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Noise Feasibility Study
Proposed Residential Building
5160-5170 Ninth Line
Mississauga, Ontario

Prepared for:

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Burlington, ON
L7L 6A9

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HGC Project No.: 02100663

December 15, 2021

VERSION CONTROL

Noise Feasibility Study,
5160-5170 Ninth Line,
Mississauga, Ontario.

Ver.	Date	Version Description / Changelog	Prepared By
0	December 15, 2021	Noise and Vibration Feasibility Study in support of the approvals process.	A. Rogers/ M. Chan

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Table of Contents

1 Introduction and Summary

HGC Engineering was retained by Branthaven Development to conduct a noise feasibility study for a proposed residential development to be located at 5160-5170 Ninth Line, in the City of Mississauga, Ontario. The purpose of this study is to determine the impact of environmental noise from the surrounding area in accordance with the Ministry of Environment, Conservation, and Parks (MECP) guidelines. The development includes a 6-storey residential building with one level of underground parking. This study has been prepared as part of the approval process by the municipality.

The primary noise sources at the proposed development site were determined to the road traffic on Highway 407 and Ninth Line. The road traffic data used for this study was obtained from the City of Mississauga. The predicted sound levels were evaluated with respect to the guidelines of the Ministry of the Environment, Conservation and Parks (MECP) and the city.

The results of the study indicate that with suitable noise control measures integrated into the design of the buildings, it is feasible to achieve MECP guideline sound levels. Central air conditioning systems and upgrade glazing constructions will be required for the buildings. Noise barriers will be required for the rooftop amenity space. Associated acoustical requirements are specified in this report. Noise warning clauses are also required to inform future occupants of the traffic noise impacts.

2 Site Description and Noise Sources

The key plan for the development is attached as Figure 1. The site is located on the southwest side of Ninth Line, northwest of Eglinton Avenue West, in Mississauga. A site plan prepared by ZO1 Architects dated November 9, 2021, is provided as Figure 2. Sound level predictions are also shown on Figure 2. The proposed development will include a 6-storey residential building with one level of underground parking.

HGC Engineering personnel visited the site during the month of July 2021 to observe the acoustical environment and note the significant noise sources. The acoustical environment surrounding the site is urban in nature. Highway 407 and Ninth Line are the dominant sources of traffic noise. Highway 407 is a 6-lane highway (three lanes in each direction), and Ninth Line is a 2-lane highway (one lane in each direction) and is proposed to be widened to four lanes. There are existing residences northeast of the site, across Ninth Line. There are no significant stationary sources of noise observed within 500 m of this site.

3 Sound Level Criteria

Guidelines for acceptable levels of road traffic noise impacting residential developments are given in the MECP 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)

Space	Daytime L_{EQ} (16 hour)	Nighttime L_{EQ} (8 hour)
Outdoor Living Areas	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, while nighttime refers to the period between 23:00 and 07:00. The term "Outdoor Living Area" (OLA) is used in reference to an outdoor patio, a backyard, a terrace or other area where passive recreation is expected to occur. Balconies and terraces that are less than 4 m in depth are not considered to be outdoor living areas under MECP guidelines.

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 (59 dBA in the Region of Peel) 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.

Warning clauses are required to notify future residents of possible excesses when nighttime sound levels exceed 50 dBA at the plane of the bedroom/living/dining room window and daytime sound levels exceed 55 dBA in the outdoor living area and at the plane of the bedroom/living/dining room window due to road traffic.

4 Traffic Noise Assessment

4.1 Road Traffic Data

Traffic data for Ninth Line was obtained from the City of Mississauga, in the form of an ultimate traffic volume, provided in Appendix A. An ultimate volume of 26 500 vehicles per day at a posted speed limit of 60 km/h was applied for the analysis for Ninth Line. A commercial vehicle percentage of 4% split into 2.2% medium trucks and 1.8% heavy trucks was applied for Ninth Line. A day/night split of 90% / 10 % was used for Ninth Line.

Traffic data for Highway 407 was not available; hence ultimate traffic volumes for a 6-lane highway were used, which was previously estimated by Region of York personnel. An ultimate volume of

130 000 vehicles per day at a posted speed limit of 100 km/h was applied for the analysis. A commercial vehicle percentage of 13% split into 5% medium trucks and 8% heavy trucks was applied, although this estimate is likely conservative given the nature of this toll highway. A day/night split of 85% and 15% was used, as this is representative of the typical usage of Highway 407 based on sound measurements conducted by HGC Engineering for past projects near Highway 407. As these volumes are representative of ultimate traffic data, they were not projected into the future. Table II summarizes the traffic volume data used in this study.

Table II: Ultimate Road Traffic Data

Street	Time	Cars	Medium Trucks	Heavy Trucks	Total
Ninth Line	Daytime	22 896	525	429	**23 850**
	Nighttime	2 544	58	48	**2 650**
	Total	**25 440**	**583**	**477**	**26 500**
Highway 407	Daytime	96 135	5 525	8 840	**110 500**
	Nighttime	16 965	975	1 560	**19 500**
	Total	**113 100**	**6 500**	**10 400**	**130 000**

4.2 Road Traffic Prediction

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. Sample STAMSON output is included in Appendix B.

Predictions of the traffic sound levels were chosen around the proposed residential buildings 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 the OLA 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. The direction used in the Tables is based on project north shown on Figure 2.

Future traffic sound levels were predicted using STAMSON version 5.04, a computer algorithm developed by the MECP. Sample STAMSON output is included in Appendix B.

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

Prediction Location	Description	Daytime – $L_{EQ-16\ hr}$	Nighttime – $L_{EQ-8\ hr}$
[A]	North Façade	68	62
[B]	East Façade	70	65
[C]	South Façade	72	67
[D]	Interior South Façade	67	62
[E]	Interior West Facade	69	64
[F]	At-grade OLA	68[1] / 59[2]	--
[G]	Rooftop OLA	66+	

Note: [1] Excluding future developments
[2] Including future developments
+ with a minimum 1.07 m high solid parapet wall

5 Discussion and Recommendations

The sound level predictions indicate that the future traffic sound levels will exceed MECP guidelines at all façades of the proposed building. 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 dwelling units in the proposed development may have balconies that are less than 4 m in depth. These areas are not considered to be outdoor amenity areas under MECP guidelines, and therefore are exempt from traffic noise assessment.

There is an outdoor amenity area on the south side of the building at-grade. The predicted sound level in this area is 68 dBA, 13 dBA in excess of the MECP limit of 55 dBA. Calculations indicate an acoustic barrier 2.8 m in height will be required at the south end of the OLA to reduce traffic noise levels to 60 dBA. It is noted that there are future developments between the subject site and Highway 407. A review of preliminary plans indicate that townhouse blocks are proposed to the west and south of the site and multi-storey buildings are proposed further southwest of the site which will shield the OLA from Highway 407. Calculations indicate that the sound levels will be 59 dBA or less with the inclusion of the future developments. As such, physical mitigation will not be required with the inclusion of a warning clause.

For the rooftop amenity space, the predicted sound level in this area is 66 dBA with a minimum 1.07 m high solid parapet around the perimeter of the area. Calculations indicate an acoustic barrier 4.2 m in height will be required around the perimeter of the rooftop amenity space to reduce traffic noise levels to 60 dBA. The location of the require noise barrier is shown on Figure 4. The acoustic barrier should be of a solid construction with a surface density of no less than 20 kg/m^2. The walls may be constructed from a variety of materials such as glass, brick, pre-cast concrete or other concrete/wood composite systems provided that it is free of gaps or cracks.

5.2 Indoor Living Areas and Ventilation Requirements

Central Air Conditioning

As per the results summarized in Table III, the predicted future sound level at all façades of the proposed building will be greater than 65 dBA during the daytime hours, and/or 60 dBA during the nighttime hours. To address these excesses, the MECP guidelines recommend that the building be equipped with central air conditioning systems, so that the windows can be kept closed.

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. For the proposed 6-storey building, suitable units are those housed in their own closet with an access door for maintenance. The location, installation and sound ratings of the outdoor air conditioning devices should minimize noise impacts and comply with criteria of MECP publication NPC-300.

5.3 Building Façade Constructions

Predicted sound levels at the building facades were used to determine sound insulation requirements of the building envelope. The required acoustic insulation of the wall and window components was determined using methods developed by the National Research Council (NRC).

