576 BYRON AVENUE
NOISE IMPACT ASSESSMENT REPORT

Prepared By:

NOVATECH
Suite 200, 240 Michael Cowpland Drive
Kanata, Ontario
K2M 1P6

August 2017

Novatech File No. 116107
Ref No.: R-2017-138

NOVATECH
Engineers, Planners & Landscape Architects

August 8, 2017

BY COURIER

Falsetto Custom Homes
52 Sullivan Drive
Ottawa, ON
K2G 1V2

Attention: Sam Falsetto

Dear Mr. Falsetto:

Reference: Noise Impact Assessment Report
576 Byron Avenue
Our File No.: 116107

Enclosed please find the 'Noise Impact Assessment Report' for the proposed development of 576 Byron Avenue in the City of Ottawa. The report will assess the impacts of noise from vehicular traffic on the proposed development using the MOE STAMSON software.

This report is submitted in order to satisfy condition 6 of the decision of the Committee of Adjustment dated October 20, 2016, approving the severance of the subject property. A copy of the conditions are included in **Appendix A** of this report.

Please contact the undersigned, should you have any questions or require additional information.

Yours truly,

NOVATECH

Lisa Bowley, P.Eng.
Project Manager | Land Development Engineering

Encl.

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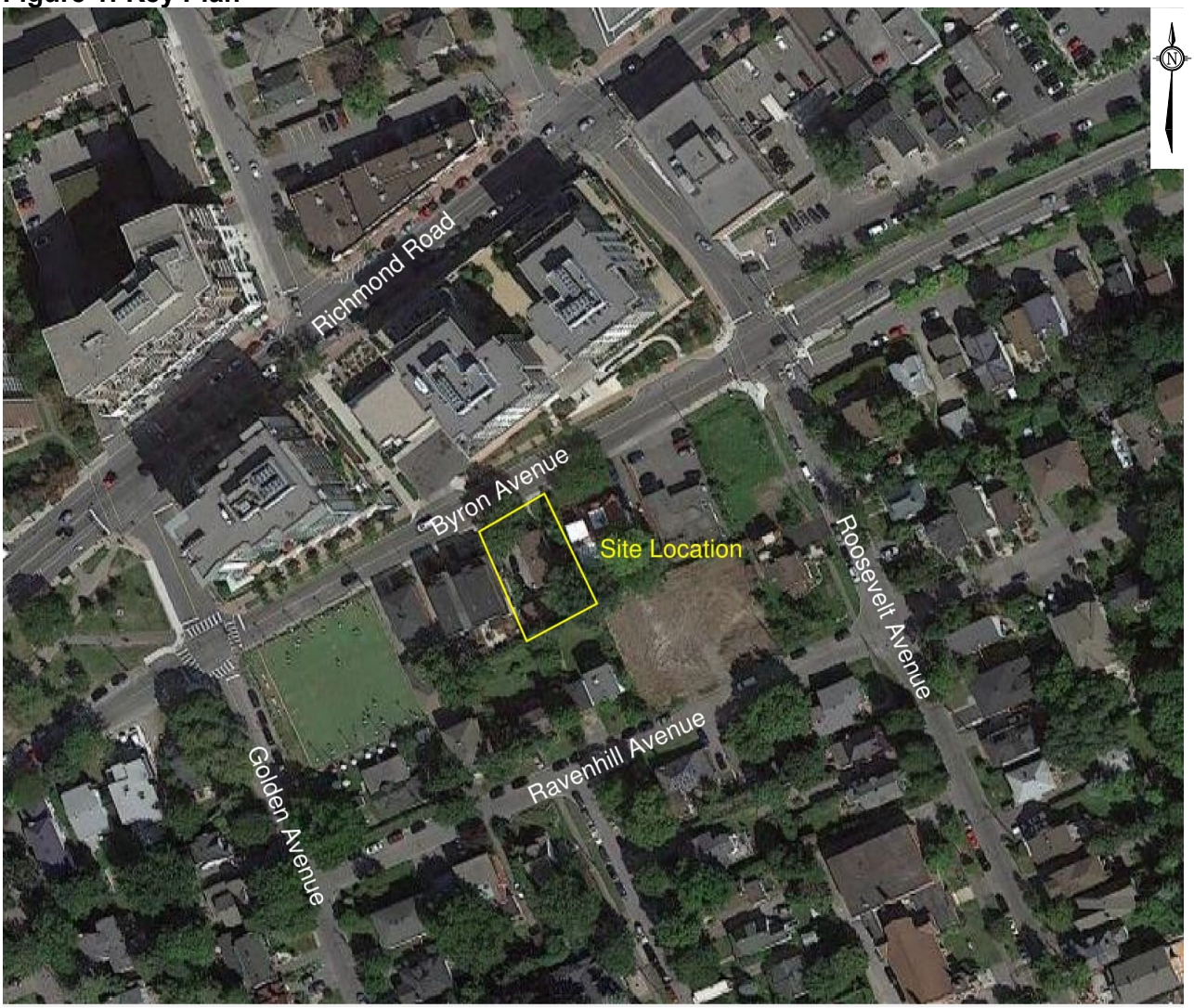
1.0 INTRODUCTION

Novatech has been retained to prepare this noise impact assessment to satisfy the Committee of Adjustment conditions for a severance of the property of 576 Byron Avenue. A copy of the decision is included in **Appendix A** of this report.

The report will assess the impacts of sound from vehicular traffic on the proposed development using the Ministry of the Environment (MOE) STAMSON 5.0 software and outline any necessary noise attenuation requirements for compliance with the City of Ottawa Environmental Noise Control Guidelines (ENCG) and the MOE Environmental Noise Guideline (MOE Publication NPC-300).

The subject site is located at 576 Byron Avenue, south of Byron Avenue, west of Roosevelt Avenue, north of Ravenhill Avenue and east of Golden Avenue, as shown on the Key Plan (**Figure 1**).

Figure 1: Key Plan



Falsetto Custom Homes is proposing to redevelop the existing lot with two triplex residences, as shown on the Elevation and Floor plans included in **Appendix E**.

2.0 NOISE CONTROL GUIDELINES

2.1 Sound Level Criteria

The City of Ottawa is concerned with noise from aircraft, roads, railways and transitways as expressed in the City of Ottawa Official Plan. As per Section 2.2 of the ENCG, unless otherwise noted, noise mitigation recommendations should be consistent with NPC-300 to the extent that is both reasonable and practical.

The areas that must be assessed for acoustic protection include the Outdoor Living Area (OLA) and the Outdoor Plane of Window (POW).

These locations are defined as:

- **Outdoor Living Area (OLA):** The outdoor living areas provide for quiet enjoyment of the outdoor environment during the daytime period (i.e. backyards, terraces and decks). OLA noise levels are analyzed at 3.0m from the building façade, 1.5m above grade.

- **Plane of Window (POW):** The plane of window is defined as the indoor living space where the sound levels will affect the living room area during daytime hours and bedrooms during night time hours. POW noise levels are analyzed inside the building, 1.5m above the finished floor.

The following table summarizes the ENCG sound level criteria pertinent to the subject site. Excerpts from the ENCG are included in **Appendix B** for reference.

Table 1: Sound Level Criteria

Type of Space	Time Period	Leq (dBA)
		Roadways
Outdoor Living Area (OLA)	7:00 – 23:00	55
Plane of Window (POW): Residential Living/Dining Areas	7:00 – 23:00	45
	23:00 – 7:00	45
Plane of Window (POW): Residential Sleeping quarters	7:00 – 23:00	45
	23:00 – 7:00	40

2.2 Alternatives for Noise Attenuation Measures

When sound levels are predicted to exceed the sound level criteria, a combination of attenuation measures and warning clauses are recommended by the City of Ottawa and the MOE to modify the development environment.

These attenuation measures may include any or all of the following:

- Distance setback with soft ground;
- Insertion of noise insensitive land uses between the source and sensitive receptor;
- Orientation of building to provide sheltered zones;
- Construction of sound or acoustic barriers;
- Installation of air conditioning and ventilation; and
- Enhanced construction techniques and construction quality.

2.2.1 Noise Barrier

When noise levels exceed 60 dBA in the Outdoor Living Area, control measures (barriers) are required to reduce the Leq to below 60 dBA and as close to 55 dBA as technically, economically and administratively feasible.

The noise barriers are to be compliant with the City standard for noise barriers and have the following characteristics:

- Minimum height of 2.2m;
- Situated 0.30m inside the private property line;
- A surface mass density not less than 20kg/sq.m; and
- No holes or gaps.

2.2.2 Ventilation Requirements

A forced air heating system with provision for a central air conditioning system is required if the plane of window daytime noise levels are between 55 dBA and 65 dBA and/or the night time noise levels are between 50 dBA and 60 dBA.

The installation of a central air conditioning system is required when the daytime noise level exceeds 65 dBA and/or the night time noise level exceeds 60 dBA.

2.2.3 Building Component Assessment

When plane of window noise levels exceed 65 dBA (daytime) or 60 dBA (night time) the exterior cladding system of the building envelope must be acoustically assessed to ensure indoor sound criteria are achieved. This includes analysis of the exterior wall, door, and/or glazing system specifications as appropriate.

The NRC research *Acoustic Insulation Factor: A Rating for the Insulation of Buildings against Noise* (June 1980, JD Quirt) is used to assess the building components and the required acoustic insulation factor (AIF). This method is recognized by the City of Ottawa.

The required AIF is based on the Outside L_{eq}, Indoor L_{eq} required, and the number of exterior façade components.

Minimum Required AIF = Outside L_{eq} – Indoor L_{eq} + 10 $\log_{10}$ (Number of Components) + 2dB

Where, N = Number of components (walls, windows and roof);

L = Sound Level expressed on a common decibel scale.

2.2.4 Warning Clauses

When predicted noise levels exceed the specified criteria, the City of Ottawa and the MOE recommend warning clauses be registered as a notice on title and incorporated into the lease/rental/sale agreements to warn potential purchaser/buyers/tenants of the possible elevated noise levels.

The following typical warning clauses are extracted from Section C8.1 of the MOE NPC-300 document.

Warning Clause Type A

"Purchasers/tenants are advised that sound levels due to increasing road traffic may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the City's and the Ministry of the Environment's noise criteria."

Warning Clause 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 traffic may on occasion interfere with some activities of the dwelling occupants as the sound levels exceed the City's and the Ministry of the Environment's noise criteria."

Warning Clause Type C

"This dwelling unit has been designed with the provision for adding central air conditioning at the occupant's discretion. Installation of central air conditioning by the occupant 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 the Environment's noise criteria."

Warning Clause Type D

"This dwelling unit has been supplied with a central air conditioning system which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the City's and the Ministry of the Environment's noise criteria."

2.2.5 Summary of Noise Attenuation Measure Requirements

Table 2 summarizes the required noise attenuation measure and warning clauses should sound criteria be exceeded. Excerpts from the MOE NPC-300 document are included in **Appendix B** for reference.

Table 2: Noise Attenuation Measure Requirements

Assessment Location	L_{eq} (dBA)	Outdoor Control Measures	Indoor Control Measures		Warning Clause
			Ventilation Requirements	Building Components	
Outdoor Living Area (OLA)	Less than 55	None required	N/A	N/A	None required
	Between 55 and 60	Control measures (barriers) may not be required but should be considered	N/A	N/A	Required if resultant L_{eq} exceeds 55 dBA Type A
	More than 60	Barriers required	N/A	N/A	Required if resultant L_{eq} exceeds 55 dBA Type B
Plane of Living Room Window (POW)	Less than 55	N/A	None Required	None Required	None Required
	Between55 5 and 65	N/A	Forced air heating with provision for central air conditioning	None Required	Required Type C
	More Than 65	N/A	Central Air Conditioning	Acoustical performance of the windows and walls should be specified	Required Type D
Plane of Bedroom Window (POW)	Less than 50	N/A	None Required	None Required	None Required
	Between 50 and 60	N/A	Forced air heating with provision for central air conditioning	None Required	Required Type C
	More than 60	N/A	Central Air Conditioning	Acoustical performance of the windows and walls should be specified	Required Type D

3.0 NOISE SOURCES

The City of Ottawa Official Plan and Environmental Noise Control Guidelines (ENCG) stipulate that a noise impact assessment is required when a noise sensitive development is within proximity to a surface transportation (road or rail), stationary, and aircraft noise sources.

Due to the site location, roadway noise will be considered. The following distances to roadway noise sources are applicable to the subject site:

- Within 100m from the right-of-way of an existing arterial (Richmond Road)
- Within 100m from the right-of-way of an existing collector (Byron Avenue)

As per Table B1 of Appendix B of the ENCG, **Table 3** outlines the traffic parameters used to calculate the sound levels for the proposed residential units. Excerpts from the ENCG are included in **Appendix B** for reference.

Table 3: Traffic and Roadway Parameters

Parameters	Richmond Road [1]	Byron Avenue
Road Classification	Arterial (2 Lane)	Collector (2 Lane)
Annual Average Daily Traffic (AADT)	15,000	8,000
Day/Night Split (%)	92/8	92/8
Medium/Heavy Trucks (%)	7/5	7/5
Posted Speed	50 km/hr	50 km/hr (Highway Traffic Act)

[1] Richmond Road is classified as a transit priority route, as per the City of Ottawa's Transportation Master Plan, 2031 Affordable Network.

3.1 Modeling Results

The noise levels for the development were analyzed using version 5.03 of the STAMSON computer noise modelling program. Representative receiver locations are shown on the Noise Control Plan **Figure 2**. Since the majority of the surrounding buildings are 2 storey, the representative receivers have been located on the third floor to model the highest predicted noise levels.

