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Environmental Noise Control Study

Proposed Residential Building
347 Gilmour Street and
278-282 O'Connor Street, Ottawa

Prepared For

AK Global Construction

July 29, 2019

Report: PG4829-1R

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Appendices

1.0 Introduction

Paterson Group (Paterson) was commissioned by AK Global Construction to conduct an environmental noise control study for the proposed residential building to be located at 347 Gilmour Street and 278-282 O'Connor 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 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 six-storey building with an outdoor living area identified at the rear of the proposed building.

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

❏ 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
❑ 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."
❑ 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.

A stationary noise analysis is not applicable for this development.

Aircraft/Airport Noise

Due to the location of the proposed development, an aircraft/airport noise analysis will not be required.

4.0 Analysis

4.1 Surface Transportation Noise

The proposed development is bordered to the east by O'Connor Street, to the south by Gilmour Street, and to the west and north by existing residential buildings. O'Connor Street, Gilmour Street, Derby Place, Lewis Street, and MacLaren Street are located within the 100 m buffer zone.

Based on the City of Ottawa Official Plan, Schedule F, O'Connor Street is considered a 2 lane urban arterial road (2-UAU). All other roads within the 100 m radius are not classified as either arterial, collector or major collector road and therefore are not included in this study. Additionally, the provincial highway 417 is outside of the 500 m radius from the proposed building. All noise sources are presented in Drawing PG4829-1B to 1E - Site Geometry, located in Appendix 1.

It is understood that the proposed development will consist of a nine-storey residential building. Reception points were selected on every elevation exposed to O'Connor Street at the first floor and ninth floor in addition to the outdoor living area at the rear of the proposed building.

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 4 - Traffic and Road Parameters

Road	Implied Roadway	AADT (Veh/day)	Posted Speed (km/h)	Day/Night Split %	Medium Truck %	Heavy Truck %
O'Connor Street	2-UAU	15000	60	92/8	7	5

❑ 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 5 - 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
Sixth floor	19.5	Living and sleeping quarters	nighttime/nighttime

For this analysis, a reception point was taken at the centre of the predetermined floors. Reception points are noted on Drawing PG4829-2 - 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 PG4829-1B to 1E - Site Geometry in Appendix 1.

Table 8 - 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 ENGC.

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

5.1 Surface Transportation Noise

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 are presented in Appendix 2, and the summary of the results are detailed in Table 7 below.

Table 6 - Proposed Noise Levels

Reception Point	Description	Daytime at Facade $L_{EQ(16)}$ (dBA)	Nighttime at Facade $L_{EQ(16)}$ (dBA)	Outdoor Living Area $L_{EQ(16)}$ (dBA)
REC 1-1	Northern elevation, first floor	56.09	48.50	--
REC 1-6	Northern elevation, sixth floor	57.58	49.98	--
REC 2-1	Eastern elevation, first floor	65.16	57.56	--
REC 2-6	Eastern elevation, sixth floor	66.09	58.49	--
REC 3-1	Southern elevation, first floor	55.80	48.20	--
REC 3-6	Southern elevation, sixth floor	57.62	50.12	--
REC 4	Outdoor Living Area	--	--	57.73

6.0 Discussion and Recommendations

6.1 Outdoor Living Areas

The outdoor living area located at the rear of the proposed building was analyzed without any building affects. The results of the STAMSON modeling indicates that the maximum $L_{eq(16)}$ from all sources will be 57.73 dBA. This value is above the 55 dBA that was specified in Table 1, and therefore additional noise mitigation measures will be required.

It is assumed that the outdoor living area will only be utilized as an outdoor living area provided that the proposed building is constructed. Therefore, the analysis was completed again utilizing the proposed building as a noise barrier. The maximum $L_{eq(16)}$ from all sources will be 54.79 dBA. The STAMSON results for this analysis is located in Appendix 2.

Provided that the outdoor living area is in operation following the completion of the proposed building, no additional mitigation measures are required.

6.2 Indoor Living Areas and Ventilation

The results of the STAMSON modeling indicates that the daytime $L_{eq(16)}$ ranges between 55.80 dBA and 66.06 dBA. The ENGC states that the limits for the exterior of the pane of glass is 55 dBA. This value was exceeded on the north, south and east elevations of the buildings. Therefore, all units on the northern and southern elevations are be designed with a provision to install a central air conditioning unit in the future and all units on the eastern elevation will require the installation of a central air conditioning unit. Additionally, warning clause Type C, as outlined in Table 3, is also recommended for units on the northern and southern elevation, and the warning clause Type D is recommended for the eastern elevation.

As detailed in Table 7, where the daytime sound level at the plane of the window exceeds 65 dBA on the eastern elevation, noise control measures should be implemented. The following table outlines the MOECC recommended options for sound mitigation and the respected responses.

Table 7 - 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 buildings are 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 buildings. The effectiveness of the noise insulation can be expressed as the Acoustical Insulation Factor (AIF), calculated as follows:

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

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 26 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 29 or higher, this would be a sufficient noise attenuation device.**

AK Global Construction provided the following exterior walls details:

- 5/8" Drywall min.
- 6 mil. Poly vapour barrier
- 90mm steel studs @ 400mm o.c. w/ R-13 batt insulation
- 15.9mm densglass sheathing
- Breathable air/moisture barrier
- R-15, 89mm rigid insulation, mineral fibre w/ z-girts
- 12mm min. steel channel system for prefinished steel panels c/w airspace & drainage layer behind.

Upon review of the proposed wall assembly, it as been determined that the STC rating of the aforementioned assembly will be 45. The reference for this STC rating is included in Appendix 2. Therefore, this wall assembly is considered acceptable and no other provisions will be required.

7.0 Conclusion

The subject site is located at 347 Gilmour Street and 278-282 O'Connor Street. It is understood that the development will consist of a single 9-storey building with a back yard identified as an outdoor living area. The associated analysis identified one noise source: O'Connor Street (surface transportation noise).

A reception point was selected in the centre of the rear yard, 1.5 m away from the wall of the building. Exceedances were noted when the effects of the proposed building was not taken into consideration. However, it was determined that the outdoor living area would only exist once the proposed building was constructed. Therefore, the rear yard reception point was analyzed taking into consideration the proposed building acting as a barrier. This resulted in a noise level of below 55 dBA and is considered acceptable without any further mitigation measures.

