Noise Impact Study
Proposed Residential Development
Dundas Urban Core
Oakville, Ontario

Prepared for:
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1 Introduction and Summary

HGC Engineering was retained by Mattamy Homes Limited to conduct a Noise Impact Study for their proposed residential development (Dundas Urban Core) to be located on the north side of Dundas Street West between Sixth line and Neyagawa Boulevard in the Town of Oakville, Ontario. The proposed development will consist of one 4-storey residential building and blocks of townhouse units. The study is required by the municipality as part of the planning and approvals process.

The primary source of noise is road traffic on Dundas Street West. Ultimate annual average daily traffic data (AADT) was obtained from the Region of Halton. This data was used to predict future traffic sound levels at the locations of the proposed dwelling facades. The predicted sound levels were compared to the guidelines of the Ministry of Environment and Climate Change (MOECC).

The sound level predictions indicate that noise control measures should be incorporated into the design of the building such that indoor sound levels comply with the MOECC noise criteria. Central air conditioning systems are required for units in the 4-storey building with exposure to Dundas Street West. Forced air ventilation systems with ductwork sized for the future installation of central air conditioning by the occupant or an alternative means of ventilation to open windows is recommended for the dwelling units in the building and townhouse blocks with some exposure to Dundas Street West. Upgraded building and glazing constructions are required for all dwellings in the 4-storey building with some exposure to Dundas Street West. The remaining townhouses may be constructed with any construction meeting the minimum requirements of the Ontario Building Code (OBC) Warning clauses are also recommended to inform future owners and tenants of the road traffic noise impacts.

An acoustical consultant should review the mechanical drawings and details of demising constructions, when available, to help ensure that the noise impact of the development on the environment, and of the development on itself, are maintained within acceptable levels. In summary, with suitable controls integrated into the building and site plan, it is concluded that this proposed development is feasible from the perspective of noise impact. Details of the assessment leading to these conclusions are provided herein.
2 Site Description and Noise Sources

Figure 1 is a key plan indicating the location of the subject site. The proposed development is located north of Dundas Street West between Sixth lane and Neyagawa Boulevard, in Oakville, Ontario. Figure 2 is the proposed site plan prepared by Q4 Architects Inc. dated December 24, 2015. The sound level prediction locations [A] to [I] for the proposed development are shown in Figure 2. The proposed development will consist of one 4-storey building with 62 units and 26 townhouse units.

HGC Engineering personnel visited the site on December 8, 2014 in order to investigate the acoustic and topographic environment of the site. The acoustical environment surrounding the site is urban in nature. Dundas Street West consists of 2 lanes in each direction with a possibility of extending to 3 lanes in the future. Surrounding the site are existing residential uses and further west of the subject site is a Bell radio communication tower. Sound was not audible from the communication tower during site visit. Background sound levels from Dundas Street West dominates the site.

3 Sound Level Criteria

3.1 Traffic Noise

Guidelines for acceptable levels of road traffic noise impacting residential developments are given in the MOECC publication NPC-300, “Environmental Noise Guideline Stationary and Transportation Sources – Approval and Planning”, release date October 21, 2013 and are listed in Table I below. The values in Table I are energy equivalent (average) sound levels [L_{EQ}] in units of A-weighted decibels [dBA].

<table>
<thead>
<tr>
<th>Space</th>
<th>Daytime L_{EQ(16 hour)} Road</th>
<th>Nighttime L_{EQ(8 hour)} Road</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outside Bedroom Windows</td>
<td>55 dBA</td>
<td>50 dBA</td>
</tr>
<tr>
<td>Outdoor Living Areas</td>
<td>55 dBA</td>
<td>--</td>
</tr>
<tr>
<td>Inside Living/Dining Rooms</td>
<td>45 dBA</td>
<td>45 dBA</td>
</tr>
<tr>
<td>Inside Bedrooms</td>
<td>45 dBA</td>
<td>40 dBA</td>
</tr>
</tbody>
</table>

Daytime refers to the period between 07:00 and 23:00, while nighttime refers to the period between 23:00 and 07:00. The term "Outdoor Living Area" (OLA) is used in reference to an outdoor patio, a
backyard, a terrace or other area where passive recreation is expected to occur. Balconies that are less than 4 m in depth are not considered to be outdoor living areas under MOECC guidelines.

