

Noise Feasibility Study

Proposed Mixed-Use/Residential Development

6 Regina Street, 24, 28, 34 Erb Street East

Waterloo, Ontario

Prepared for:

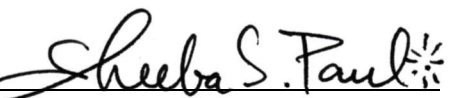
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Waterloo, Ontario.

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1 Introduction and Summary

HGC Engineering was retained by VanLegend Regina LP to conduct a noise feasibility study for a proposed mixed-use/residential development to be located at 6 Regina Street, 24, 28, 34 Erb Street East in Waterloo, Ontario. The proposed development will consist of an 18-storey mixed-use / residential building comprising of residential units above parking, office space, and retail space on the lower levels. The study is required by the Municipality and the Regional Municipality of Waterloo (RMOW) as part of the approval process for Official Plan and Zoning By-law Amendment application and a future site plan application.

The primary noise sources at the proposed development were determined to be road traffic on Erb Street East and Regina Street North. Secondary sources of noise include rail traffic on the Waterloo Central Railway. Relevant road traffic data was obtained from Region of Waterloo personnel. Rail traffic data was obtained from HGC Engineering project files and originally from AECOM Canada Ltd. The data was used to predict future traffic sound levels at the façades of the proposed mixed-use building and in the common outdoor living area. The predicted sound levels were compared to the guidelines of the Ministry of the Environment, Conservation and Parks (MECP) and the Region.

The sound level predictions indicate that future road traffic sound levels will be within MECP guidelines at the façades of the proposed mixed-use building. The recommended noise control measures include appropriate wall and window glazing assemblies and an alternative means of ventilation to open windows. Noise warning clauses are recommended in order to inform future owners/tenants of the traffic noise impacts, to address sound level excesses and to inform future residents of their proximity to the nearby existing retail and commercial uses.

An analysis was also conducted to determine the potential impact of noise from rooftop units on the adjacent buildings surrounding the proposed building. The analysis for the existing buildings surrounding the proposed development was based on aerial photos, reasonable estimates of sound data for rooftop equipment and aerial photos.

A 3D computer model of the area was created, using acoustic modelling software, in order to predict the sound levels at the proposed building. The results indicate that sound emissions from the rooftop equipment associated with the existing surrounding buildings on the proposed building are expected



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to be within the MECP's minimum exclusionary sound level limits. Further physical mitigation measures will not be required.

2 Site Description and Sources of Sound

A key plan for the development is attached as Figure 1. The site is located on the northeast corner of Regina Street North and Erb Street East, specifically at 6 Regina Street, 24, 28, 34 Erb Street East in Waterloo, Ontario. The site plan prepared by Kirkor Architects and Planners dated September 7, 2021 ("Design Presentation") is included as Figure 2 and shows the prediction locations. The proposed development will consist of an 18-storey mixed-use/residential building comprising of retail space on the ground floor, parking on the 2nd and 3rd floors, office space on the 4th floor, with residential units above. There are also indoor and outdoor amenity areas on the 5th floor. Appendix A includes preliminary floor plans.

A site visit was conducted by HGC Engineering personnel in January 2022 to make observations of the acoustic environment and to identify the significant noise sources in the vicinity. The acoustical environment surrounding the site is urban in nature. During the site visit, it was noted that the primary transportation sources of sound impacting the site are vehicular traffic on Regina Street North and Erb Street East. A secondary source of sound impacting the site is rail traffic on the Waterloo Central Railway, located approximately 100 m south of the site. The site is currently occupied by existing 2-storey commercial buildings on the west side of the site which will be demolished to make way for the proposed building. The east side of the site is currently occupied by a parking lot. The surrounding areas near the site are occupied by various low-rise retail/commercial buildings, as well as some residential buildings. Noise from these retail and commercial buildings were not discernable from traffic noise during the site visit. Nevertheless, due to the proximity of the site to a variety of existing retail, commercial, institutional, and religious uses, it is recommended that a noise warning clause to identify that such uses may be audible at times be included in the tenancy agreements, as described in Section 3.4.



3 Road Traffic Noise Assessment

3.1 Traffic Noise Criteria

Guidelines for acceptable levels of road and rail traffic noise impacting residential developments are given in the MECP publication NPC-300 “Environment Noise Guideline Stationary and Transportation sources – Approval and Planning”, release date October 21, 2013, and are listed in Table I below. The values in Table I are energy equivalent (average) sound levels [L_{EQ}] in units of A-weighted decibels [dBA]. The Railway Association of Canada/Federation of Canadian Municipalities “Report Research Phase 3: Proximity Guidelines and Best Practices” dated November 2006 and Guidelines for New Development in Proximity to Railway Operations dated May 2013 were also reviewed.

Table I: Road Noise Criteria (dBA)

	Daytime $L_{EQ}(16 \text{ hour})$ Road/Rail	Nighttime $L_{EQ}(8 \text{ hour})$ Road/Rail
Outdoor Living Areas	55 dBA	--
Inside Living/Dining Rooms	45 dBA / 40 dBA	45 dBA / 40 dBA
Inside Bedrooms	45 dBA / 40 dBA	40 dBA / 35 dBA

Daytime refers to the period between 07:00 and 23:00, while nighttime refers to the period between 23:00 and 07:00. The term "Outdoor Living Area" (OLA) is used in reference to an outdoor patio, a backyard, a terrace or other areas where passive recreation is expected to occur. Balconies and terraces that are less than 4 m in depth are not considered to be outdoor living areas under MECP guidelines, and accordingly the noise criteria are not applicable there. Large private terraces require consideration only if they are the only OLA for the occupant; in general. Common outdoor amenity terraces associated with high-rise buildings are the only OLA that require consideration.

The guidelines in the MECP publication allow the daytime sound levels in an Outdoor Living Area to be exceeded by up to 5 dBA, without mitigation, if warning clauses are placed in the purchase and rental agreements to the property. Where OLA sound levels exceed 60 dBA, physical mitigation is required to reduce the OLA sound level to below 60 dBA and as close to 55 dBA as technically, economically and administratively practical.



A central air conditioning system as an alternative means of ventilation to open windows is required for dwellings where nighttime sound levels outside bedroom or living/dining room windows exceed 60 dBA or daytime sound levels outside bedroom or living/dining room windows exceed 65 dBA. Forced-air ventilation with ducts sized to accommodate the future installation of air conditioning is required when nighttime sound levels at bedroom or living/dining room windows are in the range of 51 to 60 dBA or when daytime sound levels at bedroom or living/dining room windows are in the range of 56 to 65 dBA.

Building components such as walls, windows and doors must be designed to achieve indoor sound level criteria when the plane of window nighttime sound level is greater than 60 dBA or the daytime sound level is greater than 65 dBA due to road traffic noise.

Warning clauses are required to notify future residents of possible sound level excesses when nighttime sound levels exceed 50 dBA at the plane of the bedroom window and/or daytime sound levels exceed 55 dBA in the outdoor living area and at the plane of the bedroom or living/dining room window due to road traffic and rail traffic.

3.2 Road Traffic Data

Projected traffic data for Erb Street East and Regina Street North was obtained from the Region of Waterloo and is provided in Appendix B. A day/night split of 90/10 was used for both roadways. A commercial vehicle percentage of 2%, split into 1% medium trucks and 1% heavy trucks and a posted speed limit of 50 km/h was applied for both roadways. Table II below summarizes the road traffic volume data used in this study.

Table II: Projected Road Traffic Data (2032)

Road Name		Cars	Medium Trucks	Heavy Trucks	Total
Erb Street East	Daytime	11 466	117	117	11 700
	Nighttime	1 274	13	13	1 300
	Total	12 740	130	130	13 000
Regina Street North	Daytime	7 585	77	77	7 739
	Nighttime	843	9	9	861
	Total	8 428	86	86	8 600

3.1 Rail Traffic Data

Rail traffic data for the Waterloo Central Railway was obtained from HGC Engineering project files for similar projects in the area and originally obtained from AECOM Canada Ltd. in their letter dated May 16, 2011 provided in Appendix C. The rail data was confirmed to be current by referencing a list of at grade crossings on the Government of Canada's Open Data Portal generated by Transport Canada from March 2021. The Waterloo Central Railway is a spur line and is used for freight operations. The maximum train speed of 16 km/h (10 mph) for freight was used in the analysis. In conformance with rail assessment requirements, the maximum speeds, maximum number of cars and maximum locomotives per train were used in the traffic noise analysis to yield a worse case estimate of train noise. The data was projected to the year 2032 using a 2.5% per year growth rate. As a worst case scenario, one freight train was included in the analysis during the daytime hours. The rail volumes used in the analysis are shown in Table III.

Table III: Projected Rail Traffic Data to Year 2032

Type of Train	Maximum Number of Locomotives	Maximum Number of Cars	Maximum Speed (km/h)	Current Volume Day/Night	Projected Volume Day/Night
Freight	2	25	16	0 / 2	1 / 3.4

3.2 Traffic Noise Predictions

To assess the levels of road and rail traffic noise which will impact the site in the future, predictions were made using STAMSON version 5.04, a computer algorithm developed by the MECP. Sample STAMSON output is included in Appendix D. Reflective ground surface was used in the STAMSON calculation.

The predictions were performed at the top residential floor of the proposed mixed-use building during daytime and nighttime hours to investigate ventilation requirements and in the outdoor amenity areas to determine acoustic barrier requirements. The distance setbacks of the proposed building from the roads and railway indicated on the site plan and aerial photos were used in the analysis. The results of these predictions are summarized in Table IV. The acoustic requirements may be subject to modifications if the site plan is changed significantly.

Table IV: Predicted Road/Rail/Total Traffic Sound Levels [dBA]

Prediction Location	Location	Daytime L _{EQ-16 hr}	Nighttime L _{EQ-8 hr}
[A]	North Façade	58 / -- / 58	52 / -- / 52
[B]	East Façade	60 / 42 / 60	54 / 51 / 55
[C]	South Façade	64 / 45 / 64	58 / 54 / 59
[D]	West Façade	64 / 42 / 64	57 / 51 / 58
[E]	5 th Floor OLA*	46 / 37 / 47	--

Note: * Assuming a standard minimum 1.07 m solid parapet around the area.

3.3 Traffic Noise Recommendations

The sound level predictions indicate that the future traffic sound levels will be within the MECP guidelines at the building façades of the proposed mixed-use building. The following discussion outlines the recommendations for acoustic barrier requirements, ventilation requirements, upgraded building façade construction, and warning clauses to achieve the noise criteria stated in Table I.

3.3.1 Outdoor Living Areas

The dwelling units in the proposed development may have balconies that are less than 4 m in depth. These areas are not considered to be outdoor amenity areas under MECP guidelines, and therefore are exempt from traffic noise assessment. Since there is a common amenity terrace on the 5th floor provided for the use of all occupants, large private terraces are not considered OLAs under MECP guidelines.

There is an outdoor amenity area for all residents on the north and east sides of the 5th floor. The predicted sound level in this area (Prediction Location [E]) will be less than the MECP limit of 55 dBA, assuming a standard minimum 1.07 m high solid parapet around the perimeter. No additional noise abatement is required for this amenity space.

3.3.2 Indoor Living Areas and Ventilation Requirements

The predicted sound levels at the top-storey façades of the proposed building will be between 56 and 65 dBA during the daytime hours and between 51 and 60 dBA during the nighttime hours. To address these excesses, the MECP guidelines recommend that these units be equipped with an alternative means of ventilation to open windows. For multi-storey buildings, this requirement is typically satisfied through central air conditioning.



Window or through-the-wall air conditioning units are not recommended for any residential units because of the noise they produce and because the units penetrate through the exterior wall which degrades the overall noise insulating properties of the envelope. Acceptable units are those that are housed in their own closet with an access door for maintenance. The location, installation and sound ratings of the outdoor air conditioning devices should minimize noise impacts and comply with criteria of MECP publication NPC-300, as applicable. Associated warning clauses are also recommended.

3.3.3 Building Façade Constructions

Since the future road and rail traffic sound levels outside all the façades of the proposed building will be less than 60 dBA at night and less than 65 dBA during the daytime, any exterior wall, insulated metal exterior door and double-glazed window construction meeting the minimum requirements of the Ontario Building Code (OBC) will provide adequate sound insulation.

3.4 Warning Clauses

The MECP guidelines recommend that warning clauses be included in the property and tenancy agreements for all units with anticipated road traffic sound level. Examples are provided below.

Suggested wording for future dwellings with sound level excesses.

Type A:

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

Suggested wording for future dwellings requiring forced air ventilation systems is given below.

Type B:

This dwelling unit has been fitted with a forced air heating system and the ducting etc., was sized to accommodate central air conditioning. Installation of central air conditioning will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the noise criteria of the Municipality and the Ministry of the Environment. (Note: the location and installation of the outdoor air conditioning device should be done so as to minimize the noise impacts and comply with criteria of MECP publication NPC-300.)



Suitable wording to inform future residents of the adjacent retail/commercial facilities and that sounds from these facilities may at times be audible.

Type C:

Purchasers/tenants are advised that due to the proximity of the adjacent retail/commercial facilities, noise from these facilities may at times be audible.

The railway's standard warning clause which is required for all residential developments located within 300 m of their line is given below.

Type D:

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

These sample clauses are provided by the MECP as examples and can be modified by the Municipality as required.

