JPE Engineering
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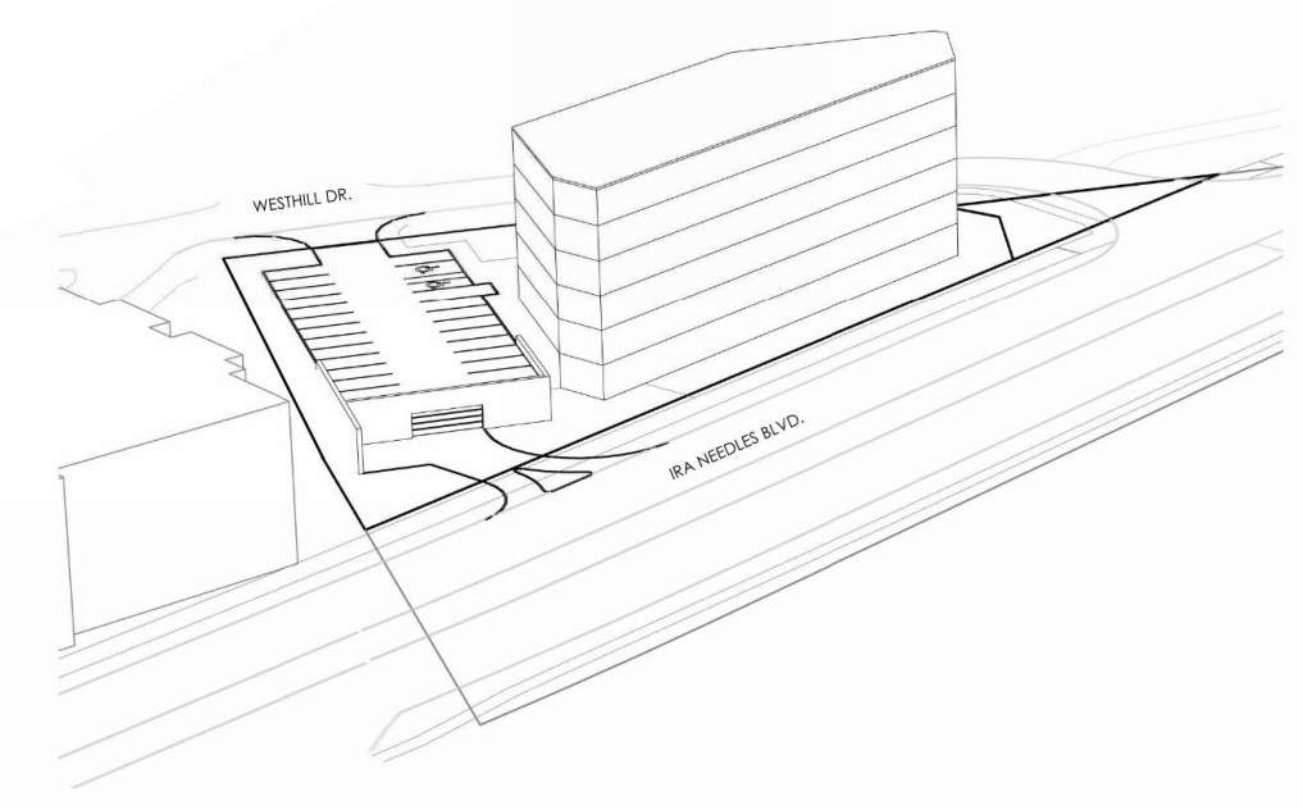
Environmental Noise Study

41 WESTHILL DRIVE
Waterloo, Ontario



Prepared for:

Region of Waterloo

March 17, 2025

JPE-1070

Owner/Authorized Agent Statement

I am the Owner, and I understand and agree with the noise attenuation measures proposed in the study entitled:

ENVIRONMENTAL NOISE STUDY
41 WESTHILL DRIVE
WATERLOO, ONTARIO

Dated: March 17, 2025.

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

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

Name: Ashley Graham

Signature: Ashley Graham

Date: March 27, 2025

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)
of Waterloo, in the Regional)
Municipality of Waterloo) _____
)

this 1 day of April, 2025)

Martin Asling, a Commissioner, etc.,
Province of Ontario, for
the Corporation of the City of Waterloo.
Expires July 29, 2025

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1 Introduction

JPE Engineering (JPE) was retained to undertake an environmental noise study to examine the potential impacts of environmental noise on, and resulting from, a proposed residential development at 41 Westhill Drive, Waterloo, Ontario (henceforth the "Site").

Assuming Ira Needles Blvd. runs north-south, the Site is bounded by Ira Needles Blvd. to the west and Westhill Drive to the east and south. A mix of residential and commercial (retail) uses surround the Site. Refer to **Plate 1**.



PLATE 1: Site Location
(source: Region of Waterloo GIS)

The Site is currently vacant. It is proposed to construct one six (6)-storey residential building. The Site will include auxiliary driveways, parking areas and landscape spaces. For more information, refer to **Appendix A** for the site and architectural plans.

This report documents the environmental noise analysis and findings related to the feasibility of the development from an environmental noise perspective and recommends mitigation measures as required.

2 Noise Sources and Criteria

The Region of Waterloo has established environmental noise guidelines to govern development with sensitive noise receivers. The Region's guidelines generally mirror the Ministry of Environment, Conservation and Parks (MECP, formerly MOE and MOECC) NPC-300 guidelines entitled "Stationary and Transportation Sources – Approval and Planning" (August 2013). The Region and MECP guidelines were utilized to guide this environmental noise study.

On review of potential environmental noise sources within the subject development's environs, the following sources were identified:

- **Road traffic**: Ira Needles Blvd. and Erb Street West are in proximity to the Site and may impact the proposed sensitive receivers. Other nearby roads have small volumes or are distant and are thus assumed to not have significant impact on the Site.
- **Rail and Airports**: The proposed development is outside the zone of influence of railways and airports and therefore these noise sources are deemed not to be an issue and will not be considered further in this study.
- **On-Site Stationary noise**: The proposed development will contain HVAC equipment to service the proposed building. This type of equipment produces noise and therefore needs consideration.
- **Off-Site Stationary noise**: The Site's environs have residential and commercial uses. On review of aerial imagery, some rooftop HVAC systems were observed on the residential building to the north, and the commercial building to the northwest. In addition, loading docks exist on the southern side of the commercial site. These noise sources will be reviewed as to their stationary noise impact on the proposed Site.

2.1 Transportation Noise Criteria

For transportation noise, Sections C6 and C7 of NPC-300 are used to determine the noise criteria for the development. The road and rail traffic criteria are shown in **Table 1**, and the mitigation and warning clause requirements are tabulated in **Table 2**.

Table 1 – Transportation Indoor Noise Level Criteria

INDOOR SPACE	TIME PERIOD	CRITERIA (dBA)	
		Road	Rail
Living/dining, den areas of residences, hospitals, nursing homes, schools, daycare centres, etc.	07:00 – 23:00	45	40
Living/dining, den areas of residences, hospitals, nursing homes, etc. (except schools or daycare centres)	23:00 – 07:00	45	40
Sleeping quarters	07:00 – 23:00	45	40
	23:00 – 07:00	40	35

Table 2 – MECP Road & Rail Traffic Noise Mitigation and Warning Clause Requirements

LOCATION	NOISE LEVELS (dBA)	REQUIREMENT
Outdoor Living Areas **(Daytime 0700 to 2300)**	Less than 55	i) No control required
	55-60	i) Physical control required -or- ii) Type A warning clause required
	Greater than 60	i) Physical control required -and- ii) Type B warning clause required
Outside Window **(Daytime 0700 to 2300)** Per NPC300-C.7.1.2.1	Less than 55	i) No control required
	55 to 65	i) Forced air heating or air conditioning required -and- ii) Type C warning clause required
	Greater than 65	i) Central air conditioning required -and- ii) Type D warning clause required -and- iii) Special building components required
Outside Window **(Nighttime 2300 to 0700)** Per NPC300-C.7.1.2.2	Less than 50	i) No control required
	50 to 60	i) Forced air heating or air conditioning required -and- ii) Type C warning clause required
	Greater than 60	i) Central air conditioning required -and- ii) Type D warning clause required -and- iii) Special building components required

Notes:

1. *Assessment of indoor noise levels required if the criteria in Table 2 requires special building components.*
2. *Residence area Dens, Hospitals, Nursing Homes, Schools, Daycares are included. During the nighttime period, Schools and Daycares are excluded if they have no nighttime sensitive uses.*
3. *Road and Rail noise impacts are combined for assessment of OLA impacts and ventilation requirements.*
4. *Train whistle noise is excluded for OLA noise assessment, and included for Living / Dining Room and Sleeping Quarter assessment.*
5. *The warning clauses cited refer to MECP warning clauses. If the municipality has augmented clause, these shall be utilized.*
6. *If noise levels (Leq, 24 hours) are greater than 60 dBA at a receiver during nighttime hours, or if the receiver is located within 100 meters of a track, then exterior walls are to be brick veneer or a masonry equivalent.*

2.2 Stationary Noise Criteria

Part C4 of MECP's NPC-300 guideline applies to Land Use Planning and stationary noise. The guideline specifies exclusionary noise limits below which the noise is considered acceptable for a sensitive use.

The sound level limit criteria for a point of reception (expressed as the one-hour Equivalent Sound Level) is the greater of the exclusionary limit or the quietest one-hour sound level (i.e., ambient noise) in each time period. **Table 3** summarizes the exclusionary limits.

Table 3 – Stationary Noise Level Exclusionary Limits (dBA)

LOCATION	TIME PERIOD	CLASS 1	CLASS 2	CLASS 3	CLASS 4
Outdoor Living Area	0700 – 1900	**50**	50	45	55
	1900 – 2300	**50**	45	40	55
Plane of Window	0700 – 1900	**50**	50	45	60
	1900 – 2300	**50**	50	40	60
	2300 – 0700	**45**	45	40	55

Notes:

1. *The Noise criteria for emergency generators that operate during non-emergency times (e.g., for testing and maintenance) is 5 dBA greater than listed.*
2. *Noise from emergency equipment is to be assessed independent of other stationary noise sources.*

With respect to stationary noise, a sensitive noise receptor can be located in one of four area classifications described as follows (refer to Section A5 of NPC 300):

a) **"Class 1 area"**: An area with an acoustical environment typical of a major population centre, where the background sound level is dominated by the activities of people, usually road traffic, often referred to as "urban hum."

b) **"Class 2 area"**: An area with an acoustical environment that has qualities representative of both Class 1 and Class 3 areas:

- Sound levels characteristic of Class 1 during daytime (07:00 to 19:00 or to 23:00 hours); and
- Low evening and night background sound level defined by natural environment and infrequent human activity starting as early as 19:00 hours (19:00 or 23:00 to 07:00 hours).

c) **"Class 3 area"**: A rural area with an acoustical environment that is dominated by natural sounds having little or no road traffic, such as:

- A small community;
- Agricultural area;
- A rural recreational area such as a cottage or a resort area; or
- A wilderness area.

d) **"Class 4 area"**: An area or specific site that would otherwise be defined as Class 1 or 2 and which:

- Is an area intended for development with new noise sensitive land use(s) that are not yet built;
- Is in proximity to existing, lawfully established stationary source(s); and
- Has formal confirmation from the land use planning authority with the Class 4 area classification which is determined during the land use planning process.

On review of the subject development's environs, it is assumed that "**Class 1**" is appropriate given it is located within an established urban area of the City of Waterloo, and is close in proximity to a significant arterial roads (i.e., Ira Needles Blvd. and Erb Street West).

Finally, while the ambient noise level may very well exceed the exclusionary limit (especially given the proximity to Ira Needles Blvd.), for ease and conservativeness, the exclusionary limit will be assumed to govern, unless otherwise noted.

3 Noise Sources

3.1 Transportation (Road)

Road traffic data for the significant roadways in proximity to the subject development were obtained from the Region of Waterloo. The road traffic data is summarized in **Table 4,** and the "raw data" is included in **Appendix B**.

Table 4 – Traffic Data for Municipal Roads

DESCRIPTION	Ira Needles Blvd.	Erb Street West
AADT (2035)	23,700	26,900
% Medium Trucks of total	1.0%	2.0%
% Heavy Trucks of total	2.0%	1.0%
Speed Limit	60 kph	60 kph
% Day/Night Split	90 / 10	90 / 10
Road gradient	1.2%	2.0%

3.2 Stationary

3.2.1 OnSite Sources

With new development, it is important to consider any new onsite noise sources which may cause impact to either onsite or existing offsite sensitive noise receivers.

On review of the proposed development the only significant noise generating source may be HVAC equipment needed to heat and cool the building. At the time of writing, the building design is in early stages and specific HVAC systems have not been selected. However, it is assumed three pieces of HVAC equipment will be located centrally on the rooftops. The assumed sound power levels of this equipment is noted in **Table 5**.

