Thornton Tomasetti

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Ottawa, Ontario

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NOISE IMPACT STUDY

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Reviewed By

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June 18, 2021

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1.0 Introduction

At the request of Figurr Architects Collective, on behalf of 12318407 CANADA INCORPORATED, Thornton Tomasetti Canada Inc. (TT) presents this Noise Impact Study (NIS) for the proposed 9-storey residential building (Project) to be located at 971 Montreal Road, Ottawa, Ontario. The building will have one level of underground parking. There are rooftop amenity areas located on the 7th floor (east side) and on the rooftop (mechanical penthouse - north side). The objective of this study is to determine the noise mitigation requirements for the Project to meet the noise guidelines of the City of Ottawa and the Ontario Ministry of the Environment, Conservation and Parks (MECP).

2.0 Site

A site plan for the Project and an aerial photo of the Project area are provided in Appendix A, Figure 1 and Figure 2. A zoning map of the project area is provided in Appendix A, Figure 3. The Project is located in a arterial mainstreet zone (zone AM, shown in Figure 3). West, east and north of the Project are other traditional mainstreet zones, whereas south of the project is a residential zones (R5C).

There is currently a restaurant and a surface parking lot occupying the Project site, which are to be removed.

3.0 Noise Sources

This NIS assesses noise impacts from nearby surface transportation and stationary sources on the Project. The surface transportation source impacting the Project is road traffic on Montreal Road. This roads is designated as an Urban Arterial road by Schedule E of the City of Ottawa Official Plan[1]. Of note, Burma Road was not included in this NIS as it is located over 100 metres away from the Project.

Based on site visits conducted by TT on June 17, 2021, and a review of satellite photos of the area, there is a significant stationary noise source located on the eastern rooftop of the neighbouring building located at 949 Montreal Road (west of the Project). The stationary source is a 4-fan air-cooled condenser unit located on the lower rooftop of 949 Montreal Road. Further details can be found in Section 5.0. No other significant stationary noise sources were observed nearby that may impact the Project.

4.0 Transportation Noise Assessment

The City of Ottawa requirements for environmental noise impact studies are outlined in the City's Environmental Noise Control Guidelines[2] (ENCG) and are based on the Ontario Ministry of the Environment, Conservation, and Parks (MECP) document Environmental Noise Guideline: Stationary and Transportation Sources – Approval and Planning[3] (NPC-300).

4.1 Surface Transportation Noise Assessment Criteria

Sound level limits outlined in ENCG for road traffic noise impacting on noise-sensitive areas applicable to the Project are summarized in Table 1. Sound level limits are given in A-weighted, equivalent sound levels (L_{eq}, dBA), defined in both ENCG and NPC-300.

Additionally, ENCG and NPC-300 provide requirements for building components, ventilation, and warning clauses to be used in sale and lease agreements. These requirements are based on calculated sound levels at OLAs and the plane-of-window of bedrooms and living/dining rooms. Sound level limits and associated requirements applicable to the Project are summarized in Table 2 and Table 3. Warning clause types are defined in NPC-300.

Table 1: Sound Level Limits for Noise-Sensitive Areas – Road Noise

Type of Space	Time Period	Maximum L_{eq} (dBA)
Outdoor Living Area	Daytime (07:00 to 23:00)	55
Living/dining, den areas of residences, hospitals, schools, etc. (indoor)	Daytime (07:00 to 23:00)	45
	Nighttime (23:00 to 07:00)	45
Sleeping quarters of residences (indoor)	Daytime (07:00 to 23:00)	45
	Nighttime (23:00 to 07:00)	40

Table 2: Building Component and Ventilation Requirements – Road Noise

Time Period	Sound Level, L_{eq} (dBA), at Bedroom or Living/Dining Room Plane-of-Window	Building Component Requirement	Ventilation Requirement
Daytime (07:00 – 23:00)	$55 < L_{eq} \leq 65$	Building components must be compliant with the Ontario Building Code (OBC)	Forced air heating with provision for central air conditioning
	$L_{eq} > 65$	Building components (walls, windows, etc.) should be designed to achieve indoor sound level criteria in Table 1	Central air conditioning
Nighttime (23:00 – 07:00)	$50 < L_{eq} \leq 60$	Building components must be compliant with the Ontario Building Code (OBC)	Forced air heating with provision for central air conditioning
	$L_{eq} > 60$	Building components (walls, windows, etc.) should be designed to achieve indoor sound level criteria in Table 1	Central air conditioning

Table 3: Warning Clause Requirements

Assessment Location	Time Period	Sound Level, L_{eq} (dBA)	Warning Clause Requirement
Bedroom or Living/Dining Room Plane-of-Window	Daytime (07:00 – 23:00)	$55 < L_{eq} \leq 65$	Type C Required
		$L_{eq} > 65$	Type D Required
	Nighttime (23:00 – 07:00)	$50 < L_{eq} \leq 60$	Type C Required
		$L_{eq} > 60$	Type D Required
Outdoor Living Areas	Daytime (07:00 – 23:00)	$55 < L_{eq} \leq 60$	If noise control measures are not provided, Type A is required
		$L_{eq} > 60$	Noise control measures must be provided to reduce levels to 60 dBA or lower; if resultant level is above 55 dBA, Type B is required

4.2 Points of Reception

Four points of reception (POR) were chosen at points on the building façade that are most exposed to the transportation noise source identified in Section 3.0. There are two rooftop amenity areas, one on the east portion of the 7th floor and another on the north portion of the rooftop, and each is considered an Outdoor Living Area (OLA), subject to the requirements of Table 1 and Table 3. Site plans showing the locations of the POR and the OLA are provided in Appendix A, Figure 4 and Figure 5. The locations of the PORs are summarized in Table 4.

Table 4: Points of Reception and Outdoor Living Areas

Point of Reception (POR)	Level	POR Height (m)	Location	Notes/Comments
POR 1	9	27.6	Southwest corner	Representative of sound levels on the plane-of-window areas of south- and southwest-facing rooms.
POR 2	9	27.6	Southeast corner	Representative of sound levels on the plane-of-window areas of southeast-facing rooms.
POR 3	9	27.6	West façade	Representative of sound levels on the plane-of-window areas of west-facing rooms.
POR 4	9	27.6	East façade	Representative of sound levels on the plane-of-window areas of east-facing rooms.
OLA 1	7	21.8	East Rooftop	Outdoor Living Area on 7th Floor.
OLA 2	Roof	31.1	North Rooftop	Outdoor Living Area on Rooftop (Mechanical Penthouse).

4.3 Road Traffic Noise Parameters

The "ultimate" road traffic data for the road traffic noise source identified in Section 3.0, including the Annual Average Daily Traffic (AADT), were obtained from the ENCG, based on the road classifications provided in the City of Ottawa Official Plan, and are summarized in Table 5.

Table 5: Traffic Parameters

Road Name	Implied Roadway Class	Speed Limit (km/h)	AADT (Vehicles per day)	Day/Night Split (%)	Medium Trucks (%)	Heavy Trucks (%)
Montreal Rd.	4-Lane Urban Arterial - Divided	60	35,000	92/8	7	5

4.4 Calculated Sound Levels

Sound levels were calculated at each POR using software developed by the MECP for the assessment of road and rail noise, STAMSON 5.04. Scaled site plans showing distances and angles used in STAMSON are provided in Appendix B, and details of these calculations are provided in Appendix C.

The calculated daytime and nighttime levels are presented in Table 6, along with the building component, ventilation, and warning clause requirements, as applicable.

For both OLAs, the Project building partially obstructs the amenity areas from Montreal Road. In both cases, this was modelled by TT as a noise barrier in STAMSON, with a height corresponding to the elevation height of the building elements surrounding the amenity area.

The sound level predictions were modelled with sound-reflective ground surfaces between the transportation corridor and the receptors.

Table 6: Calculated Sound Levels at PORs

POR	Daytime L_{eq} (dBA)	Nighttime L_{eq} (dBA)	Building Component Requirement	Ventilation Requirement	Warning Clause Requirement
POR 1	72	64	Building components designed to achieve indoor sound level criteria.	Central air conditioning	Type D
POR 2	71	64	Building components designed to achieve indoor sound level criteria.	Central air conditioning	Type D
POR 3	68	60	Building components designed to achieve indoor sound level criteria.	Central air conditioning	Type D
POR 4	64	57	OBC-compliant	Forced air heating with provision for central air conditioning	Type C
OLA 1	54	N/A	N/A	N/A	N/A
OLA 2	50	N/A	N/A	N/A	N/A

4.5 Noise Control Requirements

4.5.1 Building Component Requirements

Building components for all south- and west-facing residential units must be designed to achieve indoor sound level criteria. The sound transmission loss of the building façade glazing and wall components required to meet ENCG / MECP interior sound levels with the above-calculated outdoor sound levels were determined based on calculated building component percentages from the drawings. Of note, since the individual suite layouts have not yet been designed, TT's calculations assume typical bedroom

floor areas of 3m x 4m; should the final floor areas or glazing areas differ from these dimensions once developed, the building façade component requirements will need to be updated. The glazing and exterior wall minimum transmission losses, in terms of Sound Transmission Class (STC), are provided in Table 7.

