

ENVIRONMENTAL NOISE FEASIBILITY STUDY

36 WESTHILL DRIVE

Proposed Residential Development
Waterloo, Ontario

AUGUST 22, 2025

PROJECT: 125-0111

PREPARED FOR:

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Version History

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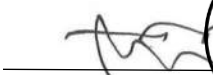
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Environmental Noise Feasibility Study

36 Westhill Drive

Proposed Residential Development

Waterloo, Ontario

EXECUTIVE SUMMARY

Valcoustics Canada Ltd. (VCL) was retained to prepare an Environmental Noise Feasibility Study for the proposed residential development in support of the Official Plan Amendment (OPA) and Zoning By-law Amendment (ZBA) application submissions to the City of Waterloo.

The proposed development consists of two residential buildings. Building A will be 6-storeys and Building B will be 8-storeys. Both buildings will have common outdoor amenity areas at grade and on the rooftop.

Transportation Noise Sources

The main transportation noise source in the vicinity with the potential to impact the subject site is road traffic on Ira Needles Boulevard and Erb Street West.

To meet the applicable transportation noise source guideline limits:

- All residential suites will require mandatory air conditioning;
- The applicable indoor noise guidelines at all suites are predicted to be met without any special wall and window upgrades beyond the minimum non-acoustical requirements of the Ontario Building Code (OBC).

Stationary Noise Sources

The stationary noise sources in the vicinity with the potential to impact the subject site are the existing apartment building at 28 Westhill Drive and the Westhill Retirement Residence. The sound levels from these facilities are predicted to meet the applicable Class 1 guideline limits at the proposed development.

1.0 INTRODUCTION

Valcoustics Canada Ltd. (VCL) has been retained to prepare an Environmental Noise Feasibility Study for the proposed residential development in support of the OPA and ZBA application submissions to the City of Waterloo.

The potential sound levels and noise mitigation measures needed for the proposed development to comply with the MECP noise guideline requirements are outlined herein.

1.1 THE SITE AND SURROUNDING AREA

The proposed development is located at 36 Westhill Drive in the City of Waterloo and is bounded by:

- An existing apartment building, with a high-rise development under construction and Erb Street West beyond, to the north;
- A residential subdivision to the east;
- A single residential dwelling with an existing residential subdivision beyond, to the south; and
- Westhill Drive, with the existing Westhill Retirement Residence building, vacant land (zoned as “R9” for low-rise residential area) and Ira Needles Boulevard beyond, to the west.

A Key Plan is shown as Figure 1.

This report is based on the architectural drawing set prepared by Architecture Unfolded, dated August 6, 2025. The Site Plan from the drawing set is included as Figure 2.

1.2 THE PROPOSED DEVELOPMENT

The proposed development consists of two residential buildings. Building A will be 6-storeys and Building B will be 8-storeys. Both buildings will have common outdoor amenity areas at grade and on the rooftop.

2.0 TRANSPORTATION NOISE SOURCE ASSESSMENT

2.1 ENVIRONMENTAL NOISE GUIDELINES – TRANSPORTATION SOURCES

2.1.1 MECP PUBLICATION NPC-300

The applicable noise guidelines for new residential development are those in MECP Publication NPC-300, *“Environmental Noise Guideline, Stationary and Transportation Sources – Approval and Planning”*.

The environmental noise guidelines of the MECP, as provided in Publication NPC-300, are discussed briefly below and summarized in Appendix A.

2.1.1.1 Architectural Elements

In the daytime, the indoor criterion for road noise is $L_{eq\ Day}$ of 45 dBA for sensitive spaces such as living/dining rooms, dens and bedrooms. At night, the indoor criterion for road noise is $L_{eq\ Night}$ of 45 dBA for sensitive spaces such as living/dining rooms and dens and 40 dBA for bedrooms.

The architectural design of the building envelope (walls, windows, etc.) must provide adequate sound isolation to achieve these indoor sound level limits, based on the applicable outdoor sound level on the facades.

2.1.1.2 Ventilation

In accordance with the MECP noise guidelines for road traffic sources, if the daytime sound energy level, $L_{eq\ Day}$, at the exterior face of a noise sensitive window is greater than 65 dBA, means must be provided so that windows can be kept closed for noise control purposes and central air conditioning is required. For daytime sound levels between 56 dBA and 65 dBA inclusive, there need only be the provision for adding air conditioning at a later date. A warning clause advising the occupant of the potential interference with some activities is also required. During nighttime hours, air conditioning would be required when the sound level exceeds 60 dBA ($L_{eq\ Night}$) at a noise sensitive window (provision for adding air conditioning is required when greater than 50 dBA).

2.1.1.3 Outdoors

For outdoor amenity areas (“Outdoor Living Area’s” – OLA’s), the guideline is 55 dBA $L_{eq\ Day}$, with an excess not exceeding 5 dBA considered acceptable if it is technically not practicable to achieve the 55 dBA objective, providing warning clauses are registered on title. Note that for road traffic sources, a balcony or terrace is not considered an OLA, unless it is:

- the only OLA for the occupant;
- at least 4 m in depth; and
- unenclosed.

2.1.2 REGIONAL MUNICIPALITY OF WATERLOO NOISE POLICY

The Regional Municipality of Water has a published Noise Policy Implementation Guideline, last updated October 22, 2019.

The requirements in the Noise Policy are generally the same as those in NPC-300, except noise barriers are only to be implemented as a noise control measure when the daytime sound level at an outdoor amenity area exceeds 60 dBA, provided warning clauses are registered on title.

The maximum permissible fence height is 2.4 m. Total barrier height may be increased by use of a berm/wall combination in order to achieve 60 dBA.

2.2 TRANSPORTATION NOISE SOURCES

The transportation noise source with the potential for impact on the proposed development will be road traffic on Ira Needles Boulevard and Erb Street West. Other roadways are either too far removed or would have minimal traffic volumes and would not be expected to have a significant impact on the subject site.

Future (Year 2035) traffic data for both roadways was obtained from the Region of Waterloo. The data includes truck percentages and day/night splits.

The road traffic data correspondence is included as Appendix B and summarized in Table 1.

TABLE 1 ROAD TRAFFIC DATA

Roadway	Year	AADT ⁽¹⁾	% Trucks		Speed Limit (kph)	Day/Night Split (%)
			Medium	Heavy		
Erb Street W ⁽²⁾	2035	20,200	1.0	2.0	60	90/10
Ira Needles Blvd ⁽²⁾	2035	33,600	1.0	2.0	60	90/10

Notes:

(1) AADT – Annual Average Daily Traffic.

(2) Road traffic data was obtained from the Region of Waterloo.

2.3 ASSESSMENT METHOD

Using the road traffic data in Table 1, the sound levels, in terms of $L_{eq\ Day}$ and $L_{eq\ Night}$, were determined using STAMSON V5.04 - ORNAMENT, the computerized road traffic noise prediction model of the MECP. The results are summarized in Table 2.

The daytime and nighttime sound levels were calculated at the following heights, representing the top storey (worst-case) locations:

- 19.5 m for Building A;
- 25.7 m for Building B.

The daytime OLA sound levels were assessed using a receptor height of 1.5 m above grade or above the terrace floor slab.

Inherent screening of each building face due to its orientation to the noise source as well as that provided by the subject development itself was taken into account. To be conservative, screening from existing developments in the vicinity of the site was not included.

2.4 ASSESSMENT RESULTS

The highest predicted daytime and nighttime sound levels of 63 dBA and 57 dBA, respectively, are predicted to occur on the west facades of Buildings A and B, the closest to Ira Needles Boulevard.

At the grade-level OLA's, the highest sound level of 57 dBA is predicted to occur at the outdoor amenity on the south side of Building A. The grade-level OLA at Building B is completely screened from the transportation noise sources by the nearby buildings and from the subject site itself. Thus, it is predicted to be below 55 dBA.

At the rooftop terrace OLA's, the highest sound level of 55 dBA is predicted to occur at the common outdoor amenity area of Building A.

The predicted sound levels are summarized in Table 2. A sample calculation is included in Appendix C.

TABLE 2 PREDICTED OUTDOOR SOUND LEVELS

Location ⁽¹⁾	Source	Distance (m) ⁽²⁾	Leq Day (dBA)	Leq Night (dBA)
A Building A Southwest Corner (West Face)	Ira Needles Blvd (Northbound)	48	61	54
	Ira Needles Blvd (Southbound)	56	60	53
	Erb St W	332	50	43
	TOTAL	–	63	57
A Building A Southwest Corner (South Face)	Ira Needles Blvd (Northbound)	48	60	53
	Ira Needles Blvd (Southbound)	56	59	52
	TOTAL	–	62	56
B Building A Northwest Corner (West Face)	Ira Needles Blvd (Northbound)	57	60	53
	Ira Needles Blvd (Southbound)	65	59	53
	Erb St W	314	50	43
	TOTAL	–	63	56
C Building B Southwest Corner (West Face)	Ira Needles Blvd (Northbound)	69	60	53
	Ira Needles Blvd (Southbound)	77	59	53
	Erb St W	289	52	46
	TOTAL	–	63	57
D Building B Northwest Corner West Face	Ira Needles Blvd (Northbound)	98	58	52
	Ira Needles Blvd (Southbound)	105	58	52
	Erb St W	238	53	47
	TOTAL	–	62	55
E Building A Grade-level Amenity (OLA)	Ira Needles Blvd (Northbound)	60	54	–
	Ira Needles Blvd (Southbound)	68	54	–
	TOTAL	–	57	–
F Building A Rooftop Outdoor Amenity Area (OLA)	Ira Needles Blvd (Northbound)	66	49	–
	Ira Needles Blvd (Southbound)	74	50	–
	Erb St W	323	52	–
	TOTAL	–	55	–
G Building B Rooftop Outdoor Amenity Area (OLA)	Ira Needles Blvd (Northbound)	85	49	–
	Ira Needles Blvd (Southbound)	92	49	–
	Erb St W	275	50	–
	TOTAL	–	54	–

Notes:

- (1) See Figure 2.
- (2) Distance indicated is taken from the centreline of the noise source to the point of reception.