Table 5 – Onsite Stationary Noise Sources

DESCRIPTION	LOCATION	SOUND POWER LEVEL (dBA)	TIME ACTIVE
HVAC equipment	On proposed rooftop	80	Daytime: 100% Nighttime: 50%

3.2.2 OffSite Sources

On review of the Site's environs a number of noise sources were identified:

- 663 Erb Street West: Shopping Mall with rooftop HVAC and loading docks; and,
- 25 Westhill Drive: Residential apartment building with rooftop HVAC.

The noise source sound power levels are noted in **Table 6** and their locations shown on **Drawings N2 through N7** in **Appendix C**.

Table 6 – Offsite Stationary Noise Sources

DESCRIPTION	SOUND POWER LEVEL (dBA)	TIME ACTIVE
HVAC equipment	80	Daytime: 100% Nighttime: 50%
Idling transport truck	90	25% (15min/hr)

4 Sensitive Noise Receiver Locations

To facilitate analysis and description, sensitive noise Receiver locations were established at worst-case locations. These worst-case locations are assumed to represent the entire sensitive noise receiver area – for example, a receiver located in the "worst-case" corner of an Amenity Area is deemed to represent the entire Amenity Area (unless a separate Receiver is identified).

For the analysis of indoor noise, Receivers are assumed to be located flush with the outside of living room and bedroom windows.

In all cases, Receiver locations are assumed to be located 1.5m above ground or floor elevation to represent ear level.

4.1 Transportation

One indoor noise Receiver location (i.e., Receivers 'A') was determined to be worst-case receiver location on the Site. This receiver is closest and most exposed to both Ira Needles Blvd. (the primary noise source) and Erb Street West. All other locations would be more distant or have more protection from buildings acting as barriers to noise sources. Note, the Receiver represents the location in plan view – where required, elevation descriptors will be included to represent the different floor elevations of the building.

The receiver location is shown on **Drawing N1** in **Appendix B**.

4.2 Stationary

The modelling for stationary noise produces a noise contour plan that shows noise levels throughout the study area at specified elevations (which are referenced). Accordingly specific Receiver Locations are not required unless there is a critical location that is close to criteria.

5 Analysis and Results

5.1 Transportation Noise

MECP's STAMSON v5 software (based on MECP's ORNAMENT algorithm) was used to model and predict noise levels resulting from road traffic at the identified Receiver locations. It was conservatively assumed that the intermediate surfaces between the traffic sources and the receivers was a reflective surface.

The STAMSON modelling output is included in **Appendix B** and the resulting noise levels are summarized in **Table 7**.

Table 7 – Predicted Un-Attenuated Traffic Noise Levels (dBA)

RECEIVER	DAYTIME		NIGHTTIME	
	Level *	Threshold **	Level *	Threshold **
A	64	55	58	50
B	61	55	55	50
C (OLA)	57	55		

* *Red numbers (if shown) indicate failure of the threshold criteria.*
*** Threshold = minimum criteria below which no requirements for warning clauses or protection.*

As demonstrated in **Table 7**, predicted noise levels for indoor receivers exceed the minimum threshold criteria and thus controls are required to ensure the living and sleeping environments meet guidelines.

From review of the requirements presented in **Table 2** and the results summarized in **Table 7**, it is determined that the following controls are required:

- Central air conditioning; and,
- Type 'C' warning clause.

Further, the OLA slightly exceeds the minimum criteria level and thus a Type 'A' warning clause is recommended to notify users that increasing traffic noise may occasionally interfere with some activities.

5.2 Stationary Noise

The noise modelling software program DBMap (utilizing algorithms based on ISO 9613 and 17534) was used to model stationary noise.

As described previously, there are a number of stationary noise sources that may impact either onsite or offsite sensitive receivers. The following general assumptions were made and used in the model:

- Temperature: 15c
- Relative humidity: 70%
- Application of reflections: 1st and 2nd order of reflections
- ISO reflector size check: Yes
- Ground surface characteristics: G=0 (i.e., hard ground) – conservative assumption.

Note, the MECP exclusionary limit has been assumed for the noise level criteria. This is a conservative assumption as the ambient noise levels are likely higher given the urban environment, and especially given traffic noise from Ira Needles Boulevard.

The results of the modelling for the stationary equipment are shown graphically on **Drawing N2 through N7** in **Appendix C,** and sample model output is also included**.** **Table 8** shows the worst-case receptor.

Table 8 – Predicted Un-Attenuated Stationary Noise Levels (dBA)

RECEIVER	DAYTIME		NIGHTTIME	
	Level *	Threshold **	Level *	Threshold **
A @ 1.5m	42	50	41	45
A @ 10.5m	45	50	43	45
A @ 16.5m	46	50	44	45
OLA @ 1.5m	38	50	n/a	n/a

** Red numbers (if shown) indicate failure of the threshold criteria.*
*** Threshold = minimum criteria below which no requirements for warning clauses or protection.*

As will be observed, noise levels are below criteria at all sensitive receiver locations. Accordingly, noise mitigation is not required for stationary noise sources.

6 Conclusions and Recommendations

Given the results of the noise analysis presented herein, the following recommendations are made to ensure the proposed development complies with municipal and provincial noise guidelines:

Recommendation #1 (All units)

All residential units within the Site shall include the following Warning Clauses (per NPC-300) in the Site's Development Agreement, registered on title, and be included in all Offers of Purchase and Sale:

1. *Type 'A': ""Purchasers/tenants are advised that sound levels due to increasing road traffic (rail traffic) (air traffic) may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the Municipality and the Ministry of the Environment."*
2. *Type 'C': "This dwelling unit has been designed with the provision for adding central air conditioning at the occupant's discretion. Installation of central air conditioning by the occupant in low and medium density developments will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment."*
3. *Type 'E': "Purchasers/tenants are advised that due to the proximity of adjacent commercial and/or industrial land uses that noise from these uses may at times be audible."*

Recommendation #2 (All units)

All units within the Site shall be designed and constructed with the provision to easily add air conditioning if not so equipped.

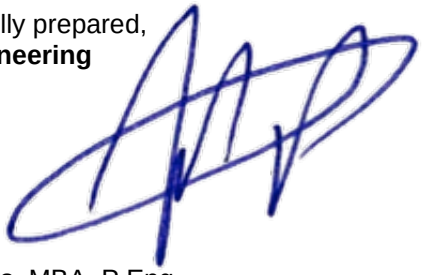
Recommendation #3

If during final design of the Site any deviations are made from the assumptions made herein, the noise analysis should be updated to determine if any changes to this report's conclusions or recommendations are required.

Based on the preceding, and with the implementation of the recommendations herein made, we conclude that the subject Site can be developed in compliance with municipal environmental noise guidelines.

* * * * * * * * * * * * * * * *

Respectfully prepared,
JPE Engineering



John Perks, MBA, P.Eng.
Senior Engineer, President

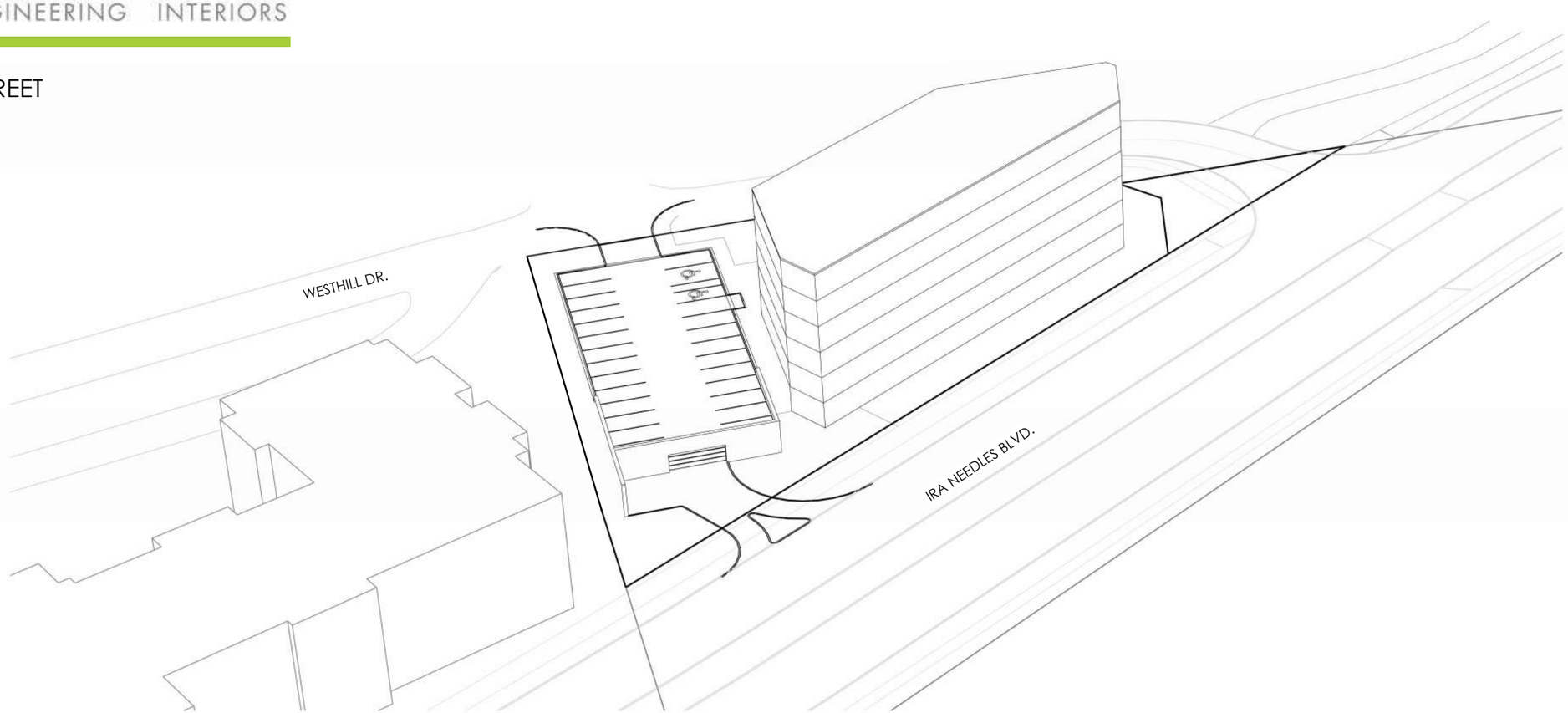
APPENDIX A:

Site & Architectural Plans

mcCallumSather
ARCHITECTURE ENGINEERING INTERIORS

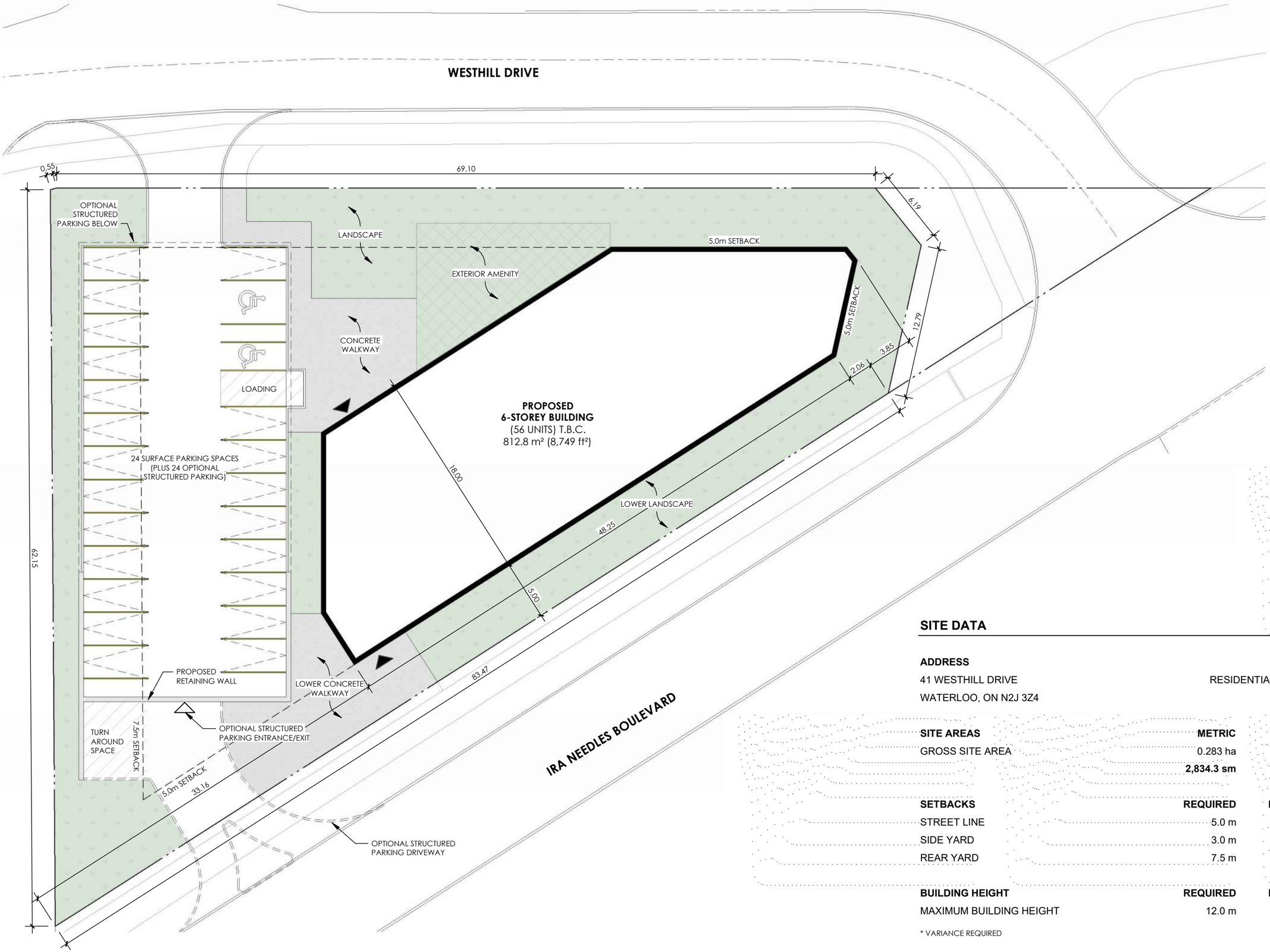
210-137 GLASGOW STREET
KITCHENER, ON
N2G 4X8

