DILLON CONSULTING

170 COLUMBIA WATERLOO INCORPORATED

Transportation Noise and Vibration Assessment

170 and 180 Columbia Street West
Waterloo, Ontario

August 2026 – 24-8475

Last Updated October 22, 2019

Appendix A: Consultant Statutory Declaration

CANADA

PROVINCE OF ONTARIO

) In the Matter of the
) Environmental Protection
) Act and the Planning Act
)
)
) And in the Matter of Part Lot
)
) in the City of
) in the Regional Municipality
) of Waterloo

I, Amir A. Iravani, Ph.D., P.Eng. , of the City of Toronto, in the Regional Municipality of Toronto, SOLEMNLY DECLARE THAT:

1. I am a (Professional Engineer/Registered Professional Planner/employed by Dillon Consulting Limited which holds a Certificate of Authorization) and have personal knowledge of the matters set out below.

2. I was retained or employed as the principal consultant to undertake the assessment of noise impacts and recommendation of noise mitigation measures for the property described as **170-180 Columbia Street West, in the municipality of Waterloo, Ontario.**

3. I had the expertise required to perform these services. Any assessment activities or recommendations requiring the application of engineering principles have been undertaken or supervised by an engineer qualified to perform such services.

4. The information used in the studies entitled **170 Columbia Waterloo Incorporated Transportation Noise and Vibration Assessment** and **170 Columbia Waterloo Incorporated Land Use Compatibility Assessment**, both dated **August 6, 2026** is the best available information as of the date of the study.

5. The noise level calculations, the interpretation of noise attenuation requirements, and the recommended measures are in accordance with Ministry of Environment, Conservation and Parks Guidelines, Region of Waterloo policies, and any applicable policy or guidelines of the Area Municipality, and any other applicable policy or guideline.

6. The physical noise attenuation measures proposed in this study are feasible to implement and will provide the level of attenuation indicated in the study.

7. I acknowledge that this study may be subject to a peer review conducted at my cost.

8. I acknowledge that public authorities and future owners, occupants and others may rely on this statement.

AND I make this solemn Declaration conscientiously believing it to be true and knowing that it is of the same force and effect as if made under oath.

Remotely

DECLARED before me at the City)
of London, by the declarant in Toronto,))
in accordance with O. Reg 431/20)

this 6th day of August 2026.)

Commissioner of Oaths & Notary Public
Brayden Loie Theodore Krell
Licensed Paralegal
LSO #P16208
Province of Ontario

Susanna Reid, MCIP, RPP
Senior Planner, Regional Growth, Development and Sustainability Services Planning,
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Submitted via email to: sreid@regionofwaterloo.ca

170 Columbia Waterloo Incorporated
"Transportation Noise and Vibration Assessment" & "Land Use Compatibility Assessment" prepared by Dillon Consulting
170 and 180 Columbia Street West, Waterloo

I am the owner of the property, and that I understand and agree with the noise attenuation measures proposed in the studies entitled "Transportation Noise and Vibration Assessment" and "Land Use Compatibility Assessment" both dated August 2026;

The application has been designed to avoid the use of berms or walls as noise attenuation features where feasible. Where berms or walls are recommended, the Noise Study provides economic, planning and engineering justification; and

If the application is changed in a way that may affect the noise level calculations, I will have a revised noise study submitted to the Region.

Eva Rygielski

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1.0 Introduction

1.1 Purpose and Objectives

Dillon Consulting Limited (Dillon) was retained by 170 Columbia Street Incorporated to complete a Transportation Noise and Vibration Assessment (the Assessment) as requested by the Region of Waterloo in support of a Proposed Development located at 170 and 180 Columbia Street West, in Waterloo, Ontario (the Proposed Development). This Assessment has been completed in support of a submission application for the Proposed Development.

Previous versions of this Assessment were prepared by Dillon Consulting Limited (Dillon) in April 2025 and February 2026. This version of the Assessment has been updated to address the Peer Review Comments provided by RWDI, dated May 7, 2026, as well as to reflect an updated Site Plan dated July 10, 2026.

The Transportation Noise and Vibration Assessment presented herein was prepared in accordance with the guidelines and requirements of the Region of Waterloo, the City of Waterloo's Terms of Reference: Noise and Vibration Studies, and the Ontario Ministry of Environment, Conservation and Parks (MECP).

This assessment does not include construction noise and vibration assessment. Upon approval of the Proposed Development and determination of construction details (e.g., equipment, activities, laydown areas etc.) and prior to commencement of the project construction phase, it is recommended that a comprehensive construction noise and vibration assessment be undertaken to determine potential mitigation measures and best management practices to minimize impacts.

1.2 The Project and Surrounding Areas

The Proposed Development of the Subject Site will include the following building:

- Phase 01 – 35 storey tower consisting of 439 residential units;
- Phase 02 – 30 storey tower consisting of 379 residential units;
- Phase 03 – 35 storey tower consisting of 443 residential units;
- Phase 04 – 25 storey tower consisting of 268 residential units; and
- Phase 05 – 30 storey tower consisting of 378 residential units.

Each tower is expected to consist of residential dwellings and ground floor office/retail space.

The subject lands are located north of Columbia Street West and east of the Waterloo Central Railway Guelph Spur Line. At the time of this assessment, the subject lands are occupied by office spaces. The subject lands are surrounded by Station Area Mixed-use and/or University College land uses in each direction.

The subject site and surrounding area are shown in **Figure 1**. The conceptual development is shown in **Appendix A**.

2.0 Transportation Noise and Vibration

This section investigates noise impacts from nearby transportation sources on the proposed sensitive uses as well as vibration impacts on the proposed sensitive uses from the adjacent railway right-of-way.

2.1 Transportation Noise Assessment

The transportation sources with the potential to impact the Proposed Development include:

- Freight rail traffic on the Waterloo Central Railway Guelph Spur Line;
- Light rail transit on the Waterloo Central Railway Guelph Spur Line;
- Road traffic along Columbia Street West; and
- Road traffic along Phillip Street.

Impacts from rail and road were predicted and compared against the applicable criteria in the City of Waterloo Terms of Reference (TOR) for Noise and Vibration Studies, the Regional Municipality of Waterloo Noise Policy Implementation Guideline, and the MECP's noise guideline publication, *NPC 300 – Environmental Noise Guideline – Stationary and Transportation Sources – Approvals and Planning* (2013). NPC-300 outlines noise level criteria for sensitive land uses, which assist in determining requirements for façade construction, ventilation requirements, warning clauses, and potential noise barriers for the Proposed Development.

2.2 City of Waterloo's Terms of Reference (ToR): Noise & Vibration Study

The City of Waterloo's Terms of Reference (ToR) for Noise Studies establishes standardized technical requirements and expectations for reports submitted under the Ontario Planning Act. The primary objective of the document is to demonstrate compatibility between noise sources—specifically road traffic, rail (including ION Light Rail), and stationary industrial or commercial sources—and sensitive points of reception.

A fundamental principle of the guidelines is the strong preference for passive mitigation measures, such as increased setbacks and noise-insensitive land use buffers, over physical noise barriers or on-receiver mitigation. The ToR requires that all submissions be compliant with the Accessibility for Ontarians with Disabilities Act (AODA), [2005] and meet the reporting checklist.

The City of Waterloo's ToR for vibration study establishes the technical standards and submission requirements for demonstrating compatibility between vibration sources (e.g., rail operation) and vibration-sensitive locations. These guidelines mandate that studies be prepared by qualified professionals to assess human comfort regarding rail operations within a 75-meter zone of influence. The TOR dictates strict adherence to vibration velocity criteria, requiring on-site measurements, detailed reporting of results, and the design of mitigation or monitoring programs signed by a Professional Engineer where necessary.

2.3 Noise Criteria

The applicable transportation noise criteria, as outlined in both of the Regional Municipality of Waterloo Noise Policy Implementation Guideline and Part C of NPC-300, is presented in **Table 1** through **Table 5**. **Table 1** summarizes the indoor sound level limits based on the type of space assessed, time of day, transportation noise source, and the maximum allowable equivalent sound levels from railway sources. The indoor noise levels are based on the assumption of closed windows and doors.

Table 1: Indoor Sound Level Limits for Road and Rail

Type of Space	Time Period	Equivalent Sound Level – L_{eq}	
		Road	Rail
General offices, reception areas, retail stores, etc.	Daytime 07:00 – 23:00	50 dBA	45 dBA
Living/dining areas of residences, hospitals, nursing homes, schools, daycares, etc.	Daytime 07:00 – 23:00	45 dBA	40 dBA
Living/dining areas of residences, hospitals, nursing homes, etc. (except schools and daycares)	Night-time 23:00 – 07:00	45 dBA	40 dBA
Sleeping quarters of residences	Daytime 07:00 – 23:00	45 dBA	40 dBA
	Night-time 23:00 – 07:00	40 dBA	35 dBA
Sleeping quarters of hotels	Night-time 23:00 – 07:00	45 dBA	40 dBA

Table 2 outlines the maximum equivalent plane-of-window sound levels for road and rail where if exceeded, a detailed building component design assessment is required to ensure the indoor sound level limits (see **Table 1**) are achieved.

Table 2: Requirements for Building Component Assessment

Assessment Location	Time Period	Equivalent Sound Level – L_{eq}	
		Road	Rail[1]
Plane of window for living area or sleeping quarters	Daytime (07:00 – 23:00)	65 dBA	60 dBA
	Night-time (23:00 – 07:00)	60 dBA	55 dBA

Note: [1] Whistle noise is included for the building component and indoor noise assessment.

The MECP's NPC-300 Noise Guideline outlines façade construction requirements for proposed residential developments within 100 metres of rail tracks, shown in **Table 3**. These requirements apply only to the first row of dwellings.

Table 3: Façade Construction Requirements

Assessment Location	Equivalent Sound Level – L_{eq} 24hr[1]	Façade Construction Requirement
Plane of window for living area or sleeping quarters	> 60 dBA	Brick veneer or acoustical equivalent
	≤ 60 dBA	No requirement

Note: [1] Whistle noise is included for façade construction requirements.

Table 4 summarizes potential noise warning clauses and ventilation requirements that should be used to warn of potential annoyance due to existing noise sources related to road and rail. Whistle noise is not included in the determination of warning clause requirements.

Table 4: Ventilation and Warning Clause Requirements for Road and Rail

Assessment Location	Time Period	Equivalent Sound Level – L_{eq} Road/Rail[1]	Ventilation and Warning Clause Requirements
Plane of window for living area or sleeping quarters	Daytime (07:00 – 23:00)	≤ 55 dBA	No Requirement.
		> 55 dBA and ≤ 65 dBA	Provision for the installation of central air conditioning with a Type C warning clause.
		> 65 dBA	Installation of central air conditioning with a Type D warning clause.
Plane of window for living area or sleeping quarters	Nighttime (23:00 – 7:00)	≤ 50 dBA	No Requirement.
		> 50 dBA and ≤ 60 dBA	Provision for the installation of central air conditioning with a Type C warning clause.
		> 60 dBA	Installation of central air conditioning with a Type D warning clause.

Note: [1] Whistle noise is not included in combined road/rail assessments for warning clause requirements.

The applicable noise criteria for Outdoor Living Areas (OLAs) specific to surface transportation are presented in **Table 5**. If the 16-Hour Equivalent Sound Level (Leq 16hr) at an OLA is greater than 55 dBA and less than or equal to 60 dBA, noise control measures may be applied to reduce the sound level to 55 dBA. Otherwise, prospective purchasers or tenants should be informed of potential elevated noise levels by way of warning clause Type A. For Leq 16-hr of greater than 60 dBA, noise mitigation measures are required to reduce the noise levels to 55 dBA or less. Whistle noise is not included in the determination of the rail outdoor sound level.

Table 5: OLA Level Limits for Road and Rail Noise

Assessment Location	Equivalent Sound Level – L_{eq} 16hr[1],[2] Road/Rail	Noise Control Measures and Warning Clause Requirements
Outdoor Living Area	≤ 55 dBA	No requirement.
	> 55 dBA and ≤ 60 dBA	Installation of noise control measure OR a Type A warning clause.
	> 60 dBA	Installation of noise control measure with a Type B warning clause.

Notes: [1] Daytime only (07:00 – 23:00)
[2] Whistle noise is not included in assessment of rail noise for warning clause requirements.

2.3.1 Transportation Sources

In assessing potential transportation noise impacts on the Proposed Development, train movements from the Waterloo Central Railway Guelph Spur Line and road traffic along Columbia Street West and Phillip Street were analyzed as surface transportation sources. All traffic data used in modelling road and rail traffic is included in **Appendix B**.

2.3.1.1 Rail Noise Sources

The Proposed Development is located directly east of the Waterloo Central Railway Guelph Spur Line. Dillon received rail traffic information from Waterloo Central Railway (WCR), the railway operator. Based on the information received, rail activity along the subject spur line consists of 1 freight passby during nighttime period (23:00-07:00). Each freight train can consist of up to 2 locomotives and up to 12 cars. The WCR confirmed that the speed limit for freight trains is 10 miles per hour. Non-emergency whistle noise for at-grade crossing in proximity to the Proposed Development is prohibited and was therefore not considered in this assessment. Freight rail traffic volumes were predicted 10 years into the future using an annual growth rate of 2.5%, as per CN's direction for assessing rail noise impacts.

The Grand River Transit's Ion light rail transit (LRT) also uses the Waterloo Central Railway Guelph Spur Line in proximity to the Proposed Development during daytime/evening period (07:00-23:00) and portions of the nighttime period. LRT traffic volumes were determined based on the publicly available train schedule at the time of preparing this assessment. LRT service during the daytime period consists of 2-way service every 10 to 15 minutes, resulting in approximately 175 LRT passbys along the subject rail spur line. LRT service during the nighttime period starts at 23:10 and ends at 04:47, resulting in approximately 19 LRT passbys during nighttime. While transportation noise assessments recommend that traffic volumes are predicted 10 years into the future, given the current frequency of service (i.e., every 10 – 15 minutes), LRT traffic volumes during the daytime period are not expected to notably increase. However, LRT traffic volumes during the nighttime period have the potential to increase. As such, the LRT nighttime traffic volumes were predicted 10 years into the future using an annual growth rate of 2.5%.

Based on observations made during the site visit of March 11th, 2025, LRT in proximity to the Proposed Development travels at approximately 36 km/h (note: average travel speed listed on the ION website is 25 km/h).

Rail traffic data assumed and forecasted to 2035 is presented in **Table 6**.

Table 6: Future (2035) Rail Traffic Data

Train Type	Daytime Trains (07:00-23:00)	Nighttime Trains (23:00-07:00)	Locomotives per Train	Cars per Train	Speed [km/h]
Freight	0	2.6	2	12	16
LRT	175	24	1	4	36

2.3.1.2 Road Noise Sources

The development area is located north of Columbia Road West and west of Phillip Street. Road traffic data was obtained from the Region of Waterloo. Per the Regional standard a 90% and 10% split for daytime and nighttime traffic volumes, respectively, was used in the analysis. The forecasted future (2034) road traffic data is presented in **Table 7**. As specified by the Region of Waterloo, the provided future road traffic data (i.e., AADT) is valid until December 31st, 2026, which is well beyond the timeline on this assessment.

