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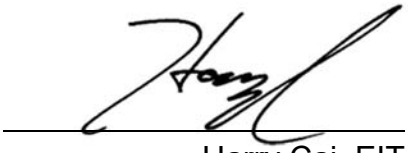
Noise Feasibility Study
Proposed Residential Development
149 Dunlop Street East
Barrie, ON

City File No. D28-011-2022

Prepared for:

Dunlop Developments (Barrie) Inc
129 Rowntree Dairy Road, Unit 4
Vaughan, Ontario
L4L 6C9

Prepared by



Harry Cai, EIT

Reviewed by

Sheeba Paul, MEng, PEng

May 7, 2024

HGC Project No: 02200386

VERSION CONTROL

Noise Feasibility Study, Proposed Residential Development, 149 Dunlop Street East, Barrie, Ontario

Ver.	Date	Version Description	Prepared By
1.0	DRAFT	Noise Feasibility Study for Planning and Approvals Process	H. Cai
2.0	Final	Noise Feasibility Study for Planning and Approvals Process	H. Cai/S.Paul

Limitations

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1 Introduction and Summary

HGC Engineering was retained by Dunlop Developments (Barrie) Inc. to conduct a noise feasibility study for a proposed residential development located at 149 Dunlop Street East in Barrie, Ontario. The residential development will consist of a 25-storey residential tower with an outdoor amenity area on the 5th floor. The study is required by the City of Barrie as part of the planning and approvals process.

This study has been updated to reflect the latest site plan prepared by Scott Shields Architect Inc. dated 2024-03-27. The traffic volumes are current, and no further growth of the traffic data is required.

The primary sources of noise are road traffic noise on Dunlop Street, Mulcaster Street, and Collier Street. Road traffic data was obtained from the City of Barrie and was used to predict future traffic sound levels at the proposed building façades and in outdoor living areas. The predicted sound levels were compared to the guidelines of the City and the Ministry of Environment, Conservation and Parks (MECP) to develop noise control recommendations.

The results of the study indicate that the proposed development is feasible with the noise control measures described in this report. Central air conditioning is required for all dwelling units. Upgraded glazing constructions are required for the north and west façades. For the other façades, building constructions meeting the minimum requirements of the Ontario Building Code will provide sufficient acoustical insulation for the indoor spaces. Noise warning clauses are also required to inform future occupants of traffic noise impacts, to address sound level excesses, and proximity to existing commercial uses.

2 Site Description and Noise Sources

Figure 1 is a key plan indicating the location of the proposed site. The site is east of Mulcaster Street and south of Dunlop Street East in Barrie, Ontario. Figure 2 shows the site plan prepared by Scott Shields Architect Inc. dated 2024-03-27. The proposed development will consist of a 25-storey residential tower with underground parking, retail units on the first floor, and an outdoor amenity area on the 5th floor.

HGC Engineering personnel visited the site on August 26, 2022 to make observations of the acoustical environment. During the site visit, it was noted that the primary sources of noise impacting the site are road traffic noise from Dunlop Street, Mulcaster Street, and Collier Street. The site is currently occupied by a commercial plaza containing several retail businesses and a restaurant, which will be demolished for the construction of the proposed tower. The areas surrounding the site are mostly commercial. There are various small retail stores, cafes, and restaurants to the north and west of the site area, and there is a residential building northeast of the site with commercial uses on the first two floors. To the south of the site area is a parking area and to the east of the site is a public park (Sam Cancilla Park).

During the site visit, sound emissions from the nearby commercial uses were found to be negligible at the site area due to the background traffic noise. Nevertheless, it is recommended that a noise warning clause to identify that such commercial uses may be audible at times be included in the property and tenancy agreements as indicated in Section 6.

3 Noise Level Criteria

3.1 Road Traffic Noise

Guidelines for acceptable levels of road traffic noise impacting residential developments are given in the MECP publication NPC-300, "Environmental Noise Guideline Stationary and Transportation Sources – Approval and Planning", release date October 21, 2013, and are listed in Table I below. The values in Table I are energy equivalent (average) sound levels [L_{EQ}] in units of A-weighted decibels [dBA].

