FREEFIELD LTD.

Ottawa, Ontario, Canada

TRAFFIC NOISE IMPACT ASSESSMENT FOR THE PROPOSED NEW ADDITION TO BE LOCATED AT THE EXISTING WOODVALE PENTECOSTAL CHURCH 205 GREENBANK ROAD

CITY OF OTTAWA

Prepared for

Woodvale Pentecostal Church

Prepared by

Freefield Ltd.

9th February 2022

Postal Address: PO Box 74056, RPO Beechwood, Ottawa, Ontario, K1M 2H9, Canada
T/F: 613 747 0983, E: info@freefieldacoustics.com, W: www.freefieldacoustics.com

TRAFFIC NOISE IMPACT ASSESSMENT FOR THE PROPOSED NEW ADDITION TO BE LOCATED AT THE EXISTING THE WOODVALE PENTECOSTAL CHURCH 205 GREENBANK ROAD CITY OF OTTAWA

Table of Contents

TRAFFIC NOISE IMPACT ASSESSMENT FOR THE PROPOSED NEW ADDITION TO BE LOCATED AT THE EXISTING THE WOODVALE PENTECOSTAL CHURCH 205 GREENBANK ROAD CITY OF OTTAWA

1.0 Introduction

Freefield Ltd. has been retained by the Woodvale Pentecostal Church to undertake a traffic noise impact assessment in relation to satisfying the City of Ottawa Environmental Noise Control Guidelines (ENCG) for the proposed New Addition to be located at the Existing Woodvale Pentecostal Church at 205 Greenbank Road, City of Ottawa, Ontario.

This report describes an assessment of noise impacts from surface transportation including road traffic on Greenbank Road at the interior noise sensitive areas of the proposed development.

This assessment has been carried out in accordance with the City of Ottawa *Environmental Noise Control Guidelines, January 2016* (ENCG)[1] and Ministry of Environment, Conservation and Parks (MECP) publication, *NPC-300*[2] by Freefield Ltd.

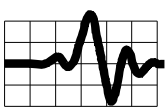
This analysis is based on drawings and information received electronically from Hobin Architecture Incorporated.

General Description of the Site

Directions in this report refer to site north as shown on Figure 1.

The site is on the east side of Greenbank Road at an approximate distance of 440 m north of the intersection with Hunt Club Road West, in the City of Ottawa, Ontario.

The site and surrounding area consist of relatively flat topography with no significant changes in elevation. The average grade level lies at approximately 93 mASL.



The site is zoned Minor Institutional Zone (I1). To north of the site, the land is zoned Open Space (O1). To the east of the site the land is zoned Residential (R2). To the south the land is zoned, Minor Institutional Zone (I1). Immediately west lies Greenbank Road. Further west, on the western side of Greenbank Road the land is zoned Open Space (O1) and Local Commercial Zone (LC).

The primary source of environmental noise impacting the site is vehicular traffic on Greenbank Road and Bellman Drive (west of Greenbank) which form the western and northern boundaries of the site.

Hunt Club Road West, located in a southerly direction, and Craig Henry Drive and Canfield Road, located in a northerly direction, are greater than 100 m from the site, hence, noise from these roads is not required to be assessed as per ENCG criteria.

Refer to Figure 1 showing the location of the site with respect to the surrounding area.

General Description of the Proposed Development

The proposed development consists of a new two storey addition to the Existing Woodvale Pentecostal Church rising to approximately 12.2 m above grade.

The new addition will comprise of a Gym, Theatre, Café, Kitchen, Youth Activity Space and Lobby located on the Ground Floor with Youth Activity Rooms, a Youth Administration Room, a Multi-Purpose Room, a Service / Kitchen Area, a Church Administration Area, Offices and Conferences Rooms located on the second floor. In addition, bathrooms will be located on each level of the new addition.

There are no outdoor amenity areas proposed at the development.

Refer to Figures 2 to 4.

2.0 Methodology and Assessment Criteria

The outdoor and indoor noise criteria, sound level limits, are provided in Appendix 1. These limits are to be met by proposed noise sensitive developments using control measures such as site design, set-backs, noise barriers, acoustical requirements for building components and ventilation requirements. In some circumstances, warning clauses related to noise are required on titles, leases and sale agreements.

The noise assessment methodology is summarised as follows:

- Noise generated by road traffic is predicted using STAMSON[3,4], a traffic noise model developed by the MECP. STAMSON takes into account such factors as distance from the road, height, nature of the intervening buildings and terrain, ground absorption, and noise barriers, if present.

- Noise from future road traffic is predicted using STAMSON at critical points of reception at the proposed development. Locations to be considered include outdoor living areas (OLA) as well as 'plane of window' (POW) locations, where rooms for living, sleeping, offices, reception areas, retail stores, theatres, places of worship, libraries, conference rooms, reading rooms etc. are provided. Noise levels are predicted as A-weighted equivalent sound levels, L_{EQ}, (i.e. average levels) for various periods such as Day (07:00 to 23:00) and Night (23:00 to 07:00) periods. A-weighting is a frequency correction to sound pressure levels which approximates the response of the human ear and is used extensively for environmental noise assessments. Results are expressed in dBA, A-weighted decibels.

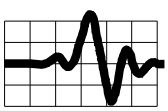
- Based on the predicted sound levels, the specifications for mitigation measures such as noise barriers, building component requirements, ventilation requirements and warning clauses, are determined according to criteria established by the City of Ottawa ENCG and MECP guidelines including NPC-300.

The noise criteria for outdoor living areas and indoor living areas are set out in Tables A1.1 and A1.2, Appendix 1.

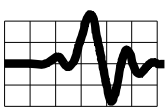
Where building components need to be designed to achieve specific indoor sound levels, restrictions apply such as the construction assembly and areas of walls, windows, and doors.

The City of Ottawa ENCG requires indoor noise impacts to be calculated based on the proposed construction assembly of the building to ensure compliance to the applicable indoor noise criteria. The MECP criteria contained in NPC-300 set outdoor noise thresholds to determine the need for building component design.

Based on the predicted exterior noise levels indoors noise levels have been calculated at worst case locations for daytime (07:00 – 23:00) periods. The more restrictive criteria for nighttime (23:00 – 07:00) periods, does not apply to the proposed uses in the building. Refer section 5.0 and a summary of the City of Ottawa and provincial criteria in Table A1.3, Appendix 1.



The ventilation requirements, outdoor noise control measures and warning clause requirements are dependent on predicted outdoor noise levels. Warning clauses, when required, are to be placed on title documents, sale agreements, and lease agreements. Refer ENCG Table A1 Surface Transportation Warning Clauses and the more specific provincial warning clauses taken from NPC-300[2] Section C8 Warning Clauses that are summarised in Appendix 1.



3.0 Points of Reception

For the evaluation of noise impacts, the critical points of reception, POR 1 to POR 4, were chosen at the eastern and southern facades of the building. These locations represent worst case noise impacts at the proposed development, hence, compliance at these locations will ensure compliance at all other locations on the development.

POR 1 is located at the first-floor level plane of window location of Youth Activity Space, Room 108, assessed with 180 degrees exposure to Greenbank Road, and 90 degrees exposure to Bellman Drive.

POR 2 and POR 3 are located at the second-floor level plane of window locations of Multi-Purpose Room (Lounge), Room 213, with 180 degrees and 90 degrees exposure to Greenbank Road respectively. POR 2 is also 90 degrees exposed to Bellman Drive.

POR 4 is located at the second-floor level plane of window location of the Executive Office, Room 225, with 90 degrees exposure to Greenbank Road.

The points of reception are listed in Table 1 and shown in Figures 2, 3 and 4.

Outdoor sound levels are predicted at the critical points of reception selected for analysis. The predicted sound levels at each point of reception are then used to determine the requirements for mitigation needed to achieve the complying indoor sound levels as set out in in Appendix 1.

For assessment of indoor sound levels, results at POR 1 were used to assess indoor noise levels at the Youth Activity Space, Room 108, location in the building most exposed to outdoor noise impacts with exposure through one facade. Points of reception, POR 2 and POR 3, were selected at the Multi-Purpose Room (Lounge), Room 213, location in the building most exposed to outdoor noise impacts with exposure through two facades.

Outdoor sound levels were calculated at these worst-case locations, at locations representing the approximate centre of the windows located on the ground and second floor level. Plane of window locations are used as windows represent the least ‘sound attenuating’ building component of the exterior partition.

Refer to Table 1 and Figures 2 to 4.

4.0 Noise Source Modelling and Data

The following road traffic data was used to assess the traffic noise impacts at each point of reception on the development. The data was taken from the City of Ottawa ENCG which provides ultimate future traffic volume data for various roadways based on roadway class and number of lanes. The traffic data used represents future traffic volumes and correspond to a 'mature state of development', in the City's Official Plan.[1]

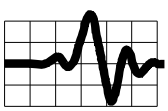
- Greenbank Road is assessed as a 4-Lane Urban Arterial Divided (4-UAD) with 35,000 AADT, posted speed limit of 60 km/hr.

- Bellman Drive is assessed as a 2-Lane Urban Collector (2-UCU) with 8,000 AADT, posted speed limit of 50 km/hr.

The proportion of traffic type and times used to develop the traffic data for the road segment consists of a 92/8 day/night split with 7% medium trucks and 5% heavy trucks by volume as set out in Appendix B, City of Ottawa Environmental Noise Control Guidelines.[1]

The surrounding topography was assessed as a generally flat, reflective surface.

Refer to Table 2: Future Traffic Volumes and Posted Speed Limits.



5.0 Noise Impact Assessment

Based on the future traffic projections, sound levels were predicted at each of the worst-case points of reception, POR 1 to POR 4, using the MECP STAMSON noise modelling software. The results of predictions are contained in Tables 1 to 5. Samples of the outputs of the STAMSON software are provided in Appendix 2.

