SS WILSON ASSOCIATES
Consulting Engineers

REPORT NO. WA12-032-B
REVISION 1

NOISE CONTROL FEASIBILITY STUDY
PROPOSED RESIDENTIAL DEVELOPMENT
BRONTE GREEN JOINT VENTURE AREA
OAKVILLE, ONTARIO

SUBMITTED TO:

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1.0 INTRODUCTION

1.1 The services of this firm were retained by David Schaeffer Engineering Ltd. on behalf of Bronte Green Corporation to prepare a Noise Control Feasibility Study for the proposed residential development referred to as the Bronte Green Property located in Oakville, Ontario. The subject site is within the planning area known as Merton Tertiary Study Area.

The objective of this report is to support an application for Draft Plan Approval of the proposed development.

The proposed development was the subject of a Noise Control Feasibility Study Report prepared earlier by SS Wilson Associates, Report No. WA12-032-B dated March 6, 2014. This Revision is based on the updated Draft Plan/Grading Plan and addresses the proposed changes to the draft plan layout.

1.2 The site is bounded by the following land uses:

- To the north by Upper Middle Road
- To the south by the Region of Halton's Head Office Complex as well as by Deerfield Golf Course
- To the east by the Deerfield Golf Course, Sixteen Mile Creek, and existing residential uses beyond
- To the west by Bronte Road

The location of the site is shown in Figure 1.

1.3 Major features of the development are defined by the Proposed Draft Plan drawing and preliminary grading plan prepared by Sorensen Gravely Lowes Planning Associates, dated April 14th, 2015.

Figure 2 illustrates the general layout of the proposed development.

1.4 Major noise sources (current and future) impacting the development include:

- **Transportation Sources of Noise:**
  1. Bronte Road
  2. Upper Middle Road
  3. Queen Elizabeth Way
- **Stationary Sources of Noise:**
  The Region of Halton's head office complex:
  1. Mechanical equipment serving 2 major buildings
  2. Public Work Yard operations (sand and gravel, truck storage, etc.)
  3. Large parking area

2.0 SUMMARY AND RECOMMENDATIONS

2.1 SUMMARY

Based on the analysis conducted in this investigation it is concluded that:

1. a) The unattenuated daytime sound levels in the Outdoor Living Areas (OLAs)[1] of some of the residential dwellings will exceed the recommended objective sound level. For these dwellings, outdoor noise control measures are required along with relevant warning clauses.
   b) All other dwellings on the development will have acceptable outdoor sound levels in their OLAs and, therefore, no outdoor noise control measures need be considered.

2. a) The unattenuated sound levels at the outside walls of some of the dwellings will exceed the recommended objective sound levels. Indoor noise controls are required for these dwellings along with relevant warning clauses.
   b) All other dwellings in the development will have acceptable indoor sound levels. Therefore, noise control measures are not required.

3. The sound levels due to the operations/activities within the Region of Halton Public Works Facilities at the lots to the east and north will be attenuated to the applicable MOECC NPC-300 sound level criteria. This will be achieved with the use of appropriate noise control measures within the subject residential development site. The details of the recommended noise control measures for the subject residential site are specified in the sections to follow in this Report.

4. Although the projected sound levels are predicted to be above the sound level criteria outlined in Section 3, it is feasible to control sound levels within the outdoor and indoor areas of the proposed development to meet the stated criteria. With implementation of the noted recommendations, we are satisfied that the applicable sound level criteria are met.

2.2 RECOMMENDATIONS – TRANSPORTATION SOURCES OF NOISE

A summary of the minimum noise attenuation requirements is presented in Table 1. Detailed description is as follows:

[1] At times, it may also be referred to as Outdoor Amenity Areas. The size of an OLA is subject to municipal standards and other project requirements (except when classified as a balcony along with other applicable MOECC rules).

1. Outdoor Noise Control Measures

Lots: 36 to 42, 222, 223, 431, 432 and 434
Blocks: 17 and 32 to 35

Acoustical barriers to be constructed to shield the Outdoor Living Areas (OLAs) with the following preliminary details:

(i) Barriers should be constructed along the alignments shown schematically in Figure 3.1.

(ii) The currently predicted required barrier height as shown in Figure 3.1.

(iii) Barriers may consist of an earth berm, an acoustic fence, or a combination thereof. The fence component should be constructed of a durable material having approximately 20 kilograms per square meter (four pounds per square foot) of surface area and be in a continuous line without openings or gaps.

A Detailed Noise Control Study will be completed prior to final approval and registration of these lots and the final berm/barrier alignments and heights based on the finalized grading plans and the finalized lot arrangements.

2. Air Conditioning

Lots: 36 to 42, 185 to 187, 219 to 226, 253 to 256, 280 to 282, 431, 432 and 434
Blocks: 3, 11 to 14, 17 to 24 and 28 to 35

Dwellings located within the above-noted areas shall be equipped with central air conditioning systems with their condensing units to be located in noise insensitive locations. The sound levels of the condensing units shall meet the MOECC's maximum Sound Rating number as well as the maximum sound level at the point(s) of reception outlined in publication NPC-216 and other levels specified by the municipality. The following warning clause shall be in all Development Agreements and Offers of Sale and Purchase or Lease of these properties:

“In order to achieve a suitable indoor noise environment, windows may have to remain closed; therefore this dwelling unit has been equipped with a central air conditioning system”.

Blocks 567 and 568 (Future Medium/High Density and/or Mixed Use Buildings):

Dwelling units within the above noted buildings shall be equipped with central air conditioning. The air conditioning system may be central to the entire building or may be central to each dwelling unit (for example using split-system or packaged incremental units with suitable duct work to all rooms). The Ministry of Environment does not accept window type air conditioning units in lieu of a central system.

The following warning clause shall be included in all Development Agreements and Offers of Sale and Purchase or Lease of these properties:

"In order to achieve a suitable indoor noise environment, windows may have to remain closed; therefore this dwelling unit has been equipped with a central air conditioning system".

It is also our recommendation that the necessary detailed technical analysis be performed prior to the certification process for Building Permit to address the specific requirements for the control of the selected air conditioning system to meet the sound level criteria[2] at the point(s) of reception and to include same in the applicable permit drawings/specifications.

Note that the Air Conditioning recommendations also considered the noise impacts from the stationary sources to account for the overall noise impacts at the building facades.

3. Provision for Air Conditioning

Lots: 43, 65 to 77, 162 to 184, 188 to 218, 227 to 230, 249 to 252, 257 to 279, 283 to 289, 326 and 327, 421 to 425, 426 to 430 and 433
Blocks: 1, 2, 15 and 16

Dwellings located within the above-noted areas shall be equipped with a ducted forced air heating system consisting of a furnace fan, supply air plenum, and duct work that are appropriately situated and sized to accommodate future installation of central air conditioning systems at the cost and option of the purchaser/occupant. The provisions for future air conditioning shall also include the necessary rough-in work such as a floor drain for the condensate, appropriate wiring for a future heat/cool thermostat and a capped sleeve in the exterior wall for future refrigeration tubing in an approved location.

[2] MOECC criteria for air conditioning included in NPC-300 and NPC-216.

If the purchaser/occupant does not take the central air conditioning option, the following clause shall be included in all Development Agreements and Offers of Sale and Purchase or Lease of these properties:

"This dwelling is fitted with a forced air heating system and the fan, ducts, etc. are sized to accommodate the installation of a central air conditioning system if it is found necessary by the owner/occupant at any time in the future. If the air conditioning is to be provided at a later date, the outdoor unit shall be located in a noise insensitive location. The final installation shall meet the Ministry of Environment criteria in Publication NPC-216 and other applicable levels specified by the municipality".

A summary of the minimum noise attenuation requirements for the Air Conditioning and Provision for Air Conditioning recommendations are shown in Figure 3.2.

4. Warning Clause

Lots: 36 to 43, 65 to 77, 162 to 218, 219 to 230, 249 to 279, 280 to 289, 326 and 327, 421 to 425 and 426 to 434
Blocks: 1 to 3, 11 to 14, 15 to 24, 28 to 35 and 567 and 568

The following warning clause shall be included in all Development Agreements and Offers of Sale and Purchase or Lease of these properties:

"Purchasers/tenants are advised that despite the inclusion of noise control features within this development area and within the dwelling units, sound levels from increasing road traffic on Bronte Road and/or Upper Middle Road may continue to be of concern, occasionally interfering with some activities of the dwelling occupants as the sound level exceeds the Municipality's and the Ministry of Environment's noise criteria."

6. Building Acoustic Insulation

Lots: 36 to 42, 185 to 187, 219 to 226, 253 to 256, 280 to 282, 431, 432 and 434
Blocks: 3, 11 to 14, 17 to 24, 28 to 35 and 567 and 568

All exterior building components (walls, windows and doors) shall meet the minimum Acoustic Insulation Factor (AIF) shown in Tables 3 and 4. All windows should be well fitted and weather-stripped. The Detailed Noise Control Study should provide complete and specific tabulations of AIF's for all lots affected.

2.3 RECOMMENDATIONS – STATIONARY SOURCES OF NOISE

The results of the investigation of the stationary sources of noise indicate that the unattenuated sound levels at the Points of Reception of concern are predicted to exceed the applicable sound level criteria for stationary sources. Accordingly, noise control measures are warranted for these Points of Reception.

1. Outdoor Noise Control Measures

Blocks: 21 and 28 to 35

Acoustical barriers shall be constructed to form envelopes about the Outdoor Living Areas (OLA's), as shown schematically in Figure 6.1.

Barriers may consist of an earth berm, an acoustical fence or a combination thereof. The fence component should be constructed of a durable material having minimum 20 kilograms per square meter (four pounds per square foot) of surface area and in a continuous manner without openings or gaps.

Sound Barrier heights and elevations are based on the proposed grade elevations shown on the proposed grading plans referenced in Section 1.3. Any changes to the noted elevations will require revisions to the barrier heights.

2. Special Dwellings Architectural Design Features

Blocks: 21 and 28 to 35

The first row of dwellings having direct exposure to the Region of Halton Public Works Facilities are recommended to have architectural design features for noise control, as shown schematically in Figure 6.2, including the following details:

(i) No windows that open into second floor or higher floors habitable rooms be permitted, where the windows could have direct exposure to the Region of Halton Public Works Facilities. Exceptions to this include sealed, non-operable windows opening into high cathedral ceilings, or windows in non-habitable rooms such as washrooms, laundry rooms, closets, staircase and storage rooms.

The foregoing restrictions do not apply to the first floor windows in any direction in the first row of dwellings having exposure to the Region of Halton Public Works Facilities Plant provided that the top of windows do not exceed 2.6 m above the finished grade elevations and that exposure to the Region of Halton Public Works Facilities is interrupted

by the recommended sound barriers. Acceptable forms of housing include, but are not limited to, townhouses, semi-detached and detached dwellings (including bungalows, split house designs and 2 storey dwellings provided that the foregoing window criteria are met.

None of the above window restrictions apply to skylights composed of 2 panes and provided that the skylights are fixed non-operable units, located in ceilings and meet the applicable sound Transmission Loss (TL) or Acoustic Insulation Factor (AIF) criteria for an indoor level of 40 dBA.

All other lots could be built using the standard two storey housing design.

(ii) Side yards should not exceed the minimum side yard distances permitted by the Town of Oakville's zoning standards. Generally, no more than 2.4m between dwellings should be maintained.

(iii) All roof designs for the first row of dwellings to provide uniform height of minimum 8 meters above ground levels using "gable end roof designs". Therefore, the roof ridges to be more-or-less continuous and run in the same direction as the property lines of the lots overlooking the Region of Halton Public Works Yards. This is essential for noise control purposes to provide adequate shielding for the second and subsequent rows of dwellings from the Region of Halton Public Works Facilities.

2.4 RECOMMENDATIONS – PROPOSED MEDIUM/HIGH DENSITY AND/OR RETAIL/MIXED USE BLOCK

Prior to the issuance of Site Plan approval or building permits for this block the issue of noise by such future activities is to be addressed and any required noise controls be applied at the source of the noise to meet the applicable Ministry of the Environment and Climate Change criteria in Publications NPC-300 and NPC-233.

2.5 IMPLEMENTATION PROCEDURES

- Prior to final approval of this development, a Detailed Noise Control Study, or an upgraded noise study should be required to take into consideration the following:

  - The proposed detailed grading plans
  - Final lot layout, lot/block numbers, etc.
  - Possible proposed building locations
  - The exact distances to all sources of concern
  - Final/approved sound barrier locations as well as barrier height-sound

level alternatives
- Other relevant conditions respecting noise in the Development Agreement

- Prior to the issuance of building permits, the Builder's plans, with respect to the units requiring noise control measures as referred to earlier, should be certified by an Acoustical Engineer as being in conformance with the recommendations of the Detailed Noise Control Study as approved and/or amended by the authorities having jurisdiction.

- Prior to their final inspection and release for occupancy, these dwellings should be certified by an Acoustical Engineer as being in compliance with the recommendations of the Detailed Noise Control Study.

- Typical cross sections should be prepared and submitted in due course by the Consulting Engineers responsible for the site grading and drainage plans based on the final elevations. The sections would typically include existing and proposed future grades, source, receiver and barrier/berm ground elevations, berm slopes, sidewalks, boulevards, ditches, etc.

3.0 SOUND LEVEL CRITERIA

3.1 SURFACE TRANSPORTATION CRITERIA[3]

The surface transportation noise is based on the objective sound levels recommended by the Ministry of the Environment and Climate Change (Ref: MOECC Publication NPC-300 "Environmental Noise Guideline, Noise Assessment Criteria for Stationary Sources and for Land Use Planning, 2013") and applicable Regional/Municipal sound level standards and procedures for different land uses and spaces.

The following is a summary of the applicable sound level criteria for surface transportation sources for the shown time periods (day=d & night=n):

Sound Level Limits for Outdoor Living Areas (OLAs)

AREA & TIME PERIOD	$L_{Aeq(day)}$ ROAD AND RAIL (dBA)
Designated (Individual or common) Outdoor Living Areas (16 hr day(d), 07:00 - 23:00)	$L_{Aeq(day)}$ 55

Indoor Sound Level Limits

Type of Space	L_{Aeq} (Time Period) (dBA)	
	Road	Rail
Living/dining, den areas of residences, hospitals, nursing homes, schools, daycare centres, etc. (Time period-day: 16 hr(d), 07:00 - 23:00)	$L_{Aeq(day)}$ 45	$L_{Aeq(day)}$ 40
Living/dining, den areas of residences, hospitals. nursing homes, etc. (except schools or daycare centres) (Time period-night: 8 hr(n), 23:00 - 07:00)	$L_{Aeq(night)}$ 45	$L_{Aeq(night)}$ 40
Sleeping quarters (Time period-day: 16 hr, 07:00 - 23:00)	$L_{Aeq(day)}$ 45	$L_{Aeq(day)}$ 40
Sleeping quarters (Time period-night: 8 hr, 23:00 - 07:00)	$L_{Aeq(night)}$ 40	$L_{Aeq(night)}$ 35

[3] Road, rail and rolling stock traffic.

Additional Supplementary (Best Management Practices) Sound Level Criteria Recommended for Other Uses

Type of Space	L_{Aeq} (Time Period) (dBA)	
	Road	Rail
General offices, reception areas, retail stores, etc. (Time period-day: 16 hr, 07:00 - 23:00)	$L_{Aeq(day)}$ 50	$L_{Aeq(day)}$ 45
Living/dining areas of residences, hospitals, schools, nursing/retirement homes, daycare centres, theatres, places of worship, libraries, individual or semiprivate offices, conference rooms, reading rooms, etc. (Time period-day: 16 hr, 23:00 - 07:00)	$L_{Aeq(day)}$ 45	$L_{Aeq(day)}$ 40
Sleeping quarters of hotels/motels (Time period-night: 8 hr, 23:00 - 07:00)	$L_{Aeq(night)}$ 45	$L_{Aeq(night)}$ 40
Sleeping quarters of residences, hospitals, nursing/retirement homes, etc. (Time period-night: 8 hr, 23:00 - 07:00)	$L_{Aeq(night)}$ 40	$L_{Aeq(night)}$ 35

The criteria for acceptable outdoor and indoor sound levels are based on "free-field" predicted and/or measured sound levels at the applicable receiver locations, thus the effects of sound reflections and reverberant sound fields are not considered.

If the sound level is less than or equal to the sound level criteria, no control measures will be required.

The outdoor sound levels ***may*** exceed the outdoor sound level criterion by up to 5 decibels, provided that it can be demonstrated that it is not technically, economically or administratively feasible to achieve the criterion and that the occupants are informed of a potential disturbance due to the excess noise by means of a warning clause or cautionary note to be registered in all Development Agreement(s) and Offers of Sale and Purchase or Lease.

Central air conditioning is required when the nighttime sound level at the outside wall of the sleeping quarters or bedrooms is equal to or exceeds $L_{Aeq(night)}$ 8hrs 60 dBA or when the daytime sound level at the outside wall of the Living/Dining/ Recreation space is equal to or exceeds $L_{Aeq(day)}$ 16 hrs 65 dBA.

If the nighttime sound level at the outside wall exceeds $L_{Aeq(night)}$ 50dBA but is less than 60dBA, or if the daytime sound level at the outside wall exceeds 55dBA but is less than $L_{Aeq(day)}$ 65dBA, then forced air heating with provision for future installation of central air conditioning is required.

Application of Criteria

The following table summarizes the requirements for noise control measures for the various sound level ranges:

SOURCE OF NOISE	DAYTIME SOUND LEVEL $L_{Aeq(day)}$	NIGHTTIME SOUND LEVEL $L_{Aeq(night)}$	AIR COND.	FORCED AIR VENTILATION WITH PROVISION FOR FUTURE AIR COND.	WARNING CLAUSE	ACOUSTIC INSULATION
ROAD	<=55	<=50	-	-	-	-
	>55 & <=65	>50 & <=60	-	Yes	Yes "Type C"	Yes
	>65	>60	Yes	-	Yes "Type D"	Yes
RAIL	<=55	<=50	-	-	-	-
	>55 & <=60	>50 & <=55	-	Yes	Yes "Type C"	-
	>60 & <=65	>55 & <=60	-	Yes	Yes "Type C"	Yes
	>65	>60	Yes	-	Yes "Type D"	Yes

3.2 CRITERIA FOR STATIONARY NOISE SOURCES

The following criteria apply to the impact of Stationary Sources of noise as defined by the MOECC to include industrial and commercial facilities. The criteria apply to the impact of Stationary Sources external to the development on the proposed development or to the impact of any proposed Stationary Sources internal to the development on the development itself.

The criteria used in this study are based on the objective sound levels recommended by the Ministry of the Environment and Climate Change (Ref.: MOECC Publication NPC-300 “Environmental Noise Guideline, Noise Assessment Criteria for Stationary Sources and for Land Use Planning, 2013) and other relevant publications.

For sound from a stationary source, including Quasi-Steady Impulsive Sound but not including other impulsive sound, the predicted and/or measured “predictable worst case” 1-hour equivalent sound levels (L_{Aeq1hr}) of the stationary source(s) at a point of reception is the higher of the applicable exclusion limit value (given in the following tables) or the background sound level for that point of reception. The outdoor sound level limits for stationary sources apply only to daytime and evening (07:00 – 23:00 hours).