Table I: MECP Road Traffic Noise Criteria (dBA)

Area	Daytime $L_{EQ\ (16\ hour)}$ Road	Nighttime $L_{EQ(8\ hour)}$ Road
Outdoor Living Area	55 dBA	--
Inside Living/Dining Rooms	45 dBA	45 dBA
Inside Bedrooms	45 dBA	40 dBA

Daytime refers to the period between 07:00 and 23:00. Nighttime refers to the time 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. Small balconies are not considered OLAs for the purposes of assessment. Terraces greater than 4 m in depth (measured perpendicular to the building façade) are considered to be OLAs.

The guidelines in the MECP publication allow the daytime sound levels in an Outdoor Living Area to be exceeded by up to 5 dBA, without mitigation, if warning clauses are placed in the purchase and rental agreements to the property. 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 practical.

A central air conditioning system as an alternative means of ventilation to open windows is required for dwellings where nighttime sound levels outside bedroom or living/dining room windows exceed 60 dBA or daytime sound levels outside bedroom or living/dining room windows exceed 65 dBA. Forced-air ventilation with ducts sized to accommodate the future installation of air conditioning is required when nighttime sound levels at bedroom or living/dining room windows are in the range of 51 to 60 dBA or when daytime sound levels at bedroom or living/dining room windows are in the range of 56 to 65 dBA.

Building components such as walls, windows and doors must be designed to achieve indoor sound level criteria when the plane of window nighttime sound level is greater than 60 dBA or the daytime sound level is greater than 65 dBA due to road traffic noise.

4 Traffic Noise Assessment

4.1 Road Traffic Data

Traffic data for Dunlop Street, Mulcaster Street, and Collier Street was obtained from the City of Barrie in the form of current Average Daily Traffic (ADT) traffic values, and is provided in Appendix A. The data was verified to be current by City staff. The traffic data was projected by 10 years to the year 2034 at an annual growth rate of 2%, as per the City of Barrie staff. An operating speed limit of 50 km/h and a day/night split of 90 % / 10 % was used for all roads. A commercial

vehicle percentage of 3 % was applied for all roads, further split into 1.2 % for medium trucks and 1.8 % for heavy trucks as per Ontario Ministry of Transportation guidelines.

Table II summarizes the traffic volume data used in this study.

Table II: Projected Road Traffic Data to Year 2034

Road Name		Cars	Medium Trucks	Heavy Trucks	Total
Dunlop Street East	Daytime	13 302	165	247	13 714
	Nighttime	1 478	18	27	1 524
	Total	**14 780**	**183**	**274**	**15 237**
Mulcaster Street	Daytime	14 266	178	267	14 811
	Nighttime	1 596	20	30	1 646
	Total	**15 963**	**197**	**296**	**16 456**
Collier Street	Daytime	5 321	66	99	5 485
	Nighttime	591	7	11	609
	Total	**5 912**	**73**	**110**	**6 095**

4.2 Road Traffic Noise Predictions

To assess the levels of road traffic noise which will impact the study area in the future, sound level predictions were made using STAMSON version 5.04, a computer algorithm developed by the MECP.

Predictions of the traffic sound levels were chosen around the proposed residential building to obtain an appropriate representation of future sound levels at various façades. Sound levels were predicted at the plane of the top storey bedroom and/or living/dining room windows during daytime and nighttime hours to investigate ventilation and façade construction requirements. Sound levels were also predicted in possible OLA's to investigate the need for noise barriers. Figure 2 shows the site plan with prediction locations. The results of these predictions are summarized in Table III. Sample stamson outputs are provided in Appendix B.

Table III: Predicted Road Traffic Sound Levels [dBA], Without Mitigation

Prediction Location	Description	Daytime – in the OLA $L_{EQ-16\ hr}$	Daytime – at the Façade $L_{EQ-16\ hr}$	Nighttime – at the Facade $L_{EQ-8\ hr}$
[A]	North façade facing Dunlop Street	--	67	61
[B]	West façade facing Mulcaster Street	--	68	61
[C]	South façade	--	63	57
[D]	East façade	--	62	56
[E]	5th floor common amenity area*	<55	--	--

Note: * with a minimum 1.07m high solid parapet

5 Discussions and Recommendations

The sound level predictions indicate that the future traffic sound levels will exceed MECP guidelines at the proposed development. The following discussion outlines the recommendations for acoustic barrier requirements, ventilation requirements, upgraded building façade construction, and warning clauses to achieve the noise criteria stated in Table I.

5.1 Outdoor Living Areas

The predicted daytime sound level at the 5th floor common amenity area, with a minimum 1.07 m high solid parapet, will be less than 55 dBA and is within the MECP guideline limit. No further mitigation is required.