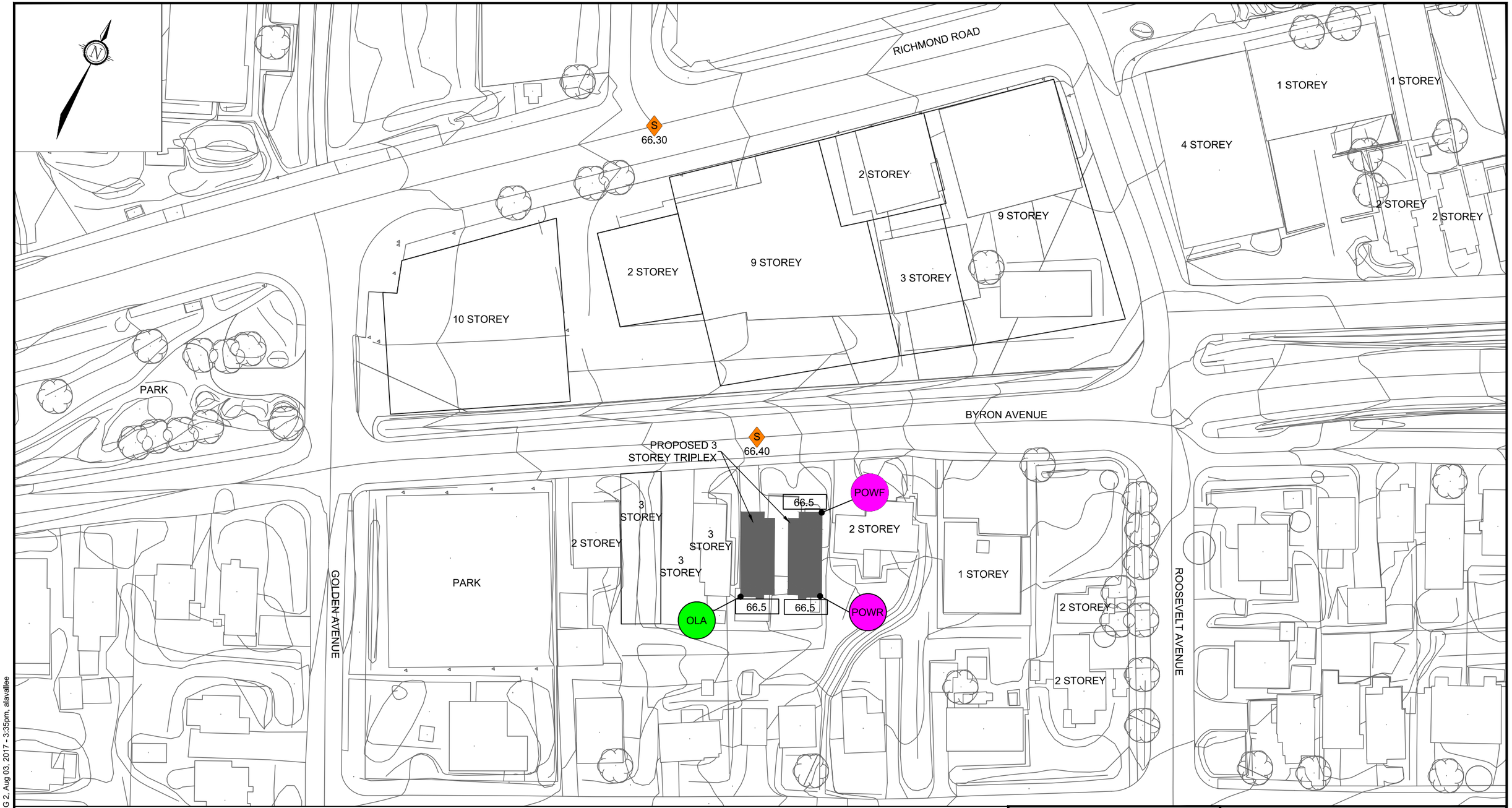
For a complete list of data modeling input, refer to the STAMSON noise modeling files in **Appendix C**. The STAMSON results for the representative receivers are summarized in **Table 4** and **Table 5**.

Table 4: Outdoor Living Area Noise Level Results

Receiver	File	Description	Unattenuated Daytime Noise level (dBA)
OLA	olarear	Southwest Amenity Area	54.5

Table 5: Plane of Window Noise Level Results

Receiver	File	Description	Unattenuated Daytime Noise level (dBA)	Unattenuated Nighttime Noise level (dBA)
POWF	powfront	North face of building (3rd floor)	**66.4**	**58.8**
POWR	powrear	South face of building (3rd floor)	55.3	47.7



LEGEND

- POWF — RECEIVER - PLANE OF WINDOW FRONT (POWF)
- POWR — RECEIVER - PLANE OF WINDOW REAR (POWR)
- OLA — RECEIVER - OUTDOOR LIVING AREA (OLA)
- S 66.30 — APPROXIMATE LOCATION OF NOISE SOURCE WITH ELEVATION

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6

Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

576 BYRON AVENUE

NOISE CONTROL PLAN

SCALE 1 : 750 (0, 10, 20, 30)

DATE AUG 2017 | JOB 116107 | FIGURE FIGURE 2

SHT11X17.DWG - 279mmX432mm

M:\2016\116107\CAD\Design\116107 - NC.dwg, FIG 2, Aug 03, 2017 - 3:35pm, alavallee

3.2 Proposed Attenuation Measures

3.2.1 Outdoor Control Measures

Comparing the noise level results in **Table 4** to the ENCG sound level criteria specified for the outdoor living area summarized in **Table 1,** the predicted noise levels are at or below the minimum threshold of **55dBA**. Therefore, no attenuation measures are required for the outdoor living areas.

3.2.2 Indoor Control Measures

Comparing the noise level results in **Table 5** to the ENCG sound level criteria specified for the plane of window summarized in **Table 1,** the predicted noise levels exceed the minimum (night time) threshold of **40dBA**. Therefore, attenuation measures are required for the indoor living areas. These attenuation measures include; ventilation requirements, building component assessment and warning clauses.

Ventilation Requirements
Warning clauses are required on title relating to the requirement for central air conditioning.

Typical wording for Type D warning clause: "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 the Environment's noise criteria."

Building Component Assessment
To comply with the ENCG policies, the residential dwellings will require a minimum acoustical insulation factor (AIF) rating to provide the indoor sound levels as shown in **Table 1**.

The acoustical insulation factor for the living room on the third floor (located at the rear of the building) is calculated as follows:

Three Building Components: AIF = = 66.4 dBA – 45 dBA + $10\log_{10}(3)$ dBA + 2dBA = 28dBA

To comply with the City and MOE Guidelines, the buildings will require a minimum AIF rating of 28 to provide the appropriate indoor sound levels. Presented below are recommended building materials that provide the required AIF rating. These building materials are only suggestions and can be substituted by the builder with equivalent building materials that meet or exceed the AIF rating.

Wall Assemblies
A wall with type EW1 composition (refer to **Appendix D** for applicable worksheets) has an AIF of 28 with an exterior wall to interior floor area of 125%; this meets the minimum requirement for 3 building components.

Window Assemblies
A standard dual pane residential window section has 4mm glazing x 6mm air space x 4mm glazing, which has an AIF of 28 if located in a room with a window to floor area ratio of 40%.

4.0 CONCLUSIONS AND RECOMMENDATIONS

To meet the City and Ministry of the Environment requirements for compliance with the City of Ottawa Environmental Noise Control Guidelines and the MOE Environmental Noise Guideline the following attenuation measures are required.

Outdoor Control Measures

No attenuation measures are required for the outdoor living areas as the predicted noise levels are below the minimum threshold of 55dBA.

Indoor Control Measures

The following minimum building requirements are recommended to reduce the indoor noise levels:

- Installation of air conditioning system.
- The installation of 'EW1' wall type assembly (or equivalent).
- The installation of window '4-6-4' type assemblies (or equivalent).

Warning Clause

The following warning clause should be incorporated into the purchase and lease/rental/sale agreements:

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

Prepared by:

NOVATECH

Lisa Bowley, P.Eng.
Project Manager
Land Development Engineering

Reviewed by:

J. Lee Sheets, C.E.T.
Director
Land Development &
Public Sector Infrastructure

APPENDIX A

Committee of Adjustment Conditions

COMMITTEE OF ADJUSTMENT
FOR THE CITY OF OTTAWA

COMITÉ DE DÉROGATION
POUR LA VILLE D'OTTAWA

DECISION/DÉCISION
CONSENT/AUTORISATION
(Section 53 of the *Planning Act*)
(Article 53 de la *Loi sur l'aménagement du territoire*)

File No./Dossier n°:	D08-01-16/B-00288 & D08-01-16/B-00289
Owner(s)/Propriétaire(s):	Falsetto Homes
Location/Emplacement:	(574), 576 Byron Avenue
Ward/Quartier:	15 - Kitchissippi
Legal Description/ Description officielle:	Lot 17, Registered Plan 204
Zoning/Zonage:	R3R
Zoning By-law/Règlement:	2008-250

Notice was given and a Public Hearing was held on October 5, 2016, as required by the *Planning Act*.

PURPOSE OF THE APPLICATION/OBJET DE LA DEMANDE:

The Owner wants to demolish the existing dwelling and shed and subdivide the property into two separate parcels of land. It is proposed to construct two, three-storey three unit dwellings, with one building on each newly created parcel. It is proposed to establish a shared driveway between the buildings to provide access to rear yard parking spaces.

CONSENT IS REQUIRED FOR THE FOLLOWING/AUTORISATION REQUISE:

In order to do this, the Owner requires the Consent of the Committee for Conveyances, Grants of Easements/Rights-of-Way and a Joint-Use and Maintenance Agreement. The property is shown as Parts 1, 2, 3 & 4 on a Draft 4R-Plan filed with the applications and the separate parcels will be as follows:

File No.	Frontage	Depth	Area	Part	Municipal Address
B-00288	10.05 m	30.48 m	307 sq. m.	1 & 3	576 Byron Avenue
B-00289	10.05 m	30.48 m	307 sq. m.	2 & 4	574 Byron Avenue

It is proposed to establish reciprocal Grants of Easements over Parts 3 & 4 for the benefit of the Owner of Parts 1 & 3 and the Owner of Parts 2 & 4 respectively, for vehicular access purposes.

The proposed parcels of land and dwellings will not be in conformity with the requirements of the Zoning By-law and therefore, Applications for Minor Variances (D08-02-16/A-00275 & D08-02-16/A-00276) have been filed and will be heard concurrently with these applications.

PUBLIC HEARING/AUDIENCE PUBLIQUE:

The Committee heard a presentation made by Mr. M. Chown and Ms. S. Lahey, Agents for the Owner. Presentations in opposition were made by Mr. G. Luddington representing the Westboro Community Association, Mr. A. Lennox president of the Condominium Corporation located at 575 Byron Avenue and from Mr. R. Abdel-Galil resident of 578 Byron Avenue. Also in attendance was Ms. J. Kluke of the City's Planning, Infrastructure and Economic Development Department.

In hearing the concerns raised in the presentations of opposition made, the Committee noted that the concerns were mainly regarding the retention of the mature trees located in the front yard, the increase in residential density, the massing of the proposed three-unit dwellings, snow removal and the parking spaces provided at the rear of the dwellings instead of amenity area. The Committee noted that, while the retention of the mature trees was not within its purview, Mr. Chown undertook to advise his client of the concerns. Mr. Chown further stated that snow removal on the property would be the responsibility of the landlord.

In presenting the proposal, Ms. Lahey indicated that as a response to some of the concerns noted by Ms. Kluke regarding the rear yard reduction, the plans were revised to bring the proposed buildings closer to the front lot line in order to increase the rear yard setback and provide more rear yard amenity area. Ms. Lahey further indicated that as a result of these changes, amendments to the Minor Variance Applications were required as follows:

<u>A-00275: 576 Byron Ave., Parts 1 & 3 on Draft 4R Plan, proposed three unit dwelling:</u>

<u>Under Bylaw 2008-250</u>

bb) To permit a reduced front yard setback of 4.0 metres; whereas the By-Law law requires on an interior lot, the average of the existing setbacks of the abutting lots on which the dwellings face the same street as the affected lot

<u>Under Zoning Bylaw Amendment 2015-228 (Infill Development Regulations – Phase II)</u>

c) To permit a reduced rear yard setback of **7.89 metres**, whereas the By-law requires where the required minimum front yard setback is greater than 4.5

metres and a lot depth greater than 25 metres and up to 32 metres: a distance equal to 28 percent of the lot depth, in this case 8.5 metres, which must comprise at least 25 percent of the lot area, in this case 76.7 square metres.

Under Zoning By-law Amendment 2015-189 (Conversions By-law)

d) To permit a reduced total communal amenity area of **35 square metres**, whereas the By-law requires communal amenity area in the amount equal to 100 percent of the amenity area located at grade, consisting of 80 percent soft landscaping and abutting the rear lot line, in this case 45 square metres.

A-00276: (574) Byron Ave., Parts 2 & 4 on Draft 4R Plan, proposed three unit dwelling:

Under By-law 2008-250

ff) To permit a reduced front yard setback of 4.0 metres; whereas the By-law requires on an interior lot, the average of the existing setbacks of the abutting lots on which the dwellings face the same street as the affected lot, in this case, 5.8 metres

Under Zoning Bylaw Amendment 2015-228(Infill Development Regulations – Phase II)

g) To permit a reduced rear yard setback of **7.79 metres**, whereas the By-law requires where the required minimum front yard setback is greater than 4.5 metres and a lot depth greater than 25 metres and up to 32 metres: a distance equal to 28 percent of the lot depth, in this case 8.5 metres, which must comprise at least 25 percent of the lot area, in this case 76.7 square metres.

Under Zoning By-law Amendment 2015-189 (Conversions By-law)

h) To permit a reduced total communal amenity area of **35 square metres**, whereas the By-law requires communal amenity area in the amount equal to 100 percent of the amenity area located at grade, consisting of 80 percent soft landscaping and abutting the rear lot line, in this case 45 square metres.

With the concurrence of Ms. Kluke, the applications were amended accordingly.

DECISION AND REASONS OF THE COMMITTEE: APPLICATIONS GRANTED
DÉCISION ET MOTIFS DU COMITÉ: DEMANDES ACCORDÉES

The Committee, having considered the evidence presented and reviewed the plans and correspondence on file, is mindful of the objectives of the Provincial Policy Statement and the City's Official Plan which encourage infill development and intensification in urban areas, provided the proposed development is compatible within the existing neighbourhood context. In this regard, the Committee notes that three-unit dwellings are a permitted use in the R3R Zone and that the proposal conforms to the performance standards that result from the conclusions of the completed Streetscape Character

Analysis. The Committee further notes that there was no relief requested for height or the side yard setbacks and therefore finds that the massing of the proposed building will not adversely affect the abutting properties.

