

Environmental Noise Feasibility Study

750 Lockhart Road

Proposed Residential Development

City of Barrie

March 6, 2019
Project: 118-0671

Prepared for

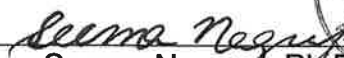
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VALCOUSTICS

Canada Ltd.

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EXECUTIVE SUMMARY

Valcoustics Canada Ltd. (VCL) was retained to prepare an Environmental Noise Feasibility Study for a proposed residential development in support of the Zoning By-law Amendment (ZBA) and Draft Plan of Subdivision application submissions to the City of Barrie. The proposed development consists of 21 blocks of street townhouses (Blocks 1 to 21), and three additional blocks for future residential development (Blocks 22 to 24). Detailed plans for Blocks 22 (40± units), 23 (40± units) and 24 (266± units) are not yet available. Additional Blocks for natural heritage buffer/area, an SWM pond, road widening and open space are also planned.

The significant transportation noise sources in vicinity are road traffic on Yonge Street and Lockhart Road, and rail traffic on the GO Barrie line.

The sound levels on site have been determined and compared with the applicable Ministry of the Environment, Conservation and Parks (MECP) noise guideline limits to determine the need for noise mitigation.

To meet the applicable transportation noise source guideline limits:

- Townhouse Blocks 1 to 5, 7, 17 and 18 require the provision for adding air conditioning at a later date;
- Townhouse Blocks 1 to 3 require brick veneer or masonry equivalent exterior wall constructions;
- Blocks 17 and 18 require upgraded exterior walls meeting Sound Transmission Class (STC) 54 (e.g. brick veneer);
- Townhouse Blocks 1 to 3, 7 and 17 to 19 require STC 29 windows. It is expected that this window requirement can be met using window construction meeting the minimum non-acoustical requirements of the Ontario Building Code (OBC);

- For all other townhouse blocks, it is expected that wall and window construction meeting the minimum requirements stated in the OBC will be sufficient to meet the indoor noise guidelines; and,
- Sound barriers are required at the rear yards of Blocks 1 to 3, as shown on Figure 2B and 2C.

Noise control requirements for future residential development in Blocks 22 to 24 should be evaluated when detailed concept plans for the blocks are available.

There are no stationary noise sources in the vicinity that are anticipated to have a significant noise impact at the subject site.

1.0 INTRODUCTION

VCL was retained to prepare an Environmental Noise Feasibility Study for the proposed residential development in support of the Zoning By-law Amendment (ZBA) and Draft Plan of Subdivision application submissions to the City of Barrie.

The potential sound levels and noise mitigation measures needed for the proposed development to comply with the MECP noise guideline requirements are outlined herein.

1.1 THE SITE AND SURROUNDING AREA

The site is located to the northeast of the intersection of Yonge Street and Lockhart Road, in the Geographic Township of Innisfil, City of Barrie, County of Simcoe (within Part of the south half of Lot 16, Concession 11).

The site is bounded by the following:

- Agricultural/vacant lands (future residential development) to the north;
- Agricultural/vacant lands and rural residential dwellings to the east;
- Lockhart Road, with agricultural/vacant lands beyond to the south; and,
- The GO Barrie (Metrolinx) rail line, with rural residential dwellings/agricultural land and Yonge Street beyond to the west.

A Key Plan of the study area is included as Figure 1. The study is based on the Draft Plan of Subdivision, prepared by KLM Planning Partners Inc., dated February 14, 2019, and the preliminary Grading Plan, prepared by SCS Consulting, received February 19, 2019. The Draft Plan is included as Figures 2A to 2C. The Grading Plan is included in Appendix A.

1.2 THE PROPOSED DEVELOPMENT

The proposed development site spans approximately 26.4 acres northeast of the intersection of Yonge Street and Lockhart Road in the Township of Innisfil. Residential portions of the development are located at the north and south ends of the site, with natural heritage buffer areas (Blocks 25 and 27), natural heritage area (Block 30), and a stormwater management pond area

(Block 28) in between. A collector road (Kneeshaw Drive) connects the northern lands to those in the south.

The northern portion of the site consists of 16 blocks of street townhouses (Blocks 1 to 16). Five blocks of street townhouses (Blocks 17 to 21) will be located in the southern part of the site. It is understood that all street townhouse units could be up to 3.5 storeys in height and will be provided with rear yard outdoor amenity areas.

In addition to the street townhouses, the southern portion of the site also includes three blocks for future residential development (Blocks 22 to 24). Detailed plans for these blocks are not yet available. It is expected that these blocks will include a combination of apartment buildings up to 6 storeys in height, residential street townhouses, residential stacked decked townhouses, and open space/park space. General noise control requirements for these blocks are outlined in Section 5.4.

2.0 NOISE SOURCES

2.1 TRANSPORTATION NOISE SOURCES

The noise sources with potential to impact the proposed development are road traffic on Yonge Street and Lockhart Road, and rail traffic on the GO Barrie line. Traffic volumes on the other surrounding and internal roadways are anticipated to be minor and no significant noise impacts at the subject site are expected. Thus, these roadways have not been considered further in this assessment.

2.1.1 Road Traffic Data

Current (year 2019) traffic volumes, total truck percentages and growth rates for Yonge Street and Lockhart Road were obtained from the City of Barrie. Future (year 2031) traffic volumes were obtained by projecting the current volumes at a growth rate of 2% (Yonge Street) and 7% (Lockhart Road), compounded annually, as directed by the City. Medium and heavy trucks were assumed to be 60% and 40%, respectively, of the total truck volume. The day/night split was assumed to be 90%/10%, as is typical for such roadways.

The traffic data correspondence is shown in Appendix B and summarized in Table 1A.

2.1.2 Rail Traffic Data

Future (10-year time horizon) rail traffic for the GO Barrie rail line from 2018 was obtained directly from Metrolinx. The rail volumes were projected to the year 2031 at a growth rate of 2.5% compounded annually, as recommended by the railways.

Note that Metrolinx has recently made significant revisions to its forecasts. The most significant changes from the noise perspective are:

- Service is being intensified along all Metrolinx corridors as part of its Regional Express Rail service; and,
- It is anticipated that GO services in the vicinity of the site will be fully electrified over a 10-year time horizon.

Metrolinx has not yet made final decisions regarding the electric train technology to be used. In the interim, for the purposes of environmental noise studies, Metrolinx is recommending that the noise level and spectrum of a diesel train be used to model the impact from the electric trains.

Canadian National Railway (CN) does not run trains along this segment of track.

The traffic data correspondence is provided for reference in Appendix B and summarized in Table 1B. Note that because the rail crossing at Lockhart Road is an at-grade crossing, whistle noise was considered in the assessment (Metrolinx has stated for previous projects completed by VCL in the area that whistles are sounded at Lockhart Road).

2.2 STATIONARY NOISE SOURCES

The GO Transit Barrie station is located more than 800 m northwest of the site. Due to the distance separation and the projected train traffic volumes, noise from the station is not anticipated to have a significant impact on the proposed development. Therefore, the GO Transit Barrie station has not been considered further in this assessment.

Based on a site visit conducted by VCL staff on January 18, 2019, there are no other stationary noise sources in the vicinity of the proposed development that are anticipated to have a significant noise impact at the subject site.

3.0 ENVIRONMENTAL NOISE GUIDELINES

3.1 MECP PUBLICATION NPC-300

The applicable noise guidelines for new residential development are those in MECP Publication NPC-300, “Environmental Noise Guideline, Stationary and Transportation Sources - Approval and Planning”.

The environmental noise guidelines of the MECP, as provided in Publication NPC-300, are discussed briefly below and summarized in Appendix C.

