HGC ENGINEERING

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Noise Feasibility Study, McGibbon Condominium 71 Main Street South Georgetown, Ontario

Prepared for:

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1 Introduction and Summary

Howe Gastmeier Chapnik Limited (HGC Engineering) was retained by Silvercreek Commercial Builders Inc. to conduct a road traffic and stationary noise feasibility study for a proposed mixed-use commercial/residential building (McGibbon Condominium) to be located at 71 Main Street South in Georgetown, Ontario. The development is to include one 11-storey building. The study is being conducted as part of the planning and approvals process required by the Municipality.

Road traffic data for Main Street South, Guelph Street and Mill Street was obtained from Town of Halton Hills. This data was used to predict future traffic sound levels at the proposed mixed-use development. The predictions were evaluated with respect to the guidelines of the Ministry of Environment and Climate Change (MOECC) and used to develop noise control recommendations.

The results of this study indicate that with suitable noise control measures integrated into the design of building, it is feasible to achieve the indoor MOECC guideline sound levels from the road traffic sources. The recommended noise control measures include appropriate wall and window glazing assemblies, and air-conditioning of suites. A number of warning clauses will need to be included in the property, tenancy and rental agreements to the building and property to warn occupants of potentially audible transportation noise levels.

An analysis was also conducted to determine the potential impact of noise from fan coil units within each suite on the existing neighboring sensitive receptors, including residences to the north, south, east and west. The analysis was based on a review of the latest site plan prepared by Studio JCI dated September 2015, aerial photos and a site visit. Detailed information regarding the type of fan coil units were not known at the time of the study, but reasonable estimates of the size and tonnage have been estimated based on experience with similar projects. Manufacturer's sound power data was used in the analysis to predict sound levels associated with the building on the sensitive receptors.

A computer model of the area was created, using acoustic modelling software, in order to predict the sound levels at the locations of the sensitive receptors. The results indicate that the sound emissions from the mixed-use commercial/residential building will be below the MOECC minimum exclusionary sound level limits on its closest sensitive receptors. Further, physical mitigation measures are not required for the proposed mixed-use commercial/residential building.

2 Description of the Site and Significant Noise Sources

Figure 1 is an aerial photo showing the subject site and surrounding land uses. A site plan prepared by Studio JCI dated September 2015 is provided as Figure 2. The noise prediction locations are also shown on Figure 2 for reference purposes. The site is proposed to include one 11-storey mixed-use commercial/residential building with ground floor commercial/retail units.

HGC Engineering personnel visited the site on August 27, 2015 to investigate the site and the surrounding land uses. The acoustical environment surrounding the site is urban, comprised primarily of road traffic noise. There is an existing 3-storey hotel building which is to be redeveloped into a mixed-use commercial/residential building. There are existing commercial, retail and residential uses surrounding the subject site. Main Street South and Mill Street are two lane roadways (one lane in each direction). Guelph Street is located east of the subject site at approximately 250 metres to the north. There is a commercial building south of the subject site with rooftop mechanical HVAC equipment. In general, sounds from the commercial/retail facilities or activities were not discernible over the traffic sounds during the site visit. Nevertheless, due to the proximity of the site to a variety of existing commercial/office/retail uses, it is recommended that a noise warning clause to identify that such commercial/retail uses may be audible at times be included in the property agreement, as described in Section 5.4.

For the purposes of this study, critical receptor locations were identified as the most potentially impacted existing residences to the north, south, east and west (R1 through R4) of the subject site. These receptors are indicated on Figures 3 and 4.

For a development of this nature, the sources of sound of greatest potential concern are the HVAC equipment. The specific model of the mechanical equipment has not yet been selected. Reasonable estimates were used in the analysis along with the manufacturer's sound level data contained in HGC Engineering project files. There are no rooftop mechanical equipment but there will be fan coil units within in each suite. Figures 3 and 4 shows the location of the fan coil units as used in the calculations.

3 Criteria

3.1 Criteria Governing Road Traffic Noise

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

Table I: MOECC Road Traffic Noise Criteria (dBA)

Area	Daytime L_{EQ} (16 hour) Road	Nighttime L_{EQ}(8 hour) Road
Outside Bedroom Windows	55 dBA	50 dBA
Outdoor Living Area	55 dBA	--
Inside Living/Dining Rooms	45 dBA	45 dBA
Inside Bedrooms	45 dBA	40 dBA

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

The MOECC guidelines allow the daytime sound levels in an OLA to be exceeded by up to 5 dBA, without mitigation, if warning clauses are placed in purchase agreements to the property. Where OLA sound levels exceed 60 dBA, physical mitigation is recommended to reduce the OLA sound level to below 60 dBA and as close to 55 dBA as technically, economically and administratively feasible.

A central air conditioning system as an alternative means of ventilation to open windows is required for all residential suites where nighttime sound levels outside windows of bedrooms/living/dining rooms exceed 65 dBA during the daytime and nighttime hours. Forced-air ventilation systems with ducts sized to accommodate the future installation of air conditioning or an alternate means of

ventilation to open windows is required when sound levels at the windows of bedrooms/living/dining rooms are in the range of 51 to 60.

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

Warning clauses to notify future purchasers of the building of possible excesses are also required when road traffic sound levels exceed 55 dBA at the plane of the windows or when daytime sound levels exceed 55 dBA in the outdoor living area.