2.5 NOISE ABATEMENT REQUIREMENTS

The noise control measures can generally be classified into two categories which are interrelated, but which can be treated separately for the most part:

- a) Architectural elements to achieve acceptable indoor noise guidelines for transportation sources; and
- b) Design features to protect the OLAs.

Noise abatement requirements are summarized in Table 3.

2.5.1 Architectural Requirements

The indoor noise level guidelines can be achieved by using appropriate construction for exterior walls, windows and doors.

In determining the worst-case architectural requirements, wall and window areas were determined using the floor plan and elevation drawings in the architectural drawing set.

Based on the predicted sound levels, exterior walls and windows meeting the minimum non-acoustical requirements of the OBC will be sufficient to meet the indoor guideline limits.

The requirements should be updated if the architectural plans change significantly.

2.5.2 Ventilation Requirements

Based on the predicted sound levels, both buildings require the provision for the adding air conditioning at a later date. In multi-unit buildings such as these, the provision for adding air conditioning requirement is typically not practical to implement. Thus, the ventilation requirement has been upgraded to mandatory air conditioning.

2.5.3 Outdoors

The highest OLA's sound level is predicted to be 57 dBA, slightly exceeds the 55 dBA OLA guideline target limit, but is below the 60 dBA upper of the MECF limit. Since the occupants will also be provided with outdoor amenity areas (the rooftop terraces) that meet the 55 dBA target limit and this 2 dBA excess over the target limit is considered acoustically insignificant, sound barriers are not being recommended for this space. Warning clauses should be registered on title indicating the potential for noise interfering with activities at this location.

2.6 WARNING CLAUSES

Warning clauses are a tool to inform prospective owners/occupants of potential annoyance due to existing noise sources. Where the guideline sound level limits are exceeded, appropriate warning clauses should be registered on title or included in the development agreement that is registered on title. The warning clauses should also be included in agreements of Offers of Purchase and Sale and lease/rental agreements to make future occupants aware of the potential noise situation.

Table 3 and the notes to Table 3 summarize the warning clauses for the site.

TABLE 3 TRANSPORTATION NOISE ABATEMENT REQUIREMENTS

Location	Air Conditioning ⁽¹⁾	Exterior Wall ⁽²⁾	Exterior Window ⁽²⁾	Sound Barriers	Warning Clauses ⁽³⁾
Buildings A and B	Mandatory	No special acoustical requirements			A + B

Notes:

- (1) Where means must be provided to allow windows to remain closed for road/rail noise control purposes, a commonly used technique is that of central air conditioning. Provision for adding air conditioning typically takes the form of a ducted ventilation system suitably sized to permit the addition of central air conditioning by the occupant.
- (2) STC - Sound Transmission Class Rating (Reference ASTM-E413). A sliding glass walkout door should be considered as a window and be included in the percentage of glazing.

The requirements were determined using the floor plans and elevation drawings in the architectural drawing set prepared by Architecture Unfolded, dated August 6, 2025. The requirements should be checked if the plans change significantly.
- (3) Example warning clauses to be registered on title and be included in Offers of Purchase and Sale and Leases on designated units:
 - A. "Purchases/tenants are advised that despite the inclusion of noise control features in the development and within the building units, sound levels due to increasing road traffic may on occasions interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the Municipality and the Ministry of the Environment, Conservation and Parks."
 - B. "This dwelling has been supplied with a central air conditioning system which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment, Conservation and Parks."
 - C. "Purchasers/tenants are advised that due to the proximity of the existing apartment and retirement facilities, noise from these facilities may at times be audible."
- (4) All exterior doors shall be fully weather-stripped.

3.0 NOISE IMPACT ASSESSMENT – STATIONARY NOISE SOURCES

3.1 MECP NOISE GUIDELINES –STATIONARY SOURCES

Stationary sources are treated differently by the MECP guideline than transportation sources of noise such as road traffic and railways. Stationary source noise criteria used for noise impact assessments are dependent on the type of area and the ambient sound environment. The site and area are Class 1, i.e., an area where the ambient sound environment is dominated by "urban hum", primarily traffic noise. This is due to the proximity of the area road network.

3.1.1 Class 1 Sound Level Criteria

MECP Publication NPC-300 states that the guideline limits shall be defined by the higher of the ambient sound level, due to road traffic noise, or the minimum exclusion limits for a Class 1 area of 50 dBA during the daytime (0700 to 1900 hours), 50 dBA during the evening (1900 to 2300 hours) and 45 dBA during the nighttime (2300 to 0700 hours) at a noise sensitive plane of window. The minimum exclusion limits are 50 dBA in the daytime and evening at an outdoor point of reception. There are no sound level limits for outdoor points of reception at night.

The MECP requires a “predictable worst case” one-hour operating scenario be analysed.

The guideline limits apply to habitable spaces such as living/dining/family rooms and sleep areas. No indoor sound level limits are provided for stationary sources.

3.2 STATIONARY NOISE SOURCES

The stationary noise sources in the vicinity with the potential to impact the subject site are the existing apartment building at 28 Westhill Drive and the Westhill Retirement Residence at 25 Westhill Drive. The noise impact from these two facilities was assessed separately, in accordance with the MECP guidelines.

There is also an existing commercial plaza on the west side of Ira Needles Boulevard. The main noise sources at these facilities would be the rooftop mechanical units and delivery truck activities. Based on the distance separation, high ambient sound levels from the intervening roadway and the presence of existing residential developments at closer setback distances, noise from this plaza is not expected to have a significant impact on the subject site and has not been considered further.

3.2.1 28 Westhill Drive

The main noise sources associated with the apartment building at 28 Westhill Drive are the rooftop cooling tower and make-up air unit. Sound level data for the cooling tower was provided by the mechanical consultants for 28 Westhill Development. Sound data for the make-up air unit was assumed based on a similarly sized unit for a similar development. The cooling tower sound data is included in Appendix D.

Two operating scenarios were considered, according to the criterion periods: daytime/evening (0700 to 2300 hours) and nighttime (2300 to 0700 hours). The operating scenarios representing the worst-case operations were assumed to be:

Daytime/Evening Scenario:

- All rooftop units operate for the full hour

Nighttime Scenario:

- The cooling tower operates for 30 minutes out of the hour.
- The make-up air unit operates for the full hour.

Figure 3 shows the locations and IDs of the noise sources.

3.2.2 Westhill Retirement Residence

The main noise sources associated with the Westhill Retirement Residence are expected to be the rooftop mechanical equipment.

The mechanical unit sizes and locations were estimated using aerial imagery. The sound data for the units and the operating times were taken from similar projects completed by VCL.

Based on aerial imagery, the facility appears to have five large air handling units (AHU's), and a 12-fan condenser.

The AHU's were modelled using manufacturer's sound data for a similar-sized unit at a long-term care facility. The condenser was modelled using manufacturer's data for a typical 12-fan condenser.

Two operating scenarios were considered, according to the criterion periods: daytime/evening (0700 to 2300 hours) and nighttime (2300 to 0700 hours).

The operating scenarios representing the worst-case operations were assumed to be:

Daytime/Evening Scenario:

- All rooftop units operate for the full hour

Nighttime Scenario:

- All rooftop units operate for 30 minutes out of the hour.

Figure 4 shows the locations and IDs of the noise sources.

3.3 ANALYSIS METHOD

A 3-D acoustic model of the proposed development and surrounding area was developed using CadnaA V2024 MR1 environmental noise modeling software, which follows the protocol of ISO Standard 9613-2 (1996), "*Acoustics – Attenuation of Sound During Propagation Outdoors*", to predict sound levels at each of the receptor locations. Accounting for distance, atmospheric absorption and ground attenuation, the sound level from all the relevant noise sources (hourly L_{eq}) was determined for each receptor position, for each of the operating scenarios.

Hard ground ($G = 0$) was used for the paved areas and soft ground ($G = 1$) was used elsewhere. Two orders of sound reflection were included in the model. Topography was based on the building section drawings in the architectural drawings set as well as topographical information from Google Earth.

The assessment was done using the Building Evaluation feature in CadnaA, where the sound level is calculated at several points around the entire building facade, at each storey. The outdoor points of reception (OPOR's) were assessed as discrete receptors, at a height of 1.5 m above the terrace floor.

Sample calculations are found in Appendix D.

3.3.1 Sound Level Limits

The sound level limits are expected to be defined by the ambient sound level from road traffic Ira Needles Boulevard. However, to be conservative, the minimum exclusion limits were used in the analysis.

3.4 ASSESSMENT RESULTS

The predicted sound levels at the proposed development due to noise from the apartment building at 28 Westhill Drive are shown on Figure 3. The number in the octagons surrounding the building represents the highest sound level at the corresponding point along the facade, at any storey. The highest daytime/evening and nighttime sound levels of 48 and 45 dBA, respectively, are predicted to occur at the north facade of Building B.

The predicted sound levels due to the Westhill Retirement Residence are shown on Figure 4. The highest daytime/evening and nighttime sound levels of 48 and 45 dBA, respectively, are predicted to occur at the north facade of Building B.

The sound levels due to the existing facilities, for all scenarios, are predicted to be below the Class 1 exclusion limits at the proposed development. Thus, mitigation measures are not required for noise control purposes.

4.0 CONCLUSIONS

With appropriate site design and mitigation measures, it is feasible to meet the noise guideline limits at the neighbouring noise sensitive receptors.

The approvals and administrative procedures are available to ensure that the acoustical requirements are implemented.

