TRAFFIC NOISE IMPACT ASSESSMENT FOR THE PROPOSED RESIDENTIAL DEVELOPMENT TO BE LOCATED AT 351 CROYDON AVENUE

CITY OF OTTAWA

Prepared for
Urban Structure Properties Ltd.

Prepared by
Hugh Williamson Associates Inc.

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Resumes Dr. Hugh Williamson, Michael Wells
TRAFFIC NOISE IMPACT ASSESSMENT
FOR THE PROPOSED RESIDENTIAL DEVELOPMENT TO BE LOCATED AT 351 CROYDON AVENUE CITY OF OTTAWA

1.0 Introduction

Hugh Williamson Associates Inc. has been retained by Urban Structure Properties Ltd. to undertake a traffic noise impact assessment in relation to satisfying the City of Ottawa Environmental Noise Control Guidelines (ENCG) for the proposed multi-unit residential development to be located at 351 Croydon Avenue, PIN: 039630003, in the City of Ottawa, Ontario.

This report describes an assessment of noise impacts from road traffic on Richmond Road at the interior and outdoor living areas of the proposed development. This assessment has been carried out in accordance with the City of Ottawa Environmental Noise Control Guidelines, January 2016 (ENCG)¹ and Ministry of Environment and Climate Change publication, NPC-300² by Hugh Williamson Associates Inc.

The proposed development is located on Croydon Avenue, approximately 40 m south of Richmond Road, as shown in Figures 1 and 2.

This analysis is based on drawings and information received electronically from Urban Structure Properties Ltd. and information prepared by P-Squared Concepts Inc.

General Description of the Proposed Development

The proposed development comprises of a three storey building housing eight private dwelling units in total.

The building rises to approximately 11 m above grade.

Residential units are located on each of the building three stories with HVAC equipment located in the basement of the building.

The development includes small balconies associated with each private dwelling unit. It is noted that the small balconies associated with the residential units do not meet the minimum area requirements to be considered as noise sensitive points of reception for the purposes of assessing compliance to ENCG criteria i.e. balcony’s must have a minimum depth of 4 m to be considered noise sensitive outdoor living areas.

Refer to Figures 2, 3 and 4.
Traffic Noise Impact Assessment for the proposed residential development at 351 Croydon Avenue, Ottawa

Site Description

The land surrounding the proposed development consists of mainly commercial uses. The site and surrounding land is zoned AM - Arterial Mainstreet Zone. The site is relatively flat with no significant changes in elevation.

The primary source of environmental noise is vehicular traffic along Richmond Road.

Ottawa River Parkway (Sir John A. Macdonald Parkway) lies in an easterly direction at an approximate distance of 275 m from the site and Carling Avenue lies in a southerly direction at an approximate distance of 200 m from the site. Due to the large distance, noise impacts at the proposed development from these roads are not required to be assessed as per ENCG, greater than 100 m, and are considered insignificant.
2.0 Methodology and Assessment Criteria

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

The noise assessment methodology is summarised as follows:

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

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

- Based on the predicted sound levels, the specifications for mitigation measures such as noise barriers, building component requirements, ventilation requirements and warning clauses are determined according to criteria established by the City of Ottawa ENCG and provincial MOECC criteria where applicable.

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

Where building component requirements need to be designed to achieve specific indoor sound levels, restrictions may apply such as the construction assembly and areas of walls, windows, and doors. The City of Ottawa ENCG does not specifically set outdoor noise thresholds for detailed building component design, however, as the provincial guidelines does set specific thresholds, the provincial criteria has been applied for this aspect of the assessment. As such, building component requirements depend on the predicted outdoor noise levels and are set out in Table A1.3, Appendix 1.

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

For the evaluation of noise impacts, the critical points of reception, POR 1 and POR 2 were chosen which represent the location of worst case noise impacts at the proposed development. These points of reception are listed in Table 1 and shown in Figures 2, 3 and 4.