Of note, the lower noise levels for a typical north- and east- facing residential unit (represented by POR 4 in Table 6) is such that any OBC-compliant building façade construction will meet the ENCG / MECP interior sound levels in those locations.

Table 7: Building Envelope Minimum Requirements

Component	Maximum Component Area Percentage Versus Floor Area of Room	Minimum STC Required
South-Facing Rooms and Southwest Corner Rooms in Residential Units		
Fixed Glazing	32%	35
Operable Glazing	16%	32
Exterior Wall	93%	41
Southeast Corner Rooms in Residential Units		
Fixed Glazing	32%	34
Operable Glazing	16%	31
Exterior Wall	93%	40
West-Facing Rooms in Residential Units		
Fixed Glazing	16%	28
Operable Glazing	16%	28
Exterior Wall	48%	34

Typical minimum constructions for exterior wall and glazing were determined to provide a basis for the final design and are presented below.

Exterior Wall

Wall assemblies in the exterior façade are required to meet a minimum of STC 41 in the worst-case locations (southwest corner), based on the calculated outdoor sound levels in Table 6. This can usually be achieved using typical constructions, such as EW2, described below:

- 12.7mm gypsum board;
- Vapour barrier;
- 38mm x 89mm studs;
- 50mm (or thicker) mineral wool or glass fibre batts in stud cavities;
- Rigid insulation (25-30mm);
- Wood siding (or metal siding on fibre backer board).

Of note, the Project's drawings currently show a brick veneer finish for all south- and west-facing residential unit facades. Constructions with this type of finish are expected to exceed the minimum building envelope requirement of STC 41.

Glazing

The minimum glazing requirements for each of the facades and types of units of the building are presented below. The glazing requirements are presented in the form 6 (13) 6 to denote 6 mm glass (13 mm airspace) 6 mm glass. Of note, operable glazing include glazed doors and patio doors.

- South-facing rooms and southwest corner rooms in residential units:
  - Fixed glazing – 6 (13) 6
  - Operable glazing – 6 (13) 6
- Southeast corner rooms in residential units:
  - Fixed glazing – 6 (6) 6
  - Operable glazing – 6 (6) 6
- West-facing rooms in residential units:
  - Fixed glazing – 2 (13) 2
  - Operable glazing – OBC-compliant glazing

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

4.5.2 Ventilation Requirements

For the residential units facing south and west, central air conditioning is required to be installed. For the residential units facing east, forced-air heating with provision for central air conditioning is required to be installed. If central air conditioning is being provided to all units, which we assume is the case, the ventilation requirements is met.

4.5.3 Outdoor Living Area Mitigation

Since the calculated noise levels at OLA 1 and OLA 2 are equal to or below 55 dBA, no noise mitigation measures are required.

4.5.4 Warning Clause Requirements

Per the ENCG, warning clause Type 'C' must be included in agreements of offers of purchase and sale, as well as any lease/rental agreements associated with residential units that face east for the Project. Sample wording from the ENCG have been adapted below for the Project.

WARNING CLAUSE TYPE 'C':

> "This dwelling unit has been designed with the provision for adding central air conditioning at the owner's discretion. Installation of central air conditioning by the owner 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."

Similarly, per the ENCG, warning clause Type 'D' must be included in agreements of offers of purchase and sale, as well as any lease/rental agreements associated with residential units that face south or west

for the Project. If central air conditioning is provided to all units, the Type 'D' warning clause is required for all units. Sample wording from the ENCG have been adapted below for the Project.

WARNING CLAUSE TYPE 'D':

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

5.0 Stationary Noise Source Assessment

As noted during a site visit undertaken by TT on June 17th 2021, there is a stationary noise source operated by the "Manoir Marochel" nursing home at 949 Montreal Road, which is the property directly adjacent to 971 Montreal Road. The stationary source is a 4-fan air-cooled condenser unit manufactured by RefPlus, located on the building's lower rooftop. The condenser unit could not be accessed for details regarding model and serial number, or for collection of nearfield noise level measurements. See Appendix A, Figure 6 for location of the condenser unit.

5.1 Noise Criteria for Stationary Noise Sources

The guidelines for assessing the noise impact of stationary noise sources on proposed noise sensitive areas in Ottawa are provided in the ENCG Part 1: Environmental Noise Control Guidelines for Land Use Planning, Section 3.0. Table 8 outlines the exclusionary noise criteria for stationary sources of noise at a noise-sensitive receptor in a Class 1 (Urban) area. A Class 1 area is an area with an acoustical environment typical of a major population centre, and accurately describes the Project location and surrounding area. The site-specific noise criteria for each time of day are either the value in Table 8 or the minimum hourly background noise level ($L_{EQ[1hr]}$), whichever is higher. Based on the site visit findings, it is not expected that the background noise levels near the northern façade of the Project (worst-case exposure to the existing stationary noise source at 949 Montreal Road) will exceed the values in Table 8 and thus the table limits apply as the maximum sound levels at all noise-sensitive receptors due to stationary noise sources.

Table 8: ENCG Exclusion Noise Level Limits – Stationary Noise Sources[1]

Time Period	Class 1 Area (Urban)	
	Plane of Window $L_{EQ(1hr)}$ (dBA)	Outdoor Point of Reception $L_{EQ(1hr)}$ (dBA)
Day-time (0700 – 1900)	50	50
Evening (1900 – 2300)	50	50
Night-time (2300 – 0700)	45	N/A

[1] Reference: ENCG Table 3.2a Guidelines for Stationary Noise – Steady and Varying Sound

5.1.1 Preliminary Sound Level Assessment

Preliminary noise level measurements were collected during the site visit at the northwest corner of 971 Montreal Road while the condenser unit was operating, and are given in Table 9. Some background

traffic noise from Montreal Road was audible during the measurement, but the condenser noise was the dominant/primary noise source. The measurement was collected north of the existing property line barrier, approximately 1.5m above the ground at about 14h45 and with line-of-sight to the condenser unit. This noise level measurement was used to estimate the condenser noise level at the Project's nearest façade (at 54 m from the unit) at approximately 59 dBA. This exceeds the 50 dBA limit during the daytime period, noted in Table 8.

Table 9: 949 Montreal Road RefPlus Condenser Measured Noise Level

Measurement Location	Distance from Source (m)	Sound Pressure Level (dB) at Octave Band (Hz)								Overall Sound Level (dBA)
		31.5	63	125	250	500	1000	2000	4000	8000
NW Corner of 971 Montreal Road Property	44	62	64	68	62	60	56	48	41	30	61

Further investigation of this stationary noise source is required in order to develop noise mitigation measures, and is expected to be addressed in an addendum to this report. The noise mitigation will be developed to meet the ENCG sound level limits for stationary sources at the Project.

6.0 Impact of the Project on Surrounding Area

Mechanical equipment within the Project may be considered as a stationary noise source which may impact nearby noise-sensitive areas. Mechanical equipment selections have not yet been made, precluding a detailed analysis at this time. The final mechanical design will be required to comply with ENCG sound level limits from a stationary source at all nearby noise-sensitive areas.

7.0 Concluding Comments

With the implementation of the proposed mitigation measures outlined in Section 4.5, along with the additional investigation outlined in Section 5.0 for the development of mitigation measures related to the condenser unit at 949 Montreal Road, the noise impact of the nearby noise sources on the Project is expected to meet the requirements of the City of Ottawa and the MECP. The proposed Project should therefore be approved from a noise perspective.

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

--------- End ---------

8.0 References

1. City of Ottawa. Official Plan, Schedule F – Central Area / Inner City Road Network, 2013.

2. City of Ottawa. Environmental Noise Control Guidelines, January 2016.

3. Ontario Ministry of the Environment and Climate Change. Environmental Noise Guideline, Stationary and Transportation Sources - Approval and Planning, Publication NPC-300, August 2013

4. City of Ottawa. geoOttawa, 2019. [Online]. Available: http://maps.ottawa.ca/geoottawa/. [Accessed: 28- January- 2021].