3.1.1 Transportation Noise Sources

3.1.1.1 Architectural Elements

In the daytime, the indoor criterion for road noise is $L_{eq\ Day}^{(1)}$ of 45 dBA for sensitive spaces such as living/dining rooms, dens and bedrooms. At night, the indoor criterion for road noise is $L_{eq\ Night}^{(2)}$ of 45 dBA for sensitive spaces such as living/dining rooms and dens and 40 dBA for bedrooms. The indoor criteria for rail noise are 5 dBA more stringent than those for the road sources; that is 40 dBA for living/dining rooms, dens and bedrooms during the daytime and nighttime periods except for bedrooms where the nighttime indoor criterion is 35 dBA. Whistle noise is included in the determination of the sound level for architectural elements.

(1) 16-hour energy equivalent sound level (0700-2300 hours).

(2) 8-hour energy equivalent sound level (2300-0700 hours).

The architectural design of the building envelope (walls, windows, etc.) must provide adequate sound isolation to achieve the indoor sound level limits.

In addition, the MECP requires brick veneer exterior wall construction or masonry equivalent construction from the foundation to the rafters for the first row of dwellings within 100 m of the rail line, when the $L_{eq\ 24}$ is greater than 60 dBA.

3.1.1.2 Ventilation Requirements

In accordance with the MECP noise guideline for road traffic sources, if the daytime sound energy level, $L_{eq\ Day}$, at the exterior face of a noise sensitive window is greater than 65 dBA, means must be provided so that windows can be kept closed for noise control purposes and central air conditioning is required. For daytime sound levels between 56 dBA and 65 dBA inclusive, there need only be the provision for adding air conditioning at a later date. A warning clause advising the occupant of the potential interference with some activities is also required. At nighttime, air conditioning would be required when the sound level exceeds 60 dBA ($L_{eq\ Night}$) at a noise sensitive window (provision for adding air conditioning is required when greater than 50 dBA). Whistle noise is not included in the determination of the sound level at the exterior face of a noise sensitive window for determining the ventilation requirements.

3.1.1.3 Outdoor Living Areas

For outdoor amenity areas ("Outdoor Living Areas" - OLAs), the guideline is 55 dBA $L_{eq\ Day}$ (0700 to 2300 hours), with an excess not exceeding 5 dBA considered acceptable if it is technically not practicable to achieve the 55 dBA objective, providing warning clauses are registered on title. Note, a balcony is not considered an OLA unless it is the only OLA for the occupant and is at least 4 m in depth, and unenclosed. Whistle noise is not included in the determination of the outdoor daytime sound level.

3.2 **FEDERATION OF CANADIAN MUNICIPALITIES AND RAILWAY ASSOCIATION OF CANADA**

The standard mitigation requirements outlined in the Federation of Canadian Municipalities and Railway Association of Canada (FCM/RAC) guideline suggests a dwelling setback of 30 m for a residential development adjacent to a principal main line, if in combination with a safety berm at least 2.5 m above the property line grade. A 5.5 m high sound barrier is also suggested (e.g., 3.0 m high acoustic fence atop a 2.5 m high safety berm).

Warning clauses are also recommended.

Aside from "standard" requirements regarding the setback of dwellings and safety berm/sound barrier configuration, the sound level design objectives of FCM/RAC are similar to those of the MECP.

4.0 **NOISE IMPACT ASSESSMENT**

4.1 **ANALYSIS METHOD**

Using the road and rail traffic data in Tables 1A and 1B, the sound levels, in terms of equivalent continuous sound pressure level over the daytime and nighttime periods ($L_{eq\ Day}$ and $L_{eq\ Night}$), were

determined using STAMSON V5.04 – ORNAMENT/STEAM, the computerized road and rail traffic noise prediction model of the MECP.

The daytime and nighttime sound levels at the townhouse building facades were calculated at a height of 10.5 m above grade, representing top floor bedroom windows for a 3.5 storey townhouse. The daytime OLA sound levels were calculated at a standing height of 1.5 m above grade, at the centre of the rear-yard amenity spaces of Blocks 1 to 3 and Blocks 17 to 21.

Inherent acoustical screening of each building due to its orientation relative to the noise sources was taken into account. An absorptive surface was considered due to the soft intervening ground between the assessment locations and the transportation noise sources. Acoustical screening from the berm shown at the northwest portion of the site on the grading plan (Appendix A) was included in the unmitigated OLA sound level calculations for Block 1 to 3.

4.2 ASSESSMENT RESULTS

At the building facades in the northern portion of the site, the highest unmitigated daytime and nighttime sound levels of 65 dBA and 61 dBA, respectively, are predicted to occur on the west façade of townhouses in Blocks 3, in the direction of the rail line. Note these sound levels included whistle noise. The highest unmitigated daytime OLA sound level of 63 dBA is predicted to occur the rear yard of the southernmost OLA of Block 3.

In the southern portion of the site, the highest unmitigated daytime and nighttime sound levels of 63 dBA and 58 dBA (including whistle noise) are predicted to occur on the west facade of townhouses in Block 17. The OLA sound levels in Blocks 17 to 21 are predicted to be 55 dBA or lower.

Table 2 summarizes the unmitigated daytime and nighttime sound level predictions for various locations within the proposed development.

5.0 NOISE CONTROL REQUIREMENTS

The noise control measures can generally be classified into two categories which are interrelated, but which the designer can treat separately for the most part:

- a) Architectural elements to achieve acceptable indoor noise guidelines;
- b) Design features to protect the OLAs.

Noise abatement requirements are shown on Figures 2B and 2C and summarized in Table 3 (and the notes to Table 3).

5.1 INDOOR REQUIREMENTS

5.1.1 Architectural Elements

The indoor noise level guidelines can be achieved by using appropriate construction for exterior walls, windows and doors. In determining the worst-case architectural requirements for the residential units, wall and window areas were assumed to be 80% and 30%, respectively, of the

floor area, on each facade of a corner room with facades exposed directly or at an angle to the road traffic noise source.

Based on the predicted sound levels, the required architectural elements are as follows:

- Blocks 1 to 3 require brick veneer or masonry equivalent exterior walls and STC 29 windows;
- Blocks 7 and 19 require STC 37 exterior walls and STC 29 windows; and,
- Blocks 17 and 18 require STC 54 (e.g. brick veneer) exterior walls and STC 29 windows;

At all other townhouse blocks, exterior wall and window construction meeting the minimum non-acoustical requirements of the OBC are predicted to be sufficient to achieve the indoor noise criteria.

For walls, a typical exterior facade construction which meets the minimum non-acoustical requirements of the OBC would be expected to achieve the requirement of STC 37. For windows, double-glazing configurations meeting the minimum non-acoustical requirements of the OBC would be expected to achieve an STC rating of 29. Note, the window frames themselves must also be designed to ensure that the overall sound isolation performance for the entire window unit meets the sound isolation requirement. This should be confirmed by the window manufacturer through the submission of acoustical test data.

The final sound isolation requirements should be reviewed when architectural plans are developed. Wall and window constructions should also be reviewed at this point to ensure that they will meet the required sound isolation performance. This is typically required by the City at the time of building permit application.

5.1.2 Ventilation Requirements

Based on the predicted sound levels, residential townhouses in Blocks 1 to 5, 7, 17 and 18 require the provision for adding air conditioning at a later date. This typically takes the form of a ducted, forced air heating system, suitably sized to accommodate central air conditioning.

5.2 OUTDOOR REQUIREMENTS

The unmitigated daytime sound levels in the OLAs of Blocks 1 to 3 are predicted to exceed the 55 dBA design objective. Thus, sound barriers have been investigated.

As previously discussed, there will be a berm along the west property line of the site, between Blocks 1 to 3 and the rail line. The south end of the berm will terminate at Kneeshaw Drive, in line with the south property line of Block 3. It is understood that the berm will continue beyond the north property line of the site as part of the adjacent future development.