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

For assessment of indoor sound levels, points of reception, POR 1 and POR 2, were chosen at locations on the building, being the most exposed to noise from Richmond Road for daytime and nighttime periods of use i.e. living room and bedroom locations.

Outdoor sound levels were calculated at these worst case locations, on the third floor level, located 9.5 m above grade. Plane of window locations are used as windows represent the least ‘sound proof’ building component of the exterior partition.

Refer to Table 1 and Figures 2, 3 and 4.
4.0 Noise Source Modelling and Data

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

- Richmond Road is assessed as a 2-Lane Urban Arterial (2-UAU) with 15,000 AADT, posted speed limit of 50 km/hr.

The proportion of traffic type and times used to develop the traffic data for each road segment consists of a 92/8 day/night split with 7% medium trucks and 5% heavy trucks by volume as set out in Table 1.7, City of Ottawa Environmental Noise Control Guidelines.¹

The surrounding topography was assumed to be a generally flat, reflective surface.

Refer to Table 2: Future Traffic Volumes and Posted Speed Limits.
5.0 Noise Impact Assessment

Based on the future traffic projections and assumptions discussed in the previous section, sound levels were predicted at each of the worst-case points of reception, POR 1 and POR 2, using the MOECC STAMSON noise modelling software. The results of predictions are contained in Tables 3 to 5. Samples of the outputs of the STAMSON software are given in Appendix 2.

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

Building Components

The City of Ottawa ENCG provides indoor sound level criteria for noise sensitive spaces including living, dining, and, sleeping areas of residences. This criterion is based on the provincial guideline, NPC-300, and is to be met by the design of building components including the walls, windows and doors of the proposed development. While, the City of Ottawa ENCG does not specifically set threshold limits for predicted outdoor noise levels that require building component design, the ENCG references the provincial noise criteria, which does provide specific thresholds for exterior noise that require detailed building component design. As per ENCG criteria where there is a discrepancy between the Federal, Provincial, and Municipal guidelines then the more specific standard should be applied. ENCG, Page 1 and 2. As such, for the assessment of building component design the provincial guidelines have been applied to this project.

As indicated in Table A1.3, where outdoor noise levels exceed various thresholds for living rooms and bedrooms, then building components, walls, windows, etc. must be designed to achieve the indoor sound level criteria set out in Table A1.2.

As shown in Tables 3, the predicted outdoor sound levels indicate that compliance with the Ontario Building Code will be sufficient in achieving acceptable indoor sound levels. i.e. predicted noise impacts are less than the provincial criteria of 65 dBA during the day and less than 60 dBA during the night.

Outdoor Noise Control Measures

The proposed balcony’s associated with the residential units do not meet the minimum area requirements specified in City of Ottawa ENCG to be considered as noise sensitive outdoor living areas. As such no outdoor noise control measures are required for these locations.

Ventilation Requirements & Warning Clauses

The predicted plane of window noise levels, shown in Table 4, indicates that there is a requirement that all units be fitted with forced air heating with provision for central air-conditioning. It is recommended that the Warning Clause, as noted below, be applied all units.
**Warning Clause**

“Purchasers/tenants are advised that sound levels due to increasing road/rail/Light Rail/transitway traffic may occasionally interfere with some indoor activities when doors and windows are open as the outdoor sound levels may exceed the sound level limits of the City and the Ministry of the Environment. To help address the need for sound attenuation this dwelling unit has been fitted with a forced air heating system and the ducting etc. was sized to accommodate central air-conditioning. Installation of central air-conditioning by the occupant will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the City's and the Ministry of Environment's noise criteria.

**Measures for sound attenuation include:**
- Provision of forced air heating system and the ducting etc. sized to accommodate central air-conditioning.”

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

*The above warning clause is an adaptation of the Generic Warning Clause presented in the ENCG and incorporates the more specific wording of the applicable provincial warning clause required for this project. Refer Table 4.*
6.0 Conclusions and Recommendations

A detailed traffic noise impact assessment has been conducted for the proposed multi-unit residential development to be located at 351 Croydon Avenue, in the City of Ottawa, Ontario.