Exclusion[4] Limit Values of One-Hour Equivalent Sound Level (L_{Aeq}, dBA) Outdoor Points of Reception

Time of Day	Class 1 Area	Class 2 Area	Class 3 Area	Class 4 Area
07:00 – 19:00	50	50	45	55
19:00 – 23:00	50	45	40	55

Exclusion Limit Values of One-Hour Equivalent Sound Level (L_{Aeq}, dBA) Plane of Window of Noise Sensitive Spaces

Time of Day	Class 1 Area	Class 2 Area	Class 3 Area	Class 4 Area
07:00 – 19:00	50	50	45	60
19:00 – 23:00	50	50	40	60
23:00 – 07:00	45	45	40	55

[4] or the minimum hourly background (ambient) sound level $LAeq_{1hr}$, whichever is higher

4.0 ANALYSIS

4.1 TRANSPORTATION SOURCES OF NOISE

The proposed development is located at the South East corner of Bronte Road and Upper Middle Road in the Town of Oakville as shown in Figure 1. The relevant road and traffic data were obtained from Read Voorhees and Associates and are summarized below:

- **Bronte Road**

Current No. of Lanes	4
Posted Speed Limit	60km/hr.
Future Posted Speed Limit	60km/hr.
Future AADT (Year 2031)	50,000 vpd
Total Truck Percentage - Medium Truck Split - Heavy Truck Split	6.3% 2.5% 3.8%
Day(16 hrs.)/Night(8 hrs.) Split (assumed)	92%/8%
Directional Traffic Split (assumed)	50%/50%
Road Gradient (assumed)	2%

- **Upper Middle Road**

Current No. of Lanes	4
Posted Speed Limit	60 km/hr.
Future Posted Speed Limit	60 km/hr.
Future/Ultimate AADT (Year 2031)	27,850 vpd
Total Truck Percentage (assumed) - Medium Truck Split (assumed) - Heavy Truck Split (assumed)	3.4% 1.7% 1.7%
Day(16 hrs.)/Night(8 hrs.) Split (assumed)	92%/8%
Directional Traffic Split (assumed)	50%/50%
Road Gradient (assumed)	2%
Current R.O.W.[5]	70m

Appendix A contains the relevant road traffic data used in this study.[6]

4.2 OUTDOOR NOISE ENVIRONMENT

Sound level predictions were carried out based on MOECC's ORNAMENT prediction modeling procedures (Ontario Road Noise Analysis Method for Environment and Transportation, Technical Document, 1989).
Overall sound levels at the OLAs of the selected representative receptor

[5] The R.O.W includes the Hydro corridor and pipeline.
[6] Despite availability of traffic data from The Region of Halton, we have used the more conservative traffic data provided to us by Read Voorhees and Associates for this study.

locations are shown in Table 2.

Sample sound level calculations at representative receptor locations are presented in Appendix B.

In consideration of the calculations, receptor locations which require outdoor noise control measures are illustrated in Figure 3.1.

The conventional approach by which excess noise in the rear yard OLAs may be mitigated is through construction of acoustical barriers. Sound barrier heights required will be up to 3.4m. Final barrier heights and locations will be confirmed in the Detailed Noise Study.

Proposed Retail/Mixed Use Block

As noted on the drawings vacant lands designated for future commercial/mixed use are located close to the proposed development. Specific details in respect of future commercial activities are presently unknown; hence the potential noise impact by these activities cannot be addressed at this time.

Adopting the conventional approach used in such circumstances, the Summary section of this Report contains a recommendation that prior to the issuance of Site Plan approvals or building permits for these properties the issue of noise by such future activities be addressed and that any required noise controls be applied at the source of the noise to meet the applicable Ministry of the Environment and Climate Change criteria in Publications NPC-300 and NPC-233.

4.3 INDOOR NOISE ENVIRONMENT

The criteria for indoor L_{eq} sound levels are based on projected L_{eq} levels at the outside face of the dwellings with appropriate assumptions for the differences between the outdoor and indoor sound levels. If the outside L_{eq} levels do not exceed the recommended objective sound levels, then the indoor L_{eq} levels will not be exceeded, assuming standard building construction and operable windows.

Overall daytime sound levels at the building facades are shown in Table 3.

Overall nighttime sound levels at the building facades are shown in Table 4.

In consideration of the estimated sound levels and by comparison to the acceptable indoor noise criteria (Section 3) the following is concluded:

- The nighttime noise environment at the outside walls of the following lots will equal or exceed 60 dBA:

Lots: 36 to 42, 185 to 187, 219 to 226, 253 to 256, 280 to 282, 431, 432 and 434
Blocks: 3, 11 to 14, 17 to 24 and 28 to 35

Central air conditioning is therefore required.

- The daytime/nighttime noise environment at the outside walls of the following lots will be in the range of 56-64 dBA day/51 – 59 dBA night:

  Lots: 43, 65 to 77, 162 to 184, 188 to 218, 227 to 230, 249 to 252, 257 to 279, 283 to 289, 326 and 327, 421 to 425, 426 to 430 and 433
  Blocks: 1, 2, 15 and 16

  Forced air heating system with provision for central air conditioning is therefore required.

- All other lots/blocks will have a nighttime noise level less than 50 dBA and therefore no noise control measures need be considered.

4.4 TYPICAL WINDOW / WALL CONSTRUCTION

As the detailed architectural plans are not available at this time, it is therefore not possible to specify the window and wall details to meet the AIF requirements presented in Tables 2 and 3. Further detailed analysis should be undertaken based on the data presented in this Report to take into consideration the final room location, floor area, window type (openable or fixed), window size and orientation, etc. Such analysis is required by the MOECC and the municipality prior to submission for building permits as part of their Certification process.

Wall construction using concrete block, or brick veneer, or precast concrete panels will be adequate to meet the indoor sound level criteria.

It must be pointed out that there are several factors affecting the final glass selection including:

1. Size of window.
2. Room dimensions.
3. Floor level and direction room faces.
4. Fixed or operable glass.
5. The number of building components.
6. Type of wall to be used.
7. Projected sound levels outside the window

For the calculation of type of windows required for each dwelling, a detailed description of each unit is required.

As an example, for a typical unit with nighttime outdoor sound level of 64 dBA, the AIF value for the bedrooms will be 31 assuming 3 components. If the window to floor ratio is 20%, then the window requirements in terms of glass thickness, mm (air space thickness, mm) glass thickness, mm are any of the following:

Double Glazed: 3mm (13mm) 3mm; 4mm (6mm) 4mm

As an example, for a typical unit with daytime outdoor sound level of 72 dBA, the AIF value for the Living Room will be 34 assuming 3 components. If the window to floor ratio is 32%, then the window requirements in terms of glass thickness, mm (air space thickness, mm) glass thickness, mm are any of the following:

Double Glazed: 3mm (13mm) 6mm (laminated); 6mm (13mm) 6mm (laminated)

As the information above are typical examples only, therefore, prior to submission of the building plans for building permit, we recommend that the detailed architectural drawings of the units requiring noise control measures, as referred to earlier, be examined by the Acoustical Consultant in order to advise the design consultant on the ***specific*** building components for noise control.

4.5 CONTROL OF AIR CONDITIONING EQUIPMENT NOISE

To control the environmental noise emitted by air conditioning or heat pump units it is essential that the following procedures and specifications be considered to by the parties responsible for the selection, design and installation of the air conditioning systems:

1. Control of air conditioning noise is governed by Provincial and/or municipal standards which specify acceptable sound emission levels for the air conditioning devices and/or acceptable sound levels at the point(s) of reception.

   The Ministry of the Environment and Climate Change criteria for control of air conditioning noise is outlined in several technical publications including publications NPC-300 and NPC-216. The applicable sound level criteria for new residential development where air conditioning is a mandatory requirement for noise control inside habitable rooms are: 1) a maximum ARI* Sound Rating to suit the site specific installation for the air conditioning device, and 2) hourly L_{Aeq} sound level limits of 55 dBA at the point(s) of reception (or the prevailing hourly L_{Aeq} due to vehicular traffic ambient noise if higher than 55 dBA).

* When tested in accordance with ARI Standard 270-84

Municipal standards for air conditioning noise may also include specific or maximum Sound Rating numbers (in bels) and/or point-of-reception sound level limits in reference to specific municipal By-Laws and/or standards as applicable.

Therefore, it is essential that the final selection, location, design, and specifications of the air conditioning devices ensure compliance with the applicable sound level criteria prior to making any commitment.

The following are examples of the preferred approach when dealing with the issue of air conditioning noise.

a) If the A/C condensing unit is to be installed in backyards in urban areas, then units having lower bels rating may be required. The use of units with lower sound rating of 6.8bel or lower may give the builder the flexibility of locating the unit as close as 3 metres from the joint property lines without exceeding the MOECC 55 dBA standard for houses in urban areas.
b) If the unit is to be located in the front or in the side yard areas (closer to the front and provided that there are no windows to habitable rooms on the side walls), then units having less stringent sound level rating requirements may result in complying with sound criteria.
c) Through the building permit process of the specific properties, additional calculations should be performed to optimize the unit sound ratings depending on the house model and the installation location.

2. The resulting sound levels due to residential air conditioners at the nearest points-of-reception should not exceed the levels in MOECC Publication NPC-216.

3. The siting of the split-system central air conditioning units and other systems should follow good planning principles.

4. Should location of the outdoor air conditioner unit be in the back or side yard areas where noise is likely to interfere with the outdoor and indoor activities of any occupant and/or neighbor, then it is necessary to design and install noise control measures. Noise control measures include any or a combination of the following:

   a. Distance setback away from the receptor(s).
   b. Sound barrier wall(s) or ultimately an acoustic enclosure.
   c. Sealing selected windows, i.e. installation of non-operable windows.
   d. Deleting selected windows.

It is also our recommendation that the necessary detailed technical analysis be performed prior to submitting an application for Building Permit to optimize the required air conditioning unit Sound Rating number in order to meet the Provincial sound level standards at the closest receptors after taking into consideration the specific property design and proposed A/C unit location. Other A/C noise control measures, where required to meet the sound level criteria at the point(s) of reception, should also be identified and shown on the applicable permit drawings/specifications.

Indoor Sound Levels

While the control of the indoor noise created by the air conditioning equipment is not the direct subject of this study, it is important that the selected and designed air conditioning systems achieve indoor sound levels that meet the OBC/ASHRAE criteria and be at least 5 dB lower than the Ministry of Environment's recommended indoor sound level criteria included in Section 3.0 of this study.

4.6 BARRIER

Where a sound barrier is required, as specified in this study, we recommend that the contractor submit the Shop Drawings for the barrier to the Acoustical Engineer for approval prior to finalization of the designs. In particular the following information should be made available for submission purposes:

1. Copy of the most up-to-date grading plan of the specific area on which the sound barrier will be erected.
2. Barrier material details including ***actual*** thickness, wood species, gauge, etc.
3. Barrier heights and extent (specified in linear metres), return sections and barrier flanking ends to be shown on a drawing to a suitable scale.

The project design consultant(s) and/or the barrier supplier/manufacturer responsible for design implementation of the sound barrier should be advised to communicate with the Acoustical Engineer respecting any of the above matters.

4.7 STATIONARY SOURCES OF NOISE EXTERNAL TO THE PROPOSED DEVELOPMENT (THE REGION OF HALTON FACILITY)

1. Introduction

The south end of the subject development is bordered by the Region of Halton office and facilities. This includes the Region’s main office, Emergency Medical Services (EMS), Public Works Services, and Police Services.

2. Description of the Sources of Stationary Noise

Public Works Facility

The public works facility includes a small holding yard for aggregates, a main building, and a yard to house the various vehicles and equipment in.

The sources of noise emanating from the aggregate yard include the operation and idling of a front-end loader and loading/dump trucks. From our meeting with the Region of Halton staff, the works yard normally operates from 7:30am to 4:00pm with the potential for some emergency work during the off hours.

The main public works building and yard houses the vehicles and equipment used for various public works operations and the sources of noise of concern include the idling and movement of the various vehicles and equipment. In addition, the main building has a repair shop for vehicles with three large overhead doors facing the north that may remain open on days with hotter temperatures. The noise emitted from inside the facility if these doors are open is assumed to be the idling of large trucks[7]. This part of the public works facility generally operates only during regular hours of 7:30am to 4:00pm.

EMS Services

The EMS building is a holding facility for the maintenance of EMS vehicles, as well as a storage area during off hours. There is a special exhaust on the roof of this building which turns on when the special exhaust system is coupled with an EMS vehicle and runs for approximately 3 minutes.

In addition, there is an emergency generator within the building that is tested approximately once a month and during off hours.

Police Services

The main sources of noise of concern related to the Police Services building are the more-or-less frequent car door slamming and the idling of its parked police and staff vehicles in the parking lot towards the southeast of the subject development around the clock. It is our understanding from the project team members that the entire Police Services operation is likely to be moved to the south part of the Regional offices abutting the north service road, thereby the issue of the parking lot noise may no longer be of concern. Otherwise, the use of a warning clause only about the parking lot may be sufficient for all the affected lots backing onto the Police Services parking lot.

[7] Other noise sources including air operated pneumatic tools, hammering, etc. which are all considered as nuisance type sources.

Main Regional Building

There are two noise sources identified respecting Halton Region's main building: a kitchen exhaust fan serving the cafeteria and the cooling tower. The kitchen exhaust operates for the full hourduring the operating hours of the buildings and are turned off during the off hours.

Figure 4 shows the location of the subject sources of stationary noise.

3. Points of Reception

Block 21 and Blocks 28 to 35 are most proximate to the operation of the Halton Region facility.

The future dwellings of Blocks 32 to 35 will be subject to the most noise from the aggregate yard and its operations, where the future dwellings of Block 21 and Blocks 28 to 31 will be subject to the noise from the rest of the Halton Region facility.

4. Applicable MOECC Ambient/Background Sound Level Criteria

Ambient noise from Bronte Road and the Highway 403 were not taken into account due to the extended distance setback of the selected receptors from these roads. Therefore, the applicable noise criteria will be the unadjusted MOECC Exclusion Limits of NPC-300 were selected as the sound level criteria mentioned in Section 3.2 of this report.

5. Measurement Equipment

The attended sound level measurements were performed using the following equipment:

- Rion NA-28, Type 1 Precision Integrating Sound Level Meter and Real Time Frequency Analyzer fitted with 1/1 & 1/3 Octave Bands filters and a 1/2" condenser microphones c/w windscreen.
- Rion Precision Calibrator Model NC-74

The unattended sound level measurements were performed using the following equipment:

- Rion NL-22 Integrating Sound Level Meters fitted with 1/4" piezoelectric microphones and a windscreen. The equipment were contained in weather-protected environmental casings

The sound level measurement procedures were primarily based on the Ministry of Environment procedures in their Publication NPC-103

"Procedures" included in the Model Municipal Noise Control by-Law, the recommendations of the instrument manufactures and the best engineering practices to suit site specific conditions. The sound level meters were checked and calibrated before, during and following completion of the measurement sessions without any appreciable change in the sound levels.

The weather conditions during the measurement sessions were favourable for measurements as the local wind speed did not exceed 30 km/hr and there was no precipitation.

Sound level measurement results can be found in Appendix C.

6. Established Stationary Source Sound Levels

The following are the noise emission levels used for calculation and prediction in the model:

- Front End Loader Idling: 76dBA @ 7.5m
- Front End Loader Moving: 79dBA @ 7.5m
- Large Truck Idling: 72dBA @ 7.5m
- Large Truck Moving: 75dBA @ 15m
- Van/Pickup Truck Idling: 70dBA @ 7.5m
- Van/Pickup Truck Moving: 70dBA @ 7.5m
- Rooftop Units: 58dBA @ 10m
- EMS Exhaust Fan: 62dBA @ 30m
- Kitchen Exhaust Fan: 50dBA @ 95m
- Cooling Tower: 55dBA @ 30m
- Automobile Idling: 57dBA @ 5m

The sound level measurements can be found in Appendix C.

7. Sound Level Calculations Model

A 3-D computer program for multiple point and line sources and multiple receivers developed by SS Wilson Associates was used to calculate the sound levels. The program takes into account:

- Reference sound levels and reference distances for the equipment working in each area of the subject development, i.e. sound emission levels.
- The Cartesian co-ordinates (x, y & z) of all sources and receivers.
- The number of events or occurrences of the noise in a given time period and the time period of each event.
- Spherical divergence factor.
- Additional attenuation due to sound barriers; natural or man-made types.
- Additional attenuation due to ground (as modified by sources/receiver

elevations, the presence of intervening barriers and the type of ground).
- Atmospheric attenuation due to air molecular absorption.

For the purposes of this study, sound level adjustments were applied to the measured sound emission levels. In accordance with the MOECC procedures, +5 dB tonal adjustments were incorporated into the overall analysis of the Leq. Other adjustments included acoustical shielding due to the presence of intervening buildings between a specific source and the receptor as well as adjustments due to the directivity.

8. Measurement Results

Long-Term Sound Level Measurements of the Stationary Sources

To gain appreciation of the hourly sound levels emitted by the entire facility around the clock, long-term sound level measurements were taken at several locations around the Halton Region facility to monitor all potential sources of noise, which included to a lesser degree the ambient noise due to traffic on the QEW and Bronte Road.

Appendix C contains the details of the measurements and the results are summarized in the sections to follow.

It is important to note that full reliance was not made on the results of the measurements due to the extraneous sources of noise that was part of the overall ambient in the area that are not associated with the Region of Halton facility. Specifically, there were close-by golfers hitting golf balls with their clubs, which created significant impact noise; the noise due to loud conversation of groups of golfers (as close as 5m to 10m away from the monitors); occasional car movements on the access road within the Halton facility; and significant noise coming from both Bronte Road and the QEW/403.

The measurement locations are illustrated in Figure 5.

Measurement Location #1: Facing the Public Works Facility

The sound level meter was left in the wooded area between the development lands and Halton Region's property, which was a low-lying area that was approximately 3m to 4m below the road grade of North Service Road. To improve the accuracy and quality of the measurements, the meter was attached to a tree so that it was above ground level.

Looking at the results of the measurements, it can be concluded that the ambient noise in this area during the daytime is most likely due to traffic and is approximately 55dBA. It was noted from the site visits that there was

asphalt work being done in the parking lots of the Halton Region's office, which is reflected in the measurements by the large number of spikes above the ambient. Another explanation of the spikes could include the operation of the Public Works department's vehicles and equipment since it was stated that it is common for the vehicles to idle for a few minutes prior to dispatch.

Measurement Location #2: South Corner Facing the Main Regional Building

The sound level meter was left at an elevated level in the L-shaped corner at the south end of the proposed development, facing the Halton Region offices. The main objective of this measurement was to provide an insight into the overall noise levels coming from the Halton Region main office.

It can be observed from the measurement results that around 5:00am the noise level begins to increase and remains relatively steady throughout the day time. Therefore, it can be concluded (and confirmed with Measurement 1) that the daytime ambient noise in this area is approximately 55dBA. As with Measurement 1 above, the parking lot areas near this measurement location were undergoing construction work, which can be seen in the large spikes in the measurement results.

Measurement Location #3: Southeast Corner Facing the Main Regional Building

The sound level meter was left at an elevated level along the joint property line between the Saw Whet Golf Course and the Region of Halton, facing the main office building.

It can be observed from this meter's measurement results that the ambient noise level in this area is approximately 55dBA. Again, the construction work in the area may be one of the causes for the large spikes during the daytime.

9. Impact Assessment and Findings

Proposed Residential Lots along the North End Of the Public Works Yard

The proposed dwelling units of Blocks 32 to 35 overlook the north end of the Public Works Yard (PWY) where mobile equipment and trucks are used to manage aggregate stockpiles and to load and unload aggregates into trucks for use on Public Works projects. The information received from the PWY indicates that this facility operates primarily during the daytime although the Region's work force is on stand-by around the clock in the event that aggregates are needed in connection with night-time and emergency situations.

For the purposes of this assessment, a reasonable number of mobile pieces of equipment was assumed to operate throughout the yard where the movements of a front-end loader including idling are based on the worst-case operational scenario, which is one hour.

The results of the worst-case operational scenario (an MOECC requirement) during any hour indicate that the expected Leq at the closest property line of the lots backing onto the yard will be up to Leq 59dBA, which is considered to be a significant increase above the MOECC daytime and night-time sound level criteria.

Proposed Residential Lots along the East End of the PWY

The proposed dwelling units of Block 21 and Blocks 28 to 31 overlook the east end of the Public Works yard where mobile equipment and trucks are used to manage equipment stockpiles and houses other vehicles and equipment for use on Public Works projects, as well as the car park that services the Halton Police Services. In addition, the receptor will be exposed to the added effect of the Public Works building where other activities take place, as indicated in the yard description. The information received from the PWY indicates that this facility operates primarily during the daytime, although the Region's work force is on stand-by around the clock in the event that aggregates and other services are needed in connection with night time and emergency situations.

For the purposes of this assessment, a reasonable number of mobile pieces of equipment were assumed to operate throughout the yard where the movements of a front-end loader and utility trucks including idling of numerous trucks and vans during the morning start up including idling, are based on the worst-case operational scenario, which is one hour.

The results of the worst-case operational scenario (an MOECC requirement) during any hour indicate that the expected Leq at the closest property line of the lots backing onto the yard will be up to Leq 52dBA, which is considered to be a noticeable increase above the MOECC daytime and night-time sound level criteria.

