J a n e T h o m p s o n A r c h i t e c t
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2009 & 2013 Prince of Wales Drive
Development Viability Assessment

July 22, 2024
(revised February 14, 2025)

1.0 Introduction

The Guidelines for New Development in Proximity to Railway Operations have been used to prepare this document outlining how the site can accommodate standard mitigation measures related to Setbacks, Indoor noise, Vibration, Safety, Security, Stormwater Management & Drainage, Warning Clauses and Other Legal Agreements and Construction Issues. Due to the raised elevation of the adjacent rail line in comparison to the subject site, standard noise barriers to reduce outdoor noise are not feasible; however, further explanation of mitigation measures and why this should not affect the viability of the project can be found below in the Development Details - Noise – Exterior Noise section.

The Model Review Process for New Residential Development, Infill and Conversions in Proximity to Railway Corridors, copied below, was the basis for determining a Development Viability Assessment was required.

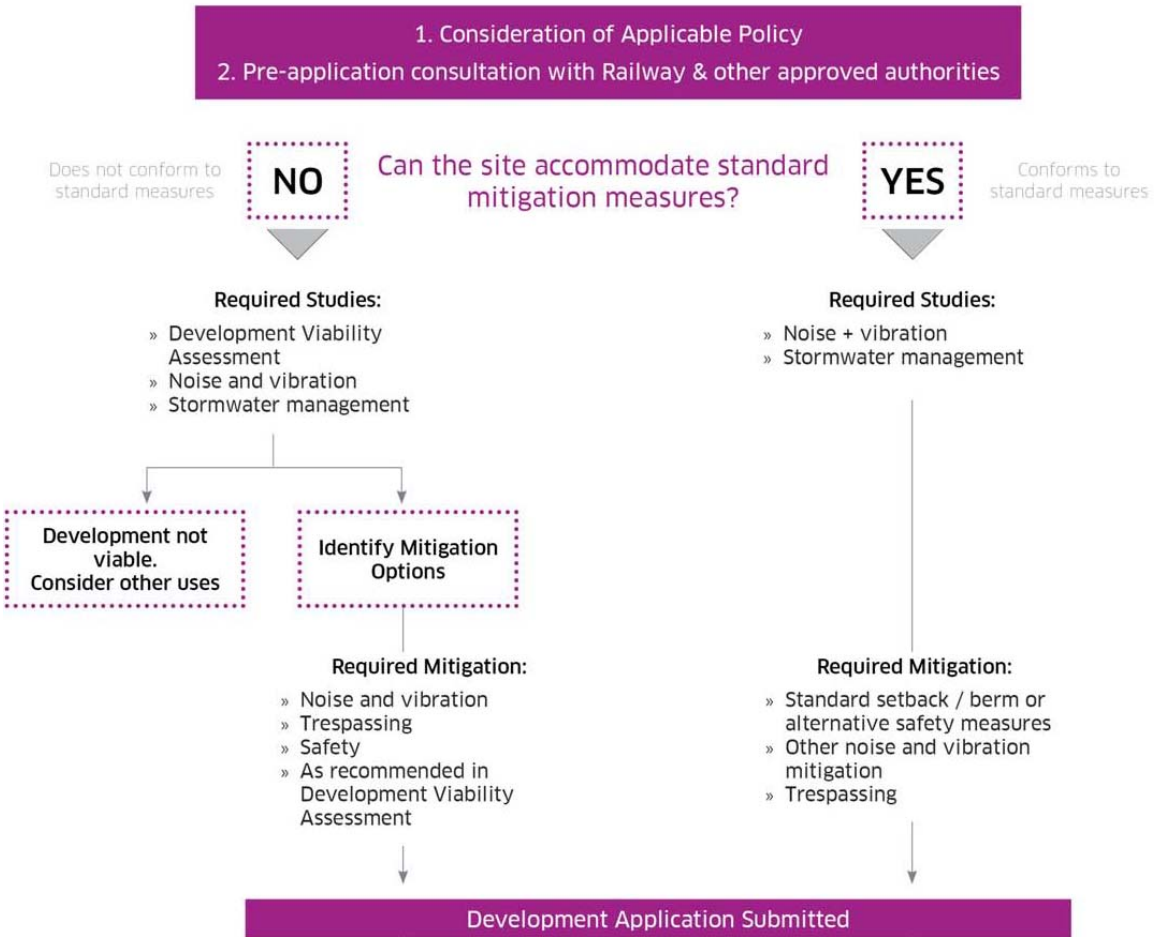

FIGURE 19 // MODEL REVIEW PROCESS FOR NEW RESIDENTIAL DEVELOPMENT, INFILL & CONVERSIONS IN PROXIMITY TO RAILWAY CORRIDORS

Appendix A, Development Viability Assessment (DVA) AA.2 through AA.6, from the Guidelines for New Development in Proximity to Railway Corridors was followed to outline the content required for the DVA.

AA.2 Site Details

The 1.12 ha development currently consists of 2 residential lots, each with a detached single family house. The site is bounded by Prince of Wales Drive to the west, a rail corridor to the south, the Rideau River to the east, and a neighbouring residential property to the north. The site is relatively flat with steep embankments down to the river and up to an elevated adjacent rail line. Dense mature vegetation wraps the property along the rail corridor and river. Depressed areas on the site currently create ponding during heavy rain fall and the spring. The soils described in the geotechnical investigation are silt and silty clay.

Site Photo Key Map

J a n e T h o m p s o n A r c h i t e c t
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View 1 looking west on northern edge of site.


View 2 looking north on northeastern edge of site.


View 3 looking southeast from eastern edge of site @ elevated rail over river.


View 4 looking south at eastern edge of the site showing emabankment to the river and elevated track.


View 5 looking south to the elevated rail from the centre of the site.


View 6 looking east along the southern edge of the site showing the steep embankment up to the rail.

View 7 looking north from the northern edge of the site.

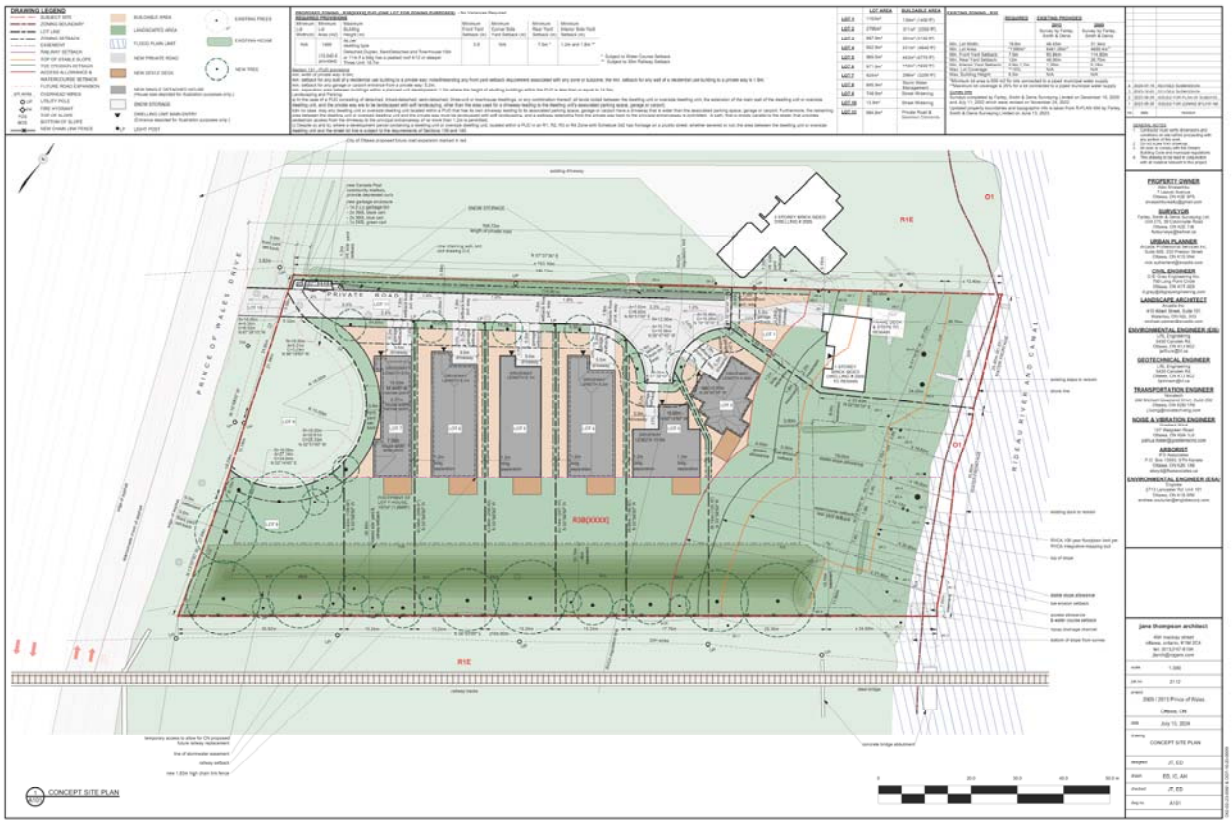
View 8 looking south from the northwestern corner of the site.

AA.3 Railway Details

The rail corridor bordering the south lot line of the proposed development contains an elevated straight rail line which is approximately 13.5m from and 5.5m above the property line and runs parallel to the site. Information obtained from the rail authorities indicates the diesel passenger train currently travels in a 45 MPH zone, with 16 movements per day and typically has 1-2 locomotives and up to 5 train cars. A temporary access easement to allow future rail replacement is planned on the south west side of the subject site.

AA.4 Development Details

The proposed development divides the two existing residential lots into a Planned Unit Development (PUD) to create 7 residential lots (Lots 1 through 7) which will each be sold for residential development by future owners (see Site Plan prepared by Jane Thompson Architect below). The existing 1 storey brick and siding house at 2009 Prince of Wales Drive will be retained (Lot 1); however, the lot has been designed to accommodate a new residence should the existing home be demolished. A new private road will provide access to the new lots along the north side of the site from Prince of Wales Drive (Lots 10 and 11). A future access road to be built by the City of Ottawa, including a cul-de-sac, overlaps the site and is integrated into the design (Lot 9). An area in the southwest corner of the site will be dedicated to stormwater management (Lot 8) and will connect to the river through an easement across the rear yards of Lots 2 through 7 forming a drainage and safety ditch (see development design perspectives 1 through 4 below).



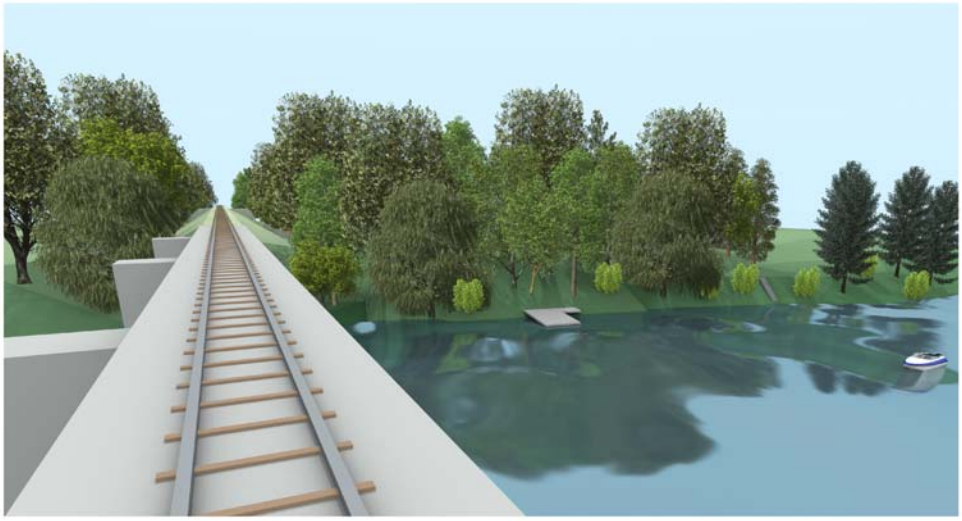
Site Plan

Bird's eye view looking towards the river.

Bird's eye view looking towards Prince of Wales.

Approach to new private road from Prince of Wales with raised railway on the right.

View along new private road from 'T' turnaround.



View from elevated railway over river towards river bank with mature vegetation.

The following outlines how the development has implemented the strategies presented in section 3.0 of the Guidelines.

3.0 Guidelines for New Development in Proximity to Railway Operations
"The intention of these guidelines is to provide a level of consistency in the approach to the design of buildings and their context in proximity to railway corridors, and the type of mitigation that is provided across the country."

3.1 Principles for Mitigation Design:

The principles for standard design mitigation outlined in the guidelines for New Development in Proximity to Railway Operations, including setback, noise, vibration, safety, security, stormwater management & drainage, warning clauses & other legal agreements, and construction issues, will be implemented as listed below. Outdoor noise is expected to be above the recommended levels; however, design mitigation is proposed as noted.

3.2 Consultation with the Railway:

Early consultation with CN Rail was undertaken at the outset of the planning process. Peer reviews by Jade Acoustics Inc. for CN Rail and Systa for VIA Rail have been completed. Comments from these peer reviews are now addressed by the project noise and vibration consultant Gradient Wind Engineers & Scientists as discussed further below. Updated Civil drawings and survey also address these comments.

3.3 Setback:

The 6 new lots adjacent to the rail corridor (Lots 2-7) will have a 30m setback to all new construction as per guideline 3.3.1. Lot 1 will have a buildable area that is 57m setback from the rail corridor should a new home ever be constructed. Lots 2 to 7 have large buildable areas ranging from 254m² to 431m² for each floor. This allows flexibility in the shape of the building footprint and placement on the lot. Due to the large buildable area, it is likely that the new buildings will not be built up to the 30m setback, increasing the setback from the rail corridor; however, this setback is used as a worst case scenario. See Appendix A – Site Plan.

3.4 Noise:

A transportation Noise and Vibration Study has been prepared by Gradient Wind Engineers & Scientists to study the effects of the adjacent rail line on the new proposed lots and the proposed mitigation measures. See Appendix B - Noise and Vibration Study.

Interior Noise – Increased STC requirements will be required for the exterior wall, glazing and roof assembly, as well as air conditioning to ensure noise levels meet the criteria of the guidelines and are outlined in Gradient Wind's report. These requirements will be enforced through Warning Clauses in all Lease, Purchase and Sale Agreements.

Exterior Noise – As per Gradient Wind's report, a sound wall is not feasible due to the elevation of the rail line in proximity to the subject site. An excessively tall wall would be required to break

the line of sight and located where it would reduce the functionality of the outdoor space. The daytime noise level for outdoor living area (OLA) is acceptable between 55 and 60 dBA. As designed, the new proposed lots will be between 58 dBA and 63 dBA in the rear yard during the day due to railway noise. Lots 1 and 2 meet the required 60 dBA and Lots 3 to 7 will be 62 and 63 dBA if built to the setback which is only a small increase from the required 60.

The rail line adjacent to the site has trains which pass by 16 times per day for less than 30 seconds each time. This means there is approximately a total of 8 minutes per day when the sound will be elevated above 60 dBA. For the rest of the day, the rear yards will be unaffected by rail noise.

Hybrid trains are quieter than diesel and are starting to be transitioned into use. The current model calculations do not take this quieter train into consideration. It can be assumed, in the future, the dBA calculations will be lower than currently modelled. The calculations also take into affect proposed future train speed increases not the slower, quieter trains currently running.

In the Lease, Purchase and Sale Agreements of the 7 new lots, Warning Clauses will be included outlining the exterior noise. These clauses are outlined in the Warning Clauses and Other Legal Agreements section below.

The subject site will have heavy vegetation with existing mature and new proposed trees along the southern property line. This will visually block the rail line from the new lots, and in turn, creates a perception of reduced noise levels as per section 3.4.1.6 Vegetation in the The Guidelines for New Development in Proximity to Railway Operations:

• While vegetation such as trees and shrubs does not actually limit the intrusion of noise, it has been shown to create the perception of reduced noise levels.

As stated above, Lots 2 to 7 have large buildable areas ranging from 254m² to 431m² per floor allowing flexibility in the shape of the building footprint and placement on the lot. Buildings can be located to decrease the proximity to the rail corridor, courtyard designs can be incorporated to create outdoor living spaces shielded from the rail noise when the train passes and front yard amenity space can create an outdoor living area further from the rail corridor and shielded by the building to name a few design mitigation measures open to the future owners.

For these reasons listed, the lots provide viable outdoor living space with respect to noise.

3.5 Vibration:

As per the findings in the report by Gradient Wind, "*Since measured vibration levels do not exceed the criterion of 0.14 mm/s RMS at the potential foundation of the dwellings, concerns due to vibration impacts on the site are not expected. As vibration levels are acceptable, correspondingly, regenerated noise levels are also expected to be acceptable."*

As an additional vibration mitigation measure, future buildings will have foundations of 12" (300mm) minimum thickness which will be outlined in all Lease, Purchase and Sale Agreements. This will further minimize vibration transmission and enhance occupant comfort.

3.6 Safety:

Within the 30m setback a ditch is proposed as per 3.6.1.1 and Figure 17 of the Guidelines for New Development in Proximity to Railway Operations and Figure 17 shown here:

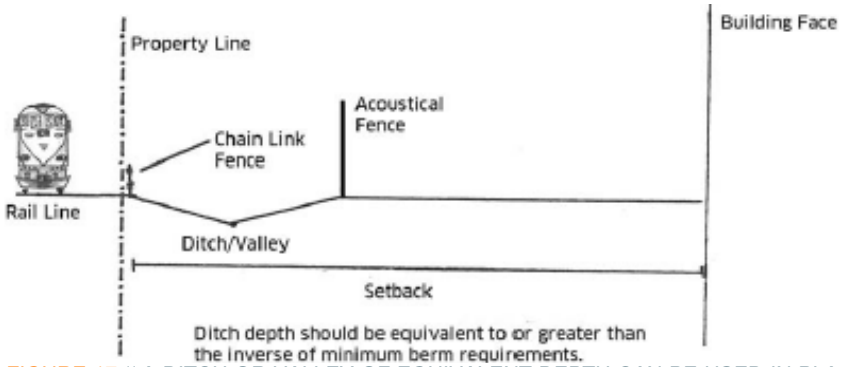
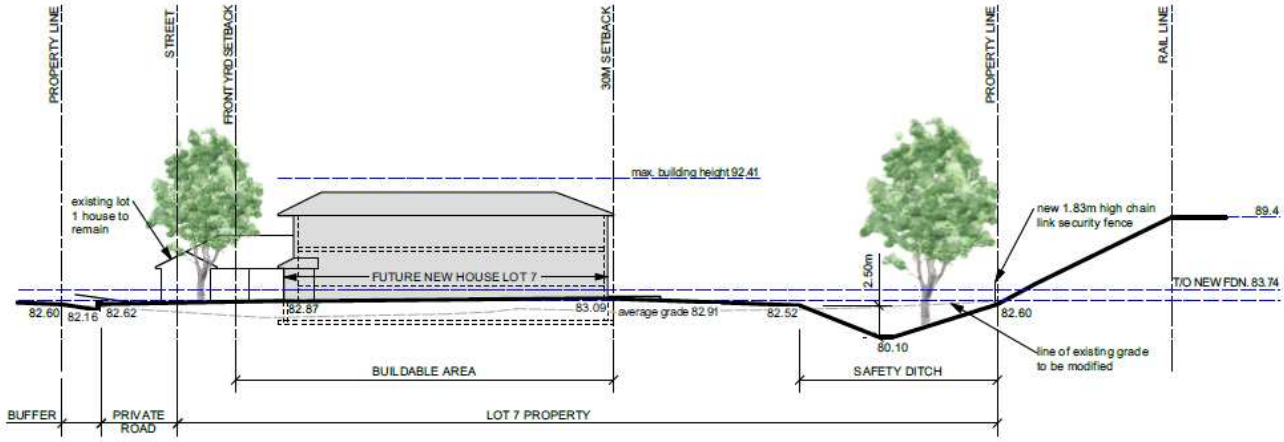


FIGURE 17 // A DITCH OR VALLEY OF EQUIVALENT DEPTH CAN BE USED IN PLACE OF A STANDARD BERM ADJACENT TO A MAIN LINE RAILWAY

The ditch proposed is 2.5m deep and at least 14m wide with maximum slopes of 2.5:1 as per the guidelines and is illustrated here and in Appendix C - Site Sections. CN Rail has reviewed the proposed safety ditch and confirmed that it meets the requirements to be used in place of a standard berm as a collision protection feature.



An easement is proposed at the south west portion of the site, along Lot 8, Lot 7, Lot 6 and Lot 5 which will allow temporary rail relocation should Prince of Wales be widened in the future. The 30m setback and safety ditch are outside of the easement; therefore, maintaining safety throughout the time of future work.

3.7 Security:

A new 1.83m high chain link fence is proposed along the property line adjacent to the rail corridor to prevent trespassing onto the railway corridor.

3.8 Stormwater Management and Drainage:

As the adjacent rail corridor is raised above the proposed development, no adverse affects are expected due to stormwater and drainage. A stormwater management and drainage plan has been prepared by D.B. Gray Engineering Inc. which shows a design to drain water away from the railway corridor to the river in conjunction with the safety ditch. See Appendix D – Grading Plan and Stomwater Management Report.

3.9 Warning Clauses and other Legal Agreements:

For the 7 new lots proposed, Warning Clauses will be registered on title and inserted into all Lease, Purchase and Sale Agreements including:

"Warning: Canadian National Railway Company or its assigns or successors in interest has or have a rights-of-way within 300 metres from the land the subject hereof. There may be alterations to or expansions of the railway facilities on such rights-of-way in the future including the possibility that the railway or its assigns or successors as aforesaid may expand its operations, which expansion may affect the living environment of the residents in the vicinity, notwithstanding the inclusion of any noise and vibration attenuating measures in the design of the development and individual dwelling(s). CNR will not be responsible for any complaints or claims arising from use of such facilities and/or operations on, over or under the aforesaid rights-of-way."

"Warning: VIA Railway Company or its assigns or successors in interest has or have a rightsof-way within 300 metres from the land the subject hereof. There may be alterations to or expansions of the railway facilities on such rights-of-way in the future including the possibility that the railway or its assigns or successors as aforesaid may expand its operations, which expansion may affect the living environment of the residents in the vicinity, notwithstanding the inclusion of any noise and vibration attenuating measures in the design of the development and individual dwelling(s). VIA will not be responsible for any complaints or claims arising from use of such facilities and/or operations on, over or under the aforesaid rights-of-way."

"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, Conservation and Parks."

"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 and rail 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."

The Owner will also, through restrictive covenants to be registered on title and all agreements of purchase and sale or lease, provide notice to the public that the safety ditch and fencing implemented are not to be tampered with or altered and further that the Owner shall have sole responsibility for and shall maintain these measures to the satisfaction of CN.

The Owner will be required to grant CN an environmental easement for operational noise and vibration emissions, registered against the subject property in favour of CN.

3.10 Construction Issues:

Safety and avoiding disruptions to train service have both been considerations in the design of the new development. No access will be required upon, below, or above the rail corridor

AA.5 Construction Details

Access to the rail corridor is not required or anticipated during construction. All work related to the development will be contained within the site. The grade change at the shared property line will prohibit access and use of the rail corridor during construction. The 1.83m chainlink fence along the shared property line will be constructed prior to construction starting.

AA.6 Hazards and Risks

The design of the new lots has taken into consideration all safety mitigation measures outlined in the guidelines to avoid risks for people occupying the development. A 30m setback to the rail corridor, a safety ditch and chain link fence along the shared property are all to be implemented as per the guidelines.

2.0 Conclusion

In conclusion, it has been demonstrated that the site can accommodate standard mitigation measures as outlined in the guideline New Development in Proximity to Railway Operations. For exterior noise, while the dBA level is slightly above 60 for a short period of time each day, this should not hinder the viability of the project for the reasons listed in this report.

3.0 Appendices

Appendix A	Site Plan prepared by Jane Thompson Architect
Appendix B	Noise and Vibration Study prepared by Gradient Wind Engineers & Scientists
Appendix C	Site Sections prepared by Jane Thompson Architect
Appendix D	Grading Plan and StormWater Management Report prepared by D.B. Gray Engineering

DRAWING LEGEND

- SUBJECT SITE
- ZONING BOUNDARY
- LOT LINE
- ZONING SETBACK
- EASEMENT
- RAILWAY SETBACK
- TOP OF STABLE SLOPE
- TOE EROSION SETBACK
- ACCESS ALLOWANCE & WATERCOURSE SETBACK
- FUTURE ROAD EXPANSION
- o/h wires OVERHEAD WIRES
- UP UTILITY POLE
- FH FIRE HYDRANT
- TOS TOP OF SLOPE
- BOS BOTTOM OF SLOPE
- NEW CHAIN LINK FENCE

- BUILDABLE AREA
- LANDSCAPED AREA
- FLOOD PLAIN LIMIT
- NEW PRIVATE ROAD
- NEW 20'X12' DECK
- NEW SINGLE DETACHED HOUSE (House size depicted for illustration purposes only.)
- EXAMPLE OF FUTURE 2 STOREY SINGLE DETACHED DWELLING 1500 FT² + GARAGE + 18'X10' DECK OUTSIDE WATER COURSE SETBACK (OR 2400 SQ.FT. OVER 3 STORIES)
- SNOW STORAGE
- DWELLING UNIT MAIN ENTRY (Entrance depicted for illustration purposes only.)
- LP LIGHT POST

- EXISTING TREES
- EXISTING HEDGE
- NEW TREE

PROPOSED ZONING - R3B[XXXX] PUD (ONE LOT FOR ZONING PURPOSES) - No Variances Required

REQUIRED PROVISIONS

Minimum Lot Width(m)	Minimum Lot Area (m2)	Maximum Building Height (m)	Minimum Front Yard Setback (m)	Minimum Corner Side Yard Setback (m)	Minimum Rear Yard Setback (m)	Minimum Interior Side Yard Setback (m)
N/A	1400 (10,540.8 provided)	As per dwelling type Detached,Duplex, SemiDetached and Townhouse:10m or 11m if a bldg has a peaked roof 4/12 or steeper Three Unit: 10.7m	3.0	N/A	7.5m *	1.2m and 1.8m **

* Subject to Water Course Setback
** Subject to 30m Railway Setback

Section 131 - PUD provisions
min. width of private way: 6.0m;
min. setback for any wall of a residential use building to a private way: notwithstanding any front yard setback requirement associated with any zone or subzone, the min. setback for any wall of a residential use building to a private way is 1.8m;
min. setback for any garage or carport entrance from a private way: 5.2m;
min. separation area between buildings within a planned unit development: 1.2m where the height of abutting buildings within the PUD is less than or equal to 14.5m;
Landscaping and Parking:
a) In the case of a PUD consisting of detached, linked-detached, semi-detached, three-unit or townhouse dwellings, or any combination thereof, all lands locted between the dwelling unit or oversize dwelling unit, the extension of the main wall of the dwelling unit or oversize dwelling unit, and the private way are to be landscaped with soft landscaping, other than the area used for a driveway leading to the dwelling unit's associated parking space, garage or carport;
b) In no case may any dwelling unit or oversize dwelling unit located within a PUD that has its own driveway leading to its associated parking space, garage or carport have a driveway that is wider than the associated parking space, garage or carport. Furthermore, the remaining area between the dwelling unit or oversize dwelling unit and the private way must be landscaped with soft landscaping, and a walkway extending from the private way back to the principal entranceway is prohibited. A path, that is mostly parallel to the street, that provides pedestrian access from the driveway to the principal entranceway of no more than 1.2m is permitted;
c) Despite a) and b), where a development parcel containing a dwelling unit or oversize dwelling unit, located within a PUD in an R1, R2, R3 or R4 Zone with Schedule 342 has frontage on a prublic street, whether severed or not, the area between the dwelling unit or oversize dwelling unit and the street lot line is subject to the requirements of Sections 139 and 140.

	LOT AREA	BUILDABLE AREA
LOT 1	1163m²	130m² (1400 ft²)
LOT 2	2795m²	311m² (3355 ft²)
LOT 3	887.9m²	291m² (3135 ft²)
LOT 4	952.9m²	431m² (4635 ft²)
LOT 5	965.5m²	430m² (4625 ft²)
LOT 6	971.8m²	416m² (4480 ft²)
LOT 7	924m²	254m² (2730 ft²)
LOT 8	895.9m²	Storm Water Management
LOT 9	748.9m²	Future Street Widening
LOT 10	12.9m²	Future Street Widening
LOT 11	984.8m²	Private Road & Common Elements

Survey Info
Surveys completed by Farley, Smith & Denis Surveying Limited on December 10, 2020 and July 11, 2022 which were revised on November 24, 2022.
Updated property boundaries and topographic info is taken from R-PLAN 404 by Farley, Smith & Denis Surveying Limited on June 13, 2023.

no.	date	revision
5	2025-02-14	REVISED SUBMISSION
4	2024-07-16	REVISED SUBMISSION
3	2023-12-20	REVISED SUBMISSION
2	2023-06-29	ISSUED FOR PLAN OF SUBDIVIS...
1	2023-06-29	ISSUED FOR ZONING BYLAW AM...

GENERAL NOTES
1. Contractor must verify dimensions and conditions on site before proceeding with any portion of this work.
2. Do not scale from drawings.
3. All work to comply with the Ontario Building Code and municipal regulations.
4. This drawing to be read in conjunction with all material relevant to this project.

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scale	1:300
job no.	2112
project	2009 / 2013 Prince of Wales Ottawa, ON
date	February 14, 2025
drawing	CONCEPT SITE PLAN
designed	JT, ED
drawn	ED, IC, AH
checked	JT, ED
dwg no.	A101

D02-02-23-0061 & D07-16-23-0009

1 A101 CONCEPT SITE PLAN

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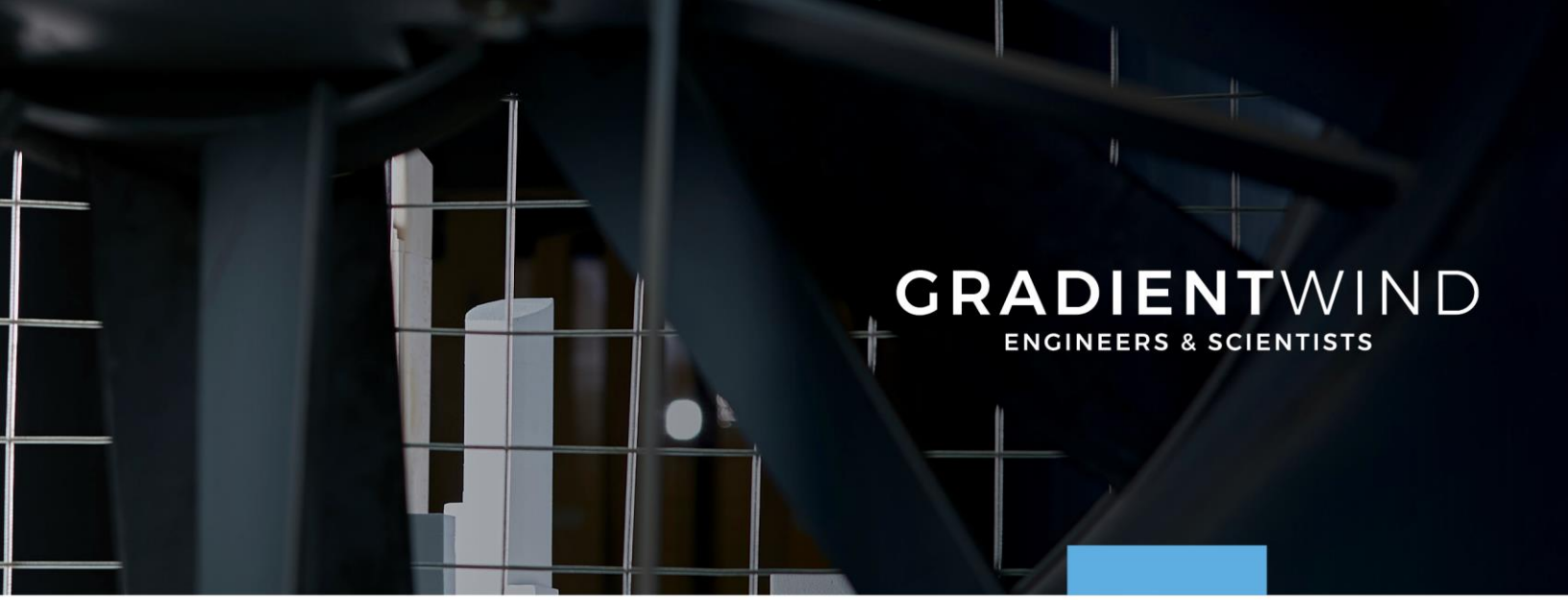
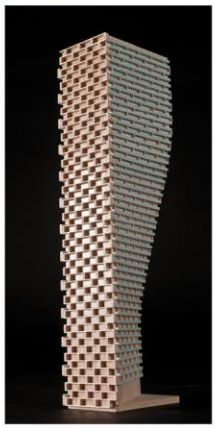


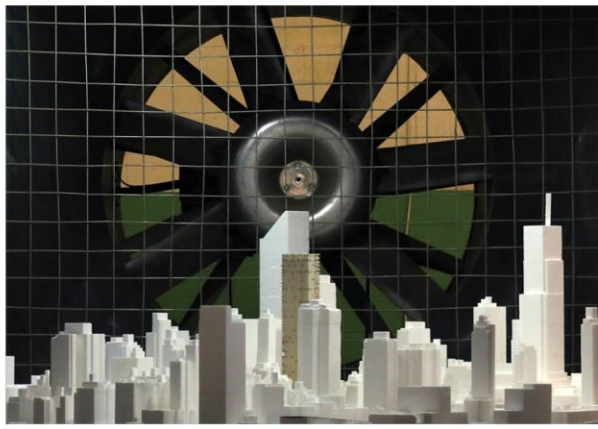
GRADIENTWIND
ENGINEERS & SCIENTISTS

TRANSPORTATION NOISE AND VIBRATION ASSESSMENT

2009-2013 Prince of Wales Drive
Ottawa, Ontario

GRADIENT WIND REPORT: 22-190 – Transportation Noise and Vibration





February 13, 2025

PREPARED FOR

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PREPARED BY

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EXECUTIVE SUMMARY

This report describes a transportation noise and vibration assessment undertaken for the property located at 2009-2013 Prince of Wales Drive in Ottawa, Ontario. The proposed development comprises seven lots and a private road located between Prince of Wales Drive and the Rideau River.

The major sources of transportation noise include Prince of Wales Drive, the Via Rail corridor (Beachburg Subdivision), and the Ottawa Macdonald-Cartier International Airport. The development resides within the Airport Vicinity Development Zone between the Airport Operating Influencing Zone (i.e., Noise Exposure Forecast (NEF) or Noise Prediction Forecast (NEP) 30 contour) and the NEF 25 contour. As the site is in proximity to the Via Rail corridor, ground vibration measurements were conducted following the procedure outlined in Section 4.3.2. Figure 1 illustrates a complete site plan with the surrounding context.

The assessment is based on (i) theoretical noise prediction methods that conform to the Ministry of the Environment, Conservation and Parks (MECP) and the City of Ottawa requirements; (ii) noise level criteria as specified by the City of Ottawa's Environmental Noise Control Guidelines (ENCG); (iii) future vehicular traffic volumes based on the City of Ottawa's Official Plan roadway classifications, (iv) railway information obtained from Via Rail; (v) site plan and cross-section drawings provided by Jane Thompson Architect in December 2023; and (vi), ground-borne vibration criteria as specified by RAC / FCM, and CN guidelines[1].

The results of the current analysis indicate that plane of window noise levels will range between 62 and 70 dBA during the daytime period (07:00-23:00) and between 59 and 62 dBA during the nighttime period (23:00-07:00). The highest noise level (70 dBA) occurs at Lot 7, which is nearest and most exposed to Prince of Wales Drive and the VIA Rail corridor. As such, upgraded building components with a higher Sound Transmission Class (STC) rating will be required to mitigate surface transportation noise. With regard to aircraft noise, the development falls within the NEF 25 composite contour line indicating that noise levels from aircraft flyovers will approach 57 dBA (24-hr L_{eq}). As a result, upgraded building components with a higher Sound Transmission Class (STC) rating will also be required to mitigate aircraft noise and surface transportation sources.

[1] Dialog and J.E. Coulter Associates Limited, prepared for The Federation of Canadian Municipalities and The Railway Association of Canada, May 2013

Section 5.1 outlines the STC requirements for the exterior wall, glazing, and roof assembly to ensure indoor noise levels meet the criteria specified by ENCG and NPC-300. Results of the calculations also indicate that the development will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. Warning Clauses will be required to address noise from roadway, railway, and aircraft traffic noise as summarized in Section 6.

Unmitigated noise levels at the rear yards are expected to exceed 60 dBA during the daytime period. Gradient Wind examined two potential barrier locations: one along the property line closest to Prince of Wales and another along the property line of Lot 7. For both locations, barriers ranging from 1.0 to 5.5 m above the local grade (bottom of slope) were evaluated. Results of the investigation showed that an excessively tall barrier would be required to provide any benefit, which is impractical. Therefore, Gradient Wind concludes that the implementation of a noise barrier is not considered technically and administratively feasible for the lots backing onto the VIA Rail corridor. This is due to the steep embankment between the site's grade level and the elevated railway tracks, as can be seen in Figure 7. A screen of 7 m or higher would be required to break the line of sight between the OLA receptor and the top of the train. The City of Ottawa only allows for a maximum wall height of 2.5 m[2]. A berm is also not feasible due to the grading and need for a swale as a rail safety measure. A Warning Clause will be required in all Lease, Purchase and Sale Agreements, as summarized in Section 6.