Table 7: Future (2034) Road Traffic Data

Roadway	2034 AADT	Medium Trucks (%)	Heavy Trucks (%)	Posted Speed Limit (km/h)
Columbia Street West	22,600	1.0	2.0	50
Phillip Street	4,300	1.0	1.0	50

2.3.2 Predicted Sound Level

The noise analysis was completed using Cadna/A, a noise propagation software. The Cadna/A software includes the implementation of the Transportation Noise Model (TNM) roadway algorithms, as well as the Federal Transit Administration/Federal Railroad Administration (FTA/FRA) railway algorithms. The model is capable of incorporating various site specific features, such as elevation, berms, absorptive grounds, and barriers to accurately predict noise levels at specific receptors, pertaining to noise emissions from a particular noise source. The model accounts for reduction in sound level due to increased distance and geometrical spreading, air absorption, ground attenuation, and acoustical shielding by intervening structures and topography. The model is considered conservative as it represents atmospheric conditions that promote propagation of sound from source to receptor.

2.3.2.1 Railway Analysis

The railway noise impact assessment was conducted using the FRA algorithm for freight train traffic and FTA algorithm for LRT traffic implemented though Cadna/A. The model's inputs are outlined in **Section 2.3.1**.

In order to confirm the modelling results of the FRA protocol implemented through Cadna/A, a comparative analysis was completed for rail traffic noise modelling in which the results from FRA in Cadna/A were compared against those of STEAM implemented through STAMSON Version 5.04. This comparative analysis is discussed in **Section 2.3.4**.

2.3.2.2 Roadway Analysis

The assessment for roadway impact noise was completed using the TNM, developed by the Federal Highway Administration (FHWA), implemented through Cadna/A. The model inputs used for the TNM algorithm are outlined in **Section 2.3.1**.

In order to confirm the modelling results of the TNM protocol implemented through Cadna/A, a comparative analysis was completed for road traffic noise modelling in which the results from TNM in Cadna/A were compared against those of ORNAMENT implemented through STAMSON Version 5.04. This comparative analysis is discussed in **Section 2.3.4**.

2.3.2.3 Sensitive Receptor Locations

For the purposes of this study, the building evaluation function implemented in Cadna/A was used to determine the worst-case impacts on each façade of the Proposed Development. Based on the latest site plan received for the Proposed Development (dated December 9, 2025), there will be terraces located atop the podium at level 7 of each tower with depths of greater than 4 m. As such, the terraces with terraces of depths greater than 4m have been considered as OLAs in this assessment, as per MECP NPC-300. Additionally, common OLAs were assessed at the rooftop of each tower. The remainder of private balconies are assumed to be less than 4 m in depth, and therefore, are not considered as OLAs in this assessment.

2.3.2.4 Transportation Noise Impacts – Plane of Window

Table 8 summarizes the representative worst-case predicted building façade noise levels from road and rail noise sources at the sensitive receptors within the Proposed Development. Points of reception throughout the Proposed Development are identified with the below notation:

PH# - Phase of development
Podium/Tower (TWR) – The podium or tower location of the development's phase
N/E/S/W – The cardinal direction of the building's façade (north, east, south, or west)

Table 8: Combined Road and Rail Noise Prediction Summary Table – Facade Impacts

Receptor	Time Period	Equivalent Sound Level - L_{eq} [1] [2] [4] [dBA]			
		Road Impacts	Railway Impacts	Combined Road and Rail	24 hr Railway Impacts [3]
PH1-Podium-N	Daytime	44	50	50	48
	Nighttime	37	46	46	
PH1-Podium-E	Daytime	**58**	48	**59**	47
	Nighttime	**52**	44	**52**	
PH1-Podium-S	Daytime	**62**	55	**62**	53
	Nighttime	**55**	**51**	**56**	
PH1-Podium-W	Daytime	**57**	55	**59**	53
	Nighttime	**51**	**51**	**54**	
PH1-TWR-N	Daytime	46	52	53	51
	Nighttime	40	48	48	
PH1-TWR-E	Daytime	**58**	49	**58**	48
	Nighttime	**51**	45	**52**	
PH1-TWR-S	Daytime	**61**	**56**	**62**	54
	Nighttime	**54**	**52**	**56**	
PH1-TWR-W	Daytime	55	**57**	**59**	55
	Nighttime	49	**53**	**54**	
PH2-Podium-N	Daytime	51	53	53	55
	Nighttime	45	50	50	
PH2-Podium-E	Daytime	54	48	55	47
	Nighttime	47	44	49	
PH2-Podium-S	Daytime	54	53	55	49
	Nighttime	47	49	49	
PH2-Podium-W	Daytime	51	53	53	55
	Nighttime	45	49	50	
PH2-TWR-N	Daytime	43	55	55	56
	Nighttime	37	**51**	**51**	
PH2-TWR-E	Daytime	54	49	55	48
	Nighttime	47	45	49	
PH2-TWR-S	Daytime	54	52	**56**	51
	Nighttime	47	48	**51**	
PH2-TWR-W	Daytime	50	**56**	**56**	56
	Nighttime	44	**52**	**52**	
PH3-Podium-N	Daytime	29	**61**	**61**	60
	Nighttime	22	**57**	**57**	
PH3-Podium-E	Daytime	**60**	53	**60**	53
	Nighttime	**53**	50	**54**	
PH3-Podium-S	Daytime	**63**	**61**	**64**	60
	Nighttime	**56**	**58**	**59**	
PH3-Podium-W	Daytime	**58**	**64**	**65**	**63**
	Nighttime	**52**	**61**	**61**	
PH3-TWR-N	Daytime	35	**60**	**60**	60
	Nighttime	29	**57**	**57**	

Receptor	Time Period	Equivalent Sound Level - L_{eq} [1] [2] [4] [dBA]			
		Road Impacts	Railway Impacts	Combined Road and Rail	24 hr Railway Impacts [3]
PH3-TWR-E	Daytime	**58**	51	**59**	50
	Nighttime	**52**	47	**53**	
PH3-TWR-S	Daytime	**62**	**61**	**64**	60
	Nighttime	**55**	**57**	**59**	
PH3-TWR-W	Daytime	**57**	**64**	**65**	**63**
	Nighttime	**51**	**60**	**61**	
PH4-Podium-N	Daytime	37	**61**	**61**	60
	Nighttime	31	**57**	**57**	
PH4-Podium-E	Daytime	50	50	52	49
	Nighttime	43	46	48	
PH4-Podium-S	Daytime	53	**61**	**62**	60
	Nighttime	47	**57**	**58**	
PH4-Podium-W	Daytime	53	**65**	**65**	**64**
	Nighttime	47	**61**	**61**	
PH4-TWR-N	Daytime	38	**61**	**61**	60
	Nighttime	32	**57**	**57**	
PH4-TWR-E	Daytime	51	51	54	50
	Nighttime	45	47	49	
PH4-TWR-S	Daytime	54	**61**	**61**	60
	Nighttime	47	**57**	**57**	
PH4-TWR-W	Daytime	53	**64**	**65**	**63**
	Nighttime	46	**60**	**61**	
PH5-Podium-N	Daytime	40	**62**	**62**	**61**
	Nighttime	34	**58**	**58**	
PH5-Podium-E	Daytime	47	49	51	48
	Nighttime	41	45	47	
PH5-Podium-S	Daytime	50	**61**	**61**	60
	Nighttime	44	**57**	**57**	
PH5-Podium-W	Daytime	51	**65**	**65**	**64**
	Nighttime	44	**61**	**61**	
PH5-TWR-N	Daytime	40	**61**	**61**	60
	Nighttime	34	**57**	**57**	
PH5-TWR-E	Daytime	48	51	52	50
	Nighttime	42	47	48	
PH5-TWR-S	Daytime	51	**61**	**61**	60
	Nighttime	44	**57**	**57**	
PH5-TWR-W	Daytime	51	**64**	**64**	**63**
	Nighttime	44	**60**	**61**	

Notes:
[1] L_{eq} represents maximum predicted impacts along façade.
[2] Predicted noise levels that exceed the applicable limits are presented in **bold**.
[3] 24hr railway impacts are only assessed at the first row of residences that are within 100 m of the railway.
[4] Representative worst-case predicted building façade noise levels.

The predicted transportation sound levels for combined road and rail impacts at the façades of the Proposed Development are presented in **Figure 2** and **Figure 3**, for daytime and nighttime, respectively.

2.3.2.5 Transportation Noise Impacts – Outdoor Living Areas

Table 9 summarizes the predicted road and rail noise levels at identified outdoor living areas.

Table 9: Road and Rail Noise Prediction Summary Table – Daytime Outdoor Impacts

Residential Outdoor Living Area	Road and Rail Noise Impacts– L_{eq}[1][dBA]
PH1-NorthTerrace	48
PH1-EastTerrace	**56**
PH1-SouthTerrace	**59**
PH1-WestTerrace	**56**
PH2-North Terrace	54
PH2-East Terrace	54
PH2-South Terrace	52
PH2-West Terrace	54
PH3-NorthTerrace	53
PH3-EastTerrace	55
PH3-SouthTerrace	**61**
PH4-NorthTerrace	53
PH4-SouthTerrace	**56**
PH5-NorthTerrace	**59**
PH5-SouthTerrace	55
PH1-Rooftop	49
PH2-Rooftop	48
PH3-Rooftop	48
PH4-Rooftop	50
PH5-Rooftop	50
OLA1	50
OLA2	**56**

Note:

[1] Predicted noise levels that exceed the applicable limits are presented in **bold**.

The results indicate that the transportation (road and rail) noise impacts at the Proposed Development exceed the applicable criteria for building façade as well as outdoor living areas. As such, noise mitigation measures are required.

2.3.3 Noise Control Measures

2.3.3.1 Façade Construction Recommendations

Based on the predicted 24 hour rail sound levels shown in **Table 8**, and the applicable criteria outlined in **Table 3,** the following facades of the Proposed Development require brick veneer or acoustical equivalent construction:

- Phase 3 west facade;
- Phase 4 west facade; and
- Phase 5 north and west facades.

Based on the predicted façade sound levels shown in **Table 8**, and the applicable criteria outlined in **Table 2**, a detailed building component design analysis is required to ensure the indoor sound level criteria is met (outlined in **Table 1**) for the following facades of the Proposed Development:

- Phase 3 north, south, and west facades;
- Phase 4 north, south, and west facades; and
- Phase 5 north, south, and west facades.

Indoor sound levels, and the building component analysis were completed using the National Research Council's (NRC) Building Practice Note 56 (BPN56). BPN56 is the method for selecting appropriate STC ratings for the façade and glazing components to control impacts from transportation noise sources and satisfy indoor sound level criterion.

At the time of this assessment, finalized detailed floor and façade plans were not available for the Proposed Development. Typical unit layouts were assumed for the initial building component analysis. It was assumed that façade glazing would be consistent with typical high-rise developments and would be represented by 70% glazed façade for living/dining spaces and 50% glazed façade for sleeping quarters.

Results from a preliminary building component analysis are shown in **Table 10**. As detailed floor plans were not available at the time of this study, typical unit layouts were assumed. Overall window STC requirements were determined using the combined (logarithmic addition) requirements from the individual transportation noise impacts, including, from locomotive, rail traffic, and road traffic noise. STC calculations were completed for daytime and nighttime periods, with the worst-case requirement selected for recommendation. The BPN56 analysis is presented in **Appendix D**.

Table 10: Building Component Analysis Using Maximum Impacts

Building	Minimum Required Glazing (STC)		Minimum Required Exterior Wall
	Living/Dining Area	Sleeping Quarters	
PH3-Podium-N	30	29	OBC Standard
PH3-Podium-S	31	30	OBC Standard
PH3-Podium-W	33	33	Brick Veneer or Acoustical Equivalent
PH3-TWR-N	29	28	OBC Standard
PH3-TWR-S	31	30	OBC Standard
PH3-TWR-W	33	32	Brick Veneer or Acoustical Equivalent
PH4-Podium-N	30	29	OBC Standard
PH4-Podium-S	30	29	OBC Standard
PH4-Podium-W	33	33	Brick Veneer or Acoustical Equivalent
PH4-TWR-N	29	28	OBC Standard
PH4-TWR-S	29	28	OBC Standard
PH4-TWR-W	33	32	Brick Veneer or Acoustical Equivalent
PH5-Podium-N	30	30	Brick Veneer or Acoustical Equivalent
PH5-Podium-S	30	29	OBC Standard
PH5-Podium-W	33	33	Brick Veneer or Acoustical Equivalent
PH5-TWR-N	30	29	Brick Veneer or Acoustical Equivalent
PH5-TWR-S	29	28	OBC Standard
PH5-TWR-W	33	32	Brick Veneer or Acoustical Equivalent

For all other facades of sensitive uses within the Proposed Development, windows and exterior walls conforming to the Ontario Building Code (OBC) are anticipated to be sufficient to ensure the indoor sound level criteria is met (as outlined in **Table 1**). Windows which meet the structural and energy saving requirements of the OBC typically have STC29/STC30 ratings.

The above mentioned STC ratings were conservatively calculated and represent the recommended minimum STC ratings for the windows. Windows should be carefully selected to ensure the entire assembly (frame and glazing) meets the specified minimum STC ratings. It is recommended that manufacturer tests and specifications be reviewed by an Acoustical Consultant upon selection.

Sensitive spaces located on corners of buildings, which have multiple façade exposure and potential contribution from multiple sources may require an increase of up to 3 for the specified STC ratings in **Table 10**. As the design progresses, the façade and glazing requirements should by reviewed by an Acoustical Consultant, ideally at the Site Plan Approval (SPA) stage, to confirm or update the above recommended STC ratings.

2.3.3.2 Ventilation Requirements and Warning Clauses

Based on the predicted façade sound levels shown in **Table 8**, and the applicable criteria outlined in **Table 4**, the units with the following facades will require the installation of air conditioning and Type D warning clause:

- Phase 3 west facade;
- Phase 4 west facade; and
- Phase 5 west facade.

The following units with the following facades of the Proposed Development will require the provision for the installation of central air conditioning and Type C warning clause:

- Phase 1 east, south, and west facades;
- Phase 2 north, south and west façades;
- Phase 3 north, east, and south facades;
- Phase 4 north and south facades; and
- Phase 5 north and south facades.

Additionally, it is recommended that Waterloo Central Railway Guelph Spur Line warning clause regarding the potential for noise and vibration impacts be included for all sensitive locations within 300 metres of their right-of-way. All warning clauses should be included in agreements that are registered on Title for all Offers of Purchase and Sale, lease/rental agreements, and condominium declarations. The list of applicable warning clauses required for the Proposed Development are provided in **Appendix C**.