10. Recommendations and Resulting Sound Levels

In consideration of the calculations, it is concluded that for Block 21 and Blocks 28 to 35, the unattenuated sound levels will exceed the MOE criteria. To ensure that the stationary sound levels comply with the applicable criteria, the noise control measures as outlined in **Section 2.3** of this report are recommended:

The following is a summary of the resulting sound level impact, with mitigation as outlined in **Section 2.3**, at the affected blocks:

Point of Reception	Point of Reception Description	Sound Level at Point of Reception Leq(1h)	Performance Limit Sound Levels Leq(1h)	Compliance with Performance Limits
Block 21	West Ground Floor Building Facade	43 dBA Day 43 dBA Evening 42 dBA Night	50 dBA Day 50 dBA Evening 45 dBA Night	Yes Yes Yes
Block 28	West Ground Floor Building Facade	45 dBA Day 45 dBA Evening 44 dBA Night	50 dBA Day 50 dBA Evening 45 dBA Night	Yes Yes Yes
Block 29	West Ground Floor Building Facade	45 dBA Day 45 dBA Evening 44 dBA Night	50 dBA Day 50 dBA Evening 45 dBA Night	Yes Yes Yes
Block 30	West Ground Floor Building Facade	47 dBA Day 47 dBA Evening 45 dBA Night	50 dBA Day 50 dBA Evening 45 dBA Night	Yes Yes Yes
Block 31	West Ground Floor Building Facade	47 dBA Day 47 dBA Evening 45 dBA Night	50 dBA Day 50 dBA Evening 45 dBA Night	Yes Yes Yes
Block 32	South Ground Floor Building Facade	45 dBA Day 45 dBA Evening 45 dBA Night	50 dBA Day 50 dBA Evening 45 dBA Night	Yes Yes Yes
Block 33	South Ground Floor Building Facade	45 dBA Day 45 dBA Evening 45 dBA Night	50 dBA Day 50 dBA Evening 45 dBA Night	Yes Yes Yes
Block 34	South Ground Floor Building Facade	45 dBA Day 45 dBA Evening 45 dBA Night	50 dBA Day 50 dBA Evening 45 dBA Night	Yes Yes Yes
Block 35	South Ground Floor Building Facade	45 dBA Day 45 dBA Evening 44 dBA Night	50 dBA Day 50 dBA Evening 45 dBA Night	Yes Yes Yes

In summary, the impact due to the stationary source sound levels at all the receptors is predicted to meet the applicable sound level criteria with the implementation of the recommended noise control measures.

11. The Region of Halton Standby Emergency Power Generators Noise Assessment

Operation of the Emergency Power Generators

Region of Halton staff advised us of the presence of three (3) independent emergency power generator stations (gensets) throughout the facility to service 3 separate areas/functions; the main building (2 gensets), the Halton Police Services section (2 gensets) and the Service Yard (1 genset).

Figure 4 illustrates the approximate locations of the three facilities.

Halton Region staff further advised that each of the facilities is tested independently starting around 6 am[8] on a scheduled bi-weekly or monthly basis with 1 or 2 units running simultaneously for the tests. Testing is acceptable on the this infrequent bases to the MOECC for emergency generators with the exception of 6am with should be 7am. None of these units is operated for normal day-to-day use and their function is only during power outage situations. The following are the highlights of each group of gensets:

- Halton Maintenance Facility Building:
  - One diesel unit
  - 230kW
  - The engine is located inside on the ground floor with air intake louvers facing east and diesel exhaust stack on the roof
  - Photographs 9, 10, and 11 illustrate the system

- Main Halton Region Office Building:
  - Two gas units
  - 1 unit 100kW and 1 unit 250kW
  - Both units are located on the top floor with no roof
  - See photographs 12 and 13

- Main Region Police Services:
  - Two diesel units
  - Both units are located inside the basement floor with three(3) contact points with the outside: Exhaust air stacks, air intake louvers and hot air discharge shaft
  - Photographs 14 and 15 illustrate the system photos from the outside

Applicable Sound Level Criteria

Ontario Regulation 346/12 (Ont. Reg.) made under the Environmental Protection Act (EPA) governs the operations of the subject units which apply to standby power systems to include one or more generator units with a rated capacity not exceeding 700 KW for each genset.

The applicable sound level criteria and/or provisions for operations of the generator(s) can be found in the text of the Ontario Reg. 346/12. For the purposes of this study only and to provide an indication of the degree of acceptance of the present system, the following sound level criterion was

[8] MOECC suggested operational time for equipment testing is from 7 am and we do not expect the Region to have any issues with changing these test times.

used (based on the MOECC or 346/12 and the ECA process) for genset testing purposes:

- Criteria 1 (Sound Emission Level):
  - L_p 75 dBA@7m from one genset

- Criteria 2 (Point of Reception Level):
  - L_p 50 dBA

Actual Sound Level Measurements

Arrangements were made with the Region of Halton operational staff to have to generators run for their normal testing purposes at 6 am to 7 am on Friday October 26, 2012 one group at a time. Measurements were taken with the use of a precision sound level analyzer, RION NA-28 calibrated with a Precision Sound Level Calibrator RION NC-74. Each individual genset was operated separately and then each pair was operated simultaneously as commonly done by the Region for the main and the Police Services generators.

The following is a summary of the sound level tests and our extrapolated/interpolated sound levels at the desired locations:

- Main Office Building:
  - Genset 1:
    - Measured L_p @ 25m: 56dBA
    - Extrapolated L_p @ 7.5m: 61dBA
    - Extrapolated L_p @ closest receptor location: 38dBA
  - Genset 2:
    - Measured L_p @ 25m: 57dBA
    - Extrapolated L_p @ 7.5m: 62 dBA
    - Extrapolated L_p @ closest receptor location: 39dBA

- Police Service Building:
  - Genset 1:
    - Measured L_p @ 7.5m: 77dBA
    - Extrapolated L_p @ closest receptor location: 51dBA
  - Genset 2:
    - Measured L_p @ 7.5m: 80dBA
    - Extrapolated L_p @ closest receptor location: 54dBA
  - Measured L_p @ closest receptor location with both gensets running: 61-63 dBA

- Halton Public Works Building:
  - Genset:
    - Measured L_p @ 25m: 62dBA
    - Measured L_p @ 7m: 79dBA

- Extrapolated L_p @ 7.5m: 67dBA
- Extrapolated L_p @ closest receptor location: 47dBA

Results and Findings

The following is a summary of the results and findings specific to each group of generators:

- Main Office Building:
  - Based on calculations, both generators comply with the MOECC NPC-300 Lp 55 dBA (daytime and no nighttime testing is allowed) sound level criteria for generators.
  - The extrapolated sound level with both gensets running to the closest point of reception is 42dBA.

- Police Services Building:
  - The measured sound levels from both generators do not comply with the MOECC NPC-300 sound level criteria Lp 55 dBA (daytime and no nighttime testing is allowed) for generators. It is recommended that additional actions as outlined below to be taken.

- Halton Public Works Building:
  - The predicted sound levels from both generators comply with the MOECC NPC-300 sound level criteria Lp 55 dBA (daytime and no nighttime testing is allowed) for generators.

Recommendations Pertaining to the Standby Power Generators

1. The Region of Halton Operations staff and the Police Services operational staff should be provided with a copy of this report and also be advised to take into consideration the MOECC requirements for testing of emergency diesel generators. Currently, each of the facilities is tested independently starting around 6 am on a scheduled bi-weekly or monthly basis with 1 or 2 units running simultaneously for the tests. Testing is acceptable on the this infrequent basis to the MOECC for emergency generators with the exception of not starting earlier than 7 am.

2. Presently, the Police Service's standby power generators are measured and predicted to have no noise impact on the existing residential receptors due to the extensive distance setbacks to the existing dwellings located on the west side of Bronte Road and the relatively high ambient at those receptors. However, our measurements and predictions at the nearest property line of the proposed development indicate the potential for sound levels that are likely to be in excess of the MOECC sound level criteria for emergency equipment with level as high as 63dBA at the joint property line with the development as a result of the insignificant noise reduction offered

by the existing mufflers and air intake/discharge opening. It should be noted that the applicable sound level criterion for emergency diesel generators of Lp 55dBA is 5 dB less stringent than the stationary sources sound level criteria of Leq 50dBA. Therefore, meeting the objectives of NPC-300 is easier to implement for emergency equipment.

3. It is our understanding from the project team members that the entire Police Services operation is likely to be moved to the south part of the Regional offices abutting the north service road, thereby the issue of the emergency generator noise may no longer be of concern. If this move does not materialize, then further negotiations should take place between the proponent and the Region of Halton with a view to implementing the necessary noise control measures to reduce the acoustic emission of the 2 generator sets. The modifications include straightforward noise control measures, such as with the use of more effective exhaust mufflers, the use of air intake silencers and/or acoustic louvers on the air discharge openings (hot air discharge), and the application of sound absorptive material on air intake openings and wells. The details of such measures can only be established during the Detailed Design stage.

4. Design, cost and implementation of such noise control measures are expected to be relatively inexpensive and without any negative effects on the present operations with the overall intent and objective of meeting Ontario Regulation 346/12.

4.8 STATIONARY SOURCES OF NOISE INTERNAL TO THE PROPOSED DEVELOPMENT (PROPOSED MEDIUM/HIGH DENSITY AND/OR RETAIL/MIXED USE BLOCK)

This section deals with the potential noise impact of the nearby future Med-High density residential block in which the cumulative noise due to the suite air conditioning units of the referenced building(s) may affect the adjacent noise sensitive area.

Typically, there are three types of suite A/C units that may be used:

1. The use of a central A/C system that is central to the entire building whereby a large chiller, condenser (or fluid cooler/air-cooled condenser), pumps, etc. are used. The general location of such system is commonly on the roof of the subject building. Noise control of the referenced equipment is a fairly straight forward design exercise whereby the engineers can make use of several standard provisions for noise control. The provisions include the use of silencers, acoustic louvers, acoustic shielding by the structure, low noise emission levels equipment, etc. All of such measures are fairly straightforward as far as selection, design, and specifications. Accordingly, the details such measures can be specified in due course suitable for this land use application.

2. For many types of buildings and for the purposes of independent energy metering for individual suites, a packaged HVAC unit that is considered central to each suite is installed within each suite in a small closet with access to the outside for heat exchange and for gas heating vents. Each closet serving one suite contains a louver to the outside for condenser intake and discharge, as well as for natural gas exhaust vents. Of concern is the potential cumulative noise impact when several of such A/C units operate simultaneously during the day and night in the hot season, thus affecting the adjoining neighbours.

3. The other alternate means for central air conditioning of apartment units in relatively low rise apartment buildings and stacked townhouses is to use split-system heating/cooling units where the condenser is located on the roof of the building along with other condensing units serving the other neighbours in the same building or on each balcony in the suite. The evaporative coils are located in a small enclosure within the suite with access to the outside for combustion exhaust release (not usually of concern). The multiple condensing unit installation on the roof or the cumulative balcony noise potential is the source of environmental noise affecting the neighbours and other nearby residential dwellings.

At the present time, there is no information available on the type of Heating, Ventilation, and Air Conditioning system (HVAC) to be used. Therefore the cumulative noise impact of the future building should be determined using noise prediction model based on reasonable technical assumptions and based on information extracted from the building plan and elevation drawings.

4.9 ABBREVIATIONS

Basic Descriptor	Measurement Weighting	Time Weighting Characteristics **F**(Fast). **S**(Slow). **I**(Impulse).
L_p Sound pressure level	A-Weighted sound pressure level	L_{AF}, L_{AS}, L_{AI}
	C-Weighted sound pressure level	L_{CF}, L_{CS}, L_{CI}
	Z-Weighted sound pressure level(Flat)	L_{ZF}, L_{ZS}, L_{ZI}
L_{eq} Equivalent continuous sound level	Equivalent continuous A-weighted sound level	$L_{Aeq,}$ L_{AIeq}
	Equivalent continuous C-weighted sound level	$L_{Ceq,}$ L_{CIeq}
	Equivalent continuous Z-weighted(Flat) sound level	$L_{Zeq,}$ L_{ZIeq}
L_E Sound Exposure Level	A-Weighted sound exposure Level	L_{AE}, L_{AIE}
	C-Weighted sound exposure Level	L_{CE}, L_{CIE}
	Z-Weighted sound exposure Level(Flat)	L_{ZE}, L_{ZIE}
L_{max}, L_{min} Maximum Sound Level	Maximum A-weighted sound level	L_{AFmax}, L_{ASmax}, L_{AImax}
	Maximum C-weighted sound level	L_{CFmax}, L_{CSmax}, L_{CImax}
	Maximum Z- weighted sound level(Flat)	L_{ZFmax}, L_{ZSmax}, L_{ZImax}
L_N Percentile Sound Level	Percentile A-weighted sound level	L_{AFNn}, L_{ASN}, L_{AIN}
	Percentile C-weighted sound level	L_{CFNn}, L_{CSN}, L_{CIN}
	Percentile Z-weighted sound level(Flat)	L_{ZFNn}, L_{ZSN}, L_{ZIN}
L_{peak} Peak Sound Level	A-Weighted peak sound level	L_{Apeak}
	C-Weighted peak sound level	L_{Cpeak}
	Z-Weighted peak sound level(Flat)	L_{Zpeak}

TABLES

TABLE 1

SUMMARY OF MINIMUM REQUIRED NOISE CONTROL MEASURES

LOT/BLOCK NUMBER	SOUND BARRIER (Due to Transportation Noise)	CENTRAL AIR CONDITIONING	PROVISION FOR CENTRAL AIR CONDITIONING	WARNING CLAUSE	SOUND BARRIER (Due to Stationary Noise)
LOTS					
36 to 42	Yes	Yes	--	Yes	No
43	No	--	Yes	Yes	No
65 to 77	No	--	Yes	Yes	No
162 to 184	No	--	Yes	Yes	No
185 to 187	No	Yes	--	Yes	No
188 to 218	No	--	Yes	Yes	No
219 to 221	No	Yes	--	Yes	No
222 and 223	Yes	Yes	--	Yes	No
224 to 226	No	Yes	--	Yes	No
227 to 230	No	--	Yes	Yes	No
249 to 252	No	--	Yes	Yes	No
253 to 256	Yes	Yes	--	Yes	No
257 to 279	No	--	Yes	Yes	No
280 to 282	No	Yes	--	Yes	No
283 to 289	No	--	Yes	Yes	No
326 and 327	No	--	Yes	Yes	No
421 to 425	No	--	Yes	Yes	No
426 to 430	No	--	Yes	Yes	No
431 and 432	Yes	Yes	--	Yes	No
433	No	--	Yes	Yes	No
434	Yes	Yes	--	Yes	No
All Other Lots	No	No	No	No	No

TABLE 1
(CONTINUED)

SUMMARY OF MINIMUM REQUIRED NOISE CONTROL MEASURES

LOT/BLOCK NUMBER	SOUND BARRIE (Due to Transportation Noise)	CENTRAL AIR CONDITIONING	PROVISION FOR CENTRAL AIR CONDITIONING	WARNING CLAUSE	SOUND BARRIER (Due to Stationary Noise)
BLOCKS					
1 and 2	No	--	Yes	Yes	No
3	No	Yes	--	Yes	No
11 to 14	No	Yes	--	Yes	No
15 and 16	No	--	Yes	Yes	No
17	Yes	Yes	--	Yes	No
18 to 20	No	Yes	--	Yes	No
21	No	Yes	--	Yes	Yes
22 to 24	No	Yes	--	Yes	No
28 to 31	No	Yes	--	Yes	Yes
32 to 35	Yes	Yes	--	Yes	Yes
567 and 568	No	Yes	--	Yes	No
All Other Blocks	No	No	No	No	No

N6 Leq-AIF Master-January 2007 Proceed

SS WILSON ASSOCIATES

16/04/2015 14:07

Leq- AIF CALCULATIONS AND TYPICAL WINDOW GLAZING REQUIREMENTS (Using NRC/MOE Pocedure

File Number :

Project Name :

OUTDOORS

Table 2

Description : WA12-032 R1

Any Heavy Rail Line ?	No

Description : BRONTE GREEN, OAKVILLE

Record Number	1	2	3	4	5	6	7	8	9	10	11	12
Consider Record	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N
RECEPTOR	LOT 36	LOT 37	LOT 38	LOT 433	LOT 39	LOT 42	LOT 223	BLOCK 17	BLOCK 35	BLOCK 34	BLOCK 33	
FACE/ DIRECTION	NORTH	NORTH	NORTH	NORTH-EAST	SOUTH-WEST	SOUTH-WEST	WEST	NORTH	SOUTH	SOUTH	SOUTH	
LOCATION	Outdoor Living Area	Outdoor Living Area	Outdoor Living Area	Outdoor Living Area	Outdoor Living Area	Outdoor Living Area	Outdoor Living Area	Outdoor Living Area	Outdoor Living Area	Outdoor Living Area	Outdoor Living Area	
Source 1: Roads	**Road Traffic**		**OUTDOOR DAYTIME LEVELS**			OUTDOOR DAYTIME LEVELS			OUTDOOR DAYTIME LEVELS			
Leq Outdoors	70.00	68.00	67.00	56.00	69.00	66.00	67.00	67.00	69.00	64.00	61.00	
Partial angle of exposure, degrees	180	180	180	180	180	180	180	180	180	180	180	
Partial exposure adjust., dB												
Additional Adjustment, dB	-11.00	-10.00	-9.00		-10.00	-8.00	-9.00	-9.00	-10.00	-8.00	-6.00	
Additional Adjustment, dB												
Sub-Total Leq, dBA	**59.00**	**58.00**	**58.00**	**56.00**	**59.00**	**58.00**	**58.00**	**58.00**	**59.00**	**56.00**	**55.00**	
Source 2:	**Road Traffic**		**OUTDOOR DAYTIME LEVELS**			OUTDOOR DAYTIME LEVELS			OUTDOOR DAYTIME LEVELS			
Leq Daytime												
Partial angle of exposure, degrees	180	180	180	180	180	180	180	180	180	180	180	
Partial exposure adjust., dB												
Additional Adjustment, dB												
Additional Adjustment, dB												
Sub-Total Leq, dBA												
Source 3:	**Road Traffic**		**OUTDOOR DAYTIME LEVELS**			OUTDOOR DAYTIME LEVELS			OUTDOOR DAYTIME LEVELS			
Leq Daytime												
Partial angle of exposure, degrees	180	180	180	180	180	180	180	180	180	180	180	
Partial exposure adjust., dB												
Additional Adjustment, dB												
Additional Adjustment, dB												
Sub-Total Leq, dBA												
Source 4:	**Road Traffic**		**OUTDOOR DAYTIME LEVELS**			OUTDOOR DAYTIME LEVELS			OUTDOOR DAYTIME LEVELS			
Leq Daytime												
Partial angle of exposure, degrees	180	180	180	180	180	180	180	180	180	180	180	
Partial exposure adjust., dB												
Additional Adjustment, dB												
Additional Adjustment, dB												
Sub-Total Leq, dBA												
Sub-Tot. 4 Sources Leq, dBA	**59.00**	**58.00**	**58.00**	**56.00**	**59.00**	**58.00**	**58.00**	**58.00**	**59.00**	**56.00**	**55.00**	
Aircraft noise NEF/NEP												
Adjust.1												
Adjust.2												
Adjusted NEF/NEP												
Approx. Overall Combined Leq	*59*	*58*	*58*	*56*	*59*	*58*	*58*	*58*	*59*	*56*	*55*	
Overall Road and/or Rail and/or Stationary Sources, Leq (dBA)	***59***	***58***	***58***	***56***	***59***	***58***	***58***	***58***	***59***	***56***	***55***	
Aircraft Noise Only, NEF												
NOTES	3.2m High Sound Barrier	3.2m High Sound Barrier	3.0m High Sound Barrier	....	3.2m High Sound Barrier	2.8m High Sound Barrier	3.0m High Sound Barrier	3.0m High Sound Barrier	3.4m High Sound Barrier	2.8m High Sound Barrier	2.4m High Sound Barrier	

N6 Leq-AIF Master-January 2007 Proceed

SS WILSON ASSOCIATES

16/04/2015 13:51

Leq- AIF CALCULATIONS AND TYPICAL WINDOW GLAZING REQUIREMENTS

File Number :

Project Name :

DAYTIME

Table 3

(Using NRC/MOE Pocedures)