The assessment has been carried out according to City of Ottawa Environmental Noise Control Guidelines taking into account future road traffic noise from Richmond Road.

The assessment has led to the following recommendations and conclusions:

6.1 Compliance with Ontario Building Code is sufficient to meet sound level criteria for building component design.

6.2 Outdoor sound levels exceed various thresholds for ventilation and warning clause requirements. The development requires the installation of forced air heating with provision for central air-conditioning. It is recommended that and adaptation of the generic warning clause taken from the ENCG that incorporates the more specific wording of the applicable provincial MOECC, NPC-300, Warning Clause, Type C, and as noted below, be applied all units.

“Purchasers/tenants are advised that sound levels due to increasing road/rail/Light Rail/transitway traffic may occasionally interfere with some indoor activities when doors and windows are open as the outdoor sound levels may exceed the sound level limits of the City and the Ministry of the Environment and Climate Change (MOECC). To help address the need for sound attenuation this dwelling unit has been fitted with a forced air heating system and the ducting etc. was sized to accommodate central air-conditioning. Installation of central air-conditioning by the occupant will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the City's and the MOECC’s noise criteria.

Measures for sound attenuation include:
Provision of forced air heating system and the ducting etc. sized to accommodate central air-conditioning.”

This clause should be included in the agreements of purchase, sale, or, lease, and, incorporated into the relevant development agreements which are registered on title of the property.

6.3 The proposed balcony’s associated with the residential units do not meet the minimum area requirements specified in City of Ottawa ENCG to be considered as noise sensitive outdoor living areas. As such no outdoor noise control measures are required for these locations.
References


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

Hugh Williamson, Ph.D., P.Eng.
Member, Canadian Acoustical Society
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Table 2: Future Traffic Volumes and Posted Speed Limits
Table 3: Traffic Noise Impacts for Building Component Requirements
Table 4: Traffic Noise Impacts for Ventilation and Warning Clause Requirements
### Table 1: Modelled Points of Reception

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Location</th>
<th>Distance to Richmond Road (m)</th>
<th>Angle of exposure (deg.)</th>
<th>Height*(m)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>POR 1</td>
<td>Third floor level window facing north (at north facade of Unit 201)</td>
<td>45</td>
<td>143</td>
<td>9.5</td>
<td>Plane of window (dining / bedroom)</td>
</tr>
<tr>
<td>POR 2</td>
<td>Third floor level window facing Croydon Avenue (at west facade of Unit 201)</td>
<td>45</td>
<td>122</td>
<td>9.5</td>
<td>Plane of window (dining / bedroom)</td>
</tr>
</tbody>
</table>

*Height measured from street level.
Table 2: Future Traffic Volumes and Posted Speed Limits

<table>
<thead>
<tr>
<th>Road Segment</th>
<th>Input Data</th>
<th>Segment Type</th>
<th>AADT (24 hours)</th>
<th>Speed kph</th>
<th>Day Split 7:00-23:00</th>
<th>Night Split 23:00-7:00</th>
<th>Day Volumes, 7:00 - 23:00</th>
<th>Night Volumes, 23:00 - 7:00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Richmond Road 2-UAU, 2 Lane Urban Arterial - Future Mature Traffic Volumes from City of Ottawa Guidelines</td>
<td>North/South</td>
<td>2-UAU</td>
<td>15,000</td>
<td>50</td>
<td>0.92</td>
<td>0.08</td>
<td>7</td>
<td>5</td>
</tr>
</tbody>
</table>
Table 3: Traffic Noise Impacts for Building Component Requirements