The dwelling units in the proposed residential building have private balconies that are less than 4 m in depth. These areas are not considered to be outdoor living areas under the MECP guidelines, and therefore are exempt from traffic noise assessment.

5.2 Indoor Living Areas and Ventilation Requirements

Air Conditioning

The predicted future sound levels outside the top storey windows will be greater than 60 dBA during nighttime hours and 65 dBA during daytime hours. To address these excesses, these units need to be equipped with central air conditioning systems so that windows may remain closed. It is likely that the building or individual suites will include air conditioning. In general, window or through-the-

wall air conditioning units are not recommended because of the noise they produce and because the units penetrate through the exterior wall which degrades the overall sound insulating properties of the envelope. Acceptable units are those that are housed in their own closet with an access door for maintenance.

5.3 Building Façade Constructions

The predicted sound levels at the north and west façades will exceed 65 dBA during daytime and/or 60 dBA during nighttime. MECP guidelines stipulate that in such cases, building components including windows, walls, and doors be designed so that the indoor sound levels comply with the noise criteria in Table I.

Calculations were performed to determine the acoustical insulation factors (AIF) to maintain indoor sound levels within MECP 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 Doors

There may be glazed exterior doors (sliding or swing) for entry onto the balconies from living/dining rooms and some bedrooms. The glazing areas of the doors should be counted as part of the total window glazing area. All exterior doors should include good weather seals to reduce air infiltration to the minimum achievable levels.

Acoustical Requirements for Glazing

A summary of the STC requirements is given in Table IV for the façades, based on the possibility of sound entering the building through walls, windows and doors for all of the dwellings. Detailed floor plans and building elevations were not available for review at the time of this report. A window to floor ratio of 50% (40% fixed, 10% operable) for living/dining room and 40% (30% fixed, 10% operable) for bedrooms were assumed to determine preliminary window STC ratings required to mitigate road traffic noise levels. Higher window to floor area ratios, such as those found with window or curtain wall constructions, will likely require higher STC ratings.

Table IV: Preliminary Minimum STC Requirements

Prediction Location	Description	Space	STC Glazing Requirements
[A], [B]	North and west façades	Living/Dining	STC-30
		Bedroom	OBC
--	Other façades	Living/Dining	OBC
		Bedroom	OBC

Notes: OBC – Ontario Building Code

The glazing requirements can be met using fairly standard sealed units. Operable sections, including doors and operable windows, must be well-fitted and weather-stripped in order to achieve the upper range of target STC values. Acoustical criteria for different facades can be optimized as part of the detail design of the development, when floor plans and elevations for the buildings are available.

Sample window assemblies which may achieve the STC requirements are summarized in Table V below. Note that acoustic performance varies with manufacture's construction details, and these are only guidelines to provide some indication of the type of glazing likely to be required; the STC requirements in Table IV are provided as a guideline based on the preliminary drawings. 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 V: Glazing Assemblies for STC Requirements

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

In Table V, the number outside parentheses indicate minimum pane thicknesses in millimeters and the number in parentheses indicates the minimum inter-pane gap in millimeters.

Further Analysis

When detailed floor plans and building elevations are available for the dwelling units, window glazing requirements should be refined based on actual window to floor area ratios.

6 Warning Clauses

The MECP guidelines recommend that warning clauses be included in the property and tenancy agreements and offers of purchase and sale for all units with anticipated traffic sound level excesses. The following noise warning clauses are required for specific dwellings as indicated in Table VI.

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 levels exceed the Municipality's and the Ministry of the Environment, Conservation and Parks noise criteria.

B):

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

C):

Purchasers are advised that due to the proximity of the existing commercial buildings, sound levels from the facilities may be at times be audible.

These sample clauses are provided by the MECP as examples, and can be modified by the Municipality as required.

7 Impact of the Development on Itself

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

Tarion's Builder Bulletin B19R requires the internal design of condominium projects to integrate suitable acoustic features to insulate the suites from noise from each other and amenities in accordance with the OBC, and limit the potential intrusions of mechanical and electrical services of the buildings on its residents. If B19R certification is needed, an acoustical consultant is required to review the mechanical and electrical drawings and details of demising constructions and mechanical/electrical equipment, when available, to help ensure that the noise impact of the development on itself is maintained within acceptable levels.

