Environmental Noise Control Study

Proposed Residential Development

304 & 308 Donald Street
Ottawa, Ontario

Prepared for Upscale Homes

Report PG7090 - 1 - Dated June 7, 2024

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Appendices

1.0 Introduction

Paterson Group (Paterson) was commissioned by Upscale Homes to conduct an environmental noise control study for the proposed residential development to be located at 304 and 308 Donald Street 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 residential development as they are understood at the time of writing this report.

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

2.0 Proposed Development

It is understood that the proposed residential development will consist of a multi-storey residential dwelling. Associated parking areas and landscaped areas are also anticipated as a part of the proposed residential development.

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 the 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 below 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
I. 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
Theatres, places 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
I. 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."
I. 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 proposed residential development is not in proximity to any existing or approved stationary sources of noise. Therefore, a stationary noise analysis will not be required with respect to off-site stationary noise sources impacting the proposed development.

However, if exterior noise-generating equipment is required for the proposed residential development a stationary noise study will be required. If required the stationary noise study with respect to these new noise sources will be completed under a separate cover

Aircraft/Airport Noise

The subject site is not located within the Airport Vicinity Development Zone. Therefore, this project will not require an aircraft/airport noise analysis. No warning clauses regarding aircraft or airport noise will be required.

4.0 Analysis

Surface Transportation Noise

The subject site is currently two property parcels each occupied by an existing 2-storey residential dwelling. Donald Street borders the subject site to the north, Edith Avenue to the west, and Lola Street to the east. An Ottawa transit bus route, Donald Street and Edith Street were identified within the 100 m radius of the proposed residential development.

Based on the new City of Ottawa Official Plan, Schedule F, Donald Street is considered a 2-lane Urban Collector Road (2-UCU). Other roads within the 100 m radius of the proposed residential development are not classified as either arterial, collector or major collector roads and therefore are not included in this study.

All noise sources are presented in Drawing PG7090-1-Site Geometry located in Appendix 1.

The noise levels from road traffic are provided by the City of Ottawa which takes 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. Based on City of Ottawa transit schedules the bus route along Donald Street will have approximately 70 buses daily. However, the modelling software does not allow for an AADT lower than 4100. Therefore, to complete the study an AADT of 4100 was used.

Table 4 - Traffic and Road Parameters

Road	Implied Roadway	AADT (Veh/day)	Posted Speed (km/h)	Day/Night Split %	Medium Truck %	Heavy Truck %
Donald Street	2-UCU	8,000	50	92/8	7	5
Ottawa Transit Bus Route #19	n/a	4,100	50	92/8	90	10
Data obtained from the City of Ottawa document ENCG or City of Ottawa Officials						

Two (2) levels of reception points were selected for this analysis. The following elevations were selected from the heights provided on the survey plan for the subject buildings.

Table 5 - Elevation of Reception Points			
Floor Number	**Elevation at the Centre of Window / Ground Surface (m)**	**Floor Use**	**Daytime/Nighttime Analysis**
Ground Floor	1.5	Living Area/Bedroom	Daytime/nighttime
Third Floor	7.5	Living Area/Bedroom	Daytime/nighttime

For this analysis, a reception point was taken at the centre of each floor at the ground floor and third floor of the structure. Reception points are detailed in Drawing PG7090-2-Receptor Locations presented in Appendix 1.

All horizontal distances have been measured from the reception point to the edge of the right-of-way. The roadways were analysed where they intersected the 100m buffer zone, which is reflected in the local angles described in Paterson Drawings PG7090-3A to 3C-Site Geometry in Appendix 1.

Table 8 - Summary of Reception Points and Geometry, located in Appendix 1, provides a summary of the points of reception and their geometry concerning the noise sources. The analysis is completed so that no effects of sound reflection off the building facade are considered, as stipulated by the ENGC. It should be noted that one receptor is assigned to the side of the building affected by noise. There is one noise source: Donald Street. The anticipated noise at each receptor represents the worst-case scenario for the residential building.

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.

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

5.0 Results

Surface Transportation

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

The proposed traffic noise levels were analysed at all reception points. The results of the STAMSON software are located in Appendix 2, and the summary of the results is noted in Table 6 below.

Table 6– Proposed Noise Levels

Reception Point	Description	OLA (dBA)	Daytime at Facade $L_{eq(16)}$ (dBA)	Nighttime at Facade $L_{eq(8)}$ (dBA)
REC 1-1	1st Floor – Western Elevation	-	62.16	54.56
REC 1-3	3rd Floor – Western Elevation	-	62.80	55.21
REC 2-1	1st Floor – Northern Elevation	-	64.13	56.54
REC 2-3	3rd Floor – Northern Elevation	-	67.72	60.13
REC 3-1	1st Floor – Eastern Elevation	-	62.16	54.56
REC 3-3	3rd Floor – Eastern Elevation	-	62.80	55.21

6.0 Discussion and Recommendations

6.1 Outdoor Living Areas

No outdoor living areas were identified as part of the proposed residential development.

6.2 Indoor Living Areas and Ventilation

The results of the STAMSON modelling indicate that the $L_{eq(16)}$ ranges between 62.16 dBA and 67.72 dBA. Some of the values calculated exceed the limit of 55 dBA and 65 dBA as specified by the ENGCC and therefore warning clauses will be required to be stated on any deeds of sale. To remain conservative as the noise levels exceeded 60 dBA Warning Clause D will be required for the proposed residential development and is summarized in Table 7 below.

Table 7 - Summary of Warning Clauses – Indoor Living Areas

Building	Elevation	Floor	Applicable Warning Clause	Additional Considerations
804 & 808 Donald Street	Northern, Eastern and Western	All	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.

Various receptors as noted exceed the 65 dBA threshold for noise. Therefore, an analysis of the building materials will be required. However, at this time the building materials and exterior wall construction details have not been finalized. Therefore, a review of the proposed building materials will need to be completed.

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 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.**

A review of industry standards for construction materials indicates that as long as the exterior claddings of all units within the residential building consist of brick or concrete panels and that all windows consist of double-pane glass, these materials have an STC rating of greater than 33 and are considered acceptable. If alternative materials are to be utilized, then a review will need to be completed once design details are finalized.

7.0 Summary of Findings

The subject site is located at 804 & 808 Donald Street, in the City of Ottawa. It is understood that the proposed residential development will consist of a multi-storey residential building. The associated analysis identified two surface transportation noise sources: Donald Street and an Ottawa Transit Bus Route.

