Thornton Tomasetti

University of Waterloo Student Residence Building

Waterloo, ON

SW22321

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NOISE & VIBRATION IMPACT STUDY

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1.0 Introduction

At the request of Diamond Schmitt Architects, Thornton Tomasetti (TT) presents this Noise & Vibration Impact Study for the planned University of Waterloo Student Residence building, located on the east side of University Avenue West on the University of Waterloo campus (the Project). TT understands that the project consists of a 12-storey student residence building. We understand that the study is required by the Regional Municipality of Waterloo for Site Plan Approval.

The objective of this study is to assess the noise and vibration impact on the proposed development from surrounding noise and vibration sources. Noise and vibration control recommendations are provided as applicable to meet the requirements of the Regional Municipality of Waterloo, using criteria developed by the Ontario Ministry of the Environment, Conservation and Parks (MECP).

2.0 Project Site

The Project site plan is provided in Appendix A, Figure 1, which shows the project north orientation. The Project is located on the east side of University Avenue West and the northwest side of Seagram Drive on the University of Waterloo campus. The Project site is bordered on the north by two rail lines for the Waterloo ION light rail transit. Academic buildings are located to the west and student residence buildings are located to the north of the site. To the south and east are parking and green space. The Project site is zoned as a UC ("University College") zone under the City of Waterloo zoning by-law. The area to the south and east are zoned as OS ("Open Space").

An aerial photo of the Project location and surrounding area is provided in Appendix A, Figure 2. A zoning map of the Project area is provided in Appendix A, Figure 3.

3.0 Noise and Vibration Sources

The major transportation noise sources that impact the site are Waterloo ION light rail and CN Rail traffic on the rail lines to the north of the Project site and road traffic on University Avenue West to the west of the Project site. Noise impacts from transportation noise sources are discussed in Section 4.0.

There are no known significant stationary noise sources that impact the Project site. A detailed discussion of off-site sources is provided in Section 5.0.

The rail lines are a vibration source that may impact the Project. Vibration impacts are discussed in Section 6.0.

4.0 Transportation Noise Sources

4.1 Sound Level Limits

Noise assessment criteria for environmental noise sources are given in the MECP publication NPC-300 "Environmental Noise Guideline, Stationary and Transportation Sources – Approval and Planning," dated August 2013.

4.1.1 MECP Indoor Sound Level Limits

The MECP indoor sound level limits for road and rail sources are shown in Table 1. The specified limits apply to the indicated indoor spaces with windows and doors closed.

Table 1: MECP indoor sound level limit for road and rail sources

Type of Space	Time Period	Sound Level Limit, L_{eq} [dBA]	
		Road Sources	Rail Sources
Sleeping quarters of residences	Daytime (07:00 - 23:00)	45	40
	Nighttime (23:00 - 07:00)	40	35
Living/dining areas of residences	Daytime (07:00 - 23:00)	45	40
	Nighttime (23:00 - 07:00)	45	40
Schools, daycare centres, etc.	Daytime (07:00 - 23:00)	45	40
	Nighttime (23:00 - 07:00)	-	-

In addition to the above indoor levels, the MECP has a sliding scale to determine the need for noise reduction measures depending on the sound level at the plane of window. Ventilation and associated warning clause requirements are based on the combined road and rail noise sources and are shown in Table 2. The rail noise level for ventilation requirements does not include train whistle noise.

Table 2: Ventilation and warning clause requirements

Assessment Location and Time Period	L_{eq} (dBA), Road and Rail Sources (Excluding Whistle)	Ventilation Requirements	Warning Clause Requirements
Plane of window (sleeping quarters or living/dining room of residences, schools, daycare centres, etc.), daytime (07:00 – 23:00)	$55 < L_{eq} \leq 65$	Forced-air heating with provision for central air conditioning.	Type C Required
	$L_{eq} > 65$	Central air conditioning	Type D Required
Plane of window (sleeping quarters of residences), nighttime (23:00 – 07:00)	$50 < L_{eq} \leq 60$	Forced-air heating with provision for central air conditioning.	Type C Required
	$L_{eq} > 60$	Central air conditioning	Type D Required

Building component requirements are assessed for road and rail sources separately. The requirements for road and rail sources are shown in Table 3. The rail noise level for building component requirements includes train whistle noise.

Table 3: Building component requirements

Assessment Location and Time Period	L_{eq} [dBA]		Building Component Requirements
	Road Sources	Rail Sources (Including Whistle)	
Plane of window (sleeping quarters or living/dining room of residences, schools, daycare centres, etc.), daytime (07:00 – 23:00)	$L_{eq} \leq 65$	$L_{eq} \leq 60$	Building components must be compliant with the Ontario Building Code (OBC).
	$L_{eq} > 65$	$L_{eq} > 60$	Building components must be designed to achieve indoor sound level criteria in Table 1.
Plane of window (sleeping quarters of residences), nighttime (23:00 – 07:00)	$L_{eq} \leq 60$	$L_{eq} \leq 55$	Building components must be compliant with the Ontario Building Code (OBC).
	$L_{eq} > 60$	$L_{eq} > 55$	Building components must be designed to achieve the indoor sound level criteria in **Error! Reference source not found.**.

In addition to the requirements above, the MECP has additional requirements for the first row of dwellings within 100m of railway tracks. If the rail traffic Leq (24-hour) at the location of a nighttime receptor for these dwellings is greater than 60 dBA, they are required to be built to a minimum of brick veneer or masonry equivalent construction.

4.2 Critical Noise Receptors

The critical noise receptors are the noise-sensitive areas of the Project that are affected by the noise sources. The critical noise receptors are Points of Reception (PORs) at the plane-of-window of the building. The locations of all PORs are summarized in Table 4 and shown in Appendix A, Figure 4 and Figure 5.

Table 4: Critical noise receptor locations

Receptor ID	Floor	Height (m)	Receptor Location
POR1	2	7.5	Open study space, north side of building
POR2	12	37.15	Southwest corner bedroom
POR3	12	37.15	West side bedroom
POR4	12	37.15	Northwest corner bedroom
POR5a	12	37.15	North side bedroom (west)
POR5b	12	37.15	North side bedroom (center)
POR5c	12	37.15	North side bedroom (east)
POR6	12	37.15	Northeast corner bedroom
POR7	12	37.15	East side bedroom
POR8	12	37.15	Southeast corner bedroom

Receptor ID	Floor	Height (m)	Receptor Location
POR9	12	37.15	Lounge, south side of building
POR10	12	37.15	South side bedroom

4.3 Sound Levels

4.3.1 Road Traffic

Traffic data for University Avenue West was obtained from the Region of Waterloo and is attached in Appendix B. Annual Average Daily Traffic (AADT) volumes, annual growth rates, the day/night traffic split, and medium/heavy truck volumes were provided in the traffic data. The road traffic data is summarized in Table 5. The forecast traffic volume from 2033 (10 years in the future) was used in the transportation noise assessment.

Table 5: Road traffic data summary

Road	Speed Limit (km/h)	Current AADT (2022)	Forecasted AADT (2033)	Implied Annual Growth Rate (%)	Medium / Heavy Trucks (%)	Day / Night (%)
University Ave W	50	15,400	17,200	1	1 / 3	90 / 10

4.3.2 Rail Traffic

The rail lines bordering the Project site to the north are a part of the Waterloo Central Railway Guelph subdivision. They are primarily used by the Waterloo ION light rail, with limited use by CN Rail. Rail traffic data for the ION light rail was based on the current schedule. Rail traffic data for CN Rail was obtained via email communication with the Region of Waterloo. This data is attached in Appendix C and summarized in Table 6.

Table 6: Rail traffic data summary

Parameter	ION Light Rail	CN Rail
Number of train passes per day (Day / Night), 2023	175 / 19	0 / 2
Train type	Electric	Diesel
Locomotives per train	1	2
Cars per train	10	15
Maximum speed (km/h)	50	50

4.3.3 Sound Level Calculations

Sound levels were calculated at each critical noise receptor using STAMSON 5.04, the software developed by the MECP for the assessment of road and rail noise. All trains were modeled as diesel trains. The trains were modeled excluding whistling, as train whistling is not expected to be used in non-emergency situations at the crossing with University Ave W. The ground was modelled as reflective for all noise sources. The calculation results are shown in Table 7. Full calculation results for all receptors are attached in Appendix D.

Table 7: Calculated sound levels at PORs

Receptor ID	Daytime L_{eq} (dBA)			Nighttime L_{eq} (dBA)			24-Hour L_{eq} (dBA)
	Road	Rail	Combined (Road + Rail)	Road	Rail	Combined (Road + Rail)	Rail
POR1	59	63	64	52	59	60	62
POR2	64	58	65	58	54	59	57
POR3	64	59	66	58	55	60	58
POR4	63	62	66	57	58	61	61
POR5a	60	63	64	53	58	60	62
POR5b	57	64	64	51	59	60	63
POR5c	54	64	65	48	60	60	63
POR6	54	65	66	48	61	61	64
POR7	50	63	63	43	59	59	62
POR8	55	62	62	48	57	58	61
POR9	57	52	58	51	48	53	51
POR10	61	-	61	54	-	54	-

4.4 Noise Control Measures

Noise control measures to meet the requirements of the MECP for the critical receptors are summarized in Table 8 and discussed in the subsequent sections.

Table 8: MECP noise control measures

Receptor ID	Location	Ventilation	Building Components	Warning Clause
POR1	Open study space, north side of building	Forced-air heating	Building components must be designed to achieve indoor sound level criteria in Table 1.	Type C
POR2	Southwest corner bedroom	Forced-air heating	Building components must be compliant with the Ontario Building Code (OBC).	Type C
POR3	West side bedroom	Central air conditioning	Building components must be compliant with the Ontario Building Code (OBC).	Type D
POR4	Northwest corner bedroom	Central air conditioning	Building components must be designed to achieve indoor sound level criteria in Table 1.	Type D
POR5a	North side bedroom (west)	Forced-air heating	Building components must be designed to achieve indoor sound level criteria in Table 1.	Type C
POR5b	North side bedroom (center)	Forced-air heating	Building components must be designed to achieve indoor sound level criteria in Table 1.	Type C
POR5c	North side bedroom (east)	Forced-air heating	Building components must be designed to achieve indoor sound level criteria in Table 1.	Type C

Receptor ID	Location	Ventilation	Building Components	Warning Clause
POR6	Northeast corner bedroom	Central air conditioning	Building components must be designed to achieve indoor sound level criteria in Table 1.	Type D
POR7	East side bedroom	Forced-air heating	Building components must be designed to achieve indoor sound level criteria in Table 1.	Type C
POR8	Southeast corner bedroom	Forced-air heating	Building components must be designed to achieve indoor sound level criteria in Table 1.	Type C
POR9	Lounge, south side of building	Forced-air heating	Building components must be compliant with the Ontario Building Code (OBC).	Type C
POR10	South side bedroom	Forced-air heating	Building components must be compliant with the Ontario Building Code (OBC).	Type C

4.4.1 Ventilation

For POR2, POR3, POR4, and POR4, the combined daytime road and rail noise is greater than 65 dBA. Therefore, central air conditioning is required for all west-facing residence units and northeast corner residence units, according to the requirements in Table 2. A Type D warning clause is also required for all future rental or sales agreements.