mccallumsather.com



DESIGN REPORT

24078 - 41 WESTHILL DR MID-RISE - 2024.12.16



mcCallumSather
ARCHITECTURE ENGINEERING INTERIORS

TRUE PROJECT

PROJECT NO.
24078

PROJECT NAME
41 WESTHILL DR
MID-RISE

41 WESTHILL DR.,
WATERLOO, ON

DRAWING TITLE
SITE PLAN

SITE DATA

ADDRESS
41 WESTHILL DRIVE
WATERLOO, ON N2J 3Z4

ZONING
RESIDENTIAL NINE (R9)

SITE AREAS	**METRIC**	**IMPERIAL**
GROSS SITE AREA	0.283 ha	0.7 acres
	2,834.3 sm	**30,508 sf**

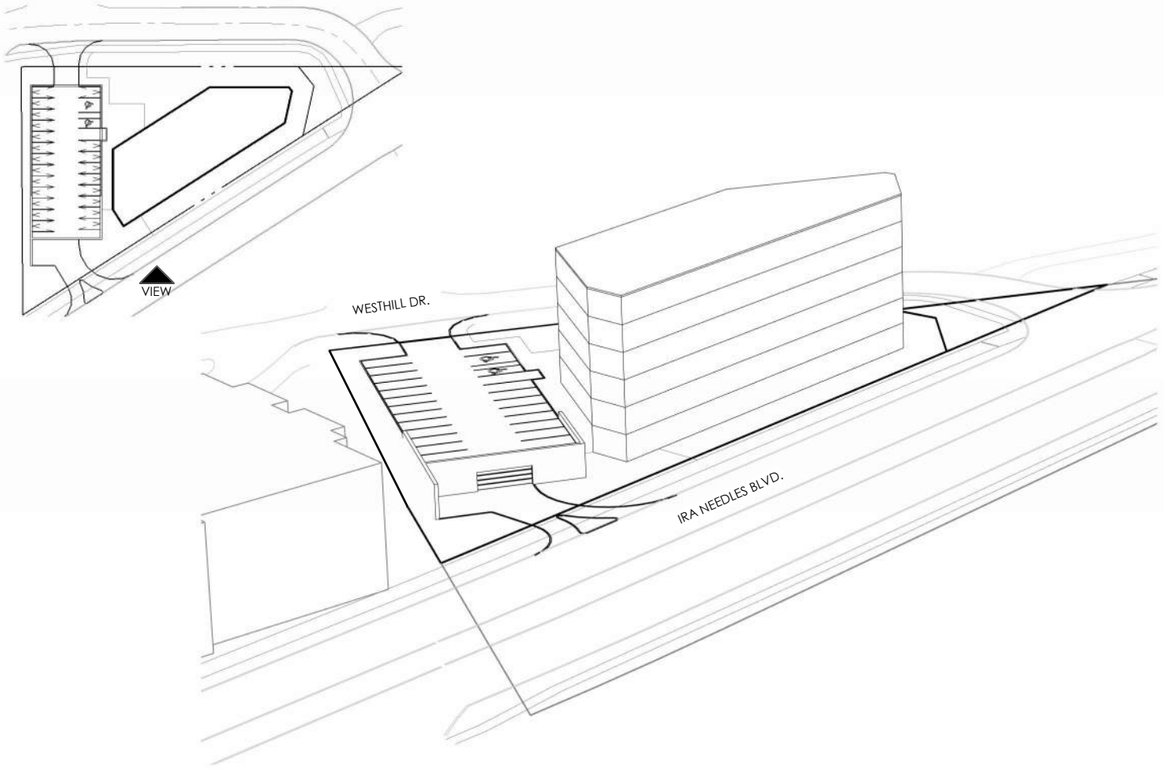
SETBACKS	**REQUIRED**	**PROPOSED**
STREET LINE	5.0 m	5.0 m
SIDE YARD	3.0 m	N/A
REAR YARD	7.5 m	17.45 m

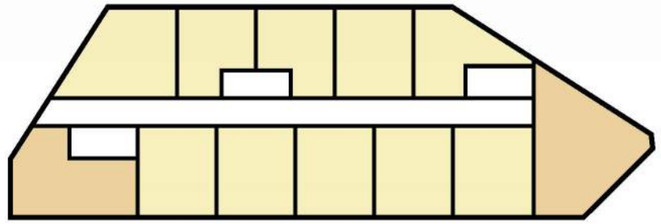
BUILDING HEIGHT	**REQUIRED**	**PROPOSED**
MAXIMUM BUILDING HEIGHT	12.0 m	20.0 m*

* VARIANCE REQUIRED

SCALE 1 : 300
ISSUED FOR
PRELIMINARY DESIGN
DATE 2024.12.16

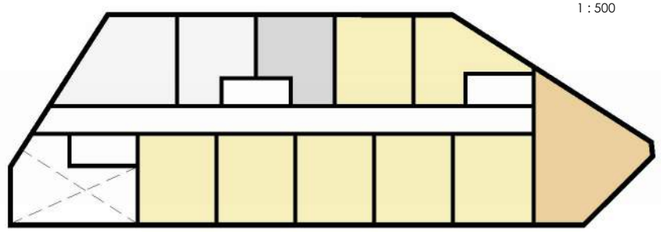
1.2





FLOOR PLAN - LEVEL TYPICAL

1 : 500



FLOOR PLAN - LEVEL 2

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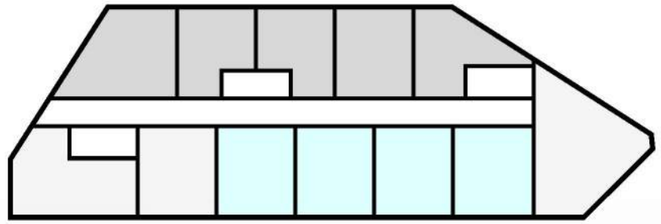

FLOOR PLAN - LEVEL 1

1 : 500

PROPOSED BUILDING DATA

	METRIC	IMPERIAL
BUILDING FOOTPRINT AT GRADE	**812.8 sm**	**8,749 sf**
GROSS FLOOR AREA (LEVEL 1-6)	**4,876.9 sm**	**52,495 sf**
ASPHALT AREA	827.8 sm	8,910 sf
CONCRETE AREA	250.1 sm	2,692 sf
TOTAL IMPERVIOUS AREA	**1,077.9 sm**	**11,602 sf**
LANDSCAPED AREA	943.6 sm	10,157 sf
TOTAL PERMEABLE AREA	**943.6 sm**	**10,157 sf**
(30% min.)	33%	

DENSITY	**REQUIRED**	**PROPOSED**
BEDS (X/ha)	---	133
FLOOR SPACE RATIO	---	1.72

PROPOSED UNIT DATA

SUITE TYPE	QUANTITY	QUANTITY %	BEDROOMS
1 BEDROOM	47	84%	47
2 BEDROOM	9	16%	18
TOTAL	**56**	**100%**	**65**
AFFORDABLE	17	30%	
MARKET RATE	39	70%	

AMENITY SPACE	**REQUIRED**	**PROPOSED**
3.0 sm/ 1ST BED + 2.0 sm/ 2ND BED	200 sm	~200 sm (int.)
		~100 sm (ext.)

PARKING DATA

OVERALL PARKING		**REQUIRED**	**PROPOSED**
VISITOR PARKING SPACES	0.1/UNIT	6	6*
STANDARD PARKING SPACES	1.0/UNIT	56	18*
TOTAL		**62**	**24***
EV PARKING SPACES		2	1
BARRIER-FREE PARKING SPACES		3	2*
PROPOSED PARKING RATIO			0.4
OPTIONAL STRUCTURED PARKING			24
TOTAL (w/ STRUCTURED PARKING)			**48***
PROPOSED PARKING RATIO (w/ STRUCTURED PARKING)			0.77

PARKING BREAKDOWN	**RATIO**	**PROPOSED**
AFFORDABLE PARKING SPACES	0.25/UNIT	5*
MARKET PARKING SPACES	0.60/UNIT	24*
VISITOR PARKING SPACES	0.1/TOTAL	6*
TOTAL	**0.95**	**35***

BICYCLE STORAGE		**REQUIRED**	**PROPOSED**
BICYCLE TYPE 'A' SPACE (0.3)	1/UNIT	56	TBD
BICYCLE TYPE 'B' SPACE (0.3)	1/UNIT	56	TBD

* VARIANCE REQUIRED

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ARCHITECTURE ENGINEERING INTERIORS

LEGEND

- COMMON AREAS
- SERVICE/ PARKING
- 1 BEDROOM
- 2 BEDROOM
- AMENITY

PROJECT NO.
24078

PROJECT NAME
41 WESTHILL DR
MID-RISE

41 WESTHILL DR.,
WATERLOO, ON

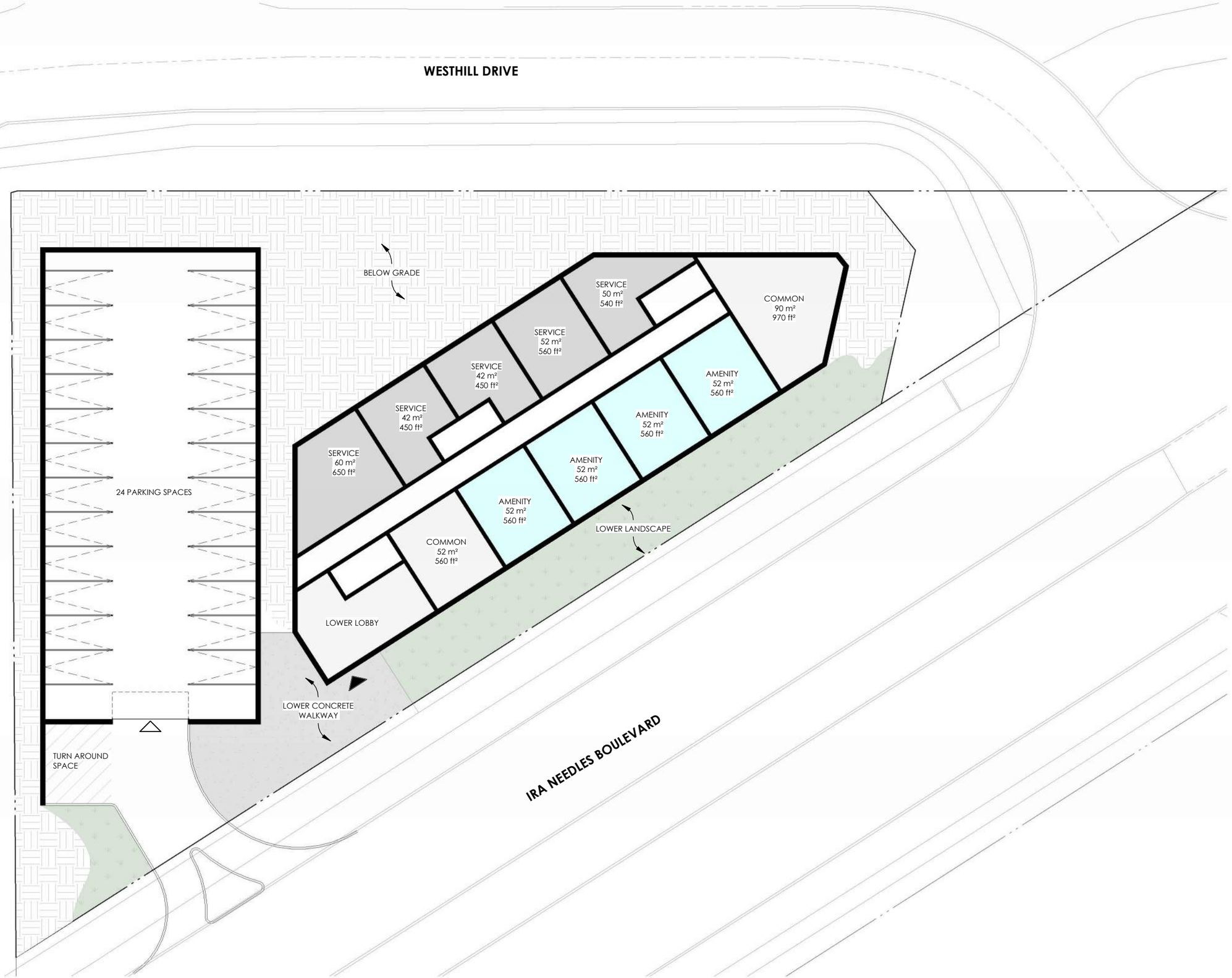
DRAWING TITLE
STATISTICS

SCALE N.T.S.