Several reception points were selected for the analysis, consisting of panes of glass reception points on both the first and top levels.

All receptors on the east and western sides of the proposed residential building exceeded the 55 dBA guideline and 65 dBA guideline specified by the ENGCC and will require Warning Clause Type D for all units.

All warning clauses are reiterated below and are to be included on all Offers of Purchase and Sale:

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.”

A review of industry standards for construction materials indicates that, provided the exterior claddings of all units of the proposed residential building consist of brick or concrete panels and that all windows consist of double-pane glass, these materials have an STC rating of greater than 33 and are considered acceptable.

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 Upscale Homes 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.

Otillia McLaughlin, B.Eng. Stephanie A. Boisvenue, P.Eng.

Report Distribution:

- ❑ Upscale Homes
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APPENDIX 1

TABLE 8 – SUMMARY OF RECEPTION POINTS AND GEOMETRY

DRAWING PG7080-1-SITE PLAN

DRAWING PG7090-2-RECEPTOR LOCATION PLAN

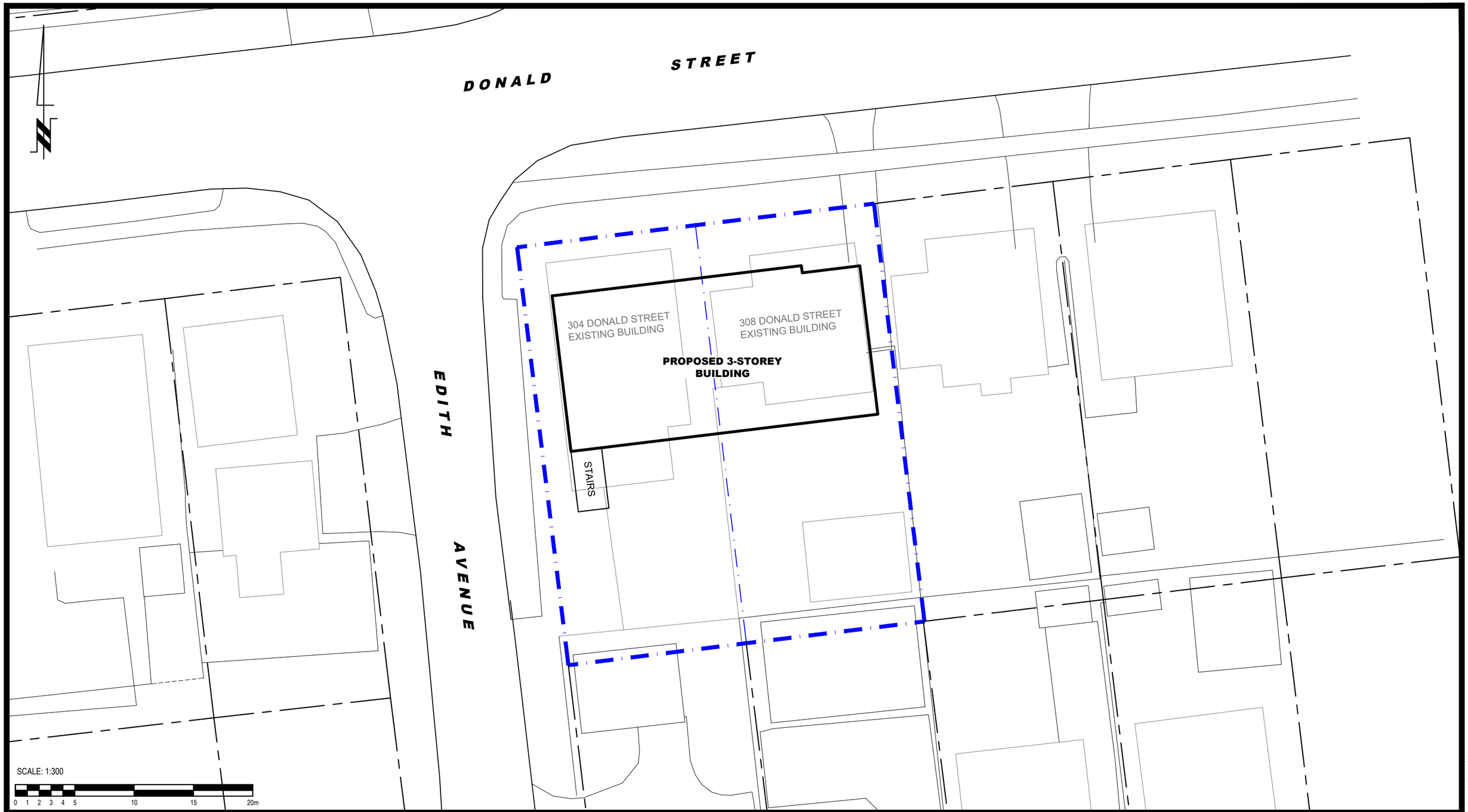
DRAWING PG7090-3-SITE GEOMETRY

DRAWING PG7090-3A-SITE GEOMETRY (REC 1-1 and REC 1-3)

DRAWING PG7090-3B-SITE GEOMETRY (REC 2-1 and REC 2-3)

DRAWING PG7090-3C-SITE GEOMETRY (REC 3-1 and REC 3-3)

Table 8 - Summary of Reception Points and Geometry											
Proposed Residential Development - 304 & 308 Donald Street											
Point of Reception	Location	Total Leq Day (dBA)	Total Leq Night (dBA)	Donald Street				Ottawa Transit Bus Route # 19			
				Horizontal (m)	Vertical (m)	Total (m)	Local Angle (degree)	Horizontal (m)	Vertical (m)	Total (m)	Local Angle (degree)
REC 1-1	1st Floor - Eastern Elevation	62.16	54.56	25	1.5	25.04	-77, 0	25	1.5	25.04	-77, 0
REC 1-3	3rd Floor - Eastern Elevation	62.80	55.21	25	7.5	26.1	-77, 0	25	7.5	26.1	-77, 0
REC 2-1	1st Floor - Northern Elevation	64.13	56.54	19	1.5	19.06	-82, 82	19	1.5	19.06	-82, 82
REC 2-3	3rd Floor - Northern Elevation	67.72	60.13	19	7.5	20.43	-82, 82	19	7.5	20.43	-82, 82
REC 3-1	1st Floor - Western Elevation	62.16	54.56	25	1.5	25.04	0, 77	25	1.5	25.04	0, 77
REC 3-3	3rd Floor - Western Elevation	62.80	55.21	25	7.5	26.1	0, 77	25	7.5	26.1	0, 77



