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Environmental Noise and Vibration Control Study

Proposed Residential Development
25 Fair Oaks Crescent, Ottawa

Prepared For

RATI Group Ltd

June 3, 2022

Report: PG6280-1

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Table of Contents

PAGE

Appendices

1.0 Introduction

Paterson Group (Paterson) was commissioned by RATI Group Ltd to conduct an environmental noise control study for the proposed residential development to be located at 25 Fair Oaks Crescent, 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 Proposed Development

It is understood that the proposed development will consist of three (3) two-storey townhouses (Townhouses A, B, and C). The townhouses will rise 7 metres above grade. Associated walkways, driveways, bicycle parking area, and landscaped areas are further anticipated. Outdoor living areas (at-grade rear yards) are identified on the proposed site plan and will be included in the analysis.

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

Surface roadway traffic noise, equivalent to sound level energy L_{eq}, provides a measure of the time varying noise level over a period of time. For roadways, the L_{eq} is commonly calculated on the basis of 16-hour (L_{eq16}) daytime (07:00-23:00) and 8-hour (L_{eq8}) nighttime (23:00-7:00) split to assess its impact on residential, commercial and institutional buildings.

The City of Ottawa's Official Plan dictates 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 Environmental Noise Guidelines for Stationary and Transportation Sources – NPC-300 outlines the limitations of noise levels in relation to the location of the receptors. These can be found in the following tables:

Table 1 – Noise Level Limit for Outdoor Living Areas

Time Period	L_{eq} Level (dBA)
Daytime, 7:00-23:00	55

- Standard taken from Table 2.2a; Sound Level Limit for Outdoor Living Areas – Road and Rail

Table 2 – Noise Level Limits for Indoor Living Areas

Type of Space	Time Period	L_{eq} Level (dBA)	
		Road	Rail
General offices, reception areas, retail stores, etc.	Daytime 7:00-23:00	50	45
Theatres, places of worship, libraries, individual or semi-private offices, conference rooms, reading rooms, etc.	Daytime 7:00-23:00	45	40
Living/dining/den areas of **residences**, hospitals, nursing/retirement homes, schools, day-care centres	Daytime 7:00-23:00	45	40
Living/dining/den areas of **residences**, hospitals, nursing/retirement homes etc. (except schools or day-care centres)	Nighttime 23:00-7:00	45	40
Sleeping quarters of hotels/motels	Nighttime 23:00-7:00	45	40
Sleeping quarters of **residences**, hospitals, nursing/retirement homes, etc.	Nighttime 23:00-7:00	40	35

- Standards taken from Table 2.2b, Sound Level Limit for Indoor Living Areas – Road and Rail and Table 2.2c, Supplementary Sound Level Limits for Indoor Spaces – Road and Rail

Predicted noise levels at the pane of window dictate the action required to achieve recommended noise levels. It is noted in ENCG that the limits outlined in Table 2 are for the noise levels on the interior of the window glass pane. An open window is considered to provide a 10 dBA noise reduction, while a standard closed window is capable to provide a minimum 20 dBA noise reduction. The noise level limits of residential building are 45 dBA daytime and 40 dBA nighttime. Therefore, where noise levels exceed 55 dBA daytime and 50 dBA nighttime, the ventilation for the building should consider the provision for central air conditioning. Where noise levels exceed 65 dBA daytime and 60 dBA nighttime, central air conditioning will be required, and the building components will require higher levels of sound attenuation.

When the noise levels are equal to or less than the specified criteria, no noise attenuation (control) measures are required.

When the exceedance of the recommended noise level limits is between 1 dBA and 5 dBA for outdoor living areas (55 dBA < Leq ≤ 60 dBA), the proposed development can be completed with no noise control measures incorporated into the site, but the prospective purchasers / tenants should be made aware by suitable Warning Clauses. When the exceedance of recommended noise level limits is more than 5 dBA for outdoor living areas (Leq > 60 dBA), noise control measures are required to reduce Leq to below 60 dBA and as close as 55 dBA as it is technically and economically feasible.

Noise attenuation (control) measures include any or all of the following:

- Noise attenuation barrier
- Provisions for the installation of central air conditioning
- Central air conditioning
- Architectural components designed to provide additional acoustic insulation

In addition to the implementation of noise attenuation features, if required, the following Warning Clauses may be recommended to advise the prospective purchasers / tenants of affected units of potential environmental noise problem:

Table 3 – Warning Clauses for Outdoor Living Areas

Leq (dBA)	Warning Clause	Description
55 dBA < $L_{eq(16)}$ ≤ 60 dBA	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."
60 dBA < $L_{eq(16)}$	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."

- Clauses taken from section C8 Warning Clauses; Environmental Noise Guidelines for Stationary and Transportation Sources - NPC-300

Table 4 – Warning Clauses for Indoor Living Areas		
Leq (dBA)	**Warning Clause**	**Description**
55 dBA < $L_{eq(16)}$ ≤ 65 dBA 50 dBA < $L_{eq(8)}$ ≤ 60 dBA	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."
65 dBA < $L_{eq(16)}$ 60 dBA < $L_{eq(8)}$	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 for Stationary and Transportation Sources - NPC-300		

Stationary Noise

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

The subject site is not in proximity to existing or approved stationary sources of noise. Therefore, a stationary noise analysis will not be required.

Aircraft / Airport Noise

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

4.0 Methodology and Vibration Assessment Criteria

Due to the location of the existing VIA Train Beachburg Rail Corridor, a ground-borne vibration and ground-borne noise review was also performed for this development.

Effects of the Rail Corridor 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 cause 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) primary 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 for 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 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.

The Federal Transit Administration's Transit Noise and Vibration Impact Assessment Manual: FTA Report No. 0123 dated September 2018 outlines the vibration standards caused by rail sources. Upon review of this document, 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 2 - Residential. 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 2	72 VdB	75 VdB	80 VdB

- Standards taken from Table 6.3; Indoor Ground-Borne Vibration and Ground-Borne Noise Impact Criteria for General Vibration Assessment.
- 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 defined as between 30 and 70 vibration events of the same source per day. Most commuter trunk lines have this number of operations.
- Infrequent events is defined as fewer than 30 vibration events of the same kind per day. This category includes most commuter rail branch lines.

Ground-borne vibration can also result in ground-borne noise. This is separate from the noise caused by the trains directly, and instead focuses on the vibration of objects to emit noise. Similar to ground-borne vibration, the noise impacts are based on a criteria for human annoyance and activity interference. For residential buildings, the criteria for acceptability is given in the following table:

Table 6 – Ground-Borne Noise (GBN) for General Assessment

Land Use Category	GBN Impact Levels (dBA re 20 micro Pascals)		
	Frequent Events	**Occasional Events**	**Infrequent Events**
Category 2	35 dBA	38 dBA	43 dBA

- Standards taken from Table 6.3; Indoor Ground-Borne Vibration and Ground-Borne Noise Impact Criteria for General Vibration Assessment.
- 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 defined as between 30 and 70 vibration events of the same source per day. Most commuter trunk lines have this number of operations.
- Infrequent events is defined as fewer than 30 vibration events of the same kind per day. This category includes most commuter rail branch lines.

5.0 Analysis

Surface Transportation Noise

The subject development is bordered to the north by Fair Oaks Crescent followed by residential dwellings and Beachburg Rail Corridor, to the east by residential dwellings, to the south by residential dwellings, and to the west by residential dwellings and Fair Oaks Crescent. Fair Oaks Crescent is identified within the 100 m radius of proposed development.

Based on the City of Ottawa's Official Plan, Schedule E, the roads within the 100 m radius of the proposed development are not classified as either arterial, collector or major collector roads and therefore are not included in this study.