To mitigate the daytime OLA sound levels at Block 3 to the 55 dBA design objective, portions of the sound barrier would need to be more than 4.0 m above grade. This is not considered feasible. However, a 1.8 m high acoustic fence along the top of the berm with a 2.3 m to 3.0 m high return to the southerly unit of Block 3 will mitigate the daytime OLA sound levels at Block 3 to 58 dBA. This is within the 5 dB leeway permitted under the MECP guidelines when it is not feasible to meet 55 dBA. The portion of the return that runs down the slope of berm should be 3.0 m high

(minimum top of fence elevation of 265.68 m) relative to the grade of the rear yard, and the portion of the return that runs along the south property line of Block 3 should be 2.3 m high (minimum top of fence elevation 264.98 m) relative to the rear yard of Block 3. The locations and orientation of the sound barriers are shown on Figure 2B.

The berm and acoustic fence combination described above will mitigate the daytime OLA sound levels at Blocks 1 and 2 to 55 dBA or less. Note, the assessment assumed the acoustic fence on top of the berm would continue north of the property line into the adjacent development. However, even if the acoustic fence atop the berm were to terminate at the north property line, the predicted sound levels at Blocks 1 and 2 would still be 55 dBA or less.

The unmitigated daytime OLA sound levels at all other dwellings are 55 dBA or lower. Thus, sound barriers are not required for noise control purposes at these locations.

5.2.1 Notes on Sound Barriers

The sound barrier requirements were based on the preliminary grading information provided by SCS Consulting Ltd. (see Appendix A). The locations of the rear building faades were based on the rear-yard setback line shown on the Draft Plan. The sound barrier requirements will need to be confirmed if the grading plan is revised or the rear-yard setbacks are changed.

The sound barriers must be of solid construction with no gaps, cracks or holes (except for small localized openings required for water drainage) and must have a minimum surface weight of 20 kg/m². A variety of materials are available, including concrete, masonry, glass, wood, specialty composite materials, or a combination of the above.

5.3 WARNING CLAUSES

Warning clauses are a tool to inform prospective owners/occupants of potential annoyance due to existing noise sources. Where the guideline sound level limits are exceeded, appropriate warning clauses should be registered on title or included in the development agreement that is registered on title. The warning clauses should also be included in agreements of Offers of Purchase and Sale and lease/rental agreements to make future occupants aware of the potential noise situation. Locations requiring warning clauses and the appropriate wording are given in Table 3 and in the notes to Table 3, respectively.

5.4 FUTURE RESIDENTIAL DEVELOPMENT BLOCKS

Detailed concept plans for Blocks 22 to 24 in the southern portion of the development are currently under development and specific mitigation measures have therefore not been established. Based on the road traffic volumes and compositions used in this assessment, general noise control requirements that could be expected are:

- The first row of dwellings adjacent to the GO Barrie line may require brick veneer or masonry equivalent exterior wall construction. Upgraded windows, mandatory air conditioning or the provision for installing air conditioning at a later date may also be required;
- Other dwellings or apartment buildings exposed to the GO Barrie line or along Lockhart Road may require mandatory central air conditioning or the provision for installing air conditioning at a later date. Upgraded exterior wall or window construction may also be required;

- If any rear-yard OLAs or elevated terraces (4.0 m in depth or greater) face towards the GO Barrie line or Lockhart Road, sound barriers may be required;
- Dwellings located adjacent to future park space or within 300 m of the GO Barrie line may require warning clauses D or E, respectively, as shown in the Notes to Table 3; and,
- If apartment buildings are located within the Block 22 and 24, associated mechanical equipment sound emissions should comply with applicable noise guideline limits at the adjacent residential dwellings within the development.

The detailed noise control requirements for these blocks should be determined as part of a future submission.

6.0 CONCLUSIONS

With appropriate acoustical design of the development, a suitable acoustical environment can be provided and the applicable MECP noise guideline requirements met.

7.0 REFERENCES

1. PC STAMSON 5.04, "Computer Program for Road Traffic Noise Assessment", Ontario Ministry of the Environment and Climate Change.
2. Building Practice Note No. 56: "Controlling Sound Transmission into Buildings", by J. D. Quirt, Division of Building Research, National Council of Canada, September 1985.
3. "Environmental Noise Assessment in Land-Use Planning 1987", Ontario Ministry of the Environment, February 1987, ISBN 0-7729-2804-5.
4. "Road and Rail Noise: Effects on Housing", Canada Mortgage and Housing Corporation, Publication NHA 5156, 81/10.
5. "Environmental Noise Guideline, Stationary and Transportation Sources – Approval and Planning", Ontario Ministry of the Environment, Publication NPC-300, October 2013.
6. "Guidelines for New Development in Proximity to Railway Operations", Prepared for The Federation of Canadian Municipalities and the Railway Association of Canada (FCM/RAC), May 2013.

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TABLE 1A: ROAD TRAFFIC DATA

Roadway	Year	AADT ⁽¹⁾	% Trucks		Day/Night Split (%)	Speed Limit (km/hr)
			Medium	Heavy		
Lockhart Road ⁽²⁾	2019 (2031)	5 000 (11 261)	1.8	1.2	90/10	60
Yonge Street ⁽³⁾	2019 (2031)	15 000 (19 024)	1.8	1.2	90/10	60

Notes:

- (1) Annual Average Daily Traffic.
- (2) Current (year 2019) data for Lockhart Road was obtained from the City of Barrie. The data was extrapolated to the year 2031 at a growth rate of 7%, compounded annually, as directed by the City. Medium and heavy trucks were assumed to be 60% and 40%, respectively, of the total truck volume. The day/night split was assumed.
- (3) Current (year 2019) data for Yonge Street was obtained from the City of Barrie. The data was extrapolated to the year 2031 at a growth rate of 2%, compounded annually, as directed by the City. Medium and heavy trucks were assumed to be 60% and 40%, respectively, of the total truck volume. The day/night split was assumed.

TABLE 1B: RAIL TRAFFIC DATA

Source	Period	Train Type	# of Trains ⁽¹⁾	# of Cars/Train	# of Locos/Train	Maximum Speed (kph)
GO Barrie Line ⁽²⁾	Daytime (0700 to 2300)	Revenue + Equipment	36 (38.8)	12	1	97
	Nighttime (2300 to 0700)	Revenue + Equipment	6 (6.4)	12	1	97

Notes:

- (1) The data in brackets was projected to the year 2031 from 2028 at a growth rate of 2.5% compounded annually.
- (2) 10-year forecast obtained directly from Metrolinx in the year 2018. Refer to Appendix B.

TABLE 2: PREDICTED UNMITIGATED OUTDOOR SOUND LEVELS

Location ⁽¹⁾	Source	Distance (m) ⁽²⁾	L _{eq} Day (dBA) ⁽⁴⁾	L _{eq} Night (dBA) ⁽⁴⁾
Block 3 West Facade ⁽³⁾ Southwest Corner	GO Barrie	39	65 (65)	60 (60)
	Yonge Street	192	51	44
	TOTAL	---	65 (65)	60 (61)
Block 3 South Facade ⁽³⁾ Southwest Corner	GO Barrie	39	62 (63)	57 (58)
	Yonge Street	192	48	41
	TOTAL	---	62 (63)	57 (58)
Block 4 North Facade ⁽³⁾ Northwest Corner	GO Barrie	82	57	52
	Yonge Street	228	47	40
	TOTAL	---	58	53
Block 5 North Facade ⁽³⁾ Northeast Corner	GO Barrie	134	55	50
	Yonge Street	280	46	39
	TOTAL	---	55	51
Block 7 South Facade ⁽³⁾ Southwest Corner	GO Barrie	84	57 (58)	52 (54)
	Yonge Street	237	45	39
	TOTAL	---	57 (59)	52 (54)
Block 17 West Facade ⁽³⁾ Southwest Corner	GO Barrie	121	58 (63)	53 (58)
	Yonge Street	362	47	40
	Lockhart Road	192	45	39
	TOTAL	---	58 (63)	53 (58)
Block 18 South Facade ⁽³⁾ Southwest Corner	GO Barrie	164	55 (60)	50 (55)
	Lockhart Road	192	48	42
	TOTAL	---	56 (60)	51 (55)
Block 19 South Facade ⁽³⁾ Southwest Corner	GO Barrie	207	53 (58)	49 (53)
	Lockhart Road	191	48	42
	TOTAL	---	55 (59)	49 (54)
Block 1 Northmost Rear- Yard OLA	GO Barrie	36	56	N/A ⁽⁵⁾
	Yonge Street	183	47	N/A ⁽⁵⁾
	TOTAL	---	57	N/A ⁽⁵⁾
Block 3 Southmost Rear- Yard OLA	GO Barrie	36	63	N/A ⁽⁵⁾
	Yonge Street	189	47	N/A ⁽⁵⁾
	TOTAL	---	63	N/A ⁽⁵⁾
Block 17 Westmost Rear- Yard OLA	GO Barrie	129	55	N/A ⁽⁵⁾
	Yonge Street	363	41	N/A ⁽⁵⁾
	TOTAL	---	55	N/A ⁽⁵⁾