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NO.	REVISIONS	DATE	INITIAL

UPSCALE HOMES
NOISE ATTENUATION STUDY
PROPOSED RESIDENTIAL DEVELOPMENT
304 & 308 DONALD STREET
OTTAWA, ONTARIO

Title:
SITE PLAN

Scale: 1:300	Date: 04/2024
Drawn by: YA	Report No.: PG7090-1
Checked by: OM	Dwg. No.: PG7090-1
Approved by: SB	Revision No.:

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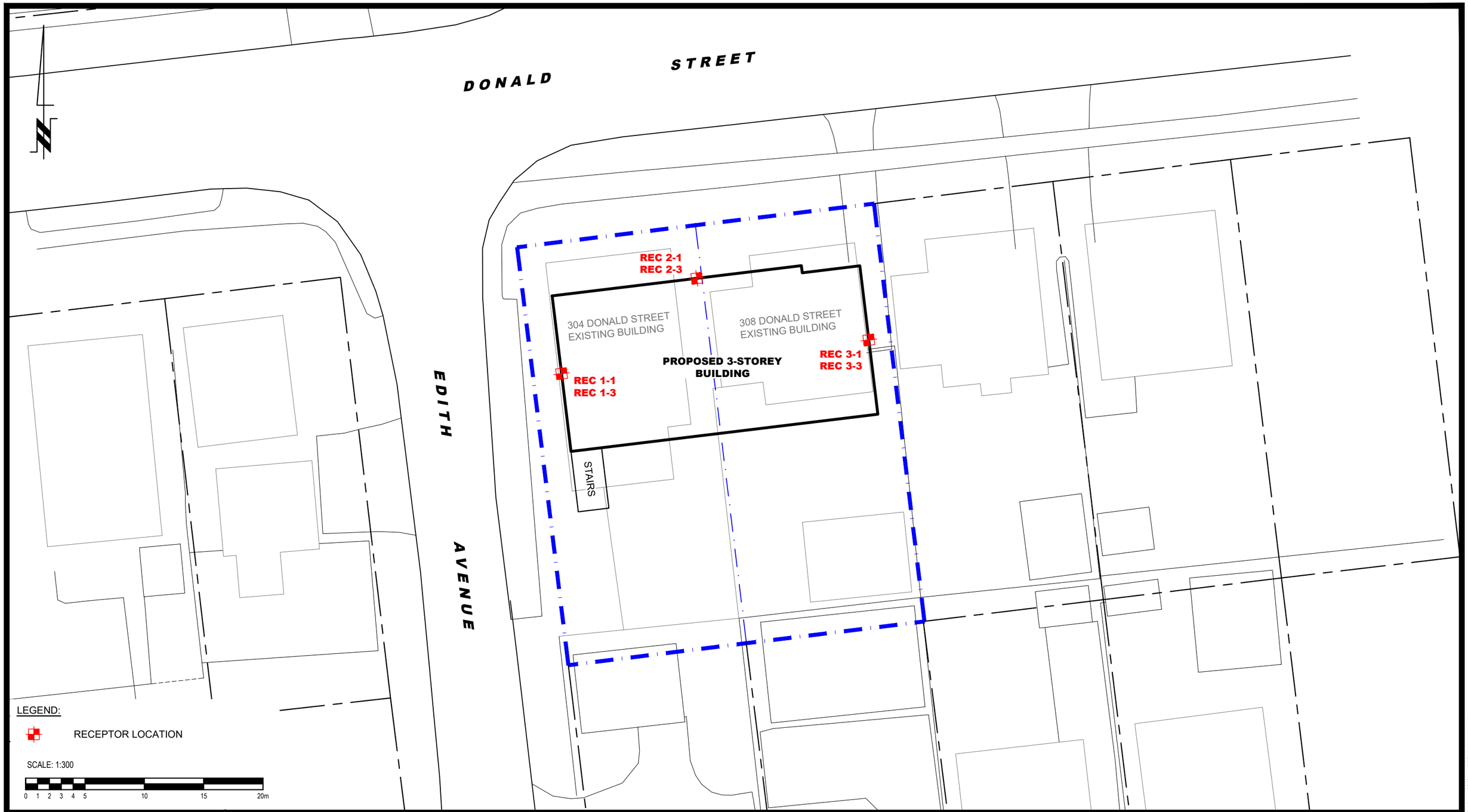

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NO.	REVISIONS	DATE	INITIAL

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PROPOSED RESIDENTIAL DEVELOPMENT
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OTTAWA, ONTARIO

Title:
RECEPTOR LOCATION PLAN

Scale: 1:300	Date: 04/2024
Drawn by: YA	Report No.: PG7090-1
Checked by: OM	Dwg. No.: PG7090-2
Approved by: SB	Revision No.:

11x17

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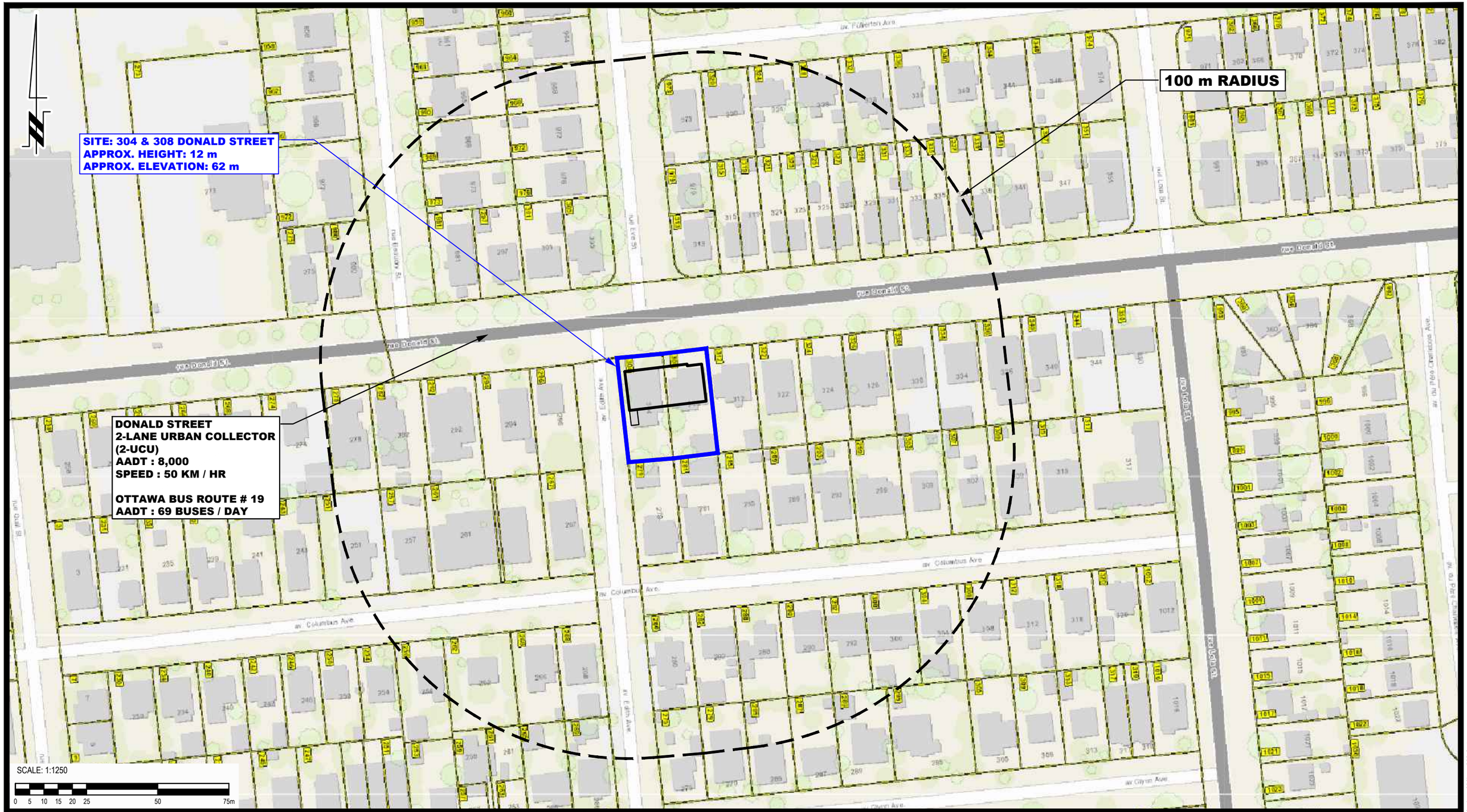

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Title:
SITE GEOMETRY

Scale: 1:1250	Date: 04/2024
Drawn by: YA	Report No.: PG7090-1
Checked by: OM	Dwg. No.: PG7090-3
Approved by: SB	Revision No.:

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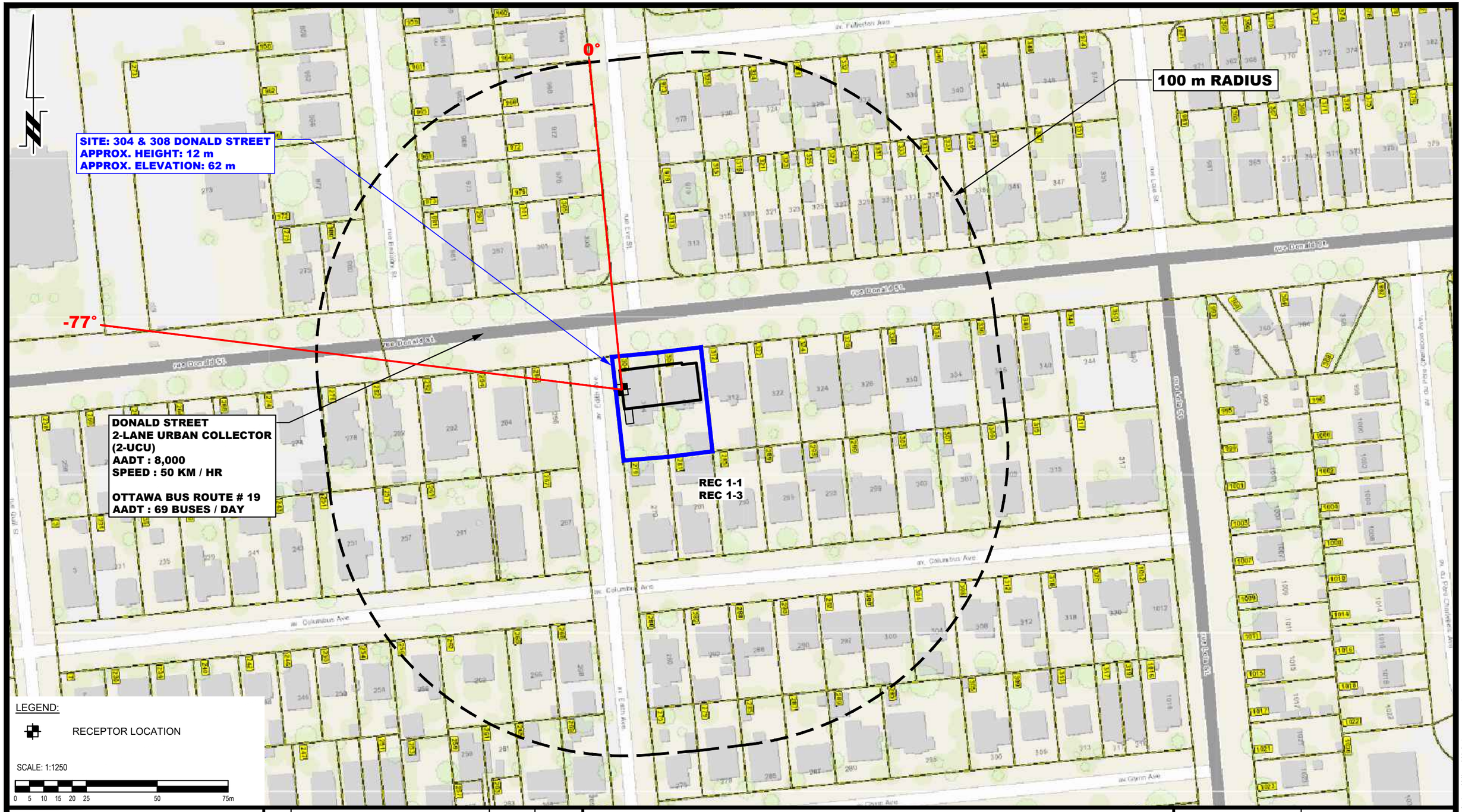

