

NOISE IMPACT STUDY

Proposed Residential Subdivision

"LM Barrie"

City of Barrie

Prepared for:

**LM Barrie Holdings Inc. &
2121191 Ontario Inc.**



Prepared by:

Ralph Bouwmeester, P. Eng.

February 14, 2017



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RBA File: A16019

EXECUTIVE SUMMARY

R. BOUWMEESTER & ASSOCIATES has been retained to assess potential noise impacts on residential uses within a proposed residential subdivision on the north side of Maplevue Drive East east of the former City boundary.

The goals and objectives of this study are four-fold, namely:

1. To identify noise sources and noise-sensitive land uses.
2. To recommend mitigation measures, if and where required.
3. To identify those areas, if any, requiring more detailed studies.
4. To satisfy the development approval requirements of the City of Barrie.

The noise source potentially impacting this project is future traffic on Maplevue Drive East.

Traffic data were provided by the City of Barrie. Roadway noise from cars and medium and heavy trucks has been accounted for in this analysis. The traffic volumes have been projected to Year 2027 thereby providing the 10-year minimum projection window required by the MOECC.

The predicted equivalent outdoor sound levels at the subject site resulting from road traffic exceed the limits established by the MOECC in certain areas. Mitigation measures are required in order to bring day and night-time sound levels down to acceptable levels.

The noise control requirements are summarized in Section 7, in Table 4, and on Figure 3.

Certain dwellings require forced air heating systems with duct work sized to accommodate the future installation of central air conditioning at the owners' option and expense. Construction meeting the minimum non-acoustical requirements of the Ontario Building Code will provide adequate sound insulation for these units. The affected lots also require warning clauses registered on title; wording is provided. See Section 7, Table 4, and Figure 3 for details.

In summary, the subject development as proposed can be developed in a manner that satisfies the requirements of MOECC noise guideline NPC-300.

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1. INTRODUCTION

R. BOUWMEESTER & ASSOCIATES has been retained to assess potential noise impacts on residential uses within a proposed residential subdivision on the north side of Mapleview Drive East east of the former City boundary. See Figure 1.

Our analysis is based on the configuration of the development as shown on a Draft Plan of Subdivision prepared by Jones Consulting dated January 24, 2017. See App. 'C'.

2. GOALS AND OBJECTIVES

The goals and objectives of this study are four-fold, namely:

1. To identify noise sources and noise-sensitive land uses.
2. To recommend mitigation measures, if and where required.
3. To identify those areas, if any, requiring more detailed studies.
4. To satisfy the development approval requirements of the City of Barrie.

3. NOISE SOURCES

The noise source potentially impacting this project is future traffic on Mapleview Drive East. Traffic data were provided by the City of Barrie. See Appendix 'A'.

4. GUIDELINES AND CRITERIA

Reference is made to Ministry of the Environment (MOECC) publication, Environmental Noise Guideline – Stationary and Transportation Sources – Approval and Planning (Publication NPC-300, Aug 2013 ver. #22) which recommends various sound level limits for indoor and outdoor settings, under different time scenarios, and under differing uses.

4.1 Sound Level Limits

The following NPC-300 sound level limits apply to road traffic:

TABLE 1 - Sound Level Limits (Leq)

Location	Time Period		Limit (dBA)
<u>Outdoor</u>			
Outdoor Living Area	Day	0700-2300 hrs	55
<u>Indoor</u>			
Living/Dining Room	All	0700-0700 hrs	45
Bedroom (day)	Day	0700-2300 hrs	45
Bedroom (night)	Night	2300-0700 hrs	40

As compared to earlier MOECC noise guidelines, NPC-300 has set indoor sound level limits in bedrooms for the day-time period in addition to night-time.

4.2 Noise Control Measures

NPC-300 states that *"Noise control measures are not required if the sound level estimated in the OLA is 55 dBA or less during the daytime and 50 dBA or less in the plane of bedroom windows during either daytime or nighttime"*.

4.2.1 Outdoor Living Areas

The above-noted outdoor limit of 55 dBA applies to a protected Outdoor Living Area (OLA) of at least 56 m² (600 sq. ft.) in the case of single family detached homes, 46 m² (500 sq. ft.) in the case of semi-detached units, and 37 m² (400 sq. ft.) in the case of row or townhouse units.