<table>
<thead>
<tr>
<th>Point of Reception</th>
<th>Location</th>
<th>Estimated Future Noise Level* (dBA)</th>
<th>Building Component Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>POR 1</td>
<td>Third floor level window facing north (at north facade of Unit 201)</td>
<td>62.71</td>
<td>55.11</td>
</tr>
<tr>
<td></td>
<td>Assessed: Living - 7:00 to 23:00 (Day)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bed - 23:00 to 07:00 (Night)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>POR 2</td>
<td>Third floor level window facing Croydon Avenue (at west facade of Unit 201)</td>
<td>62.02</td>
<td>54.42</td>
</tr>
<tr>
<td></td>
<td>Assessed: Living - 7:00 to 23:00 (Day)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bed - 23:00 to 07:00 (Night)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Daytime Noise Impacts based on Leq 16 h (07:00 – 23:00), Nighttime Noise Impacts based on Leq 8 h (23:00 – 07:00). Refer Table A1.3.

** Analysis shows that proposed construction of external walls and windows being compliant with the Ontario Building Code is sufficient to meet City of Ottawa ENCG indoor sound level criteria, see discussion in Section 5.0.
<table>
<thead>
<tr>
<th>Point of Reception (POR)</th>
<th>Location (see Figures 1 to 7)</th>
<th>Sound Levels due to Road Traffic</th>
<th>Ventilation Requirements <em>(1)</em></th>
<th>Warning Clauses <em>(2)</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>POR 1</td>
<td>Third floor level window facing north (at north facade of Unit 201)</td>
<td>62.71</td>
<td>Force Air with provision for central ducted air conditioning</td>
<td>Required (Provincial Warning Clause Type C)</td>
</tr>
<tr>
<td>POR 2</td>
<td>Third floor level window facing Croydon Avenue (at west facade of Unit 201)</td>
<td>62.02</td>
<td>Force Air with provision for central ducted air conditioning</td>
<td>Required (Provincial Warning Clause Type C)</td>
</tr>
</tbody>
</table>

*Daytime Noise Impacts based on Leq 16 h (07:00 – 23:00), Night Impacts based on Leq 8 h (23:00 – 07:00).

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

Noise Criteria and Warning Clauses

For further information refer to:

City of Ottawa Environmental Noise Control Guidelines\(^1\) (ENCG)

MOECC Document, NPC-300\(^2\)
### Table A1.1 Summary of Sound Level Criteria for Outdoor Living Areas*  
**Surface Transportation (Road and Rail)**

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Leq 16 hr (dBA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 hr, 07:00 – 23:00</td>
<td>55</td>
</tr>
</tbody>
</table>

*Reference: ENCG¹ Table 2.2a and NPC-300², Table C-1.

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

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

*Reference: ENCG¹ Table 2.2b and 2.2c and NPC-300², Table C-1 and table C-9.
### Table A1.3: Summary of Road and Rail Noise
**Daytime (07:00 – 23:00) & Nighttime (23:00 – 07:00)**

<table>
<thead>
<tr>
<th>Assessment Location &amp; Time</th>
<th>Outdoor Leq (dBA)</th>
<th>Building Component Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Plane of the Living/Dining Room Windows</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>† Daytime (07:00 – 23:00)</td>
<td>Road Less than or equal to 65</td>
<td>Building compliant with Ontario Building Code</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Building components (walls, windows, etc.) must be designed to achieve indoor sound level criteria.</td>
</tr>
<tr>
<td></td>
<td>Rail Less than or equal to 60</td>
<td>Building compliant with Ontario Building Code</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Building components (walls, windows, etc.) must be designed to achieve indoor sound level criteria.</td>
</tr>
<tr>
<td><strong>Plane of Bedroom Window</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>† Nighttime (23:00 – 07:00)</td>
<td>Road Less than or equal to 60</td>
<td>Building compliant with Ontario Building Code</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Building components (walls, windows, etc.) must be designed to achieve indoor sound level criteria.</td>
</tr>
<tr>
<td></td>
<td>Rail Less than or equal to 55</td>
<td>Building compliant with Ontario Building Code</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Building components (walls, windows, etc.) must be designed to achieve indoor sound level criteria.</td>
</tr>
</tbody>
</table>