For all other units, a minimum of forced-air heating with a provision for central air conditioning is required.

4.4.2 Building Components

For POR1, POR4, POR5a/b/c, POR6, POR7, and POR8, the daytime rail noise is greater than 60 dBA, the nighttime rail noise is greater than 55 dBA. Therefore, the requirements of Table 3 specify that building components must be designed to achieve the indoor sound level criteria found in Table 1 for all noise-sensitive spaces on the north and east sides of the building. These noise-sensitive spaces include residence units, as well as study space, offices, and the Level 1 games room and media room. In addition, the 24-hour rail noise at these PORs is greater than 60 dBA. Therefore, the north and east façades are required to be built to a minimum of brick veneer or masonry equivalent construction.

Sound Transmission Class (STC) requirements for the building components were determined based on component areas estimated based on the floor plan and elevation drawings. The minimum STC requirements for glazing and exterior wall components are provided in Table 9.

Table 9: Building envelope minimum STC requirements

Component	Maximum Component Area Percentage Versus Floor Area of Room	Minimum STC Required
POR1 – Noise-sensitive institutional spaces, 1st and 2nd Floor		
Exterior Wall	25%	31
Fixed Glazing	16%	28
Operable Glazing	8%	25
POR4 – Northwest corner residence units, 3rd to 12th Floors		
Exterior Wall	160%	40

Component	Maximum Component Area Percentage Versus Floor Area of Room	Minimum STC Required
Fixed Glazing	40%	33
Operable Glazing	20%	30
POR5a – North side residence units, 3rd to 12th Floors		
Exterior Wall	70%	36
Fixed Glazing	26%	31
Operable Glazing	13%	28
POR5b – North side residence units, 3rd to 12th Floors		
Exterior Wall	70%	36
Fixed Glazing	26%	31
Operable Glazing	13%	28
POR5c – North side residence units, 3rd to 12th Floors		
Exterior Wall	70%	37
Fixed Glazing	26%	32
Operable Glazing	13%	29
POR6 – Northeast corner residence units, 3rd to 12th Floors		
Exterior Wall	160%	42
Fixed Glazing	40%	35
Operable Glazing	20%	32
POR7 – East side residence units, 3rd to 12th Floors		
Exterior Wall	160%	40
Fixed Glazing	22%	30
Operable Glazing	11%	27
POR8 – Southwest corner residence units, 3rd to 12th Floors		
Exterior Wall	155%	38
Fixed Glazing	42%	31
Operable Glazing	21%	28

Typical minimum constructions to meet the STC requirements for exterior wall construction and glazing are given below.

4.4.2.1 Exterior Wall Construction

The highest required STC rating for the exterior walls is STC-42, for the northeast corner residence units. Any brick veneer or masonry equivalent wall construction which meets the STC requirements in Table 9 will be acceptable for the north and east façades of the building. An example of a wall construction that meets this requirement is below:

- 12.7 mm gypsum board
- Vapour barrier
- 38 x 89 mm studs
- 50 mm (or thicker) mineral wool or glass fibre batts

- Sheathing
- 25 mm air space
- 100 mm brick veneer

Any exterior wall assembly that meets OBC criteria is sufficient to achieve the required indoor sound level for the south and west façades.

4.4.2.2 Glazing

The highest required STC rating for the glazing is STC-35, for the northeast corner residence units. Table 10 provides minimum glazing recommendations which are expected to meet this requirement, and the requirements for the rest of the building. The glazing requirements are presented in the form "*x* (*y*) *z*" to denote "*x* mm glass (*y* mm airspace) *z* mm glass."

Table 10: Glazing requirements

Location	STC Requirement	Glazing Requirement
POR1 – Noise-sensitive institutional spaces, 1st and 2nd Floor	28	2 (6) 2
POR4 – Northwest corner residence units, 3rd to 12th Floors	33	3 (13) 3
POR5a – North side residence units, 3rd to 12th Floors	31	2 (13) 2
POR5b – North side residence units, 3rd to 12th Floors	31	2 (13) 2
POR5c – North side residence units, 3rd to 12th Floors	32	3 (6) 3
POR6 – Northeast corner residence units, 3rd to 12th Floors	35	3 (20) 3
POR7 – East side residence units, 3rd to 12th Floors	30	2 (6) 2
POR8 – Southwest corner residence units, 3rd to 12th Floors	31	2 (13) 2

For the south and west façades, glazing that meets OBC criteria is sufficient to achieve the required indoor sound levels.

The above constructions are provided for reference only. STC requirements should be verified with the glazing manufacturer. Any constructions with equivalent or greater STC values will be acceptable. Differences in window sizes and unit layouts from what is assumed in this report will change these requirements. Specifically, reduced window sizes will reduce the window requirements.

4.4.3 Warning Clauses

Because central air conditioning is required for all west-facing residence units and northeast corner residence units, the following Type D warning clause is required for all future agreements of Offers of Purchase and Sale and lease/rental agreements:

> "This building has been supplied with a central air conditioning system which will allow windows to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment, Conservation and Parks."

5.0 Stationary Noise Sources

5.1 Noise Criteria for Stationary Noise Sources

The guidelines for assessing the noise impact of noise-generating facilities on proposed noise-sensitive areas in Ontario are given in Part C of the MECP publication NPC-300 "Environmental Noise Guideline, Stationary and Transportation Sources – Approval and Planning," dated 2013. The site-specific noise criteria for each time period are the higher of the values in Table 11 or the minimum hourly background noise level ($L_{EQ[1hr]}$). The Project is located in a Class 1 (urban) area.

Table 11: MECP exclusionary noise level criteria for stationary noise sources (Class 1 Area)

Time Period	Plane of Window Point of Reception $L_{EQ\ [1hr]}$ (dBA)
Day-time (07:00 – 19:00)	50
Evening (19:00 – 23:00)	50
Night-time (23:00 – 07:00)	45

5.2 Existing Stationary Noise Sources

There are no known significant stationary noise sources in the surrounding area that are expected to impact the Project.

5.3 Future Stationary Noise Sources

There are no known future potential stationary noise sources associated with the Project or other developments in the vicinity of the Project. Any future stationary noise sources associated with the Project should be selected to ensure that the sound level limits are met at the nearby residential areas and at the Project itself, per NPC-300.

6.0 Ground-Borne Vibration Impact

6.1 Vibration Criteria

Currently, there are no guidelines for the impact of railway vibration in the land use approval process in Ontario. However, in May 2013, the Federation of Canadian Municipalities (FCM) and the Railway Association of Canada (RAC) issued "Guidelines for New Development in Proximity to Railway Operations" to address developments in close proximity to railway operations. The FCM/RAC guidelines identify dwellings within 75 meters from railways alignments as susceptible to vibration impact and recommend an overall maximum vibration limit of 0.14 mm/sec root-mean-square (RMS) in the vertical direction. The limit is be based on a one-second averaging time between 4 Hz and 200 Hz. Vibration mitigation is recommended to be undertaken to ensure living areas do not exceed this limit on and above the first floor of the dwelling.

It is our understanding that CN has adopted the use of this guideline and the criterion for train vibration on proposed new developments is an overall vertical vibration level of 0.14 mm/sec (RMS) between 4 Hz and 200 Hz. Furthermore, it is our understanding that the same limit should be applied to vibration-sensitive institutional buildings such as the Project building.

6.2 Vibration Assessment

6.2.1 Instrumentation

Vibration levels were measured using Bruel & Kjaer Type 4450 vibration monitoring terminals, connected to Type 8380 tri-axial geophones. The monitoring system is capable of measuring frequencies between 4Hz and 200Hz, ±3 dB with an RMS averaging time constant of 1 second, in accordance with the guidelines.

6.2.2 Measurement Location

Vibration measurements were recorded at distances of 33m and 23.5m south of the closest rail line. These locations are labelled "Location #1" and "Location #2" in Appendix A, Figure 6. Location #1 is 33m south of the tracks and is the location of the closest noise-sensitive room (the Games Room) on Level 1 of the proposed building. Location #2 is 23.5m south of the tracks and is the location of the closest bedroom on Level 3 of the proposed building.

6.2.3 Measurement Results

Six CN freight train passes were identified during the measurement period. The maximum overall vertical vibration level from each train pass are shown in Table 12. Measurements were only taken at Location #2 for the last two train passes.

Table 12: Measured vibration levels for train passes

Date	Time	Maximum Overall Vertical Vibration Level (mm/s RMS)	
		Location #1 (33m from tracks)	Location #2 (23.5m from tracks)
June 12, 2023	23:35	0.13	-
June 13, 2023	02:30	0.15	-
June 13, 2023	23:06	0.23	-
June 14, 2023	01:43	0.18	-
June 14, 2023	23:04	0.22	0.24
June 15, 2023	01:58	0.22	0.23

The CN criteria was exceeded for five of the six train passes at Location #1 and both train passes at Location #2. Therefore, vibration mitigation measures such as building isolation may be required to meet recommended vibration levels in the building.

Vibration from ION light rail train passes was found to be significantly below the CN criteria and was indistinguishable from the ambient vibration level.

7.0 Concluding Comments

With the incorporation of the noise control measures as presented in Section 4.4 of this report, the noise impact of the transportation noise sources and stationary noise sources on the Project will meet MECP criteria. Ground-borne vibration from CN Rail train passes exceeded the CN vibration criteria at the location of the proposed building. Therefore, vibration mitigation measures may be required.

Achieving the required noise control requirements relies on correct incorporation of noise control recommendations into architectural and mechanical drawings and specifications, as well as correct installation during construction. On request, TT will conduct drawing reviews and onsite reviews of noise control measures and provide observations as appropriate; however, notwithstanding the foregoing, it is expressly understood and agreed that TT shall not have control or charge of, and shall not be responsible for the acts or omissions, including but not limited to means, methods, techniques, sequences and procedures, of the design professionals and/or contractors performing design and/or construction on the Project. Accordingly, TT shall not be held responsible for the failure of any party to properly incorporate the noise control measures stated in this report.

Please do not hesitate to contact us if there are any questions.