In deliberating on the proposed parking arrangement in the rear yard, the Majority of the Committee is of the opinion that no compelling evidence has been presented to justify the provision of four parking spaces in an area that is well served by public transit, at the expense of rear yard amenity space. The Majority of the Committee finds that, since the current Zoning By-law does not require the proposal to provide parking and does require rear yard amenity area, the proposal should be revised to provide the required rear yard amenity area. Therefore, the Majority is of the view the relief requested regarding reduced amenity area should be refused.

Based on the foregoing, the Majority of the Committee having had regard to the matters set out in Section 51(24) of the Planning Act, R.S.O. 1990, c.P.13, as amended, is satisfied that, in this instance, a plan of subdivision is not necessary or desirable for the proper and orderly development of the Municipality. The Committee therefore grants the provisional consent based on the revised Draft 4R Plan that reflects the modified parking arrangement and amenity area in compliance with the provisions of the Zoning By-law and to the following conditions, **which must be fulfilled within a one-year period from the date of this Decision**:

1. That the Owner provide evidence that the accompanying Minor Variance Applications (D08-02-16/A-00275 & D08-02-16/A-00276) have been approved, with all levels of appeal exhausted.

2. That the Owner provide evidence that payment has been made to the City of Ottawa of cash-in-lieu of the conveyance of land for park or other public recreational purposes, plus applicable appraisal costs. The value of the land otherwise required to be conveyed shall be determined by the City of Ottawa in accordance with the provisions of By-Law No. 2009-95, as amended.

3. That the Owner provide evidence to the satisfaction of the City's Planning and Growth Management Department that the existing dwelling has been removed and that the services have been blanked at the property line and the existing water service has been blanked at the water main.

4. That the Owner provide evidence, to the satisfaction of the Development Review – Urban Services Branch, to be confirmed in writing from the Branch to the Committee, that each parcel can have its own independent storm (if applicable), sanitary and water services connected directly to City infrastructure. These services shall not cross the proposed severance line.

5. Prior to the stamping of the deeds, the Owner shall provide proof that a grading and drainage plan, prepared by a qualified Civil Engineer licensed in the

Province of Ontario, an Ontario Land Surveyor or a Certified Engineering Technologist, has been submitted to and approved by the City's Manager, Development Review - Urban Services Branch or his delegate. The grading and drainage plan shall delineate existing and proposed grades for both the severed and retained properties, to the satisfaction of the Manager, Development Review - Urban Services Branch, or his delegate. The grading and drainage plan may include the provision for rear yard catch basin and corresponding connection to a storm sewer on City property, in which case the Owner shall grant an easement to the City over the rear yard catch basin and connection pipe, as a condition to be fulfilled prior to the stamping of the deeds. Proposed grade changes to the existing grades will be limited at the discretion of the Manager, Development Review - Urban Services Branch or his delegate, and will not be accepted as an alternative to depressed driveways or variations to the zoning by-law requirements.

6. The Owner shall prepare a noise and vibration attenuation study in compliance with the City of Ottawa Environmental Noise Control Guidelines to the satisfaction of the General Manager, Planning & Growth Management Department. The Owner shall enter into an agreement with the City that requires the Owner to implement the noise and vibration attenuation measures recommended in the approved noise study.

7. That the Owner grant to Bell Canada without cost, such easements as may be required, the consent to the registration of which is hereby granted.

8. That the Owner file with the Committee a copy of the registered Reference Plan prepared by an Ontario Land Surveyor registered in the Province of Ontario, and signed by the Registrar, **confirming the frontage and area of the severed land. If the Registered Plan does not indicate the lot area, a letter from the Surveyor confirming the area is required**. The Reference Plan must conform substantially to the sketch filed with the Application for Consent.

9. That upon completion of the above conditions, and **within the one-year period outlined above**, the Owner file with the Committee, the "electronic registration in preparation documents" for the Conveyances, Grants of Easements/Rights-0f Way, Joint Use and Maintenance Agreement for which the Consent is required.

The Consent lapses one year from the date of this Decision.

Please note that if a major change to a condition or conditions is requested, you will be entitled to receive Notice of the changes only if you have made a written request to be notified.

The Dissenting Member of the Committee is Ms. H. Prockiw.

NOTICE OF RIGHT TO APPEAL/AVIS DE DROIT D'APPEL:

To appeal this Decision to the Ontario Municipal Board, an Appeal Form along with a certified cheque or money order payable to the Ontario Minister of Finance must be filed with the Secretary-Treasurer of the Committee of Adjustment by the **9th day of November, 2016**, delivered to the following address:

Secretary-Treasurer, Committee of Adjustment,
101 Centrepointe Drive, 4th floor, Ottawa, Ontario, K2G 5K7

The Appeal Form is available on the Board's website at www.omb.gov.on.ca. The Board has established a filing fee of $300.00 for an appeal with an additional filing fee of $25.00 for each secondary application. If you have any questions about the appeal process, please refer to the Board's website or contact the Committee of Adjustment office by calling 613-580-2436 or by email at cofa@ottawa.ca.

Only individuals, corporations and public bodies may appeal Decisions in respect of applications for consent to the Ontario Municipal Board. A notice of appeal may not be filed by an unincorporated association or group. However, a Notice of Appeal may be filed in the name of an individual who is a Member of the Association or group on its behalf.

NOTICE TO APPLICANT/AVIS AU RÉQUÉRANT:

Applicants are advised to take note of comments received from City departments and other technical agencies like Hydro Ottawa and to consult where appropriate.

DECISION SIGNATURE PAGE
PAGE DE SIGNATURE DE LA DÉCISION

File No./Dossier n°: D08-01-16/B-00288 & D08-01-16/B-00289
Owner(s)/Propriétaire(s): Falsetto Homes
Location/Emplacement: (574), 576 Byron Avenue

We, the undersigned, concur in the decision and reasons of the Committee of Adjustment.

Nous, soussignés, souscrivons à la décision et à la justification ci-devant rendues par le Comité de dérogation.

Helena Prockiw
Chair/ Président
(Chair / Présidente)

Dennis Carr

ABSENT
John Blatherwick

Stan Wilder

Grant Lindsay

I, Krista Libman, Secretary-Treasurer of the Committee of Adjustment for the City of Ottawa, certify that the attached is a true copy of the Decision of the Committee with respect to the application recorded.

Je, soussignée, Krista Libman, secrétaire-trésorière du Comité de dérogation pour la Ville d'Ottawa, confirme que l'énoncé ci-joint est une copie conforme de la décision rendue par le Comité à l'égard de la demande visée.

October 20, 2016
Date of Decision:
Date de la décision:

Krista Libman
Secretary-Treasurer/Secrétaire-trésorière

APPENDIX B

Environmental Noise Control Guidelines Excerpts

PLANNING AND GROWTH MANAGEMENT
URBANISME ET GESTION DE LA CROISSANCE

ENVIRONMENTAL NOISE CONTROL GUIDELINES: Introduction and Glossary

January 2016

Table 2.2a: Sound Level Limit for Outdoor Living Areas - Road and Rail
(from NPC-300, 2013 Table C-1)

Time Period	Required L_{eq} (16) (dBA)
16-hour, 07:00 – 23:00	55

Table 2.2b: Sound Level Limit for Indoor Living Areas Road and Rail
(from NPC-300, 2013 Table C-2)

		Required L_{eq} (dBA)	
Type of Space	Time Period	Road	Rail
Living/dining, den areas of residences, hospitals, nursing homes, schools, daycare centres, etc.	07:00 – 23:00	45	40
Living/dining, den areas of residences, hospitals, nursing homes, etc. (except schools or daycare centres)	23:00 – 07:00	45	40
Sleeping quarters	07:00 – 23:00	45	40
	23:00 – 07:00	40	35

The Province also provides for supplementary indoor sound level limits for land uses not generally considered noise sensitive (see Table 2.2c below). These good practice design objectives should be addressed in any noise study prepared for the City. These supplementary sound level limits are based on the windows and doors to an indoor space being closed.

Table 2.2c: Supplementary Sound Level Limits for Indoor Spaces - Road and Rail (adapted from NPC-300 Table C-9)

		Required L_{eq} (dBA)	
Type of Space	Time Period	Road	Rail
General offices, reception areas, retail stores, etc.	16 hours between 07:00 – 23:00	50	45
Theatres, places of worship, libraries, individual or semi- private offices, conference rooms, reading rooms, etc.	16 hours between 07:00 – 23:00	45	40
Sleeping quarters of hotels/motels	8 hours between 23:00 – 07:00	45	40
Sleeping quarters of residences, hospitals, nursing/retirement homes, etc.	8 hours between 23:00 – 07:00	40	35

Appendix B: Table of Traffic and Road Parameters To Be Used For Sound Level Predictions

Table B1 Traffic And Road Parameters To Be Used For Sound Level Predictions

Row Width (m)	Implied Roadway Class	AADT Vehicles/Day	Posted Speed Km/Hr	Day/Night Split %	Medium Trucks %	Heavy Trucks % [1]
NA [2]	Freeway, Queensway, Highway	18,333 per lane	100	92/8	7	5
37.5-44.5	6-Lane Urban Arterial-Divided (6 UAD)	50,000	50-80	92/8	7	5
34-37.5	4-Lane Urban Arterial-Divided (4-UAD)	35,000	50-80	92/8	7	5
23-34	4-Lane Urban Arterial-Undivided (4-UAU)	30,000	50-80	92/8	7	5
23-34	4-Lane Major Collector (4-UMCU)	24,000	40-60	92/8	7	5
30-35.5	2-Lane Rural Arterial (2-RAU)	15,000	50-80	92/8	7	5
20-30	2-Lane Urban Arterial (2-UAU)	15,000	50-80	92/8	7	5
20-30	2-Lane Major Collector (2-UMCU)	12,000	40-60	92/8	7	5
30-35.5	2-Lane Outer Rural Arterial (near the extremities of the City) (2-RAU)	10,000	50-80	92/8	7	5
20-30	2-Lane Urban Collector (2-UCU)	8,000	40-50	92/8	7	5

[1] The MOE Vehicle Classification definitions should be used to estimate automobiles, medium trucks and heavy trucks.

[2] The number of lanes is determined by the future mature state of the roadway.

Environmental Noise Guideline

Stationary and Transportation Sources – Approval and Planning

Publication NPC-300

Ontario

Table C-10
Supplementary Indoor Aircraft Noise Limits
(Applicable over 24-hour period)

Type of Space	Indoor NEF/NEP*
General offices, reception areas, retail stores, etc.	15
Individual or semi-private offices, conference rooms, etc.	10
Living/dining areas of residences, sleeping quarters of hotels/motels, theatres, libraries, schools, daycare centres, places of worship, etc.	5
Sleeping quarters of residences, hospitals, nursing/retirement homes, etc.	0

* The indoor NEF/NEP values listed in Table C-10 are not obtained from NEF/NEP contour maps. The values are representative of the indoor sound levels and are used as assessment criteria for the evaluation of acoustical insulation requirements.

C7 Noise Control Measures

The following sections provide MOE guidance for appropriate noise control measures. These sections constitute requirements that are applied to MOE approvals for stationary sources. This information is also provided as guidance which land use planning authorities may consider adopting.

The definition in Part A describes the various types and application of noise control measures. All the noise control measures described in the definition are appropriate to address the impact of noise of transportation sources (road, rail and aircraft) on planned sensitive land uses. Only some of the noise control measures described in the definition are appropriate to address the noise impact of stationary sources on planned sensitive land uses.

C7.1 Road Noise Control Measures

C7.1.1 Outdoor Living Areas

If the 16-Hour Equivalent Sound Level, L_{eq} (16) in the OLA is greater than 55 dBA and less than or equal to 60 dBA, noise control measures may be applied to reduce the sound level to 55 dBA. If measures are not provided, prospective purchasers or tenants should be informed of potential noise problems by a warning clause Type A.

If the 16-Hour Equivalent Sound Level, L_{eq} (16) in the OLA is greater than 60 dBA, noise control measures should be implemented to reduce the level to 55 dBA. Only in cases where the required noise control measures are not feasible for technical, economic or administrative reasons would an excess above the limit (55 dBA) be acceptable with a warning clause Type B. In the above situations, any excess above the limit will not be acceptable if it exceeds 5 dBA.

C7.1.2 Plane of a Window – Ventilation Requirements

C7.1.2.1 Daytime Period, 07:00 – 23:00 Hours

Noise control measures may not be required if the L_{eq} (16) daytime sound level in the plane of a bedroom or living/dining room window is less than or equal to 55 dBA. If the sound level in the plane of a bedroom or living/dining room window is greater than 55 dBA and less than or equal to 65 dBA, the dwelling should be designed with a provision for the installation of central air conditioning in the future, at the occupant's discretion. Warning clause Type C is also recommended.

If the daytime sound level in the plane of a bedroom or living/dining room window is greater than 65 dBA, installation of central air conditioning should be implemented with a warning clause Type D. In addition, building components including windows, walls and doors, where applicable, should be designed so that the indoor sound levels comply with the sound level limits in Table C-2. The location and installation of the outdoor air conditioning device should comply with sound level limits of Publication NPC-216, Reference [32], and guidelines contained in Environmental Noise Guidelines for Installation of Residential Air Conditioning Devices, Reference [6], or should comply with other criteria specified by the municipality.

C7.1.2.2 Nighttime Period, 23:00 – 07:00 Hours

Noise control measures may not be required if the L_{eq} (8) nighttime sound level in the plane of a bedroom or living/dining room window is less than or equal to 50 dBA. If the sound level in the plane of a bedroom or living/dining room window is greater than 50 dBA and less than or equal to 60 dBA, the dwelling should be designed with a provision for the installation of central air conditioning in the future, at the occupant's discretion. Warning clause Type C is also recommended.

If the nighttime sound level in the plane of a bedroom or living/dining room window is greater than 60 dBA, installation of central air conditioning should be implemented, with a warning clause Type D. In addition, building components including windows, walls and doors, where applicable, should be designed so that the indoor sound levels comply with the sound level limits in Table C-2. The location and installation of the outdoor air conditioning device should comply with sound level limits of Publication NPC-216, Reference [32], and guidelines contained in Environmental Noise Guidelines for Installation of Residential Air Conditioning Devices, Reference [6], or should comply with other criteria specified by the municipality.

C7.1.3 Indoor Living Areas – Building Components

If the nighttime sound level outside the bedroom or living/dining room windows exceeds 60 dBA or the daytime sound level outside the bedroom or living/dining area windows exceeds 65 dBA, building components including windows, walls and doors, where applicable, should be designed so that the indoor sound levels comply with the

sound level limits in Table C-2. The acoustical performance of the building components (windows, doors and walls) should be specified.

C7.2 Rail Noise Control Measures

C7.2.1 Outdoor Living Areas

Whistle noise is not included in the determination of the outdoor daytime sound level due to railway trains. All the provisions of Section C7.1.1 apply also to noise control requirements for rail noise.

C7.2.2 Plane of a Window – Ventilation Requirements

Whistle noise is not included in the determination of the sound level in the plane of a window. All the provisions of Section C7.1.2 apply also to noise control requirements for rail noise.

C7.2.3 Indoor Living Areas – Building Components

The sound level, L_{eq}, during the daytime (16-hour) and nighttime (8-hour) periods is determined using the prediction method STEAM, Reference [34], immediately outside the dwelling envelope. Whistle noise is included in the determination of the sound level.

If the nighttime sound level outside the bedroom or living/dining room windows exceeds 55 dBA or the daytime sound level outside the bedroom or living/dining area windows exceeds 60 dBA, building components including windows, walls and doors, where applicable, need to be designed so that the indoor sound levels comply with the sound level limits in Table C-2. The acoustical performance of the building components (windows, doors and walls) needs to be specified.

In addition, the exterior walls of the first row of dwellings next to railway tracks are to be built to a minimum of brick veneer or masonry equivalent construction, from the foundation to the rafters when the rail traffic L_{eq} (24-hour), estimated at a location of a nighttime receptor, is greater than 60 dBA, and when the first row of dwellings is within 100 metres of the tracks.

C7.3 Combination of Road and Rail Noise

The noise impact in the OLA and in the plane of a window, and the requirements for outdoor measures, ventilation measures and warning clauses, should be determined by combining road and rail traffic sound levels.

The assessment of the indoor sound levels and the resultant requirement for the acoustical descriptors of the building components should be done separately for road

In Class 4 areas, where windows for noise sensitive spaces are assumed to be closed, the use of central air conditioning may be acceptable if it forms an essential part of the overall building designs.

C7.9 Verification of Noise Control Measures

It is recommended that the implementation of noise control measures be verified by qualified individuals with experience in environmental acoustics.

C8 Warning Clauses

The use of warning clauses or easements in respect of noise are recommended when circumstances warrant. Noise warning clauses may be used to warn of potential annoyance due to an existing source of noise and/or to warn of excesses above the sound level limits. Direction on the use of warning clauses should be included in agreements that are registered on title to the lands in question. The warning clauses would be included in agreements of Offers of Purchase and Sale, lease/rental agreements and condominium declarations. Alternatively, the use of easements in respect of noise may be appropriate in some circumstances. Additional guidance on the use of noise warning clauses is provided in Section C7.1.1, Section C7.1.2.1, Section C7.1.2.2, Section C7.3 and Section C7.4.

C8.1 Transportation Sources

The following warning clauses may be used individually or in combination:

TYPE A: (see Section C7.1.1)

> "Purchasers/tenants are advised that sound levels due to increasing road traffic (rail traffic) (air traffic) may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the Municipality and the Ministry of the Environment."

TYPE B: (see Section C7.1.1 and Section C7.4)

> "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 traffic (rail traffic) (air traffic) may on occasions interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the Municipality and the Ministry of the Environment."

TYPE C: (see Section C7.1.2.1, Section C7.1.2.2 and Section C7.4)

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

central air conditioning by the occupant in low and medium density developments will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment."

TYPE D: (see Section C7.1.2.1, Section C7.1.2.2 and Section C7.4)

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

C8.2 Stationary Sources

It is not acceptable to use warning clauses in place of physical noise control measures to identify an excess over the MOE sound level limits. Warning clause (Type E) for stationary sources may identify a potential concern due to the proximity of the facility but it is not acceptable to justify exceeding the sound level limits.

TYPE E: (see Section C7.6)

"Purchasers/tenants are advised that due to the proximity of the adjacent industry (facility) (utility), noise from the industry (facility) (utility) may at times be audible."

C8.3 Class 4 Area Notification

TYPE F: (see Section B9.2 and Section C4.4.2)

"Purchasers/tenants are advised that sound levels due to the adjacent industry (facility) (utility) are required to comply with sound level limits that are protective of indoor areas and are based on the assumption that windows and exterior doors are closed. This dwelling unit has been supplied with a ventilation/air conditioning system which will allow windows and exterior doors to remain closed."

APPENDIX C

STAMSON Noise Modelling Program Results

STAMSON 5.0 NORMAL REPORT Date: 02-08-2017 13:38:12
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Road data, segment # 1: Richmond (day/night)

Car traffic volume	: 12144/1056	veh/TimePeriod *
Medium truck volume	: 966/84	veh/TimePeriod *
Heavy truck volume	: 690/60	veh/TimePeriod *
Posted speed limit	: 50	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT)	15000
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: Richmond (day/night)

Angle1 Angle2	: -90.00 deg	1.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 1 / 1	
House density	: 90	%
Surface	: 2	(Reflective ground surface)
Receiver source distance	: 100.50 / 100.50	m
Receiver height	: 1.50 / 1.50	m
Topography	: 2	(Flat/gentle slope; with barrier)
Barrier angle1	: -90.00 deg	Angle2 : 1.00 deg
Barrier height	: 27.00	m
Barrier receiver distance	: 47.00 / 47.00	m
Source elevation	: 66.30	m
Receiver elevation	: 66.50	m
Barrier elevation	: 67.50	m
Reference angle	: 0.00	

Road data, segment # 2: Richmond (day/night)

Car traffic volume	: 12144/1056	veh/TimePeriod *
Medium truck volume	: 966/84	veh/TimePeriod *

```
Heavy truck volume  :   690/60    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     2 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  15000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 2: Richmond (day/night)
------------------------------------------
Angle1   Angle2           :   1.00 deg   11.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1 / 1
House density             :     90 %
Surface                   :      2       (Reflective ground surface)
Receiver source distance  : 100.50 / 100.50 m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :   1.00 deg   Angle2 : 11.00 deg
Barrier height            :   7.00 m
Barrier receiver distance :  59.50 / 59.50  m
Source elevation          :  66.30 m
Receiver elevation        :  66.50 m
Barrier elevation         :  66.30 m
Reference angle           :   0.00

↑
Road data, segment # 3: Richmond (day/night)
--------------------------------------------
Car traffic volume  : 12144/1056  veh/TimePeriod  *
Medium truck volume :   966/84    veh/TimePeriod  *
Heavy truck volume  :   690/60    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     2 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  15000
    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 # 3: Richmond (day/night)
------------------------------------------
Angle1   Angle2           :  11.00 deg   53.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1 / 1
House density             :     90 %
Surface                   :      2       (Reflective ground surface)
Receiver source distance  : 100.50 / 100.50 m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :  11.00 deg   Angle2 : 53.00 deg
Barrier height            :  30.00 m
Barrier receiver distance :  55.40 / 55.40  m
Source elevation          :  66.30 m
Receiver elevation        :  66.50 m
Barrier elevation         :  66.00 m
Reference angle           :   0.00

♠
Road data, segment # 4: Richmond (day/night)
--------------------------------------------
Car traffic volume  : 12144/1056  veh/TimePeriod  *
Medium truck volume :   966/84    veh/TimePeriod  *
Heavy truck volume  :   690/60    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     2 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  15000
    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 # 4: Richmond (day/night)
------------------------------------------
Angle1   Angle2           :  53.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1 / 1
House density             :     90 %
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 100.50 / 100.50 m
```

```
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

↟

```
Road data, segment # 5: Byron (day/night)
-----------------------------------------
Car traffic volume  :  6477/563   veh/TimePeriod  *
Medium truck volume :   515/45    veh/TimePeriod  *
Heavy truck volume  :   368/32    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     3 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):   8000
    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 # 5: Byron (day/night)
---------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1 / 1
House density             :     90 %
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  36.50 / 36.50  m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

↟

```
Results segment # 1: Richmond (day)
-----------------------------------

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !        1.50 !        0.40 !        67.90
```

```
ROAD (0.00 + 38.18 + 0.00) = 38.18 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90      1   0.00  68.48   0.00  -8.26  -2.96   0.00  -7.56   0.00  49.69
   -90      1   0.00  68.48   0.00  -8.26  -2.96   0.00   0.00 -19.08  38.18
-------------------------------------------------------------------------------

Segment Leq : 38.18 dBA

↟
Results segment # 2: Richmond (day)
-----------------------------------

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !        1.50 !        1.58 !        67.88

ROAD (0.00 + 32.24 + 0.00) = 32.24 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     1     11   0.00  68.48   0.00  -8.26 -12.55   0.00  -7.56   0.00  40.10
     1     11   0.00  68.48   0.00  -8.26 -12.55   0.00   0.00 -15.43  32.24
-------------------------------------------------------------------------------

Segment Leq : 32.24 dBA

↟
Results segment # 3: Richmond (day)
-----------------------------------

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !        1.50 !        1.89 !        67.89

ROAD (0.00 + 33.90 + 0.00) = 33.90 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    11     53   0.00  68.48   0.00  -8.26  -6.32   0.00  -7.56   0.00  46.34
```

11	53	0.00	68.48	0.00	-8.26	-6.32	0.00	0.00	-20.00	33.90

Segment Leq : 33.90 dBA

↟

Results segment # 4: Richmond (day)

Source height = 1.50 m

ROAD (0.00 + 36.79 + 0.00) = 36.79 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
53	90	0.66	68.48	0.00	-13.71	-10.42	0.00	-7.56	0.00	36.79

Segment Leq : 36.79 dBA

↟

Results segment # 5: Byron (day)

Source height = 1.50 m

ROAD (0.00 + 54.22 + 0.00) = 54.22 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	66.38	0.00	-3.86	0.00	0.00	-8.29	0.00	54.22

Segment Leq : 54.22 dBA

Total Leq All Segments: 54.47 dBA

↟

Barrier table for segment # 1: Richmond (day)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
28.50	96.00	38.09	38.09
29.00	96.50	38.07	38.07
29.50	97.00	38.05	38.05
30.00	97.50	38.02	38.02
30.50	98.00	38.00	38.00
31.00	98.50	37.98	37.98

31.50	99.00	37.96	37.96
32.00	99.50	37.94	37.94
32.50	100.00	37.92	37.92
33.00	100.50	37.91	37.91

Barrier table for segment # 2: Richmond (day)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
8.50	74.80	30.15	30.15
9.00	75.30	29.55	29.55
9.50	75.80	28.98	28.98
10.00	76.30	28.46	28.46
10.50	76.80	27.96	27.96
11.00	77.30	27.67	27.67
11.50	77.80	27.67	27.67
12.00	78.30	27.67	27.67
12.50	78.80	27.67	27.67
13.00	79.30	27.67	27.67

Barrier table for segment # 3: Richmond (day)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
31.50	97.50	33.90	33.90
32.00	98.00	33.90	33.90
32.50	98.50	33.90	33.90
33.00	99.00	33.90	33.90
33.50	99.50	33.90	33.90
34.00	100.00	33.90	33.90
34.50	100.50	33.90	33.90
35.00	101.00	33.90	33.90
35.50	101.50	33.90	33.90
36.00	102.00	33.90	33.90

Results segment # 1: Richmond (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source	Receiver	Barrier	Elevation of

Height (m)	Height (m)	Height (m)	Barrier Top (m)
1.50	1.50	0.40	67.90

ROAD (0.00 + 30.58 + 0.00) = 30.58 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	1	0.00	60.88	0.00	-8.26	-2.96	0.00	-7.56	0.00	42.10
-90	1	0.00	60.88	0.00	-8.26	-2.96	0.00	0.00	-19.08	30.58

Segment Leq : 30.58 dBA

Results segment # 2: Richmond (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	1.58	67.88

ROAD (0.00 + 24.64 + 0.00) = 24.64 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
1	11	0.00	60.88	0.00	-8.26	-12.55	0.00	-7.56	0.00	32.51
1	11	0.00	60.88	0.00	-8.26	-12.55	0.00	0.00	-15.43	24.64

Segment Leq : 24.64 dBA

Results segment # 3: Richmond (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	1.89	67.89

ROAD (0.00 + 26.30 + 0.00) = 26.30 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
11	53	0.00	60.88	0.00	-8.26	-6.32	0.00	-7.56	0.00	38.74
11	53	0.00	60.88	0.00	-8.26	-6.32	0.00	0.00	-20.00	26.30

Segment Leq : 26.30 dBA

↟

Results segment # 4: Richmond (night)

Source height = 1.50 m

ROAD (0.00 + 29.19 + 0.00) = 29.19 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
53	90	0.66	60.88	0.00	-13.71	-10.42	0.00	-7.56	0.00	29.19

Segment Leq : 29.19 dBA

↟

Results segment # 5: Byron (night)

Source height = 1.50 m

ROAD (0.00 + 46.63 + 0.00) = 46.63 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	58.78	0.00	-3.86	0.00	0.00	-8.29	0.00	46.63

Segment Leq : 46.63 dBA

Total Leq All Segments: 46.88 dBA

↟

Barrier table for segment # 1: Richmond (night)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
28.50	96.00	30.50	30.50
29.00	96.50	30.47	30.47

OLA

29.50	97.00	30.45	30.45
30.00	97.50	30.43	30.43
30.50	98.00	30.40	30.40
31.00	98.50	30.38	30.38
31.50	99.00	30.36	30.36
32.00	99.50	30.34	30.34
32.50	100.00	30.33	30.33
33.00	100.50	30.31	30.31

Barrier table for segment # 2: Richmond (night)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
8.50	74.80	22.55	22.55
9.00	75.30	21.95	21.95
9.50	75.80	21.39	21.39
10.00	76.30	20.86	20.86
10.50	76.80	20.36	20.36
11.00	77.30	20.07	20.07
11.50	77.80	20.07	20.07
12.00	78.30	20.07	20.07
12.50	78.80	20.07	20.07
13.00	79.30	20.07	20.07