2.3.3.3 Outdoor Living Areas (OLAs)

As shown in **Table 9**, some of the predicted sound levels of the terrace OLAs exceed 60 dBA. It is recommended that acoustic barriers with a height of 1.5 m be implemented around the south terrace of Phase 3 tower. The location of the acoustic barrier is shown in **Figure 4**. For Phase 1 east, south, and west terraces, Phase 4 south terrace and Phase 5 north terrace, as well as the at-grade common outdoor area OLA2, as the predicted sound levels due to the combined road and rail impact at those OLA locations are between 55 dBA and 60 dBA, noise control measures such as 1.5 m high acoustic barriers around each terrace and OLA2 may be installed. If such noise control measures cannot be implemented, the future purchasers or tenants should be informed of potential noise problems by a Type A warning clause. The predicted with-mitigation sound levels for the terrace and/or at-grade OLAs are presented in **Table 11**. As the site design progresses, the height and location of the recommended acoustic barriers should be reviewed by an Acoustical Consultant and the analysis updated, if required.

Table 11: Mitigated Road and Rail Noise Prediction Summary Table – Daytime/Evening Outdoor Impacts

Residential Outdoor Living Area	Road and Rail Noise Impacts without Whistle – L_{eq} [1]
PH1-NorthTerrace	48
PH1-EastTerrace	**56** [2]
PH1-SouthTerrace	**59** [2]
PH1-WestTerrace	**56** [2]
PH2-North Terrace	54
PH2-East Terrace	54
PH2-South Terrace	52
PH2-West Terrace	54
PH3-NorthTerrace	53
PH3-EastTerrace	55
PH3-SouthTerrace	54
PH4-NorthTerrace	53
PH4-SouthTerrace	**56** [2]
PH5-NorthTerrace	**59** [2]
PH5-SouthTerrace	55
PH1-Rooftop	49
PH2-Rooftop	48
PH3-Rooftop	48
PH4-Rooftop	50
PH5-Rooftop	50
OLA1	50
OLA2	**56** [2]

Notes:

[1] Predicted noise levels that exceed the applicable limits are presented in **bold**.

[2] Type A warning clause is required for future purchasers and tenants.

The acoustic barriers shown in **Figure 4** should have a minimum surface density of 20 kg/m^2, be structurally sounds and appropriately designed to withstand wind and snow load. It should be constructed without surface gaps. Any gaps under the barrier that are necessary for drainage purposes should be minimized in size and localized. A Type A warning clause should be included in all agreements that are registered on Title for all Offers of Purchase and Sale, lease/rental agreements, and condominium declarations. All other assessed OLA locations are predicted to be at or below 55 dBA and do not require warning clauses or mitigation measures.

Given the land limitations at the subject site and the proposed development density, implementing passive noise mitigation measures, as recommended by the City of Waterloo's ToR, such as increasing building setback distances in various cardinal directions and adding buffering zone is not considered

feasible. Installation of noise barriers for the OLA and boosting the STC ratings to reduce indoor noise impacts are considered to be feasible options for the Proposed Development.

2.3.4 TNM/FRA Protocol Confirmation

In order to demonstrate appropriate implementation of TNM and FTA/FRA through Cadna/A, noise modelling results were compared against road and rail noise modelling using MECP's ORNAMENT and STEAM implemented through STAMSON version 5.04. The 2nd storey south façade of the Phase 3 podium during the nighttime period was used for this comparative analysis. The comparison results are presented in **Table 12**.

Table 12: TNM and FRA Protocol in Cadna/A and ORNAMENT Comparison

Assessment Location	TNM and FRA Cadna/A Result	ORNAMENT/STEAM Result	Cadna/A Modelling Parameters	ORNAMENT Modelling Parameters
Phase 3 South Façade 2nd storey	57.0 dBA Nighttime 1 hr Leq	56.4 dBA Nighttime 1 hr Leq	Ground Absorption = 1	Absorptive Ground Surface

The results indicate that the predicted noise impacts obtained through TNM and FRA protocols in Cadna/A and those of ORNAMENT are approximately equivalent. Note that this protocol confirmation does not consider LRT noise impacts. As LRT locomotive are electric powered, they cannot be accurately modelled through the STEAM protocol.

The STAMSON model output is provided in **Appendix E.**

2.4 Rail Vibration Assessment

The proposed development is located adjacent to the Waterloo Central Railway (WCR) Guelph Spur Line. As per the *Guidelines for New Development in Proximity to Railway Operations* (FCM/RAC, 2013), (the Proximity Guidelines), rail vibration assessments are not typically required for rail activity (freight or passenger train passbys) along spur line. However, a rail vibration assessment has been completed to determine potential rail vibration impacts due to the LRT passby as well as the freight train along the WCR Guelph Spur Line.

2.4.1 Vibration Criteria

There are no MECP guidelines with respect to railway vibration and proposed sensitive land-uses. Applicable guidelines for vibration impacts due to railway operations are those published in the *Guidelines for New Development in Proximity to Railway Operations* (FCM/RAC, 2013).

Overall vibration levels from railway activities are recommended not to exceed 0.14 mm/s RMS (root mean square) in the vertical direction between 4 Hz and 200 Hz, on and above the first floor of all dwellings. This criterion is based on the human perception of ground-borne vibration, published in the International Standard ISO 2631-2. Vibration levels from railway operations meeting this criterion will generally not be perceptible by the occupants.

2.4.2 Vibration Measurements

As per Railway Association of Canada's (RAC) Canadian Rail Atlas, the railway in proximity of the Proposed Development is classified as a Spur line (see **Appendix F**). Although as per the Proximity Guidelines, rail vibration assessment is not deemed necessary for a rail spur line, Dillon carried out a confirmatory ground vibration measurement in proximity of the subject rail spur. Ground vibration measurement was conducted on March 11th, 2025, at approximately 2 m from the rail right-of-way. The measurement was conducted for the LRT passbys. In total, ground vibration measurements were gathered for 6 LRT passbys. Additional ground vibration measurements were conducted on July 14th, 2026 for a freight train passby at approximately 2 m from the rail right-of-way. The location of ground vibration measurements was based on accessibility of the site at the time of the assessment. An Instantel Minimate Plus was used to complete the field measurements. The instrument can measure peak particle velocity between 2 to 250 Hz. The vertical RMS was then calculated using an averaging time constant of 1 second. The measurement results are presented in **Table 13.**

Table 13: Rail Vibration Measurements

Date and Time of Rail Passby	Type of Train	Max Vertical RMS (mm/s)	Compliance with Criterion
2025-03-11 11:18	LRT	0.08	Yes
2025-03-11 11:29	LRT	0.08	Yes
2025-03-11 11:36	LRT	0.07	Yes
2025-03-11 11:41	LRT	0.08	Yes
2025-03-11 11:47	LRT	0.07	Yes
2025-03-11 11:50	LRT	0.08	Yes
2026-07-14 00:32	Freight	0.35	No

The location that ground vibration measurements was conducted at is presented in **Figure 5**.

The measured ground vibration levels from LRT train passby were approximately at 55% of the recommended ground vibration criterion of 0.14 mm/s.

The measured ground vibration levels for the freight train passby was found to exceed the applicable criteria. The ground vibration measurements were completed approximately 2 m from the rail right-of-

way, while the closest building footprint is planned to be approximately 9.5 m from the rail right-of-way. However, due to the magnitude of the exceedance, it is expected that freight train vibration impacts at the closest building footprint will exceed the applicable criterion.The assessment of rail vibration impacts from freight train passbys is typically not required for spur lines. This is because freight traffic along spur lines is minimal when compared to main line tracks.

2.4.3 Vibration Mitigation Measures

Mitigation measures will be required to achieve ground vibration criterion of 0.14 mm/s during freight train passbys. Common mitigation measures consist of the following approaches:

Deep Trenching

Deep trench has the following components:

- A minimum depth of 4.5 m or an optimized depth to be determined based on geotechnical report Styrofoam mixture.

A detailed design of the deep trench should be created for the proposed development and account for any shallow bedrock and/or geological conditions that promote ground-borne vibration propagation. Additionally, the design of the deep trench should account for the depth of basements of the proposed development.

Building Isolation

The first row of residences should have building isolation in the form of Styrofoam on the exterior of the concreate base and basement walls and energy absorptive isolation pad (e.g., rubber pads) between the concrete basement and wood framing, where applicable. Detailed design of vibration mitigation measures can be developed during the site plan approval stage.

3.0 Conclusions

Dillon Consulting Limited was retained by 170 Columbia Street Incorporated to complete a Transportation Noise and Vibration Assessment in support of the Proposed Development as requested by the Region of Waterloo. This study has been completed in support of the submission application for the Proposed Development.

The Transportation Noise and Vibration Assessment presented in this report was prepared in accordance with the guidelines and requirements of the Region of Waterloo, the MECP, and the City of Waterloo's Terms of Reference: Noise and Vibration Studies. The findings of this assessment are summarized in the following sub-sections.

It is the recommendation of this report that upon approval of the Proposed Development and determination of construction details (e.g., equipment, activities, laydown areas etc.) and prior to commencement of the project construction phase, a comprehensive construction noise and vibration assessment be undertaken to determine potential mitigation measures and best management practices to minimize impacts.

The physical noise attenuation measures proposed in this study are deemed feasible from an acoustical perspective only, based on the achievement of the required sound level reductions. The structural feasibility, constructability, and physical integrity of these measures (including but not limited to wind loading, snow loading, dead loads, and anchoring details) have not been reviewed as part of this study. All recommended mitigation measures must be reviewed and approved by the project Architect and Structural Engineer to ensure compliance with the Building Code and to verify they can be safely implemented within specific site constraints.

Furthermore, the recommendations in this report are based strictly on the site plans, grading information, and architectural drawings provided at the time of this study. As the proposed development progresses, changes to building heights, orientation, grading, or mechanical layouts may alter the acoustical requirements. Consequently, this assessment should be updated or verified prior to the final design phase to ensure the proposed mitigation measures remain valid and effective.

3.1 Transportation Noise Assessment

The results of the transportation noise assessment confirm that the noise impacts on the Proposed Development can be sufficiently controlled by the following steps:

- Brick veneer or acoustical equivalent façade construction for Phases 3 and 4 west facades, and Phase 5 north and west facades;
- Upgraded glazing for Phases 3, 4, and 5 north, south, and west facades;

- Phases 3, 4, and 5 west facades require the installation of air conditioning and Type D warning clause;
- The provision for the installation of central air condition and Type C warning clause at the following locations:
  - Phase 1 east, south, and west facades;
  - Phase 2 north and west façades;
  - Phase 3 north, east, and south facades;
  - Phase 4 north and south facades; and
  - Phase 5 north and south facades.
- A warning clause regarding potential noise and vibration impacts due to proximity to the Waterloo Central Railway Guelph Spur Line;
- Acoustic barriers with a height of 1.5 m around the south terrace outdoor living area of Phase 3 podium; and
- Type A warning clause at the following locations:
  - Phase 1 south terrace;
  - Phase 2 west terrace;
  - Phase 3 east terrace;
  - Phase 4 south terrace; and
  - Phase 5 north terrace.

All warning clauses should be included in agreements that are registered on Title for all Offers of Purchase and Sale, lease/rental agreements, and condominium declarations.

3.2 Transportation Vibration Assessment

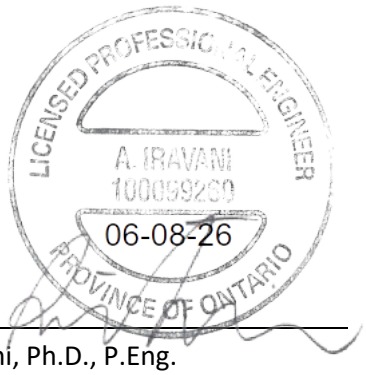
As the Waterloo Central Railway operates the subject rail line (in proximity of the Proposed Development) as a spur line(see **Appendix F**), a rail vibration assessment is not required. However, a rail vibration assessment, consisting of ground vibration measurement was completed for the LRT passby as well as the freight train along the WCR Guelph Spur Line. The measured ground vibration levels, measured at approximately 2m from the rail right-of-way with LRT passby were well below the applicable vibration criterion of 0.14 mm/s. Ground vibration for the freight train passby along the Spur Line exceeded the criterion. As such, vibration mitigation measures would be required. Vibration mitigation measures such as trenching and/or building isolation are typical mitigation options that can be implemented. Detailed design of vibration mitigation measures can be developed during the site plan approval stage.

4.0 Closure

This Transportation Noise and Vibration Assessment has been prepared based on the information provided and/or approved by 170 Columbia Street Incorporated. This report is intended to provide a reasonable review of available information within an agreed work scope, schedule, and budget. This report was prepared by Dillon for the sole benefit of the 170 Columbia Street Incorporated. The material in the report reflects Dillon's judgement in light of the information available to Dillon at the time of this report preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Dillon accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

We trust that the report is to your satisfaction. Please do not hesitate to contact the undersigned if you have any further questions on this report.

DILLON CONSULTING LIMITED



Amir Iravani, Ph.D., P.Eng.
Associate



James Wang, P.Eng.



Callum Heggart, P.Eng.

5.0 References

Ontario Ministry of Environment Publication NPC-300, Environmental Noise Guideline, Stationary and Transportation Sources- Approval and Planning, October 2013.

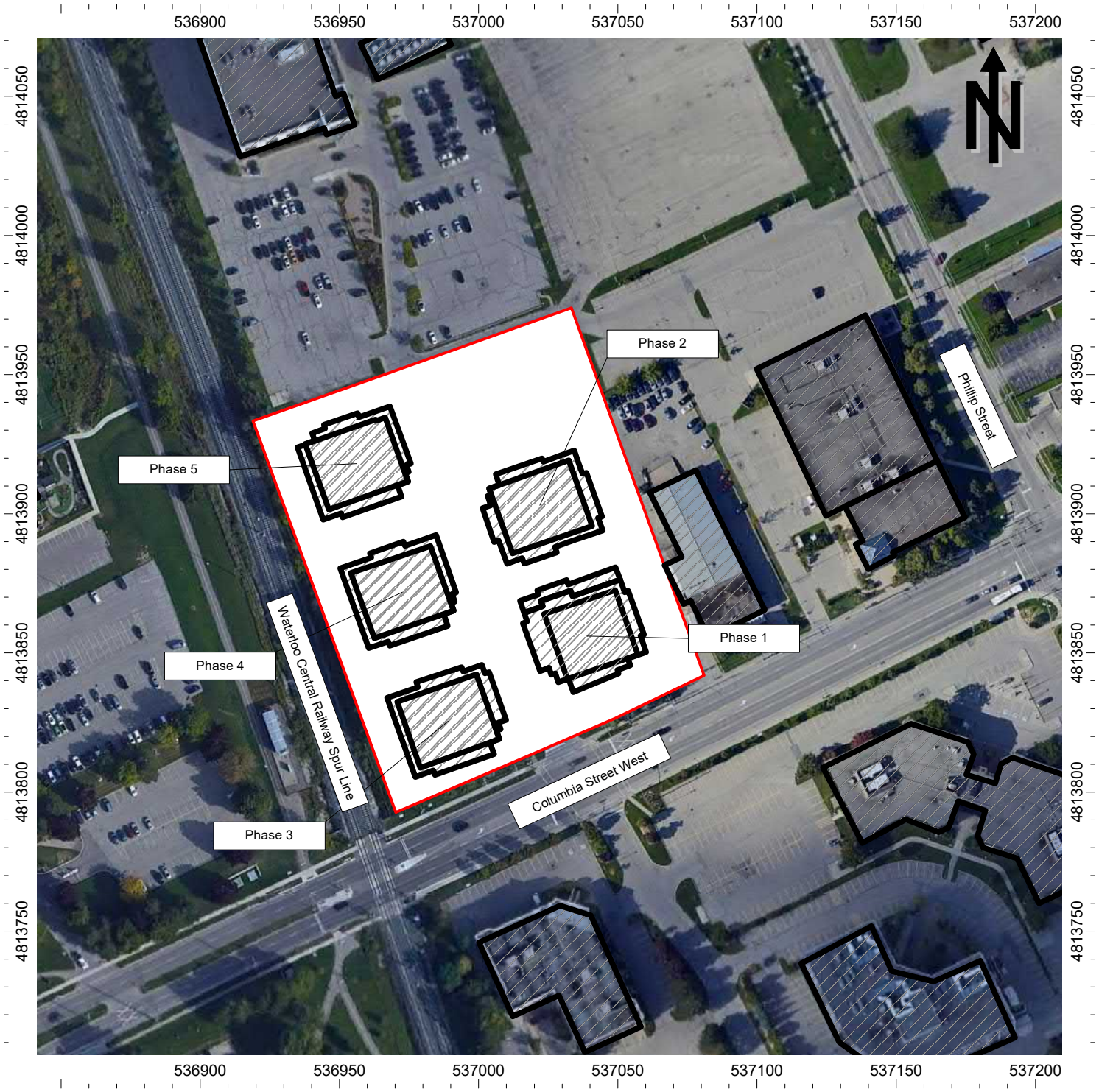
US FTA Transit Noise and Vibration Impact Assessment Manual, 2018

Guidelines for New Development in Proximity to Railway Operations, Railway Association of Canada and Federation of Canadian Municipalities, May 2013.