Yours Truly,

Thornton Tomasetti

Paul Vanoostveen, P.Eng.
Engineer

Reviewed by:
Michael Wesolowsky, Ph.D., P.Eng.
Principal

Appendix A: Figures

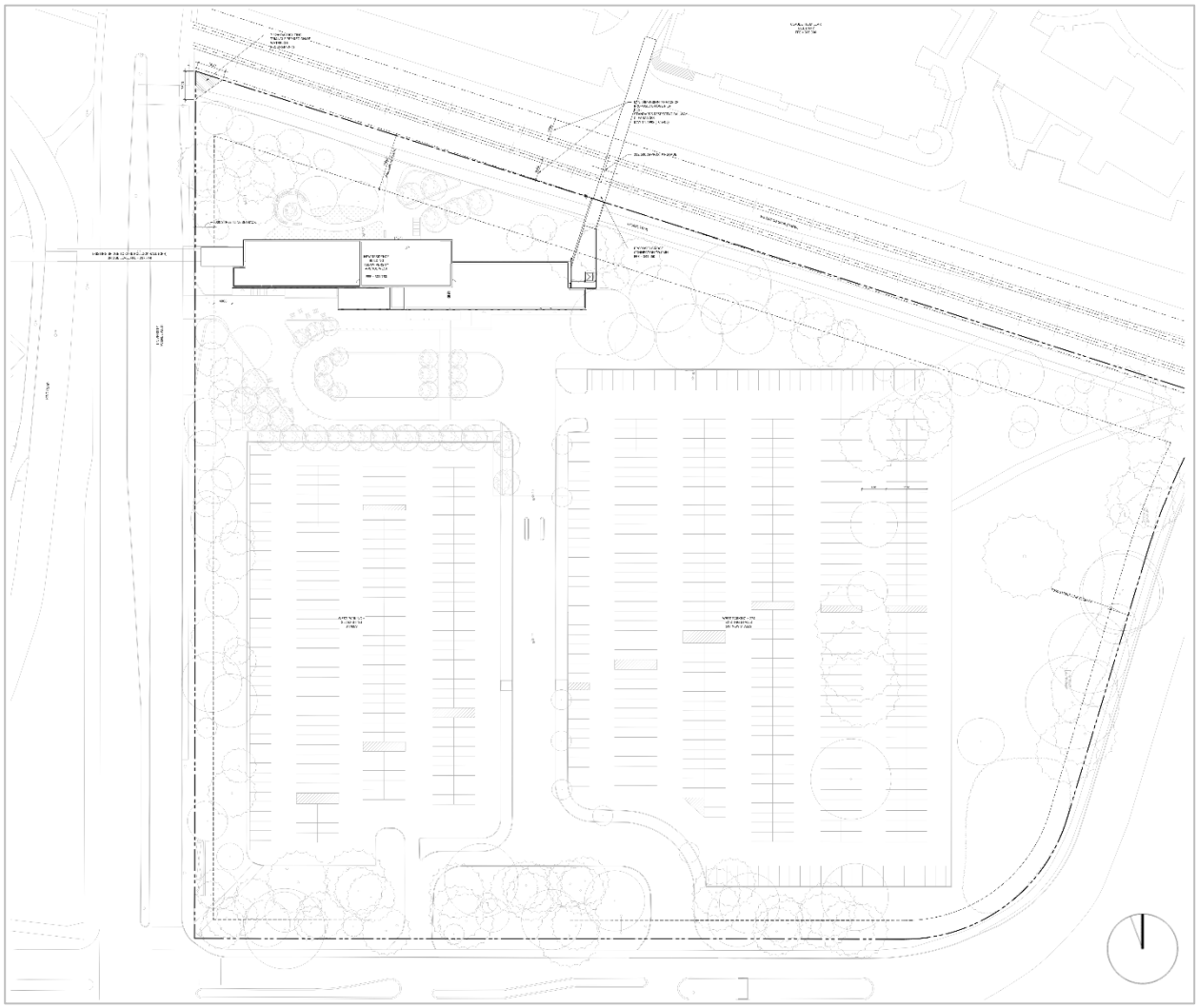


Figure 1: Project site plan

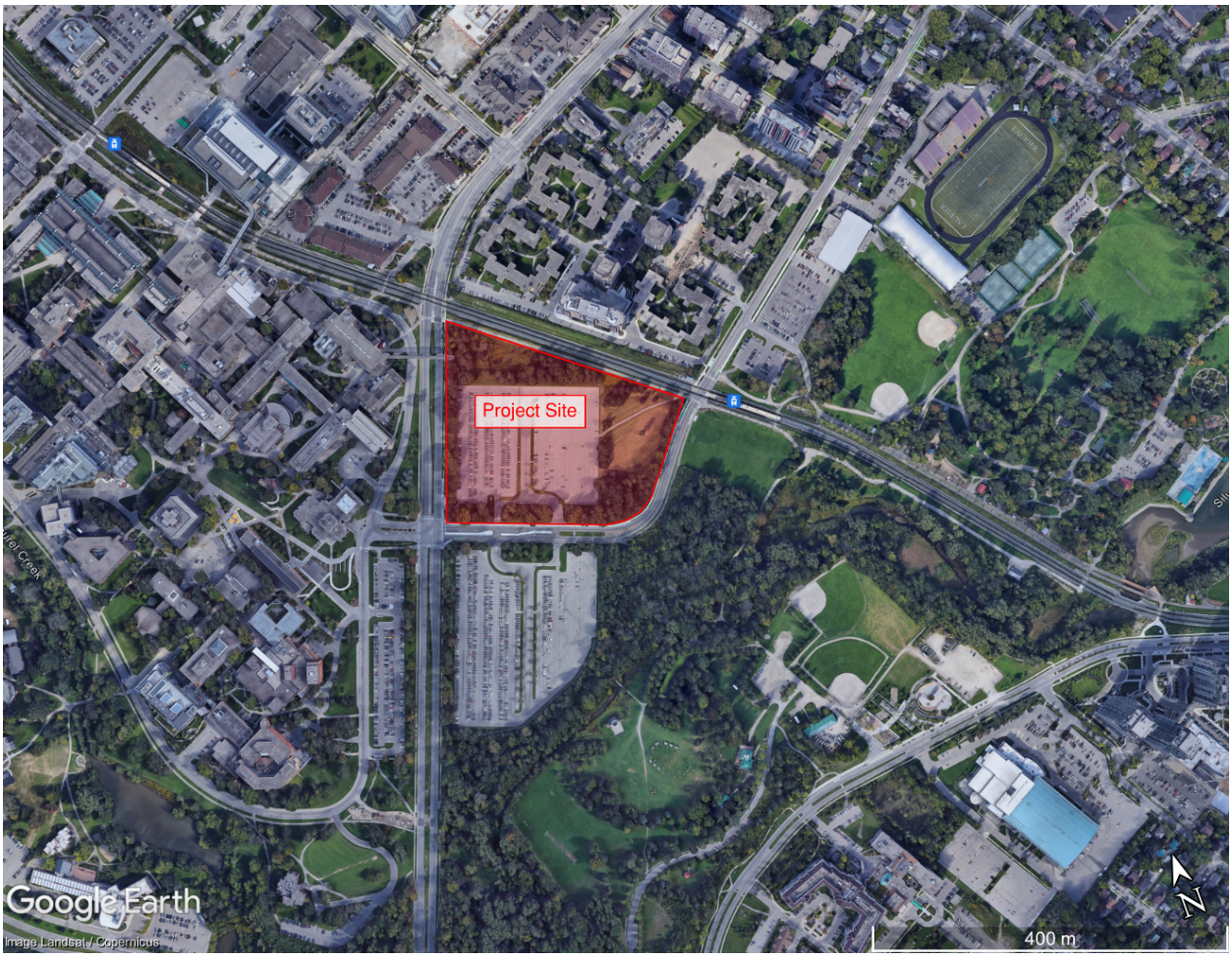


Figure 2: Project location & surroundings

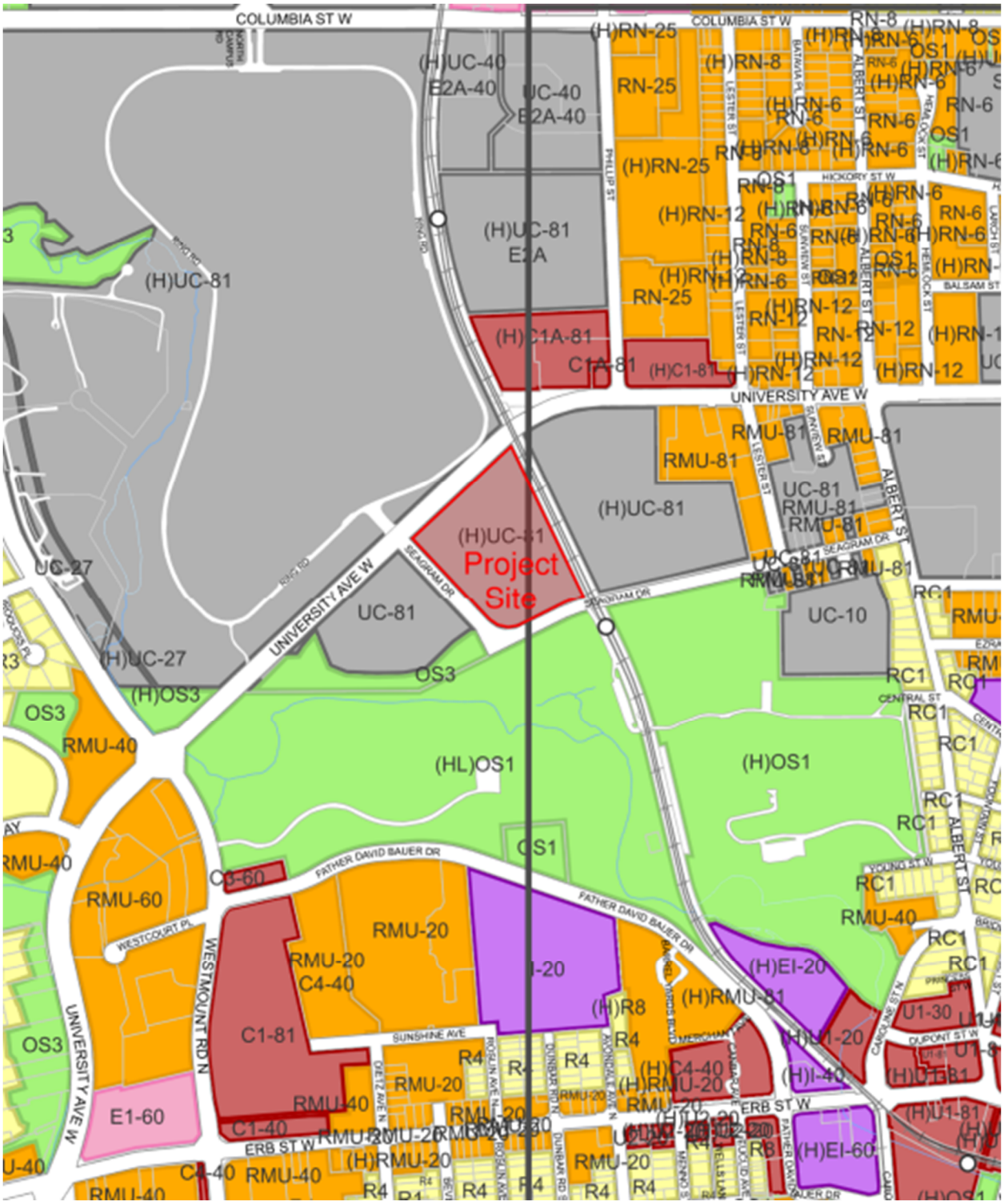


Figure 3: Zoning map

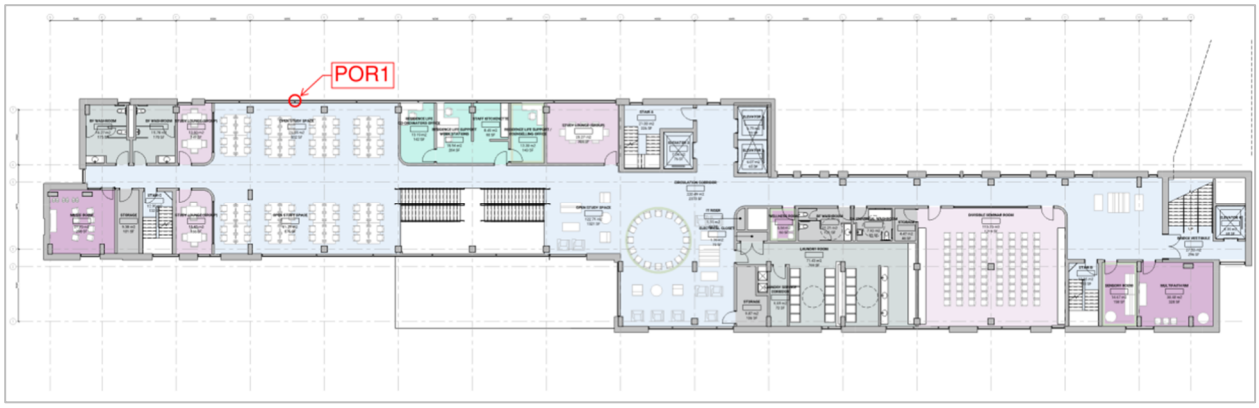


Figure 4: Point of Reception (POR) locations, 2nd floor

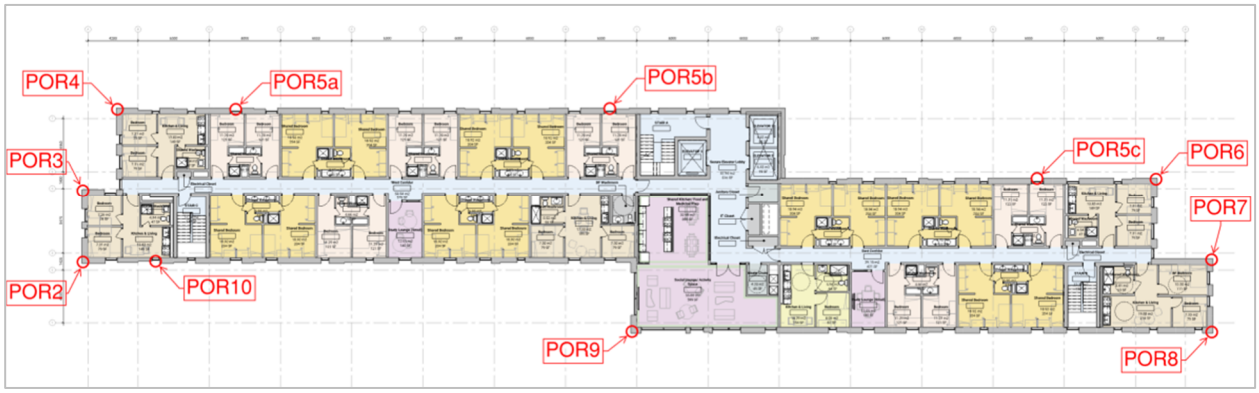


Figure 5: Point of Reception (POR) locations, 12th floor

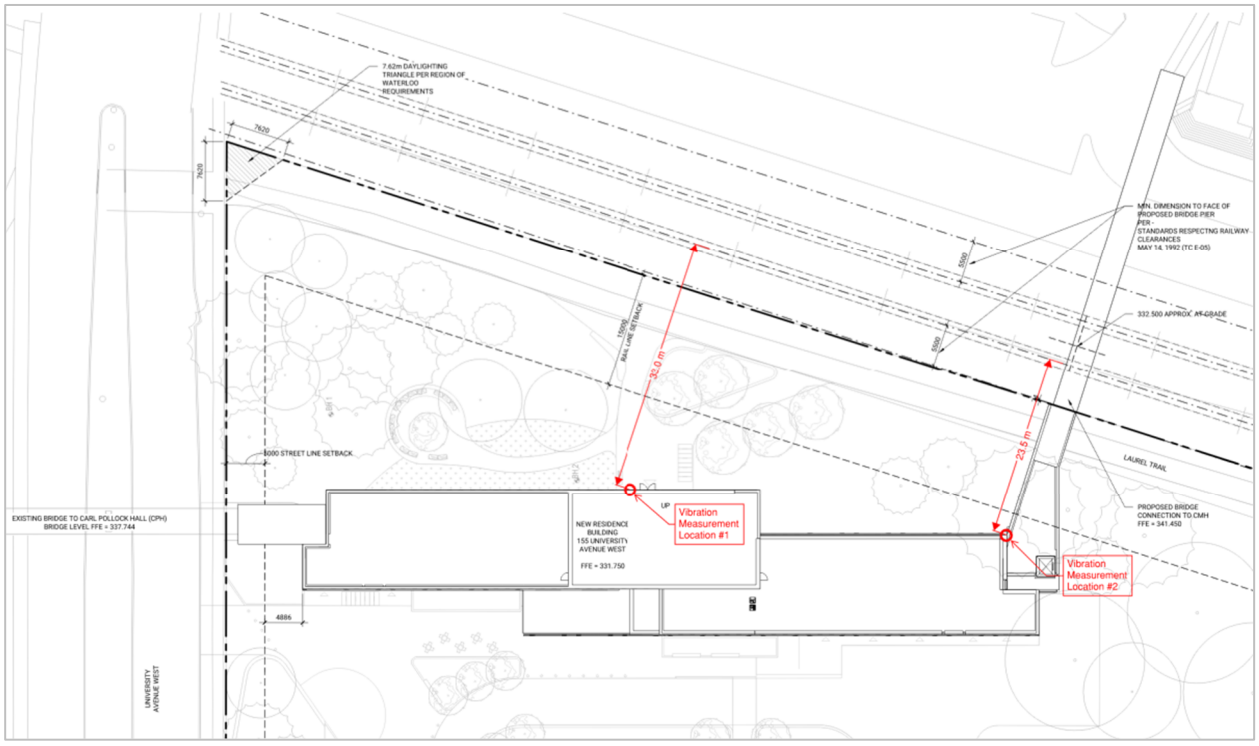


Figure 6: Vibration measurement locations

Appendix B: Road Traffic Data

Region of Waterloo AADT Forecast for Noise Studies

1. Development/Location	University Ave W - South side - West of the ION corridor			
	University Ave W			
2. Current AADT	15,400			
2022				
	University Ave W			
3. Forecast AADT	17,200			
2033				
4. Commercial Vehicle Rates	University Ave E			
% Medium Trucks	1%			
% Heavy Trucks	3%			
	University Ave E			
5. Posted Speed Limit	50 km/h			
6. Day/Night Splits	Regional Standard 90/10 Day/Night Split			
7. Expiry	Dec 31 2023			

8. Notes

This forecast is intended for the purpose of carrying out a noise study . 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.

Appendix C: Rail Traffic Data

Weekday Schedule

to Fairway

Conestoga	Northfield	Research and Technology	University of Waterloo	Laurier-Waterloo Park	Willis Way	Allen	Grand River Hospital	Central Station	Victoria Park	Queen	Kitchener Market	Borden	Mill	Block Line	Fairway
		4:45	4:47	4:48	4:52	4:54	4:56	4:59	5:01	5:03	5:05	5:07	5:10	5:15	5:20
5:10	5:14	5:17	5:20	5:21	5:25	5:27	5:29	5:32	5:34	5:36	5:38	5:40	5:43	5:48	5:53
5:25	5:29	5:32	5:35	5:36	5:40	5:42	5:44	5:47	5:49	5:51	5:53	5:55	5:58	6:03	6:08
5:40	5:44	5:47	5:50	5:51	5:55	5:57	5:59	6:02	6:04	6:06	6:08	6:10	6:13	6:18	6:23
5:55	5:59	6:02	6:05	6:06	6:10	6:12	6:14	6:17	6:19	6:21	6:23	6:25	6:28	6:33	6:38
6:10	6:14	6:17	6:20	6:21	6:25	6:27	6:29	6:32	6:34	6:36	6:38	6:40	6:43	6:48	6:53