8 Impact of the Development on the Environment

Sound levels from noise sources such as rooftop air-conditioners, cooling towers, exhaust fans, etc. should not exceed the minimum one-hour L_{EQ} ambient (background) sound level from road traffic, at any potentially impacted residential point of reception. Based on the levels observed during our site visit, the typical minimum ambient sound levels in the area are expected to be 50 dBA during the day and 45 dBA at night. Thus, any electro-mechanical equipment associated with this development (e.g. emergency generator testing, air handling or air conditioning equipment, etc.) should be designed such that they do not result in noise impact beyond the minimum background sound levels.

9 Summary and Recommendations

The following list and Table VI summarize the recommendations made in this report. The reader is referred to previous sections of the report where these recommendations are applied and discussed in more detail.

1. Central air conditioning will be required for the proposed building.

2. Upgraded glazing constructions are required for the north and west façades as noted in Section 5.3. When detailed floor plans and building elevations are available for the dwelling units with exposure to the roadways, window glazing construction should be refined on actual window to floor ratios.

3. The use of warning clauses in the property and tenancy agreements is recommended to inform future residents of traffic noise issues.

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

Description	Acoustic Barrier	Ventilation Requirements*	Type of Warning Clause	Upgraded Glazing Constructions +
North façade	--	Central A/C	A, B, C	LD/DR: STC-30 BR: OBC
West façade	--			
South façade	--			OBC
East façade	--			
5th floor common amenity	--**			

Notes:
* The location, installation and sound rating of the air conditioning condensers must be compliant with MECP Guideline NPC-300, as applicable.
** with a minimum 1.07 m high solid parapet around the perimeter of the amenity area
-- No specific requirements
OBC – Ontario Building Code
LR/DR – Living Room/Dining Room
BR – Bedroom
+ When detailed floor plans and building elevations are available for the dwelling units with exposure to the roadways, window glazing construction should be refined on actual window to floor ratios.