5.0 REFERENCES

1. "Environmental Noise Guideline, Stationary and Transportation Sources – Approval and Planning", Ontario Ministry of the Environment, Publication NPC-300, October 2013.
2. "Procedures", Ontario Ministry of the Environment, Publication NPC-103, August 1978.
3. Building Practice Note No. 56: "Controlling Sound Transmission into Buildings", by J. D. Quirt, Division of Building Research, National Council of Canada, September 1985.
4. "Acoustics – Attenuation of Sound during Propagation Outdoors – Part 2: General Method of Calculation", ISO 9613-2, December 15, 1996.
5. CadnaA version 2024 MR 1, DataKustik GmbH
6. PC STAMSON 5.04, "Computer Program for Road Traffic Noise Assessment", Ontario Ministry of the Environment.
7. Regional Municipality of Waterloo Noise Policy Implementation Guideline, Part A, New Development Impacted by Roads and Railways", Policy adopted by Regional Council July 14, 1999. Last updated October 22, 2019.

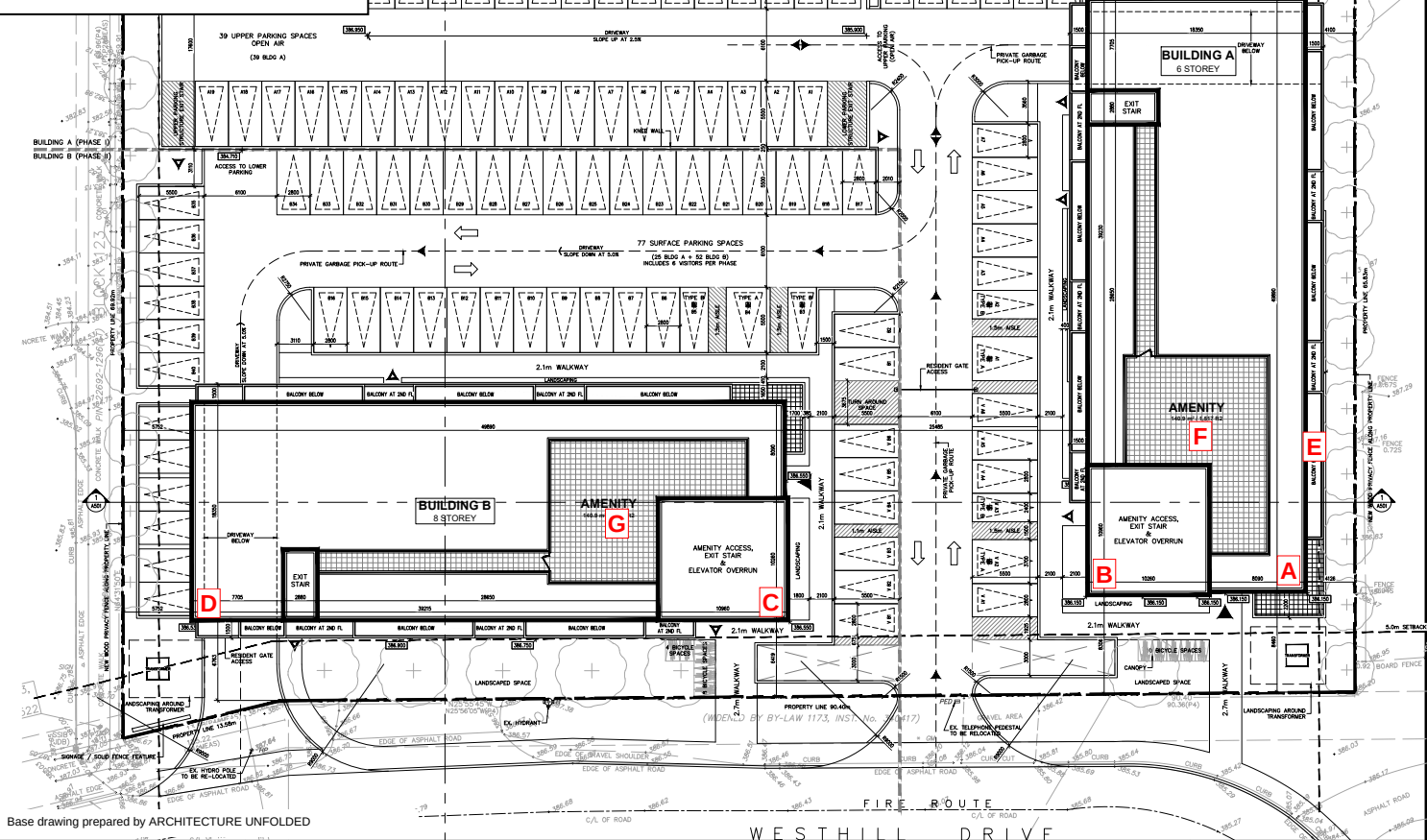


 VALCOUSTICS <i>Canada Ltd.</i> consulting acoustical engineers	Title		Date	Figure 1
	Key Plan		2025-08-21	
	Project Name		Project No.	
	36 Westhill Drive, Waterloo		1250111.000	