In the following, the implications of the estimated future noise levels in relation to ENCG and NPC-300 criteria, as set out in Appendix 1, are discussed.

The requirement for building components, ventilation, and warning clauses, as noted below, apply to the development.

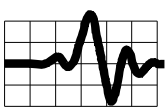
Building Components

The City of Ottawa ENCG provides indoor sound level criteria for noise sensitive spaces including offices, reception areas, theatres and youth activity / multi-purpose spaces. This criterion is based on the provincial guideline, NPC-300, and is to be met by the design of building components including the walls, windows and doors of the proposed development.

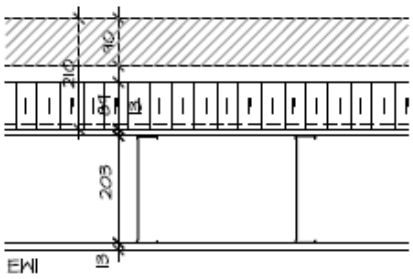
To assess compliance POR 1, POR 2 and POR 3 were selected at locations which represent the worst-case noise impact, that is, the part of the building most exposed to road traffic noise, hence, the building components designed for these locations are sufficient to meet the indoor sound level criteria at all locations on the building.

Indoor sound levels in the developments worst case ground floor Youth Activity Space, Room 108, and second floor Multi-Purpose Room (Lounge) Room 213, have been estimated using standard acoustical procedures, see IBANA-Calculation output in Appendix 2, which takes into account window areas, wall areas, room sizes and room absorption, as well as the sound transmission characteristic of the external walls and windows and the proposed construction assembly of the building.

The proposed construction assembly of the building will consist of the assemblies as noted in Architectural Drawing A1.02 summarise below.

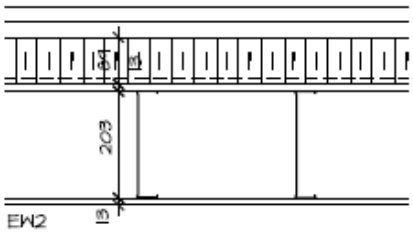


Construction Assemblies: (Source: Hobin Architecture Incorporated)



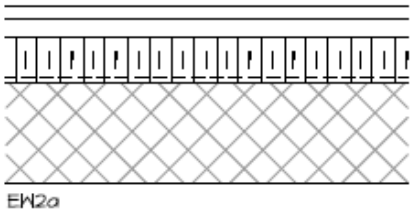
EXTERIOR LOW MASONRY WALL

EW1 90mm MASONRY VENEER
AIR SPACE
89mm SEMI-RIGID INSULATION
PEEL & STICK AIR/VAPOUR BARRIER MEMBRANE
SEAL ALL PENETRATIONS WITH MASTIC
13mm EXTERIOR SHEATHING
203mm METAL STUDS
13mm GYPSUM BOARD

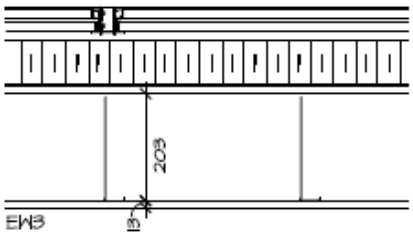


EXTERIOR SIDING WALL

EW2 VERTICAL SIDING
AIR SPACE
89mm SEMI-RIGID INSULATION
22mm HORIZONTAL FURRING CHANNEL
100mm VERTICAL Z-GIRT
PEEL & STICK AIR/VAPOUR BARRIER MEMBRANE
SEAL ALL PENETRATIONS WITH MASTIC
13mm EXTERIOR SHEATHING
203mm METAL STUDS
13mm GYPSUM BOARD



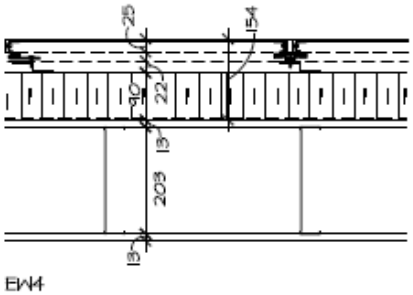
EW2a VERTICAL SIDING
AIR SPACE
89mm SEMI-RIGID INSULATION
22mm HORIZONTAL FURRING CHANNEL
100mm VERTICAL Z-GIRT
PEEL & STICK AIR/VAPOUR BARRIER MEMBRANE
SEAL ALL PENETRATIONS WITH MASTIC
CONCRETE BLOCK WALL, THICKNESS AS INDICATED ON FLOOR PLANS



EXTERIOR CURTAINWALL

EW3 ALUMINUM OR GLASS PANEL IN ALUMINUM FRAME SLAB BY-PASS CURTAINWALL WINDOW SYSTEM COMPLETE WITH BACK PAN INFILLED WITH SEMI-RIGID INSULATION
203mm METAL STUDS 18GA
13mm GYPSUM BOARD

EW3a SAME AS EW3 WITH CONCRETE BLOCK IN STEAD OF 203 METAL STUDS.



EW4 ALUMINUM PANEL WALLS

REFER TO ELEVATIONS FOR LOCATIONS OF VARIOUS COLOURS OF ALUMINUM PANELS.

ALUMINUM PANELS TO PROFILES INDICATED IN DETAILS.
RAIN-SCREEN SYSTEM C/W 22mm GALV. VERT. Z-GIRTS @ 600mm O.C. MAX.
90mm GALVANIZED HOR. METAL "Z-GIRTS" THROUGH INSULATION @ 600mm O/C ANCHORED THROUGH SHEATHING TO STEEL STUDS
89mm SEMI-RIGID INSULATION
PEEL & STICK A/V BARRIER MEMBRANE
SEAL ALL PENETRATIONS WITH MASTIC
13mm EXTERIOR SHEATHING
203mm METAL STUDS
13mm GYPSUM BOARD

With the proposed construction assemblies at Room 108 and Room 213 consisting of Wall / Window Type EW3. EW3 is the least sound attenuating of the proposed assemblies, hence, compliance with the Wall / Window Type EW3 assembly at worst case locations will ensure compliance at other less impacted interior areas with any of the proposed assemblies as noted above.

In order to consider worst case interior noise impacts the following construction assemblies where considered:

- External walls and windows have been modelled as aluminium frame, double pane windows, 3 mm glass 13 mm air 3 mm glass with STC 28 rating.

Sound transmission characteristics used in this analysis are based on National Research Council (NRC) test data, as shown in Appendix 2.

As shown in Table 5 the resulting estimates of indoor sound levels comply with the daytime sound level criteria. As such, with the proposed wall and window construction, indoor sound levels will meet the indoor sound level criteria set out in Table A1.2.

Outdoor Noise Control Measures

There are no Outdoor Living Area (OLA's) proposed at the development, hence, outdoor noise control measures, such as barriers, are not required.

Ventilation Requirements & Warning Clauses

The predicted plane of window noise levels, shown in Table 4, indicate that there is a provincial requirement in NPC-300 that the building be fitted with central ducted air-conditioning so windows and exterior doors can remain closed, thereby ensuring that the indoor sound levels are within the City's and the Ministry of Environment, Conservation and Parks noise criteria.

The development is being constructed with central air conditioning which meets this requirement.

The predicted plane of window noise levels, shown in Table 4, indicate that the Warning Clause, as noted below, adapted from the ENCG and provincial guidelines, be applied.

> ***"Purchasers/tenants are advised that sound levels due to increasing road traffic may occasionally interfere with some indoor activities when doors and windows are open as the outdoor sound levels may exceed the sound level limits of the City and the Ministry of the Environment, Conservation and Parks. To help address the need for sound attenuation, this building has been fitted with air conditioning which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the City's and the Ministry of Environment, Conservation and Parks noise criteria.***

Measures for sound attenuation include:

- ***Provision of air conditioning".***

This clause should be included in Agreements of Purchase and Sale or Lease Agreements and incorporated into the relevant Development Agreements which are registered on title of the property.

The above warning clauses are an adaptation of the "Generic" Warning Clause presented in the ENCG and the applicable provincial warning clause, Type D, required for this project. Refer Table 4.

6.0 Conclusions and Recommendations

A detailed traffic noise impact assessment has been conducted for the proposed New Addition to be located at the Existing Woodvale Pentecostal Church, at 205 Greenbank Road, City of Ottawa, Ontario.

The assessment has been carried out according to City of Ottawa Environmental Noise Control Guidelines and MECP NPC-300 taking into account future road traffic noise from Greenbank Road and Bellman Drive.

The assessment has led to the following recommendations and conclusions:

6.1 It has been found that MECP criteria for surface transportation noise impacts can be met for the proposed development provided that the building components are constructed as noted in Section 5.0. The proposed assemblies as noted in this report meet the City of Ottawa ENCG requirement for building component design.

6.2 Outdoor sound levels exceed various thresholds for ventilation and warning clause requirements. The development is being constructed with air conditioning which meet the ENCG and NPC-300 requirements.
It is recommended that the Warning Clause, as noted below, adapted from the ENCG and provincial guidelines, be applied all units.
"Purchasers/tenants are advised that sound levels due to increasing road traffic may occasionally interfere with some indoor activities when doors and windows are open as the outdoor sound levels may exceed the sound level limits of the City and the Ministry of the Environment, Conservation and Parks. To help address the need for sound attenuation, this building has been fitted with air conditioning which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the City's and the Ministry of Environment, Conservation and Parks noise criteria.
Measures for sound attenuation include:
- ***Provision of air conditioning".***

This clause should be included in Agreements of Purchase and Sale or Lease Agreements and incorporated into the relevant Development Agreements which are registered on title of the property.