Regional Municipality of Waterloo Noise Policy Implementation Guideline, 1999.

MECP Environmental land use planning guides, 1995.

Figures



Scale 1: 2,000

Figure 1

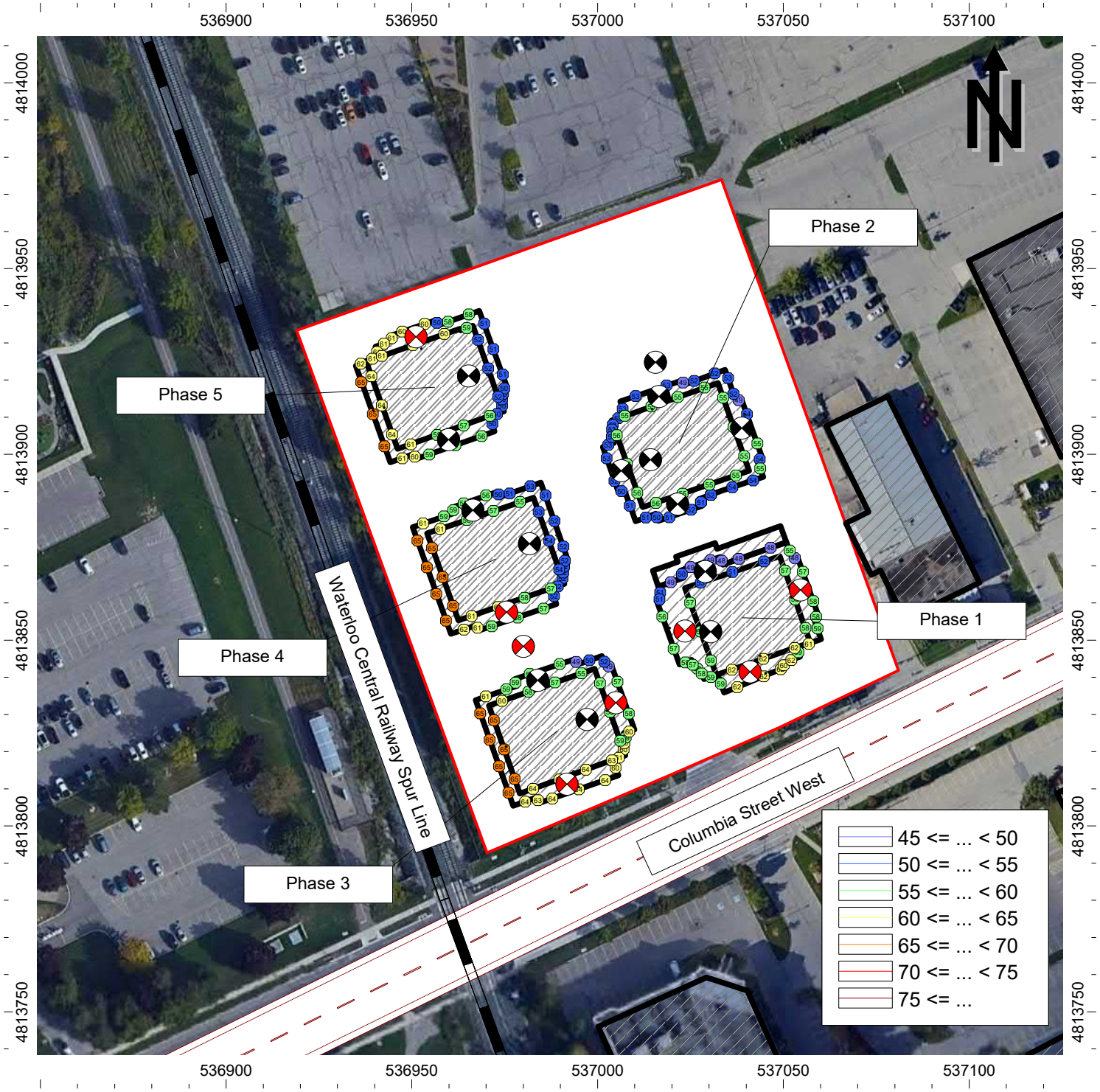
Project # 24-8475

Jul 2026

Subject Site and Surrounding Area

170-180 Columbia Street W, Waterloo, Ontario

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Scale 1: 1,500

Figure 2

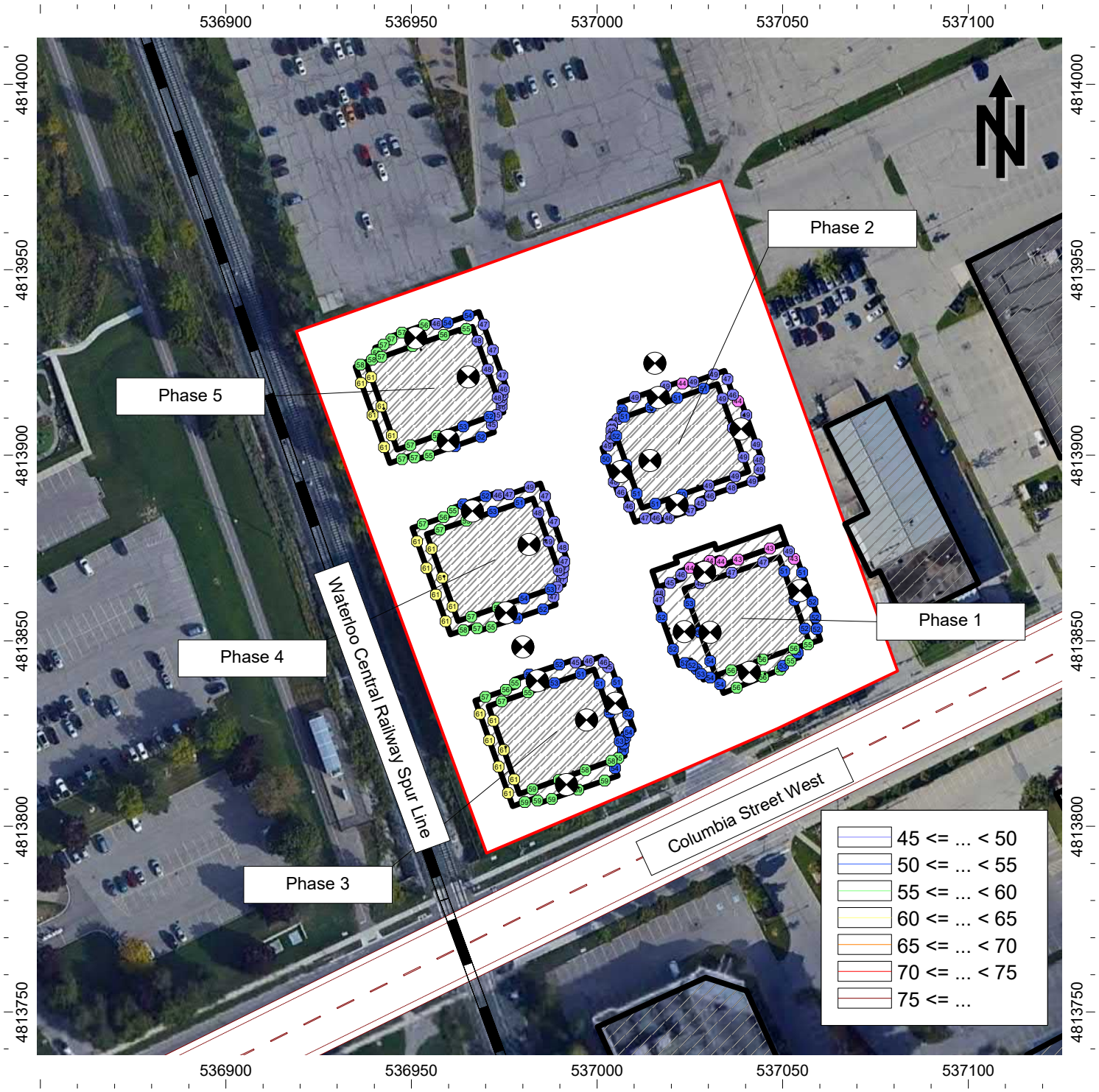
Road and Rail Predicted Daytime Noise Impact

170-180 Columbia Street W, Waterloo, Ontario

Project # 24-8475

Jul 2026

DILLON CONSULTING



Scale 1: 1,500

Figure 3

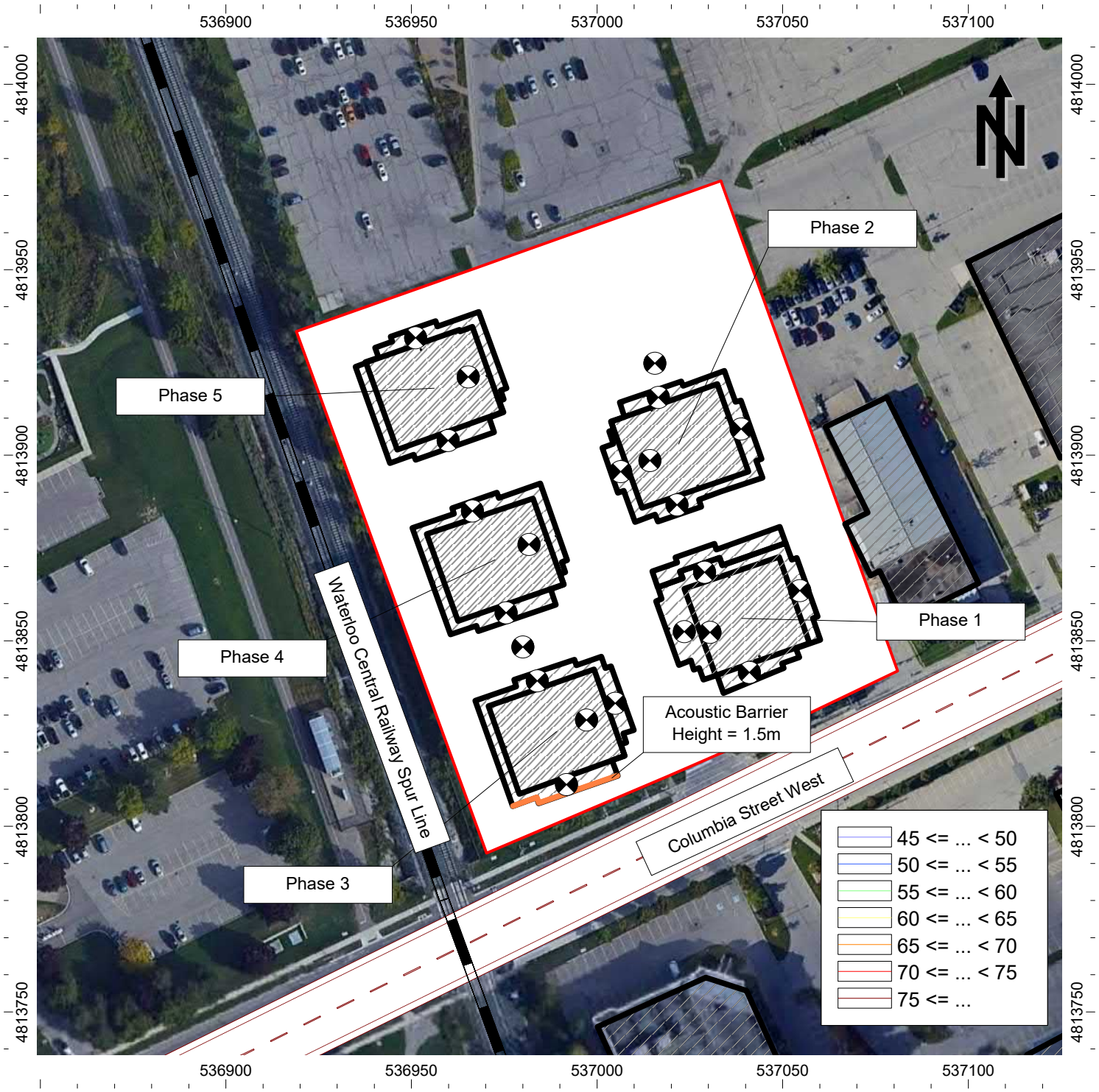
Road and Rail Predicted Nighttime Noise Impact