Date Plotted: 21.08.25

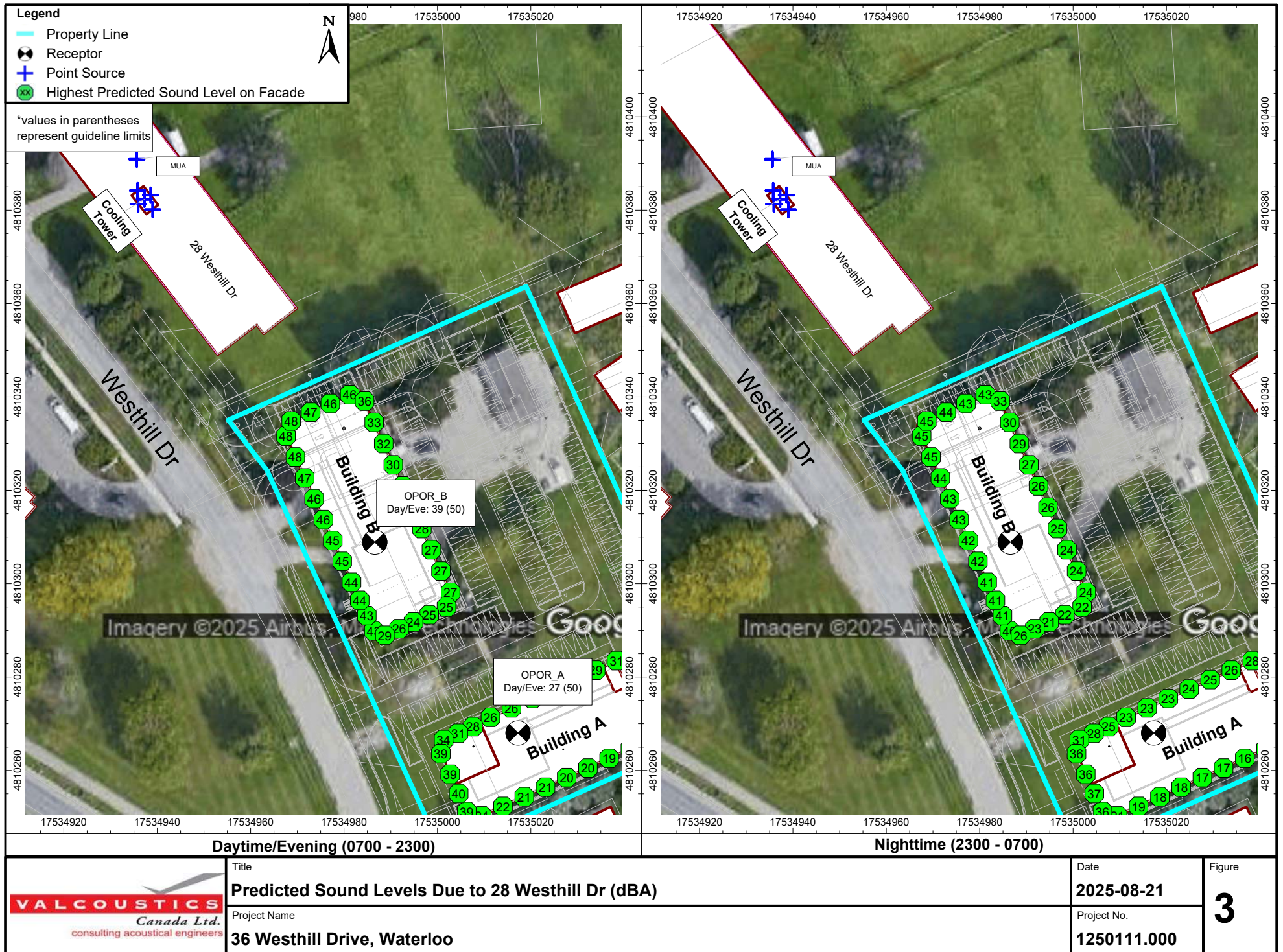
NOISE CONTROL REQUIREMENTS

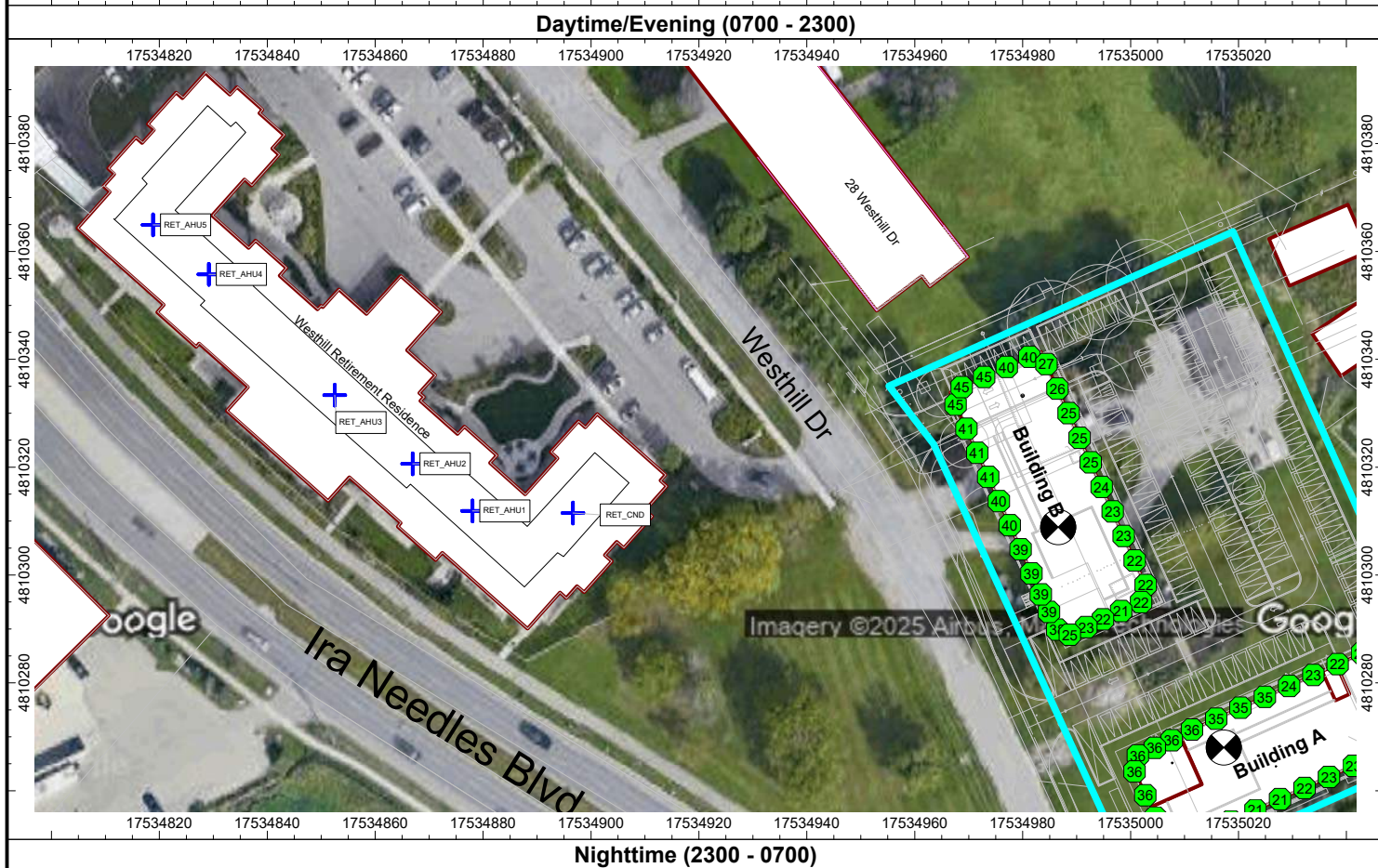
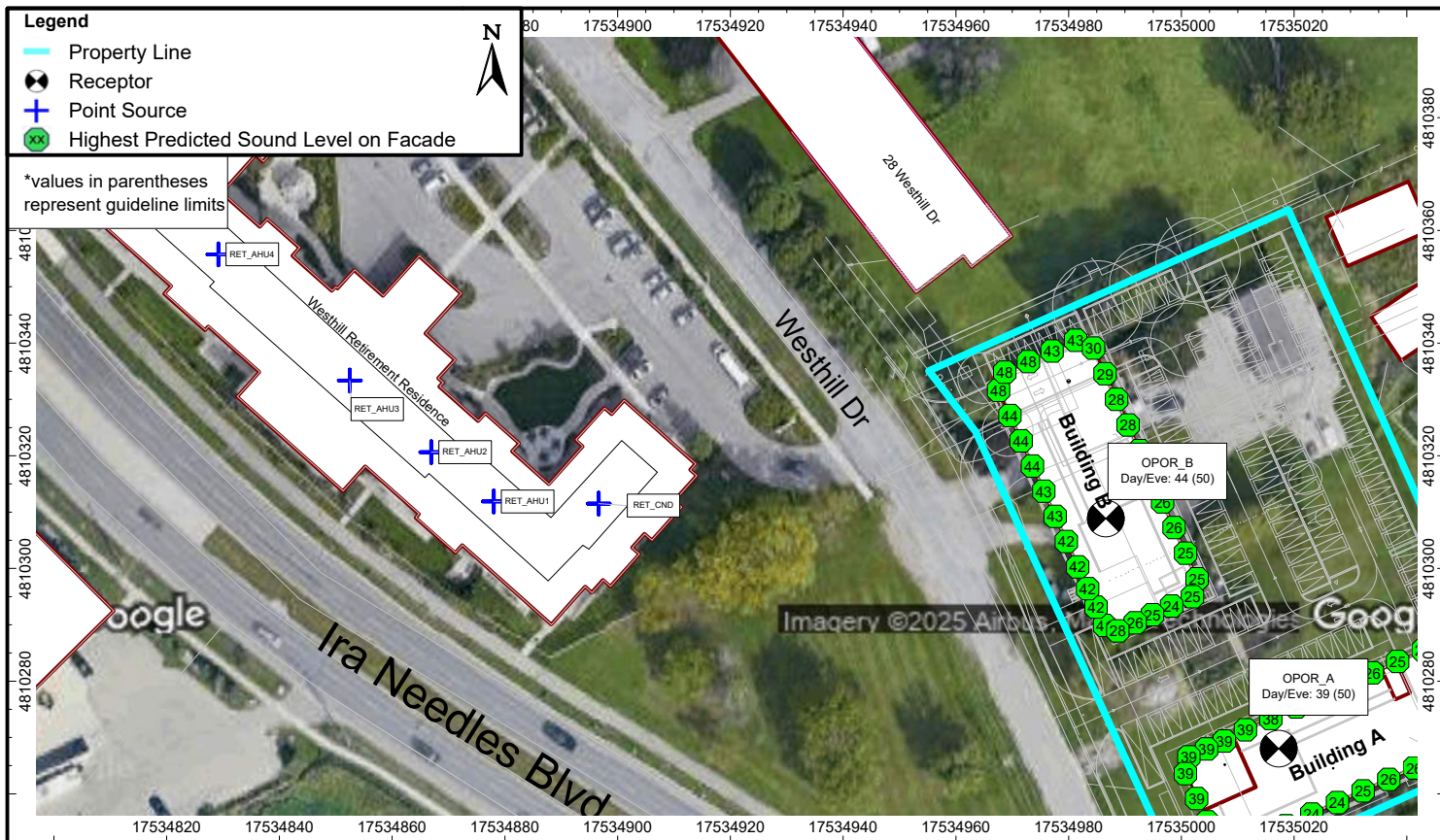
All units require mandatory air conditioning.



Base drawing prepared by ARCHITECTURE UNFOLDED

 Valcoustics Canada Ltd. consulting acoustical engineers	Title Site Plan Project Name 36 Westhill Drive, Waterloo	Date Aug. 20, 2025 Project No. 1250111.000	Figure 2
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	Title	Date	Figure
	Predicted Sound Levels Due to Westhill Retirement Residence (dBA) Project Name 36 Westhill Drive, Waterloo	2025-08-21 Project No. 1250111.000	4

APPENDIX A

ENVIRONMENTAL NOISE GUIDELINES

APPENDIX A

ENVIRONMENTAL NOISE GUIDELINES

MINISTRY OF THE ENVIRONMENT, CONSERVATION AND PARKS (MECP)

Reference: MOE Publication NPC-300, October 2013: *“Environmental Noise Guideline, Stationary and Transportation Source – Approval and Planning”*.

SPACE	SOURCE	TIME PERIOD	CRITERION
Living/dining, den areas of residences, hospitals, nursing homes, schools, daycare centres, etc.	Road	07:00 to 23:00	45 dBA
	Rail	07:00 to 23:00	40 dBA
	Aircraft	24-hour period	NEF/NEP 5
Living/dining, den areas of residences, hospitals, nursing homes, etc. (except schools or daycare centres)	Road	23:00 to 07:00	45 dBA
	Rail	23:00 to 07:00	40 dBA
	Aircraft	24-hour period	NEF/NEP 5
Sleeping quarters	Road	07:00 to 23:00	45 dBA
	Rail	07:00 to 23:00	40 dBA
	Aircraft	24-hour period	NEF/NEP 0
Sleeping quarters	Road	23:00 to 07:00	40 dBA
	Rail	23:00 to 07:00	35 dBA
	Aircraft	24-hour period	NEF/NEP 0
Outdoor Living Areas	Road and Rail	07:00 to 23:00	55 dBA
Outdoor Point of Reception	Aircraft	24-hour period	NEF/NEP 30 [#]
	Stationary Source		
	Class 1 Area	07:00 to 19:00 ⁽¹⁾	50 ⁺ dBA
		19:00 to 23:00 ⁽¹⁾	50 ⁺ dBA
	Class 2 Area	07:00 to 19:00 ⁽²⁾	50 ⁺ dBA
		19:00 to 23:00 ⁽²⁾	45 ⁺ dBA
	Class 3 Area	07:00 to 19:00 ⁽³⁾	45 ⁺ dBA
		19:00 to 23:00 ⁽³⁾	40 ⁺ dBA
	Class 4 Area	07:00 to 19:00 ⁽⁴⁾	55 ⁺ dBA
		19:00 to 23:00 ⁽⁴⁾	55 ⁺ dBA

..../cont'd

SPACE	SOURCE	TIME PERIOD	CRITERION
Plane of a Window of Noise Sensitive Spaces	Stationary Source Class 1 Area	07:00 to 19:00 ⁽¹⁾	50* dBA
		19:00 to 23:00 ⁽¹⁾	50* dBA
		23:00 to 07:00 ⁽¹⁾	45* dBA
	Class 2 Area	07:00 to 19:00 ⁽²⁾	50* dBA
		19:00 to 23:00 ⁽²⁾	50* dBA
		23:00 to 07:00 ⁽²⁾	45* dBA
	Class 3 Area	07:00 to 19:00 ⁽³⁾	45* dBA
		19:00 to 23:00 ⁽³⁾	45* dBA
		23:00 to 07:00 ⁽³⁾	40* dBA
	Class 4 Area	07:00 to 19:00 ⁽⁴⁾	60* dBA
		19:00 to 23:00 ⁽⁴⁾	60* dBA
		23:00 to 07:00 ⁽⁴⁾	55* dBA

- # may not apply to in-fill or re-development.
 * or the minimum hourly background sound exposure $L_{eq(1)}$, due to road traffic, if higher.
- (1) Class 1 Area: Urban.
 (2) Class 2 Area: Urban during day; rural-like evening and night.
 (3) Class 3 Area: Rural.
 (4) Class 4 Area: Subject to land use planning authority's approval.