Michael Wells, B. Architecture (Hons), B.Sc. Arch. Registered Architect of NSW, ARN: 8111
Member, Canadian Acoustical Society, Member, Australian Acoustical Society, Associate Member, INCE-USA

Hugh Williamson, Ph.D., P.Eng.
Member, Canadian Acoustical Society

References

1. City of Ottawa *Environmental Noise Control Guidelines, January 2016*.

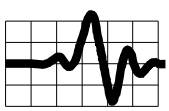
2. Ministry of Environment, Conservation and Parks, Publication NPC-300, *Environmental Noise Guideline Stationary and Transportation Sources - Approval and Planning*, August 2013.

3. Ministry of Environment, Conservation and Parks, *Sample Application Package, Basic Comprehensive Certificate of Approval (Air and Noise)*, July 2009.

4. Ministry of Environment, Conservation and Parks, Road Noise Analysis Method for Environment and Transportation (ORNAMENT), 1989.

5. Ministry of Environment, Conservation and Parks, STAMSON Software, Version 5.04, 1996. (Software version of References 5 and 6.)

6. City of Ottawa *"Official Plan - Annex 10*", 2011.



FIGURES

Contents:

Figure 1: Area Plan, Proposed Development at 205 Greenbank Road (Source: geoOttawa)

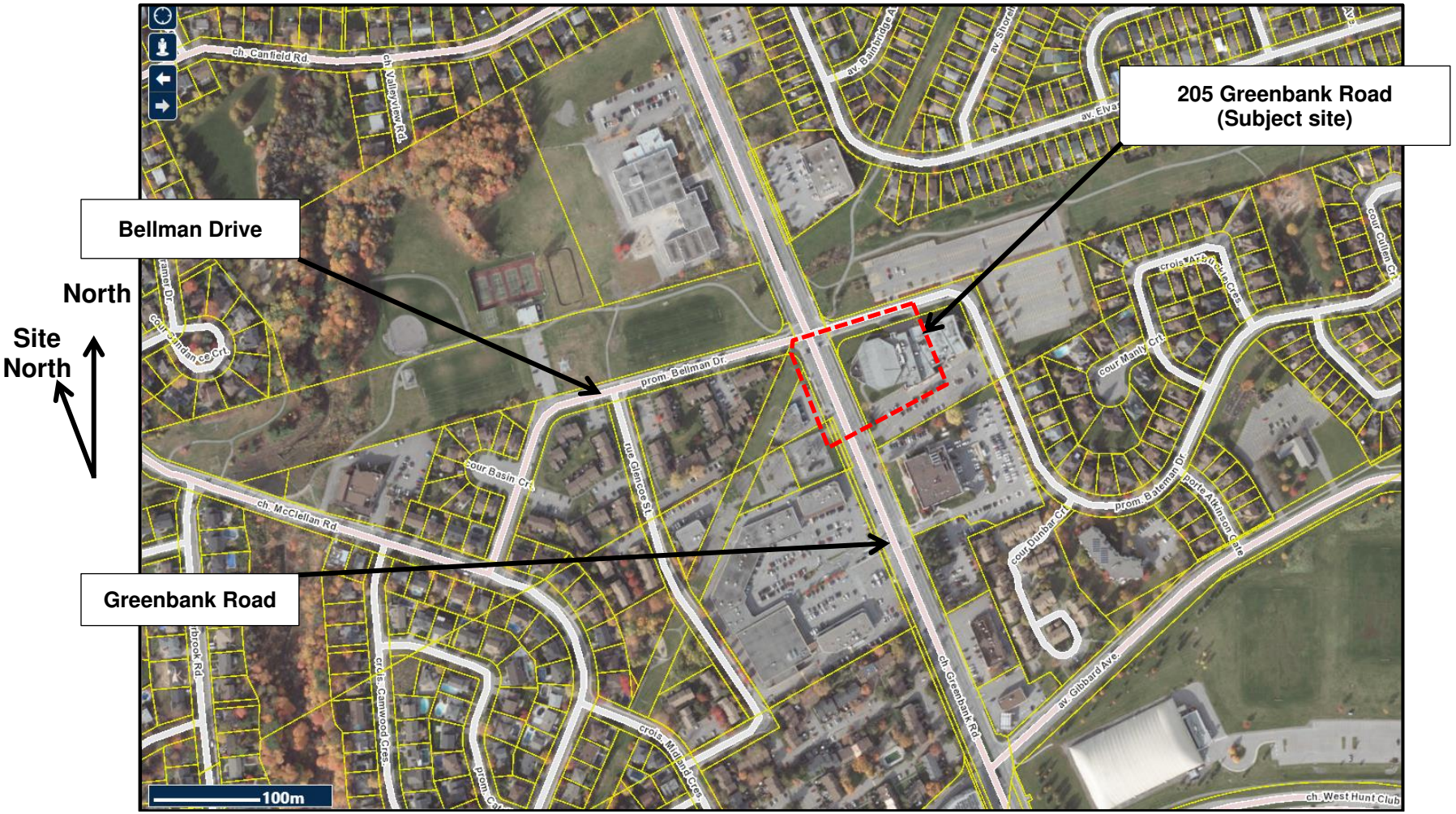


Figure 2: Site Plan showing Points of Reception (Source: Hobin Architecture Incorporated)
Refer Table 1 for distance and angle of exposure to nearby roads)

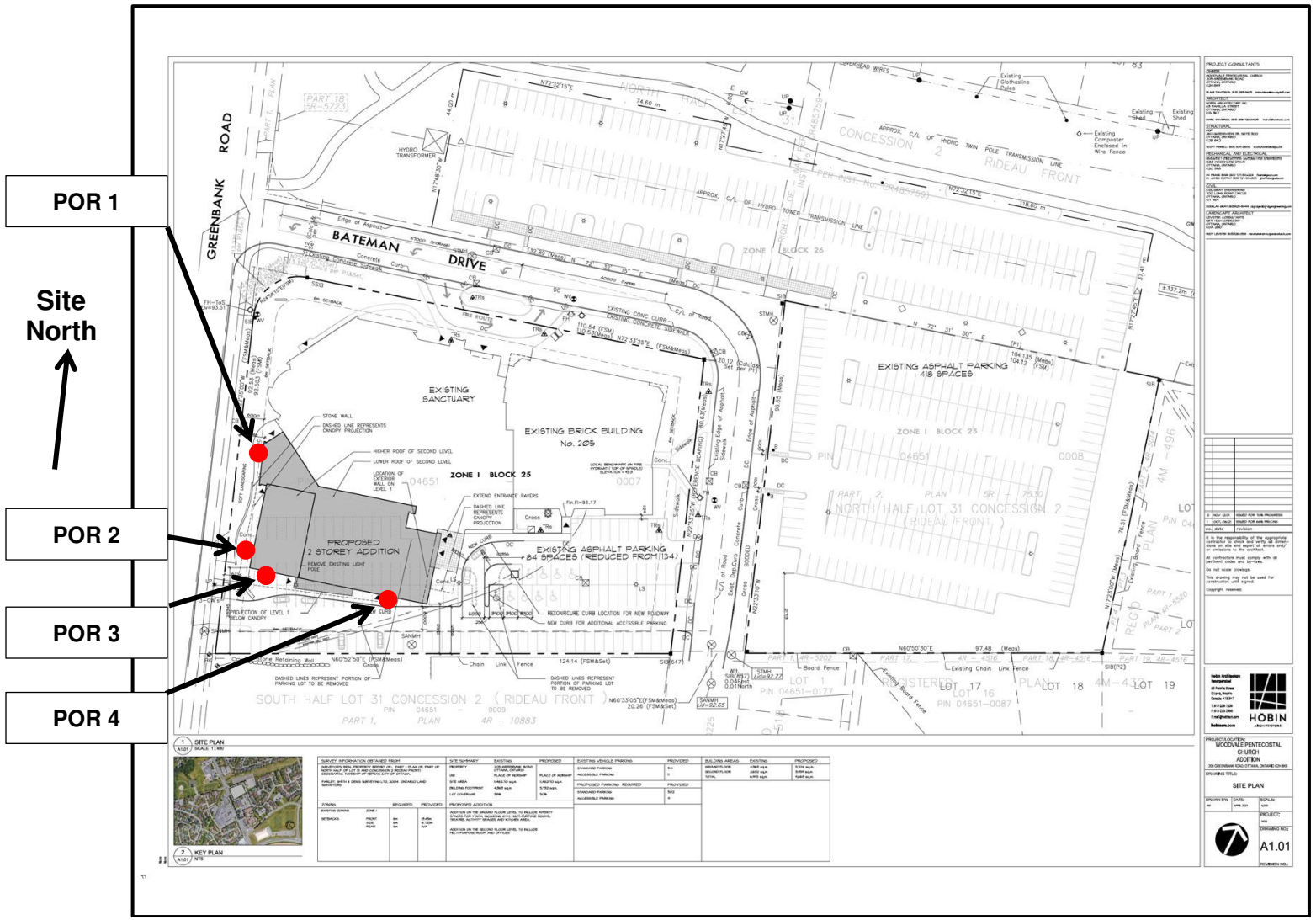


Figure 3: Ground Floor Plan showing Points of Reception (Source: Hobin Architecture Inc.)