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Title:
SITE GEOMETRY - REC 1-1 AND REC 1-3

Scale: 1:1250	Date: 04/2024
Drawn by: YA	Report No.: PG7090-1
Checked by: OM	Dwg. No.: PG7090-3A
Approved by: SB	Revision No.:

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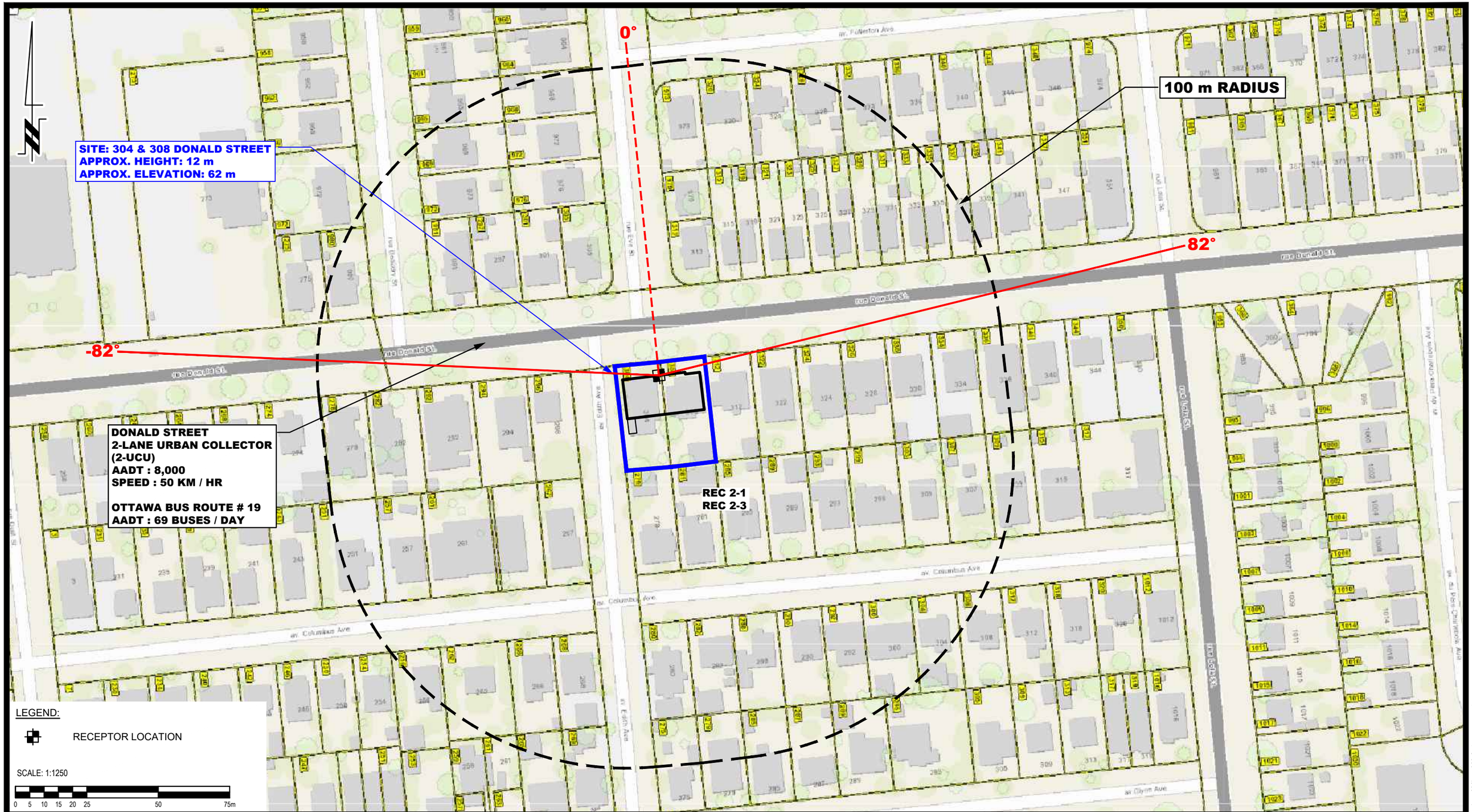

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Title:
SITE GEOMETRY - REC 2-1 AND REC 2-3

Scale: 1:1250	Date: 04/2024
Drawn by: YA	Report No.: PG7090-1
Checked by: OM	Dwg. No.: PG7090-3B
Approved by: SB	Revision No.:

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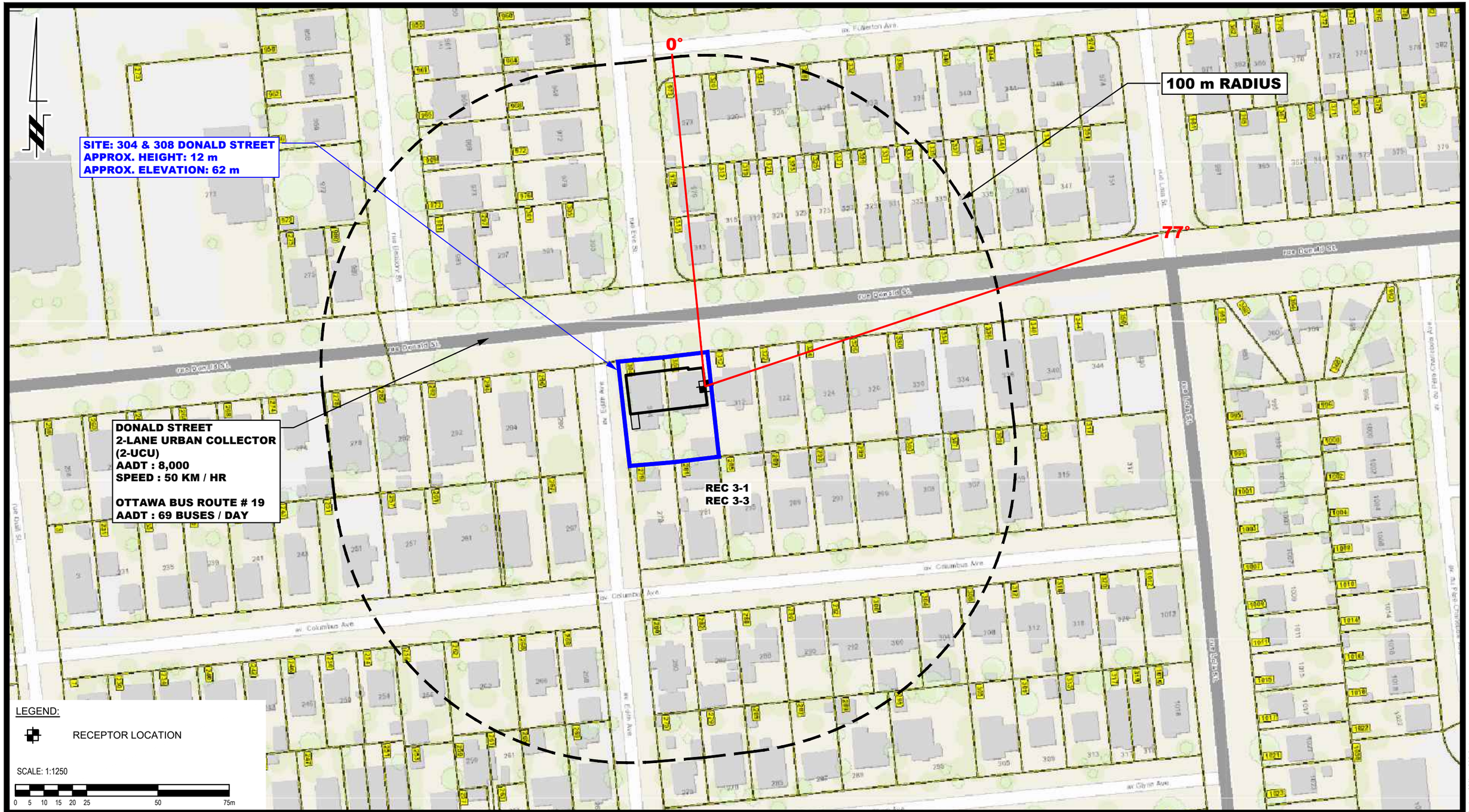