Pane of glass reception points were selected on the northern, western, and southern elevation, at both the ground floor (1.5 m) and ninth floor (24.5 m). These results indicate that the noise levels will be above 55 dBA on the northern, eastern and souther elevation. It was further noted that the noise levels will be above 65 dBA on the eastern elevation. Therefore, standard construction materials were reviewed for the exterior of the building and were noted to be sufficient to provide adequate noise protection to the indoor-living areas. However, warning clauses will be required to be included on all Offers of Purchase and Sale and/or lease agreements for units on the northern, eastern and southern elevation. Units on the northern and southern elevation will require a warning clause Type C as follows:

> "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."

Additionally, all units on the eastern elevation will required a warning clause type D as follows:

> "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."

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 AK Global Construction 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.

David J. Gilbert, P.Eng.

Report Distribution:

- ❑ AK Global Construction (3 copies)
- ❑ Paterson Group (1 copy)

APPENDIX 1

TABLE 8 - SUMMARY OF RECEPTION POINTS AND GEOMETRY

DRAWING PG4829-1B - SITE GEOMETRY (REC 1-1, REC 1-6)

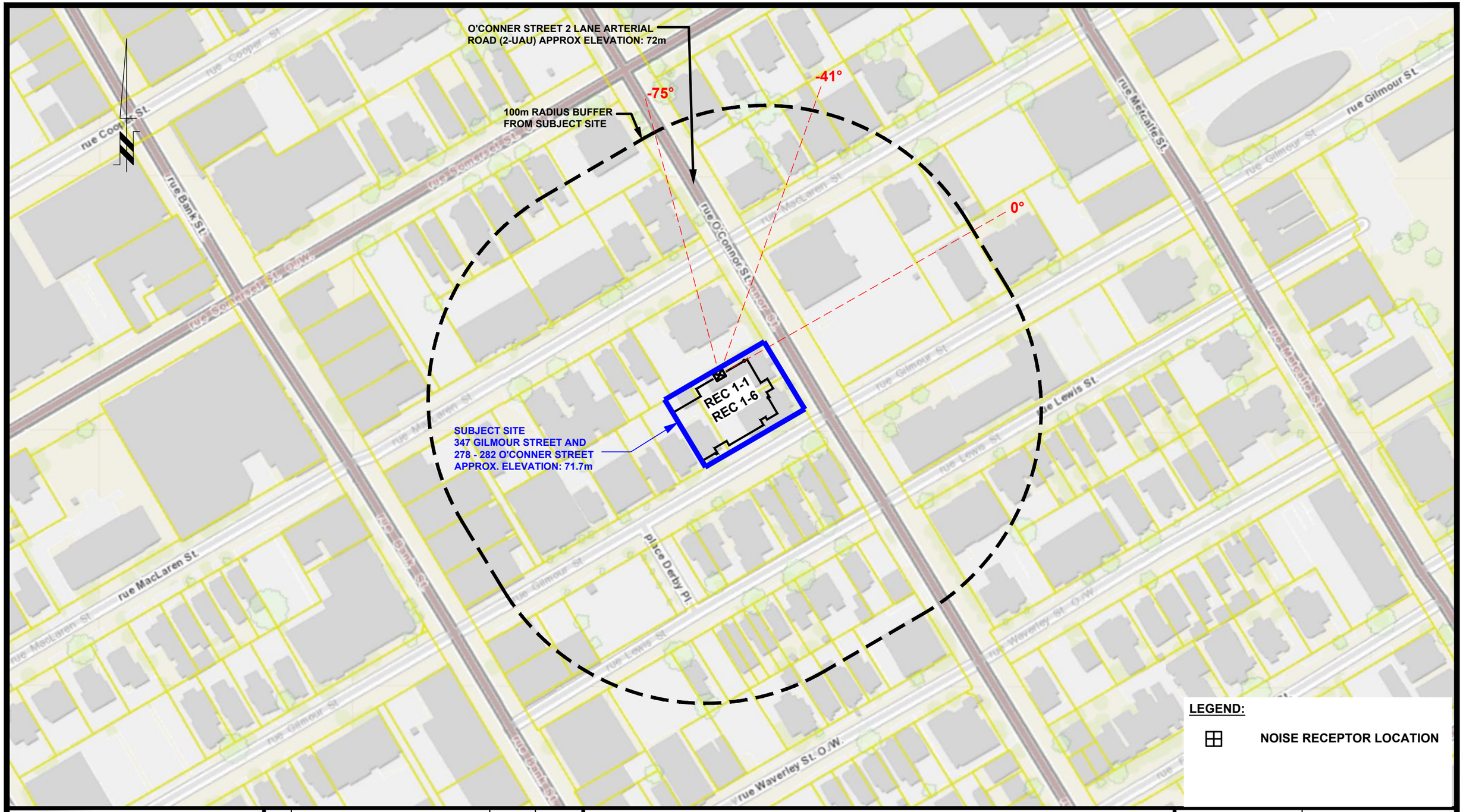
DRAWING PG4829-1C - SITE GEOMETRY (REC 2-1, REC 2-6)

DRAWING PG4829-1D - SITE GEOMETRY (REC 3-1, REC 3-6)

DRAWING PG4829-1E - SITE GEOMETRY (REC 4)

DRAWING PG4829-2 - RECEPTOR LOCATIONS

Table 7 - Summary of Reception Points and Geometry									
347 Gilmour Street and 278-282 O'Connor Street									
Point of Reception	Location	Leq	O'Connor Street						
		Day	Horizontal	Vertical	Total	Local Angle	Building Barrier	Distance	Local Angle
		(dBA)	(m)	(m)	(m)	(degree)	(m)	(m)	(degree)
REC 1-1	Northern elevation, first floor	56.09	26	1.5	26.04	-75, 0	22.5	10	-75, -41
REC 1-6	Northern elevation, sixth floor	57.58	26	19.5	32.5	-75, 0	22.5	10	-75, -41
REC 2-1	Eastern elevation, first floor	65.16	15	1.5	15.07	-84, 82	n/a	n/a	n/a
REC 2-6	Eastern elevation, sixth floor	66.09	15	19.5	24.6	-84, 82	n/a	n/a	n/a
REC 3-1	Southern elevation, first floor	56.78	26	1.5	26.04	0, 71	7.5	20	-38, -71
REC 3-6	Southern elevation, sixth floor	57.62	26	19.5	32.5	0, 71	7.5	20	38, 71
REC 4	Outdoor Living Area	57.73	40	1.5	40.03	-69, 71	26	1.5	0, 71



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NOISE ATTENUATION STUDY
347 GILMOUR STREET AND 278-282 O'CONNOR STREET

OTTAWA, ONTARIO

Title:

SITE GEOMETRY - REC 1-1, REC 1-6

Scale: 1:1500	Date: 02/2019
Drawn by: RCG	Report No.: PG4829-1
Checked by: SB	**PG4829-1B**
Approved by: DJG	Revision No.:

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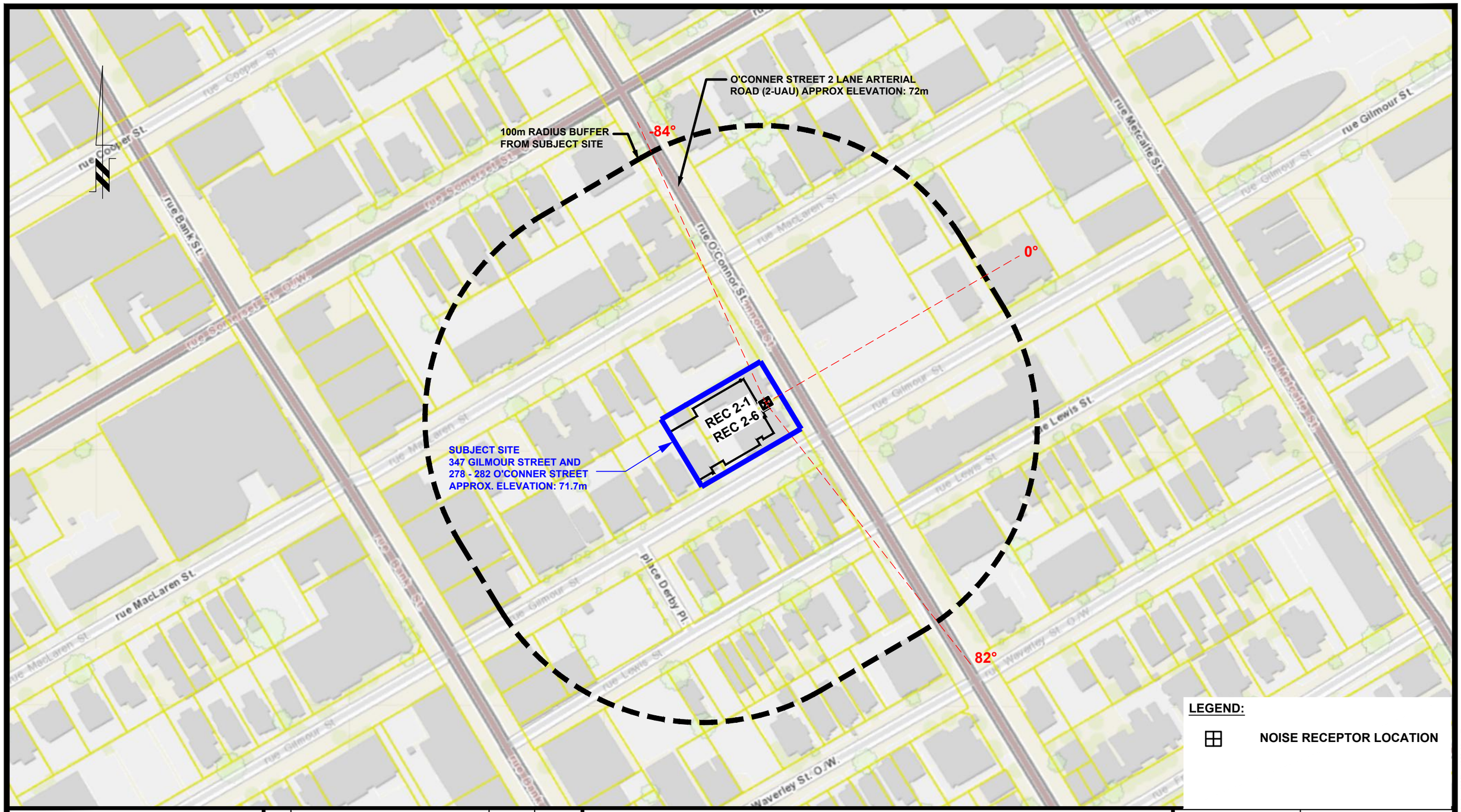

LEGEND:

⊞ NOISE RECEPTOR LOCATION

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NOISE ATTENUATION STUDY
347 GILMOUR STREET AND 278-282 O'CONNOR STREET

OTTAWA, ONTARIO

Title:

SITE GEOMETRY - REC 2-1, REC 2-6

Scale: 1:1500	Date: 02/2019
Drawn by: EA	Report No.: PG4829-1
Checked by: SB	PG4829-1C
Approved by: DJG	Revision No.:

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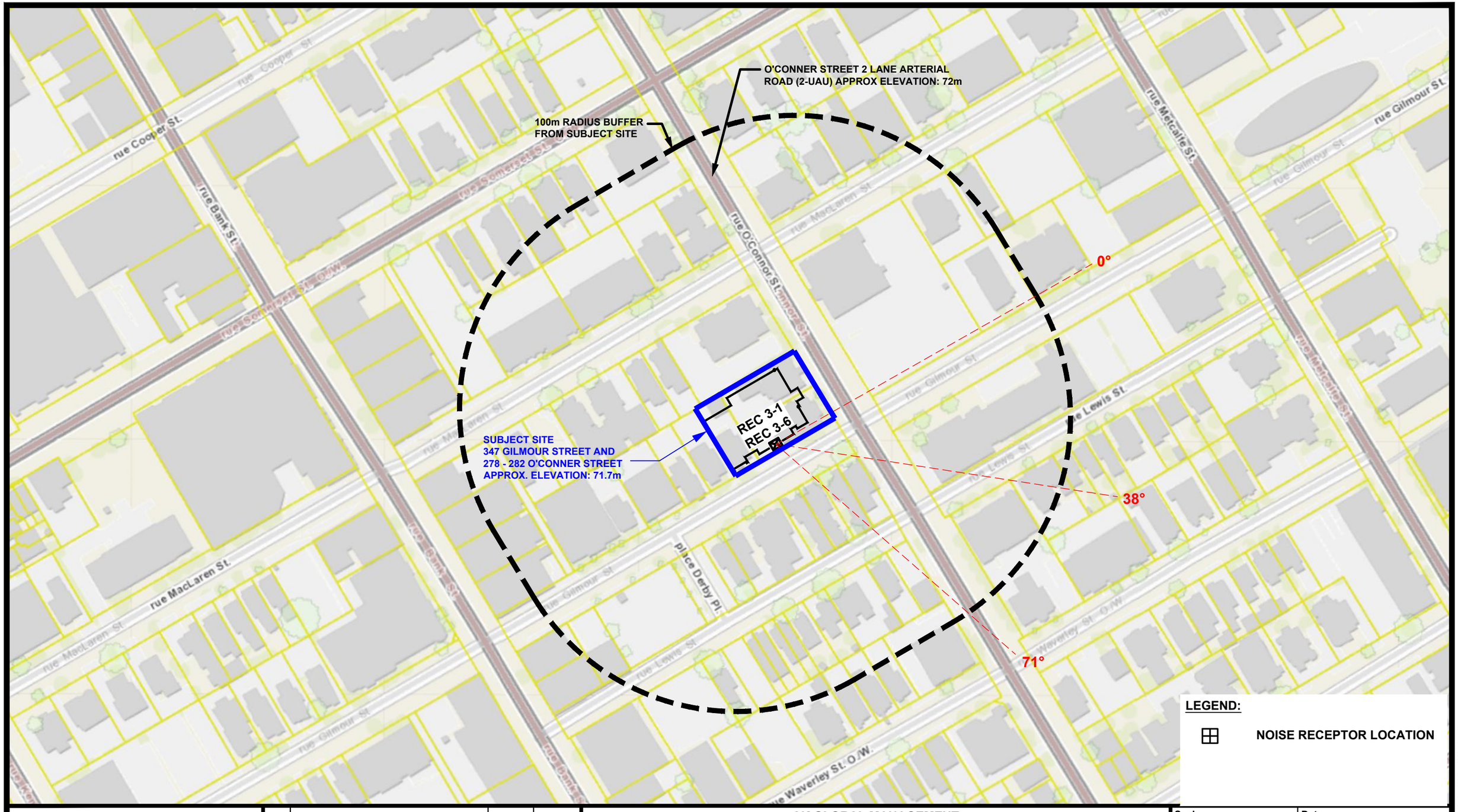

