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Environmental Noise Control Study

Proposed Building
144 Bentley Avenue
Ottawa, Ontario

Prepared For

Cityscape

August 10, 2020

Report: PG5456-1

Table of Contents Page

Appendices

1.0 Introduction

Paterson Group (Paterson) was commissioned by Cityscape to conduct an environmental noise control study for the proposed building to be located at 144 Bentley Avenue, in the City of Ottawa.

The objective of the current study is to:

- ❏ Determine the primary noise sources impacting the site and compare the projected sound levels to guidelines set out by the Ministry of Environment and Climate Change (MOECC) and the City of Ottawa.

- ❏ Review the projected noise levels and offer recommendations regarding warning classes, construction materials or alternative sound barriers.

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

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

2.0 Background

It is understood that the proposed development will consist of a single storey warehouse building and a two storey office building to be located at 144 Bentley Avenue. Final details are not known at the time of issuance of this report. Due to the proposed industrial/commercial use of the proposed building, it is assumed that there will be no ground-surface outdoor living areas located within the subject site.

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.

No outdoor living areas were identified within 100 m of the subject site. Therefore, a stationary noise analysis was not completed for this analysis.

Aircraft/Airport Noise

Aircraft noise is distinct as compared to surface transportation noise or stationary noise, as it is typically a lower frequency for longer durations. The sound level may also differ between different types of aircraft creating a unknown spectrum of noise. Due to these differences, the analysis of aircraft noise is performed separately from both the stationary and surface traffic noise studies. For aircraft noise, the levels are defined by the Noise Exposure Forecast (NEF), which measures the sound produced by all types of aircraft at an airport, taking into consideration the number of flights, the duration of the noise, the time of day and the frequency components of the sound (pure tones). The Noise Exposure Projection (NEP) is similar to the NEF, but takes into consideration a long term projection beyond 10 years. Annex 10 - Land Use Constraints Due to Aircraft Noise located with the City of Ottawa's Official Plan outlines the NEF/NEP boundaries in addition to the Airport Vicinity Development Zone (AVDZ).

The limitations for the aircraft/airport noise is dictated by the local airport in collaboration with the City of Ottawa. It is stated within the ENCG that there is no development within the 30 NEF/NEP contour, but that a detailed noise analysis with respect to aircraft/airport noise study is required any time the property is located within the AVDZ. The NPC-300 stipulates that a aircraft/airport noise analysis is required where the sensitive land use is located at or above the NEF/NEP contour of 25

The following table outlines the limitations for indoor Aircraft Noise:

Table 4 - Indoor Aircraft Noise Limits (Applicable over 24 hours)

Type of Space	Indoor NEF/NEP
Living/dining/den areas of residences, hospital, schools, nursing/retirement homes, daycare centres, etc	5
Sleeping quarters	0

It is noted that the warehouse portion of the site is not classified as any of the situations outlined in Table 4. However, the office portion of the building would be considered a noise sensitive area and this will be the focus of the aircraft noise analysis.

4.0 Methodology and Vibration Assessment Criteria

Due to the presence of the VIA Rail corridor, a ground vibration and ground-borne noise review may also be required for this development.

Effects of the Rail Line on the Proposed Development

The human body can be affected by exposure to vibration, in particular ground-borne vibrations occurring at low frequencies. These can be caused by the surrounding vibration sources previously identified, such as wheels on a road or rail system. These ground-borne vibrations can cause the building to shake (ground-borne vibration) and/or rumbling sounds (ground-borne noise).

The methods of defining and measuring vibrations has its own challenges, based on the oscillatory motion identified as a vibration. Due to the nature of the oscillatory motion of the vibration, there is no net movement of the vibration element, and therefore motion descriptors are zero.

There are two (2) main methods of defining the magnitude of the overall vibration. The main one utilized in construction activities is the peak particle velocity (PPV). The PPV is defined as the maximum instantaneous positive or negative peak of the vibration signal and is often used when monitoring blasting vibrations and is ideal for evaluating the potential of building damage.

However, human responses require a different method of analysis as the human body requires time to respond to vibration signals. The average vibration amplitude would be an applicable method of reporting the ground-borne vibrations that humans would respond to, however with the vibration being represented as a sine wave, the average vibration amplitude would be zero. Therefore, the root mean square (RMS) amplitude, typically calculated over a 1 second interval, is utilized for the analysis. The RMS value is always less than the PPV.

General factors that could affect the magnitude of the created vibrations include, but are not limited to, whether the light rail is above grade or below grade, speed, vehicle suspension, wheel and track condition, track support system, depth of system and soil conditions. It should be noted that vibrations that travel through the bedrock surface should be minimal, but can travel a further distance.

It is anticipated that the day to day operational frequency of the VIA Rail Line will create vibrations that may be experienced within 144 Bentley Avenue. Vibrations caused by the VIA Rail Line could propagate through the ground surface, and extend to the building foundation at 144 Bentley Avenue.

The Federal Transit Administration's Transit Noise and Vibration Impact Assessment Report: FTA-VA-90-1003-06 was utilized as the standard for vibration standards caused by rail. Upon review of these documents, the following standards were obtained that are applicable to this analysis.

The criteria for the environmental impact from vibrations are based on the RMS vibration levels for repeated events. The proposed development would be classified as a Vibration Category 3 - Institutional Land used with primarily daytime use. This is defined as an area that has quiet offices that do note have vibration-sensitive equipment, but still have the potential for activity interference. The following table outlines the limits for ground-borne vibrations.

Table 5 - Ground-Borne Vibration (GBV) for General Assessment

Land Use Category	GBV Impact Levels (VdB re 1 micro-inch/sec)		
	Frequent Events	**Occasional Events**	**Infrequent Events**
Category 3	75 VdB	78 VdB	83 VdB

Notes:

- ❏ Frequent events is defined as more than 70 vibration events of the same source per day. Most rapid transit projects fall into this category.
- ❏ Occasional events is define as between 30 and 70 vibration events of the same source per day. Most commuter trunk lines have this many operations.
- ❏ Infrequent events is defined as fewer tan 30 vibration events of the same kind per day. This category includes most commuter rail branch lines.

The VIA Rail Line is classified as locomotive powered passenger or freight. This document also outlines screening radiuses, defined as where there is a potential for disturbing ground-borne vibrations, where additional studies should be completed. For a source of locomotive powered freight within a category 3 classification, the screening distance for vibration assessment is 36 m (120').

The proposed development is outside of this screening radius and therefore a vibration assessment will not be required.

5.0 Analysis

5.1 Surface Transportation Noise

The proposed development is bordered to the north by Bentley Avenue, and to the east and west by commercial/industrial properties. The Smith Falls Rail Corridor is located to the south of the subject site. The only roadway within 100 m of the subject site is Bentley Avenue.

Based on the City of Ottawa Official Plan, Schedule E, Bentley Road is not classified as either arterial, collector or major collector roads and therefore is not included in this study.

It is understood that this rail line is used by VIA Rail. Based on a discussion with Mr. Paul Charbachi, P.Eng. of VIA Rail Canada, the method to determine the volume of trains along this rail line is to count the number of departures off of the rail schedule. It was further confirmed by Mr. Charbachi, P.Eng. that the trains consist of a diesel locomotive pulling 5 cars.