Description : WA12-032 R1

Description : BRONTE GREEN, OAKVILLE

Record Number	1	2	3	4	5	6	7	8	9	10	11	12
Consider Record	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N
RECEPTOR	LOT 36	LOT 37	LOT 38	LOT 433	LOT 39	LOT 223	BLOCK 3	BLOCK 35				
FACE/ DIRECTION	WEST	NORTH	NORTH	SOTUH-WEST	WEST	WEST	WEST	WEST				
LOCATION	Building Façade	Building Façade	Building Façade	Building Façade	Building Façade	Building Façade	Building Façade	Building Façade				
ROOM CLASSIFICATION	Living / Dining	Living / Dining	Living / Dining	Living / Dining	Living / Dining	Living / Dining	Living / Dining	Living / Dining				
Adjustm. to Criterion, dBA												
MOE Transportation Sources Daytime Leq Indoor Criteria, dBA	45	45	45	45	45	45	45	45				
Aircraft Indoor Criteria, NEF	5	5	5	5	5	5	5	5				
Source 1: Roads	**Road Traffic**		**DAYTIME LEVELS**			DAYTIME LEVELS			DAYTIME LEVELS			
Leq Daytime	72.00	70.00	67.00	56.00	72.00	72.00	65.00	72.00				
Partial angle of exposure, degrees	180	180	180	180	180	180	180	180				
Partial exposure adjust., dB												
Additional Adjustment, dB												
Sub-Total Leq, dBA	**72.00**	**70.00**	**67.00**	**56.00**	**72.00**	**72.00**	**65.00**	**72.00**				
Angular range of incidence (0,1,2,3)												
Adjusted AIF	34	32	29	18	34	34	27	34	#N/A	#N/A	#N/A	#N/A
Source 2:	**Road Traffic**		**DAYTIME LEVELS**			DAYTIME LEVELS			DAYTIME LEVELS			
Leq Daytime												
Partial angle of exposure, degrees	180	180	180	180	180	180	180	180				
Partial exposure adjust., dB												
Additional Adjustment, dB												
Sub-Total Leq, dBA												
Angular range of incidence (0,1,2,3)												
Adjusted AIF	-38	-38	-38	-38	-38	-38	-38	-38	#N/A	#N/A	#N/A	#N/A
Source 3:	**Road Traffic**		**DAYTIME LEVELS**			DAYTIME LEVELS			DAYTIME LEVELS			
Leq Daytime												
Partial angle of exposure, degrees	180	180	180	180	180	180	180	180				
Partial exposure adjust., dB												
Additional Adjustment, dB												
Sub-Total Leq, dBA												
Angular range of incidence (0,1,2,3)												
Adjusted AIF	-38	-38	-38	-38	-38	-38	-38	-38	#N/A	#N/A	#N/A	#N/A
Source 4:	**Road Traffic**		**DAYTIME LEVELS**			DAYTIME LEVELS			DAYTIME LEVELS			
Leq Daytime												
Partial angle of exposure, degrees	180	180	180	180	180	180	180	180				
Partial exposure adjust., dB												
Additional Adjustment, dB												
Sub-Total Leq, dBA												
Angular range of incidence (0,1,2,3)												
Adjusted AIF	-38	-38	-38	-38	-38	-38	-38	-38	#N/A	#N/A	#N/A	#N/A
Sub-Tot. 4 Sources Leq, dBA	**72.00**	**70.00**	**67.00**	**56.00**	**72.00**	**72.00**	**65.00**	**72.00**				
Aircraft noise NEF/NEP												
Adjust.1												
Adjust.2												
Adjusted NEF/NEP												
Approx. Overall Combined Leq	*72*	*70*	*67*	*56*	*72*	*72*	*65*	*72*				
Assumed Window/ Floor Area %	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0				
Assumed Total # of Components (Road, Rail, and Other Sources)	3	3	3	3	3	3	3	3				
Assumed Total # of Components Aircraft ONLY	3	3	3	3	3	3	3	3				
AIF of 4 Sources	*34*	*32*	*29*	*18*	*34*	*34*	*27*	*34*				
Aircraft AIF												
Combined AIF	34	32	29	18	34	34	27	34				
Openable or Fixed windows ?	Openable	Openable	Openable	Openable	Openable	Openable	Openable	Openable				
Regular or Laminated Glass	Laminated	Regular	Regular	Regular	Laminated	Laminated	Regular	Laminated				
Other Adjustment												
Final Adjusted AIF	31	32	29	18	31	31	27	31				
Minimum STC (Approx)	*32*	*33*	*30*	*19*	*32*	*32*	*28*	*32*				
Typical Minimum Double Glazing Alternatives	3(13)6 6(13)6	3(25)3 4(20)4 3(16)6 6(16)6	3(13)3 4(6)4	3(6)3	3(13)6 6(13)6	3(13)6 6(13)6	3(6)3	3(13)6 6(13)6				
NOTES	....	....	....	....	....	....	....	....				

SS WILSON ASSOCIATES

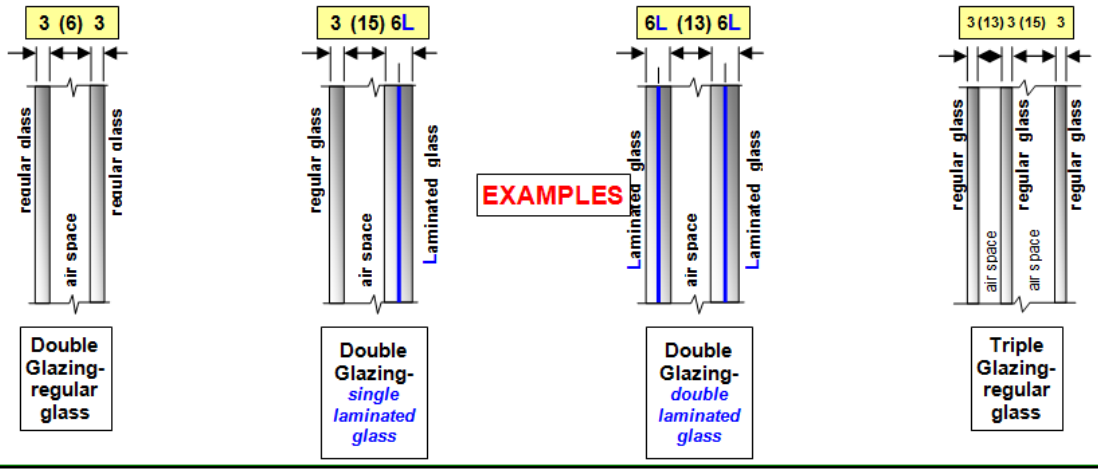
SUMMARY TABLE OF Leq- AIF CALCULATIONS AND TYPICAL WINDOW GLAZING REQUIREMENTS

DAYTIME
Table 3

- Windows must be well-fitted weatherstripped units.
- The interpane spacing shown in the tables are the minimum acceptable.
- Larger spacing for a given glazing thickness normally improves the performance.

RECEPTOR	FACE/DIRECTION	ROOM CLASSIFICATION	LOCATION	Openable or Fixed Window	Regular Strength or Laminated Glass	Combined AIF	Approx. Overall Combined Leq	Double Glazing Alternatives , mm	Triple Glazing Alternatives , mm	*Minimum STC (Approx)*
LOT 36	WEST	Living /Dining	Building Façade	Openable	Laminated	34	72	3(13)6 6(13)6		*32*
LOT 37	NORTH	Living /Dining	Building Façade	Openable	Regular	32	70	3(25)3 4(20)4 3(16)6 6(16)6		*33*
LOT 38	NORTH	Living /Dining	Building Façade	Openable	Regular	29	67	3(13)3 4(6)4		*30*
LOT 433	SOTUH-WEST	Living /Dining	Building Façade	Openable	Regular	18	56	3(6)3		*19*
LOT 39	WEST	Living /Dining	Building Façade	Openable	Laminated	34	72	3(13)6 6(13)6		*32*
LOT 223	WEST	Living /Dining	Building Façade	Openable	Laminated	34	72	3(13)6 6(13)6		*32*
BLOCK 3	WEST	Living /Dining	Building Façade	Openable	Regular	27	65	3(6)3		*28*
BLOCK 35	WEST	Living /Dining	Building Façade	Openable	Laminated	34	72	3(13)6 6(13)6		*32*

ABBREVIATIONS SPECIFIC TO THIS PROJECT : FF(Front Face), RF(Rear Face), RS(Right Side face), LS(Left Side face)



Double Glazing- regular glass

Double Glazing- *single laminated glass*

Double Glazing- *double laminated glass*

Triple Glazing- regular glass

N6 Leq-AIF Master-January 2007 Proceed

16/04/2015 13:51

File Number :

Project Name :

Description : WA12-032 R1

Description : BRONTE GREEN, OAKVILLE

SS WILSON ASSOCIATES

Leq- AIF CALCULATIONS AND TYPICAL WINDOW GLAZING REQUIREMENTS (Using NRC/MOE Poc

NIGHT TIME

Table 4

Record Number	1	2	3	4	5	6	7	8	9	10	11	12
Consider Record	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N
RECEPTOR NO.	LOT 36	LOT 37	LOT 38	LOT 433	LOT 39	LOT 223	BLOCK 3	BLOCK 35				
FACE/ DIRECTION	WEST	NORTH	NORTH	SOUTH-WEST	WEST	WEST	WEST	WEST				
LOCATION	Building Façade	Building Façade	Building Façade	Building Façade	Building Façade	Building Façade	Building Façade	Building Façade				
ROOM CLASSIFICATION	Bedroom	Bedroom	Bedroom	Bedroom	Bedroom	Bedroom	Bedroom	Bedroom				
Adjustm. to Criterion, dBA												
MOE Transportation Sources Night Leq Indoor Criteria, dBA	40	40	40	40	40	40	40	40				
Aircraft Indoor Criteria, NEF												
Source 1: Roads	**Road Traffic**		**NIGHT TIME LEVELS**			NIGHT TIME LEVELS			NIGHT TIME LEVELS			
Leq Night Time	64.00	62.00	60.00	49.00	64.00	64.00	58.00	64.00				
Partial angle of exposure, degrees	180	180	180	180	180	180	180	180				
Partial exposure adjust., dB												
Additional Adjustment, dB												
Sub-Total Leq, dBA	**64.00**	**62.00**	**60.00**	**49.00**	**64.00**	**64.00**	**58.00**	**64.00**				
Angular range of incidence (0,1,2,3)												
Adjusted AIF	31	29	27	16	31	31	25	31	#N/A	#N/A	#N/A	#N/A
Source 2:	**Road Traffic**		**NIGHT TIME LEVELS**			NIGHT TIME LEVELS			NIGHT TIME LEVELS			
Leq Night Time												
Partial angle of exposure, degrees	180	180	180	180	180	180	180	180				
Partial exposure adjust., dB												
Additional Adjustment, dB												
Sub-Total Leq, dBA												
Angular range of incidence (0,1,2,3)												
Adjusted AIF	-33	-33	-33	-33	-33	-33	-33	-33	#N/A	#N/A	#N/A	#N/A
Source 3:	**Road Traffic**		**NIGHT TIME LEVELS**			NIGHT TIME LEVELS			NIGHT TIME LEVELS			
Leq Night Time												
Partial angle of exposure, degrees	180	180	180	180	180	180	180	180				
Partial exposure adjust., dB												
Additional Adjustment, dB												
Sub-Total Leq, dBA												
Angular range of incidence (0,1,2,3)												
Adjusted AIF	-33	-33	-33	-33	-33	-33	-33	-33	#N/A	#N/A	#N/A	#N/A
Source 4:	**Road Traffic**		**NIGHT TIME LEVELS**			NIGHT TIME LEVELS			NIGHT TIME LEVELS			
Leq Night Time												
Partial angle of exposure, degrees	180	180	180	180	180	180	180	180				
Partial exposure adjust., dB												
Additional Adjustment, dB												
Sub-Total Leq, dBA												
Angular range of incidence (0,1,2,3)												
Adjusted AIF	-33	-33	-33	-33	-33	-33	-33	-33	#N/A	#N/A	#N/A	#N/A
Sub-Tot. 4 Sources Leq, dBA	**64.00**	**62.00**	**60.00**	**49.00**	**64.00**	**64.00**	**58.00**	**64.00**				
Aircraft noise NEF/NEP												
Adjust.1												
Adjust.2												
Adjusted NEF/NEP												
Approx. Overall Combined Leq	*64*	*62*	*60*	*49*	*64*	*64*	*58*	*64*				
Assumed Window/ Floor Area %	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0				
Assumed Total # of Components (Road, Rail, and Other Sources)	3	3	3	3	3	3	3	3				
Assumed Total # of Components Aircraft ONLY	3	3	3	3	3	3	3	3				
AIF of 4 Sources	*31*	*29*	*27*	*16*	*31*	*31*	*25*	*31*				
Aircraft AIF												
Combined AIF	31	29	27	16	31	31	25	31				
Openable or Fixed windows ?	Openable	Openable	Openable	Openable	Openable	Openable	Openable	Openable				
Regular or Laminated Glass	Regular	Regular	Regular	Regular	Regular	Regular	Regular	Regular				
Other Adjustment												
Final Adjusted AIF	31	29	27	16	31	31	25	31				
Minimum STC (Approx)	*30*	*28*	*26*	*15*	*30*	*30*	*24*	*30*				
Typical Minimum Double Glazing Alternatives	3(13)3 4(6)4	3(6)3	3(6)3	3(6)3	3(13)3 4(6)4	3(13)3 4(6)4	3(6)3	3(13)3 4(6)4				
NOTES												

SS WILSON ASSOCIATES

SUMMARY TABLE OF Leq- AIF CALCULATIONS AND TYPICAL WINDOW GLAZING REQUIREMENTS

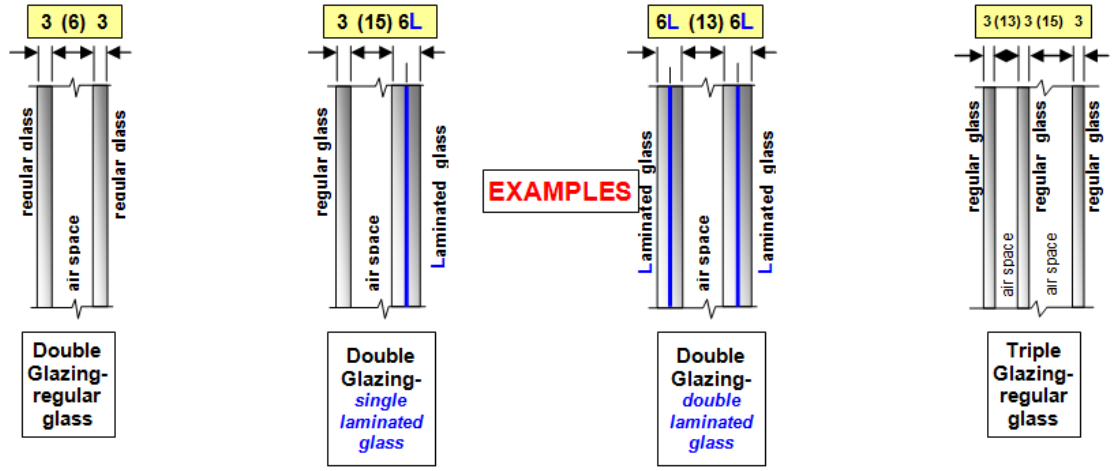
NIGHT TIME

Table 4

- Windows must be well-fitted weatherstripped units.
- The interpane spacing shown in the tables are the minimum acceptable.
- Larger spacing for a given glazing thickness normally improves the performance.

RECEPTOR NO.	FACE/DIRECTION	ROOM CLASSIFICATION	LOCATION	Openable or Fixed Window	Regular Strength or Laminated Glass	Combined AIF	Approx. Overall Combined Leq	Double Glazing Alternatives , mm	Triple Glazing Alternatives , mm	*Minimum STC (Approx)*
LOT 36	WEST	Bedroom	Building Façade	Openable	Regular	31	64	3(13)3 4(6)4		*30*
LOT 37	NORTH	Bedroom	Building Façade	Openable	Regular	29	62	3(6)3		*28*
LOT 38	NORTH	Bedroom	Building Façade	Openable	Regular	27	60	3(6)3		*26*
LOT 433	SOUTH-WEST	Bedroom	Building Façade	Openable	Regular	16	49	3(6)3		*15*
LOT 39	WEST	Bedroom	Building Façade	Openable	Regular	31	64	3(13)3 4(6)4		*30*
LOT 223	WEST	Bedroom	Building Façade	Openable	Regular	31	64	3(13)3 4(6)4		*30*
BLOCK 3	WEST	Bedroom	Building Façade	Openable	Regular	25	58	3(6)3		*24*
BLOCK 35	WEST	Bedroom	Building Façade	Openable	Regular	31	64	3(13)3 4(6)4		*30*

ABBREVIATIONS SPECIFIC TO THIS PROJECT : FF(Front Face), RF(Rear Face), RS(Right Side face), LS(Left Side face)