3.2 Criteria Governing Stationary Noise Sources

In Ontario, the guidelines of the Ontario Ministry of the Environment and Climate Change (MOECC) form the basis of environmental noise assessment. MOECC publication NPC-300, *Environmental Noise Guideline Stationary and Transportation Sources – Approval and Planning",* release date October 21, 2013 provides criteria for assessing the noise impact of this mixed-use commercial/residential building. The term Stationary Source is used to designate all noise sources at the site including mechanical equipment, conveyances, such as trucks when they are moving within the site boundaries. The MOECC guidelines assess the noise impact of fluctuating sounds on an hourly energy equivalent (average) sound level basis, rather than on short-duration maximum sound levels. Hourly equivalent sound levels are denoted as the $L_{EQ\text{-}1hr}$.

The criteria are based on the background sound level at sensitive points of reception (which are typically residences) in the quietest hour that the source can be in operation. Background sound includes sound from road traffic and natural sounds, but excludes the sources under assessment. For relatively quiet areas where background sound may fall to low levels during some hours, NPC-300 stipulates various minimum limits. In Class 1 areas, these limits are 50 dBA for daytime (07:00 to 23:00) and 45 dBA at night (23:00 to 07:00).

The MOECC guidelines stipulate that the sound level impact during a "predicable worst case hour" be considered. This is defined to be an hour when a typically busy "planned and predictable mode of operation" occurs at the subject facility coincident with a period of minimal background sound.

The decision to include the sound from trucks in an assessment under MOECC noise guidelines depends on the volume of trucking, and the nature of the facility. Occasional deliveries to retail stores and convenience stores are exempt, for example, but heavy trucking at a warehouse or busy shipping/receiving docks at an industry must generally be assessed. The likely activities at the proposed mixed-use commercial/residential building may include the occasional movement of vehicles on the property and the infrequent delivery of goods by courier vans. Garbage collection is not considered to be a significant noise source in the MOECC guidelines. It is not expected that there will be significant tractor trailer truck traffic associated with the commercial/office units of the building and these have not been included in the analysis.

3.3 Sound Level Criteria at the Residential Receptors

Typical ambient sound levels can be determined through prediction of road traffic volumes in areas where traffic sound is dominant. Where it can be demonstrated that the hourly ambient sound levels are greater than the exclusionary minimum limits listed above, the criterion becomes the lowest predicted one-hour L_{EQ} sound level during each respective period. At locations where the ambient sound levels are low, the exclusionary minimum criteria of 50/45 apply.

Background sound in the vicinity of the subject development is dominated by road traffic on Main Street South. It is therefore appropriate to predict hourly background sound from road traffic volumes in order to determine applicable limits for impact of stationary noise sources. However, hourly daytime traffic data was not available for Main Street South, thus the MOECC minimum exclusionary limits were used as the criteria at the sensitive receptors.

Table II: Recommended Noise Level Criteria at Receptors [dBA]

Receptor	Day	Night
R1 – 3rd Floor residence to the north	50	45
R2 – 3rd Floor residence to the west	50	45
R3 – 3rd Floor Residence to the south	50	45

4 Traffic Noise Predictions

4.1 Road Traffic Data

Traffic data for the Main Street South, Mill Street and Guelph Street was obtained from the Town of Halton Hills in the form of peak hour turning movement counts, and is provided in the Appendix A. The data was projected to the year 2025 using a 2.5 % growth rate. A commercial vehicle percentage of 2% for medium trucks and 1% for heavy trucks was used for Main Street South and Mill Street. Commercial vehicle percentage of 1.9% for medium trucks and 2.5% for heavy trucks was used for Guelph Street. A day/night split of 90%/10% was used in the analysis along with a posted speed of 40 km/hr for Main Street South and Mill Street and 50 km/hr for Guelph Street. The projected future traffic volumes are listed in Table III.

Table III: Projected Road Traffic Data (2025)

Road Name		Cars	Medium Trucks	Heavy Trucks	Total
Main Street South	Daytime	6 760	139	70	6 970
	Nighttime	751	15	8	774
	Total	**7 512**	**155**	**77**	**7 744**
Mill Street	Daytime	4 474	92	46	4 613
	Nighttime	497	10	5	513
	Total	**4 971**	**103**	**51**	**5 125**
Guelph Street	Daytime	**19 799**	393	518	20 710
	Nighttime	2 200	44	58	2 301
	Total	**21 999**	**437**	**575**	**23 011**

4.3 Road Traffic Noise Predictions

To assess the levels of road traffic noise which will impact the site in the future, predictions were made using STAMSON version 5.04, a computer algorithm developed by the MOE. Sample STAMSON output is included in Appendix B. Predictions of the traffic sound levels were made at various locations around the proposed mixed-use development as shown on Figure 2. The results of these predictions are summarized in Table IV.