The MOECC guidelines indicate that *"Noise control measures are not required if the sound level estimated in the OLA is 55 dBA or less during the daytime"*.

The guidelines state that if the sound level is greater than 55 dBA and less than or equal to 60 dBA, *"noise control measures may be applied to reduce the sound level to 55 dBA. If measures are not provided, prospective purchasers or tenants should be informed of potential noise problems by a warning clause Type A"*.

The guidelines further state that if the sound level in the Outdoor Living Area is greater than 60 dBA, *"noise control measures should be implemented to reduce the level to 55 dBA. Only in cases where the required noise control measures are not feasible for technical, economic or administrative reasons would an excess above the limit (55 dBA) be acceptable with a warning clause Type B. In the above situations, any excess above the limit will not be acceptable if it exceeds 5 dBA."* Acoustic barriers typically provide the mitigation needed, and warning clauses are required to be registered on title against the affected units.

4.2.2 Plane of Window - Ventilation Requirements

Ventilation requirements to reduce indoor sound levels, by allowing windows to remain closed if so desired by the occupants, include the following:

- For outdoor day-time sound levels in the plane of living/dining/bedroom windows greater than 55 dBA and less than or equal to 65 dBA, dwelling units must be equipped with forced air heating systems with ducting sized for the future installation of central air conditioning. Window, wall, and door components meeting normal Ontario Building Code requirements are typically adequate under these conditions, although warning clauses (Types B and C) must be registered on title against the affected dwelling units.
- For outdoor day-time sound levels in the plane of living/dining/bedroom windows greater than 65 dBA, dwelling units must be equipped with central air conditioning. Warning clauses (Types B and D) must be registered on title against these units.

Ventilation requirements under night-time conditions are similar to the above except that 50 and 60 dBA are used in place of 55 dBA and 65 dBA, respectively.

The location and installation of outdoor air conditioning devices should comply with the sound level limits of Publication NPC-216 and guidelines contained in Environmental Noise Guidelines for Installation of Residential Air Conditioning Devices, or should comply with other criteria specified by the municipality.

4.2.3 Indoor Living Areas - Building Component Requirements

If day-time sound levels outside living/dining/bedroom windows exceed 65 dBA (or night-time levels exceed 60 dBA) building components including windows, walls and doors must be designed so that the indoor sound levels meet the sound level limits quoted in Table 1.

The above sound level limits and mitigation requirements can be summarized as follows:

TABLE 2 - Sound Level Limits and Standard Mitigation Requirements

	<u>Outdoor Sound Level Limits (dBA)</u>		
	<u>Plane of Window</u>		OLA
	Day	Night	
Do nothing	≤55	≤50	≤55
Noise barrier or Warning Clause A			56 - 60
Mandatory noise barrier *			>60
Provision for future A/C **	56 - 65	51 - 60	
Mandatory A/C **	>65	>60	
Special building component design	>65	>60	

Notes:

* Warning Clause B required if net resultant sound level is 56-60 dBA (to max. allowable 60 dBA).

** Warning clauses required (B and C for future A/C, B and D for mandatory A/C).

5. ANALYSIS PROCEDURES

5.1 Surroundings and Site Characteristics

The subject site is located on the north side of Maplevue Drive East, east of the former City boundary, in southeast Barrie. See Figure 1. Vacant lands (future residential) are located to the east and north, and an existing residential subdivision lies to the west. Estate lot residential uses exist along the south side of Maplevue; these lands are also slated for future residential development.

The proposed development calls for 796 residential units consisting of a mix of singles, semis, townhomes, and Mixed Uses, along with various Blocks for stormwater, open space, and environmental protection uses. The site is 40.81 ha in size.

Private outdoor living space is proposed in the rear yards of the singles, semis and towns.

5.2 Noise Sources

The noise source of concern is future traffic on Maplevue Drive East. The proposed local streets are considered acoustically insignificant.

Roadway noise from cars and medium and heavy trucks has been accounted for in this analysis. The noise source heights used are in accordance with MOECC criteria.

This analysis assumes that Mapleview Drive East is of infinite length.

5.3 Traffic Data

The City of Barrie provided Year 2016 traffic counts, truck percentages, and projected annual growth rates to Year 2031 for Mapleview Drive East. Our analysis is based on Year 2027 traffic volumes which provides the 10-year minimum projection window required by the MOECC.