Barrier table for segment # 3: Richmond (night)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
31.50	97.50	26.30	26.30
32.00	98.00	26.30	26.30
32.50	98.50	26.30	26.30
33.00	99.00	26.30	26.30
33.50	99.50	26.30	26.30
34.00	100.00	26.30	26.30
34.50	100.50	26.30	26.30
35.00	101.00	26.30	26.30
35.50	101.50	26.30	26.30
36.00	102.00	26.30	26.30

TOTAL Leq FROM ALL SOURCES (DAY): 54.47
(NIGHT): 46.88

STAMSON 5.0 NORMAL REPORT Date: 01-08-2017 16:27:57
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: powfront.te Time Period: Day/Night 16/8 hours
Description: POW Front, third floor

Road data, segment # 1: Richmond (day/night)

Car traffic volume	: 12144/1056	veh/TimePeriod *
Medium truck volume	: 966/84	veh/TimePeriod *
Heavy truck volume	: 690/60	veh/TimePeriod *
Posted speed limit	: 50	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT)		15000
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: Richmond (day/night)

Angle1 Angle2	: -90.00 deg	15.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 2	(Reflective ground surface)
Receiver source distance	: 76.50 / 76.50	m
Receiver height	: 8.50 / 8.50	m
Topography	: 2	(Flat/gentle slope; with barrier)
Barrier angle1	: -90.00 deg	Angle2 : 15.00 deg
Barrier height	: 27.00	m
Barrier receiver distance	: 21.50 / 21.50	m
Source elevation	: 66.30	m
Receiver elevation	: 66.50	m
Barrier elevation	: 67.50	m
Reference angle	: 0.00	

Road data, segment # 2: Richmond (day/night)

Car traffic volume	: 12144/1056	veh/TimePeriod *
Medium truck volume	: 966/84	veh/TimePeriod *

```
Heavy truck volume  :   690/60    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     2 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  15000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 2: Richmond (day/night)
------------------------------------------
Angle1   Angle2           :  15.00 deg   33.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  76.50 / 76.50  m
Receiver height           :   8.50 / 8.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :  15.00 deg   Angle2 : 33.00 deg
Barrier height            :   7.00 m
Barrier receiver distance :  36.20 / 36.20  m
Source elevation          :  66.30 m
Receiver elevation        :  66.50 m
Barrier elevation         :  66.30 m
Reference angle           :   0.00



Road data, segment # 3: Richmond (day/night)
--------------------------------------------
Car traffic volume  : 12144/1056  veh/TimePeriod  *
Medium truck volume :   966/84    veh/TimePeriod  *
Heavy truck volume  :   690/60    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     2 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  15000
    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 # 3: Richmond (day/night)
------------------------------------------
Angle1   Angle2           :  33.00 deg   72.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  76.50 / 76.50  m
Receiver height           :   8.50 / 8.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :  33.00 deg   Angle2 : 72.00 deg
Barrier height            :  30.00 m
Barrier receiver distance :  36.50 / 36.50  m
Source elevation          :  66.30 m
Receiver elevation        :  66.50 m
Barrier elevation         :  66.00 m
Reference angle           :   0.00



Road data, segment # 4: Richmond (day/night)
--------------------------------------------
Car traffic volume  : 12144/1056  veh/TimePeriod  *
Medium truck volume :   966/84    veh/TimePeriod  *
Heavy truck volume  :   690/60    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     2 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  15000
    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 # 4: Richmond (day/night)
------------------------------------------
Angle1   Angle2           :  72.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  76.50 / 76.50  m
Receiver height           :   8.50 / 8.50   m
```

```
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

Road data, segment # 5: Byron (day/night)

```
Car traffic volume  :  6477/563   veh/TimePeriod  *
Medium truck volume :   515/45    veh/TimePeriod  *
Heavy truck volume  :   368/32    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     3 %
Road pavement       :     1 (Typical asphalt or concrete)
```

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

```
    24 hr Traffic Volume (AADT or SADT):   8000
    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 # 5: Byron (day/night)

```
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  15.00 / 15.00  m
Receiver height           :   8.50 / 8.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

Results segment # 1: Richmond (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	8.50	5.48	72.98

ROAD (0.00 + 39.87 + 0.00) = 39.87 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	15	0.00	68.48	0.00	-7.08	-2.34	0.00	0.00	-19.20	39.87

Segment Leq : 39.87 dBA

Results segment # 2: Richmond (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	8.50	5.29	71.59

ROAD (0.00 + 43.56 + 0.00) = 43.56 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
15	33	0.00	68.48	0.00	-7.08	-10.00	0.00	0.00	-7.85	43.56

Segment Leq : 43.56 dBA

Results segment # 3: Richmond (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	8.50	5.56	71.56

ROAD (0.00 + 34.76 + 0.00) = 34.76 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
33	72	0.00	68.48	0.00	-7.08	-6.64	0.00	0.00	-20.00	34.76

Segment Leq : 34.76 dBA

Results segment # 4: Richmond (day)

Source height = 1.50 m

ROAD (0.00 + 44.33 + 0.00) = 44.33 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
72	90	0.45	68.48	0.00	-10.26	-13.89	0.00	0.00	0.00	44.33

Segment Leq : 44.33 dBA

Results segment # 5: Byron (day)

Source height = 1.50 m

ROAD (0.00 + 66.38 + 0.00) = 66.38 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	66.38	0.00	0.00	0.00	0.00	0.00	0.00	66.38

Segment Leq : 66.38 dBA

Total Leq All Segments: 66.44 dBA

Barrier table for segment # 1: Richmond (day)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
28.50	96.00	39.78	39.78
29.00	96.50	39.76	39.76
29.50	97.00	39.73	39.73
30.00	97.50	39.71	39.71

30.50	98.00	39.69	39.69
31.00	98.50	39.67	39.67
31.50	99.00	39.65	39.65
32.00	99.50	39.63	39.63
32.50	100.00	39.62	39.62
33.00	100.50	39.60	39.60

Barrier table for segment # 2: Richmond (day)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
8.50	74.80	39.68	39.68
9.00	75.30	38.55	38.55
9.50	75.80	37.52	37.52
10.00	76.30	36.58	36.58
10.50	76.80	35.72	35.72
11.00	77.30	34.94	34.94
11.50	77.80	34.22	34.22
12.00	78.30	33.55	33.55
12.50	78.80	32.93	32.93
13.00	79.30	32.36	32.36

Barrier table for segment # 3: Richmond (day)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
31.50	97.50	34.76	34.76
32.00	98.00	34.76	34.76
32.50	98.50	34.76	34.76
33.00	99.00	34.76	34.76
33.50	99.50	34.76	34.76
34.00	100.00	34.76	34.76
34.50	100.50	34.76	34.76
35.00	101.00	34.76	34.76
35.50	101.50	34.76	34.76
36.00	102.00	34.76	34.76

Results segment # 1: Richmond (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	8.50	5.48	72.98

ROAD (0.00 + 32.27 + 0.00) = 32.27 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	15	0.00	60.88	0.00	-7.08	-2.34	0.00	0.00	-19.20	32.27

Segment Leq : 32.27 dBA

Results segment # 2: Richmond (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	8.50	5.29	71.59

ROAD (0.00 + 35.96 + 0.00) = 35.96 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
15	33	0.00	60.88	0.00	-7.08	-10.00	0.00	0.00	-7.85	35.96

Segment Leq : 35.96 dBA

Results segment # 3: Richmond (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)

POWF

1.50 !	8.50 !	5.56 !	71.56

ROAD (0.00 + 27.17 + 0.00) = 27.17 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
33	72	0.00	60.88	0.00	-7.08	-6.64	0.00	0.00	-20.00	27.17

Segment Leq : 27.17 dBA

Results segment # 4: Richmond (night)

Source height = 1.50 m

ROAD (0.00 + 36.73 + 0.00) = 36.73 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
72	90	0.45	60.88	0.00	-10.26	-13.89	0.00	0.00	0.00	36.73

Segment Leq : 36.73 dBA

Results segment # 5: Byron (night)

Source height = 1.50 m

ROAD (0.00 + 58.78 + 0.00) = 58.78 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	58.78	0.00	0.00	0.00	0.00	0.00	0.00	58.78

Segment Leq : 58.78 dBA

Total Leq All Segments: 58.84 dBA

Barrier table for segment # 1: Richmond (night)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
28.50	96.00	32.19	32.19
29.00	96.50	32.16	32.16
29.50	97.00	32.14	32.14
30.00	97.50	32.12	32.12
30.50	98.00	32.09	32.09
31.00	98.50	32.07	32.07
31.50	99.00	32.06	32.06
32.00	99.50	32.04	32.04
32.50	100.00	32.02	32.02
33.00	100.50	32.00	32.00

Barrier table for segment # 2: Richmond (night)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
8.50	74.80	32.09	32.09
9.00	75.30	30.95	30.95
9.50	75.80	29.92	29.92
10.00	76.30	28.98	28.98
10.50	76.80	28.13	28.13
11.00	77.30	27.34	27.34
11.50	77.80	26.62	26.62
12.00	78.30	25.96	25.96
12.50	78.80	25.34	25.34
13.00	79.30	24.76	24.76

Barrier table for segment # 3: Richmond (night)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
31.50	97.50	27.17	27.17
32.00	98.00	27.17	27.17
32.50	98.50	27.17	27.17
33.00	99.00	27.17	27.17
33.50	99.50	27.17	27.17
34.00	100.00	27.17	27.17
34.50	100.50	27.17	27.17
35.00	101.00	27.17	27.17
35.50	101.50	27.17	27.17
36.00	102.00	27.17	27.17

TOTAL Leq FROM ALL SOURCES (DAY): 66.44
(NIGHT): 58.84

STAMSON 5.0 NORMAL REPORT Date: 01-08-2017 16:28:52
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: powrear.te Time Period: Day/Night 16/8 hours
Description: POW Rear, third floor

Road data, segment # 1: Richmond (day/night)

Car traffic volume	: 12144/1056	veh/TimePeriod *
Medium truck volume	: 966/84	veh/TimePeriod *
Heavy truck volume	: 690/60	veh/TimePeriod *
Posted speed limit	: 50	km/h
Road gradient	: 2	%
Road pavement	: 1	(Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT)	15000
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: Richmond (day/night)

Angle1 Angle2	: -90.00 deg	5.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 1 / 1	
House density	: 90	%
Surface	: 2	(Reflective ground surface)
Receiver source distance	: 97.40 / 97.40	m
Receiver height	: 8.50 / 8.50	m
Topography	: 2	(Flat/gentle slope; with barrier)
Barrier angle1	: -90.00 deg	Angle2 : 5.00 deg
Barrier height	: 27.00	m
Barrier receiver distance	: 46.00 / 46.00	m
Source elevation	: 66.30	m
Receiver elevation	: 66.50	m
Barrier elevation	: 67.50	m
Reference angle	: 0.00	

Road data, segment # 2: Richmond (day/night)

Car traffic volume	: 12144/1056	veh/TimePeriod *

```
Medium truck volume :   966/84    veh/TimePeriod  *
Heavy truck volume  :   690/60    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     2 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  15000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 2: Richmond (day/night)
------------------------------------------
Angle1   Angle2           :   5.00 deg   23.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1 / 1
House density             :     90 %
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  97.40 / 97.40  m
Receiver height           :   8.50 / 8.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :   5.00 deg   Angle2 : 23.00 deg
Barrier height            :   7.00 m
Barrier receiver distance :  58.60 / 58.60  m
Source elevation          :  66.30 m
Receiver elevation        :  66.50 m
Barrier elevation         :  66.30 m
Reference angle           :   0.00



Road data, segment # 3: Richmond (day/night)
--------------------------------------------
Car traffic volume  : 12144/1056  veh/TimePeriod  *
Medium truck volume :   966/84    veh/TimePeriod  *
Heavy truck volume  :   690/60    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     2 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  15000
    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 # 3: Richmond (day/night)
------------------------------------------
Angle1   Angle2           :  23.00 deg   53.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1 / 1
House density             :     90 %
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  97.40 / 97.40  m
Receiver height           :   8.50 / 8.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :  23.00 deg   Angle2 : 53.00 deg
Barrier height            :  30.00 m
Barrier receiver distance :  54.40 / 54.40  m
Source elevation          :  66.30 m
Receiver elevation        :  66.50 m
Barrier elevation         :  66.00 m
Reference angle           :   0.00



Road data, segment # 4: Richmond (day/night)
--------------------------------------------
Car traffic volume  : 12144/1056  veh/TimePeriod  *
Medium truck volume :   966/84    veh/TimePeriod  *
Heavy truck volume  :   690/60    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     2 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  15000
    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 # 4: Richmond (day/night)
------------------------------------------
Angle1   Angle2           :  53.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1 / 1
```

```
House density             :     90 %
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  97.40 / 97.40  m
Receiver height           :   8.50 / 8.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

Road data, segment # 5: Byron (day/night)

```
Car traffic volume  :  6477/563   veh/TimePeriod  *
Medium truck volume :   515/45    veh/TimePeriod  *
Heavy truck volume  :   368/32    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     3 %
Road pavement       :     1 (Typical asphalt or concrete)
```

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

```
    24 hr Traffic Volume (AADT or SADT):   8000
    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 # 5: Byron (day/night)

```
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1 / 1
House density             :     90 %
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  31.00 / 31.00  m
Receiver height           :   8.50 / 8.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

Results segment # 1: Richmond (day)

Source height = 1.50 m

Barrier height for grazing incidence

```
Source      ! Receiver    ! Barrier     ! Elevation of
```

Height (m)	Height (m)	Height (m)	Barrier Top (m)
1.50	8.50	4.10	71.60

ROAD (0.00 + 38.69 + 0.00) = 38.69 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	5	0.00	68.48	0.00	-8.12	-2.78	0.00	-7.59	0.00	49.99
-90	5	0.00	68.48	0.00	-8.12	-2.78	0.00	0.00	-18.89	38.69

Segment Leq : 38.69 dBA

Results segment # 2: Richmond (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	8.50	4.37	70.67

ROAD (0.00 + 40.51 + 0.00) = 40.51 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
5	23	0.00	68.48	0.00	-8.12	-10.00	0.00	-7.59	0.00	42.77
5	23	0.00	68.48	0.00	-8.12	-10.00	0.00	0.00	-9.84	40.51