The guidelines in the MOECC publication allow the daytime sound levels in an Outdoor Living Area to be exceeded by up to 5 dBA, without mitigation, if warning clauses are placed in the purchase and rental agreements to the property.

A central air conditioning system as an alternative means of ventilation to open windows is required for dwellings where nighttime sound levels outside bedroom or living/dining room windows exceed 60 dBA or daytime sound levels outside bedroom or living/dining room windows exceed 65 dBA. Forced-air ventilation with ducts sized to accommodate the future installation of air conditioning by the occupant is required when nighttime sound levels at bedroom or living/dining room windows are in the range of 51 to 60 dBA or when daytime sound levels at bedroom or living/dining room windows are in the range of 56 to 65 dBA.

Building components such as walls, windows and doors must be designed to achieve indoor sound level criteria when the plane of bedroom window sound level is greater than 60 dBA or the daytime sound level is greater than 65 dBA due to road traffic noise.

Warning clauses to notify future residents of possible noise excesses are also required when nighttime sound levels exceed 50 dBA at the plane of the bedroom or living/dining room window and daytime sound levels exceed 55 dBA in the outdoor living area and at the plane of the bedroom or living/dining room window due to road traffic.

4 Traffic Noise Assessment

4.1 Road Traffic Data
Traffic data for Dundas Street was obtained from the Region of Halton in the form of Ultimate Average Annual Daily Traffic (AADT) and is provided in Appendix A. A commercial vehicle percentage of 13% on Dundas Street was split into 5% heavy trucks and 8% medium trucks. A day/night split of 90/10% was used. A speed limit of 80 km/h was used in the analysis for Dundas Street. Table II summarizes the traffic volume data used in this study.
**Table II: Ultimate Road Traffic Data**

<table>
<thead>
<tr>
<th>Road Name</th>
<th>Cars</th>
<th>Medium Trucks</th>
<th>Heavy Trucks</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dundas Street West</td>
<td><strong>Daytime</strong></td>
<td>43 065</td>
<td>3 960</td>
<td>2 475</td>
</tr>
<tr>
<td></td>
<td><strong>Nighttime</strong></td>
<td>4 785</td>
<td>440</td>
<td>275</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>47 850</td>
<td>4 400</td>
<td>2 750</td>
<td>55 000</td>
</tr>
</tbody>
</table>

### 4.2 Road Traffic Noise Predictions

To assess the levels of road traffic noise which will impact the study area in the future, sound level predictions were made using STAMSON version 5.04, a computer algorithm developed by the MOECC. This modelling software was used to predict the future road traffic sound levels (L\(_{eq}\)) at the building facades. Sample STAMSON output is included in Appendix B.

Predictions of the traffic sound levels were made at various locations around the proposed residential building. Sound levels were predicted in the plane of the living/dining room and bedroom windows during daytime and nighttime hours to investigate ventilation requirements. The results of these predictions are summarized in Table III. The acoustic requirements may be subject to modifications if the site plan is changed significantly.
Table III: Predicted Future Sound Levels, $L_{EQ}$ [dBA], Without Mitigation

<table>
<thead>
<tr>
<th>Prediction Location</th>
<th>Description</th>
<th>Outdoor Living Area $L_{EQ}(16)$</th>
<th>Daytime $L_{EQ}(16)$</th>
<th>Nighttime $L_{EQ}(8)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>[A]</td>
<td>Adjacent to Dundas Street West</td>
<td>--</td>
<td>73</td>
<td>67</td>
</tr>
<tr>
<td>[B]</td>
<td>With Some Exposure to Dundas Street West</td>
<td>--</td>
<td>68</td>
<td>61</td>
</tr>
<tr>
<td>[C]</td>
<td>With Some Exposure to Dundas Street West</td>
<td>--</td>
<td>68</td>
<td>61</td>
</tr>
<tr>
<td>[D]</td>
<td>With Some Exposure to Dundas Street West</td>
<td>--</td>
<td>60</td>
<td>53</td>
</tr>
<tr>
<td>[E]</td>
<td>Townhouse Block with some Exposure to Dundas Street West</td>
<td>--</td>
<td>60</td>
<td>55</td>
</tr>
<tr>
<td>[F]</td>
<td>Townhouse Block with some Exposure to Dundas Street West</td>
<td>--</td>
<td>60</td>
<td>55</td>
</tr>
<tr>
<td>[G]</td>
<td>Townhouse Block with some Exposure to Dundas Street West</td>
<td>57</td>
<td>58</td>
<td>52</td>
</tr>
<tr>
<td>[H]</td>
<td>Townhouse Block with some Exposure to Dundas Street West</td>
<td>--</td>
<td>58</td>
<td>53</td>
</tr>
<tr>
<td>[I]</td>
<td>Townhouse Block with some Exposure to Dundas Street West</td>
<td>--</td>
<td>55</td>
<td>50</td>
</tr>
</tbody>
</table>