ISSUED FOR
PRELIMINARY
DESIGN

DATE 2024.12.16

1.3



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TRUE PROJECT

LEGEND

- COMMON AREAS
- SERVICE/ PARKING
- 1 BEDROOM
- 2 BEDROOM
- AMENITY

PROJECT NO.
24078

PROJECT NAME
41 WESTHILL DR
MID-RISE

41 WESTHILL DR.,
WATERLOO, ON

DRAWING TITLE
FLOOR PLAN -
LEVEL 1

SCALE 1:300

ISSUED FOR
PRELIMINARY
DESIGN

DATE 2024.12.16

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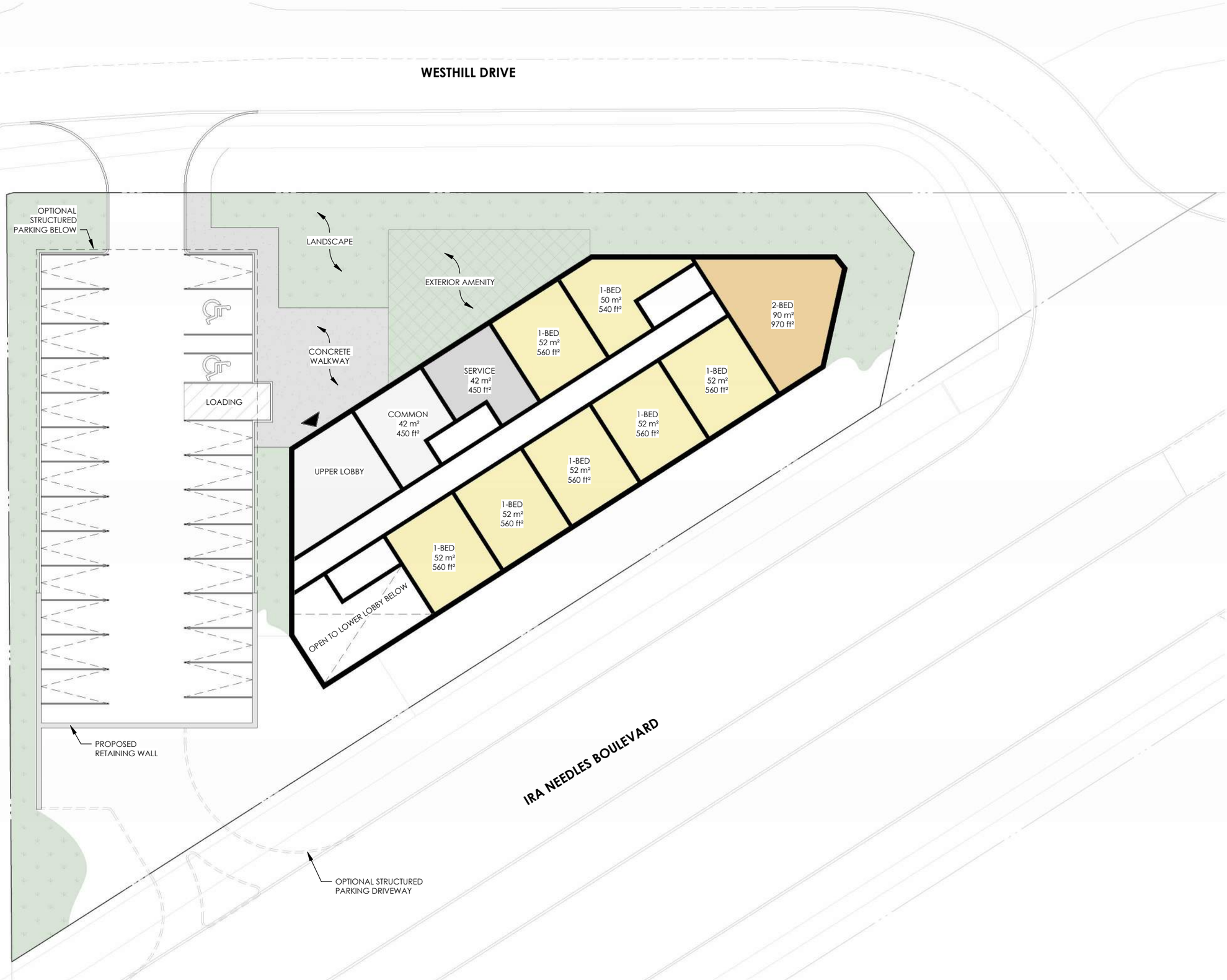

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ARCHITECTURE ENGINEERING INTERIORS

TRUE PROJECT

LEGEND

- COMMON AREAS
- SERVICE/ PARKING
- 1 BEDROOM
- 2 BEDROOM
- AMENITY

PROJECT NO.
24078

PROJECT NAME
41 WESTHILL DR
MID-RISE

41 WESTHILL DR.,
WATERLOO, ON

DRAWING TITLE
FLOOR PLAN -
LEVEL 2

SCALE 1:300

ISSUED FOR
PRELIMINARY
DESIGN

DATE 2024.12.16

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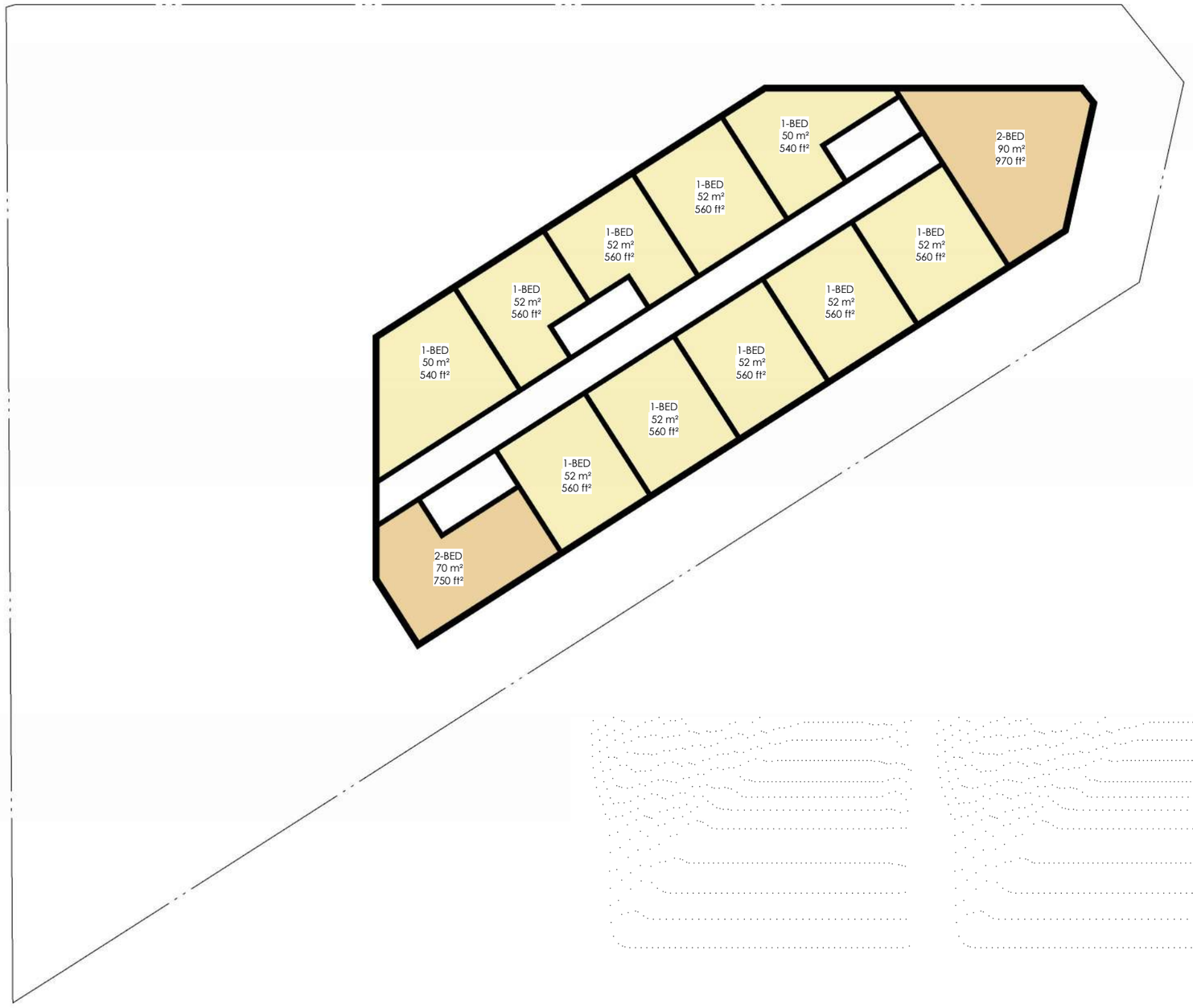

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ARCHITECTURE ENGINEERING INTERIORS

TRUE PROJECT

LEGEND

- COMMON AREAS
- SERVICE/ PARKING
- 1 BEDROOM
- 2 BEDROOM
- AMENITY

PROJECT NO.
24078

PROJECT NAME
41 WESTHILL DR
MID-RISE

41 WESTHILL DR.,
WATERLOO, ON

DRAWING TITLE
FLOOR PLAN -
TYPICAL LEVEL
(3-6)

SCALE 1:300

ISSUED FOR
PRELIMINARY
DESIGN

DATE 2024.12.16

1.6

APPENDIX B:

Traffic Noise Information



SCALE:

1:1250

scale is approx. when plotted on 11x17 paper

N

#	REVISION	BY	DATE
1	First Submission	JRP	2025-03-18

LEGEND:

x R-A Noise Receiver A

23 m — Worst case distance receiver to source

125° — Angle of exposure to line source

BASE MAPPING SOURCES:
- RofW GIS (imagery)
- mcCallumSather Architects

JPE ENGINEERING
info@jpe-engineering.ca
519-577-2238
www.jpe-engineering.ca

41 WESTHILL DRIVE
Waterloo, ON

TRAFFIC NOISE INFORMATION

SHEET 1 of 7

DWG JPE-1058 N-1

Region of Waterloo AADT Forecast for Noise Studies

1. Development/Location: 41 Westhill Dr, Kitchener

	Ira Needles Blvd	Erb St W
2. Current AADT (2025)	19,500	22,100

	Ira Needles Blvd	Erb St W
3. Forecast AADT (2035)	23,700	26,900

4. Commercial Vehicle Rates	Ira Needles Blvd	Erb St W
% Medium Trucks	1%	2%
% Heavy Trucks	2%	1%

	Ira Needles Blvd	Erb St W
5. Posted Speed Limit	60 km/h	60 km/h

6. Day/Night Splits: Regional Standard 90/10 Day/Night Split

7. Expiry: Dec 31 2027

8. Notes

This forecast is intended for the purpose of carrying out a noise study for 41 Westhill Dr, Kitchener, only. The above AADTs represent the traffic volumes on Ira Needles Blvd to the southwest of the property, and Erb St W to the northwest of the property. 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.

```
STAMSON 5.0         NORMAL REPORT         Date: 17-03-2025 10:34:31
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: westh_a.te            Time Period: Day/Night 16/8 hours
```