FIGURES

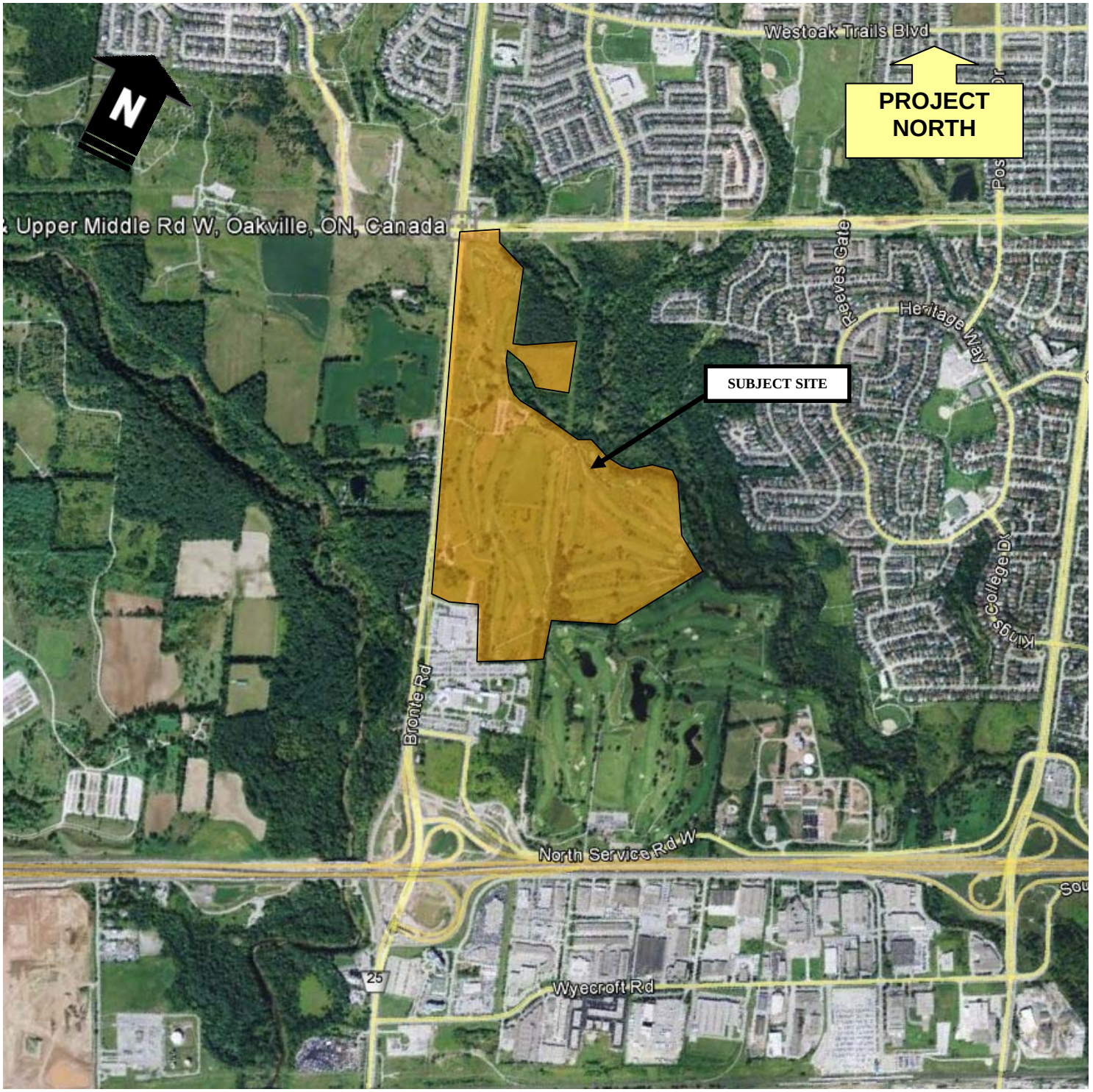


FIGURE 1
KEY PLAN

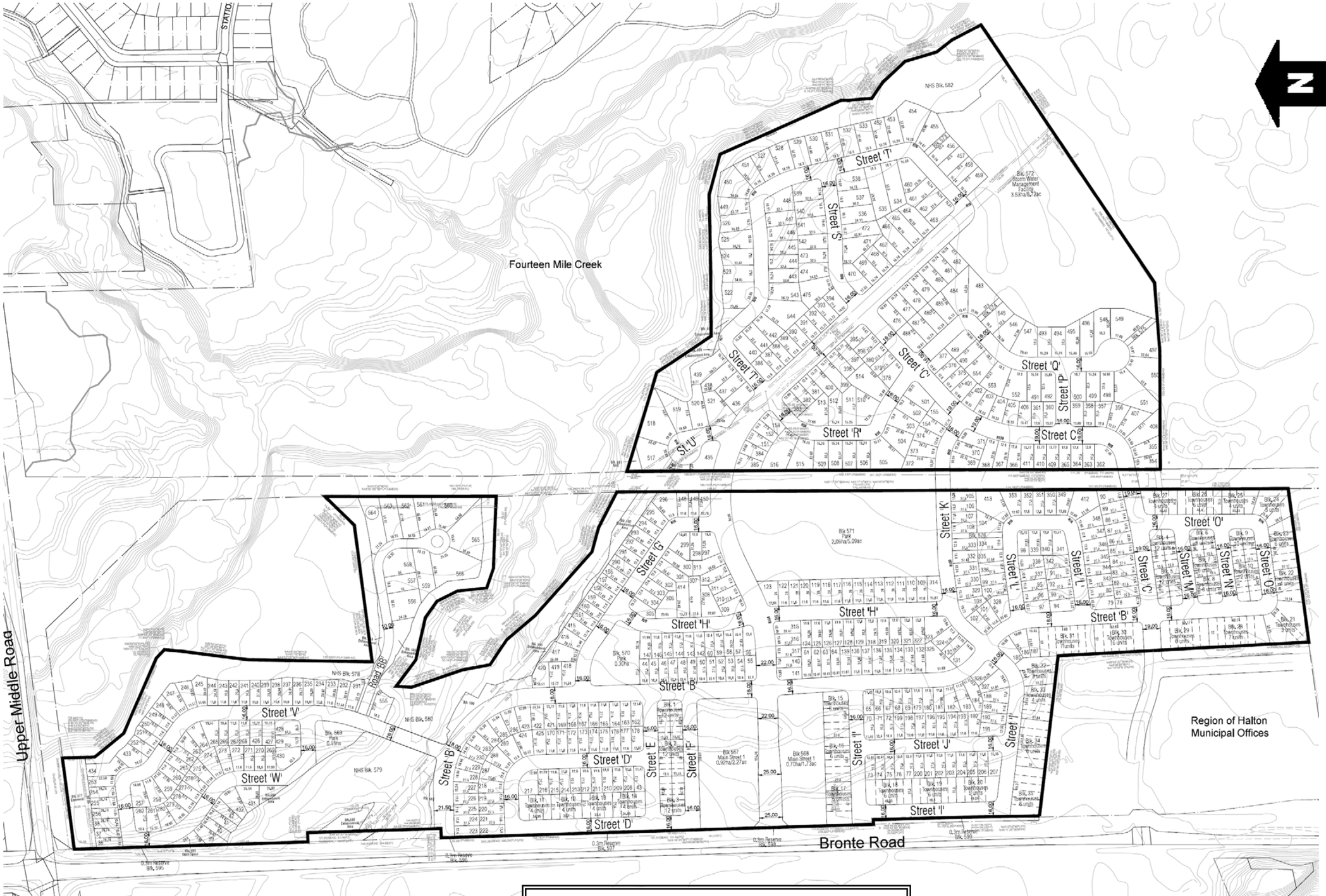


FIGURE 2
PROPOSED DRAFT PLAN

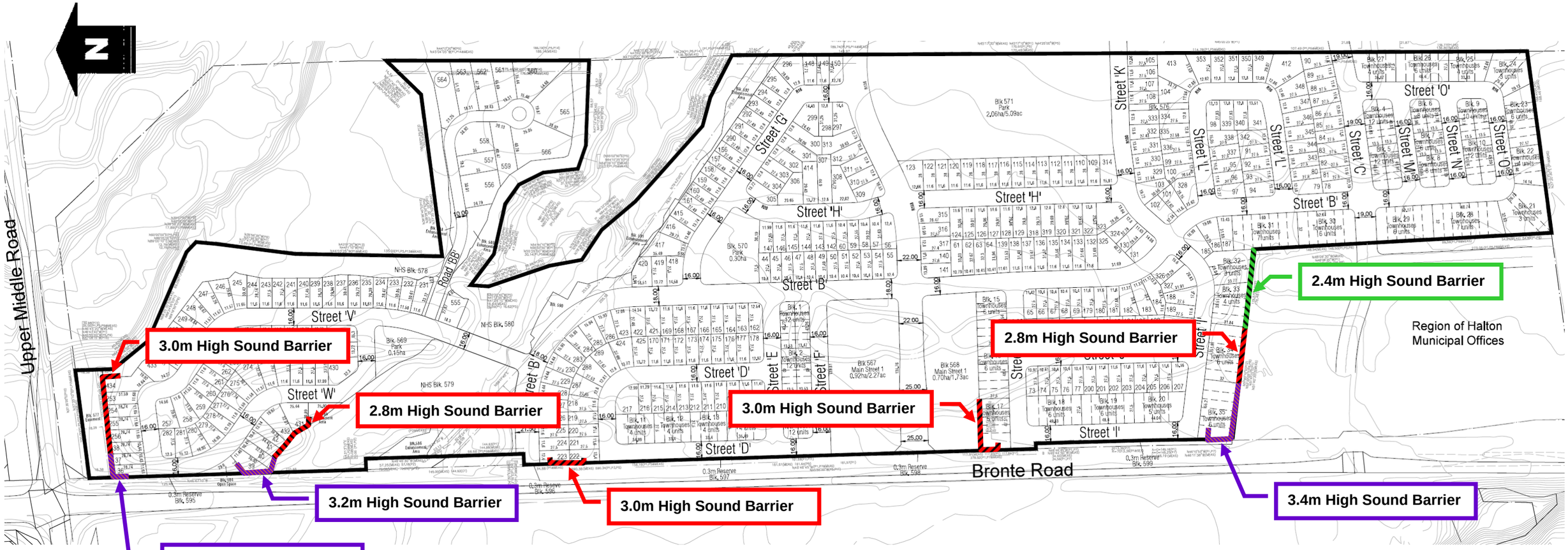


FIGURE 3.1
SCHEMATIC BARRIER ALIGNMENTS
FOR TRANSPORTATION NOISE

LEGEND

- Mandatory Air Conditioning and Warning Clause
- Provisions for Air Conditioning and Warning Clause

FIGURE 3.2
MINIMUM INDOOR ATTENUATION REQUIREMENTS
(MANDATORY A/C AND PROVISIONS FOR A/C)

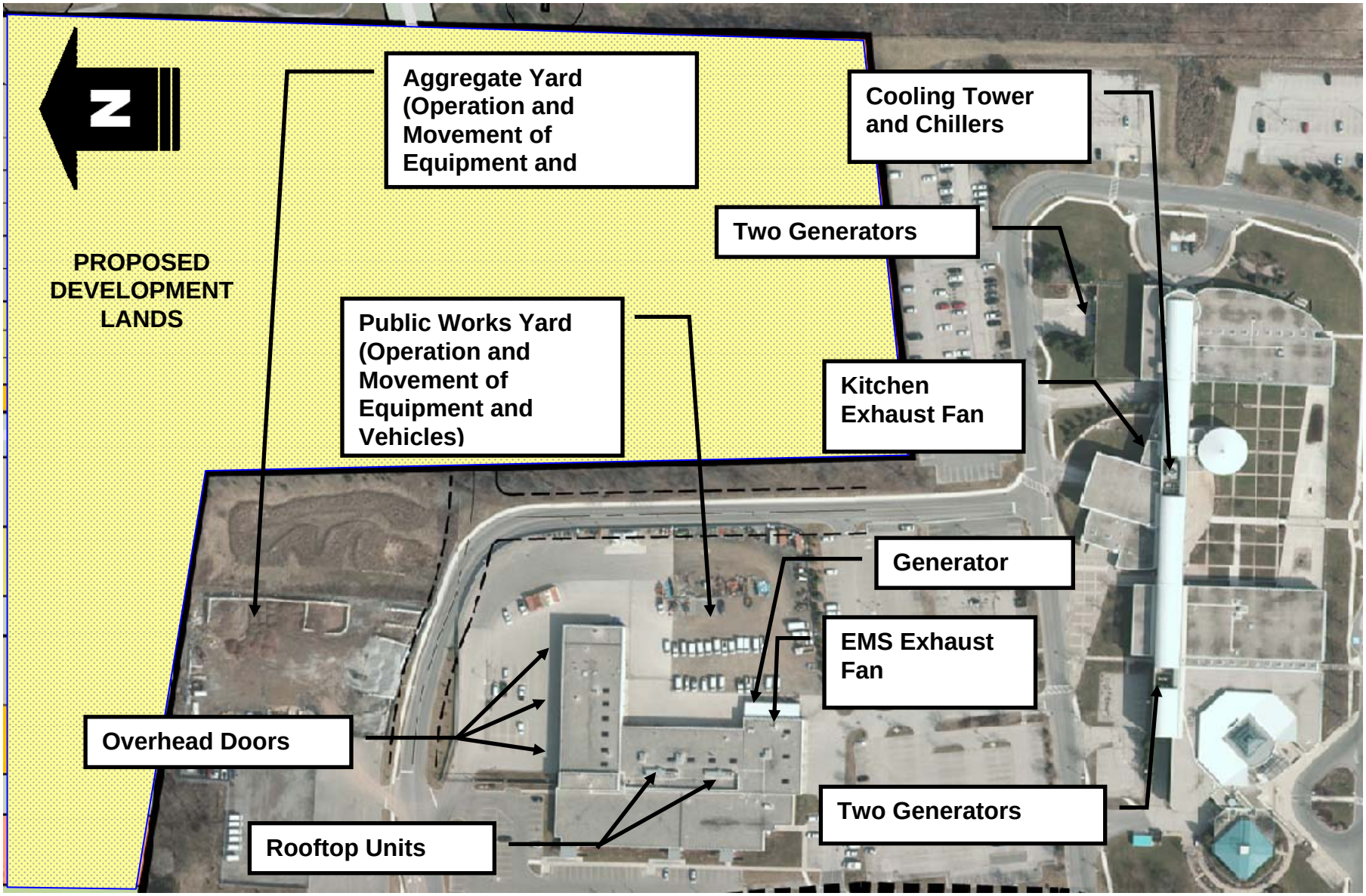


FIGURE 4
SOURCES OF STATIONARY NOISE FROM HALTON HQ

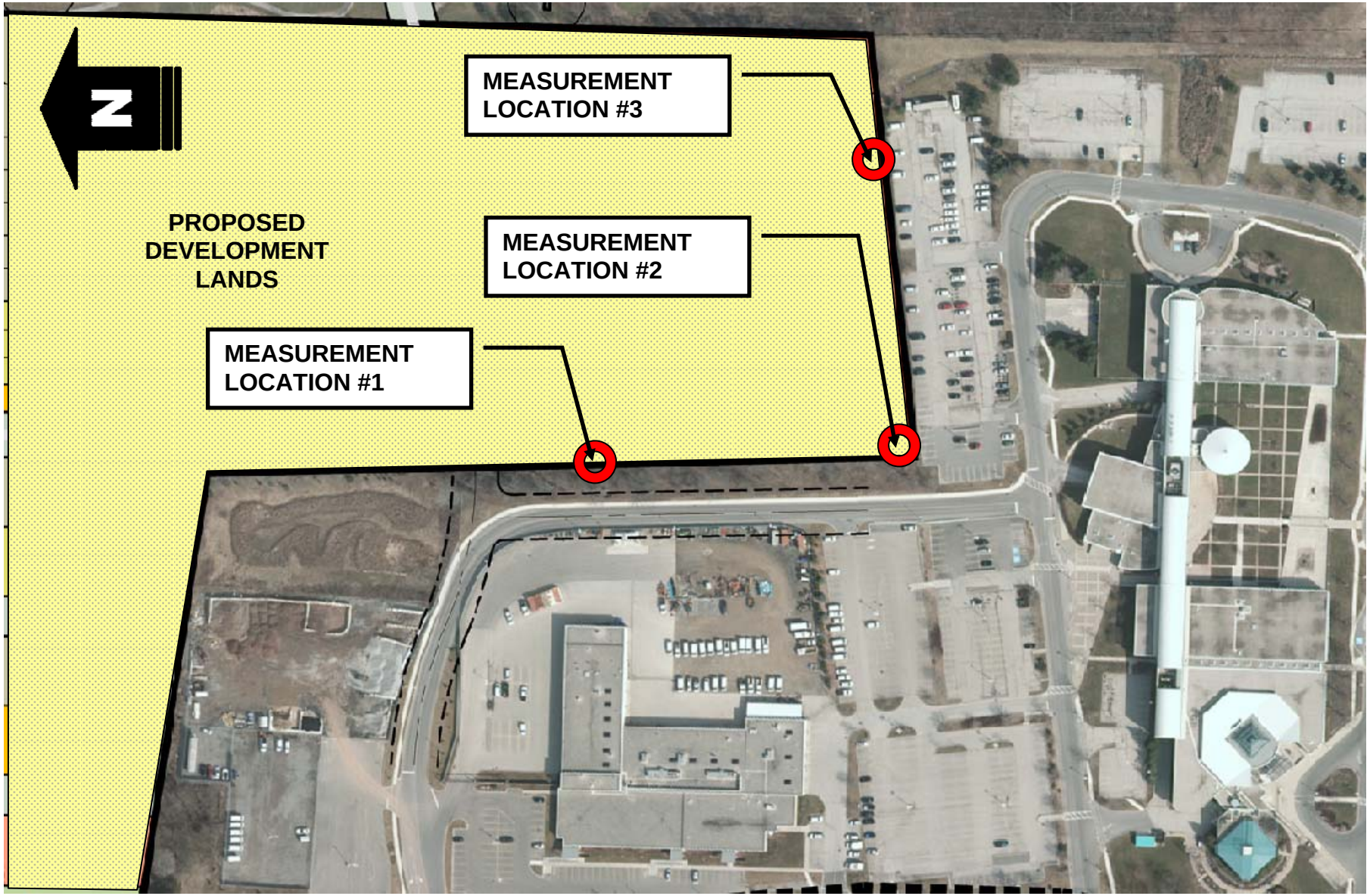


FIGURE 5
LOCATIONS OF LONG TERM MEASUREMENTS OF THE STATIONARY SOURCES OF NOISE

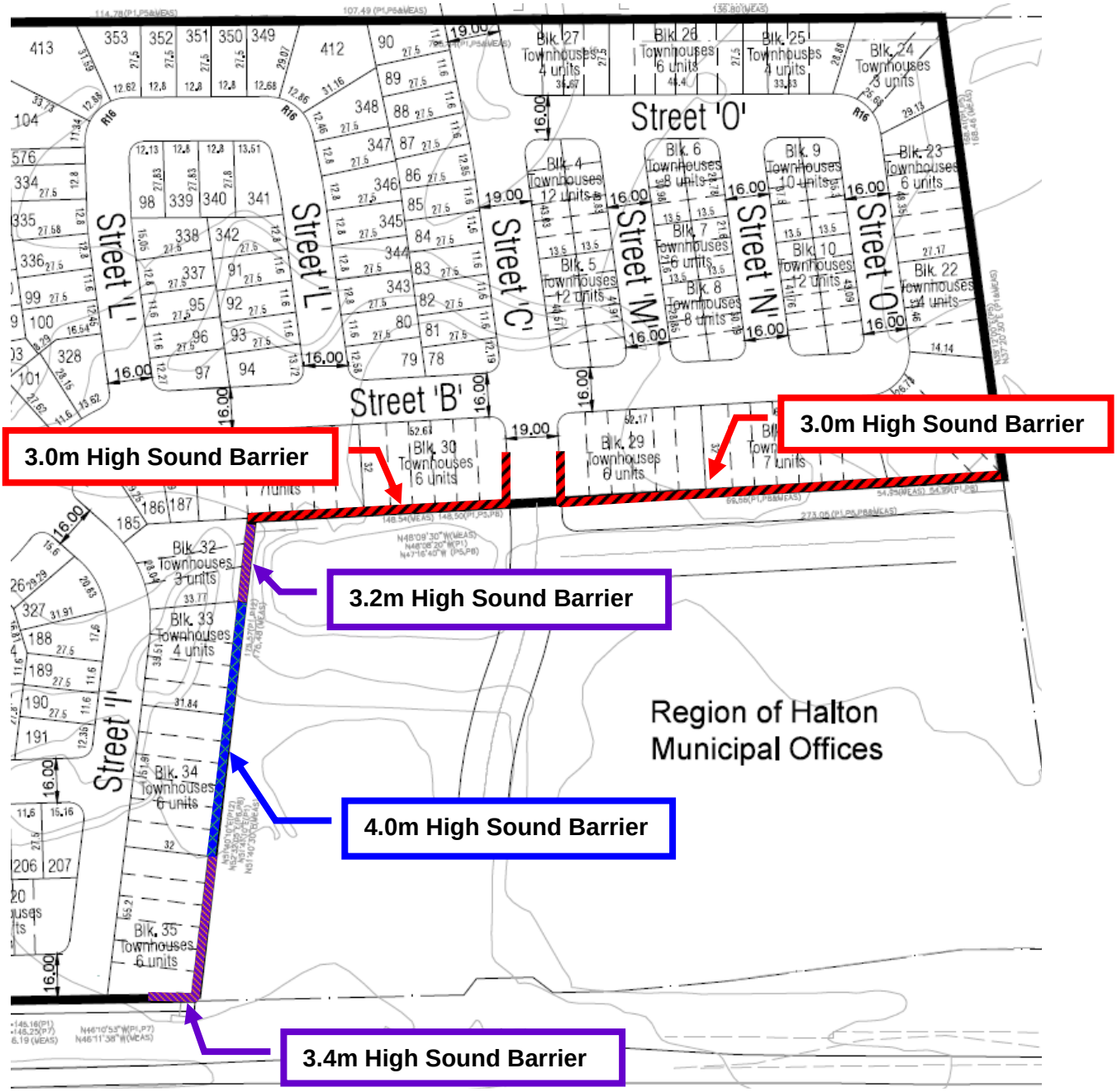


FIGURE 6.1
SCHEMATIC BARRIER ALIGNMENTS
FOR STATIONARY NOISE

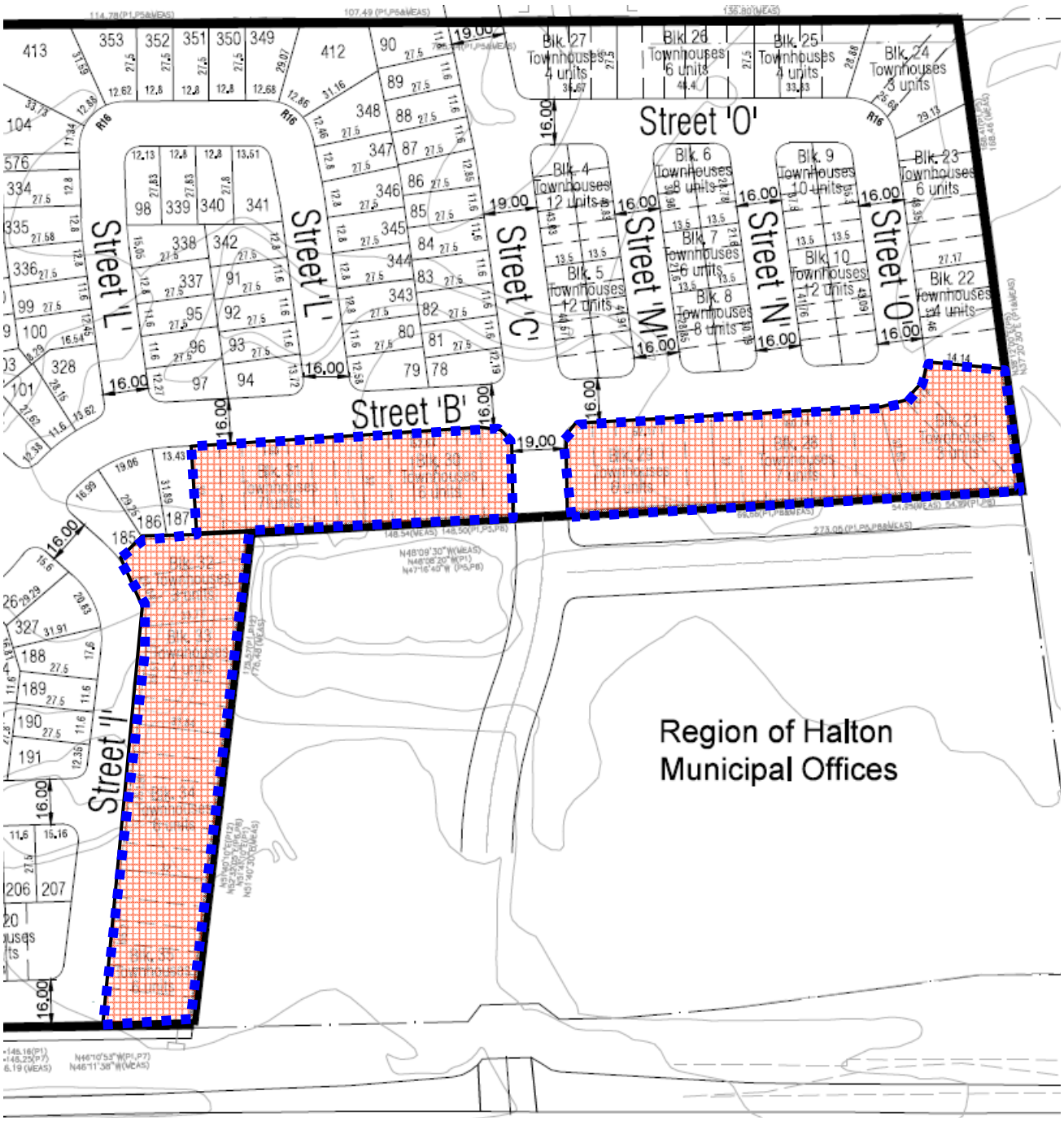


FIGURE 6.2
LOCATION OF DWELLINGS RECOMMENDED TO BE SUBJECT TO DESIGN CONTROL FOR STATIONARY NOISE REDUCTION PURPOSES

APPENDIX A

ROAD TRAFFIC DATA

From: Dan Cherepacha
To: SS Wilson Associates - Info; "Mike Baldesarra"
Subject: Re: Bronte Green - Noise Shopping List
Date: Wednesday, October 31, 2012 12:23:06 PM

Traffic data for Bronte Green.