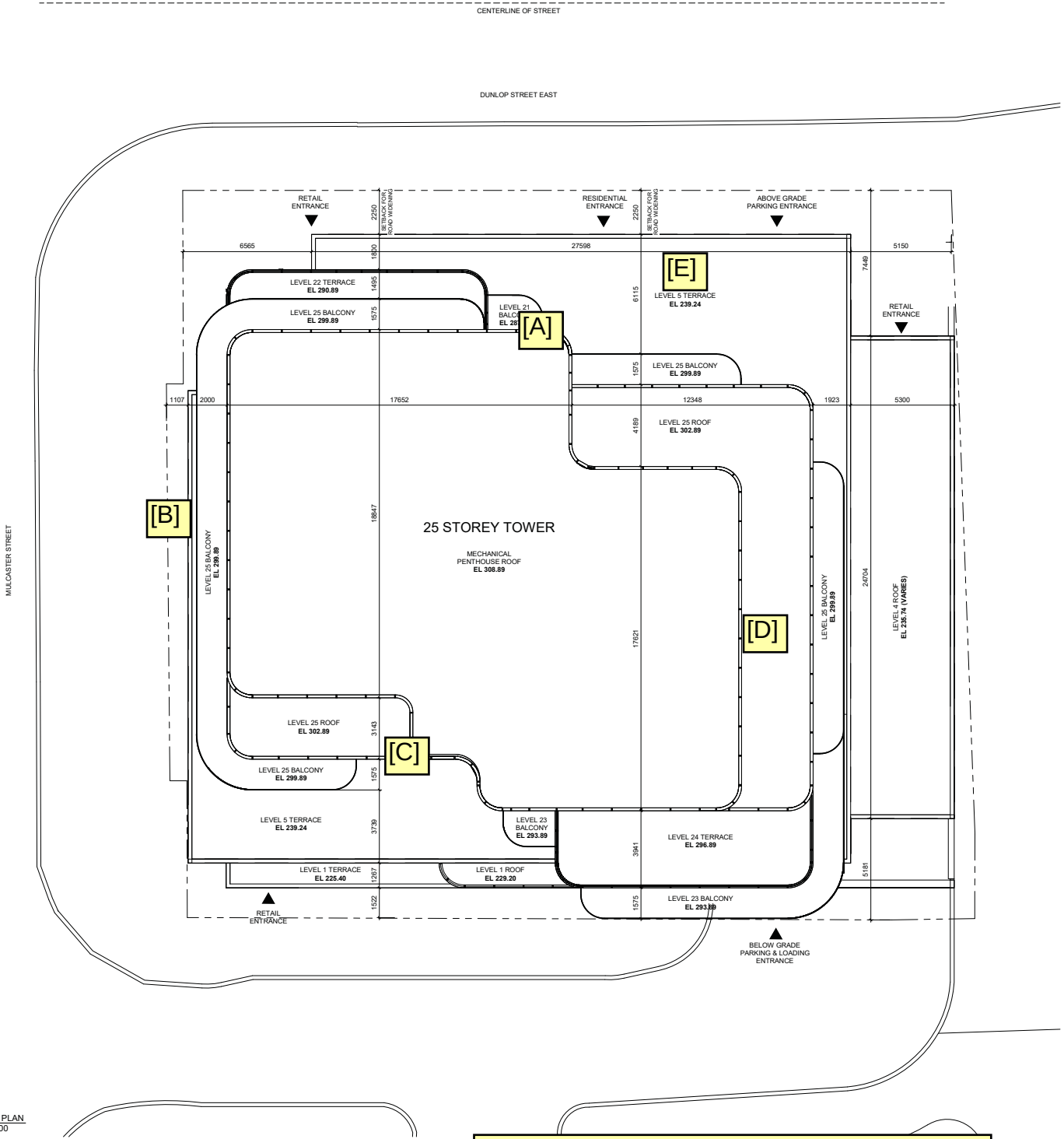
9.1 Implementation

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

1. Prior to the issuance of building permits for this development, a Professional Engineer qualified to perform acoustical engineering services in the Province of Ontario should review the detailed architectural plans and building elevations to refine glazing requirements based on actual window to floor areas ratios.

2. Prior to the issuance of occupancy 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, installed, and constructed.

Figure 1: Key Plan



1 SITE PLAN
1 : 100

Figure 2: Site Plan Showing Prediction Locations

General Notes

1. ALL DIMENSIONS IN MILLIMETRES.
2. VERIFY ALL DIMENSIONS.
3. DO NOT SCALE DRAWINGS.
4. CHECK DRAWINGS AGAINST SPECIFICATIONS.
5. USE THE LATEST REVISED DRAWINGS ONLY.
6. REPORT ANY DISCREPANCIES, DISCOVERED ERRORS, OR OMISSIONS, TO THE ARCHITECT BEFORE PROCEEDING.
7. DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF THE ARCHITECT, AND MUST BE RETURNED UPON COMPLETION OF WORK.

No.	Issue	Date
2	ISSUED FOR ZBLA	2024-03-27

SSA
Scott Shields Architects Inc.
317 King Street West, Toronto, Ontario M5V 1J5
T +1 416-924-2177 F +1 416-924-7398
scottarch.ca

Project
149 Dunlop

149 Dunlop Street East, Barrie, ON.

Drawing
SITE PLAN

Project number	27301
Date	Issue Date
Drawn by	AH, YL, RC
Checked by	AS

A1.02

Scale

Appendix A

Road Traffic Information

Sheeba Paul

From: Justin MacDonald <Justin.MacDonald@barrie.ca>
Sent: April 23, 2024 1:40 PM
To: Sheeba Paul
Subject: RE: Road Traffic Data Request - 149 Dunlop Street E

Follow Up Flag: Follow up
Flag Status: Completed

Good afternoon,

Sorry for the delay – that below information is still current.

Justin MacDonald, C.E.T., PTP
Project Delivery – Transportation Planning, Development Services
The City of Barrie
Mobile 705-734-8020

From: Sheeba Paul <spaul@hgcengineering.com>
Sent: Monday, April 22, 2024 9:37 AM
To: Justin MacDonald <Justin.MacDonald@barrie.ca>; Harry Cai <hcai@hgcengineering.com>
Subject: RE: Road Traffic Data Request - 149 Dunlop Street E

HI Justin

I am working on the final version of our noise study.

Is the data below still valid? If not, please provide new forecasts.

Thank you.