Segment Leq : 40.51 dBA

Results segment # 3: Richmond (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	8.50	4.98	70.98

ROAD (0.00 + 32.57 + 0.00) = 32.57 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
23	53	0.00	68.48	0.00	-8.12	-7.78	0.00	-7.59	0.00	44.99
23	53	0.00	68.48	0.00	-8.12	-7.78	0.00	0.00	-20.00	32.57

Segment Leq : 32.57 dBA

Results segment # 4: Richmond (day)

Source height = 1.50 m

ROAD (0.00 + 39.71 + 0.00) = 39.71 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
53	90	0.45	68.48	0.00	-11.78	-9.40	0.00	-7.59	0.00	39.71

Segment Leq : 39.71 dBA

Results segment # 5: Byron (day)

Source height = 1.50 m

ROAD (0.00 + 54.84 + 0.00) = 54.84 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	66.38	0.00	-3.15	0.00	0.00	-8.38	0.00	54.84

Segment Leq : 54.84 dBA

Total Leq All Segments: 55.25 dBA

Barrier table for segment # 1: Richmond (day)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
28.50	96.00	38.58	38.58
29.00	96.50	38.55	38.55

29.50	97.00	38.51	38.51
30.00	97.50	38.48	38.48
30.50	98.00	38.46	38.46
31.00	98.50	38.43	38.43
31.50	99.00	38.40	38.40
32.00	99.50	38.38	38.38
32.50	100.00	38.35	38.35
33.00	100.50	38.33	38.33

Barrier table for segment # 2: Richmond (day)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
8.50	74.80	37.19	37.19
9.00	75.30	36.25	36.25
9.50	75.80	35.39	35.39
10.00	76.30	34.60	34.60
10.50	76.80	33.88	33.88
11.00	77.30	33.21	33.21
11.50	77.80	32.58	32.58
12.00	78.30	32.00	32.00
12.50	78.80	31.46	31.46
13.00	79.30	30.94	30.94

Barrier table for segment # 3: Richmond (day)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
31.50	97.50	32.57	32.57
32.00	98.00	32.57	32.57
32.50	98.50	32.57	32.57
33.00	99.00	32.57	32.57
33.50	99.50	32.57	32.57
34.00	100.00	32.57	32.57
34.50	100.50	32.57	32.57
35.00	101.00	32.57	32.57
35.50	101.50	32.57	32.57
36.00	102.00	32.57	32.57

Results segment # 1: Richmond (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	8.50	4.10	71.60

ROAD (0.00 + 31.10 + 0.00) = 31.10 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	5	0.00	60.88	0.00	-8.12	-2.78	0.00	-7.59	0.00	42.39
-90	5	0.00	60.88	0.00	-8.12	-2.78	0.00	0.00	-18.89	31.10

Segment Leq : 31.10 dBA

Results segment # 2: Richmond (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	8.50	4.37	70.67

ROAD (0.00 + 32.91 + 0.00) = 32.91 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
5	23	0.00	60.88	0.00	-8.12	-10.00	0.00	-7.59	0.00	35.17
5	23	0.00	60.88	0.00	-8.12	-10.00	0.00	0.00	-9.84	32.91

Segment Leq : 32.91 dBA

Results segment # 3: Richmond (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source	Receiver	Barrier	Elevation of

Height (m)	Height (m)	Height (m)	Barrier Top (m)
1.50	8.50	4.98	70.98

ROAD (0.00 + 24.98 + 0.00) = 24.98 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
23	53	0.00	60.88	0.00	-8.12	-7.78	0.00	-7.59	0.00	37.39
23	53	0.00	60.88	0.00	-8.12	-7.78	0.00	0.00	-20.00	24.98

Segment Leq : 24.98 dBA

Results segment # 4: Richmond (night)

Source height = 1.50 m

ROAD (0.00 + 32.12 + 0.00) = 32.12 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
53	90	0.45	60.88	0.00	-11.78	-9.40	0.00	-7.59	0.00	32.12

Segment Leq : 32.12 dBA

Results segment # 5: Byron (night)

Source height = 1.50 m

ROAD (0.00 + 47.25 + 0.00) = 47.25 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	58.78	0.00	-3.15	0.00	0.00	-8.38	0.00	47.25

Segment Leq : 47.25 dBA
Total Leq All Segments: 47.65 dBA

Barrier table for segment # 1: Richmond (night)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA

			POWR
28.50	96.00	30.98	30.98
29.00	96.50	30.95	30.95
29.50	97.00	30.92	30.92
30.00	97.50	30.89	30.89
30.50	98.00	30.86	30.86
31.00	98.50	30.83	30.83
31.50	99.00	30.80	30.80
32.00	99.50	30.78	30.78
32.50	100.00	30.76	30.76
33.00	100.50	30.73	30.73

Barrier table for segment # 2: Richmond (night)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
8.50	74.80	29.59	29.59
9.00	75.30	28.65	28.65
9.50	75.80	27.79	27.79
10.00	76.30	27.01	27.01
10.50	76.80	26.28	26.28
11.00	77.30	25.61	25.61
11.50	77.80	24.99	24.99
12.00	78.30	24.40	24.40
12.50	78.80	23.86	23.86
13.00	79.30	23.35	23.35

Barrier table for segment # 3: Richmond (night)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
31.50	97.50	24.98	24.98
32.00	98.00	24.98	24.98
32.50	98.50	24.98	24.98
33.00	99.00	24.98	24.98
33.50	99.50	24.98	24.98
34.00	100.00	24.98	24.98
34.50	100.50	24.98	24.98
35.00	101.00	24.98	24.98
35.50	101.50	24.98	24.98
36.00	102.00	24.98	24.98

TOTAL Leq FROM ALL SOURCES (DAY): 55.25
(NIGHT): 47.65

APPENDIX D

AIF Tables

ISSN 0701-5232

BUILDING RESEARCH NOTE

ACOUSTIC INSULATION FACTOR: A RATING FOR THE INSULATION OF BUILDINGS AGAINST OUTDOOR NOISE

by

J.D. Quirt

Division of Building Research, National Research Council of Canada

Ottawa, June 1979
Revised June 1980

TABLE 5: Acoustic Insulation Factor for Various Types of Windows

Window area as a percentage of total floor area of room (1)													
4	5	6	8	10	13	16	20	25	32	40	50	63	80
Acoustic Insulation Factor (AIF) (2)													
35	34	33	32	31	30	29	28	27	26	25	24	23	22
36	35	34	33	32	31	30	29	28	27	26	25	24	23
37	36	35	34	33	32	31	30	29	28	27	26	25	24
38	37	36	35	34	33	32	31	30	29	28	27	26	25
39	38	37	36	35	34	33	32	31	30	29	28	27	26
40	39	38	37	36	35	34	33	32	31	30	29	28	27
41	40	39	38	37	36	35	34	33	32	31	30	29	28
42	41	40	39	38	37	36	35	34	33	32	31	30	29
43	42	41	40	39	38	37	36	35	34	33	32	31	30
44	43	42	41	40	39	38	37	36	35	34	33	32	31
45	44	43	42	41	40	39	38	37	36	35	34	33	32
46	45	44	43	42	41	40	39	38	37	36	35	34	33
47	46	45	44	43	42	41	40	39	38	37	36	35	34
48	47	46	45	44	43	42	41	40	39	38	37	36	35
49	48	47	46	45	44	43	42	41	40	39	38	37	36
50	49	48	47	46	45	44	43	42	41	40	39	38	37

Single glazing	Double glazing of indicated glass thickness					Triple Glazing	
	2mm and 2mm glass	3mm and 3mm glass	4mm and 4mm glass	3mm and 6mm glass	6mm and 6mm glass	3mm, 3mm and 3mm glass	3mm, 3mm and 6mm glass
Thickness	Interpane spacing in mm (3)					Interpane spacings in mm (5)	
2mm	6						
	13						
3mm	15	6					
4mm, 6mm	18	13	6				
	22	16	13	6	6	6,6	
9mm (4)	28	20	16	13	13	6,10	6,6
	35	25	20	16	16	6,15	6,10
12mm (4)	42	32	25	20	20	6,20	6,15
	50	40	32	25	24	6,30	6,20
	63	50	40	32	30	6,40	6,30
	80	63	50	40	37	6,50	6,40
	100	80	63	55	50	6,65	6,50
	125	100	80	75	70	6,80	6,65
	150	125	100	95	90	6,100	6,80
		150	125	110	100		6,100
			150	135	125		

Source: National Research Council, Division of Building Research, June 1980.

Explanatory Notes:

1) Where the calculated percentage window area is not presented as a column heading, the nearest percentage column in the table values should be used.
2) AIF data listed in the table are for well-fitted weatherstripped units that can be opened. The AIF values apply only when the windows are closed. For windows fixed and sealed to the frame, add three (3) to the AIF given in the table.
3) If the interpane spacing or glass thickness for a specific double glazed window is not listed in the table, the nearest listed values should be used.
4) The AIF ratings for 9mm and 12mm glass are for laminated glass only; for solid glass subtract two (2) from the AIF values listed in the table.
5) If the interpane spacings for a specific triple-glazed window are not listed in the table, use the listed case whose combined spacings are nearest the actual combined spacing.
6) The AIF data listed in the table are for typical windows, but details of glass mounting, window seals, etc. may result in slightly different performance for some manufacturers' products. If laboratory sound transmission loss data (conforming to ASTM test method E-90) are available, these should be used to calculate the AIF.

Table 6.3 - Acoustic Insulation Factor for Various Types of Exterior Wall

	Percentage of exterior wall area to total floor area of room											Type of Exterior Wall
	16	20	25	32	40	50	63	80	100	125	160	
Acoustic Insulation Factor	39	38	37	36	35	34	33	32	31	30	29	EW1
	41	40	39	38	37	36	35	34	33	32	31	EW2
	44	43	42	41	40	39	38	37	36	35	34	EW3
	47	46	45	44	43	42	41	40	39	38	37	EW4
	48	47	46	45	44	43	42	41	40	39	38	EW1R
	49	48	47	46	45	44	43	42	41	40	39	EW2R
	50	49	48	47	46	45	44	43	42	41	40	EW3R
	55	54	53	52	51	50	49	48	47	46	45	EW5
	56	55	54	53	52	51	50	49	48	47	46	EW4R
	58	57	56	55	54	53	52	51	50	49	48	EW6
	59	58	57	56	55	54	53	52	51	50	49	EW7 or EW5R
	63	62	61	60	59	58	57	56	55	54	53	EW8

Source : National Research Council, Division of Building Research, December 1980.

Explanatory Notes :

1) Where the calculated percentage wall area is not presented as a column heading, the nearest percentage column in the table should be used.
2) The common structure of walls EW1 to EW5 is composed of 12.7 mm gypsum board, vapour barrier, and 38 x 89 mm studs with 50 mm (or thicker) mineral wool or glass fibre batts in inter-stud cavities.
3) EW1 denotes exterior wall as in Note 2), plus sheathing, plus wood siding or metal siding and fibre backer board.
EW2 denotes exterior wall as in Note 2), plus rigid insulation (25-30 mm), and wood siding or metal siding and fibre backer board.
EW3 denotes simulated mansard with structure as in Note 2), plus sheathing, 28 x 89 mm framing, sheathing, and asphalt roofing material.
EW4 denotes exterior wall as in Note 2), plus sheathing and 20 mm stucco.
EW5 denotes exterior wall as in Note 2), plus sheathing, 25 mm air space, 100 mm brick veneer.
EW6 denotes exterior wall composed of 12.7 mm gypsum board, rigid insulation (25-50 mm), 100 mm back-up block, 100 mm face brick.
EW7 denotes exterior wall composed of 12.7 mm gypsum board, rigid insulation (25-50 mm), 140 mm back-up block, 100 mm face brick.
EW8 denotes exterior wall composed of 12.7 mm gypsum board, rigid insulation (25-50 mm), 200 mm concrete.
4) R signifies the mounting of the interior gypsum board on resilient clips.
5) An exterior wall conforming to rainscreen design principles and composed of 12.7 mm gypsum board, 100 mm concrete block, rigid insulation (25-50 mm), 25 mm air space, and 100 mm brick veneer has the same AIF as EW6.
6) An exterior wall described in EW1 with the addition of rigid insulation (25-50 mm) between the sheathing and the external finish has the same AIF as EW2.