Appendix A - Site Plans

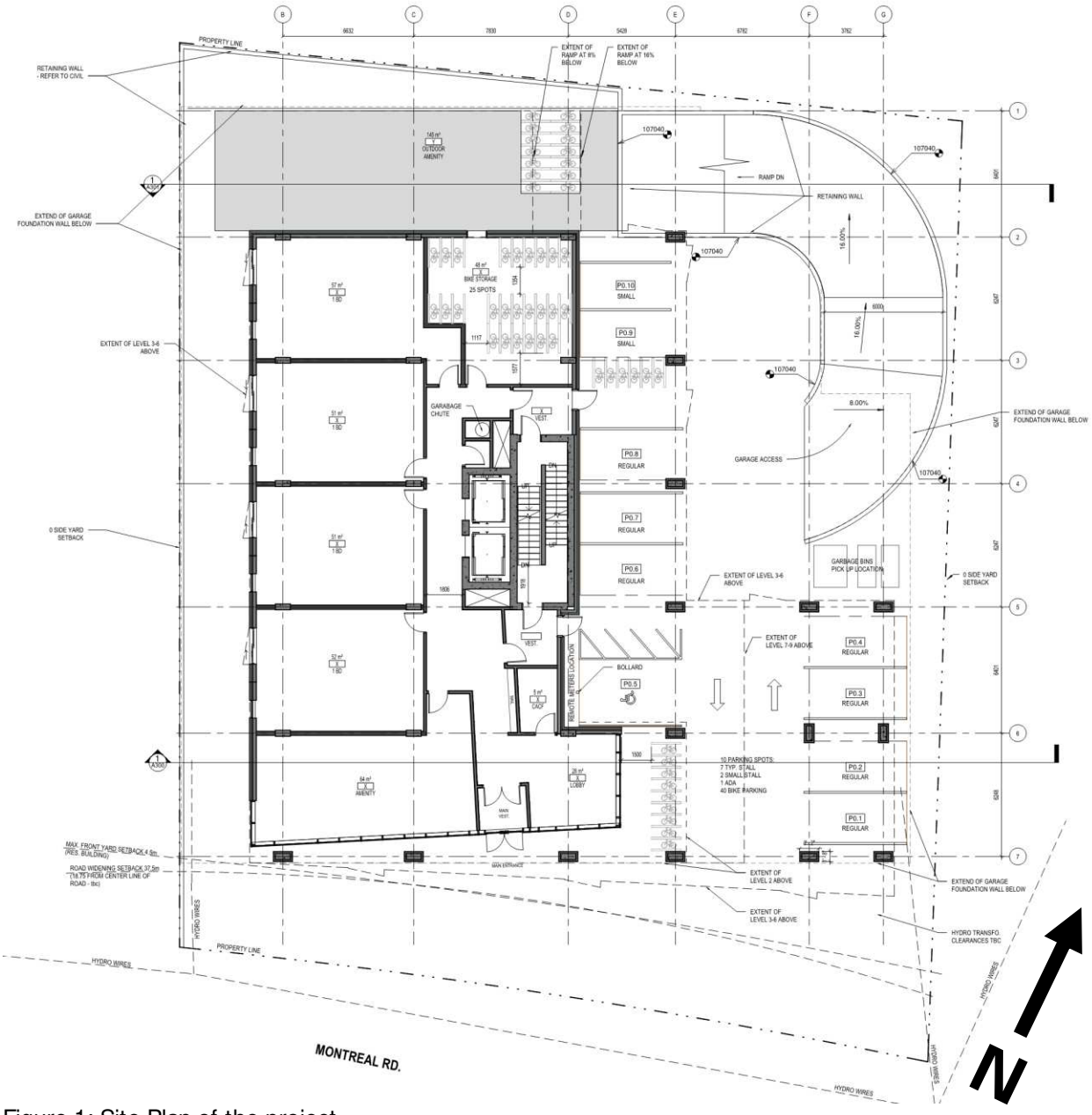

Figure 1: Site Plan of the project

Figure 2: Aerial view of the site and surroundings

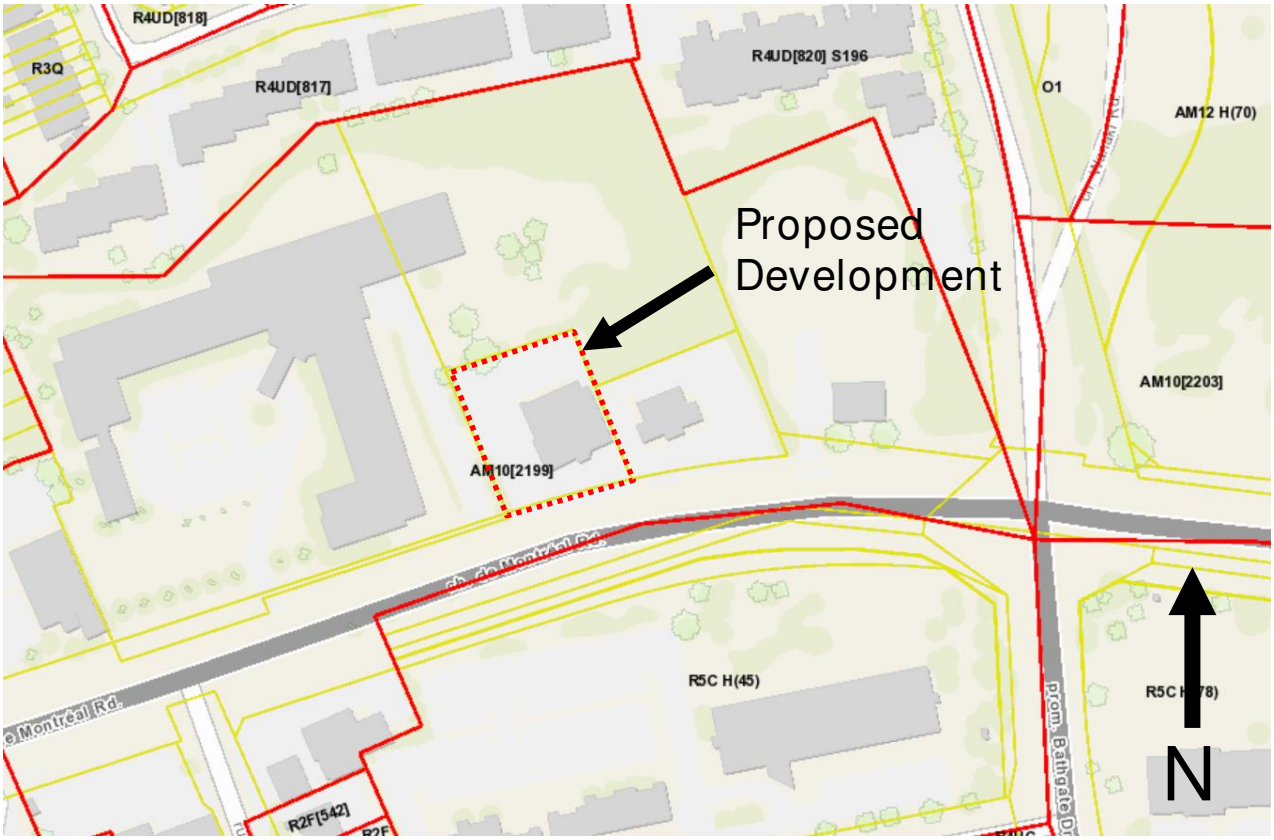

Figure 3: Zoning map of the project area[4]