We have assumed that truck traffic is split 50/50 between medium and heavy trucks.

The MOECC-recommended percentage splits for day and night time traffic volumes were used in this study (i.e. 90/10 for arterial roads).

The posted speed limit on Mapleview Drive East adjacent to the subject site is 60 kph.

The road grade along Mapleview Drive is about 0.6% as derived from the Draft Plan.

See Appendix 'A' for further road traffic details.

5.4 Study Periods

The study periods, as per MOECC guidelines, are the 16-hour day-time period between 7:00 AM and 11:00 PM, and the 8-hour night-time period from 11:00 PM and 7:00 AM.

5.5 Sound Level Prediction Model

Noise level calculations were carried out in accordance with MOECC guidelines (Environmental Noise Assessment in Land Use Planning, Training Manual, Ontario Ministry of the Environment, 1987) and through the use of their road noise model ORNAMENT. See References.

5.6 Correction Factors

The corrections required by the MOECC to be applied to the noise levels have been taken into account where applicable. These include corrections such as:

- a) Road segment lengths
- b) Ground surface type
- c) Source - receiver distance
- d) Height of elevated source/receiver, and
- e) Day/night split in traffic volumes.

6. CALCULATED EQUIVALENT SOUND LEVELS

Indoor sound levels are typically estimated by calculating outdoor levels along the face of a wall exposed to the noise source (i.e. in the plane of windows). Under NPC-300, day and night-time receiver heights are set at bedroom windows which are typically 4.5 m above grade in a typical single or semi-detached house or townhouse.

We note that, in multi-storey building scenarios, sound levels increase with building height (due to a reduction in the effect of ground attenuation). This may come into play on the Mixed Use Blocks (584 and 585). Although the building types have yet to be determined, we have assumed 4-storey structures with residential uses in the upper floors. Assuming a ground floor height of 4.5 m, and 3.0 m per floor above the first, we have used a receptor height of 12.0 m for a 4th floor window (i.e. 1.5 m above floor level) for Blocks 584 and 585.

Shielding by vegetation and buildings was not accounted for in the determination of ventilation and building component requirements, however, building shielding was accounted for in the determination of OLA sound levels.

OLA sound levels are typically calculated for receivers 3.0 m from the midpoint of the rear wall of a dwelling at a height of 1.5 m above finished grade.

Decks and balconies are exempt from the MOECC outdoor noise limits unless they are the only outdoor living area available, and they are at least 4.0 m deep, outside the building façade, and unenclosed.

Our analysis includes a sampling of noise levels that can be expected in OLAs and along the building faces based on the lotting configuration shown on the Draft Plan. These noise level predictions were used to flag those areas requiring a more detailed analysis.

Building envelopes were assumed based on typical setbacks of 3.0 m front, 5.0 m rear, 1.2 m interior side, and 2.0 m exterior side (as per the draft zoning standards for this site as provided by Jones Consulting).

An overall summary of the predicted outdoor day-time and night-time sound levels for each of the receptor locations is presented in Table 3. See Figure 2 for receptor locations and Appendix 'B' for sample calculations.

TABLE 3 - Predicted Outdoor Sound Levels (dBA)

Receptor	Source	Source / Receiver Dist. (m) (Wall / OLA)	Outdoor Equivalent Sound Levels (Leq) Due to Road Traffic (dBA) (unmitigated)		
			Day	Night	OLA
Lot 549	Mapleview	32.8 / -	55	49	-
Lot 565	Mapleview	15.8 / 19.7	60	54	57
Block 581	Mapleview	18.8 / 15.8	59	53	60

The results shown in Table 3 confirm that mitigation measures are required in order to ensure that day-time and night-time sound levels meet the MOECC criteria.

In order to provide some guidance with respect to the future site planning of Mixed Use Blocks 584 and 585, we have determined setback distances within which key noise controls are required. See Recommendations 3 and 4.

The following summarizes typical acoustic requirements and describes how they apply to this proposed development. See Section 7 and Figure 3 for detailed requirements.

Warning clauses must be registered on title and included in Agreements of Purchase and Sale or Lease where sound level limits are exceeded. Based on the predicted noise levels at the building faces, warning clauses are required for certain dwelling units (see Table 4 and Figure 3) - suggested wording is given in the Notes to Table 4.