The Beachburg Rail Corridor is located within 300 m radius of proposed development. It is understood the Beachburg Rail Corridor is used by VIA Rail. Based on an e-mail discussion with Mr. Paul Charbachi, P.Eng. of VIA Rail Canada, it is understood that during high frequency the traffic volume of passenger trains along the Beachburg Rail Corridor will be once every hour from 5 AM to Midnight, and the traffic volume of freight trains will be twice a day, resulting in an 'infrequent event' as per the GNB Impact Levels noted in Table 5. It was further confirmed by VIA Rail Canada that each VIA train consists of two diesel locomotives pulling 6 cars, and the approximate train speed is 60 mph (96 km/hr). An e-mail confirming the Beachburg Rail Corridor information is included in Appendix 3.

The major source of traffic noise is due to the Beachburg Railway Corridor to the north of the proposed development.

Table 7 – Rail Parameters

Segment	Engine Type	Maximum Speed (km/hr)	Number of Trips/day	Length of Train
VIA Rail	Diesel	96	21	8

- Data calculated from the VIA Train online schedules

All noise sources are presented in Drawing PG6280-3 - Site Geometry located in Appendix 1.

Three (3) levels of reception points were selected for this analysis. The following elevations were selected from the heights provided on the survey plan for the subject development.

Table 8 – Elevations of Reception Points			
Floor Number	**Elevation at Centre of Window (m)**	**Floor Use**	**Daytime / Nighttime Analysis**
First Floor	1.5	Living Area/Bedroom	Daytime / Nighttime
Second Floor	4.5	Living Area/Bedroom	Daytime / Nighttime

For this analysis, a reception point was taken at the centre of each floor, at the first floor and top floor. Outdoor living areas – at-grade rear yards are anticipated at the proposed development. Reception points are detailed on Drawing PG6280-2 - Receptor Locations presented in Appendix 1.

All horizontal distances have been measured from the reception point to the edge of the right-of-way. The rail line was analyzed where it intersected the 300 m buffer zone, which is reflected in the local angles described in Paterson Drawings PG6280-3A to 3E - Site Geometry in Appendix 1.

Table 10 - Summary of Reception Points and Geometry, located in Appendix 1, provides a summary of the points of reception and their geometry with respect to the noise source. 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 levelled and at grade with the neighbouring roads within the 300 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.

Standard mitigation measures for the VIA Train Rail Line - principle main line include a 30 m setback, a 2.5 m high earthen berm and a possible 3 m high acoustical fence. In this analysis, the mitigation measure includes a 70 m setback from the VIA Train railway. It is understood that earthen berm is not included in this project. The railway is located at the same level as the proposed development but has a dense layer of vegetation planted along the rail line.

Ground-Borne Noise and Vibration

The VIA Train Rail Line is located along the eastern property line. It is understood that there will be 21 trains a day, at a maximum speed of approximately 96 km/hr (60 mph). It is further understood that there will be a 75 m (246 ft) buffer zone from the centerline of VIA Train railway to the closest possible location of the proposed development.

The following figure is a base curve for ground surface vibration levels, assuming the equipment is in good condition and speeds of 80 km/hr (50 mph). Due to the nature of the rail line, identified as a locomotive powered passenger or freight train, this figure is applicable for the proposed buildings.

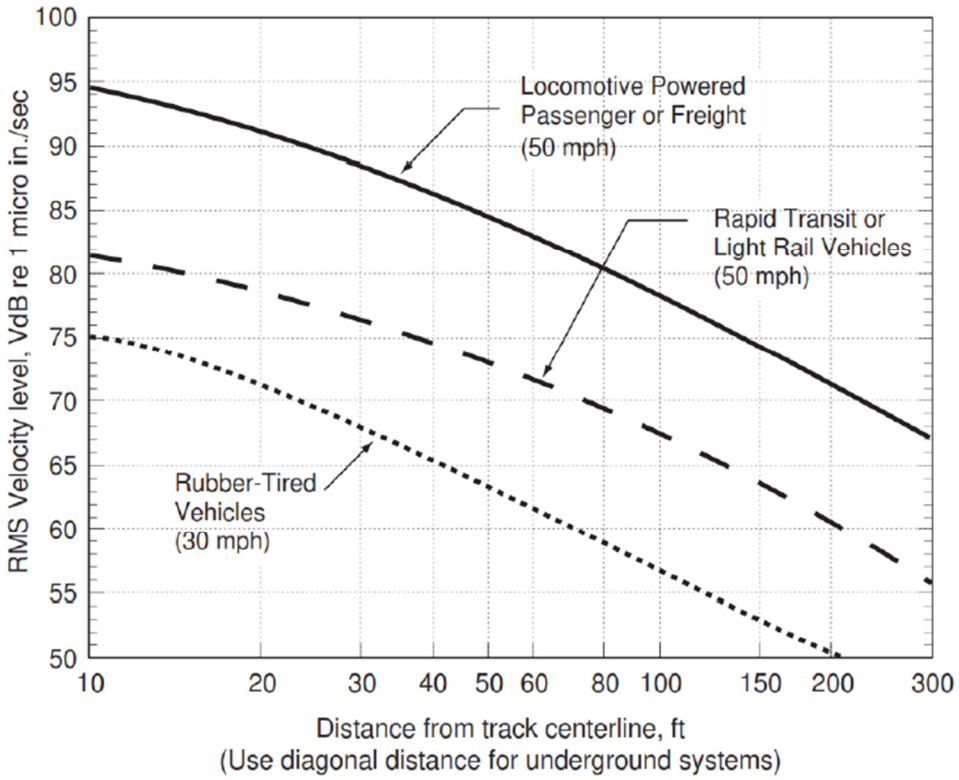


Figure 1. Generalized Ground Surface Vibration Curve

Figure 1 provides the generalized ground surface vibration curve, but adjustments, noted in Tables 6-11, 6-12 and 6-13 of the Transit Noise and Vibration Impact Assessment, can be made to the ground-borne vibration parameters. The most common adjustments are noted below:

Speed:	Vehicle speed - 96 km/hr (60 mph)	+1.6 dB
Track Conditions:	stiff primary suspension	+8 dB
Track Treatments:	Ballast	-10 dB
	High-resistence fasteners	-5 dB
	Resiliently supported ties	-10 dB
Track Structure:	at-grade tie & ballast; Elevated	-10 dB
	at-grade tie & ballast; Open cut	0 dB
Geologic Conditions:	in Soil	+10 dB
	in Rock layer (50 ft bgs.)	+2 dB
Building Foundation:	Wood-framed Houses	-5 dB
	1-2 Storey Masonry	-7 dB
Floor-to-Floor Attenuation:	1 to 5 Floors above Grade	-2 dB/Floor
	5 to 10 Floors above Grade	-1 dB/Floor
	10 to 15 Floors above Grade	0 dB/Floor
Amplification due to Resonances:		+6 dB

From a review of the neighbouring railway, the following conditions were confirmed:

Vehicle speed - 96 km/hr (60 mph)
Soft Primary Suspension (resonance around 8-10 Hz)
No track treatment: Floating slab trackbed
No track treatment: Ballast Mats
No track treatment: High resilience fasteners
No track treatment: Resiliently supported ties.
No Worn or Corrugated Track
Track located at the same level as the proposed development

From a review of the geotechnical founding conditions and the proposed dwellings, the following conditions were confirmed:

Bedrock anticipated at 10 to 15 m below ground surface
Proposed dwellings to be founded on very stiff to stiff silty clay
The rail line is constructed on (assumed) fill or engineered fill
Proposed dwellings to be 2-storey townhouses

6.0 Results

Surface Transportation Noise

The primary descriptors are the 16-hour daytime (7:00-23:00) and the 8-hour nighttime (23:00-7:00) equivalent sound levels, $L_{eq(16)}$ and $L_{eq(8)}$ for City roads.