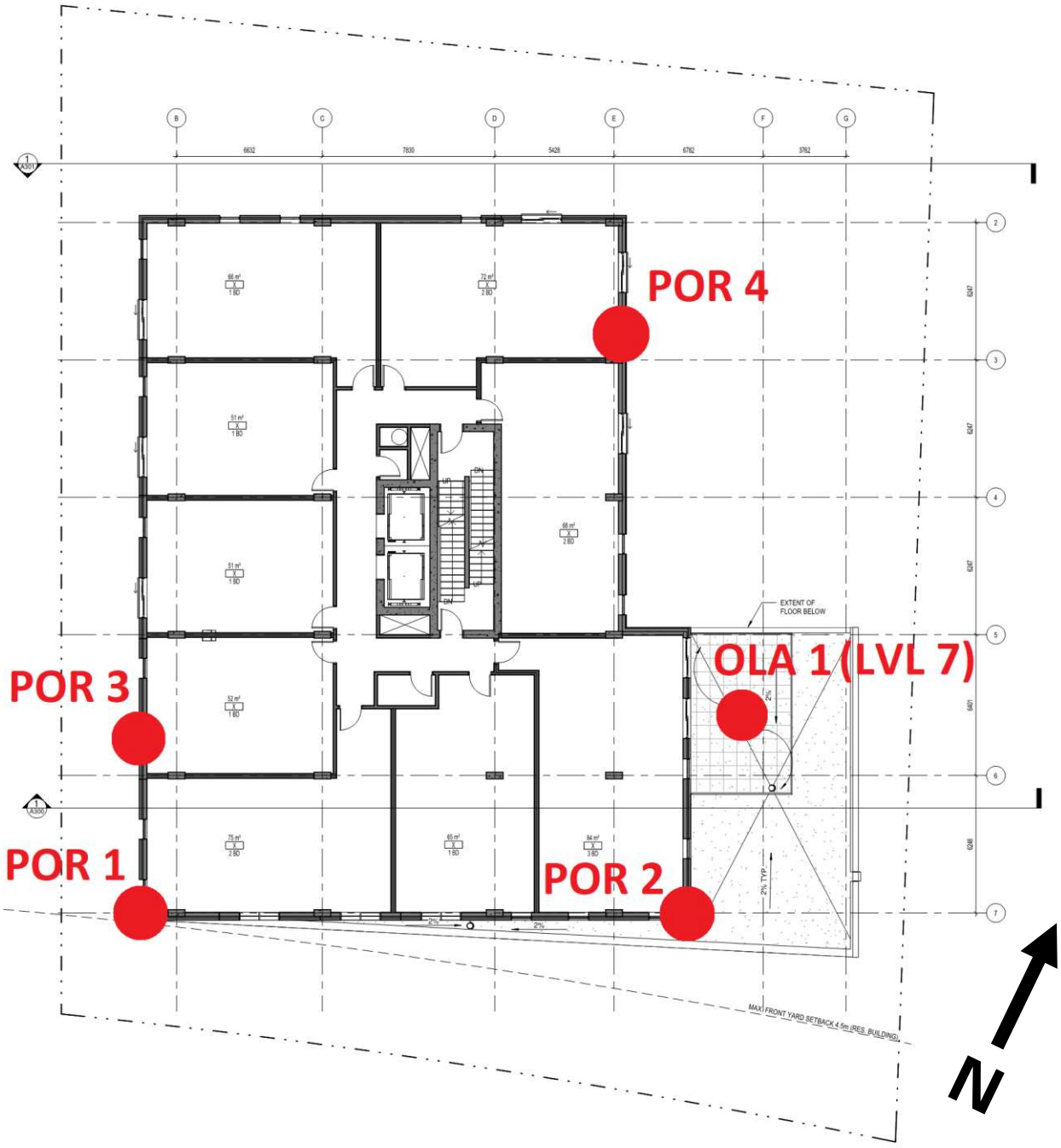

Figure 4: Points of Reception at the 9th Level. Outdoor Living Area "OLA 1" at 7th Level.

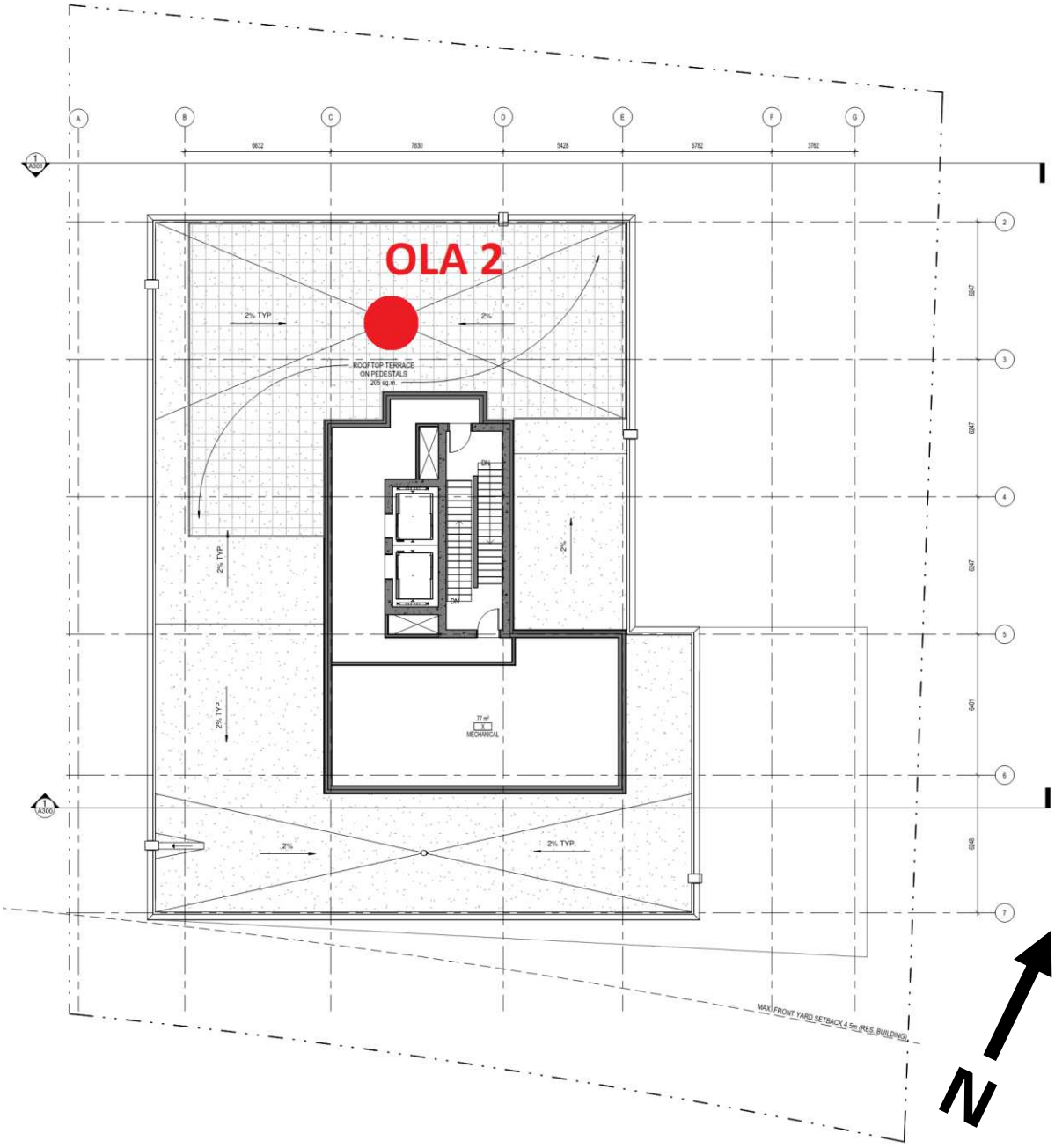

Figure 5: Outdoor Living Area "OLA 2" on rooftop level.

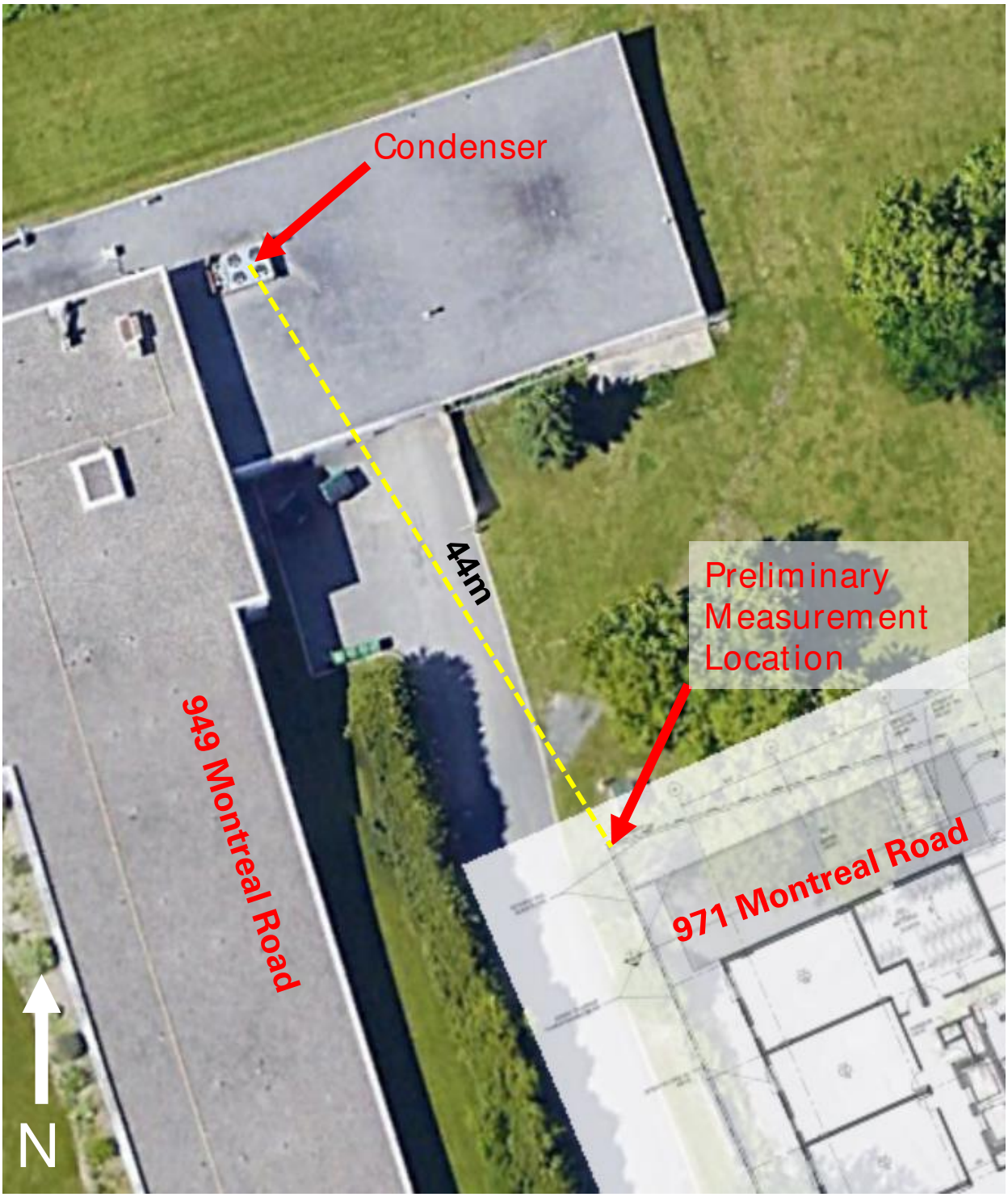

Figure 6: Location of condenser at 949 Montreal Road.