Central air conditioning is required where the sound level due to road traffic in the plane of a living/dining/bedroom window exceeds 65 dBA day-time or 60 dBA night-time. Air cooled condenser units should be located in a noise insensitive location. Central air conditioning is not meant to be a sound mitigating measure, although it does provide the dwelling occupants the option of closing windows if so desired. This requirement does not apply to any units.

Special building component design, to ensure that indoor sound levels due to road traffic meet the limits specified in Section 4, is required for residential dwelling units where the sound level in the plane of a living/dining/bedroom window exceeds 65 dBA day-time or 60 dBA night-time. This requirement does not apply to any units.

Forced air heating systems, with duct work sized to accommodate the future installation of central air conditioning, are required where the sound level due to road traffic in the plane of a living/dining/bedroom window exceeds 55 dBA day-time or 50 dBA night-time. Future air cooled condenser units should be located in a noise insensitive location. Construction meeting the minimum non-acoustical requirements of the Ontario Building Code will provide adequate sound insulation. This requirement applies to certain units (see Table 4 and Figure 3).

Acoustic barriers, to protect outdoor living areas, are required where the day-time outdoor sound level in the OLA exceeds 60 dBA. The MOECC's sound level objective for outdoor living areas is 55 dBA, however, sound level excesses of up to 5 dBA are permitted with an appropriate warning clause. Residual noise levels (in excess of 55 dBA) resulting from reduced fence heights must be covered through the use of an appropriately worded warning clause to be included in the Site Plan Agreement and in all Offers of Purchase and Sale or Lease for the affected units, and the clause is to be registered on title against those units.

Based on the configuration of the proposed Draft Plan, acoustic barriers are not required for any lots.

7. RECOMMENDATIONS

1. The first tier of lots/blocks in from Maplevue Drive East along with the first two lots flanking Maplevue require warning clauses registered on title and included in all Development Agreements and Agreements of Purchase and Sale or Lease. See Figure 3 and Table 4 for the specific lots to which this applies, and see Notes to Table 4 for wording.
2. The lots/blocks in Recommendation 1 require forced air heating systems sized for the future installation of central air conditioning at the unit owners' option and expense.
3. Detailed noise studies are required for Mixed Use Blocks 584 and 585 at the site plan approval stage for those Blocks. To provide some guidance for the site planning of these Blocks, noise barriers are mandatory for outdoor living space that is fully exposed to Maplevue Drive and less than 1.9 m from the widened right-of way limit.
4. Forced air heating systems, with duct work sized to accommodate the future installation of central air conditioning, will be required for Mixed Use Blocks 584 and 585 for residential units within 29.8 m of the widened street line. (This is based on an assumed 4-storey building and must be reviewed/confirmed at the site plan stage.)

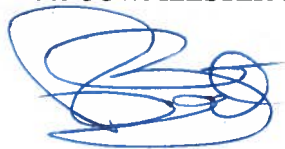
8. CONCLUSIONS

With the incorporation of the recommended noise controls summarized in Section 7 and as contained in Table 4 and shown on Figure 3, the MOECC noise guidelines can be met in all dwelling units and outdoor living areas.

In summary, the subject development as proposed can be developed in a manner that satisfies the requirements of MOECC noise guideline NPC-300.

Respectfully submitted,

R. BOUWMEESTER & ASSOCIATES



Ralph Bouwmeester, P. Eng.
Principal

TABLE 4 - Summary of Noise Controls

Lot / Block	Central Air Conditioning	Exterior Windows, Walls and Doors	Acoustic Barrier	Warning Clauses ^{1.}
546 – 553, 564 – 565 580 – 583	Provision for Adding	OBC	No	A + B + C
1 – 545, 554 – 563 566 – 579, 586 – 600	No acoustic requirements			
584, 585	Detailed Noise Studies Required at Site Plan Stage			
601 - 615	Not Residential			

Notes:

1. See Notes to Table 4 on following page for wording.

NOTES TO TABLE 4

1. Air cooled condenser units should be located in a noise insensitive location and must comply with MOECC Publication NPC-216 ("Residential Air Conditioning Devices – Publication NPC-216. 1993. Ontario Ministry of Environment and Energy").
2. 'OBC' indicates that construction meeting the minimum non-acoustical requirements of the Ontario Building Code will provide adequate sound insulation. 'Special' indicates that exterior building components such as windows, walls and doors have to be determined by an acoustic consultant when house plans are available and prior to building permit issuance.
3. Acoustic barriers shall be of solid construction with no cracks, holes or gaps, and having a surface density of no less than 20 kg/sm. Any gaps under the noise barrier that are necessary for drainage purposes must be minimized and localized, and must not deteriorate the acoustical performance. A barrier may consist of a berm, a fence, or both.
4. The following warning clauses must be registered on title and included in the Subdivision Agreement and in all Agreements of Purchase and Sale or Lease for those lots and blocks as specified in Table 4:

TYPE A: *"Purchasers/tenants are advised that sound levels due to increasing road traffic may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the Municipality and the Ministry of the Environment."*

TYPE B: *"Purchasers/tenants are advised that despite the inclusion of noise control features in the development and within the building units, sound levels due to increasing road traffic may on occasions interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the Municipality and the Ministry of the Environment."*

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

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

5. Conventional ventilated attic roof construction meeting OBC requirements is satisfactory.
6. All exterior doors must be fully weather-stripped.

REFERENCES

1. Environmental Noise Guideline – Stationary and Transportation Sources – Approval and Planning (MOE Publication NPC-300, Aug 2013 ver. #22)
2. Environmental Noise Assessment in Land Use Planning (MOE Training Manual, 1987)
3. Road and Rail Noise: Effects on Housing (CMHC, Rev. 1981)
4. ORNAMENT (Ontario Road Noise Analysis Method for Environment and Transportation) (MOE, October 1989)
5. Traffic data (City of Barrie, May 2016)
6. Zoning By-law 2009-141 as amended (City of Barrie) (including draft amendment related to Salem and Hewitt's Secondary Plans)

FIGURES

Figure 1 - Location Plan

Figure 2 - Receptor Plan

Figure 3 - Noise Control Plan



Location Plan

Scale: NTS

FIG. 1

February 2017

R. Bouwmeester & Associates

Base map source: Simcoe County



LEGEND



Building envelope and Receptor Location

Receptor Plan

Scale: 1 : 4000

FIG. 2

February 2017

R. Bouwmeester & Associates

Air photo source: Simcoe County
Draft Plan source: Jones Consulting



LEGEND

- Dwellings requiring forced air heating + Warming Clauses
- △ Detailed Noise Studies Required at Site Plan Stage

Noise Control Plan

Scale: 1 : 4000

FIG. 3

February 2017

R. Bouwmeester & Associates

Air photo source: Simcoe County
Draft Plan source: Jones Consulting

APPENDICES

- A. Road Traffic Data
 - B. Sample Sound Level Calculations
 - C. Draft Plan (source: Jones Consulting)
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APPENDIX 'A'

ROAD TRAFFIC DATA

City of Barrie

- Mapleview Drive East, east of Prince William Way:
 - Year 2016 ADT is 3,000 with 3% commercial and heavy vehicles
 - Growth rate of 6.0% compounded yearly to Year 2026, plus 5.0% to Year 2031
 - 60 kph

Ministry of the Environment and Climate Change

The MOECC recommended splits for day/night traffic are:

- arterial roads 90/10

SUMMARY OF DATA USED IN THIS STUDY

For the purpose of this noise assessment, the following Year 2027 data apply:

	Mapleview Drive East
Traffic volume (AADT) *	5,642
Day/night split (%)	90 / 10
Percent trucks M / H	1.5 / 1.5 **
Posted Speed	60 kph
Number of lanes	2 (future 2 lanes with centre left turn lane)
ROW width (m)	21.8 (future 27)
Road Grade (%)	0.6
Pavement Type	normal asphalt

* Note: Year 2027 AADT derived as follows:
 $3000 \times (1.06^{10}) \times (1.05^1) = 5,642$

**Note: assumed split 50/50

Ralph Bouwmeester

Subject: RE: Traffic Data Request - Hewitt's Secondary Plan
From: Justin MacDonald <Justin.MacDonald@barrie.ca>
Date: 7/8/2016 9:32 AM
To: Ralph Bouwmeester <rbouwmeester@rogers.com>

Good morning Ralph,

Please refer to below regarding the requested growth rates and traffic volumes. For the ROW and lane configurations please refer to the below link to our Multi-Modal Active Transportation Master Plan.