6:20	6:24	6:27	6:30	6:31	6:35	6:37	6:39	6:42	6:44	6:46	6:48	6:50	6:53	6:58	7:03
6:30	6:34	6:37	6:40	6:41	6:45	6:47	6:49	6:52	6:54	6:56	6:58	7:00	7:03	7:08	7:13
6:40	6:44	6:47	6:50	6:51	6:55	6:57	6:59	7:02	7:04	7:06	7:08	7:10	7:13	7:18	7:23
6:50	6:54	6:57	7:00	7:01	7:05	7:07	7:09	7:12	7:14	7:16	7:18	7:20	7:23	7:28	7:33
7:00	7:04	7:07	7:10	7:11	7:15	7:17	7:19	7:22	7:24	7:26	7:28	7:30	7:33	7:38	7:43
RUNS EVERY 10 MINUTES During daytime															
4:30	4:34	4:37	4:40	4:41	4:45	4:47	4:49	4:52	4:54	4:56	4:58	5:00	5:03	5:08	5:13
4:40	4:44	4:47	4:50	4:51	4:55	4:57	4:59	5:02	5:04	5:06	5:08	5:10	5:13	5:18	5:23
4:50	4:54	4:57	5:00	5:01	5:05	5:07	5:09	5:12	5:14	5:16	5:18	5:20	5:23	5:28	5:33
5:00	5:04	5:07	5:10	5:11	5:15	5:17	5:19	5:22	5:24	5:26	5:28	5:30	5:33	5:38	5:43
5:10	5:14	5:17	5:20	5:21	5:25	5:27	5:29	5:32	5:34	5:36	5:38	5:40	5:43	5:48	5:53
5:20	5:24	5:27	5:30	5:31	5:35	5:37	5:39	5:42	5:44	5:46	5:48	5:50	5:53	5:58	6:03
5:30	5:34	5:37	5:40	5:41	5:45	5:47	5:49	5:52	5:54	5:56	5:58	6:00	6:03	6:08	6:13
5:40	5:44	5:47	5:50	5:51	5:55	5:57	5:59	6:02	6:04	6:06	6:08	6:10	6:13	6:18	6:23
5:50	5:54	5:57	6:00	6:01	6:05	6:07	6:09	6:12	6:14	6:16	6:18	6:20	6:23	6:28	6:33
6:00	6:04	6:07	6:10	6:11	6:15	6:17	6:19	6:22	6:24	6:26	6:28	6:30	6:33	6:38	6:43
6:10	6:14	6:17	6:20	6:21	6:25	6:27	6:29	6:32	6:34	6:36	6:38	6:40	6:43	6:48	6:53
6:25	6:29	6:32	6:35	6:36	6:40	6:42	6:44	6:47	6:49	6:51	6:53	6:55	6:58	7:03	7:08
6:40	6:44	6:47	6:50	6:51	6:55	6:57	6:59	7:02	7:04	7:06	7:08	7:10	7:13	7:18	7:23
6:55	6:59	7:02	7:05	7:06	7:10	7:12	7:14	7:17	7:19	7:21	7:23	7:25	7:28	7:33	7:38
RUNS EVERY 15 MINUTES During evening															
10:10	10:14	10:17	10:20	10:21	10:25	10:27	10:29	10:32	10:34	10:36	10:38	10:40	10:43	10:48	10:53
10:25	10:29	10:32	10:35	10:36	10:40	10:42	10:44	10:47	10:49	10:51	10:53	10:55	10:58	11:03	11:08
10:40	10:44	10:47	10:50	10:51	10:55	10:57	10:59	11:02	11:04	11:06	11:08	11:10	11:13	11:18	11:23
11:10	11:14	11:17	11:20	11:21	11:25	11:27	11:29	11:32	11:34	11:36	11:38	11:40	11:43	11:48	11:53
11:40	11:44	11:47	11:50	11:51	11:55	11:57	11:59	12:02	12:04	12:06	12:08	12:10	12:13	12:18	12:23