Reference: MOE Publication ISBN 0-7729-2804-5, 1987: *"Environmental Noise Assessment in Land-Use Planning"*.

EXCESS ABOVE RECOMMENDED SOUND LEVEL LIMITS (dBA)	CHANGE IN SUBJECTIVE LOUDNESS ABOVE	MAGNITUDE OF THE NOISE PROBLEM	NOISE CONTROL MEASURES (OR ACTION TO BE TAKEN)
No excess (<55 dBA)	—	No expected noise problem	None
1 to 5 inclusive (56 to 60 dBA)	Noticeably louder	Slight noise impact	If no physical measures are taken, then prospective purchasers or tenants should be made aware by suitable warning clauses.
6 to 10 inclusive (61 - 65 dBA)	Almost twice as loud	Definite noise impact	Recommended.
11 to 15 inclusive (66 - 70 dBA)	Almost three times as loud	Serious noise impact	Strongly Recommended.
16 and over (>70 dBA)	Almost four times as loud	Very serious noise impact	Strongly Recommended (may be mandatory).

APPENDIX B

ROAD TRAFFIC DATA

Region of Waterloo AADT Forecast for Noise Studies

1. Development/Location

36 Westhill Drive, Waterloo

2. Current AADT (2025)

Erb St	Ira Needles Blvd
16,600	27,600

3. Forecast AADT (2035)

Erb St	Ira Needles Blvd
20,200	33,600

4. Commercial Vehicle Rates

	Erb St	Ira Needles Blvd
% Medium Trucks	1%	1%
% Heavy Trucks	2%	2%

5. Posted Speed Limit

Erb St	Ira Needles Blvd
60 km/h	60 km/h

6. Day/Night Splits

Regional Standard 90/10 Day/Night Split

7. Expiry

Dec 31 2025

8. Notes

This forecast is intended for the purpose of carrying out a noise study for **36 Westhill Dr in the City of Waterloo**. The above AADT's represents the traffic volumes on Erb St and Ira Needles Boulevard.

Note that Westhaven St, in the Vicinity of the Site, is under the jurisdiction of the City of Waterloo, the consultant should contact the City of Waterloo to determine applicable forecasts

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

SAMPLE STAMSON CALCULATION

STAMSON 5.04 NORMAL REPORT Date: 21-08-2025 21:23:48
 MINISTRY OF ENVIRONMENT, CONSERVATION AND PARKS / NOISE ASSESSMENT

Filename: a_wf.te Time Period: Day/Night 16/8 hours
 Description: **Building A - Southwest Corner - West Facade**

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

```

-----
Car traffic volume   : 14666/1630   veh/TimePeriod   *
Medium truck volume :   151/17      veh/TimePeriod   *
Heavy truck volume  :   302/34      veh/TimePeriod   *
Posted speed limit  :    60 km/h
Road gradient       :    0 %
Road pavement      :    1 (Typical asphalt or concrete)
  
```

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

```

24 hr Traffic Volume (AADT or SADT): 16800
Percentage of Annual Growth       : 0.00
Number of Years of Growth         : 0.00
Medium Truck % of Total Volume    : 1.00
Heavy Truck % of Total Volume     : 2.00
Day (16 hrs) % of Total Volume    : 90.00
  
```

Data for Segment # 1: Ira Ndls NB (day/night)

```

-----
Angle1   Angle2       : -60.00 deg   90.00 deg
Wood depth :          0      (No woods.)
No of house rows :      0 / 0
Surface     :          1      (Absorptive ground surface)
Receiver source distance : 48.00 / 48.00 m
Receiver height : 19.50 / 19.50 m
Topography   :          1      (Flat/gentle slope; no barrier)
Reference angle :    0.00
  
```

Road data, segment # 2: Ira Ndls SB (day/night)

```

-----
Car traffic volume   : 14666/1630   veh/TimePeriod   *
Medium truck volume :   151/17      veh/TimePeriod   *
Heavy truck volume  :   302/34      veh/TimePeriod   *
Posted speed limit  :    60 km/h
Road gradient       :    0 %
Road pavement      :    1 (Typical asphalt or concrete)
  
```

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

```

24 hr Traffic Volume (AADT or SADT): 16800
Percentage of Annual Growth       : 0.00
Number of Years of Growth         : 0.00
Medium Truck % of Total Volume    : 1.00
Heavy Truck % of Total Volume     : 2.00
Day (16 hrs) % of Total Volume    : 90.00
  
```

Data for Segment # 2: Ira Ndls SB (day/night)

```

-----
Angle1   Angle2           : -60.00 deg   90.00 deg
Wood depth           :           0       (No woods.)
No of house rows     :           0 / 0
Surface              :           1       (Absorptive ground surface)
Receiver source distance : 56.00 / 56.00 m
Receiver height       : 19.50 / 19.50 m
Topography           :           1       (Flat/gentle slope; no barrier)
Reference angle       :           0.00
  
```

Road data, segment # 3: Erb St (day/night)

```

-----
Car traffic volume   : 17635/1959 veh/TimePeriod *
Medium truck volume  : 182/20 veh/TimePeriod *
Heavy truck volume   : 364/40 veh/TimePeriod *
Posted speed limit   : 60 km/h
Road gradient        : 0 %
Road pavement        : 1 (Typical asphalt or concrete)
  
```

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

```

24 hr Traffic Volume (AADT or SADT): 20200
Percentage of Annual Growth         : 0.00
Number of Years of Growth           : 0.00
Medium Truck % of Total Volume      : 1.00
Heavy Truck % of Total Volume        : 2.00
Day (16 hrs) % of Total Volume      : 90.00
  
```

Data for Segment # 3: Erb St (day/night)

```

-----
Angle1   Angle2           : -90.00 deg   0.00 deg
Wood depth           :           0       (No woods.)
No of house rows     :           0 / 0
Surface              :           1       (Absorptive ground surface)
Receiver source distance : 332.00 / 332.00 m
Receiver height       : 19.50 / 19.50 m
Topography           :           1       (Flat/gentle slope; no barrier)
Reference angle       :           0.00
  
```

Results segment # 1: Ira Ndls NB (day)

Source height = 1.19 m

ROAD (0.00 + 60.51 + 0.00) = 60.51 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-60	90	0.13	67.27	0.00	-5.70	-1.05	0.00	0.00	0.00	60.51

Segment Leq : 60.51 dBA

Results segment # 2: Ira Ndls SB (day)

Source height = 1.19 m

ROAD (0.00 + 59.75 + 0.00) = 59.75 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-60	90	0.13	67.27	0.00	-6.46	-1.05	0.00	0.00	0.00	59.75

Segment Leq : 59.75 dBA

Results segment # 3: Erb St (day)

Source height = 1.19 m

ROAD (0.00 + 49.51 + 0.00) = 49.51 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.13	68.07	0.00	-15.19	-3.37	0.00	0.00	0.00	49.51

Segment Leq : 49.51 dBA

Total Leq All Segments: 63.34 dBA

Results segment # 1: Ira Ndls NB (night)

Source height = 1.19 m

ROAD (0.00 + 54.01 + 0.00) = 54.01 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-60	90	0.13	60.77	0.00	-5.70	-1.05	0.00	0.00	0.00	54.01

Segment Leq : 54.01 dBA

Results segment # 2: Ira Ndls SB (night)

Source height = 1.19 m

ROAD (0.00 + 53.25 + 0.00) = 53.25 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-60	90	0.13	60.77	0.00	-6.46	-1.05	0.00	0.00	0.00	53.25

Segment Leq : 53.25 dBA

Results segment # 3: Erb St (night)

Source height = 1.19 m

ROAD (0.00 + 42.95 + 0.00) = 42.95 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.13	61.52	0.00	-15.19	-3.37	0.00	0.00	0.00	42.95

Segment Leq : 42.95 dBA

Total Leq All Segments: 56.84 dBA

TOTAL Leq FROM ALL SOURCES (DAY) : 63.34
 (NIGHT) : 56.84

APPENDIX D

STATIONARY NOISE CALCULATION DETAILS

hill Drive, Waterloo

	Level Lr			Limit. Value			Land Use			Height		Coordinates		
	Day	Eve	Night	Day	Eve	Night	Type	Auto	Noise Type	(m)		X	Y	Z
	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)						(m)	(m)	(m)
B	43.1	43.1	40.1	0.0	0.0	0.0	x	Total	1.50	g	h	17534986.59	4810308.87	413.95
A	38.1	38.1	35.1	0.0	0.0	0.0	x	Total	1.50	g	h	17535017.27	4810268.01	406.54