4 Stationary Noise Assessment

4.1 Criteria Governing Stationary (Industrial) Noise Sources

In Ontario, the guidelines of the Ontario Ministry of the Environment, Conservation and Parks (MECP) form the basis of environmental noise assessment. MECP publication NPC-300, "*Environmental Noise Guideline Stationary and Transportation Sources – Approval and Planning*", release date October 21, 2013 provides criteria for assessing the noise impact from the nearby buildings. The term Stationary Source is used to describe all noise sources at the site including mechanical equipment. The MECP guidelines assess the noise impact of fluctuating sounds on an hourly energy equivalent (average) sound level basis, rather than on short-duration maximum sound levels. Hourly equivalent sound levels are denoted as the L_{EQ-1hr} .



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The MECP guidelines stipulate that the sound level impact during a “predicable worst case hour” be considered. This is defined to be an hour when a typically busy “planned and predictable mode of operation” occurs at the subject facility coincident with a period of minimal background sound.

The criteria is based on the background sound level at sensitive points of reception (which are typically residences) in the quietest hour that the source can be in operation. Background sound includes sound from road traffic and natural sounds, but excludes the sources under assessment. For relatively quiet areas where background sound may fall to low levels during some hours, NPC-300 stipulates various minimum limits. In Class 1 areas, these exclusionary limits are 50 dBA for daytime and evening (07:00 to 23:00) and 45 dBA at night (23:00 to 7:00).

In areas where traffic sound is dominant, typical ambient sound levels can be determined through prediction of road traffic volumes. Where it can be demonstrated that the hourly ambient sound levels are greater than the exclusionary minimum limits listed above, the criterion becomes the lowest predicted one-hour L_{EQ} sound level during each respective period. To ensure a conservative analysis, the exclusionary minimum limits listed will be adopted for the proposed sensitive receptors.

Compliance with MECP criteria generally results in acceptable levels of sound at sensitive receptors although there may be residual audibility during periods of low background sound.

4.2 Assumptions

Predictive noise modelling was used to assess the sound impact of the existing rooftop mechanical equipment on the surrounding buildings at the most potentially impacted dwelling units of the proposed development in accordance with MECP guidelines. The noise prediction model was based on a review of the proposed site plan, aerial photos, source sound levels for typical rooftop mechanical units, assumed operational profiles, and established engineering methods for the prediction of outdoor sound propagation. These methods include the effects of distance, air absorption, and acoustical screening by barrier obstacles.

Sources sound levels for typical rooftop mechanical units and assumed operational information (outlined below) were used as input to a predictive computer model. The software used for this purpose (*Cadna/A version 2021 MR2 (32 bit) build: 187.5163*) is a computer implementation of ISO Standard 9613-2.2 “Acoustics - Attenuation of Sound During Propagation Outdoors.”



The assumed sound power levels are listed in the table below.

Table V: Sound Power Level Specifications for Equipment [dB re 10-12 W]

Item	Octave Band Centre Frequency [Hz]							
	63	125	250	500	1k	2k	4k	8K
Lennox 3-Ton Rooftop Unit (TGA036)	--	63	66	70	71	68	62	53
Lennox 5-Ton Rooftop Unit (KG060)	--	67	72	77	76	73	68	61
Carrier 8.5-Ton Rooftop Unit (48LC009)	89	86	83	81	79	74	70	65
Carrier 10-Ton Rooftop Unit (020)	91	89	86	84	84	78	76	67
Lennox 25-Ton Rooftop Unit (LGH300)	--	84	85	90	90	85	80	72

The operating profiles outlined above were assumed in determining the one-hour equivalent sound level, L_{EQ} , for a predictable worst-case daytime and nighttime hour at the facades of the proposed development.

The following information and assumptions were used in the analysis.

- The existing noise sources were assumed to be located as shown in Figure 3. The green crosses represent noise sources such as rooftop HVAC equipment. The rooftop equipment was assumed to be 3-Ton for one fan, 1.0 m in height, 5-Ton for two fans, 1.0 m in height, 8.5-Ton for three fans, 1.4 m in height, 10-Ton for four fans, 1.4 m in height, and 25-Ton for six fans, 2.0 m in height. Sound data was obtained from HGC project files which were originally obtained from the manufacturer.
- The operating duty cycle of the rooftop equipment was assumed to be 100% during the daytime and evening, and 25% during the nighttime. Rooftop equipment on residential buildings were assumed to have a 50% operating duty cycle during the nighttime.

4.3 Assessment of Noise Emissions from Existing Buildings at Proposed Building Sensitive Receptors

The maximum predicted sound levels at the plane of windows of the proposed dwelling units are provided in the table below.

Table VI – Maximum Predicted Steady Source Sound Levels at the Proposed Building Façades during a Worst-Case Operating Scenario hour [dBA]

Receiver	Daytime 07:00 – 19:00	Evening 19:00 – 23:00	Nighttime 23:00 – 07:00	Criteria Day/Evening/Night
North Façade	47 dBA	47 dBA	42 dBA	50 / 50 / 45
East Façade	44 dBA	44 dBA	40 dBA	50 / 50 / 45
South Façade	48 dBA	48 dBA	44 dBA	50 / 50 / 45
West Façade	49 dBA	49 dBA	45 dBA	50 / 50 / 45

Daytime and nighttime results are also shown graphically in Figures 4 and 5. These predicted sound levels are expected to be within the MECP minimum exclusionary limits during the daytime, evening and nighttime hours, based on a typical worst-case operating scenario.

It is concluded that sounds from the rooftop mechanical equipment associated with existing surrounding buildings are anticipated to comply with the MECP guidelines at the proposed building sensitive receptors and physical mitigation is not required.

5 Impact of the Development on Itself

Section 5.8.1.1 of the Ontario Building Code (OBC), released on January 1, 2020, specifies the minimum required sound insulation characteristics for demising partitions, in terms of Sound Transmission Class (STC) or Apparent Sound Transmission Class (ASTC) values. In order to maintain adequate acoustical privacy between separate suites in a multi-tenant building, inter-suite walls must meet or exceed STC-50 or ASTC-47. Suite separation from a refuse chute or elevator

shaft must meet or exceed STC-55. In addition, it is recommended that the floor/ceiling constructions separating suites from any amenity or commercial spaces also meet or exceed STC-55. Tables 1 and 2 in Section SB-3 of the Supplementary Guideline to the OBC provide a comprehensive list of constructions that will meet the above requirements.

Information for Builder/Developer:

Tarion's Builder Bulletin B19R requires the internal design of condominium projects to integrate suitable acoustic features to insulate the suites from noise from each other and amenities in accordance with the OBC, and limit the potential intrusions of mechanical and electrical services of the building on its residents. It is expected that if Building 19 Certification is needed, an acoustical consultant will review in greater detail the mechanical and electrical drawings and details of demising constructions and mechanical/electrical equipment, during design development, to help ensure that the noise impact of the development on itself is maintained within acceptable levels.

6 Impact of the Development on the Environment

Sound levels from noise sources such as rooftop air-conditioners, cooling towers, exhaust fans, etc. should not exceed the minimum one-hour L_{EQ} ambient (background) sound level from road traffic, at any potentially impacted residential point of reception. Based on the levels observed during our site visit, the typical minimum ambient sound levels in the area are expected to be above the minimum exclusionary limits of 50 dBA or more during the day and 45 dBA or more at night. Thus, any electro-mechanical equipment associated with this development (e.g. emergency generator testing, fresh-air handling equipment, etc.) should be designed such that they do not result in noise impact beyond these ranges. At the time of this study, the design of the proposed mixed-use/residential buildings was in its initial stages, and the mechanical systems had not yet been developed.

The details of the exhaust fans and mechanical equipment will be reviewed at the SPA stage when that information is available. At this point, the site plan does not indicate any garage exhaust vents. It is likely that the majority of rooftop mechanical equipment will be housed in a mechanical penthouse on the roof of the proposed building. Any rooftop equipment not housed in the penthouse will be assessed and sufficiently shielded from neighbouring residences, as needed.



It is also HGC Engineering's experience with numerous developments, that typical HVAC equipment and parking garage exhaust fans can meet the applicable MECP noise criteria at neighbouring residential uses, either with low noise emission fans or relocation of the fans or through mitigation in the form of duct silencers or acoustic lining. Prior to building permit, an acoustical consultant should review the mechanical drawings and details of potential exhaust vents/fans, when available, to help ensure that the noise impact of the development on the environment, and of the development on itself, are maintained within acceptable levels. This is typically completed at the detailed noise study stage, at SPA.

7 Summary and Recommendations

The following list and Table VII summarize the recommendations made in this report. The reader is referred to the previous sections of the report where these recommendations are discussed in more detail.

For transportation noise sources

1. The proposed mixed-use building should be equipped with an alternative means of ventilation to open windows. Central air conditioning will meet and satisfy this requirement. The location, installation and sound ratings of the air conditioning devices should comply with NPC-300, as applicable.
2. Any glazing construction meeting the minimum requirements of the Ontario Building Code (OBC) will provide adequate sound insulation for all façades of the proposed building.
3. Warning clauses should be included in the property and tenancy agreements and offers of purchase or sale to inform future owners/occupants of the noise issues and the presence of the roadways, railway and nearby retail/commercial uses, as indicated in Section 3.4.



Table VII: Summary of Noise Control Requirements and Noise Warning Clauses

Unit No.	Acoustic Barrier	Ventilation Requirements*	Warning Clause	Upgraded Building Constructions
All Units	--	Alternative Ventilation ¹	A, B, C, D	OBC
5 th Floor OLA ²	--	--	--	--

Notes:

-- no specific requirement

* The location, installation and sound rating of the air conditioning condensers must be compliant with MECP Guideline NPC-300, as applicable.

OBC – Ontario Building Code

¹ For multi-storey buildings, this requirement is typically satisfied through central air conditioning.

² Assuming a standard minimum 1.07 m high solid parapet around the perimeter of the outdoor amenity area.

Information for Builder/Developer

1. Tarion Builder's Bulletin B19R requires that the internal design of condominium projects integrates suitable acoustic features to insulate the suites from noise from each other and amenities in accordance with the OBC, and limit the potential intrusions of mechanical and electrical services of the buildings on its residents. If B19R certification is needed, an acoustical consultant is required to review the mechanical and electrical drawings and details of demising constructions and mechanical/electrical equipment, when available, to help ensure that the noise impact of the development on itself are maintained within acceptable levels.

7.1 Implementation

To ensure that the sound control recommendations outlined above are properly implemented in the site design, it is recommended that:

- 1) Prior to the issuance of occupancy permits for this development, the Municipality's building inspector or a Professional Engineer qualified to provide acoustical engineering services in the Province of Ontario to certify that the noise control measures listed in Section 7 have been properly installed and constructed.



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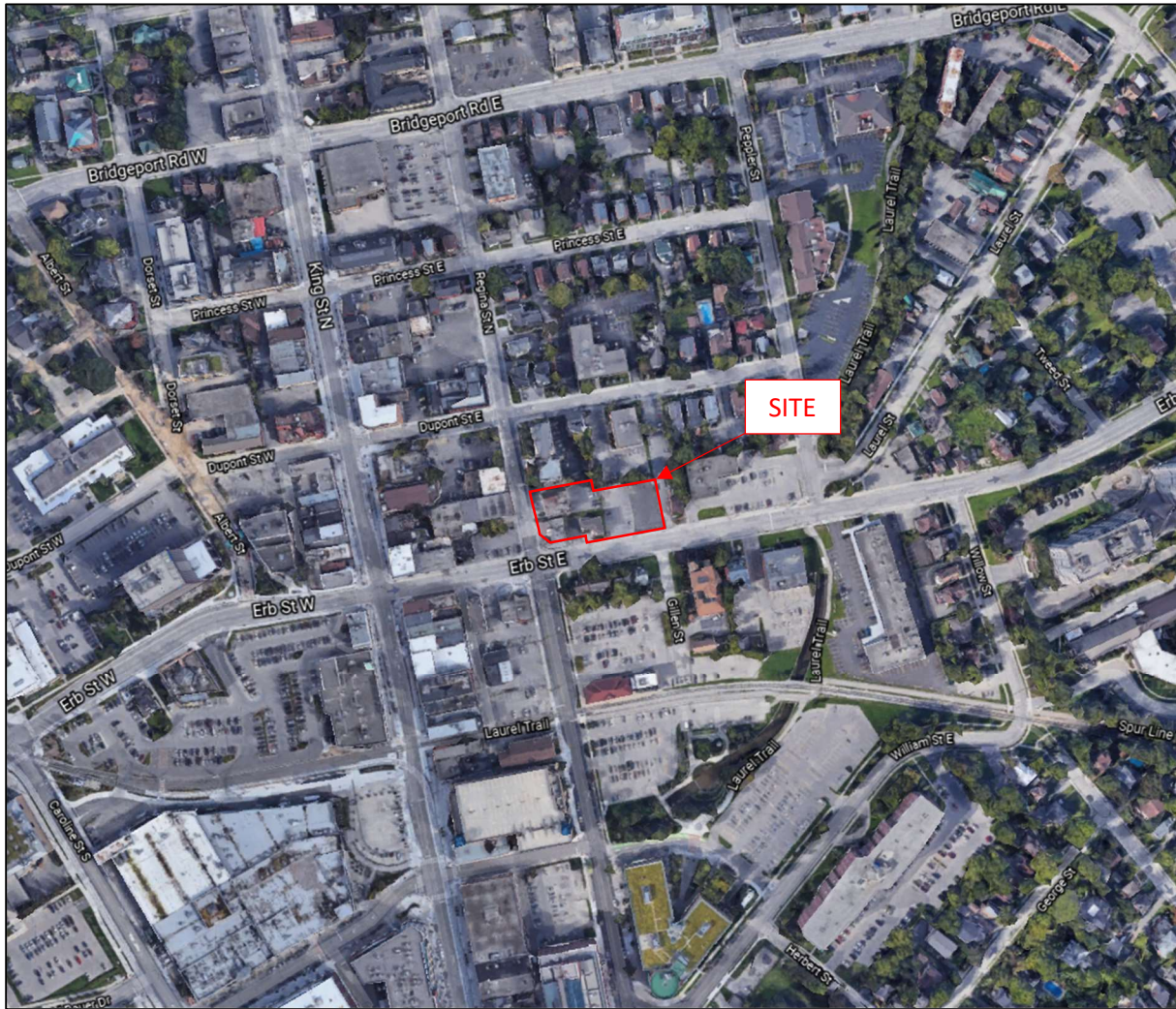