Appendix B - Distances and Angles Used in STAMSON 5.04

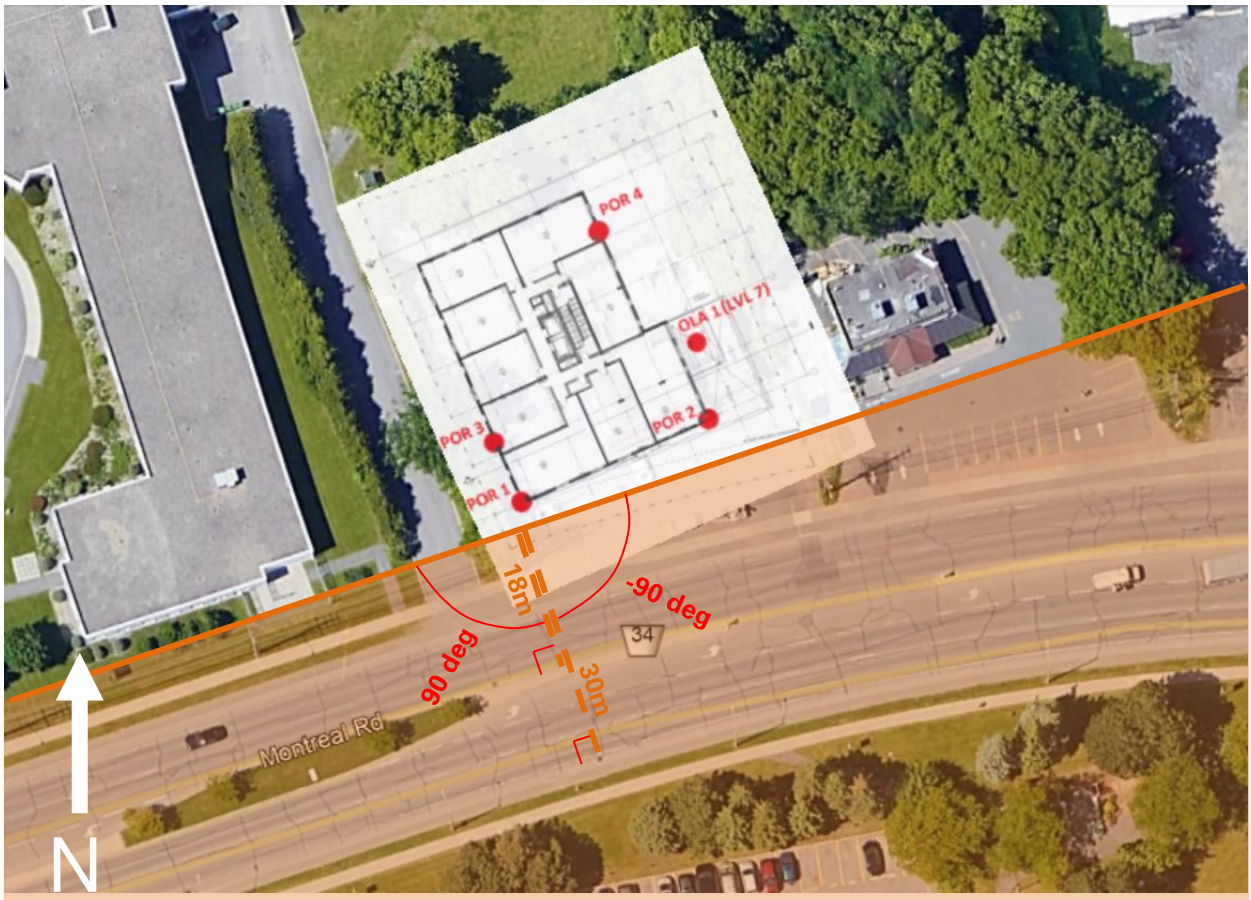

Figure 7: POR 1 distances and exposure angles to Montreal Road.

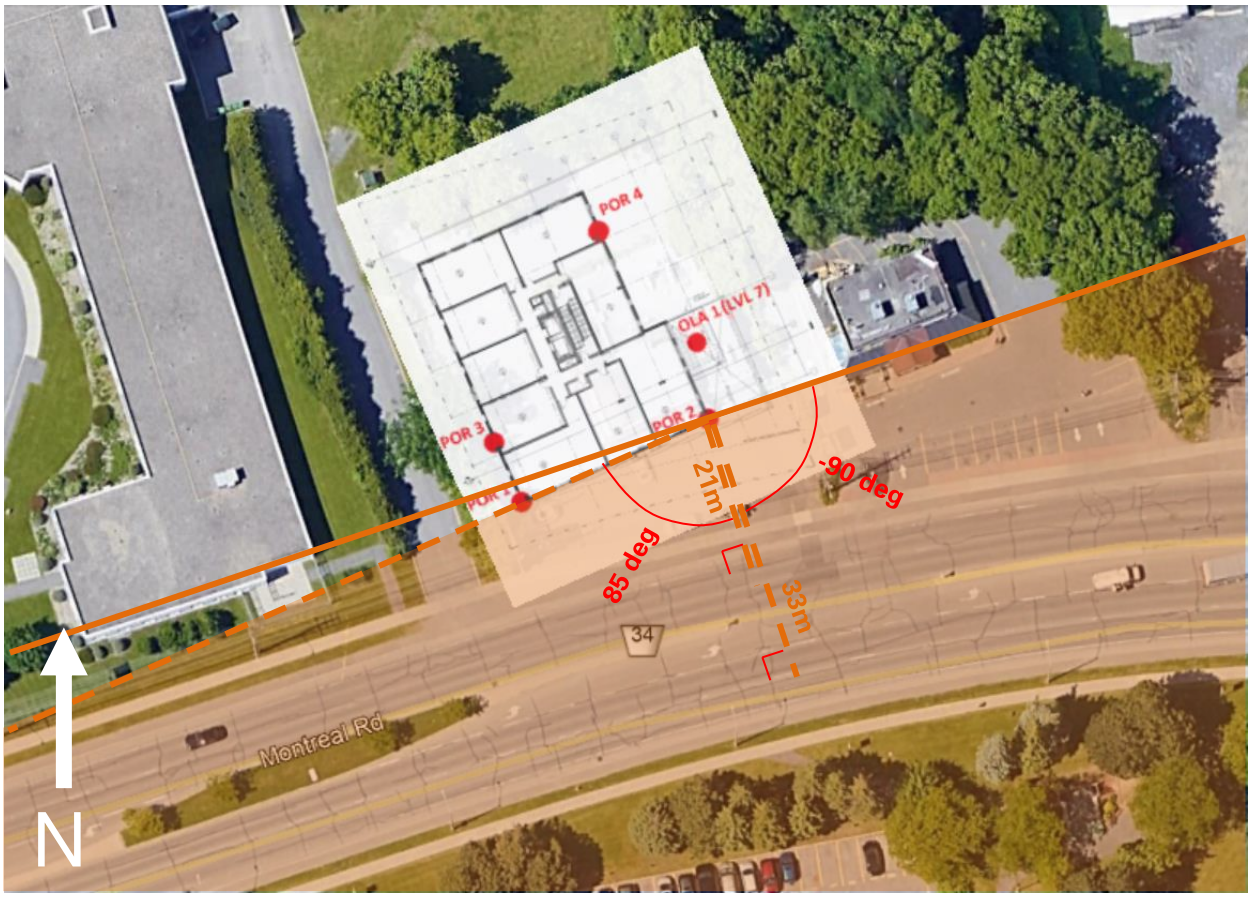

Figure 8: POR 2 distances and exposure angles to Montreal Road.