Description: 41 WESTHILL DRIVE - Receiver A

```
Road data, segment # 1: Ira Needles (day/night)
-----------------------------------------------
Car traffic volume  : 20690/2299  veh/TimePeriod  *
Medium truck volume :   213/24    veh/TimePeriod  *
Heavy truck volume  :   427/47    veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     1 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  23700
    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 Needles (day/night)
---------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  23.00 / 23.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 2: Erb Street (day/night)
----------------------------------------------
Car traffic volume  : 23484/2609  veh/TimePeriod  *
Medium truck volume :   484/54    veh/TimePeriod  *
Heavy truck volume  :   242/27    veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     2 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  26900
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   2.00
    Heavy Truck  % of Total Volume     :   1.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 2: Erb Street (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  : 275.00 / 275.00 m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Results segment # 1: Ira Needles (day)
-------------------------------------
Source height = 1.19 m

ROAD (0.00 + 64.23 + 0.00) = 64.23 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.66  68.77   0.00  -3.08  -1.46   0.00   0.00   0.00  64.23
-------------------------------------------------------------------------------
Segment Leq : 64.23 dBA

Results segment # 2: Erb Street (day)
-------------------------------------
Source height = 1.00 m

ROAD (0.00 + 43.37 + 0.00) = 43.37 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90      0   0.66  68.80   0.00 -20.97  -4.47   0.00   0.00   0.00  43.37
-------------------------------------------------------------------------------
Segment Leq : 43.37 dBA

Total Leq All Segments: 64.27 dBA

Results segment # 1: Ira Needles (night)
---------------------------------------
Source height = 1.19 m

ROAD (0.00 + 57.97 + 0.00) = 57.97 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.58  62.22   0.00  -2.93  -1.32   0.00   0.00   0.00  57.97
-------------------------------------------------------------------------------

Segment Leq : 57.97 dBA

Results segment # 2: Erb Street (night)
---------------------------------------
Source height = 1.00 m

ROAD (0.00 + 37.92 + 0.00) = 37.92 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90      0   0.58  62.28   0.00 -20.02  -4.34   0.00   0.00   0.00  37.92
-------------------------------------------------------------------------------
Segment Leq : 37.92 dBA

Total Leq All Segments: 58.01 dBA
```

TOTAL Leq FROM ALL SOURCES (DAY): 64.27
(NIGHT): 58.01

```
STAMSON 5.0         NORMAL REPORT         Date: 17-03-2025 10:34:08
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: WestH_B.te            Time Period: Day/Night 16/8 hours
```

Description: 41 WESTHILL DRIVE - Receiver B

```
Road data, segment # 1: Ira Needles (day/night)
-----------------------------------------------
Car traffic volume  : 20690/2299  veh/TimePeriod  *
Medium truck volume :   213/24    veh/TimePeriod  *
Heavy truck volume  :   427/47    veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     1 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  23700
    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 Needles (day/night)
---------------------------------------------
Angle1   Angle2           :   0.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  23.00 / 23.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 2: Erb Street (day/night)
-----------------------------------------------
Car traffic volume  : 23484/2609  veh/TimePeriod  *
Medium truck volume :   484/54    veh/TimePeriod  *
Heavy truck volume  :   242/27    veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     2 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  26900
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   2.00
    Heavy Truck  % of Total Volume     :   1.00
    Day (16 hrs) % of Total Volume     :  90.00



Data for Segment # 2: Erb Street (day/night)
---------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 275.00 / 275.00 m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Results segment # 1: Ira Needles (day)
-------------------------------------
Source height = 1.19 m

ROAD (0.00 + 61.22 + 0.00) = 61.22 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     90   0.66  68.77   0.00  -3.08  -4.47   0.00   0.00   0.00  61.22
-------------------------------------------------------------------------------
Segment Leq : 61.22 dBA


Results segment # 2: Erb Street (day)
-------------------------------------
Source height = 1.00 m

ROAD (0.00 + 46.38 + 0.00) = 46.38 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.66  68.80   0.00 -20.97  -1.46   0.00   0.00   0.00  46.38
-------------------------------------------------------------------------------
Segment Leq : 46.38 dBA

Total Leq All Segments: 61.36 dBA


Results segment # 1: Ira Needles (night)
---------------------------------------
Source height = 1.19 m

ROAD (0.00 + 54.96 + 0.00) = 54.96 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     90   0.58  62.22   0.00  -2.93  -4.33   0.00   0.00   0.00  54.96
-------------------------------------------------------------------------------
Segment Leq : 54.96 dBA

Results segment # 2: Erb Street (night)
---------------------------------------
Source height = 1.00 m

ROAD (0.00 + 40.93 + 0.00) = 40.93 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.58  62.28   0.00 -20.02  -1.33   0.00   0.00   0.00  40.93
-------------------------------------------------------------------------------
Segment Leq : 40.93 dBA

Total Leq All Segments: 55.13 dBA
```

TOTAL Leq FROM ALL SOURCES (DAY): 61.36
(NIGHT): 55.13

```
STAMSON 5.0         NORMAL REPORT         Date: 17-03-2025 13:12:03
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: westh_c.te            Time Period: Day/Night 16/8 hours
```

Description: 41 WESTHILL DRIVE - Receiver C

```
Road data, segment # 1: Ira Needles1 (day/night)
-----------------------------------------------
Car traffic volume  : 20690/2299  veh/TimePeriod  *
Medium truck volume :   213/24    veh/TimePeriod  *
Heavy truck volume  :   427/47    veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     1 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  23700
    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 Needles1 (day/night)
-----------------------------------------------
Angle1   Angle2           : -90.00 deg   -55.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  23.00 / 23.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 2: Erb Street (day/night)
-----------------------------------------------
Car traffic volume  : 23484/2609  veh/TimePeriod  *
Medium truck volume :   484/54    veh/TimePeriod  *
Heavy truck volume  :   242/27    veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     2 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  26900
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   2.00
    Heavy Truck  % of Total Volume     :   1.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 2: Erb Street (day/night)
-----------------------------------------------
Angle1   Angle2           :  -5.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 275.00 / 275.00 m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 3: Ira Needles2 (day/night)
-----------------------------------------------
Car traffic volume  : 20690/2299  veh/TimePeriod  *
Medium truck volume :   213/24    veh/TimePeriod  *
Heavy truck volume  :   427/47    veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     1 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  23700
    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: Ira Needles2 (day/night)
-----------------------------------------------
Angle1   Angle2           :  53.00 deg   65.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  23.00 / 23.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

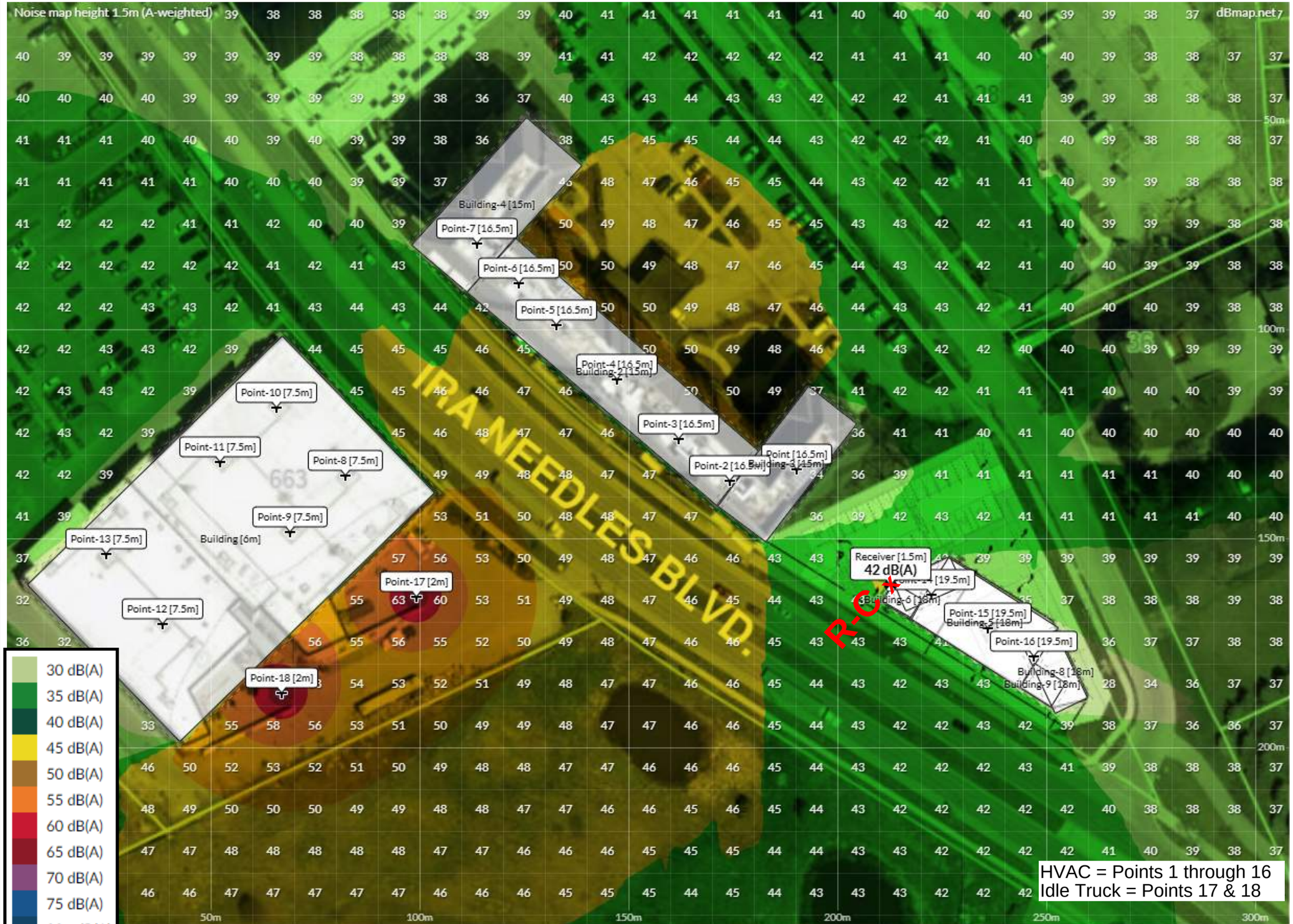
```
Results segment # 1: Ira Needles1 (day)
----------------------------------------
Source height = 1.19 m

ROAD (0.00 + 54.88 + 0.00) = 54.88 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -55   0.66  68.77   0.00  -3.08 -10.81   0.00   0.00   0.00  54.88
-------------------------------------------------------------------------------
Segment Leq : 54.88 dBA

Results segment # 2: Erb Street (day)
----------------------------------------
Source height = 1.00 m

ROAD (0.00 + 43.69 + 0.00) = 43.69 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    -5     90   0.66  68.80   0.00 -20.97  -4.14   0.00   0.00   0.00  43.69
-------------------------------------------------------------------------------
Segment Leq : 43.69 dBA

Results segment # 3: Ira Needles2 (day)
----------------------------------------
Source height = 1.19 m

ROAD (0.00 + 52.01 + 0.00) = 52.01 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    53     65   0.66  68.77   0.00  -3.08 -13.67   0.00   0.00   0.00  52.01
-------------------------------------------------------------------------------
Segment Leq : 52.01 dBA

Total Leq All Segments: 56.90 dBA


Results segment # 1: Ira Needles1 (night)
----------------------------------------

Source height = 1.19 m

ROAD (0.00 + 48.88 + 0.00) = 48.88 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -55   0.58  62.22   0.00  -2.93 -10.41   0.00   0.00   0.00  48.88
-------------------------------------------------------------------------------

Segment Leq : 48.88 dBA
```

```
Results segment # 2: Erb Street (night)
----------------------------------------

Source height = 1.00 m

ROAD (0.00 + 38.23 + 0.00) = 38.23 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    -5     90   0.58  62.28   0.00 -20.02  -4.02   0.00   0.00   0.00  38.23
-------------------------------------------------------------------------------

Segment Leq : 38.23 dBA


Results segment # 3: Ira Needles2 (night)
----------------------------------------
Source height = 1.19 m

ROAD (0.00 + 45.85 + 0.00) = 45.85 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    53     65   0.58  62.22   0.00  -2.93 -13.44   0.00   0.00   0.00  45.85
-------------------------------------------------------------------------------
Segment Leq : 45.85 dBA