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Title:
SITE GEOMETRY - REC 3-1 AND REC 3-3

Scale: 1:1250	Date: 04/2024
Drawn by: YA	Report No.: PG7090-1
Checked by: OM	Dwg. No.: PG7090-3C
Approved by: SB	Revision No.:

11x17

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APPENDIX 2

STAMSON RESULTS

STAMSON 5.0 NORMAL REPORT Date: 16-04-2024 13:31:10
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: rec11.te Time Period: Day/Night 16/8 hours
Description: REC 1-1 Western Elevation

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

Car traffic volume : 6477/563 veh/TimePeriod *
Medium truck volume : 515/45 veh/TimePeriod *
Heavy truck volume : 368/32 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): 8000
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: Donald St (day/night)

Angle1 Angle2 : -77.00 deg 0.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 25.00 / 25.00 m
Receiver height : 1.50 / 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

↑
Road data, segment # 2: Bus Route 19 (day/night)

Car traffic volume : 0/0 veh/TimePeriod *
Medium truck volume : 3395/295 veh/TimePeriod *
Heavy truck volume : 377/33 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): 4100
Percentage of Annual Growth : 0.00

```
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :  90.00
    Heavy Truck  % of Total Volume     :  10.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 2: Bus Route 19 (day/night)
------------------------------------------------
Angle1   Angle2           : -77.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  25.00 / 25.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

↟

```
Results segment # 1: Donald St (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 57.40 + 0.00) = 57.40 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -77      0   0.66  65.75   0.00  -3.68  -4.67   0.00   0.00   0.00  57.40
-------------------------------------------------------------------------------

Segment Leq : 57.40 dBA
```

↟

```
Results segment # 2: Bus Route 19 (day)
---------------------------------------

Source height = 1.78 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
-------------------------------------------------------------------------------
   -77      0   0.65  68.72   0.00  -3.66  -4.66   0.00   0.00   0.00  60.39
-------------------------------------------------------------------------------

Segment Leq : 60.39 dBA

Total Leq All Segments: 62.16 dBA
```

↟

```
Results segment # 1: Donald St (night)
-------------------------------------
```

Source height = 1.50 m

ROAD (0.00 + 49.80 + 0.00) = 49.80 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-77	0	0.66	58.16	0.00	-3.68	-4.67	0.00	0.00	0.00	49.80

Segment Leq : 49.80 dBA

Results segment # 2: Bus Route 19 (night)

Source height = 1.78 m

ROAD (0.00 + 52.80 + 0.00) = 52.80 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-77	0	0.65	61.13	0.00	-3.66	-4.66	0.00	0.00	0.00	52.80

Segment Leq : 52.80 dBA

Total Leq All Segments: 54.56 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 62.16
(NIGHT): 54.56

STAMSON 5.0 NORMAL REPORT Date: 16-04-2024 13:23:01
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: rec13.te Time Period: Day/Night 16/8 hours
Description: REC 1-3 Western Elevation

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

Car traffic volume : 6477/563 veh/TimePeriod *
Medium truck volume : 515/45 veh/TimePeriod *
Heavy truck volume : 368/32 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): 8000
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: Donald St (day/night)

Angle1 Angle2 : -77.00 deg 0.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 25.00 / 25.00 m
Receiver height : 7.50 / 7.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

↑
Road data, segment # 2: Bus Route 19 (day/night)

Car traffic volume : 0/0 veh/TimePeriod *
Medium truck volume : 3395/295 veh/TimePeriod *
Heavy truck volume : 377/33 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): 4100
Percentage of Annual Growth : 0.00

```
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :  90.00
    Heavy Truck  % of Total Volume     :  10.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 2: Bus Route 19 (day/night)
------------------------------------------------
Angle1   Angle2           : -77.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  25.00 / 25.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

↟

```
Results segment # 1: Donald St (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 58.04 + 0.00) = 58.04 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -77      0   0.48  65.75   0.00  -3.28  -4.43   0.00   0.00   0.00  58.04
-------------------------------------------------------------------------------

Segment Leq : 58.04 dBA
```

↟

```
Results segment # 2: Bus Route 19 (day)
--------------------------------------

Source height = 1.78 m

ROAD (0.00 + 61.04 + 0.00) = 61.04 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -77      0   0.47  68.72   0.00  -3.26  -4.42   0.00   0.00   0.00  61.04
-------------------------------------------------------------------------------

Segment Leq : 61.04 dBA

Total Leq All Segments: 62.80 dBA
```

↟

```
Results segment # 1: Donald St (night)
-------------------------------------
```