Existing Bronte Road ROW seems to vary. Regional OP will designate future requirement.

Based on an 8 hour turning movement count, existing AADT is estimated to be 28,500 vpd.

2031 AADT is forecast to be 50,000 vpd.

Existing truck percentages are 2.5% medium trucks and 3.8% heavy trucks. Assume same for 2031.

Current posted speed is 60 km/h, which can be expected to remain in place.

Dan Cherepacha

Read Voorhees and Associates
Phone 416-445-4360 (ext 1)
Fax 416-445-4809

email danc@rva.ca

Traffic data for Upper Middle Road.

Existing Upper Middle Road ROW appears to be 70 metres, but this includes a hydro corridor. Regional OP will designate future requirement, but doubtful if there would be any change on the south side.

Based on the 8 hour turning movement count, existing AADT is estimated to be 10,870 vpd.2031

AADT is forecast to be 27,850 vpd.

Existing truck percentages are 1.7% medium trucks and 1.7% heavy trucks. Assume same for 2031.

Current posted speed is 60 km/h, which can be expected to remain in place.

Dan Cherepacha

Read Voorhees and Associates Phone 416-445-4360 (ext 1)
Fax 416-445-4809

email danc@rva.ca

----- ORIGINAL MESSAGE ----

Prepared For: Halton Region

Prepared By: *PYRAMID* Traffic Inc. Site ID: 102501

Location: REG. RD. #25 bw QEW WB & Upper Middle Interval: 15 min.

Start Date: Thursday Sep 15, 2011

Period Ending	Channel 1 NB	Channel 2 SB	Hourly Summary	Period Ending	Channel 1 NB	Channel 2 SB	Hourly Summary
0:15	32	26		12:15	239	183	1532
0:30	43	20		12:30	242	175	1610
0:45	34	12		12:45	192	163	1581
1:00	16	15	198	13:00	185	198	1577
1:15	16	9	165	13:15	185	182	1522
1:30	18	7	127	13:30	178	187	1470
1:45	15	15	111	13:45	194	174	1483
2:00	12	8	100	14:00	188	184	1472
2:15	16	6	97	14:15	174	200	1479
2:30	11	6	89	14:30	197	195	1506
2:45	21	4	84	14:45	182	191	1511
3:00	8	5	77	15:00	222	225	1586
3:15	16	7	78	15:15	209	211	1632
3:30	11	9	81	15:30	292	210	1742
3:45	6	5	67	15:45	286	212	1867
4:00	9	11	74	16:00	259	222	1901
4:15	5	9	65	16:15	314	270	2065
4:30	11	8	64	16:30	329	356	2248
4:45	8	11	72	16:45	342	428	2520
5:00	16	19	87	17:00	373	441	2853
5:15	22	38	133	17:15	406	341	3016
5:30	37	44	195	17:30	456	312	3099
5:45	43	81	300	17:45	440	338	3107
6:00	54	82	401	18:00	356	316	2965
6:15	56	118	515	18:15	294	272	2784
6:30	81	157	672	18:30	299	228	2543
6:45	94	205	847	18:45	236	214	2215
7:00	119	298	1128	19:00	224	211	1978
7:15	163	209	1326	19:15	178	179	1769
7:30	211	327	1626	19:30	174	158	1574
7:45	214	445	1986	19:45	180	159	1463
8:00	179	411	2159	20:00	172	138	1338
8:15	199	398	2384	20:15	180	129	1290
8:30	175	409	2430	20:30	137	127	1222
8:45	183	390	2344	20:45	141	111	1135
9:00	164	387	2305	21:00	115	81	1021
9:15	140	264	2112	21:15	133	76	921
9:30	162	235	1925	21:30	116	76	849
9:45	156	213	1721	21:45	114	87	798
10:00	118	216	1504	22:00	102	64	768
10:15	119	192	1411	22:15	78	68	705
10:30	150	186	1350	22:30	67	60	640
10:45	156	156	1293	22:45	79	53	571
11:00	136	166	1261	23:00	93	41	539
11:15	150	180	1280	23:15	58	38	489
11:30	178	161	1283	23:30	64	45	471
11:45	176	208	1355	23:45	55	49	443
12:00	210	177	1440	0:00	56	43	408

AM Peak: 2430 PM Peak: 3107 24 HR VOLUME: 29140

Prepared For: Halton Region

Prepared By: *PYRAMID* Traffic Inc.

Location: REG. RD. #38 bw Postmaster Drive and Third Ln

Start Date: Thursday Oct 20, 2011

Site ID: 103812

Interval: 15 min.

Period Ending	Channel 1 EB	Channel 2 WB	Hourly Summary	Period Ending	Channel 1 EB	Channel 2 WB	Hourly Summary
0:15	6	19		12:15	124	111	865
0:30	3	22		12:30	88	108	865
0:45	4	18		12:45	110	102	847
1:00	5	5	82	13:00	82	113	838
1:15	6	8	71	13:15	94	93	790
1:30	2	8	56	13:30	103	100	797
1:45	1	7	42	13:45	94	129	808
2:00	4	3	39	14:00	71	107	791
2:15	4	5	34	14:15	78	106	788
2:30	3	7	34	14:30	112	118	815
2:45	5	2	33	14:45	111	113	816
3:00	5	2	33	15:00	146	153	937
3:15	3	4	31	15:15	103	198	1054
3:30	1	1	23	15:30	95	169	1088
3:45	3	4	23	15:45	104	187	1155
4:00	1	2	19	16:00	107	207	1170
4:15	4	2	18	16:15	109	182	1160
4:30	3	0	19	16:30	131	202	1229
4:45	8	2	22	16:45	131	209	1278
5:00	8	3	30	17:00	141	221	1326
5:15	15	4	43	17:15	148	264	1447
5:30	16	8	64	17:30	151	268	1533
5:45	25	5	84	17:45	116	244	1553
6:00	33	8	114	18:00	154	195	1540
6:15	42	7	144	18:15	158	210	1496
6:30	67	15	202	18:30	137	197	1411
6:45	96	20	288	18:45	106	175	1332
7:00	133	25	405	19:00	118	139	1240
7:15	129	34	519	19:15	101	152	1125
7:30	170	32	639	19:30	105	159	1055
7:45	255	53	831	19:45	86	134	994
8:00	287	100	1060	20:00	81	140	958
8:15	328	157	1382	20:15	61	128	894
8:30	176	128	1484	20:30	76	103	809
8:45	193	95	1464	20:45	59	109	757
9:00	221	99	1397	21:00	55	91	682
9:15	139	92	1143	21:15	58	95	646
9:30	123	67	1029	21:30	60	81	608
9:45	135	89	965	21:45	53	80	573
10:00	129	85	859	22:00	47	57	531
10:15	109	49	786	22:15	45	71	494
10:30	85	75	756	22:30	24	51	428
10:45	85	69	686	22:45	29	57	381
11:00	103	79	654	23:00	32	45	354
11:15	94	96	686	23:15	26	37	301
11:30	104	92	722	23:30	36	37	299
11:45	119	111	798	23:45	17	32	262
12:00	96	108	820	0:00	27	36	248

AM Peak:	1484	PM Peak:	1553	24 HR VOLUME:	16127

APPENDIX B

SAMPLE SOUND LEVEL CALCULATIONS

```
STAMSON 5.0        NORMAL REPORT        Date: 16-04-2015 14:26:51
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: nr1b60.te            Time Period: Day/Night 16/8 hours
```
Description: LOT 36 Sound Level at OLA without Sound Barrier

```
Road data, segment # 1: Bronte Road (day/night)
-----------------------------------------------
Car traffic volume  : 43102/3748  veh/TimePeriod  *
Medium truck volume :  1150/100   veh/TimePeriod  *
Heavy truck volume  :  1748/152   veh/TimePeriod  *
Posted speed limit  :    60 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):  50000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   2.50
    Heavy Truck  % of Total Volume     :   3.80
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: Bronte Road (day/night)
---------------------------------------------
Angle1   Angle2           : -25.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  35.00 / 35.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -25.00 deg   Angle2 : 90.00 deg
Barrier height            :   0.00 m
Barrier receiver distance :   6.00 / 6.00   m
Source elevation          : 131.25 m
Receiver elevation        : 131.32 m
Barrier elevation         : 131.32 m
Reference angle           :   0.00


Road data, segment # 2: Upper Middle (day/night)
------------------------------------------------
Car traffic volume  : 24751/2152  veh/TimePeriod  *
Medium truck volume :   436/38    veh/TimePeriod  *
Heavy truck volume  :   436/38    veh/TimePeriod  *
Posted speed limit  :    60 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):  27850
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   1.70
    Heavy Truck  % of Total Volume     :   1.70
    Day (16 hrs) % of Total Volume     :  92.00
```

```
Data for Segment # 2: Upper Middle (day/night)
------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  60.00 / 60.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :   0.00 m
Barrier receiver distance :   8.00 / 10.00  m
Source elevation          : 130.88 m
Receiver elevation        : 131.32 m
Barrier elevation         : 131.32 m
Reference angle           :   0.00


Results segment # 1: Bronte Road (day)
--------------------------------------

Source height = 1.40 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.40 !        1.50 !        1.47 !       132.79

ROAD (0.00 + 68.85 + 0.00) = 68.85 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -25     90   0.00  74.48   0.00  -3.68  -1.95   0.00   0.00  -0.31  68.54*
   -25     90   0.00  74.48   0.00  -3.68  -1.95   0.00   0.00   0.00  68.85
-------------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 68.85 dBA


Results segment # 2: Upper Middle (day)
---------------------------------------

Source height = 1.14 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.14 !        1.50 !        1.39 !       132.71

ROAD (0.00 + 58.42 + 0.00) = 58.42 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.66  69.87   0.00  -9.99  -1.46   0.00   0.00  -0.65  57.77*
   -90     90   0.66  69.87   0.00  -9.99  -1.46   0.00   0.00   0.00  58.42
-------------------------------------------------------------------------------
```

```
 * Bright Zone !

Segment Leq : 58.42 dBA

Total Leq All Segments: 69.23 dBA


Results segment # 1: Bronte Road (night)
----------------------------------------

Source height = 1.40 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.40 !        4.50 !        3.96 !       135.28

ROAD (0.00 + 61.25 + 0.00) = 61.25 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -25     90   0.00  66.88   0.00  -3.68  -1.95   0.00   0.00  -0.05  61.21*
   -25     90   0.00  66.88   0.00  -3.68  -1.95   0.00   0.00   0.00  61.25
-------------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 61.25 dBA


Results segment # 2: Upper Middle (night)
-----------------------------------------

Source height = 1.14 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.14 !        4.50 !        3.87 !       135.19

ROAD (0.00 + 51.44 + 0.00) = 51.44 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.58  62.28   0.00  -9.52  -1.32   0.00   0.00  -0.10  51.34*
   -90     90   0.58  62.28   0.00  -9.52  -1.32   0.00   0.00   0.00  51.44
-------------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 51.44 dBA

Total Leq All Segments: 61.68 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 69.23
                           (NIGHT): 61.68
```

```
STAMSON 5.0        NORMAL REPORT        Date: 16-04-2015 14:26:34
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: nr1b60.te            Time Period: Day/Night 16/8 hours
```
Description: LOT 36 Sound Level at OLA with a 3.2m High Sound Barrier

```
Road data, segment # 1: Bronte Road (day/night)
-----------------------------------------------
Car traffic volume  : 43102/3748  veh/TimePeriod  *
Medium truck volume :  1150/100   veh/TimePeriod  *
Heavy truck volume  :  1748/152   veh/TimePeriod  *
Posted speed limit  :    60 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):  50000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   2.50
    Heavy Truck  % of Total Volume     :   3.80
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: Bronte Road (day/night)
---------------------------------------------
Angle1   Angle2           : -25.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  35.00 / 35.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -25.00 deg   Angle2 : 90.00 deg
Barrier height            :   3.20 m
Barrier receiver distance :   6.00 / 6.00   m
Source elevation          : 131.25 m
Receiver elevation        : 131.32 m
Barrier elevation         : 131.32 m
Reference angle           :   0.00


Road data, segment # 2: Upper Middle (day/night)
------------------------------------------------
Car traffic volume  : 24751/2152  veh/TimePeriod  *
Medium truck volume :   436/38    veh/TimePeriod  *
Heavy truck volume  :   436/38    veh/TimePeriod  *
Posted speed limit  :    60 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):  27850
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   1.70
    Heavy Truck  % of Total Volume     :   1.70
    Day (16 hrs) % of Total Volume     :  92.00
```

```
Data for Segment # 2: Upper Middle (day/night)
------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  60.00 / 60.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :   3.20 m
Barrier receiver distance :   8.00 / 10.00  m
Source elevation          : 130.88 m
Receiver elevation        : 131.32 m
Barrier elevation         : 131.32 m
Reference angle           :   0.00


Results segment # 1: Bronte Road (day)
--------------------------------------

Source height = 1.40 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.40 !        1.50 !        1.47 !       132.79

ROAD (0.00 + 58.53 + 0.00) = 58.53 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -25     90   0.00  74.48   0.00  -3.68  -1.95   0.00   0.00 -10.32  58.53
-------------------------------------------------------------------------------

Segment Leq : 58.53 dBA


Results segment # 2: Upper Middle (day)
---------------------------------------

Source height = 1.14 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.14 !        1.50 !        1.39 !       132.71

ROAD (0.00 + 50.57 + 0.00) = 50.57 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.48  69.87   0.00  -8.90  -1.13   0.00   0.00  -9.26  50.57
-------------------------------------------------------------------------------

Segment Leq : 50.57 dBA

Total Leq All Segments: 59.17 dBA
```

```
Results segment # 1: Bronte Road (night)
-----------------------------------------

Source height = 1.40 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.40 !        4.50 !        3.96 !       135.28

ROAD (0.00 + 61.25 + 0.00) = 61.25 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -25     90   0.00  66.88   0.00  -3.68  -1.95   0.00   0.00  -2.14  59.12*
   -25     90   0.00  66.88   0.00  -3.68  -1.95   0.00   0.00   0.00  61.25
-------------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 61.25 dBA


Results segment # 2: Upper Middle (night)
-----------------------------------------

Source height = 1.14 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.14 !        4.50 !        3.87 !       135.19

ROAD (0.00 + 51.44 + 0.00) = 51.44 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.39  62.28   0.00  -8.36  -0.96   0.00   0.00  -3.99  48.97*
   -90     90   0.58  62.28   0.00  -9.52  -1.32   0.00   0.00   0.00  51.44
-------------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 51.44 dBA

Total Leq All Segments: 61.68 dBA


TOTAL Leq FROM ALL SOURCES (DAY): 59.17
                           (NIGHT): 61.68
```

```
STAMSON 5.0        NORMAL REPORT        Date: 16-04-2015 14:25:14
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: nr1dn.te             Time Period: Day/Night 16/8 hours
```
Description: LOT 32 Sound Level at Building Facade (Daytime and Nighttime)

```
Road data, segment # 1: Bronte Road (day/night)
-----------------------------------------------
Car traffic volume  : 43102/3748  veh/TimePeriod  *
Medium truck volume :  1150/100   veh/TimePeriod  *
Heavy truck volume  :  1748/152   veh/TimePeriod  *
Posted speed limit  :    60 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):  50000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   2.50
    Heavy Truck  % of Total Volume     :   3.80
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: Bronte Road (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  :  30.00 / 30.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Road data, segment # 2: Upper Middle (day/night)
------------------------------------------------
Car traffic volume  : 24751/2152  veh/TimePeriod  *
Medium truck volume :   436/38    veh/TimePeriod  *
Heavy truck volume  :   436/38    veh/TimePeriod  *
Posted speed limit  :    60 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):  27850
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   1.70
    Heavy Truck  % of Total Volume     :   1.70
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 2: Upper Middle (day/night)
----------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
```

```
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  63.00 / 63.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      0       (Define your own alpha.)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :   0.00 m
Barrier receiver distance :   8.00 / 8.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Alpha                     :   0.33
Reference angle           :   0.00


Results segment # 1: Bronte Road (day)
--------------------------------------

Source height = 1.40 m

ROAD (0.00 + 71.47 + 0.00) = 71.47 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  74.48   0.00  -3.01   0.00   0.00   0.00   0.00  71.47
-------------------------------------------------------------------------------

Segment Leq : 71.47 dBA


Results segment # 2: Upper Middle (day)
---------------------------------------

Source height = 1.14 m

ROAD (0.00 + 60.75 + 0.00) = 60.75 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.33  69.87   0.00  -8.29  -0.83   0.00   0.00   0.00  60.75
-------------------------------------------------------------------------------

Segment Leq : 60.75 dBA

Total Leq All Segments: 71.82 dBA


Results segment # 1: Bronte Road (night)
----------------------------------------

Source height = 1.40 m

ROAD (0.00 + 63.87 + 0.00) = 63.87 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  66.88   0.00  -3.01   0.00   0.00   0.00   0.00  63.87
-------------------------------------------------------------------------------

Segment Leq : 63.87 dBA


Results segment # 2: Upper Middle (night)
-----------------------------------------
```

Source height = 1.14 m

ROAD (0.00 + 53.16 + 0.00) = 53.16 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.33	62.28	0.00	-8.29	-0.83	0.00	0.00	0.00	53.16