Gradient Wind collected vibration data at two locations V1 and V2 situated towards the south side of the property parcel, nearest to the rail corridor. After review and processing of the data, the worst-case measured RMS value for events along the property line were found to be 0.51 mm/s (86 dBV). For events along the 30 m setback line, the worst-case RMS value was found to be 0.14 mm/s (75 dBV).

Since measured vibration levels do not exceed the criterion of 0.14 mm/s RMS at the potential foundation of the dwellings, concerns due to vibration impacts on the site are not expected. As vibration levels are acceptable, correspondingly, regenerated noise levels are also expected to be acceptable.

[2] ENCG, Part 5, Page 6

As an additional vibration mitigation measure, the development will incorporate 12-inch (300 mm) thick foundation walls to further minimize vibration transmission and enhance occupant comfort. Sample vibration plots are provided in Appendix E.

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1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Mr. Alex Sivasambu to undertake a transportation noise and vibration assessment for the property located at 2009-2013 Prince of Wales Drive in Ottawa, Ontario. This report summarizes the methodology, results, and recommendations related to the assessment of exterior and interior noise and vibration levels generated by local roadway, railway, and aircraft traffic.

Our work is based on theoretical noise calculation methods conforming to the City of Ottawa[3] and Ministry of the Environment, Conservation and Parks (MECP)[4] guidelines. Noise calculations were based on site plan and cross-section drawings provided by Jane Thompson Architect in December 2023, with future traffic volumes corresponding to the City of Ottawa's Official Plan (OP) roadway classifications, and railway traffic data obtained from Via Rail. Assessment of aircraft noise has been assessed based on its proximity to the airport and the nearest Noise Exposure Forecast contour line, as per Annex 10 in the City of Ottawa's OP. As the site is in proximity to the Via Rail corridor, ground vibration measurements were collected, as per the procedure outline in Section 4.3.2.

2. TERMS OF REFERENCE

The proposed development comprises seven lots and a private road located between Prince of Wales Drive and the Rideau River. The site is surrounded by Prince of Wales Drive to the west, residential land to the north, the Rideau River to the east, and the VIA Rail corridor to the south. Low-rise residential buildings are positioned in all compass directions. The south and east perimeters of the parcel of land contain a landscaped area, and between the new road and the landscaped space are buildable areas with a driveway for each lot. The six lots nearest to Prince of Wales Drive will be new, and the last lot will consist of an existing 1-storey brick sided dwelling located at 2009 Prince of Wales Drive.

The major sources of transportation noise include Prince of Wales Drive, the Via Rail corridor (Beachburg Subdivision), and the Ottawa Macdonald-Cartier International Airport. The development resides within

[3] City of Ottawa Environmental Noise Control Guidelines, January 2016
[4] Ontario Ministry of the Environment and Climate Change – Environmental Noise Guidelines, Publication NPC-300, Queens Printer for Ontario, Toronto, 2013

the Airport Vicinity Development Zone between the Airport Operating Influencing Zone (i.e., Noise Exposure Forecast (NEF) or Noise Prediction Forecast (NEP) 30 contour) and the NEF 25 contour. As the site is within 75m of the VIA Rail corridor, ground vibration measurements were collected, as described in Section 4.3.2.

The Beachburg Subdivision has a branch owned by Canadian National Rail, approximately 200 m west of the site. Historically, rail volumes on this line are very low with only a few trains a week. Furthermore the 3-year network plan, according to the Railway Association of Canada, states that the line is set to be discontinued in the near future. Therefore, this section of rail was considered to be insignificant and thus disregarded from the analysis.

Outdoor living areas associated with each lot, excluding Lot 3, will be located at the rear fully or partially exposed to the roadway and railway sources. Figure 1 illustrates a complete site plan with surrounding context.

Furthermore, the stationary noise impacts of the proposed development onto the surroundings were determined to be insignificant as no major mechanical equipment is planned. The only anticipated mechanical systems are residential air conditioners which, according to MECP noise guidelines, are not considered stationary noise sources. However, the location and installation of these systems are expected to comply with the noise regulations stipulated in *NPC-216: Residential and Air Conditioning Devices*[5], or local noise by-laws. As a result, noise from these units onto the surrounding area is anticipated to be minimal.

3. OBJECTIVES

The principal objectives of this study are to (i) calculate the future noise and vibration levels on the study buildings produced by local roadway, railway, and aircraft traffic, and (ii) ensure that interior noise and vibration levels do not exceed the allowable limits specified by the City of Ottawa's Environmental Noise Control Guidelines as outlined in Section 4.2 of this report.

[5] Ontario Ministry of the Environment and Energy – Residential Air Conditioning Devices, Publication NPC-216, Toronto Municipal Code, Toronto, 1993

4. METHODOLOGY

4.1 Background

Noise can be defined as any obtrusive sound. It is created at a source, transmitted through a medium, such as air, and intercepted by a receiver. Noise may be characterized in terms of the power of the source or the sound pressure at a specific distance. While the power of a source is characteristic by that particular source, the sound pressure depends on the location of the receiver and the path that the noise takes to reach the receiver. Measurement of noise is based on the decibel unit, dBA, which is a logarithmic ratio referenced to a standard noise level (2×10^{-5} Pascals). The 'A' suffix refers to a weighting scale, which better represents how the noise is perceived by the human ear. With this scale, a doubling of power results in a 3 dBA increase in measured noise levels and is just perceptible to most people. An increase of 10 dBA is often perceived to be twice as loud.

The ENCG specifies that surface transportation noise (road and rail) and airport noise should be evaluated separately. The overall building attenuation parameters are then combined. Section 4.2 and 4.3 addresses the methodology for the evaluation of roadway/railway and aircraft noise, respectively.

4.2 Roadway & Railway Traffic Noise

4.2.1 Criteria for Roadway and Railway Traffic Noise

For surface roadway and railway traffic noise, the equivalent sound energy level, L_{eq}, provides a measure of the time varying noise levels, which is well correlated with the annoyance of sound. It is defined as the continuous sound level, which has the same energy as a time varying noise level over a period of time. For roadways and railways, the L_{eq} is commonly calculated on the basis of a 16-hour (L_{eq16}) daytime (07:00-23:00) / 8-hour (L_{eq8}) nighttime (23:00-07:00) split to assess its impact on residential buildings. The City of Ottawa's Environmental Noise Control Guidelines (ENCG) specifies that the recommended indoor noise limit range (that is relevant to this study) is 40 and 35 dBA for living rooms and sleeping quarters respectively, as listed in Table 1.

TABLE 1: INDOOR SOUND LEVEL CRITERIA (ROAD AND RAIL) [6]

Type of Space	Time Period	Road L_{eq} (dBA)	Rail L_{eq} (dBA)
General offices, reception areas, retail stores, etc.	07:00 – 23:00	50	45
Living/dining/den areas of residences, **sleeping quarters**, hospitals, schools, nursing/retirement homes, day-care centres, theatres, places of worship, libraries, individual or semi-private offices, conference rooms, etc.	07:00 – 23:00	45	40
Sleeping quarters of hotels/motels	23:00 – 07:00	45	40
Sleeping quarters of residences, hospitals, nursing/retirement homes, etc.	23:00 – 07:00	40	35

Predicted noise levels at the plane of window (POW) dictate the action required to achieve the recommended sound levels. An open window is considered to provide a 10 dBA reduction in noise while a standard closed window is capable of providing a minimum 20 dBA noise reduction[7]. Therefore, where noise levels exceed 55 dBA daytime and 50 dBA nighttime, the ventilation for the building should consider the need for having windows and doors closed, which triggers the need for forced air heating with provision for central air conditioning. Where noise levels exceed 65 dBA daytime and 60 dBA nighttime, air conditioning will be required and building components will require higher levels of sound attenuation[8].

Due to the characteristics of rail noise which occur over short periods (i.e. whistles, brake squealing), and a significant low frequency component produced by the movement of the locomotive along the track, road and rail traffic noise require separate analyses, particularly when assessing indoor sound levels. In order to account for the special characteristics of railway sound, the indoor sound level criteria are more stringent by 5 dB as compared to the roadway traffic criteria. This difference typically results in requirements for upgraded glazing elements to provide better noise attenuation from the building envelope. Interior noise level criteria include the influence from rail crossings and warning whistle bursts.

[6] Adapted from ENCG 2016 – Tables 2.2b and 2.2c
[7] Burberry, P.B. (2014). Mitchell's Environment and Services. Routledge, Page 125
[8] MOECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.1.3

For designated Outdoor Living Areas (OLAs), the sound level limit is 55 dBA during the daytime period. An excess above the limit, between 55 dBA and 60 dBA, is acceptable only in cases where the required noise control measures are not feasible for technical, economic or administrative reasons. The development proposes several rear yards which have been identified as noise sensitive OLAs and were included in the assessment.

4.2.2 Theoretical Roadway and Railway Noise Predictions

Noise predictions were performed with the aid of the MECP computerized noise assessment program, STAMSON 5.04, for road analysis. Appendix A includes the STAMSON 5.04 input and output data.

Roadway and railway traffic noise calculations were performed by treating each segment as separate line sources of noise. In addition to the traffic volumes summarized in Table 2, theoretical noise predictions were based on the following parameters:

- Truck traffic on all roadways was taken to comprise 5% heavy trucks and 7% medium trucks, as per ENCG requirements for noise level predictions.
- The day/night split for all streets was taken to be 92%/8%, respectively.
- Ground surfaces were taken to be reflective due to the presence of hard (paved) ground. For select receptors, the ground surface was taken to be absorptive due to the presence of soft (lawn) ground. The river surface was taken to be fully reflective.
- Topography was assumed to be a flat/gentle slope for receptors influenced by Prince of Wales Drive.
- The VIA Rail corridor was modelled with a maximum elevation difference of 6.5 meters from average grade level.
- Receptor height was taken to be 4.5 metres for 2-storey buildings at the centre of the Plane of Window (POW) and 1.5 meters for the Outdoor Living Area (OLA).
- Noise receptors were strategically placed at 7 locations around the study area (see Figure 2).
- Receptor distances and exposure angles are illustrated in Figures 3 and 4.
- VIA Rail trains were modelled as diesel trains with 2 locomotives and 5 cars per train travelling at a maximum speed of 73 km/hr (45 MPH), as per the data provided by Via Rail.
- The rail line is approximately 6.5 m above the average grade.

4.2.3 Roadway and Railway Traffic Volumes

The ENCG dictates that noise calculations should consider future sound levels based on a roadway's classification at the mature state of development. Therefore, traffic volumes are based on the roadway classifications outlined in the City of Ottawa's Official Plan (OP) and Transportation Master Plan[9] which provide additional details on future roadway expansions. Average Annual Daily Traffic (AADT) volumes are then based on data in Table B1 of the ENCG for each roadway classification. For railway volumes, the data was projected to 2033 at an annual rate of 2.5% per year. Information received from Via can be seen in Appendix C. Table 2 summarizes the AADT values used for each roadway and VIA Rail line included in this assessment.

TABLE 2: TRANSPORTATION TRAFFIC DATA

Segment	Roadway Traffic Data	Speed Limit (km/h)	Traffic Volumes
Prince of Wales Drive	4-Lane Urban Arterial Road	60	**35,000**
VIA Rail	Passenger Rail	97	**18/4***

* Projected 2033 AADT daytime/nighttime rail traffic volumes based on the VIA Rail operating schedule.

4.2.4 Indoor Noise Calculations (Roadway and Railway)

The difference between outdoor and indoor noise levels is the noise attenuation provided by the building envelope. According to common industry practice, complete walls and individual wall elements are rated according to the Sound Transmission Class (STC). The STC ratings of common residential walls built in conformance with the Ontario Building Code (2020) typically exceed STC 35, depending on exterior cladding, thickness and interior finish details. For example, brick veneer walls can achieve STC 50 or more. Standard commercially-sided exterior metal stud walls have around STC 45. Standard good quality double-glazed non-operable windows can have STC ratings ranging from 25 to 40, depending on the window manufacturer, pane thickness and inter-pane spacing. As previously mentioned, the windows are the known weak point in a partition.

[9] City of Ottawa Transportation Master Plan, November 2013

As per Section 4.2, when daytime noise levels from road sources at the plane of the window exceed 65 dBA, calculations must be performed to evaluate the sound transmission quality of the building components to ensure acceptable indoor noise levels. The calculation procedure[10] considers:

- Window type and total area as a percentage of total room floor area
- Exterior wall type and total area as a percentage of the total room floor area
- Acoustic absorption characteristics of the room
- Outdoor noise source type and approach geometry
- Indoor sound level criteria, which varies according to the intended use of a space

Based on published research[11], exterior walls possess specific sound attenuation characteristics that are used as a basis for calculating the required STC ratings of windows in the same partition. Due to the limited information available at the time of the study, detailed floor layouts and building elevations have not been finalized; therefore, detailed STC calculations could not be performed at this time. Each lot will be sold separately to allow for a custom home to be built. As a guideline, the anticipated STC requirements for windows have been estimated based on the overall noise reduction required for each intended use of space and compare the results obtained using methodology outlined in the National Research Council of Canada's Building Practice Note # 56 (BPN 56)[12].

4.3 Ground Vibration and Ground-borne Noise

Rail systems and heavy vehicles on roadways can produce perceptible levels of ground vibrations, especially when they are in close proximity to residential neighbourhoods or vibration-sensitive buildings. Similar to sound waves in air, vibrations in solids are generated at a source, propagated through a medium, and intercepted by a receiver. In the case of ground vibrations, the medium can be uniform, or more often, a complex layering of soils and rock strata. Also, similar to sound waves in air, ground vibrations produce perceptible motions and regenerated noise known as 'ground-borne noise' when the vibrations encounter a hollow structure such as a building. Ground-borne noise and vibrations are generated when

[10] Building Practice Note: Controlling Sound Transmission into Buildings by J.D. Quirt, National Research Council of Canada, September 1985
[11] CMHC, Road & Rail Noise: Effects on Housing
[12] Building Practice Note: Controlling Sound Transmission into Buildings by J.D. Quirt, National Research Council of Canada, September 1985

there is excitation of the ground, such as from a train. Repetitive motion of the wheels on the track or rubber tires passing over an uneven surface causes vibrations to propagate through the soil. When they encounter a building, vibrations pass along the structure of the building beginning at the foundation and propagating to all floors. Air inside the building excited by the vibrating walls and floors represents regenerated airborne noise. Characteristics of the soil and the building are imparted to the noise, thereby creating a unique noise signature.

Human response to ground vibrations is dependent on the magnitude of the vibrations, which is measured by the root mean square (RMS) of the movement of a particle on a surface. Typical units of ground vibration measures are millimeters per second (mm/s), or inch per second (in/s). Since vibrations can vary over a wide range, it is also convenient to represent them in decibel units, or dBV. In North America, it is common practice to use the reference value of one micro-inch per second (µin/s) to represent vibration levels for this purpose. The threshold level of human perception to vibrations is about 0.10 mm/s RMS or about 72 dBV. Although somewhat variable, the threshold of annoyance for continuous vibrations is 0.5 mm/s RMS (or 85 dBV), five times higher than the perception threshold, whereas the threshold for significant structural damage is 10 mm/s RMS (or 112 dBV), at least one hundred times higher than the perception threshold level.

4.3.1 Ground Vibration Criteria

The Canadian Railway Association and Canadian Association of Municipalities have set standards for new sensitive land developments within 300 metres of a railway right-of-way, as published in their document *Guidelines for New Development in Proximity to Railway Operations*[13], which indicate that vibration conditions should not exceed 0.14 mm/s RMS averaged over a one second time-period at the first floor and above of the proposed building. As the main vibration source is due to a mainline railway, the 0.14 mm/s RMS (75 dBV) vibration criteria and 35 dBA ground borne noise criteria were adopted for this study.

[13] Dialog and J.E. Coulter Associates Limited, prepared for The Federation of Canadian Municipalities and The Railway Association of Canada, May 2013

4.3.2 Field Measurement Assessment Procedure

Existing levels of ground vibrations due to the rail line were determined by field measurements using Instantel model MicroMate seismograph capable of recording three components of ground velocity, one vertical and two horizontals. Measurements were conducted from 10:00 AM August 30th, 2023, to 04:30 PM September 1st, 2023. The measurement period was divided between two locations. One location was selected along the south property line of the development adjacent to the rail corridor right of way, as identified in Table 3 and Figure 5. The second measurement site was selected towards the southeast of the site, at the 30 m setback line from the right of way. This location would be the closest to the south façades of the future dwellings. Seismograph measurements were set to a minimum trigger level of 0.14 mm/s peak partial velocity (PPV), which is the lowest setting of the equipment.

TABLE 3: VIBRATION MEASUREMENT LOCATIONS

Receptor	Location Description	Placement of Seismographs from the Rail Corridor Centerline (m)
V1	Southern Property Line	13 (0 m from ROW)
V2	30 m setback line	43 (30 m from ROW)

4.4 Aircraft Traffic Noise

4.4.1 Criteria for Aircraft Noise

As per the City of Ottawa, the ENCG[14] establishes the sound level criteria for aircraft noise with reference to the Ottawa Macdonald Cartier International Airport located near the intersection of Hunt Club Road and Limebank Road. There are four vicinity zones surrounding the Ottawa Macdonald Cartier International Airport that indicate the intensity of the noise levels within the area illustrated in the Annex 10 - Land Use Constraints Due to Aircraft Noise[15]. For convenience, Annex 10 has been reproduced in Figure 6 of this report. Noise generated from aircraft traffic is represented as Effective Perceived Noise Levels (EPNL), a unit of noise measurement that accounts for variations in the human perception of pure tones and noise duration. Plotted EPNL around airports are represented by Noise Exposure Forecast (NEF) and Noise Exposure Projection (NEP) contours which represent the current and future operations of the airport.

[14] City of Ottawa Environmental Noise Control Guidelines, January 2016
[15] City of Ottawa Official Plan – Annex 10 (Land Use Constraints Due to Aircraft Noise)

The NEF / NEP (NEP) contour lines define the region around the airport exposed to various levels of aircraft noise impacting noise-sensitive areas, ranging from low to high outdoor noise levels. The Ottawa Airport Vicinity Development Zone is the furthest zone around the airport and holds that the development within the highlighted area will experience a minimum NEF/NEP of 25. The Airport Operating Influencing Zone (AOIZ) is the region representing 30 NEF/NEP contour where the noise levels have increased and will cause noise disruption to noise-sensitive developments. No new noise-sensitive development is allowed within the AOIZ except for infill development. For infill developments residing within the Airport Operating Influencing Zone (AOIZ), the ENCG inquires that a noise assessment is to be performed to ensure that noise mitigation measures are incorporated into the building design[16]. The composite line noise contour NEF/NEP 35 illustrates the area closest to the airport and is where the highest noise levels occur. Within this region, new developments are not permitted to be constructed in the outlined vicinity.

According to accepted research[17], Health and Welfare Canada states that people continuously exposed to NEF/NEP values less than 35 will not suffer adverse physical or psychological effects. Sociological surveys[18] have indicated that negative community reactions to noise levels may start at about 25 NEF/NEP. Table 4 identifies the sound level criteria for relevant indoor spaces exposed to aircraft noise. Where developments are within the AOIZ, building components must be designed to achieve the indoor criteria outlined in Table 4.

[16] City of Ottawa Official Plan
[17] CMHC, Road & Rail Noise: Effects on Housing
[18] Noise in Urban and Suburban Areas. Bolt, Beanik and Newman, Inc., Washington, January 1967

TABLE 4: INDOOR AIRCRAFT SOUND LEVEL CRITERIA[19]

Type of Space	NEF/NEP	L_{eq} (dBA)
General offices, reception areas, retail stores, etc.	15	47
Individual or semi-private offices, conference rooms, etc.	10	42
Living/dining/den areas of residences, hospitals, schools, nursing/retirement homes, day-care centres, theatres, places of worship, libraries, Sleeping quarters of hotels/motels	5	37
Sleeping quarters of residences, hospitals, nursing/retirement homes, etc.	0	32

4.5 Indoor Noise Calculations

The difference between outdoor and indoor noise levels is the noise attenuation provided by the building envelope. According to common industry practice, complete walls and individual wall elements are rated according to the Sound Transmission Class (STC). The STC ratings of common residential walls built in conformance with the Ontario Building Code (2020) typically exceed STC 35, depending on exterior cladding, thickness and interior finish details. For example, brick veneer walls can achieve STC 50 or more. Standard commercially-sided exterior metal stud walls have around STC 45. Standard good quality double-glazed non-operable windows can have STC ratings ranging from 25 to 40, depending on the window manufacturer, pane thickness and inter-pane spacing. As previously mentioned, the windows are the known weak point in a partition.

As per Section 4.2, when daytime noise levels from road and rail sources at the plane of the window exceed 65 dBA and 60 dBA respectively, calculations must be performed to evaluate the sound transmission quality of the building components to ensure acceptable indoor noise levels. Noise calculations also need to be made when the aircraft noise exposure is above NEF / NEP 25 ($L_{eq\text{-}24hr}$ 57). The calculation procedure[20] considers:

[19] City of Ottawa Environmental Noise Control Guidelines, January 2016
[20] Building Practice Note: Controlling Sound Transmission into Buildings by J.D. Quirt, National Research Council of Canada, September 1985

- Window type and total area as a percentage of total room floor area
- Exterior wall type and total area as a percentage of the total room floor area
- Acoustic absorption characteristics of the room
- Outdoor noise source type and approach geometry
- Indoor sound level criteria, which vary according to the intended use of a space.

Based on published research[21], exterior walls possess specific sound attenuation characteristics that are used as a basis for calculating the required STC ratings of windows in the same partition. The indoor noise levels generated by aircraft noise were assessed using EN 12354-3:2000 "Building Acoustics - Estimation of acoustic performance of buildings from the performance of elements - Part 3: Airborne sound insulation against outdoor sound"[22]. As per the ENCG, the STC requirements were determined for all building components impacted by aircraft noise, including the following:

- Exterior wall components for living/dining/bedrooms
- Window and Patio door components for living/dining/bedrooms
- Exterior door components for living/dining/kitchens

The closest NEF/ NEP contour to the site establishes the required equivalent sound pressure levels for living areas, bedrooms, and the overall sound pressure in the geographical area being studied. Refer to Section 5.2 for the theoretical and required sound level values. For this noise assessment, the theoretical sound pressure levels produced by aircraft were found to be 57 dBA ($L_{eq\text{-}24hr}$). Once the 24-hour equivalent sound pressure is determined, the reference source spectrum provided in CMHC can be used to establish the full spectrum of aircraft sound pressure levels. The spectrum representing the 1/3 octave band sound pressure levels is used to calculate the transmission of noise on each frequency band.

Indoor and outdoor rail / road traffic noise calculations were conducted using BPN 56 to develop the required noise performance of building components.

[21] CMHC, Road & Rail Noise: Effects on Housing
[22] Sound Insulation Prediction Program, INSUL Users Manual, Mashall Day Acoustics, 2017

As detailed drawings of the building interiors were not yet available, the indoor and outdoor calculations were based on the following assumptions:

- Typical bedroom dimensions are approximately 3 meters in length and 4 meters in width.
- Typical living room dimensions are approximately 4 meters in length and 4 meters in width.
- Ceiling height is at 2.7 meters.
- Window area is 2 m^2
- The bedroom was taken to be very absorptive (absorption coefficient of 1.25), due to typical bedroom finishing, and the living room was considered to be of intermediate absorption (absorption coefficient of 0.8).

As per NPC 300[23], the indoor aircraft noise was evaluated by converting the NEF/NEP to 24-hour equivalent sound pressure level. Since the development falls within the NEF 25 composite contour line, 25 was used as the NEF variable in the following equation NEF = $L_{eq\ (24)}$ - 32 dBA, used for the conversion. After the results were determined, EN 12354-3:2000 was used to evaluate the building components attenuation to sound levels. Refer to Appendix B for the EN 12354-3:2000 details and modelling of the assemblies.

5. RESULTS AND DISCUSSION

5.1 Transportation Traffic Noise Levels

5.1.1 Roadway and Railway Noise Levels

The results of the roadway and railway traffic noise calculations are summarized in Table 5 below. A complete set of input and output data from all STAMSON 5.04 calculations are available in Appendix A.

[23] Environmental Noise Guideline - Stationary and Transportation Sources - Approval and Planning (NPC-300), August 2013

TABLE 5: EXTERIOR NOISE LEVELS DUE TO ROAD AND RAIL TRAFFIC (STAMSON 5.04)

Receptor Number	Receptor Height Above Grade (m)	Receptor Location	Roadway Noise Level (dBA)		Railway Noise Level (dBA)		Combined Noise Level (dBA)	
			Day	Night	Day	Night	Day	Night
1	4.5	POW — Lot 7 North Façade	66	59	-	-	66	59
2	4.5	POW — Lot 7 West Façade	69	62	58	54	70	62
3	4.5	POW — Lot 7 South Façade	65	58	63	59	67	62
4	4.5	POW — Lot 3 South Façade	55	47	63	60	64	60
5	1.5	OLA — Lot 7 Rear Yard	67	N/a*	63	N/a*	68	N/a*
6	1.5	OLA — Lot 2 Rear Yard	-	-	62	N/a*	62	N/a*
7	1.5	OLA – Lot 3 Rear Yard	62	N/a*	63	N/a*	65	N/a*

*Nighttime noise levels are not considered for OLAs as per ENCG

The results of the current analysis indicate that plane of window noise levels will range between 62 and 70 dBA during the daytime period (07:00-23:00) and between 59 and 62 dBA during the nighttime period (23:00-07:00). The highest noise level (70 dBA) occurs at Lot 7, which is nearest and most exposed to Prince of Wales Drive and the VIA Rail corridor. The noise levels exceed the ENCG criteria requiring the need for upgraded building components. Furthermore, the results indicate that the buildings associated with each lot would require central air conditioning which will allow occupants to keep windows closed and maintain a comfortable living environment. As the OLAs are also expected to exceed the ENCG noise criteria, noise mitigation in the form of a barrier will also be required for select lots. Specific noise mitigation requirements are summarized in subsequent sections.

5.1.2 Aircraft Traffic Noise Levels

The theoretical sound levels from the NEF/ NEP 25 correspond to a 24-hour equivalent sound level ($L_{eq(24)}$) of 57 dBA outside the buildings. The noise inside the dwellings would need to be reduced to 32 dBA for bedrooms and 37 dBA for indoor living rooms.

5.1.3 Noise Control Measures

The noise levels predicted due to roadway and railway traffic exceed the criteria listed in Section 4.2 for building components. In addition, the development is located between the NEF 25 contour and the AOIZ which also requires the need for upgraded building components.

Taking into consideration the surface transportation sources and aircraft sources, the building components described below should be considered in the building design to provide the necessary noise attenuation. The mitigation measures presented below are designed to mitigate the highest expected noise levels at all facades (i.e., 70 dBA). It should be noted that these measures are required for new buildings for Lots 2-7 as Lot 1 will comprise an existing 1-storey brick-cladding building.

Window and exterior walls were evaluated to determine the attenuation required for indoor sound levels assuming windows are closed. Exterior walls have been evaluated using NRC testing data and BPN 56 to determine the necessary STC for proper indoor sound attenuation. The assemblies that were chosen to provide adequate sound insulation are based on prescribed measures outlined in the ENCG[24] and Gradient Wind's past experience. Refer to Appendix B for further STC details and modelling of the assemblies.

EXTERIOR WALL STC REVIEW

The exterior walls of the development have been evaluated using NRC test data to determine the required STC requirements established by ENCG. Greater mitigation in sound levels is achieved by higher STC ratings and is determined by the material selection of the exterior walls. Exterior wall components on all façades will require a minimum brick cladding or masonry equivalent as per NPC-300 guidelines[25].

The architectural detail for the exterior wall sample is listed below. Alternative assemblies are permissible provided they meet the same transmission loss ratings on a 1/3 octave band rating.

[24] City of Ottawa Environmental Noise Control Guidelines, January 2016. Part 6, page 1
[25] MOECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.2.3

Exterior Wall (Enhanced) – EW1

- 90 or 100 m of brick
- 25 mm air space
- 25 mm ridged insulation (not acoustic relevant)
- 13 mm of oriented strand board
- 140 mm wood studs at 400 mm o.c.
- 140 mm of acoustic batt insulation
- 15.9 mm of gypsum board

Predicted STC Rating: 53 (similar to NRC TLA-99-098a)

ROOF STC REVIEW

The roof STC requirements were determined using EN 12354-3:2000. The attic of the dwellings is required to be ventilated as per ENCG. The roof the dwelling was assumed to be inclined at an angle of 30 degrees. The recommended architectural details for the roof are listed below. Alternative assemblies are permissible provided they meet the same STC rating.

Roof – R1

- 3 mm of asphalt shingles
- 15 mm of oriented strand board
- wood trusses 600 mm O.C with ventilated attic
- 380 mm of acoustic batt insulation
- 12.7 mm of gypsum board
- Predicted STC Rating: 49 (Similar to NRC TLF-98-095a)

WINDOW AND DOOR GLAZING STC REVIEW

The window and exterior wall STC requirements for the bedroom and living/dining area were evaluated using BPN 56 and EN 12354-3:2000, as seen in Appendices B and D. While the BPN 56 results have been considered, the final recommendations are based on Gradient Wind's experience and engineering judgement.

Windows generally have lower sound attenuation in comparison to exterior walls or other building components. As a result, the STC level is lower than exterior walls, floors, roofs, and exterior doors. As per the ENCG[26], if the window area exceeds 20 percent or 50 percent of the floor area for bedrooms and dining areas, respectively, then it is necessary to acquire certification from the acoustical consultant. The recommended architectural details for the windows are listed below. Alternative assemblies are permissible provided they meet the same STC rating. Tested window assemblies should be used in the design / build phase.

Window (Bedroom and Living Room) – W1

- 3 mm inner pane
- 16 mm air space
- 6 mm outer pane

EN 12354-3:2000 Predicted STC Rating: 34

It is the responsibility of the manufacturer to ensure that the specified window achieves the required STC. This can only be assured by using window configurations that have been certified by laboratory testing. The requirements for STC ratings assume that the remaining components of the building are constructed and installed according to the minimum standards of the Ontario Building Code. The specified STC requirements also apply to swinging and/or sliding patio doors.

Results of the calculations also indicate that the dwellings will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. In addition to ventilation requirements, Warning Clauses will also be required in all Lease, Purchase and Sale Agreements, as summarized in Section 6.

5.1.4 Noise Barrier Calculation

Noise levels at the rear yards are expected to exceed 55 dBA during the daytime period without a noise barrier. If these areas are to be used as outdoor living areas, noise control measures are required to reduce noise levels to as close as possible to 55 dBA, where technically and administratively feasible.

[26] City of Ottawa Environmental Noise Control Guidelines, January 2016

Given the steep embankment between the study buildings and the rail line, with the rail line being approximately 6.5 m above the study site's average grade, an excessively tall noise barrier would be necessary to block the direct line of sight to the elevated railway, as demonstrated in Figure 7. Gradient Wind examined two potential barrier locations: one along the property line closest to Prince of Wales and another along the property line of Lot 7. For both locations, barriers ranging from 1.0 to 5.5 m above the local grade (bottom of slope) were evaluated (see Table 6). Results of the investigation showed that an excessively tall barrier would be required to provide any benefit, which is impractical.

Therefore, Gradient Wind concludes that the implementation of a noise barrier is not considered technically and administratively feasible for the lots backing onto the VIA Rail corridor, and a Warning Clause will be required in all Lease, Purchase and Sale Agreements, as summarized in Section 6.

The predicted noise levels represent a worst-case scenario, assuming that Prince of Wales Drive has been expanded into a four-lane arterial road, thereby increasing traffic volumes and that the railway operations consist of diesel-powered trains. These assumptions are intended to account for the maximum potential noise exposure for future residents and ensure that any mitigation recommendations remain valid under increased noise conditions. This conservative approach allows Gradient Wind to evaluate noise impacts comprehensively, even if infrastructure expansions or changes in rail traffic occur.

TABLE 6: RESULTS OF NOISE BARRIER INVESTIGATION

Receptor Number	Receptor Height Above Grade (m)	Receptor Location	Barrier Location	Daytime L_{eq} Noise Levels (dBA)				
				No Barrier	With 1 m Barrier	With 3 m Barrier	With 4 m Barrier	With 5.5 m Barrier
5	1.5	OLA - Lot 7 Rear Yard	Property Line of Lot 7	68	68	64	63	62
			Property Line along Prince of Wales	68	68	66	66	65

5.2 Ground Vibrations and Ground-borne Noise Levels

Gradient Wind collected vibration data at two locations V1 and V2 situated towards the south side of the property parcel, nearest to the rail corridor. During the data collection period, the seismograph was

triggered 361 times. The meter could be triggered by rail pass-bys, but also people walking, and sometimes stray electrical current. A review of the time histories and Fast Fourier Transform was used to distinguish real train pass by events, from extraneous triggered events. After review and processing of the data, the RMS value for the worst-case event along the property line was determined to be 0.51 mm/s (86 dBV).

For events along the 30 m setback line (from the right-of-way), the RMS value was calculated to be 0.14 mm/s (75 dBV). Since predicted vibration levels do not exceed the criterion of 0.14 mm/s RMS at the foundation, concerns due to vibration impacts on the site are not expected. As vibration levels are acceptable, correspondingly, regenerated noise levels are also expected to be acceptable.

As an additional vibration mitigation measure, the development will incorporate 12-inch (300 mm) thick foundation walls to further minimize vibration transmission and enhance occupant comfort. Sample vibration plots are provided in Appendix E.

6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current analysis indicate that plane of window noise levels will range between 62 and 70 dBA during the daytime period (07:00-23:00) and between 59 and 62 dBA during the nighttime period (23:00-07:00). The highest noise level (70 dBA) occurs at Lot 7, which is nearest and most exposed to Prince of Wales Drive and the VIA Rail corridor. As such, upgraded building components with a higher Sound Transmission Class (STC) rating will be required to mitigate surface transportation noise. With regard to aircraft noise, the development falls within the NEF 25 composite contour line indicating that noise levels from aircraft flyovers will approach 57 dBA. As a result, upgraded building components with a higher Sound Transmission Class (STC) rating will also be required to mitigate aircraft noise.

Section 5.1 outlines the STC requirements for the exterior wall, glazing, and roof assembly to ensure indoor noise levels meet the criteria specified by ENCG and NPC-300. Results of the calculations also indicate that the development will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment.

With respect to roadway and railway sources, Warning Clauses will be required on all Lease, Purchase and Sale Agreements, as summarized below. Furthermore, a VIA Rail Warning Clause will be required in all

Lease, Purchase and Sale Agreements, as well as agreements registered on title, because the development is within 300 m of the VIA Rail corridor.

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, Conservation and Parks."*

VIA Rail Warning Clause:

> *"Warning: VIA Railway Company or its assigns or successors in interest has or have a rights-of-way within 300 metres from the land the subject hereof. There may be alterations to or expansions of the railway facilities on such rights-of-way in the future including the possibility that the railway or its assigns or successors as aforesaid may expand its operations, which expansion may affect the living environment of the residents in the vicinity, notwithstanding the inclusion of any noise and vibration attenuating measures in the design of the development and individual dwelling(s). VIA will not be responsible for any complaints or claims arising from use of such facilities and/or operations on, over or under the aforesaid rights-of-way."*

CN Warning Clause:

> *"Warning: Canadian National Railway Company or its assigns or successors in interest has or have a rights-of-way within 300 metres from the land the subject hereof. There may be alterations to or expansions of the railway facilities on such rights-of-way in the future including the possibility that the railway or its assigns or successors as aforesaid may expand its operations, which expansion may affect the living environment of the residents in the vicinity, notwithstanding the inclusion of any noise and vibration attenuating measures in the design of the development and individual dwelling(s). CNR will not be responsible for any complaints or claims arising from use of such facilities and/or operations on, over or under the aforesaid rights-of-way."*

With respect to aircraft noise, the following Warning Clause will also be required on all Lease, Purchase and Sale Agreements, as summarized below:

> *"Purchasers/building occupants are forewarned that this property/dwelling unit 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 central air conditioning system.*
>
> *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 indoor and/or outdoor noise levels due to aircraft operations are of or are offensive."

Noise levels at the rear yards are expected to exceed 55 dBA during the daytime period without a noise barrier. Given the steep embankment between the study buildings and the rail line, with the rail line being approximately 6.5 m above the study site's average grade, an excessively tall noise barrier would be necessary to block the direct line of sight to the elevated railway, as demonstrated in Figure 7. Gradient Wind examined two potential barrier locations: one along the property line closest to Prince of Wales and another along the property line of Lot 7. For both locations, barriers ranging from 1.0 to 5.5 m above the local grade (bottom of slope) were evaluated (see Table 6). Results of the investigation showed that an excessively tall barrier would be required to provide any benefit, which is impractical. Therefore, Gradient Wind concludes that the implementation of a noise barrier is not considered technically and administratively feasible for the lots backing onto the VIA Rail corridor, and a Warning Clause will be required in all Lease, Purchase and Sale Agreements, as summarized below:

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 and rail 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."