Source height = 1.50 m

ROAD (0.00 + 50.45 + 0.00) = 50.45 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-77	0	0.48	58.16	0.00	-3.28	-4.43	0.00	0.00	0.00	50.45

Segment Leq : 50.45 dBA

Results segment # 2: Bus Route 19 (night)

Source height = 1.78 m

ROAD (0.00 + 53.45 + 0.00) = 53.45 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-77	0	0.47	61.13	0.00	-3.26	-4.42	0.00	0.00	0.00	53.45

Segment Leq : 53.45 dBA

Total Leq All Segments: 55.21 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 62.80
(NIGHT): 55.21

STAMSON 5.0 NORMAL REPORT Date: 16-04-2024 13:21:17
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: rec21.te Time Period: Day/Night 16/8 hours
Description: REC 2-1 Northern Elevation

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

Car traffic volume : 6477/563 veh/TimePeriod *
Medium truck volume : 515/45 veh/TimePeriod *
Heavy truck volume : 368/32 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): 8000
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: Donald St (day/night)

Angle1 Angle2 : -77.00 deg 0.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 19.00 / 19.00 m
Receiver height : 1.50 / 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

↑
Road data, segment # 2: Bus Route 19 (day/night)

Car traffic volume : 0/0 veh/TimePeriod *
Medium truck volume : 3395/295 veh/TimePeriod *
Heavy truck volume : 377/33 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): 4100
Percentage of Annual Growth : 0.00

```
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :  90.00
    Heavy Truck  % of Total Volume     :  10.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 2: Bus Route 19 (day/night)
------------------------------------------------
Angle1   Angle2           : -77.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  19.00 / 19.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

↟

```
Results segment # 1: Donald St (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 59.38 + 0.00) = 59.38 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -77      0   0.66  65.75   0.00  -1.70  -4.67   0.00   0.00   0.00  59.38
-------------------------------------------------------------------------------

Segment Leq : 59.38 dBA
```

↟

```
Results segment # 2: Bus Route 19 (day)
---------------------------------------

Source height = 1.78 m

ROAD (0.00 + 62.36 + 0.00) = 62.36 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -77      0   0.65  68.72   0.00  -1.70  -4.66   0.00   0.00   0.00  62.36
-------------------------------------------------------------------------------

Segment Leq : 62.36 dBA

Total Leq All Segments: 64.13 dBA
```

↟

```
Results segment # 1: Donald St (night)
-------------------------------------
```

Source height = 1.50 m

ROAD (0.00 + 51.78 + 0.00) = 51.78 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-77	0	0.66	58.16	0.00	-1.70	-4.67	0.00	0.00	0.00	51.78

Segment Leq : 51.78 dBA

↟
Results segment # 2: Bus Route 19 (night)

Source height = 1.78 m

ROAD (0.00 + 54.77 + 0.00) = 54.77 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-77	0	0.65	61.13	0.00	-1.70	-4.66	0.00	0.00	0.00	54.77

Segment Leq : 54.77 dBA

Total Leq All Segments: 56.54 dBA

↟

TOTAL Leq FROM ALL SOURCES (DAY): 64.13
(NIGHT): 56.54

↟
↟

STAMSON 5.0 NORMAL REPORT Date: 16-04-2024 13:20:32
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: rec23.te Time Period: Day/Night 16/8 hours
Description: REC 2-3 Northern Elevation

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

Car traffic volume : 6477/563 veh/TimePeriod *
Medium truck volume : 515/45 veh/TimePeriod *
Heavy truck volume : 368/32 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): 8000
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: Donald St (day/night)

Angle1 Angle2 : -82.00 deg 82.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 19.00 / 19.00 m
Receiver height : 7.50 / 7.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

↑
Road data, segment # 2: Bus Route 19 (day/night)

Car traffic volume : 0/0 veh/TimePeriod *
Medium truck volume : 3395/295 veh/TimePeriod *
Heavy truck volume : 377/33 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): 4100
Percentage of Annual Growth : 0.00

```
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :  90.00
    Heavy Truck  % of Total Volume     :  10.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 2: Bus Route 19 (day/night)
------------------------------------------------
Angle1   Angle2           : -82.00 deg   82.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  19.00 / 19.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

↟

```
Results segment # 1: Donald St (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 62.96 + 0.00) = 62.96 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -82     82   0.48  65.75   0.00  -1.52  -1.27   0.00   0.00   0.00  62.96
-------------------------------------------------------------------------------

Segment Leq : 62.96 dBA
```

↟

```
Results segment # 2: Bus Route 19 (day)
---------------------------------------

Source height = 1.78 m

ROAD (0.00 + 65.95 + 0.00) = 65.95 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -82     82   0.47  68.72   0.00  -1.51  -1.26   0.00   0.00   0.00  65.95
-------------------------------------------------------------------------------

Segment Leq : 65.95 dBA

Total Leq All Segments: 67.72 dBA
```

↟

```
Results segment # 1: Donald St (night)
-------------------------------------
```

Source height = 1.50 m

ROAD (0.00 + 55.37 + 0.00) = 55.37 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-82	82	0.48	58.16	0.00	-1.52	-1.27	0.00	0.00	0.00	55.37

Segment Leq : 55.37 dBA

↟

Results segment # 2: Bus Route 19 (night)

Source height = 1.78 m

ROAD (0.00 + 58.36 + 0.00) = 58.36 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-82	82	0.47	61.13	0.00	-1.51	-1.26	0.00	0.00	0.00	58.36

Segment Leq : 58.36 dBA

Total Leq All Segments: 60.13 dBA

↟

TOTAL Leq FROM ALL SOURCES (DAY): 67.72
(NIGHT): 60.13

↟

↟

STAMSON 5.0 NORMAL REPORT Date: 16-04-2024 13:19:19
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: rec31.te Time Period: Day/Night 16/8 hours
Description: REC 3-1 Eastern Elevation

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

Car traffic volume : 6477/563 veh/TimePeriod *
Medium truck volume : 515/45 veh/TimePeriod *
Heavy truck volume : 368/32 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): 8000
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: Donald St (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 : 25.00 / 25.00 m
Receiver height : 1.50 / 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

↑
Road data, segment # 2: Bus Route 19 (day/night)

Car traffic volume : 0/0 veh/TimePeriod *
Medium truck volume : 3395/295 veh/TimePeriod *
Heavy truck volume : 377/33 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): 4100
Percentage of Annual Growth : 0.00

```
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :  90.00
    Heavy Truck  % of Total Volume     :  10.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 2: Bus Route 19 (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  :  25.00 / 25.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

↟