Total Leq All Segments: 50.88 dBA
```

TOTAL Leq FROM ALL SOURCES (DAY): 56.90
(NIGHT): 50.88

Appendix C:

Stationary Noise Information



SCALE:

1:1000

scale is approx. when plotted on 11x17 paper

N

#	REVISION	BY	DATE
1	First Submission	JRP	2025-03-18

LEGEND:

x R-A Noise Receiver

Point-12 [7.5m]

Noise Source (& Height)

16.3 m

Worst case distance receiver to source

125°

Angle of exposure to line source

BASE MAPPING SOURCES:
- RofW GIS (imagery)
- mcCallumSather Architects

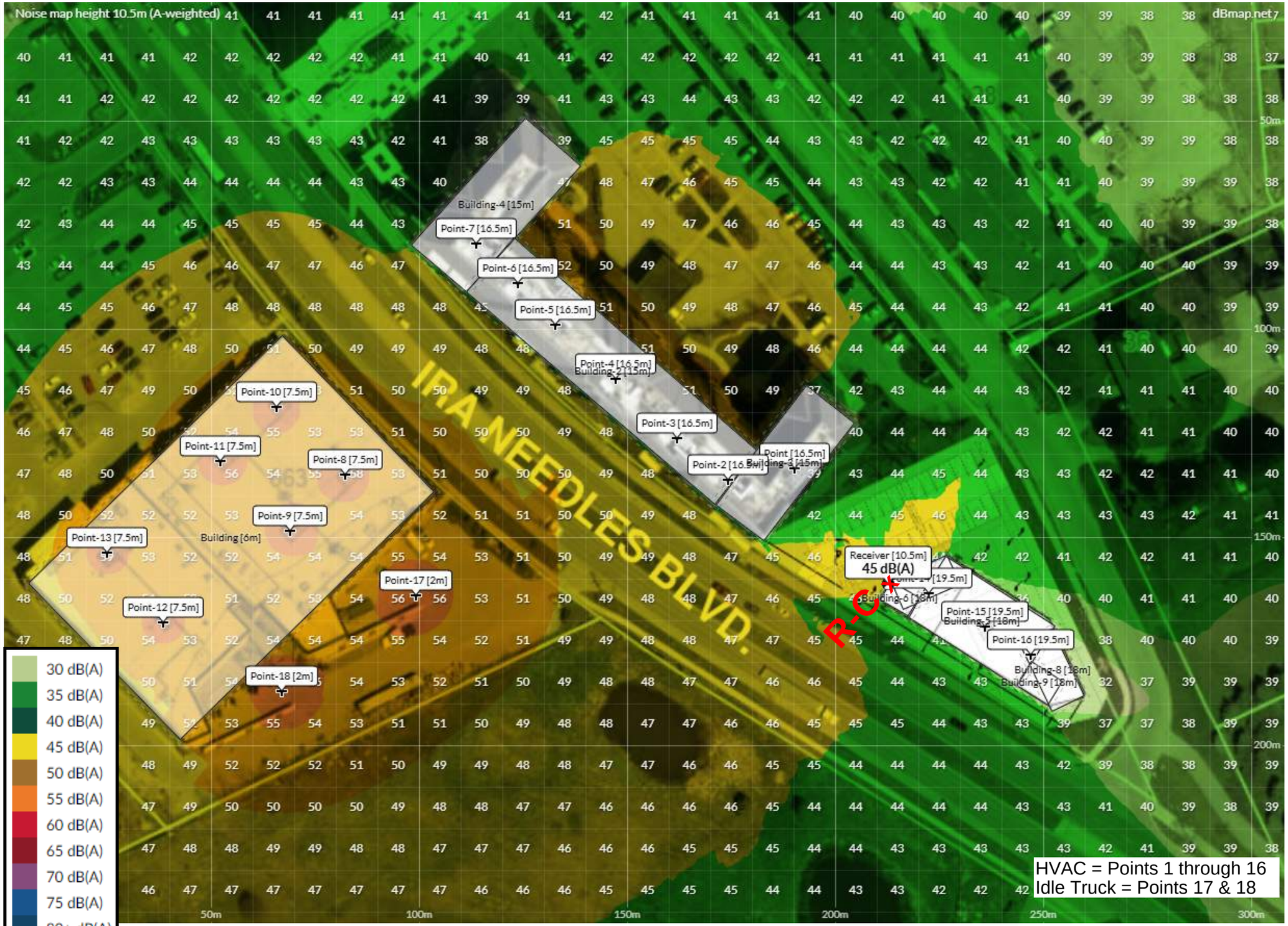
info@jpe-engineering.ca
519-577-2238
www.jpe-engineering.ca

41 WESTHILL DRIVE
Waterloo, ON

STATIONARY NOISE
Day @ Ht = 1.5m

SHEET 2 of 7

DWG JPE-1070 N-2



SCALE:

1:1000

scale is approx. when plotted on 11x17 paper

N

#	REVISION	BY	DATE
1	First Submission	JRP	2025-03-18

LEGEND:

x R-A Noise Receiver

Point-12 [7.5m]

Noise Source (& Height)

16.3 m

Worst case distance receiver to source

125°

Angle of exposure to line source

BASE MAPPING SOURCES:
- RofW GIS (imagery)
- mcCallumSather Architects

JPE ENGINEERING
info@jpe-engineering.ca
519-577-2238
www.jpe-engineering.ca

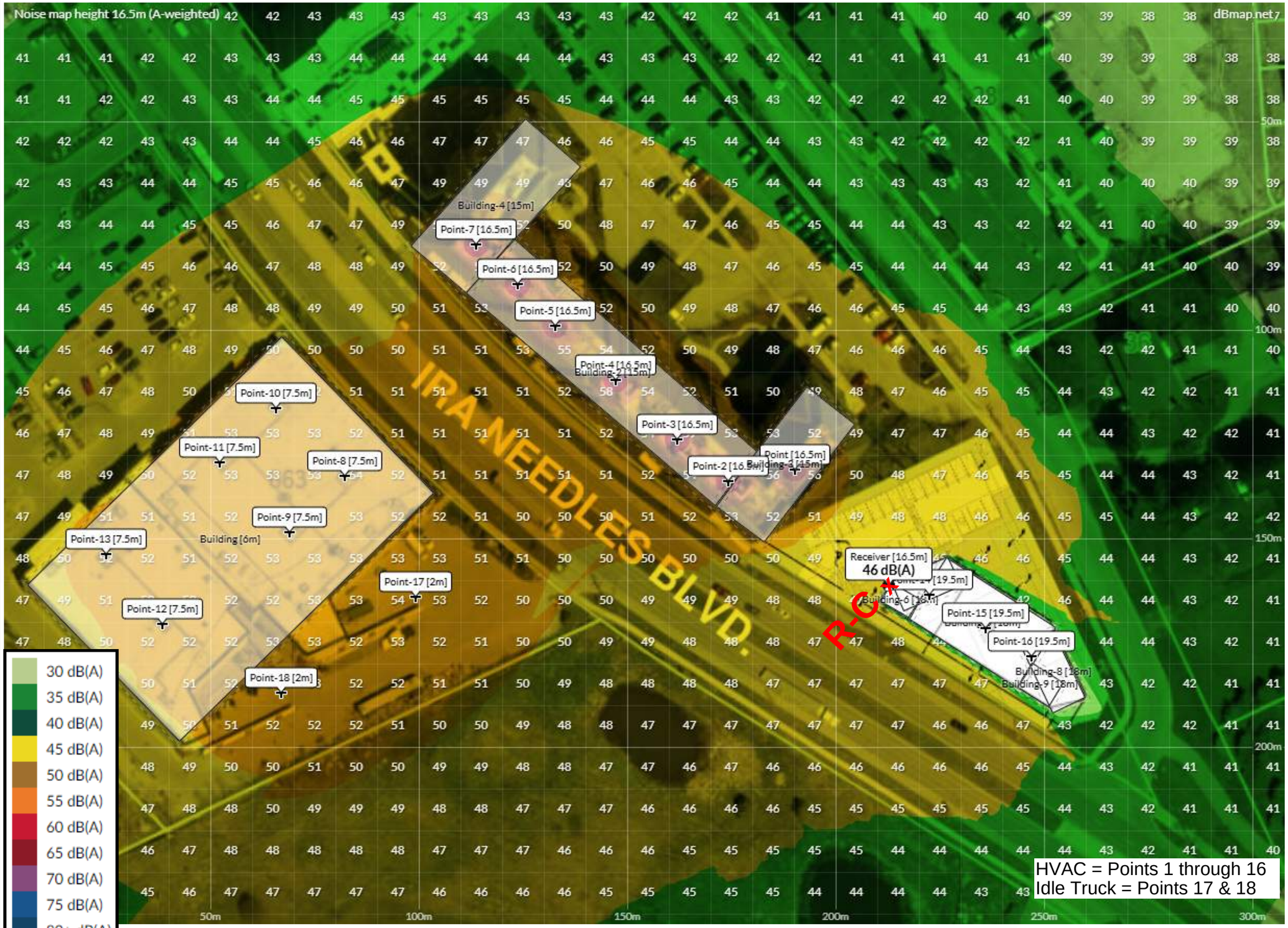
41 WESTHILL DRIVE
Waterloo, ON

STATIONARY NOISE
Day @ Ht = 10.5m

SHEET 3 of 7

DWG JPE-1070

N-3



SCALE:

1:1000

scale is approx. when plotted on 11x17 paper

N

#	REVISION	BY	DATE
1	First Submission	JRP	2025-03-18

LEGEND:

x R-A Noise Receiver

Point-12 [7.5m]

Noise Source (& Height)

16.3 m

Worst case distance receiver to source

125°

Angle of exposure to line source

BASE MAPPING SOURCES:
- RofW GIS (imagery)
- mcCallumSather Architects

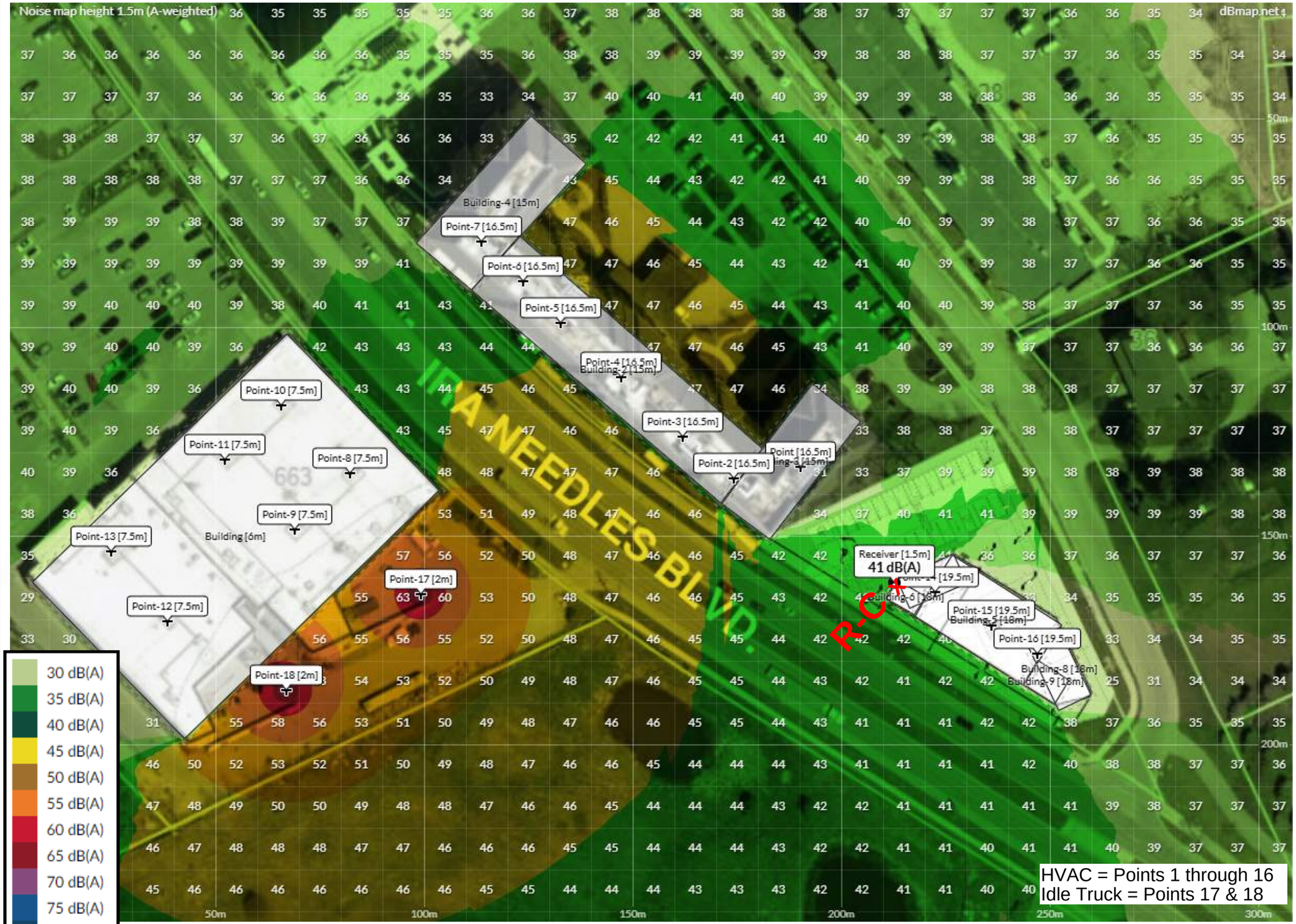
info@jpe-engineering.ca
519-577-2238
www.jpe-engineering.ca

41 WESTHILL DRIVE
Waterloo, ON

STATIONARY NOISE
Day @ Ht = 16.5m

SHEET 4 of 7

DWG JPE-1070 N-4



SCALE:

1:1000

scale is approx. when plotted on 11x17 paper

N

#	REVISION	BY	DATE
1	First Submission	JRP	2025-03-18

LEGEND:

x R-A Noise Receiver

Point-12 [7.5m]

Noise Source (& Height)

16.3 m

Worst case distance receiver to source

125°

Angle of exposure to line source

BASE MAPPING SOURCES:
- RofW GIS (imagery)
- mcCallumSather Architects

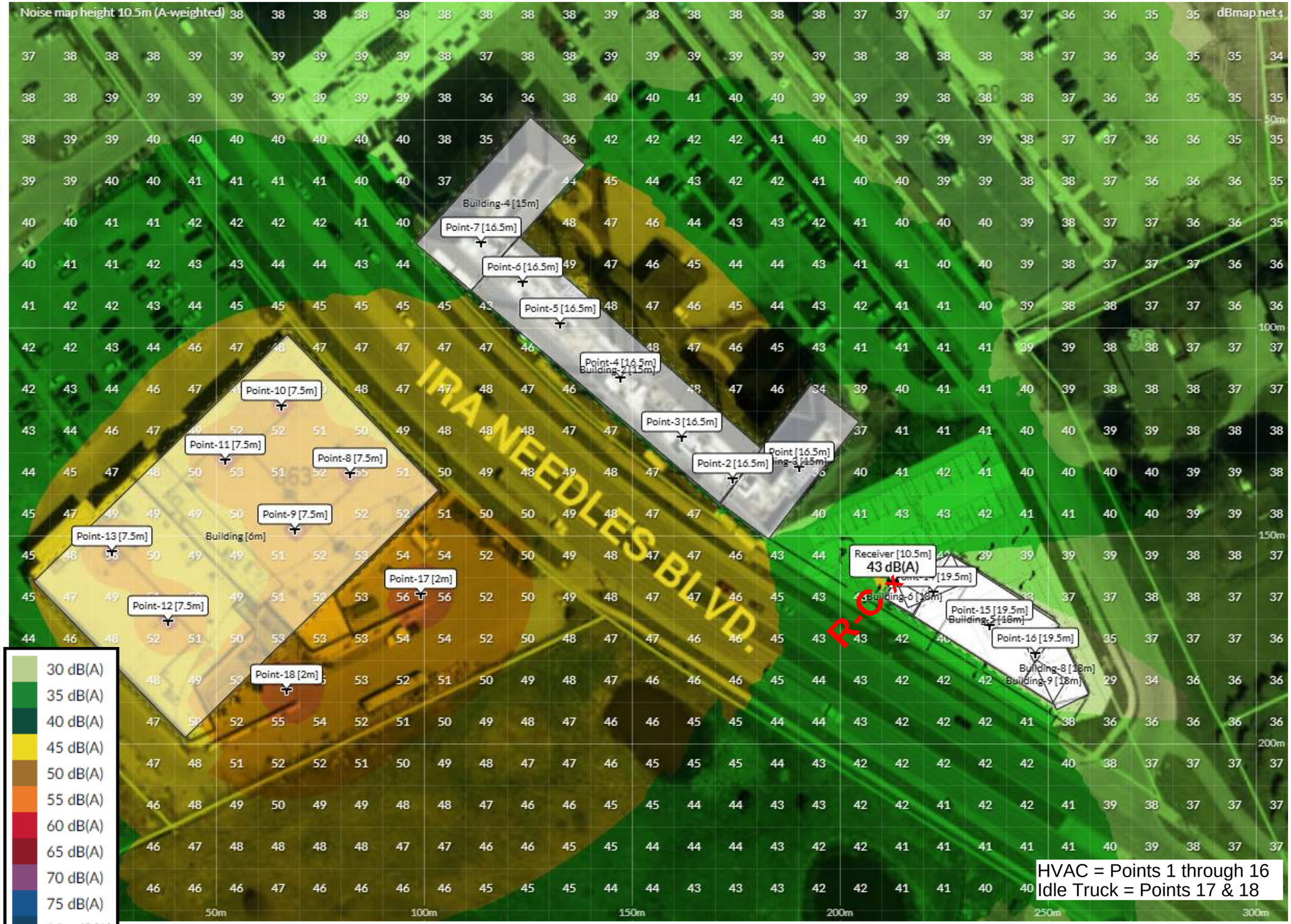
JPE ENGINEERING
info@jpe-engineering.ca
519-577-2238
www.jpe-engineering.ca

41 WESTHILL DRIVE
Waterloo, ON

STATIONARY NOISE
Night @ Ht = 1.5m

SHEET 5 of 7

DWG JPE-1070 N-5



SCALE:

1:1000

scale is approx. when plotted on 11x17 paper

N

#	REVISION	BY	DATE
1	First Submission	JRP	2025-03-18

LEGEND:

x R-A Noise Receiver

Point-12 [7.5m]

Noise Source (& Height)

16.3 m

Worst case distance receiver to source

125°

Angle of exposure to line source

BASE MAPPING SOURCES:
- RofW GIS (imagery)
- mcCallumSather Architects

JPE ENGINEERING
info@jpe-engineering.ca
519-577-2238
www.jpe-engineering.ca

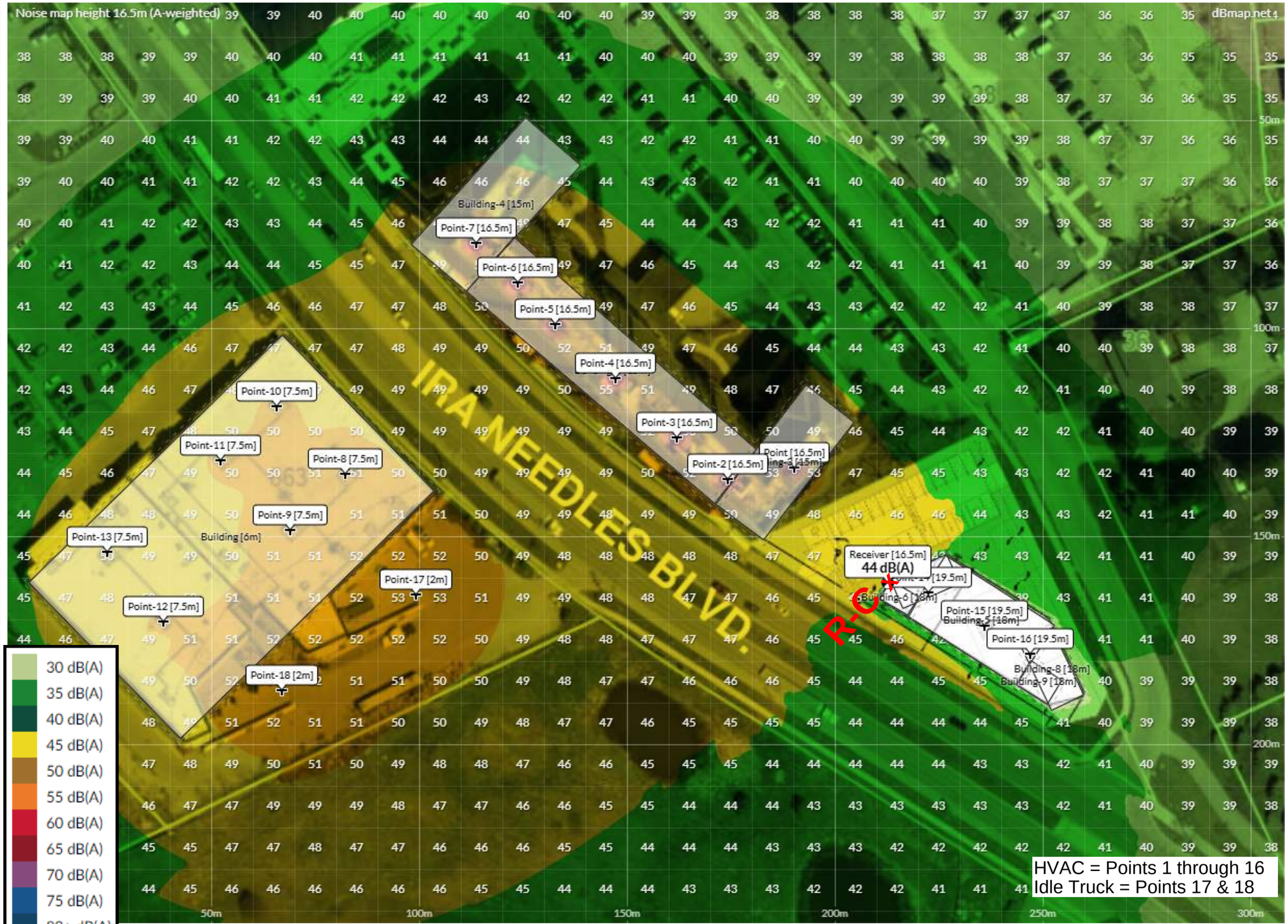
41 WESTHILL DRIVE
Waterloo, ON

STATIONARY NOISE
Night @ Ht = 10.5m

SHEET 6 of 7

DWG JPE-1070

N-6



SCALE:

1:1000

scale is approx. when plotted on 11x17 paper

N

#	REVISION	BY	DATE
1	First Submission	JRP	2025-03-18

LEGEND:

x R-A Noise Receiver

Point-12 [7.5m]

Noise Source (& Height)

16.3 m

Worst case distance receiver to source

125°

Angle of exposure to line source

BASE MAPPING SOURCES:
- RofW GIS (imagery)
- mcCallumSather Architects

JPE ENGINEERING
info@jpe-engineering.ca
519-577-2238
www.jpe-engineering.ca

41 WESTHILL DRIVE
Waterloo, ON

STATIONARY NOISE
Night @ Ht = 16.5m

SHEET 7 of 7

DWG JPE-1070

N-7

DBMap - Noise Mapping Results 27-Nov-24

Nighttime

--- Receiver Results - Summary ---

Receiver Name	Height (m)	Total dB(A)	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Receiver	1.5	41.24				41.24				
Receiver	10.5	42.65				42.65				
Receiver	16.5	43.67				43.67				

--- Receiver Results - Sources Analysis ---

Receiver Name	Height (m)	Total dB(A)	Point	Point-2	Point-3	Point-4	Point-5	Point-6	Point-7	Point-8	Point-9	Point-10	Point-11	Point-12	Point-13	Point-14	Point-15	Point-16	Point-17	Point-18
Receiver	1.5	41.24	31.8	22.73	17.89	14.33	12.02	10.68	9.53	25.51	24.94	24.49	24.08	23.49	22.95	28.63	22.57	19.74	37.13	35.67
Receiver	10.5	42.65	36.28	30.98	26.91	23.5	21.29	20.1	19.08	26.16	25.44	24.92	24.34	23.73	23.06	32.13	27.19	24.78	36.69	34.71
Receiver	16.5	43.67	36.69	34.85	32.55	30.22	28.42	27.36	26.38	26.12	25.41	24.89	24.31	23.71	23.04	31.5	23.37	20.29	36.64	34.68