Table IV: Predicted Sound Levels, Without Mitigation, [dBA]

Prediction Location	Description	Daytime at Façade $L_{EQ-16\ hr}$	Nighttime at Façade $L_{EQ-8\ hr}$	Outdoor Living Area $L_{EQ-16\ hr}$*
A	West Façade	60	53	<55
B	South Façade	60	53	<55
C	East Façade	57	51	<55
D	North Façade	57	50	<55

*Assuming 1.07 m parapet wall around the perimeter of OLA

5 Discussion and Recommendations

The following discussion outlines preliminary recommendations for building façade constructions, ventilation requirements, and noise warning clauses to achieve the noise criteria stated in Table I. The predictions indicate that the future traffic sound levels will exceed MOECC guidelines at all facades of the mixed-use development.

5.1 Outdoor Living Areas

From a review of the preliminary floor plans, the majority of residential suites will have balconies/terraces less than 4 m in depth. These balconies/terraces are not considered as outdoor living areas under MOECC guidelines, and therefore are exempt from traffic noise assessment. Physical mitigation will not be required.

The architectural plans show terraces on the west, south and north façade of the mixed-use development. These spaces are greater than 4 m in depth and are subject to the MOECC criteria outlined in Table I. The predicted sound levels in the terraces located on the west, south and north façade (prediction location [A], [B] and [D]) will be less than 55 dBA with 1.07 m parapet wall above the floor level. Further physical mitigation is not required for these areas.

5.1 Indoor Living Areas

The predicted daytime sound levels at all facades of the mixed-use development will be between 56 and 65 dBA. To address these excesses, the MOECC guidelines recommend that all units be equipped with an alternative means of ventilation to open windows. This can be achieved through central air conditioning or an Integrated Piping System for the heating and cooling within each suite.

The developer is proposing to install a geothermal heat pump system with fan coil units within each suite. When source sound level information is available for these units, an acoustical consultant should verify the sound levels at off-site residential receptors in accordance with NPC-205.

5.2 Building Facade Constructions

The predicted sound levels at all facades of the building are less than 65 dBA during the daytime and less than 60 dBA during the nighttime hours from road traffic. Thus, any double glazed window construction meeting the minimum requirements of the Ontario Building Code (OBC) will provide adequate sound insulation for the building.

5.3 Warning Clauses

MOECC guidelines recommend that appropriate warning clauses be used in the Property titles and in purchase and sale agreements (typically by reference to the Development Agreements), to inform future owners about noise concerns from transportation sources in the area. The following clauses are recommended:

(a) Purchasers are advised that despite the inclusion of noise control features in the development and within the building units, sound levels due to increasing road traffic may on occasion interfere with some activities of the residential suites as the sound levels exceed the sound level limits of the City and the Ministry of the Environment and Climate Change.

(b) Purchasers are advised that in order to achieve an acceptable indoor environment this unit has been equipped with an air conditioning unit, to allow the windows and doors to be kept closed, thereby ensuring that the indoor sounds levels meet the noise criteria of the Municipality and the Ministry of the Environment and Climate Change.

(c) Purchasers are advised that due to the proximity of the nearby commercial/office/retail facilities, sound from those facilities may at times be audible.

These sample clauses are provided by the MOECC as examples and can be modified by the Municipality as required.

6 Assessment of Stationary Noise Source

There are no rooftop equipment as the developer will be installing a geothermal heat pump system. Source sound levels for the specific fan coil units within each suite and assumed operational

information (outlined below) were used as input to a predictive computer model (Cadna-A version 4.4.145), in order to estimate the sound levels from the future mixed-use development at the existing sensitive receptors. Cadna-A is a computer implementation of ISO Standard 9613-2.2, "Acoustics – Attenuation of Sound During Propagation Outdoors", which takes into account attenuation due to distance (geometrical spreading), shielding by intervening structures (such as buildings and bush), air attenuation and ground absorption. These are shown in Figures 3 and 4 through crosses and lines.

The following information and assumptions were used in the analysis:

- The mixed-use development will be 11-storeys high.
- There will be no HVAC equipment located on the roof of the building. Several fan coil units will be located on the north, west and south façade of the building and each unit is assumed to have a sound power level of 66 dBA.
- All mechanical equipment are assumed to be operating continuously at full capacity during daytime hours (07:00 to 23:00) and 50% during night-time hours (23:00 to 07:00) for a worst case operational scenario.

The calculations consider the acoustical effects of distance and shielding by the building itself. The unmitigated sound levels due to the modelled mechanical equipment at the closest sensitive receptors (R1 through R4) are summarized in the following table.

Table V: Predicted Sound Levels from the Proposed Mixed-use Commercial/Residential Building at Existing Sensitive Receptors [dBA], Without Mitigation

Receptor	Day	Night
R1 – 2nd Floor residence to the north	36	33
R2 – 2nd Floor residence to the west	34	31
R3 – 2nd Floor Residence to the south	33	30
R4 – 2nd Floor Residence to the east	39	36

Note:
The sound level predictions at the receptor windows were performed at the 2nd floor, 4.5 m above the ground.

The predicted sound levels due to operation HVAC equipment will be within the MOECC's minimum exclusionary limits, without any addition noise mitigation measures, at the sensitive receptors during the daytime and nighttime hours.

7 Summary of Recommendations

Sound levels due to road traffic will exceed MOECC guidelines at the proposed mixed-use development. The following recommendations are provided with regard to noise mitigation.

For transportation noise sources:

1. Central air conditioning systems or alternative means of ventilation to open windows will be required for all residential suites in the building. The developer has proposed a geothermal heat pump system with fan coil units within each suite.
2. Warning clauses should be used to inform future owners of the road traffic noise issues and adjacent commercial/retail uses as outlined in this report.

