

**Richmond Road Development  
175 Richmond Road / 350 Kirkwood Avenue  
Noise Control Study**

Prepared By:

**NOVATECH ENGINEERING CONSULTANTS LTD.**

Suite 200, 240 Michael Cowpland Drive  
Ottawa, Ontario  
K2M 1P6

October 6, 2011  
Novatech File: 111130-0  
Ref: Report #-2011-154

October 6, 2011

City of Ottawa  
Planning and Growth Management Department  
Planning and Infrastructure Approvals Branch  
Infrastructure Approvals Division  
110 Laurier Street West, 4<sup>th</sup> Floor  
Ottawa, ON  
K1P 1J1

**Attention: Mr. Abdul Mottalib**

**Reference: Richmond Road Development - 175 Richmond Road / 350 Kirkwood Avenue. Noise Control Study (Our File No.: 111130)**

---

Enclosed for your review is the Noise Control Study for the Richmond Road Development, located at 175 of Richmond Road and 350 Kirkwood Avenue.

The study evaluates the impact of noise from traffic on Richmond Road and outlines noise attenuation measures to mitigate the impacts.

Please contact the undersigned should you have any questions on this report.

Yours truly,

**NOVATECH ENGINEERING CONSULTANTS LTD.**

Greg MacDonald, P.Eng.  
Senior Project Manager

## TABLE OF CONTENTS

<b>1.0 INTRODUCTION .....</b>	<b>1</b>
<b>2.0 BACKGROUND.....</b>	<b>1</b>
2.1 PROJECT DESCRIPTION.....	1
2.2 NOISE SOURCES.....	2
<b>3.0 CITY OF OTTAWA NOISE CONTROL GUIDELINES.....</b>	<b>2</b>
3.1 SOUND LEVEL CRITERIA.....	2
3.2 NOISE ATTENUATION REQUIREMENTS.....	3
<b>4.0 PREDICTION OF OUTDOOR NOISE LEVELS.....</b>	<b>5</b>
4.1 ROADWAY TRAFFIC.....	5
4.2 NOISE LEVEL ANALYSIS.....	5
4.3 NOISE LEVEL RESULTS .....	5
4.4 IMPLEMENTATION.....	6
<b>5.0 CONCLUSIONS .....</b>	<b>9</b>

### Appendices

- Appendix A: Sound Level Calculations  
Appendix B: Acoustic Insulation Factor Tables

### Tables

- Table 1: City of Ottawa – Outdoor Noise Level Criteria  
Table 2: City of Ottawa – Indoor Noise Level Criteria  
Table 3: City of Ottawa – Noise Attenuation Requirements  
Table 4: Traffic and Roadway Parameters  
Table 5: Mitigation Results  
Table 6: Percentage Window and Wall Area to Room Area  
Table 7: Typical Window and Wall Assemblies to Meet AIF  
Table 8: Equivalent Sound Transmission Class - STC Values  
Table 9: Required Noise Attenuation Measures

### Figures

- Figure 1: Key Plan – Richmond Road Residential Development  
Figure 2: Site Plan – Richmond Road Residential Development  
Figure 3: Receiver Location Plan – Richmond Road Residential Development

### Plans

- Grading Plan  
Noise Control Plan  
Typical Floor Plan

## 1.0 INTRODUCTION

This report is submitted on behalf of Claridge Homes for the Richmond Road Residential Development, located at 175 Richmond Road and 350 Kirkwood Avenue to address the noise study requirements from the City of Ottawa.

This study assesses the impact of traffic noise on the proposed development and outlines the recommended mitigation measures.

## 2.0 BACKGROUND

### 2.1 Project Description

Claridge Homes is proposing a residential/commercial development at 175 Richmond Road and 350 Kirkwood Avenue in Ottawa. The site has an area of 6,386 m<sup>2</sup> (68,745 ft<sup>2</sup>) and is located west of Kirkwood Avenue between Richmond Road and Wilber Avenue, as shown in Figure 1 (Key Plan).