Gradient Wind collected vibration data at two locations V1 and V2 situated towards the south side of the property parcel, nearest to the rail corridor. After review and processing of the data, the RMS value for events along the property line was calculated to be 0.51 mm/s (86 dBV). For events along the 30 m setback line, the RMS value was calculated to be 0.14 mm/s (75 dBV).

Since measured vibration levels do not exceed the criterion of 0.14 mm/s RMS at the potential foundation of the dwellings, concerns due to vibration impacts on the site are not expected. As vibration levels are acceptable, correspondingly, regenerated noise levels are also expected to be acceptable.

In advance of the issuance of the building permit, the analysis should be revised based on final plans to ensure that mitigation measures are sufficient, and the requirements are met. Furthermore, in advance of issuance of occupancy permits, the subject site should be inspected to ensure that acoustical requirements have been implemented. The following table provides a summary of acoustic mitigation measures required for this development:

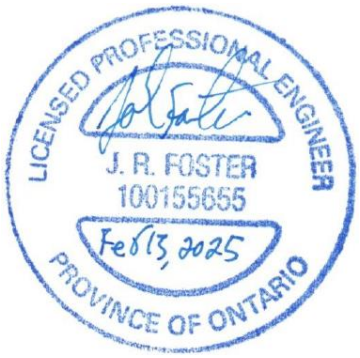
TABLE 7: SUMMARY OF MITIGATION MEASURES REQUIRED

Lot #	Window STC (Living Room / Bedroom)	Exterior Wall STC	Roof STC	Ventilation Requirements	Warning Clauses on Lease, Purchase, and Sale Agreements
1	N/A	Existing dwelling			
2 - 7	STC 34 / STC 34	STC 56	STC 56	Air Conditioning	Type D, Type B, VIA Rail, CN, Airport Proximity

This concludes our vibration and roadway, railway, and aircraft traffic noise assessment. If you have any questions or wish to discuss our findings, please advise us. In the interim, we thank you for the opportunity to be of service.

Sincerely,

Gradient Wind Engineering Inc.



Benjamin Page, AdvDip.
Junior Environmental Scientist

Joshua Foster, P.Eng.
Lead Engineer

GW22-190 -Transportation Noise & Vibration

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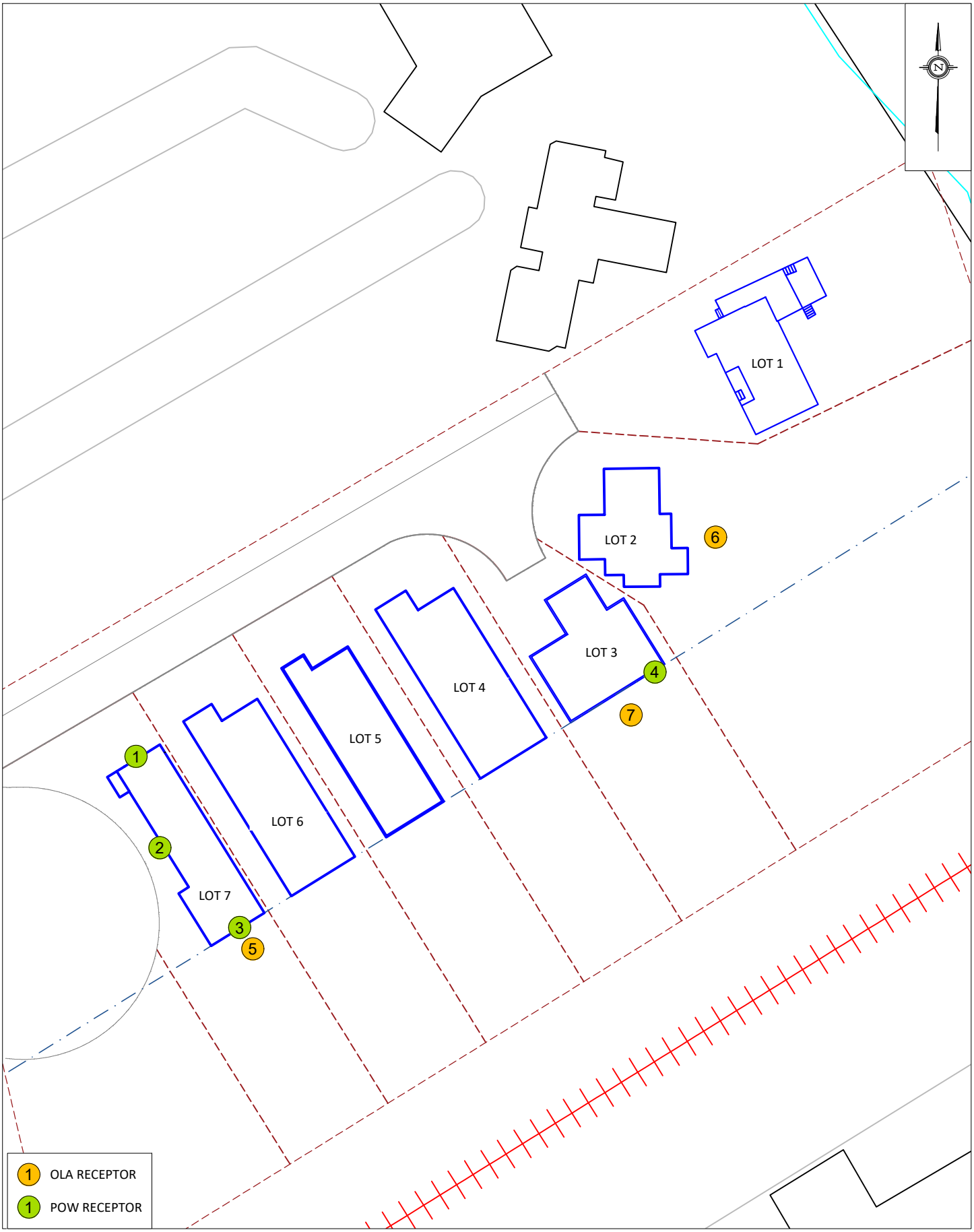
SCALE	1:2000 (APPROX.)
DRAWING NO.	GW22-190 -1
DATE	FEBRUARY 13, 2025
DRAWN BY	J.F.

DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT



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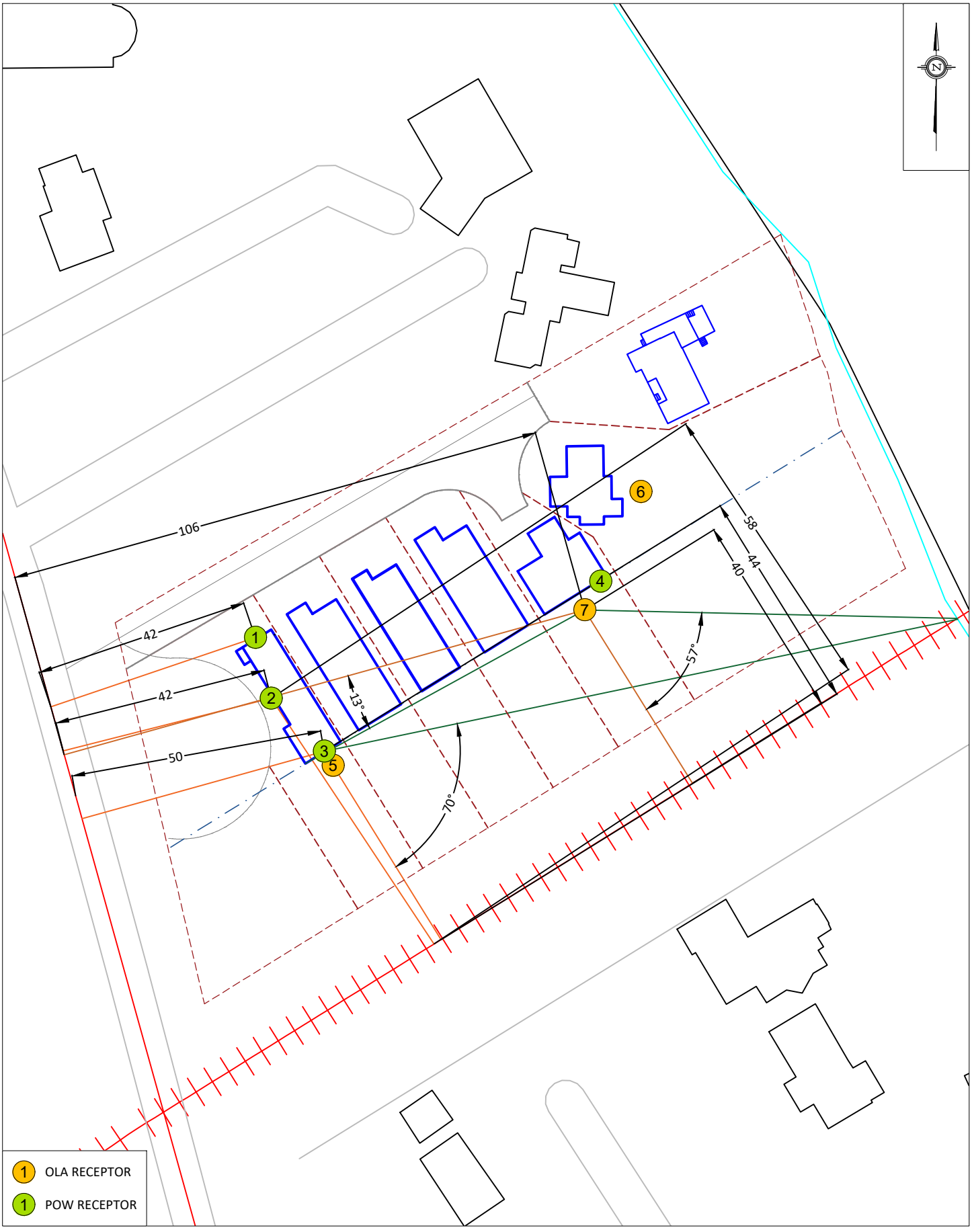
SCALE	1:150 (APPROX.)
DRAWING NO.	GW22-190 -2
DATE	FEBRUARY 13, 2025
DRAWN BY	J.F.
DESCRIPTION	FIGURE 2: RECEPTOR LOCATIONS



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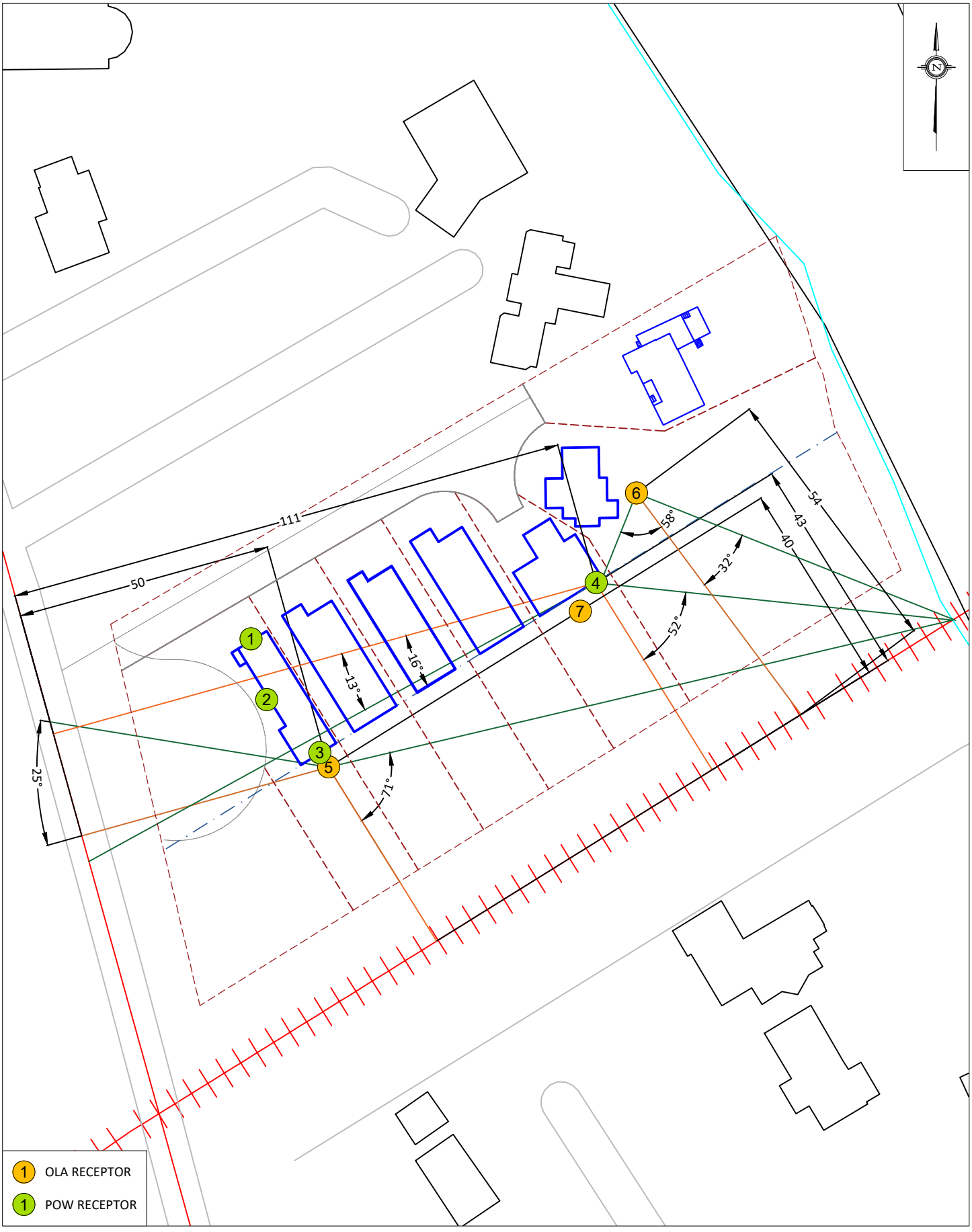
SCALE	1:1000 (APPROX.)	DRAWING NO.	GW22-190 -3
DATE	FEBRUARY 13, 2025	DRAWN BY	J.F.

FIGURE 3:
STAMSON INPUT PARAMETERS



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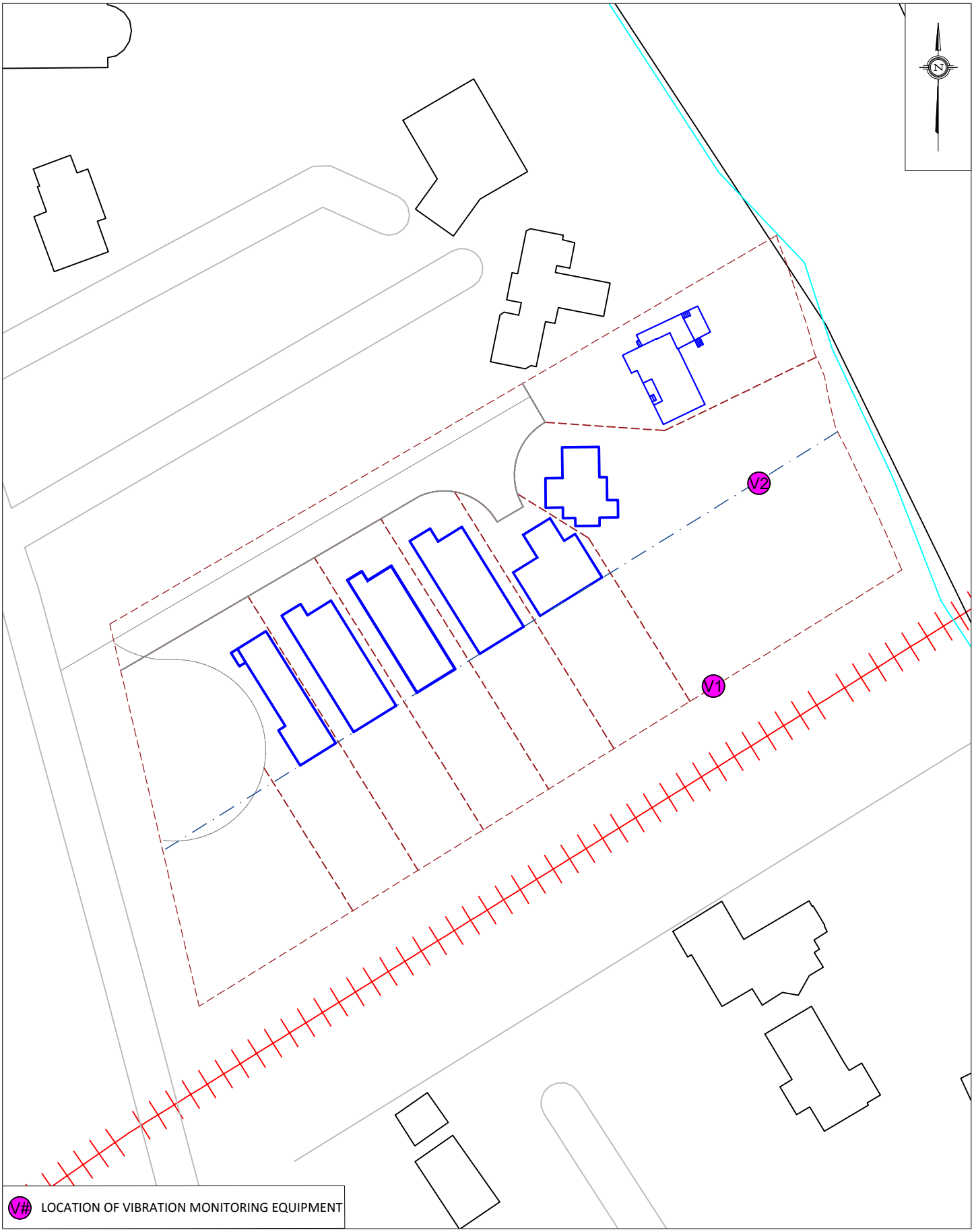
SCALE	1:1000 (APPROX.)	DRAWING NO.	GW22-190 -4
DATE	FEBRUARY 13, 2025	DRAWN BY	J.F.

FIGURE 4:
STAMSON INPUT PARAMETERS (2)



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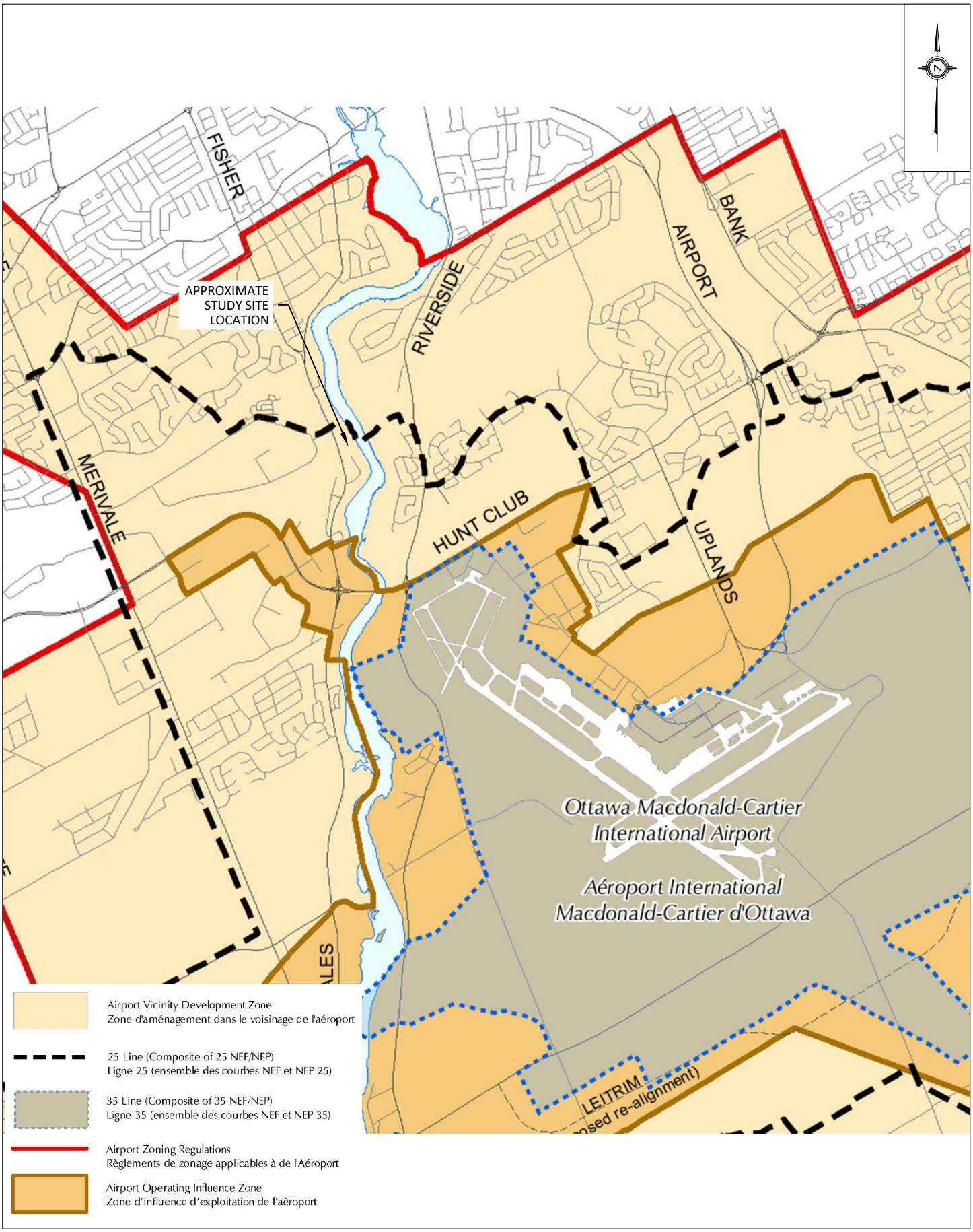
PROJECT	2009-2013 PRINCE OF WALES DRIVE, OTTAWA TRANSPORTATION NOISE AND VIBRATION ASSESSMENT		DESCRIPTION
SCALE	1:1000 (APPROX.)	DRAWING NO.	GW22-190 -5
DATE	FEBRUARY 13, 2025	DRAWN BY	J.F.

FIGURE 5:
VIBRATION MONITORING LOCATIONS



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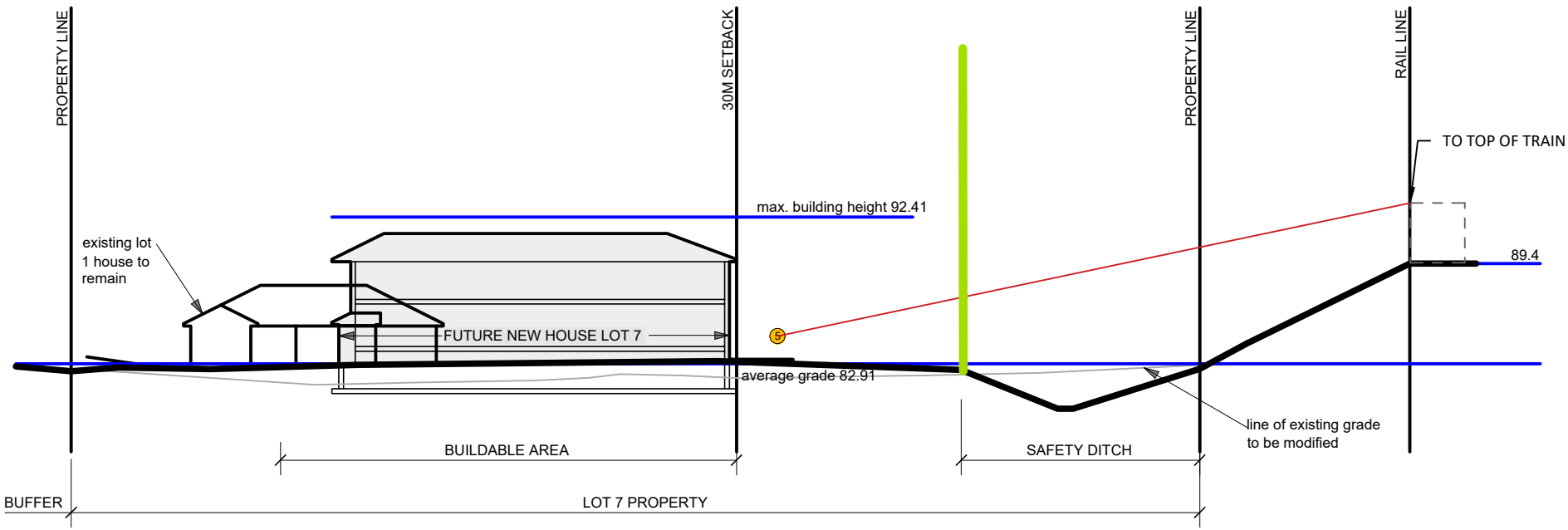
PROJECT	2009-2013 PRINCE OF WALES DRIVE, OTTAWA TRANSPORTATION NOISE AND VIBRATION ASSESSMENT
SCALE	1:1000 (APPROX.)
DRAWING NO.	GW22-190 -6
DATE	FEBRUARY 13, 2025
DRAWN BY	B.P.

DESCRIPTION

FIGURE 6:
ANNEX 10 - LAND USE CONSTRAINTS DUE TO AIRCRAFT NOISE WITH REFERENCE TO STUDY SITE



1 OLA RECEPTOR

LINE OF SIGHT

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SCALE	1:1000 (APPROX.)
DRAWING NO.	GW22-190-7
DATE	FEBRUARY 13, 2025
DRAWN BY	B.P.

DESCRIPTION

FIGURE 7:
LOT 7 CROSS-SECTION - RECEPTOR 5 LINE OF SIGHT

APPENDIX A

STAMSON 5.04 – INPUT AND OUTPUT DATA

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STAMSON 5.0 NORMAL REPORT Date: 06-11-2024 08:48:36
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: R1.te Time Period: Day/Night 16/8 hours
Description:

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

Car traffic volume : 28336/2464 veh/TimePeriod *
Medium truck volume : 2254/196 veh/TimePeriod *
Heavy truck volume : 1610/140 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 35000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

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

Angle1 Angle2 : 0.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 42.00 / 42.00 m
Receiver height : 4.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: POW (day)

Source height = 1.50 m

ROAD (0.00 + 66.19 + 0.00) = 66.19 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	73.68	0.00	-4.47	-3.01	0.00	0.00	0.00	66.19

Segment Leq : 66.19 dBA

Total Leq All Segments: 66.19 dBA

```
Results segment # 1: POW (night)
--------------------------------

Source height = 1.50 m

ROAD (0.00 + 58.60 + 0.00) = 58.60 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     90   0.00  66.08   0.00  -4.47  -3.01   0.00   0.00   0.00  58.60
-------------------------------------------------------------------------------

Segment Leq : 58.60 dBA

Total Leq All Segments: 58.60 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 66.19
                           (NIGHT): 58.60
```

STAMSON 5.0 NORMAL REPORT Date: 11-02-2025 10:44:37
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: R2.te Time Period: Day/Night 16/8 hours
Description:

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. PASSENGER	18.0/4.0	97.0	2.0	5.0	Diesel	No

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

Angle1 Angle2	:	0.00 deg 90.00 deg
Wood depth	:	0 (No woods.)
No of house rows	:	0 / 0
Surface	:	1 (Absorptive ground surface)
Receiver source distance	:	58.00 / 58.00 m
Receiver height	:	4.50 / 4.50 m
Topography	:	3 (Elevated; no barrier)
No Whistle		
Elevation	:	6.50 m
Reference angle	:	0.00

Results segment # 1: VIA (day)

LOCOMOTIVE (0.00 + 57.30 + 0.00) = 57.30 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.30	68.72	-7.64	-3.78	0.00	0.00	0.00	57.30

WHEEL (0.00 + 47.80 + 0.00) = 47.80 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.41	60.06	-8.25	-4.00	0.00	0.00	0.00	47.80

Segment Leq : 57.76 dBA

Total Leq All Segments: 57.76 dBA

```
Results segment # 1: VIA (night)
--------------------------------

LOCOMOTIVE (0.00 + 53.78 + 0.00) = 53.78 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------
     0     90   0.30  65.20  -7.64  -3.78   0.00   0.00   0.00  53.78
-----------------------------------------------------------------------

WHEEL (0.00 + 44.28 + 0.00) = 44.28 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------
     0     90   0.41  56.54  -8.25  -4.00   0.00   0.00   0.00  44.28
-----------------------------------------------------------------------

Segment Leq : 54.24 dBA

Total Leq All Segments: 54.24 dBA

Road data, segment # 1: POW (day/night)
---------------------------------------
Car traffic volume  : 28336/2464  veh/TimePeriod  *
Medium truck volume :  2254/196   veh/TimePeriod  *
Heavy truck volume  :  1610/140   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

    24 hr Traffic Volume (AADT or SADT):  35000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: POW (day/night)
-------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  42.00 / 42.00  m
Receiver height           :   4.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Results segment # 1: POW (day)
------------------------------

Source height = 1.50 m

ROAD (0.00 + 69.20 + 0.00) = 69.20 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  73.68   0.00  -4.47   0.00   0.00   0.00   0.00  69.20
-------------------------------------------------------------------------------

Segment Leq : 69.20 dBA

Total Leq All Segments: 69.20 dBA

Results segment # 1: POW (night)
--------------------------------

Source height = 1.50 m

ROAD (0.00 + 61.61 + 0.00) = 61.61 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  66.08   0.00  -4.47   0.00   0.00   0.00   0.00  61.61
-------------------------------------------------------------------------------

Segment Leq : 61.61 dBA

Total Leq All Segments: 61.61 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 69.50
                           (NIGHT): 62.34
```

STAMSON 5.0 NORMAL REPORT Date: 11-02-2025 10:46:08
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: R3.te Time Period: Day/Night 16/8 hours
Description:

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. PASSENGER	18.0/4.0	97.0	2.0	5.0	Diesel	No

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

Angle1 Angle2	: -70.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 44.00 / 44.00	m
Receiver height	: 4.50 / 4.50	m
Topography	: 3	(Elevated; no barrier)
No Whistle		
Elevation	: 6.50 m	
Reference angle	: 0.00	

Rail data, segment # 2: VIA-River (day/night)

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. Passenger	18.0/4.0	97.0	2.0	5.0	Diesel	No

Data for Segment # 2: VIA-River (day/night)

Angle1 Angle2	: -90.00 deg	-70.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 2	(Reflective ground surface)
Receiver source distance	: 44.00 / 44.00	m
Receiver height	: 4.50 / 4.50	m
Topography	: 3	(Elevated; no barrier)
No Whistle		
Elevation	: 6.50 m	
Reference angle	: 0.00	

```
Results segment # 1: VIA-Lawn (day)
-----------------------------------

LOCOMOTIVE (0.00 + 61.54 + 0.00) = 61.54 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -70     90   0.30  68.72  -6.08  -1.10   0.00   0.00   0.00  61.54
-------------------------------------------------------------------------

WHEEL (0.00 + 52.21 + 0.00) = 52.21 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -70     90   0.41  60.06  -6.57  -1.28   0.00   0.00   0.00  52.21
-------------------------------------------------------------------------

Segment Leq : 62.02 dBA

Results segment # 2: VIA-River (day)
-----------------------------------

LOCOMOTIVE (0.00 + 54.50 + 0.00) = 54.50 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -70   0.00  68.72  -4.67  -9.54   0.00   0.00   0.00  54.50
-------------------------------------------------------------------------

WHEEL (0.00 + 45.84 + 0.00) = 45.84 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -70   0.00  60.06  -4.67  -9.54   0.00   0.00   0.00  45.84
-------------------------------------------------------------------------

Segment Leq : 55.05 dBA

Total Leq All Segments: 62.82 dBA

Results segment # 1: VIA-Lawn (night)
-------------------------------------

LOCOMOTIVE (0.00 + 58.02 + 0.00) = 58.02 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -70     90   0.30  65.20  -6.08  -1.10   0.00   0.00   0.00  58.02
-------------------------------------------------------------------------

WHEEL (0.00 + 48.69 + 0.00) = 48.69 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -70     90   0.41  56.54  -6.57  -1.28   0.00   0.00   0.00  48.69
-------------------------------------------------------------------------

Segment Leq : 58.50 dBA
```

```
Results segment # 2: VIA-River (night)
--------------------------------------

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
-------------------------------------------------------------------------
   -90    -70   0.00  65.20  -4.67  -9.54   0.00   0.00   0.00  50.98
-------------------------------------------------------------------------

WHEEL (0.00 + 42.32 + 0.00) = 42.32 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -70   0.00  56.54  -4.67  -9.54   0.00   0.00   0.00  42.32
-------------------------------------------------------------------------

Segment Leq : 51.53 dBA

Total Leq All Segments: 59.30 dBA

Road data, segment # 1: POW (day/night)
---------------------------------------
Car traffic volume  : 28336/2464  veh/TimePeriod  *
Medium truck volume :  2254/196   veh/TimePeriod  *
Heavy truck volume  :  1610/140   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

    24 hr Traffic Volume (AADT or SADT):  35000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: POW (day/night)
-------------------------------------
Angle1   Angle2           : -90.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  50.00 / 50.00  m
Receiver height           :   4.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Results segment # 1: POW (day)
------------------------------

Source height = 1.50 m

ROAD (0.00 + 65.44 + 0.00) = 65.44 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90      0   0.00  73.68   0.00  -5.23  -3.01   0.00   0.00   0.00  65.44
-------------------------------------------------------------------------------

Segment Leq : 65.44 dBA

Total Leq All Segments: 65.44 dBA

Results segment # 1: POW (night)
--------------------------------

Source height = 1.50 m

ROAD (0.00 + 57.84 + 0.00) = 57.84 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90      0   0.00  66.08   0.00  -5.23  -3.01   0.00   0.00   0.00  57.84
-------------------------------------------------------------------------------

Segment Leq : 57.84 dBA

Total Leq All Segments: 57.84 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 67.33
                           (NIGHT): 61.64
```

STAMSON 5.0 NORMAL REPORT Date: 11-02-2025 10:48:11
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: R4.te Time Period: Day/Night 16/8 hours
Description:

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. PASSENGER	18.0/4.0	97.0	2.0	5.0	Diesel	No

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

Angle1 Angle2	: -52.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 43.00 / 43.00	m
Receiver height	: 4.50 / 4.50	m
Topography	: 3	(Elevated; no barrier)
No Whistle		
Elevation	: 6.50 m	
Reference angle	: 0.00	

Rail data, segment # 2: Via-River (day/night)

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. Passenger	18.0/4.0	97.0	2.0	5.0	Diesel	No

Data for Segment # 2: Via-River (day/night)

Angle1 Angle2	: -90.00 deg	-52.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 2	(Reflective ground surface)
Receiver source distance	: 43.00 / 43.00	m
Receiver height	: 4.50 / 4.50	m
Topography	: 3	(Elevated; no barrier)
No Whistle		
Elevation	: 6.50 m	
Reference angle	: 0.00	

```
Results segment # 1: VIA-Lawn (day)
-----------------------------------

LOCOMOTIVE (0.00 + 61.20 + 0.00) = 61.20 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -52     90   0.30  68.72  -5.95  -1.58   0.00   0.00   0.00  61.20
-------------------------------------------------------------------------

WHEEL (0.00 + 51.89 + 0.00) = 51.89 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -52     90   0.41  60.06  -6.43  -1.74   0.00   0.00   0.00  51.89
-------------------------------------------------------------------------

Segment Leq : 61.68 dBA

Results segment # 2: Via-River (day)
-----------------------------------

LOCOMOTIVE (0.00 + 57.39 + 0.00) = 57.39 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -52   0.00  68.72  -4.57  -6.75   0.00   0.00   0.00  57.39
-------------------------------------------------------------------------

WHEEL (0.00 + 48.73 + 0.00) = 48.73 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -52   0.00  60.06  -4.57  -6.75   0.00   0.00   0.00  48.73
-------------------------------------------------------------------------

Segment Leq : 57.94 dBA

Total Leq All Segments: 63.21 dBA

Results segment # 1: VIA-Lawn (night)
-------------------------------------

LOCOMOTIVE (0.00 + 57.67 + 0.00) = 57.67 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -52     90   0.30  65.20  -5.95  -1.58   0.00   0.00   0.00  57.67
-------------------------------------------------------------------------

WHEEL (0.00 + 48.37 + 0.00) = 48.37 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -52     90   0.41  56.54  -6.43  -1.74   0.00   0.00   0.00  48.37
-------------------------------------------------------------------------

Segment Leq : 58.15 dBA
```

```
Results segment # 2: Via-River (night)
--------------------------------------

LOCOMOTIVE (0.00 + 53.87 + 0.00) = 53.87 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -52   0.00  65.20  -4.57  -6.75   0.00   0.00   0.00  53.87
-------------------------------------------------------------------------

WHEEL (0.00 + 45.21 + 0.00) = 45.21 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -52   0.00  56.54  -4.57  -6.75   0.00   0.00   0.00  45.21
-------------------------------------------------------------------------

Segment Leq : 54.42 dBA

Total Leq All Segments: 59.68 dBA

Road data, segment # 1: POW (day/night)
---------------------------------------
Car traffic volume  : 28336/2464  veh/TimePeriod  *
Medium truck volume :  2254/196   veh/TimePeriod  *
Heavy truck volume  :  1610/140   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

    24 hr Traffic Volume (AADT or SADT):  35000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: POW (day/night)
-------------------------------------
Angle1   Angle2           : -90.00 deg   -16.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 111.00 / 111.00 m
Receiver height           :   4.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Results segment # 1: POW (day)
------------------------------

Source height = 1.50 m

ROAD (0.00 + 54.53 + 0.00) = 54.53 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -16   0.57  73.68   0.00 -13.65  -5.50   0.00   0.00   0.00  54.53
-------------------------------------------------------------------------------

Segment Leq : 54.53 dBA

Total Leq All Segments: 54.53 dBA

Results segment # 1: POW (night)
--------------------------------

Source height = 1.50 m

ROAD (0.00 + 46.94 + 0.00) = 46.94 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -16   0.57  66.08   0.00 -13.65  -5.50   0.00   0.00   0.00  46.94
-------------------------------------------------------------------------------

Segment Leq : 46.94 dBA

Total Leq All Segments: 46.94 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 63.76
                           (NIGHT): 59.91
```