Detailed glazing requirements for different facades and spaces could be considered in value engineering, if required, when detailed floor plans and building elevations are available.

Exterior Wall Constructions

The exterior walls of the proposed building may include precast/masonry panel portions, as well as spandrel glass panels within an aluminum window system. In this analysis, it has been assumed that

sound transmitted through elements other than the glazing elements is negligible in comparison. For this assumption to be true, spandrel or metal panel sections must have an insulated drywall partition on separate framing behind.

Exterior Doors

There may be swing doors and some glazed sliding patio doors for entry onto the balconies from living/dining/bedrooms. The glazing areas on the doors are to be counted as part of the total window glazing area. If exterior swing doors are to be used, they shall be insulated metal doors equipped with head, jamb and threshold weather seals.

Acoustical Requirements for Glazing

At the time of this report, detailed floor plans and elevations are under development. Assuming a typical window to floor area of 50% (30% fixed and 20% operable) for the living/dining rooms and 40% (30% fixed and 10% operable) for the bedrooms in the building, the minimum acoustical requirement for the basic window glazing, including glass in fixed sections, swing or sliding doors, and operable windows, is provided in Table IV and shown on Figure 3.

Table IV: Preliminary Minimum Glazing STC Requirements for Specific Building Façades

Façade	Space	Glazing STC[1, 2]
North Façade	Living/Dining	STC-30
	Bedroom	OBC
East and West Façades	Living/Dining	STC-32
	Bedroom	STC-30
South Façade	Living/Dining	STC-34
	Bedroom	STC-32
Interior South Façade	Living/Dining	STC-29
	Bedroom	OBC
Interior West Facade	Living/Dining	STC-31
	Bedroom	STC-29

Note: [X] Prediction location
[1] Based on 50% window to floor area ratio for living/dining rooms and 40% for the bedrooms.
[2] STC requirement refers to fixed glazing. Small leaks through operable doors and windows are assumed, however, tight weather seals should be provided to reduce such leakage to the extent feasible.
OBC – Ontario Building Code

Note that acoustic performance varies with manufacturer's construction details, and these are only guidelines to provide some indication of the type of glazing likely to be required. Acoustical test data for the selected assemblies should be requested from the suppliers, to ensure that the stated acoustic performance levels will be achieved by their assemblies.

Further Work

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

5.4 Warning Clauses

The MECP guidelines recommend that warning clauses be included in the property and tenancy agreements for all units with anticipated road traffic sound level. Examples are provided below.

Suggested wording for future dwellings with sound level excesses.

Type A:

> Purchasers/tenants are advised that sound levels due to increasing road traffic may occasionally interfere with some activities of the dwelling unit occupants as the sound levels exceed the Municipality's and the Ministry of the Environment, Conservation and Parks' noise criteria.

Suitable wording for future dwellings requiring central air conditioning systems is given below.

Type B:

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

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

6 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 construction and mechanical/electrical equipment, when available, to help ensure that the noise impact of the redevelopment on itself is maintained within acceptable levels.

7 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 in the range of 50 dBA or more during the day and 45 dBA or more at night. Thus, any electro-mechanical equipment associated with this development (e.g., emergency generator testing, fresh-air handling equipment, etc.) should be designed such that they do not result in noise impact beyond these ranges.

8 Summary of Recommendations

The following list and Table V summarize the recommendations made in this report.

1. Central air conditioning is required for the proposed 6-storey building. The location, installation and sound ratings of the air conditioning devices should comply with NPC-300.

2. Upgraded exterior building façade and glazing constructions are required for most façades of the building as shown on Figure 3. When detailed floor plans and building elevations are available, the glazing requirements should be refined based on window to floor area ratios.

3. A noise barrier is required around the perimeter of the rooftop amenity space.

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

5. A detailed noise study should be performed when detailed floor plans and building elevations are available to refine glazing requirements based on actual window to floor area ratios and confirm noise barrier requirements.

6. Tarion Builders Bulletin B19R requires that the internal design of condominium projects integrates 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 building on its residents. If B19R certification is to be sought, 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 are maintained within acceptable levels.

The following table summarizes the noise control recommendations and noise warning clauses for the dwellings in the proposed building.

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

Description	Acoustic Barrier	Ventilation Requirements*	Type of Warning Clause	Preliminary Glazing STC Requirements+
North Façade	--	Central A/C	A, B	LRDR: STC-30 BR: OBC
East and West Façade	--			LRDR: STC-32 BR: STC-30
South Façade	--			LRDR: STC-34 BR: STC-32
Interior South Façade	--			LRDR: STC-29 BR: OBC
Interior West Façade	--			LRDR: STC-31 BR: STC-29
Outdoor Amenity Area (GF)	--	--	--	--
Outdoor Amenity Area (Roof)	✓	--	--	--

Notes:
-- no specific requirement
OBC – meeting the minimum requirements of the Ontario Building Code
LRDR – Living Room/Dining Room
BR – Bedroom
* The location, installation and sound rating of the air conditioning condensers must be compliant with MECP Guideline NPC-300, as applicable.
+ With assumed window to floor area ratios of 50% for LRDR and 40% for BR. Refer to Figure 3 for STC requirements for all building facades. When detailed floor plans and building elevations are available, an acoustical consultant should review the drawings to refine the window glazing constructions based on actual window to floor area ratios, and to verify exterior wall construction.

8.1 Implementation

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

1. When architectural plans are available for the building, an acoustical consultant should review the window and room floor areas to refine glazing construction requirements and confirm noise barrier requirements.

2. Prior to the issuance of building permits for this development, a Professional Engineer qualified to perform acoustical engineer services in the Province of Ontario should review the exterior wall constructions, architectural plans and building elevations to ensure the building façade and glazing constructions will provide sufficient sound insulation for the indoor spaces and provide additional recommendations, as required.

3. Prior to the issuance of occupancy permits for this development, the City's building inspector or a Professional Engineer qualified to perform acoustical engineer services in the province of Ontario should certify that the noise control measures have been properly incorporated, installed, and constructed.