The proposed development will consist of a 9 storey residential building with ground floor commercial at 175 Richmond Road and a 6 storey residential building at 350 Kirkwood Avenue. The two buildings will be adjoined at levels two through five. The development is to be constructed in two phases. Phase 1 will include the 6 storey building at 350 Kirkwood Avenue with 140 residential units. A two-level underground parking garage with access onto Wilber Street will also be constructed as part of Phase 1 and will provide a total of 310 vehicle parking spaces for both buildings. Phase 2 will include the 9 storey building at 175 Richmond Road with 99 residential units and 6,622 ft<sup>2</sup> of ground floor commercial. The proposed development is presented in Figure 2 – Site Plan.

**Figure 1 – Key Plan**



## 2.2 NOISE SOURCES

The City of Ottawa Official Plan stipulates that a noise study shall be prepared when a new development is proposed within 100 metres of an arterial or major collector roadway, or a rapid-transit corridor.

For the purpose of this report both buildings will be analyzed as they are within 100m of the primary noise source of Richmond Road.

Within the area of the proposed site, Schedule 'E', Section 7, Annex 1-65 of The City of Ottawa Official Plan, Amendment 76, entitled "Urban Road Network" is as follows:

- Richmond Road: An urban arterial undivided road with a protected right of way (ROW) width of 20.0m, consisting of two eastbound and two westbound lanes with on street parking permitted on both sides and a posted speed of 50Km/hr

No rail or airport noise affects this site.

## 3.0 CITY OF OTTAWA NOISE CONTROL GUIDELINES

### 3.1 Sound Level Criteria

The City of Ottawa is concerned with noise from aircraft, roads, transitways and railways as expressed in the City of Ottawa Official Plan (May 2003) since it can affect the quality of life of residents. To protect residents from unacceptable levels of noise, the City of Ottawa has specific environmental noise control guidelines, which are based on the technical guidelines and recommendations prepared by the Ontario Ministry of Environment. The City of Ottawa's *Environmental Noise Control Guidelines (ENCG)*, Final Draft - May 10, 2006 has been used for the purpose of this report.

The quantitative sound level criteria, which require that specific outdoor and indoor living areas of residential developments meet certain energy equivalent sound levels (Leq), are summarized in *Table 1 and Table 2*, respectively. Compliance with the outdoor sound level criteria will generally ensure compliance with the indoor sound level criteria when normal construction materials are utilized.

**Table 1: City of Ottawa Outdoor Noise Level Criteria**

Time Period	Receiver Location	Noise Level Criteria (Leq)
Daytime (07:00 – 23:00)	Outdoor Living Area (OLA)	55 dBA
Daytime (07:00 – 23:00)	Plane of Window (POW) at Living/Dining Rooms	55 dBA
Nighttime (23:00 – 07:00)	Plane of Window (POW) at Bedrooms/Sleeping Quarter	50 dBA

The outdoor living area is defined as that part of an outdoor amenity area, which is provided for the quiet enjoyment of the outdoor environment during the daytime period. These amenity areas are typically backyards, gardens, terraces and patios.

**Table 2: City of Ottawa Indoor Noise Level Criteria**

Time Period	Receiver Location	Noise Level Criteria (Leq)
Daytime (07:00 – 23:00)	Living/Dining Rooms of residential dwelling units, theatres, places of worship, school, individual or semi-private offices, conference rooms, reading rooms, classrooms, etc	45 dBA
Nighttime (23:00 – 07:00)	Sleeping quarters of residential units, hospitals, nursing homes, senior citizen homes, etc	40 dBA

### 3.2 Noise Attenuation Requirements

When sound levels are predicted to be less than the specified criteria for the daytime and nighttime conditions, no attenuation measures are required by the proponent. As the noise criteria is exceeded, a combination of attenuation measures are available to modify the development environment. These attenuation measures may include:

- Construction of a noise barrier wall and/or berm;
- Installation of a forced air ventilation system with provision for central air conditioning;
- Installation of central air conditioning;
- Custom building design, construction and/or acoustic insulation.

If noise levels are expected to exceed the applicable sound level criteria, the City of Ottawa recommends a warning clause be registered on title. This warning clause serves to alert potential buyers and/or renters of the possible noise condition and of any limitations that may exist on his/her property. The warning clause would be registered on title and incorporated in the Subdivision Agreement and in the Agreement of Purchase and Sale.