170-180 Columbia Street W, Waterloo, Ontario

Project # 24-8475

Jul 2026

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Scale 1: 1,500

Figure 4

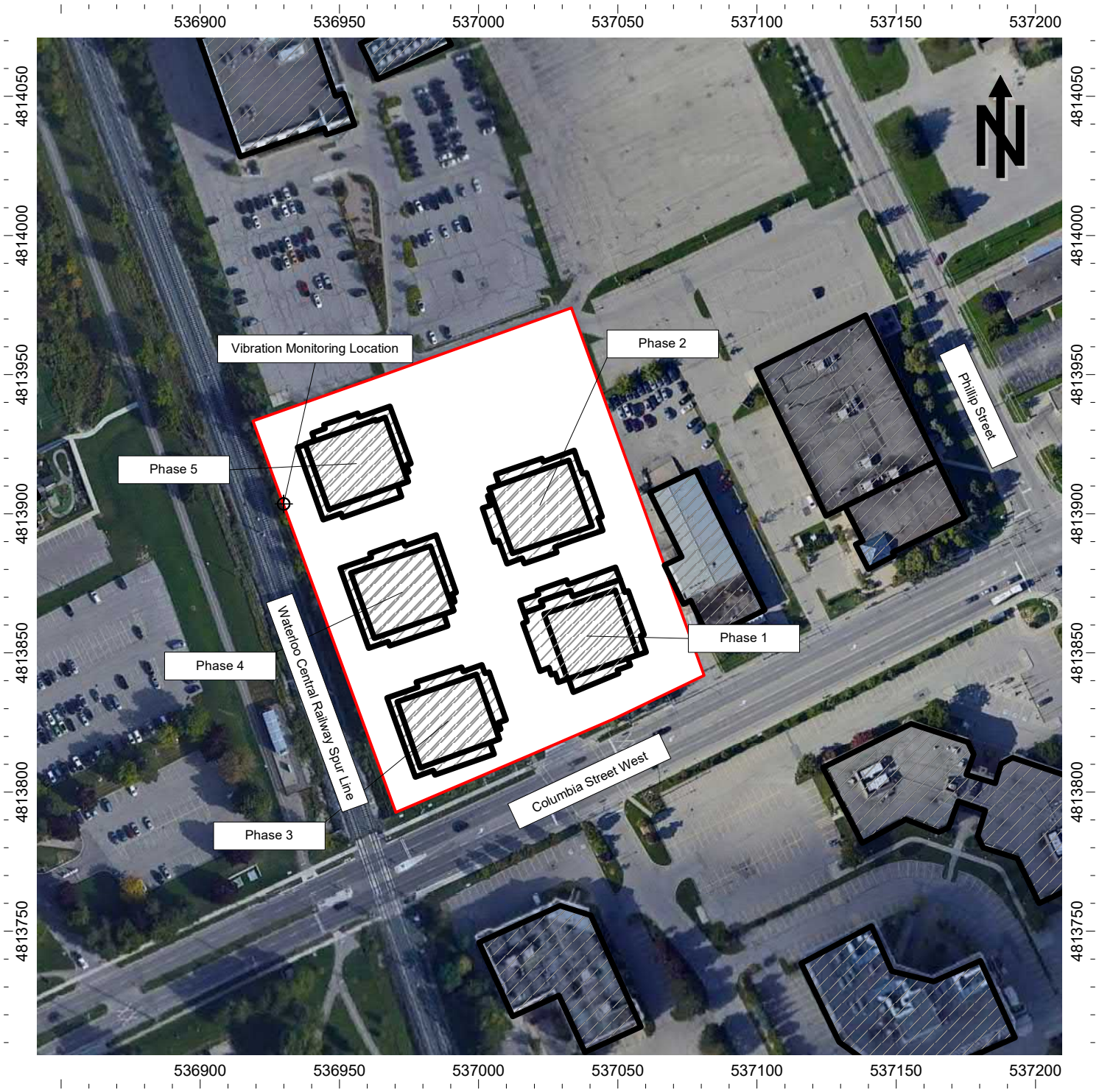
Acoustic Barrier Locations

Project # 24-8475

170-180 Columbia Street W, Waterloo, Ontario

Jul 2026

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Scale 1: 2,000

Figure 5

Vibration Monitoring Location

Project # 24-8475

170-180 Columbia Street W, Waterloo, Ontario

Jul 2026

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Appendix A

Development Site Plan

Check for overlapping text, dashes before printing.

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CONTEXT PLAN-NTS
SCALE: N.T.S.

True North
Project North
90.15°

SITE PLAN LEGEND

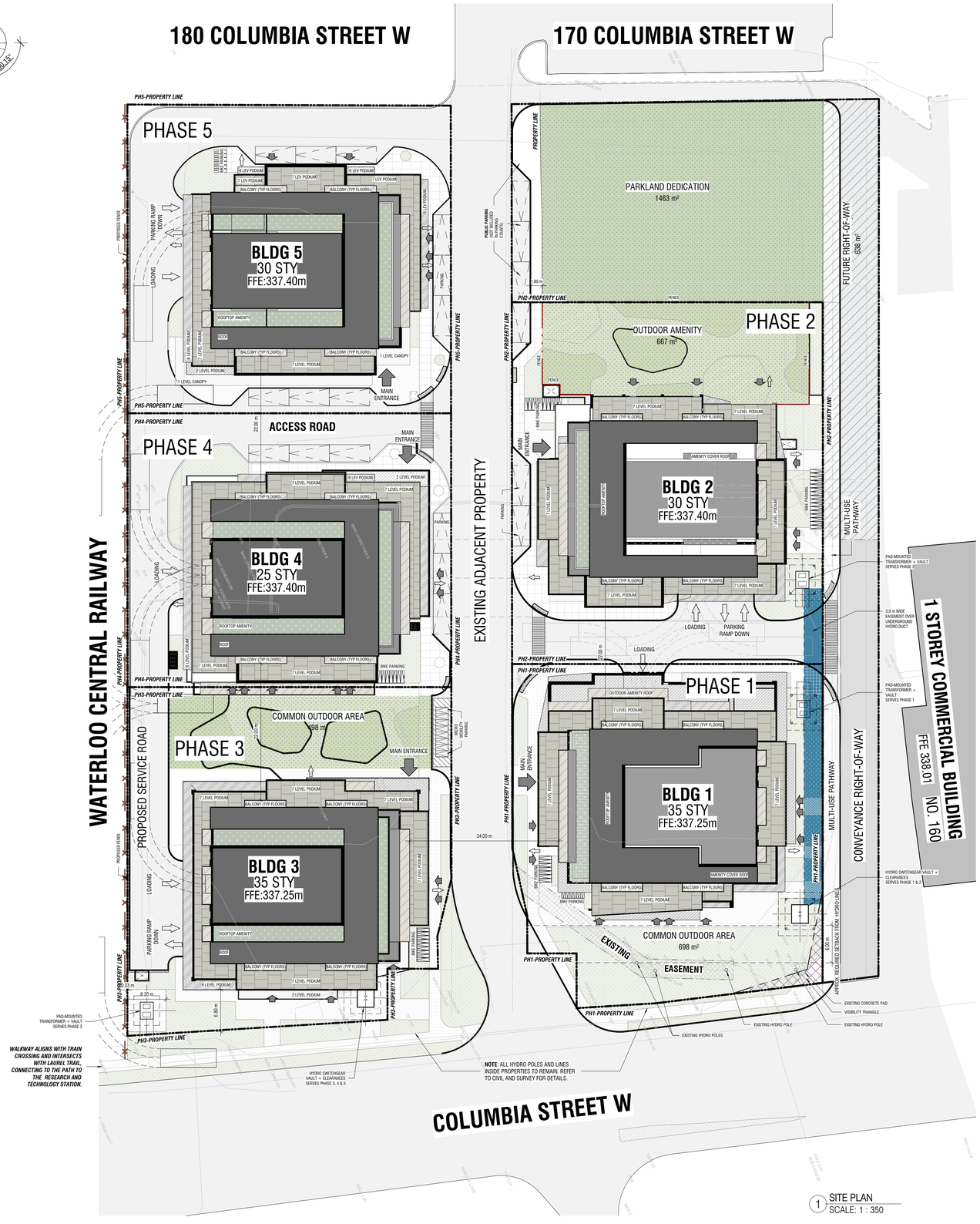
- PROPERTY LINE
- ROOF OUTLINE
- MAIN / SECONDARY ENTRANCE DOORS
- ACCESS TO LOADING/PARKING RAMP
- EMERGENCY EXIT
- PROPOSED LANDSCAPING BY FERRIS + ASSOCIATES
- XXX.XXm — PROPOSED GRADING ELEVATION-SEE GRADING PLAN PROVIDED BY WALTERFEDY
- XXX.XXm — EXISTING GRADING ELEVATION-SEE TOPOGRAPHIC SURVEY PREPARED BY IBW SURVEYORS
- X.X % — PROPOSED SLOPE-SEE GRADING PLAN PROVIDED BY WALTERFEDY
- PROPOSED SLOPE-SEE GRADING PLAN PROVIDED BY WALTERFEDY
- PROPOSED UNIT PAVING(PATTERN 1)
- PROPOSED UNIT PAVING(PATTERN 2)
- ROOF EXTENT
- ROOFTOP AMENITY LANDSCAPED AREA
- ROOF FOR TOWER
- LEVEL 7 PODIUM
- LEVEL 6 PODIUM
- LEVEL 2 PODIUM/CANOPY FOR LEVEL 1
- BALCONY EXTENT
- MPH ROOF

AVERAGE GRADES

PH3:	337.25m
PH1-2-4-5:	337.40m

TOWER STOREYS

PH1:	35
PH2:	30
PH3:	35
PH4:	25
PH5:	30



1 SITE PLAN
SCALE: 1 : 350

aaa architects
SUITE 1018-130 QUEENS QUAY EAST, TORONTO ON, M5A 0P6
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SEAL:

DRAWING ISSUE/REVISION SCHEDULE

ISSUE #	DESCRIPTION	ISSUE DATE
1	ISSUED FOR COORDINATION	2026-07-07

THE CITY OF Waterloo

CLIENT:
IN8 Developments

PROJECT:
NEW MIXED USE DEVELOPMENT

170-180 COLUMBIA STREET WEST, WATERLOO

DRAWING:
SITE PLAN - 170 AND 180 COLUMBIA

SCALE VERIFICATION:
1 CM
1 INCH
THIS DRAWING IS TO BE PRINTED AT 100% ON ARCH E

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D.A/H.A/F.P/P.R	A.A.
DESIGNED BY:	APPROVED BY:
A.A.	A.A.
SCALE:	PROJECT No:
As indicated	

DRAWING NO.:
A100a

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Building Area Legend

- BIKE STORAGE
- COMMON OUTDOOR AREA
- CORRIDOR
- ELEVATOR
- GARBAGE
- INDOOR AMENITY
- LOADING
- LOBBY
- MERCANTILE
- OUTDOOR AMENITY
- PARKING
- RAMP
- SERVICES
- SHAFT
- STAIRS
- STORAGE
- VESTIBULE
- WASHROOM



1 GROUND FLOOR FFE
A103
Scale: 1 : 300

NON-RESIDENTIAL USES ON GROUND LEVEL

	PHASE	AREA NAME	AREA (m²)
170 COLUMBIA			
170 COLUMBIA	PHASE 1	RETAIL 2	53 m²
170 COLUMBIA	PHASE 1	RETAIL 3	53 m²
170 COLUMBIA	PHASE 1	RETAIL 1	60 m²
170 COLUMBIA	PHASE 1	RETAIL 4	138 m²
170 COLUMBIA	PHASE 1	RETAIL 5	160 m²
PHASE 1: 5			463 m²
170 COLUMBIA	PHASE 2	OFFICE SPACE 2	20 m²
170 COLUMBIA	PHASE 2	OFFICE SPACE 1	22 m²
PHASE 2: 2			42 m²
180 COLUMBIA			
180 COLUMBIA	PHASE 3	RETAIL 6	61 m²
180 COLUMBIA	PHASE 3	RETAIL 5	75 m²
180 COLUMBIA	PHASE 3	RETAIL 7	130 m²
PHASE 3: 3			266 m²
180 COLUMBIA	PHASE 4	RETAIL/OFFICE 1	63 m²
180 COLUMBIA	PHASE 4	RETAIL/OFFICE 1	63 m²
180 COLUMBIA	PHASE 4	RETAIL/OFFICE 2	137 m²
PHASE 4: 3			264 m²
180 COLUMBIA	PHASE 5	OFFICE SPACE 5	130 m²
PHASE 5: 1			130 m²
TOTAL AREAS: 14			1166 m²

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IN8 Developments

PROJECT:
NEW MIXED USE DEVELOPMENT

170-180 COLUMBIA STREET WEST, WATERLOO

DRAWING:
GROUND FLOOR - AREA PLAN

SCALE VERIFICATION: 1 CM | 1 INCH
THIS DRAWING IS TO BE PRINTED AT 100% ON ARCH E

DRAWN BY:	CHECKED BY:
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DESIGNED BY:	APPROVED BY:
A.A.	A.A.
SCALE: 1 : 300	PROJECT No:

DRAWING NO.:
A103

Appendix B

Traffic Data

Region of Waterloo AADT Forecast for Noise Studies

1. Development/Location

170 Columbia St W, Waterloo

2. Current AADT (2024)

Columbia St W	Phillip St
19,500	3,700

3. Forecast AADT (2034)

Columbia St W	Phillip St
22,600	4,300

4. Commercial Vehicle Rates

	Columbia St W	Phillip St
% Medium Trucks	1%	1%
% Heavy Trucks	2%	1%

5. Posted Speed Limit

Columbia St W	Phillip St
50 km/h	50 km/h

6. Day/Night Splits

Regional Standard 90/10 Day/Night Split

7. Expiry

Dec 31 2026

8. Notes

This forecast is intended for the purpose of carrying out a noise study for the above mentioned location only.

As Columbia St W and Phillip St are under the jurisdiction of City of Waterloo, City of Waterloo should verify the forecasts for these roads.

This forecast remains valid up to the date indicated above. The Region of Waterloo should be contacted for an updated forecast if there are plans to use this forecast beyond the above validity period.

Heggart, Callum <cheggart@dillon.ca>

Rail Data Information Request - 170 Columbia Road

Bob Fallowfield <gm@waterloocentralrailway.com> Fri, Mar 28, 2025 at 3:57 PM
To: Callum Heggart <cheggart@dillon.ca>

In the event of an emergency, the whistle may be used.

Bob Fallowfield
General Manager
Waterloo Central Railway
(519) 465-7710 cell

> On Mar 28, 2025, at 2:47 PM, Heggart, Callum <cheggart@dillon.ca> wrote:
>
> Hi Bob,
>
> Thanks for taking the call today. Just one last question about whether non-emergency whistling is prohibited at the Columbia Street West and the William Tutte Way (at the University of Waterloo) crossing?
>
> Otherwise, summarizing the info from our call:
>
> - In the area of the Columbia Street West crossing, only CN freight trains are operated, and only 1 train during the nighttime period (between 23:00 and 07:00)
> - The CN Freights consist of 2 locomotives and 10-12 cars
> - The speed limit for that rail line is 10 mph
>
> Please let me know if I got all of that correct.
>
> Thanks and have a great weekend,
> Callum
>
> DILLON CONSULTING
>
> BEST MANAGED COMPANIES CANADA Platinum member
>
> **Callum Heggart**
> **Dillon Consulting Limited**
> Suite 200 - 51 Breithaupt Street
> Kitchener, Ontario, N2H 5G5
> C - 519.577.7832
> T - 519.571.9833 ext. 3153
> CHeggart@dillon.ca
> www.dillon.ca

> On Thu, Mar 20, 2025 at 4:13 PM Heggart, Callum <cheggart@dillon.ca> wrote:
> > Hi Bob,
> >
> > Just following up on this information request. Let me know if you are able to review it.
> >
> > Thanks
> > Callum
> >
> > DILLON CONSULTING
> >
> > BEST MANAGED COMPANIES CANADA Platinum member
> >
> > **Callum Heggart**
> > **Dillon Consulting Limited**
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On Fri, Mar 7, 2025 at 10:44 AM Heggart, Callum <cheggart@dillon.ca> wrote:

Hi Bob,

Thanks for taking my call today. Listed below is the information that I'm looking for regarding rail usage along the Waterloo Central Railway Guelph Spur Line in proximity to 170 Columbia Road in Waterloo.