The exterior noise levels due to roadway traffic sources were analyzed with the STAMSON version 5.04 software at all reception points. The input and output data of the STAMSON modeling can be found in Appendix 2, and the summary of the results can be found in Table 9.

Table 9: Exterior Noise Levels due to Roadway Traffic Sources

Reception Point	Height Above Grade (m)	Receptor Location	Daytime $L_{eq(16)}$ (dBA)	Nighttime $L_{eq(8)}$ (dBA)
REC 1-1	1.5	Townhouse A, Northern Elevation, 1st Floor	56	51
REC 1-2	4.5	Townhouse A, Northern Elevation, 2nd Floor	57	52
REC 2-1	1.5	Townhouse A, Western Elevation, 1st Floor	52	47
REC 2-2	4.5	Townhouse A, Western Elevation, 2nd Floor	52	47
REC 3-1	1.5	Townhouse B, Northern Elevation, 1st Floor	56	51
REC 3-2	4.5	Townhouse B, Northern Elevation, 2nd Floor	57	52
REC 4-1	1.5	Townhouse C, Northern Elevation, 1st Floor	56	51
REC 4-2	4.5	Townhouse C, Northern Elevation, 2nd Floor	57	52
REC 5-1	1.5	Townhouse C, Eastern Elevation, 1st Floor	54	49
REC 5-2	4.5	Townhouse C, Eastern Elevation, 2nd Floor	54	50

Ground-Borne Noise and Vibration

Based on the site proximity to the rail line, the closest location was selected for the analysis at 75 m (246 ft). Therefore, the maximum ground-borne vibrations will be 69 VdB, based on the Generalized Ground Surface Vibration Curve (Figure 1) printed in the FTA document "Transit Noise and Vibration Impact Assessment Manual" dated September 2018. The following table outlines the adjustments for this site:

train speed of 96 km/hr (+1.6 dB)
no special vehicle parameters (0 dB)
no track conditions (0 dB)
no track treatments (0 dB)
not resiliently supported ties (0 dB)
Type of Transit: at-grade tie & ballast; open cut (0 dB)
Coupling to building foundation – wood-frame houses (-5 dB)

Therefore, before floor to floor receiver adjustments, the ground-borne vibration will be 67 dB. Calculating the floor to floor adjustments, the ground-borne vibrations at proposed development will be 70 dB on the first floor and 68 dB on the second floor. The estimated ground-borne vibrations are below the 80 VdB threshold value. Therefore, the estimated ground-borne vibrations at proposed dwellings are considered acceptable and no additional mitigation measures are required with respect to ground-borne vibrations from the rail line.

Ground-borne noise is a common concern for buildings in close proximity to a rail line. The vibration of the transit structure excites the adjacent ground, creating vibration waves that propagate through the subsurface materials, and into the foundation of neighbouring buildings. This vibration will then be transferred throughout the building, often at the resonance frequency of the various components of the building. This ground-borne vibration of floors and walls may cause items to rattle, or it may manifest itself as a rumble, defined as ground-borne noise.

A conservative conversion from ground-borne vibration to ground-borne noise noted in Table 6-14 of the Transit Noise and Vibration Impact Assessment, can be made to the adjusted ground-borne vibration parameters. The conversion is as follow:

Low frequency (<30 Hz):	-50 dB
Typical (peak 30 to 60 Hz):	-35 dB
High frequency (>60 Hz):	-20 dB

The existing railway is classified as a surface track, and therefore would be considered mid-frequency. The conversion from ground-borne vibration to ground-borne noise will result in the estimated ground-borne noise of 35 dBA and 33 dBA, respectively, for the receivers at the first floor and the second floor at proposed dwellings. The estimated ground-borne noises at the first floor of proposed dwellings are below the 43 dBA threshold value by 2 dBA. Therefore, the estimated ground-borne noises at proposed dwellings are considered acceptable and no additional mitigation measures are required with respect to ground-borne noises from the rail line.

7.0 Discussion and Recommendations

7.1 Outdoor Living Areas

Outdoor living areas are anticipated at the rear yards of proposed townhouses (Townhouses A, B, and C). It is noted that the at-grade rear yards at the proposed development are isolated from the major source of traffic noise. Therefore, no additional mitigation measures will be required.

7.2 Indoor Living Areas and Ventilation

The results of the STAMSON modeling indicate that the noise levels at proposed dwellings (Townhouses A, B, and C) will range between 52 dBA and 57 dBA during the daytime period (07:00-23:00) and between 47 dBA and 52 dBA during the nighttime period (23:00-7:00). The noise levels on the northern elevation of proposed dwellings will exceed the limit for the exterior of the pane of glass (55 dBA) specified by the ENCG. Therefore, Townhouses A, B, and C should be designed with the provision for adding a central air conditioning unit, along with the warning clause Type C, as outlined in Table 3. It is also noted that the results of STAMSON modeling indicate that the noise levels at proposed dwellings will be below 65 dBA, and therefore standard building materials are acceptable to provide adequate soundproofing.

8.0 Summary of Findings

The subject site is located at 25 Fair Oaks Crescent, in the City of Ottawa. It is understood that the proposed development will consist of three two-storey townhouses. The dwellings will rise 7 metres above grade. There is a single major source of surface transportation noise to the proposed development: VIA Train Beachburg Rail Corridor.

Several reception points were selected for the analysis, consisting of pane of glass reception points on both the first and top level. The estimated ground-borne vibrations for the receivers at proposed dwellings will be 70 dB on the first floor and 68 dB on the second floor. The ground-borne vibrations are below the threshold value of 80 dB outlined in the FTA. Therefore, the estimated ground-borne vibrations are considered acceptable as outlined by the FTA, and no additional mitigation measures are required with respect to ground-borne vibrations from the rail line. The estimated ground-borne noises for the receivers at proposed dwellings will be 35 dB on the first floor and 33 dB on the second floor. The ground-borne noise levels are considered acceptable as outlined by the FTA and no additional noise mitigation measures are required.

Outdoor Living Areas – at-grade rear yards are anticipated at the proposed development. It is noted that the at-grade rear yards are isolated from the major source of traffic noise. Therefore, the noise levels at rear yards are expected to be lower than the 55 dBA threshold specified by the ENGC.

Several reception points were selected for the surface transportation noise analysis, consisting of the centre of first level and top level of proposed townhouses. The results of STAMSON modeling indicate that the noise levels at the northern elevation of proposed townhouses are expected to exceed the 55 dBA threshold specified by the ENCG. Therefore, the design with the provision for a central air conditioning unit, along with a warning clause Type C, will be required for Townhouses A, B, and C. It is also noted that the modeling indicates that the noise levels are below 65 dBA, and therefore standard building materials are acceptable to provide adequate soundproofing.

The following warning clause is to be included on all Offers of Purchase and Sale and/or lease agreements:

> " 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."

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 RATI Group Ltd 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.

Yolanda Tang, M.Sc.Eng

Stephanie A. Boisvenue, P.Eng.