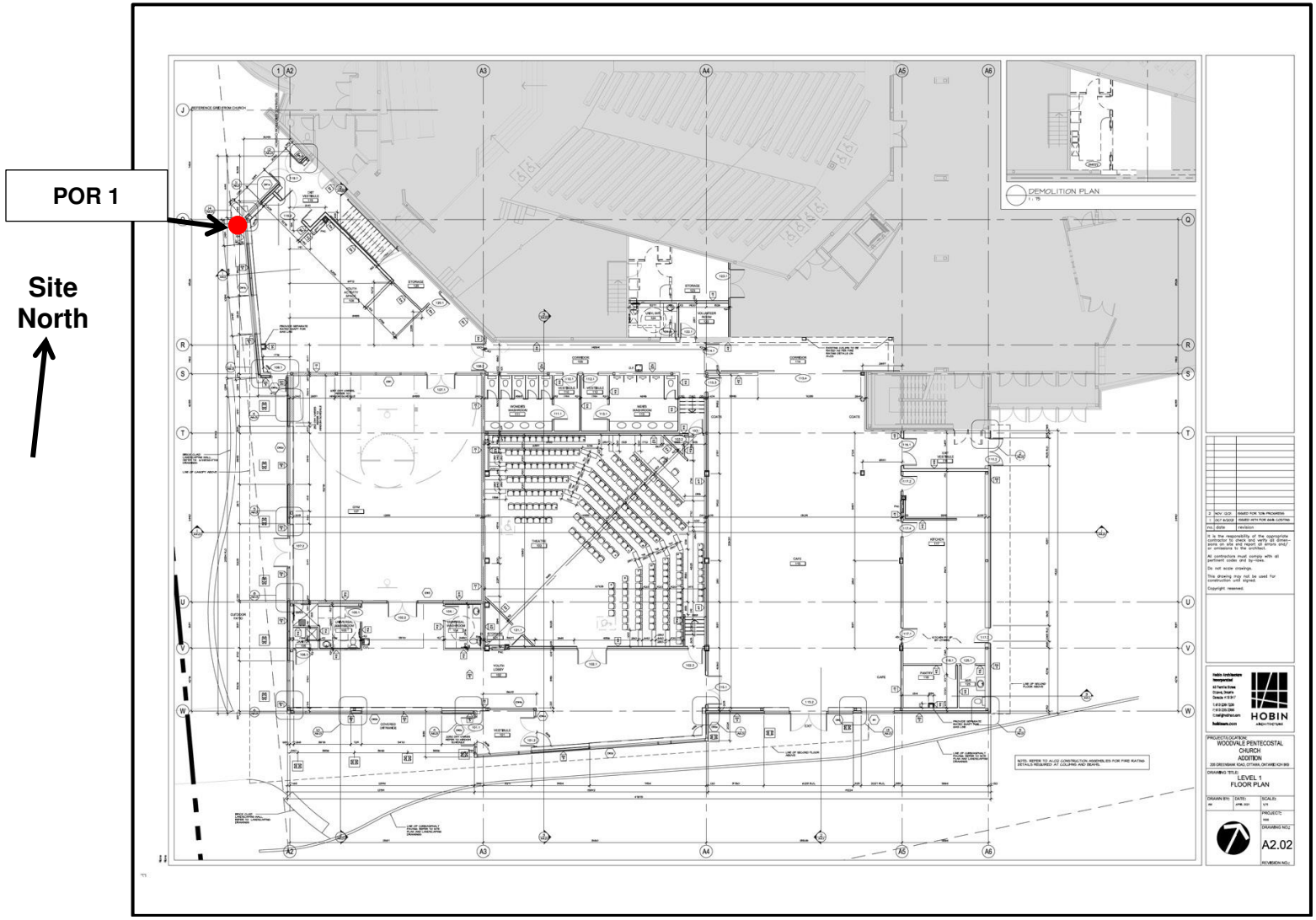


Figure 4: Second Floor Plan showing Points of Reception (Source: Hobin Architecture Inc.)

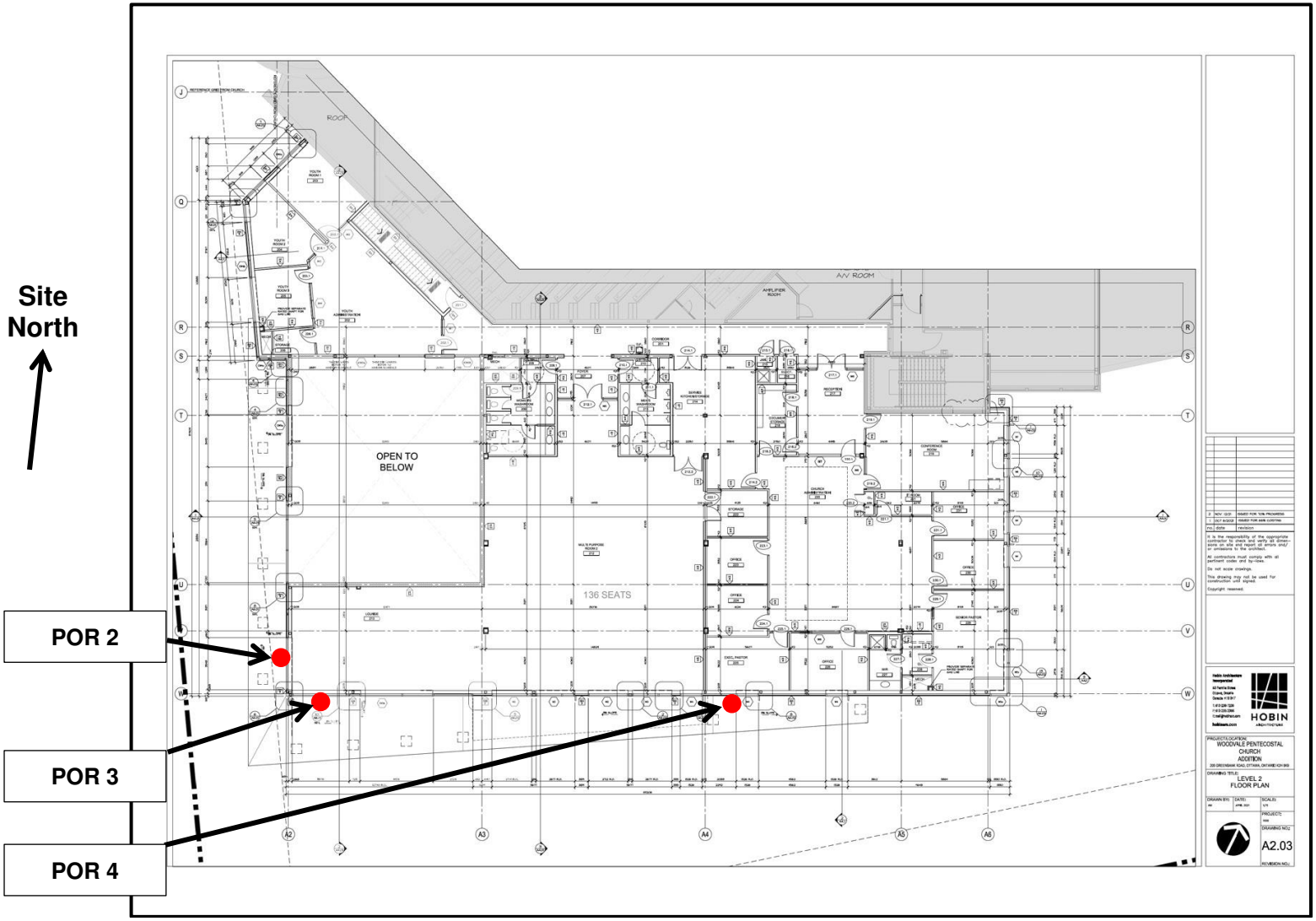


Figure 5: Building Elevations showing Points of Reception (Source: Hobin Architecture Inc.)