5 Discussion and Recommendations

The predictions indicate that the traffic sound levels will exceed the outdoor MOECC guidelines listed in Table I at the facades of the proposed buildings. Recommendations to meet the indoor MOECC guidelines are discussed below.

5.1 Outdoor Living Areas

The dwellings units in the 4-storey building are to include balconies or terraces which are less than 4 metres in depth. The townhouse units next to the channel include decks and patios which are less than 4 metres in depth. These are exempt from the definition of OLA under MOECC guidelines. Physical mitigation is not required.

There is an outdoor amenity area on ground floor (labelled patio) located on the northeast side and southwest of the 4-storey building. These are less than 4 metres in depth and are exempt from the
definition of OLA under MOECC guidelines that is larger than 4 m in depth. Physical mitigation is not required.

There are rear yards greater than 4 m in depth for the townhouse block with some Exposure to Dundas Street West (prediction location [G]). The predicted sound level in the rear yards of townhouse block at prediction location [G] will be 57 dBA. The 2 dBA in excess of the MOECC limit is acceptable with the use of a noise earning clause.

There are no other outdoor living areas identified on the site plan.

5.2 Indoor Living Areas

The predicted daytime sound levels at Locations [A], [B] and [C], will be greater than 65 dBA and greater than 60 dBA during the nighttime hours. To address these excesses, MOECC guidelines recommend that all units facing Dundas Street West and all units with some exposure to Dundas Street West be equipped with central air conditioning systems, so that the windows can be kept closed. Window or through-the-wall air conditioning units are not recommended because of the noise they produce and because the units penetrate through the exterior wall which degrades the overall sound insulating properties of the envelope. The location, installation and sound ratings of the outdoor air conditioning devices should minimize noise impacts and comply with criteria of MOECC publication NPC-216, Residential Air Conditioning Devices. Figure 3 indicates the facades requiring central air conditioning.

The predicted daytime sound levels at Locations [D] – [H], will be between 55 dBA and 65 dBA. These units will require forced air ventilation systems with ductwork sized for the provision for the future installation of central air conditioning systems by the occupant or an alternative means of ventilation to open windows. These units are indicated in Figure 3. The location, installation and sound ratings of the outdoor air conditioning devices should minimize noise impacts and comply with criteria of MOECC publication NPC-216, Residential Air Conditioning Devices.

All remaining units within the development do not require any specific ventilation requirements.
5.3 Building Façade Constructions

The predicted sound levels at prediction locations [A], [B] and [C] are greater than 65 dBA during the daytime and greater than 60 dBA during the nighttime hours due to road traffic. MOECC guidelines recommend that the windows, walls and doors be designed so that the indoor sound levels comply with MOECC noise criteria.

The floor plans and building elevations of the proposed development were available for review by HGC Engineering and are provided in Appendix C. Preliminary calculations have been performed to determine the building envelope constructions likely to be required to maintain indoor sound levels within MOECC guidelines. The calculations methods were developed by National Research Council (NRC). They are based on the predicted future sound levels at the building facades and the anticipated area of the façade components (walls, windows and doors) relative to the floor area of the adjacent room.

In this analysis, it has been assumed that sound transmitted through elements other than the glazing elements is negligible in comparison. Thus the exterior walls should have sufficient acoustical insulation value such that the noise transmitted through the walls is negligible in comparison with the windows. Exterior walls that include spandrel glass or metal panels within an aluminum window system can have sufficient sound insulation if a drywall assembly on separate framing behind the spandrel panels is used.