Table 6 - Rail Parameters

Rail Line	Engine Type	Maximum Speed (km/hr)	Number of Trips/day	Length of Train
VIA Rail	Diesel	80	22	6

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 7 - Elevation of Reception Points

Floor Number	Elevation at Centre of Window (m)	Floor Use	Daytime/Nighttime Analysis
Ground Floor	1.5	Office	daytime
Second Floor	4.5	Office	daytime

It is understood that the proposed development will consist of a two storey office with a one storey warehouse. Reception points were selected on every elevation adjacent to the rail corridor at 1.5 m and at 4.5 m where there is a second storey, representing the first and second floor. Reception points are noted on Drawing PG5456-2 - Receptor Locations in Appendix 1.

All horizontal distances have been measured from the reception point to the edge of the right-of-way. The railway was analyzed where it intersected the 300 m buffer zone, which is reflected in the local angles, presented in Drawings PG5456-3A to 3E - Site Geometry in Appendix 1.

Table 9 - 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 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.

5.2 Aircraft/Airport Noise

Due to the proximity to the Ottawa International Airport, an aircraft/airport noise study will be required. The site at 144 Bentley Avenue within the airport zoning regulations but just outside of the 25 NEF/NEP boundary as stated on the Ottawa Official Plan Annex 10 - Land Use Constraints Due to Aircraft Noise. As a conservative approach, the analysis has been completed with an NEF/NEP of 35.

The ENCG provides criteria to mitigate the impact of aircraft noise on residential communities proposed between the 25 NEF/NEP and the Ottawa Airport Operating Influence Zone (OAOIZ), however, these do not apply to commercial or industrial complexes. Therefore, a full noise analysis will be required for the office portion of this development.

The software that will be utilized for this analysis will be IBANA-Calc Version 1.2 Revision 122, provided by Transport Canada, the Department of National Defense and the National Research Council. IBANA-Calc contains a large database of typical building materials and sound insulation design.

When performing the noise analysis, it is critical to determine both the noise source and the insulating properties of the proposed building. There are three types of aircraft that produce different noise: jet-turbine powered aircraft, propeller aircraft and rotary wing helicopters. However, jet-turbine powered aircraft departures and arrivals are typically the primary noise source of airports. IBANA-Calc contains the information for the noise levels and frequency of "Standard Aircraft".

The analysis calculates three (3) values: an Outdoor Sound (based on the noise of the aircraft), an Indoor Sound (based on the sound dissipation through the various elements) and a Outdoor-Indoor transmission class (OITC) Rating. An OITC uses a different frequency range and source spectrum from the corresponding ISO standard and can differ. It is a single-number rating that can be used for comparing the sound isolation performance of building facades and facade elements.

The indoor sound levels, also defined as $L_{eq(24)}$ can be related to the Indoor NEF/NEP value by the following formula:

$$NEF = L_{eq(24)} - 32 \text{ dBA}$$

It was noted that the only noise sensitive area located within this development would be an office space located adjacent to Bentley Avenue. It is understood that the proposed building will be a pre-fabricated building which is constructed with an insulated panel system. However, details of the proposed construction were not known at the time of issuance of this report. A full material analysis will be completed once the proposed wall and roof details are known.

6.0 Results

6.1 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 8 below.

Table 8 - 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	Western elevation, office portion, first floor	48.78	--	--
REC 1-2	Western elevation, office portion, second floor	49.66	--	--
REC 2-1	Southern elevation, office portion, first floor	49.67	--	--
REC 2-2	Southern elevation, office portion, second floor	50.52	--	--
REC 3-1	Eastern elevation, warehouse portion	48.77	--	--
REC 4-1	Southern elevation, warehouse portion	53.64	--	--
REC 5-1	Western elevation, warehouse portion	47.48	--	--

6.1 Aircraft/Airport Noise

The analysis for the aircraft/airplane noise study will be completed once the final roof and wall details have been determined.

7.0 Discussion and Recommendations

7.1 Outdoor Living Areas

No outdoor living areas were identified within this development.

7.2 Indoor Living Areas and Ventilation

Surface Transportation Noise

The results of the STAMSON modeling indicates that the daytime $L_{eq(16)}$ ranges between 47.48 dBA and 53.64 dBA. The ENGC states that the limits for the exterior of the pane of glass is 55 dBA. This value was not exceeded. Therefore, standard construction materials are considered acceptable for this development and no warning clauses will be required for surface transportation noise levels.

Aircraft/Airport Noise

The analysis for the aircraft/airplane noise study will be completed once the final roof and wall details have been determined.

8.0 Conclusion

The subject site is located at 144 Bentley Avenue. It is understood that the development will consist of a single storey warehouse and a two storey office building. No outdoor living areas were identified on the proposed site plan. The noise analysis identified two noise sources: VIA Rail (surface transportation noise) and the Ottawa McDonald-Cartier International Airport (aircraft/airplane noise).

Pane of glass reception points were selected on the western, southern and eastern elevations, at both 1.5 m (warehouse building) and at 1.5 m and 4.5 m (office building). These results indicate that the noise levels will be below 55 dBA. This is below the stated limits and therefore no additional noise mitigation measures will be required.

The aircraft/airplane noise study was not finalized as part of this submission. Once the wall and roof details are known, a full analysis will be completed. To help address the need for sound attenuation this development will include:

- multi-pane glass;
- high sound transmission class walls;
- central air conditioning unit;
- forced air heating unit.

However, due to the location of the airport, the following warning clause will need to be located on all deeds of sale:

> Purchasers/building occupants are forewarned that this property is located in a noise sensitive area due to its proximity to Ottawa Macdonald-Cartier International Airport. In order to reduce the impact of aircraft noise in the indoor spaces, the unit has been designed and built to meet provincial standards for noise control by the use of components and building systems that provide sound attenuation. In addition to the building components (i.e. walls, windows, doors, ceiling-roof), since the benefit of sound attenuation is lost when windows or doors are left open, this unit has been fitted with a forced air heating system, all components of which are sized to accommodate the future installation of central air conditioning-by the owner/occupant.

Despite the inclusion of noise control features within the dwelling unit, noise due to aircraft operations may continue to interfere with some indoor activities and with outdoor activities, particularly during the summer months. The purchaser/building occupant is further advised that the Airport is open and operates 24 hours a day, and that changes to operations or expansion of the airport facilities, including the construction of new runways, may affect the living environment of the residents of this property/area.

The Ottawa Macdonald-Cartier International Airport Authority, its acoustical consultants and the City of Ottawa are not responsible if, regardless of the implementation of noise control features, the purchaser/occupant of this dwelling finds that the noise levels due to aircraft operations continue to be of concern or are offensive.

9.0 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 Cityscape 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.

Scott S. Dennis, P.Eng

Stephanie A. Boisvenue, P.Eng.