STAMSON 5.0 NORMAL REPORT Date: 11-02-2025 13:59:40
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: R5.te Time Period: Day/Night 16/8 hours
Description:

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. PASSENGER	18.0/4.0	97.0	2.0	5.0	Diesel	No

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

Angle1 Angle2	: -71.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 40.00 / 40.00	m
Receiver height	: 1.50 / 1.50	m
Topography	: 3	(Elevated; no barrier)
No Whistle		
Elevation	: 6.50 m	
Reference angle	: 0.00	

Rail data, segment # 2: Via-River (day/night)

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. Passenger	18.0/4.0	97.0	2.0	5.0	Diesel	No

Data for Segment # 2: Via-River (day/night)

Angle1 Angle2	: -90.00 deg	-71.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 2	(Reflective ground surface)
Receiver source distance	: 40.00 / 40.00	m
Receiver height	: 1.50 / 1.50	m
Topography	: 3	(Elevated; no barrier)
No Whistle		
Elevation	: 6.50 m	
Reference angle	: 0.00	

```
Results segment # 1: VIA-Lawn (day)
-----------------------------------

LOCOMOTIVE (0.00 + 61.56 + 0.00) = 61.56 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -71     90   0.39  68.72  -5.92  -1.24   0.00   0.00   0.00  61.56
-------------------------------------------------------------------------

WHEEL (0.00 + 52.28 + 0.00) = 52.28 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -71     90   0.50  60.06  -6.37  -1.40   0.00   0.00   0.00  52.28
-------------------------------------------------------------------------

Segment Leq : 62.04 dBA

Results segment # 2: Via-River (day)
-----------------------------------

LOCOMOTIVE (0.00 + 54.70 + 0.00) = 54.70 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -71   0.00  68.72  -4.26  -9.77   0.00   0.00   0.00  54.70
-------------------------------------------------------------------------

WHEEL (0.00 + 46.03 + 0.00) = 46.03 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -71   0.00  60.06  -4.26  -9.77   0.00   0.00   0.00  46.03
-------------------------------------------------------------------------

Segment Leq : 55.25 dBA

Total Leq All Segments: 62.87 dBA

Results segment # 1: VIA-Lawn (night)
-------------------------------------

LOCOMOTIVE (0.00 + 58.04 + 0.00) = 58.04 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -71     90   0.39  65.20  -5.92  -1.24   0.00   0.00   0.00  58.04
-------------------------------------------------------------------------

WHEEL (0.00 + 48.76 + 0.00) = 48.76 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -71     90   0.50  56.54  -6.37  -1.40   0.00   0.00   0.00  48.76
-------------------------------------------------------------------------

Segment Leq : 58.52 dBA
```

```
Results segment # 2: Via-River (night)
---------------------------------------

LOCOMOTIVE (0.00 + 51.17 + 0.00) = 51.17 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -71   0.00  65.20  -4.26  -9.77   0.00   0.00   0.00  51.17
-------------------------------------------------------------------------

WHEEL (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    -71   0.00  56.54  -4.26  -9.77   0.00   0.00   0.00  42.51
-------------------------------------------------------------------------

Segment Leq : 51.72 dBA

Total Leq All Segments: 59.34 dBA

Road data, segment # 1: POW (day/night)
---------------------------------------
Car traffic volume  : 28336/2464  veh/TimePeriod  *
Medium truck volume :  2254/196   veh/TimePeriod  *
Heavy truck volume  :  1610/140   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

    24 hr Traffic Volume (AADT or SADT):  35000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: POW (day/night)
---------------------------------------
Angle1   Angle2           : -90.00 deg   25.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  50.00 / 50.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Results segment # 1: POW (day)
-------------------------------

Source height = 1.50 m

ROAD (0.00 + 66.50 + 0.00) = 66.50 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     25   0.00  73.68   0.00  -5.23  -1.95   0.00   0.00   0.00  66.50
-------------------------------------------------------------------------------

Segment Leq : 66.50 dBA

Total Leq All Segments: 66.50 dBA

Results segment # 1: POW (night)
---------------------------------

Source height = 1.50 m

ROAD (0.00 + 58.90 + 0.00) = 58.90 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     25   0.00  66.08   0.00  -5.23  -1.95   0.00   0.00   0.00  58.90
-------------------------------------------------------------------------------

Segment Leq : 58.90 dBA

Total Leq All Segments: 58.90 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 68.06
                           (NIGHT): 62.14
```

STAMSON 5.0 NORMAL REPORT Date: 11-02-2025 14:00:23
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: R5B-1M.te Time Period: Day/Night 16/8 hours
Description:

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. PASSENGER	18.0/4.0	97.0	2.0	5.0	Diesel	No

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

Angle1 Angle2	-71.00 deg	90.00 deg
Wood depth	0	(No woods.)
No of house rows	0 / 0	
Surface	1	(Absorptive ground surface)
Receiver source distance	40.00 / 40.00	m
Receiver height	1.50 / 1.50	m
Topography	4	(Elevated; with barrier)
No Whistle		
Barrier angle1	22.00 deg	Angle2 : 90.00 deg
Barrier height	1.00 m	
Elevation	6.50 m	
Barrier receiver distance	27.00 / 27.00	m
Source elevation	0.00 m	
Receiver elevation	0.00 m	
Barrier elevation	0.00 m	
Reference angle	0.00	

Rail data, segment # 2: Via-River (day/night)

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. Passenger	18.0/4.0	97.0	2.0	5.0	Diesel	No

Data for Segment # 2: Via-River (day/night)

Angle1 Angle2	-90.00 deg	-71.00 deg
Wood depth	0	(No woods.)
No of house rows	0 / 0	
Surface	2	(Reflective ground surface)
Receiver source distance	40.00 / 40.00	m
Receiver height	1.50 / 1.50	m
Topography	3	(Elevated; no barrier)
No Whistle		
Elevation	6.50 m	
Reference angle	0.00	

Results segment # 1: VIA-Lawn (day)

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	1.50	3.19	3.19
0.50	1.50	0.82	0.82

LOCOMOTIVE (59.54 + 57.27 + 0.00) = 61.56 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-71	22	0.39	68.72	-5.92	-3.26	0.00	0.00	0.00	59.54
22	90	0.33	68.72	-5.67	-5.36	0.00	0.00	-0.42	57.27*
22	90	0.39	68.72	-5.92	-5.53	0.00	0.00	0.00	57.27

* Bright Zone !

WHEEL (50.34 + 43.23 + 0.00) = 51.11 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-71	22	0.50	60.06	-6.37	-3.35	0.00	0.00	0.00	50.34
22	90	0.44	60.06	-6.11	-5.66	0.00	0.00	-5.05	43.23

Segment Leq : 61.93 dBA

Results segment # 2: Via-River (day)

LOCOMOTIVE (0.00 + 54.70 + 0.00) = 54.70 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-71	0.00	68.72	-4.26	-9.77	0.00	0.00	0.00	54.70

WHEEL (0.00 + 46.03 + 0.00) = 46.03 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-71	0.00	60.06	-4.26	-9.77	0.00	0.00	0.00	46.03

Segment Leq : 55.25 dBA

Total Leq All Segments: 62.77 dBA

Results segment # 1: VIA-Lawn (night)

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	1.50	3.19	3.19
0.50	1.50	0.82	0.82

LOCOMOTIVE (56.02 + 53.74 + 0.00) = 58.04 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-71	22	0.39	65.20	-5.92	-3.26	0.00	0.00	0.00	56.02
22	90	0.33	65.20	-5.67	-5.36	0.00	0.00	-0.42	53.75*
22	90	0.39	65.20	-5.92	-5.53	0.00	0.00	0.00	53.74

* Bright Zone !

WHEEL (46.82 + 39.71 + 0.00) = 47.59 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-71	22	0.50	56.54	-6.37	-3.35	0.00	0.00	0.00	46.82
22	90	0.44	56.54	-6.11	-5.66	0.00	0.00	-5.05	39.71

Segment Leq : 58.41 dBA

Results segment # 2: Via-River (night)

LOCOMOTIVE (0.00 + 51.17 + 0.00) = 51.17 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-71	0.00	65.20	-4.26	-9.77	0.00	0.00	0.00	51.17

WHEEL (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	-71	0.00	56.54	-4.26	-9.77	0.00	0.00	0.00	42.51

Segment Leq : 51.72 dBA

Total Leq All Segments: 59.25 dBA

```
Road data, segment # 1: POW (day/night)
---------------------------------------
Car traffic volume  : 28336/2464  veh/TimePeriod  *
Medium truck volume :  2254/196   veh/TimePeriod  *
Heavy truck volume  :  1610/140   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

    24 hr Traffic Volume (AADT or SADT):  35000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: POW (day/night)
-------------------------------------
Angle1   Angle2           : -90.00 deg   25.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  50.00 / 50.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 25.00 deg
Barrier height            :   1.00 m
Barrier receiver distance :  11.00 / 11.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Results segment # 1: POW (day)
------------------------------

Source height = 1.50 m

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

ROAD (0.00 + 66.50 + 0.00) = 66.50 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     25   0.00  73.68   0.00  -5.23  -1.95   0.00   0.00  -4.42  62.08*
   -90     25   0.00  73.68   0.00  -5.23  -1.95   0.00   0.00   0.00  66.50
-------------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 66.50 dBA

Total Leq All Segments: 66.50 dBA
```

```
Results segment # 1: POW (night)
---------------------------------

Source height = 1.50 m

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

ROAD (0.00 + 58.90 + 0.00) = 58.90 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     25   0.00  66.08   0.00  -5.23  -1.95   0.00   0.00  -4.42  54.49*
   -90     25   0.00  66.08   0.00  -5.23  -1.95   0.00   0.00   0.00  58.90
-------------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 58.90 dBA

Total Leq All Segments: 58.90 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 68.04
                           (NIGHT): 62.09
```

STAMSON 5.0 NORMAL REPORT Date: 11-02-2025 14:01:23
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: R5B-3M.te Time Period: Day/Night 16/8 hours
Description:

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. PASSENGER	18.0/4.0	97.0	2.0	5.0	Diesel	No

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

Angle1 Angle2	: -71.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 40.00 / 40.00	m
Receiver height	: 1.50 / 1.50	m
Topography	: 4	(Elevated; with barrier)
No Whistle		
Barrier angle1	: 22.00 deg	Angle2 : 90.00 deg
Barrier height	: 3.00 m	
Elevation	: 6.50 m	
Barrier receiver distance	: 27.00 / 27.00	m
Source elevation	: 0.00 m	
Receiver elevation	: 0.00 m	
Barrier elevation	: 0.00 m	
Reference angle	: 0.00	

Rail data, segment # 2: Via-River (day/night)

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. Passenger	18.0/4.0	97.0	2.0	5.0	Diesel	No

Data for Segment # 2: Via-River (day/night)

Angle1 Angle2	: -90.00 deg	-71.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 2	(Reflective ground surface)
Receiver source distance	: 40.00 / 40.00	m
Receiver height	: 1.50 / 1.50	m
Topography	: 3	(Elevated; no barrier)
No Whistle		
Elevation	: 6.50 m	
Reference angle	: 0.00	

Results segment # 1: VIA-Lawn (day)

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	1.50	3.19	3.19
0.50	1.50	0.82	0.82

LOCOMOTIVE (59.54 + 57.27 + 0.00) = 61.56 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-71	22	0.39	68.72	-5.92	-3.26	0.00	0.00	0.00	59.54
22	90	0.21	68.72	-5.15	-4.98	0.00	0.00	-4.94	53.64*
22	90	0.39	68.72	-5.92	-5.53	0.00	0.00	0.00	57.27

* Bright Zone !

WHEEL (50.34 + 40.09 + 0.00) = 50.73 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-71	22	0.50	60.06	-6.37	-3.35	0.00	0.00	0.00	50.34
22	90	0.31	60.06	-5.60	-5.31	0.00	0.00	-9.06	40.09

Segment Leq : 61.90 dBA

Results segment # 2: Via-River (day)

LOCOMOTIVE (0.00 + 54.70 + 0.00) = 54.70 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-71	0.00	68.72	-4.26	-9.77	0.00	0.00	0.00	54.70

WHEEL (0.00 + 46.03 + 0.00) = 46.03 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-71	0.00	60.06	-4.26	-9.77	0.00	0.00	0.00	46.03

Segment Leq : 55.25 dBA

Total Leq All Segments: 62.75 dBA

```
Results segment # 1: VIA-Lawn (night)
-------------------------------------

Barrier height for grazing incidence
-------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        1.50 !        3.19 !         3.19
       0.50 !        1.50 !        0.82 !         0.82

LOCOMOTIVE (56.02 + 53.74 + 0.00) = 58.04 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -71     22   0.39  65.20  -5.92  -3.26   0.00   0.00   0.00  56.02
-------------------------------------------------------------------
    22     90   0.21  65.20  -5.15  -4.98   0.00   0.00  -4.94  50.12*
    22     90   0.39  65.20  -5.92  -5.53   0.00   0.00   0.00  53.74
-------------------------------------------------------------------

 * Bright Zone !

WHEEL (46.82 + 36.56 + 0.00) = 47.21 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -71     22   0.50  56.54  -6.37  -3.35   0.00   0.00   0.00  46.82
-------------------------------------------------------------------
    22     90   0.31  56.54  -5.60  -5.31   0.00   0.00  -9.06  36.56
-------------------------------------------------------------------

Segment Leq : 58.38 dBA

Results segment # 2: Via-River (night)
--------------------------------------

LOCOMOTIVE (0.00 + 51.17 + 0.00) = 51.17 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -90    -71   0.00  65.20  -4.26  -9.77   0.00   0.00   0.00  51.17
-------------------------------------------------------------------

WHEEL (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    -71   0.00  56.54  -4.26  -9.77   0.00   0.00   0.00  42.51
-------------------------------------------------------------------

Segment Leq : 51.72 dBA

Total Leq All Segments: 59.23 dBA
```

```
Road data, segment # 1: POW (day/night)
---------------------------------------
Car traffic volume  : 28336/2464  veh/TimePeriod  *
Medium truck volume :  2254/196   veh/TimePeriod  *
Heavy truck volume  :  1610/140   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

    24 hr Traffic Volume (AADT or SADT):  35000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: POW (day/night)
-------------------------------------
Angle1   Angle2           : -90.00 deg   25.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  50.00 / 50.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 25.00 deg
Barrier height            :   3.00 m
Barrier receiver distance :  11.00 / 11.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Results segment # 1: POW (day)
------------------------------

Source height = 1.50 m

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

ROAD (0.00 + 58.27 + 0.00) = 58.27 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     25   0.00  73.68   0.00  -5.23  -1.95   0.00   0.00  -8.23  58.27
-------------------------------------------------------------------------------

Segment Leq : 58.27 dBA

Total Leq All Segments: 58.27 dBA
```

```
Results segment # 1: POW (night)
--------------------------------

Source height = 1.50 m

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

ROAD (0.00 + 50.67 + 0.00) = 50.67 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     25   0.00  66.08   0.00  -5.23  -1.95   0.00   0.00  -8.23  50.67
-------------------------------------------------------------------------------

Segment Leq : 50.67 dBA

Total Leq All Segments: 50.67 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 64.07
                           (NIGHT): 59.80
```

STAMSON 5.0 NORMAL REPORT Date: 11-02-2025 14:04:11
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: R5B-4M.te Time Period: Day/Night 16/8 hours
Description:

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. PASSENGER	18.0/4.0	97.0	2.0	5.0	Diesel	No

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

Angle1 Angle2	: -71.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 40.00 / 40.00	m
Receiver height	: 1.50 / 1.50	m
Topography	: 4	(Elevated; with barrier)
No Whistle		
Barrier angle1	: 22.00 deg	Angle2 : 90.00 deg
Barrier height	: 4.00	m
Elevation	: 6.50	m
Barrier receiver distance	: 27.00 / 27.00	m
Source elevation	: 0.00	m
Receiver elevation	: 0.00	m
Barrier elevation	: 0.00	m
Reference angle	: 0.00	

Rail data, segment # 2: Via-River (day/night)

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. Passenger	18.0/4.0	97.0	2.0	5.0	Diesel	No

Data for Segment # 2: Via-River (day/night)

Angle1 Angle2	: -90.00 deg	-71.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 2	(Reflective ground surface)
Receiver source distance	: 40.00 / 40.00	m
Receiver height	: 1.50 / 1.50	m
Topography	: 3	(Elevated; no barrier)
No Whistle		
Elevation	: 6.50	m
Reference angle	: 0.00	

Results segment # 1: VIA-Lawn (day)

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	1.50	3.19	3.19
0.50	1.50	0.82	0.82

LOCOMOTIVE (59.54 + 53.12 + 0.00) = 60.44 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-71	22	0.39	68.72	-5.92	-3.26	0.00	0.00	0.00	59.54
22	90	0.15	68.72	-4.90	-4.78	0.00	0.00	-5.92	53.12

WHEEL (50.34 + 38.52 + 0.00) = 50.61 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-71	22	0.50	60.06	-6.37	-3.35	0.00	0.00	0.00	50.34
22	90	0.25	60.06	-5.35	-5.13	0.00	0.00	-11.06	38.52

Segment Leq : 60.87 dBA

Results segment # 2: Via-River (day)

LOCOMOTIVE (0.00 + 54.70 + 0.00) = 54.70 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-71	0.00	68.72	-4.26	-9.77	0.00	0.00	0.00	54.70

WHEEL (0.00 + 46.03 + 0.00) = 46.03 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-71	0.00	60.06	-4.26	-9.77	0.00	0.00	0.00	46.03

Segment Leq : 55.25 dBA

Total Leq All Segments: 61.92 dBA

Results segment # 1: VIA-Lawn (night)

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	1.50	3.19	3.19
0.50	1.50	0.82	0.82

LOCOMOTIVE (56.02 + 49.60 + 0.00) = 56.91 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-71	22	0.39	65.20	-5.92	-3.26	0.00	0.00	0.00	56.02
22	90	0.15	65.20	-4.90	-4.78	0.00	0.00	-5.92	49.60

WHEEL (46.82 + 35.00 + 0.00) = 47.09 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-71	22	0.50	56.54	-6.37	-3.35	0.00	0.00	0.00	46.82
22	90	0.25	56.54	-5.35	-5.13	0.00	0.00	-11.06	35.00

Segment Leq : 57.34 dBA

Results segment # 2: Via-River (night)

LOCOMOTIVE (0.00 + 51.17 + 0.00) = 51.17 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-71	0.00	65.20	-4.26	-9.77	0.00	0.00	0.00	51.17

WHEEL (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	-71	0.00	56.54	-4.26	-9.77	0.00	0.00	0.00	42.51

Segment Leq : 51.72 dBA

Total Leq All Segments: 58.39 dBA

```
Road data, segment # 1: POW (day/night)
---------------------------------------
Car traffic volume  : 28336/2464  veh/TimePeriod  *
Medium truck volume :  2254/196   veh/TimePeriod  *
Heavy truck volume  :  1610/140   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

    24 hr Traffic Volume (AADT or SADT):  35000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: POW (day/night)
-------------------------------------
Angle1   Angle2           : -90.00 deg   25.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  50.00 / 50.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 25.00 deg
Barrier height            :   4.00 m
Barrier receiver distance :  11.00 / 11.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Results segment # 1: POW (day)
------------------------------

Source height = 1.50 m

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

ROAD (0.00 + 55.60 + 0.00) = 55.60 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     25   0.00  73.68   0.00  -5.23  -1.95   0.00   0.00 -10.90  55.60
-------------------------------------------------------------------------------

Segment Leq : 55.60 dBA

Total Leq All Segments: 55.60 dBA
```

```
Results segment # 1: POW (night)
--------------------------------

Source height = 1.50 m

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

ROAD (0.00 + 48.01 + 0.00) = 48.01 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     25   0.00  66.08   0.00  -5.23  -1.95   0.00   0.00 -10.90  48.01
-------------------------------------------------------------------------------

Segment Leq : 48.01 dBA

Total Leq All Segments: 48.01 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 62.83
                           (NIGHT): 58.77
```

STAMSON 5.0 NORMAL REPORT Date: 11-02-2025 14:13:44
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: R5B-5.5M.te Time Period: Day/Night 16/8 hours
Description:

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. PASSENGER	18.0/4.0	97.0	2.0	5.0	Diesel	No

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

```
Angle1   Angle2           : -71.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  40.00 / 40.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      4       (Elevated; with barrier)
No Whistle
Barrier angle1            :  22.00 deg   Angle2 : 90.00 deg
Barrier height            :   5.50 m
Elevation                 :   6.50 m
Barrier receiver distance :  27.00 / 27.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

Rail data, segment # 2: Via-River (day/night)

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. Passenger	18.0/4.0	97.0	2.0	5.0	Diesel	No

Data for Segment # 2: Via-River (day/night)

```
Angle1   Angle2           : -90.00 deg   -71.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  40.00 / 40.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      3       (Elevated; no barrier)
No Whistle
Elevation                 :   6.50 m
Reference angle           :   0.00
```

Results segment # 1: VIA-Lawn (day)

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	1.50	3.19	3.19
0.50	1.50	0.82	0.82

LOCOMOTIVE (59.54 + 50.38 + 0.00) = 60.04 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-71	22	0.39	68.72	-5.92	-3.26	0.00	0.00	0.00	59.54
22	90	0.06	68.72	-4.52	-4.46	0.00	0.00	-9.37	50.38

WHEEL (50.34 + 36.87 + 0.00) = 50.53 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-71	22	0.50	60.06	-6.37	-3.35	0.00	0.00	0.00	50.34
22	90	0.17	60.06	-4.96	-4.83	0.00	0.00	-13.39	36.87

Segment Leq : 60.50 dBA

Results segment # 2: Via-River (day)

LOCOMOTIVE (0.00 + 54.70 + 0.00) = 54.70 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-71	0.00	68.72	-4.26	-9.77	0.00	0.00	0.00	54.70

WHEEL (0.00 + 46.03 + 0.00) = 46.03 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-71	0.00	60.06	-4.26	-9.77	0.00	0.00	0.00	46.03

Segment Leq : 55.25 dBA

Total Leq All Segments: 61.63 dBA

```
Results segment # 1: VIA-Lawn (night)
-------------------------------------

Barrier height for grazing incidence
-------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        1.50 !        3.19 !         3.19
       0.50 !        1.50 !        0.82 !         0.82

LOCOMOTIVE (56.02 + 46.86 + 0.00) = 56.52 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -71     22   0.39  65.20  -5.92  -3.26   0.00   0.00   0.00  56.02
-------------------------------------------------------------------
    22     90   0.06  65.20  -4.52  -4.46   0.00   0.00  -9.37  46.86
-------------------------------------------------------------------

WHEEL (46.82 + 33.35 + 0.00) = 47.01 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -71     22   0.50  56.54  -6.37  -3.35   0.00   0.00   0.00  46.82
-------------------------------------------------------------------
    22     90   0.17  56.54  -4.96  -4.83   0.00   0.00 -13.39  33.35
-------------------------------------------------------------------

Segment Leq : 56.98 dBA

Results segment # 2: Via-River (night)
--------------------------------------

LOCOMOTIVE (0.00 + 51.17 + 0.00) = 51.17 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -90    -71   0.00  65.20  -4.26  -9.77   0.00   0.00   0.00  51.17
-------------------------------------------------------------------

WHEEL (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    -71   0.00  56.54  -4.26  -9.77   0.00   0.00   0.00  42.51
-------------------------------------------------------------------

Segment Leq : 51.72 dBA

Total Leq All Segments: 58.11 dBA
```

```
Road data, segment # 1: POW (day/night)
---------------------------------------
Car traffic volume  : 28336/2464  veh/TimePeriod  *
Medium truck volume :  2254/196   veh/TimePeriod  *
Heavy truck volume  :  1610/140   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

    24 hr Traffic Volume (AADT or SADT):  35000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: POW (day/night)
-------------------------------------
Angle1   Angle2           : -90.00 deg   25.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  50.00 / 50.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 25.00 deg
Barrier height            :   5.50 m
Barrier receiver distance :  11.00 / 11.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Results segment # 1: POW (day)
------------------------------

Source height = 1.50 m

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

ROAD (0.00 + 52.66 + 0.00) = 52.66 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     25   0.00  73.68   0.00  -5.23  -1.95   0.00   0.00 -13.84  52.66
-------------------------------------------------------------------------------

Segment Leq : 52.66 dBA

Total Leq All Segments: 52.66 dBA
```

```
Results segment # 1: POW (night)
--------------------------------

Source height = 1.50 m

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

ROAD (0.00 + 45.06 + 0.00) = 45.06 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     25   0.00  66.08   0.00  -5.23  -1.95   0.00   0.00 -13.84  45.06
-------------------------------------------------------------------------------

Segment Leq : 45.06 dBA

Total Leq All Segments: 45.06 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 62.15
                           (NIGHT): 58.32
```

STAMSON 5.0 NORMAL REPORT Date: 11-02-2025 14:26:43
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: R5B2-1M.te Time Period: Day/Night 16/8 hours
Description:

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. PASSENGER	18.0/4.0	97.0	2.0	5.0	Diesel	No

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

Angle1 Angle2	: -71.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 40.00 / 40.00	m
Receiver height	: 1.50 / 1.50	m
Topography	: 4	(Elevated; with barrier)
No Whistle		
Barrier angle1	: 60.00 deg	Angle2 : 90.00 deg
Barrier height	: 1.00	m
Elevation	: 6.50	m
Barrier receiver distance	: 27.00 / 27.00	m
Source elevation	: 0.00	m
Receiver elevation	: 0.00	m
Barrier elevation	: 0.00	m
Reference angle	: 0.00	

Rail data, segment # 2: Via-River (day/night)

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. Passenger	18.0/4.0	97.0	2.0	5.0	Diesel	No

Data for Segment # 2: Via-River (day/night)

Angle1 Angle2	: -90.00 deg	-71.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 2	(Reflective ground surface)
Receiver source distance	: 40.00 / 40.00	m
Receiver height	: 1.50 / 1.50	m
Topography	: 3	(Elevated; no barrier)
No Whistle		
Elevation	: 6.50	m
Reference angle	: 0.00	

Results segment # 1: VIA-Lawn (day)

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	1.50	3.19	3.19
0.50	1.50	0.82	0.82

LOCOMOTIVE (60.99 + 52.46 + 0.00) = 61.56 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-71	60	0.39	68.72	-5.92	-1.81	0.00	0.00	0.00	60.99
60	90	0.33	68.72	-5.67	-9.97	0.00	0.00	-1.03	52.06*
60	90	0.39	68.72	-5.92	-10.34	0.00	0.00	0.00	52.46

* Bright Zone !

WHEEL (51.77 + 38.31 + 0.00) = 51.97 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-71	60	0.50	60.06	-6.37	-1.91	0.00	0.00	0.00	51.77
60	90	0.44	60.06	-6.11	-10.61	0.00	0.00	-5.02	38.31

Segment Leq : 62.01 dBA

Results segment # 2: Via-River (day)

LOCOMOTIVE (0.00 + 54.70 + 0.00) = 54.70 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-71	0.00	68.72	-4.26	-9.77	0.00	0.00	0.00	54.70

WHEEL (0.00 + 46.03 + 0.00) = 46.03 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-71	0.00	60.06	-4.26	-9.77	0.00	0.00	0.00	46.03

Segment Leq : 55.25 dBA

Total Leq All Segments: 62.84 dBA

Results segment # 1: VIA-Lawn (night)

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	1.50	3.19	3.19
0.50	1.50	0.82	0.82

LOCOMOTIVE (57.47 + 48.94 + 0.00) = 58.04 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-71	60	0.39	65.20	-5.92	-1.81	0.00	0.00	0.00	57.47
60	90	0.33	65.20	-5.67	-9.97	0.00	0.00	-1.03	48.53*
60	90	0.39	65.20	-5.92	-10.34	0.00	0.00	0.00	48.94

* Bright Zone !

WHEEL (48.25 + 34.79 + 0.00) = 48.44 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-71	60	0.50	56.54	-6.37	-1.91	0.00	0.00	0.00	48.25
60	90	0.44	56.54	-6.11	-10.61	0.00	0.00	-5.02	34.79

Segment Leq : 58.49 dBA

Results segment # 2: Via-River (night)

LOCOMOTIVE (0.00 + 51.17 + 0.00) = 51.17 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-71	0.00	65.20	-4.26	-9.77	0.00	0.00	0.00	51.17

WHEEL (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	-71	0.00	56.54	-4.26	-9.77	0.00	0.00	0.00	42.51

Segment Leq : 51.72 dBA

Total Leq All Segments: 59.32 dBA

```
Road data, segment # 1: POW (day/night)
---------------------------------------
Car traffic volume  : 28336/2464  veh/TimePeriod  *
Medium truck volume :  2254/196   veh/TimePeriod  *
Heavy truck volume  :  1610/140   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

    24 hr Traffic Volume (AADT or SADT):  35000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: POW (day/night)
-------------------------------------
Angle1   Angle2           : -90.00 deg   25.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  50.00 / 50.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : -11.00 deg
Barrier height            :   1.00 m
Barrier receiver distance :  35.00 / 35.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Results segment # 1: POW (day)
------------------------------

Source height = 1.50 m

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

ROAD (0.00 + 64.87 + 61.46) = 66.50 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -11   0.00  73.68   0.00  -5.23  -3.58   0.00   0.00  -4.62  60.25*
   -90    -11   0.00  73.68   0.00  -5.23  -3.58   0.00   0.00   0.00  64.87
-------------------------------------------------------------------------------
   -11     25   0.00  73.68   0.00  -5.23  -6.99   0.00   0.00   0.00  61.46
-------------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 66.50 dBA

Total Leq All Segments: 66.50 dBA

Results segment # 1: POW (night)
--------------------------------

Source height = 1.50 m

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

ROAD (0.00 + 57.27 + 53.86) = 58.90 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -11   0.00  66.08   0.00  -5.23  -3.58   0.00   0.00  -4.62  52.66*
   -90    -11   0.00  66.08   0.00  -5.23  -3.58   0.00   0.00   0.00  57.27
-------------------------------------------------------------------------------
   -11     25   0.00  66.08   0.00  -5.23  -6.99   0.00   0.00   0.00  53.86
-------------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 58.90 dBA

Total Leq All Segments: 58.90 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 68.06
                           (NIGHT): 62.12
```

```
STAMSON 5.0         NORMAL REPORT         Date: 11-02-2025 14:31:53
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: R5B2-3M.te                Time Period: Day/Night 16/8 hours
Description:

Rail data, segment # 1: VIA-Lawn (day/night)
-----------------------------------------------
Train             ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type              !             !(km/h) !/Train!/Train! type !weld
------------------+-------------+-------+------+------+------+----
  1. PASSENGER    !  18.0/4.0   !  97.0 !  2.0 !  5.0 !Diesel!  No

Data for Segment # 1: VIA-Lawn (day/night)
-----------------------------------------
Angle1   Angle2           : -71.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  40.00 / 40.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      4       (Elevated; with barrier)
No Whistle
Barrier angle1            :  60.00 deg   Angle2 : 90.00 deg
Barrier height            :   3.00 m
Elevation                 :   6.50 m
Barrier receiver distance :  27.00 / 27.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Rail data, segment # 2: Via-River (day/night)
-----------------------------------------------
Train             ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type              !             !(km/h) !/Train!/Train! type !weld
------------------+-------------+-------+------+------+------+----
  1. Passenger    !  18.0/4.0   !  97.0 !  2.0 !  5.0 !Diesel!  No

Data for Segment # 2: Via-River (day/night)
-----------------------------------------
Angle1   Angle2           : -90.00 deg   -71.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  40.00 / 40.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      3       (Elevated; no barrier)
No Whistle
Elevation                 :   6.50 m
Reference angle           :   0.00
```

Results segment # 1: VIA-Lawn (day)

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	1.50	3.19	3.19
0.50	1.50	0.82	0.82

LOCOMOTIVE (60.99 + 52.46 + 0.00) = 61.56 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-71	60	0.39	68.72	-5.92	-1.81	0.00	0.00	0.00	60.99
60	90	0.21	68.72	-5.15	-9.21	0.00	0.00	-4.97	49.38*
60	90	0.39	68.72	-5.92	-10.34	0.00	0.00	0.00	52.46

* Bright Zone !

WHEEL (51.77 + 37.09 + 0.00) = 51.92 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-71	60	0.50	60.06	-6.37	-1.91	0.00	0.00	0.00	51.77
60	90	0.31	60.06	-5.60	-9.88	0.00	0.00	-7.48	37.09

Segment Leq : 62.01 dBA

Results segment # 2: Via-River (day)

LOCOMOTIVE (0.00 + 54.70 + 0.00) = 54.70 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-71	0.00	68.72	-4.26	-9.77	0.00	0.00	0.00	54.70

WHEEL (0.00 + 46.03 + 0.00) = 46.03 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-71	0.00	60.06	-4.26	-9.77	0.00	0.00	0.00	46.03

Segment Leq : 55.25 dBA

Total Leq All Segments: 62.84 dBA

Results segment # 1: VIA-Lawn (night)

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	1.50	3.19	3.19
0.50	1.50	0.82	0.82

LOCOMOTIVE (57.47 + 48.94 + 0.00) = 58.04 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-71	60	0.39	65.20	-5.92	-1.81	0.00	0.00	0.00	57.47
60	90	0.21	65.20	-5.15	-9.21	0.00	0.00	-4.97	45.86*
60	90	0.39	65.20	-5.92	-10.34	0.00	0.00	0.00	48.94

* Bright Zone !

WHEEL (48.25 + 33.57 + 0.00) = 48.40 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-71	60	0.50	56.54	-6.37	-1.91	0.00	0.00	0.00	48.25
60	90	0.31	56.54	-5.60	-9.88	0.00	0.00	-7.48	33.57

Segment Leq : 58.49 dBA

Results segment # 2: Via-River (night)

LOCOMOTIVE (0.00 + 51.17 + 0.00) = 51.17 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-71	0.00	65.20	-4.26	-9.77	0.00	0.00	0.00	51.17

WHEEL (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	-71	0.00	56.54	-4.26	-9.77	0.00	0.00	0.00	42.51

Segment Leq : 51.72 dBA

Total Leq All Segments: 59.32 dBA

```
Road data, segment # 1: POW (day/night)
---------------------------------------
Car traffic volume  : 28336/2464  veh/TimePeriod  *
Medium truck volume :  2254/196   veh/TimePeriod  *
Heavy truck volume  :  1610/140   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

    24 hr Traffic Volume (AADT or SADT):  35000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: POW (day/night)
-------------------------------------
Angle1   Angle2           : -90.00 deg   25.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  50.00 / 50.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : -11.00 deg
Barrier height            :   3.00 m
Barrier receiver distance :  35.00 / 35.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Results segment # 1: POW (day)
------------------------------

Source height = 1.50 m

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

ROAD (0.00 + 57.48 + 61.46) = 62.92 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -11   0.00  73.68   0.00  -5.23  -3.58   0.00   0.00  -7.39  57.48
-------------------------------------------------------------------------------
   -11     25   0.00  73.68   0.00  -5.23  -6.99   0.00   0.00   0.00  61.46
-------------------------------------------------------------------------------

Segment Leq : 62.92 dBA

Total Leq All Segments: 62.92 dBA
```

```
Results segment # 1: POW (night)
--------------------------------

Source height = 1.50 m

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

ROAD (0.00 + 49.88 + 53.86) = 55.32 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -11   0.00  66.08   0.00  -5.23  -3.58   0.00   0.00  -7.39  49.88
-------------------------------------------------------------------------------
   -11     25   0.00  66.08   0.00  -5.23  -6.99   0.00   0.00   0.00  53.86
-------------------------------------------------------------------------------