Report Distribution:

- ❑ RATI Group Ltd (email copy)
- ❑ Paterson Group (1 copy)

APPENDIX 1

TABLE 10 - SUMMARY OF RECEPTION POINTS AND GEOMETRY

Drawing PG6280-1 - Site Plan

Drawing PG6280-2 - Receptor Location Plan

Drawing PG6280-3 - Site Geometry

Drawing PG6280-3A - Site Geometry (REC 1-1 and REC 1-2)

Drawing PG6280-3B - Site Geometry (REC 2-1 and REC 2-2)

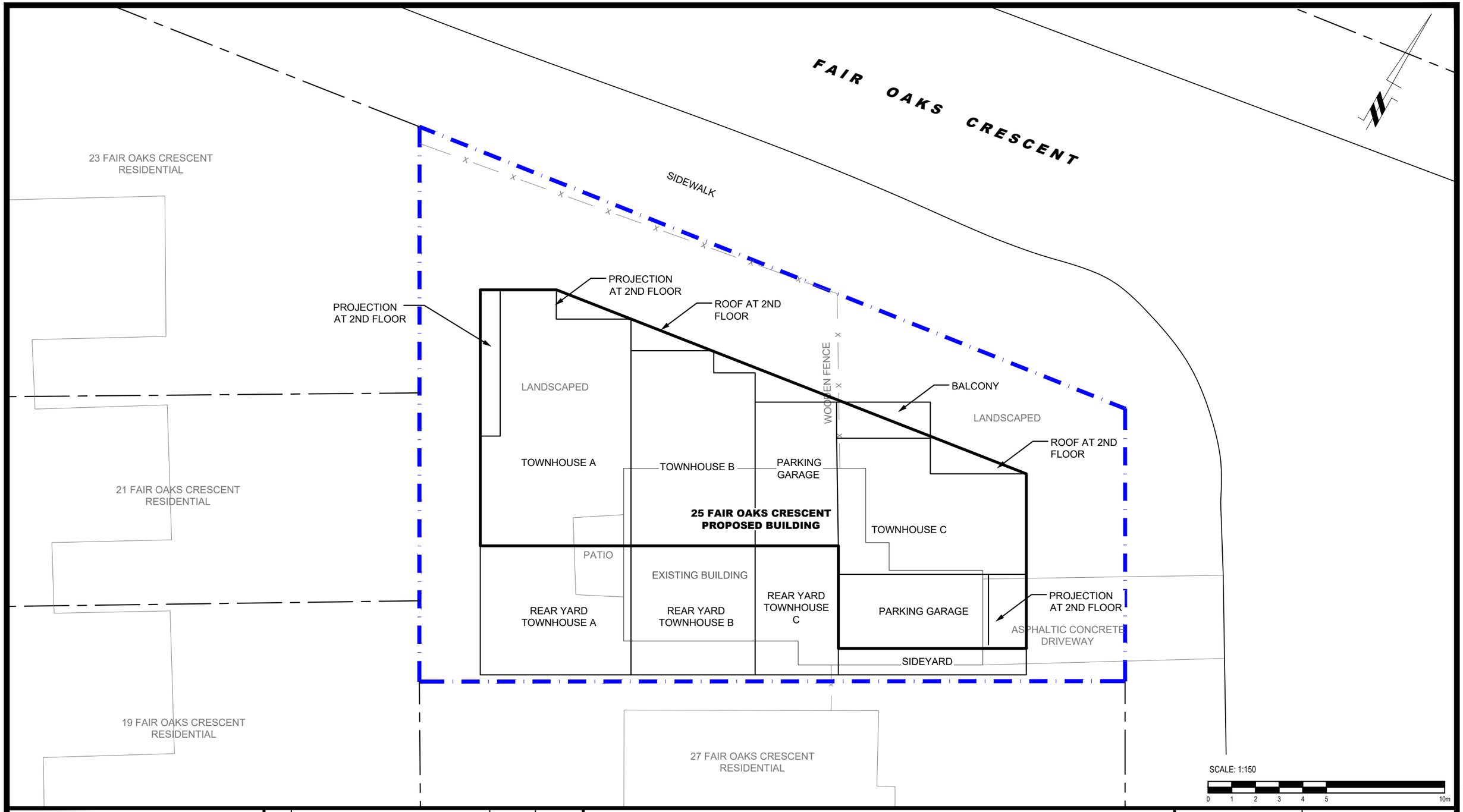
Drawing PG6280-3C - Site Geometry (REC 3-1 and REC 3-2)

Drawing PG6280-3D - Site Geometry (REC 4-1 and REC 4-2)

Drawing PG6280-3E - Site Geometry (REC 5-1 and REC 5-2)

Table 10 - Summary of Reception Points and Geometry
25 Fair Oaks Crescent

Point of Reception	Location	Leq Day (dBA)	VIA Rail Line					
			Horizontal (m)	Vertical (m)	Total (m)	Local Angle (degree)	Number of Rows of Houses	Density (%)
REC 1-1	Townhouse A, Northern Elevation, 1st Floor	56	70	1.5	70.0	-57, 90	1	20
REC 1-2	Townhouse A, Northern Elevation, 2nd Floor	57	70	4.5	70.1	-57, 90	1	20
REC 2-1	Townhouse A, Western Elevation, 1st Floor	52	78	1.5	78.0	-56, 0	1	20
REC 2-2	Townhouse A, Western Elevation, 2nd Floor	52	78	4.5	78.1	-56, 0	1	20
REC 3-1	Townhouse B, Northern Elevation, 1st Floor	56	70	1.5	70.0	-57, 90	1	20
REC 3-2	Townhouse B, Northern Elevation, 2nd Floor	57	70	4.5	70.1	-57, 90	1	20
REC 4-1	Townhouse C, Northern Elevation, 1st Floor	56	70	1.5	70.0	-57, 90	1	20
REC 4-2	Townhouse C, Northern Elevation, 2nd Floor	57	70	4.5	70.1	-57, 90	1	20
REC 5-1	Townhouse C, Eastern Elevation, 1st Floor	54	73	1.5	73.0	-90, 9	1	20
REC 5-2	Townhouse C, Eastern Elevation, 2nd Floor	54	73	4.5	73.1	-90, 9	1	20



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NO.	REVISIONS	DATE	INITIAL

RATI GROUP LTD.

NOISE ATTENUATION STUDY
PROPOSED RESIDENTIAL DEVELOPMENT
25 FAIR OAKS CRESCENT

OTTAWA, ONTARIO

Title:

SITE PLAN

Scale: 1:150	Date: 06/2022
Drawn by: YA	Report No.: PG6280-1
Checked by: YT	Dwg. No.: PG6280-1
Approved by: SB	Revision No.:

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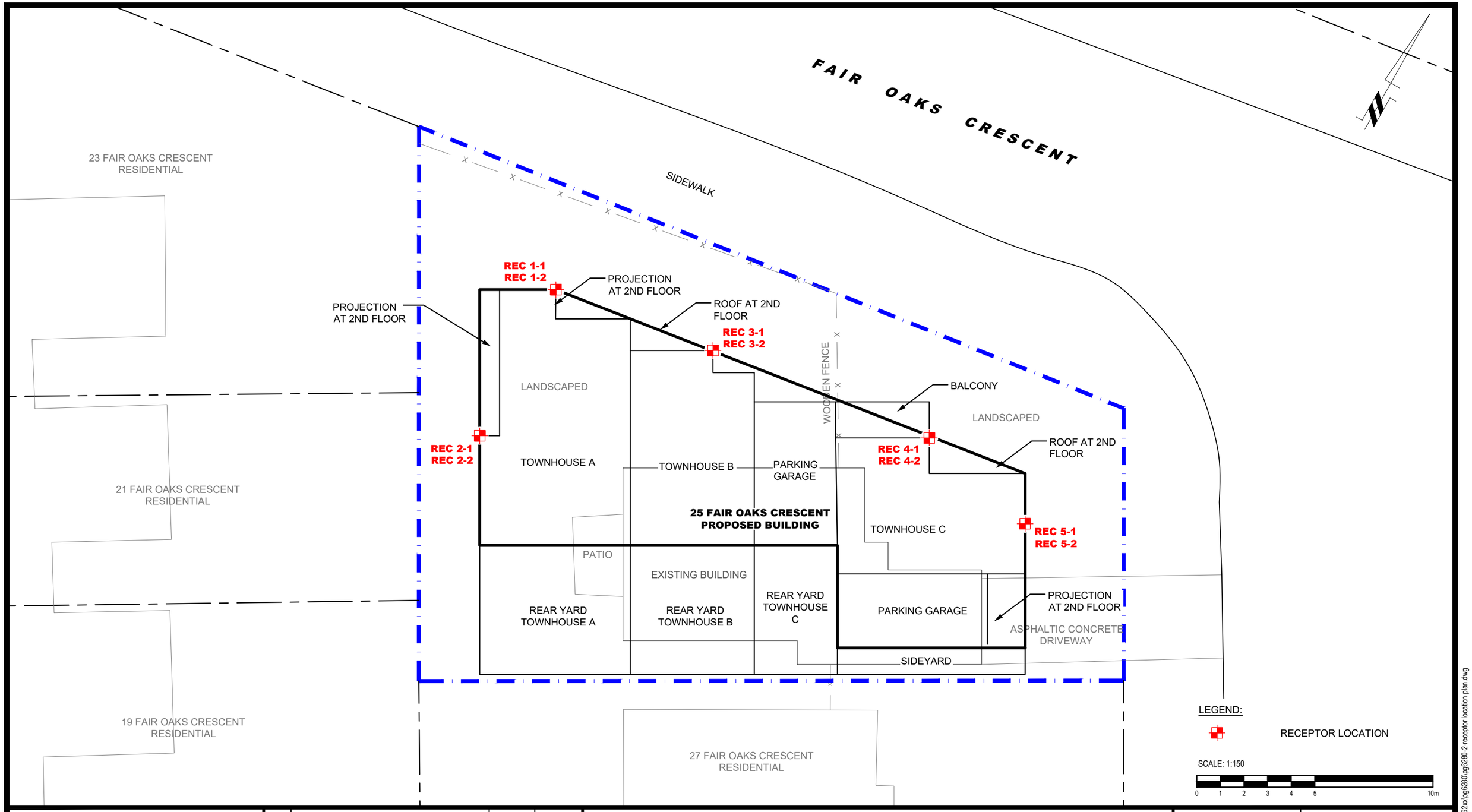