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- ❑ Cityscape (3 copies)
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APPENDIX 1

TABLE 9 - SUMMARY OF RECEPTION POINTS AND GEOMETRY

DRAWING PG5456-1 - SITE PLAN

DRAWING PG5456-2 - RECEPTOR LOCATION PLAN

DRAWING PG5456-3A - SITE GEOMETRY (REC 1-1 and REC 1-2)

DRAWING PG5456-3B - SITE GEOMETRY (REC 2-1 and REC 2-2)

DRAWING PG5456-3C - SITE GEOMETRY (REC 3-1)

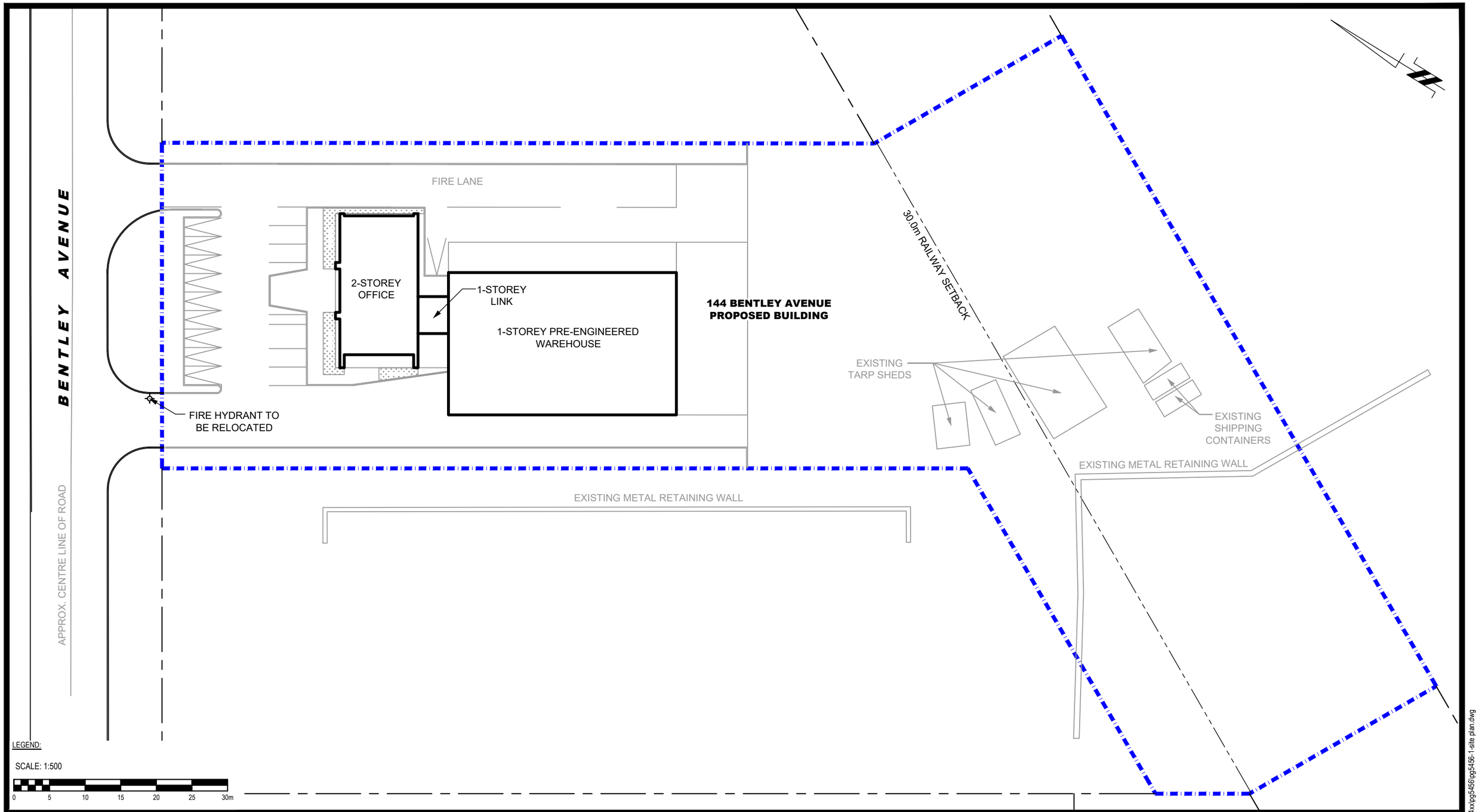
DRAWING PG5456-3D - SITE GEOMETRY (REC 4-1)

DRAWING PG5456-3E - SITE GEOMETRY (REC 5-1)

DRAWING PG5456-4 - AIRCRAFT NOISE LIMITATIONS

Table 9 - Summary of Reception Points and Geometry
144 Bentley Avenue

Point of Reception	Location	Leq Day (dBA)	VIA Railway					
			Horizontal (m)	Vertical (m)	Total (m)	Local Angle (degree)	Barrier Height (m)	Distance (m)
REC 1-1 (day)	Western Elevation, Office Portion, First Floor	48.78	105	1.5	105.01	-90, 0	n/a	n/a
REC 1-2 (day)	Western Elevation, Office Portion, Second Floor	49.66	105	4.5	105.1	-90, 0	n/a	n/a
REC 2-1 (day)	Southern Elevation, Office Portion, First Floor	49.67	100	1.5	100.01	-90, 15	n/a	n/a
REC 2-2 (day)	Southern Elevation, Office Portion, Second Floor	50.52	100	4.5	100.1	-90, 15	n/a	n/a
REC 3-1 (day)	Eastern Elevation, Warehouse Portion	48.77	120	1.5	120.01	-30, 90	n/a	n/a
REC 4-1 (day)	Southern Elevation, Warehouse Portion	53.64	72	1.5	72.02	-80, 80	n/a	n/a
REC 5-1 (day)	Western Elevation, Warehouse Portion	47.48	97	1.5	97.01	0, 50	n /a	na



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NOISE ATTENUATION STUDY
PROPOSED BUILDING - 144 BENTLEY AVENUE

OTTAWA, ONTARIO

Title:

SITE PLAN

Scale: 1:500	Date: 08/2020
Drawn by: YA	Report No.: PG5456-1
Checked by: SB	Dwg. No.: PG5456-1
Approved by: DJG	Revision No.:

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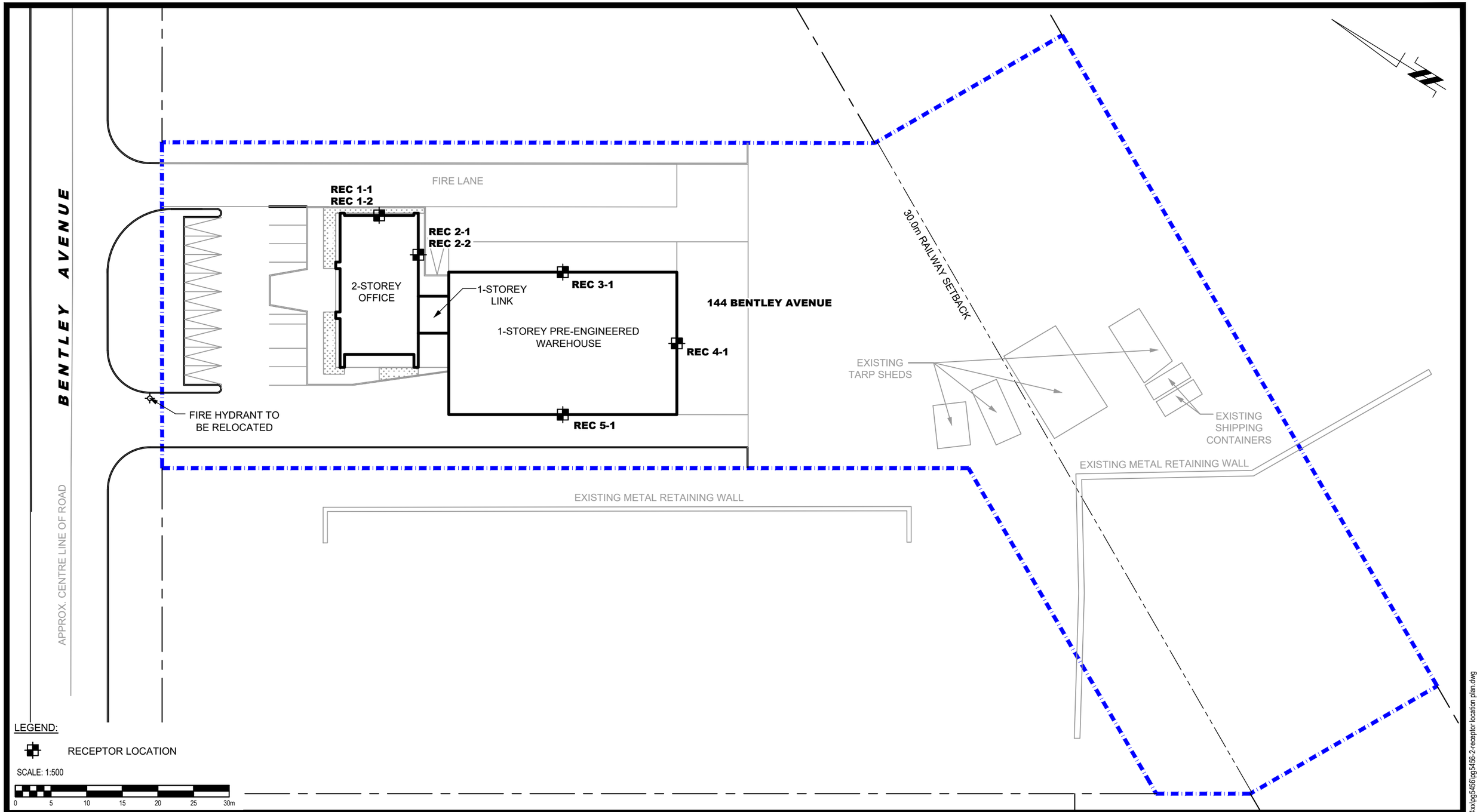

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NOISE ATTENUATION STUDY
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OTTAWA, ONTARIO

Title:

RECEPTOR LOCATION PLAN

Scale: 1:500	Date: 08/2020
Drawn by: YA	Report No.: PG5456-1
Checked by: SB	Dwg. No.: PG5456-2
Approved by: DJG	Revision No.:

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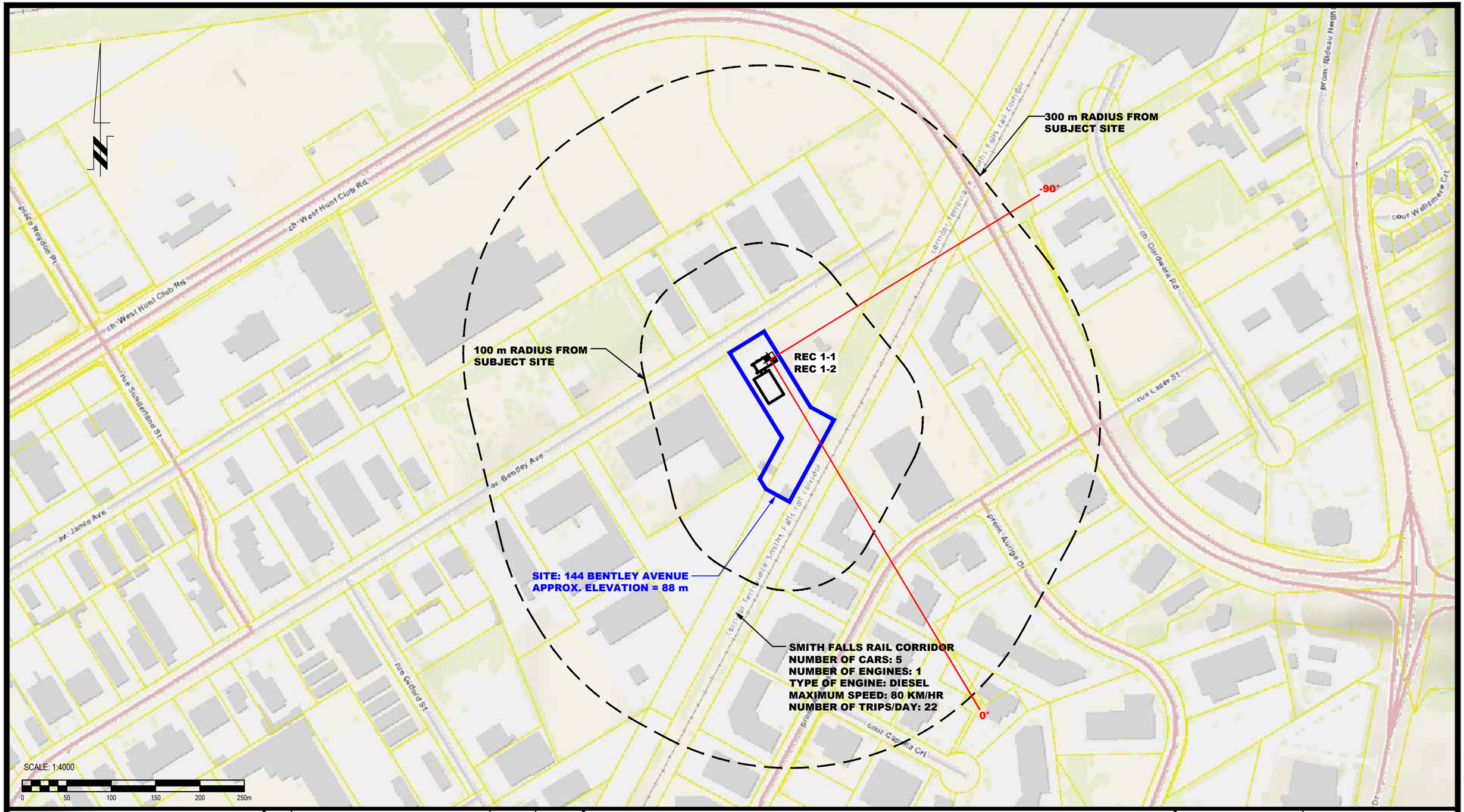

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NOISE ATTENUATION STUDY
PROPOSED BUILDING - 144 BENTLEY AVENUE

OTTAWA, ONTARIO

Title:

SITE GEOMETRY - REC 1-1 AND REC 1-2

Scale: 1:4000	Date: 08/2020
Drawn by: YA	Report No.: PG5456-1
Checked by: SB	Dwg. No.: PG5456-3A
Approved by: DJG	Revision No.:

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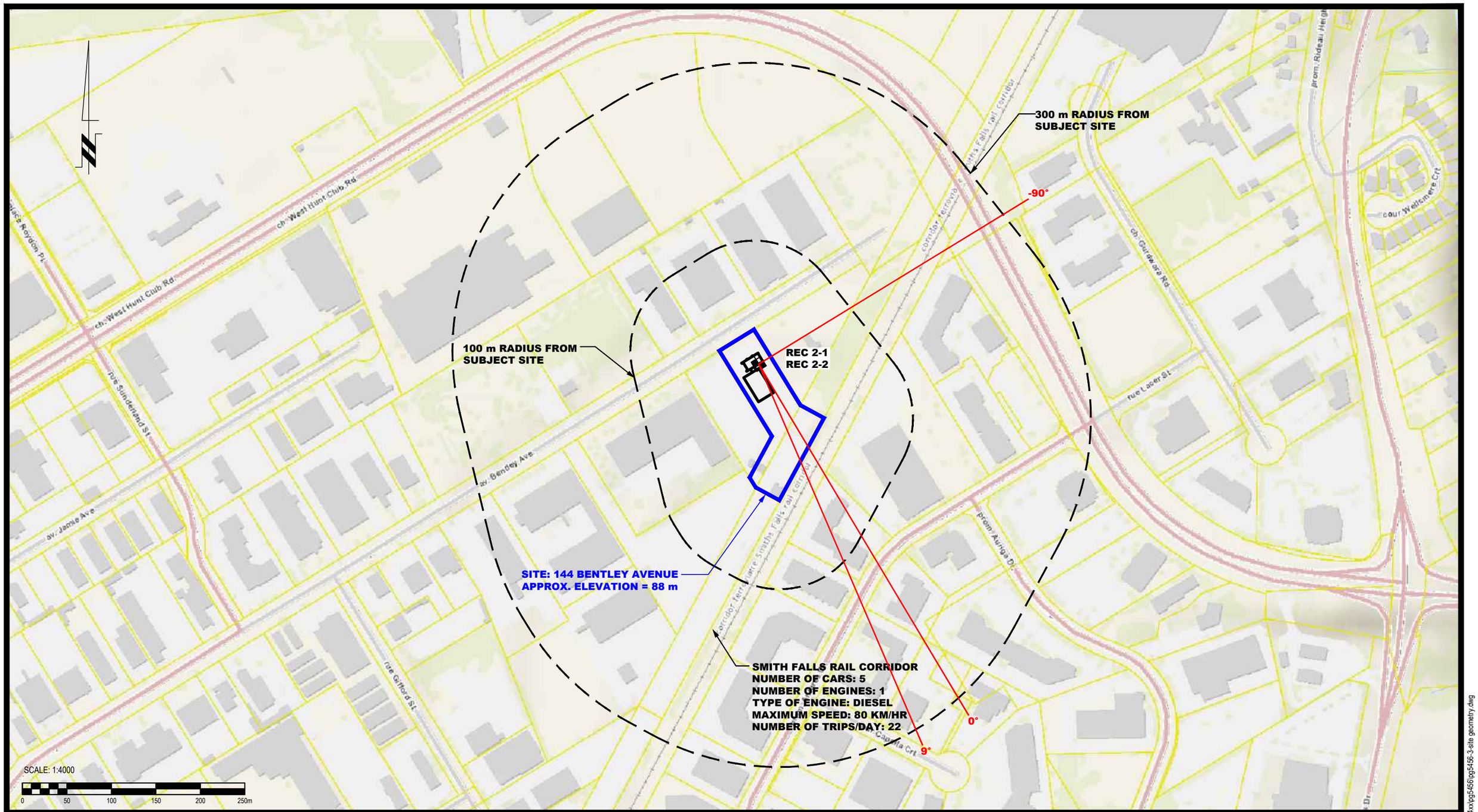

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NOISE ATTENUATION STUDY
PROPOSED BUILDING - 144 BENTLEY AVENUE

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Title:

SITE GEOMETRY - REC 2-1 AND REC 2-2

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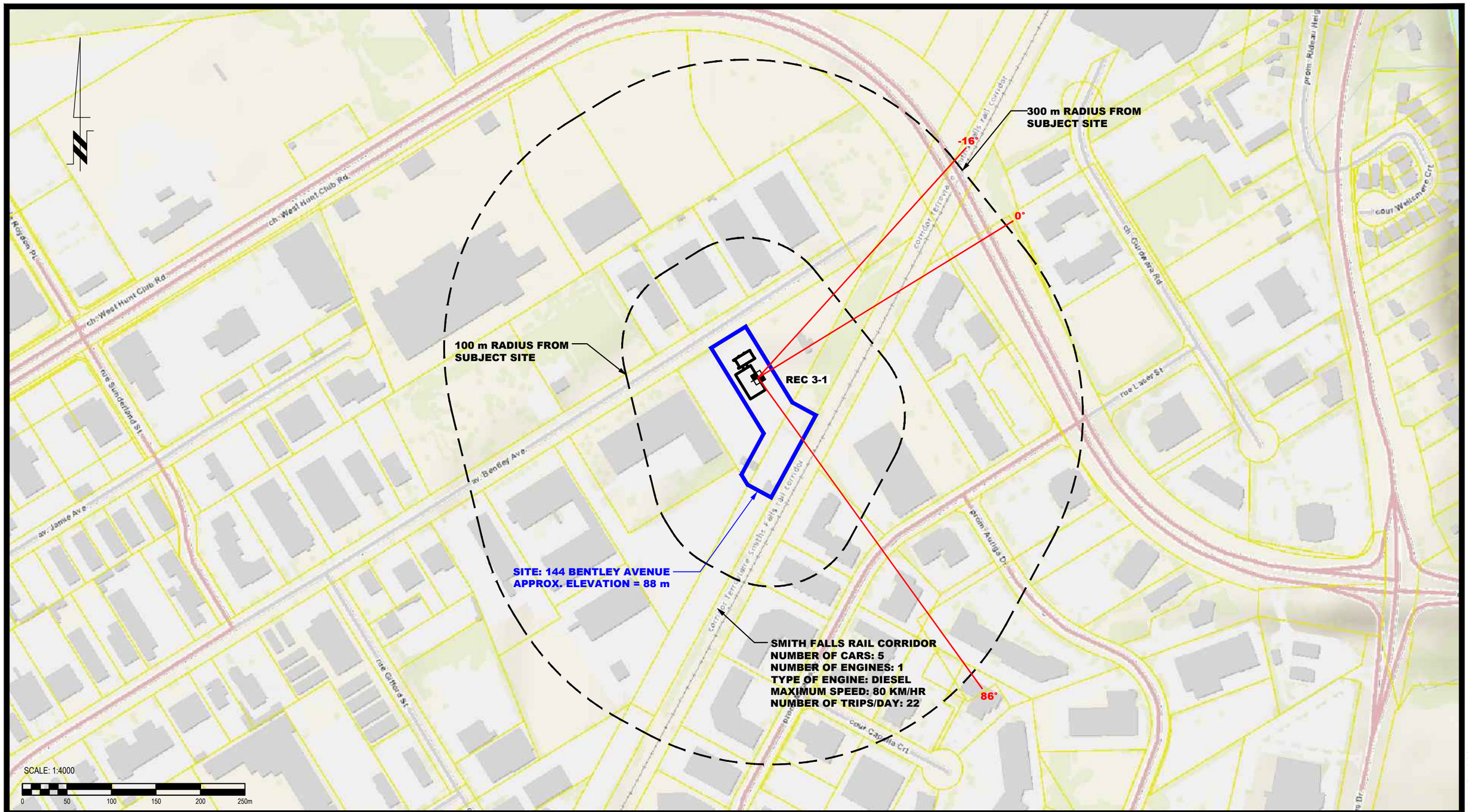