Segment Leq : 55.32 dBA

Total Leq All Segments: 55.32 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.89
                           (NIGHT): 60.77
```

STAMSON 5.0 NORMAL REPORT Date: 11-02-2025 14:35:23
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: R5B2-4M.te Time Period: Day/Night 16/8 hours
Description:

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. PASSENGER	18.0/4.0	97.0	2.0	5.0	Diesel	No

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

Angle1 Angle2	: -71.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 40.00 / 40.00	m
Receiver height	: 1.50 / 1.50	m
Topography	: 4	(Elevated; with barrier)
No Whistle		
Barrier angle1	: 60.00 deg	Angle2 : 90.00 deg
Barrier height	: 4.00	m
Elevation	: 6.50	m
Barrier receiver distance	: 27.00 / 27.00	m
Source elevation	: 0.00	m
Receiver elevation	: 0.00	m
Barrier elevation	: 0.00	m
Reference angle	: 0.00	

Rail data, segment # 2: Via-River (day/night)

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. Passenger	18.0/4.0	97.0	2.0	5.0	Diesel	No

Data for Segment # 2: Via-River (day/night)

Angle1 Angle2	: -90.00 deg	-71.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 2	(Reflective ground surface)
Receiver source distance	: 40.00 / 40.00	m
Receiver height	: 1.50 / 1.50	m
Topography	: 3	(Elevated; no barrier)
No Whistle		
Elevation	: 6.50	m
Reference angle	: 0.00	

```
Results segment # 1: VIA-Lawn (day)
-----------------------------------

Barrier height for grazing incidence
-----------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        1.50 !        3.19 !         3.19
       0.50 !        1.50 !        0.82 !         0.82

LOCOMOTIVE (60.99 + 49.53 + 0.00) = 61.29 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -71     60   0.39  68.72  -5.92  -1.81   0.00   0.00   0.00  60.99
-------------------------------------------------------------------
    60     90   0.15  68.72  -4.90  -8.82   0.00   0.00  -5.47  49.53
-------------------------------------------------------------------

WHEEL (51.77 + 36.17 + 0.00) = 51.89 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -71     60   0.50  60.06  -6.37  -1.91   0.00   0.00   0.00  51.77
-------------------------------------------------------------------
    60     90   0.25  60.06  -5.35  -9.50   0.00   0.00  -9.04  36.17
-------------------------------------------------------------------

Segment Leq : 61.76 dBA

Results segment # 2: Via-River (day)
-----------------------------------

LOCOMOTIVE (0.00 + 54.70 + 0.00) = 54.70 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -90    -71   0.00  68.72  -4.26  -9.77   0.00   0.00   0.00  54.70
-------------------------------------------------------------------

WHEEL (0.00 + 46.03 + 0.00) = 46.03 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -90    -71   0.00  60.06  -4.26  -9.77   0.00   0.00   0.00  46.03
-------------------------------------------------------------------

Segment Leq : 55.25 dBA

Total Leq All Segments: 62.64 dBA
```

```
Results segment # 1: VIA-Lawn (night)
-------------------------------------

Barrier height for grazing incidence
-------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        1.50 !        3.19 !         3.19
       0.50 !        1.50 !        0.82 !         0.82

LOCOMOTIVE (57.47 + 46.01 + 0.00) = 57.77 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -71     60   0.39  65.20  -5.92  -1.81   0.00   0.00   0.00  57.47
-------------------------------------------------------------------
    60     90   0.15  65.20  -4.90  -8.82   0.00   0.00  -5.47  46.01
-------------------------------------------------------------------

WHEEL (48.25 + 32.65 + 0.00) = 48.37 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -71     60   0.50  56.54  -6.37  -1.91   0.00   0.00   0.00  48.25
-------------------------------------------------------------------
    60     90   0.25  56.54  -5.35  -9.50   0.00   0.00  -9.04  32.65
-------------------------------------------------------------------

Segment Leq : 58.24 dBA

Results segment # 2: Via-River (night)
--------------------------------------

LOCOMOTIVE (0.00 + 51.17 + 0.00) = 51.17 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -90    -71   0.00  65.20  -4.26  -9.77   0.00   0.00   0.00  51.17
-------------------------------------------------------------------

WHEEL (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    -71   0.00  56.54  -4.26  -9.77   0.00   0.00   0.00  42.51
-------------------------------------------------------------------

Segment Leq : 51.72 dBA

Total Leq All Segments: 59.11 dBA
```

```
Road data, segment # 1: POW (day/night)
---------------------------------------
Car traffic volume  : 28336/2464  veh/TimePeriod  *
Medium truck volume :  2254/196   veh/TimePeriod  *
Heavy truck volume  :  1610/140   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

    24 hr Traffic Volume (AADT or SADT):  35000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: POW (day/night)
-------------------------------------
Angle1   Angle2           : -90.00 deg   25.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  50.00 / 50.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : -11.00 deg
Barrier height            :   4.00 m
Barrier receiver distance :  35.00 / 35.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Results segment # 1: POW (day)
------------------------------

Source height = 1.50 m

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

ROAD (0.00 + 55.24 + 61.46) = 62.39 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -11   0.00  73.68   0.00  -5.23  -3.58   0.00   0.00  -9.63  55.24
-------------------------------------------------------------------------------
   -11     25   0.00  73.68   0.00  -5.23  -6.99   0.00   0.00   0.00  61.46
-------------------------------------------------------------------------------

Segment Leq : 62.39 dBA

Total Leq All Segments: 62.39 dBA
```

```
Results segment # 1: POW (night)
--------------------------------

Source height = 1.50 m

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

ROAD (0.00 + 47.64 + 53.86) = 54.79 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -11   0.00  66.08   0.00  -5.23  -3.58   0.00   0.00  -9.63  47.64
-------------------------------------------------------------------------------
   -11     25   0.00  66.08   0.00  -5.23  -6.99   0.00   0.00   0.00  53.86
-------------------------------------------------------------------------------

Segment Leq : 54.79 dBA

Total Leq All Segments: 54.79 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.52
                           (NIGHT): 60.48
```

STAMSON 5.0 NORMAL REPORT Date: 11-02-2025 14:36:41
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: R5B2-5.5M.te Time Period: Day/Night 16/8 hours
Description:

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. PASSENGER	18.0/4.0	97.0	2.0	5.0	Diesel	No

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

Angle1 Angle2	: -71.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 40.00 / 40.00	m
Receiver height	: 1.50 / 1.50	m
Topography	: 4	(Elevated; with barrier)
No Whistle		
Barrier angle1	: 60.00 deg	Angle2 : 90.00 deg
Barrier height	: 5.50	m
Elevation	: 6.50	m
Barrier receiver distance	: 27.00 / 27.00	m
Source elevation	: 0.00	m
Receiver elevation	: 0.00	m
Barrier elevation	: 0.00	m
Reference angle	: 0.00	

Rail data, segment # 2: Via-River (day/night)

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. Passenger	18.0/4.0	97.0	2.0	5.0	Diesel	No

Data for Segment # 2: Via-River (day/night)

Angle1 Angle2	: -90.00 deg	-71.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 2	(Reflective ground surface)
Receiver source distance	: 40.00 / 40.00	m
Receiver height	: 1.50 / 1.50	m
Topography	: 3	(Elevated; no barrier)
No Whistle		
Elevation	: 6.50	m
Reference angle	: 0.00	

```
Results segment # 1: VIA-Lawn (day)
-----------------------------------

Barrier height for grazing incidence
-----------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        1.50 !        3.19 !         3.19
       0.50 !        1.50 !        0.82 !         0.82

LOCOMOTIVE (60.99 + 48.29 + 0.00) = 61.22 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -71     60   0.39  68.72  -5.92  -1.81   0.00   0.00   0.00  60.99
-------------------------------------------------------------------
    60     90   0.06  68.72  -4.52  -8.21   0.00   0.00  -7.71  48.29
-------------------------------------------------------------------

WHEEL (51.77 + 35.14 + 0.00) = 51.87 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -71     60   0.50  60.06  -6.37  -1.91   0.00   0.00   0.00  51.77
-------------------------------------------------------------------
    60     90   0.17  60.06  -4.96  -8.92   0.00   0.00 -11.03  35.14
-------------------------------------------------------------------

Segment Leq : 61.70 dBA

Results segment # 2: Via-River (day)
-----------------------------------

LOCOMOTIVE (0.00 + 54.70 + 0.00) = 54.70 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -90    -71   0.00  68.72  -4.26  -9.77   0.00   0.00   0.00  54.70
-------------------------------------------------------------------

WHEEL (0.00 + 46.03 + 0.00) = 46.03 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -90    -71   0.00  60.06  -4.26  -9.77   0.00   0.00   0.00  46.03
-------------------------------------------------------------------

Segment Leq : 55.25 dBA

Total Leq All Segments: 62.59 dBA
```

Results segment # 1: VIA-Lawn (night)

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	1.50	3.19	3.19
0.50	1.50	0.82	0.82

LOCOMOTIVE (57.47 + 44.77 + 0.00) = 57.70 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-71	60	0.39	65.20	-5.92	-1.81	0.00	0.00	0.00	57.47
60	90	0.06	65.20	-4.52	-8.21	0.00	0.00	-7.71	44.77

WHEEL (48.25 + 31.62 + 0.00) = 48.35 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-71	60	0.50	56.54	-6.37	-1.91	0.00	0.00	0.00	48.25
60	90	0.17	56.54	-4.96	-8.92	0.00	0.00	-11.03	31.62

Segment Leq : 58.18 dBA

Results segment # 2: Via-River (night)

LOCOMOTIVE (0.00 + 51.17 + 0.00) = 51.17 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-71	0.00	65.20	-4.26	-9.77	0.00	0.00	0.00	51.17

WHEEL (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	-71	0.00	56.54	-4.26	-9.77	0.00	0.00	0.00	42.51

Segment Leq : 51.72 dBA

Total Leq All Segments: 59.06 dBA

```
Road data, segment # 1: POW (day/night)
---------------------------------------
Car traffic volume  : 28336/2464  veh/TimePeriod  *
Medium truck volume :  2254/196   veh/TimePeriod  *
Heavy truck volume  :  1610/140   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

    24 hr Traffic Volume (AADT or SADT):  35000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: POW (day/night)
-------------------------------------
Angle1   Angle2           : -90.00 deg   25.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  50.00 / 50.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : -11.00 deg
Barrier height            :   5.50 m
Barrier receiver distance :  35.00 / 35.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Results segment # 1: POW (day)
------------------------------

Source height = 1.50 m

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

ROAD (0.00 + 52.56 + 61.46) = 61.98 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -11   0.00  73.68   0.00  -5.23  -3.58   0.00   0.00 -12.31  52.56
-------------------------------------------------------------------------------
   -11     25   0.00  73.68   0.00  -5.23  -6.99   0.00   0.00   0.00  61.46
-------------------------------------------------------------------------------

Segment Leq : 61.98 dBA

Total Leq All Segments: 61.98 dBA
```

```
Results segment # 1: POW (night)
--------------------------------

Source height = 1.50 m

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

ROAD (0.00 + 44.97 + 53.86) = 54.39 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -11   0.00  66.08   0.00  -5.23  -3.58   0.00   0.00 -12.31  44.97
-------------------------------------------------------------------------------
   -11     25   0.00  66.08   0.00  -5.23  -6.99   0.00   0.00   0.00  53.86
-------------------------------------------------------------------------------

Segment Leq : 54.39 dBA

Total Leq All Segments: 54.39 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.30
                           (NIGHT): 60.34
```

STAMSON 5.0 NORMAL REPORT Date: 11-02-2025 15:03:37
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: R6.te Time Period: Day/Night 16/8 hours
Description:

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. PASSENGER	18.0/4.0	97.0	2.0	5.0	Diesel	No

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

Angle1 Angle2	: -32.00 deg	58.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 54.00 / 54.00	m
Receiver height	: 1.50 / 1.50	m
Topography	: 3	(Elevated; no barrier)
No Whistle		
Elevation	: 6.50 m	
Reference angle	: 0.00	

Rail data, segment # 2: Via-River (day/night)

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. PASSENGER	18.0/4.0	97.0	2.0	5.0	Diesel	No

Data for Segment # 2: Via-River (day/night)

Angle1 Angle2	: -90.00 deg	-32.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 2	(Reflective ground surface)
Receiver source distance	: 54.00 / 54.00	m
Receiver height	: 1.50 / 1.50	m
Topography	: 3	(Elevated; no barrier)
No Whistle		
Elevation	: 6.50 m	
Reference angle	: 0.00	

```
Results segment # 1: VIA-Lawn (day)
-----------------------------------

LOCOMOTIVE (0.00 + 57.74 + 0.00) = 57.74 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -32     58   0.39  68.72  -7.73  -3.24   0.00   0.00   0.00  57.74
-------------------------------------------------------------------------

WHEEL (0.00 + 48.44 + 0.00) = 48.44 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -32     58   0.50  60.06  -8.32  -3.30   0.00   0.00   0.00  48.44
-------------------------------------------------------------------------

Segment Leq : 58.22 dBA

Results segment # 2: Via-River (day)
-----------------------------------

LOCOMOTIVE (0.00 + 58.24 + 0.00) = 58.24 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -32   0.00  68.72  -5.56  -4.92   0.00   0.00   0.00  58.24
-------------------------------------------------------------------------

WHEEL (0.00 + 49.58 + 0.00) = 49.58 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -32   0.00  60.06  -5.56  -4.92   0.00   0.00   0.00  49.58
-------------------------------------------------------------------------

Segment Leq : 58.79 dBA

Total Leq All Segments: 61.52 dBA

Results segment # 1: VIA-Lawn (night)
-------------------------------------

LOCOMOTIVE (0.00 + 54.22 + 0.00) = 54.22 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -32     58   0.39  65.20  -7.73  -3.24   0.00   0.00   0.00  54.22
-------------------------------------------------------------------------

WHEEL (0.00 + 44.91 + 0.00) = 44.91 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -32     58   0.50  56.54  -8.32  -3.30   0.00   0.00   0.00  44.91
-------------------------------------------------------------------------

Segment Leq : 54.70 dBA
```

```
Results segment # 2: Via-River (night)
---------------------------------------

LOCOMOTIVE (0.00 + 54.72 + 0.00) = 54.72 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -32   0.00  65.20  -5.56  -4.92   0.00   0.00   0.00  54.72
-------------------------------------------------------------------------

WHEEL (0.00 + 46.05 + 0.00) = 46.05 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -32   0.00  56.54  -5.56  -4.92   0.00   0.00   0.00  46.05
-------------------------------------------------------------------------

Segment Leq : 55.27 dBA

Total Leq All Segments: 58.00 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.52
                           (NIGHT): 58.00
```

STAMSON 5.0 NORMAL REPORT Date: 11-02-2025 15:06:06
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: R7.te Time Period: Day/Night 16/8 hours
Description:

Rail data, segment # 1: Via-Lawn (day/night)

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. Passenger	18.0/4.0	97.0	2.0	5.0	Diesel	No

Data for Segment # 1: Via-Lawn (day/night)

Angle1 Angle2	: -57.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 40.00 / 40.00	m
Receiver height	: 1.50 / 4.50	m
Topography	: 3	(Elevated; no barrier)
No Whistle		
Elevation	: 6.50 m	
Reference angle	: 0.00	

Rail data, segment # 2: Via-River (day/night)

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. Passenger	18.0/4.0	97.0	2.0	5.0	Diesel	No

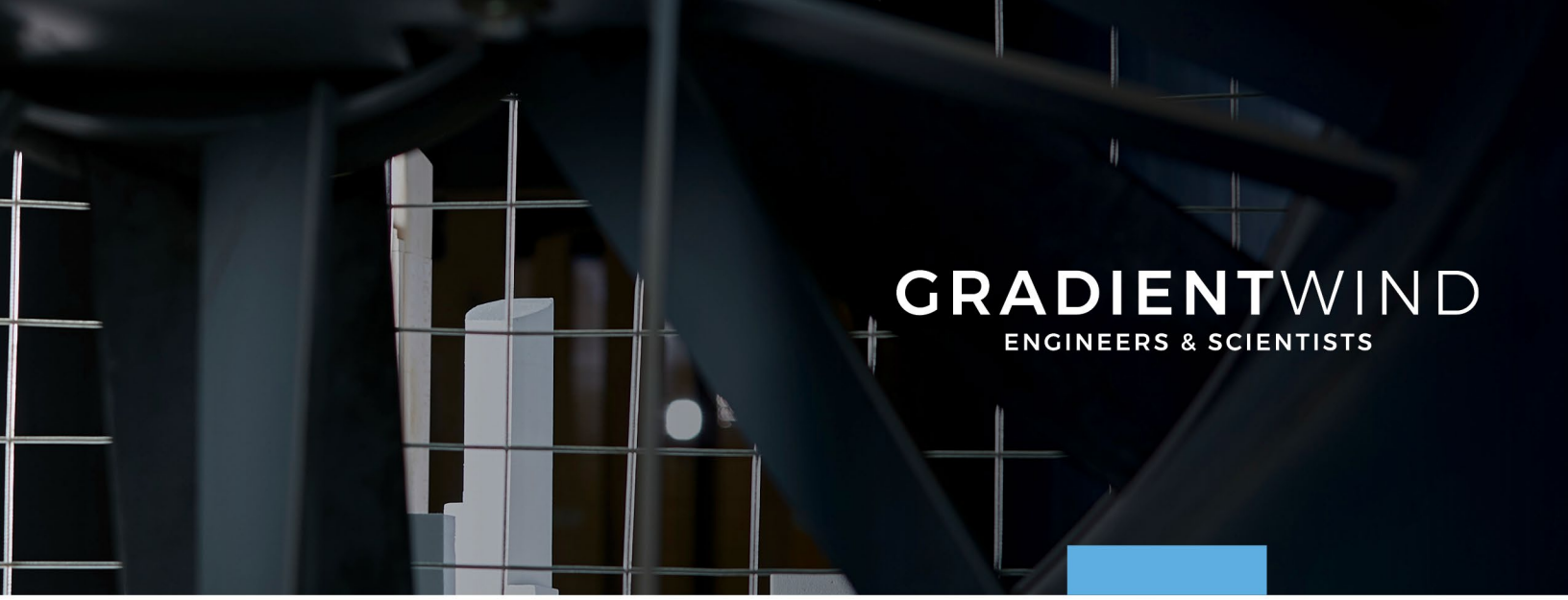
Data for Segment # 2: Via-River (day/night)

Angle1 Angle2	: -90.00 deg	-57.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 2	(Reflective ground surface)
Receiver source distance	: 40.00 / 40.00	m
Receiver height	: 1.50 / 1.50	m
Topography	: 3	(Elevated; no barrier)
No Whistle		
Elevation	: 6.50 m	
Reference angle	: 0.00	

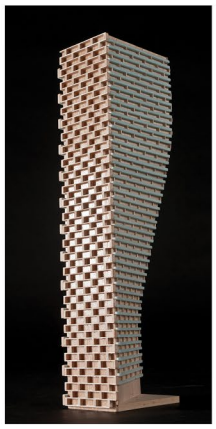
```
Results segment # 1: Via-Lawn (day)
-----------------------------------

LOCOMOTIVE (0.00 + 61.23 + 0.00) = 61.23 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -57     90   0.39  68.72  -5.92  -1.57   0.00   0.00   0.00  61.23
-------------------------------------------------------------------------

WHEEL (0.00 + 51.96 + 0.00) = 51.96 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -57     90   0.50  60.06  -6.37  -1.72   0.00   0.00   0.00  51.96
-------------------------------------------------------------------------

Segment Leq : 61.72 dBA

Results segment # 2: Via-River (day)
-----------------------------------

LOCOMOTIVE (0.00 + 57.09 + 0.00) = 57.09 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -57   0.00  68.72  -4.26  -7.37   0.00   0.00   0.00  57.09
-------------------------------------------------------------------------

WHEEL (0.00 + 48.43 + 0.00) = 48.43 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -57   0.00  60.06  -4.26  -7.37   0.00   0.00   0.00  48.43
-------------------------------------------------------------------------

Segment Leq : 57.64 dBA

Total Leq All Segments: 63.15 dBA

Results segment # 1: Via-Lawn (night)
-------------------------------------

LOCOMOTIVE (0.00 + 58.23 + 0.00) = 58.23 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -57     90   0.30  65.20  -5.54  -1.43   0.00   0.00   0.00  58.23
-------------------------------------------------------------------------

WHEEL (0.00 + 48.95 + 0.00) = 48.95 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -57     90   0.41  56.54  -5.98  -1.60   0.00   0.00   0.00  48.95
-------------------------------------------------------------------------

Segment Leq : 58.71 dBA
```

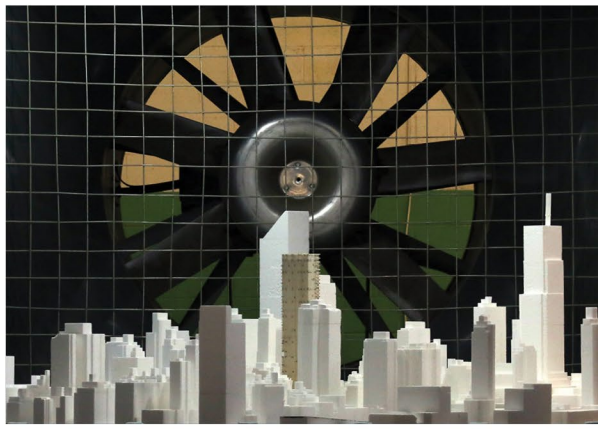
```
Results segment # 2: Via-River (night)
---------------------------------------

LOCOMOTIVE (0.00 + 53.57 + 0.00) = 53.57 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -57   0.00  65.20  -4.26  -7.37   0.00   0.00   0.00  53.57
-------------------------------------------------------------------------

WHEEL (0.00 + 44.91 + 0.00) = 44.91 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -57   0.00  56.54  -4.26  -7.37   0.00   0.00   0.00  44.91
-------------------------------------------------------------------------

Segment Leq : 54.12 dBA

Total Leq All Segments: 60.01 dBA

Road data, segment # 1: POW (day/night)
---------------------------------------
Car traffic volume  : 28336/2464  veh/TimePeriod  *
Medium truck volume :  2254/196   veh/TimePeriod  *
Heavy truck volume  :  1610/140   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

    24 hr Traffic Volume (AADT or SADT):  35000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: POW (day/night)
---------------------------------------
Angle1   Angle2           : -90.00 deg   -13.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  : 106.00 / 106.00 m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Results segment # 1: POW (day)
------------------------------

Source height = 1.50 m

ROAD (0.00 + 61.50 + 0.00) = 61.50 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -13   0.00  73.68   0.00  -8.49  -3.69   0.00   0.00   0.00  61.50
-------------------------------------------------------------------------------

Segment Leq : 61.50 dBA

Total Leq All Segments: 61.50 dBA

Results segment # 1: POW (night)
--------------------------------

Source height = 1.50 m

ROAD (0.00 + 53.90 + 0.00) = 53.90 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -13   0.00  66.08   0.00  -8.49  -3.69   0.00   0.00   0.00  53.90
-------------------------------------------------------------------------------