Notes:

- (1) Refer to Figures 2A, 2B and 2C for Block locations.
- (2) Distance indicated is taken from the centreline of the noise source (road or railway) to the point of reception.
- (3) Receptors at the building facades were assessed at a height of 10.5 m above grade representing the top floor (worst case) planes of windows. OLA receptors were assessed at a standing height of 1.5 m above grade.
- (4) Sound level in brackets includes whistle noise due to the at-grade crossing of the GO Barrie railway line at Lockhart Road. Anti-whistling by-laws are in effect at the Maplevue Drive crossing located north of the site.
- (5) Not applicable for OLA during nighttime hours.

TABLE 3: NOISE ABATEMENT MEASURES

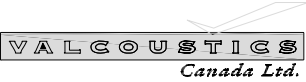
Location	Air Conditioning ⁽¹⁾	Exterior Wall ⁽²⁾	Exterior Window ⁽³⁾	Sound Barrier ⁽⁴⁾	Warning Clauses ⁽⁵⁾
Blocks 1, 2 and 3	Provision for adding	Brick Veneer or Masonry Equivalent	STC 29	Required. Refer to Section 5.2 and Figure 2B.	A + B + C + E
Blocks 4 and 5	Provision for adding	No special acoustical requirements		None	A + B + E
Block 7	Provision for adding	STC 37	STC 29	None	A + B + E
Blocks 17 and 18	Provision for adding	STC 54 (e.g. brick veneer)	STC 29	None	A + B + E
Block 19	None	STC 37	STC 29	None	A + B + E
All Other Townhouse Blocks	No special acoustical requirements				E

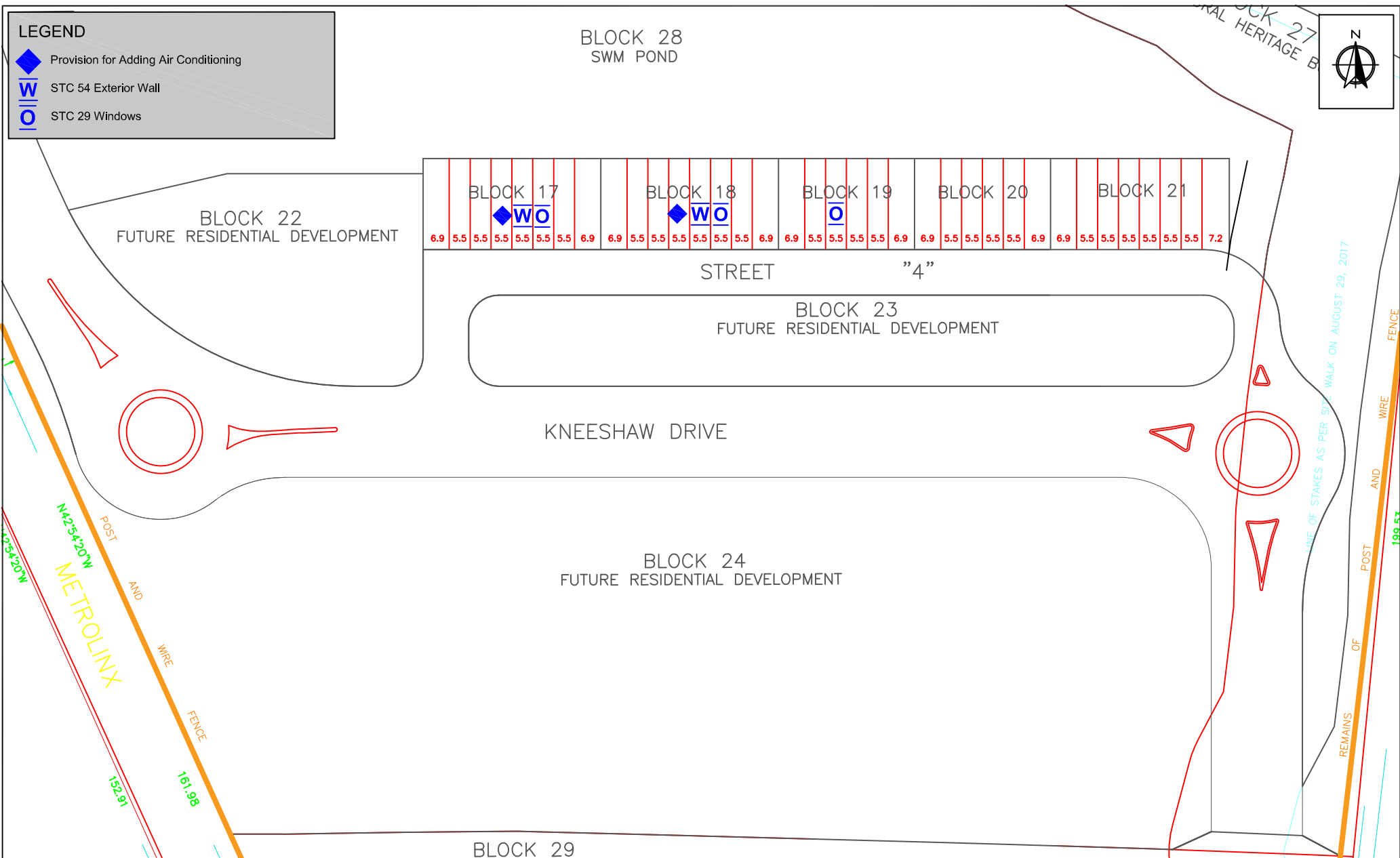
Notes:

- (1) Provision for adding air conditioning typically takes the form of a ducted ventilation system suitably sized to permit the addition of central air conditioning by the occupant.
- (2) STC - Sound Transmission Class Rating (Reference ASTM-E413).
The requirements are based on the assumptions discussed in Section 5.1 and should be reviewed when the building plans are available.
- (3) STC - Sound Transmission Class Rating (Reference ASTM-E413). A sliding glass walkout door should be considered as a window and be included in the percentage of glazing.
The requirements are based on the assumptions discussed in Section 5.1 and should be reviewed when the building plans are available.
- (4) Sound barriers must be of solid construction having a minimum face density of 20 kg/m² with no gaps or cracks. The acoustic fence height shown is taken relative to grade.
- (5) Warning clauses to be registered on title and be included in Offers of Purchase and Sale for designated lots:
 - 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 traffic may occasionally interfere with some activities of the dwelling occupants as the sound level may exceed the noise criteria of the Ministry of the Environment and/or the municipality."
 - B. "This dwelling unit has been designed with the provision for adding central air conditioning at the occupant's discretion. Installation of central air conditioning by the occupant in low and medium density developments will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment."
 - C. "Purchasers/occupants are advised that the acoustical berm and/or 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."
 - D. "Purchasers/occupants are advised that due to the proximity of the community park/parkette, noise from activities occurring in the parks/parkettes may at times be audible."
 - E. "Warning: Metrolinx/GO Transit have rights-of-way within 300 metres from the land the subject hereof. There may be alterations 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 dwelling(s). Metrolinx/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 rights-of-way."
- (5) Conventional ventilated attic roof construction meeting OBC requirements is satisfactory.
- (6) All exterior doors shall be fully weatherstripped