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NOISE ATTENUATION STUDY
PROPOSED BUILDING - 144 BENTLEY AVENUE

OTTAWA, ONTARIO

Title:

SITE GEOMETRY - REC 3-1

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Approved by: DJG	Revision No.:

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300 m RADIUS FROM SUBJECT SITE

-97°

100 m RADIUS FROM SUBJECT SITE

REC 4-1

SITE: 144 BENTLEY AVENUE
APPROX. ELEVATION = 88 m

SMITH FALLS RAIL CORRIDOR
NUMBER OF CARS: 5
NUMBER OF ENGINES: 1
TYPE OF ENGINE: DIESEL
MAXIMUM SPEED: 80 KM/HR
NUMBER OF TRIPS/DAY: 22

0°

48°

SCALE: 1:4000

0 50 100 150 200 250m

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NOISE ATTENUATION STUDY
PROPOSED BUILDING - 144 BENTLEY AVENUE

OTTAWA, ONTARIO

Title:

SITE GEOMETRY - REC 4-1

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Approved by: DJG	Revision No.:

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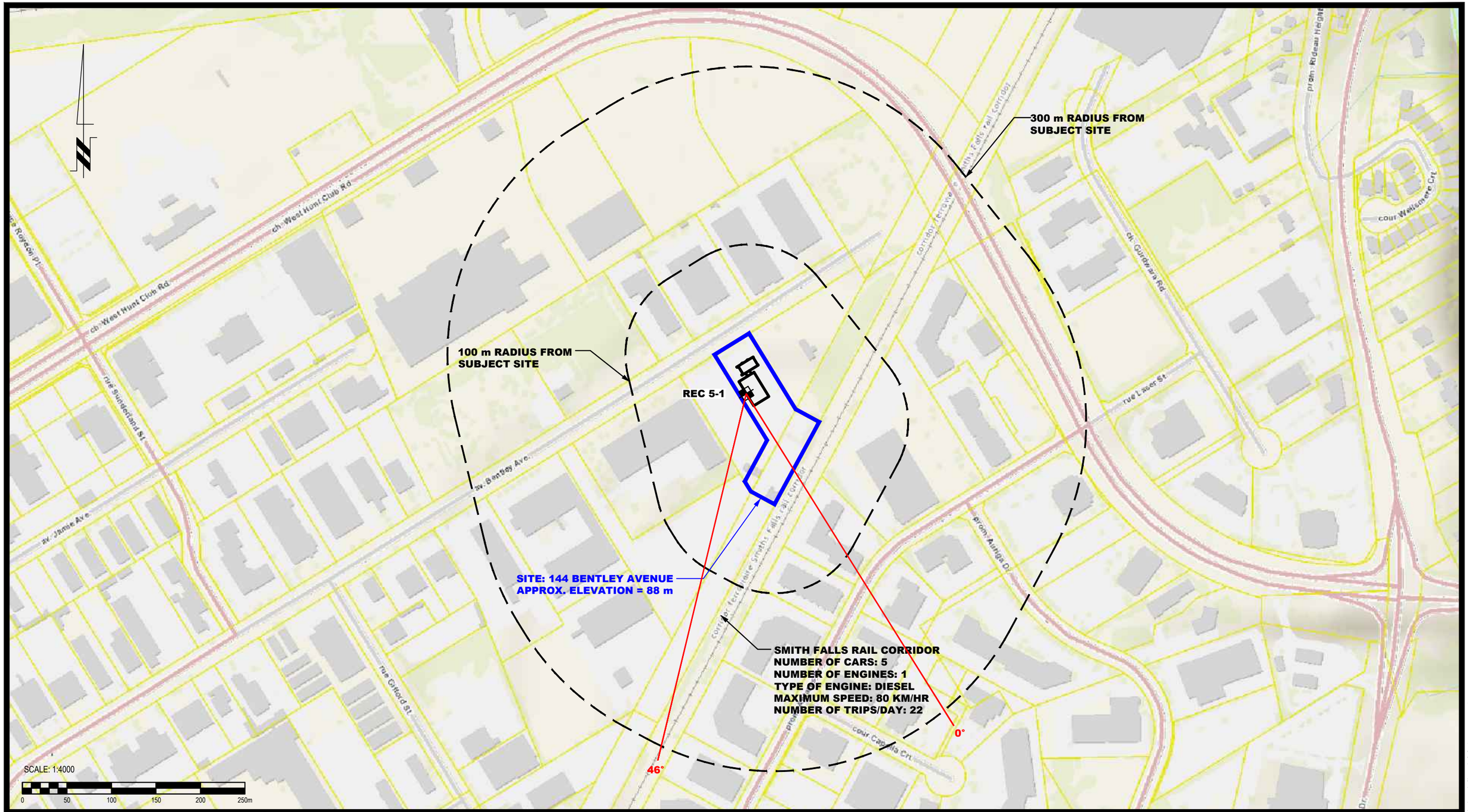

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NO.	REVISIONS	DATE	INITIAL

CITYSCAPE

NOISE ATTENUATION STUDY
PROPOSED BUILDING - 144 BENTLEY AVENUE

OTTAWA, ONTARIO

Title:

SITE GEOMETRY - REC 5-1

Scale: 1:4000	Date: 08/2020
Drawn by: YA	Report No.: PG5456-1
Checked by: SB	Dwg. No.: PG5456-3E
Approved by: DJG	Revision No.:

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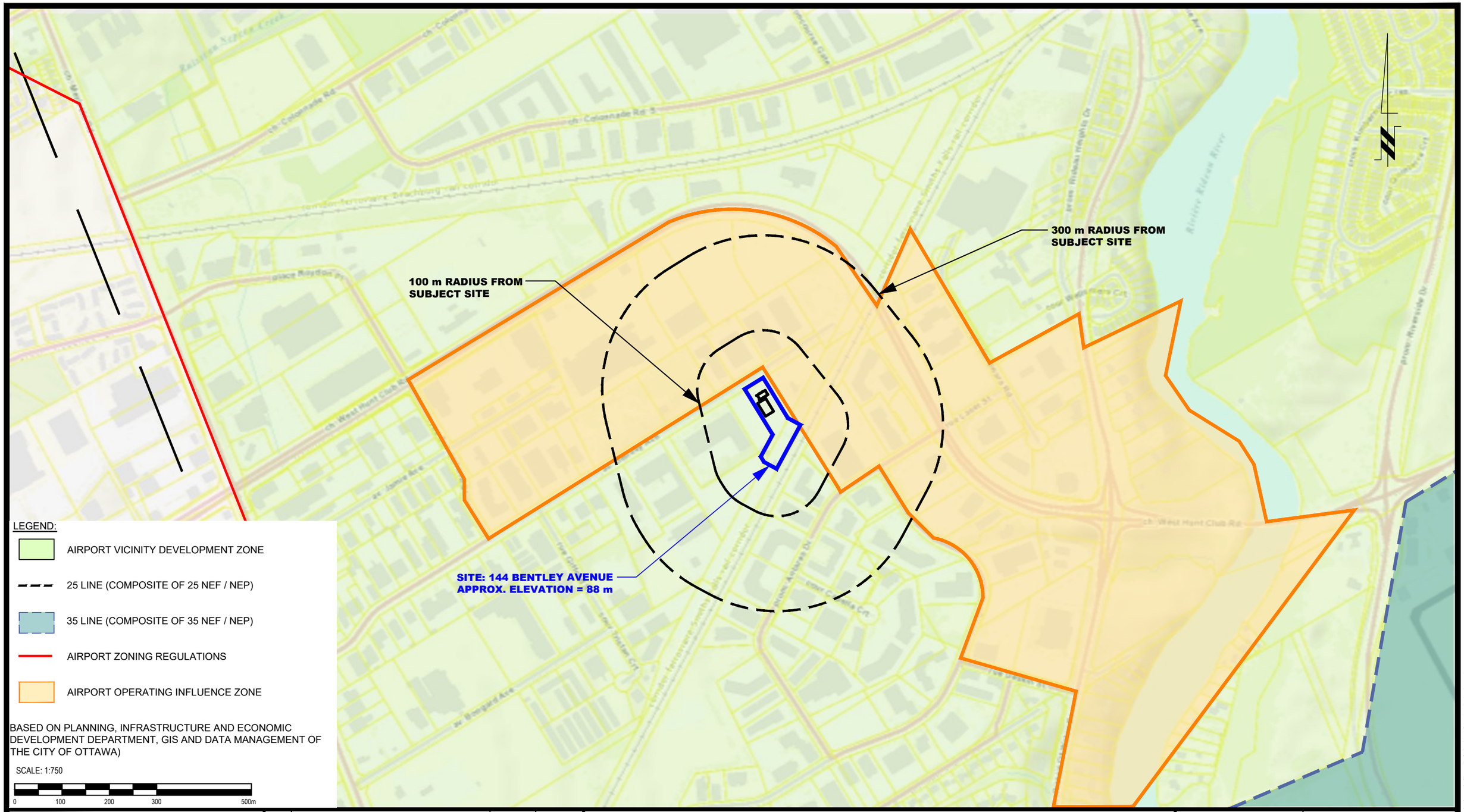

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NO.	REVISIONS	DATE	INITIAL

CITYSCAPE

NOISE ATTENUATION STUDY
PROPOSED BUILDING - 144 BENTLEY AVENUE

OTTAWA, ONTARIO

Title:

AIRCRAFT NOISE LIMITATIONS

Scale: 1:7500	Date: 08/2020
Drawn by: YA	Report No.: PG5456-1
Checked by: SB	Dwg. No.: PG5456-4
Approved by: DJG	Revision No.:

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APPENDIX 2

STAMSON RESULTS

STAMSON 5.0 NORMAL REPORT Date: 12-08-2020 05:55:45
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Rail data, segment # 1: VIA (day/night)

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. VIA	22.0/1.0	80.0	1.0	5.0	Diesel	No

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

Angle1 Angle2	: -90.00 deg	0.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 105.00 / 105.00 m	
Receiver height	: 1.50 / 1.50 m	
Topography	: 1	(Flat/gentle slope; no barrier)

No Whistle
Reference angle : 0.00

Results segment # 1: VIA (day)

LOCOMOTIVE (0.00 + 48.09 + 0.00) = 48.09 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.58	65.83	-13.39	-4.34	0.00	0.00	0.00	48.09

WHEEL (0.00 + 40.45 + 0.00) = 40.45 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.66	58.95	-14.03	-4.47	0.00	0.00	0.00	40.45

Segment Leq : 48.78 dBA

Total Leq All Segments: 48.78 dBA

Results segment # 1: VIA (night)

LOCOMOTIVE (0.00 + 37.68 + 0.00) = 37.68 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.58	55.41	-13.39	-4.34	0.00	0.00	0.00	37.68

WHEEL (0.00 + 30.04 + 0.00) = 30.04 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.66	48.53	-14.03	-4.47	0.00	0.00	0.00	30.04

Segment Leq : 38.37 dBA

Total Leq All Segments: 38.37 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 48.78
(NIGHT): 38.37

STAMSON 5.0 NORMAL REPORT Date: 12-08-2020 06:27:33
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: rec12.te Time Period: Day/Night 16/8 hours
Description: Reception Point 1-2

Rail data, segment # 1: VIA (day/night)

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. VIA	22.0/1.0	80.0	1.0	5.0	Diesel	No

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

Angle1 Angle2	: -90.00 deg	0.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 105.00 / 105.00 m	
Receiver height	: 4.50 / 4.50 m	
Topography	: 1	(Flat/gentle slope; no barrier)
No Whistle		
Reference angle	: 0.00	

Results segment # 1: VIA (day)

LOCOMOTIVE (0.00 + 49.02 + 0.00) = 49.02 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.50	65.83	-12.63	-4.18	0.00	0.00	0.00	49.02

WHEEL (0.00 + 41.06 + 0.00) = 41.06 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.60	58.95	-13.52	-4.37	0.00	0.00	0.00	41.06

Segment Leq : 49.66 dBA

Total Leq All Segments: 49.66 dBA

Results segment # 1: VIA (night)

LOCOMOTIVE (0.00 + 38.60 + 0.00) = 38.60 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.50	55.41	-12.63	-4.18	0.00	0.00	0.00	38.60

WHEEL (0.00 + 30.64 + 0.00) = 30.64 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.60	48.53	-13.52	-4.37	0.00	0.00	0.00	30.64

Segment Leq : 39.24 dBA

Total Leq All Segments: 39.24 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 49.66
(NIGHT): 39.24

STAMSON 5.0 NORMAL REPORT Date: 12-08-2020 06:28:43
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: rec21.te Time Period: Day/Night 16/8 hours
Description: Reception Point 2-1

Rail data, segment # 1: VIA (day/night)

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. VIA	22.0/1.0	80.0	1.0	5.0	Diesel	No

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

Angle1 Angle2	: -90.00 deg	9.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 100.00 / 100.00 m	
Receiver height	: 1.50 / 1.50	m
Topography	: 1	(Flat/gentle slope; no barrier)
No Whistle		
Reference angle	: 0.00	

Results segment # 1: VIA (day)

LOCOMOTIVE (0.00 + 48.98 + 0.00) = 48.98 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	9	0.58	65.83	-13.06	-3.79	0.00	0.00	0.00	48.98