Segment Leq : 53.90 dBA

Total Leq All Segments: 53.90 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.41
                           (NIGHT): 60.96
```



GRADIENTWIND
ENGINEERS & SCIENTISTS





APPENDIX B

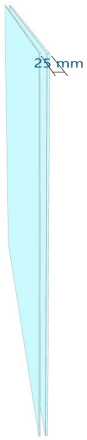
INSUL CALCULATIONS

127 WALGREEN ROAD, OTTAWA, ON, CANADA K0A 1L0 | 613 836 0934
GRADIENTWIND.COM

Sound Insulation Prediction (v9.0.24)

Margin of error is generally within STC ±3 dB
- Key No. 11036
Job Name:
Job No.: Initials:ggarro
Date:01/11/22
File Name:Glazing STC 36.ixl

Notes:



STC 34
OITC 28

Mass-air-mass resonant frequency = =212 Hz

Panel Size = 2.0 m x 1.5 m

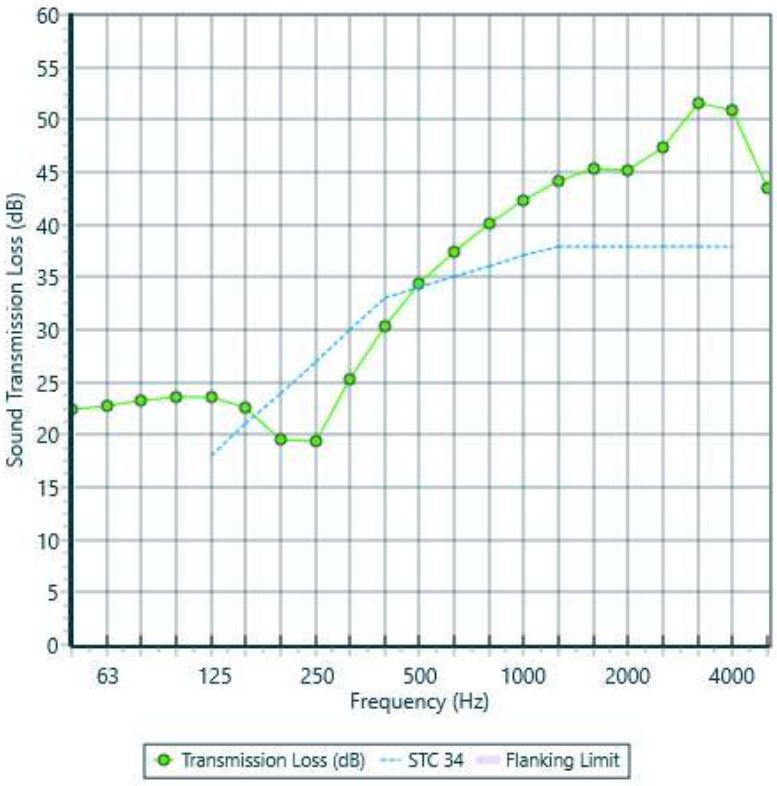
Partition surface mass = 22.5 kg/m²

System description

Pane 1 : 1 x 3 mm Glass

air: 16 mm
Pane 2 : 1 x 6 mm Glass

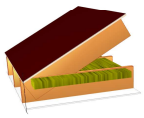
freq.(Hz)	TL(dB)	TL(dB)
50	22	
63	23	23
80	23	
100	24	
125	24	23
160	23	
200	20	
250	19	21
315	25	
400	30	
500	34	33
630	37	
800	40	
1000	42	42
1250	44	
1600	45	
2000	45	46
2500	47	
3150	52	
4000	51	47
5000	44	



Sound Insulation Prediction (v9.0.24)

Margin of error is generally within STC ±3 dB
- Key No. 11036
Job Name:
Job No.: Initials:ggarro
Date:01/11/22
File Name:Roof - R1 - STC.ixl

Notes:



STC 56
OITC 45

Mass-air-mass resonant frequency = =34 Hz

Panel Size = 2.7 m x 4.0 m

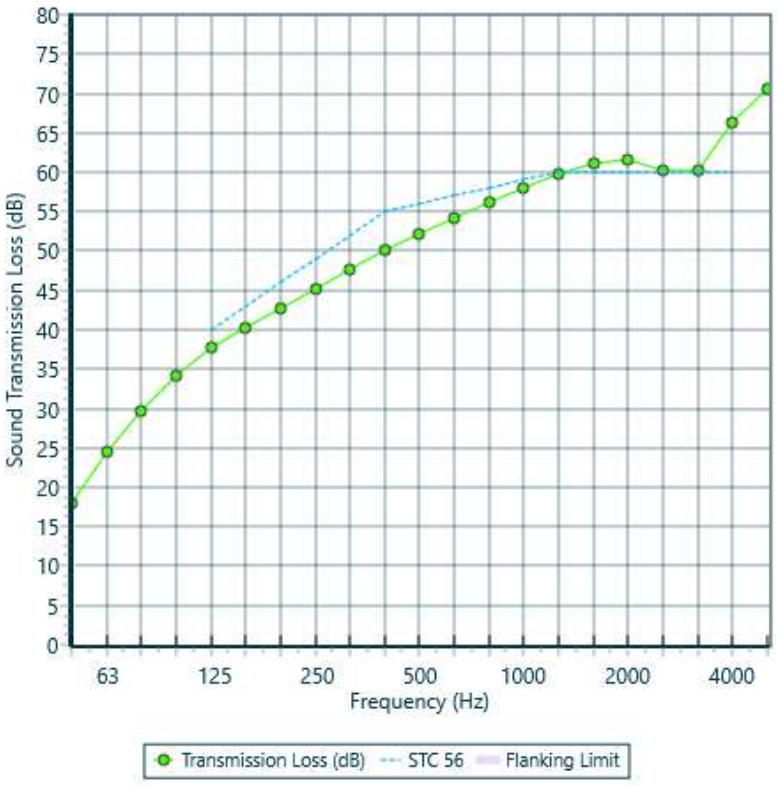
Partition surface mass = 31 kg/m²

System description

Panel 1 : 1 x 3 mm Asphalt Shingles (2.7lb/ft²) + 1 x 15 mm OSB (Oriented Strand Board)

Frame: Pitched Roof (2.6E2 mm x 45 mm), Stud spacing 600 mm ; Cavity Width 355.3 mm , 1 x Fibreglass (10kg/m3) 60mm Thickness 75 mm
Panel 2 : 1 x 12.7 mm Type C Gypsum Board

freq.(Hz)	TL(dB)	TL(dB)
50	18	
63	24	22
80	30	
100	34	
125	38	37
160	40	
200	43	
250	45	45
315	48	
400	50	
500	52	52
630	54	
800	56	
1000	58	58
1250	60	
1600	61	
2000	62	61
2500	60	
3150	60	
4000	66	64
5000	70	



APPENDIX C
VIA RAIL INFORMATION

127 WALGREEN ROAD, OTTAWA, ON, CANADA K0A 1L0 | 613 836 0934
GRADIENTWIND.COM

APPENDIX A

"We request train speeds, train volumes, train types (Diesel or Electric), as well as the number of locomotives and cars per train for the VIA Rail Beachburg Subdivision, specifically for the corridor nearest to 2013 Prince of Wales Drive in Ottawa, Ontario."

Train Speeds: Passenger train currently in a 45 MPH zone.

Train Volumes: Passenger currently 16 movements per day.

TrainType: Diesel

Number of locomotives and cars per train: Typically, 1-2 locomotives and up to five (5) train cars.

Montreal, October 27, 2023

BY E-MAIL
(essraa.alqassab@gradientwind.com)

Access to Information and Privacy Office
3, Place Ville Marie, Suite 500
Montreal (Quebec) H3B 2C9
Fax: 514-874-0661

Email: Sandra_Melkart@viarail.ca

Sandra Melkart
514-871-6126

Ms. Essraa Al Qassab
GRADIENT WIND
127 Walgreen Road
Ottawa (Ontario) K0A 1L0

Object: Response to Access to Information Request #23-2324 AI (D)

Dear Ms. Al Qassab,

We write further to your request for access to information made under the *Access to Information Act* ("*ATIA*") and received by VIA Rail Canada Inc. ("VIA Rail") on October 5th, 2023 for the following records/information:

> ***"We request train speeds, train volumes, train types (Diesel or Electric), as well as the number of locomotives and cars per train for the VIA Rail Beachburg Subdivision, specifically for the corridor nearest to 2013 Prince of Wales Drive in Ottawa, Ontario."***

You will find enclosed hereto Appendix A which contains the requested information.

Please be advised that you may file a complaint regarding the handling of your request with the *Information Commissioner of Canada*, in accordance with the requirements of section 31 of the *ATIA*, which reads as follows:

> *"31. A complaint under this Act shall be made to the Information Commissioner in writing unless the Commissioner authorizes otherwise. If the complaint relates to a request by a person for access to a record, it shall be made within sixty days after the day in which the person receives a notice of a refusal under section 7, is given to access to all or part of the record or, in any other case, becomes aware that grounds for the complaint exist."*

Notice of complaint should be sent to the following address:

> *Office of the Information Commissioner of Canada*
> *30, Victoria Street*
> *Gatineau (Quebec) K1A 1H3*
> *E-mail: general@oic-ci.gc.ca*

Please note that you may also file a complaint online on the *Information Commissioner of Canada*'s website at the following address: https://www.oic-ci.gc.ca/en#deposer-une-plainte-submit-a-complaint.

Before submitting a complaint pursuant to the *ATIA* to the *Information Commissioner of Canada*, you may contact us to obtain more information regarding the handling of your access to information request.

Trusting the whole to be in order, we remain at your disposal should you have any questions.

Best regards,

Sandra Melkart
Access to Information and Privacy Analyst
VIA Rail Canada Inc.

Encl. Appendix A

APPENDIX D

BPN 56 CALCULATIONS

127 WALGREEN ROAD, OTTAWA, ON, CANADA K0A 1L0 | 613 836 0934
GRADIENTWIND.COM

CALCULATIONS TO REDUCE INTERIOR ROAD AND RAIL NOISE LOT 7 WEST FACADE - BEDROOM

		Rail	Road	
Outdoor Sound Level	=	53	58	dBA
Source Geometry Correction:	=	0	0	dBA
Correction For Surface Reflectior	=	3	3	dBA
Target Indoor Noise Level:	=	35	40	dBA
Required Noise Reduction:	=	21	21	dBA

R2 RECEPTOR, NIGHTTIME VALUES

Rail

COMPONENT: WALL — STC Is: **56**

Noise Spectrum Type	F				
Component Category	d	Correction: (Table 5)	10		
Room Floor Area:	12 m²			-10	dBA
Component Area:	8.1 m²				
Component / Floor (%):	68 %				
Room Absorption Category:	Very Absorptive	Correction: (Table 4 Equation)	-3		dBA
				3	
Noise Reduction If Only This Component Transmits Sound Energy:				49	dBA
			Required Noise Reduction:	21	dBA
Surplus noise reduction for comparison to Table 3				28	
Component Transmits	0 % Of Sound				

COMPONENT: Surface A Window — Required Noise Reduction Is: **21** dBA

Percentage Of Sound Energy Transmitted:	100 %	Correction: (Table 3 Equation)	0	
Room Floor Area:	12 m²			
Component Area:	2 m²			
Component / Floor (%):	17 %			
Room Absortion Category:	Very Absorptive	Correction: (Table 4 Equation)	-9	dBA
Noise Spectrum	F			
Component Category	b	Correction: (Table 5)	3	dBA
		Required STC Is:	15	

Road

COMPONENT: WALL — STC Is: **56**

Noise Spectrum Type	D				
Component Category	d	Correction: (Table 5)	7		
Room Floor Area:	12 m²			-7	dBA
Component Area:	8.1 m²				
Component / Floor (%):	68 %				
Room Absorption Category:	Very Absorptive	Correction: (Table 4 Equation)	-3		dBA
				3	
Noise Reduction If Only This Component Transmits Sound Energy:				52	dBA
			Required Noise Reduction:	21	dBA
Surplus noise reduction for comparison to Table 3				31	
Component Transmits	0 % Of Sound				

COMPONENT: Surface A Window — Required Noise Reduction Is: **21** dBA

Percentage Of Sound Energy Transmitted:	100 %	Correction: (Table 3 Equation)	0	
Room Floor Area:	12 m²			
Component Area:	2 m²			
Component / Floor (%):	17 %			
Room Absortion Category:	Very Absorptive	Correction: (Table 4 Equation)	-9	dBA
Noise Spectrum	D			
Component Category	b	Correction: (Table 5)	2	dBA
		Required STC Is:	14	

	Raod	Rail	Combined
Combined Window STC	15	14	**17.8**

CALCULATIONS TO REDUCE INTERIOR ROAD AND RAIL NOISE LOT 7 WEST FACADE - LIVING ROOM

		Rail	Road		
Outdoor Sound Level	=	56	66	dBA	R2 RECEPTOR, DAYTIME VALUES
Source Geometry Correction:	=	0	0	dBA	
Correction For Surface Reflectic	=	3	3	dBA	
Target Indoor Noise Level:	=	40	45	dBA	
Required Noise Reduction:	=	19	24	dBA	

Rail

COMPONENT: WALL				STC Is:	56	
Noise Spectrum Type	F					
Component Category	d	Correction: (Table 5)	10			
Room Floor Area:	16 m²				-10	dBA
Component Area:	10.8 m²					
Component / Floor (%):	68 %					
Room Absorption Category:	Intermediate	Correction: (Table 4 Equation)	-1			dBA
					1	
Noise Reduction If Only This Component Transmits Sound Energy:					47	dBA
				Required Noise Reduction:	19	dBA
Surplus noise reduction for comparison to Table 3					28	
Component Transmits	0 % Of Sound					

COMPONENT: Surface A Window				Required Noise Reduction Is:	19	dBA
Percentage Of Sound Energy Transmitted:	100 %			Correction: (Table 3 Equation)	0	
Room Floor Area:	16 m²					
Component Area:	2 m²					
Component / Floor (%):	13 %					
Room Absortion Category:	Intermediate			Correction: (Table 4 Equation)	-8	dBA
Noise Spectrum	F					
Component Category	b			Correction: (Table 5)	3	dBA
				Required STC Is:	14	

Road

COMPONENT: WALL				STC Is:	56	
Noise Spectrum Type	D					
Component Category	d	Correction: (Table 5)	7			
Room Floor Area:	16 m²				-7	dBA
Component Area:	10.8 m²					
Component / Floor (%):	68 %					
Room Absorption Category:	Intermediate	Correction: (Table 4 Equation)	-1			dBA
					1	
Noise Reduction If Only This Component Transmits Sound Energy:					50	dBA
				Required Noise Reduction:	24	dBA
Surplus noise reduction for comparison to Table 3					26	
Component Transmits	0 % Of Sound					

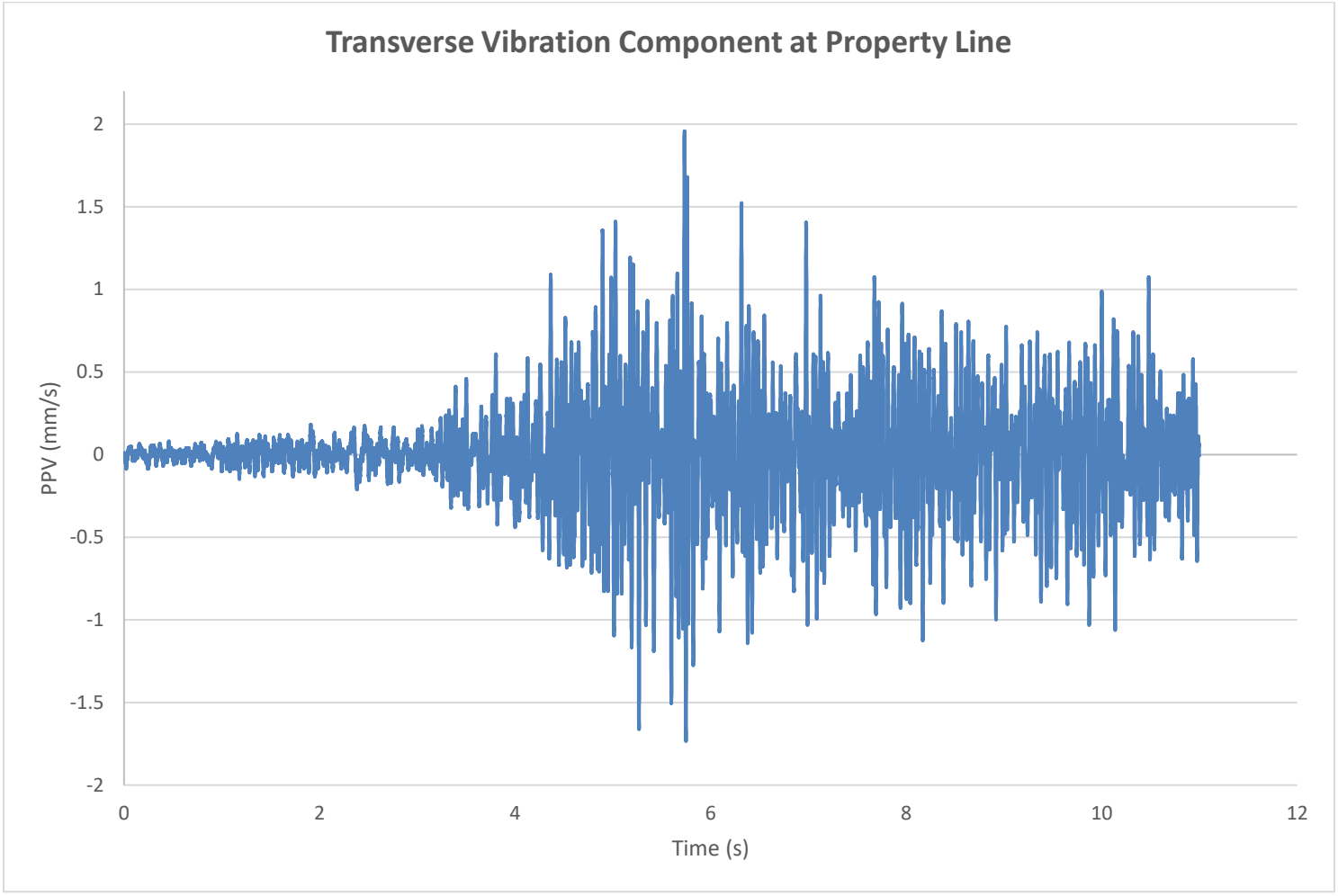
COMPONENT: Surface A Window				Required Noise Reduction Is:	24	dBA
Percentage Of Sound Energy Transmitted:	100 %			Correction: (Table 3 Equation)	0	
Room Floor Area:	16 m²					
Component Area:	2 m²					
Component / Floor (%):	13 %					
Room Absortion Category:	Intermediate			Correction: (Table 4 Equation)	-8	dBA
Noise Spectrum	D					
Component Category	b			Correction: (Table 5)	2	dBA
				Required STC Is:	18	

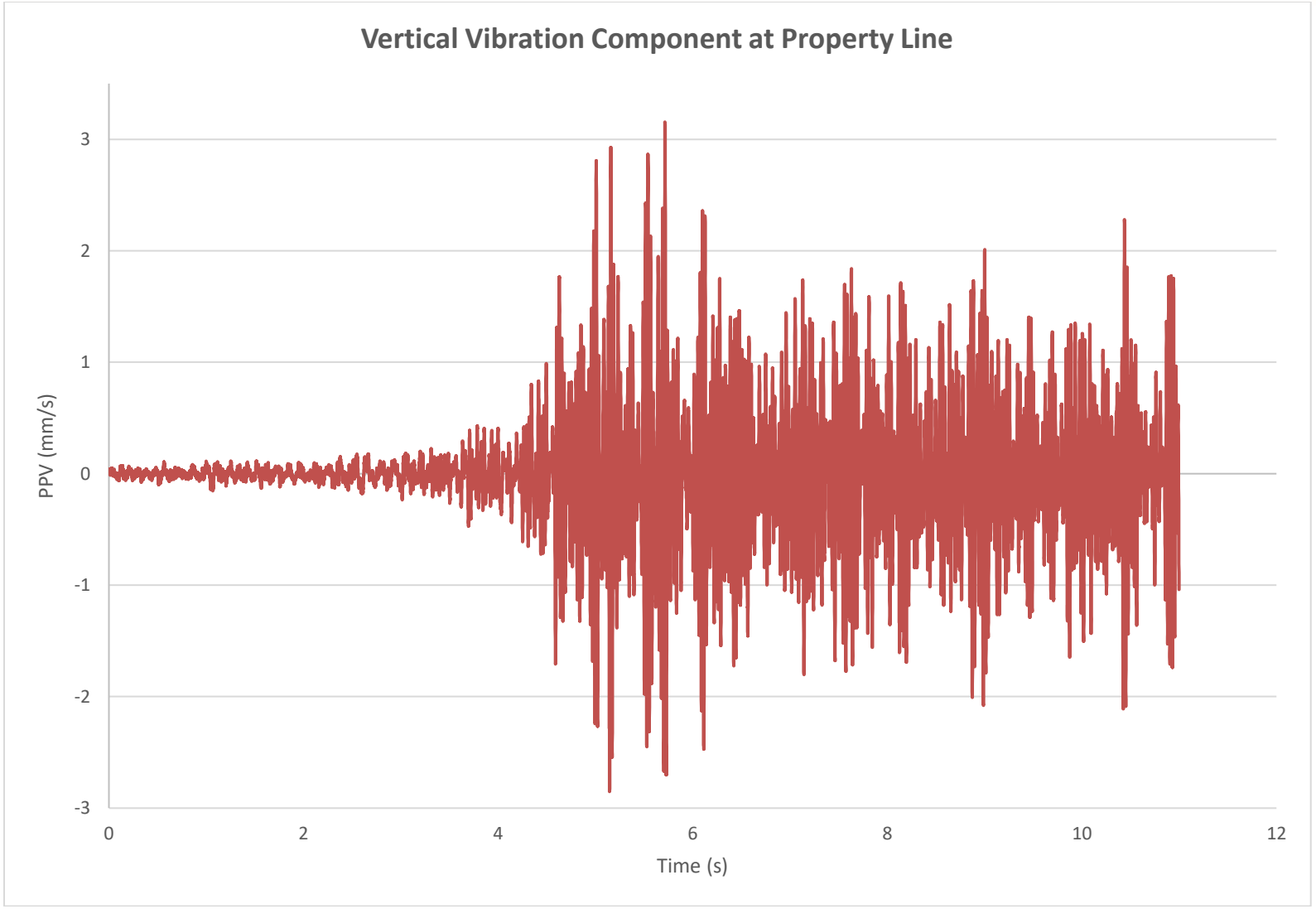
	Raod	Rail	Combined
Combined Window STC	14	18	**19.4**

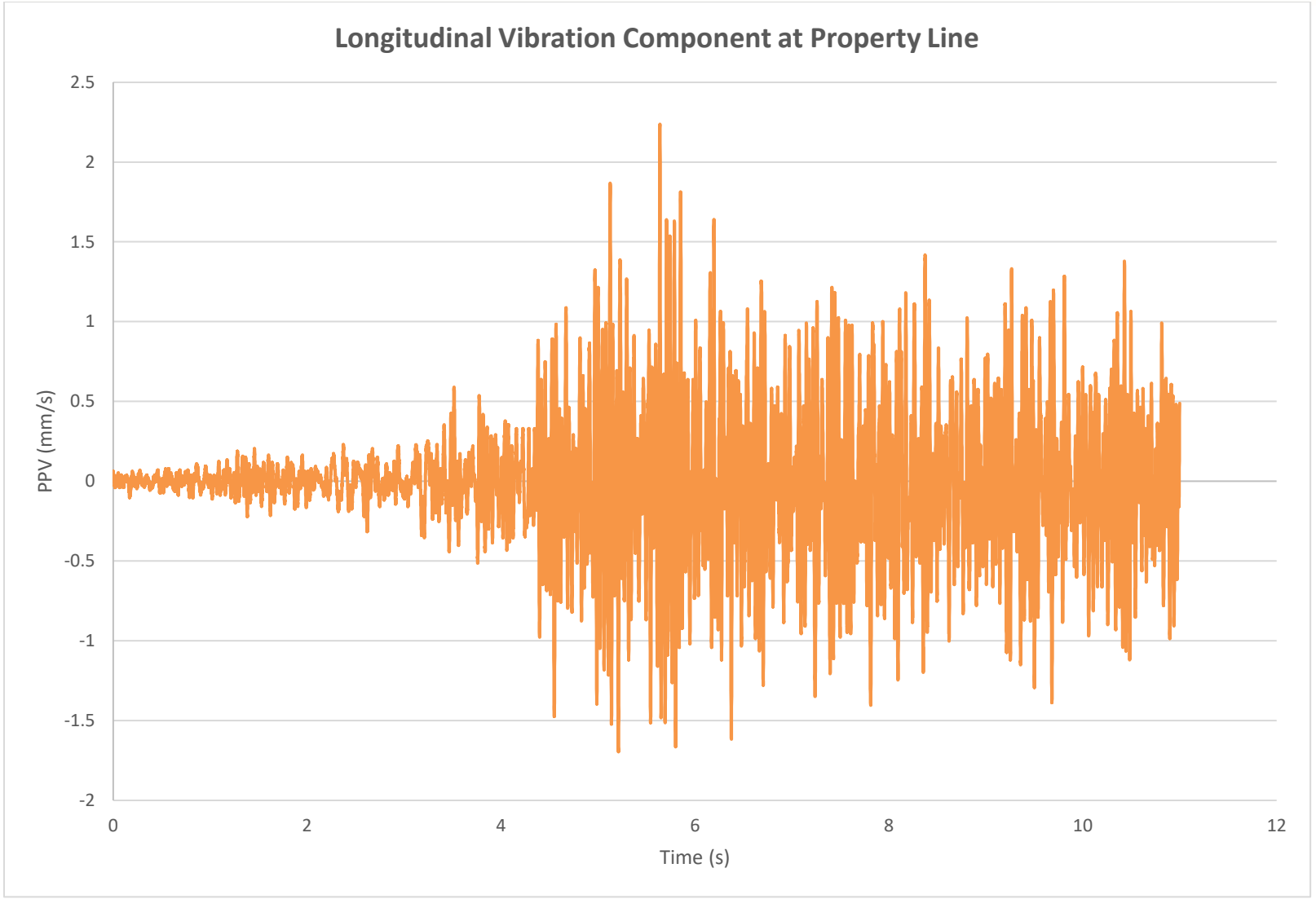
APPENDIX E

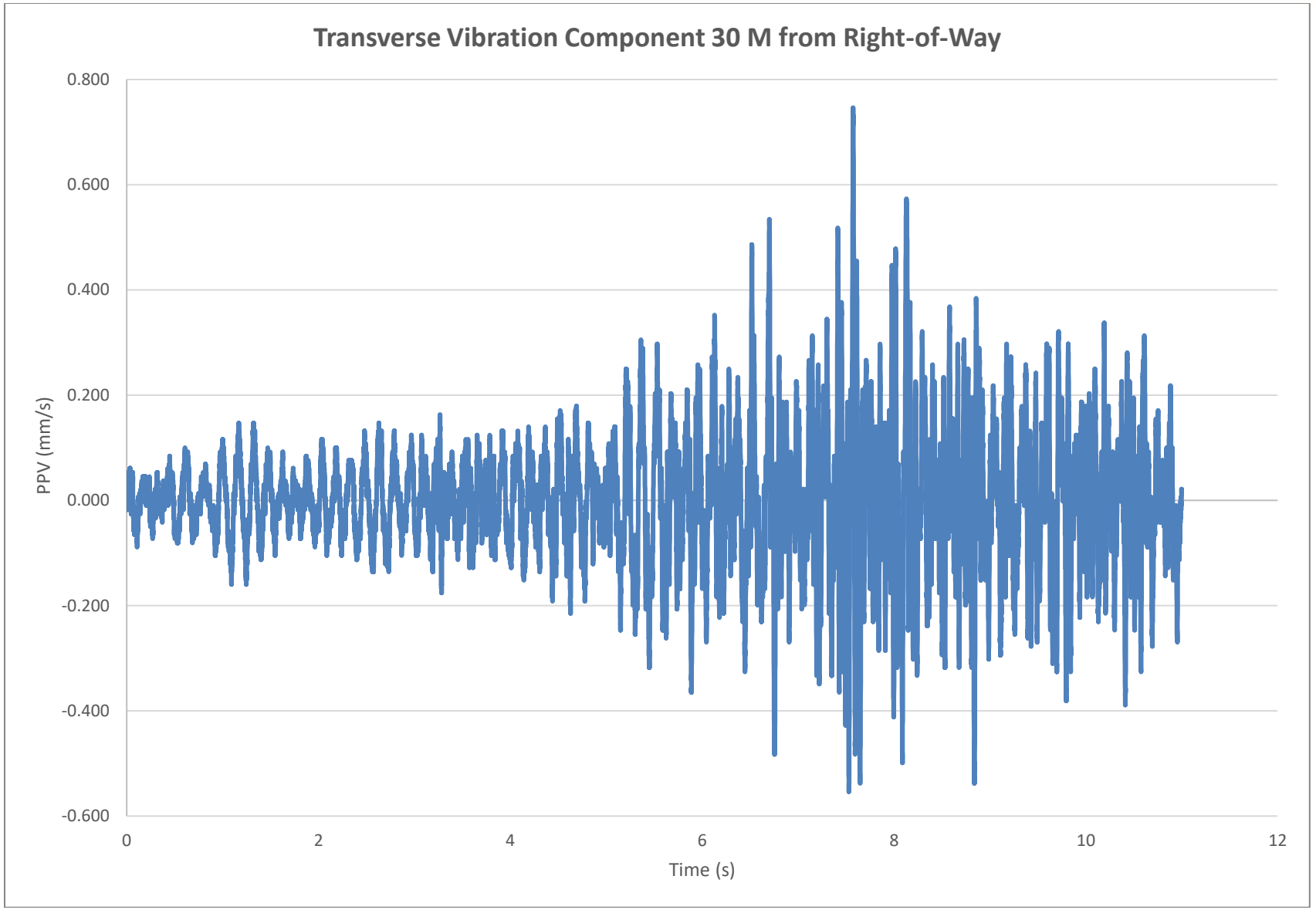
SAMPLE VIBRATION GRAPHS

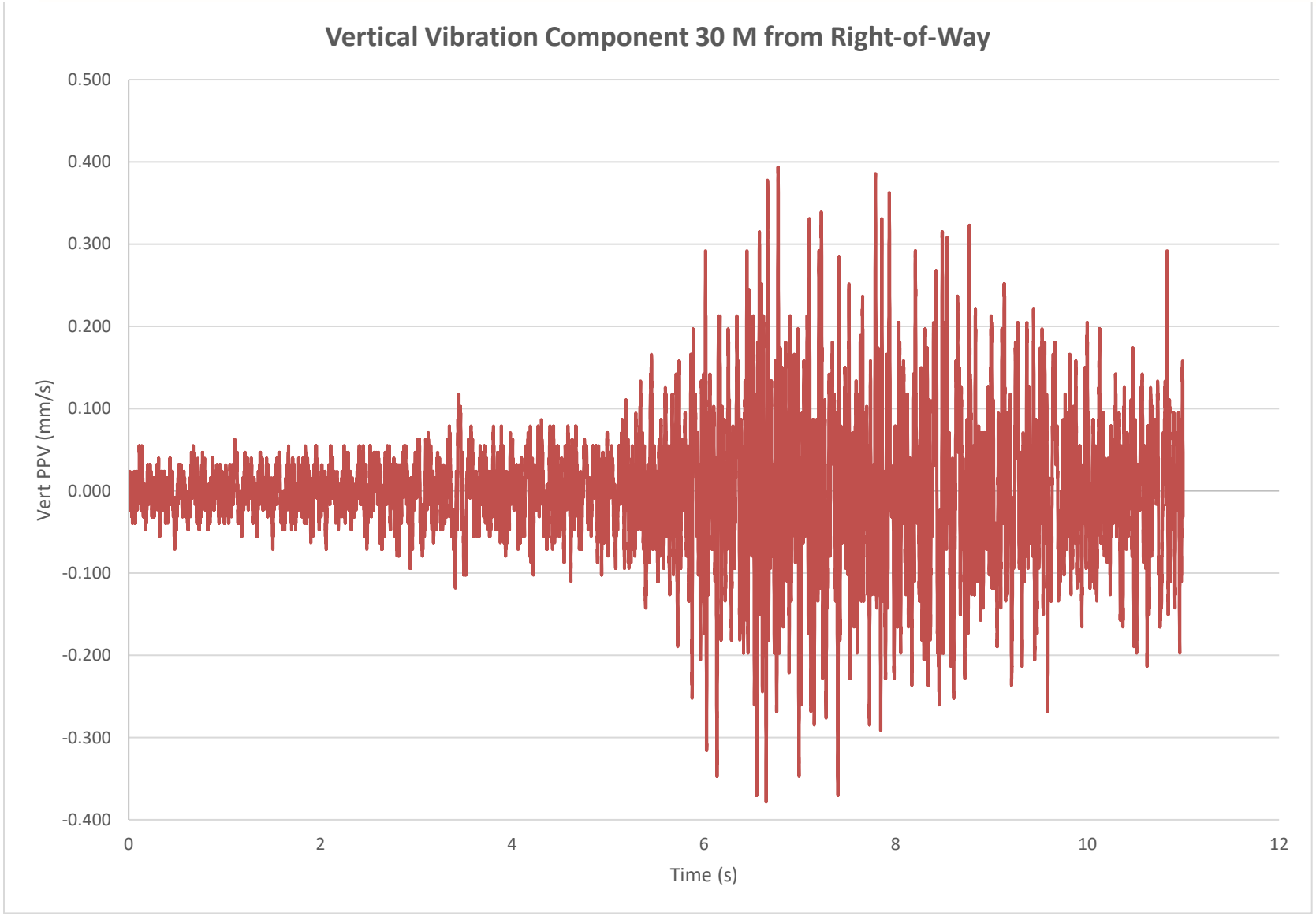
127 WALGREEN ROAD, OTTAWA, ON, CANADA K0A 1L0 | 613 836 0934
GRADIENTWIND.COM

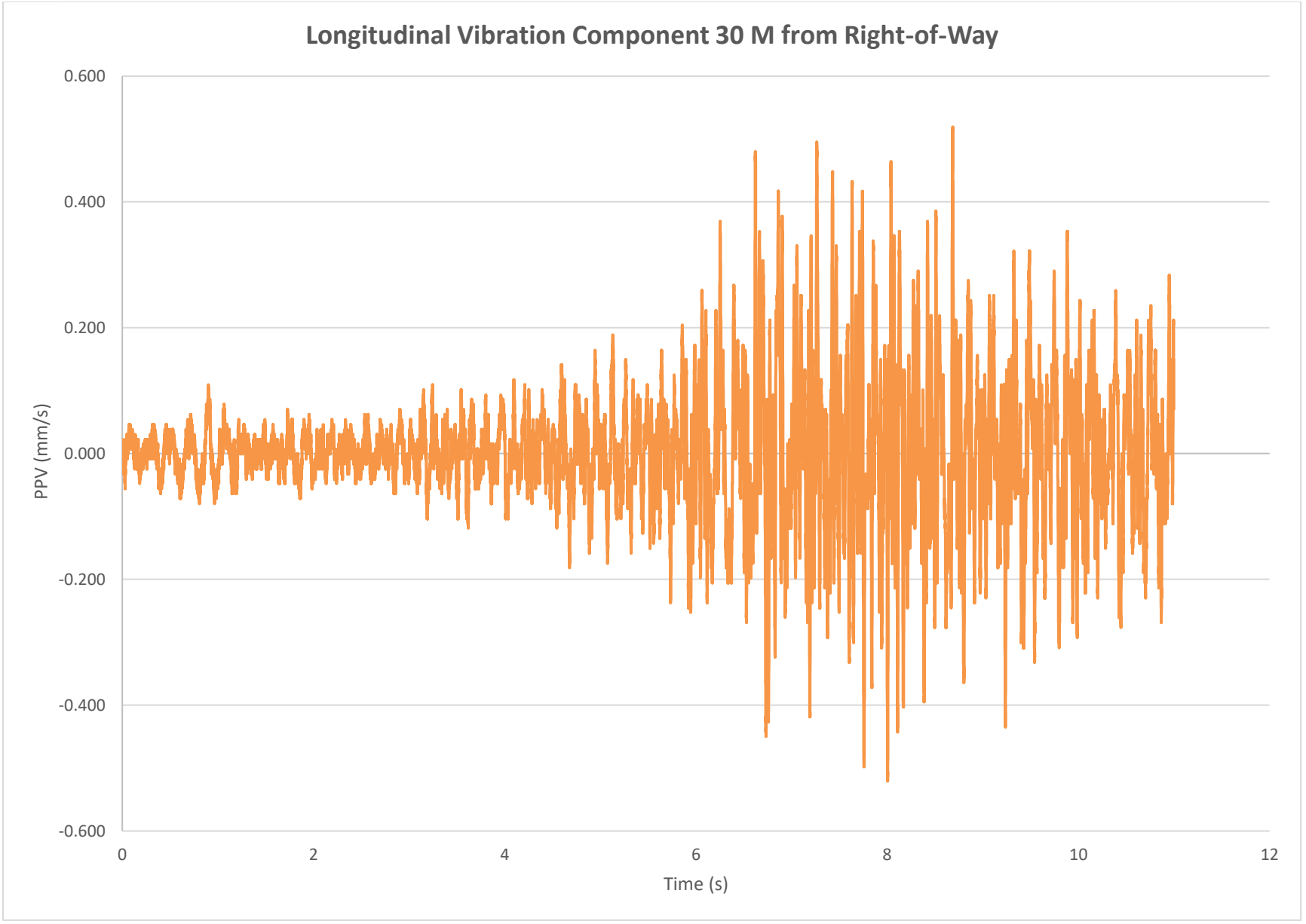

Transverse Vibration Component at Property Line
PPV (mm/s)
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
0
2
4
6
8
10
12
Time (s)


Vertical Vibration Component at Property Line
PPV (mm/s)
3
2
1
0
-1
-2
-3
0
2
4
6
8
10
12
Time (s)

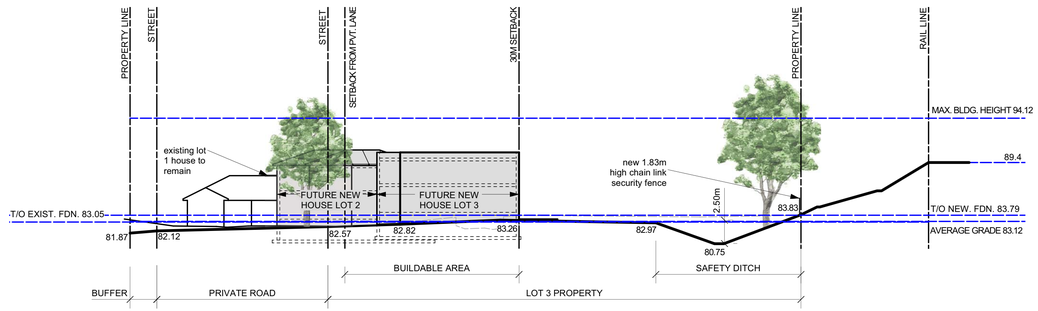

Longitudinal Vibration Component at Property Line
PPV (mm/s)
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
0
2
4
6
8
10
12
Time (s)


Transverse Vibration Component 30 M from Right-of-Way
0.800
0.600
0.400
0.200
0.000
-0.200
-0.400
-0.600
PPV (mm/s)
0
2
4
6
8
10
12
Time (s)


Vertical Vibration Component 30 M from Right-of-Way
Vert PPV (mm/s)
0.500
0.400
0.300
0.200
0.100
0.000
-0.100
-0.200
-0.300
-0.400
0
2
4
6
8
10
12
Time (s)


Longitudinal Vibration Component 30 M from Right-of-Way
0.600
0.400
0.200
0.000
-0.200
-0.400
-0.600
PPV (mm/s)
0
2
4
6
8
10
12
Time (s)

SITE KEY PLAN
scale: 1:500



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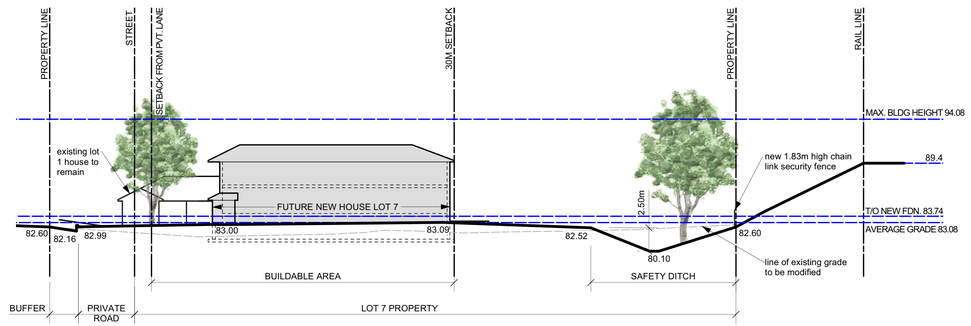

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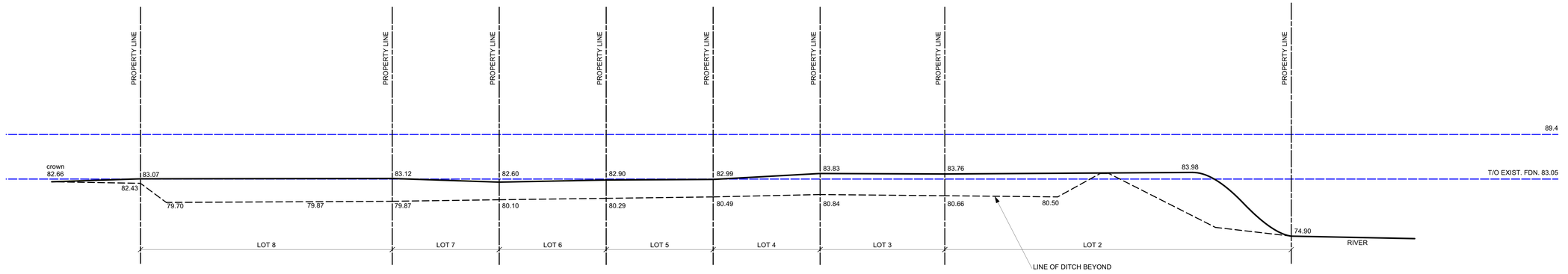

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no.	date	revision
5	2025-02-15	REVISED SUBMISSION
4	2024-07-16	REVISED SUBMISSION
3	2023-12-20	REVISED SUBMISSION
2	2023-06-29	ISSUED FOR PLAN OF SUBDIVIS...
1	2023-06-29	ISSUED FOR ZONING BYLAW AM...

GENERAL NOTES
1. Contractor must verify dimensions and conditions on site before proceeding with any portion of this work.
2. Do not scale from drawings.
3. All work to comply with the Ontario Building Code and municipal regulations.
4. This drawing to be read in conjunction with all material relevant to this project.

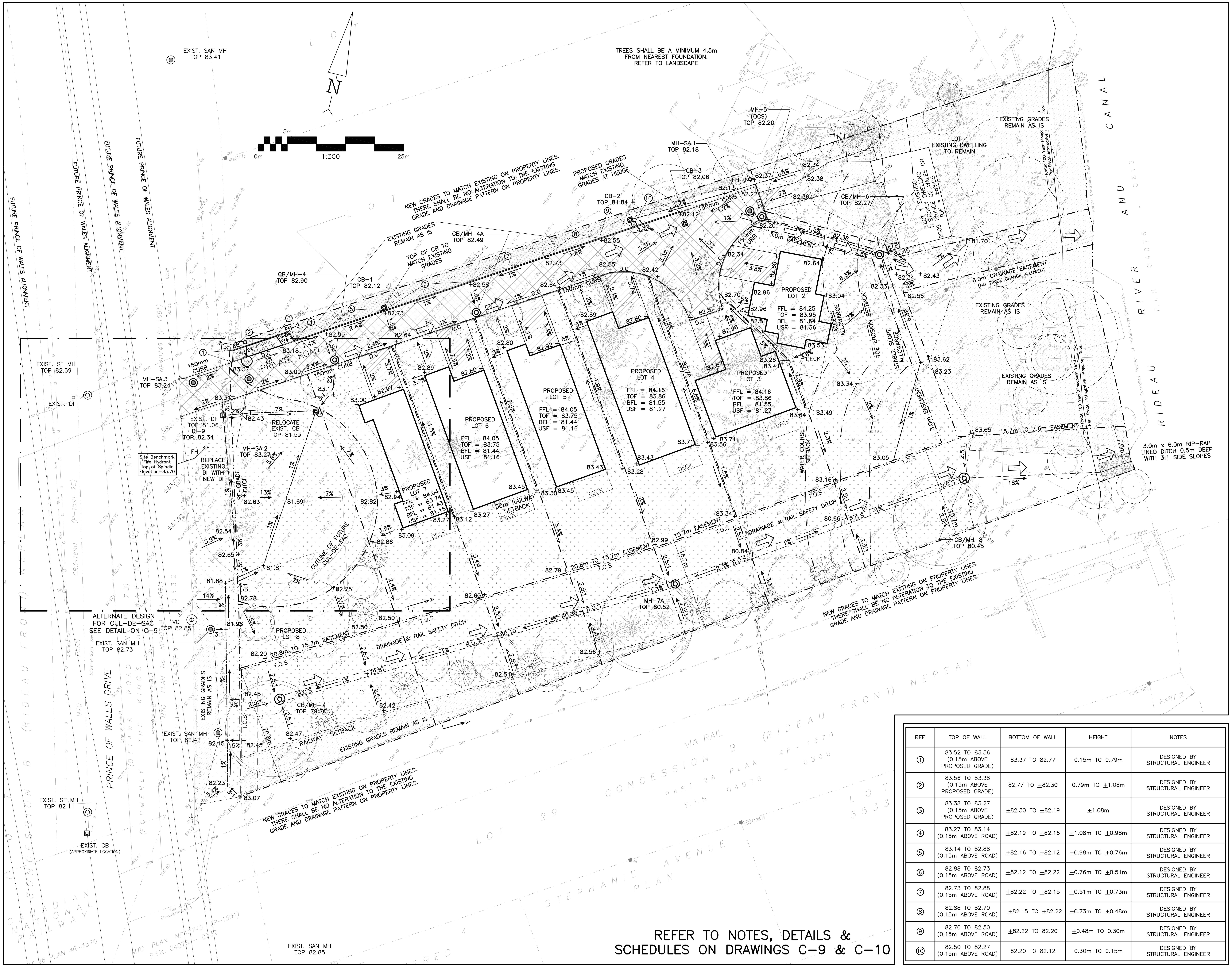
ONTARIO ASSOCIATION OF ARCHITECTS
JANE SEDGEWICK THOMPSON
LICENCE 4537

jane thompson architect

404 mackay street
ottawa, ontario, K1M 2C4
tel: (613)747-8104
jtarch@rogers.com

scale	1:300
job no.	2112
project	2009 / 2013 Prince of Wales Ottawa, ON
date	February 14, 2025
drawing	SITE SECTIONS
designed	JT, ED
drawn	IC, ED
checked	JT, ED
dwg no.	A102

D02-02-23-0061 & D07-16-23-0009



REFER TO NOTES, DETAILS & SCHEDULES ON DRAWINGS C-9 & C-10

REF	TOP OF WALL	BOTTOM OF WALL	HEIGHT	NOTES
①	83.52 TO 83.56 (0.15m ABOVE PROPOSED GRADE)	83.37 TO 82.77	0.15m TO 0.79m	DESIGNED BY STRUCTURAL ENGINEER
②	83.56 TO 83.38 (0.15m ABOVE PROPOSED GRADE)	82.77 TO ±82.30	0.79m TO ±1.08m	DESIGNED BY STRUCTURAL ENGINEER
③	83.38 TO 83.27 (0.15m ABOVE PROPOSED GRADE)	±82.30 TO ±82.19	±1.08m	DESIGNED BY STRUCTURAL ENGINEER
④	83.27 TO 83.14 (0.15m ABOVE ROAD)	±82.19 TO ±82.16	±1.08m TO ±0.98m	DESIGNED BY STRUCTURAL ENGINEER
⑤	83.14 TO 82.88 (0.15m ABOVE ROAD)	±82.16 TO ±82.12	±0.98m TO ±0.76m	DESIGNED BY STRUCTURAL ENGINEER
⑥	82.88 TO 82.73 (0.15m ABOVE ROAD)	±82.12 TO ±82.22	±0.76m TO ±0.51m	DESIGNED BY STRUCTURAL ENGINEER
⑦	82.73 TO 82.88 (0.15m ABOVE ROAD)	±82.22 TO ±82.15	±0.51m TO ±0.73m	DESIGNED BY STRUCTURAL ENGINEER
⑧	82.88 TO 82.70 (0.15m ABOVE ROAD)	±82.15 TO ±82.22	±0.73m TO ±0.48m	DESIGNED BY STRUCTURAL ENGINEER
⑨	82.70 TO 82.50 (0.15m ABOVE ROAD)	±82.22 TO 82.20	±0.48m TO 0.30m	DESIGNED BY STRUCTURAL ENGINEER
⑩	82.50 TO 82.27 (0.15m ABOVE ROAD)	82.20 TO 82.12	0.30m TO 0.15m	DESIGNED BY STRUCTURAL ENGINEER

LEGEND

FFL	FINISHED FLOOR ELEVATION
TOF	TOP OF FOUNDATION
BFL	BASEMENT FLOOR ELEVATION
USF	UNDERSIDE OF FOOTING
	PROPERTY LINE
C.R.Z	CRITICAL ROOT ZONE
CB	CATCH-BASIN
MH	STORM MANHOLE
CB/MH	CATCH-BASIN/MANHOLE
MH	SANITARY MANHOLE
VC	VALVE CHAMBER
FH	FIRE HYDRANT
x99.99	EXISTING GRADE ELEVATION
+99.99	PROPOSED GRADE ELEVATION
2%	EXISTING SLOPE OF GRADE
2%	PROPOSED SLOPE OF GRADE
	EMERGENCY OVERLAND FLOW
T.O.S	TOP OF SLOPE
B.O.S	BOTTOM OF SLOPE
	CENTERLINE OF SWALE
	150mm BARRIER CURB
D.C	DEPRESSED CURB
	SILT FENCE BARRIER
	LIGHT-DUTY PAVEMENT
	HEAVY-DUTY PAVEMENT
	CONCRETE
	LANDSCAPE

KEY PLAN

No.	DATE	REVISION
6	JAN 28-25	RE-ISSUED FOR APPROVAL
5	JUL 8-24	RE-ISSUED FOR APPROVAL
4	DEC 11-23	RE-ISSUED FOR APPROVAL
3	JUN 29-23	ISSUED FOR APPROVAL
2	MAY 10-23	ISSUED FOR COORDINATION
1	MAR 6-23	PRELIMINARY

D. B. GRAY ENGINEERING INC.
Stormwater Management - Grading & Drainage - Storm & Sanitary Sewers - Watermains
700 Long Point Circle 613-425-8044
Ottawa, Ontario d.gray@dbgrayengineering.com

Project
PROPOSED 7 LOT DEVELOPMENT 2009–2013 PRINCE OF WALES DR
OTTAWA, ONTARIO

Drawing Title
GRADING PLAN

Engineer's Seal
LICENSED PROFESSIONAL ENGINEER
D.B. GRAY
17016502
JAN 28-25
PROVINCE OF ONTARIO
NOT VALID UNLESS SIGNED & DATED

Drawn	D.B.G
H. Scale	1:300
V. Scale	
Date	DEC 7-22
Job No.	22055

Drawing No.
C-2 of 10

D02-02-23-0061 & D07-16-23-0009

D.B. Gray Engineering Inc.

Stormwater Management - Grading & Drainage - Storm & Sanitary Sewers - Watermains

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d.gray@dbgrayengineering.com

SITE SERVICING STUDY & STORMWATER MANAGEMENT REPORT

2009-2013 PRINCE OF WALES DRIVE
OTTAWA, ONTARIO

REPORT NO. 22055

JUNE 29, 2023
REVISED DECEMBER 11, 2023
REVISED JULY 8, 2024
REVISED JANUARY 17, 2025

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1.0 INTRODUCTION

This Site Servicing Study & Stormwater Management Report has been prepared in support of a rezoning application and an application for a seven residential lot subdivision on a private roadway located on a 1.13 hectare property at 2009-2013 Prince of Wales Drive in Ottawa, Ontario. The property backs onto the Rideau River to the east and is adjacent to a railway line to the south, and is currently occupied by two single residential dwellings. The dwelling at 2009 Prince of Wales Drive is to remain and the dwelling at 2013 will be demolished. Refer to Key Plan and Pre-Consultation Meeting notes in Appendix A.

This report forms part of the site servicing and stormwater management design for the proposed development. Also refer to drawings C-1 to C-7 prepared by D.B. Gray Engineering Inc.

2.0 WATER SERVICING

2.1 WATER SUPPLY FOR FIREFIGHTING

There is an existing municipal Class AA fire hydrant located in the Prince of Wales Drive ROW in front of the subject property. Two private onsite hydrants are proposed. One fire hydrant (FH-1) is located at the far east end of the private road and the other (FH-2) is located near the entrance (west end) of the private road.

In accordance with City of Ottawa Technical Bulletin ISTB-2021-03, when calculating the required fire flow where pipe sizing is affected, the Fire Underwriters Survey Method (FUS) is to be used. However, as per City of Ottawa Technical Bulletins ISDB-2014-02 and ISTB-2018-02, the FUS calculated fire flows may be capped to 10,000 L/min for single detached dwellings and row houses (provided there is a minimum spatial separation of 10 m between the back of adjacent units); therefore, the fire flow is capped at 10,000 L/min (166.7 L/s).

The boundary conditions for the 166.7 L/s fire flow (based on the city's computer model of the municipal water distribution system) were received from the City. They include a HGL (hydraulic grade line) of 126.7 m for the above flow rate in the 400 mm Prince of Wales Drive municipal watermain in front of the subject property. This HGL calculates to be 426 kPa (61.9 psi). Since the pressure is above 138 kPa (20 psi) there is an adequate water supply for firefighting from the existing municipal water distribution system.

A 150 mm private watermain, connecting to the 400 mm municipal watermain, is proposed to serve the proposed residential development including the two private on-site fire hydrants. A model was created using EPANET software to analyze the hydraulics of the private watermain. Using the provided HGL boundary conditions, and a 95 L/s demand at hydrant FH-2 and 59 L/s at FH-1 (plus the Max Day flow of 0.7 L/s – see Domestic Water Supply below), the pressure at fire hydrant FH-2 is calculated to be 243 kPa (35.2 psi); and 138 kPa (20.0 psi) at FH-1. Since the pressures are at least 138 kPa (20 psi), the private watermain is adequately sized. Refer to Appendix B.

A model was also created using EPANET assuming no flow (0 L/s) at FH-2. Under this scenario and using the for the fire flow of 166.7 L/s only 87 L/s demand is available at hydrant FH-1 (plus the Max Day flow of 0.7 L/s) and based on a minimum pressure of 138 kPa (20.0 psi) at FH-1. This means that, while a hydrant flow test will likely rate FH-1 as Class AA, 95 L/s will not be available during fire flow conditions.

In accordance with City of Ottawa Technical Bulletin ISTB-2018-02, the aggregate flow of all contributing fire hydrants within 150 m of the building shall not be less than the required fire flow; and the contribution from a given hydrant shall be as per Table 1 in Appendix I (an excerpt is below):

Hydrant Class	Distance to Building m	Contribution to Fire Flow L/min (L/s)
AA	≤ 75	5,700 (95)
	> 75 and ≤ 150	3,800 (63.3)
A	≤ 75	3,800 (63.3)
	> 75 and ≤ 150	2,850 (47.5)
B	≤ 75	1,900 (31.7)
	> 75 and ≤ 150	1500 (25)

The front entrances of Lots 6 & 7 (the two west dwelling units closest to Prince of Wales Drive) will be less than 75 m from the existing municipal and proposed private hydrant FH-2. Therefore, the aggregate flow of the two contributing fire hydrants is 11,400 L/min (190 L/s) (= 2 x 5,700 L/min or 2 x 95 L/s); which is greater than required fire flow of 10,000 L/min or 166.7 L/s. The front entrances of Lots 1 to 5 (the five east dwelling units furthest from Prince of Wales Drive) will be greater than 75 m and less than 150 m from the existing municipal fire hydrant (contributing 63.3 L/s) and less than 75 m from FH-1 (contributing 95 L/s) and FH-2. Since, during fire flow conditions, only 59 L/s is available from FH-1, to be conservative it is assumed that FH-1 is rated as a Class B hydrant, and such, as per Table 1 in ISTB-2018-02, can only contribute 31.7 L/s (1,900 L/min). Therefore, the aggregate flow of the three contributing fire hydrants is 11,400 L/min or 190 L/s (= 3,800 + 5,700 + 1,900 L/min or 63.3 + 95 + 31.7 L/s); which is greater than required fire flow of 10,000 L/min (166.7 L/s). Therefore, the aggregate flow of all contributing fire hydrants within 150 m of each dwelling unit is greater than the required fire flow.

2.2 DOMESTIC WATER SUPPLY

In accordance with:

i. the City of Ottawa Water Design Guidelines for the populations;
ii. City of Ottawa Technical Bulletin ISTB-2021-03 for the consumption rate; and
iii. the Ministry of the Environment Water Design Guidelines for the peaking factors.

Based on seven single family dwelling units, the average daily demand was calculated to be 0.1 L/s, the maximum daily demand was calculated to be 0.7 L/s and the maximum hourly demand was calculated to be 1.1 L/s. Refer to calculations in Appendix B.

To determine water pressure under these demands, boundary conditions, based on the City of Ottawa computer simulation of the water distribution system, at the subject location, are required. The boundary conditions received from the City stated that the minimum HGL (hydraulic grade line) is 124.3 m, and the maximum is 132.3 m. Based on these HGLs the water pressure at the water meters are calculated to vary from 410 kPa to 490 kPa (59 psi to 71 psi). This is an acceptable range of water pressures for the proposed development.

3.0 SANITARY SERVICING

In accordance with:

i. the City of Ottawa Sewer Design Guidelines for the populations;
ii. City of Ottawa Technical Bulletin ISTB-2018-01 for the average daily flow, Harmon Formula correction factor and infiltration allowance; and
iii. the Harmon Formula for the peaking factor.

Based on seven single family dwelling units, the total sanitary flow rate was calculated to be 0.58 L/s. A proposed 200 mm private sanitary sewer at 0.65% slope (26.80 L/s capacity) is proposed to service the subdivision. At the design flow rate the private sanitary sewer service will only be at about 2% of its capacity. Refer to calculations in Appendix C.

The proposed 200 mm sanitary sewer will connect to the existing 250 mm Prince of Wales Drive municipal sanitary sewer, which at 0.85% slope has a capacity of 44.17 L/s. Refer to calculations in Appendix C. Given the capacity of the municipal sewer and the generated peak flow generated (0.58 L/s) the proposed development is expected to have an acceptable impact on the municipal sanitary sewer.

Backwater valves are proposed for each dwelling unit.

Since the proposed sanitary sewers services more than one property, it is expected that a Ministry of the Environment (MECP) Environmental Compliance Approval (ECA) will be required.

4.0 STORMWATER MANAGEMENT

4.1 QUANTITY CONTROL

City staff has stated: *"The City's preferred stormwater arrangement is for the proposed subdivision to outlet to the Rideau River. If the RVCA requires quantity control, the City will not support oversized underground sewers to accommodate storage requirements. Catchbasin (CB) inlet-control devices (ICDs), with associated street ponding, per City guidelines, are acceptable to control storm events greater than the 2 year event. Quantity control to the Rideau River is within the RVCA's jurisdiction."* Refer to Appendix A. In response, Rideau Valley Conservation Authority (RVCA) staff has stated: *"The RVCA deferred quantity control requirements to the City, so we will provide comments based on the design parameters that is required by the City."* Refer to Appendix D.

However, in the City's 1st Review Comments it is stated:

> *"The pre-consultation meeting notes were provided on the applicant's presentation that the proposed development would be a public subdivision. Now that the submitted application is for a private subdivision, some of the City requirements/constraints related to stormwater do not apply as we will not be assuming the proposed stormwater infrastructure. Since this private subdivision will direct drainage straight to the Rideau River, the stormwater requirements are under the RVCA's jurisdiction. The City has noted RVCA's correspondence to D.B Gray's office on Nov 4, 2022 deferring quantity control to the City. On other similarly located projects (i.e. directly adjacent to the Rideau River), and post the introduction of Bill 109 and Bill 23, the RVCA has stated to the City that:*
