

Geotechnical
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Environmental Noise Control Study

Proposed Multi-Storey Building
455 McArthur Avenue - Ottawa

Prepared For

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Report: PG5178-1

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1.0 Introduction

Paterson Group (Paterson) was commissioned by Prestwick Building Corporation to conduct an environmental noise control study for the proposed residential building to be located at 455 McArthur Avenue, in the City of Ottawa.

The objective of the current study is to:

- ❑ Determine the primary noise sources impacting the site and compare the projected sound levels to guidelines set out by the Ministry of Environment and Climate Change (MOECC) and the City of Ottawa.
- ❑ Review the projected noise levels and offer recommendations regarding warning classes, construction materials or alternative sound barriers.

The following report has been prepared specifically and solely for the aforementioned project which is described herein. It contains our findings and includes acoustical recommendations pertaining to the design and construction of the subject development as they are understood at the time of writing this report.

This study has been conducted according to City of Ottawa document - Engineering Noise Control Guidelines (ENCG), dated January 2016, and the Ontario Ministry of the Environment Guideline NPC-300.

2.0 Background

It is understood that the proposed development will consist of a three (3) storey building with associated parking and landscaped areas. No outdoor living areas were identified on the proposed site plan.

3.0 Methodology and Noise Assessment Criteria

The City of Ottawa outlines three (3) sources of environmental noise that must be analyzed separately:

- ☐ Surface Transportation Noise
- ☐ Stationary Noise
 - ☐ new noise-sensitive development applications (noise receptors) in proximity to existing or approved stationary sources of noise, and
 - ☐ new stationary sources of noise (noise generating) in proximity to existing or approved noise-sensitive developments
- ☐ Aircraft noise

Surface Transportation Noise

The City of Ottawa's Official Plan, in addition to the ENCG dictate that the influence area must contain any of following conditions to classify as a surface transportation noise source for a subject site:

- ☐ Within 100 m of the right-of-way of an existing or proposed arterial, collector or major collector road; a light rail transit corridor; bus rapid transit, or transit priority corridor
- ☐ Within 250 m of the right-of-way for an existing or proposed highway or secondary rail line
- ☐ Within 300 m from the right of way of a proposed or existing rail corridor or a secondary main railway line
- ☐ Within 500 m of an existing 400 series provincial highway, freeway or principle main railway line.

The NPC-300 outlines the limitations of the stationary and environmental noise levels in relation to the location of the receptors. These can be found in the following tables:

Table 1 - Sound Level Limits for Outdoor Living Areas	
Time Period	Required $L_{eq(16)}$ (dBA)
16-hour, 7:00-23:00	55
<input type="checkbox"/> Standards taken from Table 2.2a; Sound Level Limit for Outdoor Living Areas - Road and Rail	

Table 2 - Sound Level Limits for Indoor Living Area			
Type of Space	Time Period	Required L_{eq} (dBA)	
		Road	Rail
Living/Dining, den areas of residences, hospitals, nursing homes, schools, daycare centres, etc	7:00-23:00	45	40
Theaters, place of worship, libraries, individual or semi-private offices, conference rooms, reading rooms	23:00-7:00	45	40
Sleeping quarters	7:00-23:00	45	40
	23:00-7:00	40	35
<input type="checkbox"/> Standards taken from Table 2.2b; Sound Level Limit for Indoor Living Areas - Road and Rail			

It is noted in ENCG, that the limits outlined in Table 2 are for the sound levels on the interior of the glass pane. The ENCG further goes on to state that the limit for the exterior of the pane of glass will be 55 dBA.

If the sound level limits are exceeded at the window panes for the indoor living areas, the following Warning Clauses may be referenced:

Table 3 - Warning Clauses for Sound Level Exceedances	
Warning Clause	Description
Warning Clause Type A	"Purchasers/tenants are advised that sound levels due to increasing road traffic (rail traffic) (air traffic) may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the Municipality and the Ministry of the Environment."
Warning Clause Type B	"Purchasers/tenants are advised that despite the inclusion of noise control features in the development and within the building units, sound levels due to increasing road traffic (rail traffic) (air traffic) may on occasions interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the Municipality and the Ministry of the Environment."
Warning Clause Type C	"This dwelling unit has been designed with the provision for adding central air conditioning at the occupant's discretion. Installation of central air conditioning by the occupant in low and medium density developments will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment."
Warning Clause Type D	"This dwelling unit has been supplied with a central air conditioning system which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment."
<input type="checkbox"/> Clauses taken from section C8 Warning Clauses; Environmental Noise Guidelines - NPC-300	

Stationary Noise

Stationary noise sources include sources or facilities that are fixed or mobile and can cause a combination of sound and vibration levels emitted beyond the property line. These sources may include commercial air conditioner units, generators and fans. Facilities that may contribute to stationary noise may include car washes, snow disposal sites, transit stations and manufacturing facilities.

The impact of stationary noise sources are directly related to the location of the subject site within the urban environment. The proposed development can be classified as Class 2 by provincial guidelines and outlined in the ENGC, meaning "a suburban areas of the City outside of the busy core where the urban hum is evident but within the urban boundary."

Table 4 - Guidelines for Stationary Noise - Class 2		
Time of Day	Outdoor Point of Reception	Pane of Window
7:00-19:00	50	50
19:00-23:00	45	50
23:00-7:00	-	45
<input type="checkbox"/> Standards taken from Table 3.2a; Guidelines for Stationary Noise - Steady and Varying Sound		

Due to the location of the subject site, a stationary noise analysis is not required.

Aircraft/Airport Noise

Aircraft noise is distinct, as it is typically low frequency for longer durations. The sound level may also differ between different types of aircraft. Due to the location of the subject site, an analysis of aircraft/airport noise is not required.

4.0 Analysis

The proposed development is bordered to the south by McArthur Avenue and to the east, north, and west by residential buildings.

Based on the City of Ottawa Official Plan, McArthur Avenue is classified as a 4 lane urban arterial undivided (4-UAU). There are no other roadways within the 100 m radius of the subject site that are classified as an arterial, collector or major collector. Highway 417 is not located within the 500 m radius of the subject site, and therefore is not included in this analysis. Noise sources are presented on Paterson Drawing PG5178-1 - Site Plan, located in Appendix 1.

There are no stationary noise sources or aircraft noise within the influence area for this subject site.

The noise levels from road traffic are provided by the City of Ottawa, taking into consideration the right-of-way width and the implied roadway class. It is understood that these values represent the maximum allowable capacity of the proposed roadways. The parameters to be used for sound level predictions can be found below.