Segment Leq : 53.16 dBA

Total Leq All Segments: 64.22 dBA

TOTAL Leq FROM ALL SOURCES (DAY): **71.82**
(NIGHT): **64.22**

APPENDIX C

SAMPLE SOUND LEVEL MEASUREMENTS

MSThird Octave Bands Sound Levels 6 NC , August 2007 Proceed

13/11/2012 16:06

SS WILSON ASSOCIATES

***Consulting Engineers*, Richmond Hill, Ontario**

MEASURED/PREDICTED 1/3 OCTAVE BANDS SOUND LEVELS

File No. : WA12-032

Project : Saw Whet Lands

Source Name: EMS Fan

SLM Mem.Code: M-50

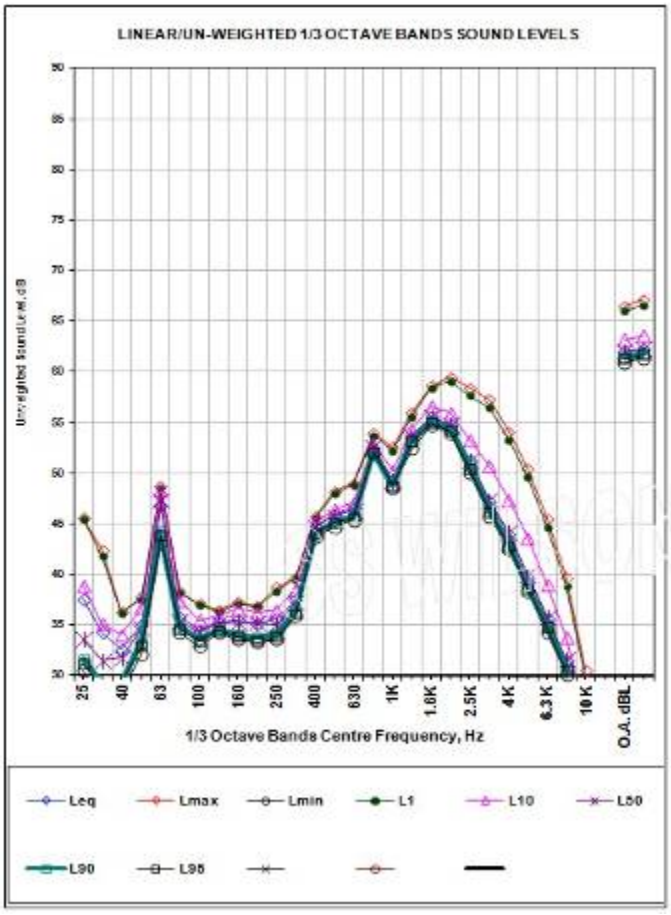
Other Data: 30m from exhaust

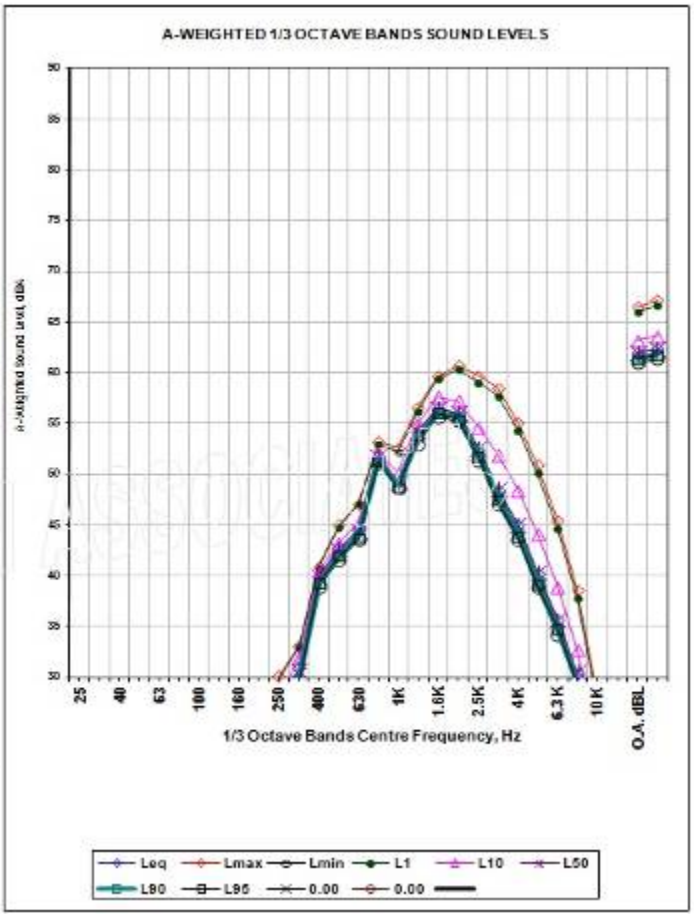
.....

.....

.....

1/3 OCTAVE BANDS





SS WILSON ASSOCIATES
***Consulting Engineers*, Richmond Hill, Ontario**

MEASURED/PREDICTED 1/3 OCTAVE BANDS SOUND LEVELS

File No. : WA12-032
Project : Saw Whet / Bronte Green Subdivision

Source Name: Penthouse Louver
Source Tag/ID: .....
Source Location: Rooftop, middle of the building (approx.)
Source Type: HVAC
Other Description: .....

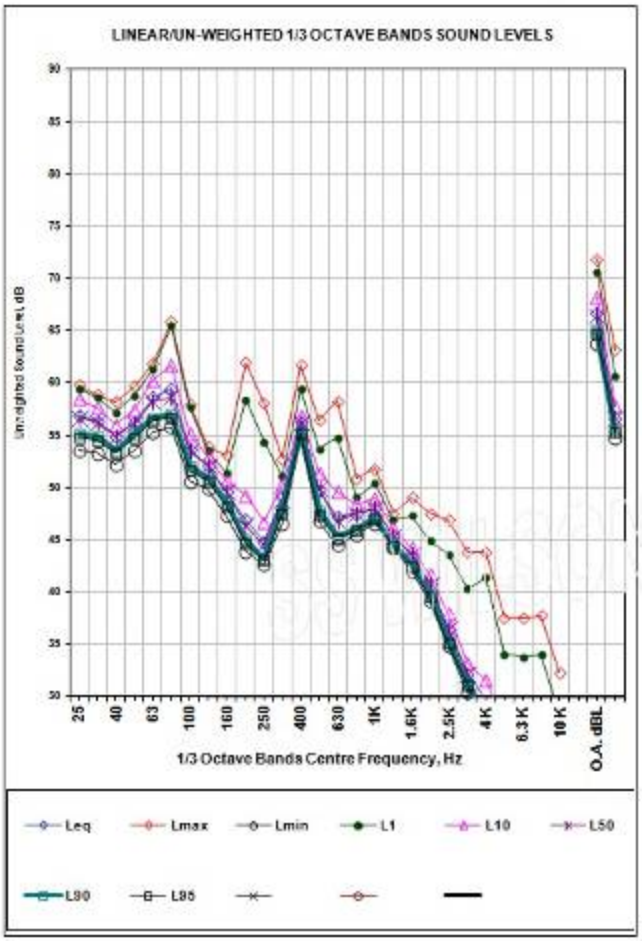
Opening/Duct Size: .....
Opening Direction: .....
Opening/Source Ht.: .....
Above: .....

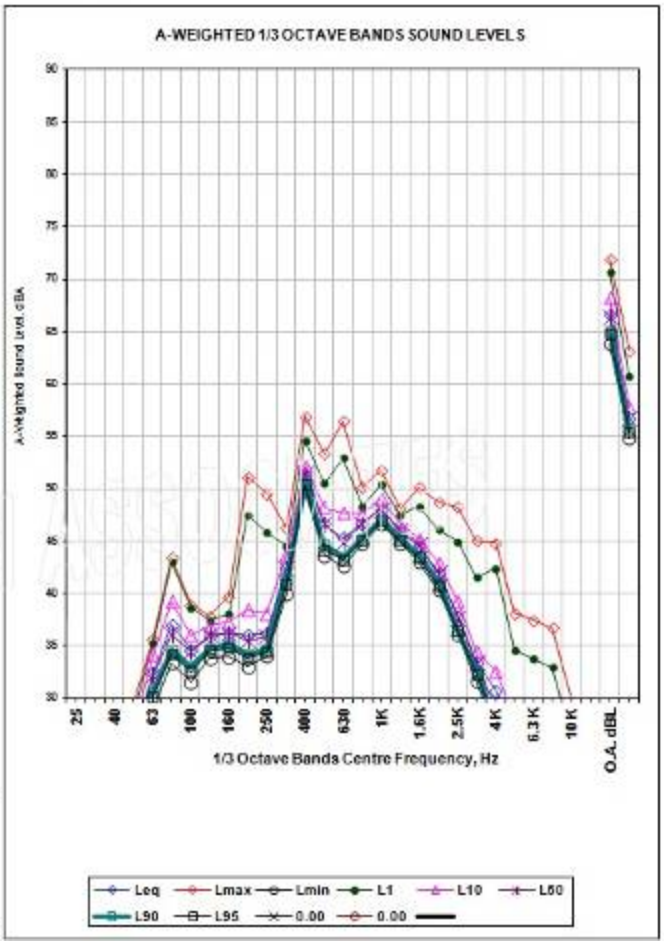
Measurement Date: October 26, 2012 (5:45am!)
SLM Mem.Code: M-01

Tonality,..etc .....
Condition of Source: .....

Other Data: Ambient Present
Use L90
56m, N of middle entrance
.....

1/3 OCTAVE BANDS





SS WILSON ASSOCIATES
***Consulting Engineers*, Richmond Hill, Ontario**

MEASURED/PREDICTED 1/3 OCTAVE BANDS SOUND LEVELS

File No. : WA12-032
Project : Saw Whet / Bronte Green Subdivision

Source Name: Public Works Generator
Source Tag/ID: .....
Source Location: Rooftop, west die of the building
Source Type: HVAC
Other Description: .....

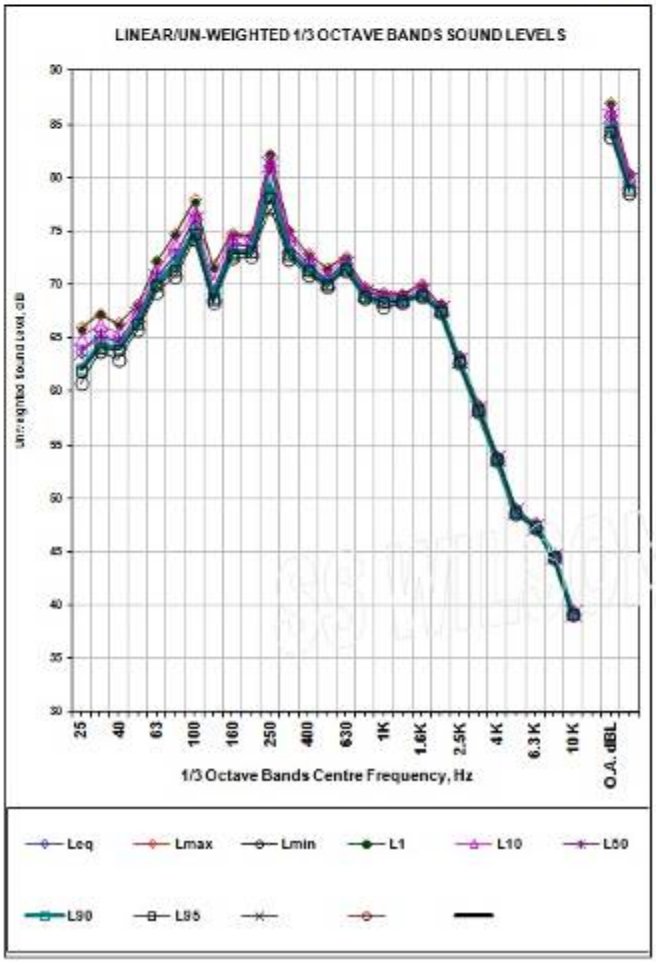
Opening/Duct Size: .....
Opening Direction: .....
Opening/Source Ht.: .....
Above: .....

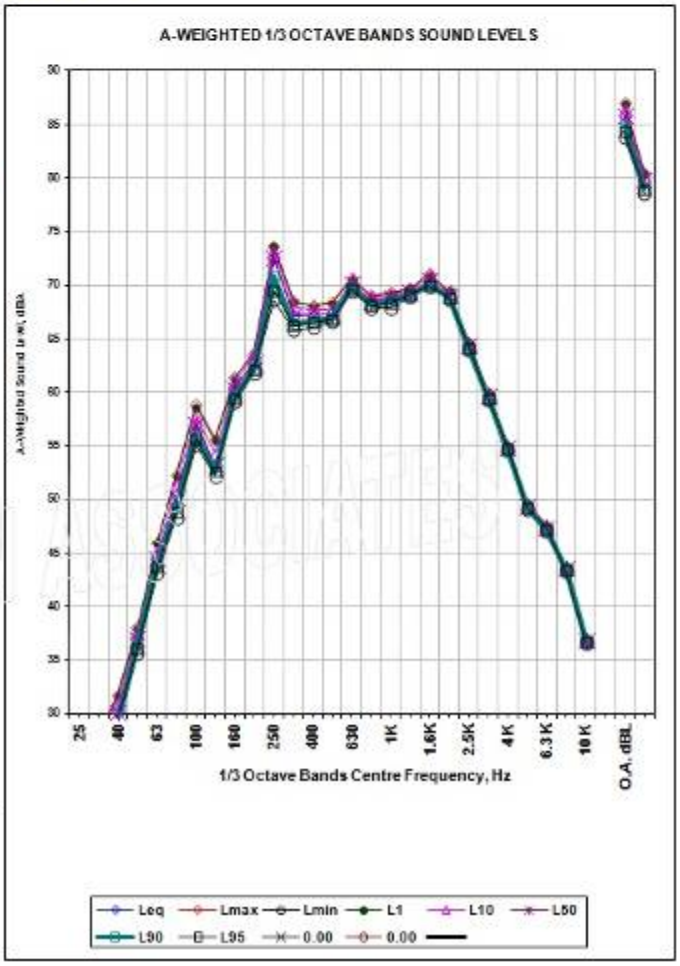
Measurement Date: October 26, 2012 (5:45am!)
SLM Mem.Code: M-06

Tonality,..etc .....
Condition of Source: .....

Other Data: Little Ambient Present
Use L90 or Lmin
7m from Hot Air louver
Some reflections

1/3 OCTAVE BANDS





SS WILSON ASSOCIATES
***Consulting Engineers*, Richmond Hill, Ontario**

MEASURED/PREDICTED 1/3 OCTAVE BANDS SOUND LEVELS

File No. : WA12-032
Project : Saw Whet / Bronte Green Subdivision

Source Name: Rooftop Generator #1
Source Tag/ID: .....
Source Location: Rooftop, west die of the building
Source Type: HVAC
Other Description: .....

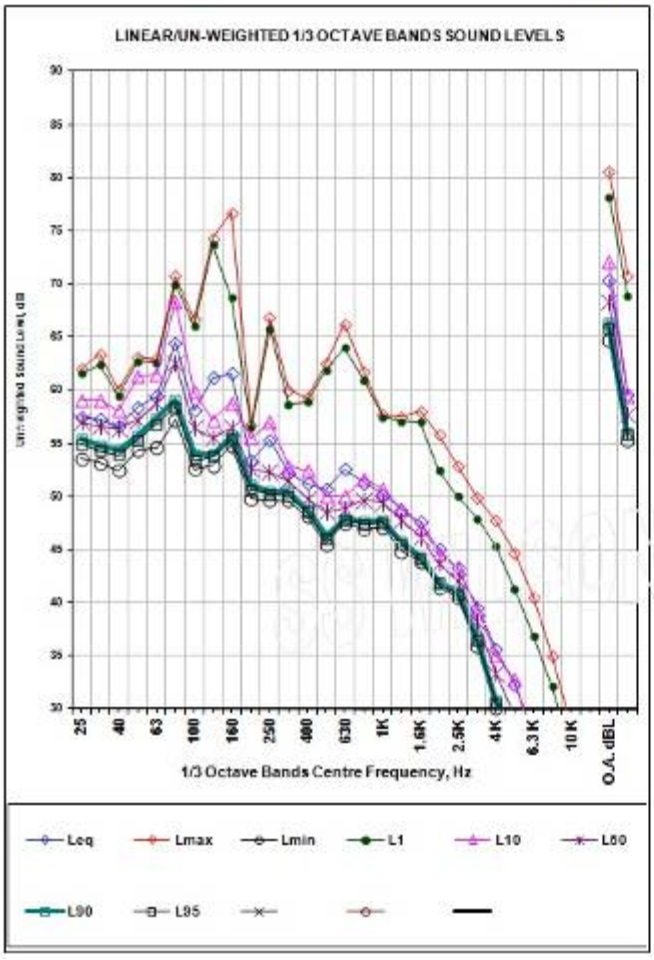
Opening/Duct Size: .....
Opening Direction: .....
Opening/Source Ht.: .....
Above: .....

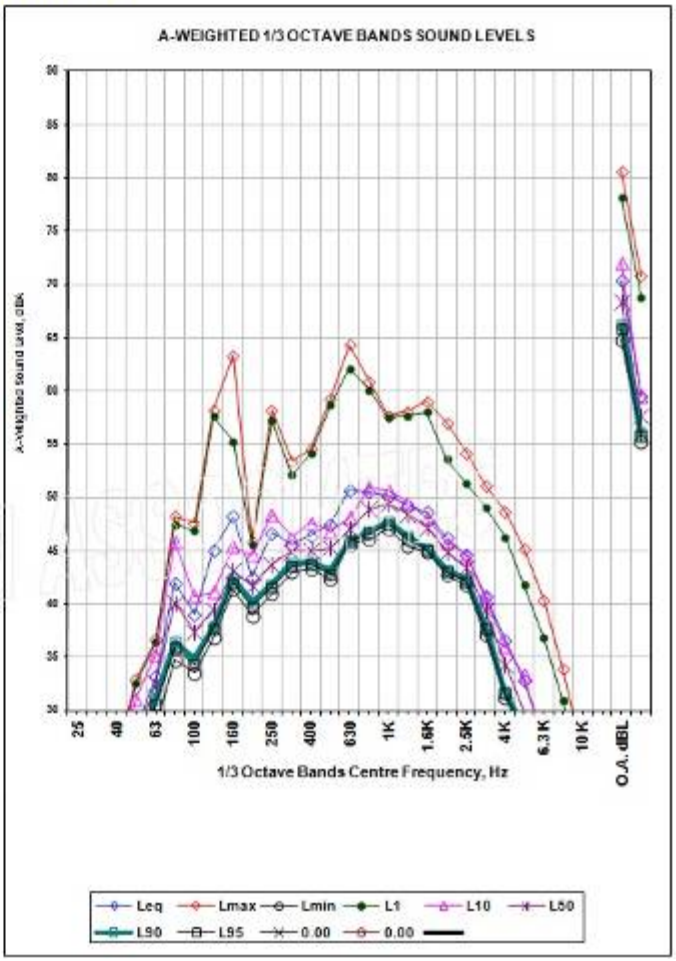
Measurement Date: October 26, 2012 (5:45am!)
SLM Mem.Code: M-03

Tonality,..etc .....
Condition of Source: .....

Other Data: Ambient Present
Use L90 or Lmin
25m from roof opening
.....

1/3 OCTAVE BANDS





SS WILSON ASSOCIATES
***Consulting Engineers*, Richmond Hill, Ontario**

MEASURED/PREDICTED 1/3 OCTAVE BANDS SOUND LEVELS

File No. : WA12-032
Project : Saw Whet / Bronte Green Subdivision

Source Name: Police Generator #1
Source Tag/ID: .....
Source Location: Rooftop, west die of the building
Source Type: HVAC
Other Description: .....

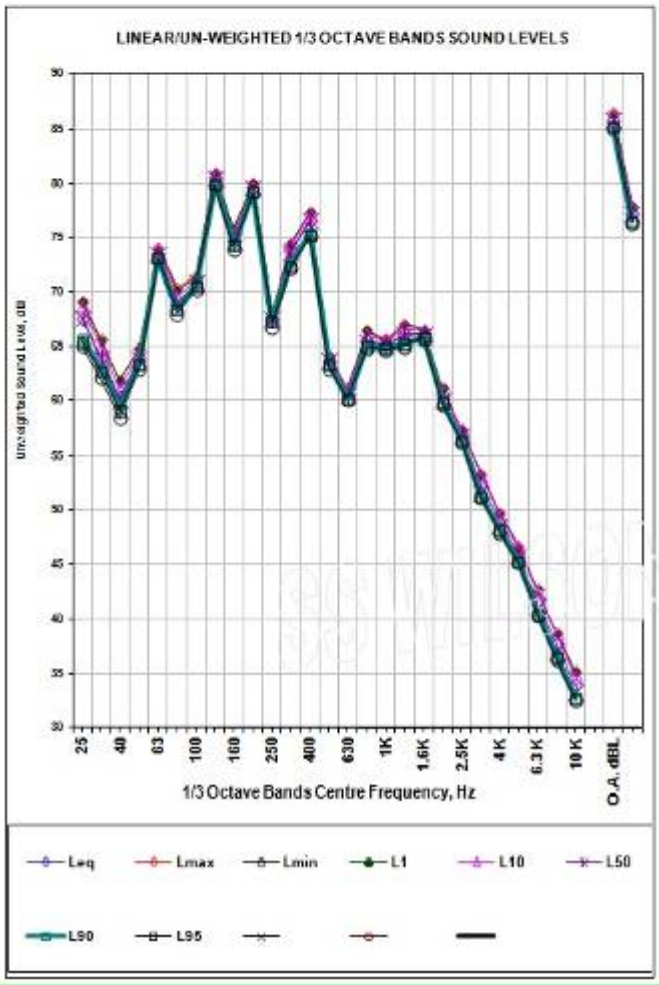
Opening/Duct Size: .....
Opening Direction: .....
Opening/Source Ht.: .....
Above: .....