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NOISE ATTENUATION STUDY
PROPOSED RESIDENTIAL DEVELOPMENT
25 FAIR OAKS CRESCENT

OTTAWA, ONTARIO

Title:

RECEPTOR LOCATION PLAN

Scale: 1:150	Date: 06/2022
Drawn by: YA	Report No.: PG6280-1
Checked by: YT	Dwg. No.: PG6280-2
Approved by: SB	Revision No.:

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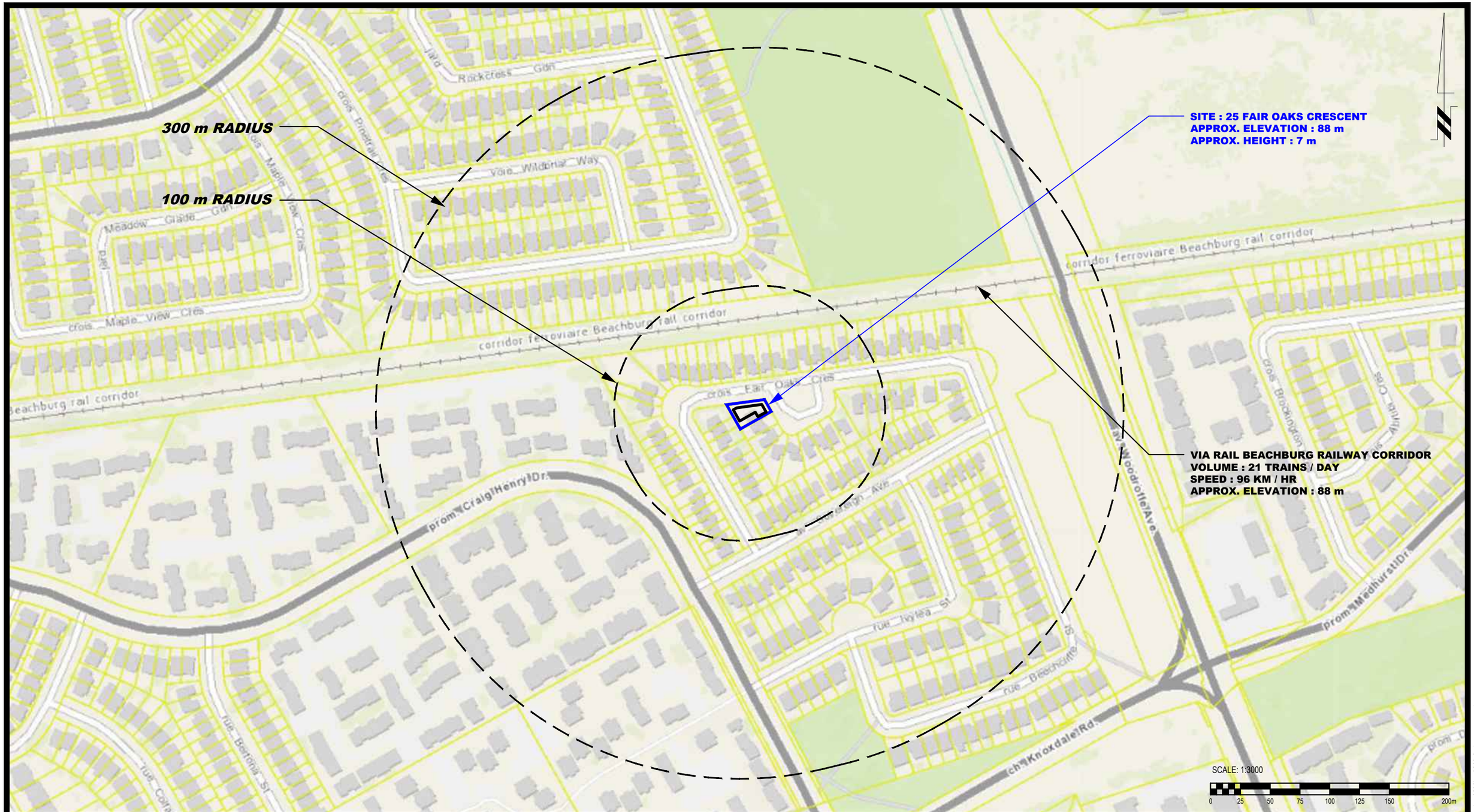

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NOISE ATTENUATION STUDY
PROPOSED RESIDENTIAL DEVELOPMENT
25 FAIR OAKS CRESCENT

OTTAWA, ONTARIO

Title:

SITE GEOMETRY

Scale: 1:3000	Date: 06/2022
Drawn by: YA	Report No.: PG6280-1
Checked by: YT	Dwg. No.: PG6280-3
Approved by: SB	Revision No.:

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PROPOSED RESIDENTIAL DEVELOPMENT
25 FAIR OAKS CRESCENT

OTTAWA, ONTARIO

Title:

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

Scale: 1:3000	Date: 06/2022
Drawn by: YA	Report No.: PG6280-1
Checked by: YT	Dwg. No.: PG6280-3A
Approved by: SB	Revision No.:

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25 FAIR OAKS CRESCENT

OTTAWA, ONTARIO

Title:

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

Scale: 1:3000	Date: 06/2022
Drawn by: YA	Report No.: PG6280-1
Checked by: YT	Dwg. No.: PG6280-3B
Approved by: SB	Revision No.:

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25 FAIR OAKS CRESCENT

OTTAWA, ONTARIO

Title:

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

Scale: 1:3000	Date: 06/2022
Drawn by: YA	Report No.: PG6280-1
Checked by: YT	Dwg. No.: PG6280-3C
Approved by: SB	Revision No.:

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NOISE ATTENUATION STUDY
PROPOSED RESIDENTIAL DEVELOPMENT
25 FAIR OAKS CRESCENT

OTTAWA, ONTARIO

Title:

SITE GEOMETRY - REC 4-1 AND REC 4-2

Scale: 1:3000	Date: 06/2022
Drawn by: YA	Report No.: PG6280-1
Checked by: YT	Dwg. No.: PG6280-3D
Approved by: SB	Revision No.:

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PROPOSED RESIDENTIAL DEVELOPMENT
25 FAIR OAKS CRESCENT

OTTAWA, ONTARIO

Title:

SITE GEOMETRY - REC 5-1 AND REC 5-2

Scale: 1:3000	Date: 06/2022
Drawn by: YA	Report No.: PG6280-1
Checked by: YT	Dwg. No.: PG6280-3E
Approved by: SB	Revision No.:

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APPENDIX 2

STAMSON RESULTS

STAMSON 5.0 NORMAL REPORT Date: 02-06-2022 14:47:34
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. VIA Train	18.0/3.0	96.0	2.0	6.0	Diesel	No

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

Angle1 Angle2	: -57.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 1 / 1	
House density	: 20 %	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 70.00 / 70.00	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 Train (day)

LOCOMOTIVE (0.00 + 55.39 + 0.00) = 55.39 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-57	90	0.58	68.73	-10.60	-1.85	0.00	-0.90	0.00	55.39

WHEEL (0.00 + 46.62 + 0.00) = 46.62 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-57	90	0.66	60.57	-11.11	-1.94	0.00	-0.90	0.00	46.62

Segment Leq : 55.93 dBA

Total Leq All Segments: 55.93 dBA

↟
Results segment # 1: VIA Train (night)

LOCOMOTIVE (0.00 + 50.61 + 0.00) = 50.61 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-57	90	0.58	63.96	-10.60	-1.85	0.00	-0.90	0.00	50.61

WHEEL (0.00 + 41.85 + 0.00) = 41.85 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-57	90	0.66	55.79	-11.11	-1.94	0.00	-0.90	0.00	41.85

Segment Leq : 51.15 dBA

Total Leq All Segments: 51.15 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 55.93
(NIGHT): 51.15

STAMSON 5.0 NORMAL REPORT Date: 02-06-2022 14:49:50
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. VIA Train	18.0/3.0	96.0	2.0	6.0	Diesel	No

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

Angle1 Angle2	-57.00 deg	90.00 deg
Wood depth	0	(No woods.)
No of house rows	1 / 1	
House density	20 %	
Surface	1	(Absorptive ground surface)
Receiver source distance	70.00 / 70.00	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 Train (day)

LOCOMOTIVE (0.00 + 56.11 + 0.00) = 56.11 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-57	90	0.50	68.73	-10.00	-1.72	0.00	-0.90	0.00	56.11

WHEEL (0.00 + 47.10 + 0.00) = 47.10 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-57	90	0.60	60.57	-10.70	-1.87	0.00	-0.90	0.00	47.10

Segment Leq : 56.62 dBA

Total Leq All Segments: 56.62 dBA

Results segment # 1: VIA Train (night)

LOCOMOTIVE (0.00 + 51.34 + 0.00) = 51.34 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-57	90	0.50	63.96	-10.00	-1.72	0.00	-0.90	0.00	51.34

WHEEL (0.00 + 42.33 + 0.00) = 42.33 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-57	90	0.60	55.79	-10.70	-1.87	0.00	-0.90	0.00	42.33

Segment Leq : 51.85 dBA

Total Leq All Segments: 51.85 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 56.62
(NIGHT): 51.85

STAMSON 5.0 NORMAL REPORT Date: 02-06-2022 15:01:50
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. VIA Train	18.0/3.0	96.0	2.0	6.0	Diesel	No

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

Angle1 Angle2	-56.00 deg	0.00 deg
Wood depth	0	(No woods.)
No of house rows	1 / 1	
House density	20 %	
Surface	1	(Absorptive ground surface)
Receiver source distance	78.00 / 78.00	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 Train (day)

LOCOMOTIVE (0.00 + 50.98 + 0.00) = 50.98 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-56	0	0.58	68.73	-11.35	-5.50	0.00	-0.90	0.00	50.98

WHEEL (0.00 + 42.23 + 0.00) = 42.23 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-56	0	0.66	60.57	-11.89	-5.56	0.00	-0.90	0.00	42.23

Segment Leq : 51.52 dBA

Total Leq All Segments: 51.52 dBA

↟
Results segment # 1: VIA Train (night)

LOCOMOTIVE (0.00 + 46.21 + 0.00) = 46.21 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-56	0	0.58	63.96	-11.35	-5.50	0.00	-0.90	0.00	46.21

WHEEL (0.00 + 37.45 + 0.00) = 37.45 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-56	0	0.66	55.79	-11.89	-5.56	0.00	-0.90	0.00	37.45

Segment Leq : 46.75 dBA

Total Leq All Segments: 46.75 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 51.52
(NIGHT): 46.75

STAMSON 5.0 NORMAL REPORT Date: 02-06-2022 15:02:26
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. VIA Train	18.0/3.0	96.0	2.0	6.0	Diesel	No

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

Angle1 Angle2	: -56.00 deg	0.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 1 / 1	
House density	: 20 %	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 78.00 / 78.00	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 Train (day)

LOCOMOTIVE (0.00 + 51.69 + 0.00) = 51.69 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-56	0	0.50	68.73	-10.70	-5.44	0.00	-0.90	0.00	51.69

WHEEL (0.00 + 42.70 + 0.00) = 42.70 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-56	0	0.60	60.57	-11.46	-5.51	0.00	-0.90	0.00	42.70

Segment Leq : 52.21 dBA

Total Leq All Segments: 52.21 dBA

↟
Results segment # 1: VIA Train (night)

LOCOMOTIVE (0.00 + 46.92 + 0.00) = 46.92 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-56	0	0.50	63.96	-10.70	-5.44	0.00	-0.90	0.00	46.92

WHEEL (0.00 + 37.93 + 0.00) = 37.93 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-56	0	0.60	55.79	-11.46	-5.51	0.00	-0.90	0.00	37.93

Segment Leq : 47.44 dBA

Total Leq All Segments: 47.44 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 52.21
(NIGHT): 47.44

STAMSON 5.0 NORMAL REPORT Date: 02-06-2022 14:56:25
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. VIA Train	18.0/3.0	96.0	2.0	6.0	Diesel	No

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

Angle1 Angle2	-57.00 deg	90.00 deg
Wood depth	0	(No woods.)
No of house rows	1 / 1	
House density	20 %	
Surface	1	(Absorptive ground surface)
Receiver source distance	70.00 / 70.00	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 Train (day)

LOCOMOTIVE (0.00 + 55.39 + 0.00) = 55.39 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-57	90	0.58	68.73	-10.60	-1.85	0.00	-0.90	0.00	55.39

WHEEL (0.00 + 46.62 + 0.00) = 46.62 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-57	90	0.66	60.57	-11.11	-1.94	0.00	-0.90	0.00	46.62

Segment Leq : 55.93 dBA

Total Leq All Segments: 55.93 dBA

↟
Results segment # 1: VIA Train (night)

LOCOMOTIVE (0.00 + 50.61 + 0.00) = 50.61 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-57	90	0.58	63.96	-10.60	-1.85	0.00	-0.90	0.00	50.61

WHEEL (0.00 + 41.85 + 0.00) = 41.85 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-57	90	0.66	55.79	-11.11	-1.94	0.00	-0.90	0.00	41.85

Segment Leq : 51.15 dBA

Total Leq All Segments: 51.15 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 55.93
(NIGHT): 51.15

STAMSON 5.0 NORMAL REPORT Date: 02-06-2022 14:54:02
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: rec32.te Time Period: Day/Night 16/8 hours
Description: Receptor Point 3-2

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. VIA Train	18.0/3.0	96.0	2.0	6.0	Diesel	No

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

Angle1 Angle2	: -57.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 1 / 1	
House density	: 20 %	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 70.00 / 70.00	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 Train (day)