--- Receiver Results - Full Detail ---

Receiver Name	Source Name	Distance to so	Height includi	Source height	Frequency (Hz	Lw	Ad	Aa	Ag	Ab (total)	Ab (top edg	Ab (lateral :	Ab (lateral :	Adjustment	Weighting	Lp
Receiver	Point-17	113.66	1.5	2	500	93.2	-52.11	-0.26	3.23	0	-	-	-	-6.02	-3.2	34.84
Receiver	Point-17 (refle	135.44	1.5	2	500	92.74	-53.63	-0.31	3.67	0	-	-	-	-6.02	-3.2	33.25
Receiver	Point-18	148.13	1.5	2	500	93.2	-54.41	-0.34	3.87	0	-	-	-	-6.02	-3.2	33.1
Receiver	Point-18 (refle	158.61	1.5	2	500	92.74	-55.01	-0.36	4.01	0	-	-	-	-6.02	-3.2	32.17
Receiver	Point	38.85	1.5	16.5	500	83.2	-42.79	-0.09	2.86	-5.18	-5.18	-	-	-3.01	-3.2	31.8
Receiver	Point-14 (refle	71.72	1.5	19.5	500	82.74	-48.11	-0.16	2.95	-3.89	-3.89	-	-	-3.01	-3.2	27.32
Receiver	Point-8	133.23	1.5	7.5	500	83.2	-53.49	-0.3	2.99	-0.68	-0.68	-	-	-3.01	-3.2	25.51
Receiver	Point-9	144.43	1.5	7.5	500	83.2	-54.19	-0.33	3	-0.52	-0.52	-	-	-3.01	-3.2	24.94
Receiver	Point-10	153.12	1.5	7.5	500	83.2	-54.7	-0.35	3	-0.44	-0.44	-	-	-3.01	-3.2	24.49
Receiver	Point-11	163.29	1.5	7.5	500	83.2	-55.26	-0.37	3	-0.27	-0.27	-	-	-3.01	-3.2	24.08
Receiver	Point-12	174.61	1.5	7.5	500	83.2	-55.84	-0.4	3	-0.26	-0.26	-	-	-3.01	-3.2	23.49
Receiver	Point-13	187.99	1.5	7.5	500	83.2	-56.48	-0.43	3	-0.12	-0.12	-	-	-3.01	-3.2	22.95
Receiver	Point-14	20.55	1.5	19.5	500	83.2	-37.25	-0.05	2.5	-19.4	-20	-28.29	-	-3.01	-3.2	22.79
Receiver	Point-2	48.25	1.5	16.5	500	83.2	-44.67	-0.11	2.91	-12.39	-12.62	-25.38	-	-3.01	-3.2	22.73
Receiver	Point-15	31.08	1.5	19.5	500	83.2	-40.85	-0.07	2.76	-19.21	-20	-29.6	-30.45	-3.01	-3.2	19.62
Receiver	Point-15 (refle	86.97	1.5	19.5	500	82.74	-49.79	-0.2	2.97	-10.03	-10.03	-	-	-3.01	-3.2	19.49
Receiver	Point-3	63.4	1.5	16.5	500	83.2	-47.04	-0.14	2.95	-14.87	-15.32	-33.12	-25.61	-3.01	-3.2	17.89
Receiver	Point-16	42.25	1.5	19.5	500	83.2	-43.52	-0.1	2.86	-19.19	-20	-29.41	-30.41	-3.01	-3.2	17.05
Receiver	Point-16 (refle	99.66	1.5	19.5	500	82.74	-50.97	-0.23	2.97	-11.94	-11.94	-	-	-3.01	-3.2	16.37
Receiver	Point-4	83.26	1.5	16.5	500	83.2	-49.41	-0.19	2.97	-16.03	-16.6	-31.52	-26.24	-3.01	-3.2	14.33
Receiver	Point-5	102.42	1.5	16.5	500	83.2	-51.21	-0.23	2.98	-16.51	-17.19	-30.66	-26.21	-3.01	-3.2	12.02
Receiver	Point-6	115.56	1.5	16.5	500	83.2	-52.26	-0.26	2.98	-16.77	-17.44	-30.1	-26.97	-3.01	-3.2	10.68
Receiver	Point-7	129.21	1.5	16.5	500	83.2	-53.23	-0.29	2.99	-16.93	-17.63	-29.75	-27.1	-3.01	-3.2	9.53
Receiver	Point	36.33	10.5	16.5	500	83.2	-42.21	-0.08	2.18	-0.6	-0.6	-	-	-3.01	-3.2	36.28
Receiver	Point-17	113.97	10.5	2	500	93.2	-52.14	-0.26	2.99	0	-	-	-	-6.02	-3.2	34.57
Receiver	Point-17 (refle	135.7	10.5	2	500	92.74	-53.65	-0.31	2.99	0	-	-	-	-6.02	-3.2	32.55
Receiver	Point-18	148.38	10.5	2	500	93.2	-54.43	-0.34	2.99	0	-	-	-	-6.02	-3.2	32.21
Receiver	Point-14 (refle	70	10.5	19.5	500	82.74	-47.9	-0.16	2.68	0	-	-	-	-3.01	-3.2	31.15
Receiver	Point-18 (refle	158.84	10.5	2	500	92.74	-55.02	-0.36	2.99	0	-	-	-	-6.02	-3.2	31.13
Receiver	Point-2	46.25	10.5	16.5	500	83.2	-44.3	-0.11	2.43	-4.03	-4.03	-	-	-3.01	-3.2	30.98
Receiver	Point-3	61.89	10.5	16.5	500	83.2	-46.83	-0.14	2.65	-5.76	-5.83	-23.96	-	-3.01	-3.2	26.91
Receiver	Point-15 (refle	85.56	10.5	19.5	500	82.74	-49.65	-0.19	2.78	-3.17	-3.17	-	-	-3.01	-3.2	26.3
Receiver	Point-8	133.13	10.5	7.5	500	83.2	-53.49	-0.3	2.96	0	-	-	-	-3.01	-3.2	26.16
Receiver	Point-9	144.34	10.5	7.5	500	83.2	-54.19	-0.33	2.97	0	-	-	-	-3.01	-3.2	25.44
Receiver	Point-14	13.39	10.5	19.5	500	83.2	-33.53	-0.03	0.71	-18.94	-20	-29.67	-27.7	-3.01	-3.2	25.2
Receiver	Point-10	153.03	10.5	7.5	500	83.2	-54.7	-0.35	2.97	0	-	-	-	-3.01	-3.2	24.92
Receiver	Point-11	163.21	10.5	7.5	500	83.2	-55.26	-0.37	2.97	0	-	-	-	-3.01	-3.2	24.34
Receiver	Point-16 (refle	98.43	10.5	19.5	500	82.74	-50.86	-0.22	2.83	-4.31	-4.31	-	-	-3.01	-3.2	23.96
Receiver	Point-12	174.54	10.5	7.5	500	83.2	-55.84	-0.4	2.98	0	-	-	-	-3.01	-3.2	23.73
Receiver	Point-4	82.12	10.5	16.5	500	83.2	-49.29	-0.19	2.79	-6.8	-6.88	-24.61	-	-3.01	-3.2	23.5
Receiver	Point-13	187.92	10.5	7.5	500	83.2	-56.48	-0.43	2.98	0	-	-	-	-3.01	-3.2	23.06
Receiver	Point-5	101.49	10.5	16.5	500	83.2	-51.13	-0.23	2.86	-7.2	-7.28	-24.58	-	-3.01	-3.2	21.29
Receiver	Point-6	114.74	10.5	16.5	500	83.2	-52.19	-0.26	2.89	-7.33	-7.4	-25.14	-	-3.01	-3.2	20.1
Receiver	Point-15	26.88	10.5	19.5	500	83.2	-39.59	-0.06	1.66	-19.12	-20	-28.9	-30.24	-3.01	-3.2	19.88