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347 GILMOUR STREET AND 278-282 O'CONNOR STREET

OTTAWA, ONTARIO

Title:

SITE GEOMETRY - REC 3-1, REC 3-6

Scale: 1:1500	Date: 02/2019
Drawn by: EA	Report No.: PG4829-1
Checked by: SB	**PG4829-1D**
Approved by: DJG	Revision No.:

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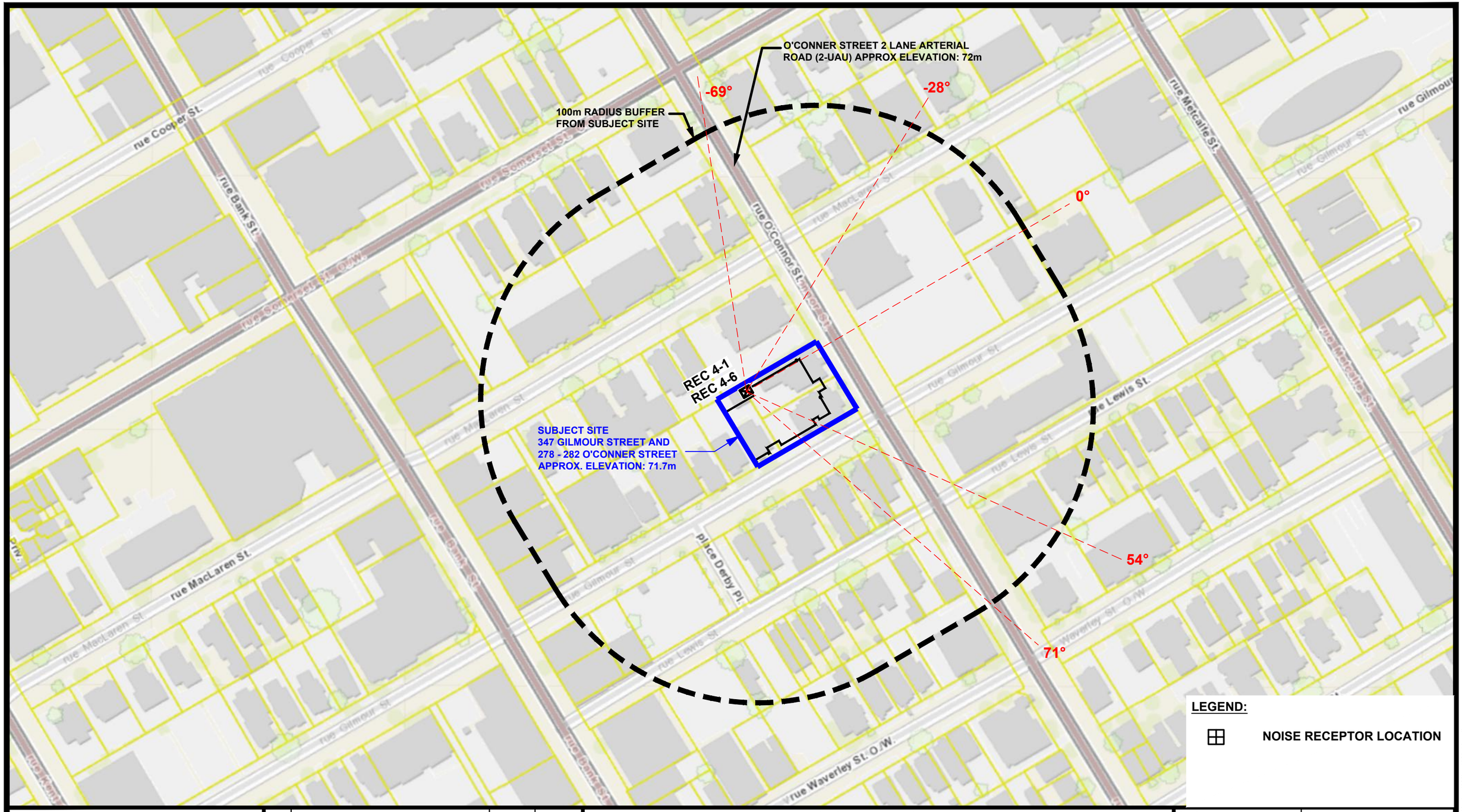

LEGEND:

⊞ NOISE RECEPTOR LOCATION

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347 GILMOUR STREET AND 278-282 O'CONNOR STREET

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SITE GEOMETRY - REC 4-1, REC 4-6

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Checked by: SB	PG4829-1E
Approved by: DJG	Revision No.:

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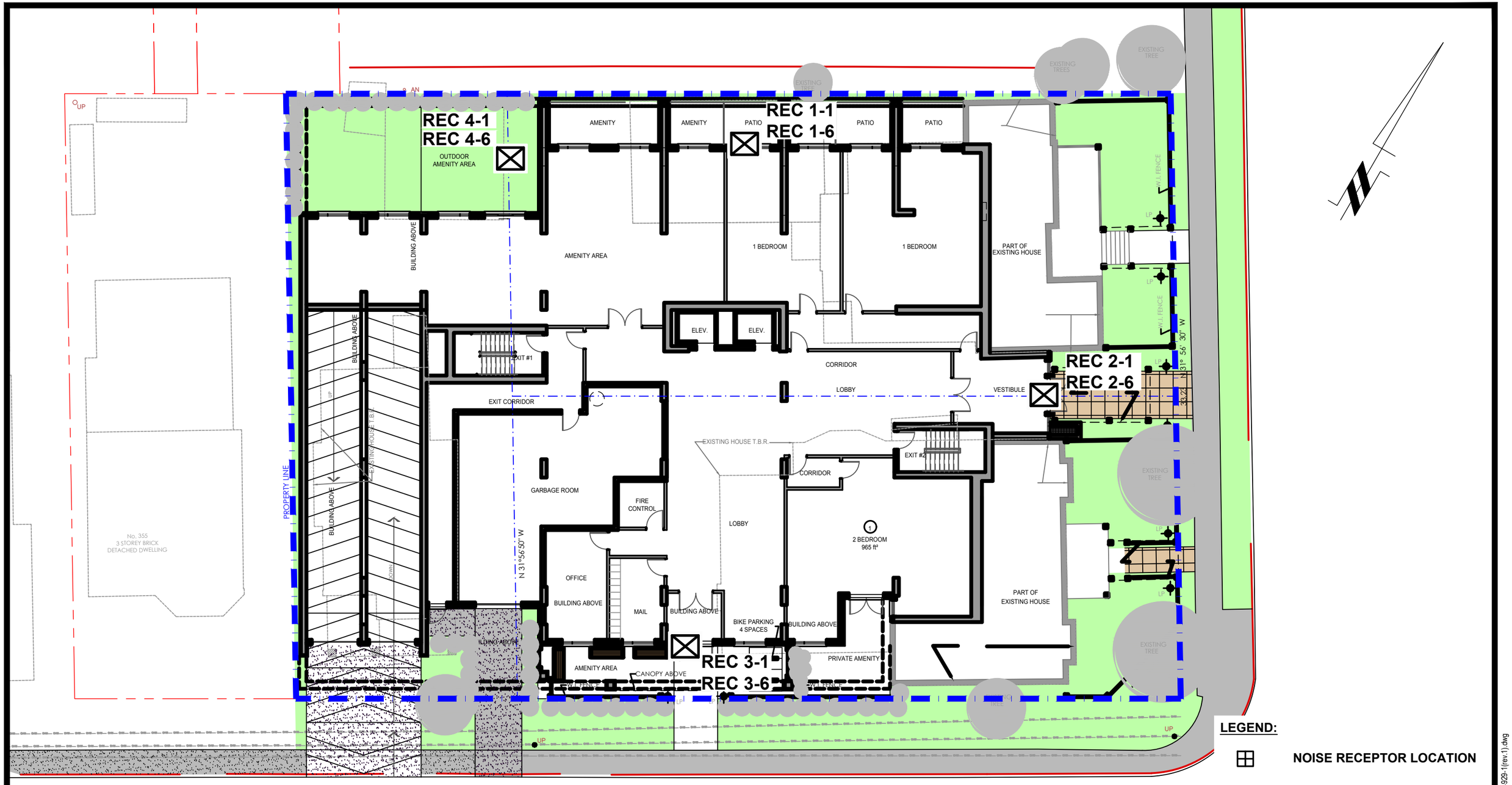

LEGEND:

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NOISE ATTENUATION STUDY
347 GILMOUR STREET AND 278-282 O'CONNOR STREET

OTTAWA, ONTARIO

Title:

NOISE RECEPTOR LOCATION PLAN

Scale: 1:200	Date: 02/2019
Drawn by: RCG	Report No.: PG4829-1
Checked by: SB	Dwg. No.: PG4829-2
Approved by: DJG	Revision No.:

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APPENDIX 2

STAMSON RESULTS

STAMSON 5.0 NORMAL REPORT Date: 12-03-2019 15:35:46
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: O'Connor (day/night)

Car traffic volume	: 12144/1056	veh/TimePeriod *
Medium truck volume	: 966/84	veh/TimePeriod *
Heavy truck volume	: 690/60	veh/TimePeriod *
Posted speed limit	: 40	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)	15000
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: O'Connor (day/night)

Angle1 Angle2	: -75.00 deg	-41.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 1	
House density	: 60	%
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 26.00 / 26.00	m
Receiver height	: 1.50 / 1.50	m
Topography	: 2	(Flat/gentle slope; with barrier)
Barrier angle1	: -75.00 deg	Angle2 : -41.00 deg
Barrier height	: 22.50	m
Barrier receiver distance	: 10.00 / 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: O'Connor (day/night)

Car traffic volume	: 12144/1056	veh/TimePeriod *
Medium truck volume	: 966/84	veh/TimePeriod *

```
Heavy truck volume  :   690/60    veh/TimePeriod  *
Posted speed limit  :    40 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):  15000
    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 # 2: O'Connor (day/night)
------------------------------------------
Angle1   Angle2           : -41.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  26.00 / 26.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

↟
Results segment # 1: O'Connor (day)
-----------------------------------

Source height = 1.50 m

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

ROAD (0.00 + 37.06 + 0.00) = 37.06 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -75    -41   0.00  66.69   0.00  -2.39  -7.24   0.00   0.00 -20.00  37.06
-------------------------------------------------------------------------------

Segment Leq : 37.06 dBA

↟
Results segment # 2: O'Connor (day)
```

Source height = 1.50 m

ROAD (0.00 + 56.04 + 0.00) = 56.04 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-41	0	0.66	66.69	0.00	-3.97	-6.68	0.00	0.00	0.00	56.04

Segment Leq : 56.04 dBA

Total Leq All Segments: 56.09 dBA

Results segment # 1: O'Connor (night)

Source height = 1.50 m

Barrier height for grazing incidence

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

ROAD (0.00 + 29.46 + 0.00) = 29.46 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-75	-41	0.66	59.09	0.00	-3.97	-9.14	0.00	-3.70	0.00	42.28
-75	-41	0.00	59.09	0.00	-2.39	-7.24	0.00	0.00	-20.00	29.46

Segment Leq : 29.46 dBA

Results segment # 2: O'Connor (night)

Source height = 1.50 m

ROAD (0.00 + 48.45 + 0.00) = 48.45 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-41	0	0.66	59.09	0.00	-3.97	-6.68	0.00	0.00	0.00	48.45