>
> > *"Where flows are connected directly to the Rideau, there are typically no Quantity Control requirements on the Rideau River", therefore no quantity control is required for this site."*

Therefore no quantity controls are proposed for the site.

4.2 QUALITY CONTROL

City staff has stated: "*If agreeable to the RVCA, the City of Ottawa would accept an oil-grit separator (OGS) prior to releasing drainage into the Rideau River. Quality control requirements are to be provided by the RVCA however, the City expects Enhanced Level protection will be the requirement (i.e. 80% TSS removal).* In response, RVCA staff has stated: *"Water Quality Control is required as detailed* [above]*, a new outlet to the Rideau would also need to be designed to ensure that adequate erosion protection is provided as part of the design."*

To meet the water quality target of 80% TSS (total suspended solids) removal an oil grit separator (OGS) is proposed to be located downstream of the inlet control device (ICD). A CDS Model PMSU2015-4-C was selected by the manufacturer based on the manufacturer's software which calculated that it would

remove about 89% of the TSS. The proposed OGS has an oil capacity of 313 L and a sediment capacity of 1.1 m^3.

An erosion and sediment control plan has been developed to be implemented during construction, (see drawing C-4 and notes 2.1 to 2.7 on drawing C-7). In summary: to filter out construction sediment a silt fence barrier will be installed where runoff will drain off the site toward the river; sediment capture filter sock inserts are to be installed in all existing catch-basins adjacent to the site and in all new catch basins as they are installed; straw bale check dams will be installed at the proposed outlet to the river; and any material deposited on a public road will be removed.

4.3 STORM SERVICING

A private storm sewer system is proposed. Backwater valves are proposed for each dwelling units.

The unrestricted 5-year flow rate in each pipe segment varies from 2% to 88% capacity, with the flow rate in the last segment being 99.15 L/s. As previously mentioned, the private storm sewer system is proposed to outlet near the southeast corner of the property and to the Rideau River.

4.4 EMERGENCY OVERLAND FLOW ROUTE

The proposed grading directs the emergency overland flow routes (indicated on drawing C-2) towards the Rideau River.

5.0 ENVIRONMENTAL COMPLIANCE APPROVAL

Since the proposed storm and sanitary sewers services more than one property, it is expected that a Ministry of the Environment (MECP) Environmental Compliance Approval (ECA) will be required.

6.0 CONCLUSIONS

1. Two private onsite hydrants are required.

2. There is an adequate water supply for firefighting from the existing municipal water distribution system.

3. Since the pressures are above 138 kPa (20 psi) during fire flow conditions, the private watermain is adequately sized.

4. The aggregate flow of all contributing fire hydrants within 150 m of each dwelling unit is greater than the required fire flow.

5. There is an acceptable range of water pressures available for the proposed development.

6. The post-development sanitary flow rates will be adequately handled by the proposed private sanitary sewer system.

7. The proposed development is expected to have an acceptable impact on the existing municipal sanitary sewer.

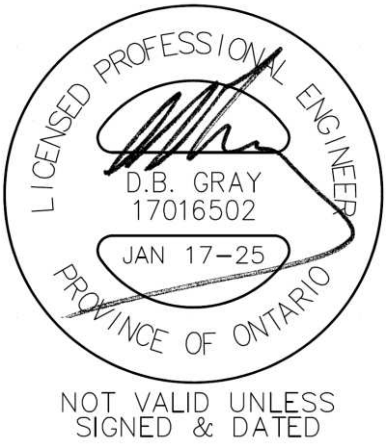
8. Since the proposed sewers service more than one property, it is expected that a Ministry of the Environment (MECP) Environmental Compliance Approval (ECA) will be required.

9. The proposed OGS will achieve 80% TSS removal.

10. An Erosion & Sediment Control Plan has been developed to be implemented during construction.

11. The peak flow rates during the 5-year event will be adequately handled by the proposed private storm sewer system.

Prepared by D.B. Gray Engineering Inc.



APPENDIX A

KEY PLAN
&
PRE-APPLICATION CONSULTATION MEETING NOTES

Date: April 29, 2022

ADDRESS: 2009 & 2013 Prince Of Wales
Pre-Consultation Meeting Minutes
Meeting Date: April 8, 2022

Attendee	Role	Organization
Lisa Stern	File Lead	City of Ottawa
Sami Rehman	Environmental Planner	
Louise Cerveny	Parks Planner	
Mark Richardson	Forester	
Gabrielle Shaeffer	Engineer	
Josiane Gervais	Transportation	
Eric Lalande	Planner	RVCA
Alex Sivasambu		Land Owner
Jane Thompson	Applicant	Jane Thompson Architect
Erin Duncan		

Comments from the Applicant:

1. Subdivision and rezoning to facilitate the creation of seven residential lots and a public roadway.
2. 1 storey brick dwelling at 2009 Prince of Wales to remain

Planning Comments:

1. A minor rezoning and subdivision application are required.
2. The site is located adjacent to the Rideau River and next to an elevated rail corridor.
3. The site is designated General Urban Area and Natural Heritage in the Existing Official Plan and is designated Neighbourhood Area within the Outer Urban Transect and Natural Area in the Council Adopted Official Plan. These designations support low rise infill development that is compatible with existing development.
4. The site is zoned Residential First Density subzone E (R1E). A rezoning is required to facilitate reduced lot areas, increased setbacks from the Watercourse and rail line.
5. A Planning Rationale prepared by a qualified professional is required to support the proposed application. The Planning Rationale should discuss compliance with Official Plan policy and guidelines and should address compatibility with adjacent residential uses, rail line and Rideau River.
6. A “no touch” setback to the Rideau River is required as per the environmental comments below. Parks Canada and the NCC will be circulated on the application and will provide comments on impacts to the River.
7. To improve compatibility, retention of existing mature vegetation should be considered.
8. Consideration for the interface between the roadway and the property to the north should be given. Minimizing retaining walls and lighting ,and the retention or provision of screening plantings should be thought-out.
9. As the site is adjacent to a rail line, the Guidelines for New Development in Proximity to Railway Operations which was prepared for the Federation of Canadian Municipalities and the Railway Association of Canada apply. These guidelines recommend a *minimum* 30m setback from the building face to the rail right of way. Additionally, noise walls and crash berms may be required to mitigate impacts. Please reach out to the railway to discuss requirements for safety setbacks and/or mitigation measures.

10. As this property is located adjacent to the Rideau Canal World Heritage Site, a Cultural Heritage Impact Statement *may* be required. Please reach out to the Heritage Planning branch via our general email: heritage@ottawa.ca prior to submission.

Parks:

1. Parks and Facilities Planning request that Cash-in-lieu of parkland be taken based on the total developable area of the site

Environment:

1. The subject property is situated next to the Rideau River, so according to the new Official Plan (OP) policies, the proposed development will require an Environmental Impact Study (EIS).
2. The EIS should address the setback requirements outlined in the OP Section 4.9.
3. The minimum required setbacks are to be kept in a naturally vegetated state. So, the EIS should provide recommendations for ecological enhancements in the setbacks, in addition to general tree retention throughout the property.
4. The EIS should focus on mitigating potential impacts on the Rideau River.
5. The EIS should also explore potential significant habitat for threatened or endangered species on or near the subject property.

Forestry:

1. a Tree Conservation Report (TCR) must be supplied for review along with the suite of other plans/reports required by the City
    a. an approved TCR is a requirement of Site Plan approval.
    b. The TCR may be combined with the EIS provided all information is supplied
2. Any removal of privately-owned trees 10cm or larger in diameter, or city-owned trees of any diameter requires a tree permit issued under the Tree Protection Bylaw (Bylaw 2020 – 340); the permit will be based on an approved TCR and made available at or near plan approval.
3. The Planning Forester from Planning and Growth Management as well as foresters from Forestry Services will review the submitted TCR
    a. If tree removal is required, both municipal and privately-owned trees will be addressed in a single permit issued through the Planning Forester
    b. Compensation may be required for city owned trees – if so, it will need to be paid prior to the release of the tree permit
4. the TCR must list all trees on site, as well as off-site trees if the CRZ extends into the developed area, by species, diameter and health condition
5. please identify trees by ownership – private onsite, private on adjoining site, city owned, co-owned (trees on a property line)
6. If trees are to be removed, the TCR must clearly show where they are, and document the reason they cannot be retained
7. All retained trees must be shown, and all retained trees within the area impacted by the development process must be protected as per City guidelines available at Tree Protection Specification or by searching Ottawa.ca
    a. the location of tree protection fencing must be shown on the plan
    b. show the critical root zone of the retained trees
    c. if excavation will occur within the critical root zone, please show the limits of excavation
8. the City encourages the retention of healthy trees; if possible, please seek opportunities for retention of trees that will contribute to the design/function of the site.

9. For more information on the process or help with tree retention options, contact Mark Richardson mark.richardson@ottawa.ca or on City of Ottawa

LP tree planting requirements:
For additional information on the following please contact tracy.smith@Ottawa.ca

Minimum Setbacks
- Maintain 1.5m from sidewalk or MUP/cycle track.
- Maintain 2.5m from curb
- Coniferous species require a minimum 4.5m setback from curb, sidewalk or MUP/cycle track/pathway.
- Maintain 7.5m between large growing trees, and 4m between small growing trees. Park or open space planting should consider 10m spacing, except where otherwise approved in naturalization / afforestation areas. Adhere to Ottawa Hydro's planting guidelines (species and setbacks) when planting around overhead primary conductors.

Tree specifications
- Minimum stock size: 50mm tree caliper for deciduous, 200cm height for coniferous.
- Maximize the use of large deciduous species wherever possible to maximize future canopy coverage
- Tree planting on city property shall be in accordance with the City of Ottawa's Tree Planting Specification; and include watering and warranty as described in the specification (can be provided by Forestry Services).
- Plant native trees whenever possible
- No root barriers, dead-man anchor systems, or planters are permitted.
- No tree stakes unless necessary (and only 1 on the prevailing winds side of the tree)

Hard surface planting
- Curb style planter is highly recommended
- No grates are to be used and if guards are required, City of Ottawa standard (which can be provided) shall be used.
- Trees are to be planted at grade

Soil Volume
- Please ensure adequate soil volumes are met:

Tree Type/Size	Single Tree Soil Volume (m3)	Multiple Tree Soil Volume (m3/tree)
Ornamental	15	9
Columnar	15	9
Small	20	12
Medium	25	15
Large	30	18
Conifer	25	15

Please note that these soil volumes are not applicable in cases with Sensitive Marine Clay.
Sensitive Marine Clay
- Please follow the City's 2017 Tree Planting in Sensitive Marine Clay guidelines

Tree Canopy Cover

- The landscape plan shall show how the proposed tree planting will replace and increase canopy cover on the site over time, to support the City's 40% urban forest canopy cover target.
- At a site level, efforts shall be made to provide as much canopy cover as possible, through tree planting and tree retention, with an aim of 40% canopy cover at 40 years, as appropriate.
- Indicate on the plan the projected future canopy cover at 40 years for the site.

Engineering:

1. The Servicing Study Guidelines for Development Applications are available at the following address: https://ottawa.ca/en/planning-development-and-construction/developing-property/development-application-review-process/development-application-submission/guide-preparing-studies-and-plans#servicing-study-guidelines-development-applications
2. Servicing and site works shall be in accordance with the following documents:
    - ⇨ Ottawa Sewer Design Guidelines (October 2012)
    - ⇨ Ottawa Design Guidelines – Water Distribution (2010)
    - ⇨ Geotechnical Investigation and Reporting Guidelines for Development Applications in the City of Ottawa (2007)
    - ⇨ City of Ottawa Slope Stability Guidelines for Development Applications (revised 2012)
    - ⇨ City of Ottawa Environmental Noise Control Guidelines (January, 2016)
    - ⇨ City of Ottawa Park and Pathway Development Manual (2012)
    - ⇨ City of Ottawa Accessibility Design Standards (2012)
    - ⇨ Ottawa Standard Tender Documents (latest version)
    - ⇨ Ontario Provincial Standards for Roads & Public Works (2013)
    - ⇨ Fire Underwriter's Survey (2020)
3. Record drawings and utility plans are also available for purchase from the City (Contact the City's Information Centre by email at geoinformation@ottawa.ca or by phone at (613) 580-2424 x.44455).

Stormwater

4. There is a 525mm diameter concrete storm sewer on Prince of Wales Drive built in 1975 fronting the site. The site also fronts the Rideau River.
5. There is an existing localized stormwater management system in place within the Prince of Wales roadside ditch fronting the site. The proposed cul-de-sac connection to Prince of Wales is through this system. Please incorporate into the design changes that would relocate the localized stormwater system.
6. The City's preferred stormwater arrangement is for the proposed subdivision to outlet to the Rideau River. To pursue this option, please confirm with the Rideau Valley Conservation Authority (RVCA) if this option is possible, as they have Rideau River jurisdiction.
    a) If agreeable to the RVCA, the City of Ottawa would accept an oil-grit separator (OGS) prior to releasing drainage into the Rideau River. Quality control requirements are to be provided by the RVCA however, the City expects Enhanced Level protection will be the requirement (i.e. 80% TSS removal).
    b) If the RVCA requires quantity control, the City will not support oversized underground sewers to accommodate storage requirements. Catchbasin (CB) inlet-control devices (ICDs), with associated street ponding, per City guidelines, are acceptable to control storm events greater than the 2 year event. Quantity control to the Rideau River is within the RVCA's jurisdiction.
    c) If basements are proposed the storm sewer is to be for the 5 year minor storm event. All storm events greater than the minor storm event is to be controlled with CB ICDs and/or overland flow toward the Rideau River.

7. If the applicant wishes to explore connection to the Prince of Wales 525mm diameter concrete storm sewer (built in 1975):
    a. Please provide gabrielle.schaeffer@ottawa.ca the expected flow rate from the site to the Prince of Wales storm sewer to assess storm boundary conditions. Please note this is not the City's preferred option and is expected to be a more restrictive option with respect to stormwater release rates.
    b. Utilize the 5-yr storm event using the IDF information derived from the Meteorological Services of Canada rainfall data, taken from the MacDonald Cartier Airport, collected 1966 to 1997.
    c. Utilize the pre-development runoff coefficient or a maximum equivalent 'C' of 0.5, whichever is less (§ 8.3.7.3).
    d. A calculated time of concentration (Cannot be less than 10 minutes).
    e. Flows to the storm sewer in excess of the allowable release rate, up to and including the 100-year storm event, may need to be detained on site.
    f. This option may work best when only necessary flows (i.e. road and fronting half of houses) flow toward the Prince of Wales minor system, and the rest flows to the Rideau River.

Sanitary

8. There is an existing 250mm diameter sanitary ductile iron sewer on Prince of Wales built in 1975 fronting the site.

Water

9. There is an existing 406mm diameter ductile iron watermain on Prince of Wales built in +/-1975 fronting the site.
10. Water Boundary condition requests must include the location of the service (map or plan with connection location(s) indicated) and the expected loads required by the proposed development, including calculations. Please provide the following information:
    i. Location of service
    ii. Type of development and the amount of fire flow required (as per FUS, 1999).
    iii. Average daily demand: ___ l/s.
    iv. Maximum daily demand: ___l/s.
    v. Maximum hourly daily demand: ___ l/s.
11. Fire trucks require access to each building entrance as per the Ontario Building Code. Please ensure that the fire route extends as much as needed. Also, a fire route does not need a turn around unless the road length is more than 90m. If a turn around is needed for fire services, please follow the City standard. Please note the City standard turn around may be needed for other reasons.

MECP ECA Requirements

12. An MECP Environmental Compliance Approval (Municipal Sewage Works), for SWM/STM/SAN, will be required for the proposed development. This application qualifies to be reviewed by Transfer of Review through the City.

Slope Stability / Geotechnical Report

13. A slope stability analysis will need to be completed as per City guidelines for the slope next to the river.
14. A geotechnical report is required as per City guidelines.

ESAs

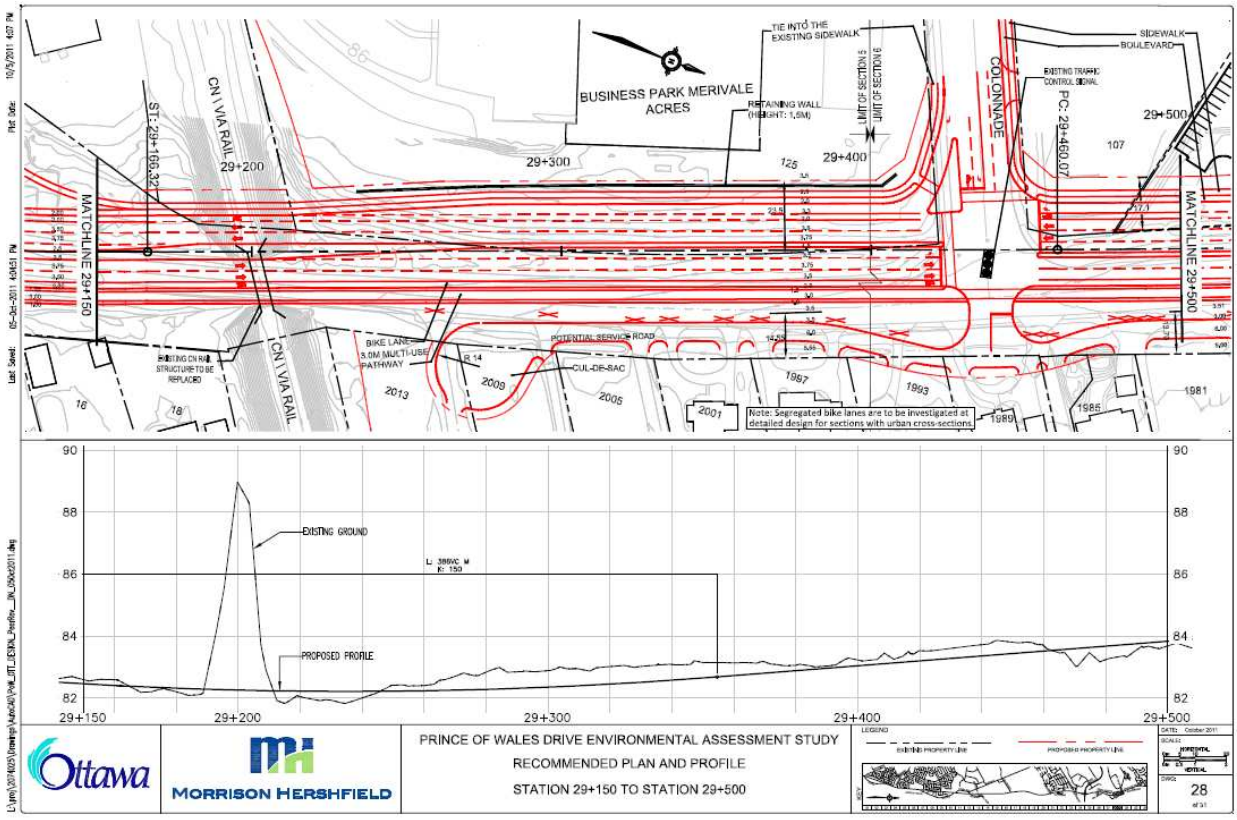
15. Phase 1 ESAs and Phase 2 ESAs must conform to clause 4.8.4 of the Official Plan that requires that development applications conform to Ontario Regulation 153/04.

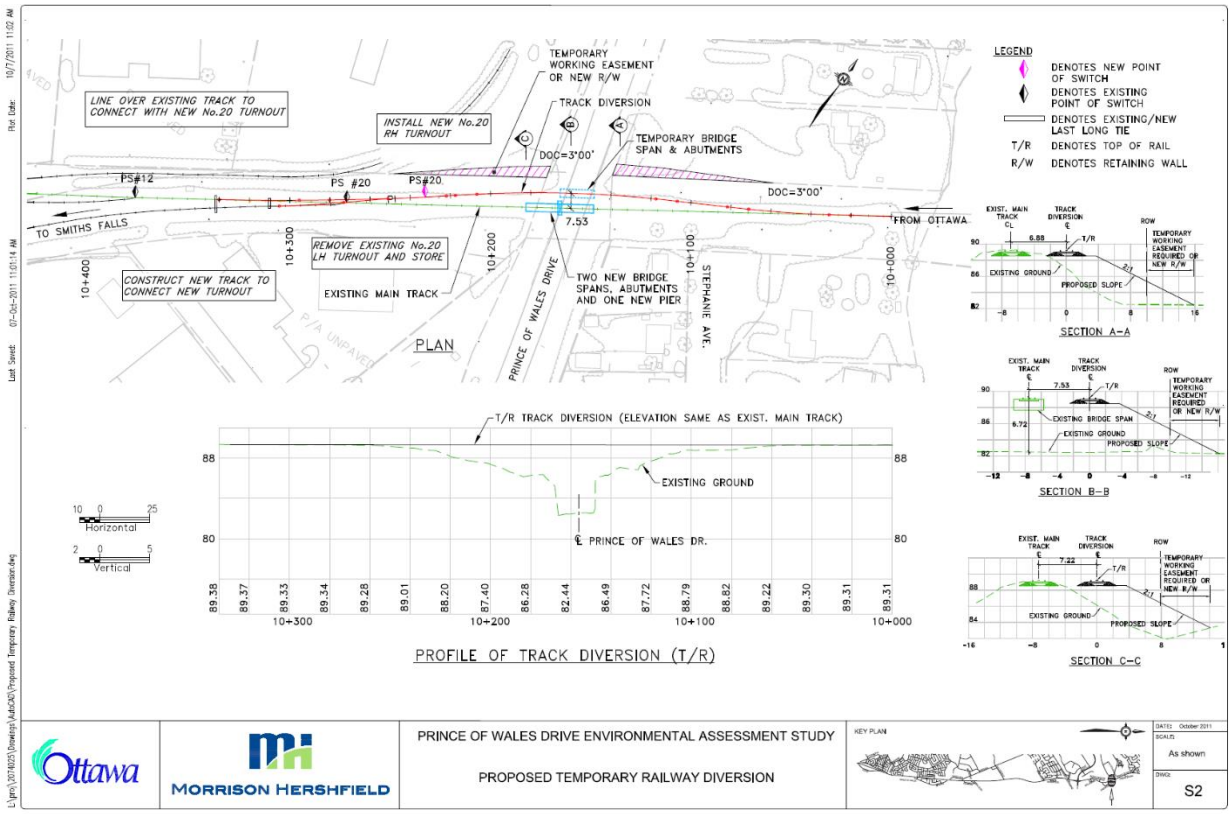
Transportation:

1. Follow Transportation Impact Assessment Guidelines:
    a. A TIA is required. Submit a Scoping Report at your earliest convenience to josiane.gervais@ottawa.ca.
    b. Correct the Screening Form:
        i. The proposed roadway is within the area of influence of the Colonnade Rd traffic signal.
        ii. The proposed roadway is within the auxiliary lanes of the intersection.
    c. A review of auxiliary lane warrants and sightline analysis must be addressed with the TIA.
    d. A turning lane on Prince of Wales may be required, which would trigger an RMA.
    e. Start this process asap, the TIA process is iterative and the majority of the work must take place before submission. The application will not be deemed complete until the submission of the draft step 1-4, including the functional draft RMA package (if applicable) and/or monitoring report (if applicable).
    f. Request base mapping asap if RMA is required. Contact Engineering Services (https://ottawa.ca/en/city-hall/planning-and-development/engineering-services)
    g. An update to the *TRANS Trip Generation Manual* has been completed (October 2020). This manual is to be utilized for this TIA. A copy of this document can be provided upon request.
2. ROW protection on Prince of Wales between Colonnade and Rideau Heights Lane is 32-58m (varies and subject to unequal widening requirements of the Prince of Wales Dr Widening ESR). Future ROW line must be shown on the site plan, and all set-backs must be measured from this new property line.
3. Widening of Prince of Wales is on the TMP's Affordable Network. Note that ROW is required from these parcels, as described in the Prince of Wales Drive EA. I've included a plan depicting the ROW lines as per the EA, note that these are still subject to change during detailed design. As per the EA, a service road parallel to Prince of Wales is proposed along the frontage of the properties to provide access via the Colonnade signalized intersection.
4. The proposed local roadway design would need to consider both the existing condition of Prince of Wales, as well as the future horizon when Prince of Wales is widened.
5. Corner triangles as per OP Annex 1 - Road Classification and Rights-of-Way at the following locations on the final plan will be required (measure on the property line/ROW protected line; no structure above or below this triangle): Local Road to Arterial Road: 5 m x 5 m
6. The proposed local roadway would require a cul-de-sac at the end to allow vehicles to turn around. Refer to Ontario Provincial Standard Drawing (OPSD) 500.020.
7. While preparing the Draft Plan, note that all new local residential streets should be designed with a target operating speed of 30km/h per the new Strategic Road Safety Action Plan Update. Please follow the City's *Local Residential Streets 30 km/h Design Toolbox* (2021) document.
8. A sidewalk would be required along the new local road.
9. Corner clearances should follow minimum distances set out within TAC Figure 8.8.2.
10. Geometric Road Design Drawings (GRDD) will be required with the first submission of underground infrastructure and grading drawings. These drawings should include such items as, but are not limited to:
    a. Road signage and pavement markings.
    b. Location of depressed curbs and tactile walking surface indicators (TWSI).

c. Traffic calming measures aimed at reducing vehicle speed and enhancing pedestrian safety. Measures may include either vertical or horizontal features, however such measures shall not interfere with stormwater management and overland flow routing. Traffic calming measures shall reference best management practices from the Canadian Guide to Neighbourhood Traffic Calming, published by the Transportation Association of Canada, and/or Ontario Traffic Manual, and/or the City of Ottawa's Traffic Calming Design Guidelines.

11. Noise Impact Studies required for the following:
    a. Road, as the site is within proximity to Prince of Wales
    b. Rail, Noise and Vibration study required. The Outdoor Living Area noise levels may be a concern and mitigation may be a challenge as a traditional noise wall would be less effective since the railway is raised.
    c. Aircraft, as the site falls within the Airport Vicinity Development Zone.





RVCA:

1. A RVCA permit is required for any works within the Regulated area of the property.
2. Please contact the RVCA to determine if any permits or approvals are required under their regulations.

Please refer to the links to "Guide to preparing studies and plans" and fees for general information. Additional information is available related to building permits, development charges, and the Accessibility Design Standards. Be aware that other fees and permits may be required, outside of the development review process. You may obtain background drawings by contacting informationcentre@ottawa.ca.

These pre-con comments are valid for one year. If you submit a development application(s) after this time, you may be required to meet for another pre-consultation meeting and/or the submission requirements may change. You are as well encouraged to contact us for a follow-up meeting if the plan/concept will be further refined.
Please contact me at Lisa.Stern@ottawa.ca or at 613-580-2424 extension 21108 if you have any questions.

APPENDIX B

WATER SERVICING

D.B. Gray Engineering Inc.

Stormwater Management - Grading & Drainage - Storm & Sanitary Sewers - Watermains

700 Long Point Circle
Ottawa, Ontario K1T 4E9

613-425-8044
d.gray@dbgrayengineering.com

February 28, 2023
REVISED June 28, 2023

2009-2013 Prince of Wales Dr

7-Lot Residential Development