1. What types of trains are travelling on this line during the daytime (07:00-23:00) and nighttime (23:00-07:00) periods?
2. How many of each type of train are travelling on the line during the daytime and nighttime periods?
3. What is the typical rail speed in that area?
4. How many locomotives per train? How many cars per train?
5. We are required to predict noise impacts 10 years in the future. Are there plans to increase the rail usage in 10 years? Note that we typically assume 2.5% annual growth for rail traffic.
6. Are horns or whistles used at the Columbia Street crossing in non-emergency situations

Additionally, please let me know if you have information about the LRT usage in this area as well. I can be contacted at 519-577-7832 if a call is easier.

Thanks
Callum

DILLON CONSULTING

CANADA BEST MANAGED COMPANIES
Platinum member

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This message is directed in confidence solely to the person(s) named above and may contain privileged, confidential or private information which is not to be disclosed. If you are not the addressee or an authorized representative thereof, please contact the undersigned and then destroy this message.

Ce message est destiné uniquement aux personnes indiquées dans l'entête et peut contenir une information privilégiée, confidentielle ou privée et ne pouvant être divulguée. Si vous n'êtes pas le destinataire de ce message ou une personne autorisée à le recevoir, veuillez communiquer avec le soussigné et ensuite détruire ce message.

Appendix C

Warning Clauses

Warning Clauses

All warning clauses should be included in agreements that are registered on title for all Offers of Purchase and Sale, lease/rental agreements, and condominium declarations.

Type A: "Purchasers/tenants are advised that sound levels due to increasing road traffic (rail traffic) (air traffic) may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the Municipality and the Ministry of the Environment."

Type C: "This dwelling unit has been designed with the provision for adding central air conditioning at the occupant's discretion. Installation of central air conditioning by the occupant in low and medium density developments will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment."

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."

Waterloo Central Railway Warning Clause: "Warning: Waterloo Central Railway or its assigns or successors in interest has or have a right-of-way within 300 metres from the land the subject hereof. There may be alterations to or expansions of the rail facilities on such right-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). Waterloo Central Railway will not be responsible for any complaints or claims arising from use of such facilities and/or operations on, over or under the aforesaid right-of-way."

> Note: The above is a recommended warning clause for proximity to the Waterloo Central Railway that has been adapted based on Dillon's experience with other railway operators. Waterloo Central Railway should be contacted prior to implementation of this warning clause.

Appendix D

BPN-56

BPN-56

Receptor	Source	Time of Day	Location	Sound Levels				Façade and Room Inputs									Source Inputs				Component 1 - Veneer						Component 2 - Glazing						Required Glazing	
				Façade Level	Free Field Correction	Indoor Requirement	Required Reduction	Exposed Façade Height	Exposed Façade Length	Room Depth	Floor Area	Façade Area	Glazing as % of Façade Area	Glazing as % of Floor Area	Veneer as % of Floor Area	Room Absorption	Height of Receptor	Horizontal Distance to Source	Incident Sound Angle	Angle Correction	Source Spectrum	Assumed Veneer	Building Component	Spectrum Correction	Room Correction	% Total Transmitted Energy	Energy Correction	Building Component	Spectrum Correction	Room Correction	% Total Transmitted Energy	Energy Correction		
				(dBA)	(dBA)	(dBA)	(dBA)	(m)	(m)	(m)	(m^2)	(m^2)	(%)	(%)	(%)		(m)	(m)	(deg)			(STC)				(%)					(%)		(STC)	
PH3-Podium-N	Roadway	Daytime	Living/Dining	37	3	45	-5	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	D	40	D	7	-4	5%	37	C	4	-1	95%	0	*-1*	
	Locomotive	Daytime	Living/Dining	61	3	40	24	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	F	40	D	10	-4	5%	34	C	6	-1	95%	0	*30*	
	Wheel	Daytime	Living/Dining	49	3	40	12	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	B	40	D	2	-4	5%	42	C	1	-1	95%	0	*13*	Living / Dining Areas
																																30	
	Roadway	Night-time	Living/Dining	30	3	45	-12	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	D	40	D	7	-4	5%	37	C	4	-1	95%	0	*-8*	
	Locomotive	Night-time	Living/Dining	57	3	40	20	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	F	40	D	10	-4	5%	34	C	6	-1	95%	0	*26*	
	Wheel	Night-time	Living/Dining	44	3	40	7	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	B	40	D	2	-4	5%	42	C	1	-1	95%	0	*8*	
																																26	**30**
	Roadway	Daytime	Sleeping Quarters	37	3	45	-5	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	D	40	D	7	-2	5%	35	C	4	-2	95%	0	*-3*	
	Locomotive	Daytime	Sleeping Quarters	61	3	40	24	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	F	40	D	10	-2	5%	32	C	6	-2	95%	0	*28*	
	Wheel	Daytime	Sleeping Quarters	49	3	40	12	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	B	40	D	2	-2	5%	40	C	1	-2	95%	0	*11*	Sleeping Quarters
																																28	
	Roadway	Night-time	Sleeping Quarters	30	3	40	-7	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	D	40	D	7	-2	5%	35	C	4	-2	95%	0	*-5*	
	Locomotive	Night-time	Sleeping Quarters	57	3	35	25	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	F	40	D	10	-2	5%	32	C	6	-2	95%	0	*29*	
	Wheel	Night-time	Sleeping Quarters	44	3	35	12	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	B	40	D	2	-2	5%	40	C	1	-2	95%	0	*11*	
																																29	**29**
PH3-Podium-S	Roadway	Daytime	Living/Dining	63	3	45	21	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	D	40	D	7	-4	5%	37	C	4	-1	95%	0	*25*	
	Locomotive	Daytime	Living/Dining	61	3	40	24	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	F	40	D	10	-4	5%	34	C	6	-1	95%	0	*30*	
	Wheel	Daytime	Living/Dining	49	3	40	12	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	B	40	D	2	-4	5%	42	C	1	-1	95%	0	*13*	Living / Dining Areas
																																31	
	Roadway	Night-time	Living/Dining	56	3	45	14	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	D	40	D	7	-4	5%	37	C	4	-1	95%	0	*18*	
	Locomotive	Night-time	Living/Dining	57	3	40	20	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	F	40	D	10	-4	5%	34	C	6	-1	95%	0	*26*	
	Wheel	Night-time	Living/Dining	44	3	40	7	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	B	40	D	2	-4	5%	42	C	1	-1	95%	0	*8*	
																																26	**31**
	Roadway	Daytime	Sleeping Quarters	63	3	45	21	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	D	40	D	7	-2	5%	35	C	4	-2	95%	0	*23*	
	Locomotive	Daytime	Sleeping Quarters	61	3	40	24	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	F	40	D	10	-2	5%	32	C	6	-2	95%	0	*28*	
	Wheel	Daytime	Sleeping Quarters	49	3	40	12	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	B	40	D	2	-2	5%	40	C	1	-2	95%	0	*11*	Sleeping Quarters
																																29	
	Roadway	Night-time	Sleeping Quarters	56	3	40	19	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	D	40	D	7	-2	5%	35	C	4	-2	95%	0	*21*	
	Locomotive	Night-time	Sleeping Quarters	57	3	35	25	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	F	40	D	10	-2	5%	32	C	6	-2	95%	0	*29*	
	Wheel	Night-time	Sleeping Quarters	44	3	35	12	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	B	40	D	2	-2	5%	40	C	1	-2	95%	0	*11*	
																																30	**30**
PH3-Podium-W	Roadway	Daytime	Living/Dining	58	3	45	16	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	D	54	D	7	-4	5%	51	C	4	-1	95%	0	*20*	
	Locomotive	Daytime	Living/Dining	64	3	40	27	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	F	54	D	10	-4	5%	48	C	6	-1	95%	0	*33*	
	Wheel	Daytime	Living/Dining	52	3	40	15	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	B	54	D	2	-4	5%	56	C	1	-1	95%	0	*16*	Living / Dining Areas
																																33	
	Roadway	Night-time	Living/Dining	52	3	45	10	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	D	54	D	7	-4	5%	51	C	4	-1	95%	0	*14*	
	Locomotive	Night-time	Living/Dining	61	3	40	24	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	F	54	D	10	-4	5%	48	C	6	-1	95%	0	*30*	
	Wheel	Night-time	Living/Dining	48	3	40	11	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	B	54	D	2	-4	5%	56	C	1	-1	95%	0	*12*	
																																30	**33**
	Roadway	Daytime	Sleeping Quarters	58	3	45	16	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	D	54	D	7	-2	5%	49	C	4	-2	95%	0	*18*	
	Locomotive	Daytime	Sleeping Quarters	64	3	40	27	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	F	54	D	10	-2	5%	46	C	6	-2	95%	0	*31*	
	Wheel	Daytime	Sleeping Quarters	52	3	40	15	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	B	54	D	2	-2	5%	54	C	1	-2	95%	0	*14*	Sleeping Quarters
																																31	
	Roadway	Night-time	Sleeping Quarters	52	3	40	15	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	D	54	D	7	-2	5%	49	C	4	-2	95%	0	*17*	
	Locomotive	Night-time	Sleeping Quarters	61	3	35	29	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	F	54	D	10	-2	5%	46	C	6	-2	95%	0	*33*	
	Wheel	Night-time	Sleeping Quarters	48	3	35	16	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	B	54	D	2	-2	5%	54	C	1	-2	95%	0	*15*	
																																33	**33**
PH3-TWR-N	Roadway	Daytime	Living/Dining	43	3	45	1	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	D	40	D	7	-4	5%	37	C	4	-1	95%	0	*5*	
	Locomotive	Daytime	Living/Dining	60	3	40	23	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	F	40	D	10	-4	5%	34	C	6	-1	95%	0	*29*	
	Wheel	Daytime	Living/Dining	48	3	40	11	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	B	40	D	2	-4	5%	42	C	1	-1	95%	0	*12*	Living / Dining Areas
																																29	
	Roadway	Night-time	Living/Dining	37	3	45	-5	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	D	40	D	7	-4	5%	37	C	4	-1	95%	0	*-1*	
	Locomotive	Night-time	Living/Dining	56	3	40	19	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	F	40	D	10	-4	5%	34	C	6	-1	95%	0	*25*	
	Wheel	Night-time	Living/Dining	43	3	40	6	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	B	40	D	2	-4	5%	42	C	1	-1	95%	0	*7*	
																																25	**29**
	Roadway	Daytime	Sleeping Quarters	43	3	45	1	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	D	40	D	7	-2	5%	35	C	4	-2	95%	0	*3*	
	Locomotive	Daytime	Sleeping Quarters	60	3	40	23	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	F	40	D	10	-2	5%	32	C	6	-2	95%	0	*27*	
	Wheel	Daytime	Sleeping Quarters	48	3	40	11	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	B	40	D	2	-2	5%	40	C	1	-2	95%	0	*10*	Sleeping Quarters
																																27	
	Roadway	Night-time	Sleeping Quarters	37	3	40	0	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	D	40	D	7	-2	5%	35	C	4	-2	95%	0	*2*	
	Locomotive	Night-time	Sleeping Quarters	56	3	35	24	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	F	40	D	10	-2	5%	32	C	6	-2	95%	0	*28*	
	Wheel	Night-time	Sleeping Quarters	43	3	35	11	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	B	40	D	2	-2	5%	40	C	1	-2	95%	0	*10*	
																																28	**28**
PH3-TWR-S	Roadway	Daytime	Living/Dining	62	3	45	20	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	D	40	D	7	-4	5%	37	C	4	-1	95%	0	*24*	
	Locomotive	Daytime	Living/Dining	61	3	40	24	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	F	40	D	10	-4	5%	34	C	6	-1	95%	0	*30*	
	Wheel	Daytime	Living/Dining	49	3	40	12	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	B	40	D	2	-4	5%	42	C	1	-1	95%	0	*13*	Living / Dining Areas
																																31	
	Roadway	Night-time	Living/Dining	55	3	45	13	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	D	40	D	7	-4	5%	37	C	4	-1	95%	0	*17*	
	Locomotive	Night-time	Living/Dining	57	3	40	20	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	F	40	D	10	-4	5%	34	C	6	-1	95%	0	*26*	
	Wheel	Night-time	Living/Dining	44	3	40	7	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	B	40	D	2	-4	5%	42	C	1	-1	95%	0	*8*	
																																26	**31**
	Roadway	Daytime	Sleeping Quarters	62	3	45	20	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	D	40	D	7	-2	5%	35	C	4	-2	95%	0	*22*	
	Locomotive	Daytime	Sleeping Quarters	61	3	40	24	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	F	40	D	10	-2	5%	32	C	6	-2	95%	0	*28*	
	Wheel	Daytime	Sleeping Quarters	49	3	40	12	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	B	40	D	2	-2	5%	40	C	1	-2	95%	0	*11*	Sleeping Quarters
																																29	
	Roadway	Night-time	Sleeping Quarters	55	3	40	18	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	D	40	D	7	-2	5%	35	C	4	-2	95%	0	*20*	
	Locomotive	Night-time	Sleeping Quarters	57	3	35	25	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	F	40	D	10	-2	5%	32	C	6	-2	95%	0	*29*	
	Wheel	Night-time	Sleeping Quarters	44	3	35	12	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	B	40	D	2	-2	5%	40	C	1	-2	95%	0	*11*	
																																30	**30**
PH3-TWR-W	Roadway	Daytime	Living/Dining	57	3	45	15	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	D	54	D	7	-4	5%	51	C	4	-1	95%	0	*19*	
	Locomotive	Daytime	Living/Dining	64	3	40	27	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	F	54	D	10	-4	5%	48	C	6	-1	95%	0	*33*	
	Wheel	Daytime	Living/Dining	52	3	40	15	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	B	54	D	2	-4	5%	56	C	1	-1	95%	0	*16*	Living / Dining Areas
																																33	
	Roadway	Night-time	Living/Dining	51	3	45	9	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	D	54	D	7	-4	5%	51	C	4	-1	95%	0	*13*	
	Locomotive	Night-time	Living/Dining	60	3	40	23	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	F	54	D	10	-4	5%	48	C	6	-1	95%	0	*29*	
	Wheel	Night-time	Living/Dining	47	3	40	10	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	B	54	D	2	-4	5%	56	C	1	-1	95%	0	*11*	
																																29	**33**
	Roadway	Daytime	Sleeping Quarters	57	3	45	15	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	D	54	D	7	-2	5%	49	C	4	-2	95%	0	*17*	
	Locomotive	Daytime	Sleeping Quarters	64	3	40	27	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	F	54	D	10	-2	5%	46	C	6	-2	95%	0	*31*	
	Wheel	Daytime	Sleeping Quarters	52	3	40	15	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	B	54	D	2	-2	5%	54	C	1	-2	95%	0	*14*	Sleeping Quarters
																																31	
	Roadway	Night-time	Sleeping Quarters	51	3	40	14	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	D	54	D	7	-2	5%	49	C	4	-2	95%	0	*16*	
	Locomotive	Night-time	Sleeping Quarters	60	3	35	28	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	F	54	D	10	-2	5%	46	C	6	-2	95%	0	*32*	
	Wheel	Night-time	Sleeping Quarters	47	3	35	15	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	B	54	D	2	-2	5%	54	C	1	-2	95%	0	*14*	
																																32	**32**