4-Storey Building

Calculations of the required sound insulation (STC) ratings for the glazing elements have been conducted based on the current architectural drawings showing the building elevations and suite layouts. Window and floor areas were calculated based on the drawings in order to determine the area of glazing for a room as percentage of respective floor area. Window-to-floor areas were generally found to be in the range of 30-60% for most of the suites with corner suites reaching upto 90%.

There are glazed exterior doors (sliding or swing) for entry onto the balconies from living/dining rooms and some bedrooms. The glazing areas on the doors are counted as part of the total window
glazing area. All exterior doors should include good weather seals to reduce air (and noise) infiltration to the minimum achievable levels.

Based on this information, detailed calculations were conducted to optimize the glazing requirements to achieve target indoor sound levels. A minimum STC of 36 is required for the south façade facing Dundas Street West and STC-30 is required for the east and west façades with some exposure to Dundas Street West. These STC ratings are for the glazing alone. Operable elements should be tightly fitted, and weather-stripped with good quality seals to achieve installed ratings no more than 3 points lower.

STC-36 can likely be achieved with typical residential glazing including one 4 mm and 6mm panes separated by 16 mm air space. For STC-30, any doubled glazed window construction meeting the minimum requirements of the Ontario Building Code (OBC) will provide adequate sound insulation for the dwelling units. Alternative glazing assemblies which provide similar or better sound insulation values may be substituted. Test data should be submitted to verify the performance of all selected assemblies.

**Remaining Dwelling Units**

All other remaining units will have daytime sound levels that are less than 65 dBA and 60 dBA during nighttime. For these units, any exterior wall, and doubled glazed window construction meeting the minimum requirements of the Ontario Building Code (OBC) will provide adequate sound insulation for the dwelling units.

### 5.4 Warning Clauses

The MOECC guidelines recommend that warning clauses be included in the property and tenancy agreements for all units with anticipated road traffic sound levels. Examples are provided below.

Suggested wording for future dwelling units with minor sound level excesses.

**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 sound level limits of the Municipality and the Ministry of the Environment and Climate Change.
Suggested wording for future dwellings for which physical mitigation has been provided is given below.

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 Municipality’s and the Ministry of the Environment and Climate Change noise criteria.

Suggested wording for future dwellings requiring forced air ventilation systems is given below.

Type C:

This dwelling unit has been fitted with a forced air heating system and the ducting etc., was sized to accommodate central air conditioning. Installation of central air conditioning will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the Municipality’s and the Ministry of the Environment and Climate Change noise criteria. (Note: The location and installation of the outdoor air conditioning device should be done so as to minimize the noise impacts and comply with criteria of MOECC publication NPC-216, Residential Air Conditioning Devices.)

Suggested wording for future dwellings requiring central air conditioning systems is given below.

Type D:

This dwelling unit has been supplied with a central air conditioning system which allows windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the noise criteria of the Municipality and the Ministry of the Environment and Climate Change.

The sample clauses are provided by the MOECC as an example and can be modified by the Municipality as required.

6 Summary of Recommendations

The following list and Table IV summarizes the recommendations made in this report.

1. Central air conditioning systems will be required for the dwelling units in the 4-storey building facing Dundas Street West (prediction location [A]) and units with some exposure to
Dundas Street West (prediction location [B] and [C]). Forced air ventilation systems with ductwork sized for future installation of central air conditioning systems by the occupant will be required for the townhouse units with some exposure to Dundas Street West (prediction location [D] – [H]). The location, installation and sound ratings of the air conditioning devices should comply with NPC-216, Residential air Conditioning Devices.

2. Upgraded building constructions and glazing construction will be required at the south, east and west facades of the proposed 4-storey building, as indicated in section 5.3.

3. Warning clauses should be included in the property agreements to inform future owners and tenants of the property of the road traffic noise impacts.