LOCOMOTIVE (0.00 + 56.11 + 0.00) = 56.11 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-57	90	0.50	68.73	-10.00	-1.72	0.00	-0.90	0.00	56.11

WHEEL (0.00 + 47.10 + 0.00) = 47.10 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-57	90	0.60	60.57	-10.70	-1.87	0.00	-0.90	0.00	47.10

Segment Leq : 56.62 dBA

Total Leq All Segments: 56.62 dBA

↟
Results segment # 1: VIA Train (night)

LOCOMOTIVE (0.00 + 51.34 + 0.00) = 51.34 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-57	90	0.50	63.96	-10.00	-1.72	0.00	-0.90	0.00	51.34

WHEEL (0.00 + 42.33 + 0.00) = 42.33 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-57	90	0.60	55.79	-10.70	-1.87	0.00	-0.90	0.00	42.33

Segment Leq : 51.85 dBA

Total Leq All Segments: 51.85 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 56.62
(NIGHT): 51.85

STAMSON 5.0 NORMAL REPORT Date: 02-06-2022 14:55:55
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. VIA Train	18.0/3.0	96.0	2.0	6.0	Diesel	No

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

Angle1 Angle2	: -57.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 1 / 1	
House density	: 20 %	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 70.00 / 70.00	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 Train (day)

LOCOMOTIVE (0.00 + 55.39 + 0.00) = 55.39 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-57	90	0.58	68.73	-10.60	-1.85	0.00	-0.90	0.00	55.39

WHEEL (0.00 + 46.62 + 0.00) = 46.62 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-57	90	0.66	60.57	-11.11	-1.94	0.00	-0.90	0.00	46.62

Segment Leq : 55.93 dBA

Total Leq All Segments: 55.93 dBA

↟
Results segment # 1: VIA Train (night)

LOCOMOTIVE (0.00 + 50.61 + 0.00) = 50.61 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-57	90	0.58	63.96	-10.60	-1.85	0.00	-0.90	0.00	50.61

WHEEL (0.00 + 41.85 + 0.00) = 41.85 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-57	90	0.66	55.79	-11.11	-1.94	0.00	-0.90	0.00	41.85

Segment Leq : 51.15 dBA

Total Leq All Segments: 51.15 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 55.93
(NIGHT): 51.15

STAMSON 5.0 NORMAL REPORT Date: 02-06-2022 14:54:24
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: rec42.te Time Period: Day/Night 16/8 hours
Description: Receptor Point 4-2

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. VIA Train	18.0/3.0	96.0	2.0	6.0	Diesel	No

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

Angle1 Angle2	: -57.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 1 / 1	
House density	: 20 %	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 70.00 / 70.00	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 Train (day)

LOCOMOTIVE (0.00 + 56.11 + 0.00) = 56.11 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-57	90	0.50	68.73	-10.00	-1.72	0.00	-0.90	0.00	56.11

WHEEL (0.00 + 47.10 + 0.00) = 47.10 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-57	90	0.60	60.57	-10.70	-1.87	0.00	-0.90	0.00	47.10

Segment Leq : 56.62 dBA

Total Leq All Segments: 56.62 dBA

↟
Results segment # 1: VIA Train (night)

LOCOMOTIVE (0.00 + 51.34 + 0.00) = 51.34 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-57	90	0.50	63.96	-10.00	-1.72	0.00	-0.90	0.00	51.34

WHEEL (0.00 + 42.33 + 0.00) = 42.33 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-57	90	0.60	55.79	-10.70	-1.87	0.00	-0.90	0.00	42.33

Segment Leq : 51.85 dBA

Total Leq All Segments: 51.85 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 56.62
(NIGHT): 51.85

STAMSON 5.0 NORMAL REPORT Date: 02-06-2022 15:08:21
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. VIA Train	18.0/3.0	96.0	2.0	6.0	Diesel	No

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

Angle1 Angle2	: -90.00 deg	9.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 1 / 1	
House density	: 20 %	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 73.00 / 73.00	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 Train (day)

LOCOMOTIVE (0.00 + 53.15 + 0.00) = 53.15 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	9	0.58	68.73	-10.89	-3.79	0.00	-0.90	0.00	53.15

WHEEL (0.00 + 44.36 + 0.00) = 44.36 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	9	0.66	60.57	-11.41	-3.90	0.00	-0.90	0.00	44.36

Segment Leq : 53.69 dBA

Total Leq All Segments: 53.69 dBA

↟
Results segment # 1: VIA Train (night)

LOCOMOTIVE (0.00 + 48.38 + 0.00) = 48.38 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	9	0.58	63.96	-10.89	-3.79	0.00	-0.90	0.00	48.38

WHEEL (0.00 + 39.59 + 0.00) = 39.59 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	9	0.66	55.79	-11.41	-3.90	0.00	-0.90	0.00	39.59

Segment Leq : 48.92 dBA

Total Leq All Segments: 48.92 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 53.69
(NIGHT): 48.92

STAMSON 5.0 NORMAL REPORT Date: 02-06-2022 15:10:34
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: rec52.te Time Period: Day/Night 16/8 hours
Description: Receptor Point 5-2

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. VIA Train	18.0/3.0	96.0	2.0	6.0	Diesel	No

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

Angle1 Angle2	: -90.00 deg	9.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 1 / 1	
House density	: 20 %	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 73.00 / 73.00	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 Train (day)

LOCOMOTIVE (0.00 + 53.92 + 0.00) = 53.92 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	9	0.50	68.73	-10.27	-3.64	0.00	-0.90	0.00	53.92

WHEEL (0.00 + 44.86 + 0.00) = 44.86 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	9	0.60	60.57	-11.00	-3.81	0.00	-0.90	0.00	44.86

Segment Leq : 54.43 dBA

Total Leq All Segments: 54.43 dBA

↟
Results segment # 1: VIA Train (night)

LOCOMOTIVE (0.00 + 49.15 + 0.00) = 49.15 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	9	0.50	63.96	-10.27	-3.64	0.00	-0.90	0.00	49.15

WHEEL (0.00 + 40.09 + 0.00) = 40.09 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	9	0.60	55.79	-11.00	-3.81	0.00	-0.90	0.00	40.09

Segment Leq : 49.66 dBA

Total Leq All Segments: 49.66 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 54.43
(NIGHT): 49.66

APPENDIX 3

CORRESPONDENCE

Train Schedule:

Montréal/Ottawa - Toronto

- Locations in bold indicate a possible connection.
- Travel between Union Station and Pearson Airport on UP Express trains in 25 minutes, with departures every 15 minutes.
- No local service between Guildwood and Toronto
- Schedules are valid all year round

# Train	63	633	65	67
Business class	Yes	Yes	Yes	Yes
Baggage check-in	No	Yes	Yes	No
Dates	All year round	All year round	All year round	All year round
Days	Day 1 MTWTFSS	Day 1 MTWTFSS	Day 1 MTWTFSS	Day 1 MTWTFSS

# Train		63	633	65	67
Dorval, QC Shuttle service runs between the station and the airport.	Departure	09:15	**09:24**	**11:26**	**13:47**
Cornwall, ON	Departure	10:05	-	12:17	14:36
Ottawa, ON OC Transpo offers frequent bus service from the Ottawa train station to downtown Ottawa. For Further information call (613) 560-5000.	Arrival	-	**11:04 Eastern Time**	-	-
Fallowfield, ON	-	-	-	-	-
Smiths Falls, ON	-	-	-	-	-
Brockville, ON	Departure	10:51	-	-	-
Gananoque, ON	-	-	-	-	-
Kingston, ON	Arrival Departure	**11:34** **11:38**	-	**13:41** **13:45**	**15:58** **16:02**