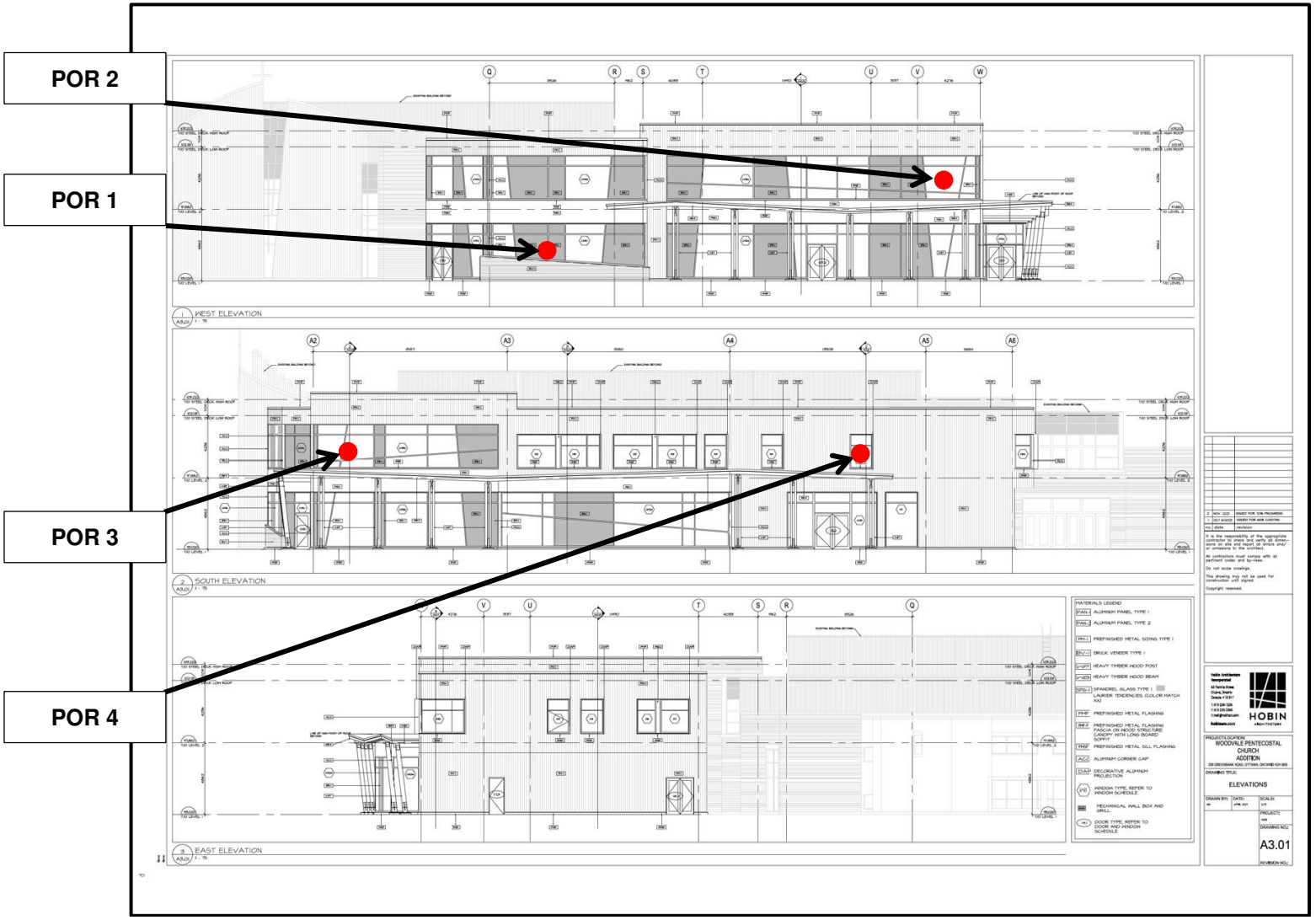


Figure 6: Layout of Youth Activity Space (Room 108) – Worst Case Ground Floor

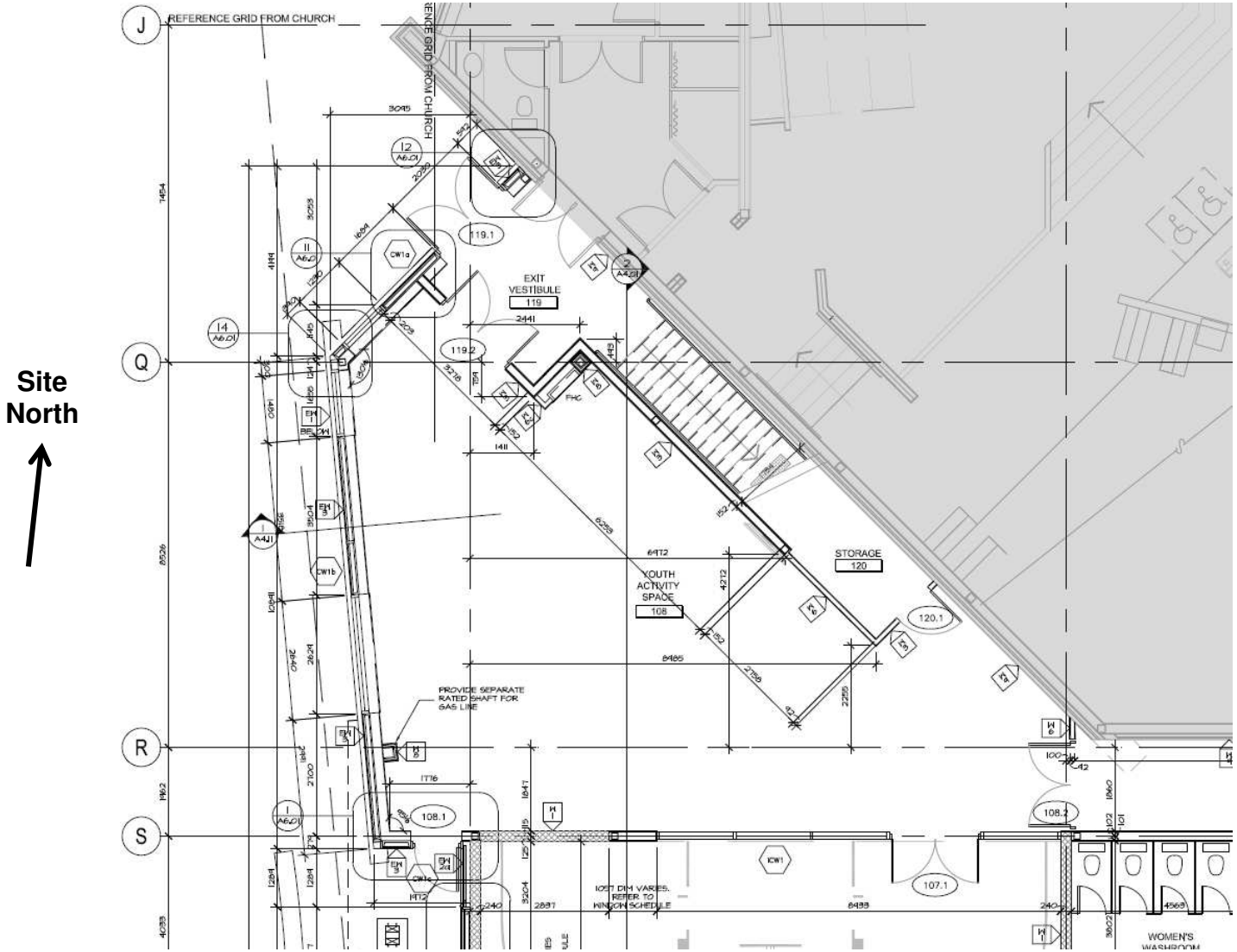
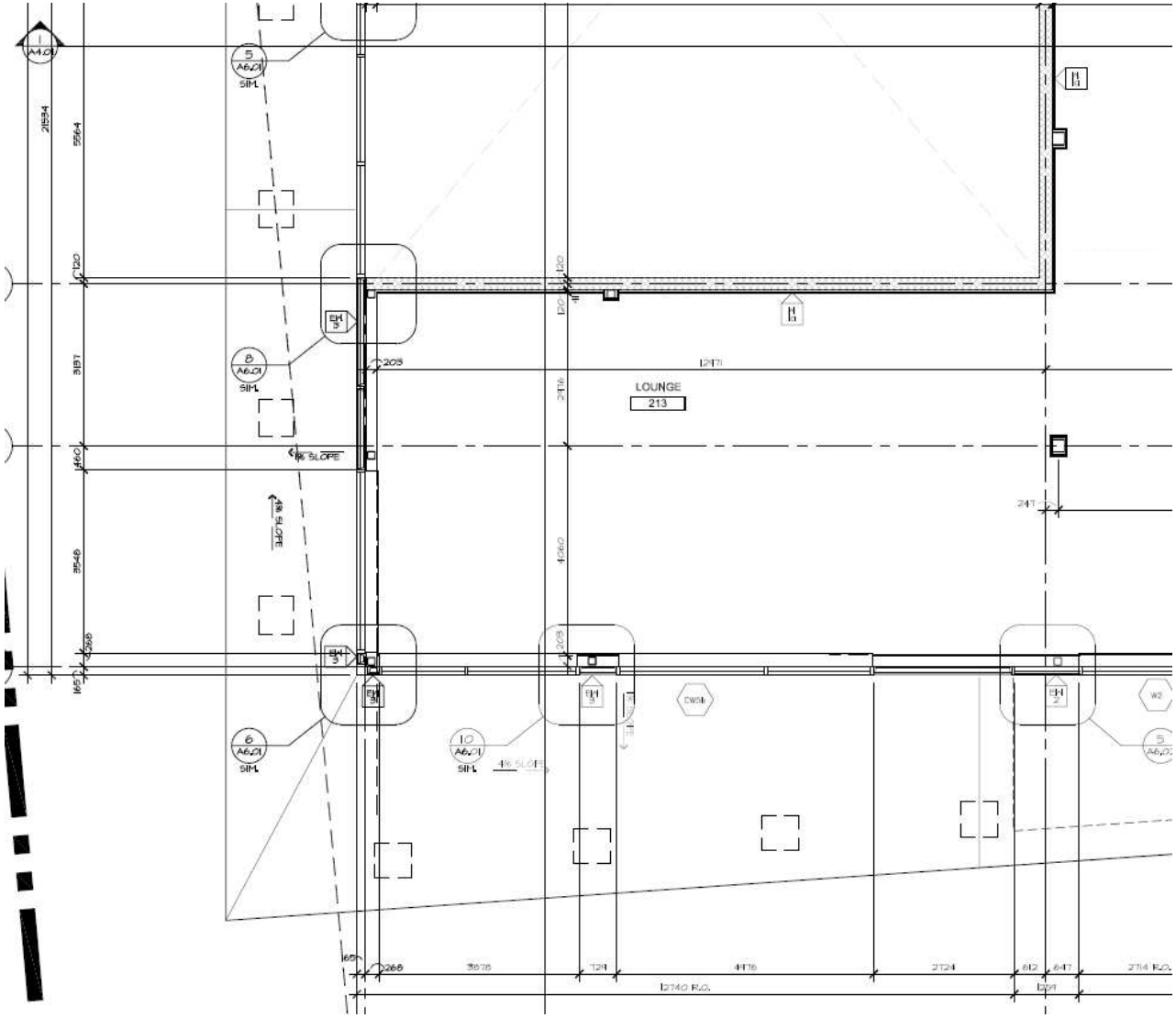


Figure 7: Layout of Multi-Purpose Room - Lounge (Room 213) – Worst Case Second Floor

Site North



TABLES

Contents:

Table 1: Modelled Points of Reception

Symbol	Location	Greenbank (S1)		Greenbank (S2)		Bellman Drive (S3)		Height (m)	Description
		Distance (m)	Angle (deg)	Distance (m)	Angle (deg)	Distance (m)	Angle (deg)		
POR 1	Ground floor level window – Western Facade (Youth Activity Space - Room 108)	17.3	180.0	29.3	180.0	62.1	90.0	2	Plane of window (Reading room, rehearsal space)
POR 2	Second floor level window – Western Facade (Multi-Purpose Room (Lounge) - Room 213)	17.2	180.0	90.4	90.0	90.4	90.0	7.2	Plane of window (Multi-Purpose Room)
POR 3	Second floor level window – Southern Facade (Multi-Purpose Room (Lounge) - Room 213)	19.2	90.0	31.2	90.0	-	-	7.2	Plane of window (Multi-Purpose Room)
POR 4	Second floor level window – Southern Facade (Executive Office - Room 225)	47.9	90.0	59.9	90.0	-	-	7.2	Outdoor Living Area (Office)