*Reference: NPC-300\(^2\), Section C7.1 Road Noise Control Measures.*
Table A3.3.4: Summary of Facade Material Requirement for Rail Noise Only*

<table>
<thead>
<tr>
<th>Assessment Location</th>
<th>Distance to Railway</th>
<th>Sound Level dBA</th>
<th>Facade Material Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plane of Bedroom Window</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Less than 100 m</td>
<td>Leq $24 \text{ hr}$ less than or equal to 60</td>
<td>No additional requirement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Leq $24 \text{ hr}$ greater than 60</td>
<td>Brick veneer or acoustically equivalent</td>
</tr>
<tr>
<td></td>
<td>Greater than 100 m</td>
<td>Leq $24 \text{ hr}$ less than or equal to 60</td>
<td>No additional requirement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Leq $24 \text{ hr}$ greater than 60</td>
<td>No additional requirement</td>
</tr>
</tbody>
</table>

*Reference: NPC-300\textsuperscript{2}, Section C7.2 Rail Noise Control Measures.
Table A1.5: Summary of Combination of Road and Rail Noise*
Day-time (07:00 – 23:00) & Night-time (23:00 – 07:00)
Outdoor, Ventilation and Warning Clause Requirements

<table>
<thead>
<tr>
<th>Assessment Location &amp; Time</th>
<th>Outdoor Leq (dBA)</th>
<th>Ventilation Requirements</th>
<th>Outdoor Control Measures</th>
<th>Warning Clauses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Outdoor Living Area (OLA)</strong></td>
<td>Less than or equal to 55</td>
<td>N/A</td>
<td>None Required</td>
<td>Not Required</td>
</tr>
<tr>
<td>◆ Day-time (07:00 – 23:00)</td>
<td>Greater than 55 to less than 60</td>
<td>N/A</td>
<td>Control Measures (barriers) not required but should be considered.</td>
<td>Type A required if resultant Leq exceeds 55 dBA</td>
</tr>
<tr>
<td></td>
<td>Greater than 60</td>
<td>N/A</td>
<td>Control measures (barriers) required to reduce the Leq to as close to 55 dBA as technically, economically, and administratively feasible. Any excess above 55 dBA will not be acceptable if it exceeds 5 dBA.</td>
<td>Type B required if resultant Leq exceeds 55 dBA</td>
</tr>
<tr>
<td><strong>Plane of the Living/Dining Room Windows</strong></td>
<td>Less than or equal to 55</td>
<td>N/A</td>
<td>None Required</td>
<td>Not Required</td>
</tr>
<tr>
<td>◆ Day-time (07:00 – 23:00)</td>
<td>Greater than 55 to less than or equal to 65</td>
<td>Forced air heating with provision for central air-conditioning</td>
<td>N/A</td>
<td>Required Type C</td>
</tr>
<tr>
<td></td>
<td>Greater than 65</td>
<td>Central ducted air-conditioning</td>
<td>N/A</td>
<td>Required Type D</td>
</tr>
<tr>
<td><strong>Plane of Bedroom Window</strong></td>
<td>Less than or equal to 50</td>
<td>None Required</td>
<td>N/A</td>
<td>Not Required</td>
</tr>
<tr>
<td>◆ Night-time (23:00 – 07:00)</td>
<td>Greater than 50 to less than or equal to 60</td>
<td>Forced air heating with provision for central ducted air-conditioning</td>
<td>N/A</td>
<td>Required Type C</td>
</tr>
<tr>
<td></td>
<td>Greater than 60</td>
<td>Central ducted air-conditioning</td>
<td>N/A</td>
<td>Required Type D</td>
</tr>
</tbody>
</table>

*Reference: NPC-300², Section C7.1 and C7.2.
### Table A1.6: Summary of Provincial Warning Type Clauses (may be used individually or in combination)*