to Conestoga

Fairway	Block Line	Mill	Borden	Kitchener Market	Frederick	Kitchener City Hall	Central Station	Grand River Hospital	Allen	Waterloo Public Square	Laurier-Waterloo Park	University of Waterloo	Research and Technology	Northfield	Conestoga
5:30	5:34	5:39	5:43	5:45	5:47	5:50	5:53	5:55	5:57	6:00	6:03	6:05	6:07	6:10	6:14
6:00	6:04	6:09	6:13	6:15	6:17	6:20	6:23	6:25	6:27	6:30	6:33	6:35	6:37	6:40	6:44
6:15	6:19	6:24	6:28	6:30	6:32	6:35	6:38	6:40	6:42	6:45	6:48	6:50	6:52	6:55	6:59
6:30	6:34	6:39	6:43	6:45	6:47	6:50	6:53	6:55	6:57	7:00	7:03	7:05	7:07	7:10	7:14
6:45	6:49	6:54	6:58	7:00	7:02	7:05	7:08	7:10	7:12	7:15	7:18	7:20	7:22	7:25	7:29
7:00	7:04	7:09	7:13	7:15	7:17	7:20	7:23	7:25	7:27	7:30	7:33	7:35	7:37	7:40	7:44
7:10	7:14	7:19	7:23	7:25	7:27	7:30	7:33	7:35	7:37	7:40	7:43	7:45	7:47	7:50	7:54
7:20	7:24	7:29	7:33	7:35	7:37	7:40	7:43	7:45	7:47	7:50	7:53	7:55	7:57	8:00	8:04
7:30	7:34	7:39	7:43	7:45	7:47	7:50	7:53	7:55	7:57	8:00	8:03	8:05	8:07	8:10	8:14
RUNS EVERY 10 MINUTES During daytime															
5:20	5:24	5:29	5:33	5:35	5:37	5:40	5:43	5:45	5:47	5:50	5:53	5:55	5:57	6:00	6:04
5:30	5:34	5:39	5:43	5:45	5:47	5:50	5:53	5:55	5:57	6:00	6:03	6:05	6:07	6:10	6:14
5:40	5:44	5:49	5:53	5:55	5:57	6:00	6:03	6:05	6:07	6:10	6:13	6:15	6:17	6:20	6:24
5:50	5:54	5:59	6:03	6:05	6:07	6:10	6:13	6:15	6:17	6:20	6:23	6:25	6:27	6:30	6:34
6:00	6:04	6:09	6:13	6:15	6:17	6:20	6:23	6:25	6:27	6:30	6:33	6:35	6:37	6:40	6:44
6:10	6:14	6:19	6:23	6:25	6:27	6:30	6:33	6:35	6:37	6:40	6:43	6:45	6:47	6:50	6:54
6:20	6:24	6:29	6:33	6:35	6:37	6:40	6:43	6:45	6:47	6:50	6:53	6:55	6:57	7:00	7:04
6:30	6:34	6:39	6:43	6:45	6:47	6:50	6:53	6:55	6:57	7:00	7:03	7:05	7:07	7:10	7:14
6:40	6:44	6:49	6:53	6:55	6:57	7:00	7:03	7:05	7:07	7:10	7:13	7:15	7:17	7:20	7:24
6:50	6:54	6:59	7:03	7:05	7:07	7:10	7:13	7:15	7:17	7:20	7:23	7:25	7:27	7:30	7:34
7:00	7:04	7:09	7:13	7:15	7:17	7:20	7:23	7:25	7:27	7:30	7:33	7:35	7:37	7:40	7:44
7:15	7:19	7:24	7:28	7:30	7:32	7:35	7:38	7:40	7:42	7:45	7:48	7:50	7:52	7:55	7:59
7:30	7:34	7:39	7:43	7:45	7:47	7:50	7:53	7:55	7:57	8:00	8:03	8:05	8:07	8:10	8:14
7:45	7:49	7:54	7:58	8:00	8:02	8:05	8:08	8:10	8:12	8:15	8:18	8:20	8:22	8:25	8:29
RUNS EVERY 15 MINUTES During evening															
10:00	10:04	10:09	10:13	10:15	10:17	10:20	10:23	10:25	10:27	10:30	10:33	10:35	10:37	10:40	10:44
10:15	10:19	10:24	10:28	10:30	10:32	10:35	10:38	10:40	10:42	10:45	10:48	10:50	10:52	10:55	10:59
10:35	10:39	10:44	10:48	10:50	10:52	10:55	10:58	11:00	11:02	11:05	11:08	11:10	11:12	11:15	11:19
10:50	10:54	10:59	11:03	11:05	11:07	11:10	11:13	11:15	11:17	11:20	11:23	11:25	11:27	11:30	11:34
11:05	11:09	11:14	11:18	11:20	11:22	11:25	11:28	11:30	11:32	11:35	11:38	11:40	11:42	11:45	11:49
11:20	11:24	11:29	11:33	11:35	11:37	11:40	11:43	11:45	11:47	11:50	11:53	11:55	11:57	12:00	12:04
11:35	11:39	11:44	11:48	11:50	11:52	11:55	11:58	12:00	12:02	12:05	12:08	12:10	12:12	12:15	12:19

Connection to 302 ION Bus

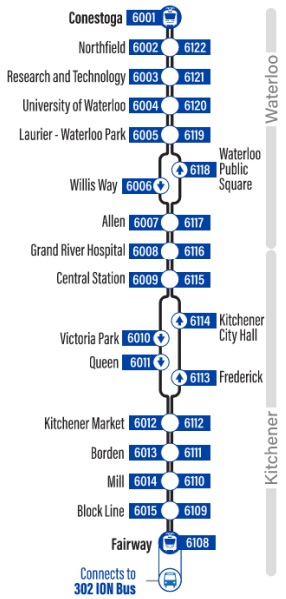
Fares and schedules are subject to change without notice.

A.M.	0:00
P.M.	0:00

ION Light Rail

GRT ION 301

Effective: September 5, 2022



easyGO grt.ca

519-585-7555 Deaf and hard of hearing (TTY): 519-575-4608
Text: 57555 & key in your bus stop number

Appendix D: STAMSON Calculation Results

STAMSON 5.0 NORMAL REPORT Date: 08-06-2023 25:23:41
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: por1.te Time Period: Day/Night 16/8 hours
Description:

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. ION Rail	175.0/19.0	50.0	1.0	10.0	Elec	No
2. CN Rail	0.0/2.0	50.0	2.0	15.0	Diesel	No

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

```
24 hr Traffic Volume (AADT or SADT):  17200
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     :   3.00
Day (16 hrs) % of Total Volume     :  90.00
```

Data for Segment # 1: Rail Lines (day/night)

```
Angle1   Angle2           : -90.00 deg   72.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  42.70 / 42.70  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
No Whistle
Reference angle           :   0.00
```

↑

Results segment # 1: Rail Lines (day)

LOCOMOTIVE (0.00 + 51.96 + 0.00) = 51.96 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	72	0.00	56.97	-4.54	-0.46	0.00	0.00	0.00	51.96

WHEEL (0.00 + 62.38 + 0.00) = 62.38 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	72	0.00	67.38	-4.54	-0.46	0.00	0.00	0.00	62.38

```
----------------------------------------------------------------------

Segment Leq : 62.76 dBA

Total Leq All Segments: 62.76 dBA

↑
Results segment # 1: Rail Lines (night)
---------------------------------------

LOCOMOTIVE (0.00 + 54.60 + 0.00) = 54.60 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------
   -90     72   0.00  59.60  -4.54  -0.46   0.00   0.00   0.00  54.60
----------------------------------------------------------------------

WHEEL (0.00 + 56.40 + 0.00) = 56.40 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------
   -90     72   0.00  61.40  -4.54  -0.46   0.00   0.00   0.00  56.40
----------------------------------------------------------------------

Segment Leq : 58.60 dBA

Total Leq All Segments: 58.60 dBA

↑
Road data, segment # 1: University (day/night)
----------------------------------------------
Car traffic volume  : 14861/1651  veh/TimePeriod  *
Medium truck volume :   155/17    veh/TimePeriod  *
Heavy truck volume  :   464/52    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):  17200
    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     :   3.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: University (day/night)
--------------------------------------------
Angle1   Angle2           :   0.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
```

```
Surface                    :      2       (Reflective ground surface)
Receiver source distance   :  45.50 / 45.50  m
Receiver height            :   7.50 / 7.50   m
Topography                 :      1       (Flat/gentle slope; no barrier)
Reference angle            :   0.00
```

↑

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

Source height = 1.32 m

ROAD (0.00 + 58.87 + 0.00) = 58.87 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
     0     90   0.00  66.70   0.00  -4.82  -3.01   0.00   0.00   0.00  58.87
--------------------------------------------------------------------------------

Segment Leq : 58.87 dBA

Total Leq All Segments: 58.87 dBA
```

↑

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

Source height = 1.32 m

ROAD (0.00 + 52.36 + 0.00) = 52.36 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
     0     90   0.00  60.19   0.00  -4.82  -3.01   0.00   0.00   0.00  52.36
--------------------------------------------------------------------------------

Segment Leq : 52.36 dBA

Total Leq All Segments: 52.36 dBA
```

↑

```
TOTAL Leq FROM ALL SOURCES (DAY): 64.25
                         (NIGHT): 59.53
```

↑

↑

STAMSON 5.0 NORMAL REPORT Date: 08-06-2023 17:00:46
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: por2.te Time Period: Day/Night 16/8 hours
Description:

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. ION Rail	175.0/19.0	50.0	1.0	10.0	Elec	No
2. CN Rail	0.0/2.0	50.0	2.0	15.0	Diesel	No

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

24 hr Traffic Volume (AADT or SADT)	17200
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	3.00
Day (16 hrs) % of Total Volume	90.00

Data for Segment # 1: Rail Lines (day/night)

Angle1 Angle2	: -90.00 deg	-18.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 2	(Reflective ground surface)
Receiver source distance	: 61.10 / 61.10 m	
Receiver height	: 37.15 / 37.15 m	
Topography	: 1	(Flat/gentle slope; no barrier)
No Whistle		
Reference angle	: 0.00	

Results segment # 1: Rail Lines (day)

LOCOMOTIVE (0.00 + 46.89 + 0.00) = 46.89 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-18	0.00	56.97	-6.10	-3.98	0.00	0.00	0.00	46.89

WHEEL (0.00 + 57.30 + 0.00) = 57.30 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-18	0.00	67.38	-6.10	-3.98	0.00	0.00	0.00	57.30

```
---------------------------------------------------------------------

Segment Leq : 57.68 dBA

Total Leq All Segments: 57.68 dBA

↑
Results segment # 1: Rail Lines (night)
---------------------------------------

LOCOMOTIVE (0.00 + 49.52 + 0.00) = 49.52 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
---------------------------------------------------------------------
   -90    -18   0.00  59.60  -6.10  -3.98   0.00   0.00   0.00  49.52
---------------------------------------------------------------------

WHEEL (0.00 + 51.32 + 0.00) = 51.32 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
---------------------------------------------------------------------
   -90    -18   0.00  61.40  -6.10  -3.98   0.00   0.00   0.00  51.32
---------------------------------------------------------------------

Segment Leq : 53.52 dBA

Total Leq All Segments: 53.52 dBA

↑
Road data, segment # 1: University (day/night)
----------------------------------------------
Car traffic volume  : 14861/1651  veh/TimePeriod  *
Medium truck volume :   155/17    veh/TimePeriod  *
Heavy truck volume  :   464/52    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):  17200
    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     :   3.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: University (day/night)
--------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
```

```
Surface                    :      2       (Reflective ground surface)
Receiver source distance   :  25.00 / 25.00  m
Receiver height            :  37.15 / 37.15  m
Topography                 :      1       (Flat/gentle slope; no barrier)
Reference angle            :   0.00
```

↑

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

Source height = 1.32 m

ROAD (0.00 + 64.49 + 0.00) = 64.49 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  66.70   0.00  -2.22   0.00   0.00   0.00   0.00  64.49
-------------------------------------------------------------------------------

Segment Leq : 64.49 dBA

Total Leq All Segments: 64.49 dBA
```

↑

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

Source height = 1.32 m

ROAD (0.00 + 57.97 + 0.00) = 57.97 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  60.19   0.00  -2.22   0.00   0.00   0.00   0.00  57.97
-------------------------------------------------------------------------------

Segment Leq : 57.97 dBA

Total Leq All Segments: 57.97 dBA
```

↑

```
TOTAL Leq FROM ALL SOURCES (DAY): 65.31
                         (NIGHT): 59.30
```

↑

↑

STAMSON 5.0 NORMAL REPORT Date: 08-06-2023 16:59:32
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: por3.te Time Period: Day/Night 16/8 hours
Description:

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. ION Rail	175.0/19.0	50.0	1.0	10.0	Elec	No
2. CN Rail	0.0/2.0	50.0	2.0	15.0	Diesel	No

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

24 hr Traffic Volume (AADT or SADT)	17200
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	3.00
Day (16 hrs) % of Total Volume	90.00

Data for Segment # 1: Rail Lines (day/night)

Angle1 Angle2	-90.00 deg 6.00 deg	
Wood depth	0	(No woods.)
No of house rows	0 / 0	
Surface	2	(Reflective ground surface)
Receiver source distance	55.70 / 55.70 m	
Receiver height	37.15 / 37.15 m	
Topography	1	(Flat/gentle slope; no barrier)
No Whistle		
Reference angle	0.00	

Results segment # 1: Rail Lines (day)

LOCOMOTIVE (0.00 + 48.54 + 0.00) = 48.54 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	6	0.00	56.97	-5.70	-2.73	0.00	0.00	0.00	48.54

WHEEL (0.00 + 58.95 + 0.00) = 58.95 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	6	0.00	67.38	-5.70	-2.73	0.00	0.00	0.00	58.95

```
----------------------------------------------------------------------

Segment Leq : 59.33 dBA

Total Leq All Segments: 59.33 dBA

↑
Results segment # 1: Rail Lines (night)
---------------------------------------

LOCOMOTIVE (0.00 + 51.17 + 0.00) = 51.17 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------
   -90      6   0.00  59.60  -5.70  -2.73   0.00   0.00   0.00  51.17
----------------------------------------------------------------------

WHEEL (0.00 + 52.97 + 0.00) = 52.97 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------
   -90      6   0.00  61.40  -5.70  -2.73   0.00   0.00   0.00  52.97
----------------------------------------------------------------------

Segment Leq : 55.17 dBA

Total Leq All Segments: 55.17 dBA

↑
Road data, segment # 1: University (day/night)
----------------------------------------------
Car traffic volume  : 14861/1651  veh/TimePeriod  *
Medium truck volume :   155/17    veh/TimePeriod  *
Heavy truck volume  :   464/52    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):  17200
    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     :   3.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: University (day/night)
--------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
```

```
Surface                    :      2       (Reflective ground surface)
Receiver source distance   :  25.00 / 25.00  m
Receiver height            :  37.15 / 37.15  m
Topography                 :      1       (Flat/gentle slope; no barrier)
Reference angle            :   0.00
```

↑

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

Source height = 1.32 m

ROAD (0.00 + 64.49 + 0.00) = 64.49 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  66.70   0.00  -2.22   0.00   0.00   0.00   0.00  64.49
-------------------------------------------------------------------------------

Segment Leq : 64.49 dBA

Total Leq All Segments: 64.49 dBA
```

↑

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

Source height = 1.32 m

ROAD (0.00 + 57.97 + 0.00) = 57.97 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  60.19   0.00  -2.22   0.00   0.00   0.00   0.00  57.97
-------------------------------------------------------------------------------

Segment Leq : 57.97 dBA

Total Leq All Segments: 57.97 dBA
```

↑

```
TOTAL Leq FROM ALL SOURCES (DAY): 65.65
                         (NIGHT): 59.80
```

↑

↑

STAMSON 5.0 NORMAL REPORT Date: 08-06-2023 16:58:49
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: por4.te Time Period: Day/Night 16/8 hours
Description:

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. ION Rail	175.0/19.0	50.0	1.0	10.0	Elec	No
2. CN Rail	0.0/2.0	50.0	2.0	15.0	Diesel	No

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

24 hr Traffic Volume (AADT or SADT)	17200
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	3.00
Day (16 hrs) % of Total Volume	90.00

Data for Segment # 1: Rail Lines (day/night)

Angle1 Angle2	: -90.00 deg	72.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 2	(Reflective ground surface)
Receiver source distance	: 48.10 / 48.10 m	
Receiver height	: 37.15 / 37.15 m	
Topography	: 1	(Flat/gentle slope; no barrier)
No Whistle		
Reference angle	: 0.00	

Results segment # 1: Rail Lines (day)

LOCOMOTIVE (0.00 + 51.45 + 0.00) = 51.45 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	72	0.00	56.97	-5.06	-0.46	0.00	0.00	0.00	51.45

WHEEL (0.00 + 61.86 + 0.00) = 61.86 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	72	0.00	67.38	-5.06	-0.46	0.00	0.00	0.00	61.86

```
----------------------------------------------------------------------

Segment Leq : 62.24 dBA

Total Leq All Segments: 62.24 dBA

↑
Results segment # 1: Rail Lines (night)
---------------------------------------

LOCOMOTIVE (0.00 + 54.08 + 0.00) = 54.08 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------
   -90     72   0.00  59.60  -5.06  -0.46   0.00   0.00   0.00  54.08
----------------------------------------------------------------------

WHEEL (0.00 + 55.88 + 0.00) = 55.88 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------
   -90     72   0.00  61.40  -5.06  -0.46   0.00   0.00   0.00  55.88
----------------------------------------------------------------------

Segment Leq : 58.08 dBA

Total Leq All Segments: 58.08 dBA

↑
Road data, segment # 1: University (day/night)
----------------------------------------------
Car traffic volume  : 14861/1651  veh/TimePeriod  *
Medium truck volume :   155/17    veh/TimePeriod  *
Heavy truck volume  :   464/52    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):  17200
    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     :   3.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: University (day/night)
--------------------------------------------
Angle1   Angle2           : -67.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
```

```
Surface                    :      2       (Reflective ground surface)
Receiver source distance   :  28.00 / 28.00  m
Receiver height            :  37.15 / 37.15  m
Topography                 :      1       (Flat/gentle slope; no barrier)
Reference angle            :   0.00
```

↑

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

Source height = 1.32 m

ROAD (0.00 + 63.40 + 0.00) = 63.40 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -67     90   0.00  66.70   0.00  -2.71  -0.59   0.00   0.00   0.00  63.40
--------------------------------------------------------------------------------

Segment Leq : 63.40 dBA

Total Leq All Segments: 63.40 dBA
```

↑

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

Source height = 1.32 m

ROAD (0.00 + 56.89 + 0.00) = 56.89 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -67     90   0.00  60.19   0.00  -2.71  -0.59   0.00   0.00   0.00  56.89
--------------------------------------------------------------------------------

Segment Leq : 56.89 dBA

Total Leq All Segments: 56.89 dBA
```

↑

```
TOTAL Leq FROM ALL SOURCES (DAY): 65.87
                         (NIGHT): 60.54
```

↑

↑

STAMSON 5.0 NORMAL REPORT Date: 08-06-2023 25:49:58
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: por5a.te Time Period: Day/Night 16/8 hours
Description:

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. ION Rail	175.0/19.0	50.0	1.0	10.0	Elec	No
2. CN Rail	0.0/2.0	50.0	2.0	15.0	Diesel	No

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

```
24 hr Traffic Volume (AADT or SADT):  17200
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     :   3.00
Day (16 hrs) % of Total Volume     :  90.00
```

Data for Segment # 1: Rail Lines (day/night)

```
Angle1   Angle2           : -90.00 deg   72.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  45.00 / 45.00  m
Receiver height           :  37.15 / 37.15  m
Topography                :      1       (Flat/gentle slope; no barrier)
No Whistle
Reference angle           :   0.00
```

↑

Results segment # 1: Rail Lines (day)

LOCOMOTIVE (0.00 + 51.74 + 0.00) = 51.74 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	72	0.00	56.97	-4.77	-0.46	0.00	0.00	0.00	51.74

WHEEL (0.00 + 62.15 + 0.00) = 62.15 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	72	0.00	67.38	-4.77	-0.46	0.00	0.00	0.00	62.15

```
---------------------------------------------------------------------

Segment Leq : 62.53 dBA

Total Leq All Segments: 62.53 dBA

↑
Results segment # 1: Rail Lines (night)
---------------------------------------

LOCOMOTIVE (0.00 + 54.37 + 0.00) = 54.37 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
---------------------------------------------------------------------
   -90     72   0.00  59.60  -4.77  -0.46   0.00   0.00   0.00  54.37
---------------------------------------------------------------------

WHEEL (0.00 + 56.17 + 0.00) = 56.17 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
---------------------------------------------------------------------
   -90     72   0.00  61.40  -4.77  -0.46   0.00   0.00   0.00  56.17
---------------------------------------------------------------------

Segment Leq : 58.37 dBA

Total Leq All Segments: 58.37 dBA

↑
Road data, segment # 1: University (day/night)
----------------------------------------------
Car traffic volume  : 14861/1651  veh/TimePeriod  *
Medium truck volume :   155/17    veh/TimePeriod  *
Heavy truck volume  :   464/52    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):  17200
    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     :   3.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: University (day/night)
--------------------------------------------
Angle1   Angle2           :   0.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
```

```
Surface                    :      2       (Reflective ground surface)
Receiver source distance   :  38.10 / 38.10  m
Receiver height            :  37.15 / 37.15  m
Topography                 :      1       (Flat/gentle slope; no barrier)
Reference angle            :   0.00
```