Segment Leq : 48.45 dBA

Total Leq All Segments: 48.50 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 56.09
(NIGHT): 48.50

STAMSON 5.0 NORMAL REPORT Date: 29-07-2019 16:21:44
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: rec16.te Time Period: Day/Night 16/8 hours
Description: Reception Point 1-6

Road data, segment # 1: O'Connor (day/night)

Car traffic volume : 12144/1056 veh/TimePeriod *
Medium truck volume : 966/84 veh/TimePeriod *
Heavy truck volume : 690/60 veh/TimePeriod *
Posted speed limit : 40 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): 15000
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: O'Connor (day/night)

Angle1 Angle2 : -75.00 deg -41.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 1
House density : 60 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 26.00 / 26.00 m
Receiver height : 19.50 / 19.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -75.00 deg Angle2 : -41.00 deg
Barrier height : 22.50 m
Barrier receiver distance : 10.00 / 10.00 m
Source elevation : 72.20 m
Receiver elevation : 72.20 m
Barrier elevation : 72.20 m
Reference angle : 0.00

Road data, segment # 2: O'Connor (day/night)

Car traffic volume : 12144/1056 veh/TimePeriod *
Medium truck volume : 966/84 veh/TimePeriod *
Heavy truck volume : 690/60 veh/TimePeriod *
Posted speed limit : 40 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):  15000
    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 # 2: O'Connor (day/night)
------------------------------------------
Angle1   Angle2           : -41.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  26.00 / 26.00  m
Receiver height           :  19.50 / 19.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

🠉
Results segment # 1: O'Connor (day)
-----------------------------------

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       19.50 !       12.58 !        84.78

ROAD (0.00 + 37.13 + 0.00) = 37.13 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -75    -41   0.00  66.69   0.00  -2.39  -7.24   0.00   0.00 -19.93  37.13
-------------------------------------------------------------------------------

Segment Leq : 37.13 dBA

🠉
Results segment # 2: O'Connor (day)
-----------------------------------

Source height = 1.50 m
```

ROAD (0.00 + 57.54 + 0.00) = 57.54 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-41	0	0.12	66.69	0.00	-2.68	-6.47	0.00	0.00	0.00	57.54

Segment Leq : 57.54 dBA

Total Leq All Segments: 57.58 dBA

Results segment # 1: O'Connor (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	19.50	12.58	84.78

ROAD (0.00 + 29.53 + 0.00) = 29.53 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-75	-41	0.12	59.09	0.00	-2.68	-7.60	0.00	-3.70	0.00	45.12
-75	-41	0.00	59.09	0.00	-2.39	-7.24	0.00	0.00	-19.93	29.53

Segment Leq : 29.53 dBA

Results segment # 2: O'Connor (night)

Source height = 1.50 m

ROAD (0.00 + 49.94 + 0.00) = 49.94 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-41	0	0.12	59.09	0.00	-2.68	-6.47	0.00	0.00	0.00	49.94

Segment Leq : 49.94 dBA

Total Leq All Segments: 49.98 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 57.58
(NIGHT): 49.98

STAMSON 5.0 NORMAL REPORT Date: 12-03-2019 15:26:52
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Road data, segment # 1: O'Connor (day/night)

Car traffic volume	: 12144/1056	veh/TimePeriod *
Medium truck volume	: 966/84	veh/TimePeriod *
Heavy truck volume	: 690/60	veh/TimePeriod *
Posted speed limit	: 40	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)	15000
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: O'Connor (day/night)

Angle1 Angle2	: -84.00 deg	82.00 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: O'Connor (day)

Source height = 1.50 m

ROAD (0.00 + 65.16 + 0.00) = 65.16 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-84	82	0.66	66.69	0.00	0.00	-1.53	0.00	0.00	0.00	65.16

Segment Leq : 65.16 dBA

Total Leq All Segments: 65.16 dBA

↟

Results segment # 1: O'Connor (night)

Source height = 1.50 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
-84	82	0.66	59.09	0.00	0.00	-1.53	0.00	0.00	0.00	57.56

Segment Leq : 57.56 dBA

Total Leq All Segments: 57.56 dBA

↟

TOTAL Leq FROM ALL SOURCES (DAY): 65.16
(NIGHT): 57.56

↟
↟

STAMSON 5.0 NORMAL REPORT Date: 29-07-2019 16:22:24
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: rec26.te Time Period: Day/Night 16/8 hours
Description: Reception Point 2-6

Road data, segment # 1: O'Connor (day/night)

Car traffic volume : 12144/1056 veh/TimePeriod *
Medium truck volume : 966/84 veh/TimePeriod *
Heavy truck volume : 690/60 veh/TimePeriod *
Posted speed limit : 40 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): 15000
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: O'Connor (day/night)

Angle1 Angle2 : -84.00 deg 82.00 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 : 19.50 / 19.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: O'Connor (day)

Source height = 1.50 m

ROAD (0.00 + 66.09 + 0.00) = 66.09 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-84	82	0.12	66.69	0.00	0.00	-0.60	0.00	0.00	0.00	66.09

Segment Leq : 66.09 dBA

Total Leq All Segments: 66.09 dBA

↟
Results segment # 1: O'Connor (night)

Source height = 1.50 m

ROAD (0.00 + 58.49 + 0.00) = 58.49 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-84	82	0.12	59.09	0.00	0.00	-0.60	0.00	0.00	0.00	58.49

Segment Leq : 58.49 dBA

Total Leq All Segments: 58.49 dBA

↟

TOTAL Leq FROM ALL SOURCES (DAY): 66.09
(NIGHT): 58.49
↟
↟

STAMSON 5.0 NORMAL REPORT Date: 12-03-2019 15:37:40
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: O'Connor (day/night)

Car traffic volume	: 12144/1056	veh/TimePeriod *
Medium truck volume	: 966/84	veh/TimePeriod *
Heavy truck volume	: 690/60	veh/TimePeriod *
Posted speed limit	: 40	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)	15000
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: O'Connor (day/night)

Angle1 Angle2	: 0.00 deg	38.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 26.00 / 26.00	m
Receiver height	: 1.50 / 1.50	m
Topography	: 1	(Flat/gentle slope; no barrier)
Reference angle	: 0.00	

Road data, segment # 2: O'Connor (day/night)

Car traffic volume	: 12144/1056	veh/TimePeriod *
Medium truck volume	: 966/84	veh/TimePeriod *
Heavy truck volume	: 690/60	veh/TimePeriod *
Posted speed limit	: 40	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):  15000
    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 # 2: O'Connor (day/night)
------------------------------------------
Angle1   Angle2           :  38.00 deg   71.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  26.00 / 26.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :  38.00 deg   Angle2 : 71.00 deg
Barrier height            :   7.50 m
Barrier receiver distance :  20.00 / 20.00  m
Source elevation          :  71.70 m
Receiver elevation        :  71.70 m
Barrier elevation         :  71.70 m
Reference angle           :   0.00

↟
Results segment # 1: O'Connor (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 55.75 + 0.00) = 55.75 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     38   0.66  66.69   0.00  -3.97  -6.97   0.00   0.00   0.00  55.75
-------------------------------------------------------------------------------

Segment Leq : 55.75 dBA

↟
Results segment # 2: O'Connor (day)
-----------------------------------

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
```

```
------------+-------------+-------------+--------------
       1.50 !        1.50 !        1.50 !        73.20

ROAD (0.00 + 36.25 + 0.00) = 36.25 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    38     71   0.21  66.69   0.00  -2.89  -7.90   0.00   0.00 -19.64  36.25
-------------------------------------------------------------------------------

Segment Leq : 36.25 dBA

Total Leq All Segments: 55.80 dBA
```



```
Results segment # 1: O'Connor (night)
-------------------------------------

Source height = 1.50 m

ROAD (0.00 + 48.15 + 0.00) = 48.15 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     38   0.66  59.09   0.00  -3.97  -6.97   0.00   0.00   0.00  48.15
-------------------------------------------------------------------------------

Segment Leq : 48.15 dBA
```



```
Results segment # 2: O'Connor (night)
-------------------------------------

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !        1.50 !        1.50 !        73.20

ROAD (0.00 + 28.66 + 0.00) = 28.66 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    38     71   0.21  59.09   0.00  -2.89  -7.90   0.00   0.00 -19.64  28.66
-------------------------------------------------------------------------------

Segment Leq : 28.66 dBA
```

Total Leq All Segments: 48.20 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 55.80
(NIGHT): 48.20

STAMSON 5.0 NORMAL REPORT Date: 29-07-2019 16:23:15
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: rec36.te Time Period: Day/Night 16/8 hours
Description: Reception Point 3-6

Road data, segment # 1: O'Connor (day/night)

Car traffic volume : 12144/1056 veh/TimePeriod *
Medium truck volume : 966/84 veh/TimePeriod *
Heavy truck volume : 690/60 veh/TimePeriod *
Posted speed limit : 40 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): 15000
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: O'Connor (day/night)

Angle1 Angle2 : 0.00 deg 38.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 26.00 / 26.00 m
Receiver height : 19.50 / 19.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

↑
Road data, segment # 2: O'Connor (day/night)

Car traffic volume : 12144/1056 veh/TimePeriod *
Medium truck volume : 966/84 veh/TimePeriod *
Heavy truck volume : 690/60 veh/TimePeriod *
Posted speed limit : 40 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): 15000
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 # 2: O'Connor (day/night)
------------------------------------------
Angle1   Angle2           :  38.00 deg   71.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  26.00 / 26.00  m
Receiver height           :  19.50 / 19.50  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :  38.00 deg   Angle2 : 71.00 deg
Barrier height            :   7.50 m
Barrier receiver distance :  20.00 / 20.00  m
Source elevation          :  71.70 m
Receiver elevation        :  71.70 m
Barrier elevation         :  71.70 m
Reference angle           :   0.00

🠉
Results segment # 1: O'Connor (day)
-----------------------------------

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
-------------------------------------------------------------------------------
     0     38   0.12  66.69   0.00  -2.68  -6.79   0.00   0.00   0.00  57.22
-------------------------------------------------------------------------------

Segment Leq : 57.22 dBA

🠉
Results segment # 2: O'Connor (day)
-----------------------------------

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       19.50 !        5.65 !        77.35

ROAD (0.00 + 48.04 + 0.00) = 48.04 dBA
```

```
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
    38     71   0.00  66.69   0.00  -2.39  -7.37   0.00   0.00  -8.88  48.04
-------------------------------------------------------------------------

Segment Leq : 48.04 dBA

Total Leq All Segments: 57.72 dBA

↟
Results segment # 1: O'Connor (night)
-------------------------------------

Source height = 1.50 m

ROAD (0.00 + 49.62 + 0.00) = 49.62 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
     0     38   0.12  59.09   0.00  -2.68  -6.79   0.00   0.00   0.00  49.62
-------------------------------------------------------------------------

Segment Leq : 49.62 dBA

↟
Results segment # 2: O'Connor (night)
-------------------------------------

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       19.50 !        5.65 !        77.35

ROAD (0.00 + 40.45 + 0.00) = 40.45 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
    38     71   0.00  59.09   0.00  -2.39  -7.37   0.00   0.00  -8.88  40.45
-------------------------------------------------------------------------