St. M.	ID	Result. PwL			Type	Lw / Li			Correction			Sound Reduction		Attenuation	Operating Time			K0	Freq.	Direct.	Height	Coordinates			
		Day	Evening	Night		Value	norm.	Day	Evening	Night	R	Area (m²)	Day		Special	Night									
		(dBA)	(dBA)	(dBA)				(dB(A))	(dB(A))	(dB(A))			(min)		(min)	(min)	(dB)					(Hz)			
~	CT AI	83.1	83.1	83.1	Lw	CT_R_01_BACK			-4.0	-4.0	-4.0				60.00	60.00	30.00	0.0	(none)	5.60	g	h	17534938.62	4810383.24	405.60
~	CT Top	86.4	86.4	86.4	Lw	CT_R_01_TOP			-6.0	-6.0	-6.0				60.00	60.00	30.00	0.0	(none)	0.05	g	h	17534937.25	4810382.33	405.65
~	CT Back	88.6	88.6	88.6	Lw	CT_R_01_AI			-1.0	-1.0	-1.0				60.00	60.00	30.00	0.0	(none)	2.80	g	h	17534935.92	4810381.29	402.80
~	CT End	80.3	80.3	80.3	Lw	CT_R_01_END			-6.0	-6.0	-6.0				60.00	60.00	30.00	0.0	(none)	2.80	g	h	17534939.03	4810380.12	402.80
~	CT_C_End	87.2	87.2	87.2	Lw	CT_R_01_C_END			-3.0	-3.0	-3.0				60.00	60.00	30.00	0.0	(none)	2.80	g	h	17534935.78	4810384.21	402.80
	RET_CND	93.7	93.7	93.7	Lw	CND12			0.0	0.0	0.0				60.00	60.00	30.00	0.0	(none)	1.50	g	h	17534896.64	4810311.51	405.50
	RET_AHU1	85.4	85.4	85.4	Lw	AHU_Casing++AHU_OA++AHU_EA			0.0	0.0	0.0				60.00	60.00	30.00	0.0	(none)	1.50	g	h	17534878.02	4810311.88	405.50
	RET_AHU2	85.4	85.4	85.4	Lw	AHU_Casing++AHU_OA++AHU_EA			0.0	0.0	0.0				60.00	60.00	30.00	0.0	(none)	1.50	g	h	17534866.94	4810320.63	405.50
	RET_AHU3	85.4	85.4	85.4	Lw	AHU_Casing++AHU_OA++AHU_EA			0.0	0.0	0.0				60.00	60.00	30.00	0.0	(none)	1.50	g	h	17534852.49	4810333.35	405.50
	RET_AHU4	85.4	85.4	85.4	Lw	AHU_Casing++AHU_OA++AHU_EA			0.0	0.0	0.0				60.00	60.00	30.00	0.0	(none)	1.50	g	h	17534829.19	4810355.75	405.50
	RET_AHU5	85.4	85.4	85.4	Lw	AHU_Casing++AHU_OA++AHU_EA			0.0	0.0	0.0				60.00	60.00	30.00	0.0	(none)	1.50	g	h	17534818.85	4810364.94	405.50
~	MUA	72.0	72.0	72.0	Lw	MUA_In			0.0	0.0	0.0				60.00	60.00	60.00	0.0	(none)	1.30	g	h	17534935.64	4810390.91	401.30

ID	Type	1/3 Oktave Spectrum (dB)												Source	
		Weight	31.5	63	125	250	500	1000	2000	4000	8000	A	lin		
CT_R_01_AI	Lw (c)		31.6	103.6	95.6	91.6	86.6	82.6	78.6	76.6	70.6	89.6	104.6	Shop Drawing of the Cooling Tower, Air Inlet	
CT_R_01_TOP	Lw (c)		31.6	96.6	95.6	93.6	88.6	86.6	82.6	81.6	80.6	92.4	100.9	Shop Drawing of the Cooling Tower, Top	
CT_R_01_BACK	Lw (c)		31.6	98.6	91.6	90.6	83.6	81.6	73.6	68.6	63.6	87.1	100.1	Shop Drawing of the Cooling Tower, Back	
CT_R_01_END	Lw (c)		31.6	99.6	93.6	89.6	83.6	78.6	72.6	67.6	62.6	86.3	101.1	Shop Drawing of the Cooling Tower, End	
CT_R_01_C_END	Lw (c)		31.6	100.6	93.6	90.6	84.6	87.6	75.6	72.6	68.6	90.2	102.0	Shop Drawing of the Cooling Tower, Connection End	
CND12	Lw		-6.8	101.2	102.2	96.2	91.2	87.2	80.2	75.2	71.2	93.7	105.6	Manufacturer's Data	
AHU_Casing	Lw			85.7	80.0	83.7	77.1	63.9	58.1	51.4	44.6	78.0	88.8	EngA LM21/C/HRW2700 from 1190001.100	
AHU_EA	Lw			92.4	84.0	79.9	76.8	75.9	69.9	64.0	81.8	93.5		EngA LM21/C/HRW2700 from 1190001.100	
AHU_OA	Lw			75.5	76.7	83.5	82.1	70.6	67.4	62.2	56.9	81.2	86.9	EngA LM21/C/HRW2700 from 1190001.100	
MUA_In	Lw			70.7	78.7	68.4	63.1	68.0	64.7	59.7	58.6	72.0	80.2	EngA FWE63/DJX40 (1190275)	

Configuration	Value
	0.00
	2000.00
	0.00
	0.50
	1000.00
	1.00
	0.00
	On
	On
	0.00
	6.00
	10.00
	0.00
	Triangulation
	2
	100.00
	100.00
	1000.00 1000.00
	1.00 1.00
or	0.10
	some Obj
ield	On
	Excl. Ground Alt. over Barrier
	Dz with limit (20/25)
	3.0 20.0 0.0
	10

Configuration	
	Value
	70
	1.00
	3.0
all-Transrapid	

Receiver

Name: OPOR_B

ID: OPOR_B

X: 17534986.59 m

Y: 4810308.87 m

Z: 413.95 m

Point Source, ISO 9613, Name: "Cooling Tower - Back", ID: "CT_Back"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
1	17534935.92	4810381.29	402.80	0	D	A	88.6	0.0	0.0	0.0	0.0	50.0	0.4	-2.8	0.0	0.0	6.8	0.0	0.0	34.1
1	17534935.92	4810381.29	402.80	0	N	A	88.6	0.0	-3.0	0.0	0.0	50.0	0.4	-2.8	0.0	0.0	6.8	0.0	0.0	31.1
1	17534935.92	4810381.29	402.80	0	E	A	88.6	0.0	0.0	0.0	0.0	50.0	0.4	-2.8	0.0	0.0	6.8	0.0	0.0	34.1
3	17534935.92	4810381.29	402.80	1	D	A	88.6	0.0	0.0	0.0	0.0	51.5	0.5	-2.8	0.0	0.0	8.5	0.0	2.0	28.9
3	17534935.92	4810381.29	402.80	1	N	A	88.6	0.0	-3.0	0.0	0.0	51.5	0.5	-2.8	0.0	0.0	8.5	0.0	2.0	25.9
3	17534935.92	4810381.29	402.80	1	E	A	88.6	0.0	0.0	0.0	0.0	51.5	0.5	-2.8	0.0	0.0	8.5	0.0	2.0	28.9

Point Source, ISO 9613, Name: "Cooling Tower - Connection End", ID: "CT_C_End"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
5	17534935.78	4810384.21	402.80	0	D	A	87.2	0.0	0.0	0.0	0.0	50.2	0.3	-2.8	0.0	0.0	18.9	0.0	0.0	20.5
5	17534935.78	4810384.21	402.80	0	N	A	87.2	0.0	-3.0	0.0	0.0	50.2	0.3	-2.8	0.0	0.0	18.9	0.0	0.0	17.5
5	17534935.78	4810384.21	402.80	0	E	A	87.2	0.0	0.0	0.0	0.0	50.2	0.3	-2.8	0.0	0.0	18.9	0.0	0.0	20.5
7	17534935.78	4810384.21	402.80	1	D	A	87.2	0.0	0.0	0.0	0.0	51.7	0.4	-2.8	0.0	0.0	22.0	0.0	2.0	13.9
7	17534935.78	4810384.21	402.80	1	N	A	87.2	0.0	-3.0	0.0	0.0	51.7	0.4	-2.8	0.0	0.0	22.0	0.0	2.0	10.9
7	17534935.78	4810384.21	402.80	1	E	A	87.2	0.0	0.0	0.0	0.0	51.7	0.4	-2.8	0.0	0.0	22.0	0.0	2.0	13.9

Point Source, ISO 9613, Name: "Cooling Tower - Top", ID: "CT_Top"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
9	17534937.25	4810382.33	405.65	0	D	A	86.4	0.0	0.0	0.0	0.0	50.0	0.7	-2.8	0.0	0.0	5.8	0.0	0.0	32.7
9	17534937.25	4810382.33	405.65	0	N	A	86.4	0.0	-3.0	0.0	0.0	50.0	0.7	-2.8	0.0	0.0	5.8	0.0	0.0	29.7
9	17534937.25	4810382.33	405.65	0	E	A	86.4	0.0	0.0	0.0	0.0	50.0	0.7	-2.8	0.0	0.0	5.8	0.0	0.0	32.7
10	17534937.25	4810382.33	405.65	1	D	A	86.4	0.0	0.0	0.0	0.0	51.5	0.8	-2.8	0.0	0.0	7.2	0.0	2.0	27.7
10	17534937.25	4810382.33	405.65	1	N	A	86.4	0.0	-3.0	0.0	0.0	51.5	0.8	-2.8	0.0	0.0	7.2	0.0	2.0	24.7
10	17534937.25	4810382.33	405.65	1	E	A	86.4	0.0	0.0	0.0	0.0	51.5	0.8	-2.8	0.0	0.0	7.2	0.0	2.0	27.7

Point Source, ISO 9613, Name: "Cooling Tower - Air Inlet Side", ID: "CT_AI"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
12	17534938.62	4810383.24	405.60	0	D	A	83.1	0.0	0.0	0.0	0.0	50.0	0.3	-2.8	0.0	0.0	5.3	0.0	0.0	30.3
12	17534938.62	4810383.24	405.60	0	N	A	83.1	0.0	-3.0	0.0	0.0	50.0	0.3	-2.8	0.0	0.0	5.3	0.0	0.0	27.3
12	17534938.62	4810383.24	405.60	0	E	A	83.1	0.0	0.0	0.0	0.0	50.0	0.3	-2.8	0.0	0.0	5.3	0.0	0.0	30.3
13	17534938.62	4810383.24	405.60	1	D	A	83.1	0.0	0.0	0.0	0.0	51.5	0.3	-2.8	0.0	0.0	6.7	0.0	2.0	25.4
13	17534938.62	4810383.24	405.60	1	N	A	83.1	0.0	-3.0	0.0	0.0	51.5	0.3	-2.8	0.0	0.0	6.7	0.0	2.0	22.4
13	17534938.62	4810383.24	405.60	1	E	A	83.1	0.0	0.0	0.0	0.0	51.5	0.3	-2.8	0.0	0.0	6.7	0.0	2.0	25.4