APPENDIX E

Elevation and Floor Plans

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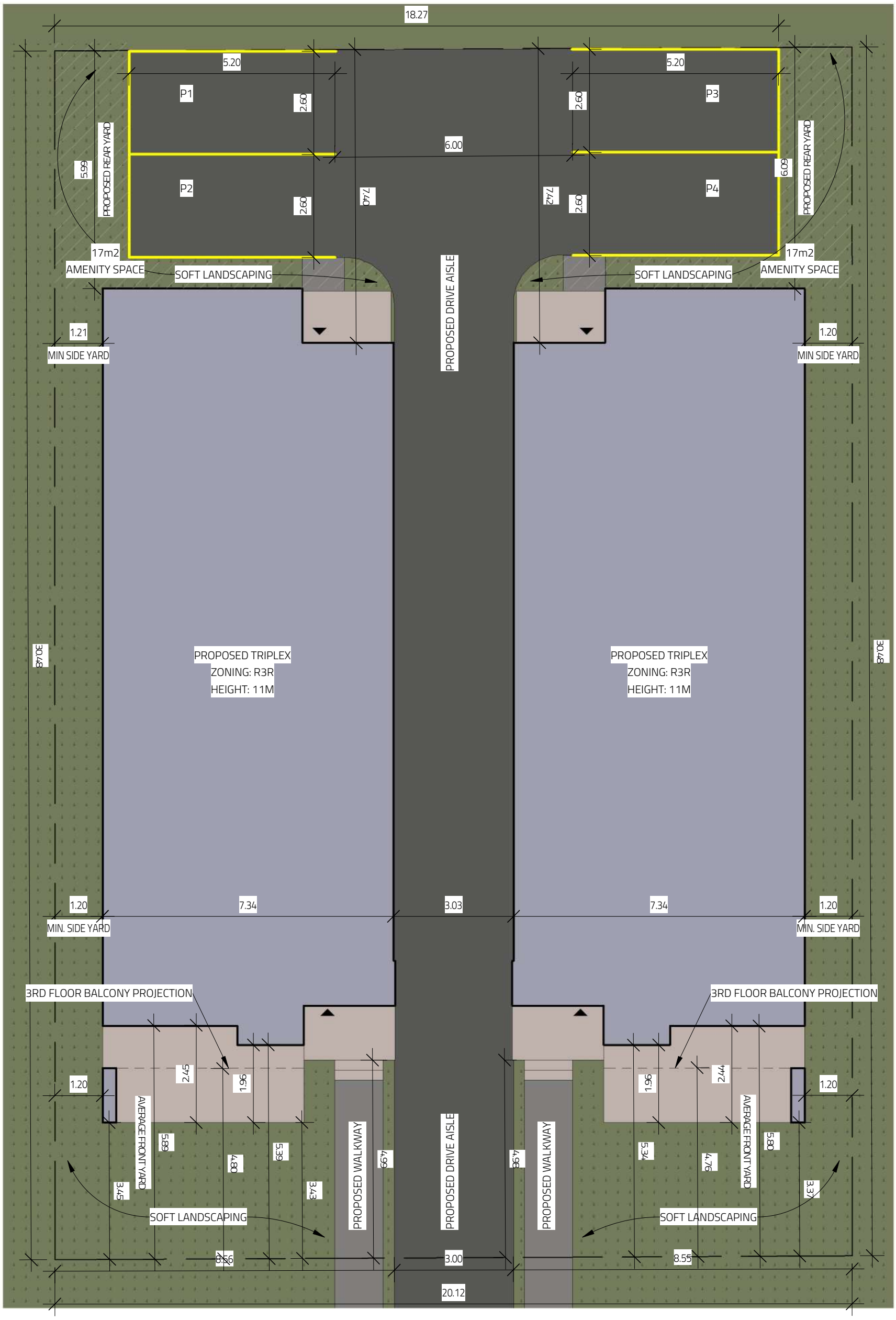
TRIPLEX



1 PROPOSED SITE

SCALE: 1 : 100

TRUE N

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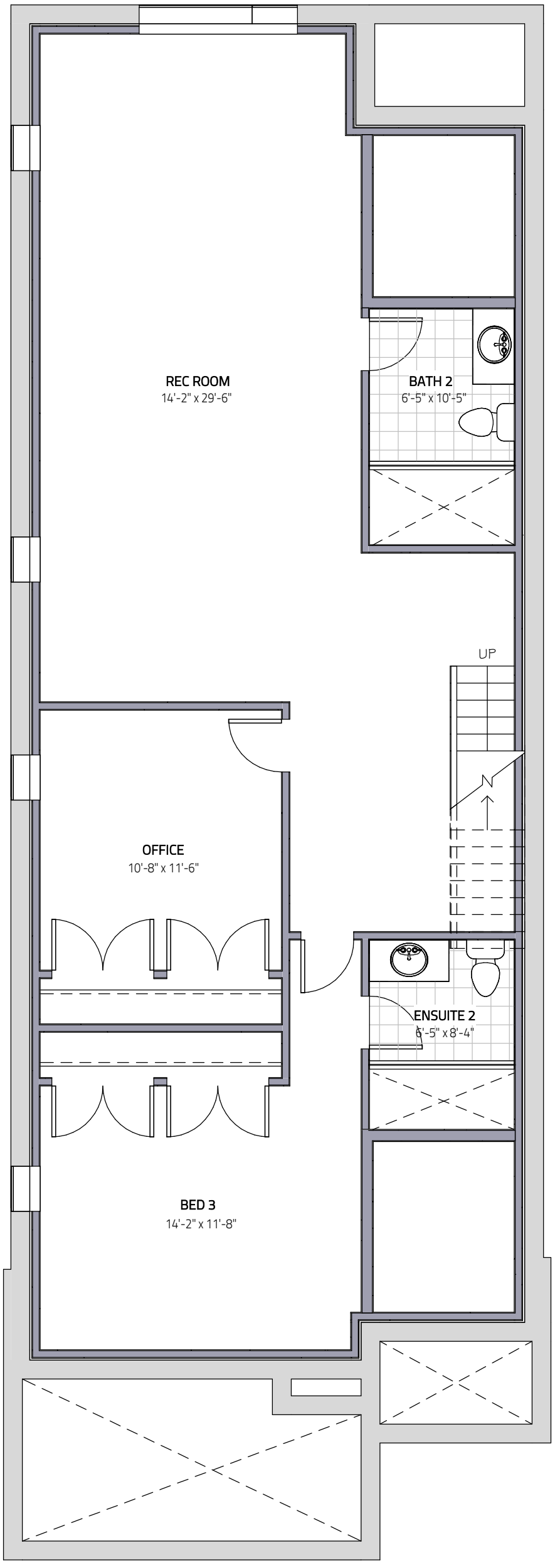

1 0-T/O BASEMENT SLAB

SCALE: 3/16" = 1'-0"

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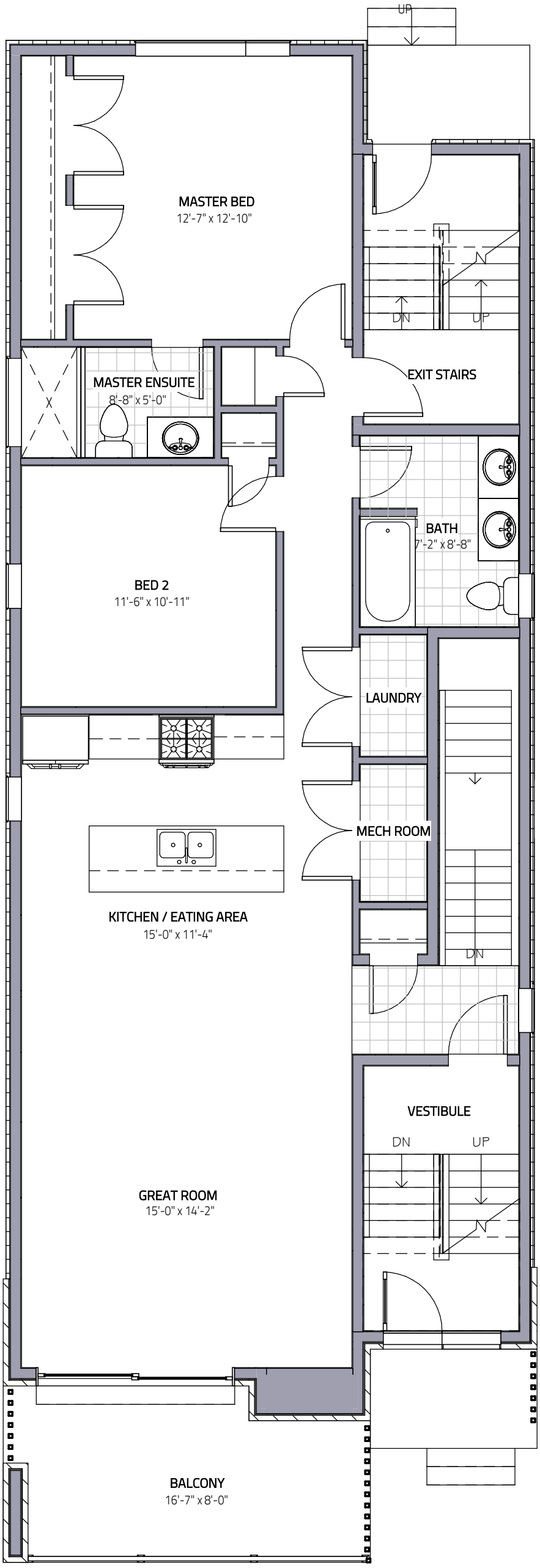
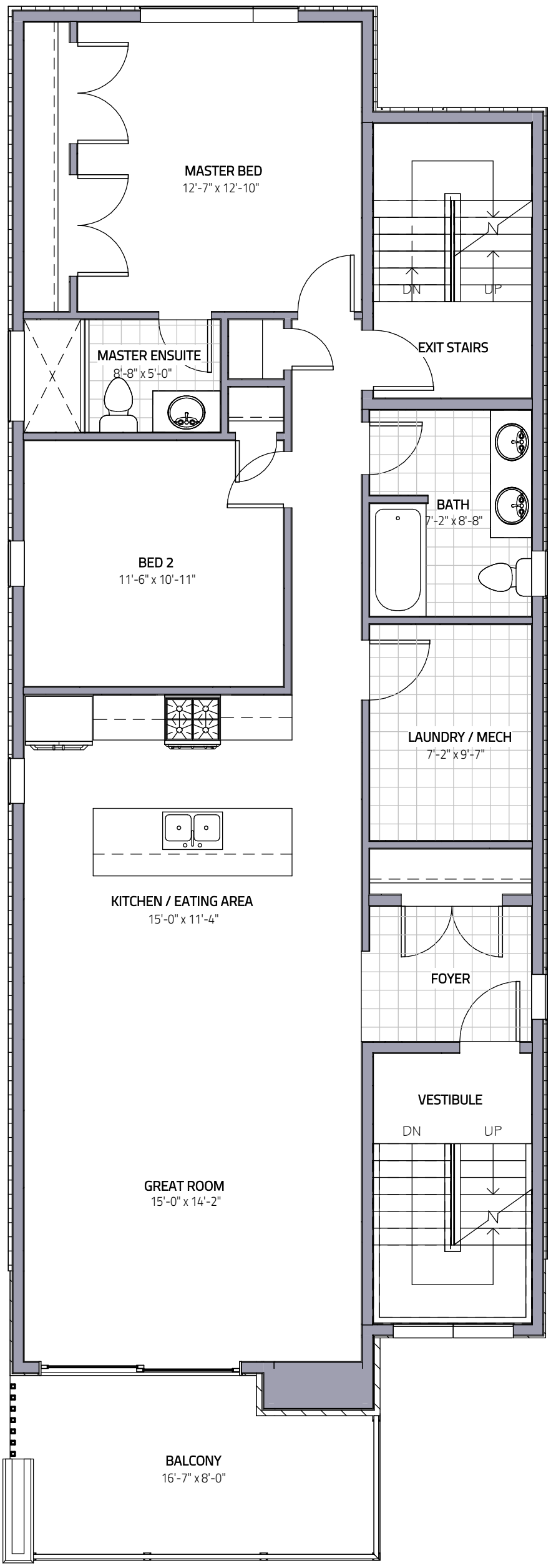


2 1-GROUND FLOOR

SCALE: 3/16" = 1'-0"



1 2-SECOND FLOOR

SCALE: 3/16" = 1'-0"

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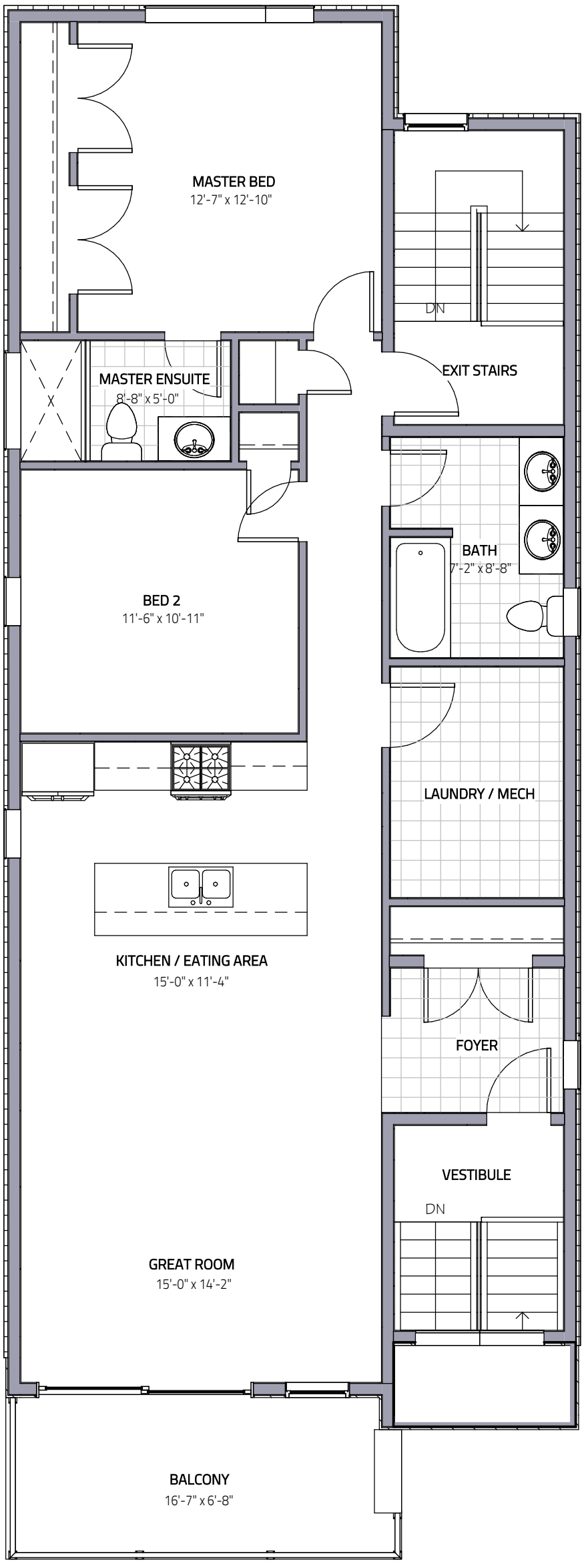

1 3-THIRD FLOOR

SCALE: 3/16" = 1'-0"