↑

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

Source height = 1.32 m

ROAD (0.00 + 59.65 + 0.00) = 59.65 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
     0     90   0.00  66.70   0.00  -4.05  -3.01   0.00   0.00   0.00  59.65
--------------------------------------------------------------------------------

Segment Leq : 59.65 dBA

Total Leq All Segments: 59.65 dBA
```

↑

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

Source height = 1.32 m

ROAD (0.00 + 53.13 + 0.00) = 53.13 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
     0     90   0.00  60.19   0.00  -4.05  -3.01   0.00   0.00   0.00  53.13
--------------------------------------------------------------------------------

Segment Leq : 53.13 dBA

Total Leq All Segments: 53.13 dBA
```

↑

```
TOTAL Leq FROM ALL SOURCES (DAY): 64.33
                         (NIGHT): 59.51
```

↑

↑

STAMSON 5.0 NORMAL REPORT Date: 08-06-2023 23:37:52
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: por5b.te Time Period: Day/Night 16/8 hours
Description:

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. ION Rail	175.0/19.0	50.0	1.0	10.0	Elec	No
2. CN Rail	0.0/2.0	50.0	2.0	15.0	Diesel	No

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

24 hr Traffic Volume (AADT or SADT)	17200
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	3.00
Day (16 hrs) % of Total Volume	90.00

Data for Segment # 1: Rail Lines (day/night)

Angle1 Angle2	: -90.00 deg	72.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 2	(Reflective ground surface)
Receiver source distance	: 35.40 / 35.40 m	
Receiver height	: 37.15 / 37.15 m	
Topography	: 1	(Flat/gentle slope; no barrier)
No Whistle		
Reference angle	: 0.00	

↑

Results segment # 1: Rail Lines (day)

LOCOMOTIVE (0.00 + 52.78 + 0.00) = 52.78 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	72	0.00	56.97	-3.73	-0.46	0.00	0.00	0.00	52.78

WHEEL (0.00 + 63.19 + 0.00) = 63.19 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	72	0.00	67.38	-3.73	-0.46	0.00	0.00	0.00	63.19

```
----------------------------------------------------------------------

Segment Leq : 63.57 dBA

Total Leq All Segments: 63.57 dBA

↑
Results segment # 1: Rail Lines (night)
---------------------------------------

LOCOMOTIVE (0.00 + 55.41 + 0.00) = 55.41 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------
   -90     72   0.00  59.60  -3.73  -0.46   0.00   0.00   0.00  55.41
----------------------------------------------------------------------

WHEEL (0.00 + 57.21 + 0.00) = 57.21 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------
   -90     72   0.00  61.40  -3.73  -0.46   0.00   0.00   0.00  57.21
----------------------------------------------------------------------

Segment Leq : 59.41 dBA

Total Leq All Segments: 59.41 dBA

↑
Road data, segment # 1: University (day/night)
----------------------------------------------
Car traffic volume  : 14861/1651  veh/TimePeriod  *
Medium truck volume :   155/17    veh/TimePeriod  *
Heavy truck volume  :   464/52    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):  17200
    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     :   3.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: University (day/night)
--------------------------------------------
Angle1   Angle2           :   0.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
```

```
Surface                    :      2       (Reflective ground surface)
Receiver source distance   :  69.60 / 69.60  m
Receiver height            :  37.15 / 37.15  m
Topography                 :      1       (Flat/gentle slope; no barrier)
Reference angle            :   0.00
```

↑

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

Source height = 1.32 m

ROAD (0.00 + 57.03 + 0.00) = 57.03 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
     0     90   0.00  66.70   0.00  -6.67  -3.01   0.00   0.00   0.00  57.03
--------------------------------------------------------------------------------

Segment Leq : 57.03 dBA

Total Leq All Segments: 57.03 dBA
```

↑

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

Source height = 1.32 m

ROAD (0.00 + 50.52 + 0.00) = 50.52 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
     0     90   0.00  60.19   0.00  -6.67  -3.01   0.00   0.00   0.00  50.52
--------------------------------------------------------------------------------

Segment Leq : 50.52 dBA

Total Leq All Segments: 50.52 dBA
```

↑

```
TOTAL Leq FROM ALL SOURCES (DAY): 64.44
                         (NIGHT): 59.94
```

↑

↑

STAMSON 5.0 NORMAL REPORT Date: 08-06-2023 26:25:50
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: por5c.te Time Period: Day/Night 16/8 hours
Description:

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. ION Rail	175.0/19.0	50.0	1.0	10.0	Elec	No
2. CN Rail	0.0/2.0	50.0	2.0	15.0	Diesel	No

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

24 hr Traffic Volume (AADT or SADT)	17200
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	3.00
Day (16 hrs) % of Total Volume	90.00

Data for Segment # 1: Rail Lines (day/night)

Angle1 Angle2	: -90.00 deg	72.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 2	(Reflective ground surface)
Receiver source distance	: 29.90 / 29.90 m	
Receiver height	: 37.15 / 37.15 m	
Topography	: 1	(Flat/gentle slope; no barrier)
No Whistle		
Reference angle	: 0.00	

↑

Results segment # 1: Rail Lines (day)

LOCOMOTIVE (0.00 + 53.51 + 0.00) = 53.51 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	72	0.00	56.97	-3.00	-0.46	0.00	0.00	0.00	53.51

WHEEL (0.00 + 63.93 + 0.00) = 63.93 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	72	0.00	67.38	-3.00	-0.46	0.00	0.00	0.00	63.93

```
---------------------------------------------------------------------

Segment Leq : 64.31 dBA

Total Leq All Segments: 64.31 dBA

↑
Results segment # 1: Rail Lines (night)
---------------------------------------

LOCOMOTIVE (0.00 + 56.15 + 0.00) = 56.15 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
---------------------------------------------------------------------
   -90     72   0.00  59.60  -3.00  -0.46   0.00   0.00   0.00  56.15
---------------------------------------------------------------------

WHEEL (0.00 + 57.95 + 0.00) = 57.95 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
---------------------------------------------------------------------
   -90     72   0.00  61.40  -3.00  -0.46   0.00   0.00   0.00  57.95
---------------------------------------------------------------------

Segment Leq : 60.15 dBA

Total Leq All Segments: 60.15 dBA

↑
Road data, segment # 1: University (day/night)
----------------------------------------------
Car traffic volume  : 14861/1651  veh/TimePeriod  *
Medium truck volume :   155/17    veh/TimePeriod  *
Heavy truck volume  :   464/52    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):  17200
    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     :   3.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: University (day/night)
--------------------------------------------
Angle1   Angle2           :  15.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
```

```
Surface                    :      2       (Reflective ground surface)
Receiver source distance  : 106.00 / 106.00 m
Receiver height           :  37.15 / 37.15  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

↑

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

Source height = 1.32 m

ROAD (0.00 + 54.41 + 0.00) = 54.41 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
    15     90   0.00  66.70   0.00  -8.49  -3.80   0.00   0.00   0.00  54.41
--------------------------------------------------------------------------------

Segment Leq : 54.41 dBA

Total Leq All Segments: 54.41 dBA
```

↑

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

Source height = 1.32 m

ROAD (0.00 + 47.90 + 0.00) = 47.90 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
    15     90   0.00  60.19   0.00  -8.49  -3.80   0.00   0.00   0.00  47.90
--------------------------------------------------------------------------------

Segment Leq : 47.90 dBA

Total Leq All Segments: 47.90 dBA
```

↑

```
TOTAL Leq FROM ALL SOURCES (DAY): 64.73
                         (NIGHT): 60.40
```

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STAMSON 5.0 NORMAL REPORT Date: 08-06-2023 23:50:13
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: por6.te Time Period: Day/Night 16/8 hours
Description:

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. ION Rail	175.0/19.0	50.0	1.0	10.0	Elec	No
2. CN Rail	0.0/2.0	50.0	2.0	15.0	Diesel	No

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

```
24 hr Traffic Volume (AADT or SADT):  17200
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     :   3.00
Day (16 hrs) % of Total Volume     :  90.00
```

Data for Segment # 1: Rail Lines (day/night)

```
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  26.70 / 26.70  m
Receiver height           :  37.15 / 37.15  m
Topography                :      1       (Flat/gentle slope; no barrier)
No Whistle
Reference angle           :   0.00
```

Results segment # 1: Rail Lines (day)

LOCOMOTIVE (0.00 + 54.46 + 0.00) = 54.46 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	56.97	-2.50	0.00	0.00	0.00	0.00	54.46

WHEEL (0.00 + 64.87 + 0.00) = 64.87 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	67.38	-2.50	0.00	0.00	0.00	0.00	64.87

```
---------------------------------------------------------------------

Segment Leq : 65.25 dBA

Total Leq All Segments: 65.25 dBA

↑
Results segment # 1: Rail Lines (night)
---------------------------------------

LOCOMOTIVE (0.00 + 57.10 + 0.00) = 57.10 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
---------------------------------------------------------------------
   -90     90   0.00  59.60  -2.50   0.00   0.00   0.00   0.00  57.10
---------------------------------------------------------------------

WHEEL (0.00 + 58.90 + 0.00) = 58.90 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
---------------------------------------------------------------------
   -90     90   0.00  61.40  -2.50   0.00   0.00   0.00   0.00  58.90
---------------------------------------------------------------------

Segment Leq : 61.10 dBA

Total Leq All Segments: 61.10 dBA

↑
Road data, segment # 1: University (day/night)
----------------------------------------------
Car traffic volume  : 14861/1651  veh/TimePeriod  *
Medium truck volume :   155/17    veh/TimePeriod  *
Heavy truck volume  :   464/52    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):  17200
    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     :   3.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: University (day/night)
--------------------------------------------
Angle1   Angle2           :  10.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
```

```
Surface                    :      2       (Reflective ground surface)
Receiver source distance  : 116.10 / 116.10 m
Receiver height           :  37.15 / 37.15  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

↑

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

Source height = 1.32 m

ROAD (0.00 + 54.30 + 0.00) = 54.30 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
    10     90   0.00  66.70   0.00  -8.89  -3.52   0.00   0.00   0.00  54.30
--------------------------------------------------------------------------------

Segment Leq : 54.30 dBA

Total Leq All Segments: 54.30 dBA
```

↑

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

Source height = 1.32 m

ROAD (0.00 + 47.78 + 0.00) = 47.78 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
    10     90   0.00  60.19   0.00  -8.89  -3.52   0.00   0.00   0.00  47.78
--------------------------------------------------------------------------------

Segment Leq : 47.78 dBA

Total Leq All Segments: 47.78 dBA
```