Point Source, ISO 9613, Name: "Cooling Tower - End", ID: "CT_End"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
15	17534939.03	4810380.12	402.80	0	D	A	80.3	0.0	0.0	0.0	0.0	49.7	0.2	-2.8	0.0	0.0	6.7	0.0	0.0	26.4
15	17534939.03	4810380.12	402.80	0	N	A	80.3	0.0	-3.0	0.0	0.0	49.7	0.2	-2.8	0.0	0.0	6.7	0.0	0.0	23.4
15	17534939.03	4810380.12	402.80	0	E	A	80.3	0.0	0.0	0.0	0.0	49.7	0.2	-2.8	0.0	0.0	6.7	0.0	0.0	26.4
16	17534939.03	4810380.12	402.80	1	D	A	80.3	0.0	0.0	0.0	0.0	51.3	0.3	-2.8	0.0	0.0	8.4	0.0	2.0	21.2
16	17534939.03	4810380.12	402.80	1	N	A	80.3	0.0	-3.0	0.0	0.0	51.3	0.3	-2.8	0.0	0.0	8.4	0.0	2.0	18.1
16	17534939.03	4810380.12	402.80	1	E	A	80.3	0.0	0.0	0.0	0.0	51.3	0.3	-2.8	0.0	0.0	8.4	0.0	2.0	21.2

Point Source, ISO 9613, Name: "Make-up Air Unit", ID: "MUA"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)	dB(A)
17	17534935.64	4810390.91	401.30	0	D	A	72.0	0.0	0.0	0.0	0.0	50.8	0.7	-2.8	0.0	0.0	8.3	0.0	0.0	14.9
17	17534935.64	4810390.91	401.30	0	N	A	72.0	0.0	0.0	0.0	0.0	50.8	0.7	-2.8	0.0	0.0	8.3	0.0	0.0	14.9
17	17534935.64	4810390.91	401.30	0	E	A	72.0	0.0	0.0	0.0	0.0	50.8	0.7	-2.8	0.0	0.0	8.3	0.0	0.0	14.9

Point Source, ISO 9613, Name: "Make-up Air Unit", ID: "MUA"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
18	17534935.64	4810390.91	401.30	1	D	A	72.0	0.0	0.0	0.0	0.0	52.2	0.8	-2.8	0.0	0.0	10.1	0.0	2.0	9.7
18	17534935.64	4810390.91	401.30	1	N	A	72.0	0.0	0.0	0.0	0.0	52.2	0.8	-2.8	0.0	0.0	10.1	0.0	2.0	9.7
18	17534935.64	4810390.91	401.30	1	E	A	72.0	0.0	0.0	0.0	0.0	52.2	0.8	-2.8	0.0	0.0	10.1	0.0	2.0	9.7

Receiver

Name: OPOR_B

ID: OPOR_B

X: 17534986.59 m

Y: 4810308.87 m

Z: 413.95 m

Point Source, ISO 9613, Name: "12 Fan Condenser", ID: "RET_CND"

Nr.	X (m)	Y (m)	Z (m)	Refl.	DEN	Freq. (Hz)	Lw dB(A)	l/a dB	Optime dB	K0 (dB)	Di (dB)	Adiv (dB)	Aatm (dB)	Agr (dB)	Afol (dB)	Ahous (dB)	Abar (dB)	Cmet (dB)	RL (dB)	Lr dB(A)
2	17534896.64	4810311.51	405.50	0	D	A	93.7	0.0	0.0	0.0	0.0	50.1	0.3	-1.7	0.0	0.0	4.8	0.0	0.0	40.3
2	17534896.64	4810311.51	405.50	0	N	A	93.7	0.0	-3.0	0.0	0.0	50.1	0.3	-1.7	0.0	0.0	4.8	0.0	0.0	37.3
2	17534896.64	4810311.51	405.50	0	E	A	93.7	0.0	0.0	0.0	0.0	50.1	0.3	-1.7	0.0	0.0	4.8	0.0	0.0	40.3

Point Source, ISO 9613, Name: "Air Handling Unit", ID: "RET_AHU1"

Nr.	X (m)	Y (m)	Z (m)	Refl.	DEN	Freq. (Hz)	Lw dB(A)	l/a dB	Optime dB	K0 (dB)	Di (dB)	Adiv (dB)	Aatm (dB)	Agr (dB)	Afol (dB)	Ahous (dB)	Abar (dB)	Cmet (dB)	RL (dB)	Lr dB(A)
4	17534878.02	4810311.88	405.50	0	D	A	85.4	0.0	0.0	0.0	0.0	51.7	0.5	-1.9	0.0	0.0	0.0	0.0	0.0	35.1
4	17534878.02	4810311.88	405.50	0	N	A	85.4	0.0	-3.0	0.0	0.0	51.7	0.5	-1.9	0.0	0.0	0.0	0.0	0.0	32.1
4	17534878.02	4810311.88	405.50	0	E	A	85.4	0.0	0.0	0.0	0.0	51.7	0.5	-1.9	0.0	0.0	0.0	0.0	0.0	35.1

Point Source, ISO 9613, Name: "Air Handling Unit", ID: "RET_AHU2"

Nr.	X (m)	Y (m)	Z (m)	Refl.	DEN	Freq. (Hz)	Lw dB(A)	l/a dB	Optime dB	K0 (dB)	Di (dB)	Adiv (dB)	Aatm (dB)	Agr (dB)	Afol (dB)	Ahous (dB)	Abar (dB)	Cmet (dB)	RL (dB)	Lr dB(A)
6	17534866.94	4810320.63	405.50	0	D	A	85.4	0.0	0.0	0.0	0.0	52.6	0.5	-2.0	0.0	0.0	0.0	0.0	0.0	34.2
6	17534866.94	4810320.63	405.50	0	N	A	85.4	0.0	-3.0	0.0	0.0	52.6	0.5	-2.0	0.0	0.0	0.0	0.0	0.0	31.2
6	17534866.94	4810320.63	405.50	0	E	A	85.4	0.0	0.0	0.0	0.0	52.6	0.5	-2.0	0.0	0.0	0.0	0.0	0.0	34.2

Point Source, ISO 9613, Name: "Air Handling Unit", ID: "RET_AHU3"

Nr.	X (m)	Y (m)	Z (m)	Refl.	DEN	Freq. (Hz)	Lw dB(A)	l/a dB	Optime dB	K0 (dB)	Di (dB)	Adiv (dB)	Aatm (dB)	Agr (dB)	Afol (dB)	Ahous (dB)	Abar (dB)	Cmet (dB)	RL (dB)	Lr dB(A)
8	17534852.49	4810333.35	405.50	0	D	A	85.4	0.0	0.0	0.0	0.0	53.7	0.6	-2.3	0.0	0.0	0.0	0.0	0.0	33.4
8	17534852.49	4810333.35	405.50	0	N	A	85.4	0.0	-3.0	0.0	0.0	53.7	0.6	-2.3	0.0	0.0	0.0	0.0	0.0	30.4
8	17534852.49	4810333.35	405.50	0	E	A	85.4	0.0	0.0	0.0	0.0	53.7	0.6	-2.3	0.0	0.0	0.0	0.0	0.0	33.4

Point Source, ISO 9613, Name: "Air Handling Unit", ID: "RET_AHU4"

Nr.	X (m)	Y (m)	Z (m)	Refl.	DEN	Freq. (Hz)	Lw dB(A)	l/a dB	Optime dB	K0 (dB)	Di (dB)	Adiv (dB)	Aatm (dB)	Agr (dB)	Afol (dB)	Ahous (dB)	Abar (dB)	Cmet (dB)	RL (dB)	Lr dB(A)
10	17534829.19	4810355.75	405.50	0	D	A	85.4	0.0	0.0	0.0	0.0	55.3	0.7	-2.4	0.0	0.0	4.8	0.0	0.0	27.0
10	17534829.19	4810355.75	405.50	0	N	A	85.4	0.0	-3.0	0.0	0.0	55.3	0.7	-2.4	0.0	0.0	4.8	0.0	0.0	24.0
10	17534829.19	4810355.75	405.50	0	E	A	85.4	0.0	0.0	0.0	0.0	55.3	0.7	-2.4	0.0	0.0	4.8	0.0	0.0	27.0

Point Source, ISO 9613, Name: "Air Handling Unit", ID: "RET_AHU5"

Nr.	X (m)	Y (m)	Z (m)	Refl.	DEN	Freq. (Hz)	Lw dB(A)	l/a dB	Optime dB	K0 (dB)	Di (dB)	Adiv (dB)	Aatm (dB)	Agr (dB)	Afol (dB)	Ahous (dB)	Abar (dB)	Cmet (dB)	RL (dB)	Lr dB(A)
12	17534818.85	4810364.94	405.50	0	D	A	85.4	0.0	0.0	0.0	0.0	56.0	0.7	-2.5	0.0	0.0	0.0	0.0	0.0	31.3
12	17534818.85	4810364.94	405.50	0	N	A	85.4	0.0	-3.0	0.0	0.0	56.0	0.7	-2.5	0.0	0.0	0.0	0.0	0.0	28.2
12	17534818.85	4810364.94	405.50	0	E	A	85.4	0.0	0.0	0.0	0.0	56.0	0.7	-2.5	0.0	0.0	0.0	0.0	0.0	31.3