*Height measured from ground level

Table 2: Future Traffic Volumes and Posted Speed Limits

Road Segment	Input Data*							Day Volumes, 7:00 - 23:00			Night Volumes, 23:00 - 7:00		
	Segment	AADT	Posted	Split	Split	Medium	Heavy	Cars	Medium	Heavy	Cars	Medium	Heavy
	Type	(24 hours)	Speed	Day	Night	Trucks	Trucks		Trucks	Trucks		Trucks	Trucks
			kph	7:00-23:00	23:00-7:00	%	%	no.	no.	no.	no.	no.	no.
Greenbank Road, 4 Lane Urban Arterial Divided (4-UAD) - Future Mature Traffic Volumes from City of Ottawa Guidelines													
North	S1	17,500	60	0.92	0.08	7	5	14168	1127	805	1232	98	70
	(4-UAD / 2)												
Greenbank Road, 4 Lane Urban Arterial Divided (4-UAD) - Future Mature Traffic Volumes from City of Ottawa Guidelines													
South	S2	17,500	60	0.92	0.08	7	5	14168	1127	805	1232	98	70
	(4-UAD / 2)												
Bellman Drive, 2 Lane, 2-Lane Urban Collector (2-UCU), Future Mature Traffic Volumes from City of Ottawa Guidelines*													
East/West	S3 (2-UCU)	8,000	50	0.92	0.08	7	5	6477	515	368	563	45	32

*Future Mature State Traffic Data for Greenbank Road based on 2 - two lane segments each with 17,500 AADT Volume. Total of two segments combined 35,000 as per City of Ottawa Guidelines.

Table 3: Traffic Noise Impacts for Building Component Requirements

Point of Reception	Location	Estimated Future Noise Level* (dBA)		Building Component Requirement
		Day (Living Room - 7:00 to 23:00)	**Night** (Bedroom – 23:00 to 07:00)	
POR 1	Ground floor level window – Western Facade (Youth Activity Space - Room 108)	72.2	-	Building components (walls, windows, etc.) must be designed to achieve indoor sound level criteria in Table A1.2.
POR 2	Second floor level window – Western Facade (Multi-Purpose Room (Lounge) - Room 213)	72.2	-	Building components (walls, windows, etc.) must be designed to achieve indoor sound level criteria in Table A1.2.
POR 3	Second floor level window – Southern Facade (Multi-Purpose Room (Lounge) - Room 213)	68.7	-	Building components (walls, windows, etc.) must be designed to achieve indoor sound level criteria in Table A1.2.
POR 4	Second floor level window – Southern Facade (Executive Office - Room 225)	65.2	-	Building components (walls, windows, etc.) must be designed to achieve indoor sound level criteria in Table A1.2.

*Daytime Noise Impacts based on Leq 16 h (07:00 – 23:00), Nighttime Noise Impacts based on Leq 8 h (23:00 – 07:00). It is noted night limits do not apply to these spaces. Refer Table A1.3.

Table 4: Traffic Noise Impacts for Ventilation and Warning Clause Requirements

Point of Reception (POR)	Location (see Figures 1 to 7)	Sound Levels due to Road Traffic*		Ventilation Requirements (1)	Warning Clauses (2)
		Day (dBA)	Night (dBA)		
POR 1	Ground floor level window – Western Facade (Youth Activity Space - Room 108)	72.2	-	Central ducted air-conditioning	Required Type D
POR 2	Second floor level window – Western Facade (Multi-Purpose Room (Lounge) - Room 213)	72.2	-	Central ducted air-conditioning	Required Type D
POR 3	Second floor level window – Southern Facade (Multi-Purpose Room (Lounge) - Room 213)	68.7	-	Central ducted air-conditioning	Required Type D
POR 4	Second floor level window – Southern Facade (Executive Office - Room 225)	65.2	-	Central ducted air-conditioning	Required Type D

*Daytime Noise Impacts based on Leq 16 h (07:00 – 23:00), Nighttime Noise Impacts based on Leq 8 h (23:00 – 07:00). It is noted night limits do not apply to these spaces. Refer Table A1.3.

Notes: 1. Ventilation Requirements - Refer Table A1.5, Appendix 1
2. Warning Clause Requirements - Refer Tables A1.5 and A1.6, Appendix 1(

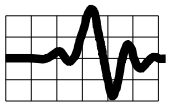
Table 5: Predicted Indoor Sound Levels*

Room	Period	Area (m2)	Facade 1 (West)			Facade 2 (South)			Combined Indoor Sound Level (dBA)	City Criterion (dBA)	Complies (Yes/No)
			Window[1] (m2)	Wall[1] (m2)	Indoor Sound Level (dBA)	Window[1] (m2)	Wall[1] (m2)	Indoor Sound Level (dBA)			
Youth Activity Space (Room 108)	Day	116	45	17.9	45	-	-	-	45	45	Yes
Multi-Purpose Room -Lounge (Room 213)	Day	92	21	7	39	38.1	7	37	41.1	45	Yes

*Prediction Method: IBANA Calculations Refer to Appendix 2.

Notes:

1. Wall Type EW3 consists of an Aluminium or Glass Panel in Aluminium Frame Curtain Wall / Window System. To access worst case noise impacts the entire façade, including areas of wall and windows, has been assessed as glass panel consisting of 3 mm glass, 13 mm air gap, 3 mm glass in aluminium frame with an STC 28 rating. Refer Section 5 for further details.



Appendix 1

City of Ottawa
Noise Criteria and Warning Clauses

For further information refer to:

City of Ottawa Environmental Noise Control Guidelines[1] (ENCG)

MECP Documents, NPC-300[5, 6, 7]

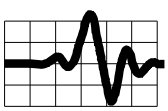


Table A1.1 Summary of Sound Level Criteria for Outdoor Living Areas* Surface Transportation (Road and Rail)

Time Period	Leq 16 hr (dBA)
16 hr, 07:00 – 23:00	55

*Reference: ENCG[1] Table 2.2a and NPC-300[2], Table C-1.

Table A1.2 Summary of Indoor Sound Level Criteria* Surface Transportation (Road and Rail)

Type of Space	Leq (Time Period (dBA))	
	Roadways, Transitways and LRT	Rail (diesel engines/ locomotives)
General offices, reception areas, retail stores, etc. (Time period: 16 hr., 07:00 – 23:00)	50	45
Living/dining areas of residences, hospitals, schools, nursing/retirement homes, day-care centres, theatres, places of worship, libraries, individual semi-private offices, conference rooms, reading rooms, etc. (Time period: 16 hr., 07:00 – 23:00)	45	40
Sleeping quarters of hotels/motels (Time period: 8 hr., 23:00 – 07:00)	45	40
Sleeping Quarters of residences, hospitals, nursing/retirement homes, etc. (Time period: 8 hr., 23:00 – 07:00)	40	35

*Reference: ENCG[1] Table 2.2b and 2.2c and NPC-300[2], Table C-1 and table C-9.

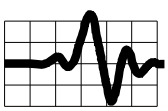


Table A1.3: Summary of Road and Rail Noise* Daytime (07:00 – 23:00) & Nighttime (23:00 – 07:00) Building Component Requirements

Assessment Location & Time		Outdoor Leq (dBA)	Building Component Requirements
Plane of the Window (Living, Dining, Office, Theatre, Reception etc.) ♦ Daytime (07:00 – 23:00)	Road	Less than or equal to 65	Building compliant with Ontario Building Code
		Greater than 65	Building components (walls, windows, etc.) must be designed to achieve indoor sound level criteria in Table A1.2.
	Rail	Less than or equal to 60	Building compliant with Ontario Building Code
		Greater than 60	Building components (walls, windows, etc.) must be designed to achieve indoor sound level criteria in Table A1.2.
Plane of Window (Bedroom etc.) ♦ Nighttime (23:00 – 07:00)	Road	Less than or equal to 60	Building compliant with Ontario Building Code
		Greater than 60	Building components (walls, windows, etc.) must be designed to achieve indoor sound level criteria in Table A1.2.
	Rail	Less than or equal to 55	Building compliant with Ontario Building Code
		Greater than 55	Building components (walls, windows, etc.) must be designed to achieve indoor sound level criteria in Table A1.2.

*Reference: NPC-300, Section C7.1 Road Noise Control Measures

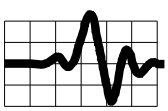


Table A1.4: Summary of Facade Material Requirement for Rail Noise Only*

Assessment Location	Distance to Railway	Sound Level dBA	Facade Material Requirement
Plane of Bedroom Window ♦ 24 hr.	**Less than 100 m**	**Leq $_{24\ hr}$ less than or equal to 60**	**No additional requirement**
		Leq $_{24\ hr}$ greater than 60	**Brick veneer or acoustically equivalent**
	Greater than 100 m	**Leq $_{24\ hr}$ less than or equal to 60**	**No additional requirement**
		Leq $_{24\ hr}$ greater than 60	**No additional requirement**

*Reference: NPC-300, Section C7.2 Rail Noise Control Measures.