For stationary noise sources:

1. There are no HVAC equipment located on the roof of the building. Fan coil units to be used within each suite should have a sound power level of 66 dBA or less, respectively. The mechanical equipment selections and the source sound level specifications must conform to the assumptions as contained in this report.
2. When detailed roof plans and mechanical specifications for the mechanical equipment are available, an acoustical consultant should verify that the sound levels of the equipment are in accordance with the noise study at all off-site residential receptors.
3. After construction, the municipal building inspector or a Professional Engineer qualified to perform acoustical engineering services in the Province of Ontario should certify that the mechanical equipment has been installed in accordance with the noise report.

8 Conclusions

Our analysis assuming typical worst-case equipment and operating scenarios as described above indicates that the noise impact of the mixed-use commercial/residential building on the sensitive receptors can comply with MOECC criteria without additional noise mitigation. Recommendations are provided.

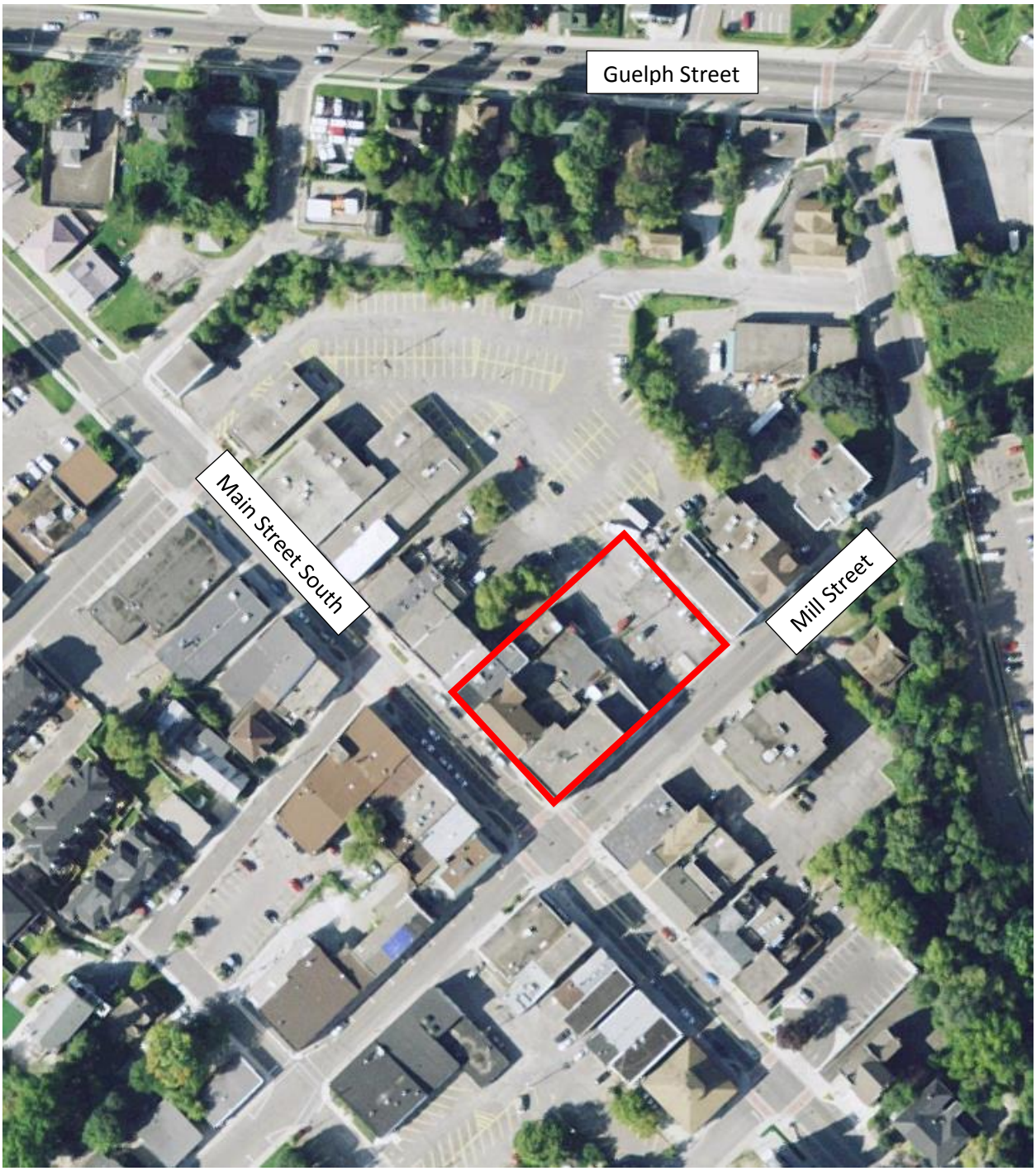
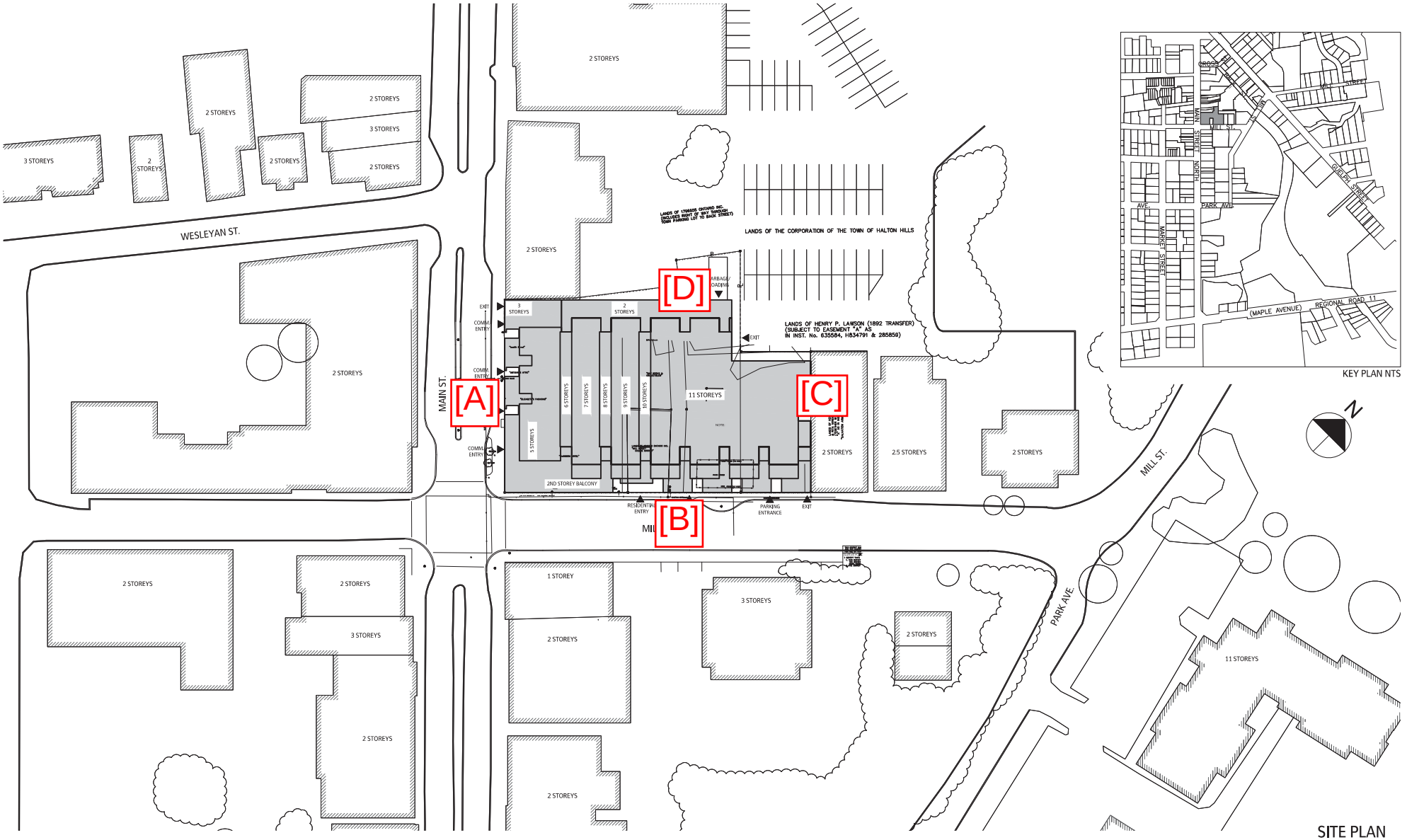


Figure 1: Key Plan



SITE PLAN

Address: 71 Main St., Halton Hills, ON
Scale: 1:750
Date: SEPT. 2015

55 Eglinton Ave E, suite 606
Toronto, Ontario, M4P 1G8
t. 416 901 652 f. 416 901 8962
www.studiojci.com

STUDIO JCI

Figure 2: Site Plan Showing Prediction Locations

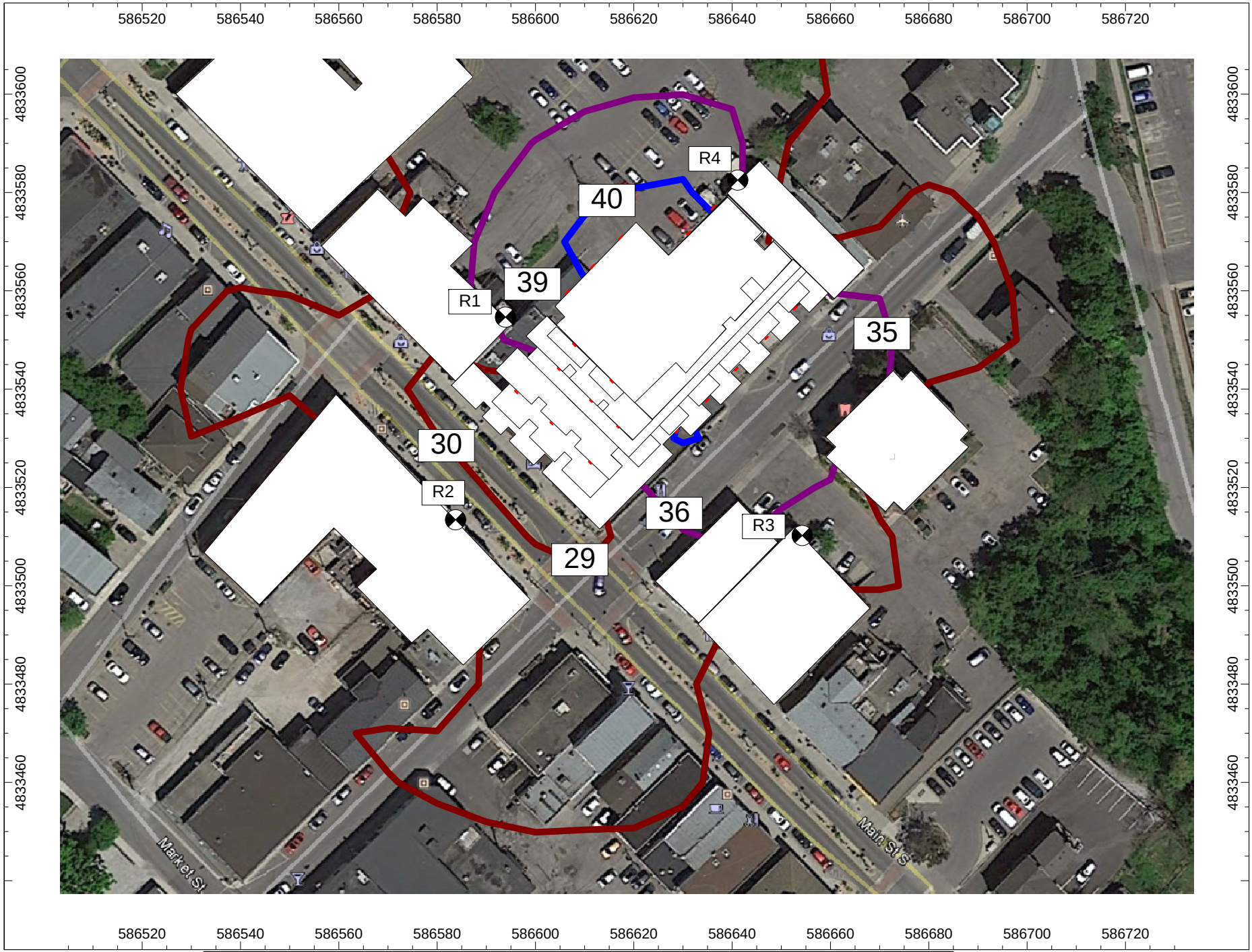


Figure 3: Daytime Sound Level Contours, without Mitigation, at 4.5 m Height