<table>
<thead>
<tr>
<th>Type</th>
<th>Warning Clause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type A</td>
<td>“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.”</td>
</tr>
<tr>
<td>Type B</td>
<td>“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.”</td>
</tr>
<tr>
<td>Type C</td>
<td>“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.”</td>
</tr>
<tr>
<td>Type D</td>
<td>“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.”</td>
</tr>
<tr>
<td>Type E</td>
<td>“Purchasers/tenants are advised that due to the proximity of the adjacent industry (facility) (utility), sound levels from the industry (facility) (utility) may at times be audible.”</td>
</tr>
</tbody>
</table>

*Reference: NPC-300<sup>2</sup> Section C8 Warning Clauses. Refer ENCG Table A1 Surface Transportation Warning Clauses for example of applicable generic warning clause.*
Appendix 2

Calculation Details and Software Outputs

Contents:

Sample outputs from STAMSON:

POR 1: Third floor level Plane of Window facing north – (Daytime)
POR 1: Third floor level Plane of Window facing north – (Nighttime)
POR 2: Third floor level Plane of Window facing Croydon Ave – (Daytime)
POR 2: Third floor level Plane of Window facing Croydon Avenue – (Nighttime)
STAMSON 5.0        SUMMARY REPORT        Date: 05-06-2017 16:52:01
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT
Filename: por1d.te        Time Period: 16 hours
Description: POR 1 Plane of Window Day

Road data, segment # 1: Richmond Rd
--------------------------------- 
Car traffic volume : 12144 veh/TimePeriod 
Medium truck volume :   966 veh/TimePeriod 
Heavy truck volume :   690 veh/TimePeriod 
Posted speed limit :    50 km/h 
Road gradient :     0 % 
Road pavement :     1 (Typical asphalt or concrete)

Data for Segment # 1: Richmond Rd
--------------------------------- 
Angle1   Angle2           :  -90.00 deg   53.00 deg 
Wood depth                :      0       (No woods.) 
No of house rows          :      0 
Surface                   :      2 
(Reflective ground surface) 
Receiver source distance  :  45.00 m 
Receiver height           :   9.50 m 
Topography                :  1 
(Flat/gentle slope; no barrier) 
Reference angle           :  143.00 

Result summary
-------------- 
! source ! Road   ! Total
! height ! Leq  ! Leq
! (m)    ! (dBA) ! (dBA)
-----------------------------------+-------------------------
1.Richmond Rd   !  1.50 ! 62.71 !
62.71
-----------------------------------+-------------------------
          Total
62.71 dBA
TOTAL Leq FROM ALL SOURCES:         62.71
## Result summary

<table>
<thead>
<tr>
<th>source</th>
<th>Road</th>
<th>Total Leq</th>
</tr>
</thead>
<tbody>
<tr>
<td>Richmond Rd</td>
<td></td>
<td>55.11</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>55.11</td>
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</table>

TOTAL Leq FROM ALL SOURCES: 55.11 dBA
STAMSON 5.0 SUMMARY REPORT Date: 05-06-2017 16:48:38
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT
Filename: por2d.te Time Period: 16 hours
Description: POR 2 Plane of Window Day

Road data, segment # 1: Richmond Rd
-----------------------------------
Car traffic volume : 12144 veh/TimePeriod
Medium truck volume : 966 veh/TimePeriod
Heavy truck volume : 690 veh/TimePeriod
Posted speed limit : 50 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: Richmond Rd
-----------------------------------
Angle1 Angle2 : -32.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 45.00 m
Receiver height : 9.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 122.00

Result summary
-----------------------------------

<table>
<thead>
<tr>
<th>source</th>
<th>Road</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Leq</td>
<td>Leq</td>
</tr>
<tr>
<td></td>
<td>(m)</td>
<td>(dBA)</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Richmond Rd</td>
<td>1.50</td>
<td>62.02</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td></td>
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</table>

TOTAL Leq FROM ALL SOURCES: 62.02 dB
Traffic Noise Impact Assessment for the proposed residential development at 351 Croydon Avenue, Ottawa

Urban Structure Properties Ltd.