Table A1.5: Summary of Combination of Road and Rail Noise* Day-time (07:00 – 23:00) & Night-time (23:00 – 07:00) Outdoor, Ventilation and Warning Clause Requirements

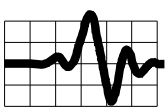
Assessment Location & Time	Outdoor Leq (dBA)	Ventilation Requirements	Outdoor Control Measures	Warning Clauses (see Table A1.6)
Outdoor Living Area (OLA) ♦ Day-time (07:00 – 23:00)	Less than or equal to 55	N/A	None Required	Not Required
	Greater than 55 to less than 60	N/A	Control Measures (barriers) not required but should be considered.	Type A required if resultant Leq exceeds 55 dBA
	Greater than 60	N/A	Control measures (barriers) required to reduce the Leq to below 60 dBA and as close to 55 dBA as technically, economically and administratively feasible.	Type B required if resultant Leq exceeds 55 dBA
Plane of the Window (Living, Dining, Office, Theatre, Reception etc.) ♦ Daytime (07:00 – 23:00)	Less than or equal to 55	None Required	N/A	Not Required
	Greater than 55 to less than or equal to 65	Forced air heating with provision for central air-conditioning	N/A	Required Type C
	Greater than 65	Central ducted air-conditioning	N/A	Required Type D
Plane of Window (Bedroom etc.) Nighttime (23:00 – 07:00)	Less than or equal to 50	None Required	N/A	Not Required
	Greater than 50 to less than or equal to 60	Forced air heating with provision for central ducted air-conditioning	N/A	Required Type C
	Greater than 60	Central ducted air-conditioning	N/A	Required Type D

*Reference: NPC-300, Section C7.1 and C7.2.

Table A1.6: Summary of Provincial Warning Type Clauses (may be used individually or in combination)*

Type	Warning Clause
Type A	"Purchasers/Tenants are advised that sound levels due to increasing (road) (transitway) (rail) (air) traffic may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the City's and the Ministry of Environment, Parks and Conservation noise criteria."
Type B	"Purchasers/Tenants are advised that despite the inclusion of noise control features in the development and within the building units, sound levels due to increasing (road) (transitway) (rail) (air) traffic may on occasions interfere with some activities of the dwelling occupants as the sound levels exceed the City's and the Ministry of Environment, Parks and Conservation noise criteria."
Type C	"This dwelling unit has been fitted with a forced air heating system and the ducting etc. was sized to accommodate central air-conditioning. Installation of central air-conditioning by the occupant will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the City's and the Ministry of Environment, Parks and Conservation noise criteria. (Note: The location and installation of the outdoor air conditioning device should be done so as to comply with the noise criteria of MECP Publication NPC-216, Residential Air Conditioning Devices and thus minimize the noise impacts on and in the immediate vicinity of the subject property."
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 City's and the Ministry of Environment, Parks and Conservation noise criteria."
Type E	"Purchasers/tenants are advised that due to the proximity of the adjacent industry (facility) (utility), sound levels from the industry (facility) (utility) may at times be audible.

*Reference: NPC-300[2] Section C8 Warning Clauses. Refer ENCG Table A1 Surface Transportation Warning Clauses for example of applicable "no outdoor amenity area provided" type warning clause.

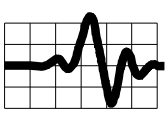


Appendix 2

Calculation Details and Software Outputs

Contents:

Sample outputs from STAMSON:



STAMSON 5.0 SUMMARY REPORT Date: 07-02-2022 15:46:58
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: por1.te Time Period: 16 hours
Description: POR 1 - Plane of Window - Daytime

Road data, segment # 1: Greenbank S1

Car traffic volume : 14168 veh/TimePeriod
Medium truck volume : 1127 veh/TimePeriod
Heavy truck volume : 805 veh/TimePeriod
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: Greenbank S1

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 17.30 m
Receiver height : 2.00 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 2: Greenbank S2

Car traffic volume : 14168 veh/TimePeriod
Medium truck volume : 1127 veh/TimePeriod
Heavy truck volume : 805 veh/TimePeriod
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 2: Greenbank S2

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 29.30 m
Receiver height : 2.00 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 3: Bellman S3

Car traffic volume : 6477 veh/TimePeriod
Medium truck volume : 515 veh/TimePeriod
Heavy truck volume : 368 veh/TimePeriod
Posted speed limit : 50 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 3: Bellman S3

Angle1 Angle2 : -90.00 deg 0.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 62.10 m
Receiver height : 2.00 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Result summary
---

	source height (m)	Road Leq (dBA)	Total Leq (dBA)
1.Greenbank S1	1.50	70.05	70.05
2.Greenbank S2	1.50	67.76	67.76
3.Bellman S3	1.50	56.57	56.57
Total			72.19 dBA

TOTAL Leq FROM ALL SOURCES: 72.19

STAMSON 5.0 SUMMARY REPORT Date: 07-02-2022 16:08:37
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: por2.te Time Period: 16 hours
Description: POR 2 - Plane of Window - Daytime

Road data, segment # 1: Greenbank S1

Car traffic volume : 14168 veh/TimePeriod
Medium truck volume : 1127 veh/TimePeriod
Heavy truck volume : 805 veh/TimePeriod
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: Greenbank S1

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 17.20 m
Receiver height : 7.20 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 2: Greenbank S2

Car traffic volume : 14168 veh/TimePeriod
Medium truck volume : 1127 veh/TimePeriod
Heavy truck volume : 805 veh/TimePeriod
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 2: Greenbank S2

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 29.20 m
Receiver height : 7.20 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 3: Bellman S3

Car traffic volume : 6477 veh/TimePeriod
Medium truck volume : 515 veh/TimePeriod
Heavy truck volume : 368 veh/TimePeriod
Posted speed limit : 50 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 3: Bellman S3

Angle1 Angle2 : -90.00 deg 0.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 90.40 m
Receiver height : 7.20 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Result summary
---

	source height (m)	Road Leq (dBA)	Total Leq (dBA)
1.Greenbank S1	1.50	70.07	70.07
2.Greenbank S2	1.50	67.77	67.77
3.Bellman S3	1.50	54.94	54.94
Total			72.16 dBA

TOTAL Leq FROM ALL SOURCES: 72.16

STAMSON 5.0 SUMMARY REPORT Date: 07-02-2022 16:09:27
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: por3.te Time Period: 16 hours
Description: POR 3 - Plane of Window - Daytime

Road data, segment # 1: Greenbank S1

Car traffic volume : 14168 veh/TimePeriod
Medium truck volume : 1127 veh/TimePeriod
Heavy truck volume : 805 veh/TimePeriod
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: Greenbank S1

Angle1 Angle2 : -90.00 deg 0.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 19.20 m
Receiver height : 7.20 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 2: Greenbank S2

Car traffic volume : 14168 veh/TimePeriod
Medium truck volume : 1127 veh/TimePeriod
Heavy truck volume : 805 veh/TimePeriod
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 2: Greenbank S2

Angle1 Angle2 : -90.00 deg 0.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 31.20 m
Receiver height : 7.20 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Result summary
---

	source height (m)	Road Leq (dBA)	Total Leq (dBA)
1.Greenbank S1	1.50	66.58	66.58
2.Greenbank S2	1.50	64.47	64.47
Total			68.66 dBA

TOTAL Leq FROM ALL SOURCES: 68.66

STAMSON 5.0 SUMMARY REPORT Date: 07-02-2022 16:10:03
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: por4.te Time Period: 16 hours
Description: POR 4 - Plane of Window - Daytime

Road data, segment # 1: Greenbank S1

Car traffic volume : 14168 veh/TimePeriod
Medium truck volume : 1127 veh/TimePeriod
Heavy truck volume : 805 veh/TimePeriod
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: Greenbank S1

Angle1 Angle2 : -90.00 deg 0.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 47.90 m
Receiver height : 7.20 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 2: Greenbank S2

Car traffic volume : 14168 veh/TimePeriod
Medium truck volume : 1127 veh/TimePeriod
Heavy truck volume : 805 veh/TimePeriod
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 2: Greenbank S2

Angle1 Angle2 : -90.00 deg 0.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 59.90 m
Receiver height : 7.20 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Result summary
---

	source height (m)	Road Leq (dBA)	Total Leq (dBA)
1.Greenbank S1	1.50	62.61	62.61
2.Greenbank S2	1.50	61.64	61.64
Total			65.16 dBA

TOTAL Leq FROM ALL SOURCES: 65.16

Traffic Noise Sound Insulation Scenario Calculation Results

Project: POR 1
ProjectID:
Date:2022-02-07
Outdoor level: NEF 40 or Leq24 72 or Ldn 73 dBA

Source Spectrum details:

100% ISO 717 Road Traffic
Corrections:

Receiving room:

Floor Area: 116.00 ft²
Absorbtion: 100% of floor area

Construction Description:

Element 1: GL3_AIR13_GL3

Construction Type: Window
Area: 62.90 m²
Test ID: TLA-99-177a
Test Date: 1999-05-31

Aluminum casement window (seals not taped).

Sound Level vs. Frequency - Spectrum Values:

Frequency(Hz)	Indoor Sound Level(dB)
50	54.9
63	52.6
80	48.6
100	47.6
125	45.5
160	48.5
200	45.8
250	44.4
315	39.0
400	40.4
500	35.5
630	34.5
800	34.8
1000	35.5
1250	31.7
1600	28.3
2000	23.8
2500	20.2
3150	19.6
4000	18.6
5000	13.9

A-Weighted Sound Level vs. Frequency - Spectrum Values:

Frequency(Hz)	A-Wtd Sound Level(dBA)
50	24.7
63	26.4
80	26.1
100	28.5
125	29.4
160	35.1
200	34.9
250	35.8
315	32.4
400	35.6
500	32.3
630	32.6
800	34.0
1000	35.5
1250	32.3
1600	29.3
2000	25.0
2500	21.5
3150	20.8
4000	19.6
5000	14.4

Transmission Loss vs. Frequency - Spectrum Values:

Frequency(Hz)	Transmission Loss(dB)
50	19.4
63	19.7
80	22.0
100	20.6
125	19.7
160	16.1
200	18.2
250	18.3
315	22.7
400	20.5
500	24.8
630	25.5
800	26.1
1000	25.6
1250	27.8
1600	29.8
2000	33.1
2500	34.6
3150	33.2
4000	33.2
5000	36.3

Source Sound Level vs. Frequency - Spectrum Values:

Frequency(Hz)	Source Sound Level(dB)
50	77.0
63	75.0
80	73.3
100	70.9
125	67.9
160	67.2
200	66.7
250	65.4
315	64.4
400	63.6
500	63.0
630	62.7
800	63.6
1000	63.8
1250	62.2
1600	60.8
2000	59.6
2500	57.5
3150	55.6
4000	54.8
5000	53.3

Single Number Ratings

Outdoor Sound Level:	72 dBA
Indoor Sound Level:	45 dBA
A-wtd Level Reduction:	27 dB
A-wtd Reduction re Standard Source:	26 dB
OITC Rating:	23 dB

Traffic Noise Sound Insulation Scenario Calculation Results

Project: POR 2
ProjectID:
Date:2022-02-07
Outdoor level: NEF 37 or Leq24 69 or Ldn 70 dBA

Source Spectrum details:

100% ISO 717 Road Traffic
Corrections:

Receiving room:

Floor Area: 92.00 ft²
Absorbtion: 100% of floor area

Construction Description:

Element 1: GL3_AIR13_GL3

Construction Type: Window
Area: 28.00 m²
Test ID: TLA-99-177a
Test Date: 1999-05-31

Aluminum casement window (seals not taped).