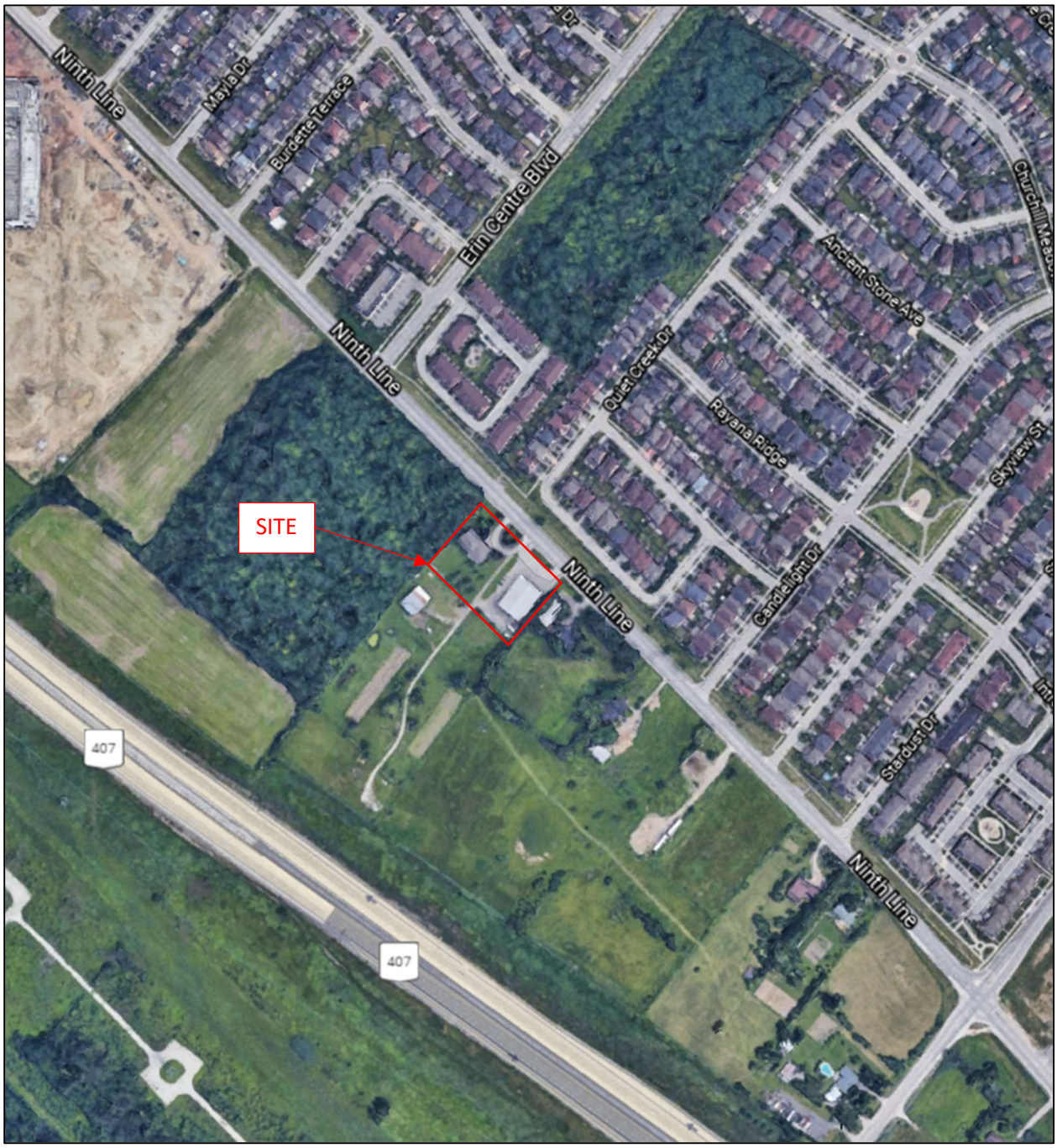

Figure 1: Key Plan

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PROJECT NUMBER 21014

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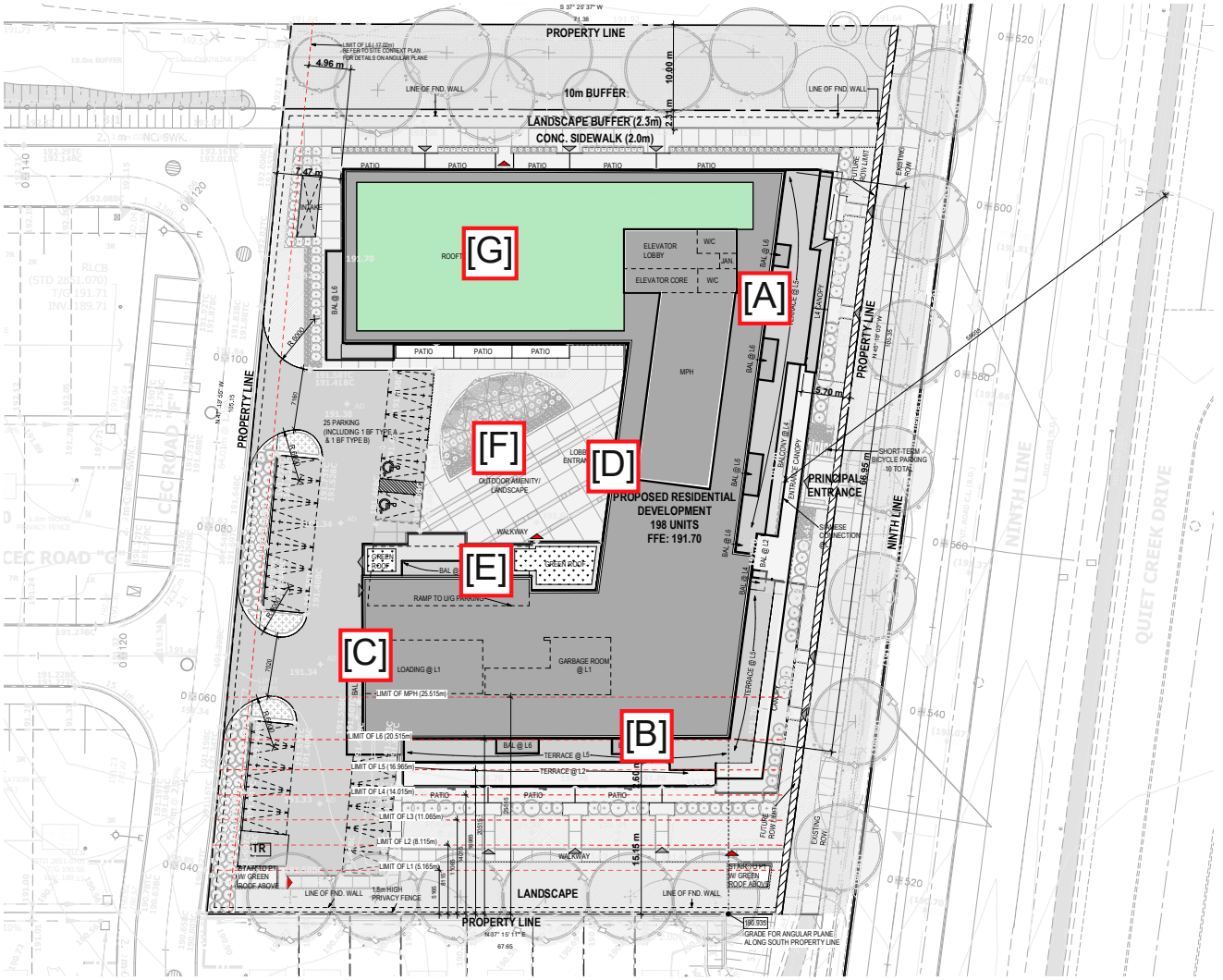

Figure 2 - Proposed Site Plan Showing Prediction Locations

Site Plan 1 : 250 — 1 / A101

No.:	Date:	Description:
01	2021-11-05	Rezoning Submission

Architects: ZO1

Seal: ONTARIO ASSOCIATION OF ARCHITECTS — BONNIE A. CHAN LICENCE 8291

Client: BRANTHAVEN

Project: Proposed Residential Development - 5160-5170 Ninth Line, Mississauga
Enter address

Drawing Title: Site Plan

Scale:	Drawn by:
1 : 250	L.B.
Checked by: B.C. & D.L.	Project No.: 21014
Date: 2021-11-05	Drawing No.: A101