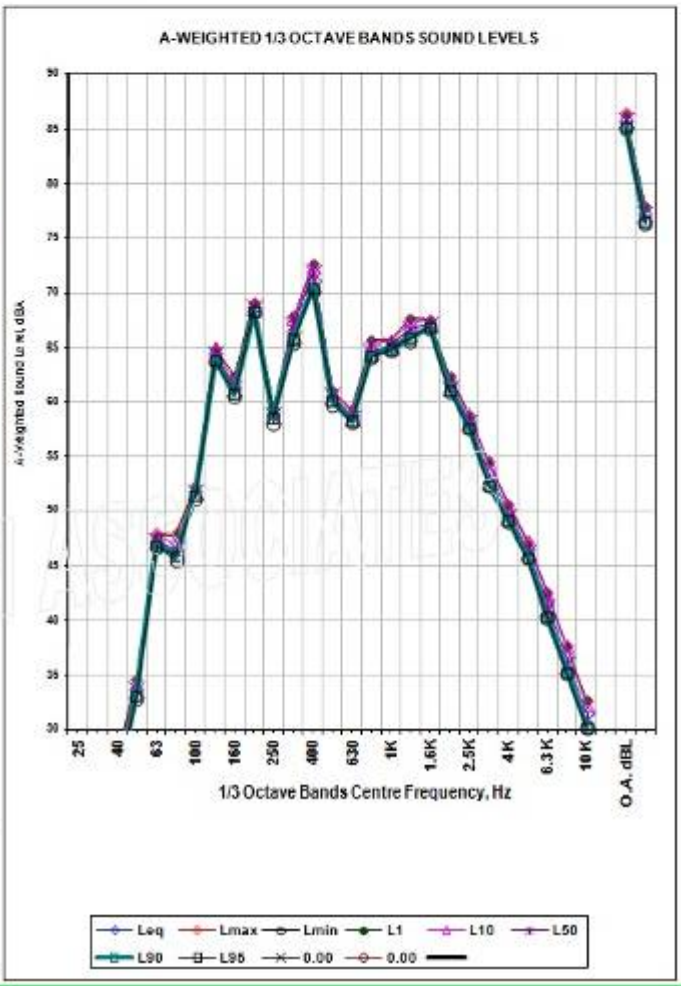
Measurement Date: October 26, 2012 (5:45am!)
SLM Mem.Code: M-08

Tonality,..etc .....
Condition of Source: .....

Other Data: Little Ambient Present
Use L90 or Lmin
7.5m east of Stacks

1/3 OCTAVE BANDS





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***Consulting Engineers*, Richmond Hill, Ontario**

MEASURED/PREDICTED 1/3 OCTAVE BANDS SOUND LEVELS

File No. : WA12-032
Project : Saw Whet / Bronte Green Subdivision

Source Name: Police Generator #1 Intake
Source Tag/ID: .....
Source Location: Rooftop, west die of the building
Source Type: HVAC
Other Description: .....

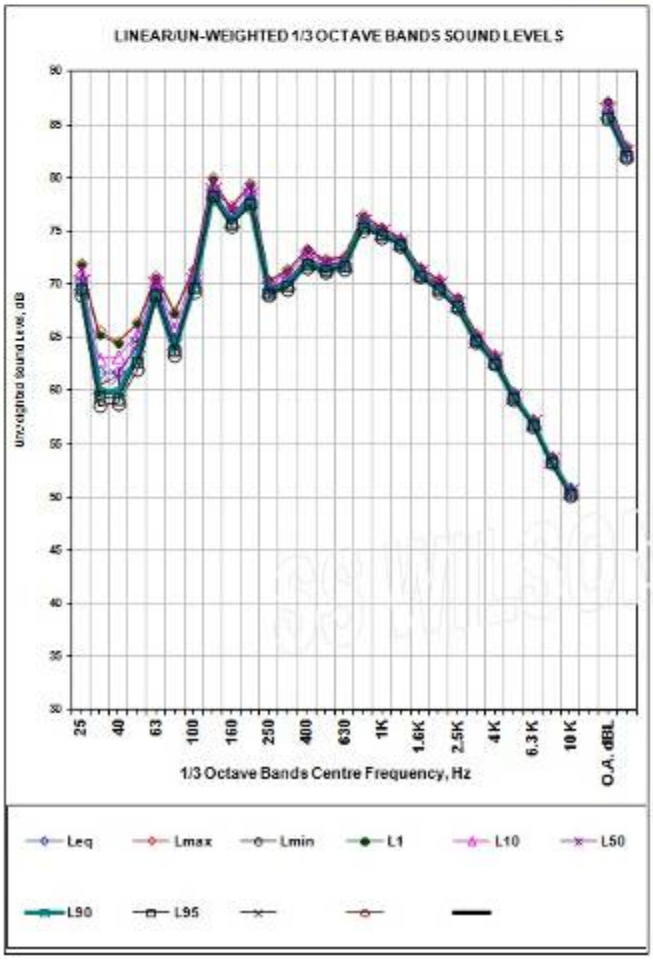
Opening/Duct Size: .....
Opening Direction: .....
Opening/Source Ht.: .....
Above: .....

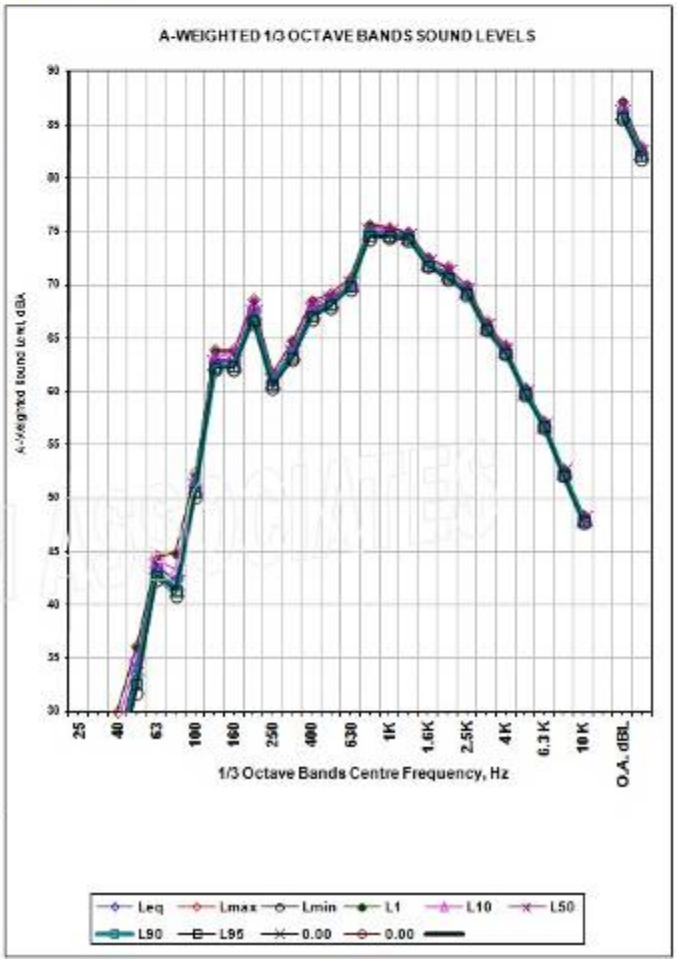
Measurement Date: October 26, 2012 (5:45am!)
SLM Mem.Code: M-09

Tonality,..etc .....
Condition of Source: .....

Other Data: Little Ambient Present
Use L90 or Lmin
7m east from intake
Intake Louver

1/3 OCTAVE BANDS





SS WILSON ASSOCIATES
***Consulting Engineers*, Richmond Hill, Ontario**
MEASURED/PREDICTED 1/3 OCTAVE BANDS SOUND LEVELS

File No. : WA12-032
Project : Saw Whet / Bronte Green Subdivision

Source Name: Police Generator #1 + #2
Source Tag/ID: .....
Source Location: Rooftop, west die of the building
Source Type: HVAC
Other Description: .....

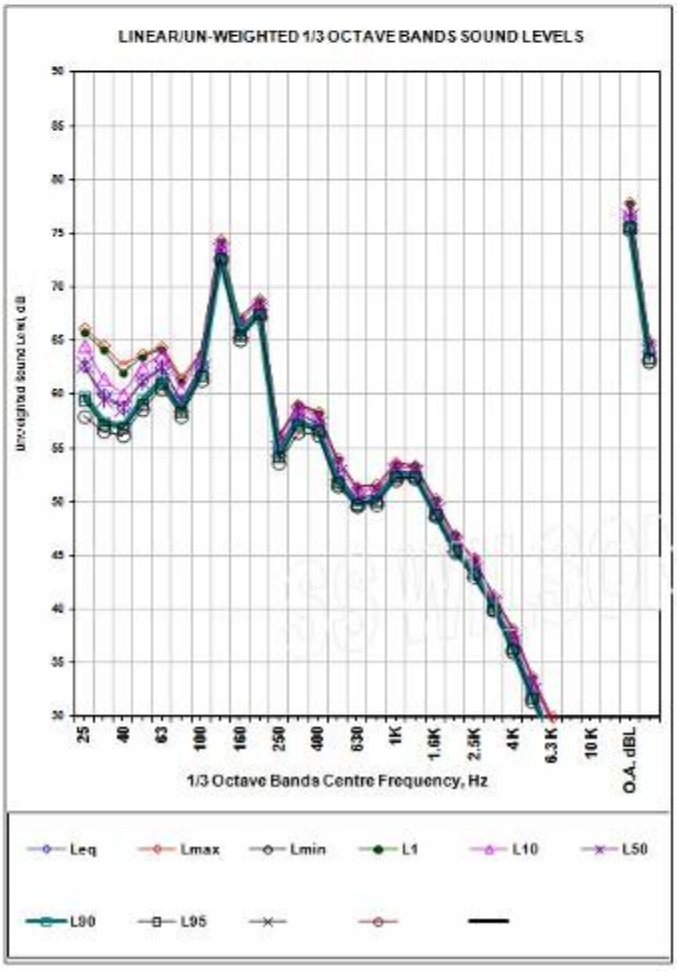
Opening/Duct Size: .....
Opening Direction: .....
Opening/Source Ht.: .....
Above: .....

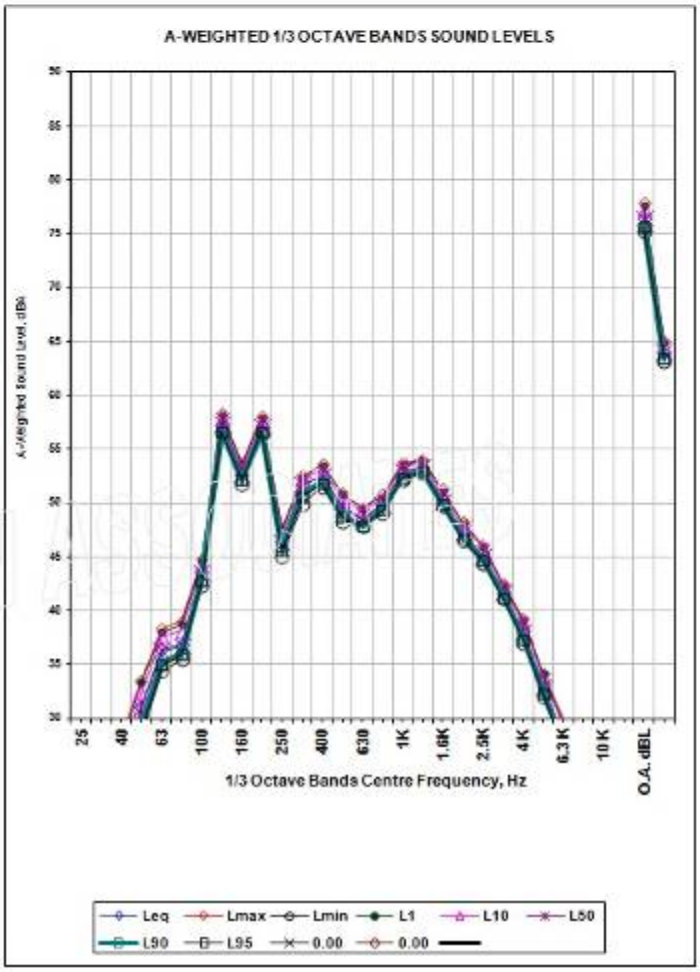
Measurement Date: October 26, 2012 (5:45am!)
SLM Mem.Code: M-12

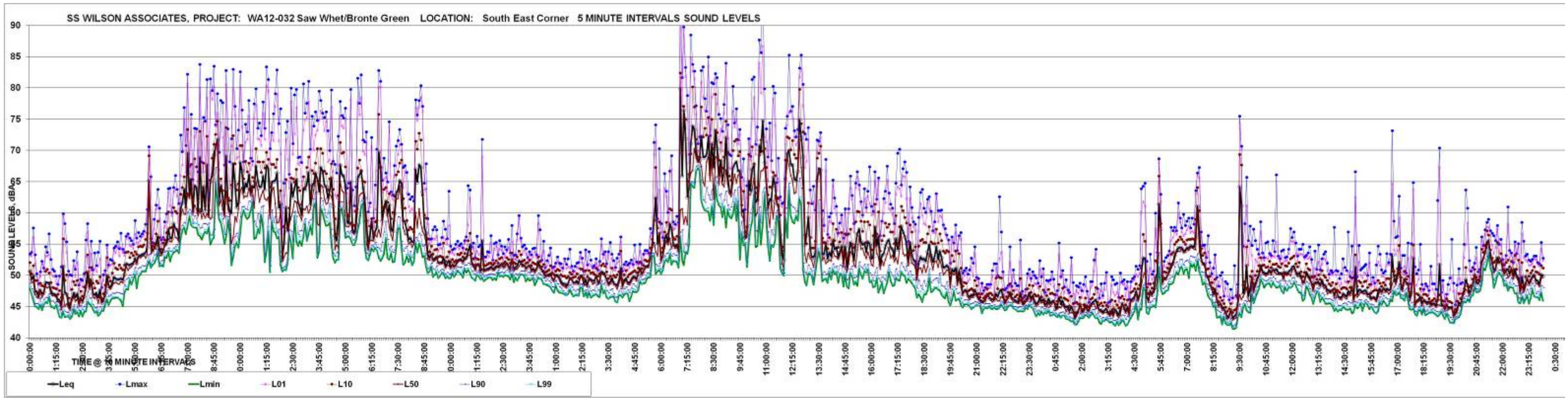
Tonality,..etc .....
Condition of Source: .....

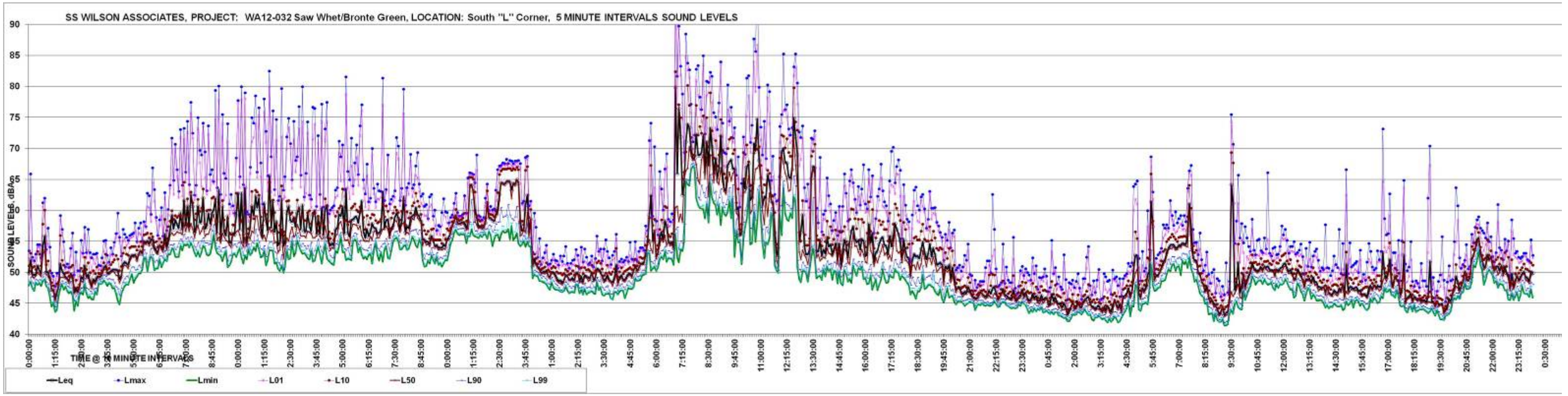
Other Data: Little Ambient Present
Use L90 or Lmin
Near PL directly north of Stacks
.....

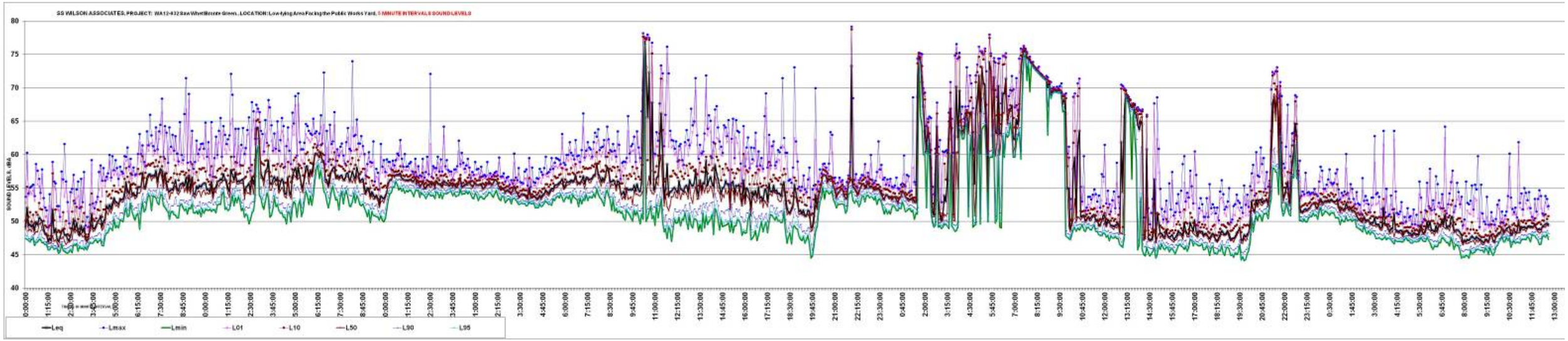
1/3 OCTAVE BANDS






SS WILSON ASSOCIATES, PROJECT: WA12-032 Saw Whet/Bronte Green LOCATION: South East Corner 5 MINUTE INTERVALS SOUND LEVELS
SOUND LEVELS, dBA re
90
85
80
75
70
65
60
55
50
45
40
TIME @ 15 MINUTE INTERVALS
Leq
Lmax
Lmin
L01
L10
L50
L90
L99


SS WILSON ASSOCIATES, PROJECT: WA12-032 Saw Whet/Bronte Green, LOCATION: South "L" Corner, 5 MINUTE INTERVALS SOUND LEVELS
SOUND LEVELS, dBA
90
85
80
75
70
65
60
55
50
45
40
TIME @ 15 MINUTE INTERVALS
Leq
Lmax
Lmin
L01
L10
L50
L90
L99


SS WILSON ASSOCIATES, PROJECT: WA12-032B Wh
Leq
Lmax
Lmin
L01
L10
L50
L90
L95