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Receptor	Source	Time of Day	Location	Sound Levels				Façade and Room Inputs									Source Inputs				Component 1 - Veneer						Component 2 - Glazing						Required Glazing
				Façade Level	Free Field Correction	Indoor Requirement	Required Reduction	Exposed Façade Height	Exposed Façade Length	Room Depth	Floor Area	Façade Area	Glazing as % of Façade Area	Glazing as % of Floor Area	Veneer as % of Floor Area	Room Absorption	Height of Receptor	Horizontal Distance to Source	Incident Sound Angle	Angle Correction	Source Spectrum	Assumed Veneer	Building Component	Spectrum Correction	Room Correction	% Total Transmitted Energy	Energy Correction	Building Component	Spectrum Correction	Room Correction	% Total Transmitted Energy	Energy Correction		
				(dBA)	(dBA)	(dBA)	(dBA)	(m)	(m)	(m)	(m^2)	(m^2)	(%)	(%)	(%)		(m)	(m)	(deg)			(STC)				(%)					(%)		(STC)	
PH4-Podium-N	Roadway	Daytime	Living/Dining	40	3	45	-2	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	75	14.93	0	D	40	D	7	-4	5%	37	C	4	-1	95%	0	*2*	
	Locomotive	Daytime	Living/Dining	61	3	40	24	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	F	40	D	10	-4	5%	34	C	6	-1	95%	0	*30*	
	Wheel	Daytime	Living/Dining	49	3	40	12	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	B	40	D	2	-4	5%	42	C	1	-1	95%	0	*13*	Living / Dining Areas
																																30	
	Roadway	Night-time	Living/Dining	33	3	45	-9	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	75	14.93	0	D	40	D	7	-4	5%	37	C	4	-1	95%	0	*-5*	
	Locomotive	Night-time	Living/Dining	57	3	40	20	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	F	40	D	10	-4	5%	34	C	6	-1	95%	0	*26*	
	Wheel	Night-time	Living/Dining	44	3	40	7	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	B	40	D	2	-4	5%	42	C	1	-1	95%	0	*8*	
																																26	**30**
	Roadway	Daytime	Sleeping Quarters	40	3	45	-2	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	75	14.93	0	D	40	D	7	-2	5%	35	C	4	-2	95%	0	*0*	
	Locomotive	Daytime	Sleeping Quarters	61	3	40	24	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	F	40	D	10	-2	5%	32	C	6	-2	95%	0	*28*	
	Wheel	Daytime	Sleeping Quarters	49	3	40	12	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	B	40	D	2	-2	5%	40	C	1	-2	95%	0	*11*	Sleeping Quarters
																																28	
	Roadway	Night-time	Sleeping Quarters	33	3	40	-4	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	75	14.93	0	D	40	D	7	-2	5%	35	C	4	-2	95%	0	*-2*	
	Locomotive	Night-time	Sleeping Quarters	57	3	35	25	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	F	40	D	10	-2	5%	32	C	6	-2	95%	0	*29*	
	Wheel	Night-time	Sleeping Quarters	44	3	35	12	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	B	40	D	2	-2	5%	40	C	1	-2	95%	0	*11*	
																																29	**29**
PH4-Podium-S	Roadway	Daytime	Living/Dining	54	3	45	12	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	75	14.93	0	D	40	D	7	-4	5%	37	C	4	-1	95%	0	*16*	
	Locomotive	Daytime	Living/Dining	61	3	40	24	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	F	40	D	10	-4	5%	34	C	6	-1	95%	0	*30*	
	Wheel	Daytime	Living/Dining	49	3	40	12	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	B	40	D	2	-4	5%	42	C	1	-1	95%	0	*13*	Living / Dining Areas
																																30	
	Roadway	Night-time	Living/Dining	47	3	45	5	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	75	14.93	0	D	40	D	7	-4	5%	37	C	4	-1	95%	0	*9*	
	Locomotive	Night-time	Living/Dining	57	3	40	20	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	F	40	D	10	-4	5%	34	C	6	-1	95%	0	*26*	
	Wheel	Night-time	Living/Dining	44	3	40	7	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	B	40	D	2	-4	5%	42	C	1	-1	95%	0	*8*	
																																26	**30**
	Roadway	Daytime	Sleeping Quarters	54	3	45	12	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	75	14.93	0	D	40	D	7	-2	5%	35	C	4	-2	95%	0	*14*	
	Locomotive	Daytime	Sleeping Quarters	61	3	40	24	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	F	40	D	10	-2	5%	32	C	6	-2	95%	0	*28*	
	Wheel	Daytime	Sleeping Quarters	49	3	40	12	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	B	40	D	2	-2	5%	40	C	1	-2	95%	0	*11*	Sleeping Quarters
																																28	
	Roadway	Night-time	Sleeping Quarters	47	3	40	10	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	75	14.93	0	D	40	D	7	-2	5%	35	C	4	-2	95%	0	*12*	
	Locomotive	Night-time	Sleeping Quarters	57	3	35	25	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	F	40	D	10	-2	5%	32	C	6	-2	95%	0	*29*	
	Wheel	Night-time	Sleeping Quarters	44	3	35	12	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	B	40	D	2	-2	5%	40	C	1	-2	95%	0	*11*	
																																29	**29**
PH4-Podium-W	Roadway	Daytime	Living/Dining	53	3	45	11	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	75	14.93	0	D	54	D	7	-4	5%	51	C	4	-1	95%	0	*15*	
	Locomotive	Daytime	Living/Dining	64	3	40	27	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	F	54	D	10	-4	5%	48	C	6	-1	95%	0	*33*	
	Wheel	Daytime	Living/Dining	52	3	40	15	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	B	54	D	2	-4	5%	56	C	1	-1	95%	0	*16*	Living / Dining Areas
																																33	
	Roadway	Night-time	Living/Dining	47	3	45	5	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	75	14.93	0	D	54	D	7	-4	5%	51	C	4	-1	95%	0	*9*	
	Locomotive	Night-time	Living/Dining	61	3	40	24	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	F	54	D	10	-4	5%	48	C	6	-1	95%	0	*30*	
	Wheel	Night-time	Living/Dining	48	3	40	11	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	B	54	D	2	-4	5%	56	C	1	-1	95%	0	*12*	
																																30	**33**
	Roadway	Daytime	Sleeping Quarters	53	3	45	11	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	75	14.93	0	D	54	D	7	-2	5%	49	C	4	-2	95%	0	*13*	
	Locomotive	Daytime	Sleeping Quarters	64	3	40	27	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	F	54	D	10	-2	5%	46	C	6	-2	95%	0	*31*	
	Wheel	Daytime	Sleeping Quarters	52	3	40	15	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	B	54	D	2	-2	5%	54	C	1	-2	95%	0	*14*	Sleeping Quarters
																																31	
	Roadway	Night-time	Sleeping Quarters	47	3	40	10	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	75	14.93	0	D	54	D	7	-2	5%	49	C	4	-2	95%	0	*12*	
	Locomotive	Night-time	Sleeping Quarters	61	3	35	29	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	F	54	D	10	-2	5%	46	C	6	-2	95%	0	*33*	
	Wheel	Night-time	Sleeping Quarters	48	3	35	16	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	B	54	D	2	-2	5%	54	C	1	-2	95%	0	*15*	
																																33	**33**
PH4-TWR-N	Roadway	Daytime	Living/Dining	40	3	45	-2	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	75	53.13	2	D	40	D	7	-4	5%	37	C	4	-1	95%	0	*2*	
	Locomotive	Daytime	Living/Dining	60	3	40	23	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	F	40	D	10	-4	5%	34	C	6	-1	95%	0	*29*	
	Wheel	Daytime	Living/Dining	48	3	40	11	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	B	40	D	2	-4	5%	42	C	1	-1	95%	0	*12*	Living / Dining Areas
																																29	
	Roadway	Night-time	Living/Dining	33	3	45	-9	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	75	53.13	2	D	40	D	7	-4	5%	37	C	4	-1	95%	0	*-5*	
	Locomotive	Night-time	Living/Dining	56	3	40	19	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	F	40	D	10	-4	5%	34	C	6	-1	95%	0	*25*	
	Wheel	Night-time	Living/Dining	43	3	40	6	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	B	40	D	2	-4	5%	42	C	1	-1	95%	0	*7*	
																																25	**29**
	Roadway	Daytime	Sleeping Quarters	40	3	45	-2	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	75	53.13	2	D	40	D	7	-2	5%	35	C	4	-2	95%	0	*0*	
	Locomotive	Daytime	Sleeping Quarters	60	3	40	23	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	F	40	D	10	-2	5%	32	C	6	-2	95%	0	*27*	
	Wheel	Daytime	Sleeping Quarters	48	3	40	11	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	B	40	D	2	-2	5%	40	C	1	-2	95%	0	*10*	Sleeping Quarters
																																27	
	Roadway	Night-time	Sleeping Quarters	33	3	40	-4	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	75	53.13	2	D	40	D	7	-2	5%	35	C	4	-2	95%	0	*-2*	
	Locomotive	Night-time	Sleeping Quarters	56	3	35	24	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	F	40	D	10	-2	5%	32	C	6	-2	95%	0	*28*	
	Wheel	Night-time	Sleeping Quarters	43	3	35	11	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	B	40	D	2	-2	5%	40	C	1	-2	95%	0	*10*	
																																28	**28**
PH4-TWR-S	Roadway	Daytime	Living/Dining	54	3	45	12	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	75	53.13	2	D	40	D	7	-4	5%	37	C	4	-1	95%	0	*16*	
	Locomotive	Daytime	Living/Dining	60	3	40	23	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	F	40	D	10	-4	5%	34	C	6	-1	95%	0	*29*	
	Wheel	Daytime	Living/Dining	48	3	40	11	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	B	40	D	2	-4	5%	42	C	1	-1	95%	0	*12*	Living / Dining Areas
																																29	
	Roadway	Night-time	Living/Dining	47	3	45	5	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	75	53.13	2	D	40	D	7	-4	5%	37	C	4	-1	95%	0	*9*	
	Locomotive	Night-time	Living/Dining	56	3	40	19	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	F	40	D	10	-4	5%	34	C	6	-1	95%	0	*25*	
	Wheel	Night-time	Living/Dining	43	3	40	6	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	B	40	D	2	-4	5%	42	C	1	-1	95%	0	*7*	
																																25	**29**
	Roadway	Daytime	Sleeping Quarters	54	3	45	12	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	75	53.13	2	D	40	D	7	-2	5%	35	C	4	-2	95%	0	*14*	
	Locomotive	Daytime	Sleeping Quarters	60	3	40	23	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	F	40	D	10	-2	5%	32	C	6	-2	95%	0	*27*	
	Wheel	Daytime	Sleeping Quarters	48	3	40	11	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	B	40	D	2	-2	5%	40	C	1	-2	95%	0	*10*	Sleeping Quarters
																																27	
	Roadway	Night-time	Sleeping Quarters	47	3	40	10	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	75	53.13	2	D	40	D	7	-2	5%	35	C	4	-2	95%	0	*12*	
	Locomotive	Night-time	Sleeping Quarters	56	3	35	24	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	F	40	D	10	-2	5%	32	C	6	-2	95%	0	*28*	
	Wheel	Night-time	Sleeping Quarters	43	3	35	11	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	B	40	D	2	-2	5%	40	C	1	-2	95%	0	*10*	
																																28	**28**
PH4-TWR-W	Roadway	Daytime	Living/Dining	53	3	45	11	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	75	53.13	2	D	54	D	7	-4	5%	51	C	4	-1	95%	0	*15*	
	Locomotive	Daytime	Living/Dining	64	3	40	27	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	F	54	D	10	-4	5%	48	C	6	-1	95%	0	*33*	
	Wheel	Daytime	Living/Dining	52	3	40	15	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	B	54	D	2	-4	5%	56	C	1	-1	95%	0	*16*	Living / Dining Areas
																																33	
	Roadway	Night-time	Living/Dining	46	3	45	4	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	75	53.13	2	D	54	D	7	-4	5%	51	C	4	-1	95%	0	*8*	
	Locomotive	Night-time	Living/Dining	60	3	40	23	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	F	54	D	10	-4	5%	48	C	6	-1	95%	0	*29*	
	Wheel	Night-time	Living/Dining	47	3	40	10	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	B	54	D	2	-4	5%	56	C	1	-1	95%	0	*11*	
																																29	**33**
	Roadway	Daytime	Sleeping Quarters	53	3	45	11	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	75	53.13	2	D	54	D	7	-2	5%	49	C	4	-2	95%	0	*13*	
	Locomotive	Daytime	Sleeping Quarters	64	3	40	27	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	F	54	D	10	-2	5%	46	C	6	-2	95%	0	*31*	
	Wheel	Daytime	Sleeping Quarters	52	3	40	15	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	B	54	D	2	-2	5%	54	C	1	-2	95%	0	*14*	Sleeping Quarters
																																31	
	Roadway	Night-time	Sleeping Quarters	46	3	40	9	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	75	53.13	2	D	54	D	7	-2	5%	49	C	4	-2	95%	0	*11*	
	Locomotive	Night-time	Sleeping Quarters	60	3	35	28	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	F	54	D	10	-2	5%	46	C	6	-2	95%	0	*32*	
	Wheel	Night-time	Sleeping Quarters	47	3	35	15	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	B	54	D	2	-2	5%	54	C	1	-2	95%	0	*14*	
																																32	**32**