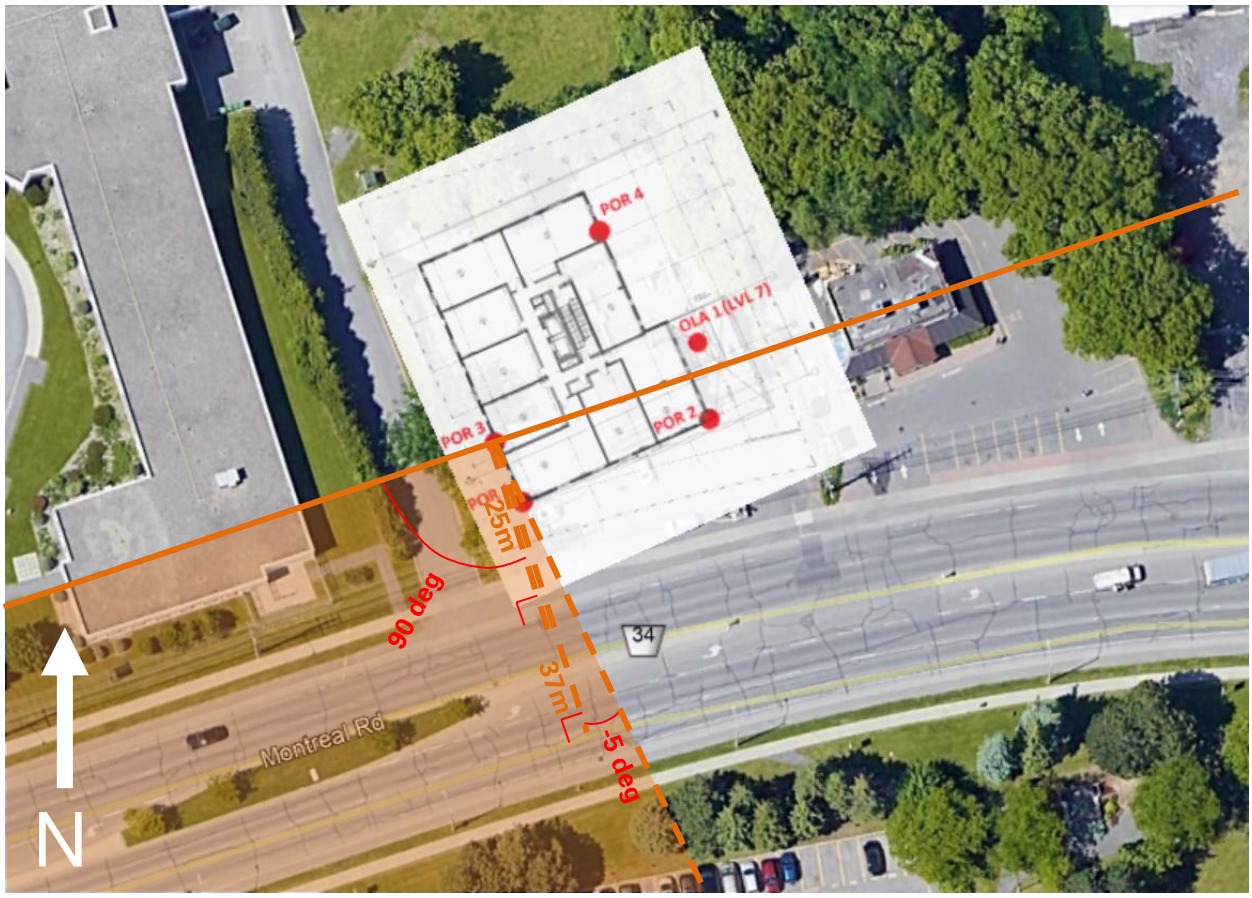

Figure 9: POR 3 distances and exposure angles to Montreal Road.

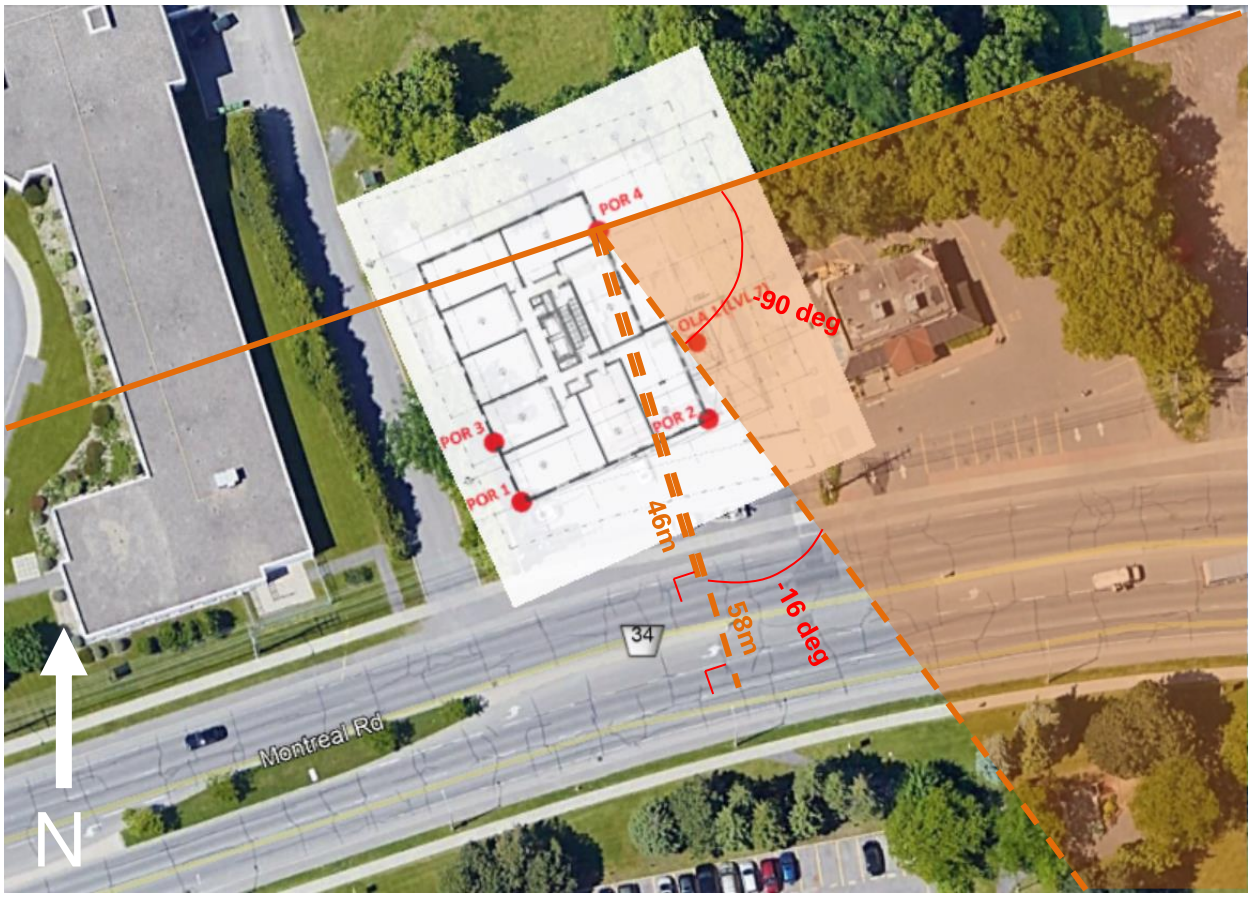

Figure 10: POR 4 distances and exposure angles to Montreal Road.