Figure 1: Key Plan

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SITE PLAN

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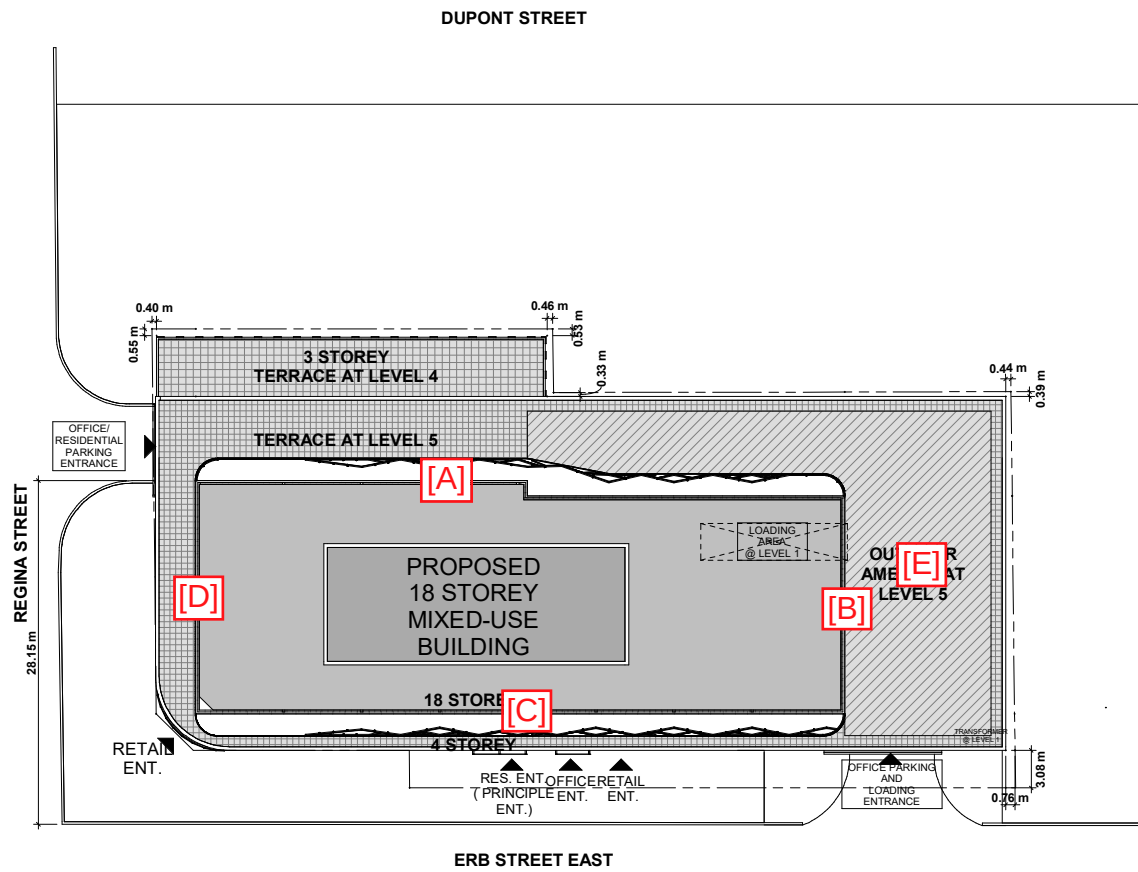


Figure 2 - Proposed Site Plan Showing Prediction Locations



Figure 3: Existing Noise Sources Locations



Figure 4: Predicted Daytime and Evening Sound Levels from Existing Stationary Noise Sources, dBA

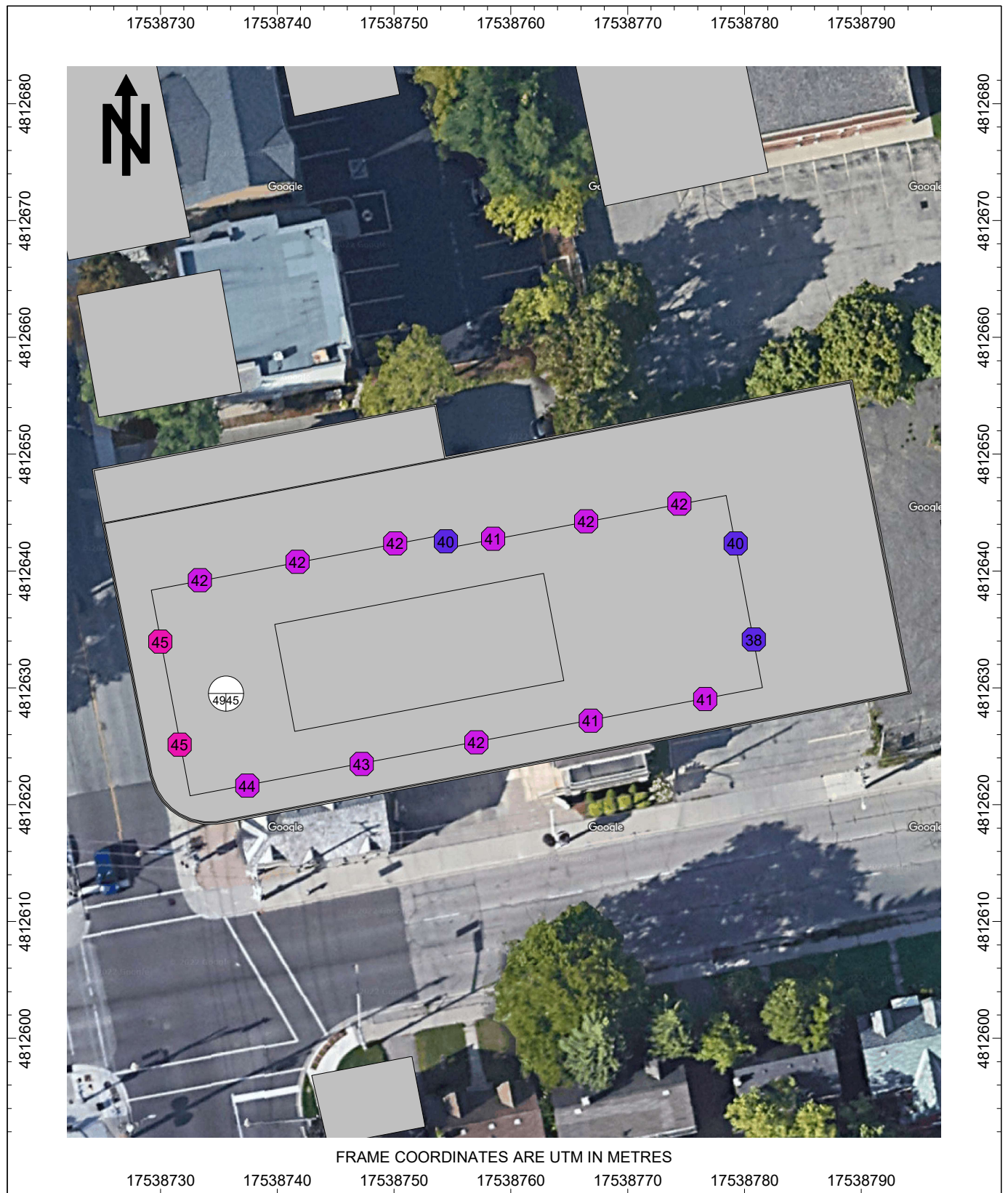


Figure 5: Predicted Nighttime Sound Levels from Existing Stationary Noise Sources, dBA

Appendix A

Supporting Drawings



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DESIGN PROPOSAL REVIEW

6 Regina St N, Waterloo
Mixed Use Development



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6 REGINA ST N, WATERLOO

1.0 Site Location



ONE

SITE LOCATION

NTS



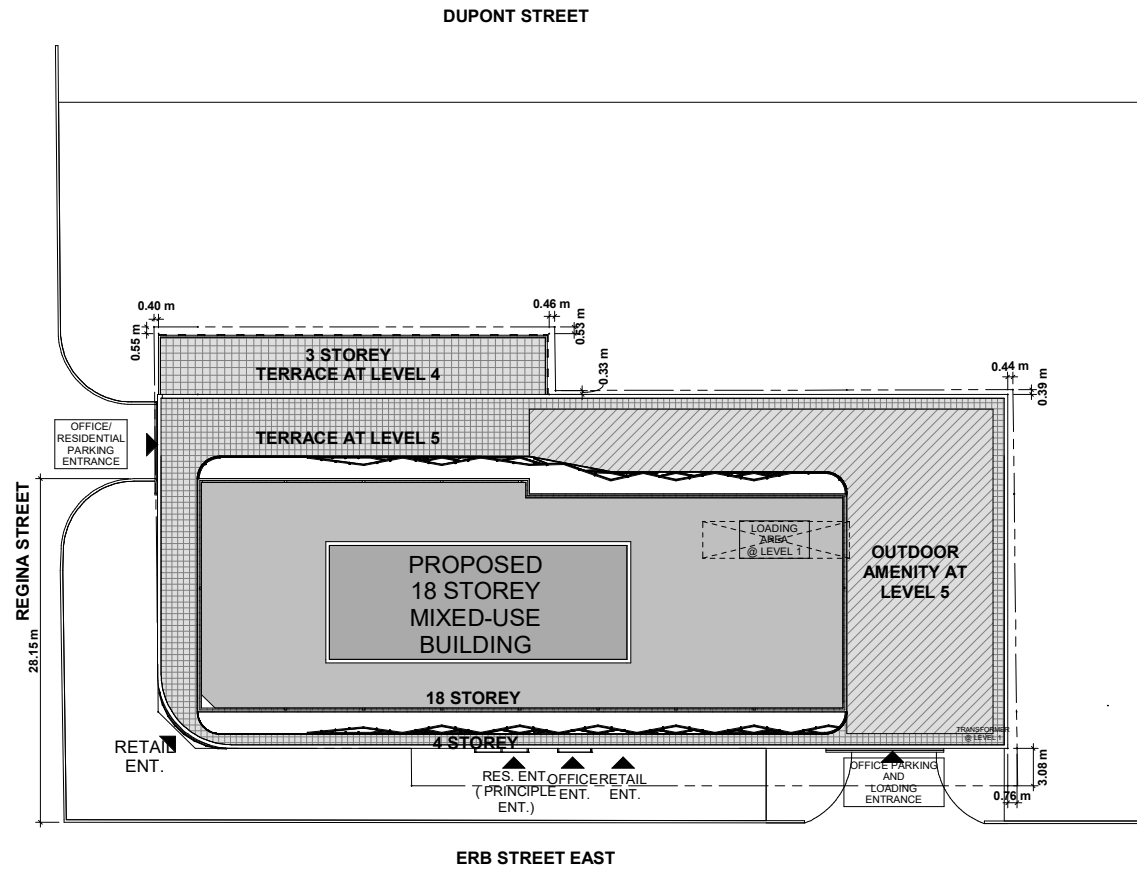
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6 REGINA ST N, WATERLOO