Ms. Sheeba Paul, MEng, PEng
Senior Associate

HGC Engineering **NOISE | VIBRATION | ACOUSTICS**
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From: Justin MacDonald <Justin.MacDonald@barrie.ca>
Sent: Friday, August 26, 2022 1:49 PM
To: Harry Cai <hcai@hgcengineering.com>
Subject: RE: Road Traffic Data Request - 149 Dunlop Street E

Good afternoon Harry,

I have summarized the requested information below:

Dunlop St E
Current ADT – 12,500
Growth Rate - 2% per annum
Median and Heavy – 3%

Mulcaster St
Current ADT – 13,500
Growth Rate - 2% per annum
Median and Heavy – 3%

Collier St
Current ADT – 5,000
Growth Rate - 2% per annum
Median and Heavy – 3%

Justin MacDonald, C.E.T., PTP
Project Delivery – Transportation Planning, Development Services
The City of Barrie
Mobile 705-734-8020

From: Harry Cai <hcai@hgcengineering.com>
Sent: Thursday, August 25, 2022 3:45 PM
To: Justin MacDonald <Justin.MacDonald@barrie.ca>
Subject: Road Traffic Data Request - 149 Dunlop Street E

Good afternoon Justin,

HGC Engineering is conducting a noise study located near 149 Dunlop Street East, see google maps link here for reference.

We're looking for volume/ADT, commercial vehicle percentages, and speed data for the following roadways near that location:

- Dunlop St E
- Mulcaster St
- Collier St

Please advise if data is available.

Thank you.

Harry Cai, EIT
Project Consultant

HGC Engineering **NOISE | VIBRATION | ACOUSTICS**
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Appendix B

Sample STAMSON 5.04 Output

STAMSON 5.0 NORMAL REPORT Date: 07-05-2024 13:42:19
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: a.te Time Period: Day/Night 16/8 hours
Description: ***Daytime and nighttime sound levels at prediction location [A], North façade facing Dunlop Street***

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

Car traffic volume : 13302/1478 veh/TimePeriod *
Medium truck volume : 165/18 veh/TimePeriod *
Heavy truck volume : 247/27 veh/TimePeriod *
Posted speed limit : 50 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): 12500
Percentage of Annual Growth : 2.00
Number of Years of Growth : 10.00
Medium Truck % of Total Volume : 1.20
Heavy Truck % of Total Volume : 1.80
Day (16 hrs) % of Total Volume : 90.00

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

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 15.00 / 15.00 m
Receiver height : 73.50 / 73.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 2: Mulcaster (day/night)

Car traffic volume : 14366/1596 veh/TimePeriod *
Medium truck volume : 178/20 veh/TimePeriod *
Heavy truck volume : 267/30 veh/TimePeriod *
Posted speed limit : 50 km/h
Road gradient : 5 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 13500
Percentage of Annual Growth : 2.00
Number of Years of Growth : 10.00
Medium Truck % of Total Volume : 1.20
Heavy Truck % of Total Volume : 1.80
Day (16 hrs) % of Total Volume : 90.00

```
Data for Segment # 2: Mulcaster (day/night)
-------------------------------------------
Angle1   Angle2           :   0.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  15.00 / 15.00  m
Receiver height           :  73.50 / 73.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Road data, segment # 3: Collier (day/night)
-------------------------------------------
Car traffic volume  :  5321/591   veh/TimePeriod  *
Medium truck volume :    66/7     veh/TimePeriod  *
Heavy truck volume  :    99/11    veh/TimePeriod  *
Posted speed limit  :    50 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):   5000
    Percentage of Annual Growth        :   2.00
    Number of Years of Growth          :  10.00
    Medium Truck % of Total Volume     :   1.20
    Heavy Truck  % of Total Volume     :   1.80
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 3: Collier (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  : 125.00 / 125.00 m
Receiver height           :  73.50 / 73.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: Dunlop (day)
---------------------------------

Source height = 1.16 m

ROAD (0.00 + 65.00 + 0.00) = 65.00 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
---
   -90     90   0.00  65.00   0.00   0.00   0.00   0.00   0.00   0.00
65.00
-------------------------------------------------------------------------------
---
```

```
Segment Leq : 65.00 dBA

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

Source height = 1.16 m

ROAD (0.00 + 63.29 + 0.00) = 63.29 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
---
     0     90   0.00  66.30   0.00   0.00  -3.01   0.00   0.00   0.00
63.29
-------------------------------------------------------------------------
---

Segment Leq : 63.29 dBA

Results segment # 3: Collier (day)
----------------------------------

Source height = 1.16 m

ROAD (0.00 + 51.82 + 0.00) = 51.82 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
---
   -90     90   0.00  61.02   0.00  -9.21   0.00   0.00   0.00   0.00
51.82
-------------------------------------------------------------------------
---

Segment Leq : 51.82 dBA

Total Leq All Segments: 67.36 dBA

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

Source height = 1.15 m

ROAD (0.00 + 58.43 + 0.00) = 58.43 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
---
   -90     90   0.00  58.43   0.00   0.00   0.00   0.00   0.00   0.00
58.43
-------------------------------------------------------------------------
---

Segment Leq : 58.43 dBA
```

```
Results segment # 2: Mulcaster (night)
--------------------------------------

Source height = 1.16 m

ROAD (0.00 + 56.79 + 0.00) = 56.79 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
---
     0     90   0.00  59.80   0.00   0.00  -3.01   0.00   0.00   0.00
56.79
-------------------------------------------------------------------------
---

Segment Leq : 56.79 dBA

Results segment # 3: Collier (night)
------------------------------------

Source height = 1.16 m

ROAD (0.00 + 45.27 + 0.00) = 45.27 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
---
   -90     90   0.00  54.48   0.00  -9.21   0.00   0.00   0.00   0.00
45.27
-------------------------------------------------------------------------
---

Segment Leq : 45.27 dBA

Total Leq All Segments: 60.82 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 67.36
                           (NIGHT): 60.82
```