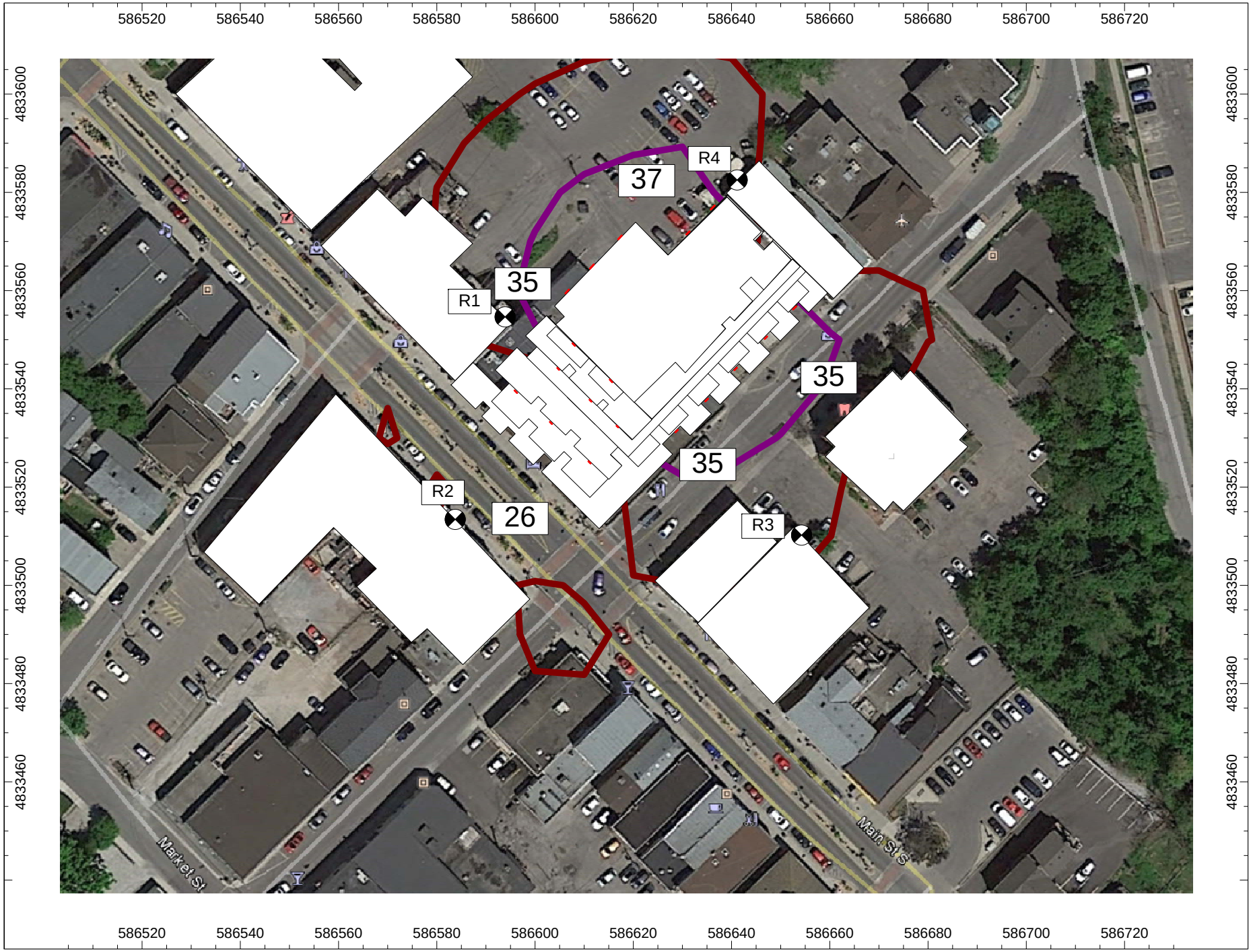


Figure 4: Nighttime Sound Level Contours, without Mitigation, at 4.5 m Height

APPENDIX A

Road Traffic Data

Main St S @ Mill St

Total Count Diagram

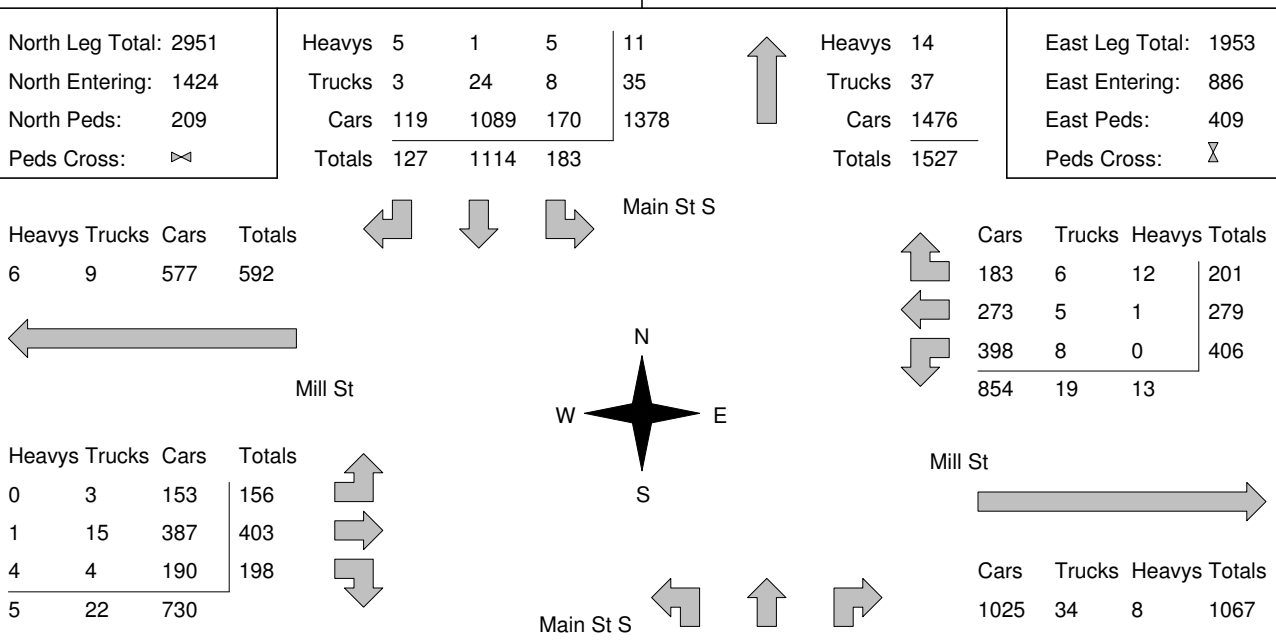
Municipality: Halton Hills
Site #: 0000000014
Intersection: Main St S & Mill St
TFR File #: 3
Count date: 16-Dec-2014