# Train		63	633	65	67
Trenton Junction, ON	-	-	-	-	-
Cobourg, ON	Departure	13:02	-	15:04	17:21
Port Hope, ON	-	-	-	-	-
Oshawa, ON	Departure	13:40	-	15:39	17:56
Guildwood, ON Stops to disembark. Conditional stop	Departure	14:00	-	16:00	18:15
Toronto, ON Shuttle service runs between the station and the airport.	Arrival	**14:18 Eastern Time**	-	**16:18 Eastern Time**	**18:33 Eastern Time**

Train Schedule:

Ottawa - Kingston - Toronto

- Locations in bold indicate a possible connection.
- No local service between Guildwood and Toronto
- Travel between Union Station and Pearson Airport on UP Express trains in 25 minutes, with departures every 15 minutes.
- No local service between Ottawa and Fallowfield
- No local service between Toronto and Guildwood.
- Schedules are valid all year round

# Train	643	47	53	55	59
Business class	Yes	Yes	Yes	Yes	Yes
Baggage check-in	No	No	No	No	No
Dates	All year round	All year round	All year round	All year round	All year round

# Train		643	47	53	55	59
Ottawa, ON OC Transpo offers frequent bus service from the Ottawa train station to downtown Ottawa. For Further information call (613) 560-5000.	Departure	**08:35 Eastern Time**	**12:31 Eastern Time**	**11:45 Eastern Time**	**15:03 Eastern Time**	**18:05 Eastern Time**
Fallowfield, ON	Departure	08:56	12:52	12:05	15:22	18:26
Smiths Falls, ON	Departure	09:24	-	12:35	-	18:54
Brockville, ON	Departure	09:53	13:59	13:10	16:22	19:27
Kingston, ON	Arrival Departure	**10:33** **10:36**	**14:44** **14:48**	**13:57** **14:01**	**17:02** **17:06**	**20:08** **20:11**
Napanee, ON	Departure	10:57	-	-	17:29	-
Belleville, ON	Departure	11:20	15:31	14:43	17:51	20:53
Trenton Junction, ON Conditional stop	Departure	11:32	-	-	18:01	21:04

# Train		643	47	53	55	59
Oshawa, ON Conditional stop	Departure	12:38	16:41	15:56	19:08	22:07
Guildwood, ON Stops to disembark. Conditional stop	Departure	13:00	17:00	16:15	19:30	22:30
Toronto, ON Shuttle service runs between the station and the airport.	Arrival	**13:18 Eastern Time**	**17:18 Eastern Time**	**16:33 Eastern Time**	**19:48 Eastern Time**	**22:48 Eastern Time**

Train Schedule:

Toronto - Kingston - Ottawa

- Locations in bold indicate a possible connection.
- Travel between Union Station and Pearson Airport on UP Express trains in 25 minutes, with departures every 15 minutes.
- No local service between Guildwood and Toronto.
- No local service between Fallowfield and Ottawa
- Schedules are valid all year round

# Train	52	40	42	46	54
Business class	Yes	Yes	Yes	Yes	Yes
Baggage check-in	No	No	No	No	No
Dates	All year round	All year round	All year round	All year round	All year round
	Day 1	Day 1	Day 1	Day 1	Day 1

# Train		52	40	42	46	54
Guildwood, ON	Departure	08:52	10:52	12:37	15:52	18:07
Oshawa, ON	Arrival Departure	- 09:11	-	12:50 12:55	- 16:10	- 18:23
Port Hope, ON	Departure	-	-	13:20	-	18:49
Cobourg, ON	Departure	09:43	-	13:29	16:43	18:57
Trenton Junction, ON	Departure	-	-	13:53	-	19:24
Belleville, ON	Departure	10:20	12:09	14:07	-	19:39
Napanee, ON	Departure	-	-	14:26	-	19:59
Kingston, ON	Arrival Departure	**10:57** **11:01**	**12:46** **12:49**	**-** **14:47**	**17:52** **17:55**	**20:18** **20:21**
Gananoque, ON	Departure	-	-	15:09	-	-
Brockville, ON	Departure	11:56	-	15:34	18:40	21:07

# Train		52	40	42	46	54
Ottawa, ON OC Transpo offers frequent bus service from the Ottawa train station to downtown Ottawa. For Further information call (613) 560-5000.	Arrival	**13:25 Eastern Time**	**14:54 Eastern Time**	**16:52 Eastern Time**	**20:14 Eastern Time**	**22:26 Eastern Time**

Train Schedule:

Toronto - Ottawa/Montréal

- Locations in bold indicate a possible connection.
- No local service between Guildwood and Toronto.
- Travel between Union Station and Pearson Airport on UP Express trains in 25 minutes, with departures every 15 minutes.
- No local service between Dorval and Montreal
- No local service between Fallowfield and Ottawa
- Schedules are valid all year round

# Train	52	64	42	68
Business class	Yes	Yes	Yes	Yes
Baggage check-in	No	No	No	No
Dates	All year round	All year round	All year round	All year round

# Train		52	64	42	68
Toronto, ON Shuttle service runs between the station and the airport.	Departure	**08:32 Eastern Time**	**11:32 Eastern Time**	**12:17 Eastern Time**	**17:02 Eastern Time**
Guildwood, ON	Departure	08:52	11:52	12:37	17:22
Oshawa, ON	Arrival Departure	- 09:11	- 12:11	12:50 12:55	- 17:40
Port Hope, ON	Departure	-	-	13:20	-
Cobourg, ON	Departure	09:43	12:48	13:29	18:11
Trenton Junction, ON	Departure	-	-	13:53	-
Belleville, ON	Departure	10:20	13:29	14:07	18:49
Napanee, ON	Departure	-	-	14:26	-
Kingston, ON	Arrival Departure	**10:57** **11:01**	**14:06** **14:11**	**-** **14:47**	**-** **19:27**

# Train		52	64	42	68
Smiths Falls, ON	Departure	12:25	-	16:08	-
Fallowfield, ON	Departure	13:08	-	16:35	-
Ottawa, ON OC Transpo offers frequent bus service from the Ottawa train station to downtown Ottawa. For Further information call (613) 560-5000.	Arrival	**13:25 Eastern Time**	-	**16:52 Eastern Time**	-
Cornwall, ON	Departure	-	15:49	-	21:04
Dorval, QC Shuttle service runs between the station and the airport.	Departure	-	**16:41**	-	**21:53**
Montréal, QC	Arrival	-	**17:01 Eastern Time**	-	**22:13 Eastern Time**

Yolanda Tang

From: Paul Charbachi <Paul_Charbachi@viarail.ca>
Sent: December 15, 2021 3:54 PM
To: Yolanda Tang
Cc: Stephanie Boisvenue
Subject: RE: Request For Rail Information - Beachburg Rail Corridor

Hello Yolanda,
Please check below my answers,
Pc

From: Yolanda Tang <YTang@patersongroup.ca>
Sent: Wednesday, December 15, 2021 3:28 PM
To: Paul Charbachi <Paul_Charbachi@viarail.ca>
Cc: Stephanie Boisvenue <SBoisvenue@patersongroup.ca>
Subject: Request For Rail Information - Beachburg Rail Corridor

Good afternoon Paul,

I believe that VIA Rail trains operate along the Beachburg Rail Corridor, as it is the rail line that connects the Ottawa and Fallowfield Train Stations. I was wondering if you could fill in some information for me.

Rail Line: Beachburg Rail Corridor (Ottawa)
Number of trains a day: depending, with high frequency Rail project it's will be one every hour from 5 AM to Mid night plus freight operation 2 twice a day
Number of Engines: 2
Type of Engine: Charger Siemens
Number of Cars: 6
Approximate Speed: 60 MPH

Thanks for your time.

Best Regards

Yolanda Tang, M.Sc.Eng.
patersongroup
solution oriented engineering
over 60 years serving our clients

154 Colonnade Road South
Ottawa, Ontario, K2E 7J5
Tel: (613) 226-7381 Ext.255