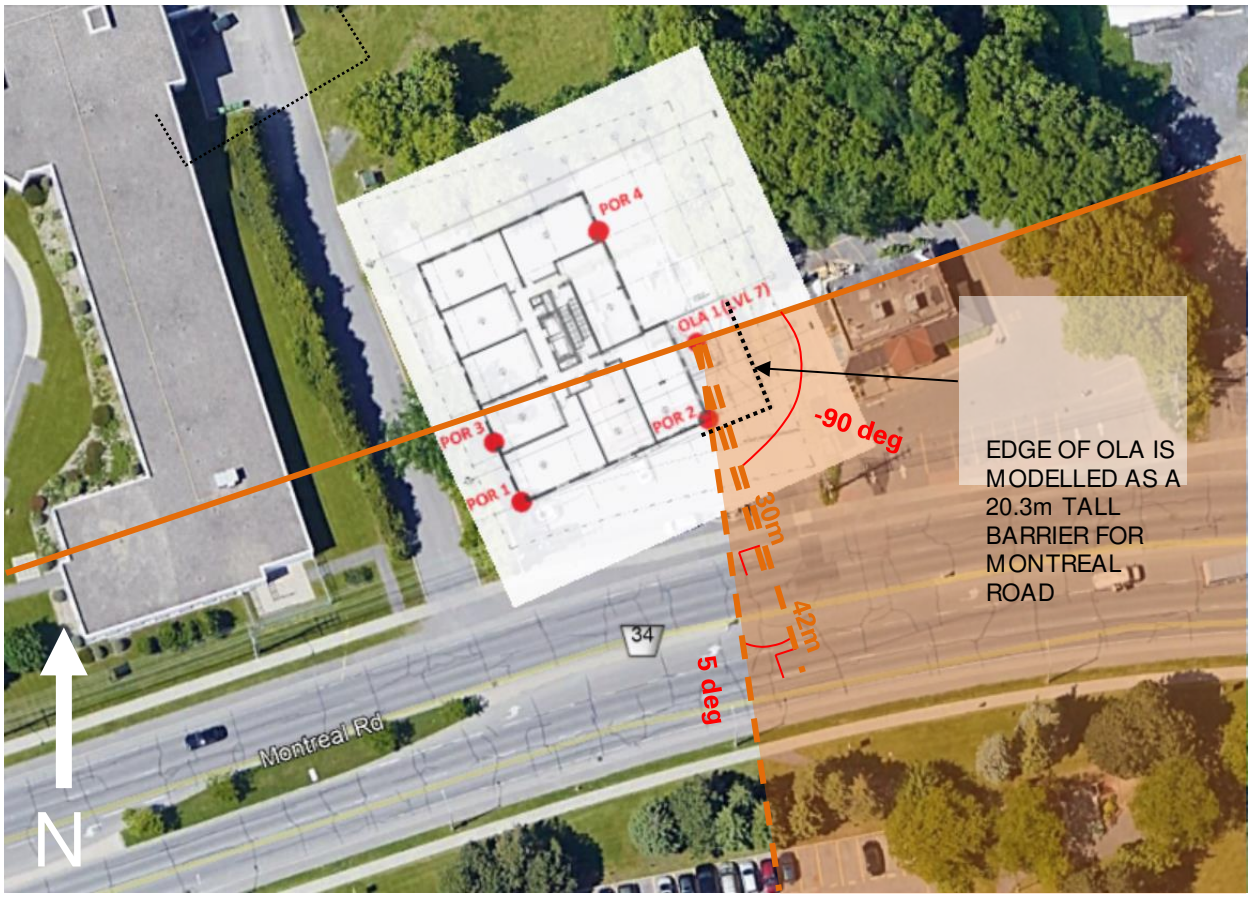

Figure 11: OLA 1 distances and exposure angles to Montreal Road.

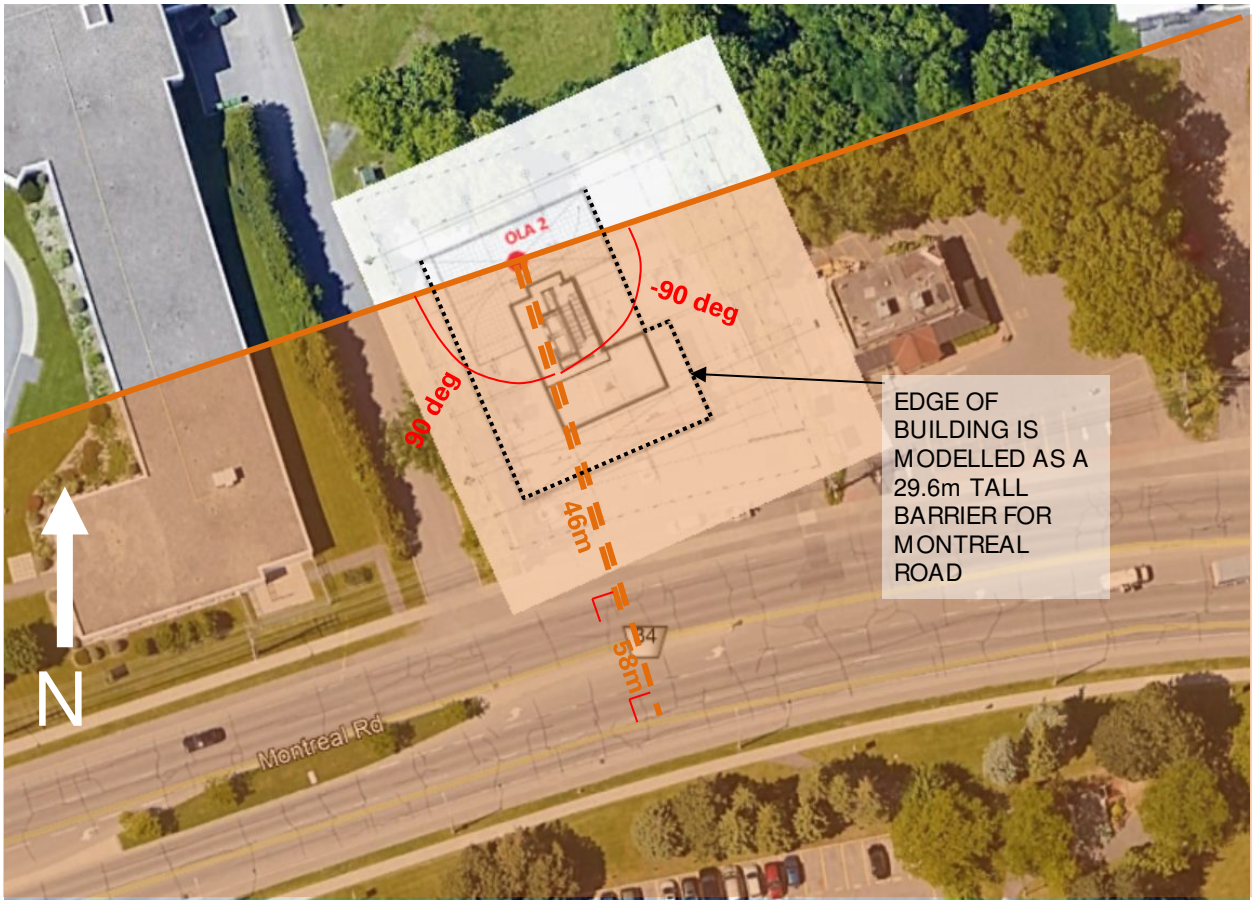

Figure 12: OLA 2 distances and exposure angles to Montreal Road.

Appendix C - STAMSON 5.04 Calculations

```
STAMSON 5.0        SUMMARY REPORT        Date: 17-06-2021 15:49:46
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 971m_p1.te           Time Period: Day/Night 16/8 hours
Description: Sound level predictions at POR1.


Road data, segment # 1: Montreal_EB (day/night)
-----------------------------------------------
Car traffic volume  : 14168/1232  veh/TimePeriod  *
Medium truck volume :  1127/98    veh/TimePeriod  *
Heavy truck volume  :   805/70    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):  17500
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: Montreal_EB (day/night)
---------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  30.00 / 30.00  m
Receiver height           :  27.60 / 27.60  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Road data, segment # 2: Montreal_WB (day/night)
-----------------------------------------------
Car traffic volume  : 14168/1232  veh/TimePeriod  *
Medium truck volume :  1127/98    veh/TimePeriod  *
Heavy truck volume  :   805/70    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):  17500
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00
```

```
Data for Segment # 2: Montreal_WB (day/night)
-----------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  18.00 / 18.00  m
Receiver height           :  27.60 / 27.60  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Result summary (day)
--------------------

                     !  source  !   Road   !  Total
                     !  height  !   Leq    !   Leq
                     !   (m)    !  (dBA)   !  (dBA)
--------------------+----------+----------+----------
 1.Montreal_EB       !     1.50 !    67.66 !    67.66
 2.Montreal_WB       !     1.50 !    69.87 !    69.87
--------------------+----------+----------+----------
                       Total                  71.91 dBA


Result summary (night)
----------------------

                     !  source  !   Road   !  Total
                     !  height  !   Leq    !   Leq
                     !   (m)    !  (dBA)   !  (dBA)
--------------------+----------+----------+----------
 1.Montreal_EB       !     1.50 !    60.06 !    60.06
 2.Montreal_WB       !     1.50 !    62.28 !    62.28
--------------------+----------+----------+----------
                       Total                  64.32 dBA


TOTAL Leq FROM ALL SOURCES (DAY): 71.91
                           (NIGHT): 64.32
```

```
STAMSON 5.0        SUMMARY REPORT        Date: 17-06-2021 15:51:10
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 971m_p2.te           Time Period: Day/Night 16/8 hours
Description: Sound level predictions at POR2.


Road data, segment # 1: Montreal_EB (day/night)
-----------------------------------------------
Car traffic volume  : 14168/1232  veh/TimePeriod  *
Medium truck volume :  1127/98    veh/TimePeriod  *
Heavy truck volume  :   805/70    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):  17500
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: Montreal_EB (day/night)
---------------------------------------------
Angle1   Angle2           : -90.00 deg   85.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  33.00 / 33.00  m
Receiver height           :  27.60 / 27.60  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Road data, segment # 2: Montreal_WB (day/night)
-----------------------------------------------
Car traffic volume  : 14168/1232  veh/TimePeriod  *
Medium truck volume :  1127/98    veh/TimePeriod  *
Heavy truck volume  :   805/70    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):  17500
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 2: Montreal_WB (day/night)
---------------------------------------------
```

```
Angle1   Angle2           : -90.00 deg   85.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  21.00 / 21.00  m
Receiver height           :  27.60 / 27.60  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

Result summary (day)

	source height (m)	Road Leq (dBA)	Total Leq (dBA)
1.Montreal_EB	1.50	67.12	67.12
2.Montreal_WB	1.50	69.08	69.08
Total			71.22 dBA

Result summary (night)

	source height (m)	Road Leq (dBA)	Total Leq (dBA)
1.Montreal_EB	1.50	59.52	59.52
2.Montreal_WB	1.50	61.49	61.49
Total			63.63 dBA

```
TOTAL Leq FROM ALL SOURCES (DAY): 71.22
                           (NIGHT): 63.63
```

```
STAMSON 5.0        SUMMARY REPORT        Date: 17-06-2021 15:48:41
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 971m_p3.te           Time Period: Day/Night 16/8 hours
Description: Sound level predictions at POR3.