28th September, 2017

HUGH WILLIAMSON ASSOCIATES INC.

<table>
<thead>
<tr>
<th>Source</th>
<th>Road</th>
<th>Total Leq</th>
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</thead>
<tbody>
<tr>
<td>Richmond Rd</td>
<td>1.50</td>
<td>54.42</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>54.42 dBA</strong></td>
</tr>
</tbody>
</table>

**Result summary**

<table>
<thead>
<tr>
<th>! source !</th>
<th>! Road !</th>
<th>! Total Leq</th>
</tr>
</thead>
<tbody>
<tr>
<td>! ! !</td>
<td>! ! !</td>
<td>! ! !</td>
</tr>
</tbody>
</table>

**Filename:** por2n.te  **Time Period:** 8 hours

**Description:** POR 2 Plane of Window Night

**Road data, segment # 1: Richmond Rd**

- **Car traffic volume:** 1056 veh/TimePeriod
- **Medium truck volume:** 84 veh/TimePeriod
- **Heavy truck volume:** 60 veh/TimePeriod
- **Posted speed limit:** 50 km/h
- **Road gradient:** 0%
- **Road pavement:** 1 (Typical asphalt or concrete)

**Data for Segment # 1: Richmond Rd**

- **Angle1** | **Angle2** | 32.00 deg | 90.00 deg
- **Wood depth:** 0 (No woods.)
- **No of house rows:** 0
- **Surface:** 2 (Reflective ground surface)
- **Receiver source distance:** 45.00 m
- **Receiver height:** 9.50 m
- **Topography:** 1 (Flat/gentle slope; no barrier)
- **Reference angle:** 122.00

**Road Structure Properties Ltd.**

**28th September, 2017**

**HUGH WILLIAMSON ASSOCIATES INC.**
RESUMÉ: Dr. HUGH WILLIAMSON, P.Eng.

QUALIFICATIONS:
Ph.D. Mechanical Engineering, University of New South Wales, 1972
B.Sc. Mechanical Engineering, (with Distinction), University of Alberta, 1967
Member, Professional Engineers, Ontario
Member, Canadian Acoustical Association
Member, American Society of Heating, Refrigeration and Air-conditioning Engineers

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

PROFESSIONAL EXPERIENCE:
Hugh Williamson is a professional engineer with many years of experience in the measurement, analysis and control of noise and vibration. Hugh Williamson Associates was incorporated in 1997 and provides consulting services in architectural, building, industrial, transportation and environmental acoustics and vibration. Clients include architects, engineering firms, industrial firms and government departments. Prior to establishing Hugh Williamson Associates, his career included extensive periods in industry as well as university level research and teaching. He is a former Director of the Acoustics and Vibration Unit at the Australian Defence Force Academy. He has published over 50 engineering and scientific papers and has been an invited speaker on noise and vibration at national and international conferences. He has more than 20 years of experience as a consultant.

CLIENT LIST:
RESUMÉ: MICHAEL WELLS

QUALIFICATIONS: Registered Architect of NSW, Registration Number: 8111
B. Architecture (Hons), University of Sydney, 2002
B.Sc. Architecture, University of Sydney, 1999
Member, Canadian Acoustical Association

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

PROFESSIONAL EXPERIENCE:

Michael Wells is a professional Architect registered in NSW with many years of experience in the Architectural and Construction industries. With key competencies in measurement, analysis and control of noise and vibration, Michael Wells joined Hugh Williamson Associates in 2012 and provides consulting services in architectural, building, industrial, transportation and environmental acoustics and vibration. Clients include architects, engineering firms, industrial firms and government departments. Prior to joining Hugh Williamson Associates, his career includes the founding of Michael Wells Architect in Sydney Australia which specialized in the design of institutional, commercial and residential projects. He is a Director of Architectural Workshops Australia and Vision Blue Pty Ltd. He has more than 10 years of experience as a consultant.

CLIENT LIST: