: spaul@hgcengineering.com
Visit our website – www.hgcengineering.com **Follow Us** – LinkedIn | Twitter | YouTube

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APPENDIX D

Sample STAMSON 5.04 Output

STAMSON 5.0 NORMAL REPORT Date: 13-01-2017 14:49:56
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Description: Dwellings backing onto railway

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
* 1. GO	33.8/11.3	80.0	1.0	12.0	Diesel	No

* 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.	GO	33.0/11.0	2.50	1.00

Data for Segment # 1: GO Transit (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		: 45.60 / 45.60 m
Receiver height		: 4.50 / 4.50 m
Topography		: 2 (Flat/gentle slope; with barrier)
No Whistle		
Barrier angle1		: -90.00 deg Angle2 : 90.00 deg
Barrier height		: 0.00 m
Barrier receiver distance		: 10.00 / 10.00 m
Source elevation		: 1.50 m
Receiver elevation		: 0.00 m
Barrier elevation		: 0.00 m
Reference angle		: 0.00

Results segment # 1: GO Transit (day)

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	4.50	4.72	4.72
0.50	4.50	3.95	3.95

LOCOMOTIVE (0.00 + 60.36 + 0.00) = 60.36 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.50	68.74	-7.22	-1.17	0.00	0.00	-0.06	60.30*
-90	90	0.50	68.74	-7.22	-1.17	0.00	0.00	0.00	60.36

* Bright Zone !

WHEEL (0.00 + 55.09 + 0.00) = 55.09 dBA

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

```
-------------------------------------------------------------------------
   -90     90   0.60  64.17  -7.73  -1.35   0.00   0.00  -0.09  55.00*
   -90     90   0.60  64.17  -7.73  -1.35   0.00   0.00   0.00  55.09
-------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 61.49 dBA

Total Leq All Segments: 61.49 dBA

Results segment # 1: GO Transit (night)
---------------------------------------

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        4.50 !        4.72 !         4.72
       0.50 !        4.50 !        3.95 !         3.95

LOCOMOTIVE (0.00 + 58.61 + 0.00) = 58.61 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.50  66.99  -7.22  -1.17   0.00   0.00  -0.06  58.55*
   -90     90   0.50  66.99  -7.22  -1.17   0.00   0.00   0.00  58.61
-------------------------------------------------------------------------

 * Bright Zone !

WHEEL (0.00 + 53.34 + 0.00) = 53.34 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.60  62.42  -7.73  -1.35   0.00   0.00  -0.09  53.25*
   -90     90   0.60  62.42  -7.73  -1.35   0.00   0.00   0.00  53.34
-------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 59.74 dBA

Total Leq All Segments: 59.74 dBA

Road data, segment # 1: Yonge St (day/night)
--------------------------------------------
Car traffic volume  :  9603/1067  veh/TimePeriod  *
Medium truck volume :    99/11    veh/TimePeriod  *
Heavy truck volume  :   198/22    veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  11000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   1.00
    Heavy Truck  % of Total Volume     :   2.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: Yonge St (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  : 186.20 / 186.20 m
Receiver height           :   4.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Road data, segment # 2: Mapleview (day/night)
-----------------------------------------
Car traffic volume  :  5184/576   veh/TimePeriod  *
Medium truck volume :    54/6     veh/TimePeriod  *
Heavy truck volume  :   162/18    veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):   6000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   1.00
    Heavy Truck  % of Total Volume     :   3.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 2: Mapleview (day/night)
-----------------------------------------
Angle1   Angle2           :   0.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 296.70 / 296.70 m
Receiver height           :   4.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: Yonge St (day)
-----------------------------------

Source height = 1.19 m

ROAD (0.00 + 46.84 + 0.00) = 46.84 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.58  65.43   0.00 -17.28  -1.32   0.00   0.00   0.00  46.84
-------------------------------------------------------------------------------

Segment Leq : 46.84 dBA

Results segment # 2: Mapleview (day)
-----------------------------------

Source height = 1.32 m

ROAD (0.00 + 38.95 + 0.00) = 38.95 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     90   0.58  63.70   0.00 -20.42  -4.32   0.00   0.00   0.00  38.95
-------------------------------------------------------------------------------
```

Segment Leq : 38.95 dBA

Total Leq All Segments: 47.49 dBA

Results segment # 1: Yonge St (night)

Source height = 1.19 m

ROAD (0.00 + 40.30 + 0.00) = 40.30 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.58	58.90	0.00	-17.28	-1.32	0.00	0.00	0.00	40.30

Segment Leq : 40.30 dBA

Results segment # 2: Mapleview (night)

Source height = 1.32 m

ROAD (0.00 + 32.42 + 0.00) = 32.42 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.58	57.17	0.00	-20.42	-4.32	0.00	0.00	0.00	32.42

Segment Leq : 32.42 dBA

Total Leq All Segments: 40.96 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.66 dBA
(NIGHT): 59.80 dBA

STAMSON 5.0 NORMAL REPORT Date: 13-01-2017 14:56:59
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: aola.te Time Period: 16 hours

Description: OLA's of dwellings backing onto railway

Rail data, segment # 1: GO Transit

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
* 1. GO	33.8/11.3	80.0	1.0	12.0	Diesel	No

* 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.	GO	33.0/11.0	2.50	1.00

Data for Segment # 1: GO Transit

Angle1	Angle2	: -90.00 deg	90.00 deg
Wood depth		: 0	(No woods.)
No of house rows		: 0	
Surface		: 1	(Absorptive ground surface)
Receiver source distance		: 42.60 m	
Receiver height		: 1.50 m	
Topography		: 2	(Flat/gentle slope; with barrier)
No Whistle			
Barrier angle1		: -90.00 deg	Angle2 : 90.00 deg
Barrier height		: 4.50 m	
Barrier receiver distance		: 17.00 m	
Source elevation		: 1.50 m	
Receiver elevation		: 0.00 m	
Barrier elevation		: 0.00 m	
Reference angle		: 0.00	