STAMSON 5.0 NORMAL REPORT Date: 07-05-2024 13:42:27
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: b.te Time Period: Day/Night 16/8 hours
Description: ***Daytime and nighttime sound levels at prediction location [B], West façade facing Mulcaster Street***

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

Car traffic volume : 13302/1478 veh/TimePeriod *
Medium truck volume : 165/18 veh/TimePeriod *
Heavy truck volume : 247/27 veh/TimePeriod *
Posted speed limit : 50 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): 12500
Percentage of Annual Growth : 2.00
Number of Years of Growth : 10.00
Medium Truck % of Total Volume : 1.20
Heavy Truck % of Total Volume : 1.80
Day (16 hrs) % of Total Volume : 90.00

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

Angle1 Angle2 : -90.00 deg 0.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 15.00 / 15.00 m
Receiver height : 73.50 / 73.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 2: Mulcaster (day/night)

Car traffic volume : 14366/1596 veh/TimePeriod *
Medium truck volume : 178/20 veh/TimePeriod *
Heavy truck volume : 267/30 veh/TimePeriod *
Posted speed limit : 50 km/h
Road gradient : 5 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 13500
Percentage of Annual Growth : 2.00
Number of Years of Growth : 10.00
Medium Truck % of Total Volume : 1.20
Heavy Truck % of Total Volume : 1.80
Day (16 hrs) % of Total Volume : 90.00

```
Data for Segment # 2: Mulcaster (day/night)
------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  15.00 / 15.00  m
Receiver height           :  73.50 / 73.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Road data, segment # 3: Collier (day/night)
------------------------------------------
Car traffic volume  :  5321/591   veh/TimePeriod  *
Medium truck volume :    66/7     veh/TimePeriod  *
Heavy truck volume  :    99/11    veh/TimePeriod  *
Posted speed limit  :    50 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):   5000
    Percentage of Annual Growth        :   2.00
    Number of Years of Growth          :  10.00
    Medium Truck % of Total Volume     :   1.20
    Heavy Truck  % of Total Volume     :   1.80
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 3: Collier (day/night)
------------------------------------------
Angle1   Angle2           : -90.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 125.00 / 125.00 m
Receiver height           :  73.50 / 73.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: Dunlop (day)
---------------------------------

Source height = 1.16 m

ROAD (0.00 + 61.99 + 0.00) = 61.99 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
---
   -90      0   0.00  65.00   0.00   0.00  -3.01   0.00   0.00   0.00
61.99
-------------------------------------------------------------------------
---
```

```
Segment Leq : 61.99 dBA

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

Source height = 1.16 m

ROAD (0.00 + 66.30 + 0.00) = 66.30 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
---
   -90     90   0.00  66.30   0.00   0.00   0.00   0.00   0.00   0.00
66.30
-------------------------------------------------------------------------
---

Segment Leq : 66.30 dBA

Results segment # 3: Collier (day)
----------------------------------

Source height = 1.16 m

ROAD (0.00 + 48.81 + 0.00) = 48.81 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
---
   -90      0   0.00  61.02   0.00  -9.21  -3.01   0.00   0.00   0.00
48.81
-------------------------------------------------------------------------
---

Segment Leq : 48.81 dBA

Total Leq All Segments: 67.73 dBA

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

Source height = 1.15 m

ROAD (0.00 + 55.42 + 0.00) = 55.42 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
---
   -90      0   0.00  58.43   0.00   0.00  -3.01   0.00   0.00   0.00
55.42
-------------------------------------------------------------------------
---

Segment Leq : 55.42 dBA
```

```
Results segment # 2: Mulcaster (night)
-------------------------------------

Source height = 1.16 m

ROAD (0.00 + 59.80 + 0.00) = 59.80 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
---
   -90     90   0.00  59.80   0.00   0.00   0.00   0.00   0.00   0.00
59.80
-------------------------------------------------------------------------
---

Segment Leq : 59.80 dBA

Results segment # 3: Collier (night)
-----------------------------------

Source height = 1.16 m