Weather conditions:
Rain

Person(s) who counted:
Daniela

**** Signalized Intersection ****

Major Road: Main St S runs N/S



Comments

Guelph St @ Mill St

Total Count Diagram

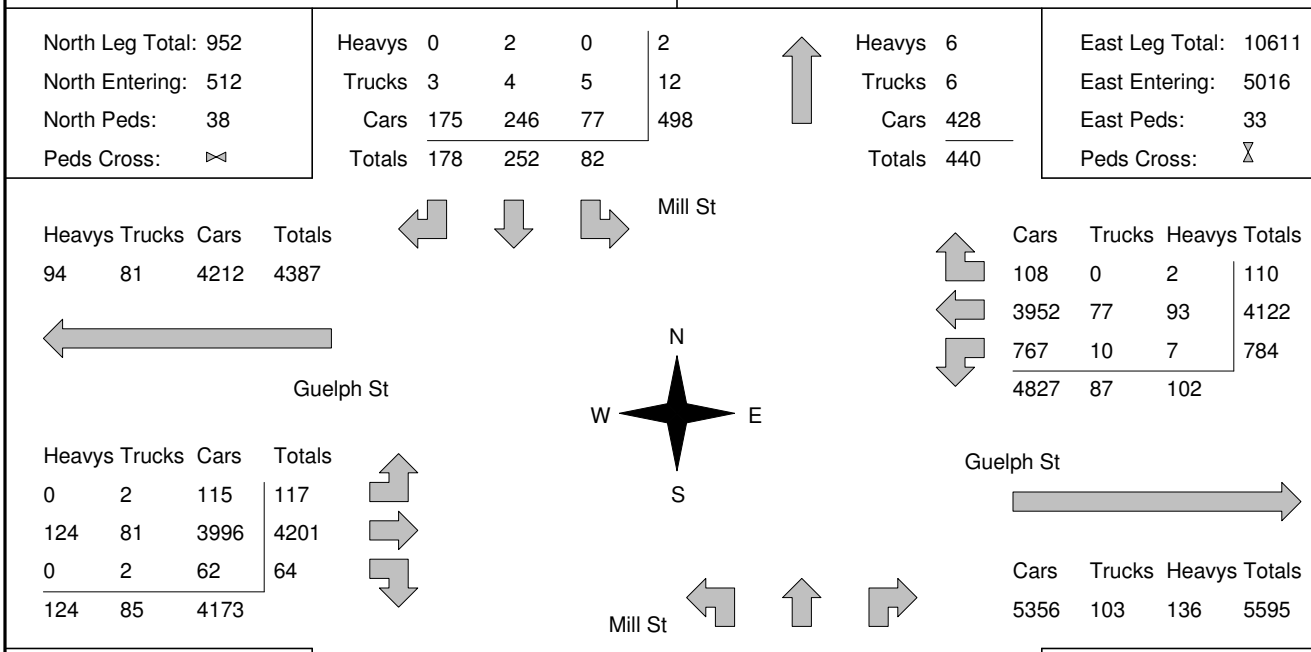
Municipality: Halton Hills
Site #: 0000000002
Intersection: Guelph St & Mill St
TFR File #: 2
Count date: 16-Dec-2014

Weather conditions:
Cloudy, Rain

Person(s) who counted:
Leszek

**** Signalized Intersection ****

Major Road: Guelph St runs W/E



Comments

APPENDIX B

Sample STAMSON Output

STAMSON 5.0 NORMAL REPORT Date: 09-10-2015 11:20:43
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT
Filename: loca.te Time Period: Day/Night 16/8 hours
Description: West Façade, Prediction Location [A]
Road data, segment # 1: Main (day/night)

Car traffic volume : 6760/751 veh/TimePeriod *
Medium truck volume : 139/15 veh/TimePeriod *
Heavy truck volume : 70/8 veh/TimePeriod *
Posted speed limit : 40 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)
* Refers to calculated road volumes based on the following input:
24 hr Traffic Volume (AADT or SADT): 5902
Percentage of Annual Growth : 2.50
Number of Years of Growth : 11.00
Medium Truck % of Total Volume : 2.00
Heavy Truck % of Total Volume : 1.00
Day (16 hrs) % of Total Volume : 90.00
Data for Segment # 1: Main (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 : 15.00 / 15.00 m
Receiver height : 28.50 / 28.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00
Road data, segment # 2: Mill (day/night)

Car traffic volume : 4474/497 veh/TimePeriod *
Medium truck volume : 92/10 veh/TimePeriod *
Heavy truck volume : 46/5 veh/TimePeriod *
Posted speed limit : 40 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)
* Refers to calculated road volumes based on the following input:
24 hr Traffic Volume (AADT or SADT): 3906
Percentage of Annual Growth : 2.50
Number of Years of Growth : 11.00
Medium Truck % of Total Volume : 2.00
Heavy Truck % of Total Volume : 1.00
Day (16 hrs) % of Total Volume : 90.00
Data for Segment # 2: Mill (day/night)

Angle1 Angle2 : 0.00 deg 90.00 deg
Wood depth : 0 (No woods.)

No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 25.00 / 25.00 m
Receiver height : 28.50 / 28.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00
Results segment # 1: Main (day)

Source height = 1.00 m
ROAD (0.00 + 59.08 + 0.00) = 59.08 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	59.08	0.00	0.00	0.00	0.00	0.00	0.00	59.08

Segment Leq : 59.08 dBA
Results segment # 2: Mill (day)

Source height = 1.00 m
ROAD (0.00 + 52.04 + 0.00) = 52.04 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	57.27	0.00	-2.22	-3.01	0.00	0.00	0.00	52.04

Segment Leq : 52.04 dBA
Total Leq All Segments: 59.86 dBA
Results segment # 1: Main (night)

Source height = 1.01 m
ROAD (0.00 + 52.57 + 0.00) = 52.57 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	52.57	0.00	0.00	0.00	0.00	0.00	0.00	52.57

Segment Leq : 52.57 dBA
Results segment # 2: Mill (night)

Source height = 0.99 m
ROAD (0.00 + 45.46 + 0.00) = 45.46 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	50.69	0.00	-2.22	-3.01	0.00	0.00	0.00	45.46

Segment Leq : 45.46 dBA
Total Leq All Segments: 53.34 dBA
TOTAL Leq FROM ALL SOURCES (DAY): 59.86
(NIGHT): 53.34