Receiver	Point-7	128.48	10.5	16.5	500	83.2	-53.18	-0.29	2.91	-7.35	-7.45	-29.77	-25.21	-3.01	-3.2	19.08
Receiver	Point-16	39.26	10.5	19.5	500	83.2	-42.88	-0.09	2.17	-19.07	-20	-28.57	-30.01	-3.01	-3.2	17.12
Receiver	Point	35.83	16.5	16.5	500	83.2	-42.09	-0.08	1.87	0	-	-	-	-3.01	-3.2	36.69

Receiver	Point-2	45.86	16.5	16.5	500	83.2	-44.23	-0.1	2.19	0	-	-	-	-3.01	-3.2	34.85
Receiver	Point-17	114.58	16.5	2	500	93.2	-52.18	-0.26	2.98	0	-	-	-	-6.02	-3.2	34.52
Receiver	Point-3	61.6	16.5	16.5	500	83.2	-46.79	-0.14	2.49	0	-	-	-	-3.01	-3.2	32.55
Receiver	Point-17 (refle	136.21	16.5	2	500	92.74	-53.68	-0.31	2.98	0	-	-	-	-6.02	-3.2	32.51
Receiver	Point-18	148.84	16.5	2	500	93.2	-54.45	-0.34	2.99	0	-	-	-	-6.02	-3.2	32.17
Receiver	Point-14	10.35	16.5	19.5	500	83.2	-31.3	-0.02	0.32	-14.49	-15.34	-27.36	-23.47	-3.01	-3.2	31.5
Receiver	Point-18 (refle	159.27	16.5	2	500	92.74	-55.04	-0.36	2.99	0	-	-	-	-6.02	-3.2	31.11
Receiver	Point-4	81.9	16.5	16.5	500	83.2	-49.27	-0.19	2.69	0	0	-	-	-3.01	-3.2	30.22
Receiver	Point-5	101.32	16.5	16.5	500	83.2	-51.11	-0.23	2.79	-0.01	-0.01	-	-	-3.01	-3.2	28.42
Receiver	Point-6	114.58	16.5	16.5	500	83.2	-52.18	-0.26	2.83	-0.01	-0.01	-	-	-3.01	-3.2	27.36
Receiver	Point-7	128.34	16.5	16.5	500	83.2	-53.17	-0.29	2.86	-0.01	-0.01	-	-	-3.01	-3.2	26.38
Receiver	Point-8	133.4	16.5	7.5	500	83.2	-53.5	-0.3	2.94	0	-	-	-	-3.01	-3.2	26.12
Receiver	Point-9	144.59	16.5	7.5	500	83.2	-54.2	-0.33	2.95	0	-	-	-	-3.01	-3.2	25.41
Receiver	Point-10	153.26	16.5	7.5	500	83.2	-54.71	-0.35	2.96	0	-	-	-	-3.01	-3.2	24.89
Receiver	Point-11	163.43	16.5	7.5	500	83.2	-55.27	-0.37	2.96	0	-	-	-	-3.01	-3.2	24.31
Receiver	Point-12	174.74	16.5	7.5	500	83.2	-55.85	-0.4	2.97	0	-	-	-	-3.01	-3.2	23.71
Receiver	Point-15	25.51	16.5	19.5	500	83.2	-39.13	-0.06	1.25	-15.68	-16.02	-26.96	-	-3.01	-3.2	23.37
Receiver	Point-13	188.11	16.5	7.5	500	83.2	-56.49	-0.43	2.97	0	-	-	-	-3.01	-3.2	23.04
Receiver	Point-16	38.34	16.5	19.5	500	83.2	-42.67	-0.09	1.85	-15.79	-16.15	-26.79	-	-3.01	-3.2	20.29

--- Objects ---

Receivers	x	y	Height
Receiver	95.23	63.06	-

Point Sources	x	y	Height	Lw	Hz	Adjust Level
Point	72.67	35.22	16.5	83.2	500	50%
Point-2	56.73	38.14	16.5	83.2	500	50%
Point-3	44.48	28.14	16.5	83.2	500	50%
Point-4	29.73	13.89	16.5	83.2	500	50%
Point-5	15.23	0.89	16.5	83.2	500	50%
Point-6	6.23	-9.11	16.5	83.2	500	50%
Point-7	-3.77	-18.61	16.5	83.2	500	50%
Point-8	-35.27	36.89	7.5	83.2	500	50%
Point-9	-48.52	50.39	7.5	83.2	500	50%
Point-10	-51.77	20.64	7.5	83.2	500	50%
Point-11	-65.28	33.64	7.5	83.2	500	50%
Point-12	-79.03	72.39	7.5	83.2	500	50%
Point-13	-92.52	55.64	7.5	83.2	500	50%
Point-14	104.86	65.39	19.5	83.2	500	50%
Point-15	118.36	73.39	19.5	83.2	500	50%
Point-16	129.48	80.02	19.5	83.2	500	50%
Point-17	-18.39	65.85	2	93.2	500	25%
Point-18	-50.64	88.85	2	93.2	500	25%

Buildings	x	y	Height	Reflection Coefficient
Building	-75.08	100.45	6	0.9
-	-14.02	41.02		
-	-50.52	3.52		
-	-111.58	62.95		
Building-2	5.13	-20.13	15	0.9
-	63.36	31.02		
-	53.61	44.21		
-	-6.37	-7		
Building-3	53.38	43.98	15	0.9
-	75.36	15.4		
-	86.98	24.52		
-	65.12	52.72		
Building-4	-19.61	-18.39	15	0.9
-	7.98	-48.73		
-	21.24	-37.35		
-	-6.35	-7.01		
Building-5	135.27	73.16	18	0.9
-	108.98	56.39		
-	99.73	70.89		
-	126.02	87.66		
Building-6	102.82	66.4	18	0.9
-	95.73	62.39		
-	93.11	67.02		
-	100.2	71.03		
Building-7	98.76	69.26	18	0.9
-	95.61	62.27		
-	109.23	56.14		
-	112.38	63.13		
Building-8	126.79	77.58	18	0.9
-	134.6	73.89		
-	142.23	90.02		
-	134.42	93.71		
Building-9	129.37	81.73	18	0.9
-	125.86	87.52		
-	133.48	92.14		
-	136.99	86.35		

--- Configuration ---
Calculation Method ISO9613-2:2024 (New)
Hard Ground (Ground Factor = 0)
15.0°C Temperature
70% Humidity
Results are A-weighted
Second order reflections are included
Reflections are only considered at a distance of 1m or greater from a reflector (facade level)
ISO9613-2 barrier attenuation limit (20/25dB) is enabled
Vertical edges (lateral paths) are included
Limited to convex paths
Following ISO17534-3 recommendation 5.2
Ground reflections are not screened (as recommended in ISO17534-3 5.3)

--- Key ---

Lw	Sound Power Level (dB)
Lp	Sound Pressure Level (dB)
Ad	Distance attenuation (geometric divergence) ISO9613-2 (dB)
Ab	Barrier attenuation ISO9613-2 (dB)
Ag	Ground effect ISO9613-2 (dB)
Aa	Air absorption ISO9613-1 (dB)