Google Earth

			 30 Wertheim Court, Unit 25 Richmond Hill, Ontario Canada L4B 1B9 solutions@valcoustics.com Phone: (905) 764-5223 Fax: (905) 764-6813	Title Key Plan of Study Area		Project No. 118-0671	Date 2019-03-06
				Project Name 750 Lockhart Road/Barrie - Noise		Scale N.T.S.	Figure 1
No.	Revision/Issue	Date					



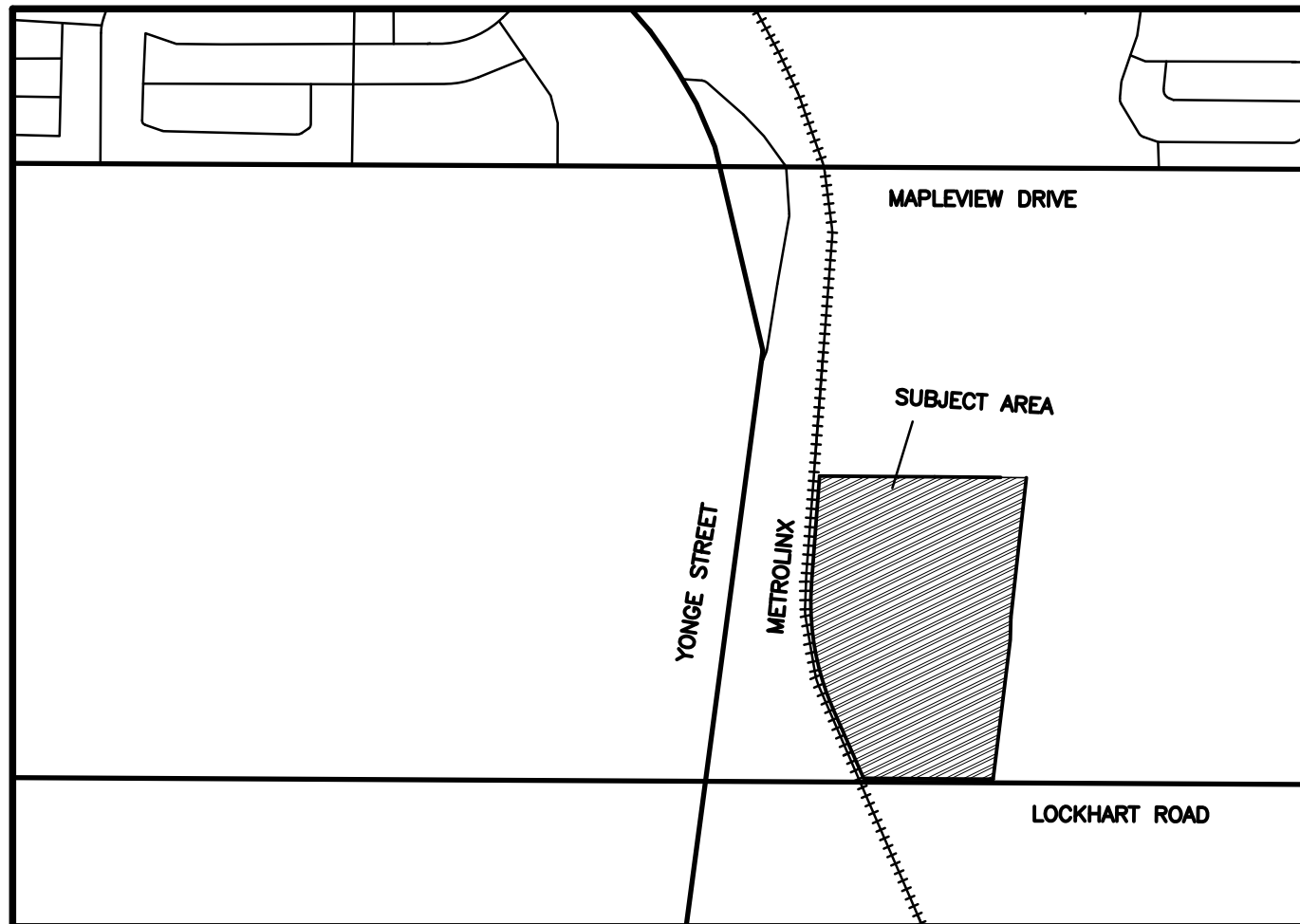
			VALCOUSTICS Canada Ltd. 30 Wertheim Court, Unit 25 Richmond Hill, Ontario Canada L4B 1B9 solutions@valcoustics.com Phone: (905) 764-5223 Fax: (905) 764-6813	Title Minimum Noise Control Requirements - Southern Lands	Project No. 118-0671	Date 2019-03-06
No.	Revision/Issue	Date		Project Name 750 Lockhart Road/Barrie - Noise	Scale N.T.S.	Figure 2C

APPENDIX A

DRAFT PLAN AND PRELIMINARY GRADING INFORMATION

DRAFT PLAN OF SUBDIVISION
PART OF THE SOUTH HALF OF LOT 16,
CONCESSION 11
(GEOGRAPHIC TOWNSHIP OF INNISFIL)
CITY OF BARRIE
COUNTY OF SIMCOE
SCALE 1:1000

DRAFT PLAN T-



KEY PLAN

N.T.S

SECTION 51, PLANNING ACT,
ADDITIONAL INFORMATION

- A. AS SHOWN ON DRAFT PLAN
B. AS SHOWN ON DRAFT PLAN
C. AS SHOWN ON DRAFT PLAN
D. SEE SCHEDULE OF LAND USE
E. AS SHOWN ON DRAFT PLAN
F. AS SHOWN ON DRAFT PLAN
G. AS SHOWN ON DRAFT PLAN
H. MUNICIPAL PIPED WATER AVAILABLE AT TIME OF DEVELOPMENT
I. CLAY-LOAM
J. AS SHOWN ON DRAFT PLAN
K. SANITARY AND STORM SEWERS, GARBAGE COLLECTION, FIRE PROTECTION
L. AS SHOWN ON DRAFT PLAN

SURVEYOR'S CERTIFICATE

I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LAND TO BE
SUBDIVIDED AS SHOWN ON THIS PLAN, AND THEIR RELATIONSHIP TO
THE ADJACENT LAND ARE ACCURATELY AND CORRECTLY SHOWN.

DATE -----, 2018

PIER DE ROSA OLS
J.D. BARNES LTD.

OWNER'S CERTIFICATE

I AUTHORIZE KLM PLANNING PARTNERS INC. TO PREPARE AND SUBMIT
THIS DRAFT PLAN OF SUBDIVISION TO THE CITY OF BARRIE FOR APPROVAL.

OWNER

BALLYMORE BUILDING
(BARRIE) CORP.

12840 YONGE STREET
SUITE 200
RICHMOND HILL, ON
L4E 4H1

LOUIE MORRA A.S.O.

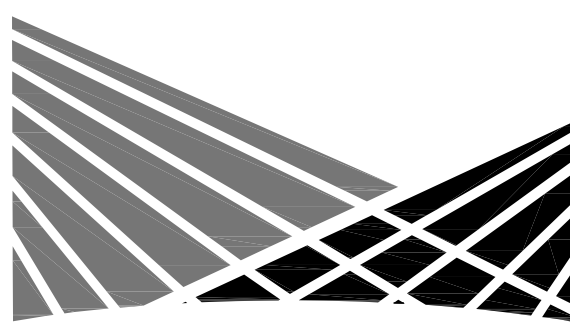
SCHEDULE OF LAND USE

TOTAL AREA OF LAND = 26.416±Ha. (65.275±Acs)

TOWNHOUSE DWELLINGS		BLOCKS		LOTS	UNITS	±Ha.	±Acs.
STREET TOWNHOUSES							
BLOCKS 1-21		21	123	2.148	5.308		
MIN. UNIT FRONTAGE = 5.5m.							
FUTURE RESIDENTIAL DEVELOPMENT							
BLOCKS 22-24		3	346*	3.534	8.733		
SUBTOTAL		24	469*	5.682	14.041		
BLOCKS 25-27 - NATURAL HERITAGE BUFFER 30m		3		2.461	6.081		
BLOCK 28 - SWM POND		1		1.988	4.912		
BLOCK 29 - ROAD WIDENING		1		0.626	1.547		
BLOCK 30 - NATURAL HERITAGE AREA		1		12.324	30.453		
BLOCK 31 - OPEN SPACE		1		0.011	0.027		
STREETS AND LANEWAYS				3.324	8.214		
TOTAL		31	469*	26.416	65.275		

NOTE — ELEVATIONS RELATED TO
CANADIAN GEODETIC DATUM

NOTE —*SUBJECT TO FINAL CALCULATION



PROJECT No. P-3006

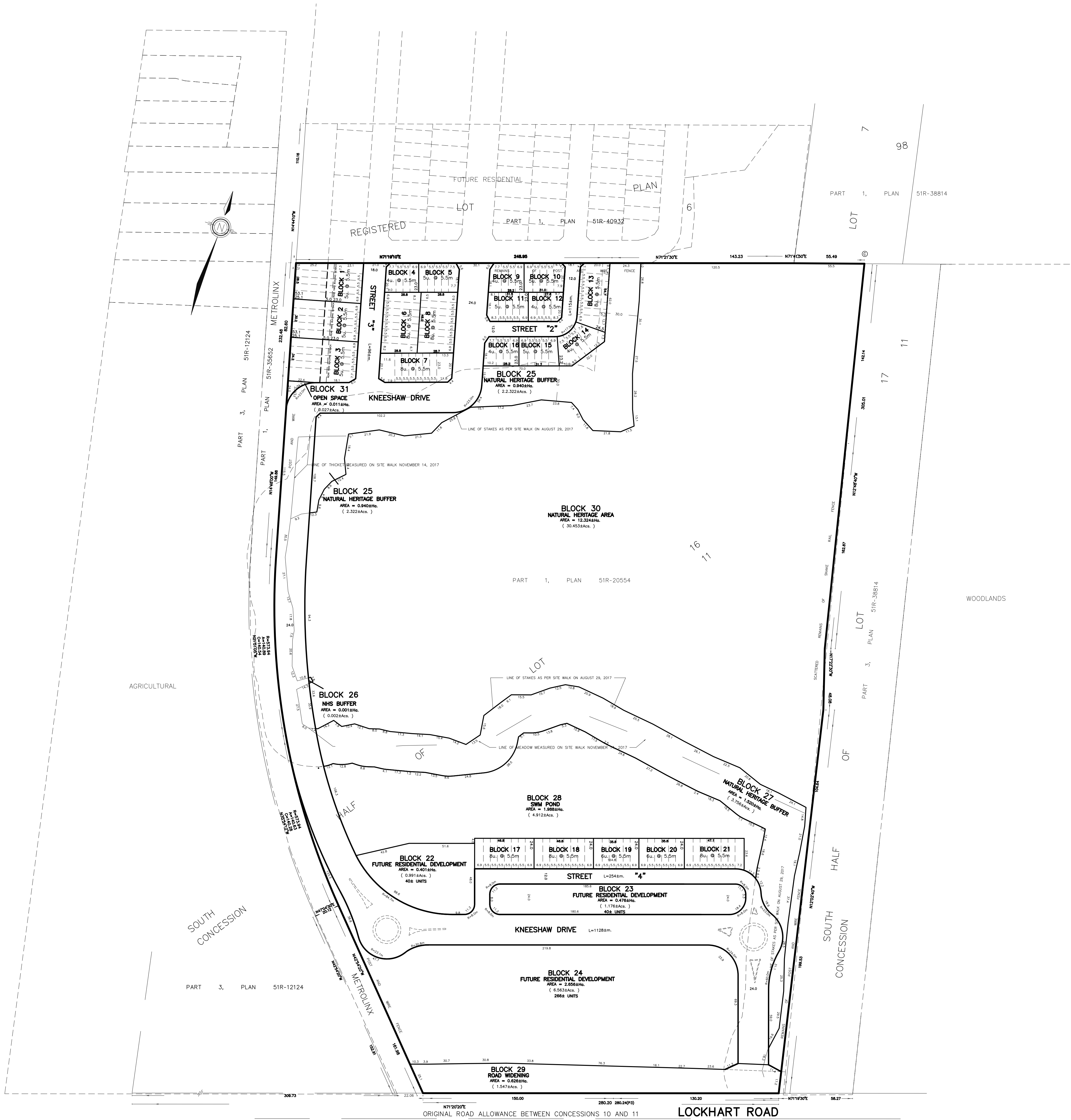
SCALE 1:1000 FEB. 14, 2019

(3006DES12) X-REF: (3006MAS1 & 3006TOPO)

DWG. No. - 19:5

64 JARDIN DRIVE - UNIT 1B, CONCORD ONTARIO L4K 3P3
TEL: (905) 669-4055 FAX: (905) 669-0097 design@klmplanning.com

Planning • Design • Development





APPENDIX B

TRAFFIC DATA CORRESPONDENCE

Keni Mallinen

From: Rail Data Requests <RailDataRequests@metrolinx.com>
Sent: August-27-18 9:50 AM
To: Seema Nagaraj
Cc: Brandon Gaffoor
Subject: RE: Rail traffic data request (VCL File: 118-0293)

Hello Seema,

Further to your request dated July 24, 2018 (attached below), the subject site (in proximity to Yonge Street and Maplevue Drive in the City of Barrie) is located adjacent to GO Transit's Barrie rail corridor and is within close proximity to Barrie South GO Station. I note that we do not maintain information pertaining to the idling activities at stations – that would be up to the consultant to collect that information for a typical weekday period.

It's anticipated that GO service will be comprised of electric trains within (at least) a 10-year time horizon. The combined preliminary midterm weekday train volume forecast at this location, including both revenue and equipment trips is in the order of 42 trains (36 day, 6 night). Trains will be comprised of a single locomotive and up to 12 passenger cars.

The track design speed on this corridor is 60 mph (97 km/h).

An anti-whistle by-law is in effect at Maplevue Drive East.

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 GO Expansion rail service. Everything else being equal, this will likely result in an overall increase in train noise emissions.

Given the above considerations, it would be prudent, for the purposes of acoustical analyses, to either use established model pre-sets for electrified trains or conservatively assume that the acoustical characteristics of electrified and diesel trains are equivalent. We anticipate that additional information regarding specific operational parameters for electrified trains will become available in the near future.

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

I trust this information is useful. Should you have any questions, please feel free to contact myself.

IVAN CHEUNG, M.Sc, B.URPI

Intern
Metrolinx
Pre-Construction Services | Capital Projects Group
20 Bay Street, Suite 600 | Toronto | Ontario | M5J 2E3
T: 416-202-5920



Keni Mallinen

From: Justin MacDonald <Justin.MacDonald@barrie.ca>
Sent: January-11-19 9:23 AM
To: Seema Nagaraj
Cc: Keni Mallinen
Subject: RE: Traffic data request (VCL File: 118-0671)

Good morning Seema,

- Lockhart Road, east of Yonge Street - 5,000 vehicles per day with 3% commercial and heavy vehicles, with a growth factor of 7% growth per year to a horizon year of 2031.
- Yonge Street, north of Lockhart Road – 15,000 vehicles per day with 3% commercial and heavy vehicles, with a growth factor of 2% growth per year to a horizon year of 2031.