Results segment # 1: GO Transit

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	1.50	3.10	3.10
0.50	1.50	1.70	1.70

LOCOMOTIVE (0.00 + 54.65 + 0.00) = 54.65 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.31	68.74	-5.96	-0.80	0.00	0.00	-7.33	54.65

WHEEL (0.00 + 46.12 + 0.00) = 46.12 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.42	64.17	-6.44	-1.02	0.00	0.00	-10.59	46.12

```
Segment Leq : 55.22 dBA

Total Leq All Segments: 55.22 dBA

Road data, segment # 1: Yonge St
--------------------------------
Car traffic volume  :  9603 veh/TimePeriod  *
Medium truck volume :    99 veh/TimePeriod  *
Heavy truck volume  :   198 veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: Yonge St
------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 183.20 m
Receiver height           :   1.50 m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :   4.70 m
Barrier receiver distance :  17.00 m
Source elevation          :   1.50 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Road data, segment # 2: Mapleview
---------------------------------
Car traffic volume  :  5184 veh/TimePeriod  *
Medium truck volume :    54 veh/TimePeriod  *
Heavy truck volume  :   162 veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 2: Mapleview
------------------------------
Angle1   Angle2           :   0.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 293.30 m
Receiver height           :   1.50 m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :   0.00 deg   Angle2 : 90.00 deg
Barrier height            :   4.70 m
Barrier receiver distance :  17.00 m
Source elevation          :   1.50 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Results segment # 1: Yonge St
------------------------------

Source height = 1.19 m

Barrier height for grazing incidence
```

```
-----------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.19 !        1.50 !        1.61 !         1.61

ROAD (0.00 + 39.42 + 0.00) = 39.42 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.39  65.43   0.00 -15.08  -0.95   0.00   0.00  -9.98  39.42
-------------------------------------------------------------------------------

Segment Leq : 39.42 dBA

Results segment # 2: Mapleview
------------------------------

Source height = 1.32 m

Barrier height for grazing incidence
-----------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.32 !        1.50 !        1.58 !         1.58

ROAD (0.00 + 31.94 + 0.00) = 31.94 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     90   0.38  63.70   0.00 -17.86  -3.96   0.00   0.00  -9.94  31.94
-------------------------------------------------------------------------------

Segment Leq : 31.94 dBA

Total Leq All Segments: 40.13 dBA

TOTAL Leq FROM ALL SOURCES: 55.35 dBA
```

STAMSON 5.0 NORMAL REPORT Date: 13-01-2017 14:59:10
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Description: Dwellings backing onto Mapleview Drive

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

Car traffic volume	:	5184/576	veh/TimePeriod *
Medium truck volume	:	54/6	veh/TimePeriod *
Heavy truck volume	:	162/18	veh/TimePeriod *
Posted speed limit	:	60 km/h	
Road gradient	:	0 %	
Road pavement	:	1 (Typical asphalt or concrete)	

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

24 hr Traffic Volume (AADT or SADT)	:	6000
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	1.00
Heavy Truck % of Total Volume	:	3.00
Day (16 hrs) % of Total Volume	:	90.00

Data for Segment # 1: Mapleview (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	:	32.50 / 32.50 m
Receiver height	:	4.50 / 4.50 m
Topography	:	2 (Flat/gentle slope; with barrier)
Barrier angle1	:	-90.00 deg Angle2 : 90.00 deg
Barrier height	:	0.00 m
Barrier receiver distance	:	10.00 / 10.00 m
Source elevation	:	1.50 m
Receiver elevation	:	0.00 m
Barrier elevation	:	0.00 m
Reference angle	:	0.00

Results segment # 1: Mapleview (day)

Source height = 1.32 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.32	4.50	3.98	3.98

ROAD (0.00 + 57.10 + 0.00) = 57.10 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.58	63.70	0.00	-5.29	-1.31	0.00	0.00	-0.07	57.02*
-90	90	0.58	63.70	0.00	-5.29	-1.31	0.00	0.00	0.00	57.10

* Bright Zone !

```
Segment Leq : 57.10 dBA

Total Leq All Segments: 57.10 dBA

Results segment # 1: Mapleview (night)
--------------------------------------

Source height = 1.32 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.32 !        4.50 !        3.98 !         3.98

ROAD (0.00 + 50.56 + 0.00) = 50.56 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.58  57.17   0.00  -5.29  -1.31   0.00   0.00  -0.07  50.49*
   -90     90   0.58  57.17   0.00  -5.29  -1.31   0.00   0.00   0.00  50.56
-------------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 50.56 dBA

Total Leq All Segments: 50.56 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 57.10 dBA
                           (NIGHT): 50.56 dBA
```

STAMSON 5.0 NORMAL REPORT Date: 13-01-2017 15:02:18
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: dola.te Time Period: 16 hours

Description: OLA of dwellings backing onto Mapleview Drive

Road data, segment # 1: Mapleview

Car traffic volume : 5184 veh/TimePeriod *
Medium truck volume : 54 veh/TimePeriod *
Heavy truck volume : 162 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: Mapleview

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 28.00 m
Receiver height : 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Mapleview

Source height = 1.32 m

ROAD (0.00 + 57.74 + 0.00) = 57.74 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	63.70	0.00	-4.50	-1.46	0.00	0.00	0.00	57.74

Segment Leq : 57.74 dBA

Total Leq All Segments: 57.74 dBA

TOTAL Leq FROM ALL SOURCES: 57.74