```
Results segment # 1: Donald St (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 57.40 + 0.00) = 57.40 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     77   0.66  65.75   0.00  -3.68  -4.67   0.00   0.00   0.00  57.40
-------------------------------------------------------------------------------

Segment Leq : 57.40 dBA
```

↟

```
Results segment # 2: Bus Route 19 (day)
---------------------------------------

Source height = 1.78 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
-------------------------------------------------------------------------------
     0     77   0.65  68.72   0.00  -3.66  -4.66   0.00   0.00   0.00  60.39
-------------------------------------------------------------------------------

Segment Leq : 60.39 dBA

Total Leq All Segments: 62.16 dBA
```

↟

```
Results segment # 1: Donald St (night)
-------------------------------------
```

Source height = 1.50 m

ROAD (0.00 + 49.80 + 0.00) = 49.80 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	77	0.66	58.16	0.00	-3.68	-4.67	0.00	0.00	0.00	49.80

Segment Leq : 49.80 dBA

Results segment # 2: Bus Route 19 (night)

Source height = 1.78 m

ROAD (0.00 + 52.80 + 0.00) = 52.80 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	77	0.65	61.13	0.00	-3.66	-4.66	0.00	0.00	0.00	52.80

Segment Leq : 52.80 dBA

Total Leq All Segments: 54.56 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 62.16
(NIGHT): 54.56

STAMSON 5.0 NORMAL REPORT Date: 16-04-2024 13:18:23
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: rec33.te Time Period: Day/Night 16/8 hours
Description: REC 3-3 Eastern Elevation

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

Car traffic volume : 6477/563 veh/TimePeriod *
Medium truck volume : 515/45 veh/TimePeriod *
Heavy truck volume : 368/32 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): 8000
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: Donald St (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 : 25.00 / 25.00 m
Receiver height : 7.50 / 7.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

↑
Road data, segment # 2: Bus Route 19 (day/night)

Car traffic volume : 0/0 veh/TimePeriod *
Medium truck volume : 3395/295 veh/TimePeriod *
Heavy truck volume : 377/33 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): 4100
Percentage of Annual Growth : 0.00

```
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :  90.00
    Heavy Truck  % of Total Volume     :  10.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 2: Bus Route 19 (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  :  25.00 / 25.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

↟

```
Results segment # 1: Donald St (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 58.04 + 0.00) = 58.04 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     77   0.48  65.75   0.00  -3.28  -4.43   0.00   0.00   0.00  58.04
-------------------------------------------------------------------------------

Segment Leq : 58.04 dBA
```

↟

```
Results segment # 2: Bus Route 19 (day)
--------------------------------------

Source height = 1.78 m

ROAD (0.00 + 61.04 + 0.00) = 61.04 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     77   0.47  68.72   0.00  -3.26  -4.42   0.00   0.00   0.00  61.04
-------------------------------------------------------------------------------

Segment Leq : 61.04 dBA

Total Leq All Segments: 62.80 dBA
```

↟

```
Results segment # 1: Donald St (night)
-------------------------------------
```

Source height = 1.50 m

ROAD (0.00 + 50.45 + 0.00) = 50.45 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	77	0.48	58.16	0.00	-3.28	-4.43	0.00	0.00	0.00	50.45

Segment Leq : 50.45 dBA

Results segment # 2: Bus Route 19 (night)

Source height = 1.78 m

ROAD (0.00 + 53.45 + 0.00) = 53.45 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	77	0.47	61.13	0.00	-3.26	-4.42	0.00	0.00	0.00	53.45

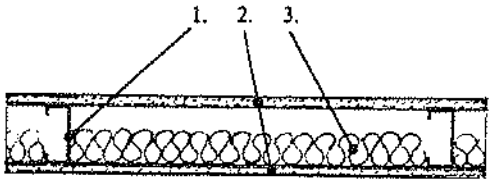
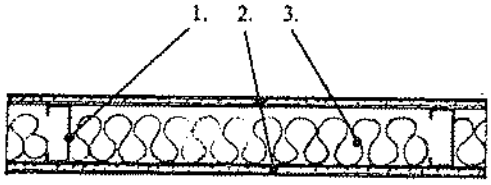
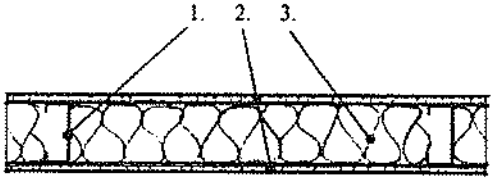
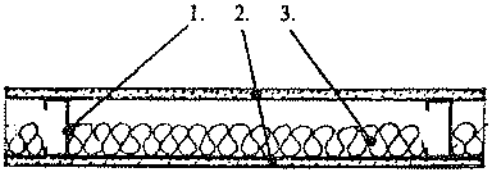
Segment Leq : 53.45 dBA

Total Leq All Segments: 55.21 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 62.80
(NIGHT): 55.21

APPENDIX 3

BUILDING MATERIALS INDUSTRY STANDARDS

Sketch	Brief Description	...	Laboratory Test Number Year Frequencies Tested Source of Data	STC	Section Number
	1. 3 5/8" metal studs, 24"o.c. 2. 5/8" gypsum board screwed to studs. 3. 2" thick sound attenuation blanket.	...	National Research Council of Canada NRC #66 1968 16f National Research Council of Canada	47	1.3.3.1.5.7
	1. 3 5/8" metal studs, 24"o.c. 2. 5/8" type X gypsum board screwed to studs. 3. 3" thick sound attenuation blanket.	...	Owens/Corning Fiberglas OCF 469 1967 16f Owens/Corning Fiberglas	44	1.3.3.1.5.8
	1. 3 5/8" metal studs, 24"o.c. 2. 5/8" gypsum board screwed to studs. 3. 4" thick sound attenuation blanket compressed to fit in stud space.	...	National Research Council of Canada NRC #66 1968 16f National Research Council of Canada	45	1.3.3.1.5.9
	1. 3 5/8" metal studs, 24"o.c. 2. 5/8" type X gypsum board spot-laminated to studs with daubs of adhesive 12"o.c. drywall screws at third points along joints and ends. 3. 2" thick sound attenuation blanket.	...	Riverbank Acoustical Labs. TL66-253 1966 16f Celotex Corp.	51	1.3.3.1.5.10