WHEEL (0.00 + 41.37 + 0.00) = 41.37 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	9	0.66	58.95	-13.68	-3.90	0.00	0.00	0.00	41.37

Segment Leq : 49.67 dBA

Total Leq All Segments: 49.67 dBA

Results segment # 1: VIA (night)

LOCOMOTIVE (0.00 + 38.57 + 0.00) = 38.57 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	9	0.58	55.41	-13.06	-3.79	0.00	0.00	0.00	38.57

WHEEL (0.00 + 30.95 + 0.00) = 30.95 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	9	0.66	48.53	-13.68	-3.90	0.00	0.00	0.00	30.95

Segment Leq : 39.26 dBA

Total Leq All Segments: 39.26 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 49.67
(NIGHT): 39.26

STAMSON 5.0 NORMAL REPORT Date: 12-08-2020 06:29:16
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: rec22.te Time Period: Day/Night 16/8 hours
Description: Reception Point 2-2

Rail data, segment # 1: VIA (day/night)

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. VIA	22.0/1.0	80.0	1.0	5.0	Diesel	No

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

Angle1 Angle2	-90.00 deg	9.00 deg
Wood depth	0	(No woods.)
No of house rows	0 / 0	
Surface	1	(Absorptive ground surface)
Receiver source distance	100.00 / 100.00 m	
Receiver height	4.50 / 4.50 m	
Topography	1	(Flat/gentle slope; no barrier)

No Whistle
Reference angle : 0.00

Results segment # 1: VIA (day)

LOCOMOTIVE (0.00 + 49.87 + 0.00) = 49.87 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	9	0.50	65.83	-12.32	-3.64	0.00	0.00	0.00	49.87

WHEEL (0.00 + 41.95 + 0.00) = 41.95 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	9	0.60	58.95	-13.18	-3.81	0.00	0.00	0.00	41.95

Segment Leq : 50.52 dBA

Total Leq All Segments: 50.52 dBA

Results segment # 1: VIA (night)

LOCOMOTIVE (0.00 + 39.45 + 0.00) = 39.45 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	9	0.50	55.41	-12.32	-3.64	0.00	0.00	0.00	39.45

WHEEL (0.00 + 31.54 + 0.00) = 31.54 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	9	0.60	48.53	-13.18	-3.81	0.00	0.00	0.00	31.54

Segment Leq : 40.10 dBA

Total Leq All Segments: 40.10 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 50.52
(NIGHT): 40.10

STAMSON 5.0 NORMAL REPORT Date: 12-08-2020 06:30:15
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Rail data, segment # 1: VIA (day/night)

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. VIA	22.0/1.0	80.0	1.0	5.0	Diesel	No

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

Angle1 Angle2	-16.00 deg	86.00 deg
Wood depth	0	(No woods.)
No of house rows	0 / 0	
Surface	1	(Absorptive ground surface)
Receiver source distance	120.00 / 120.00 m	
Receiver height	1.50 / 1.50 m	
Topography	1	(Flat/gentle slope; no barrier)
No Whistle		
Reference angle	0.00	

Results segment # 1: VIA (day)

LOCOMOTIVE (0.00 + 48.08 + 0.00) = 48.08 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-16	86	0.58	65.83	-14.31	-3.44	0.00	0.00	0.00	48.08

WHEEL (0.00 + 40.42 + 0.00) = 40.42 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-16	86	0.66	58.95	-14.99	-3.53	0.00	0.00	0.00	40.42

Segment Leq : 48.77 dBA

Total Leq All Segments: 48.77 dBA

Results segment # 1: VIA (night)

LOCOMOTIVE (0.00 + 37.66 + 0.00) = 37.66 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-16	86	0.58	55.41	-14.31	-3.44	0.00	0.00	0.00	37.66

WHEEL (0.00 + 30.01 + 0.00) = 30.01 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-16	86	0.66	48.53	-14.99	-3.53	0.00	0.00	0.00	30.01

Segment Leq : 38.35 dBA

Total Leq All Segments: 38.35 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 48.77
(NIGHT): 38.35

STAMSON 5.0 NORMAL REPORT Date: 12-08-2020 06:31:22
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: rec41.te Time Period: Day/Night 16/8 hours
Description: Reception Point 4-1

Rail data, segment # 1: VIA (day/night)

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. VIA	22.0/1.0	80.0	1.0	5.0	Diesel	No

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

Angle1 Angle2	: -90.00 deg	48.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 72.00 / 72.00	m
Receiver height	: 1.50 / 1.50	m
Topography	: 1	(Flat/gentle slope; no barrier)

No Whistle
Reference angle : 0.00

Results segment # 1: VIA (day)

LOCOMOTIVE (0.00 + 52.93 + 0.00) = 52.93 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	48	0.58	65.83	-10.80	-2.10	0.00	0.00	0.00	52.93

WHEEL (0.00 + 45.44 + 0.00) = 45.44 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	48	0.66	58.95	-11.31	-2.19	0.00	0.00	0.00	45.44

Segment Leq : 53.64 dBA

Total Leq All Segments: 53.64 dBA

Results segment # 1: VIA (night)

LOCOMOTIVE (0.00 + 42.51 + 0.00) = 42.51 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	48	0.58	55.41	-10.80	-2.10	0.00	0.00	0.00	42.51

WHEEL (0.00 + 35.03 + 0.00) = 35.03 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	48	0.66	48.53	-11.31	-2.19	0.00	0.00	0.00	35.03

Segment Leq : 43.22 dBA

Total Leq All Segments: 43.22 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 53.64
(NIGHT): 43.22

STAMSON 5.0 NORMAL REPORT Date: 12-08-2020 06:33:39
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: rec51.te Time Period: Day/Night 16/8 hours
Description: Reception Point 5-1

Rail data, segment # 1: VIA (day/night)

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. VIA	22.0/1.0	80.0	1.0	5.0	Diesel	No

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

Angle1 Angle2	:	0.00 deg 46.00 deg
Wood depth	:	0 (No woods.)
No of house rows	:	0 / 0
Surface	:	1 (Absorptive ground surface)
Receiver source distance	:	97.00 / 97.00 m
Receiver height	:	1.50 / 1.50 m
Topography	:	1 (Flat/gentle slope; no barrier)

No Whistle
Reference angle : 0.00

Results segment # 1: VIA (day)

LOCOMOTIVE (0.00 + 46.77 + 0.00) = 46.77 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	46	0.58	65.83	-12.85	-6.21	0.00	0.00	0.00	46.77

WHEEL (0.00 + 39.24 + 0.00) = 39.24 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	46	0.66	58.95	-13.46	-6.25	0.00	0.00	0.00	39.24

Segment Leq : 47.48 dBA

Total Leq All Segments: 47.48 dBA

Results segment # 1: VIA (night)

LOCOMOTIVE (0.00 + 36.35 + 0.00) = 36.35 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	46	0.58	55.41	-12.85	-6.21	0.00	0.00	0.00	36.35

WHEEL (0.00 + 28.83 + 0.00) = 28.83 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	46	0.66	48.53	-13.46	-6.25	0.00	0.00	0.00	28.83

Segment Leq : 37.06 dBA

Total Leq All Segments: 37.06 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 47.48
(NIGHT): 37.06