Should you have any questions please let me know.

Thanks,

Justin MacDonald, C.E.T.,
Senior Transportation Operations Technologist
Roads, Parks & Fleet



City of Barrie: Barrie Operations Centre, 165 Ferndale Drive North, Barrie ON, L4N 9V9
Office: 705-739-4220 5178

From: Seema Nagaraj [mailto:seema@valcoustics.com]
Sent: Thursday, January 10, 2019 11:42 AM
To: Justin MacDonald <Justin.MacDonald@barrie.ca>
Cc: Keni Mallinen <keni@valcoustics.com>
Subject: RE: Traffic data request (VCL File: 118-0671)

Hi Justin,

Happy new year! I wanted to follow on the request below. Can you please provide the data at your earliest convenience?

Thanks,

Seema

From: Seema Nagaraj
Sent: Wednesday, December 19, 2018 9:10 AM
To: 'Justin.MacDonald@barrie.ca' <Justin.MacDonald@barrie.ca>
Subject: Traffic data request (VCL File: 118-0671)

APPENDIX C

ENVIRONMENTAL NOISE GUIDELINES

APPENDIX C

ENVIRONMENTAL NOISE GUIDELINES

MINISTRY OF THE ENVIRONMENT, CONSERVATION AND PARKS (MECP)

Reference: MECP Publication NPC-300, October 2013: *“Environmental Noise Guideline, Stationary and Transportation Source – Approval and Planning”*.

SPACE	SOURCE	TIME PERIOD	CRITERION
Living/dining, den areas of residences, hospitals, nursing homes, schools, daycare centres, etc.	Road	07:00 to 23:00	45 dBA
	Rail	07:00 to 23:00	40 dBA
	Aircraft	24-hour period	NEF/NEP 5
Living/dining, den areas of residences, hospitals, nursing homes, etc. (except schools or daycare centres)	Road	23:00 to 07:00	45 dBA
	Rail	23:00 to 07:00	40 dBA
	Aircraft	24-hour period	NEF/NEP 5
Sleeping quarters	Road	07:00 to 23:00	45 dBA
	Rail	07:00 to 23:00	40 dBA
	Aircraft	24-hour period	NEF/NEP 0
Sleeping quarters	Road	23:00 to 07:00	40 dBA
	Rail	23:00 to 07:00	35 dBA
	Aircraft	24-hour period	NEF/NEP 0
Outdoor Living Areas	Road and Rail	07:00 to 23:00	55 dBA
Outdoor Point of Reception	Aircraft	24-hour period	NEF/NEP 30 [#]
	Stationary Source		
	Class 1 Area	07:00 to 19:00 ⁽¹⁾	50 ⁺ dBA
		19:00 to 23:00 ⁽¹⁾	50 ⁺ dBA
	Class 2 Area	07:00 to 19:00 ⁽²⁾	50 ⁺ dBA
		19:00 to 23:00 ⁽²⁾	45 ⁺ dBA
	Class 3 Area	07:00 to 19:00 ⁽³⁾	45 ⁺ dBA
		19:00 to 23:00 ⁽³⁾	40 ⁺ dBA
	Class 4 Area	07:00 to 19:00 ⁽⁴⁾	55 ⁺ dBA
		19:00 to 23:00 ⁽⁴⁾	55 ⁺ dBA

..../cont'd

SPACE	SOURCE	TIME PERIOD	CRITERION
Plane of a Window of Noise Sensitive Spaces	Stationary Source Class 1 Area	07:00 to 19:00 ⁽¹⁾	50* dBA
		19:00 to 23:00 ⁽¹⁾	50* dBA
		23:00 to 07:00 ⁽¹⁾	45* dBA
	Class 2 Area	07:00 to 19:00 ⁽²⁾	50* dBA
		19:00 to 23:00 ⁽²⁾	50* dBA
		23:00 to 07:00 ⁽²⁾	45* dBA
	Class 3 Area	07:00 to 19:00 ⁽³⁾	45* dBA
		19:00 to 23:00 ⁽³⁾	45* dBA
		23:00 to 07:00 ⁽³⁾	40* dBA
	Class 4 Area	07:00 to 19:00 ⁽⁴⁾	60* dBA
		19:00 to 23:00 ⁽⁴⁾	60* dBA
		23:00 to 07:00 ⁽⁴⁾	55* dBA

- # may not apply to in-fill or re-development.
 * or the minimum hourly background sound exposure $L_{eq(1)}$, due to road traffic, if higher.
 (1) Class 1 Area: Urban.
 (2) Class 2 Area: Urban during day; rural-like evening and night.
 (3) Class 3 Area: Rural.
 (4) Class 4 Area: Subject to land use planning authority's approval.

Reference: MECP Publication ISBN 0-7729-2804-5, 1987: "Environmental Noise Assessment in Land-Use Planning".

EXCESS ABOVE RECOMMENDED SOUND LEVEL LIMITS (dBA)	CHANGE IN SUBJECTIVE LOUDNESS ABOVE	MAGNITUDE OF THE NOISE PROBLEM	NOISE CONTROL MEASURES (OR ACTION TO BE TAKEN)
No excess (<55 dBA)	—	No expected noise problem	None
1 to 5 inclusive (56 to 60 dBA)	Noticeably louder	Slight noise impact	If no physical measures are taken, then prospective purchasers or tenants should be made aware by suitable warning clauses.
6 to 10 inclusive (61 - 65 dBA)	Almost twice as loud	Definite noise impact	Recommended.
11 to 15 inclusive (66 - 70 dBA)	Almost three times as loud	Serious noise impact	Strongly Recommended.
16 and over (>70 dBA)	Almost four times as loud	Very serious noise impact	Strongly Recommended (may be mandatory).

APPENDIX D

SAMPLE CALCULATIONS

STAMSON 5.04 NORMAL REPORT Date: 06-03-2019 10:46:01
MINISTRY OF ENVIRONMENT, CONSERVATION AND PARKS / NOISE ASSESSMENT

Filename: b3_wfs.te Time Period: Day/Night 16/8 hours
Description: Block 3 - West Facade, Southwest Corner

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

Train Type	! Trains ! (Left)	! Trains ! (Right)	! Speed ! (km/h)	!# loc !/Train	!# Cars !/Train	! Eng ! type	!Cont !weld
1.	! 19.4/3.2	! 19.4/3.2	! 97.0	! 1.0	! 12.0	!Diesel	! Yes

Data for Segment # 1: GO Barrie (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	:	38.50 / 38.50	m
Receiver height	:	10.50 / 10.50	m
Topography	:	1	(Flat/gentle slope; no barrier)
Whistle Angle	:	-86 deg	Track 1
Reference angle	:	0.00	

Results segment # 1: GO Barrie (day)

LOCOMOTIVE (0.00 + 64.29 + 0.00) = 64.29 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.31	70.47	-5.38	-0.80	0.00	0.00	0.00	64.29

WHEEL (0.00 + 56.25 + 0.00) = 56.25 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.42	63.08	-5.81	-1.02	0.00	0.00	0.00	56.25

LEFT WHISTLE (0.00 + 44.81 + 0.00) = 44.81 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-88	-86	0.31	74.67	-5.38	-24.48	0.00	0.00	0.00	44.81

RIGHT WHISTLE (0.00 + 53.74 + 0.00) = 53.74 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-86	-77	0.31	74.67	-5.38	-15.55	0.00	0.00	0.00	53.74

Segment Leq : 65.28 dBA

Total Leq All Segments: 65.28 dBA

Results segment # 1: GO Barrie (night)