ROAD (0.00 + 42.26 + 0.00) = 42.26 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
---
   -90      0   0.00  54.48   0.00  -9.21  -3.01   0.00   0.00   0.00
42.26
-------------------------------------------------------------------------
---

Segment Leq : 42.26 dBA

Total Leq All Segments: 61.21 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 67.73
                           (NIGHT): 61.21
```

```
STAMSON 5.0        NORMAL REPORT        Date: 07-05-2024 13:42:57
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: e.te                  Time Period: 16 hours
Description:  Daytime sound level at prediction location [E], 5th floor
common amenity area including 1.07 m high solid parapet

Road data, segment # 1: Dunlop
------------------------------
Car traffic volume  : 13302 veh/TimePeriod  *
Medium truck volume :   165 veh/TimePeriod  *
Heavy truck volume  :   247 veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: Dunlop
----------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  15.00 m
Receiver height           :   1.50 m
Topography                :      4       (Elevated; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :   1.07 m
Elevation                 :  13.00 m
Barrier receiver distance :  10.00 m
Source elevation          :   0.00 m
Receiver elevation        :  13.00 m
Barrier elevation         :  13.00 m
Reference angle           :   0.00

Road data, segment # 2: Mulcaster
---------------------------------
Car traffic volume  : 14366 veh/TimePeriod  *
Medium truck volume :   178 veh/TimePeriod  *
Heavy truck volume  :   267 veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     5 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 2: Mulcaster
-------------------------------
Angle1   Angle2           :   0.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  15.00 m
Receiver height           :   1.50 m
Topography                :      4       (Elevated; with barrier)
Barrier angle1            :   0.00 deg   Angle2 : 90.00 deg
Barrier height            :   1.07 m
```

```
Elevation                 :  13.00 m
Barrier receiver distance :  10.00 m
Source elevation          :   0.00 m
Receiver elevation        :  13.00 m
Barrier elevation         :  13.00 m
Reference angle           :   0.00

Road data, segment # 3: Collier
------------------------------
Car traffic volume  :  5321 veh/TimePeriod  *
Medium truck volume :    66 veh/TimePeriod  *
Heavy truck volume  :    99 veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 3: Collier
------------------------------
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  : 125.00 m
Receiver height           :   1.50 m
Topography                :      4       (Elevated; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :   1.07 m
Elevation                 :  13.00 m
Barrier receiver distance :  10.00 m
Source elevation          :   0.00 m
Receiver elevation        :  13.00 m
Barrier elevation         :  13.00 m
Reference angle           :   0.00

Results segment # 1: Dunlop
---------------------------

Source height = 1.16 m

Barrier height for grazing incidence
-----------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.16 !        1.50 !       -7.39 !         5.61

ROAD (0.00 + 47.65 + 0.00) = 47.65 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
---
   -90     90   0.00  65.00   0.00   0.00   0.00   0.00   0.00 -17.35
47.65
```

```
-------------------------------------------------------------------------
---

Segment Leq : 47.65 dBA

Results segment # 2: Mulcaster
------------------------------

Source height = 1.16 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.16 !        1.50 !       -7.39 !         5.61

ROAD (0.00 + 45.93 + 0.00) = 45.93 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
---
     0     90   0.00  66.30   0.00   0.00  -3.01   0.00   0.00 -17.35
45.93
-------------------------------------------------------------------------

Segment Leq : 45.93 dBA

Results segment # 3: Collier
----------------------------

Source height = 1.16 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.16 !        1.50 !        0.43 !        13.43

ROAD (0.00 + 43.58 + 0.00) = 43.58 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
---
   -90     90   0.22  61.02   0.00 -11.20  -0.58   0.00   0.00  -5.68
43.58
-------------------------------------------------------------------------

Segment Leq : 43.58 dBA

Total Leq All Segments: 50.80 dBA

TOTAL Leq FROM ALL SOURCES:       50.80
```