Sound Rating

Closed Circuit Product

Page: 4 of 21
Date: 6/7/2023

Project Name: 28 West Hill Drive
Project City: Kitchener
Project Country: Canada

Model Information

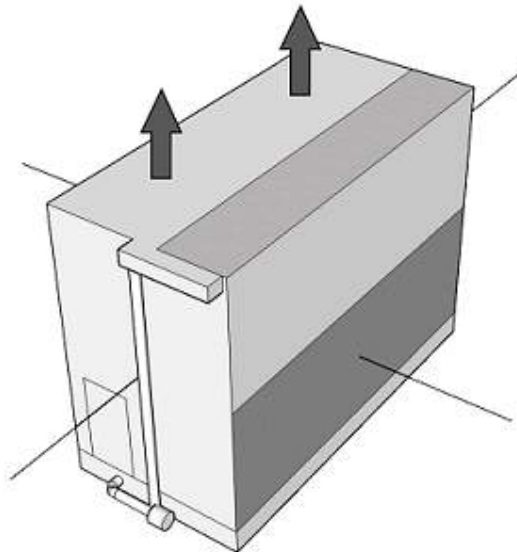
Product line: FXV Closed Circuit Cooler Tower
Model: FXV-0809B-24D-J/WQ
Number of Units: 1
Total Pump Motor Power: (1) 5.00 = 5.00 HP/Unit
Total Standard Fan Power: 90.58%, 5.56 HP/Unit
Fan type: Whisper Quiet Fan
Fan Motor: (1) 7.50 = 7.50 HP/Unit

Intake option: None
Internal Option:
Discharge option: None
Coil Finning: No Coil fins
Wet Coil Type: Hot Dip Galvanised

Octave band and A-weighted sound pressure levels (Lp) are expressed in decibels (dB) reference 0.0002 microbar. Sound power levels (Lw) are expressed in decibels (dB) reference one picowatt. Octave band 1 has a center frequency of 63 Hertz.

Back Sound Pressure (dB)		
Octave Band	Distance	
	5 ft.	50 ft.
1	71	67
2	71	60
3	66	59
4	59	52
5	56	50
6	45	42
7	40	37
8	36	32
A-wgtd	62	55

Connection End Sound Pressure (dB)		
Octave Band	Distance	
	5 ft.	50 ft.
1	75	69
2	71	62
3	67	59
4	63	53
5	68	56
6	57	44
7	53	41
8	47	35
A-wgtd	70	58



Top Sound Pressure (dB)		
Octave Band	Distance	
	5 ft.	50 ft.
1	78	65
2	76	64
3	74	62
4	70	57
5	67	55
6	64	51
7	61	50
8	59	49
A-wgtd	73	61

End Sound Pressure (dB)		
Octave Band	Distance	
	5 ft.	50 ft.
1	75	68
2	71	62
3	66	58
4	59	52
5	57	47
6	47	41
7	44	36
8	41	31
A-wgtd	63	54

Air Inlet Sound Pressure (dB)		
Octave Band	Distance	
	5 ft.	50 ft.
1	78	72
2	76	64
3	74	60
4	68	55
5	65	51
6	61	47
7	60	45
8	55	39
A-wgtd	71	58

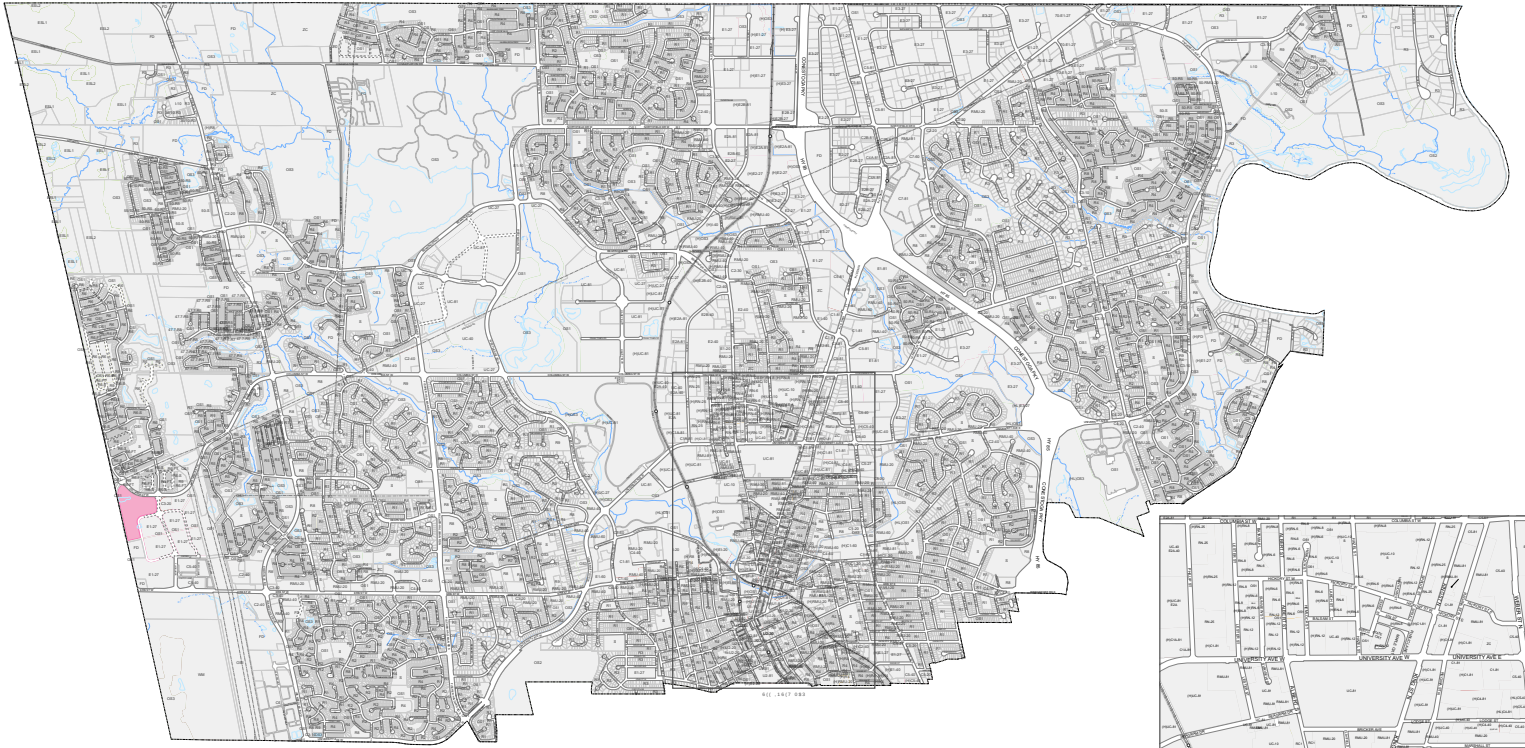
Sound Power (dB)		
Octave Band	Center Frequency (Hertz)	Lw
1	63	100
2	125	97
3	250	94
4	500	90
5	1000	87
6	2000	83
7	4000	82
8	8000	81
A-wgtd		93

Notes

- The use of frequency inverters (variable frequency drives) can increase sound levels.
- The values presented in this document are estimates only and are subject to change by BAC.
- Sound rating is for a single unit.
- Sound data provided by 'ATC 128 (2019)' sound test code.
- Sound data is free field data valid for unit installation without elevation, not taking into account any reflections. Octave band values are shown for indicative purposes only. Values are obtained according to CTI ATC-128 (Test Code for Measurement of Sound From Water-Cooling Towers) for small towers.

APPENDIX E

ZONING MAP



THE CITY OF
Waterloo

=RQLQJ %\ /DZ
=RQLQJ 0DS
6FKHGXOH

m

May © 2022, City of Waterloo
For current zoning please visit:
<http://open.waterloo.ca>
"Zoning" or "Planning"

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THIS IS NOT A PLAN OF SURVEY

0 250 500 750 1000 metres

7HJHQG

- ION Rapid Transit Stations
- Hydro Transmission Lines
- ION LRT
- Railway
- Perennial Creeks
- Intermittent Creeks
- Rivers
- Water Bodies
- City Boundary
- Property Fabric
- = RQH & ODVVLILFDV
- Academic
- Institutional
- Educational Institution
- School
- Residential
- Residential Mixed-Use
- Residential Northdale
- Open Space
- Environmentally Sensitive Landscape
- Commercial
- Uptown
- Employment
- Waste Management
- Future Determination
- Zone Change

0DS 1RWHV

A2B1A / S33520' 21' EWSWHPENU

SURMPTWRO, BTD-RQH
OWSP, ISUM SPULVOD, OWSP
0DS AHDWNG W, "A" 0SR 2000QJ ASSORTY
0DS AHDWNG 2D, AHDWHPENU

APPENDIX F

CONSULTANT STATUTORY DECLARATION

APPENDIX E: 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 Residential
	)	Development
	)	36 Westhill Drive, Waterloo
	)	in the Regional Municipality
	)	of Waterloo

I, Brett Lipson, of the City of Richmond Hill, in the Regional Municipality of York,
SOLEMNLY DECLARE THAT:

1. I am a Professional Engineer employed by Valcoustics Canada Ltd. 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 Residential Development at 36 Westhill Drive, Waterloo in the Regional Municipality of Waterloo.
3. I had 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 Environmental Noise Feasibility Study, 36 Westhill Drive, Proposed Residential Development, Waterloo, Ontario, dated August 22, 2025, is the most current information available as of the date of the study, as provided.
5. The noise level calculations, the interpretation of noise attenuation requirements, and the recommended measures are in accordance with Ministry of Environment and Energy Guidelines, Region of Waterloo policies, and any applicable policy or guidelines of the Area Municipality, and any other applicable policy or guideline.
6. The physical noise attenuation measures proposed in this study are feasible to implement and can 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 Richmond Hill, in the Regional
Municipality of York
this 22 day of August 2025

)
)
)
)


Brett Lipson