2.0 Site Plan

TWO

SITE PLAN

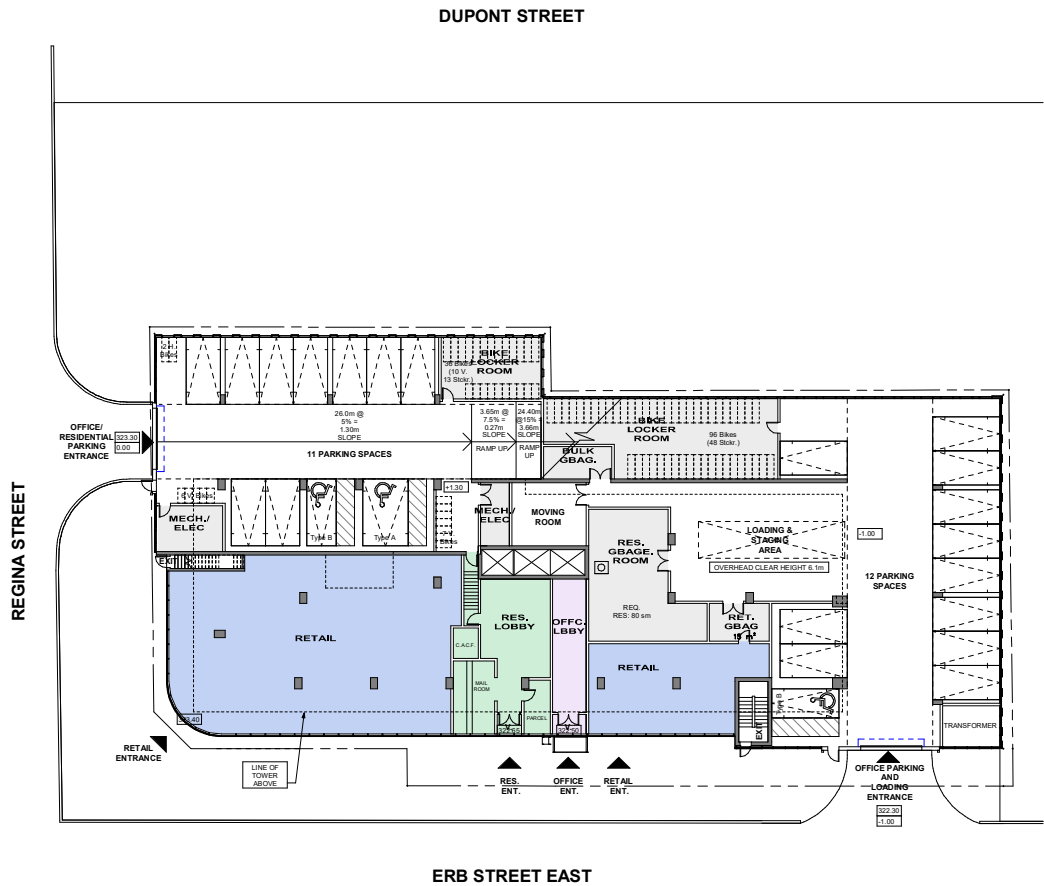
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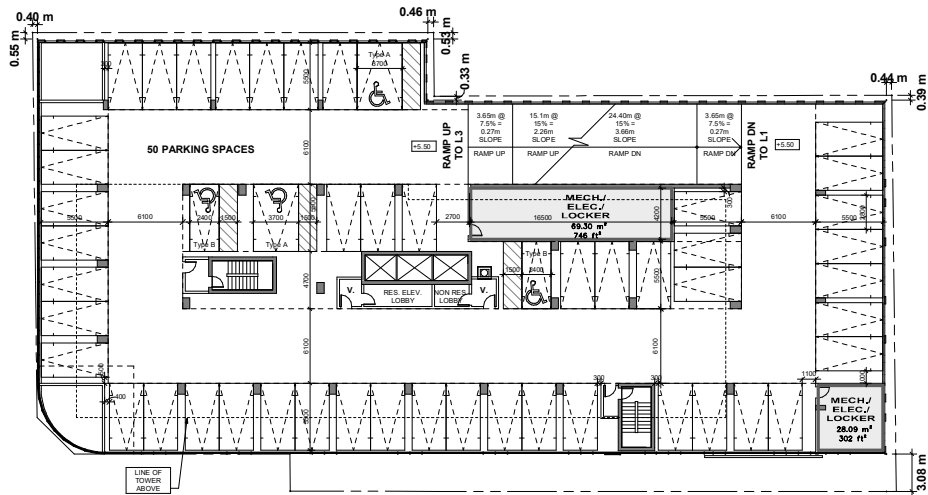
DESIGN PROPOSAL REVIEW
6 REGINA ST N, WATERLOO

3.0 Floor Plans

THREE
FLOOR PLANS
L1
1:400



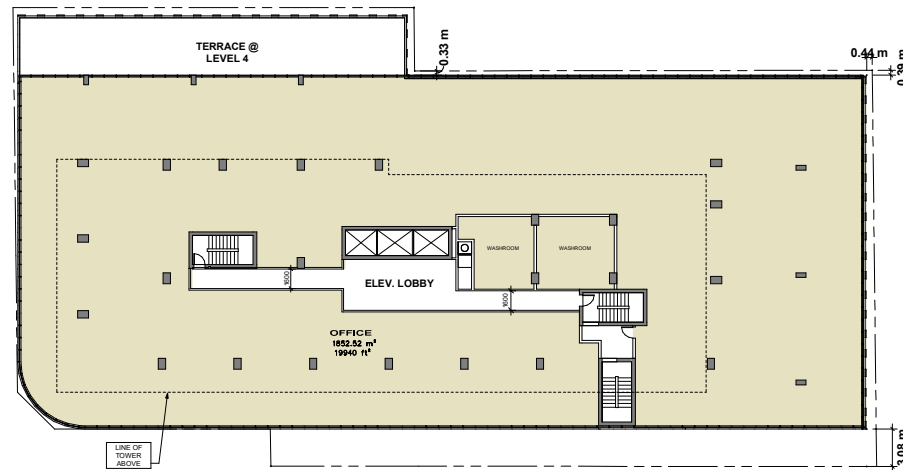
THREE
FLOOR PLANS
L2
1:400



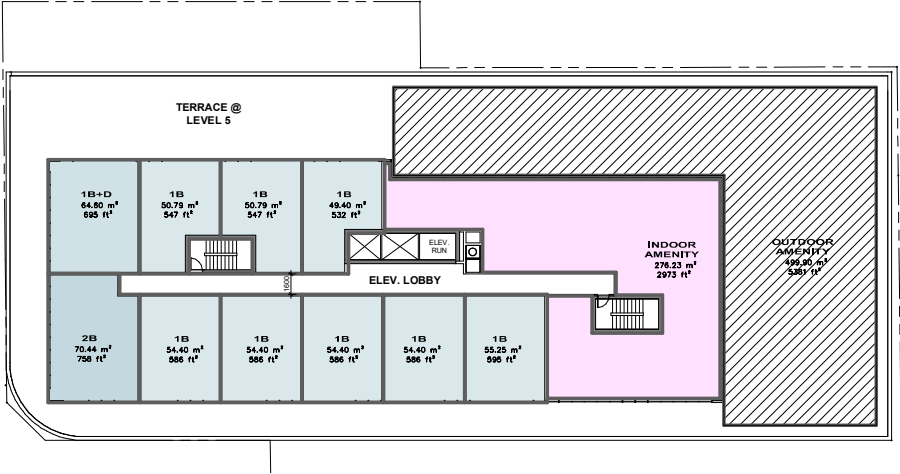
THREE

FLOOR PLANS
L4

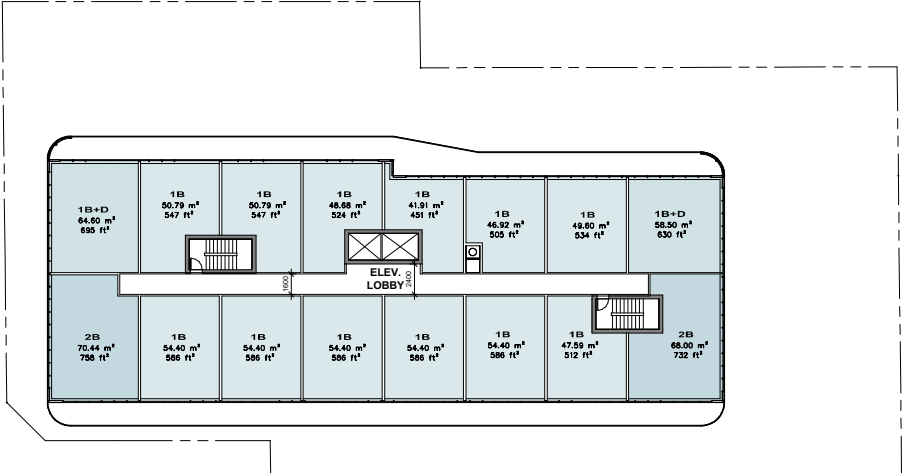
1:400



THREE
FLOOR PLANS
L5
1:400

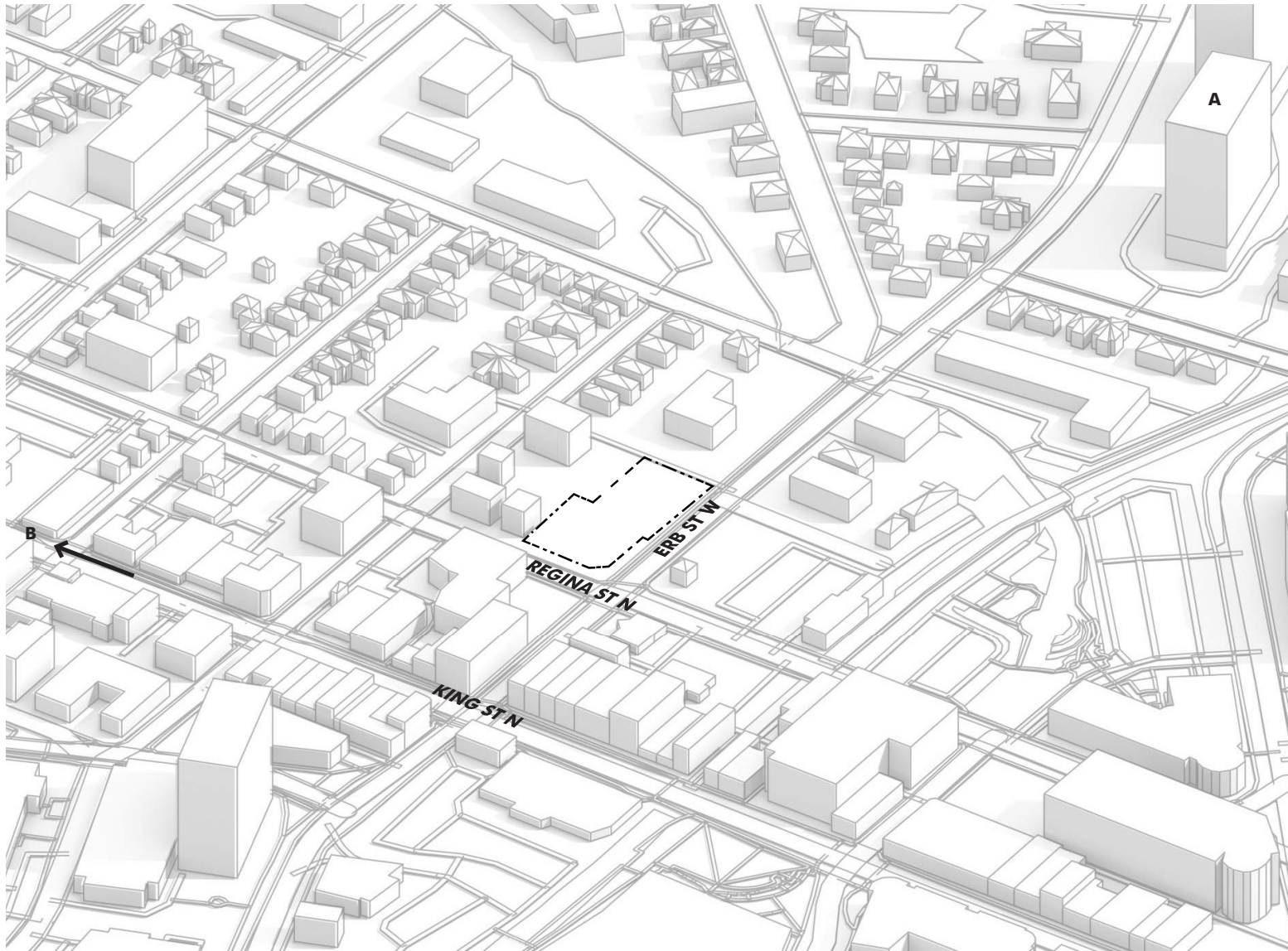


THREE
FLOOR PLANS
L6-18 Typical
1:400



DESIGN PROPOSAL REVIEW
6 REGINA ST N, WATERLOO

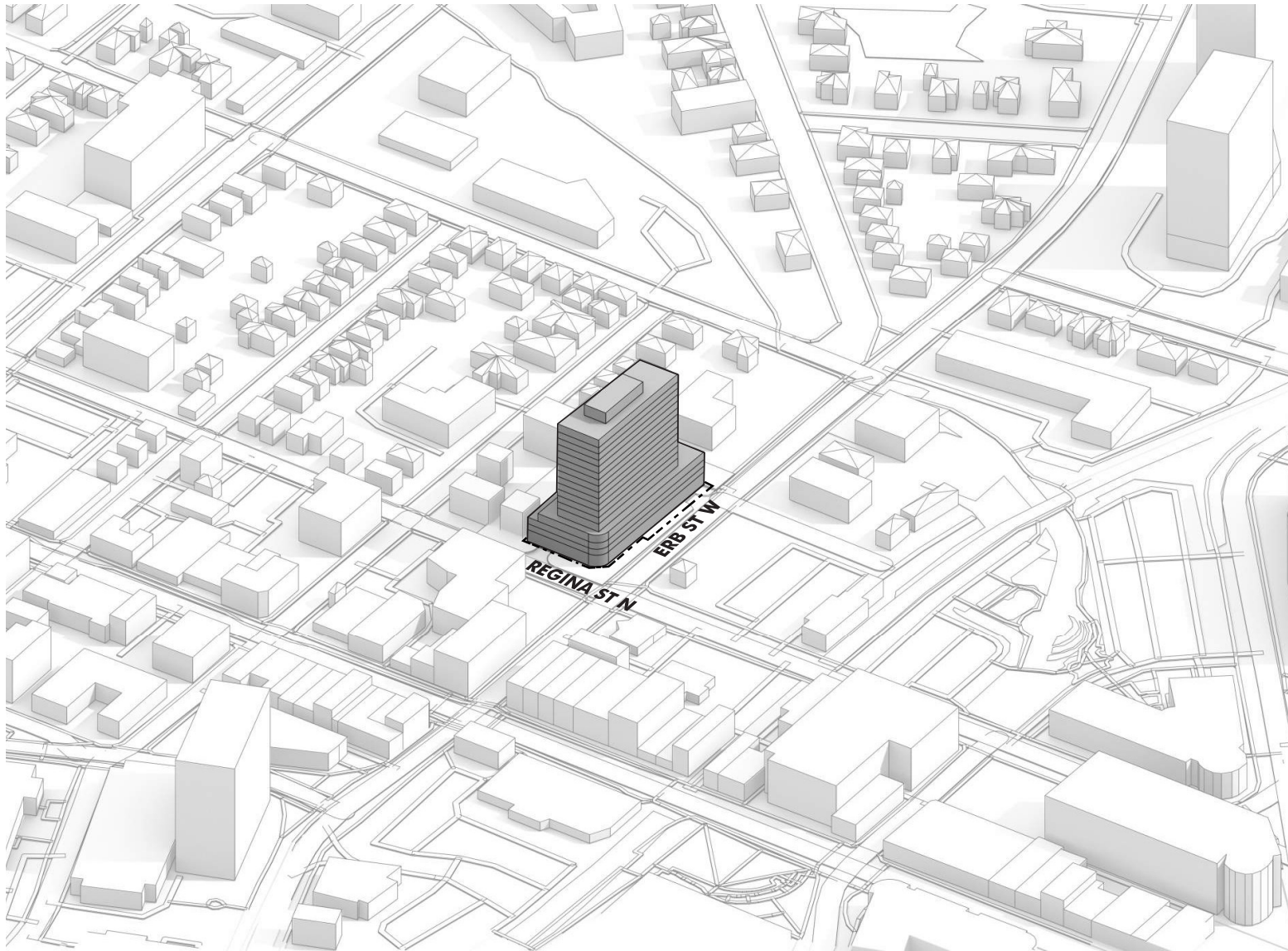
4.0 Design Intent



FOUR

DESIGN INTENT
Site Context





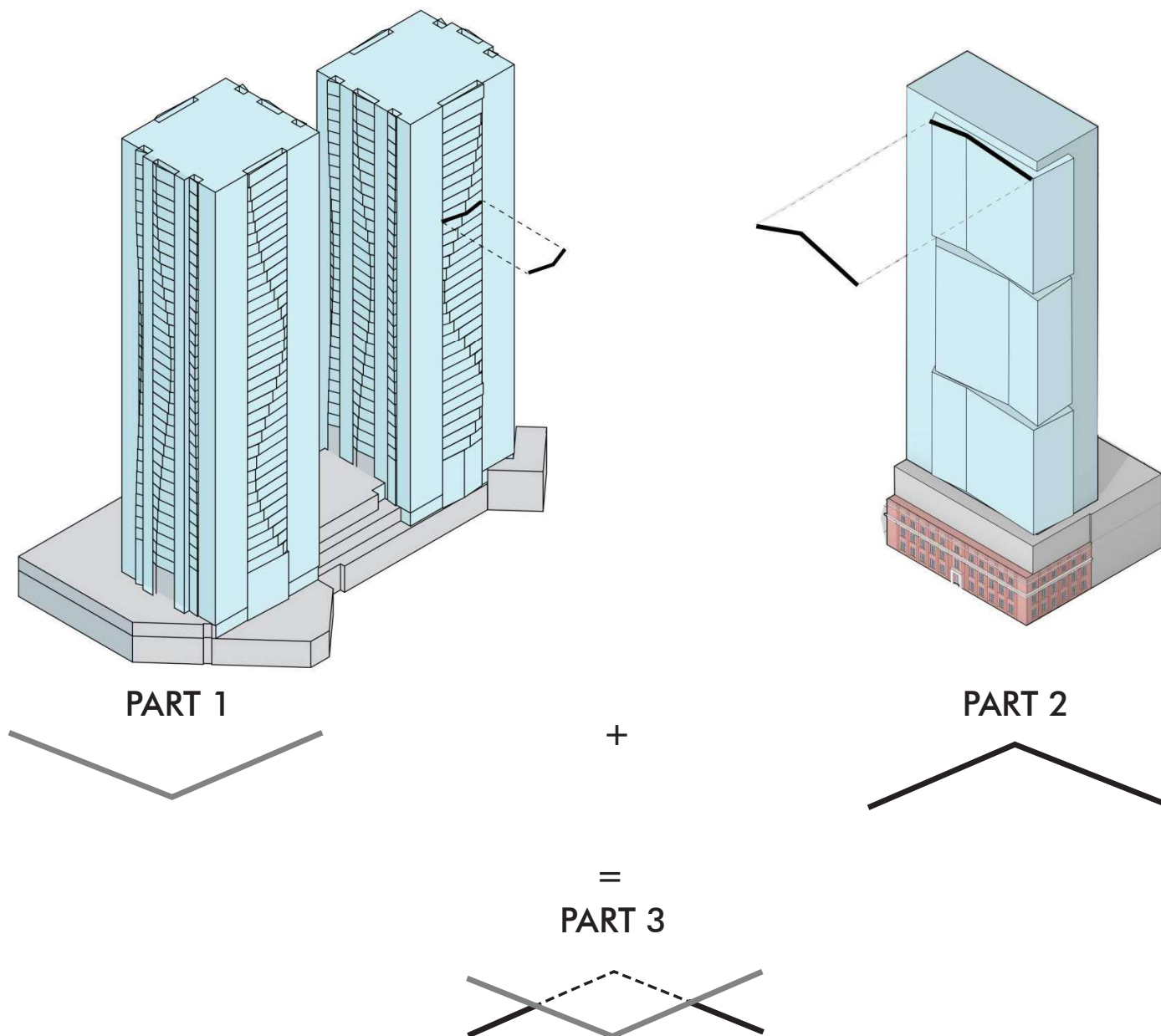
FOUR

DESIGN INTENT
Built Mass



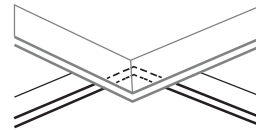
FOUR

DESIGN INTENT
The Trilogy



FOUR

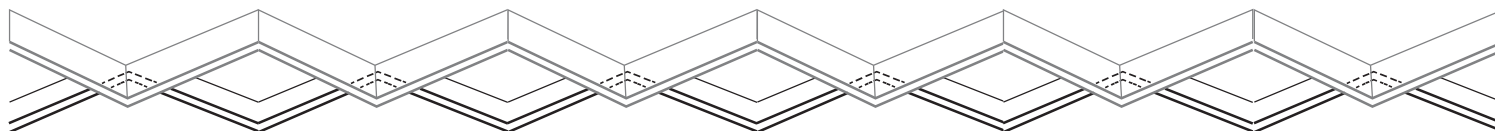
DESIGN INTENT
Part 3



BALCONY UNIT

FOUR

DESIGN INTENT
Part 3

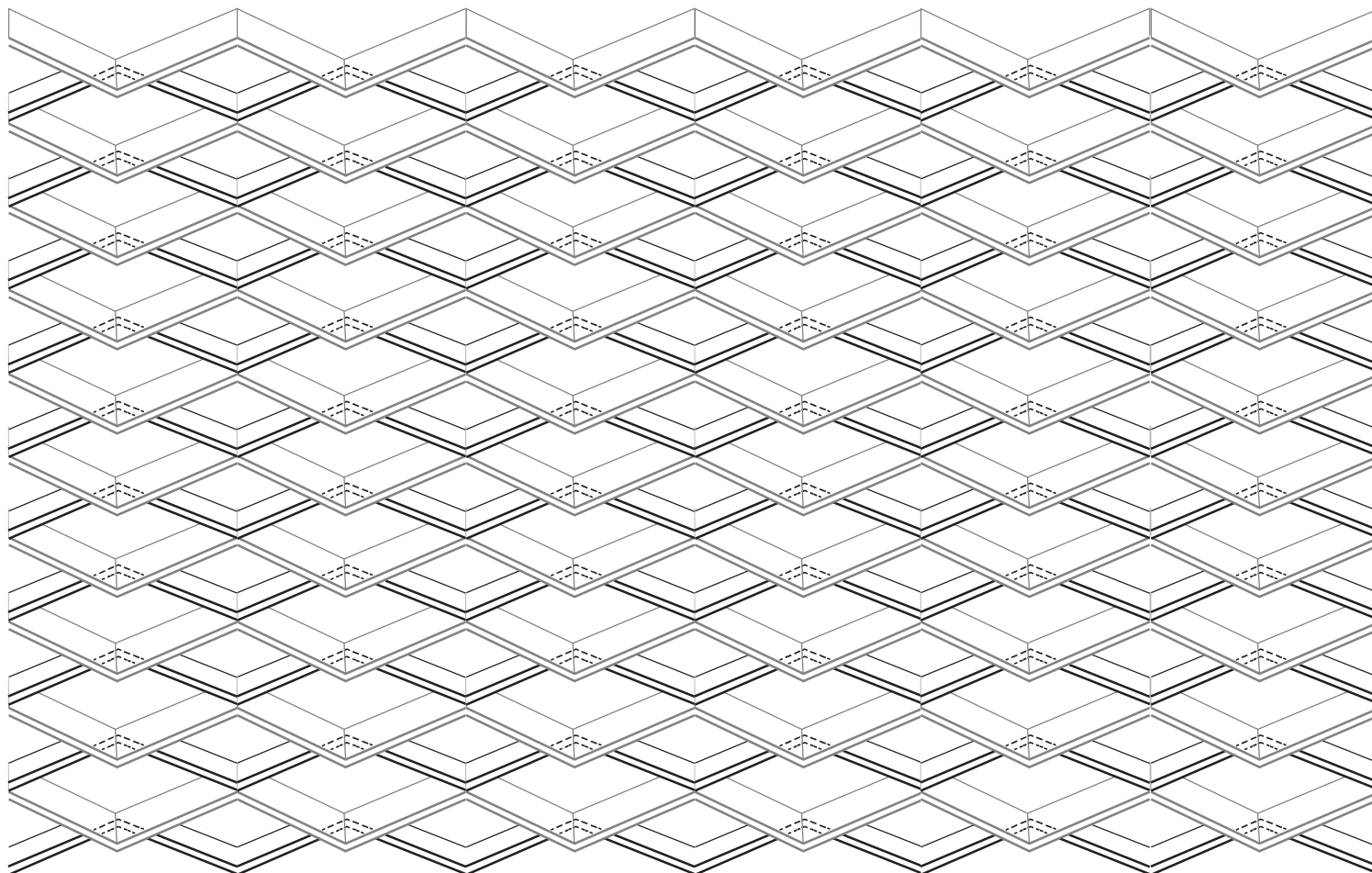


REPEAT

FOUR

DESIGN INTENT

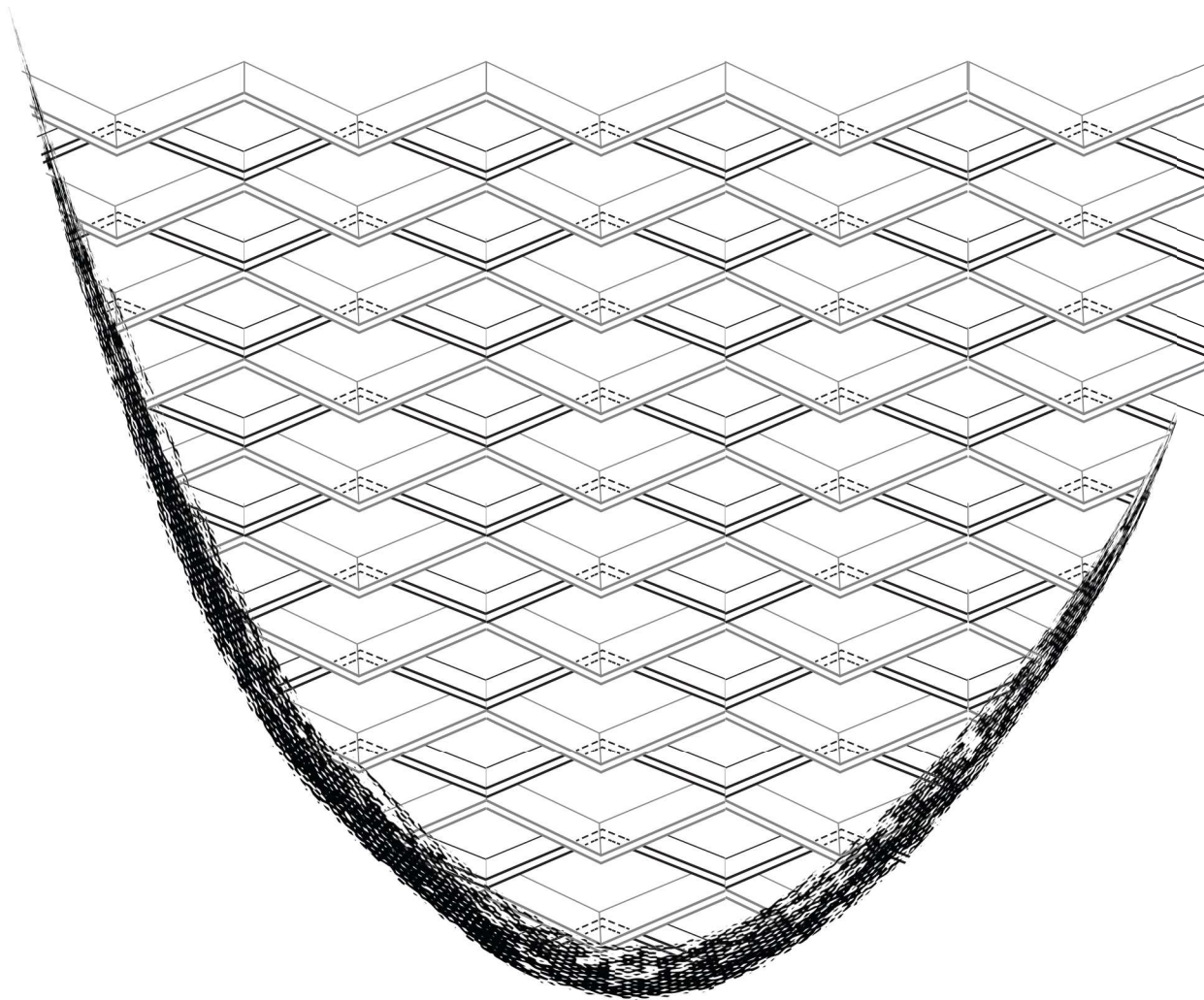
ALTERNATE AND FILL



FOUR

DESIGN INTENT

CONCEAL

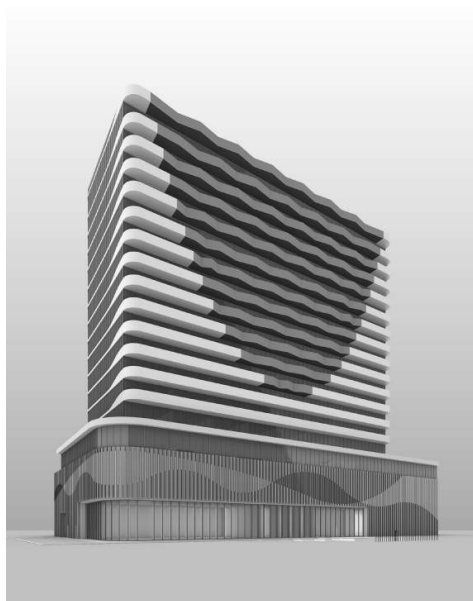


DESIGN PROPOSAL REVIEW
6 REGINA ST N, WATERLOO

5.0 Design Studies

FIVE

DESIGN STUDIES



Catenary



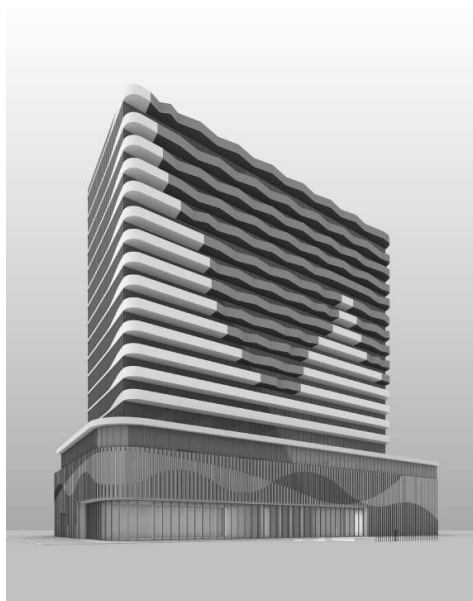
Displaced Catenary



Hills

FIVE

DESIGN STUDIES



Peak



Corroded



Waterfall

DESIGN PROPOSAL REVIEW
6 REGINA ST N, WATERLOO

6.0 Renderings

SIX
RENDERINGS



SIX

RENDERINGS



SIX
RENDERINGS



An aerial architectural rendering of a city block in Waterloo, Ontario. The image shows a grid of streets with various building footprints. A central building, located at 6 Regina St N, is highlighted with a dark, textured facade and a grid-like pattern of windows. The surrounding area includes other commercial and residential buildings, parking lots, and a network of roads. The overall style is a light gray, isometric architectural visualization.

THANK YOU

6 Regina St N, Waterloo
Mixed-use Development

Appendix B

Road Traffic Data



ACOUSTICS



NOISE



VIBRATION

Region of Waterloo AADT Forecast for Noise Studies

1. Development/Location	Erb St @ Regina St, Waterloo			
2. Current AADT (2022)	Erb St (east of Regina St)	Erb St (west of Regina St)	Regina St (north of Erb St)	Regina St (south of Erb St)
	11,800	11,100	7,500	8,200
3. Forecast AADT (2032)	Erb St (east of Regina St)	Erb St (west of Regina St)	Regina St (north of Erb St)	Regina St (south of Erb St)
	13,000	12,300	7,900	8,600
4. Commercial Vehicle Rates	Erb St (east of Regina St)	Erb St (west of Regina St)	Regina St (north of Erb St)	Regina St (south of Erb St)
% Medium Trucks	1%	1%	1%	1%
% Heavy Trucks	1%	2%	1%	1%
5. Posted Speed Limit	Erb St (east of Regina St)	Erb St (west of Regina St)	Regina St (north of Erb St)	Regina St (south of Erb St)
	50 km/h	50 km/h	50 km/h	50 km/h
6. Day/Night Splits	Regional Standard 90/10 Day/Night Split			
7. Expiry	Dec 31 2022			
8. Notes	This forecast is intended for the purpose of carrying out a noise study for the development at Erb St x Regina St in Waterloo, only. The above AADTs represent the traffic volumes at the Erb St x Regina St intersection. As Regina St is under the jurisdiction of City of Waterloo, City of Waterloo should verify the forecast. City of Waterloo data was considered in the creation of the forecast. This forecast remains valid until the expiry date 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



ACOUSTICS



NOISE



VIBRATION

Transmittal Form

Date	May 16, 2011	Project Number	60114380-0800-11-12
Contact	Sheeba Paul, MEng. P.Eng.	Routing	spaul@hgcengineering.com
Company	HGC Engineering Ltd.		
Address	2000 Argentia Road, Plaza One, Suite 203 Mississauga, ON L5N 1P7		
Telephone #	905-826-4044		
Sent By	Warren D'Andrade	Copies To	Nick Coleman, CN – email Steve Sieunarine, Region of Waterloo – email
Project Name	Train Traffic Data – Waterloo Spur in the vicinity of Duke Street and Bismark Avenue, Kitchener, Ontario – Approximately at Mile 0.60		

☐ Urgent ☒ For Your Use ☐ For Review ☐ For Your Information ☐ Confidential

Comments: Please find attached the requested Train Traffic Data.
Should you have any questions, please do not hesitate to contact the undersigned at
905-238-0007 ext. 8214.

Sent Via: ☐ mail ☐ courier ☐ picked up ☐ by hand ☒ email ☐ fax ☐ other

Authorized Signature:



Name (please print): Warren D'Andrade Title: E.I.T.

Sheeba Paul, M.Eng. P.Eng.
HGC Engineering Ltd.
2000 Argentia Road, Plaza One, Suite 203
Mississauga, ON L5N 1P7

Dear Sheeba:

Project No: 60114380-0800-11-12

**Regarding: Train Traffic Data – Waterloo Spur in the vicinity of Duke Street and Bismark Avenue
in Kitchener, Ontario – Approximately at Mile 0.60**

The following is provided in response to your April 29, 2010 request for information regarding rail traffic in the vicinity of Duke Street and Bismark Avenue in Kitchener, Ontario, at approximately Mile 0.60 on the Waterloo Spur.