Sound Level vs. Frequency - Spectrum Values:

Frequency(Hz)	Indoor Sound Level(dB)
50	49.4
63	47.1
80	43.1
100	42.1
125	40.0
160	42.9
200	40.3
250	38.9
315	33.5
400	34.9
500	30.0
630	29.0
800	29.3
1000	30.0
1250	26.2
1600	22.8
2000	18.3
2500	14.7
3150	14.1
4000	13.1
5000	8.4

A-Weighted Sound Level vs. Frequency - Spectrum Values:

Frequency(Hz)	A-Wtd Sound Level(dBA)
50	19.2
63	20.9
80	20.6
100	23.0
125	23.9
160	29.5
200	29.4
250	30.3
315	26.9
400	30.1
500	26.8
630	27.1
800	28.5
1000	30.0
1250	26.8
1600	23.8
2000	19.5
2500	16.0
3150	15.3
4000	14.1
5000	8.9

Transmission Loss vs. Frequency - Spectrum Values:

Frequency(Hz)	Transmission Loss(dB)
50	19.4
63	19.7
80	22.0
100	20.6
125	19.7
160	16.1
200	18.2
250	18.3
315	22.7
400	20.5
500	24.8
630	25.5
800	26.1
1000	25.6
1250	27.8
1600	29.8
2000	33.1
2500	34.6
3150	33.2
4000	33.2
5000	36.3

Source Sound Level vs. Frequency - Spectrum Values:

Frequency(Hz)	Source Sound Level(dB)
50	74.0
63	72.0
80	70.3
100	67.9
125	64.9
160	64.2
200	63.7
250	62.4
315	61.4
400	60.6
500	60.0
630	59.7
800	60.6
1000	60.8
1250	59.2
1600	57.8
2000	56.6
2500	54.5
3150	52.6
4000	51.8
5000	50.3

Single Number Ratings

Outdoor Sound Level:	69 dBA
Indoor Sound Level:	39 dBA
A-wtd Level Reduction:	30 dB
A-wtd Reduction re Standard Source:	28 dB
OITC Rating:	23 dB

Traffic Noise Sound Insulation Scenario Calculation Results

Project: POR 3
ProjectID:
Date:2022-02-07
Outdoor level: NEF 33 or Leq24 65 or Ldn 66 dBA

Source Spectrum details:

100% ISO 717 Road Traffic
Corrections:

Receiving room:

Floor Area: 92.00 ft²
Absorbtion: 100% of floor area

Construction Description:

Element 1: GL3_AIR13_GL3

Construction Type: Window
Area: 45.10 m²
Test ID: TLA-99-177a
Test Date: 1999-05-31

Aluminum casement window (seals not taped).

Sound Level vs. Frequency - Spectrum Values:

Frequency(Hz)	Indoor Sound Level(dB)
50	47.4
63	45.2
80	41.2
100	40.2
125	38.0
160	41.0
200	38.4
250	37.0
315	31.6
400	32.9
500	28.0
630	27.1
800	27.3
1000	28.1
1250	24.3
1600	20.8
2000	16.4
2500	12.7
3150	12.1
4000	11.2
5000	6.4

A-Weighted Sound Level vs. Frequency - Spectrum Values:

Frequency(Hz)	A-Wtd Sound Level(dBA)
50	17.2
63	19.0
80	18.7
100	21.1
125	21.9
160	27.6
200	27.5
250	28.4
315	25.0
400	28.1
500	24.8
630	25.2
800	26.5
1000	28.1
1250	24.9
1600	21.8
2000	17.6
2500	14.0
3150	13.3
4000	12.2
5000	6.9

Transmission Loss vs. Frequency - Spectrum Values:

Frequency(Hz)	Transmission Loss(dB)
50	19.4
63	19.7
80	22.0
100	20.6
125	19.7
160	16.1
200	18.2
250	18.3
315	22.7
400	20.5
500	24.8
630	25.5
800	26.1
1000	25.6
1250	27.8
1600	29.8
2000	33.1
2500	34.6
3150	33.2
4000	33.2
5000	36.3

Source Sound Level vs. Frequency - Spectrum Values:

Frequency(Hz)	Source Sound Level(dB)
50	70.0
63	68.0
80	66.3
100	63.9
125	60.9
160	60.2
200	59.7
250	58.4
315	57.4
400	56.6
500	56.0
630	55.7
800	56.6
1000	56.8
1250	55.2
1600	53.8
2000	52.6
2500	50.5
3150	48.6
4000	47.8
5000	46.3

Single Number Ratings

Outdoor Sound Level:	65 dBA
Indoor Sound Level:	37 dBA
A-wtd Level Reduction:	28 dB
A-wtd Reduction re Standard Source:	26 dB
OITC Rating:	23 dB

RESUMÉ: Dr. HUGH WILLIAMSON, P.Eng.

QUALIFICATIONS:

Ph.D. Mechanical Engineering, University of New South Wales, 1972

B.Sc. Mechanical Engineering, (with Distinction), University of Alberta, 1967

Member, Professional Engineers, Ontario

Member, Canadian Acoustical Association

KEY COMPETENCIES:

- Environmental noise and vibration assessments, Environmental Compliance Approval (ECA). Noise assessment for land use planning
- Architectural and building acoustics, acoustics of office spaces, meeting rooms, auditoriums and studios, noise and vibration control of building mechanical services.
- Industrial noise and vibration assessment and control.
- Transportation noise and vibration.

PROFESSIONAL EXPERIENCE:

Hugh Williamson is a professional engineer with many years of experience in the measurement, analysis and control of noise and vibration. Freefield Ltd. was incorporated in 2017 and provides consulting services in architectural, building, industrial, transportation and environmental acoustics and vibration. Clients include architects, engineering firms, industrial firms and government departments. Prior to joining Freefield Ltd. Hugh Williamson founded and directed Hugh Williamson Associates Inc. which specialized in consulting services in architectural, building, industrial, transportation and environmental acoustics and vibration. His career included extensive periods in industry as well as university level research and teaching. He is a former Director of the Acoustics and Vibration Unit at the Australian Defence Force Academy. He has published over 50 engineering and scientific papers and has been an invited speaker on noise and vibration at national and international conferences. He has more than 25 years of experience as a consultant.

CLIENT LIST:

Hugh Williamson has provided consulting services to large and small clients including: National Research Council, J. L. Richards & Associates, Barry Padolsky Associates, Atkinson Schroeter Design Group, R. W. Tomlinson Limited, Geo. Tackaberry Construction, Miller Paving, City of Ottawa.

Postal Address: PO Box 74056, RPO Beechwood, Ottawa, Ontario, K1M 2H9, Canada
Phone: 613-747-0983, Email: hugh@freefieldacoustics.com, http://www.freefieldacoustics.com

RESUMÉ: MICHAEL WELLS

QUALIFICATIONS:

Registered Architect of NSW, Registration Number: 8111

B. Architecture (Hons), University of Sydney, 2002

B.Sc. Architecture, University of Sydney, 1999

Member, Canadian Acoustical Association

Member, Australian Acoustical Society

Associate Member, INCE-USA

KEY COMPETENCIES:

- Environmental noise and vibration assessments, Environmental Compliance Approval (ECA). Noise assessment for land use planning.
- Architectural and building acoustics, acoustics of office spaces, meeting rooms, auditoriums and studios, noise and vibration control of building mechanical services.
- Industrial noise and vibration assessment and control.
- Transportation noise and vibration.
- Design services including sketch design, design development (development / permit applications), contract documents, tendering and contract administration.

PROFESSIONAL EXPERIENCE:

Michael Wells is a professional Architect registered in NSW, Australia, with many years of experience in the measurement, analysis and control of noise and vibration. Michael Wells is a founding Director of Freefield Ltd. which was incorporated in 2017, and provides consulting services in architectural, building, industrial, transportation and environmental acoustics and vibration. Clients include architects, engineering firms, industrial firms and government departments. Prior to establishing Freefield Ltd., his career included working for Hugh Williamson Associates Inc. specializing in acoustics, noise and vibration consulting services, and, the founding of Michael Wells Architect in Sydney, Australia, specializing in the design of institutional, commercial and residential projects. He is the former Director of Architectural Workshops Australia and Vision Blue Pty Ltd. He has more than 15 years of experience as a consultant.

CLIENT LIST:

Michael Wells has provided consulting services to large and small clients including: National Research Council, R. W. Tomlinson, G. Tackaberry & Sons Construction, Miller Paving, J. L. Richards & Associates, Barry Padolsky Associates, Atkinson Schroeter Design Group and Industry Canada.