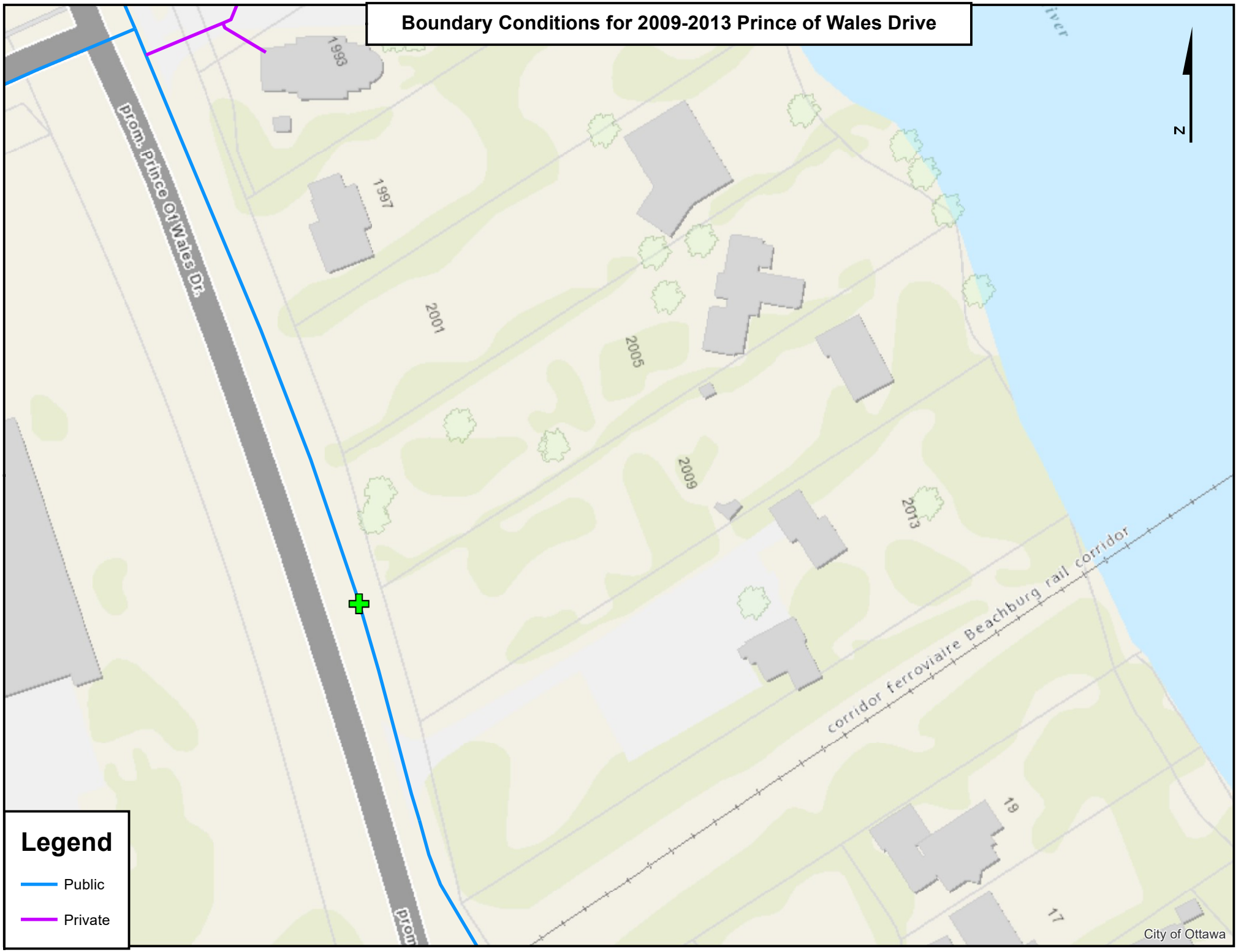
Ottawa, Ontario

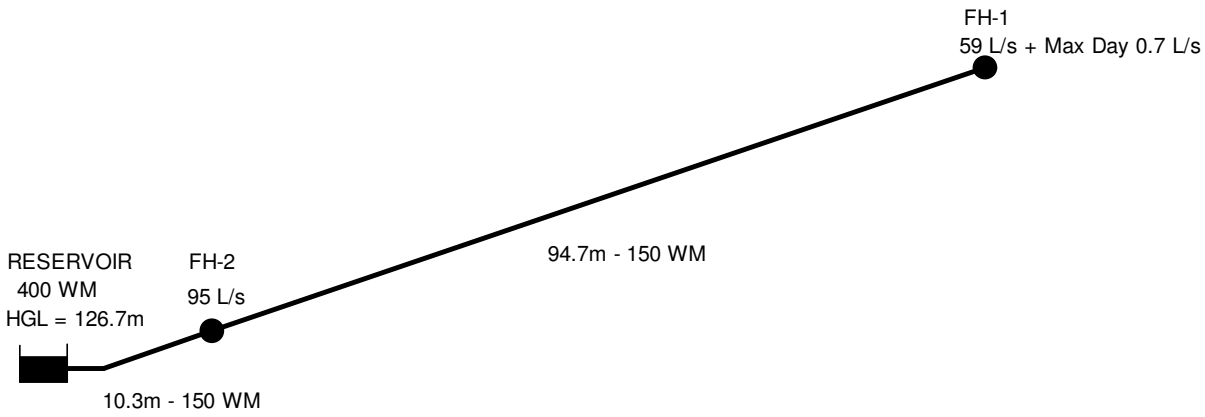
WATER DEMAND CALCULATIONS

	Number of Units	Persons per Unit	Population
Single Family:	7	3.4	23.8
Semi- detached:	0	2.7	0.0
Duplex:	0	2.3	0.0
Townhouse:	0	2.7	0.0
Total:	7		23.8

Average Daily Demand:	280	L/capita/day				
	4.6	L/min	0.1	L/s	1.2	USgpm
Maximum Daily Demand:	9.5	(Peaking factor for a population of 23.8 interpolated from MOE Design Guidelines for Drinking Water Systems Table 3-3)				
	44.0	L/min	0.7	L/s	11.6	USgpm
Maximum Hourly Demand:	14.3	(Peaking factor for a population of 23.8 interpolated from MOE Design Guidelines for Drinking Water Systems Table 3-3)				
	66.2	L/min	1.1	L/s	17.5	USgpm

Elevation of Water Meter:	82.53	m				
Basement Floor Elevation: (Varies - Highest):	81.63	m				
Minimum HGL:	124.3	m				
Static Pressure at Water Meter:	41.8	m	410	kPa	59	psi
Maximum HGL:	132.3	m				
Static Pressure at Water Meter:	49.8	m	488	kPa	71	psi
Elevation of Water Meter:	82.33	m				
Basement Floor Elevation: (Varies - Lowest):	81.43	m				
Minimum HGL:	124.3	m				
Static Pressure at Water Meter:	42.0	m	411	kPa	60	psi
Maximum HGL:	132.3	m				
Static Pressure at Water Meter:	50.0	m	490	kPa	71	psi


Boundary Conditions for 2009-2013 Prince of Wales Drive
prom. Prince Of Wales Dr.
1993
1997
2001
2005
2009
2013
corridor ferroviaire Beachburg rail corridor
19
17
N
Legend
Public
Private
City of Ottawa


FH-1
59 L/s + Max Day 0.7 L/s
94.7m - 150 WM
RESERVOIR
400 WM
HGL = 126.7m
FH-2
95 L/s
10.3m - 150 WM

Network Table - Links

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s
Pipe 1	10.3	150	100	154.70	8.75
Pipe 2	94.7	150	100	59.70	3.38

December 11, 2023

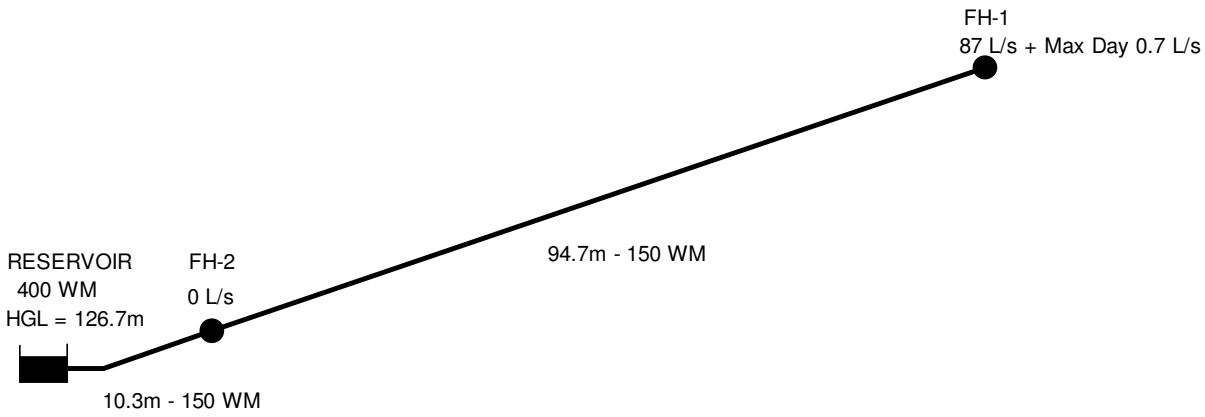
2009-2013 Prince of Wales Drive

Ottawa, Ontario

EPANET RESULTS

Node ID	Demand (L/s)	HGL (m)	Elevation (m)	Pressure (m)	Pressure (kPa)	Pressure (psi)
1 - Reservoir	-87.7	126.7	83.20	43.5	426	61.9
2 - Fire Hydrant FH-2	0.0	120.47	83.15	37.3	366	53.1
3 - Fire Hydrant FH-1 (inc Max Day 0.7 L/s)	87.7	97.01	82.37	14.6	144	20.8

Link ID	Length (m)	Diameter (mm)	Roughness Coefficient	Minor Loss Coefficient	Flow (L/s)	Velocity (m/s)
1 - Reservoir to Fire Hydrant FH-2	10.3	150	100	3.00	87.7	4.96
2 - Fire Hydrant FH-2 to FH-1	94.7	150	100	0.60	87.7	4.96


FH-1
87 L/s + Max Day 0.7 L/s
94.7m - 150 WM
RESERVOIR
400 WM
HGL = 126.7m
FH-2
0 L/s
10.3m - 150 WM

Network Table - Nodes

Node ID	Elevation m	Demand LPS	Head m	Pressure m
Junc 2	83.15	0.00	120.47	37.32
Junc 3	82.37	87.70	97.01	14.64
Resvr 1	126.7	-87.70	126.70	0.00

Network Table - Links

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s
Pipe 1	10.3	150	100	87.70	4.96
Pipe 2	94.7	150	100	87.70	4.96

APPENDIX C

SANITARY SERVICING

D.B. Gray Engineering Inc.

Stormwater Management - Grading & Drainage - Storm & Sanitary Sewers - Watermains

700 Long Point Circle
Ottawa, Ontario K1T 4E9

613-425-8044
d.gray@dbgrayengineering.com

SANITARY SEWER CALCULATIONS

2009-2013 Prince of Wales
7 Lot Development
Ottawa, Ontario

June 28, 2023

Residential Average Daily Flow:	280	L/capita/day	Residential Peaking Factor:	Harmon Formula	
Commercial Average Daily Flow:	28,000	L/ha/day	Harmon Formula Correction Factor:	0.8	
Institutional Average Daily Flow:	28,000	L/ha/day	Commercial Peaking Factor:	1.5	
Light Industrial Average Daily Flow:	35,000	L/ha/day	Institutional Peaking Factor:	1.5	
Heavy Industrial Average Daily Flow:	55,000	L/ha/day	Industrial Peaking Factor:	Ministry of the Environment	
Infiltration Allowance:	0.33	L/s/ha	Manning's Roughness Coefficient:	0.013	

		Residential													Non-Residential				Infiltration			Q	Sewer Data						
		Individual									Cumulative				Individual			Cumulative	Individual	Cumulative		Total							
Location		Single	Semi		Apartment				Area	Population	Area	Population	Peaking	Flow Rate	Area	Daily Flow	Peaking	Flow Rate	Area	Area	Flow Rate	Flow Rate	Length	Nominal Diameter	Actual Diameter	Slope	Velocity	Q_{Full} Capacity	Q / Q_{Full}
From	To	Family	Detached	Duplex	(1 Bed)	(2 Bed)	(3 Bed)	(Average)	(ha)		(ha)		Factor	(L/s)	(ha)	L/ha/day	Factor	(L/s)	(ha)	(ha)	(L/s)	(L/s)	(m)	(mm)	(mm)	(%)	(m/s)	(L/s)	
		ppu = 3.4	ppu = 2.7	ppu = 2.3	ppu = 1.4	ppu = 2.1	ppu = 3.1	ppu = 1.8																					
Lot 1	MH-SA.1	1							0.1114	3.4	0.1114	3.4	3.2	0.04					0.1114	0.1114	0.04	0.07	22.2	135	133	2.00	1.12	15.63	0.00
Lot 2	MH-SA.1	1							0.2370	3.4	0.2370	3.4	3.2	0.04					0.2370	0.2370	0.08	0.11	15.4	135	133	2.00	1.12	15.63	0.01
Lot 3	MH-SA.1	1							0.0750	3.4	0.0750	3.4	3.2	0.04					0.0750	0.0750	0.02	0.06	19.2	135	133	2.00	1.12	15.63	0.00
Lot 4	MH-SA.1	1							0.0908	3.4	0.0908	3.4	3.2	0.04					0.0908	0.0908	0.03	0.07	11.9	135	133	2.00	1.12	15.63	0.00
Lot 5	MH-SA.1	1							0.0917	3.4	0.1825	3.4	3.2	0.04					0.0917	0.1825	0.06	0.10	11.5	135	133	2.00	1.12	15.63	0.01
Lot 6	MH-SA.1	1							0.0924	3.4	0.0924	3.4	3.2	0.04					0.0924	0.0924	0.03	0.07	11.5	135	133	2.00	1.12	15.63	0.00
Lot 7	MH-SA.1	1							0.2122	3.4	0.2122	3.4	3.2	0.04					0.2122	0.2122	0.07	0.11	11.5	135	133	2.00	1.12	15.63	0.01
MH-SA.1	MH-SA.2									0.0	1.0013	23.8	3.2	0.25					0.0000	1.0013	0.33	0.58	97.5	200	201	0.65	0.84	26.80	0.02
MH-SA.2	Existing									0.0	1.5792	23.8	3.2	0.25					0.0000	1.0013	0.33	0.58	3.2	200	201	0.65	0.84	26.80	0.02
	250 SAN																												
																			250 mm Prince of Wales Drive Sanitary Sewer:				250	251	0.54	0.89	44.17	

APPENDIX D

STORMWATER MANAGEMENT

D.B. Gray Engineering Inc.

Douglas Gray <d.gray@dbgrayengineering.com>

RE: 2009-2013 Prince of Wales Dr

1 message

Eric Lalande <eric.lalande@rvca.ca> Fri, Nov 4, 2022 at 9:35 AM
To: Douglas Gray <d.gray@dbgrayengineering.com>

Hi Doug,

Water Quality Control is required as detailed below, a new outlet to the Rideau would also need to be designed to ensure that adequate erosion protection is provided as part of the design.

The RVCA deferred quantity control requirements to the City, so we will provide comments based on the design parameters that is required by the City.

Thank you,

Eric Lalande, MCIP, RPP

Planner, Rideau Valley Conservation Authority

613-692-3571 x1137

From: Douglas Gray <d.gray@dbgrayengineering.com>
Sent: Wednesday, November 02, 2022 9:53 AM
To: Eric Lalande <eric.lalande@rvca.ca>
Cc: Laurent Brosseau <l.brosseau@dbgrayengineering.com>
Subject: 2009-2013 Prince of Wales Dr

Hi Eric

We are working on a 7 lot subdivision at 2009-2013 Prince of Wales Dr (see attached site plan and two topo survey plans).

The City has stated:

> *“The City’s preferred stormwater arrangement is for the proposed subdivision to outlet to the Rideau River. To pursue this option, please confirm with the Rideau Valley Conservation Authority (RVCA) if this option is possible, as they have Rideau River jurisdiction.*
>
> *a) If agreeable to the RVCA, the City of Ottawa would accept an oil-grit separator (OGS) prior to releasing drainage into the Rideau River. Quality control requirements are to be provided by the RVCA however, the City expects Enhanced Level protection will be the requirement (i.e. 80% TSS removal).*
>
> *b) If the RVCA requires quantity control, the City will not support oversized underground sewers to accommodate storage requirements. Catchbasin (CB) inlet-control devices (ICDs), with associated street*

ponding, per City guidelines, are acceptable to control storm events greater than the 2 year event. Quantity control to the Rideau River is within the RVCA's jurisdiction.

c) If basements are proposed the storm sewer is to be for the 5 year minor storm event. All storm events greater than the minor storm event is to be controlled with CB ICDs and/or overland flow toward the Rideau River."

Please comment on the above and any other issues that RVCA may have concerning this site.

Also, please identify any permits or approvals that are required

Regards, Doug

Stormwater Management - Grading & Drainage - Storm & Sanitary Sewers - Watermains

700 Long Point Circle Tel: 613-425-8044

Ottawa, Ontario K1T 4E9 d.gray@dbgrayengineering.com

D.B. Gray Engineering Inc.

Douglas Gray <d.gray@dbgrayengineering.com>

RE: CDS Sizing - 2009-2013 Prince of Wales Dr

1 message

Shane <shane@echelonenvironmental.ca> Tue, Feb 20, 2024 at 9:44 AM
To: Laurent Brosseau <l.brosseau@dbgrayengineering.com>
Cc: Douglas Gray <d.gray@dbgrayengineering.com>

Good morning Laurent,

Please see revised sizing, as requested I sized using the OK 110 distribution.

I am a little confused by the comment. The “Fine” distribution has a d50 of 75um while the OK 110 has a d50 of 110. The NJDEP ha a much lower d50 then the other 2.

If we size the CDS to a finer distribute, ETV (NJDEP) we would only be able to achieve 60% TSS removal due to the large percentage of ultra fine material that can’t be gravity separation. Hopefully using the 110 will satisfy the reviewer.

Thank you,

Shane Jensen

Project Manager

416-460-6328

From: Laurent Brosseau <l.brosseau@dbgrayengineering.com>
Sent: Friday, February 16, 2024 12:39 PM
To: Shane <shane@echelonenvironmental.ca>
Cc: Douglas Gray <d.gray@dbgrayengineering.com>
Subject: Re: CDS Sizing - 2009-2013 Prince of Wales Dr

Hi Shane,

We have made additional revisions. See below revised areas and coefficient:

Roof Area: 708 sq.m
Hard Area: 1146 sq.m
Soft Area: 2107 sq.m
Total Catchment Area: 3961 sq.m
C: 0.53

We received the following comment from the City: "*The particle distribution size is set to 'fine', however the minimum provincial requirement is 'OK-110'. Please use OK-110 or a more stringent distribution like that from NJDEP.*" Could you provide a response?

Thank you

On Thu, Nov 2, 2023 at 4:52 PM Shane <shane@echelonenvironmental.ca> wrote:

> Hello Laurent,
>
> Please attached revised sizing, with the reduced sizing the CDS model decreased to a PMSU2015_4.
>
> If you have any questions please let me know.
>
> Thank you,
>
> Shane Jensen
>
> Project Manager
>
> 416-460-6328

From: Laurent Brosseau <l.brosseau@dbgrayengineering.com>
Sent: Wednesday, November 01, 2023 3:26 PM
To: Shane <shane@echelonenvironmental.ca>
Cc: Douglas Gray <d.gray@dbgrayengineering.com>
Subject: Re: CDS Sizing - 2009-2013 Prince of Wales Dr

Hi Shane,

Just following up on this. Have you had a chance to revise your calculations?

Thank you

On Fri, Oct 20, 2023 at 2:11 PM Laurent Brosseau <l.brosseau@dbgrayengineering.com> wrote:

> Hi Shane,
>
> We made some revisions. Could you please size the required CDS for 80% TSS removal for the following drainage area?

Roof Area: 1395 sq.m
Hard Area: 1119 sq.m
Soft Area: 2008 sq.m
Total Catchment Area: 4522 sq.m
C: 0.32

Thanks,

On Thu, Jun 8, 2023 at 4:15 PM Shane <shane@echelonenvironmental.ca> wrote:

> Hello Laurent,
>
> That you for the sizing request, please see attached CDS TSS calculations. The selected model is a PMSU2020_5. Budget price, assuming a typical 2m depth to invert, is $29,000.
>
> Please let me know if you have any questions.
>
> Regards,
>
> Shane Jensen
>
> Project Manager
>
> Cell: 416-460-6328
>
> ---
>
> **From:** Laurent Brosseau <l.brosseau@dbgrayengineering.com>
> **Sent:** Thursday, June 08, 2023 2:58 PM
> **To:** Shane <shane@echelonenvironmental.ca>
> **Cc:** Douglas Gray <d.gray@dbgrayengineering.com>
> **Subject:** CDS Sizing - 2009-2013 Prince of Wales Dr
>
> Hi Shane,
>
> We are working on a project at 2009-2013 Prince of Wales Dr (Ottawa, Ontario). Could you please size the required CDS for 80% TSS removal for the following drainage area?
>
> Roof Area: 1 546 sq.m
> Hard Area: 2 120 sq.m
> Soft Area: 8 427 sq.m
> Total Catchment Area: 12 093sq.m
> C: 0.48
>
> Thanks,
>
> --

Laurent Brosseau

D.B. GRAY ENGINEERING INC.

Stormwater Management - Grading & Drainage - Storm & Sanitary Sewers - Watermains

700 Long Point Circle Tel: 613-425-8044
Ottawa, Ontario K1T 4E9 l.brosseau@dbgrayengineering.com

--

Laurent Brosseau

D.B. GRAY ENGINEERING INC.

Stormwater Management - Grading & Drainage - Storm & Sanitary Sewers - Watermains

700 Long Point Circle Tel: 613-425-8044
Ottawa, Ontario K1T 4E9 l.brosseau@dbgrayengineering.com

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Laurent Brosseau

D.B. GRAY ENGINEERING INC.

Stormwater Management - Grading & Drainage - Storm & Sanitary Sewers - Watermains

700 Long Point Circle Tel: 613-425-8044
Ottawa, Ontario K1T 4E9 l.brosseau@dbgrayengineering.com

--

Laurent Brosseau

D.B. Gray Engineering Inc.
700 Long Point Circle
Ottawa, Ontario K1T 4E9
613-425-8044

CDS TSSR-2009-2013 Prince of Wales,Dr., Ottawa - R2 20-Feb-2024.pdf
474K

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD
BASED ON A OK - 110 PARTICLE SIZE DISTRIBUTION

Project Name: 2009-2016 Prince of Wales Dr.
Location: Ottawa, ON
OGS #: OGS

Engineer: D. B. Gray Engineering Inc.
Contact: Laurent Brosseau
Report Date: 20-Feb-24

Area	0.3961	ha	**Rainfall Station #**	215	
Weighted C	0.53		**Particle Size Distribution**	OK - 110	
CDS Model	2015-4		**CDS Treatment Capacity**	20	l/s

Rainfall Intensity[1] (mm/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (l/s)	Treated Flowrate (l/s)	Operating Rate (%)	Removal Efficiency (%)	Incremental Removal (%)
0.5	9.2%	9.2%	0.3	0.3	1.5	98.4	9.0
1.0	10.6%	19.8%	0.6	0.6	2.9	98.0	10.4
1.5	9.9%	29.7%	0.9	0.9	4.4	97.6	9.7
2.0	8.4%	38.1%	1.2	1.2	5.9	97.2	8.1
2.5	7.7%	45.8%	1.5	1.5	7.4	96.7	7.4
3.0	5.9%	51.7%	1.8	1.8	8.8	96.3	5.7
3.5	4.4%	56.1%	2.0	2.0	10.3	95.9	4.2
4.0	4.7%	60.7%	2.3	2.3	11.8	95.5	4.5
4.5	3.3%	64.0%	2.6	2.6	13.2	95.1	3.2
5.0	3.0%	67.1%	2.9	2.9	14.7	94.6	2.9
6.0	5.4%	72.4%	3.5	3.5	17.7	93.8	5.1
7.0	4.4%	76.8%	4.1	4.1	20.6	92.9	4.0
8.0	3.5%	80.3%	4.7	4.7	23.6	92.1	3.3
9.0	2.8%	83.2%	5.3	5.3	26.5	91.3	2.6
10.0	2.2%	85.3%	5.8	5.8	29.4	90.4	2.0
15.0	7.0%	92.3%	8.8	8.8	44.2	86.2	6.0
20.0	4.5%	96.9%	11.7	11.7	58.9	82.0	3.7
25.0	1.4%	98.3%	14.6	14.6	73.6	77.8	1.1
30.0	0.7%	99.0%	17.5	17.5	88.3	73.5	0.5
35.0	0.5%	99.5%	20.4	19.8	100.0	68.1	0.3
40.0	0.5%	100.0%	23.3	19.8	100.0	59.6	0.3
45.0	0.0%	100.0%	26.3	19.8	100.0	53.0	0.0
50.0	0.0%	100.0%	29.2	19.8	100.0	47.7	0.0
							94.0

Removal Efficiency Adjustment[2] = 6.5%

Predicted Net Annual Load Removal Efficiency = 87.5%

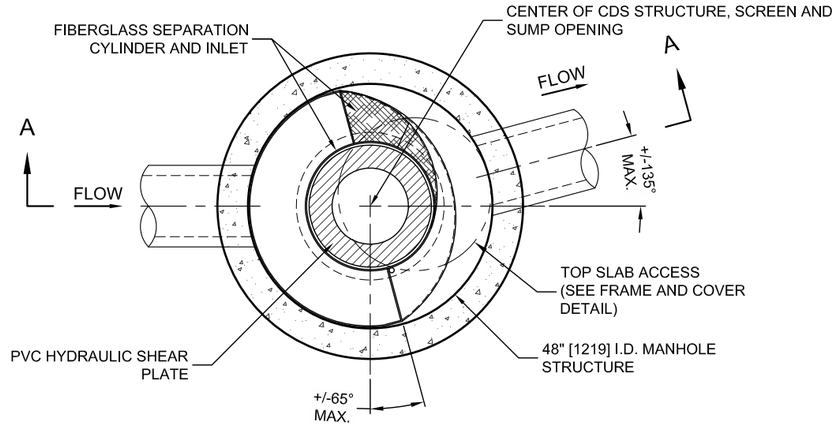
Predicted Annual Rainfall Treated = 99.9%

1 - Based on 42 years of hourly rainfall data from Canadian Station 6105976, Ottawa ON

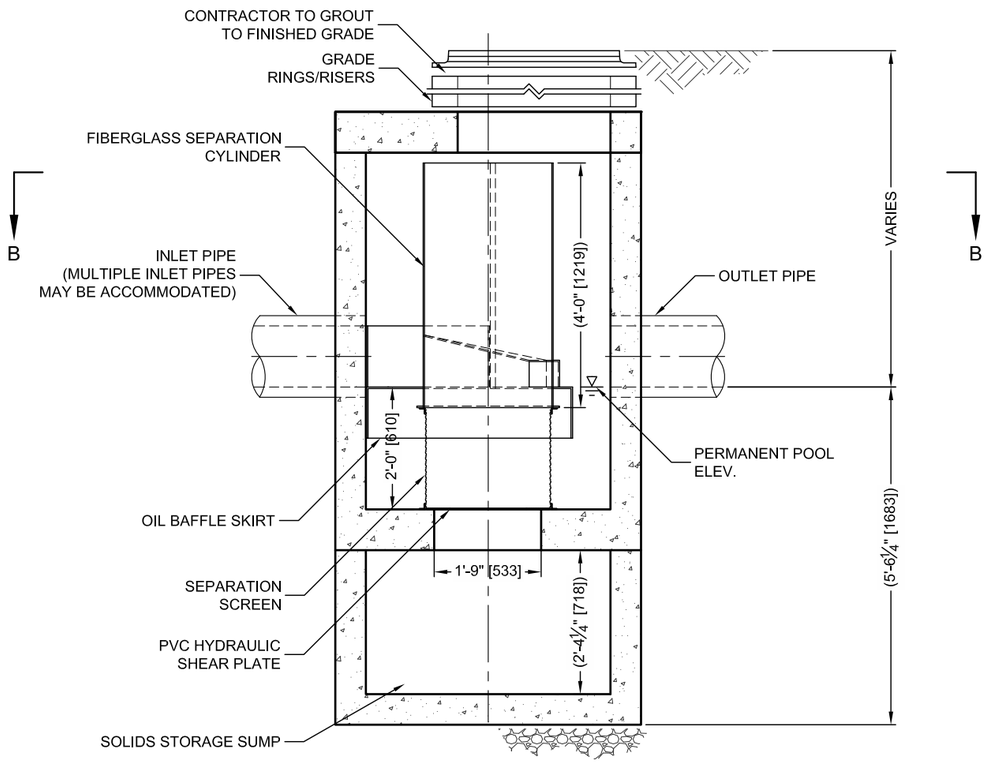
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

3 - CDS efficiency based on testing conducted at the University of Central Florida.

4 - CDS design and scaling based on original manufacturer model and product specifications.



PLAN VIEW B-B
N.T.S.



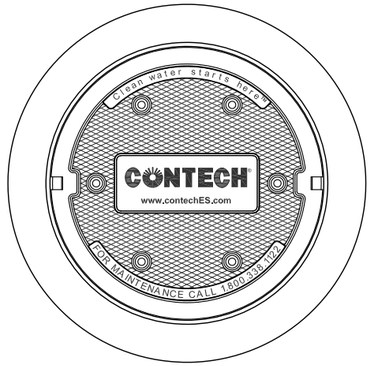
ELEVATION A-A
N.T.S.

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,788,848; 6,641,720; 8,511,500; 6,581,783; RELATED FOREIGN PATENTS, OR OTHER PATENTS PENDING.

CDS PMSU2015-4-C DESIGN NOTES

THE STANDARD CDS PMSU2015-4-C CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES
CUSTOMIZABLE SUMP DEPTH AVAILABLE
ANTI-FLOTATION DESIGN AVAILABLE UPON REQUEST



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	
WATER QUALITY FLOW RATE (CFS OR L/s)	*
PEAK FLOW RATE (CFS OR L/s)	*
RETURN PERIOD OF PEAK FLOW (YRS)	*
SCREEN APERTURE (2400 OR 4700)	*

PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*

RIM ELEVATION	*

ANTI-FLOTATION BALLAST	WIDTH	HEIGHT
	*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.contechES.com
4. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET HS20 (AASHTO M 306) LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
6. PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO ADD JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS, AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CONTECH® ENGINEERED SOLUTIONS LLC
www.contechES.com
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800-338-1122 513-645-7000 513-645-7993 FAX

CDS PMSU2015-4-C INLINE CDS STANDARD DETAIL

D.B. Gray Engineering Inc.

Stormwater Management - Grading & Drainage - Storm & Sanitary Sewers - Watermains

700 Long Point Circle
Ottawa, Ontario K1T 4E9

613-425-8044
d.gray@dbgrayengineering.com

STORM SEWER CALCULATIONS

Rational Method

FIVE YEAR EVENT

2009-2013 Prince of Wales
7 Lot development
Ottawa, Ontario

January 7, 2025

Manning's Roughness Coefficient: 0.013

Location		Individual					Cumulative				Sewer Data							
From	To	Roof C = 0.90 (ha)	Hard C = 0.90 (ha)	Gravel C = 0.70 (ha)	Soft C = 0.20 (ha)	2.78AC	2.78AC	Time (min)	Rainfall Intensity (mm/hr)	Flow Rate (L/s)	Length (m)	Nominal Diameter (mm)	Actual Diameter (mm)	Slope (%)	Velocity (m/s)	Q_{Full} Capacity (L/s)	Time (min)	Q / Q_{Full}
CB-1	CB/MH-4				0.0357	0.0198	0.0198	10.00	104	2.07	5.8	250	251	2	1.72	85.00	0.06	0.02
CB/MH-4	CB/MH-4A					0.0000	0.0198	10.06	104	2.06	25.7	250	251	0.43	0.80	39.41	0.54	0.05
CB-2	CB/MH-4A				0.0555	0.0309	0.0309	10.00	104	3.22	6.7	250	251	0.43	0.80	39.41	0.14	0.08
CB-3	CB/MH-4A	0.0406	0.0619		0.0636	0.2918	0.2918	10.00	104	30.41	3.1	250	251	1	1.21	60.10	0.04	0.51
CB/MH-4A	MH-5	0.0302	0.0527		0.0559	0.2385	0.5810	10.59	101	58.77	51.9	375	366	0.26	0.80	83.79	1.09	0.70
MH-5	CB/MH-6					0.0000	0.5810	11.68	96	55.83	21.3	375	366	0.26	0.80	83.79	0.45	0.67
CB/MH-6	CB/MH-8		0.0008		0.0348	0.0214	0.6024	12.13	94	56.72	41.1	375	366	0.95	1.52	160.17	0.45	0.35
CB/MH-7	MH-7A	0.0422			0.4071	0.3319	0.3319	10.00	104	34.59	70.9	250	251	0.43	0.80	39.41	1.48	0.88
MH-7A	CB/MH-8					0.0000	0.3319	11.48	97	32.18	53	250	251	0.43	0.80	39.41	1.11	0.82
CB/MH-8	Rideau	0.0093			0.2110	0.1406	1.0749	12.59	92	99.15	23.7	375	366	3.7	3.00	316.10	0.13	0.31
	River																	

APPENDIX E

DEVELOPMENT SERVICING STUDY CHECKLIST

GENERAL

Executive Summary: **N/A**

Date and revision number of report: **Included**

Location map and plan showing municipal address, boundary and layout of proposed development: **Included**

Plan showing site and location of all existing services: **Included**

Development statistics, land use, density, adherence to zoning and Official Plan and reference to applicable watershed and subwatershed plans: **N/A**

Summary of Pre-Application Consultation meetings with City of Ottawa and other approval agencies: **Included**

Confirmation of conformance with higher level studies: **N/A**

Statement of objectives and servicing criteria: **Included**

Identification of existing and proposed infrastructure available in the immediate area: **Included**

Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development: **N/A**

Concept level master grading plan to confirm existing and proposed grades in the proposed development: **Included**

Identification of potential impacts of proposed piped services on private services on adjacent lands: **N/A**

Proposed phasing of proposed development: **N/A**

Reference to geotechnical studies: **Included**

All preliminary and formal site plan submissions should have the following information:

- Metric scale: **Included**
- North arrow: **Included**
- Key plan: **Included**
- Property limits: **Included**
- Existing and proposed structures and parking areas: **Included**
- Easements, road widenings and right-of-ways: **Included**
- Street names: **Included**

WATER SERVICING

Confirmation of conformance with Master Servicing Study: **N/A**

Availability of public infrastructure to service proposed development: **Included**

Identification of system constraints: **Included**

Identification of boundary conditions: **Included**

Confirmation of adequate domestic supply: **Included**

Confirmation of adequate fire flow: **Included**

Check of high pressures: **Included**

Definition of phasing constraints: **N/A**

Address reliability requirements: **Included**

Check on necessity of a pressure zone boundary modification: **N/A**

Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for proposed development: **Included**

Description of proposed water distribution network: **Included**

Description of required off-site infrastructure to service proposed development: **N/A**

Confirmation that water demands are calculated based on the City of Ottawa Water Design Guidelines: **Included**

Provision of a model schematic showing the boundary conditions locations, streets, parcels and building locations: **Included**

SANITARY SERVICING

Summary of proposed design criteria: **Included**

Confirmation of conformance with Master Servicing Study: **N/A**

Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the City of Ottawa Sewer Design Guidelines: **N/A**

Description of existing sanitary sewer available for discharge of wastewater from proposed development: **Included**

Verification of available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service proposed development: **N/A**

Calculations related to dry-weather and wet-weather flow rates: **Included**

Description of proposed sewer network: **Included**

Discussion of previously identified environmental constraints and impact on servicing: **N/A**

Impacts of proposed development on existing pumping stations or requirements for new pumping station: **N/A**

Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity: **N/A**

Identification and implementation of emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding: **N/A**

Special considerations (e.g. contamination, corrosive environment): **N/A**

STORMWATER MANAGEMENT & STORM SERVICING

Description of drainage outlets and downstream constraints: **Included**

Analysis of available capacity in existing public infrastructure: **N/A**

Plan showing subject lands, its surroundings, receiving watercourse, existing drainage pattern and proposed drainage pattern: **Included**

Water quantity control objective: **Included**

Water quality control objective: **Included**

Description of the stormwater management concept: **Included**

Setback from private sewage disposal systems: **N/A**

Watercourse and hazard lands setbacks: **N/A**

Record of pre-consultation with the Ministry of the Environment, Conservation and Parks and the Conservation Authority having jurisdiction on the affected watershed: **Included**

Confirmation of conformance with Master Servicing Study: **N/A**

Storage requirements and conveyance capacity for minor events (5-year return period) and major events (100-year return period): **Included**

Identification of watercourses within the proposed development and how watercourses will be protected or if necessary altered by the proposed development: **N/A**

Calculation of pre-development and post-development peak flow rates: **N/A**

Any proposed diversion of drainage catchment areas from one outlet to another: **N/A**

Proposed minor and major systems: **N/A**

If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100-year return period storm event: **N/A**

Identification of potential impacts to receiving watercourses: **N/A**

Identification of municipal drains: **N/A**

Description of how the conveyance and storage capacity will be achieved for the proposed development: **Included**

100-year flood levels and major flow routing: **N/A**

Inclusion of hydraulic analysis including hydraulic grade line elevations: **N/A**

Description of erosion and sediment control during construction: **Included**

Obtain relevant floodplain information from Conservation Authority: **N/A**

Identification of fill constraints related to floodplain and geotechnical investigation: **N/A**

APPROVAL AND PERMIT REQUIREMENTS

Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not the approval authority for the Lakes and Rivers Improvement Act. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act: **N/A**

Application for Certificate of Approval (CofA) under the Ontario Water Resources Act: **N/A**

Changes to Municipal Drains: **N/A**

Other permits (e.g. National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation): **N/A**

CONCLUSIONS

Clearly stated conclusions and recommendations: **Included**

Comments received from review agencies: **N/A**

Signed and stamped by a professional Engineer registered in Ontario: **Included**