Typical daily traffic volumes are recorded below. However, traffic volumes may fluctuate due to overall economic conditions, varying traffic demands, weather conditions, track maintenance programs, statutory holidays and traffic detours that when required may be heavy although temporary.

Typical daily traffic volumes at this site location are as follows:

***Maximum train speed is given in Miles per Hour**

Northbound	0700 - 1900			
Type of Train	Volumes	Max. Consist	Max. Speed	Max. Power
Freight	0	140	10	4
Way Freight	0	25	10	2
Passenger	0	15	10	2

Southbound	0700 - 1900			
Type of Train	Volumes	Max. Consist	Max. Speed	Max. Power
Freight	0	140	10	4
Way Freight	0	25	10	2
Passenger	0	15	10	2

Northbound	1900 - 0700			
Type of Train	Volumes	Max. Consist	Max. Speed	Max. Power
Freight	0	140	10	4
Way Freight	1	25	10	2
Passenger	0	15	10	2

Southbound	1900 - 0700			
Type of Train	Volumes	Max. Consist	Max. Speed	Max. Power
Freight	0	140	10	4
Way Freight	1	25	10	2
Passenger	0	15	10	2

The volumes recorded reflect northbound and southbound freight, way freight and passenger operations on the Waterloo Spur.

Except where anti-whistling bylaws are in effect, engine-warning whistles and bells are normally sounded at all at-grade crossings. There are thirteen at-grade crossings in the immediate vicinity of the study area, at Breithaupt Street (M.0.15), Ahrens Street (M.0.17), Wellington Street (M.0.25), Louisa Street (M.0.32), Weber Street (M.0.35), Wilhelm Street (M.0.44), Guelph Street (M.0.68), Roger Street (M.0.97), Moore Avenue (M.1.16), Union Street (M.1.23), John Street (M.1.30), Allen Street (M.1.40), and Willow Street (M.1.53). Anti-whistling bylaws are in effect at these thirteen crossings. Please note that engine warning whistles may be sounded in cases of emergency, as a safety and or warning precaution at pedestrian crossings and occasionally for operating requirements.

With respect to equipment restrictions, the gross weight of the heaviest permissible car is 263,000 lbs. The single mainline track is constructed of bolted rail throughout the study area.

The Canadian National Railway continues to be strongly opposed to locating developments near railway facilities and rights-of-way due to potential safety and environmental conflicts. Development adjacent to the Railway Right-of-Way is not appropriate without sound impact mitigation measures to reduce the incompatibility. For confirmation of the applicable rail noise, vibration and safety standards, Mr. Nick Coleman, Canadian National Railway Properties at 905-760-5007 should be contacted directly.

We trust the above information will satisfy your current request.

Sincerely,
AECOM Canada Ltd.



Warren D'Andrade
warren.dandrade@aecom.com

cc: Nick Coleman, CN – email
Steve Sieunarine, Region of Waterloo – email

Sheeba Paul

From: nick.coleman@cn.ca
Sent: November-07-11 11:28 AM
To: Sheeba Paul
Cc: Steve Sieunarine (SSieunarine@regionofwaterloo.ca); D'Andrade, Warren
Subject: re: CN rail data request in Kitchener, ON
Attachments: Rail Line Classification.pdf; RPT-60114380-0800-11-12-Train Traffic Data-HGC.pdf; SPUR.pdf; PBL.pdf

Sorry. I bet that scared you. Its a principal branch line.

Nick

----- Forwarded by Nick Coleman/COLEMA02/CNR/CA on 2011/11/07 11:27 -----

From: Nick Coleman/COLEMA02/CNR/CA
To: Sheeba Paul <spaul@hgcengineering.com>
Cc: "Steve Sieunarine (SSieunarine@regionofwaterloo.ca)" <SSieunarine@regionofwaterloo.ca>, "D'Andrade, Warren" <Warren.DAndrade@aecom.com>
Date: 2011/11/07 11:26
Subject: re: CN rail data request in Kitchener, ON

As there is daily traffic (2 trains/day), it is classified as a principal main line.

Regards,
Nick

From: Sheeba Paul <spaul@hgcengineering.com>
To: "D'Andrade, Warren" <Warren.DAndrade@aecom.com>, Nick Coleman <nick.coleman@cn.ca>, "Steve Sieunarine (SSieunarine@regionofwaterloo.ca)" <SSieunarine@regionofwaterloo.ca>
Date: 2011/11/06 11:13
Subject: re: CN rail data request in Kitchener, ON

Hi All,

I have not heard any response regarding my request below. Is this something you can help me with?

Thank you.

Ms. Sheeba Paul, MEng. PEng.
HGC Engineering
Howe Gastmeier Chapnik Limited
2000 Argentia Road
Plaza One, Suite 203

Mississauga, Ontario, Canada L5N 1P7
Phone (905) 826-4044
Fax (905) 826-4940

From: Sheeba Paul
Sent: November-02-11 12:44 PM
To: 'D'Andrade, Warren'
Cc: nick.coleman@cn.ca; Steve Sieunarine
Subject: RE: CN rail data request in Kitchener, ON

Hi Warren,

We are performing another rail noise and vibration study for a residential at 112 Union Street in Waterloo, Ontario.

Please find attached a Google link for your reference.

<http://maps.google.ca/maps?q=112+Union+Street+East,+Waterloo,+ON&hl=en&ll=43.463222,-80.511128&spn=0.004735,0.009602&sll=43.461283,-80.507255&sspn=0.009843,0.019205&vpsrc=6&hnear=112+Union+St+E,+Waterloo,+Ontario+N2J+1C2&t=m&z=17>

We have rail data obtained from AECOM which is attached.

The railway line is called the Waterloo Spur, but I am wondering what the classification of the railway line is?

Is this railway line a spur line or a branch line. We will need to perform vibration measurements if the railway line is classified as a Principal Branch Line.

Thank you.

Ms. Sheeba Paul, MEng. PEng.
HGC Engineering
Howe Gastmeier Chapnik Limited
2000 Argentia Road
Plaza One, Suite 203
Mississauga, Ontario, Canada L5N 1P7
Phone (905) 826-4044
Fax (905) 826-4940

From: D'Andrade, Warren [<mailto:Warren.DAndrade@aecom.com>]
Sent: May-16-11 2:52 PM
To: Sheeba Paul
Cc: nick.coleman@cn.ca; Steve Sieunarine
Subject: RE: CN rail data request in Kitchener, ON

Hi Sheeba,

As per your request, attached is the train traffic data for the location given in Kitchener, Ontario, on the Waterloo Spur. The location was found to be approximately at Mile 0.60.

Please contact me if you have any concerns.

Regards,

Warren D'Andrade
Rail Transportation
D 905.238.0007 ext. 8214
warren.dandrade@aecom.com

AECOM
5080 Commerce Boulevard, Mississauga, ON L4W 4P2
T 905.238.0007 F 905.238.0038

www.aecom.com

From: Sheeba Paul [<mailto:spaul@hgcengineering.com>]
Sent: Friday, April 29, 2011 12:06 PM
To: D'Andrade, Warren
Cc: McCready, Colin
Subject: re: CN rail data request in Kitchener, ON

Hello Warren

HGC Engineering is performing a noise and vibration study for a residential land severance in Kitchener, Ontario, specifically near Duke Street and Bismark Avenue.

Please find attached a Google link for your reference.

<http://maps.google.ca/maps?hl=en&q=duke+street+and+bismar,+kitchener,+on&ie=UTF8&hq=&hnear=Duke+St+W+%26+Bismark+Ave,+Kitchener,+Waterloo+Regional+Municipality,+Ontario+N2H+5S7&gl=ca&ll=43.459788,-80.500238&spn=0.009657,0.027788&t=h&z=16>

We would like to request rail traffic data for the CN railway line to the east of the site. Typically we need daytime volumes, nighttime volumes, number of locomotives, number of cars, speed of trains, speed and whistle information.

Please also let me know how much credit is remaining.

Thank you.

Sheeba Paul, MEng. PEng.
HGC Engineering
Howe Gastmeier Chapnik Limited
2000 Argentia Road
Plaza One, Suite 203
Mississauga, Ontario, Canada L5N 1P7
Phone (905) 826-4044
Fax (905) 826-4940

Appendix D

Sample STAMSON 5.04 Output



ACOUSTICS



NOISE



VIBRATION

Filename: n.te Time Period: Day/Night 16/8 hours
 Description: North facade.

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

 Car traffic volume : 7585/843 veh/TimePeriod
 Medium truck volume : 77/9 veh/TimePeriod
 Heavy truck volume : 77/9 veh/TimePeriod
 Posted speed limit : 50 km/h
 Road gradient : 0 %
 Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: Regina (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 : 15.50 / 15.50 m
 Receiver height : 52.50 / 52.50 m
 Topography : 1 (Flat/gentle slope; no barrier)
 Reference angle : 0.00

↑

Results segment # 1: Regina (day)

 Source height = 1.00 m

ROAD (0.00 + 58.22 + 0.00) = 58.22 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.00	61.37	0.00	-0.14	-3.01	0.00	0.00	0.00	58.22

Segment Leq : 58.22 dBA

Total Leq All Segments: 58.22 dBA

↑

Results segment # 1: Regina (night)

 Source height = 1.01 m

A

ROAD (0.00 + 51.79 + 0.00) = 51.79 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.00	54.94	0.00	-0.14	-3.01	0.00	0.00	0.00	51.79

Segment Leq : 51.79 dBA

Total Leq All Segments: 51.79 dBA

↑

TOTAL Leq FROM ALL SOURCES (DAY): 58.22
(NIGHT): 51.79

↑

↑

B

STAMSON 5.0 NORMAL REPORT Date: 27-01-2022 11:39:42
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: e.te Time Period: Day/Night 16/8 hours
 Description: East facade.

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

Train Type	! Trains	! Speed (km/h)	!# loc /Train	!# Cars /Train	! Eng type	!Cont weld
1. Way Freight	1.0/3.4	16.0	2.0	25.0	Diesel	No

Data for Segment # 1: WCR (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 : 107.40 / 107.40 m
 Receiver height : 52.50 / 52.50 m
 Topography : 1 (Flat/gentle slope; no barrier)
 No Whistle
 Reference angle : 0.00

↑
 Results segment # 1: WCR (day)

LOCOMOTIVE (0.00 + 41.95 + 0.00) = 41.95 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	53.51	-8.55	-3.01	0.00	0.00	0.00	41.95

WHEEL (0.00 + 29.52 + 0.00) = 29.52 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	41.08	-8.55	-3.01	0.00	0.00	0.00	29.52

Segment Leq : 42.19 dBA

Total Leq All Segments: 42.19 dBA

↑
 Results segment # 1: WCR (night)

B

LOCOMOTIVE (0.00 + 50.27 + 0.00) = 50.27 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
--------	--------	-------	--------	-------	-------	-------	-------	-------	--------

0	90	0.00	61.83	-8.55	-3.01	0.00	0.00	0.00	50.27
---	----	------	-------	-------	-------	------	------	------	-------

WHEEL (0.00 + 37.84 + 0.00) = 37.84 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
--------	--------	-------	--------	-------	-------	-------	-------	-------	--------

0	90	0.00	49.40	-8.55	-3.01	0.00	0.00	0.00	37.84
---	----	------	-------	-------	-------	------	------	------	-------

Segment Leq : 50.51 dBA

Total Leq All Segments: 50.51 dBA

↑

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

Car traffic volume : 11466/1274 veh/TimePeriod
Medium truck volume : 117/13 veh/TimePeriod
Heavy truck volume : 117/13 veh/TimePeriod
Posted speed limit : 50 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: Erb (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	:	15.00 / 15.00	m	
Receiver height	:	52.50 / 52.50	m	
Topography	:	1	(Flat/gentle slope; no barrier)	
Reference angle	:	0.00		

↑

Results segment # 1: Erb (day)

Source height = 1.00 m

ROAD (0.00 + 60.17 + 0.00) = 60.17 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
--------	--------	-------	--------	-------	-------	-------	-------	-------	-------	--------

						B						
0	90	0.00	63.18	0.00	0.00	-3.01	0.00	0.00	0.00	0.00	60.17	

Segment Leq : 60.17 dBA

Total Leq All Segments: 60.17 dBA

↑
Results segment # 1: Erb (night)

Source height = 1.00 m

ROAD (0.00 + 53.64 + 0.00) = 53.64 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	56.65	0.00	0.00	-3.01	0.00	0.00	0.00	53.64

Segment Leq : 53.64 dBA

Total Leq All Segments: 53.64 dBA

↑

TOTAL Leq FROM ALL SOURCES (DAY): 60.24
(NIGHT): 55.36

↑

↑

C

STAMSON 5.0 NORMAL REPORT Date: 27-01-2022 11:40:00
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: s.te Time Period: Day/Night 16/8 hours
 Description: South facade.

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

Train Type	! Trains	! Speed (km/h)	!# loc /Train	!# Cars /Train	! Eng type	!Cont weld
1. Way Freight	1.0/3.4	16.0	2.0	25.0	Diesel	No

Data for Segment # 1: WCR (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 : 107.40 / 107.40 m
 Receiver height : 52.50 / 52.50 m
 Topography : 1 (Flat/gentle slope; no barrier)
 No Whistle
 Reference angle : 0.00

↑
 Results segment # 1: WCR (day)

LOCOMOTIVE (0.00 + 44.96 + 0.00) = 44.96 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	53.51	-8.55	0.00	0.00	0.00	0.00	44.96

WHEEL (0.00 + 32.53 + 0.00) = 32.53 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	41.08	-8.55	0.00	0.00	0.00	0.00	32.53

Segment Leq : 45.20 dBA

Total Leq All Segments: 45.20 dBA

↑
 Results segment # 1: WCR (night)

C

LOCOMOTIVE (0.00 + 53.28 + 0.00) = 53.28 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
--------	--------	-------	--------	-------	-------	-------	-------	-------	--------

-90	90	0.00	61.83	-8.55	0.00	0.00	0.00	0.00	53.28
-----	----	------	-------	-------	------	------	------	------	-------

WHEEL (0.00 + 40.86 + 0.00) = 40.86 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
--------	--------	-------	--------	-------	-------	-------	-------	-------	--------

-90	90	0.00	49.40	-8.55	0.00	0.00	0.00	0.00	40.86
-----	----	------	-------	-------	------	------	------	------	-------

Segment Leq : 53.52 dBA

Total Leq All Segments: 53.52 dBA

↑

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

Car traffic volume : 11466/1274 veh/TimePeriod
Medium truck volume : 117/13 veh/TimePeriod
Heavy truck volume : 117/13 veh/TimePeriod
Posted speed limit : 50 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: Erb (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 : 15.00 / 15.00 m
Receiver height : 52.50 / 52.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

↑

Road data, segment # 2: Regina (day/night)

Car traffic volume : 7585/843 veh/TimePeriod
Medium truck volume : 77/9 veh/TimePeriod
Heavy truck volume : 77/9 veh/TimePeriod
Posted speed limit : 50 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

C

Data for Segment # 2: Regina (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 : 15.50 / 15.50 m
Receiver height : 52.50 / 52.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

↑

Results segment # 1: Erb (day)

Source height = 1.00 m

ROAD (0.00 + 63.18 + 0.00) = 63.18 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	63.18	0.00	0.00	0.00	0.00	0.00	0.00	63.18

Segment Leq : 63.18 dBA

↑

Results segment # 2: Regina (day)

Source height = 1.00 m

ROAD (0.00 + 58.22 + 0.00) = 58.22 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	61.37	0.00	-0.14	-3.01	0.00	0.00	0.00	58.22

Segment Leq : 58.22 dBA

Total Leq All Segments: 64.38 dBA

↑

Results segment # 1: Erb (night)

Source height = 1.00 m

C

ROAD (0.00 + 56.65 + 0.00) = 56.65 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	56.65	0.00	0.00	0.00	0.00	0.00	0.00	56.65

Segment Leq : 56.65 dBA

↑

Results segment # 2: Regina (night)

Source height = 1.01 m

ROAD (0.00 + 51.79 + 0.00) = 51.79 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	54.94	0.00	-0.14	-3.01	0.00	0.00	0.00	51.79

Segment Leq : 51.79 dBA

Total Leq All Segments: 57.88 dBA

↑

TOTAL Leq FROM ALL SOURCES (DAY): 64.44
(NIGHT): 59.23

↑

↑

Filename: w.te Time Period: Day/Night 16/8 hours
 Description: West facade.

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

Train Type	! Trains	! Speed (km/h)	!# loc /Train	!# Cars /Train	! Eng type	!Cont weld
1. Way Freight	1.0/3.4	16.0	2.0	25.0	Diesel	No

Data for Segment # 1: WCR (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 : 107.40 / 107.40 m
 Receiver height : 52.50 / 52.50 m
 Topography : 1 (Flat/gentle slope; no barrier)
 No Whistle
 Reference angle : 0.00



Results segment # 1: WCR (day)

LOCOMOTIVE (0.00 + 41.95 + 0.00) = 41.95 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.00	53.51	-8.55	-3.01	0.00	0.00	0.00	41.95

WHEEL (0.00 + 29.52 + 0.00) = 29.52 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.00	41.08	-8.55	-3.01	0.00	0.00	0.00	29.52

Segment Leq : 42.19 dBA

Total Leq All Segments: 42.19 dBA



Results segment # 1: WCR (night)

D

LOCOMOTIVE (0.00 + 50.27 + 0.00) = 50.27 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
--------	--------	-------	--------	-------	-------	-------	-------	-------	--------

-90	0	0.00	61.83	-8.55	-3.01	0.00	0.00	0.00	50.27
-----	---	------	-------	-------	-------	------	------	------	-------

WHEEL (0.00 + 37.84 + 0.00) = 37.84 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
--------	--------	-------	--------	-------	-------	-------	-------	-------	--------

-90	0	0.00	49.40	-8.55	-3.01	0.00	0.00	0.00	37.84
-----	---	------	-------	-------	-------	------	------	------	-------

Segment Leq : 50.51 dBA

Total Leq All Segments: 50.51 dBA

↑

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

Car traffic volume : 11466/1274 veh/TimePeriod
Medium truck volume : 117/13 veh/TimePeriod
Heavy truck volume : 117/13 veh/TimePeriod
Posted speed limit : 50 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: Erb (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 : 15.00 / 15.00 m
Receiver height : 52.50 / 52.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

↑

Road data, segment # 2: Regina (day/night)

Car traffic volume : 7585/843 veh/TimePeriod
Medium truck volume : 77/9 veh/TimePeriod
Heavy truck volume : 77/9 veh/TimePeriod
Posted speed limit : 50 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

D

Data for Segment # 2: Regina (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 : 15.50 / 15.50 m
Receiver height : 52.50 / 52.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

↑

Results segment # 1: Erb (day)

Source height = 1.00 m

ROAD (0.00 + 60.17 + 0.00) = 60.17 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.00	63.18	0.00	0.00	-3.01	0.00	0.00	0.00	60.17

Segment Leq : 60.17 dBA

↑

Results segment # 2: Regina (day)

Source height = 1.00 m

ROAD (0.00 + 61.23 + 0.00) = 61.23 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	61.37	0.00	-0.14	0.00	0.00	0.00	0.00	61.23

Segment Leq : 61.23 dBA

Total Leq All Segments: 63.74 dBA

↑

Results segment # 1: Erb (night)

Source height = 1.00 m

D

ROAD (0.00 + 53.64 + 0.00) = 53.64 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.00	56.65	0.00	0.00	-3.01	0.00	0.00	0.00	53.64

Segment Leq : 53.64 dBA

↑

Results segment # 2: Regina (night)

Source height = 1.01 m

ROAD (0.00 + 54.80 + 0.00) = 54.80 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	54.94	0.00	-0.14	0.00	0.00	0.00	0.00	54.80

Segment Leq : 54.80 dBA

Total Leq All Segments: 57.27 dBA

↑

TOTAL Leq FROM ALL SOURCES (DAY): 63.77
(NIGHT): 58.10

↑

↑

E

STAMSON 5.0 NORMAL REPORT Date: 27-01-2022 11:40:38
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: ola.te Time Period: 16 hours
 Description: 5th floor OLA.