**Table IV: Summary of Noise Control Requirements and Noise Warning Clauses**

<table>
<thead>
<tr>
<th>Prediction Location</th>
<th>Acoustic Barrier</th>
<th>Ventilation Requirements *</th>
<th>Warning Clause</th>
<th>STC</th>
</tr>
</thead>
<tbody>
<tr>
<td>[A]</td>
<td>--</td>
<td>Central A/C</td>
<td>B, D</td>
<td>36</td>
</tr>
<tr>
<td>[B]</td>
<td>--</td>
<td>Central A/C</td>
<td>B, D</td>
<td>30</td>
</tr>
<tr>
<td>[C]</td>
<td>--</td>
<td>Central A/C</td>
<td>B, D</td>
<td>30</td>
</tr>
<tr>
<td>[D]</td>
<td>--</td>
<td>Forced Air</td>
<td>A, C</td>
<td>OBC</td>
</tr>
<tr>
<td>[E]</td>
<td>--</td>
<td>Forced Air</td>
<td>A, C</td>
<td>OBC</td>
</tr>
<tr>
<td>[F]</td>
<td>--</td>
<td>Forced Air</td>
<td>A, C</td>
<td>OBC</td>
</tr>
<tr>
<td>[G]</td>
<td>--</td>
<td>Forced Air</td>
<td>A, C</td>
<td>OBC</td>
</tr>
<tr>
<td>[H]</td>
<td>--</td>
<td>Forced Air</td>
<td>A, C</td>
<td>OBC</td>
</tr>
<tr>
<td>[I]</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>OBC</td>
</tr>
</tbody>
</table>

Note:
* The location, installation and sound rating of the air conditioning condensers must be compliant with MOECC Guideline NPC-216.

OBC – meets the minimum requirements of the Ontario Building Code.
6.1 Implementation

To ensure that the noise control recommendations outlined above are fully implemented, it is recommended that:

1) Prior to the issuance of occupancy permits for this development, the Municipality’s building inspector or a Professional Engineer qualified to provide acoustical engineering services in the Province of Ontario should certify that the noise control measures for the dwellings units have been properly incorporated, installed and constructed.
Figure 1: Key Plan
APPENDIX A

Road Traffic Data
Hi Sheeba,

The below data is also what is used for Dundas Street through Oakville as well.

Matt

---

From: Sheeba Paul [mailto:spaul@hgcengineering.com]
Sent: Monday, November 17, 2014 9:44 AM
To: Krusto, Matt
Subject: RE: traffic data request, Preserve Drive and Dundas Street West, Oakville, ON

Hello Matt,

HGC Engineering is performing a noise study for a proposed residential development in the Town of Oakville.

Please find attached a Google link for your reference.

https://www.google.ca/maps/place/103+Dundas+St+W,+Oakville,+ON+L6M+4L9/@43.4755512,-79.7333544,407m/data=!3m1!1e3!4m2!3m1!1s0x882b5d517b71c2f9:0x4fc1492945726bc6?hl=en

We would like to request road traffic volumes, ultimate AADT or current traffic counts along with commercial vehicle percentages (medium and heavy trucks) and speed.

We have some data in our files for Dundas Street in Burlington (below).

For Dundas Street:
- AADT (ultimate) = 55,000
- Medium Trucks = 8%
- Heavy Trucks = 5%
- Number of Lanes = 6
- Posted Speed Limit = 80 km/h
- Day/Night split = 90%/10%

Thank you.

Ms. Sheeba Paul, MEng, PEng
Senior Engineer, Associate

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Thank you
APPENDIX B
Sample Stamson Calculations
Car traffic volume : 43065/4785 veh/TimePeriod *
Medium truck volume : 3960/440 veh/TimePeriod *
Heavy truck volume : 2475/275 veh/TimePeriod *
Posted speed limit : 80 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:
  24 hr Traffic Volume (AADT or SADT): 55000
  Percentage of Annual Growth : 0.00
  Number of Years of Growth : 10.00
  Medium Truck % of Total Volume : 8.00
  Heavy Truck % of Total Volume : 5.00
  Day (16 hrs) % of Total Volume : 90.00

Results segment # 1: dundas (day)
-----------------------------
Source height = 1.50 m
ROAD (0.00 + 73.03 + 0.00) = 73.03 dBA

Results segment # 1: dundas (night)
-----------------------------
Source height = 1.50 m
ROAD (0.00 + 66.50 + 0.00) = 66.50 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 73.03
(NIGHT): 66.50