Table 5 - Traffic and Road Parameters						
Road	Implied Roadway	AADT (Veh/day)	Posted Speed (km/h)	Day/Night Split %	Medium Truck %	Heavy Truck %
McArthur Avenue	4-UAU	30000	50	92/8	7	5
<input type="checkbox"/> Data obtained from the City of Ottawa document ENCG						

Two (2) levels of reception points were selected for this analysis. The following elevations were selected from the heights provided on the building elevation plans for this development.

Table 6 - Elevation of Reception Points			
Floor Number	Elevation at Centre of Window (m)	Floor Use	Daytime/Nighttime Analysis
Ground Floor	1.5	Living and sleeping quarters	daytime/nighttime
Third Floor	7.5	Living and sleeping quarters	daytime/nighttime

For this analysis, a reception point was taken at the centre of the predetermined floors. Reception points are noted on Drawing PG5178-3 - Receptor Locations in Appendix 1.

All horizontal distances have been measured from the reception point to the edge of the right-of-way. The roadways were analyzed where they intersected the 100 m buffer zone, which is reflected in the local angles, presented in Drawings PG5178-2B to 2D - Site Geometry in Appendix 1.

Table 11 - Summary of Reception Points and Geometry in Appendix 1, provides a summary of the points of reception and their geometry with respect to the noise sources. The analysis is completed so that no effects of sound reflection off of the building facade are considered, as stipulated by the ENCG.

The subject site is relatively flat and at grade with the neighbouring roads within the 100 m radius.

The analysis was completed using STAMSON version 5.04, a computer program which uses the road and rail traffic noise prediction methods using ORNAMENT (Ontario Road Noise Analysis Method for Environment and Transportation) and STEAM (Sound from Trains Environment Analysis Method), publications from the Ontario Ministry of Environment and Energy.

5.0 Results

The primary descriptors are the 16-hour daytime and the 8-hour night time equivalent sound levels, $L_{eq(16)}$ and the $L_{eq(8)}$ for City roads.

The proposed traffic noise levels were analyzed at all reception points. The results of the STAMSON software can be located in Appendix 2, and the summary of the results can be noted in Table 7.

Table 7 - Proposed Noise Levels			
Reception Point	Description	Daytime at Facade $L_{EQ(16)}$ (dBA)	Nighttime at Facade $L_{eq(8)}$ (dBA)
REC 1-1	Southern elevation, 1 st floor	69.99	62.39
REC 1-3	Southern elevation, 3 rd floor	70.28	62.69
REC 2-1	Western elevation, 1 st floor	64.75	57.15
REC 2-3	Western elevation, 3 rd floor	65.21	57.62
REC 3-1	Eastern elevation, 1 st floor	64.82	57.22
REC 6-6	Eastern elevation, 3 rd floor	62.3	57.71

6.0 Discussion and Recommendations

6.1 Outdoor Living Areas

There were no outdoor living areas identified for the proposed development

6.2 Indoor Living Areas and Ventilation

The results of the STAMSON modelling indicates that the $L_{eq(16)}$ ranges between 62.30 dBA and 70.28 dBA. The ENG C states that the limits for the exterior of the pane of glass is 55 dBA. These results exceed 55 dBA and therefore warning clauses will be required to be stated on any property titles. The applicable warning clauses are summarized in Table 8.

Table 8 - Summary of Warning Clauses		
Elevation	Applicable Warning Clause	Additional Considerations
Southern Elevation	Warning Clause Type D	All units must be equipped with a central air conditioning system, reducing the need to open windows.
Western Elevation	Warning Clause Type D	All units must be equipped with a central air conditioning system, reducing the need to open windows.
Eastern Elevation	Warning Clause Type D	All units must be equipped with a central air conditioning system, reducing the need to open windows.
Western Elevation	n/a	n/a

6.3 Noise Control Measures for Surface Transportation Noise

Outdoor Living Area

There were no outdoor living areas identified for the proposed development

Indoor Living Area

All units must have a Warning Clause Type D attached to all purchase of sales and be supplied with central air conditioning:

"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."

As previously described, where the daytime sound level at the plane of the window exceeds 60 dBA on the southern, western and eastern elevations, noise control measures should be implemented. The following table outlines the MOECC recommended options for sound mitigation and the respected responses.

Table 9 - Indoor Living Area Noise Mitigation Solutions	
MOECC Recommended Option	Site Specific Response
Distance setback with soft ground.	The proposed development configuration limits the actual maximum setback distance. An additional setback is not feasible.
Insertion of noise insensitive land uses between the source and sensitive receptor.	Not applicable to this development.
Orientation of buildings to provide sheltered zones or modified interior spaces (room and corridor arrangement) and amenity areas	The proposed building is situated in order to shield the rear yards from the noise sources. There is a possibility that living areas and bedrooms will face the noise source.
Enhanced construction techniques and construction quality (e.g. brick veneers, multi-pane windows).	Construction techniques and building materials are to be analyzed to confirm sufficient soundproofing.
Earth berms (sound barriers).	Not required
Indoor isolation - air conditioning and ventilation, enhanced dampening materials (indoor isolation)	Not required

Proposed Construction Specifications

It is understood that typical window and wall details are proposed for the residential building. The effectiveness of the noise insulation can be expressed as the Acoustical Insulation Factor (AIF), calculated as follows:

$$AIF = L_{eq(16)(Exterior)} - L_{eq(16)(Interior)} + 10 \log_{10}(N) + 2 \text{dBA}$$

Where:

$L_{eq(16)(Exterior)}$ = Calculated value at the window pane
 $L_{eq(16)(Interior)}$ = 45 dBA
N = number of components in the room

No floor plans or detailed design drawings were provided for this portion of the review. A conservative approach is to assume that there are 2 components per room. Therefore, the AIF would need to be at least 30 dBA.

A conversion from AIF to a Standard Transmission Class (STC) rating will require the knowledge of room dimensions in addition to the wall and window dimensions. However, a conservative approach would be to increase the AIF factor by 3. **Therefore, provided the building materials of either the windows and/or exterior walls have an STC rating of 33 or higher, this would be a sufficient noise attenuation device.**

Detailed shop drawing are not available at the time of issuance of this report. Once detailed shop drawings are available, they are to be reviewed with respect to soundproofing.

7.0 Conclusion

The subject site is located at 455 McArthur Avenue. It is understood that the development will consist of a three storey building with no outdoor living areas. The noise analysis identified one noise source: McArthur Avenue (surface transportation noise).

Pane of glass reception points were selected on all elevations, at both 1.5 m (ground floor) and 7.5 m (third floor). These results indicate that the noise levels will be above 55 dBA but below 71 dBA. Therefore all units must be designed to include central air conditioning. In addition, Warning Clause D, outlined below, must be added to all deeds of sale.

"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."

Due to the noise levels exceeding 65 dBA, a review of the construction materials will be required. At the time of issuance of this report, this information is not available. However, any materials with an STC rating of 33 or greater will provide sufficient soundproofing.

8.0 Statement of Limitations

The recommendations made in this report are in accordance with our present understanding of the project. Our recommendations should be reviewed when the project drawings and specifications are complete.

The present report applies only to the project described in this document. Use of this report for purposes other than those described herein or by person(s) other than the Prestwick Building Corporation or their agent(s) is not authorized without review by this firm for the applicability of our recommendations to the altered use of the report.

Paterson Group Inc.



Stephanie A. Boisvenue, P.Eng.



Scott Dennis P.Eng.



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APPENDIX 1

TABLE 11 - SUMMARY OF RECEPTION POINTS AND GEOMETRY

DRAWING PG5178-1 - SITE PLAN

DRAWING PG5178-2B - SITE GEOMETRY (REC 1-1 AND REC 1-3)

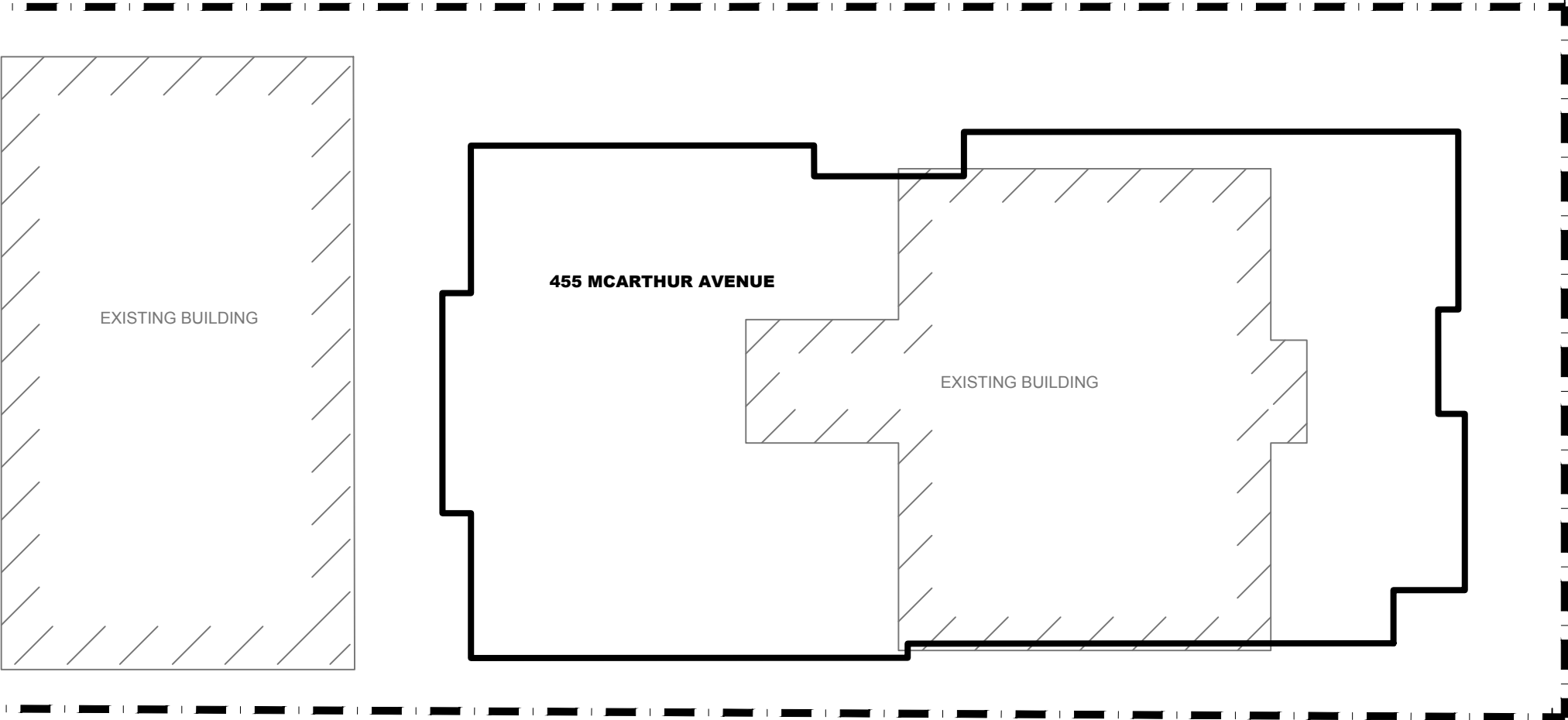
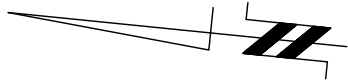
DRAWING PG5178-2C - SITE GEOMETRY (REC 2-1 AND REC 2-3)

DRAWING PG5178-2D - SITE GEOMETRY (REC 3-1 AND REC 3-3)

DRAWING PG5178-3 - RECEPTOR LOCATIONS

Table 11 - Summary of Reception Points and Geometry
455 McArthur Avenue

Point of Reception	Location	Leq Day (dBA)	Murray Street					
			Horizontal (m)	Vertical (m)	Total (m)	Local Angle (degree)	Number of Houses	Density (%)
REC 1-1	Southern Elevation, 1st floor	69.99	15	1.5	15.07	-86, 84	n/a	n/a
REC 1-3	Southern Elevation, 3rd floor	70.28	15	7.5	16.77	-86, 84	n/a	n/a
REC 2-1	Western Elevation, 1st floor	64.75	20	1.5	20.06	0, 77	n/a	n/a
REC 2-3	Western Elevation, 3rd floor	65.21	20	7.5	21.36	0, 77	n/a	n/a
REC 3-1	Eastern Elevation, 1st floor	64.82	20	1.5	20.06	-80, 0	n/a	n/a
REC 3-3	Eastern Elevation, 3rd floor	62.3	20	7.5	21.36	-80, 0	n/a	n/a



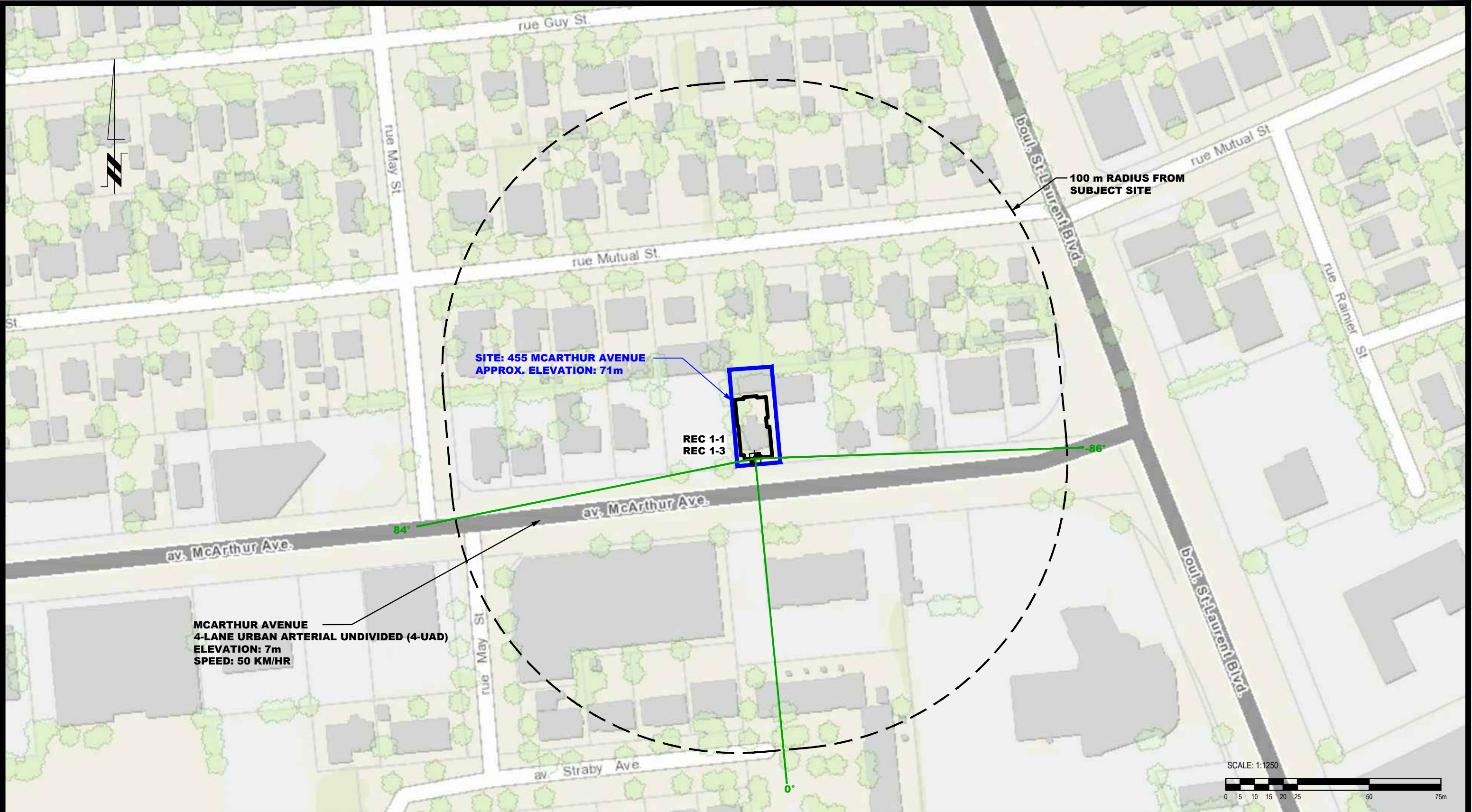
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NO.	REVISIONS	DATE	INITIAL

PRESTWICK BUILDING CORPORATION	
NOISE ATTENUATION STUDY	
455 MCARTHUR AVENUE	
OTTAWA,	ONTARIO
Title:	
SITE PLAN	

Scale:	1:125	Date:	11/2019
Drawn by:	YA	Report No.:	PG5178-1
Checked by:	SB	Dwg. No.:	PG5178-1
Approved by:	DJG	Revision No.:	



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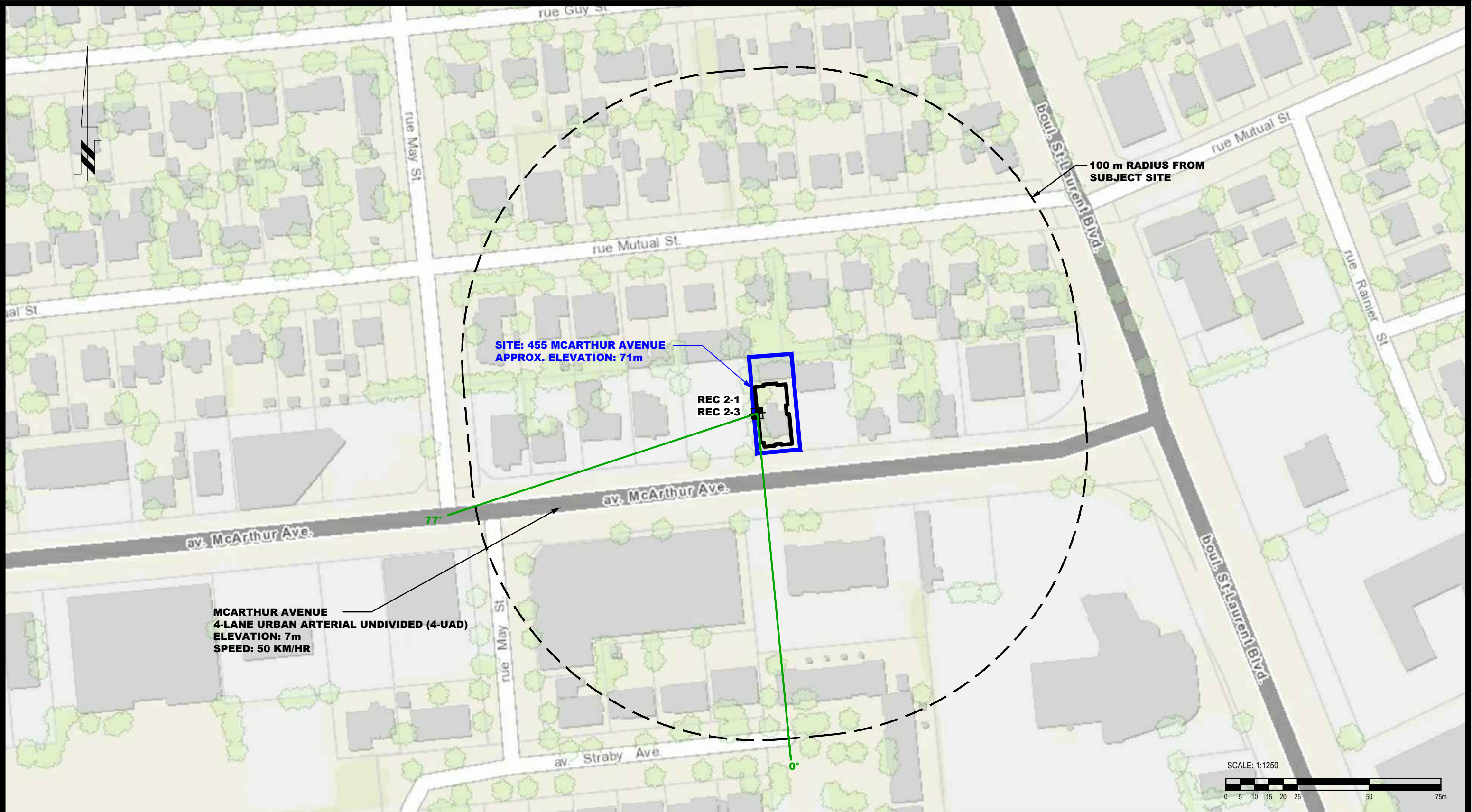
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NOISE ATTENUATION STUDY	
455 MCARTHUR AVENUE	
OTTAWA,	ONTARIO
Title:	
SITE GEOMETRY REC 1-1 & REC 1-3	

Scale:	1:1250	Date:	11/2019
Drawn by:	YA	Report No.:	PG5178-1
Checked by:	SB	Dwg. No.:	PG5178-2B
Approved by:	DJG	Revision No.:	

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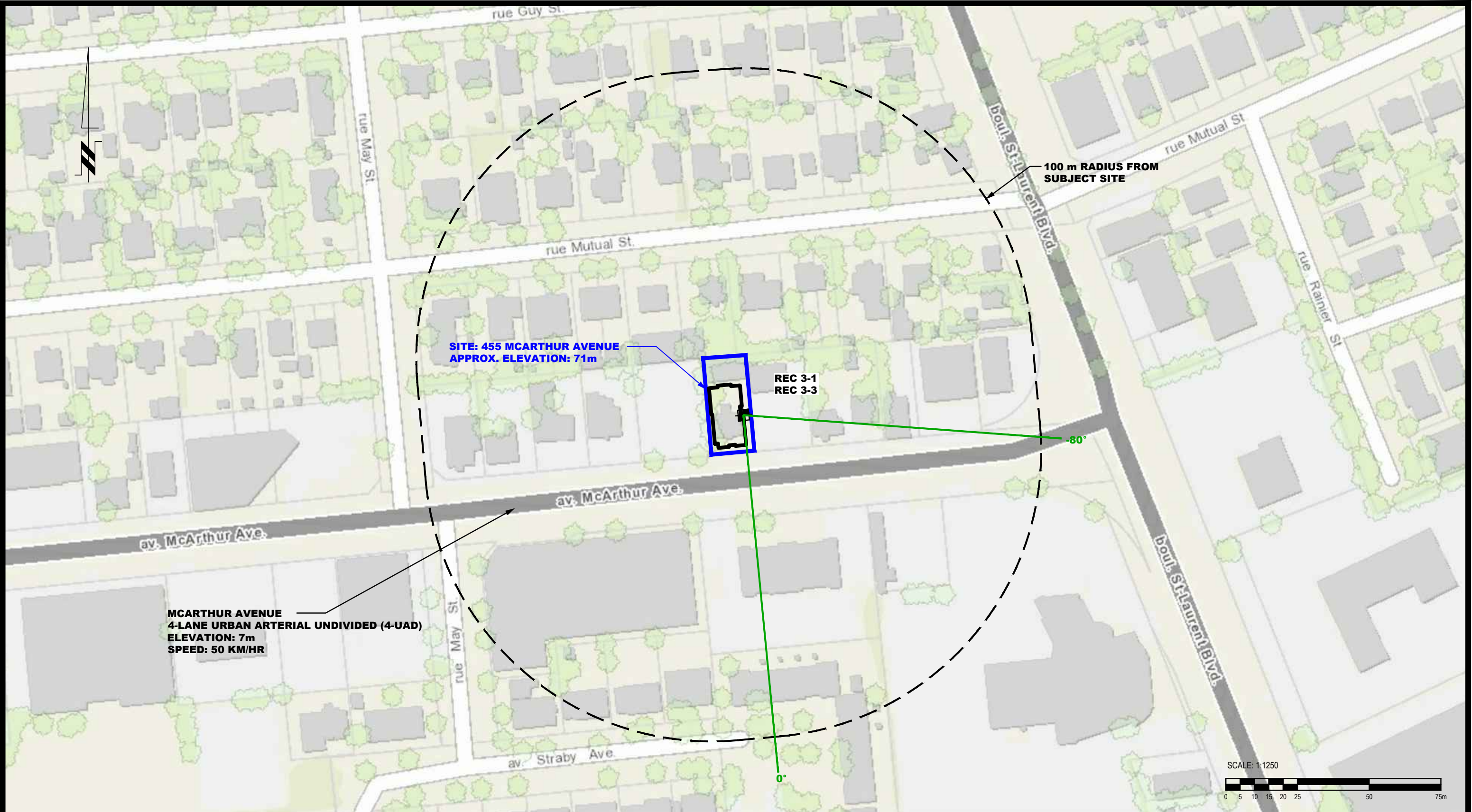
NO.	REVISIONS	DATE	INITIAL

PRESTWICK BUILDING CORPORATION
NOISE ATTENUATION STUDY
455 MCARTHUR AVENUE

OTTAWA, ONTARIO

Title: **SITE GEOMETRY REC 2-1 & REC 2-3**

Scale:	1:1250	Date:	11/2019
Drawn by:	YA	Report No.:	PG5178-1
Checked by:	SB	Dwg. No.:	PG5178-2C
Approved by:	DJG	Revision No.:	



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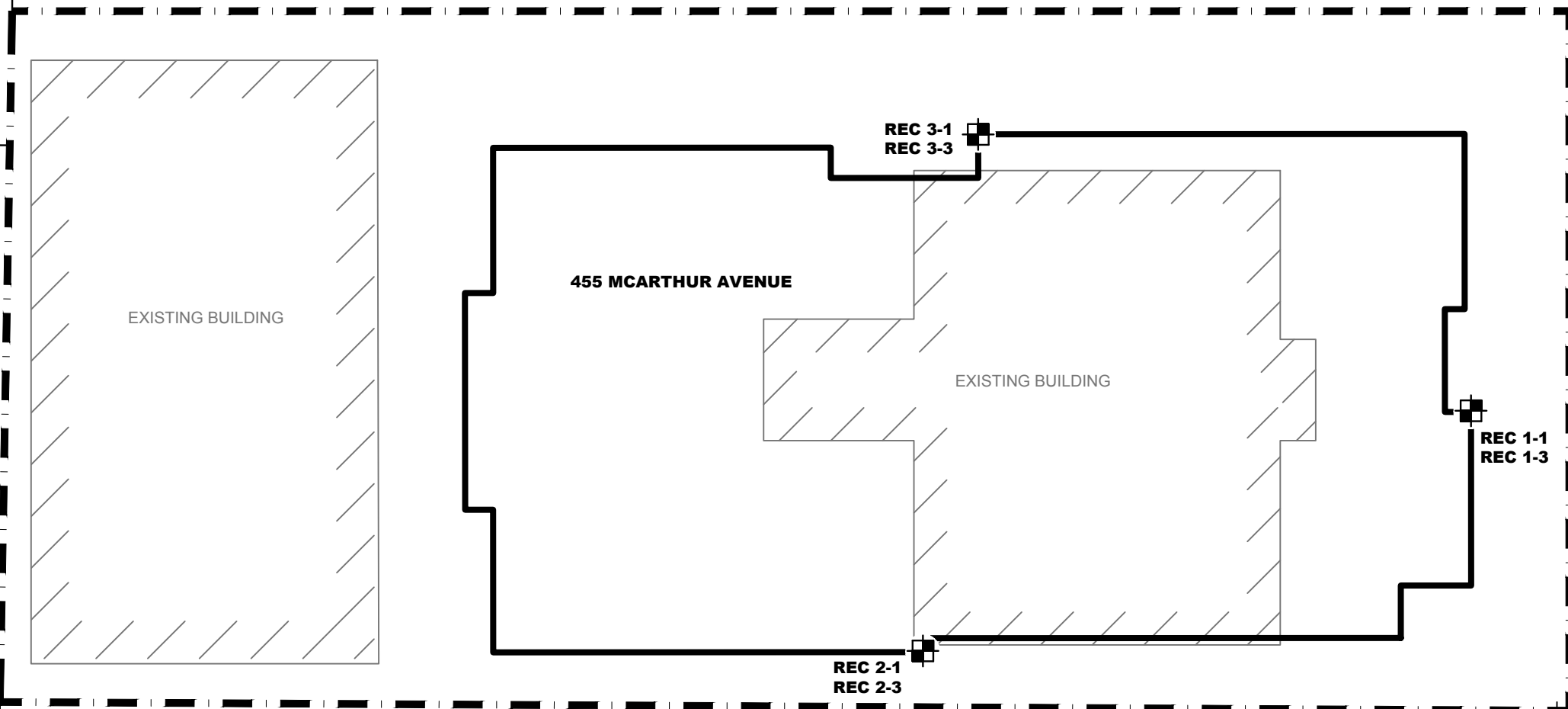
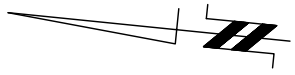
NO.	REVISIONS	DATE	INITIAL

PRESTWICK BUILDING CORPORATION
NOISE ATTENUATION STUDY
455 MCARTHUR AVENUE
OTTAWA, ONTARIO


Title:
SITE GEOMETRY REC 3-1 & REC 3-3

Scale:	1:1250	Date:	11/2019
Drawn by:	YA	Report No.:	PG5178-1
Checked by:	SB	Dwg. No.:	PG5178-2D
Approved by:	DJG	Revision No.:	


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LEGEND:

 RECEPTOR LOCATION

SCALE: 1:125



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PRESTWICK BUILDING CORPORATION

NOISE ATTENUATION STUDY

455 MCARTHUR AVENUE

OTTAWA, ONTARIO

Title:

RECEPTOR LOCATION PLAN

Scale:	1:125	Date:	11/2019
Drawn by:	YA	Report No.:	PG5178-1
Checked by:	SB	Dwg. No.:	PG5178-3
Approved by:	DJG	Revision No.:	

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APPENDIX 2

STAMSON RESULTS

STAMSON 5.0 NORMAL REPORT Date: 14-01-2020 09:54:05
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: rec11.te Time Period: Day/Night 16/8 hours
Description: Reception Point 1-1

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

Car traffic volume : 24288/2112 veh/TimePeriod *
Medium truck volume : 1932/168 veh/TimePeriod *
Heavy truck volume : 1380/120 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): 30000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

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

Angle1 Angle2 : -86.00 deg 84.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 15.00 / 15.00 m
Receiver height : 1.50 / 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

↑

Results segment # 1: McArthur (day)

Source height = 1.50 m

ROAD (0.00 + 69.99 + 0.00) = 69.99 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-86	84	0.66	71.49	0.00	0.00	-1.50	0.00	0.00	0.00	69.99

Segment Leq : 69.99 dBA

Total Leq All Segments: 69.99 dBA

↑

Results segment # 1: McArthur (night)

Source height = 1.50 m

ROAD (0.00 + 62.39 + 0.00) = 62.39 dBA

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

-86	84	0.66	63.89	0.00	0.00	-1.50	0.00	0.00	0.00	62.39
-----	----	------	-------	------	------	-------	------	------	------	-------

Segment Leq : 62.39 dBA

Total Leq All Segments: 62.39 dBA

↑

TOTAL Leq FROM ALL SOURCES (DAY): 69.99

(NIGHT): 62.39

↑

↑

STAMSON 5.0 NORMAL REPORT Date: 14-01-2020 09:54:36
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: rec13.te Time Period: Day/Night 16/8 hours
Description: Reception Point 1-3

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

Car traffic volume : 24288/2112 veh/TimePeriod *
Medium truck volume : 1932/168 veh/TimePeriod *
Heavy truck volume : 1380/120 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): 30000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

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

Angle1 Angle2 : -86.00 deg 84.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 15.00 / 15.00 m
Receiver height : 7.50 / 7.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

↑

Results segment # 1: McArthur (day)

Source height = 1.50 m

ROAD (0.00 + 70.28 + 0.00) = 70.28 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-86	84	0.48	71.49	0.00	0.00	-1.21	0.00	0.00	0.00	70.28

Segment Leq : 70.28 dBA

Total Leq All Segments: 70.28 dBA

↑

Results segment # 1: McArthur (night)

Source height = 1.50 m

ROAD (0.00 + 62.69 + 0.00) = 62.69 dBA

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

-86	84	0.48	63.89	0.00	0.00	-1.21	0.00	0.00	0.00	62.69
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Segment Leq : 62.69 dBA

Total Leq All Segments: 62.69 dBA

↑

TOTAL Leq FROM ALL SOURCES (DAY): 70.28

(NIGHT): 62.69

↑

↑

STAMSON 5.0 NORMAL REPORT Date: 14-01-2020 09:52:56
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: REC21.te Time Period: Day/Night 16/8 hours
Description: Reception Point 2-1

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

Car traffic volume : 24288/2112 veh/TimePeriod *
Medium truck volume : 1932/168 veh/TimePeriod *
Heavy truck volume : 1380/120 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): 30000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

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

Angle1 Angle2 : 0.00 deg 77.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 20.00 / 20.00 m
Receiver height : 1.50 / 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

↑

Results segment # 1: McArthur (day)

Source height = 1.50 m

ROAD (0.00 + 64.75 + 0.00) = 64.75 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	77	0.66	71.49	0.00	-2.07	-4.67	0.00	0.00	0.00	64.75

Segment Leq : 64.75 dBA

Total Leq All Segments: 64.75 dBA

↑

Results segment # 1: McArthur (night)

Source height = 1.50 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
--------	--------	-------	--------	-------	-------	-------	-------	-------	-------	--------

0	77	0.66	63.89	0.00	-2.07	-4.67	0.00	0.00	0.00	57.15
---	----	------	-------	------	-------	-------	------	------	------	-------

Segment Leq : 57.15 dBA

Total Leq All Segments: 57.15 dBA

↑

TOTAL Leq FROM ALL SOURCES (DAY): 64.75

(NIGHT): 57.15

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↑

STAMSON 5.0 NORMAL REPORT Date: 14-01-2020 09:53:25
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: REC23.te Time Period: Day/Night 16/8 hours
Description: Reception Point 2-3

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

Car traffic volume : 24288/2112 veh/TimePeriod *
Medium truck volume : 1932/168 veh/TimePeriod *
Heavy truck volume : 1380/120 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): 30000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

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

Angle1 Angle2 : 0.00 deg 77.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 20.00 / 20.00 m
Receiver height : 7.50 / 7.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

↑

Results segment # 1: McArthur (day)

Source height = 1.50 m

ROAD (0.00 + 65.21 + 0.00) = 65.21 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	77	0.48	71.49	0.00	-1.85	-4.43	0.00	0.00	0.00	65.21

Segment Leq : 65.21 dBA

Total Leq All Segments: 65.21 dBA

↑

Results segment # 1: McArthur (night)

Source height = 1.50 m

ROAD (0.00 + 57.62 + 0.00) = 57.62 dBA

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

0	77	0.48	63.89	0.00	-1.85	-4.43	0.00	0.00	0.00	57.62
---	----	------	-------	------	-------	-------	------	------	------	-------

Segment Leq : 57.62 dBA

Total Leq All Segments: 57.62 dBA

↑

TOTAL Leq FROM ALL SOURCES (DAY): 65.21

(NIGHT): 57.62

↑

↑

STAMSON 5.0 NORMAL REPORT Date: 14-01-2020 09:55:27
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: rec31.te Time Period: Day/Night 16/8 hours
Description: Reception Point 3-1

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

Car traffic volume : 24288/2112 veh/TimePeriod *
Medium truck volume : 1932/168 veh/TimePeriod *
Heavy truck volume : 1380/120 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): 30000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

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

Angle1 Angle2 : -80.00 deg 0.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 20.00 / 20.00 m
Receiver height : 1.50 / 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

↑

Results segment # 1: McArthur (day)

Source height = 1.50 m

ROAD (0.00 + 64.82 + 0.00) = 64.82 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-80	0	0.66	71.49	0.00	-2.07	-4.60	0.00	0.00	0.00	64.82

Segment Leq : 64.82 dBA

Total Leq All Segments: 64.82 dBA

↑

Results segment # 1: McArthur (night)

Source height = 1.50 m

ROAD (0.00 + 57.22 + 0.00) = 57.22 dBA

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

-80	0	0.66	63.89	0.00	-2.07	-4.60	0.00	0.00	0.00	57.22
-----	---	------	-------	------	-------	-------	------	------	------	-------

Segment Leq : 57.22 dBA

Total Leq All Segments: 57.22 dBA

↑

TOTAL Leq FROM ALL SOURCES (DAY): 64.82

(NIGHT): 57.22

↑

↑

STAMSON 5.0 NORMAL REPORT Date: 14-01-2020 09:59:02
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: rec33.te Time Period: Day/Night 16/8 hours
Description: Reception Point 3-3

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

Car traffic volume : 24288/2112 veh/TimePeriod *
Medium truck volume : 1932/168 veh/TimePeriod *
Heavy truck volume : 1380/120 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): 30000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

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

Angle1 Angle2 : -80.00 deg 0.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 20.00 / 20.00 m
Receiver height : 7.50 / 7.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

↑

Results segment # 1: McArthur (day)

Source height = 1.50 m

ROAD (0.00 + 65.30 + 0.00) = 65.30 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-80	0	0.48	71.49	0.00	-1.85	-4.34	0.00	0.00	0.00	65.30

Segment Leq : 65.30 dBA

Total Leq All Segments: 65.30 dBA

↑

Results segment # 1: McArthur (night)

Source height = 1.50 m

ROAD (0.00 + 57.71 + 0.00) = 57.71 dBA

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

-80	0	0.48	63.89	0.00	-1.85	-4.34	0.00	0.00	0.00	57.71
-----	---	------	-------	------	-------	-------	------	------	------	-------

Segment Leq : 57.71 dBA

Total Leq All Segments: 57.71 dBA

↑

TOTAL Leq FROM ALL SOURCES (DAY): 65.30

(NIGHT): 57.71

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APPENDIX 3

INDUSTRY STANDARDS

Insulating Glass (Table 2)

			Frequency in Hertz (Hz)																		
Glass Makeup			100	125	160	200	250	315	400	500	650	800	1000	1250	1600	2000	2500	3150	4000	5000	STC
Glass Ply	Air Space	Glass Ply	Sound Transmission Loss (dB)																		
1/8"	1/4"	1/8"	26	21	23	23	26	21	19	24	27	30	33	36	40	44	46	39	34	45	28
3 mm	6 mm	3 mm																			
1/8"	3/8"	1/8"	26	23	23	20	23	19	23	27	29	32	35	39	44	47	48	41	36	43	31
3 mm	9 mm	3 mm																			
1/4"	1/2"	1/4"	27	24	29	22	22	25	30	33	35	38	40	42	42	37	37	43	46	49	35
6 mm	13 mm	6 mm																			
1/4"	1/2"	5/16"	28	29	33	29	29	32	36	37	40	43	42	43	42	37	40	44	48	53	40
6 mm	13 mm	8 mm																			
1/4"	1/2"	3/8"	28	26	32	29	29	31	35	37	38	39	41	43	41	40	41	44	47	49	39
6 mm	13 mm	10 mm																			
5/16"	1/2"	5/16"	26	24	25	31	24	32	32	35	37	39	39	38	36	38	42	44	46	49	37
8 mm	13 mm	8 mm																			
1/4"	3/4"	1/4"	27	23	28	21	27	29	34	35	37	41	43	45	44	39	39	46	49	52	38
6 mm	19 mm	6 mm																			
1/4"	1"	1/4"	22	19	27	23	31	30	35	35	36	39	41	42	41	36	37	46	51	56	37
6 mm	25 mm	6 mm																			

Laminated Insulating Glass (Table 3)

					Frequency in Hertz (Hz)																			
Glass Makeup					100	125	160	200	250	315	400	500	650	800	1000	1250	1600	2000	2500	3150	4000	5000	STC	
Sound Transmission Loss (dB)																								
Glass Ply	Air Space	Glass Ply	PVB*	Glass Ply																				
3/16"	3/8"	1/8"	.030"	1/8"	27	27	26	24	22	28	32	35	38	38	39	40	42	43	41	45	52	57	37	
5 mm	9 mm	3 mm	.76 mm	3 mm																				
3/16"	1/2"	1/8"	.030"	1/8"	26	23	25	23	27	31	34	36	38	39	41	43	45	46	43	49	55	55	39	
5 mm	13 mm	3 mm	.76 mm	3 mm																				
1/4"	1/2"	1/8"	.030"	1/8"	28	20	29	24	26	30	34	36	39	42	43	44	44	41	40	47	52	56	39	
6 mm	13 mm	3 mm	.76 mm	3 mm																				
1/4"	1/2"	1/4"	.030"	1/8"	28	17	28	29	33	34	38	40	40	41	41	41	41	40	43	49	54	58	40	
6 mm	13 mm	6 mm	.76 mm	3 mm																				
1/4"	1/2"	3/16"	.060"	3/16"	30	29	31	28	31	34	37	39	41	42	44	46	45	44	47	52	55	60	42	
6 mm	13 mm	5 mm	1.52 mm	5 mm																				
1/4"	1/2"	1/4"	.030"	1/4"	31	29	32	30	32	35	38	40	40	42	44	46	47	46	47	52	56	61	43	
6 mm	13 mm	6 mm	.76 mm	6 mm																				
5/16"	5/8"	3/16"	.060"	3/16"	28	28	34	36	33	40	41	42	43	43	42	40	40	43	49	53	57	61	43	
8 mm	16 mm	5 mm	1.52 mm	5 mm																				
1/4"	3/4"	3/16"	.060"	3/16"	28	26	32	30	35	37	40	41	43	44	45	47	47	44	47	53	57	60	44	
6 mm	19 mm	5 mm	1.52 mm	5 mm																				
1/4"	3/4"	1/4"	.060"	1/4"	28	29	36	32	34	39	41	41	41	43	44	45	45	46	47	52	56	61	44	
6 mm	19 mm	6 mm	1.52 mm	6 mm																				
3/8"	3/4"	1/4"	.060"	1/4"	25	31	38	33	37	39	42	43	43	42	40	40	41	56	50	55	58	61	43	
10 mm	19 mm	6 mm	1.52 mm	6 mm																				

Data based on testing 36" x 84" glass in an acoustical wall. Glass size and glazing system will affect STC rating.

*PVB (polyvinyl butyral) interlayer

Wall & Floor Assembly Guide

Insulation for Sound & Fire Rated Assemblies

Sound Transmission Loss of Exterior Walls

<i>Exterior finish</i>	<i>Cavity Insulation</i>	<i>Resilient channel</i>	<i>STC</i>
Wood siding (1)	None	No	37
	3-1/2" PINK™ FIBERGLAS® Batt Insulation	No	39
	None	Yes	43
	3-1/2" PINK™ FIBERGLAS® Batt Insulation	Yes	47
Stucco (2)	3-1/2" PINK™ FIBERGLAS® Batt Insulation	No	46
	None	Yes	49
	3-1/2" PINK™ FIBERGLAS® Batt Insulation	Yes	57
Brick veneer (3)	3-1/2" PINK™ FIBERGLAS® Batt Insulation	No	56
	None	Yes	54
	3-1/2" PINK™ FIBERGLAS® Batt Insulation	Yes	58
Concrete block	None	No	45

Wall construction details

Wood siding (1)	Framing	2"x4" wood studs, (16" o.c.)
	Sheathing	1/2" wood fiberboard insulation nailed to studs
	Siding	5/8"x10" redwood nailed through sheathing into studs
	Interior	1/2" gypsum board screwed to studs or to metal resilient channels which were attached to the studs
Stucco (2)	Framing	2"x4" woods studs, (16" o.c.)
	Sheathing	None
	Stucco	No. 15 felt building and 1" wire mesh nailed to studs. Stucco Applied in 3 coats to 7/8" total thickness. Dry weight of Stucco 7.9 lb/sq ft
	Interior	1/2" gypsum board screwed to studs or resilient channel
Brick veneer (3)	Framing	2"x4" wood studs, (16" o.c.)
	Sheathing	3/4" wood fiberboard insulation
	Brick	standard face brick 3-1/2" wide, spaced 1/2" out from sheathing with metal ties nailed through sheathing into studs. Dry weight of brick and mortar 41 lb/sq ft .
	Interior	1/2" gypsum board screwed to studs or resilient channel

Taken from the U.S. Department of Commerce National Bureau of Standards Building Science Series 77.

* Information received in imperial units only