Rail data, segment # 1: WCR

```

-----
Train          ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type           !              !(km/h) !/Train!/Train! type !weld
-----+-----+-----+-----+-----+-----
  1. Way Freight !   1.0/3.4   !  16.0 !  2.0 ! 25.0 !Diesel! No
  
```

Data for Segment # 1: WCR

```

-----
Angle1  Angle2      : -90.00 deg   28.00 deg
Wood depth      :      0      (No woods.)
No of house rows :      0
Surface         :      2      (Reflective ground surface)
Receiver source distance : 118.70 m
Receiver height  :    1.50 m
Topography      :      2      (Flat/gentle slope; with barrier)
No Whistle
Barrier angle1   : -90.00 deg   Angle2 : 28.00 deg
Barrier height   :    1.07 m
Barrier receiver distance : 14.20 m
Source elevation :    0.00 m
Receiver elevation : 12.00 m
Barrier elevation : 12.00 m
Reference angle  :    0.00
  
```

↑

Rail data, segment # 2: WCR_Bar

```

-----
Train          ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type           !              !(km/h) !/Train!/Train! type !weld
-----+-----+-----+-----+-----+-----
  1.            !   1.0/3.4   !  16.0 !  2.0 ! 25.0 !Diesel! No
  
```

Data for Segment # 2: WCR_Bar

```

-----
Angle1  Angle2      :  28.00 deg   90.00 deg
Wood depth      :      0      (No woods.)
No of house rows :      0
Surface         :      2      (Reflective ground surface)
Receiver source distance : 118.70 m
Receiver height  :    1.50 m
  
```

Topography : 2 E (Flat/gentle slope; with barrier)
 No Whistle
 Barrier angle1 : 28.00 deg Angle2 : 90.00 deg
 Barrier height : 54.00 m
 Barrier receiver distance : 6.00 m
 Source elevation : 0.00 m
 Receiver elevation : 12.00 m
 Barrier elevation : 0.00 m
 Reference angle : 0.00

↑

Results segment # 1: WCR

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	1.50	0.36	12.36
0.50	1.50	-0.06	11.94

LOCOMOTIVE (0.00 + 37.00 + 0.00) = 37.00 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	28	0.00	53.51	-8.98	-1.83	0.00	0.00	-5.69	37.00

WHEEL (0.00 + 23.70 + 0.00) = 23.70 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	28	0.00	41.08	-8.98	-1.83	0.00	0.00	-6.56	23.70

Segment Leq : 37.20 dBA

↑

Results segment # 2: WCR_Bar

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	1.50	13.02	13.02
0.50	1.50	12.84	12.84

E

LOCOMOTIVE (0.00 + 20.31 + 0.00) = 20.31 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
28	90	0.00	53.51	-8.98	-4.63	0.00	0.00	-19.58	20.31

WHEEL (0.00 + 7.88 + 0.00) = 7.88 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
28	90	0.00	41.08	-8.98	-4.63	0.00	0.00	-19.59	7.88

Segment Leq : 20.55 dBA

Total Leq All Segments: 37.29 dBA

↑

Road data, segment # 1: Erb

Car traffic volume : 11466 veh/TimePeriod
 Medium truck volume : 117 veh/TimePeriod
 Heavy truck volume : 117 veh/TimePeriod
 Posted speed limit : 50 km/h
 Road gradient : 0 %
 Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: Erb

Angle1 Angle2 : -90.00 deg 28.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0
 Surface : 2 (Reflective ground surface)
 Receiver source distance : 26.10 m
 Receiver height : 1.50 m
 Topography : 2 (Flat/gentle slope; with barrier)
 Barrier angle1 : -90.00 deg Angle2 : 28.00 deg
 Barrier height : 1.07 m
 Barrier receiver distance : 14.20 m
 Source elevation : 0.00 m
 Receiver elevation : 12.00 m
 Barrier elevation : 12.00 m
 Reference angle : 0.00

↑

Road data, segment # 2: Regina_N

Car traffic volume : 7585 veh/TimePeriod
 Medium truck volume : 77 veh/TimePeriod

E

Heavy truck volume : 77 veh/TimePeriod
 Posted speed limit : 50 km/h
 Road gradient : 0 %
 Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 2: Regina_N

Angle1	Angle2	:	47.00 deg	90.00 deg
Wood depth	:	0	(No woods.)	
No of house rows	:	0		
Surface	:	2	(Reflective ground surface)	
Receiver source distance	:	74.50 m		
Receiver height	:	1.50 m		
Topography	:	2	(Flat/gentle slope; with barrier)	
Barrier angle1	:	47.00 deg	Angle2 :	90.00 deg
Barrier height	:	1.07 m		
Barrier receiver distance	:	14.20 m		
Source elevation	:	0.00 m		
Receiver elevation	:	12.00 m		
Barrier elevation	:	12.00 m		
Reference angle	:	0.00		



Road data, segment # 3: Regina_S

Car traffic volume : 7585 veh/TimePeriod
 Medium truck volume : 77 veh/TimePeriod
 Heavy truck volume : 77 veh/TimePeriod
 Posted speed limit : 50 km/h
 Road gradient : 0 %
 Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 3: Regina_S

Angle1	Angle2	:	-90.00 deg	-62.00 deg
Wood depth	:	0	(No woods.)	
No of house rows	:	0		
Surface	:	2	(Reflective ground surface)	
Receiver source distance	:	74.50 m		
Receiver height	:	1.50 m		
Topography	:	2	(Flat/gentle slope; with barrier)	
Barrier angle1	:	-90.00 deg	Angle2 :	-62.00 deg
Barrier height	:	1.07 m		
Barrier receiver distance	:	14.20 m		
Source elevation	:	0.00 m		
Receiver elevation	:	12.00 m		
Barrier elevation	:	12.00 m		
Reference angle	:	0.00		



Road data, segment # 4: Erb_Bar

```

-----
Car traffic volume : 11466 veh/TimePeriod
Medium truck volume : 117 veh/TimePeriod
Heavy truck volume : 117 veh/TimePeriod
Posted speed limit : 50 km/h
Road gradient      : 0 %
Road pavement     : 1 (Typical asphalt or concrete)

```

Data for Segment # 4: Erb_Bar

```

-----
Angle1  Angle2      : 28.00 deg  90.00 deg
Wood depth      : 0          (No woods.)
No of house rows : 0
Surface         : 2          (Reflective ground surface)
Receiver source distance : 26.10 m
Receiver height  : 1.50 m
Topography      : 2          (Flat/gentle slope; with barrier)
Barrier angle1   : 28.00 deg  Angle2 : 90.00 deg
Barrier height   : 54.00 m
Barrier receiver distance : 6.00 m
Source elevation : 0.00 m
Receiver elevation : 12.00 m
Barrier elevation : 0.00 m
Reference angle  : 0.00

```



Road data, segment # 5: Regina_Bar

```

-----
Car traffic volume : 7585 veh/TimePeriod
Medium truck volume : 77 veh/TimePeriod
Heavy truck volume : 77 veh/TimePeriod
Posted speed limit : 50 km/h
Road gradient      : 0 %
Road pavement     : 1 (Typical asphalt or concrete)

```

Data for Segment # 5: Regina_Bar

```

-----
Angle1  Angle2      : -62.00 deg  47.00 deg
Wood depth      : 0          (No woods.)
No of house rows : 0
Surface         : 2          (Reflective ground surface)
Receiver source distance : 74.50 m
Receiver height  : 1.50 m
Topography      : 2          (Flat/gentle slope; with barrier)
Barrier angle1   : -62.00 deg  Angle2 : 47.00 deg

```

E

Barrier height : 54.00 m
 Barrier receiver distance : 6.00 m
 Source elevation : 0.00 m
 Receiver elevation : 12.00 m
 Barrier elevation : 0.00 m
 Reference angle : 0.00

↑

Results segment # 1: Erb

Source height = 1.00 m

Barrier height for grazing incidence

Source Height (m)	! Receiver ! Height (m)	! Barrier ! Height (m)	! Elevation of ! Barrier Top (m)
1.00 !	1.50 !	-5.30 !	6.70

ROAD (0.00 + 42.17 + 0.00) = 42.17 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	28	0.00	63.18	0.00	-2.41	-1.83	0.00	0.00	-16.77	42.17

Segment Leq : 42.17 dBA

↑

Results segment # 2: Regina_N

Source height = 1.00 m

Barrier height for grazing incidence

Source Height (m)	! Receiver ! Height (m)	! Barrier ! Height (m)	! Elevation of ! Barrier Top (m)
1.00 !	1.50 !	-0.88 !	11.12

ROAD (0.00 + 40.99 + 0.00) = 40.99 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
47	90	0.00	61.37	0.00	-6.96	-6.22	0.00	0.00	-7.20	40.99

Segment Leq : 40.99 dBA

E



Results segment # 3: Regina_S

Source height = 1.00 m

Barrier height for grazing incidence

Source Height (m)	! Receiver Height (m)	! Barrier Height (m)	! Elevation of Barrier Top (m)
1.00	!	1.50	!
		-0.88	!
			11.12

ROAD (0.00 + 39.72 + 0.00) = 39.72 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-62	0.00	61.37	0.00	-6.96	-8.08	0.00	0.00	-6.61	39.72

Segment Leq : 39.72 dBA



Results segment # 4: Erb_Bar

Source height = 1.00 m

Barrier height for grazing incidence

Source Height (m)	! Receiver Height (m)	! Barrier Height (m)	! Elevation of Barrier Top (m)
1.00	!	1.50	!
		10.63	!
			10.63

ROAD (0.00 + 36.42 + 0.00) = 36.42 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
28	90	0.00	63.18	0.00	-2.41	-4.63	0.00	0.00	-19.72	36.42

Segment Leq : 36.42 dBA



Results segment # 5: Regina_Bar

Source height = 1.00 m

E

Barrier height for grazing incidence

```
-----
Source      ! Receiver      ! Barrier      ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
-----+-----+-----+-----
          1.00 !          1.50 !          12.49 !          12.49
```

ROAD (0.00 + 32.24 + 0.00) = 32.24 dBA

```
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
-----
  -62    47    0.00  61.37   0.00  -6.96  -2.18   0.00   0.00 -20.00  32.24
-----
```

Segment Leq : 32.24 dBA

Total Leq All Segments: 46.48 dBA

↑

TOTAL Leq FROM ALL SOURCES: 46.98

↑

↑

Appendix E

Consultant Declaration Form



ACOUSTICS



NOISE



VIBRATION

CONSULTANT STATUTORY DECLARATION

CANADA	)	In the Matter of the
	)	Environmental Protection
PROVINCE OF ONTARIO	)	Act and the Planning Act
	)	
	)	And in the Matter of an
	)	Application for a Proposed
	)	Mixed-Use/Residential Development
	)	6 Regina Street, 24, 28, 34 Erb Street East
	)	Waterloo, Ontario

I, Sheeba Paul, of the City of Brampton, SOLEMNLY DECLARE THAT:

1. I am a Professional Engineer employed by HGC Engineering 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 a Proposed Mixed-Use/Residential Development at 6 Regina Street, 24, 28, 34 Erb Street East, 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 study entitled Noise Feasibility Study, Proposed Mixed-Use/Residential Development, 6 Regina Street, 24, 28, 34 Erb Street East, Waterloo, Ontario is the best available information as of the date of the study.
5. The sound level calculations, the interpretation of noise attenuation requirements, and the recommended measures are in accordance with Ministry of the Environment, Conservation and Parks' Guidelines, Region of Waterloo policies, any applicable policy of guidelines or 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.

DECLARED before me at the City
of Mississauga, in the Region of Peel

) Sheeba Paul
)
) Sheeba Paul



this 27 day of January 2022

Lily N. Tran
Barrister & Solicitor
Greg Guzik Professional Corporation
82 Queen Street South
Mississauga, ON L5M 1K6