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```
TOTAL Leq FROM ALL SOURCES (DAY): 65.59
                         (NIGHT): 61.30
```

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↑

STAMSON 5.0 NORMAL REPORT Date: 08-06-2023 24:19:02
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: por7.te Time Period: Day/Night 16/8 hours
Description:

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. ION Rail	175.0/19.0	50.0	1.0	10.0	Elec	No
2. CN Rail	0.0/2.0	50.0	2.0	15.0	Diesel	No

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

24 hr Traffic Volume (AADT or SADT)	17200
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	3.00
Day (16 hrs) % of Total Volume	90.00

Data for Segment # 1: Rail Lines (day/night)

Angle1 Angle2	: -47.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 2	(Reflective ground surface)
Receiver source distance	: 32.00 / 32.00 m	
Receiver height	: 37.15 / 37.15 m	
Topography	: 1	(Flat/gentle slope; no barrier)
No Whistle		
Reference angle	: 0.00	

Results segment # 1: Rail Lines (day)

LOCOMOTIVE (0.00 + 52.49 + 0.00) = 52.49 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-47	90	0.00	56.97	-3.29	-1.19	0.00	0.00	0.00	52.49

WHEEL (0.00 + 62.90 + 0.00) = 62.90 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-47	90	0.00	67.38	-3.29	-1.19	0.00	0.00	0.00	62.90

```
----------------------------------------------------------------------

Segment Leq : 63.28 dBA

Total Leq All Segments: 63.28 dBA

↑
Results segment # 1: Rail Lines (night)
---------------------------------------

LOCOMOTIVE (0.00 + 55.12 + 0.00) = 55.12 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------
   -47     90   0.00  59.60  -3.29  -1.19   0.00   0.00   0.00  55.12
----------------------------------------------------------------------

WHEEL (0.00 + 56.92 + 0.00) = 56.92 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------
   -47     90   0.00  61.40  -3.29  -1.19   0.00   0.00   0.00  56.92
----------------------------------------------------------------------

Segment Leq : 59.12 dBA

Total Leq All Segments: 59.12 dBA

↑
Road data, segment # 1: University (day/night)
----------------------------------------------
Car traffic volume  : 14861/1651  veh/TimePeriod  *
Medium truck volume :   155/17    veh/TimePeriod  *
Heavy truck volume  :   464/52    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):  17200
    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     :   3.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: University (day/night)
--------------------------------------------
Angle1   Angle2           :  60.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
```

```
Surface                    :      2       (Reflective ground surface)
Receiver source distance  : 120.30 / 120.30 m
Receiver height           :  37.15 / 37.15  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

↑

Results segment # 1: University (day)

Source height = 1.32 m

ROAD (0.00 + 49.88 + 0.00) = 49.88 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
60	90	0.00	66.70	0.00	-9.04	-7.78	0.00	0.00	0.00	49.88

Segment Leq : 49.88 dBA

Total Leq All Segments: 49.88 dBA

↑

Results segment # 1: University (night)

Source height = 1.32 m

ROAD (0.00 + 43.37 + 0.00) = 43.37 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
60	90	0.00	60.19	0.00	-9.04	-7.78	0.00	0.00	0.00	43.37

Segment Leq : 43.37 dBA

Total Leq All Segments: 43.37 dBA

↑

TOTAL Leq FROM ALL SOURCES (DAY): 63.47
(NIGHT): 59.23

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STAMSON 5.0 NORMAL REPORT Date: 08-06-2023 24:20:21
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: por8.te Time Period: Day/Night 16/8 hours
Description:

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. ION Rail	175.0/19.0	50.0	1.0	10.0	Elec	No
2. CN Rail	0.0/2.0	50.0	2.0	15.0	Diesel	No

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

24 hr Traffic Volume (AADT or SADT)	17200
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	3.00
Day (16 hrs) % of Total Volume	90.00

Data for Segment # 1: Rail Lines (day/night)

Angle1 Angle2	: -18.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 2	(Reflective ground surface)
Receiver source distance	: 37.60 / 37.60 m	
Receiver height	: 37.15 / 37.15 m	
Topography	: 1	(Flat/gentle slope; no barrier)
No Whistle		
Reference angle	: 0.00	

Results segment # 1: Rail Lines (day)

LOCOMOTIVE (0.00 + 50.76 + 0.00) = 50.76 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-18	90	0.00	56.97	-3.99	-2.22	0.00	0.00	0.00	50.76

WHEEL (0.00 + 61.17 + 0.00) = 61.17 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-18	90	0.00	67.38	-3.99	-2.22	0.00	0.00	0.00	61.17

```
---------------------------------------------------------------------

Segment Leq : 61.55 dBA

Total Leq All Segments: 61.55 dBA

↑
Results segment # 1: Rail Lines (night)
---------------------------------------

LOCOMOTIVE (0.00 + 53.39 + 0.00) = 53.39 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
---------------------------------------------------------------------
   -18     90   0.00  59.60  -3.99  -2.22   0.00   0.00   0.00  53.39
---------------------------------------------------------------------

WHEEL (0.00 + 55.19 + 0.00) = 55.19 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
---------------------------------------------------------------------
   -18     90   0.00  61.40  -3.99  -2.22   0.00   0.00   0.00  55.19
---------------------------------------------------------------------

Segment Leq : 57.39 dBA

Total Leq All Segments: 57.39 dBA

↑
Road data, segment # 1: University (day/night)
----------------------------------------------
Car traffic volume  : 14861/1651  veh/TimePeriod  *
Medium truck volume :   155/17    veh/TimePeriod  *
Heavy truck volume  :   464/52    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):  17200
    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     :   3.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: University (day/night)
--------------------------------------------
Angle1   Angle2           : -90.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
```

```
Surface                    :      2       (Reflective ground surface)
Receiver source distance  : 120.30 / 120.30 m
Receiver height           :  37.15 / 37.15  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

↑

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

Source height = 1.32 m

ROAD (0.00 + 54.65 + 0.00) = 54.65 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -90      0   0.00  66.70   0.00  -9.04  -3.01   0.00   0.00   0.00  54.65
--------------------------------------------------------------------------------

Segment Leq : 54.65 dBA

Total Leq All Segments: 54.65 dBA
```

↑

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

Source height = 1.32 m

ROAD (0.00 + 48.14 + 0.00) = 48.14 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -90      0   0.00  60.19   0.00  -9.04  -3.01   0.00   0.00   0.00  48.14
--------------------------------------------------------------------------------

Segment Leq : 48.14 dBA

Total Leq All Segments: 48.14 dBA
```

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```
TOTAL Leq FROM ALL SOURCES (DAY): 62.36
                         (NIGHT): 57.88
```

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STAMSON 5.0 NORMAL REPORT Date: 08-06-2023 24:56:02
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: por9.te Time Period: Day/Night 16/8 hours
Description:

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. ION Rail	175.0/19.0	50.0	1.0	10.0	Elec	No
2. CN Rail	0.0/2.0	50.0	2.0	15.0	Diesel	No

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

24 hr Traffic Volume (AADT or SADT)	17200
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	3.00
Day (16 hrs) % of Total Volume	90.00

Data for Segment # 1: Rail Lines (day/night)

Angle1 Angle2	: 72.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 2	(Reflective ground surface)
Receiver source distance	: 52.50 / 52.50 m	
Receiver height	: 37.15 / 37.15 m	
Topography	: 1	(Flat/gentle slope; no barrier)
No Whistle		
Reference angle	: 0.00	

↑

Results segment # 1: Rail Lines (day)

LOCOMOTIVE (0.00 + 41.52 + 0.00) = 41.52 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
72	90	0.00	56.97	-5.44	-10.00	0.00	0.00	0.00	41.52

WHEEL (0.00 + 51.94 + 0.00) = 51.94 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
72	90	0.00	67.38	-5.44	-10.00	0.00	0.00	0.00	51.94

```
----------------------------------------------------------------------

Segment Leq : 52.32 dBA

Total Leq All Segments: 52.32 dBA

↑
Results segment # 1: Rail Lines (night)
---------------------------------------

LOCOMOTIVE (0.00 + 44.16 + 0.00) = 44.16 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------
    72     90   0.00  59.60  -5.44 -10.00   0.00   0.00   0.00  44.16
----------------------------------------------------------------------

WHEEL (0.00 + 45.96 + 0.00) = 45.96 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------
    72     90   0.00  61.40  -5.44 -10.00   0.00   0.00   0.00  45.96
----------------------------------------------------------------------

Segment Leq : 48.16 dBA

Total Leq All Segments: 48.16 dBA

↑
Road data, segment # 1: University (day/night)
----------------------------------------------
Car traffic volume  : 14861/1651  veh/TimePeriod  *
Medium truck volume :   155/17    veh/TimePeriod  *
Heavy truck volume  :   464/52    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):  17200
    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     :   3.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: University (day/night)
--------------------------------------------
Angle1   Angle2           : -90.00 deg   7.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
```

```
Surface                    :      2       (Reflective ground surface)
Receiver source distance   :  71.30 / 71.30  m
Receiver height            :  37.15 / 37.15  m
Topography                 :      1       (Flat/gentle slope; no barrier)
Reference angle            :   0.00
```

↑

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

Source height = 1.32 m

ROAD (0.00 + 57.25 + 0.00) = 57.25 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -90      7   0.00  66.70   0.00  -6.77  -2.69   0.00   0.00   0.00  57.25
--------------------------------------------------------------------------------

Segment Leq : 57.25 dBA

Total Leq All Segments: 57.25 dBA
```

↑

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

Source height = 1.32 m

ROAD (0.00 + 50.74 + 0.00) = 50.74 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -90      7   0.00  60.19   0.00  -6.77  -2.69   0.00   0.00   0.00  50.74
--------------------------------------------------------------------------------

Segment Leq : 50.74 dBA

Total Leq All Segments: 50.74 dBA
```

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```
TOTAL Leq FROM ALL SOURCES (DAY): 58.46
                         (NIGHT): 52.65
```

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STAMSON 5.0 NORMAL REPORT Date: 08-06-2023 25:06:09
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: por10.te Time Period: Day/Night 16/8 hours
Description:

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

Car traffic volume : 14861/1651 veh/TimePeriod *
Medium truck volume : 155/17 veh/TimePeriod *
Heavy truck volume : 464/52 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): 17200
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 : 3.00
Day (16 hrs) % of Total Volume : 90.00

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

Angle1 Angle2 : -90.00 deg 0.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 31.30 / 31.30 m
Receiver height : 37.15 / 37.15 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

↑
Results segment # 1: University (day)

Source height = 1.32 m

ROAD (0.00 + 60.50 + 0.00) = 60.50 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.00	66.70	0.00	-3.19	-3.01	0.00	0.00	0.00	60.50

Segment Leq : 60.50 dBA

Total Leq All Segments: 60.50 dBA

🡅

Results segment # 1: University (night)

Source height = 1.32 m

ROAD (0.00 + 53.99 + 0.00) = 53.99 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.00	60.19	0.00	-3.19	-3.01	0.00	0.00	0.00	53.99

Segment Leq : 53.99 dBA

Total Leq All Segments: 53.99 dBA

🡅

TOTAL Leq FROM ALL SOURCES (DAY): 60.50
(NIGHT): 53.99

🡅

🡅