LOCOMOTIVE (0.00 + 59.47 + 0.00) = 59.47 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.31	65.65	-5.38	-0.80	0.00	0.00	0.00	59.47

WHEEL (0.00 + 51.43 + 0.00) = 51.43 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.42	58.26	-5.81	-1.02	0.00	0.00	0.00	51.43

LEFT WHISTLE (0.00 + 39.99 + 0.00) = 39.99 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-88	-86	0.31	69.85	-5.38	-24.48	0.00	0.00	0.00	39.99

RIGHT WHISTLE (0.00 + 48.92 + 0.00) = 48.92 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-86	-77	0.31	69.85	-5.38	-15.55	0.00	0.00	0.00	48.92

Segment Leq : 60.46 dBA

Total Leq All Segments: 60.46 dBA

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

Car traffic volume : 16608/1845 veh/TimePeriod *
Medium truck volume : 308/34 veh/TimePeriod *
Heavy truck volume : 205/23 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): 15000
Percentage of Annual Growth : 2.00
Number of Years of Growth : 12.00
Medium Truck % of Total Volume : 1.80
Heavy Truck % of Total Volume : 1.20
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 : 191.60 / 191.60 m
Receiver height : 10.50 / 10.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Yonge St (day)

Source height = 1.05 m

ROAD (0.00 + 50.66 + 0.00) = 50.66 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.40	67.17	0.00	-15.53	-0.99	0.00	0.00	0.00	50.66

Segment Leq : 50.66 dBA

Total Leq All Segments: 50.66 dBA

Results segment # 1: Yonge St (night)

Source height = 1.05 m

ROAD (0.00 + 44.14 + 0.00) = 44.14 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.40	60.65	0.00	-15.53	-0.99	0.00	0.00	0.00	44.14

Segment Leq : 44.14 dBA

Total Leq All Segments: 44.14 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.43
(NIGHT): 60.56

STAMSON 5.04 NORMAL REPORT Date: 19-02-2019 13:24:10
MINISTRY OF ENVIRONMENT, CONSERVATION AND PARKS / NOISE ASSESSMENT

Filename: b3_olalm.te Time Period: Day/Night 16/8 hours
Description: Block 3 OLA - Southmost OLA - Mitigated

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

Train Type	! Trains !	! Speed !(km/h)	!# loc !/Train!	!# Cars !/Train!	! Eng ! type	!Cont !weld						
1.	!	38.8/6.4	!	97.0	!	1.0	!	12.0	!	Diesel	!	Yes

Data for Segment # 1: GO Barrie (day/night)

Angle1	Angle2	: -90.00 deg	-52.00 deg
Wood depth	:	0	(No woods.)
No of house rows	:	0 / 0	
Surface	:	1	(Absorptive ground surface)
Receiver source distance	:	36.00 / 36.00	m
Receiver height	:	1.50 / 10.50	m
Topography	:	2	(Flat/gentle slope; with barrier)
No Whistle			
Barrier angle1	:	-90.00 deg	Angle2 : -52.00 deg
Barrier height	:	2.30 m	
Barrier receiver distance	:	6.70 / 6.70	m
Source elevation	:	265.20 m	
Receiver elevation	:	262.31 m	
Barrier elevation	:	262.68 m	
Reference angle	:	0.00	

Rail data, segment # 2: GO Barrie (day/night)

Train Type	! Trains !	! Speed !(km/h)	!# loc !/Train!	!# Cars !/Train!	! Eng ! type	!Cont !weld						
1.	!	38.8/6.4	!	97.0	!	1.0	!	12.0	!	Diesel	!	Yes

Data for Segment # 2: GO Barrie (day/night)

Angle1	Angle2	: -52.00 deg	33.00 deg
Wood depth	:	0	(No woods.)
No of house rows	:	0 / 0	
Surface	:	1	(Absorptive ground surface)
Receiver source distance	:	36.00 / 36.00	m
Receiver height	:	1.50 / 10.50	m
Topography	:	2	(Flat/gentle slope; with barrier)
No Whistle			
Barrier angle1	:	-52.00 deg	Angle2 : 33.00 deg
Barrier height	:	3.00 m	
Barrier receiver distance	:	9.80 / 9.80	m
Source elevation	:	265.20 m	
Receiver elevation	:	262.31 m	
Barrier elevation	:	262.68 m	
Reference angle	:	0.00	

Rail data, segment # 3: GO Barrie (day/night)

Train Type	! Trains !	! Speed !(km/h)	!# loc !/Train!	!# Cars !/Train!	! Eng ! type	!Cont !weld
1.	!	38.8/6.4	!	97.0	!	1.0
					!	12.0
					!	Diesel
						Yes

Data for Segment # 3: GO Barrie (day/night)

Angle1	Angle2	:	33.00 deg	90.00 deg
Wood depth	:	0	(No woods.)	
No of house rows	:	0 / 0		
Surface	:	1	(Absorptive ground surface)	
Receiver source distance	:	36.00 / 36.00	m	
Receiver height	:	1.50 / 10.50	m	
Topography	:	2	(Flat/gentle slope; with barrier)	
No Whistle				
Barrier angle1	:	33.00 deg	Angle2 :	90.00 deg
Barrier height	:	1.80 m		
Barrier receiver distance	:	19.00 / 19.00	m	
Source elevation	:	265.20 m		
Receiver elevation	:	262.31 m		
Barrier elevation	:	267.80 m		
Reference angle	:	0.00		

Results segment # 1: GO Barrie (day)

Barrier height for grazing incidence

Source Height (m)	! Receiver ! Height (m)	! Barrier ! Height (m)	! Elevation of ! Barrier Top (m)
4.00	!	1.50	!
		2.13	!
0.50	!	1.50	!
		1.48	!
			264.81
			264.16

LOCOMOTIVE (0.00 + 50.71 + 0.00) = 50.71 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-52	0.45	70.47	-5.50	-9.22	0.00	0.00	-5.04	50.71

WHEEL (0.00 + 41.55 + 0.00) = 41.55 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-52	0.55	63.08	-5.90	-9.73	0.00	0.00	-5.90	41.55

Segment Leq : 51.21 dBA

Results segment # 2: GO Barrie (day)

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	1.50	2.60	265.28
0.50	1.50	1.64	264.32

LOCOMOTIVE (0.00 + 56.17 + 0.00) = 56.17 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-52	33	0.41	70.47	-5.34	-3.45	0.00	0.00	-5.50	56.17

WHEEL (0.00 + 44.69 + 0.00) = 44.69 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-52	33	0.51	63.08	-5.74	-3.50	0.00	0.00	-9.15	44.69

Segment Leq : 56.47 dBA

Results segment # 3: GO Barrie (day)

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	1.50	-1.15	266.65
0.50	1.50	-2.99	264.81

LOCOMOTIVE (0.00 + 47.93 + 0.00) = 47.93 Dba

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
33	90	0.48	70.47	-5.62	-6.85	0.00	0.00	-10.08	47.93

WHEEL (0.00 + 36.89 + 0.00) = 36.89 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
33	90	0.58	63.08	-6.01	-7.19	0.00	0.00	-12.99	36.89

Segment Leq : 48.26 dBA

Total Leq All Segments: 58.08 dBA

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

Car traffic volume : 16608/1845 veh/TimePeriod *
Medium truck volume : 308/34 veh/TimePeriod *
Heavy truck volume : 205/23 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): 15000
Percentage of Annual Growth : 2.00
Number of Years of Growth : 12.00
Medium Truck % of Total Volume : 1.80
Heavy Truck % of Total Volume : 1.20
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 : 188.90 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Yonge St (day)

Source height = 1.05 m

ROAD (0.00 + 47.46 + 0.00) = 47.46 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	67.17	0.00	-18.26	-1.46	0.00	0.00	0.00	47.46

Segment Leq : 47.46 dBA

Total Leq All Segments: 47.46 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 58.44