Plot Date: 2021-11-12 8:29:05 AM

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PROJECT NUMBER 21014

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www.savanta.ca

STC (LR/DR) / (BR)
Applies to all Floors

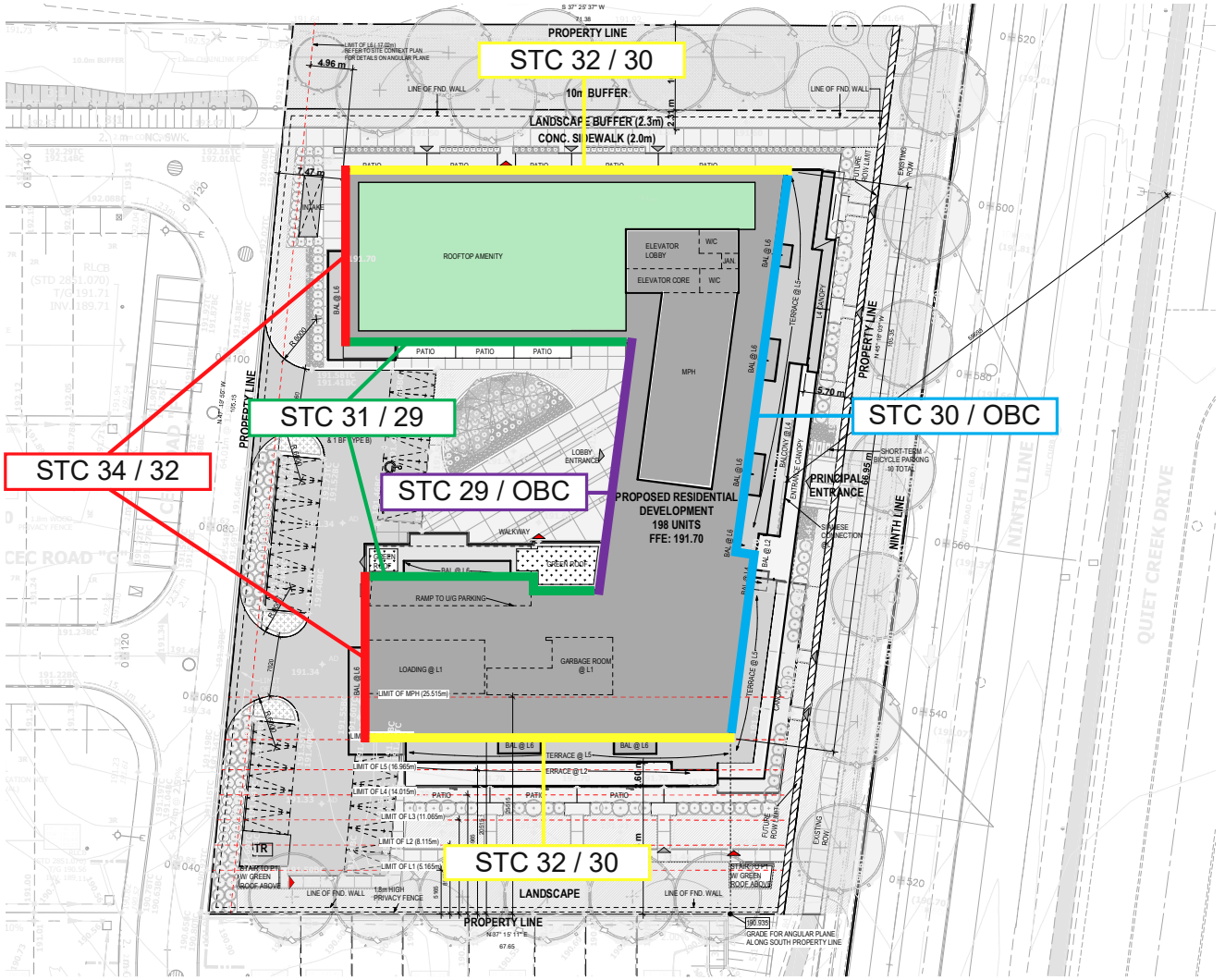

Figure 3 - Plan Showing Preliminary Glazing STC Requirements

No.:	Date:	Description:
01	2021-11-05	Rezoning Submission

Architects:
ZO1

Seal:
ONTARIO ASSOCIATION OF ARCHITECTS
BONNIE A. CHAN
LICENCE
8291

Client:
BRANTHAVEN

Project:
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Enter address

Drawing Title:
Site Plan

Scale:	Drawn by:
1 : 250	L.B.
Checked by:	Project No.:
B.C. & D.L.	21014
Date:	Drawing No.:
2021-11-05	A101

Site Plan
1 : 250
1 / A101

Plot Date: 2021-11-12 8:29:05 AM

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PROJECT NUMBER 21014

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PLANNER:

NAME: KORSIAK URBAN PLANNING
ADDRESS: 277 LAKESHORE RD E #206, OAKVILLE, ON. L6J 1H9
TEL: 905-257-0227
www.korsiak.com

SURVEYOR:

NAME: JD BARNES
ADDRESS: 140 RENFREW DR. Ste. 100. MARKHAM, ON. L3R 6B3
TEL: 905-477-3600
www.jdbarnes.com

SITE SERVICING:

NAME: URBAN TECH
ADDRESS: 3760 14TH AVENUE, Ste. 301. MARKHAM, ON. L3R 3T7
TEL: 905-946-9461
www.urbantech.com

LANDSCAPE ARCHITECT:

NAME ADESSO DESIGN INC.
ADDRESS: 218 LOCKE ST. S, HAMILTON, ON. L8P 4B4
TEL: 905-526-8876
www.adessodesigninc.ca

WIND STUDY:

NAME: GRADIENT WIND ENGINEERING INC.
ADDRESS: 127 WALGREEN RD. CARP, ON. K0A 1L0
TEL: 613-836-0934
www.gradientwind.com

GEO-ENVIRONMENTAL ENGINEER:

NAME: DS CONSULTANTS LTD.
ADDRESS: 6221 HWY 7 UNIT 16, WOODBRIDGE, ON. L4H 0K8
TEL: 905-264-9393
www.dsconsultants.ca

ACOUSTICAL ENGINEERS:

NAME: HGC ENGINEERING
ADDRESS: 2000 ARGENTIA RD 1, Ste. 203, MISSISSAUGA, ON. L5N 1P7
TEL: 905-826-4044
www.acoustical-consultants.com

LAND DEVELOPMENT ENGINEERING:

NAME: CROZIER CONSULTING ENGINEERS
ADDRESS: 211 YONGE ST. Ste. 301. TORONTO, ON. M5B 1M4
TEL: 416-477-3392
www.cfcrozier.ca

ENVIRONMENTAL CONSULTANTS:

NAME: SAVANTA
ADDRESS: 75 TIVERTON COURT, UNIT 100. MARKHAM, ON. L3R 4M8
TEL: 1-800-810-3281
www.savanta.ca

4.2 m Acoustic Barrier

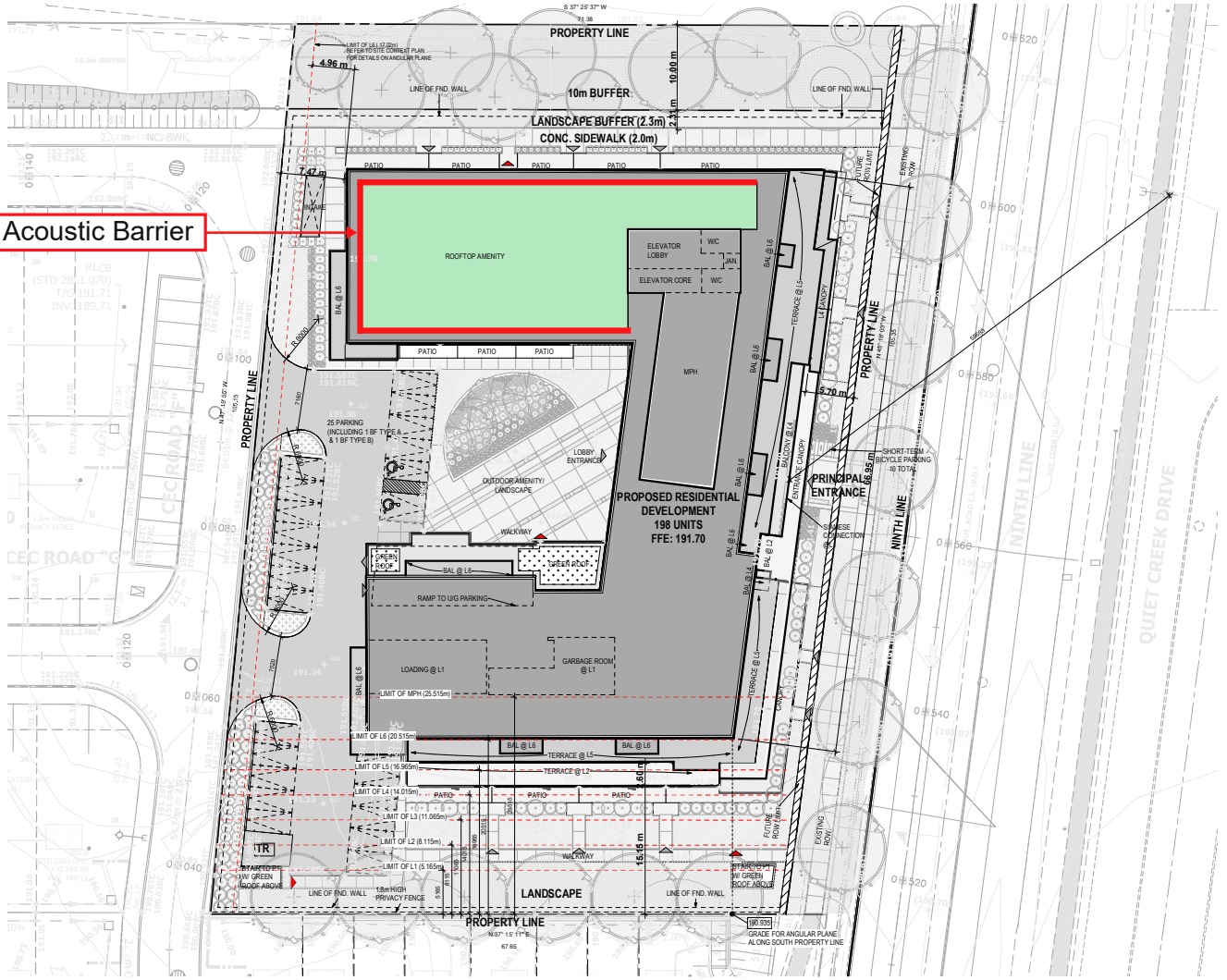

Figure 4 - Acoustic Barrier Locations

Site Plan
1 : 250
1 / A101

No.:	Date:	Description:
01	2021-11-05	Rezoning Submission

Architects:
ZO1

Seal:
ONTARIO ASSOCIATION OF ARCHITECTS
BONNIE A. CHAN
LICENCE
8291

Client:
BRANTHAVEN

Project:
Proposed Residential Development - 5160-5170 Ninth Line, Mississauga
Enter address

Drawing Title:
Site Plan

Scale:	Drawn by:
1 : 250	L.B.
Checked by:	Project No.:
B.C. & D.L.	21014
Date:	Drawing No.:
2021-11-05	A101

Plot Date: 2021-11-12 8:29:05 AM

Appendix A

Road Traffic Data

NOISE REPORT FOR PROPOSED DEVELOPMENT

Date:	30-Jun-21

REQUESTED BY:

Name:	Andrew Rogers
Company:	HGC Engineering

PREPARED BY:

Nam	Steven Guan
Tel#:	905-615-3200 ext. 5933

MISSISSAUGA

Location: Ninth Line - Eglinton Avenue West to Erin Centre Boulevard
Eglinton Avenue West - Ninth Line to City West Limits

ID 514

ON SITE TRAFFIC DATA

Specific	*Street Names*				
[redacted]	Ninth Line	Eglinton Ave W			
AADT:	26,500	17,000			
# of Lanes:	4 Lanes*	2 Lanes			
% Trucks:	4%	3%			
Medium/Heavy Trucks Ratio:	55/45	55/45			
Day/Night Split:	90/10	90/10			
Posted Speed Limit:	60 km/h**	60 km/h			
Gradient Of Road:	<2%	<2%			
Ultimate R.O.W:	35 m	30 m			

Comments:

Ultimate traffic data only (2041).

*Note: Ninth Line is proposed to be widened (between Derry Road West to Eglinton Avenue West) from two lanes to four lanes (tentatively scheduled to begin 2023).

**Note: As part of the Ninth Line road widening project, the speed limit is proposed to be reduced from 70 km/h to 60 km/h.

Appendix B

Sample Stamson Output

STAMSON 5.0 NORMAL REPORT Date: 28-09-2021 15:17:50
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: n.te Time Period: Day/Night 16/8 hours
Description: North Facade.

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

Car traffic volume	: 22896/2544	veh/TimePeriod
Medium truck volume	: 525/58	veh/TimePeriod
Heavy truck volume	: 429/48	veh/TimePeriod
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

Data for Segment # 1: Ninth (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	: 20.70 / 20.70	m
Receiver height	: 17.50 / 17.50	m
Topography	: 1	(Flat/gentle slope; no barrier)
Reference angle	: 0.00	

Results segment # 1: Ninth (day)

Source height = 1.16 m

ROAD (0.00 + 68.39 + 0.00) = 68.39 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	69.79	0.00	-1.40	0.00	0.00	0.00	0.00	68.39

Segment Leq : 68.39 dBA

Total Leq All Segments: 68.39 dBA

Results segment # 1: Ninth (night)

Source height = 1.16 m

ROAD (0.00 + 61.87 + 0.00) = 61.87 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	63.27	0.00	-1.40	0.00	0.00	0.00	0.00	61.87

Segment Leq : 61.87 dBA

Total Leq All Segments: 61.87 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 68.39
(NIGHT): 61.87

STAMSON 5.0 NORMAL REPORT Date: 28-09-2021 15:18:49
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: e.te Time Period: Day/Night 16/8 hours
Description: East Facade.

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

Car traffic volume	: 22896/2544	veh/TimePeriod
Medium truck volume	: 525/58	veh/TimePeriod
Heavy truck volume	: 429/48	veh/TimePeriod
Posted speed limit	: 60 km/h	
Road gradient	: 2 %	
Road pavement	: 1 (Typical asphalt or concrete)	

Data for Segment # 1: Ninth (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	: 20.70 / 20.70	m
Receiver height	: 17.50 / 17.50	m
Topography	: 1	(Flat/gentle slope; no barrier)
Reference angle	: 0.00	

Road data, segment # 2: 407N (day/night)

Car traffic volume	: 48068/8483	veh/TimePeriod
Medium truck volume	: 2763/488	veh/TimePeriod
Heavy truck volume	: 4420/780	veh/TimePeriod
Posted speed limit	: 100 km/h	
Road gradient	: 0 %	
Road pavement	: 1 (Typical asphalt or concrete)	

Data for Segment # 2: 407N (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	: 321.50 / 321.50	m
Receiver height	: 17.50 / 17.50	m
Topography	: 1	(Flat/gentle slope; no barrier)
Reference angle	: 0.00	

Road data, segment # 3: 407S (day/night)

Car traffic volume : 48068/8483 veh/TimePeriod
Medium truck volume : 2763/488 veh/TimePeriod
Heavy truck volume : 4420/780 veh/TimePeriod
Posted speed limit : 100 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 3: 407S (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 : 351.50 / 351.50 m
Receiver height : 17.50 / 17.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Ninth (day)

Source height = 1.16 m

ROAD (0.00 + 65.38 + 0.00) = 65.38 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	69.79	0.00	-1.40	-3.01	0.00	0.00	0.00	65.38

Segment Leq : 65.38 dBA

Results segment # 2: 407N (day)

Source height = 1.68 m

ROAD (0.00 + 64.91 + 0.00) = 64.91 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.00	81.23	0.00	-13.31	-3.01	0.00	0.00	0.00	64.91

Segment Leq : 64.91 dBA

↟
Results segment # 3: 407S (day)

Source height = 1.68 m

ROAD (0.00 + 64.53 + 0.00) = 64.53 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.00	81.23	0.00	-13.70	-3.01	0.00	0.00	0.00	64.53

Segment Leq : 64.53 dBA

Total Leq All Segments: 69.73 dBA

↟
Results segment # 1: Ninth (night)

Source height = 1.16 m

ROAD (0.00 + 58.86 + 0.00) = 58.86 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	63.27	0.00	-1.40	-3.01	0.00	0.00	0.00	58.86

Segment Leq : 58.86 dBA

↟
Results segment # 2: 407N (night)

Source height = 1.68 m

ROAD (0.00 + 60.39 + 0.00) = 60.39 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.00	76.71	0.00	-13.31	-3.01	0.00	0.00	0.00	60.39

Segment Leq : 60.39 dBA

↟
Results segment # 3: 407S (night)

Source height = 1.68 m

ROAD (0.00 + 60.00 + 0.00) = 60.00 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.00	76.71	0.00	-13.70	-3.01	0.00	0.00	0.00	60.00

Segment Leq : 60.00 dBA

Total Leq All Segments: 64.57 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 69.73
(NIGHT): 64.57

C
STAMSON 5.0 NORMAL REPORT Date: 28-09-2021 15:19:12
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: s.te Time Period: Day/Night 16/8 hours
Description: South Facade.

Road data, segment # 1: 407S (day/night)

Car traffic volume : 48068/8483 veh/TimePeriod
Medium truck volume : 2763/488 veh/TimePeriod
Heavy truck volume : 4420/780 veh/TimePeriod
Posted speed limit : 100 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: 407S (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 : 297.50 / 297.50 m
Receiver height : 17.50 / 17.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

↟
Road data, segment # 2: 407N (day/night)

Car traffic volume : 48068/8483 veh/TimePeriod
Medium truck volume : 2763/488 veh/TimePeriod
Heavy truck volume : 4420/780 veh/TimePeriod
Posted speed limit : 100 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 2: 407N (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 : 267.50 / 267.50 m
Receiver height : 17.50 / 17.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

↟
Results segment # 1: 407S (day)

Source height = 1.68 m

ROAD (0.00 + 68.26 + 0.00) = 68.26 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	81.23	0.00	-12.97	0.00	0.00	0.00	0.00	68.26

Segment Leq : 68.26 dBA

↟
Results segment # 2: 407N (day)

Source height = 1.68 m

ROAD (0.00 + 68.72 + 0.00) = 68.72 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	81.23	0.00	-12.51	0.00	0.00	0.00	0.00	68.72

Segment Leq : 68.72 dBA

Total Leq All Segments: 71.51 dBA

↟
Results segment # 1: 407S (night)

Source height = 1.68 m

ROAD (0.00 + 63.74 + 0.00) = 63.74 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	76.71	0.00	-12.97	0.00	0.00	0.00	0.00	63.74

Segment Leq : 63.74 dBA

↟
Results segment # 2: 407N (night)

C

Source height = 1.68 m

ROAD (0.00 + 64.20 + 0.00) = 64.20 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	76.71	0.00	-12.51	0.00	0.00	0.00	0.00	64.20

Segment Leq : 64.20 dBA

Total Leq All Segments: 66.99 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 71.51
(NIGHT): 66.99

D
STAMSON 5.0 NORMAL REPORT Date: 28-09-2021 15:20:47
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: s_int.te Time Period: Day/Night 16/8 hours
Description: Interior South Facade.

Road data, segment # 1: 407N (day/night)

Car traffic volume : 48068/8483 veh/TimePeriod
Medium truck volume : 2763/488 veh/TimePeriod
Heavy truck volume : 4420/780 veh/TimePeriod
Posted speed limit : 100 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: 407N (day/night)

Angle1 Angle2 : -28.00 deg 16.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 301.50 / 301.50 m
Receiver height : 17.50 / 17.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 2: 407S (day/night)

Car traffic volume : 48068/8483 veh/TimePeriod
Medium truck volume : 2763/488 veh/TimePeriod
Heavy truck volume : 4420/780 veh/TimePeriod
Posted speed limit : 100 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 2: 407S (day/night)

Angle1 Angle2 : -28.00 deg 16.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 331.50 / 331.50 m
Receiver height : 17.50 / 17.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

↟
Road data, segment # 3: 407N.B.E (day/night)

Car traffic volume : 48068/8483 veh/TimePeriod
Medium truck volume : 2763/488 veh/TimePeriod
Heavy truck volume : 4420/780 veh/TimePeriod
Posted speed limit : 100 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 3: 407N.B.E (day/night)

Angle1 Angle2 : -90.00 deg -28.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 301.50 / 301.50 m
Receiver height : 17.50 / 17.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : -28.00 deg
Barrier height : 19.00 m
Barrier receiver distance : 20.00 / 20.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

↟
Road data, segment # 4: 407S.B.E (day/night)

Car traffic volume : 48068/8483 veh/TimePeriod
Medium truck volume : 2763/488 veh/TimePeriod
Heavy truck volume : 4420/780 veh/TimePeriod
Posted speed limit : 100 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 4: 407S.B.E (day/night)

Angle1 Angle2 : -90.00 deg -28.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 331.50 / 331.50 m
Receiver height : 17.50 / 17.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : -28.00 deg
Barrier height : 19.00 m

D
Barrier receiver distance : 20.00 / 20.00 m
Source elevation   :   0.00 m
Receiver elevation   :   0.00 m
Barrier elevation   :   0.00 m
Reference angle   :   0.00

↟
Road data, segment # 5: 407N.B.W (day/night)

Car traffic volume : 48068/8483 veh/TimePeriod
Medium truck volume : 2763/488   veh/TimePeriod
Heavy truck volume : 4420/780   veh/TimePeriod
Posted speed limit :   100 km/h
Road gradient   :   0 %
Road pavement   :   1 (Typical asphalt or concrete)

Data for Segment # 5: 407N.B.W (day/night)

Angle1   Angle2   : 16.00 deg   90.00 deg
Wood depth   :   0   (No woods.)
No of house rows   :   0 / 0
Surface   :   2   (Reflective ground surface)
Receiver source distance : 301.50 / 301.50 m
Receiver height   : 17.50 / 17.50 m
Topography   :   2   (Flat/gentle slope; with barrier)
Barrier angle1   : 16.00 deg   Angle2 : 90.00 deg
Barrier height   : 19.00 m
Barrier receiver distance : 20.00 / 20.00 m
Source elevation   :   0.00 m
Receiver elevation   :   0.00 m
Barrier elevation   :   0.00 m
Reference angle   :   0.00

↟
Road data, segment # 6: 407S.B.W (day/night)

Car traffic volume : 48068/8483 veh/TimePeriod
Medium truck volume : 2763/488   veh/TimePeriod
Heavy truck volume : 4420/780   veh/TimePeriod
Posted speed limit :   100 km/h
Road gradient   :   0 %
Road pavement   :   1 (Typical asphalt or concrete)

Data for Segment # 6: 407S.B.W (day/night)

Angle1   Angle2   : 16.00 deg   90.00 deg
Wood depth   :   0   (No woods.)
No of house rows   :   0 / 0

```
                                        D
Surface                    :      2       (Reflective ground surface)
Receiver source distance   : 331.50 / 331.50 m
Receiver height            :  17.50 / 17.50  m
Topography                 :      2       (Flat/gentle slope; with barrier)
Barrier angle1             :  16.00 deg   Angle2 : 90.00 deg
Barrier height             :  19.00 m
Barrier receiver distance  :  20.00 / 20.00  m
Source elevation           :   0.00 m
Receiver elevation         :   0.00 m
Barrier elevation          :   0.00 m
Reference angle            :   0.00

🠕
Results segment # 1: 407N (day)
-------------------------------

Source height = 1.68 m

ROAD (0.00 + 62.08 + 0.00) = 62.08 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -28     16   0.00  81.23   0.00 -13.03  -6.12   0.00   0.00   0.00  62.08
-------------------------------------------------------------------------------

Segment Leq : 62.08 dBA

🠕
Results segment # 2: 407S (day)
-------------------------------

Source height = 1.68 m

ROAD (0.00 + 61.67 + 0.00) = 61.67 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -28     16   0.00  81.23   0.00 -13.44  -6.12   0.00   0.00   0.00  61.67
-------------------------------------------------------------------------------

Segment Leq : 61.67 dBA

🠕
Results segment # 3: 407N.B.E (day)
-----------------------------------

Source height = 1.68 m

Barrier height for grazing incidence
-----------------------------------
```

D

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.68	17.50	16.45	16.45

ROAD (0.00 + 55.64 + 0.00) = 55.64 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-28	0.00	81.23	0.00	-13.03	-4.63	0.00	0.00	-7.93	55.64

Segment Leq : 55.64 dBA

Results segment # 4: 407S.B.E (day)

Source height = 1.68 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.68	17.50	16.55	16.55

ROAD (0.00 + 55.39 + 0.00) = 55.39 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-28	0.00	81.23	0.00	-13.44	-4.63	0.00	0.00	-7.77	55.39

Segment Leq : 55.39 dBA

Results segment # 5: 407N.B.W (day)

Source height = 1.68 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.68	17.50	16.45	16.45

ROAD (0.00 + 56.11 + 0.00) = 56.11 dBA

D

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
16	90	0.00	81.23	0.00	-13.03	-3.86	0.00	0.00	-8.23	56.11

Segment Leq : 56.11 dBA

↟
Results segment # 6: 407S.B.W (day)

Source height = 1.68 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.68	17.50	16.55	16.55

ROAD (0.00 + 55.87 + 0.00) = 55.87 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
16	90	0.00	81.23	0.00	-13.44	-3.86	0.00	0.00	-8.06	55.87

Segment Leq : 55.87 dBA

Total Leq All Segments: 66.62 dBA

↟
Results segment # 1: 407N (night)

Source height = 1.68 m

ROAD (0.00 + 57.56 + 0.00) = 57.56 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-28	16	0.00	76.71	0.00	-13.03	-6.12	0.00	0.00	0.00	57.56

Segment Leq : 57.56 dBA

↟
Results segment # 2: 407S (night)

D

Source height = 1.68 m

ROAD (0.00 + 57.15 + 0.00) = 57.15 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-28	16	0.00	76.71	0.00	-13.44	-6.12	0.00	0.00	0.00	57.15

Segment Leq : 57.15 dBA

Results segment # 3: 407N.B.E (night)

Source height = 1.68 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.68	17.50	16.45	16.45

ROAD (0.00 + 51.12 + 0.00) = 51.12 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-28	0.00	76.71	0.00	-13.03	-4.63	0.00	0.00	-7.93	51.12

Segment Leq : 51.12 dBA

Results segment # 4: 407S.B.E (night)

Source height = 1.68 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.68	17.50	16.55	16.55

ROAD (0.00 + 50.87 + 0.00) = 50.87 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-28	0.00	76.71	0.00	-13.44	-4.63	0.00	0.00	-7.77	50.87

Segment Leq : 50.87 dBA

↟
Results segment # 5: 407N.B.W (night)

Source height = 1.68 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.68	17.50	16.45	16.45

ROAD (0.00 + 51.59 + 0.00) = 51.59 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
16	90	0.00	76.71	0.00	-13.03	-3.86	0.00	0.00	-8.23	51.59

Segment Leq : 51.59 dBA

↟
Results segment # 6: 407S.B.W (night)

Source height = 1.68 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.68	17.50	16.55	16.55

ROAD (0.00 + 51.35 + 0.00) = 51.35 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
16	90	0.00	76.71	0.00	-13.44	-3.86	0.00	0.00	-8.06	51.35

Segment Leq : 51.35 dBA

Total Leq All Segments: 62.10 dBA

D

TOTAL Leq FROM ALL SOURCES (DAY): 66.62
(NIGHT): 62.10

STAMSON 5.0 NORMAL REPORT Date: 28-09-2021 15:21:34
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: e_int.te Time Period: Day/Night 16/8 hours
Description: Interior West Facade.

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

Car traffic volume	: 22896/2544	veh/TimePeriod
Medium truck volume	: 525/58	veh/TimePeriod
Heavy truck volume	: 429/48	veh/TimePeriod
Posted speed limit	: 60	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

Data for Segment # 1: Ninth (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	: 74.70 / 74.70	m
Receiver height	: 17.50 / 17.50	m
Topography	: 2	(Flat/gentle slope; with barrier)
Barrier angle1	: 0.00 deg	Angle2 : 90.00 deg
Barrier height	: 19.00 m	
Barrier receiver distance	: 34.00 / 34.00	m
Source elevation	: 0.00 m	
Receiver elevation	: 0.00 m	
Barrier elevation	: 0.00 m	
Reference angle	: 0.00	

↑
Road data, segment # 2: 407N (day/night)

Car traffic volume	: 48068/8483	veh/TimePeriod
Medium truck volume	: 2763/488	veh/TimePeriod
Heavy truck volume	: 4420/780	veh/TimePeriod
Posted speed limit	: 100	km/h
Road gradient	: 0	%
Road pavement	: 1	(Typical asphalt or concrete)

Data for Segment # 2: 407N (day/night)

Angle1 Angle2	: -90.00 deg	0.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	

```
                                        E
Surface                    :      2       (Reflective ground surface)
Receiver source distance   : 267.50 / 267.50 m
Receiver height            :  17.50 / 17.50  m
Topography                 :      1       (Flat/gentle slope; no barrier)
Reference angle            :   0.00
```

↟

```
Road data, segment # 3: 407S (day/night)
---------------------------------------
Car traffic volume  : 48068/8483  veh/TimePeriod
Medium truck volume :  2763/488   veh/TimePeriod
Heavy truck volume  :  4420/780   veh/TimePeriod
Posted speed limit  :   100 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 3: 407S (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   : 297.50 / 297.50 m
Receiver height            :  17.50 / 17.50  m
Topography                 :      1       (Flat/gentle slope; no barrier)
Reference angle            :   0.00
```

↟

```
Results segment # 1: Ninth (day)
---------------------------------

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 !       17.50 !       10.06 !        10.06

ROAD (0.00 + 43.97 + 0.00) = 43.97 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     90   0.00  69.79   0.00  -6.97  -3.01   0.00   0.00 -15.83  43.97
-------------------------------------------------------------------------------

Segment Leq : 43.97 dBA
```

Results segment # 2: 407N (day)

Source height = 1.68 m

ROAD (0.00 + 65.71 + 0.00) = 65.71 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.00	81.23	0.00	-12.51	-3.01	0.00	0.00	0.00	65.71

Segment Leq : 65.71 dBA

Results segment # 3: 407S (day)

Source height = 1.68 m

ROAD (0.00 + 65.25 + 0.00) = 65.25 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.00	81.23	0.00	-12.97	-3.01	0.00	0.00	0.00	65.25

Segment Leq : 65.25 dBA

Total Leq All Segments: 68.51 dBA

Results segment # 1: Ninth (night)

Source height = 1.16 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.16	17.50	10.06	10.06

ROAD (0.00 + 37.45 + 0.00) = 37.45 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	63.27	0.00	-6.97	-3.01	0.00	0.00	-15.83	37.45

Segment Leq : 37.45 dBA

↟
Results segment # 2: 407N (night)

Source height = 1.68 m

ROAD (0.00 + 61.19 + 0.00) = 61.19 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.00	76.71	0.00	-12.51	-3.01	0.00	0.00	0.00	61.19

Segment Leq : 61.19 dBA

↟
Results segment # 3: 407S (night)

Source height = 1.68 m

ROAD (0.00 + 60.73 + 0.00) = 60.73 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.00	76.71	0.00	-12.97	-3.01	0.00	0.00	0.00	60.73

Segment Leq : 60.73 dBA

Total Leq All Segments: 63.99 dBA

↟

TOTAL Leq FROM ALL SOURCES (DAY): 68.51
(NIGHT): 63.99

↟
↟

STAMSON 5.0 NORMAL REPORT Date: 09-12-2021 16:23:01
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: ola.te Time Period: 16 hours
Description: OLA excluding future development

Road data, segment # 1: 407N

Car traffic volume : 48068 veh/TimePeriod
Medium truck volume : 2763 veh/TimePeriod
Heavy truck volume : 4420 veh/TimePeriod
Posted speed limit : 100 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: 407N

Angle1 Angle2 : -45.00 deg 33.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 284.50 m
Receiver height : 1.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -45.00 deg Angle2 : 33.00 deg
Barrier height : 2.80 m
Barrier receiver distance : 10.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

↑
Road data, segment # 2: 407S

Car traffic volume : 48068 veh/TimePeriod
Medium truck volume : 2763 veh/TimePeriod
Heavy truck volume : 4420 veh/TimePeriod
Posted speed limit : 100 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 2: 407S

Angle1 Angle2 : -45.00 deg 33.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0

F1

```
Surface                    :      2       (Reflective ground surface)
Receiver source distance   : 314.50 m
Receiver height            :   1.50 m
Topography                 :      2       (Flat/gentle slope; with barrier)
Barrier angle1             : -45.00 deg   Angle2 : 33.00 deg
Barrier height             :   2.80 m
Barrier receiver distance  :  10.00 m
Source elevation           :   0.00 m
Receiver elevation         :   0.00 m
Barrier elevation          :   0.00 m
Reference angle            :   0.00
```

```
Road data, segment # 3: 407N.B.E
------------------------------
Car traffic volume  : 48068 veh/TimePeriod
Medium truck volume :  2763 veh/TimePeriod
Heavy truck volume  :  4420 veh/TimePeriod
Posted speed limit  :   100 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 3: 407N.B.E
------------------------------
Angle1   Angle2            : -90.00 deg   -45.00 deg
Wood depth                 :      0       (No woods.)
No of house rows           :      0
Surface                    :      2       (Reflective ground surface)
Receiver source distance   : 284.50 m
Receiver height            :   1.50 m
Topography                 :      2       (Flat/gentle slope; with barrier)
Barrier angle1             : -90.00 deg   Angle2 : -45.00 deg
Barrier height             :  19.00 m
Barrier receiver distance  :  17.00 m
Source elevation           :   0.00 m
Receiver elevation         :   0.00 m
Barrier elevation          :   0.00 m
Reference angle            :   0.00
```

```
Road data, segment # 4: 407S.B.E
------------------------------
Car traffic volume  : 48068 veh/TimePeriod
Medium truck volume :  2763 veh/TimePeriod
Heavy truck volume  :  4420 veh/TimePeriod
Posted speed limit  :   100 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)
```

Data for Segment # 4: 407S.B.E

Angle1 Angle2 : -90.00 deg -45.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 314.50 m
Receiver height : 1.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : -45.00 deg
Barrier height : 19.00 m
Barrier receiver distance : 17.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

Road data, segment # 5: 407N.B.W

Car traffic volume : 48068 veh/TimePeriod
Medium truck volume : 2763 veh/TimePeriod
Heavy truck volume : 4420 veh/TimePeriod
Posted speed limit : 100 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 5: 407N.B.W

Angle1 Angle2 : 33.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 284.50 m
Receiver height : 1.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : 33.00 deg Angle2 : 90.00 deg
Barrier height : 19.00 m
Barrier receiver distance : 17.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

Road data, segment # 6: 407S.B.W

```
Car traffic volume  : 48068 veh/TimePeriod
Medium truck volume :  2763 veh/TimePeriod
Heavy truck volume  :  4420 veh/TimePeriod
Posted speed limit  :   100 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 6: 407S.B.W
------------------------------
Angle1   Angle2           :  33.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  : 314.50 m
Receiver height           :   1.50 m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :  33.00 deg   Angle2 : 90.00 deg
Barrier height            :  19.00 m
Barrier receiver distance :  17.00 m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

↑
Road data, segment # 7: Ninth.B
------------------------------
Car traffic volume  : 22896 veh/TimePeriod
Medium truck volume :   525 veh/TimePeriod
Heavy truck volume  :   429 veh/TimePeriod
Posted speed limit  :    60 km/h
Road gradient       :     2 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 7: Ninth.B
------------------------------
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  :  53.70 m
Receiver height           :   1.50 m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :  19.00 m
Barrier receiver distance :  17.00 m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
```

Barrier elevation : 0.00 m
Reference angle : 0.00

↟

Results segment # 1: 407N

Source height = 1.68 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.68	1.50	1.51	1.51

ROAD (0.00 + 56.64 + 0.00) = 56.64 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-45	33	0.00	81.23	0.00	-12.78	-3.63	0.00	0.00	-8.18	56.64

Segment Leq : 56.64 dBA

↟

Results segment # 2: 407S

Source height = 1.68 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.68	1.50	1.51	1.51

ROAD (0.00 + 56.22 + 0.00) = 56.22 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-45	33	0.00	81.23	0.00	-13.22	-3.63	0.00	0.00	-8.17	56.22

Segment Leq : 56.22 dBA

↟

Results segment # 3: 407N.B.E

Source height = 1.68 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.68	1.50	1.51	1.51

ROAD (0.00 + 44.97 + 0.00) = 44.97 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-45	0.00	81.23	0.00	-12.78	-6.02	0.00	0.00	-17.46	44.97

Segment Leq : 44.97 dBA

Results segment # 4: 407S.B.E

Source height = 1.68 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.68	1.50	1.51	1.51

ROAD (0.00 + 44.55 + 0.00) = 44.55 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-45	0.00	81.23	0.00	-13.22	-6.02	0.00	0.00	-17.45	44.55

Segment Leq : 44.55 dBA

Results segment # 5: 407N.B.W

Source height = 1.68 m

Barrier height for grazing incidence

Source	Receiver	Barrier	Elevation of

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.68	1.50	1.51	1.51

ROAD (0.00 + 45.57 + 0.00) = 45.57 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
33	90	0.00	81.23	0.00	-12.78	-4.99	0.00	0.00	-17.89	45.57

Segment Leq : 45.57 dBA

↑

Results segment # 6: 407S.B.W

Source height = 1.68 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.68	1.50	1.51	1.51

ROAD (0.00 + 45.15 + 0.00) = 45.15 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
33	90	0.00	81.23	0.00	-13.22	-4.99	0.00	0.00	-17.88	45.15

Segment Leq : 45.15 dBA

↑

Results segment # 7: Ninth.B

Source height = 1.16 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.16	1.50	1.39	1.39

ROAD (0.00 + 45.30 + 0.00) = 45.30 dBA

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

F1

-90	90	0.00	69.79	0.00	-5.54	0.00	0.00	0.00	-18.95	45.30

Segment Leq : 45.30 dBA

Total Leq All Segments: 60.18 dBA

TOTAL Leq FROM ALL SOURCES: 60.18

STAMSON 5.0 NORMAL REPORT Date: 09-12-2021 16:20:57
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: ola2.te Time Period: 16 hours
Description: OLA including future development.

Road data, segment # 1: 407N

Car traffic volume : 48068 veh/TimePeriod
Medium truck volume : 2763 veh/TimePeriod
Heavy truck volume : 4420 veh/TimePeriod
Posted speed limit : 100 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: 407N

Angle1 Angle2 : -45.00 deg 30.00 deg
Wood depth : 0 (No woods.)
No of house rows : 3
House density : 90 %
Surface : 2 (Reflective ground surface)
Receiver source distance : 284.50 m
Receiver height : 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 2: 407S

Car traffic volume : 48068 veh/TimePeriod
Medium truck volume : 2763 veh/TimePeriod
Heavy truck volume : 4420 veh/TimePeriod
Posted speed limit : 100 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 2: 407S

Angle1 Angle2 : -45.00 deg 30.00 deg
Wood depth : 0 (No woods.)
No of house rows : 3
House density : 80 %
Surface : 2 (Reflective ground surface)
Receiver source distance : 314.50 m
Receiver height : 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)

Reference angle : 0.00

↟

Results segment # 1: 407N

Source height = 1.68 m

ROAD (0.00 + 54.98 + 0.00) = 54.98 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-45	30	0.00	81.23	0.00	-12.78	-3.80	0.00	-9.67	0.00	54.98

Segment Leq : 54.98 dBA

↟

Results segment # 2: 407S

Source height = 1.68 m

ROAD (0.00 + 56.07 + 0.00) = 56.07 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-45	30	0.00	81.23	0.00	-13.22	-3.80	0.00	-8.14	0.00	56.07

Segment Leq : 56.07 dBA

Total Leq All Segments: 58.57 dBA

↟

TOTAL Leq FROM ALL SOURCES: 58.57

↟

↟

STAMSON 5.0 NORMAL REPORT Date: 15-12-2021 10:44:11
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: rfola2.te Time Period: 16 hours
Description: Rooftop OLA

Road data, segment # 1: 407S

Car traffic volume : 48068 veh/TimePeriod
Medium truck volume : 2763 veh/TimePeriod
Heavy truck volume : 4420 veh/TimePeriod
Posted speed limit : 100 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: 407S

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 : 314.50 m
Receiver height : 1.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 1.07 m
Barrier receiver distance : 18.00 m
Source elevation : 0.00 m
Receiver elevation : 19.35 m
Barrier elevation : 19.35 m
Reference angle : 0.00

↑
Road data, segment # 2: 407N

Car traffic volume : 48068 veh/TimePeriod
Medium truck volume : 2763 veh/TimePeriod
Heavy truck volume : 4420 veh/TimePeriod
Posted speed limit : 100 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 2: 407N

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0

```
                                        G
Surface                    :      2       (Reflective ground surface)
Receiver source distance   : 285.50 m
Receiver height            :   1.50 m
Topography                 :      2       (Flat/gentle slope; with barrier)
Barrier angle1             : -90.00 deg   Angle2 : 90.00 deg
Barrier height             :   1.07 m
Barrier receiver distance  :  18.00 m
Source elevation           :   0.00 m
Receiver elevation         :  19.35 m
Barrier elevation          :  19.35 m
Reference angle            :   0.00

🡅
Results segment # 1: 407S
-------------------------

Source height = 1.68 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.68 !        1.50 !        0.40 !        19.75

ROAD (0.00 + 62.60 + 0.00) = 62.60 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  81.23   0.00 -13.22   0.00   0.00   0.00  -5.42  62.60
-------------------------------------------------------------------------------

Segment Leq : 62.60 dBA

🡅
Results segment # 2: 407N
-------------------------

Source height = 1.68 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.68 !        1.50 !        0.29 !        19.64

ROAD (0.00 + 62.88 + 0.00) = 62.88 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
```

G

-90	90	0.00	81.23	0.00	-12.80	0.00	0.00	0.00	-5.56	62.88

Segment Leq : 62.88 dBA

Total Leq All Segments: 65.75 dBA

TOTAL Leq FROM ALL SOURCES: 65.75