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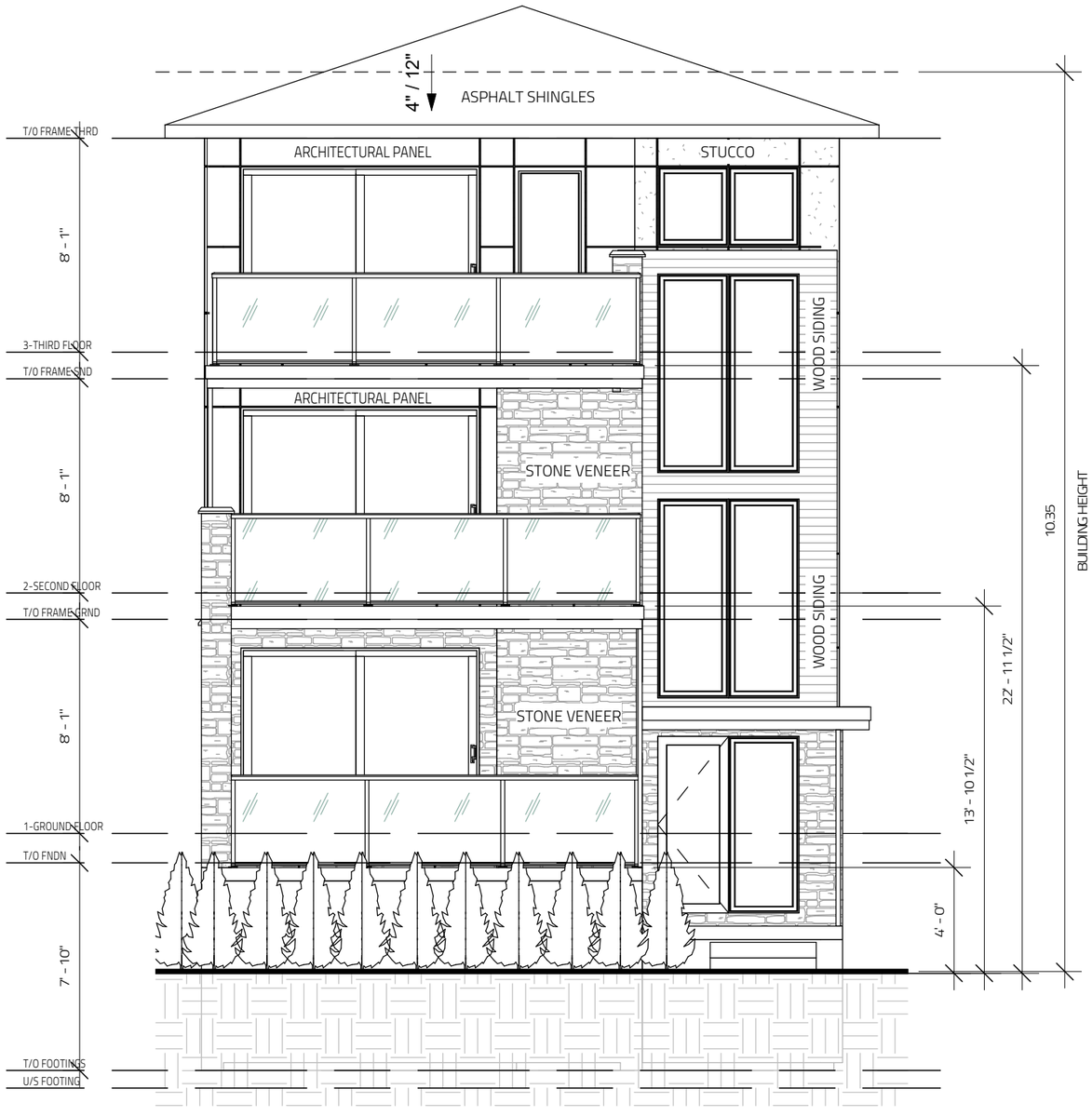
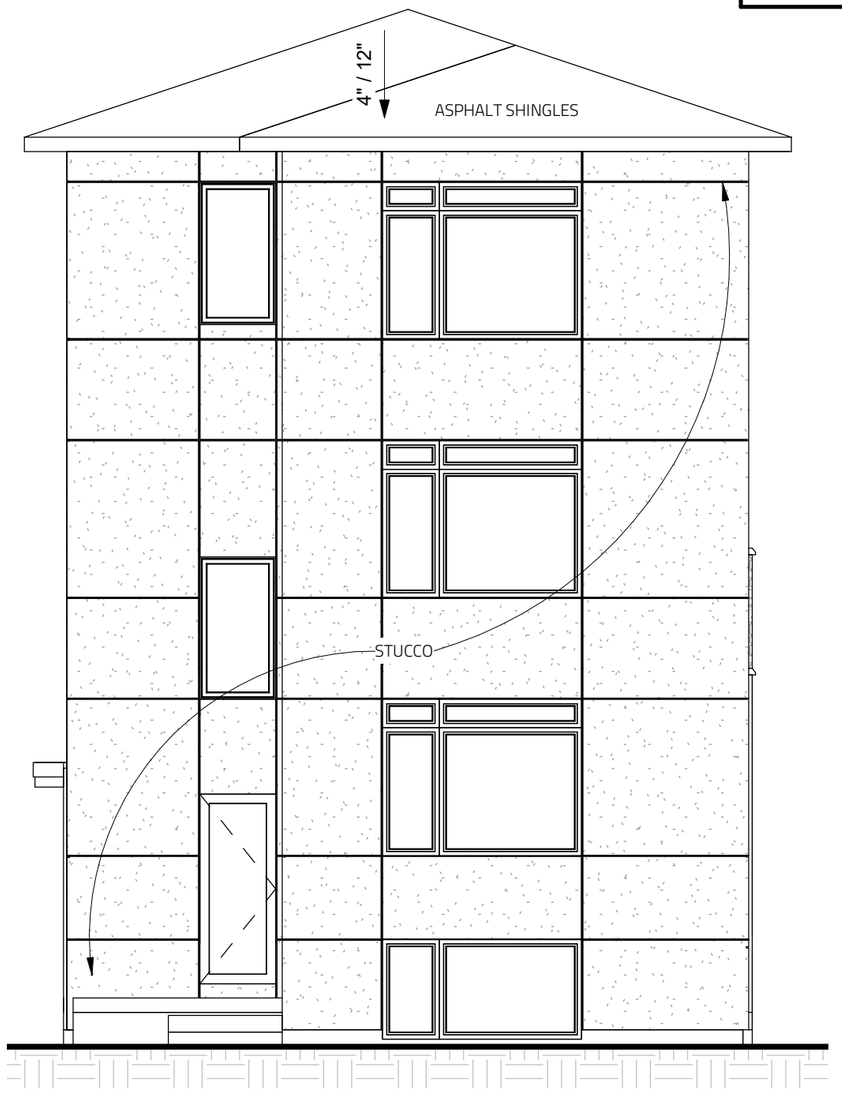


1 FRONT

SCALE: 3/16" = 1'-0"



2 REAR

SCALE: 3/16" = 1'-0"

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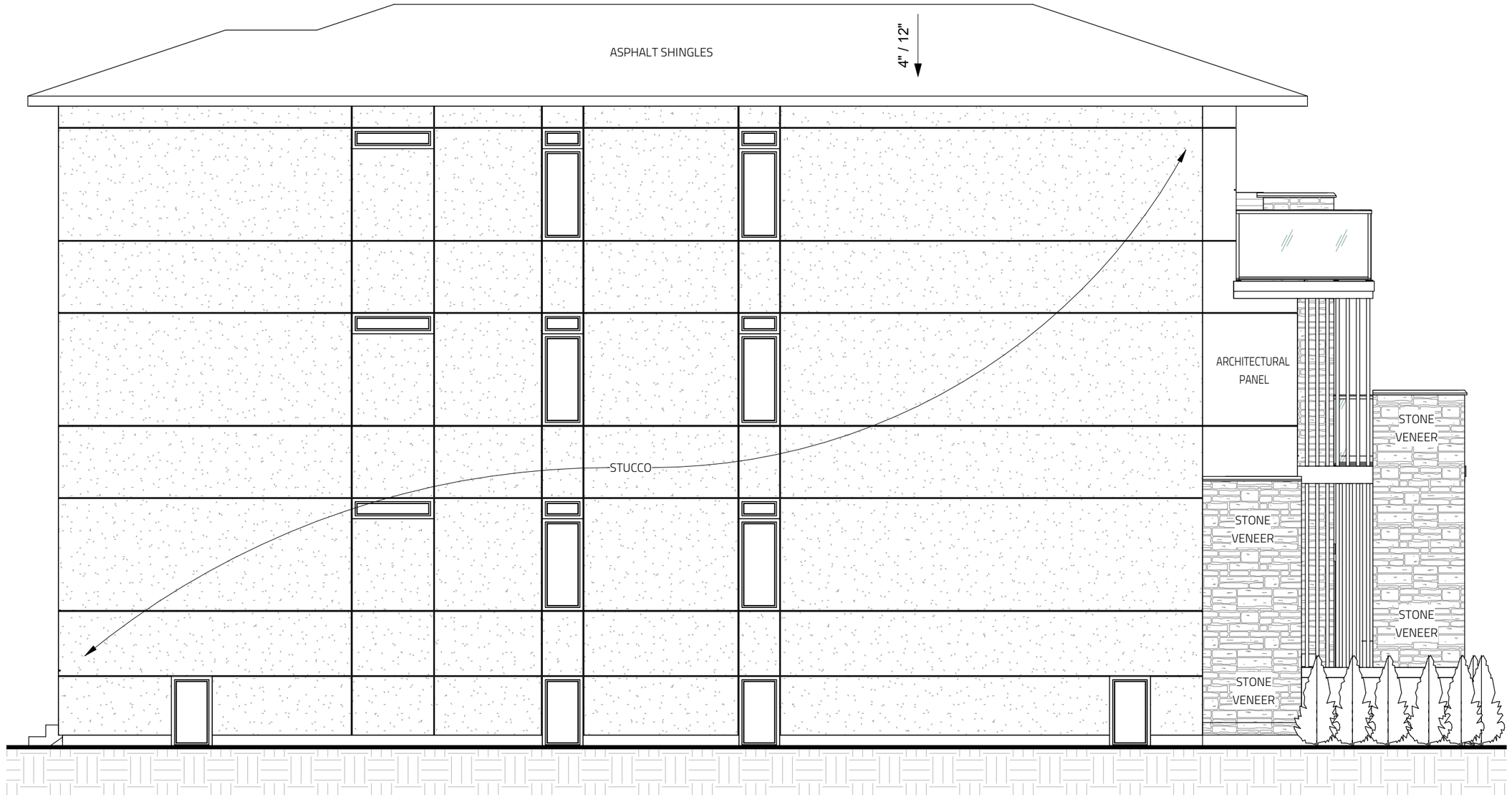

1 LEFT

SCALE: 3/16" = 1'-0"

AUGUST 10, 2016

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TRIPLEX

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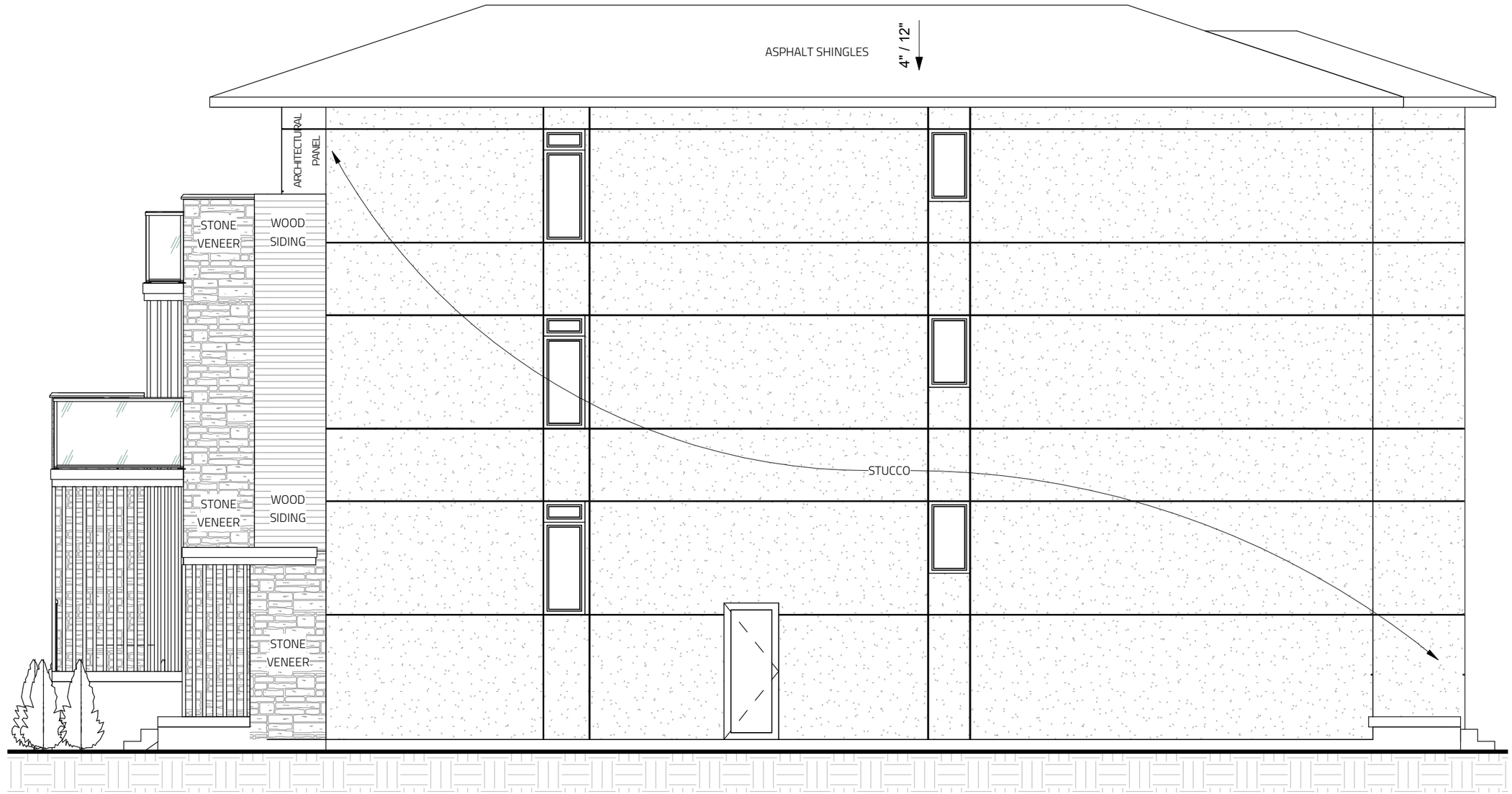

1 RIGHT

SCALE: 3/16" = 1'-0"

AUGUST 10, 2016