<http://www.barrie.ca/City%20Hall/growth/Documents/Oct.%202013%20-%20AT%20MP%20-%20Report%20-%20PG%20141-208.pdf>

Big Bay Point Road east of Prince William Way – 6,500 vehicles per day; 5.5% per year to 2026; 5% per year to 2031.
4% commercial and heavy vehicles
50km/h in built up area, turns to 80km/h in rural section.

Mapleview Drive

- East of Country Lane to Yonge – 11,000 vehicles per day; 7% per year to 2026; 6% per year to 2031.
- 3% commercial and heavy vehicles
- 60km/h speed limit

- East of Yonge to Prince William Way – 8,000 vehicles per day; 6% per year to 2026; 4% per year to 2031.
- 3% commercial and heavy vehicles+60 km/h speed limit

- East of Prince William Way – 3,000 vehicles per day; 6% per year to 2026; 5% per year to 2031.
- 3% commercial and heavy vehicles
- 60km/h speed limit

Lockhart Road

3,600 vehicles per day; 6% per year to 2026 (west of Yonge Street), 2% per year to 2026 (east of Yonge Street); 4% per year to 2031 (west of Yonge Street), 2% per year to 2026 (east of Yonge Street);
2% commercial and heavy vehicles
60km/h speed limit

Yonge Street

11,000 vehicles per day; 4% per year to 2026 (Big Bay Point to Mapleview), 2% per year to 2026 (Mapleview to Lockhart), 3% per year to 2031 (Lockhart south); 3% per year to 2031 (Big Bay Point to Mapleview), 1% per year to 2031 (Mapleview to Lockhart),
3% per year to 2026 (Lockhart south)
4% commercial and heavy
60km/h speed limit

Thanks,

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

APPENDIX 'B'

SAMPLE SOUND LEVEL CALCULATIONS

STAMSON 5.0 NORMAL REPORT Date: 10-02-2017 15:23:00
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 6191549w.te Time Period: Day/Night 16/8 hours
Description: Lot 549 day/night at wall

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

Car traffic volume : 4925/547 veh/TimePeriod *
Medium truck volume : 76/8 veh/TimePeriod *
Heavy truck volume : 76/8 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 1 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 5373
Percentage of Annual Growth : 5.00
Number of Years of Growth : 1.00
Medium Truck % of Total Volume : 1.50
Heavy Truck % of Total Volume : 1.50
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 : 32.80 / 32.80 m
Receiver height : 4.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Mapleview (day)

Source height = 1.11 m

ROAD (0.00 + 55.44 + 0.00) = 55.44 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.58	62.14	0.00	-5.37	-1.32	0.00	0.00	0.00	55.44

Segment Leq : 55.44 dBA

Total Leq All Segments: 55.44 dBA

Results segment # 1: Mapleview (night)

Source height = 1.09 m

ROAD (0.00 + 48.80 + 0.00) = 48.80 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.58	55.50	0.00	-5.38	-1.32	0.00	0.00	0.00	48.80

Segment Leq : 48.80 dBA

Total Leq All Segments: 48.80 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 55.44
(NIGHT): 48.80

STAMSON 5.0 NORMAL REPORT Date: 10-02-2017 15:20:51
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 6191565w.te Time Period: Day/Night 16/8 hours
Description: Lot 565 day/night at wall

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

Car traffic volume : 4925/547 veh/TimePeriod *
Medium truck volume : 76/8 veh/TimePeriod *
Heavy truck volume : 76/8 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 1 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 5373
Percentage of Annual Growth : 5.00
Number of Years of Growth : 1.00
Medium Truck % of Total Volume : 1.50
Heavy Truck % of Total Volume : 1.50
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 : 15.80 / 15.80 m
Receiver height : 4.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Mapleview (day)

Source height = 1.11 m

ROAD (0.00 + 60.46 + 0.00) = 60.46 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.58	62.14	0.00	-0.36	-1.32	0.00	0.00	0.00	60.46

Segment Leq : 60.46 dBA

Total Leq All Segments: 60.46 dBA

Results segment # 1: Mapleview (night)

Source height = 1.09 m

ROAD (0.00 + 53.81 + 0.00) = 53.81 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.58	55.50	0.00	-0.36	-1.32	0.00	0.00	0.00	53.81

Segment Leq : 53.81 dBA

Total Leq All Segments: 53.81 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.46
(NIGHT): 53.81