Noise attenuation requirements at the Outdoor Living Areas (OLA) and Plane of Window (POW) are outlined in *Table 3*.

**Table 3: City of Ottawa Noise Attenuation Requirements**

Noise Level (dBA)				Noise Attenuation Requirements
Daytime (07:00-23:00)		Nighttime (23:00-07:00)		
Unattenuated	Attenuated	Unattenuated	Attenuated	
<b>OUTDOOR LIVING AREA (OLA)</b>				
OLA < 55				None
55 < OLA < 60				Noise Clause Type A
OLA > 60	OLA < 55			Noise Barrier
OLA > 60	OLA > 55			Noise Barrier Noise Clause Type B
<b>PLANE OF WINDOW (POW)</b>				
POW < 55		POW < 50		None
55 < POW < 65		50 < POW < 60		Forced Air Ventilation Noise Clause Type C
POW > 65		POW > 60		Central Air Conditioning Noise Clause Type D Building Façade Analysis

The wording of the warning clauses to be placed on title and included in the Site Plan Agreement, Condominium Agreement and the Offer of Purchase and Sale are as follows:

#### **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 Environment’s noise criteria.”

#### **Type B**

“Purchasers/tenants are advised that despite the inclusion of noise control features in this development and within the building units, sound levels due to increasing road traffic may on occasions 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.”

#### **Type C**

“This dwelling unit is fitted with a forced air heating system and the ducting, etc was sized to accommodate a central air conditioning system. Installation of central air conditioning by the occupant will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the City’s and the Ministry of Environment’s noise criteria. (Note: The location and installation of the outdoor air conditioning device should be done so

as to comply with noise criteria of MOE Publication NPC-216, Residential Air Conditioning Devices and thus minimize the noise impacts both on and in the immediate vicinity of the subject property.”)

#### **Type D**

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

### **4.0 PREDICTION OF OUTDOOR NOISE LEVELS**

#### **4.1 Roadway Traffic**

Noise levels from Richmond Road were assessed using the ultimate road and traffic data from Table 1.7 of the City of Ottawa’s Environmental Noise Control Guidelines. The traffic and roadway parameters used for sound level predictions are shown in Table 4.

**Table 4: Traffic and Roadway Parameters**

	<b>Richmond Road</b>
Roadway Classification	4-Lane Urban Arterial - Undivided
Annual Average Daily Traffic (AADT)	30,000 veh/day
Day/Night Split (%)	92/8
Medium Trucks (%)	7
Heavy Trucks (%)	5
Posted Speed	50Km/hr

#### **4.2 NOISE LEVEL ANALYSIS**

The noise levels were analyzed using Version 5.03 of the STAMSON computer program issued by the MOE. Proposed grades were required for the software and were obtained from the Grading Plan contained in the back of this report. Receiver locations used in the noise simulations are shown on Figure 3 – Receiver Location Plan. A larger scale plan is included in the back of this report.

#### **4.3 Noise Level Results**

Simulated noise levels for the condominiums adjacent to Richmond Road exceed the allowable noise level criteria, resulting in the requirement for a building façade analysis and warning clauses.



The predicted noise levels at the selected receiver locations within the complex are illustrated in *Table 5*. Daytime and night time noise levels are shown for the plane of window (POW). The receivers for the condominium units were located at the north & north-west sides for the Richmond Building and the south-west side for the Kirkwood Building. The OLA for balconies does not meet the City of Ottawa OLA criteria (e.g., OLA needs to be a minimum of 4.0m deep per Appendix B5-B6 of ENCG).

**Table 5: Simulation Results**

File Name (R=Receiver)	Noise Levels Leq (dBA)	
	Daytime (POW – Living/Dining)	Nighttime (POW - Bedroom)
R <sub>1</sub> (Ground Floor - Commercial)	72.35	-----
R <sub>2</sub> (Second Floor - Residential)	72.35	64.75
R <sub>3</sub> (Sixth Floor - Residential)	72.35	64.75
R <sub>4</sub> (Ninth Floor - Residential)	72.35	64.75
R <sub>5</sub> (Ground Floor - Commercial)	68.75	-----
R <sub>6</sub> (Second Floor - Residential)	68.75	61.15
R <sub>7</sub> (Sixth Floor - Residential)	68.75	61.15
R <sub>8</sub> (Ninth Floor - Residential)	68.75	61.15
R <sub>9</sub> (Ground Floor - Residential)	66.91	59.31
R <sub>10</sub> (Forth Floor - Residential)	66.91	59.31
R <sub>11</sub> (Sixth Floor - Residential)	66.91	59.31

#### 4.4 Implementation

The City of Ottawa ENCG requires that noise clauses be applied when noise levels are above 55dBA and wall & window construction be reviewed when noise levels exceed 60 dBA. The acoustical insulation factor (AIF) method recognized by the City of Ottawa is used to assess the wall and window requirements.

The Acoustic Insulation Factor (AIF) is used as a measure of the reduction of outdoor noise provided by the elements of the outer surface of a building. The difference between the indoor noise criterion and the outdoor noise level establishes the acoustical insulation requirement for the exterior shell. The exterior shell is comprised of primarily two components; windows and walls (patio doors are treated as windows). Canada Mortgage and Housing (CMHC) Standards <sup>1</sup> require that no component transmit more than 1/N of the total sound power that would give the maximum acceptable noise level inside the room.

<sup>1</sup> Road and Rail Noise: Effects on Housing, CMHC, Ottawa. Publication NHA #185 1/78, 1978

Thus, in a room with two exterior components, neither should transmit more than one-half of the total allowable sound power. Mathematically, this basic requirement can be expressed as:

$$\text{Required AIF} = L_{eg} (\text{Outside}) - L_{eg} (\text{Inside}) + 10 \log_{10} (N) + 2\text{dBA}$$

Where, N = Number of components;

L = Sound Level expressed on a common decibel scale.

The acoustical insulation factor for each of the buildings, day time giving the highest result, is calculated as follows:

175 Richmond Road;

- $\text{AIF}_{\text{Day-time}} = 72 \text{ dBA} - 45 \text{ dBA} + 10\log(2) \text{ dBA} + 2\text{dBA} = \underline{32 \text{ dBA}}$

350 Kirkwood Avenue;

- $\text{AIF}_{\text{Day-time}} = 67 \text{ dBA} - 45 \text{ dBA} + 10\log(2) \text{ dBA} + 2\text{dBA} = \underline{27 \text{ dBA}}$

The above value can also be referenced directly from Table 11.2 in Appendix B.

Tables from the document entitled “Acoustic Insulation Factor: A Rating for the Insulation of Buildings Against Outdoor Noise”, produced by the Division of Building Research, National Research Council of Canada, June 1980 (J.D. Quirt) were used to assess the exterior facade against the required AIF. This reference material is included in Appendix B.

In order to assess the façade against the required AIF, percentage of window to room area and exterior wall to room area are required. This information was derived from the typical floor plan which were obtained from the architect and is included in the back of this report. Results are presented in Table 6.

**Table 6: Percentage Window and Wall Area to Room Area**

Description	Values		
	Corner Unit 175 Richmond	Typical Unit 175 Richmond 350 Kirkwood	Commercial Unit 175 Richmond
Number and Type of Components Forming Building Envelope = 2 (Windows and Exterior Walls)			
Percentage of Window Area to Total Floor Area of Room	62	25	30
Percentage of Wall Area to Total Floor Area of Room	25	10	5

Using the percentage of window area to room area, and the required acoustical insulation factor (AIF), Table 5 in Appendix B was used to identify the various window assemblies that would satisfy the required AIF. Similarly, Table 6.3 in Appendix B was used to select the typical wall assembly that would satisfy the required AIF. Results of this exercise are provided in Table 7.

**Table 7: Selected Window and Wall Assemblies to Meet AIF**

Description	AIF	Window Assembly Options	Typical Wall Assembly
Residential Corner Unit	32	<ul style="list-style-type: none"> <li>▪ 2 mm – 63 mm – 2 mm</li> <li>▪ 3 mm – 50 mm – 3 mm</li> <li>▪ 4 mm – 40 mm – 4 mm</li> <li>▪ 6 mm – 16 mm – 6 mm</li> <li>▪ Triple Glazing (See Table 5 in Appendix B)</li> </ul>	EW1
Residential Typical Unit	29	<ul style="list-style-type: none"> <li>▪ 3 mm single glazing</li> <li>▪ 2 mm – 15 mm – 2 mm</li> <li>▪ 3 mm – 6 mm – 3 mm</li> </ul>	EW1
Commercial Unit	32	<ul style="list-style-type: none"> <li>▪ 2 mm – 35 mm – 2 mm</li> <li>▪ 3 mm – 25 mm – 3 mm</li> <li>▪ 4 mm – 20 mm – 4 mm</li> <li>▪ 6 mm – 16 mm – 6 mm</li> <li>▪ Triple Glazing (See Table 5 in Appendix B)</li> </ul>	EW1
Notes:			
<ol style="list-style-type: none"> <li>1. EW1 type wall consisting of 12.7mm gypsum board, vapour barrier, 38x89mm studs with 50mm (or thicker) mineral wool or glass fibre batts in inter stud cavities plus sheathing, wood siding or metal siding and fibre backer board.</li> <li>2. "2 mm – 63 mm – 2 mm" denotes 2 mm glass, 63 mm air space and 2 mm glass.</li> </ol>			

Tables 11 and 12 in Appendix B were used to convert the AIF values to Sound Transmission Class, or STC values. Results are summarized in Table 8.

**Table 8: Equivalent Sound Transmission Class , STC Values**

	AIF	Windows		Walls	
		Conversion	STC	Conversion	STC
<b>175 Richmond Road</b>					
Corner Residential Unit	32	STC – 4 = AIF	36	STC – 1 = AIF	33
Typical Residential Unit	32	STC + 0 = AIF	32	STC + 3 = AIF	29
Commercial Unit	32	STC – 1 = AIF	33	STC + 3 = AIF	29
<b>350 Kirkwood Avenue</b>					
Typical Residential Unit	27	STC + 0 = AIF	27	STC + 3 = AIF	24

The attenuation measures required to satisfy the City of Ottawa noise criteria and the noise clauses that are to be included on title and in the Agreement of Purchase and Sale for the various dwelling units are summarized in Table 9.

**Table 9 - Required Noise Attenuation Measures**

Units	Attenuation Measure	Notice on Title
175 Richmond Road - All (Residential & Commercial)	Central Air Conditioning. Acoustically selected walls and windows for all rooms.	D
350 Kirkland Avenue – All (Residential)	Central Air Conditioning. Acoustically selected walls and windows for all rooms.	D

## 5.0 CONCLUSIONS

An analysis of the roadway traffic along Richmond Road indicates attenuation measures will be necessary.

The following is a summary of the attenuation measures and notice requirements to be placed on title for all residential and commercial units

### Ground Floor Commercial 175 Richmond Road

- Provide Central Air Conditioning
- Provide window assembly to meet a sound transmission class, **STC of 33**.
- Provide wall assembly to meet a sound transmission class, **STC of 29**.
- Notice on title: *“This dwelling unit has been supplied with a central air conditioning system which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the City’s and the Ministry of Environment’s noise criteria.”*

### Corner Residential Units 175 Richmond Road

- Provide Central Air Conditioning
- Provide window assembly to meet a sound transmission class, **STC of 36**.
- Provide wall assembly to meet a sound transmission class, **STC of 33**.
- Notice on title: *“This dwelling unit has been supplied with a central air conditioning system which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the City’s and the Ministry of Environment’s noise criteria.”*

**All other Residential Units (175 Richmond and 350 Kirkwood)**

- Central Air Conditioning;
- Provide window assembly to meet a sound transmission class, **STC of 27.**
- Provide wall assembly to meet a sound transmission class, **STC of 24.**
- Notice on title: *“This dwelling unit has been supplied with a central air conditioning system which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the City’s and the Ministry of Environment’s noise criteria.”*

**NOVATECH ENGINEERING CONSULTANTS LTD.**

Prepared by:

Reviewed by:

Martin Connolly

Greg MacDonald, P. Eng  
Senior Project Manager

**APPENDIX A**  
**SOUND LEVEL CALCULATIONS**

## **APPENDIX B**

### **ACCOUSTIC INSULATION FACTOR TABLES**