Segment Leq : 40.45 dBA

Total Leq All Segments: 50.12 dBA

↟
```

TOTAL Leq FROM ALL SOURCES (DAY): 57.72
(NIGHT): 50.12

STAMSON 5.0 NORMAL REPORT Date: 12-03-2019 15:51:26
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: Time Period: Day/Night 16/8 hours
Description: Reception Point 4 - without proposed building

Road data, segment # 1: O'Connor (day/night)

Car traffic volume	: 12144/1056	veh/TimePeriod *
Medium truck volume	: 966/84	veh/TimePeriod *
Heavy truck volume	: 690/60	veh/TimePeriod *
Posted speed limit	: 40	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)		15000
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: O'Connor (day/night)

Angle1 Angle2	: -69.00 deg	71.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 40.00 / 40.00	m
Receiver height	: 1.50 / 1.50	m
Topography	: 1	(Flat/gentle slope; no barrier)
Reference angle	: 0.00	

Results segment # 1: O'Connor (day)

Source height = 1.50 m

ROAD (0.00 + 57.73 + 0.00) = 57.73 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-69	71	0.66	66.69	0.00	-7.07	-1.88	0.00	0.00	0.00	57.73

Segment Leq : 57.73 dBA

Total Leq All Segments: 57.73 dBA

↟

Results segment # 1: O'Connor (night)

Source height = 1.50 m

ROAD (0.00 + 50.14 + 0.00) = 50.14 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-69	71	0.66	59.09	0.00	-7.07	-1.88	0.00	0.00	0.00	50.14

Segment Leq : 50.14 dBA

Total Leq All Segments: 50.14 dBA

↟

TOTAL Leq FROM ALL SOURCES (DAY): 57.73

(NIGHT): 50.14

↟

↟

STAMSON 5.0 NORMAL REPORT Date: 12-03-2019 15:52:29
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: REC4B.te Time Period: Day/Night 16/8 hours
Description: Reception Point 4 - with proposed building

Road data, segment # 1: O'Connor (day/night)

Car traffic volume	: 12144/1056	veh/TimePeriod *
Medium truck volume	: 966/84	veh/TimePeriod *
Heavy truck volume	: 690/60	veh/TimePeriod *
Posted speed limit	: 40	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)	15000
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: O'Connor (day/night)

Angle1 Angle2	: -69.00 deg	71.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 40.00 / 40.00	m
Receiver height	: 1.50 / 1.50	m
Topography	: 2	(Flat/gentle slope; with barrier)
Barrier angle1	: 0.00 deg	Angle2 : 71.00 deg
Barrier height	: 26.00	m
Barrier receiver distance	: 1.50 / 1.50	m
Source elevation	: 71.70	m
Receiver elevation	: 71.70	m
Barrier elevation	: 71.70	m
Reference angle	: 0.00	

↑
Results segment # 1: O'Connor (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	1.50	73.20

ROAD (54.69 + 38.39 + 0.00) = 54.79 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-69	0	0.66	66.69	0.00	-7.07	-4.93	0.00	0.00	0.00	54.69
0	71	0.00	66.69	0.00	-4.26	-4.04	0.00	0.00	-20.00	38.39

Segment Leq : 54.79 dBA

Total Leq All Segments: 54.79 dBA

Results segment # 1: O'Connor (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	1.50	73.20

ROAD (47.09 + 30.79 + 0.00) = 47.19 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-69	0	0.66	59.09	0.00	-7.07	-4.93	0.00	0.00	0.00	47.09
0	71	0.00	59.09	0.00	-4.26	-4.04	0.00	0.00	-20.00	30.79

Segment Leq : 47.19 dBA

Total Leq All Segments: 47.19 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 54.79
(NIGHT): 47.19

APPENDIX 3

E-MAIL CORRESPONDENCE

INDUSTRY STANDARDS

Stephanie Boisvenue

From: tony.k@akgmanagement.com
Sent: June 20, 2019 8:18 PM
To: Stephanie Boisvenue
Cc: Faisal Abou-Seido
Subject: Project 18054 -- O'Connor Residential Development -- Exterior wall construction

Hello Stephanie:

As per your request, please see below email from the architect identifying the wall assemblies. Note we will be using 5/8" drywall in lieu of ½" drywall.

In reference to the windows. We wait to your recommendation to finalize the window design.

Should you require additional information, please do not hesitate to call me.

From: David Blakely <mdblakely@bellnet.ca>
Sent: June 20, 2019 2:00 PM
To: tony.k@akgmanagement.com
Subject: 280 O'Connor - Exterior wall construction

Tony,

East Elevation – Above the houses
Wall Assembly – from interior
Wall Type – W1

- ½" Drywall min.
- 6 mil. Poly vapour barrier
- 90mm steel studs @ 400mm o.c. w/ R-13 batt insulation
- 15.9mm densglass sheathing
- Breathable air/moisture barrier
- R-15, 89mm rigid insulation, mineral fibre w/ z-girts
- 12mm min. steel channel system for prefinished steel panels c/w airspace & drainage layer behind.

South Elevation – Combination of W1 & W2
Wall Type- W2

- ½" Drywall min.
- 6 mil. Poly vapour barrier
- 90mm steel studs @ 400mm o.c. w/ R-13 batt insulation
- 15.9mm densglass sheathing
- Breathable air/moisture barrier
- R-15, 89mm rigid insulation, mineral fibre w/ z-girts
- Ferro slotted, side mount rap ties with insulation support
- 38mm airspace
- 90mm – brick veneer

West & North Elevation

- Similar but with 5/8" Type X drywall on interior.

David Blakely

M. David Blakely Architect Inc.
2200 Prince of Wales Dr., Suite 101
Ottawa, Ontario K2E 6Z9
P- 613-226-8811
F- 613-226-7942
E- mdblakely@bellnet.ca

From: Stephanie Boisvenue <SBoisvenue@Patersongroup.ca>
Sent: June 14, 2019 9:14 AM
To: tony.k@akgmanagement.com; Faisal Abou-Seido <FAbou-Seido@Patersongroup.ca>
Subject: RE: RE:Project 18054 -- O' Connor Residential Development -- Noise Study

No problem Tony,

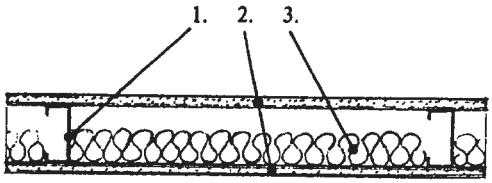
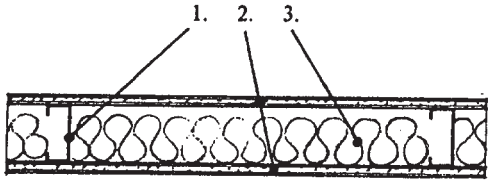
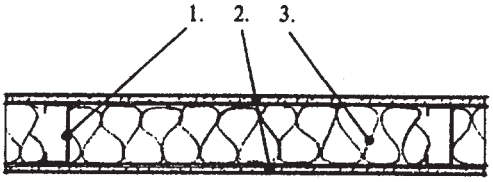
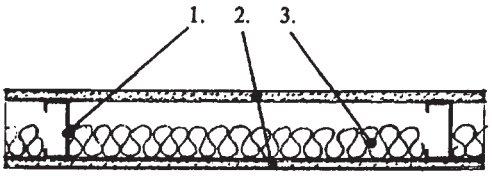
As per my previous e-mail for this site, the noise levels from O'Connor are at a level where we will need to review the proposed building materials. See my original question below.

Due to the proposed traffic levels on O'Connor Street, there is a noise exceedance on the eastern elevation. Therefore, in order to complete my analysis, I am going to need information on the proposed building materials for the eastern elevation – the elevation directly facing O'Connor Street. Depending on what stage you are at in your design, this could consist of either a shop drawing, or an e-mail from you indicating what the exterior of the building will consist of (i.e. brick, concrete panels, etc). In addition, I was wondering if you could confirm if you are using double-pane windows.

Best Regards

Stephanie Boisvenue, P.Eng.
patersongroup
solution oriented engineering
over 60 years servicing our clients

154 Colonnade Road South
Ottawa, Ontario, K2E 7J5
Tel: (613) 226-7381 Ext. 219

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