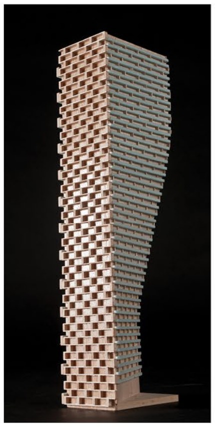
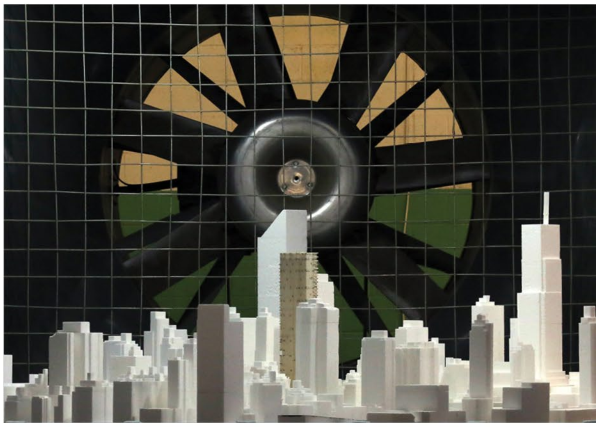
TRANSPORTATION NOISE STUDY

82 Colonnade Road North
Ottawa, Ontario

REPORT: 26-089 – Transportation Noise Study





June 9, 2026

PREPARED FOR
Redeemer Christian High School
82 Colonnade Road
Ottawa, ON K2E 7L2

PREPARED BY
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EXECUTIVE SUMMARY

This report describes a transportation noise study performed for a proposed addition to a private christian highscool located at 82 Colonnade Road North in Ottawa, Ontario.

The major sources of transportation noise associated with the site are Colonnade Road North and aircraft noise generated by the Ottawa MacDonald-Cartier International Airport. The site is located on Colonnade Road North, which is classified as a 2-lane major collector roadway in Ottawa's Offical Plan (Schedule - C4).

The assessment is based on (i) theoretical noise prediction methods that conform to the Ministry of the Environment, Conservation and Parks (MECP) and City of Ottawa requirements; (ii) noise level criteria as specified by the City of Ottawa's Environmental Noise Control Guidelines (ENCG); and (iii) architectural drawings prepared by Vandendberg & Wildeboer Architects in May 2026

The results of the current analysis indicate that noise levels will range between 65 and 66 dBA during the daytime period (07:00-23:00) and between 55 and 59 dBA during the nighttime period (23:00-07:00). The highest noise level (66 dBA) occurs at the north façade, which is most exposed and closest to Colonnade Road North. The indoor noise calculations summarized in Section 5.3.1 show that the combined impact of the roadway and aircraft noise result in the minimum required STC rating for windows on all façades to be 30.

The development will incorporate central air conditioning, or similar mechanical ventilation, which will allow occupants to keep windows closed to maintain a comfortable indoor environment. Type D and Aircraft Noise Warning Clauses, as summarized in Section 6, will also be required to be placed on all Lease, Purchase and Sale Agreements.

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1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Redeemer Christian High School to undertake a transportation noise study in support of a Site Plan Application (SPA) for the proposed development located at 82 Colonnade Road North in Ottawa, Ontario. This report summarizes the methodology, results, and recommendations related to the assessment of exterior and interior noise levels generated by local transportation noise sources.

Our work is based on theoretical noise calculation methods conforming to the City of Ottawa[1] and Ministry of the Environment, Conservation and Parks (MECP)[2] guidelines. Noise calculations were based on architectural drawings provided by Vandenberg & Wildeboer Architects in May 2026, with future traffic volumes corresponding to the City of Ottawa's Official Plan (OP) roadway classifications.

2. TERMS OF REFERENCE

The focus of this Transportation Noise Study is the proposed addition for the educational facility located at 82 Colonnade Road North in Ottawa, Ontario. The main source of roadway transportation noise is Colonnade Road North, a 2-lane major collector directly to the north of the subject site. As the subject site is also within the NEF/NEP-25 contour of the Ottawa MacDonald-Cartier International Airport (YOW), aircraft noise generated by the airport is also considered.

The proposed additions include an extension to the cafeteria to the north on the ground floor, and a 2-storey addition. The cafeteria expansion has an irregular arc planform and will have an area of 123 m^2. The proposed 2-storey rectangular addition will have an area of 698 m^2 north of the existing gym. The 2-storey expansion includes classrooms, a reception, and staff rooms at grade, and additional classrooms and a library at Level 2.

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[1] City of Ottawa Environmental Noise Control Guidelines, January 2016
[2] Ontario Ministry of the Environment and Climate Change – Environmental Noise Guidelines, Publication NPC-300, Queens Printer for Ontario, Toronto, 2013

3. OBJECTIVES

The principal objectives of this study are to (i) calculate the future noise levels on the study building produced by local roadway traffic, (ii) predict noise levels on the study building produced by aircraft flyover, and (iii) ensure that interior and exterior noise and vibration levels do not exceed the allowable limits specified by the City of Ottawa's Environmental Noise Control Guidelines as outlined in Section 4.2.

4. METHODOLOGY

4.1 Background

Noise can be defined as any obtrusive sound. It is created at a source, transmitted through a medium, such as air, and intercepted by a receiver. Noise may be characterized in terms of the power of the source or the sound pressure at a specific distance. While the power of a source is characteristic of that particular source, the sound pressure depends on the location of the receiver and the path that the noise takes to reach the receiver. Measurement of noise is based on the decibel unit, dBA, which is a logarithmic ratio referenced to a standard noise level (2×10^{-5} Pascals). The 'A' suffix refers to a weighting scale, which better represents how the noise is perceived by the human ear. With this scale, a doubling of power results in a 3 dBA increase in measured noise levels and is just perceptible to most people. An increase of 10 dBA is often perceived to be twice as loud.

4.2 Roadway Traffic Noise

4.2.1 Criteria for Roadway Traffic Noise

For surface roadway traffic noise, the equivalent sound energy level, L_{eq}, provides a measure of the time-varying noise levels, which is well correlated with the annoyance of sound. It is defined as the continuous sound level, which has the same energy as a time-varying noise level over a period of time. For roadways, the L_{eq} is commonly calculated on the basis of a 16-hour (L_{eq16}) daytime (07:00-23:00) / 8-hour (L_{eq8}) nighttime (23:00-07:00) split to assess its impact on residential buildings. The City of Ottawa's Environmental Noise Control Guidelines (ENCG) specifies that the recommended indoor noise limit range (that is relevant to this study) is 45 dBA for schools as listed in Table 1. Based on Gradient Wind's experience, more comfortable indoor noise levels should be targeted, towards 42 dBA, , to control peak noise and deficiencies in building envelope construction.

TABLE 1: INDOOR SOUND LEVEL CRITERIA (ROAD) [3]

Type of Space	Time Period	L_{eq} (dBA)
General offices, reception areas, retail stores, etc.	07:00 – 23:00	50
Living/dining/den areas of residences, hospitals, **schools**, nursing/retirement homes, day-care centres, theatres, places of worship, libraries, individual or semi-private offices, conference rooms, etc.	07:00 – 23:00	45
Sleeping quarters of hotels/motels	23:00 – 07:00	45
Sleeping quarters of residences, hospitals, nursing/retirement homes, etc.	23:00 – 07:00	40

Predicted noise levels at the plane of window (POW) dictate the action required to achieve the recommended sound levels. An open window is considered to provide a 10 dBA reduction in noise, while a standard closed window is capable of providing a minimum 20 dBA noise reduction[4]. A closed window due to a ventilation requirement will bring noise levels down to achieve an acceptable indoor environment[5]. Therefore, where noise levels exceed 55 dBA daytime and 50 dBA nighttime, the ventilation for the building should consider the need for having windows and doors closed, which triggers the need for forced air heating with provision for central air conditioning. Where noise levels exceed 65 dBA daytime and 60 dBA nighttime, air conditioning will be required and building components will require higher levels of sound attenuation[6].

4.2.2 Theoretical Roadway Noise Predictions

Noise predictions were performed with the aid of the MECP computerized noise assessment program, STAMSON 5.04, for road analysis. Appendix A includes the STAMSON 5.04 input and output data. Roadway traffic noise calculations were performed by treating each roadway segment as separate line sources of noise. In addition to the traffic volumes summarized in Table 2, theoretical noise predictions were based on the following parameters:

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[3] Adapted from ENCG 2016 – Tables 2.2b and 2.2c
[4] Burberry, P.B. (2014). Mitchell's Environment and Services. Routledge, Page 125
[5] MOECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.8
[6] MOECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.1.3

- Truck traffic on all roadways was taken to comprise 5% heavy trucks and 7% medium trucks, as per ENCG requirements for noise level predictions.
- The day/night split for all streets was taken to be 92%/8%, respectively.
- Ground surfaces were taken to be reflective due to the presence of hard (paved) ground.
- Topography was assumed to be a flat/gentle slope surrounding the study building.
- Noise receptors were strategically placed at 4 locations around the study area (see Figure 2).

4.2.1 Transportation Traffic Volumes

The ENCG dictates that noise calculations should consider future sound levels based on a roadway's classification at the mature state of development. Therefore, traffic volumes are based on the roadway classifications outlined in the City of Ottawa's Official Plan (OP) and Transportation Master Plan[7] which provide additional details on future roadway expansions. Average Annual Daily Traffic (AADT) volumes are then based on data in Table B1 of the ENCG for each roadway classification. Table 2 (below) summarizes the AADT values used for each roadway included in this assessment.

TABLE 2: TRANSPORTATION TRAFFIC DATA

Segment	Roadway Traffic Data	Speed Limit (km/h)	AADT
Colonnade Road N	2-Lane MajorCollector (2-UMCU)	60	**12,000**

[7] City of Ottawa Transportation Master Plan, November 2013

4.3 Aircraft Noise

4.3.1 Criteria for Aircraft Noise

The ENCG outlines the sound level criteria for aircraft noise based on a site's location near the Ottawa International Airport. The Ottawa Airport Vicinity Development Zone (OAVDZ) is a zone around the airport defined by NEF/NEP contour lines that follow fixed features, such as roads or lot boundaries. NEF/NEP contours reflect the predetermined noise levels which would impact sensitive areas around airports. These contours include the influences of noise levels from aircraft flight, take-off, and ground operations to specific urban areas. Noise generated from aircraft traffic is represented as Effective Perceived Noise Levels (EPNL), a unit of noise measurement that accounts for variations in the human perception of pure tones and noise duration. Recorded noise levels are plotted geographically to generate NEF/NEP contour maps, where lower NEF/NEP levels correspond to lower average outdoor noise levels. The Ottawa Airport Vicinity Development Zone (OAVDZ) represents the 25 NEF/NEP contour. The Ottawa Airport Operating Influence Zone (OAOIZ) represents the NEF/NEP 30 contour, where commercial air traffic may negatively influence noise-sensitive developments. Within the OAOIZ, noise-sensitive development is not permitted, although infill and redevelopment may occur in specific areas within the zone in keeping with the criteria set out in the Official Plan.

According to accepted research[8], Health and Welfare Canada states that people continuously exposed to NEF/NEP values less than 35 will not suffer adverse physical or psychological effects. Sociological surveys[9] have indicated that negative community reactions to noise levels may start at about 25 NEF/NEP. Table 3 identifies the sound level criteria for relevant outdoor and indoor living spaces exposed to aircraft noise. Table 4.2a in Ottawa's ENCG states that the limit for a school is an indoor NEF/NEP of 5.

[8] Report of the Special Meeting on Aircraft Noise in the Vicinity of Aerodromes, Montreal ICAO, 1969.
[9] Noise in Urban and Suburban Areas. Bolt, Beanik and Newman, Inc., Washington, January 1967.

TABLE 3: OUTDOOR AND INDOOR AIRCRAFT SOUND LEVEL CRITERIA[10]

Type of Space	NEF/NEP	Approximate $L_{eq}(24)$
Outdoor Point of Reception	30	62 dBA
General offices, reception areas, retail stores, etc.	15	47 dBA
Individual or semi-private offices, conference rooms, etc.	10	42 dBA
Living/dining areas of residences, sleeping quarters in hotels/motels, theatres, libraries, **schools**, day-care centres, places of worship, etc.	5	37 dBA
Sleeping quarters of residences, hospitals, nursing/retirement homes, etc.	0	32 dBA

4.4 Indoor Noise Calculations

The difference between outdoor and indoor noise levels is the noise attenuation provided by the building envelope. According to common industry practice, complete walls and individual wall elements are rated according to the Sound Transmission Class (STC). The STC ratings of common residential walls built in conformance with the Ontario Building Code (OBC, 2024) typically exceed STC 35, depending on exterior cladding, thickness and interior finish details. For example, brick veneer walls can achieve STC 50 or more. Standard commercially sided exterior metal stud walls have around STC 45. Standard good quality double-glazed non-operable windows can have STC ratings ranging from 25 to 40, depending on the window manufacturer, pane thickness and inter-pane spacing. As previously mentioned, the windows are the known weak point in a partition.

[10] Adapted from ENCG – Tables 4.2a, 4.2b

Per Section 4.2, when daytime noise levels from road sources at the plane of the window exceed 65 dBA, calculations must be performed to evaluate the sound transmission quality of the building components to ensure acceptable indoor noise levels. The calculation procedure[11] considers:

- Window type and total area as a percentage of total room floor area.
- Exterior wall type and total area as a percentage of the total room floor area.
- Acoustic absorption characteristics of the room.
- Outdoor noise source type and approach geometry.
- Indoor sound level criteria, which varies according to the intended use of a space.

Based on published research[12], exterior walls possess specific sound attenuation characteristics that are used as a basis for calculating the required STC ratings of windows in the same partition. Due to the limited information available at the time of the study, detailed floor layouts have not been finalized. Thus, some assumptions about the building's construction were made to approximate indoor noise calculations performed to prescribe minimum STC ratings for windows. Calculation methods adhering to the Building Practive Note No. 45 (BPN-56) published by the NRC were used to determine the required STC ratings of windows exposed to roadway and aircraft noise. Window STC calculations have therefore been based on the following assumptions:

- The school is assumed to have an intermediate absorption coefficient of 0.8.
- Exterior walls were assumed to have an STC of 45 (Non combustible steel stud walls with 16 mm gypsum board, insulation, and gypsum sheathing
- In portions where there are windows, the façade is assumed to be covered 50% by the window wall system, and 50% by the exterior wall system.
- Room, window, and wall dimensions are based on assumptions pertaining to the site, plans, and elevations drawings provided by Vandenberg & Wildeboer Architects.

The relevant BPN-56 indoor-outdoor calculations are presented in Appendix B. These calculations inform the STC requirements for windows outlined in Section 5.3.1.

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[11] Building Practice Note: Controlling Sound Transmission into Buildings by J.D. Quirt, National Research Council of Canada, September 1985

[12] CMHC, Road & Rail Noise: Effects on Housing

STC recommendations for the windows are made on a combined basis shared between roadway and aircraft transportation noise levels. Section 5.3.1 summarizes the BPN-56 calculations undertaken to determine these STC recommendations.

5. RESULTS AND DISCUSSION

5.1 Roadway Transportation Noise Levels

The results of the roadway noise calculations are summarized in Table 3 below.

TABLE 3: EXTERIOR NOISE LEVELS DUE TO ROADWAY SOURCES

Receptor Number	Receptor Height Above Grade (m)	Receptor Location	CadnaA Noise Level (dBA)	
			Day	Night
1	1.5	POW –1st Floor Cafeteria Extension– North Façade	63	55
2	1.5	POW – 1st Floor Art Room – North Façade	66	59
3	1.5	POW – 1st Floor Principal's Office – North Façade	66	58
4	4.5	POW – 2nd Floor Classroom 200 – North Façade	66	58
5	4.5	POW – 2nd Floor Classroom 200 – East Façade	63	55

The results of the current analysis indicate that noise levels will range between 65 and 66 dBA during the daytime period (07:00-23:00) and between 55 and 59 dBA during the nighttime period (23:00-07:00). The highest noise level (66 dBA) occurs at the north façade, which is most exposed and closest to Colonnade Road North. Figures 3 and 4 present the daytime and nighttime horizontal noise contours form roadway noise, respectively.

Table 4 on the proceeding page provides a comparison between CadnaA and STAMSON. Noise levels calculated in STAMSON were generally greater than in CadnaA; however, they do not necessitate a change in recommended noise control measures as the results are below the requirements outlined in Section 4.2. The difference in noise level between CadnaA and STAMSON is between ±1 dBA. An acceptable tolerance given that human hearing does not detect a change in sound level less than 3 dBA.

TABLE 4: RESULT CORRELATION WITH STAMSON

Receptor Number	Receptor Height Above Grade (m)	Receptor Location	STAMSON 5.04 Noise Level (dBA)		CadnaA Noise Level (dBA)	
			Day	Night	Day	Night
R1	1.5	POW –1st Floor Cafeteria Extension– North Façade	64	56	63	55
R3	1.5	POW – 1st Floor Principal's Office – North Façade	66	59	66	58
R5	4.5	POW – 2nd Floor Classroom 200 – East Façade	62	54	63	55

5.2 Aircraft Transportation Noise Levels

As per NPC-300[13], the aircraft noise exposure was evaluated by converting the NEF/NEP contours to 24-hour equivalent sound pressure level ($L_{eq\ (24)}$). The following equation is used for the conversion:

L_{eq24}=NEF+32 dBA

L_{eq24}=25+32=57 dBA

Per the calculations above, the proposed building will be exposed to an aircraft noise level of 57 dBA (L_{eq24}), which is lower than the roadway traffic noise levels. Per the NPC-300 guidelines, the minimum STC requirements were determined by combining the minimum STC for roadway and aircraft noise exposure.

The subject site is an extension to an existing school. As such, indoor sound levels should not exceed 37 dBA. Since the study site is within the NEF/NEP contour of 25, the aircraft noise level means that the site should be designed with a provision for central air conditioning. This provision leads to a Type C Warning Clause recommendation. However, since the existing school already has central air conditioning and the extension is planned to include central air conditioiing, a Type D Warning Clause (summarized in Section 6) is recommended.

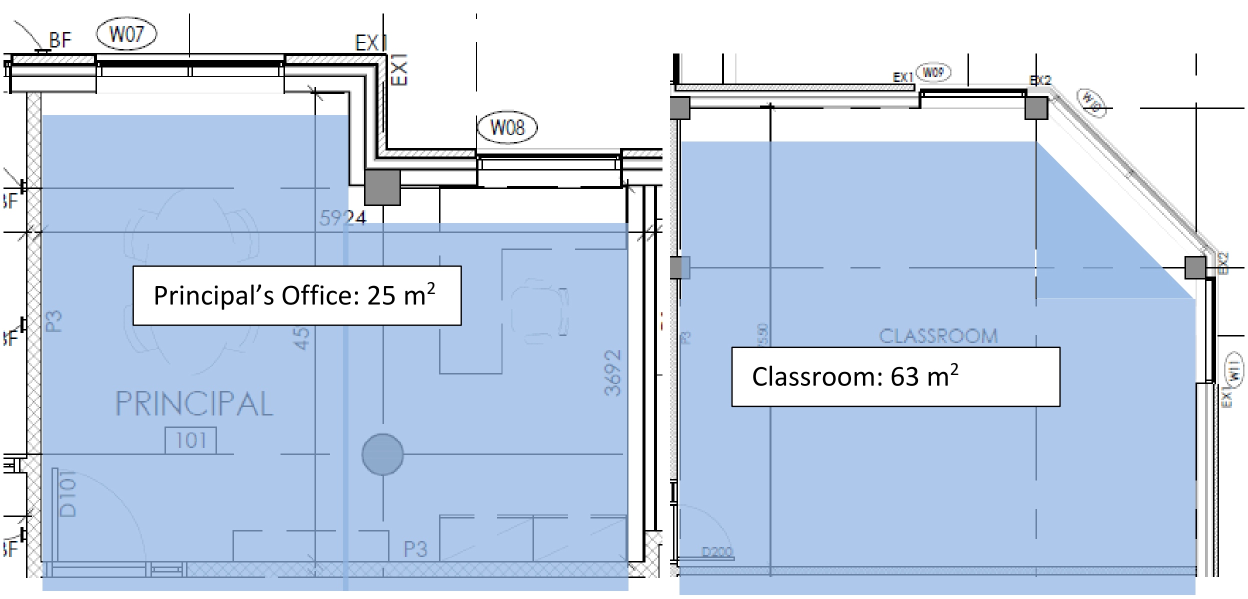
[13] Environmental Noise Guideline - Stationary and Transportation Sources - Approval and Planning (NPC-300), August 2013

5.3 Noise Control Measures

The NPC-300 guidelines dictate that the assessment of the indoor sound levels, and the requirements for the acoustical performance of building components should be done separately for road noise, rail noise and aircraft noise. The resultant sound isolation parameters should be subsequently combined logarithmically (on an energy basis) to determine the overall acoustical parameter. Selection of the required components should be based on the overall combined acoustical parameter. The maximum surface transportation noise (66 dBA) would require an approximately 24 dBA reduction to meet the indoor sound level criteria for a school of 45 dBA (when considering a safety factor). To meet the indoor sound level criteria due to aircraft noise for a school of 37 dBA, an approximately 23 dBA reduction would be required based on the $L_{eq}(24)$ of 57 dBA, and a safety factor. Since the separate requirements are so close, detailed BPN-56 calculaions were performed to fulfill the combined acoustic parameter requirement. Section 5.3.1 below summarizes the result of the calculations, which may be seen in detail in Appendix B.

5.3.1 Indoor Noise Calculations

The image below outlines the two rooms considered in the BPN calculation. One of the rooms is the principal's office, which experiences the highest roadway noise levels. The other room is a corner classroom, which must consider noise exposure from the north and the east.



ROOM AREA OF PRINCIPAL'S OFFICE AND CORNER CLASSROOM FOR INDOOR NOISE CALCULATIONS

The results of the BPN-56 calculations (see Appendix B) show that the north façade and the eastern façade of the northeast corner classrooms, and the western façade of the art and seminar/conference rooms are required to have windows with an STC rating of at least 26. However, to include a safety factor and because most standard windows are able to achieve it, Gradient Wind recommends that all windows have a minimum STC rating of 30.

6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current analysis indicate that noise levels will range between 65 and 66 dBA during the daytime period (07:00-23:00) and between 55 and 59 dBA during the nighttime period (23:00-07:00). The highest noise level (66 dBA) occurs at the north façade, which is most exposed and closest to Colonnade Road North.

It is recommended that the development install central air conditioning, or similar mechanical ventilation, which will allow occupants to keep windows closed to maintain a comfortable indoor environment. A Type D Warning Clause will also be required to be placed on all Lease, Purchase and Sale Agreements, as summarized below:

Type D:

> *"This school 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."*

The indoor noise calculations summarized in Section 5.3.1 show that the combined impact of the roadway and aircraft noise result in the minimum required STC rating for all window to be 30. Furthermore, for all units in the development the Warning Clause (Type Aircraft[14]) must be included in all Agreements of Lease, Purchase and Sale.

[14] Appendix D, ENCG

“Purchasers/building occupants are forewarned that this school is located in a noise sensitive area due to its proximity to Ottawa Macdonald-Cartier International Airport. In order to reduce the impact of aircraft noise in the indoor spaces, the unit has been designed and built to meet provincial standards for noise control by the use of components and building systems that provide sound attenuation. In addition to the building components (i.e. walls, windows, doors, ceiling-roof), since the benefit of sound attenuation is lost when windows or doors are left open, this unit has been fitted with a forced air heating system, all components of which are sized to accommodate the future installation of central air conditioning-by the owner/occupant.

Despite the inclusion of noise control features within the schoolbedro, noise due to aircraft operations may continue to interfere with some indoor activities and with outdoor activities, particularly during the summer months. The purchaser/building occupant is further advised that the Airport is open and operates 24 hours a day and that changes to operations or expansion of the airport facilities, including the construction of new runways, may affect the living environment of the residents of this property/area.

The Ottawa MacDonald-Cartier International Airport Authority, its acoustical consultants and the Municipality are not responsible if, regardless of the implementation of noise control features, the purchaser/occupant of this school finds that the indoor noise levels due to aircraft operations continue to be of concern or are offensive.”

This concludes our transportation noise study. If you have any questions or wish to discuss our findings, please advise us. In the interim, we thank you for the opportunity to be of service.

Sincerely,

Gradient Wind Engineering Inc.

LICENSED PROFESSIONAL ENGINEER
J. R. FOSTER
100155655
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PROVINCE OF ONTARIO

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Gradient Wind File #26-089-Transportation Noise Study

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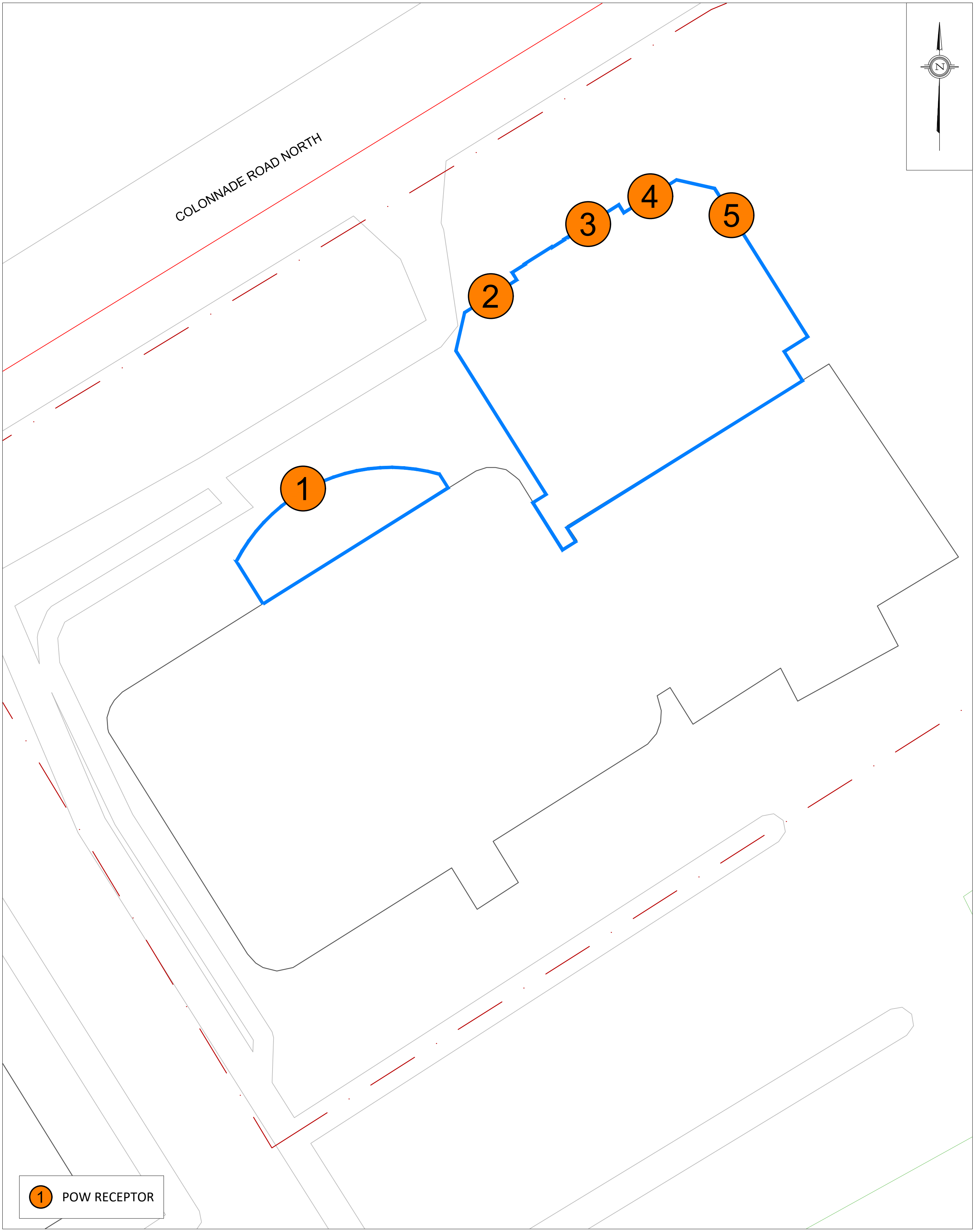
PROJECT	82 COLONNADE RD NORTH, OTTAWA DETAILED TRANSPORTATION NOISE STUDY		
SCALE	1:1000 (APPROX.)	DRAWING NO.	GW26-089-1
DATE	JUNE 1, 2026	DRAWN BY	M.P.

DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT



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PROJECT	82 COLONNADE RD N, OTTAWA DETAILED TRANSPORTATION NOISE STUDY		
SCALE	1:500 (APPROX.)	DRAWING NO.	GW26-089-2
DATE	JUNE 1, 2026	DRAWN BY	M.P.

DESCRIPTION

FIGURE 2:
RECEPTOR LOCATIONS

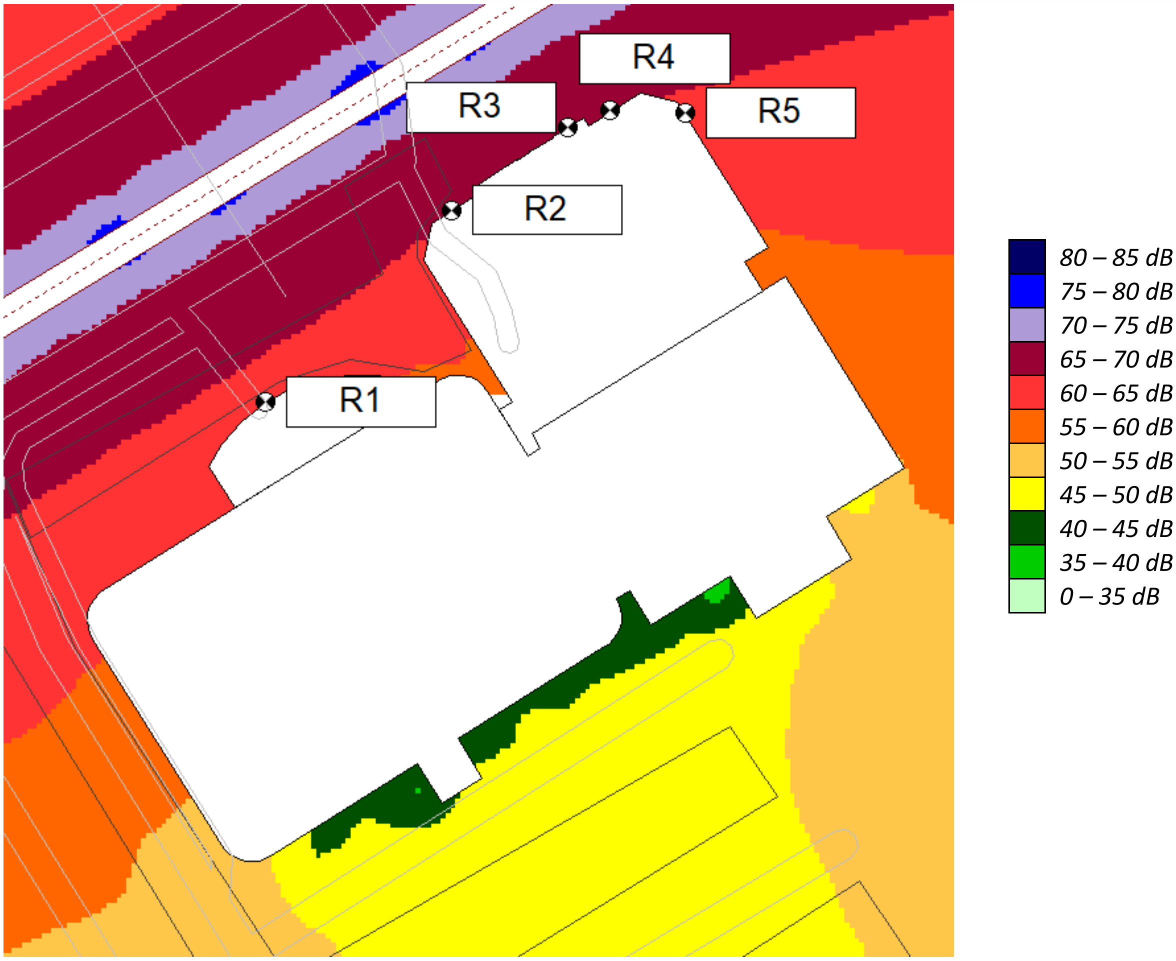


FIGURE 3: DAYTIME HORIZONTAL ROADWAY NOISE CONTOURS (4.5 M)

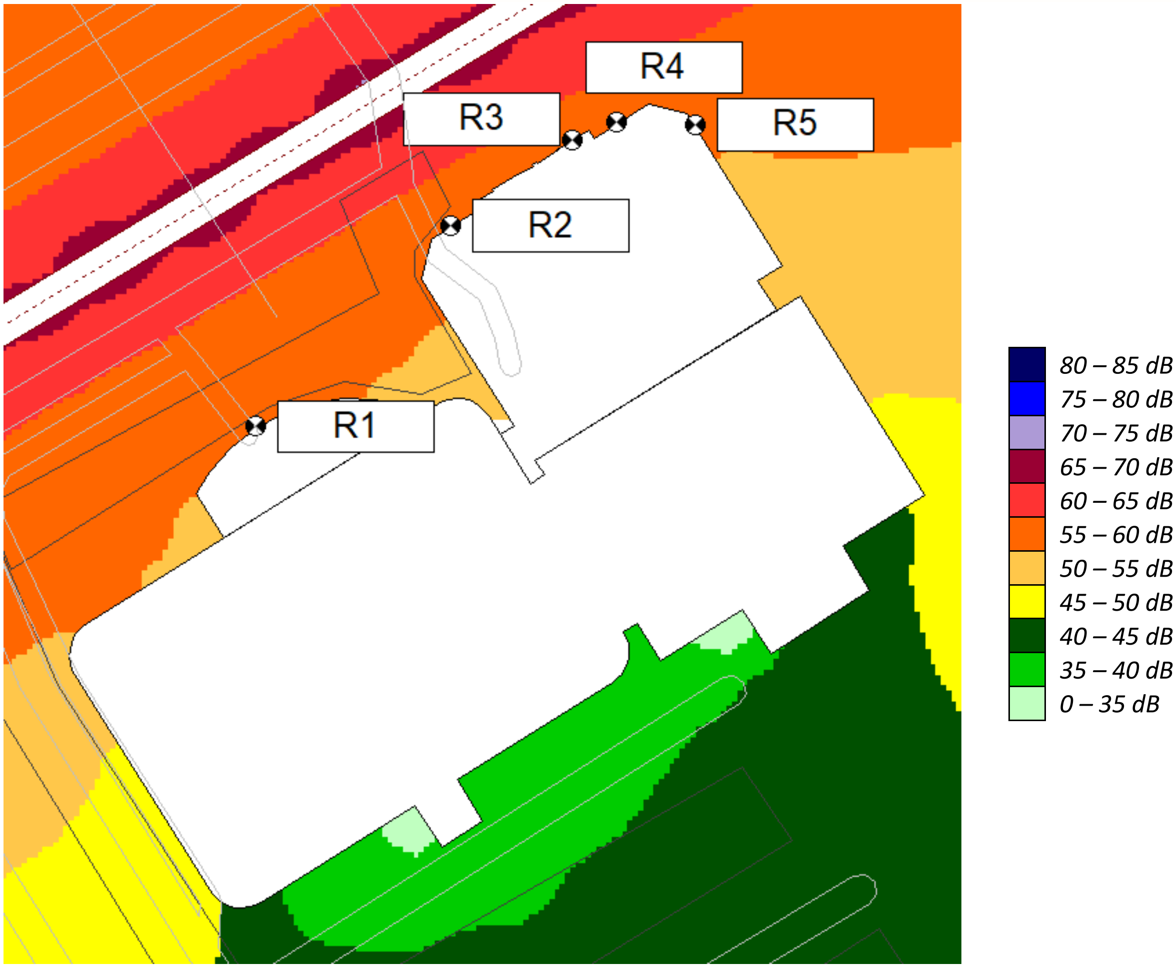
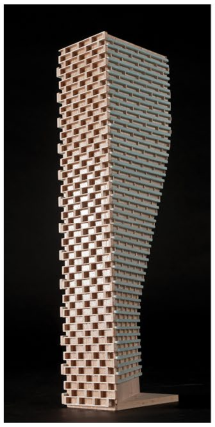
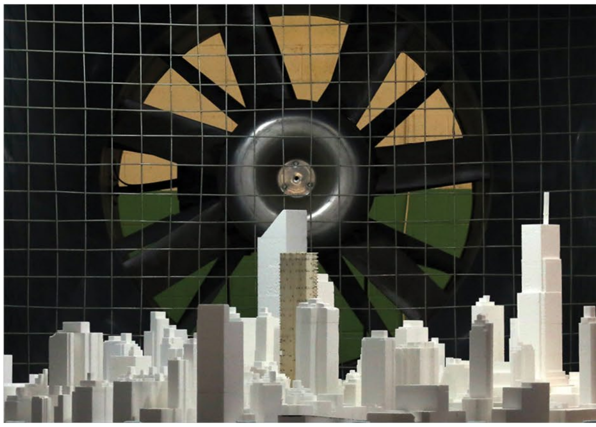


FIGURE 4: NIGHTTIME HORIZONTAL ROADWAY NOISE CONTOURS (4.5 M)





APPENDIX A

STAMSON 5.04 – INPUT AND OUTPUT DATA

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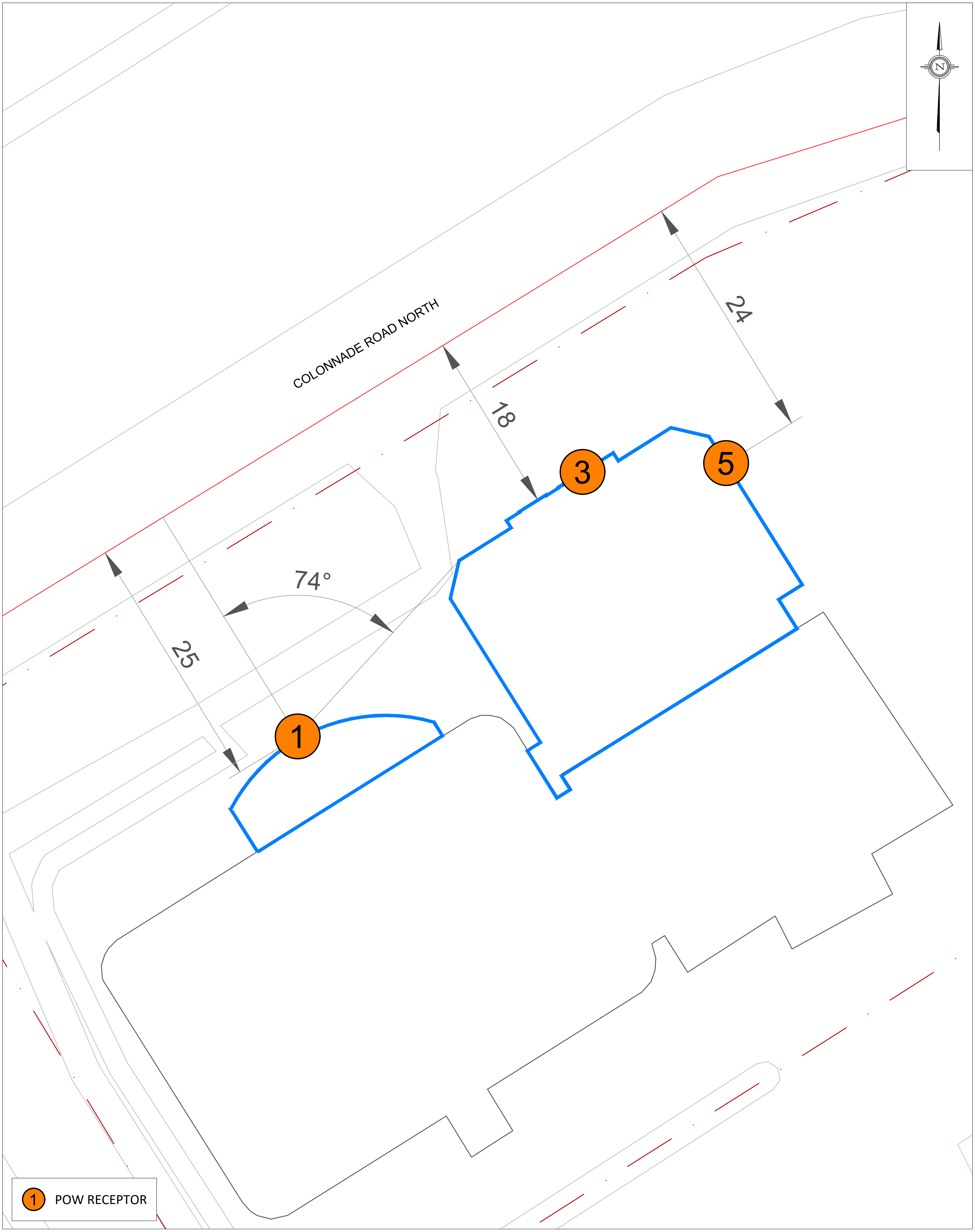

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PROJECT	82 COLONNADE RD NORTH, OTTAWA DETAILED TRANSPORTATION NOISE STUDY		
SCALE	1:500 (APPROX.)	DRAWING NO.	GW26-089-A1
DATE	JUNE 3, 2026	DRAWN BY	M.P.

DESCRIPTION

FIGURE A1:
STAMSON ROAD INPUT PARAMETERS

```
STAMSON 5.0         NORMAL REPORT        Date: 03-06-2026 12:02:55
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r1.te                 Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: Colonnade (day/night)
---------------------------------------------
Car traffic volume  :  9715/845   veh/TimePeriod  *
Medium truck volume :   773/67    veh/TimePeriod  *
Heavy truck volume  :   552/48    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):  12000
    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: Colonnade (day/night)
-------------------------------------------
Angle1   Angle2            : -90.00 deg   74.00 deg
Wood depth                 :      0       (No woods.)
No of house rows           :      0 / 0
Surface                    :      1       (Absorptive ground surface)
Receiver source distance   :  25.00 / 25.00  m
Receiver height            :   1.50 / 1.50   m
Topography                 :      1       (Flat/gentle slope; no barrier)
Reference angle            :   0.00

Results segment # 1: Colonnade (day)
------------------------------------

Source height = 1.50 m

ROAD (0.00 + 63.75 + 0.00) = 63.75 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -90     74   0.66  69.03   0.00  -3.68  -1.60   0.00   0.00   0.00  63.75
----------------------------------------------------------------------------

Segment Leq : 63.75 dBA

Total Leq All Segments: 63.75 dBA
```

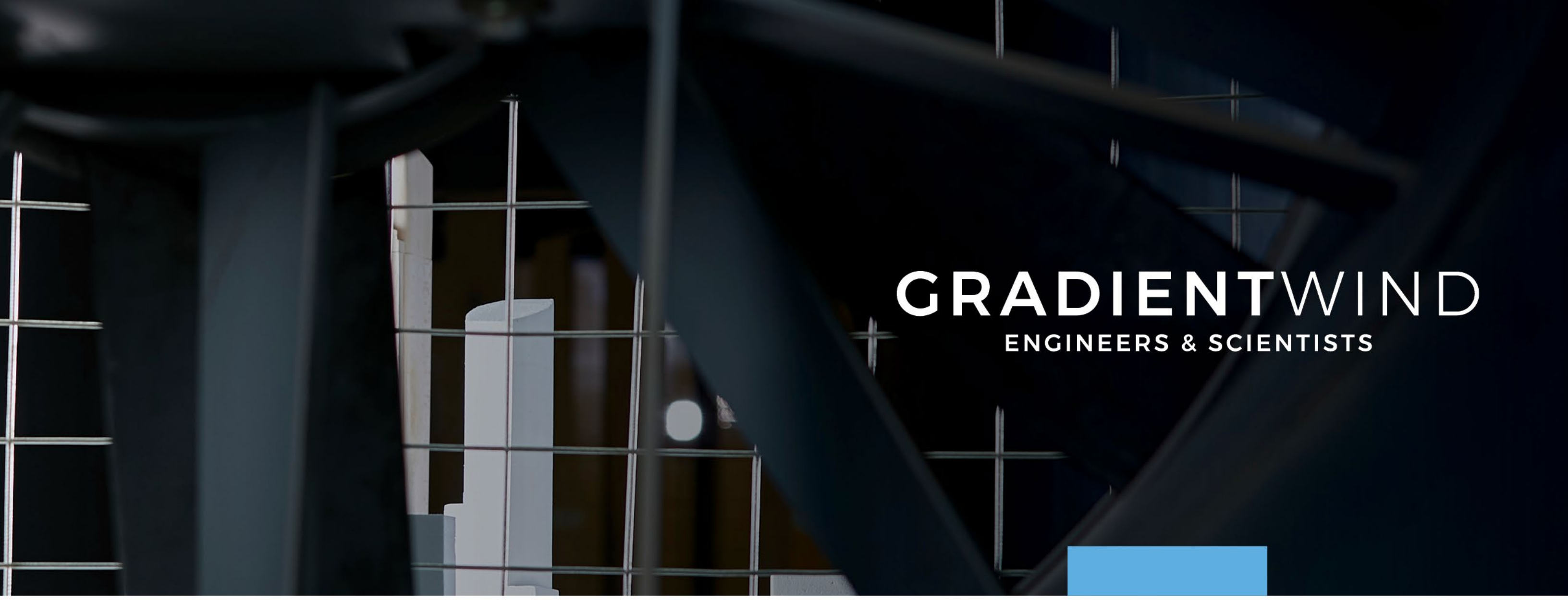
```
Results segment # 1: Colonnade (night)
--------------------------------------

Source height = 1.50 m

ROAD (0.00 + 56.15 + 0.00) = 56.15 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -90     74   0.66  61.43   0.00  -3.68  -1.60   0.00   0.00   0.00  56.15
----------------------------------------------------------------------------

Segment Leq : 56.15 dBA

Total Leq All Segments: 56.15 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 63.75
                         (NIGHT): 56.15
```

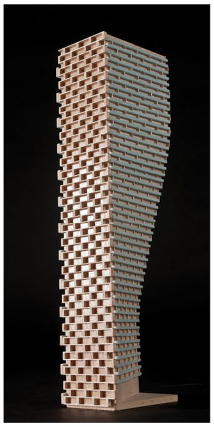
```
STAMSON 5.0        NORMAL REPORT        Date: 02-06-2026 10:31:30
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r3.te                 Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: Colonnade (day/night)
---------------------------------------------
Car traffic volume  :  9715/845   veh/TimePeriod  *
Medium truck volume :   773/67    veh/TimePeriod  *
Heavy truck volume  :   552/48    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):  12000
    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: Colonnade (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  :  18.00 / 18.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: Colonnade (day)
------------------------------------

Source height = 1.50 m

ROAD (0.00 + 66.26 + 0.00) = 66.26 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -90     90   0.66  69.03   0.00  -1.31  -1.46   0.00   0.00   0.00  66.26
----------------------------------------------------------------------------

Segment Leq : 66.26 dBA

Total Leq All Segments: 66.26 dBA
```

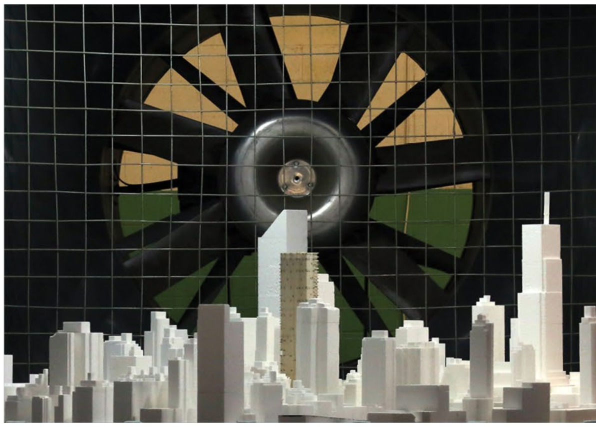
```
Results segment # 1: Colonnade (night)
--------------------------------------

Source height = 1.50 m

ROAD (0.00 + 58.66 + 0.00) = 58.66 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -90     90   0.66  61.43   0.00  -1.31  -1.46   0.00   0.00   0.00  58.66
----------------------------------------------------------------------------

Segment Leq : 58.66 dBA

Total Leq All Segments: 58.66 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 66.26
                         (NIGHT): 58.66
```

```
STAMSON 5.0        NORMAL REPORT        Date: 02-06-2026 10:32:25
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r5.te                Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: Colonnade (day/night)
---------------------------------------------
Car traffic volume  :  9715/845   veh/TimePeriod  *
Medium truck volume :   773/67    veh/TimePeriod  *
Heavy truck volume  :   552/48    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):  12000
    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: Colonnade (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  :  24.00 / 24.00  m
Receiver height           :   4.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: Colonnade (day)
------------------------------------

Source height = 1.50 m

ROAD (0.00 + 61.51 + 0.00) = 61.51 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
     0     90   0.57  69.03   0.00  -3.20  -4.31   0.00   0.00   0.00  61.51
----------------------------------------------------------------------------

Segment Leq : 61.51 dBA

Total Leq All Segments: 61.51 dBA
```

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

Source height = 1.50 m

ROAD (0.00 + 53.91 + 0.00) = 53.91 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------
     0     90   0.57  61.43   0.00  -3.20  -4.31   0.00   0.00   0.00  53.91
--------------------------------------------------------------------------

Segment Leq : 53.91 dBA

Total Leq All Segments: 53.91 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 61.51
                         (NIGHT): 53.91
```







APPENDIX B

BPN-56 STC REQUIREMENTS CALCULATIONS

CALCULATIONS TO REDUCE INTERIOR AIRCRAFT & ROAD TRAFFIC NOISE
NORTHEAST FACING CLASSROOM

		Aircraft		Road		
		Surface N	Surface E	Surface N	Surface E	
Outdoor Sound Level	=	57	57	66	63	dBA
Source Geometry Correction:	=	3	3	2	2	dBA
Correction For Surface Reflection:	=	3	3	3	3	dBA
Target Indoor Noise Level:	=	37	37	45	45	dBA
Required Noise Reduction:	=	26	26	26	23	dBA

	NORTH	EAST
Façade Area	37.2	18.8
	Surface N	Surface E
Wall Area	26.20	15.40
Room Floor Area	63.435	63.435
Window Area	11.00	3.40
Wall Spectrum Type	d	d
Window Spectrum Type	b	b
Noise Source Type (Aircraft)	B	B
Noise Source Type (Road)	D	D

Absorption Level **Intermediate**

Absorption Coefficient	0.5	0.8	Hard
	0.8		Intermediate
	1.25		Very Absorptive

		Noise Source Specturm Type					
		Large Aircraft Landing	Average Aircraft Noise, Railway Wheel Noise	Railway Wheel Noise Screened By Barrier	Mixed Road Traffic, Distant Aircraft	Road Traffic Screened By Barrier	Diesel Railway Locomotive
Building Component		A	B	C	D	E	F
Single Exterior Door	a	-1	0	0	1	1	1
Double Exterior Door, Single Glazed Window, Openable Thin Window	b	0	1	2	2	3	3
Sealed Thin Window, Openable Thick Window	c	0	1	3	4	6	6
Sealed Thick Window, Exterior Wall, Roof/Ceiling	d	0	2	5	7	9	10

	Aircraft	Road
Window Value	1	2
Wall Value	2	7

Enter Value From Table Into Box

0 = Perpendicular To Surface	Correction
60 to 90 degrees	3
40 to 90 degrees	2
30 to 90 degrees	1
0 to 90 degrees	0
Value	2

NORTH
Aircraft

COMPONENT:	**Wall N - Spandral**		STC Is:	45	
Noise Spectrum Type	B				
Component Category	d	Correction:	2		
Room Floor Area:	63.435 m²			-2	dBA
Component Area:	26.20 m²				
Component / Floor (%):	41 %				
Room Absorption Category:	Intermediate	Correction:	-3		dBA
				3	
Noise Reduction If Only This Component Transmits Sound Energy:				46	dBA
			Required Noise Reduction:	26	dBA
Surplus noise reduction for comparison to Table 3				20	
Component Transmits	1 % Of Sound				

COMPONENT: **Surface N Window**		Required Noise Reduction Is:	26	dBA
Percentage Of Sound Energy Transmitted:	99 %	Correction:	0	
Room Floor Area:	63.435 m²			
Component Area:	11 m²			
Component / Floor (%):	17 %			
Room Absortion Category:	Intermediate	Correction:	-7	dBA
Noise Spectrum	B			
Component Category	b	Correction:	1	dBA
		Required STC Is:	20	

NORTH
Road

COMPONENT:	**Wall S - Spandral**		STC Is:	45	
Noise Spectrum Type	D				
Component Category	d	Correction:	7		
Room Floor Area:	63.435 m²			-7	dBA
Component Area:	26.20 m²				
Component / Floor (%):	41 %				
Room Absorption Category:	Intermediate	Correction:	-3		dBA
				3	
Noise Reduction If Only This Component Transmits Sound Energy:				41	dBA
			Required Noise Reduction:	26	dBA
Surplus noise reduction for comparison to Table 3				15	
Component Transmits	3 % Of Sound				

COMPONENT: **Surface S Window**		Required Noise Reduction Is:	26	dBA
Percentage Of Sound Energy Transmitted:	97 %	Correction:	0	
Room Floor Area:	63.435 m²			
Component Area:	11 m²			
Component / Floor (%):	17 %			
Room Absortion Category:	Intermediate	Correction:	-7	dBA
Noise Spectrum	D			
Component Category	b	Correction:	2	dBA
		Required STC Is:	22	

EAST
Aircraft

COMPONENT:	**Wall E - Spandral**		STC Is:	50	
Noise Spectrum Type	B				
Component Category	d	Correction:	2		
Room Floor Area:	63.435 m²			-2	dBA
Component Area:	15.40 m²				
Component / Floor (%):	24 %				
Room Absorption Category:	Intermediate	Correction:	-5		dBA
				5	
Noise Reduction If Only This Component Transmits Sound Energy:				53	dBA
			Required Noise Reduction:	26	dBA
Surplus noise reduction for comparison to Table 3				27	
Component Transmits	0 % Of Sound				

COMPONENT: **Surface E Window**		Required Noise Reduction Is:	26	dBA
Percentage Of Sound Energy Transmitted:	100 %	Correction:	0	
Room Floor Area:	63.435 m²			
Component Area:	3.40 m²			
Component / Floor (%):	5 %			
Room Absortion Category:	Intermediate	Correction:	-11.7	dBA
Noise Spectrum	B			
Component Category	b	Correction:	1	dBA
		Required STC Is:	15	

WEST
Road

COMPONENT:	**Wall W - Spandral**		STC Is:	50	
Noise Spectrum Type	D				
Component Category	d	Correction:	7		
Room Floor Area:	63.435 m²			-7	dBA
Component Area:	15.40 m²				
Component / Floor (%):	24 %				
Room Absorption Category:	Intermediate	Correction:	-5		dBA
				5	
Noise Reduction If Only This Component Transmits Sound Energy:				48	dBA
			Required Noise Reduction:	23	dBA
Surplus noise reduction for comparison to Table 3				25	
Component Transmits	0 % Of Sound				

COMPONENT: **Surface W Window**		Required Noise Reduction Is:	23	dBA
Percentage Of Sound Energy Transmitted:	100 %	Correction:	0	
Room Floor Area:	63.435 m²			
Component Area:	3.40 m²			
Component / Floor (%):	5 %			
Room Absortion Category:	Intermediate	Correction:	-12	dBA
Noise Spectrum	D			
Component Category	b	Correction:	2	dBA
		Required STC Is:	13	

	Aircraft	Road	Combined
Combined Window STC	22	22	**25**

CALCULATIONS TO REDUCE INTERIOR AIRCRAFT & ROAD TRAFFIC NOISE

SOUTH FACING LIVING ROOM

		Aircraft	Road	
Outdoor Sound Level	=	57	66	dBA
Source Geometry Correction:	=	3	2	dBA
Correction For Surface Reflection:	=	3	3	dBA
Target Indoor Noise Level:	=	37	45	dBA
Required Noise Reduction:	=	26	26	dBA

Façade Area	22.4	22.4
	Aircraft	Road
Wall Area	15.8	15.8
Room Floor Area	25.2	25.2
Window Area	6.6	6.6
Wall Spectrum Type	d	d
Window Spectrum Type	b	b
Noise Source Type	B	D

Absorption Level: Intermediate

Absorption Coefficient	0.5	0.8	Hard
	0.8		Intermediate
	1.25		Very Absorptive

Building Component		A	B	C	D	E	F
		Noise Source Specturm Type					
		Large Aircraft Landing	Average Aircraft Noise, Railway Wheel Noise	Railway Wheel Noise Screened By Barrier	Mixed Road Traffic, Distant Aircraft	Road Traffic Screened By Barrier	Diesel Railway Locomotive
Single Exterior Door	a	-1	0	0	1	1	1
Double Exterior Door, Single Glazed Window, Openable Thin Window	b	0	1	2	2	3	3
Sealed Thin Window, Openable Thick Window	c	0	1	3	4	6	6
Sealed Thick Window, Exterior Wall, Roof/Ceiling	d	0	2	5	7	9	10

	Aircraft	Road
Window Value	1	2
Wall Value	2	7

0 = Perpendicular To Surface	Correction
60 to 90 degrees	3
40 to 90 degrees	2
30 to 90 degrees	1
0 to 90 degrees	0
Value	2

Aircraft

COMPONENT: Wall A - Spandral				STC Is:	45	
Noise Spectrum Type	B					
Component Category	d	Correction: (Table 5)	2			
Room Floor Area:	25.2 m²				-2	dBA
Component Area:	15.8 m²					
Component / Floor (%):	63 %					
Room Absorption Category:	Intermediate	Correction: (Table 4 Equation)	-1			dBA
					1	
Noise Reduction If Only This Component Transmits Sound Energy:					44	dBA
				Required Noise Reduction:	26	dBA
Surplus noise reduction for comparison to Table 3					18	
Component Transmits	2 % Of Sound					

COMPONENT: Surface A Window			Required Noise Reduction Is:	26	dBA
Percentage Of Sound Energy Transmitted:		98 %	Correction: (Table 3 Equation)	0	
Room Floor Area:		25.2 m²			
Component Area:		6.6 m²			
Component / Floor (%):		26 %			
Room Absortion Category:	Intermediate		Correction: (Table 4 Equation)	-5	dBA
Noise Spectrum	B				
Component Category	b		Correction: (Table 5)	1	dBA
			Required STC Is:	22	

Road

COMPONENT: Wall A - Spandral				STC Is:	45	
Noise Spectrum Type	D					
Component Category	d	Correction: (Table 5)	7			
Room Floor Area:	25.2 m²				-7	dBA
Component Area:	15.8 m²					
Component / Floor (%):	63 %					
Room Absorption Category:	Intermediate	Correction: (Table 4 Equation)	-1			dBA
					1	
Noise Reduction If Only This Component Transmits Sound Energy:					39	dBA
		Required Noise Reduction:			26	dBA
Surplus noise reduction for comparison to Table 3					13	
Component Transmits	5 % Of Sound					

COMPONENT: Surface A Window			Required Noise Reduction Is:	26	dBA
Percentage Of Sound Energy Transmitted:		95 %	Correction: (Table 3 Equation)	0	
Room Floor Area:		25.2 m²			
Component Area:		6.6 m²			
Component / Floor (%):		26 %			
Room Absortion Category:	Intermediate		Correction: (Table 4 Equation)	-5	dBA
Noise Spectrum	D				
Component Category	b		Correction: (Table 5)	2	dBA
		Required STC Is:		23	

	Aircraft	Road	Combined
Combined Window STC	22	23	**26**