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Receptor	Source	Time of Day	Location	Sound Levels				Façade and Room Inputs									Source Inputs				Component 1 - Veneer						Component 2 - Glazing						
				Façade Level	Free Field Correction	Indoor Requirement	Required Reduction	Exposed Façade Height	Exposed Façade Length	Room Depth	Floor Area	Façade Area	Glazing as % of Façade Area	Glazing as % of Floor Area	Veneer as % of Floor Area	Room Absorption	Height of Receptor	Horizontal Distance to Source	Incident Sound Angle	Angle Correction	Source Spectrum	Assumed Veneer	Building Component	Spectrum Correction	Room Correction	% Total Transmitted Energy	Energy Correction	Building Component	Spectrum Correction	Room Correction	% Total Transmitted Energy	Energy Correction	Required Glazing	
				(dBA)	(dBA)	(dBA)	(dBA)	(m)	(m)	(m)	(m^2)	(m^2)	(%)	(%)	(%)		(m)	(m)	(deg)			(STC)				(%)					(%)		(STC)	
PH5-Podium-N	Roadway	Daytime	Living/Dining	39	3	45	-3	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	125	9.09	0	D	54	D	7	-4	5%	51	C	4	-1	95%	0	*1*	
	Locomotive	Daytime	Living/Dining	61	3	40	24	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	F	54	D	10	-4	5%	48	C	6	-1	95%	0	*30*	
	Wheel	Daytime	Living/Dining	50	3	40	13	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	B	54	D	2	-4	5%	56	C	1	-1	95%	0	*14*	Living / Dining Areas
																																30	
	Roadway	Night-time	Living/Dining	32	3	45	-10	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	125	9.09	0	D	54	D	7	-4	5%	51	C	4	-1	95%	0	*-6*	
	Locomotive	Night-time	Living/Dining	58	3	40	21	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	F	54	D	10	-4	5%	48	C	6	-1	95%	0	*27*	
	Wheel	Night-time	Living/Dining	45	3	40	8	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	B	54	D	2	-4	5%	56	C	1	-1	95%	0	*9*	
																																27	**30**
	Roadway	Daytime	Sleeping Quarters	39	3	45	-3	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	125	9.09	0	D	54	D	7	-2	5%	49	C	4	-2	95%	0	*-1*	
	Locomotive	Daytime	Sleeping Quarters	61	3	40	24	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	F	54	D	10	-2	5%	46	C	6	-2	95%	0	*28*	
	Wheel	Daytime	Sleeping Quarters	50	3	40	13	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	B	54	D	2	-2	5%	54	C	1	-2	95%	0	*12*	Sleeping Quarters
																																28	
	Roadway	Night-time	Sleeping Quarters	32	3	40	-5	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	125	9.09	0	D	54	D	7	-2	5%	49	C	4	-2	95%	0	*-3*	
	Locomotive	Night-time	Sleeping Quarters	58	3	35	26	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	F	54	D	10	-2	5%	46	C	6	-2	95%	0	*30*	
	Wheel	Night-time	Sleeping Quarters	45	3	35	13	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	B	54	D	2	-2	5%	54	C	1	-2	95%	0	*12*	
																																30	**30**
PH5-Podium-S	Roadway	Daytime	Living/Dining	50	3	45	8	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	125	9.09	0	D	40	D	7	-4	5%	37	C	4	-1	95%	0	*12*	
	Locomotive	Daytime	Living/Dining	61	3	40	24	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	F	40	D	10	-4	5%	34	C	6	-1	95%	0	*30*	
	Wheel	Daytime	Living/Dining	49	3	40	12	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	B	40	D	2	-4	5%	42	C	1	-1	95%	0	*13*	Living / Dining Areas
																																30	
	Roadway	Night-time	Living/Dining	44	3	45	2	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	125	9.09	0	D	40	D	7	-4	5%	37	C	4	-1	95%	0	*6*	
	Locomotive	Night-time	Living/Dining	57	3	40	20	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	F	40	D	10	-4	5%	34	C	6	-1	95%	0	*26*	
	Wheel	Night-time	Living/Dining	44	3	40	7	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	B	40	D	2	-4	5%	42	C	1	-1	95%	0	*8*	
																																26	**30**
	Roadway	Daytime	Sleeping Quarters	50	3	45	8	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	125	9.09	0	D	40	D	7	-2	5%	35	C	4	-2	95%	0	*10*	
	Locomotive	Daytime	Sleeping Quarters	61	3	40	24	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	F	40	D	10	-2	5%	32	C	6	-2	95%	0	*28*	
	Wheel	Daytime	Sleeping Quarters	49	3	40	12	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	B	40	D	2	-2	5%	40	C	1	-2	95%	0	*11*	Sleeping Quarters
																																28	
	Roadway	Night-time	Sleeping Quarters	44	3	40	7	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	125	9.09	0	D	40	D	7	-2	5%	35	C	4	-2	95%	0	*9*	
	Locomotive	Night-time	Sleeping Quarters	57	3	35	25	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	F	40	D	10	-2	5%	32	C	6	-2	95%	0	*29*	
	Wheel	Night-time	Sleeping Quarters	44	3	35	12	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	B	40	D	2	-2	5%	40	C	1	-2	95%	0	*11*	
																																29	**29**
PH5-Podium-W	Roadway	Daytime	Living/Dining	51	3	45	9	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	125	9.09	0	D	54	D	7	-4	5%	51	C	4	-1	95%	0	*13*	
	Locomotive	Daytime	Living/Dining	64	3	40	27	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	F	54	D	10	-4	5%	48	C	6	-1	95%	0	*33*	
	Wheel	Daytime	Living/Dining	52	3	40	15	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	B	54	D	2	-4	5%	56	C	1	-1	95%	0	*16*	Living / Dining Areas
																																33	
	Roadway	Night-time	Living/Dining	44	3	45	2	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	125	9.09	0	D	54	D	7	-4	5%	51	C	4	-1	95%	0	*6*	
	Locomotive	Night-time	Living/Dining	61	3	40	24	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	F	54	D	10	-4	5%	48	C	6	-1	95%	0	*30*	
	Wheel	Night-time	Living/Dining	48	3	40	11	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	20	25	38.66	1	B	54	D	2	-4	5%	56	C	1	-1	95%	0	*12*	
																																30	**33**
	Roadway	Daytime	Sleeping Quarters	51	3	45	9	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	125	9.09	0	D	54	D	7	-2	5%	49	C	4	-2	95%	0	*11*	
	Locomotive	Daytime	Sleeping Quarters	64	3	40	27	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	F	54	D	10	-2	5%	46	C	6	-2	95%	0	*31*	
	Wheel	Daytime	Sleeping Quarters	52	3	40	15	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	B	54	D	2	-2	5%	54	C	1	-2	95%	0	*14*	Sleeping Quarters
																																31	
	Roadway	Night-time	Sleeping Quarters	44	3	40	7	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	125	9.09	0	D	54	D	7	-2	5%	49	C	4	-2	95%	0	*9*	
	Locomotive	Night-time	Sleeping Quarters	61	3	35	29	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	F	54	D	10	-2	5%	46	C	6	-2	95%	0	*33*	
	Wheel	Night-time	Sleeping Quarters	48	3	35	16	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	20	25	38.66	1	B	54	D	2	-2	5%	54	C	1	-2	95%	0	*15*	
																																33	**33**
PH5-TWR-N	Roadway	Daytime	Living/Dining	40	3	45	-2	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	125	38.66	1	D	54	D	7	-4	5%	51	C	4	-1	95%	0	*2*	
	Locomotive	Daytime	Living/Dining	61	3	40	24	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	F	54	D	10	-4	5%	48	C	6	-1	95%	0	*30*	
	Wheel	Daytime	Living/Dining	49	3	40	12	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	B	54	D	2	-4	5%	56	C	1	-1	95%	0	*13*	Living / Dining Areas
																																30	
	Roadway	Night-time	Living/Dining	33	3	45	-9	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	125	38.66	1	D	54	D	7	-4	5%	51	C	4	-1	95%	0	*-5*	
	Locomotive	Night-time	Living/Dining	57	3	40	20	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	F	54	D	10	-4	5%	48	C	6	-1	95%	0	*26*	
	Wheel	Night-time	Living/Dining	44	3	40	7	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	B	54	D	2	-4	5%	56	C	1	-1	95%	0	*8*	
																																26	**30**
	Roadway	Daytime	Sleeping Quarters	40	3	45	-2	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	125	38.66	1	D	54	D	7	-2	5%	49	C	4	-2	95%	0	*0*	
	Locomotive	Daytime	Sleeping Quarters	61	3	40	24	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	F	54	D	10	-2	5%	46	C	6	-2	95%	0	*28*	
	Wheel	Daytime	Sleeping Quarters	49	3	40	12	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	B	54	D	2	-2	5%	54	C	1	-2	95%	0	*11*	Sleeping Quarters
																																28	
	Roadway	Night-time	Sleeping Quarters	33	3	40	-4	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	125	38.66	1	D	54	D	7	-2	5%	49	C	4	-2	95%	0	*-2*	
	Locomotive	Night-time	Sleeping Quarters	57	3	35	25	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	F	54	D	10	-2	5%	46	C	6	-2	95%	0	*29*	
	Wheel	Night-time	Sleeping Quarters	44	3	35	12	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	B	54	D	2	-2	5%	54	C	1	-2	95%	0	*11*	
																																29	**29**
PH5-TWR-S	Roadway	Daytime	Living/Dining	52	3	45	10	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	125	38.66	1	D	40	D	7	-4	5%	37	C	4	-1	95%	0	*14*	
	Locomotive	Daytime	Living/Dining	60	3	40	23	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	F	40	D	10	-4	5%	34	C	6	-1	95%	0	*29*	
	Wheel	Daytime	Living/Dining	48	3	40	11	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	B	40	D	2	-4	5%	42	C	1	-1	95%	0	*12*	Living / Dining Areas
																																29	
	Roadway	Night-time	Living/Dining	45	3	45	3	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	125	38.66	1	D	40	D	7	-4	5%	37	C	4	-1	95%	0	*7*	
	Locomotive	Night-time	Living/Dining	56	3	40	19	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	F	40	D	10	-4	5%	34	C	6	-1	95%	0	*25*	
	Wheel	Night-time	Living/Dining	43	3	40	6	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	B	40	D	2	-4	5%	42	C	1	-1	95%	0	*7*	
																																25	**29**
	Roadway	Daytime	Sleeping Quarters	52	3	45	10	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	125	38.66	1	D	40	D	7	-2	5%	35	C	4	-2	95%	0	*12*	
	Locomotive	Daytime	Sleeping Quarters	60	3	40	23	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	F	40	D	10	-2	5%	32	C	6	-2	95%	0	*27*	
	Wheel	Daytime	Sleeping Quarters	48	3	40	11	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	B	40	D	2	-2	5%	40	C	1	-2	95%	0	*10*	Sleeping Quarters
																																27	
	Roadway	Night-time	Sleeping Quarters	45	3	40	8	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	125	38.66	1	D	40	D	7	-2	5%	35	C	4	-2	95%	0	*10*	
	Locomotive	Night-time	Sleeping Quarters	56	3	35	24	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	F	40	D	10	-2	5%	32	C	6	-2	95%	0	*28*	
	Wheel	Night-time	Sleeping Quarters	43	3	35	11	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	B	40	D	2	-2	5%	40	C	1	-2	95%	0	*10*	
																																28	**28**
PH5-TWR-W	Roadway	Daytime	Living/Dining	51	3	45	9	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	125	38.66	1	D	54	D	7	-4	5%	51	C	4	-1	95%	0	*13*	
	Locomotive	Daytime	Living/Dining	64	3	40	27	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	F	54	D	10	-4	5%	48	C	6	-1	95%	0	*33*	
	Wheel	Daytime	Living/Dining	52	3	40	15	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	B	54	D	2	-4	5%	56	C	1	-1	95%	0	*16*	Living / Dining Areas
																																33	
	Roadway	Night-time	Living/Dining	44	3	45	2	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	125	38.66	1	D	54	D	7	-4	5%	51	C	4	-1	95%	0	*6*	
	Locomotive	Night-time	Living/Dining	60	3	40	23	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	F	54	D	10	-4	5%	48	C	6	-1	95%	0	*29*	
	Wheel	Night-time	Living/Dining	47	3	40	10	3.00	3.00	3.00	9.00	9.00	70%	70%	30%	Intermediate	100	25	75.96	3	B	54	D	2	-4	5%	56	C	1	-1	95%	0	*11*	
																																29	**33**
	Roadway	Daytime	Sleeping Quarters	51	3	45	9	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	125	38.66	1	D	54	D	7	-2	5%	49	C	4	-2	95%	0	*11*	
	Locomotive	Daytime	Sleeping Quarters	64	3	40	27	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	F	54	D	10	-2	5%	46	C	6	-2	95%	0	*31*	
	Wheel	Daytime	Sleeping Quarters	52	3	40	15	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	B	54	D	2	-2	5%	54	C	1	-2	95%	0	*14*	Sleeping Quarters
																																31	
	Roadway	Night-time	Sleeping Quarters	44	3	40	7	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	125	38.66	1	D	54	D	7	-2	5%	49	C	4	-2	95%	0	*9*	
	Locomotive	Night-time	Sleeping Quarters	60	3	35	28	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	F	54	D	10	-2	5%	46	C	6	-2	95%	0	*32*	
	Wheel	Night-time	Sleeping Quarters	47	3	35	15	3.00	3.00	3.00	9.00	9.00	50%	50%	50%	Intermediate	100	25	75.96	3	B	54	D	2	-2	5%	54	C	1	-2	95%	0	*14*	
																																32	**32**

Appendix E

STAMSON Modelling

DILLON CONSULTING

STAMSON 5.0 NORMAL REPORT Date: 29-01-2026 12:42:51
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: PH3_S.te Time Period: Day/Night 16/8 hours
Description: Confirmation Modelling of TNM and FRA

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1.	0.0/2.6	16.0	2.0	12.0	Diesel	Yes

Data for Segment # 1: WCR Freight (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	41.00 / 41.00	m
Receiver height	4.50 / 4.50	m
Topography	1	(Flat/gentle slope; no barrier)
No Whistle		
Reference angle	0.00	

Results segment # 1: WCR Freight (night)

LOCOMOTIVE (0.00 + 48.98 + 0.00) = 48.98 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.50	59.69	-6.53	-4.18	0.00	0.00	0.00	48.98

WHEEL (0.00 + 31.03 + 0.00) = 31.03 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.60	42.39	-6.99	-4.37	0.00	0.00	0.00	31.03

Segment Leq : 49.05 dBA

Total Leq All Segments: 49.05 dBA

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

Car traffic volume	19730/2192	veh/TimePeriod *
Medium truck volume	203/23	veh/TimePeriod *

```
Heavy truck volume  :   407/45    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  22600
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   1.00
    Heavy Truck  % of Total Volume     :   2.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1:  (day/night)
---------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  25.00 / 25.00  m
Receiver height           :   4.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

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

Source height = 1.19 m

ROAD (0.00 + 55.53 + 0.00) = 55.53 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.58  60.35   0.00  -3.50  -1.32   0.00   0.00   0.00  55.53
-------------------------------------------------------------------------------

Segment Leq : 55.53 dBA

Total Leq All Segments: 55.53 dBA

TOTAL Leq FROM ALL SOURCES (NIGHT): 56.41
```

Appendix F

RAC Canadian Rail Atlas – Rail Spur Line

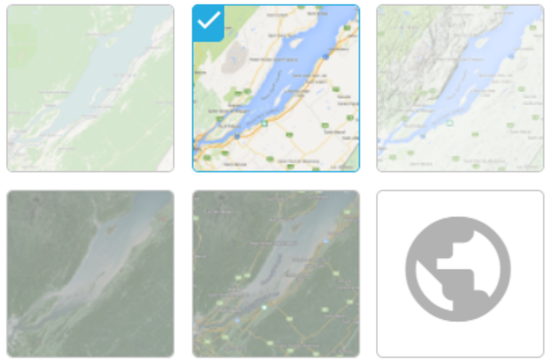
The Railway Association of Canada (RAC) cannot guarantee the quality, accuracy, or completeness of this map. The RAC shall have no liability whatsoever regarding the use of, or reliance upon, the data by any party and any errors or omissions contained therein. The map is provided for informational purposes only.

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- RAILWAYS
- CROSSINGS
- PASSENGER STATIONS
- RAIL FACILITIES
- RAIL TRAINING EVENTS
- 2023 ORIGIN-DESTINATION OF TRANSPORTE...
- CRITICAL MINERALS
- Mile Posts
- Canadian cities

Base maps



Railways

Carrier : Waterloo Central Railway
Subdivision : **Guelph**
Track classification : **Spur**
Track usage : **Freight**
Type of passengers : **N/A**
Track status : **In operation**

Railway Association of Canada

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