Road data, segment # 1: Montreal_EB (day/night)
-----------------------------------------------
Car traffic volume  : 14168/1232  veh/TimePeriod  *
Medium truck volume :  1127/98    veh/TimePeriod  *
Heavy truck volume  :   805/70    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):  17500
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: Montreal_EB (day/night)
---------------------------------------------
Angle1   Angle2           :  -5.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  37.00 / 37.00  m
Receiver height           :  27.60 / 27.60  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Road data, segment # 2: Montreal_WB (day/night)
-----------------------------------------------
Car traffic volume  : 14168/1232  veh/TimePeriod  *
Medium truck volume :  1127/98    veh/TimePeriod  *
Heavy truck volume  :   805/70    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):  17500
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 2: Montreal_WB (day/night)
---------------------------------------------
```

```
Angle1   Angle2           :  -5.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  25.00 / 25.00  m
Receiver height           :  27.60 / 27.60  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

Result summary (day)

	source height (m)	Road Leq (dBA)	Total Leq (dBA)
1.Montreal_EB	1.50	63.97	63.97
2.Montreal_WB	1.50	65.67	65.67
Total			67.91 dBA

Result summary (night)

	source height (m)	Road Leq (dBA)	Total Leq (dBA)
1.Montreal_EB	1.50	56.37	56.37
2.Montreal_WB	1.50	58.08	58.08
Total			60.32 dBA

```
TOTAL Leq FROM ALL SOURCES (DAY): 67.91
                           (NIGHT): 60.32
```

```
STAMSON 5.0        SUMMARY REPORT        Date: 17-06-2021 15:58:33
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 971m_p4.te           Time Period: Day/Night 16/8 hours
Description: Sound level predictions at POR4.


Road data, segment # 1: Montreal_EB (day/night)
-----------------------------------------------
Car traffic volume  : 14168/1232  veh/TimePeriod  *
Medium truck volume :  1127/98    veh/TimePeriod  *
Heavy truck volume  :   805/70    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):  17500
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: Montreal_EB (day/night)
---------------------------------------------
Angle1   Angle2           : -90.00 deg   -16.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  58.00 / 58.00  m
Receiver height           :  27.60 / 27.60  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Road data, segment # 2: Montreal_WB (day/night)
-----------------------------------------------
Car traffic volume  : 14168/1232  veh/TimePeriod  *
Medium truck volume :  1127/98    veh/TimePeriod  *
Heavy truck volume  :   805/70    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):  17500
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 2: Montreal_WB (day/night)
---------------------------------------------
```

```
Angle1   Angle2           : -90.00 deg   -16.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  46.00 / 46.00  m
Receiver height           :  27.60 / 27.60  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

Result summary (day)

	source height (m)	Road Leq (dBA)	Total Leq (dBA)
1.Montreal_EB	1.50	60.93	60.93
2.Montreal_WB	1.50	61.94	61.94
Total			64.47 dBA

Result summary (night)

	source height (m)	Road Leq (dBA)	Total Leq (dBA)
1.Montreal_EB	1.50	53.34	53.34
2.Montreal_WB	1.50	54.34	54.34
Total			56.88 dBA

```
TOTAL Leq FROM ALL SOURCES (DAY): 64.47
                           (NIGHT): 56.88
```

```
STAMSON 5.0        SUMMARY REPORT        Date: 17-06-2021 22:14:58
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 971m_o1.te           Time Period: Day/Night 16/8 hours
Description: Sound level prediction at OLA 1.


Road data, segment # 1: Montreal_EB (day/night)
-----------------------------------------------
Car traffic volume  : 14168/1232  veh/TimePeriod  *
Medium truck volume :  1127/98    veh/TimePeriod  *
Heavy truck volume  :   805/70    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):  17500
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: Montreal_EB (day/night)
---------------------------------------------
Angle1   Angle2           : -90.00 deg   5.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  42.00 / 42.00  m
Receiver height           :  21.80 / 21.80  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 5.00 deg
Barrier height            :  20.30 m
Barrier receiver distance :  10.00 / 10.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Road data, segment # 2: Montreal_WB (day/night)
-----------------------------------------------
Car traffic volume  : 14168/1232  veh/TimePeriod  *
Medium truck volume :  1127/98    veh/TimePeriod  *
Heavy truck volume  :   805/70    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):  17500
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
```

```
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 2: Montreal_WB (day/night)
-----------------------------------------------
Angle1   Angle2           : -90.00 deg   5.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  30.00 / 30.00  m
Receiver height           :  21.80 / 21.80  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 5.00 deg
Barrier height            :  20.30 m
Barrier receiver distance :  10.00 / 10.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Result summary (day)
--------------------

                    !  source  !   Road   !  Total
                    !  height  !   Leq    !   Leq
                    !   (m)    !  (dBA)   !  (dBA)
--------------------+----------+----------+----------
 1.Montreal_EB      !     1.50 !    51.47 !    51.47
 2.Montreal_WB      !     1.50 !    50.21 !    50.21
--------------------+----------+----------+----------
                      Total                  53.90 dBA


Result summary (night)
----------------------

                    !  source  !   Road   !  Total
                    !  height  !   Leq    !   Leq
                    !   (m)    !  (dBA)   !  (dBA)
--------------------+----------+----------+----------
 1.Montreal_EB      !     1.50 !    43.88 !    43.88
 2.Montreal_WB      !     1.50 !    42.61 !    42.61
--------------------+----------+----------+----------
                      Total                  46.30 dBA


TOTAL Leq FROM ALL SOURCES (DAY): 53.90
                           (NIGHT): 46.30
```

```
STAMSON 5.0        SUMMARY REPORT        Date: 18-06-2021 11:42:49
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 971m_o2.te           Time Period: Day/Night 16/8 hours
Description: Sound level prediction at OLA 2.


Road data, segment # 1: Montreal_EB (day/night)
-----------------------------------------------
Car traffic volume  : 14168/1232  veh/TimePeriod  *
Medium truck volume :  1127/98    veh/TimePeriod  *
Heavy truck volume  :   805/70    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):  17500
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: Montreal_EB (day/night)
---------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  58.00 / 58.00  m
Receiver height           :  31.10 / 31.10  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :  29.60 m
Barrier receiver distance :  27.50 / 27.50  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Road data, segment # 2: Montreal_WB (day/night)
-----------------------------------------------
Car traffic volume  : 14168/1232  veh/TimePeriod  *
Medium truck volume :  1127/98    veh/TimePeriod  *
Heavy truck volume  :   805/70    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):  17500
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
```

```
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 2: Montreal_WB (day/night)
-----------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  46.00 / 46.00  m
Receiver height           :  31.10 / 31.10  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :  29.60 m
Barrier receiver distance :  27.50 / 27.50  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Result summary (day)
--------------------

                    !  source  !   Road   !  Total
                    !  height  !   Leq    !   Leq
                    !   (m)    !  (dBA)   !  (dBA)
--------------------+----------+----------+----------
 1.Montreal_EB      !     1.50 !    47.38 !    47.38
 2.Montreal_WB      !     1.50 !    47.52 !    47.52
--------------------+----------+----------+----------
                      Total                  50.46 dBA


Result summary (night)
----------------------

                    !  source  !   Road   !  Total
                    !  height  !   Leq    !   Leq
                    !   (m)    !  (dBA)   !  (dBA)
--------------------+----------+----------+----------
 1.Montreal_EB      !     1.50 !    39.78 !    39.78
 2.Montreal_WB      !     1.50 !    39.93 !    39.93
--------------------+----------+----------+----------
                      Total                  42.87 dBA


TOTAL Leq FROM ALL SOURCES (DAY): 50.46
                           (NIGHT): 42.87
```