Filename: 6191565o.te Time Period: 16 hours
Description: Lot 565 OLA

Road data, segment # 1: Maplevuew

Car traffic volume : 4925 veh/TimePeriod *
Medium truck volume : 76 veh/TimePeriod *
Heavy truck volume : 76 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 1 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: Maplevuew

Angle1 Angle2 : -90.00 deg -61.00 deg
Wood depth : 0 (No woods.)
No of house rows : 1
House density : 95 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 19.70 m
Receiver height : 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 2: Maplevuew

Car traffic volume : 4925 veh/TimePeriod *
Medium truck volume : 76 veh/TimePeriod *
Heavy truck volume : 76 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 1 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 2: Maplevuew

Angle1 Angle2 : -61.00 deg 39.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 19.70 m
Receiver height : 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 3: Maplevuew

Car traffic volume : 4925 veh/TimePeriod *
Medium truck volume : 76 veh/TimePeriod *
Heavy truck volume : 76 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 1 %

Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 3: Mapleview

Angle1 Angle2 : 39.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 1
House density : 95 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 19.70 m
Receiver height : 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Mapleview

Source height = 1.11 m
ROAD (0.00 + 37.94 + 0.00) = 37.94 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

-90 -61 0.66 62.14 0.00 -1.97 -12.14 0.00 -10.10 0.00 37.94

Segment Leq : 37.94 dBA

Results segment # 2: Mapleview

Source height = 1.11 m
ROAD (0.00 + 57.18 + 0.00) = 57.18 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

-61 39 0.66 62.14 0.00 -1.97 -2.99 0.00 0.00 0.00 57.18

Segment Leq : 57.18 dBA

Results segment # 3: Mapleview

Source height = 1.11 m
ROAD (0.00 + 41.89 + 0.00) = 41.89 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

39 90 0.66 62.14 0.00 -1.97 -8.18 0.00 -10.10 0.00 41.89

Segment Leq : 41.89 dBA

Total Leq All Segments: 57.36 dBA

TOTAL Leq FROM ALL SOURCES: 57.36

Filename: 619b581w.te Time Period: Day/Night 16/8 hours
 Description: Lot 581 day/night at wall

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

```
-----
Car traffic volume : 4925/547    veh/TimePeriod *
Medium truck volume : 76/8       veh/TimePeriod *
Heavy truck volume : 76/8       veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient       : 1 %
Road pavement       : 1 (Typical asphalt or concrete)
```

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

```
24 hr Traffic Volume (AADT or SADT): 5373
Percentage of Annual Growth        : 5.00
Number of Years of Growth          : 1.00
Medium Truck % of Total Volume     : 1.50
Heavy Truck % of Total Volume       : 1.50
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         : 18.80 / 18.80 m
Receiver height                  : 4.50 / 4.50 m
Topography                       : 1            (Flat/gentle slope; no barrier)
Reference angle                  : 0.00
```

Results segment # 1: Mapleview (day)

Source height = 1.11 m

ROAD (0.00 + 59.27 + 0.00) = 59.27 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.58	62.14	0.00	-1.55	-1.32	0.00	0.00	0.00	59.27

Segment Leq : 59.27 dBA

Total Leq All Segments: 59.27 dBA

Results segment # 1: Mapleview (night)

Source height = 1.09 m

ROAD (0.00 + 52.62 + 0.00) = 52.62 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.58	55.50	0.00	-1.55	-1.32	0.00	0.00	0.00	52.62

Segment Leq : 52.62 dBA

Total Leq All Segments: 52.62 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.27
(NIGHT): 52.62

STAMSON 5.0 NORMAL REPORT Date: 10-02-2017 15:24:16
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 619b581o.te Time Period: 16 hours
Description: Block 581 OLA

Road data, segment # 1: Mapleview

Car traffic volume : 4925 veh/TimePeriod *
Medium truck volume : 76 veh/TimePeriod *
Heavy truck volume : 76 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 1 %
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 : 15.80 m
Receiver height : 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Mapleview

Source height = 1.11 m

ROAD (0.00 + 60.31 + 0.00) = 60.31 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	62.14	0.00	-0.37	-1.46	0.00	0.00	0.00	60.31

Segment Leq : 60.31 dBA

Total Leq All Segments: 60.31 dBA

TOTAL Leq FROM ALL SOURCES: 60.31

APPENDIX 'C'

DRAFT PLAN

(Source: Jones Consulting)

