



76 Wyndham Street South

Guelph, Ontario

Detailed Noise Study

SACL #SW19067.A0

August 8, 2019

Submitted to:

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1. Introduction

At the request of EXP Services Inc., Swallow Acoustic Consultants Ltd. (SACL) has completed a Detailed Noise Study for the proposed residential development (Project), which is located at 76 Wyndham Street South in Guelph, Ontario. We understand that the study is required by the City of Guelph for Site Plan Approval.

The Project consists of a 3-storey duplex building and a 4-storey building with 9 residential units. The purpose of this study is to assess the noise impact to the proposed residential development from surrounding noise sources, the noise impact of the development on the surrounding noise-sensitive areas, and to provide noise control recommendations to meet the requirements of the City of Guelph. The City of Guelph requirements are outlined in the *Guelph Noise Control Guidelines, Version 1.0*^[1] and are based on the Ontario Ministry of the Environment, Conservation, and Parks (MECP) document *Environmental Noise Guideline: Stationary and Transportation Sources – Approval and Planning*^[2] (NPC-300). Noise control recommendations are summarized in Section 4.4 for transportation noise sources.

2. Site

The Project is located on the east side of Wyndham Street South, south of Howitt Street. For the purposes of this report, Wyndham Street South is defined as the north-south direction. To the east and south of the Project are single family dwellings. To the southeast is a townhouse development. Opposite Wyndham Street South, to the west, are 1 and 2 storey commercial buildings. Also to the west is the site of a proposed 14-storey condominium development, located at 71 Wyndham Street South. To the northeast of the Project, opposite Wyndham Street South and Howitt Street, is a 3-storey condo building. To the north of the Project, opposite Howitt Street, is a 10-storey condo building.

An aerial photo showing the Project location and the surrounding area is provided in Figure 1. The City of Guelph Zoning Map with the Project boundary highlighted is shown in Figure 2. A site plan for the Project is shown in Figure 3. Note that the building labelled as a 3-storey 6-plex on the site plan has been updated to a 4-storey building with 9 units. Its location remains the same.

3. Noise Sources

A site visit was conducted on May 16, 2019 to identify significant noise sources that may impact the Project. The major transportation noise source that may impact the site is Wyndham Street South, which runs north-south and is located directly west of the Project.

No stationary noise sources that may affect the Project were identified during the site visit. Potential stationary noise sources associated with the Project and potential future stationary noise sources will be discussed in Section 5.



4. Transportation Noise Sources

4.1. Critical Noise Receptors

The critical noise receptors are the noise sensitive areas of the proposed development most likely to be affected by the traffic noise. Thus, critical noise receptors were chosen at the façades of the buildings that are most exposed to Wyndham Street South. The locations of the critical noise receptors are summarized in Table 1 and shown in Figure 3, Figure 4, and Figure 5.

Points of Reception (PORs) at the plane-of-window on the highest levels of the buildings are used as typical critical noise receptors. PORs are located on the 3rd floor of the duplex and the 4th floor of the 4-storey 9-unit building.

There are no designed outdoor living areas (OLAs) for the proposed development. Front yards are not considered OLAs according to the City of Guelph guidelines ^[2]. Balconies in the duplex and the 4-storey building are less than 4m in depth and are not considered OLAs, according to the requirements of the City of Guelph and the MECP.

Table 1: Critical Noise Receptors

<i>Receptor ID</i>	<i>Height (m)</i>	<i>Receptor Location</i>
POR1	10.5	West façade of the 4-storey building
POR2	10.5	Southwest corner of the 4-storey building
POR3	10.5	South façade of the 4-storey building
POR4	7.5	West façade of the duplex
POR5	7.5	Northwest corner of the duplex
POR6	7.5	North façade of the duplex

4.2. Sound Levels

Traffic data for Wyndham Street South was obtained from the City of Guelph and is attached in Appendix A. The data is in the form of Turning Movement Counts for the intersection of Wyndham Street South and Wellington Street East, recorded on March 27, 2019. As specified by the City of Guelph, the current AADT was calculated by multiplying the highest peak hour traffic volume by a factor of 10. The current AADT was increased by an annual growth rate of 2% for 10 years to obtain the future AADT in 2029. In addition to a 2% annual increase of the current traffic volume, the proposed condo building at 71 Wyndham Street South is expected to increase the current traffic volume at the Project location. According to the Traffic Impact Study for the proposed development at 71 Wyndham Street South, prepared by Stantec Consulting Ltd. ^[3], the peak hourly traffic volume for the development is 64 vehicles, as shown in Table 2. This peak hourly traffic volume is multiplied by a factor of 10 to obtain the daily traffic volume for the condo, which

is added to the future AADT previously calculated. The total projected future AADT value of 12,623 is used to assess the impact of traffic noise on the Project. Details of these calculations are provided in Appendix A.

Table 2: 71 Wyndham Street South Site Trip Generation ^[3]

ITE Manual	Land Use	Dwelling Units	A.M. Peak Hour			P.M. Peak Hour		
			In	Out	Total	In	Out	Total
Trip Generation, 10 th Edition	Multifamily Housing (High-Rise) LUC #222	164	14	45	59	39	25	64

The road traffic data is summarized in Table 3. The medium truck and heavy truck percentages were calculated based on the provided 8-hour Turning Movement Count data. The day/night split of 90%/10% is based on a typical distribution for cities.

Table 3: Road Traffic Data

<i>Parameter</i>	<i>Wyndham Street South</i>
Current Traffic Volume, 2019 (AADT)	9,830
Annual Growth Rate	2%
Forecast Traffic Volume, 2029 (AADT) (proposed development at 71 Wyndham St S not included)	11,983
Forecast Daily Traffic Volume for proposed development at 71 Wyndham St S	640
Forecast Traffic Volume, 2029 (AADT) (proposed development at 71 Wyndham St S included)	12,623
Day/Night Split	90% / 10%
Medium Trucks	1.45%
Heavy Trucks	4.25%
Speed Limit	50 km/h

Calculations of traffic sound levels were performed using STAMSON 5.04, the software implementation of the MECPC ORNAMENT model for road traffic which was developed and



published by the MECP for transportation noise prediction. The calculated sound levels are summarized in Table 4. STAMSON calculation output reports for the traffic noise predictions are attached in Appendix B.

Table 4: Calculated Outdoor Sound Levels

<i>Receptor ID</i>	<i>Sound Level (Road)</i>	
	<i>Day Leq (16 hrs)</i>	<i>Night Leq (8 hrs)</i>
POR1	65 dBA	58 dBA
POR2	64 dBA	58 dBA
POR3	58 dBA	52 dBA
POR4	64 dBA	58 dBA
POR5	64 dBA	58 dBA
POR6	60 dBA	53 dBA

4.3. Sound Level Limits

Guidelines for acceptable sound levels of road traffic on residential developments are given in Part C of the MECP publication NPC-300 [2].

4.3.1. Indoor Sound Level Limits

The indoor sound levels limits developed by MECP for road sources are as follows:

Table 5: MECP Indoor Sound Level Limit

<i>Room</i>	<i>Time Period</i>	<i>Road Sound Level (Leq)</i>
Living rooms	Day-time (07:00 - 23:00)	45 dBA
	Night-time (23:00 - 07:00)	45 dBA
Bedrooms	Day-time (07:00 - 23:00)	45 dBA
	Night-time (23:00 - 07:00)	40 dBA

In addition to the above indoor levels, the MECP has a sliding scale to determine the need for noise reduction measures depending on the outdoor sound level:



Table 6: Road Noise Ventilation and Warning Clause Requirements

ASSESSMENT LOCATION	Leq	VENTILATION REQUIREMENTS	WARNING CLAUSE
PLANE OF LIVING ROOM WINDOW (07:00-23:00)	Greater than 55 dBA to less than or equal to 65 dBA.	Forced air heating with provision for central air conditioning.	Type C
	Greater than 65 dBA.	Central air conditioning	Type D
PLANE OF BEDROOM WINDOW (23:00-07:00)	Greater than 50 dBA to less than or equal to 60 dBA.	Forced air heating with provision for central air conditioning.	Type C
	Greater than 60 dBA	Central air conditioning	Type D

Table 7: Road Noise Building Component Requirements

ASSESSMENT LOCATION	Noise Source	Leq	BUILDING COMPONENT REQUIREMENTS
PLANE OF BEDROOM, LIVING OR DINING ROOM WINDOW (07:00-23:00)	Road	Less than or equal to 65 dBA	Building compliant with the Ontario Building Code.
	Road	Greater than 65 dBA	Building components must be designed to achieve indoor sound level criteria.
PLANE OF BEDROOM, LIVING OR DINING ROOM WINDOW (23:00-07:00)	Road	Less than or equal to 60 dBA	Building compliant with the Ontario Building Code.
	Road	Greater than 60 dBA	Building components must be designed to achieve indoor sound level criteria

4.4. Noise Control Measures

Noise control recommendations for the critical receptors and the corresponding areas that they represent in the proposed development are summarized in Table 9 and discussed in the subsequent sections.



Table 8: Noise Control Measures

<i>Receptor and Representative Areas</i>	<i>Ventilation</i>	<i>Building Components</i>	<i>Warning Clause</i>
POR1 – West façade of the 4-storey building	Forced-Air Heating	Meet OBC requirements	Type C
POR2 – Southwest corner of the 4-storey building	Forced-Air Heating	Meet OBC requirements	Type C
POR3 – South façade of the 4-storey building	Forced-Air Heating	Meet OBC requirements	Type C
POR4 – West façade of the duplex	Forced-Air Heating	Meet OBC requirements	Type C
POR5 – Northwest corner of the duplex	Forced-Air Heating	Meet OBC requirements	Type C
POR6 – North façade of the duplex	Forced-Air Heating	Meet OBC requirements	Type C

4.4.1. Ventilation

According to the requirements of Table 6, a minimum of forced-air heating with the provision for central air conditioning is required for all residential units in both the duplex and the 4-storey building.

4.4.2. Building Components

For all PORs, the calculated sound levels are less than the lower limits of Table 7. Therefore, building façade components which meet OBC criteria are sufficient to meet indoor sound level limits for all units in both buildings.

4.4.3. Warning Clauses

Since a minimum of forced-air heating with the provision for central air conditioning is required for all residential units in both the duplex and the 4-storey building, the following Type C warning clause should be inserted in all development agreements for each of these dwellings:

“This dwelling unit has been designed with the provision for adding central air conditioning at the occupant’s discretion. Installation of central air conditioning by the occupant in low and medium density developments will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment, Conservation and Parks.”



If any of the residential units are instead supplied with central air conditioning, the Type C warning clause above should be replaced with the following Type D warning clause:

“This dwelling unit has been supplied with a central air conditioning system which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment, Conservation and Parks.”

5. Stationary Noise Sources

The following sections describe the noise impact assessment for stationary noise sources.

5.1. Noise Criteria for Stationary Noise Sources

5.1.1. MECP Noise Guideline Limits

The guidelines for assessing the noise impact of noise generating facilities on proposed noise sensitive areas in Ontario are given in Part C of the MECP publication NPC-300 [2], which outlines the minimum noise criteria for stationary sources of noise. The site specific noise criteria for each time period of day are either the value in Table 9 or the minimum hourly background noise level (L_{EQ-1hr}), whichever is higher. The Project is considered to be located in a Class 1 area due to the activities and zoning of the area surrounding the Project.

Table 9: Noise Level Criteria – Stationary Noise Sources

Time Period	Class 1 Area L_{EQ-1hr} (dBA)	
	Plane of Window	Outdoor Points of Reception
Day-time (0700 – 1900)	50	50
Evening (1900 – 2300)	50	50
Night-time (2300 – 0700)	45	-

5.2. Existing Stationary Noise Sources

SACL conducted a site visit on May 16, 2019. No significant stationary sources of noise from the surrounding area were identified.

5.3. Future Stationary Noise Sources

Potential stationary sources associated with the duplex are expected to consist of small single-residence air conditioning units, and are unlikely to be a significant stationary noise source. Potential stationary sources associated with the 4-storey building, such as rooftop mechanical equipment, should be selected to ensure that indoor noise level limits are met at the Project and at the neighbouring buildings.



There are future potential stationary noise sources associated with the proposed condo building at 71 Wyndham Street South, such as cooling towers, make-up air units, etc. Most of this mechanical equipment is expected to be located on the rooftop level or in the mechanical penthouse, and is unlikely to impact the Project due to the height difference.

6. Concluding Comments

The noise impact of the nearby transportation noise sources on the Project is expected to meet MECP criteria, provided the recommended noise mitigation as described in Section 4.4 is implemented. The proposed development should therefore be approved from a noise perspective.

--- End ---



References

1. City of Guelph Engineering and Transportation Services. *Guelph Noise Control Guidelines, Version 1.0*, November 2018.
2. Ontario Ministry of the Environment and Climate Change. *Environmental Noise Guideline, Stationary and Transportation Sources - Approval and Planning, Publication NPC-300*, August 2013.
3. Stantec Consulting Ltd. *71 Wyndham Street South Traffic Impact Study*, 30 May 2018.
4. City of Guelph. *Online Zoning Map*, 2019. [Online]. Available: <https://guelph.ca/city-hall/by-laws-and-policies-2/zoning-by-law/online-zoning-map/>. [Accessed: 31- May- 2019].



Figures



Figure 1: Aerial View of Site and Surrounding Area

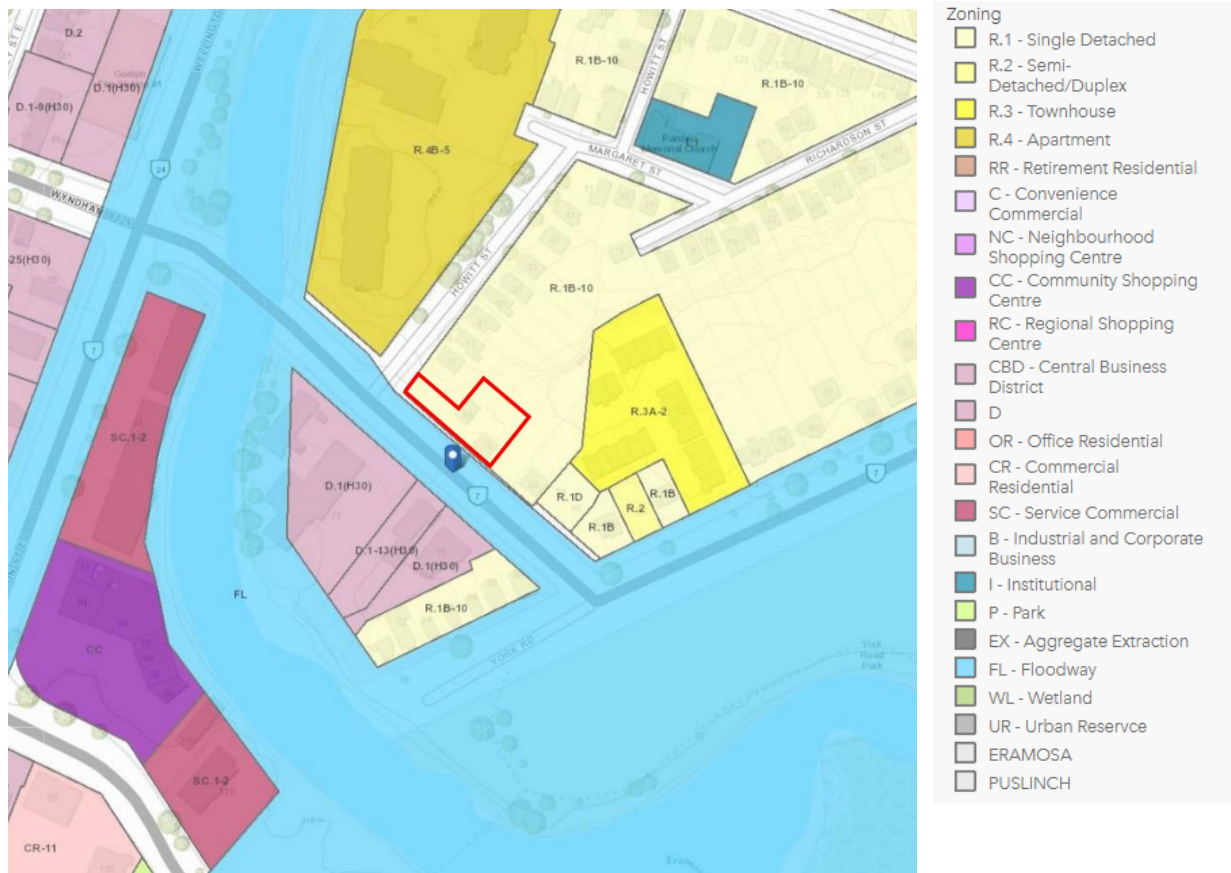


Figure 2: Zoning Map with Project Boundary Outlined [4]

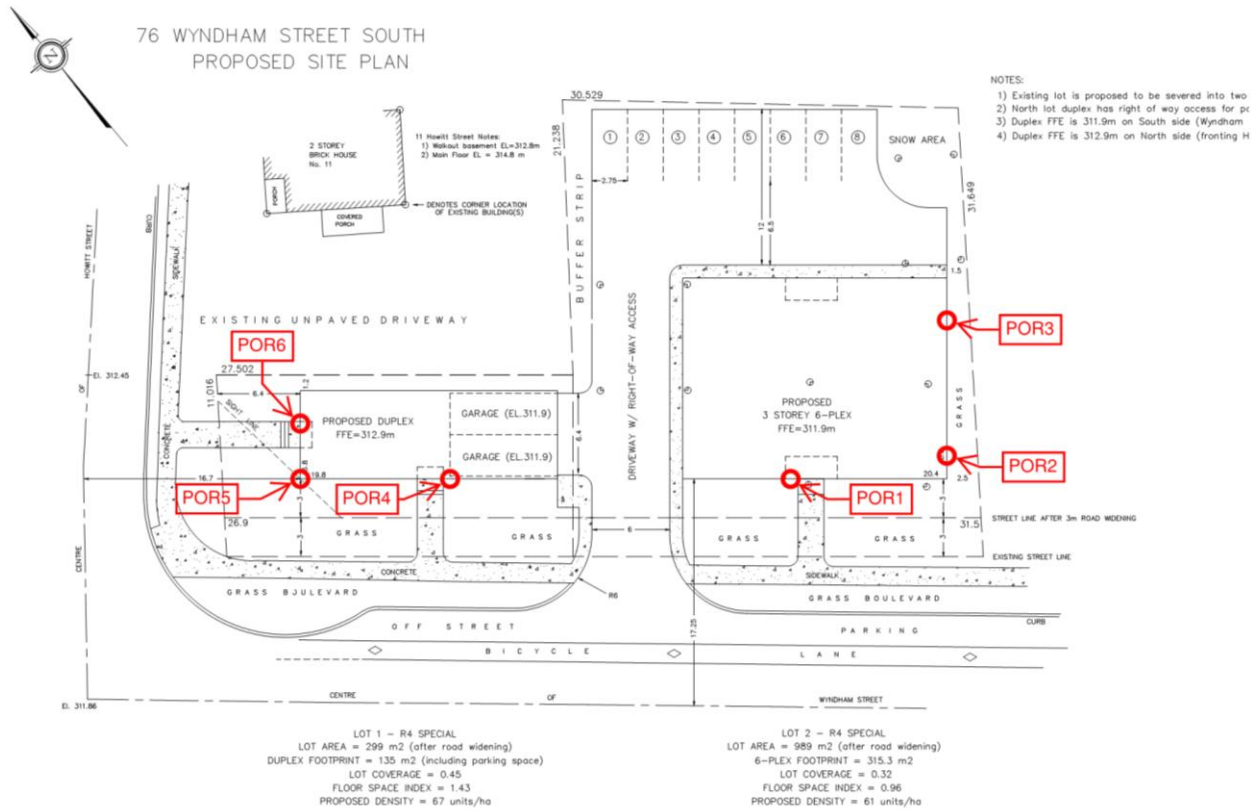


Figure 3: Site Plan and POR Locations

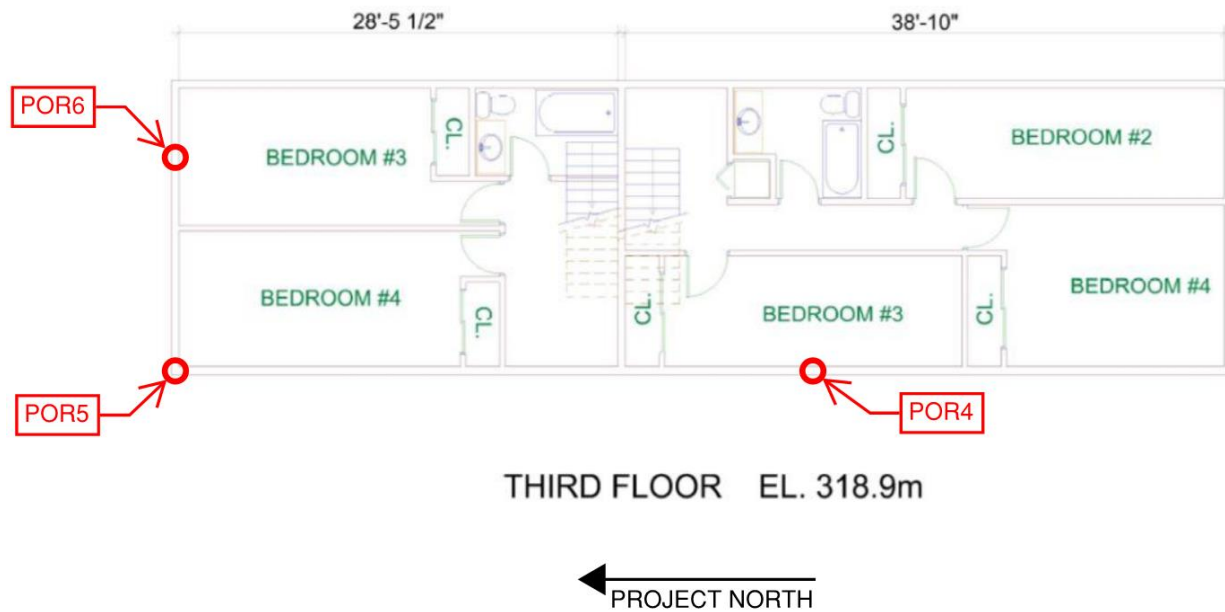


Figure 4: Duplex POR Locations

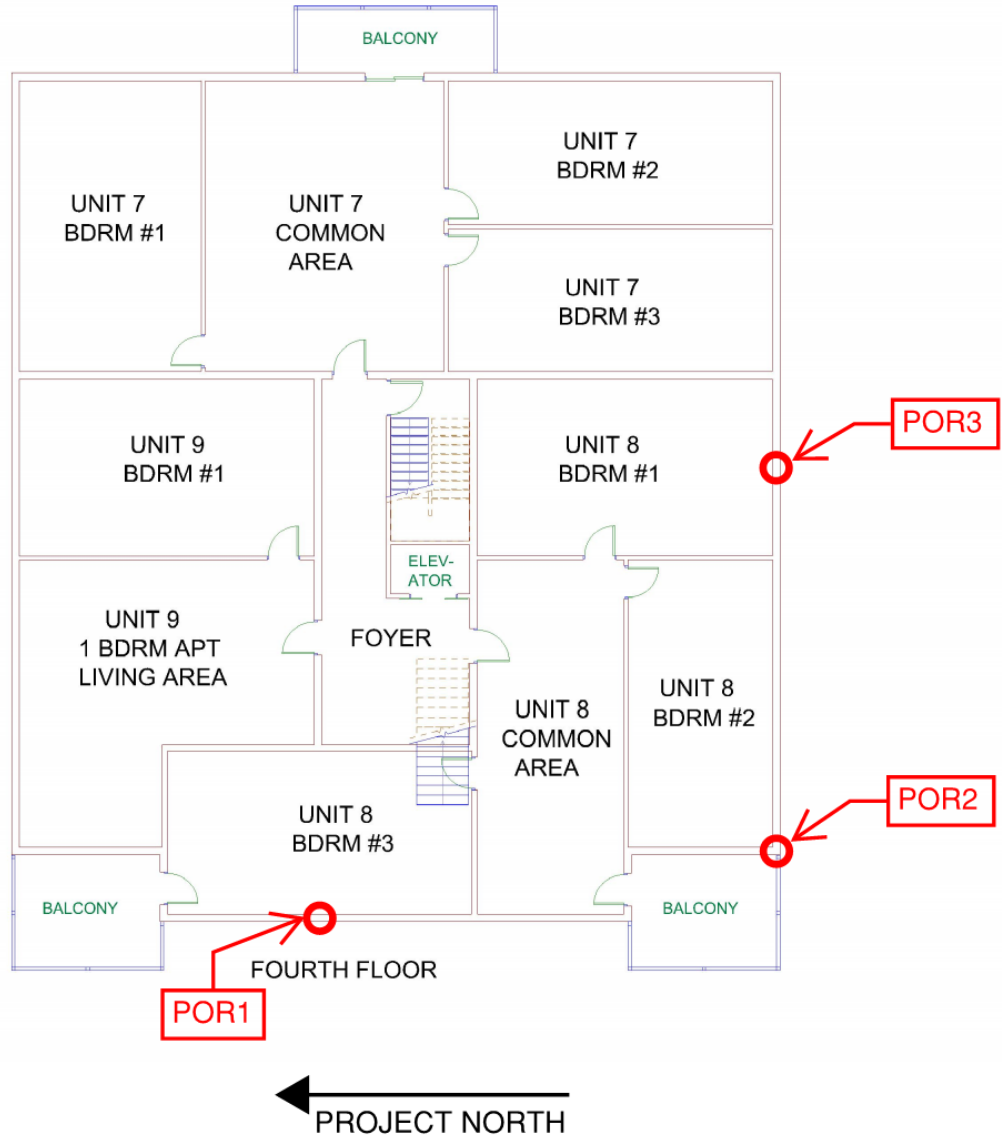


Figure 5: 4-Storey Building POR Locations



Appendices



APPENDIX A: City of Guelph Road Traffic Data

Horizon Data Services Ltd

318 Simonston Blvd
Thornhill, ON L3T 4T5

"we always count...never estimated"

File Name : Wellington St E at Wyndham St S

Site Code : 00000000

Start Date : 3/27/2019

Page No : 1

Groups Printed- Cars - Trucks - Heavys - Cyclists

Start Time	Wyndham St S From North					Wellington St E From East					Wyndham St S From South					Wellington St E From West					Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
07:00 AM	20	7	2	0	29	5	74	0	1	80	2	10	49	2	63	37	72	11	2	122	294
07:15 AM	29	13	8	2	52	6	95	2	1	104	0	12	58	1	71	49	86	25	1	161	388
07:30 AM	26	11	12	2	51	5	114	0	3	122	2	19	74	2	97	64	134	26	0	224	494
07:45 AM	29	13	8	3	53	3	125	0	1	129	1	16	66	3	86	76	183	32	2	293	561
Total	104	44	30	7	185	19	408	2	6	435	5	57	247	8	317	226	475	94	5	800	1737
08:00 AM	28	7	8	2	45	0	147	1	3	151	3	16	85	4	108	38	144	40	4	226	530
08:15 AM	31	13	9	4	57	7	129	3	3	142	3	36	72	1	112	50	183	49	2	284	595
08:30 AM	29	8	8	3	48	5	144	2	3	154	2	33	75	5	115	52	180	52	8	292	609
08:45 AM	37	22	8	1	68	4	151	4	2	161	2	23	53	1	79	76	202	56	3	337	645
Total	125	50	33	10	218	16	571	10	11	608	10	108	285	11	414	216	709	197	17	1139	2379
11:00 AM	32	12	7	1	52	7	90	2	3	102	4	13	50	1	68	47	109	37	5	198	420
11:15 AM	38	18	9	3	68	5	115	3	0	123	1	23	62	4	90	52	106	30	2	190	471
11:30 AM	40	19	11	1	71	10	115	3	0	128	2	27	67	8	104	49	105	32	5	191	494
11:45 AM	50	12	10	3	75	11	114	6	3	134	4	20	71	1	96	38	131	44	3	216	521
Total	160	61	37	8	266	33	434	14	6	487	11	83	250	14	358	186	451	143	15	795	1906
12:00 PM	44	12	5	9	70	3	94	2	4	103	4	15	52	8	79	34	112	34	8	188	440
12:15 PM	43	28	14	3	88	7	100	3	5	115	9	22	70	6	107	53	120	35	10	218	528
12:30 PM	48	16	14	7	85	5	98	4	6	113	4	25	74	7	110	66	128	27	6	227	535
12:45 PM	30	16	14	11	71	5	97	1	2	105	7	31	61	5	104	60	156	32	5	253	533
Total	165	72	47	30	314	20	389	10	17	436	24	93	257	26	400	213	516	128	29	886	2036
01:00 PM	46	19	14	8	87	6	138	3	8	155	3	26	62	9	100	66	142	25	0	233	575
01:15 PM	39	17	15	15	86	10	97	3	7	117	5	13	67	3	88	53	124	39	8	224	515
01:30 PM	39	21	9	1	70	6	118	3	9	136	10	18	57	7	92	58	113	31	0	202	500
01:45 PM	35	12	5	1	53	3	107	6	4	120	5	18	55	6	84	69	131	38	4	242	499
Total	159	69	43	25	296	25	460	15	28	528	23	75	241	25	364	246	510	133	12	901	2089
03:00 PM	54	12	10	8	84	7	126	1	2	136	3	16	87	10	116	49	129	37	1	216	552
03:15 PM	56	15	12	4	87	4	146	1	4	155	4	17	78	7	106	64	161	27	4	256	604

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File Name : Wellington St E at Wyndham St S

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Page No : 2

Groups Printed- Cars - Trucks - Heavys - Cyclists

Start Time	Wyndham St S From North					Wellington St E From East					Wyndham St S From South					Wellington St E From West					Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
03:30 PM	50	16	14	3	83	1	140	3	1	145	3	26	73	4	106	67	175	29	6	277	611
03:45 PM	33	15	9	8	65	3	136	3	0	142	5	15	74	8	102	65	169	33	5	272	581
Total	193	58	45	23	319	15	548	8	7	578	15	74	312	29	430	245	634	126	16	1021	2348
04:00 PM	60	29	9	5	103	5	165	1	7	178	5	33	90	3	131	75	153	39	7	274	686
04:15 PM	56	28	14	3	101	6	163	4	6	179	5	27	103	7	142	79	175	41	2	297	719
04:30 PM	68	32	11	5	116	6	189	4	9	208	3	35	102	11	151	63	173	29	6	271	746
04:45 PM	49	28	17	1	95	7	163	8	6	184	3	33	105	6	147	77	197	41	4	319	745
Total	233	117	51	14	415	24	680	17	28	749	16	128	400	27	571	294	698	150	19	1161	2896
05:00 PM	62	30	10	5	107	4	180	4	6	194	4	27	92	0	123	89	203	35	1	328	752
05:15 PM	75	27	14	0	116	6	167	5	3	181	3	20	80	5	108	66	195	37	4	302	707
05:30 PM	52	25	8	4	89	7	131	3	5	146	4	23	78	7	112	81	169	44	6	300	647
05:45 PM	42	17	7	3	69	5	102	2	4	113	4	20	78	7	109	69	176	32	3	280	571
Total	231	99	39	12	381	22	580	14	18	634	15	90	328	19	452	305	743	148	14	1210	2677
Grand Total	1370	570	325	129	2394	174	4070	90	121	4455	119	708	2320	159	3306	1931	4736	1119	127	7913	18068
Apprch %	57.2	23.8	13.6	5.4		3.9	91.4	2	2.7		3.6	21.4	70.2	4.8		24.4	59.9	14.1	1.6		
Total %	7.6	3.2	1.8	0.7	13.2	1	22.5	0.5	0.7	24.7	0.7	3.9	12.8	0.9	18.3	10.7	26.2	6.2	0.7	43.8	
Cars	1318	561	319	129	2327	168	3990	87	121	4366	117	689	2161	159	3126	1783	4589	1090	127	7589	17408
% Cars	96.2	98.4	98.2	100	97.2	96.6	98	96.7	100	98	98.3	97.3	93.1	100	94.6	92.3	96.9	97.4	100	95.9	96.3
Trucks	13	2	1	0	16	4	33	1	0	38	0	9	36	0	45	35	63	6	0	104	203
% Trucks	0.9	0.4	0.3	0	0.7	2.3	0.8	1.1	0	0.9	0	1.3	1.6	0	1.4	1.8	1.3	0.5	0	1.3	1.1
Heavys	37	3	5	0	45	2	43	1	0	46	2	7	121	0	130	109	79	23	0	211	432
% Heavys	2.7	0.5	1.5	0	1.9	1.1	1.1	1.1	0	1	1.7	1	5.2	0	3.9	5.6	1.7	2.1	0	2.7	2.4
Cyclists	2	4	0	0	6	0	4	1	0	5	0	3	2	0	5	4	5	0	0	9	25
% Cyclists	0.1	0.7	0	0	0.3	0	0.1	1.1	0	0.1	0	0.4	0.1	0	0.2	0.2	0.1	0	0	0.1	0.1

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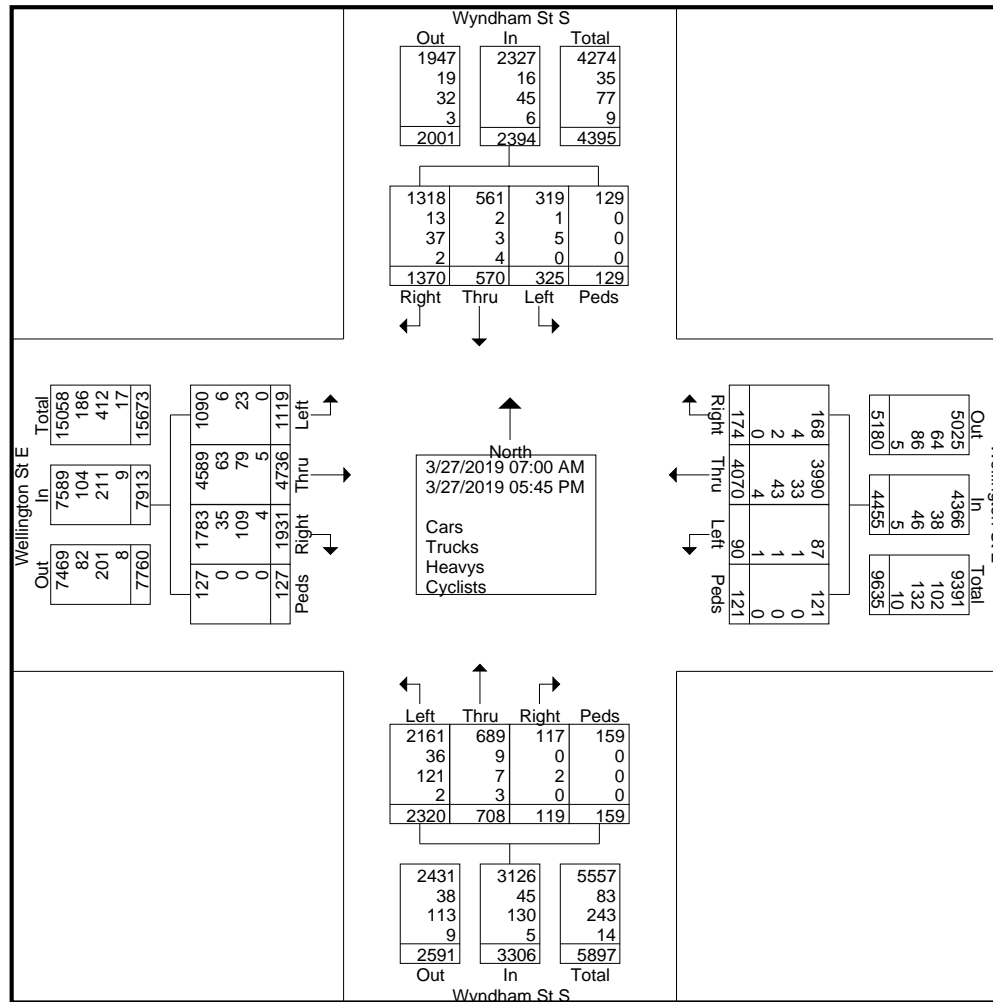
"we always count...never estimated"

File Name : Wellington St E at Wyndham St S

Site Code : 00000000

Start Date : 3/27/2019

Page No : 3



SACL Calculation Notes:

8hr total traffic volume
= Total - Cyclists - Peds
= 5897 - 14 - 159
= 5724

Trucks%
= Total trucks / Total traffic volume
= 83 / 5724
= 1.45%

Heavys%
= Total heavys / Total traffic volume
= 243 / 5724
= 4.25%

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Site Code : 00000000

Start Date : 3/27/2019

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Start Time	Wyndham St S From North					Wellington St E From East					Wyndham St S From South					Wellington St E From West					Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	28	7	8	2	45	0	147	1	3	151	3	16	85	4	108	38	144	40	4	226	530
08:15 AM	31	13	9	4	57	7	129	3	3	142	3	36	72	1	112	50	183	49	2	284	595
08:30 AM	29	8	8	3	48	5	144	2	3	154	2	33	75	5	115	52	180	52	8	292	609
08:45 AM	37	22	8	1	68	4	151	4	2	161	2	23	53	1	79	76	202	56	3	337	645
Total Volume	125	50	33	10	218	16	571	10	11	608	10	108	285	11	414	216	709	197	17	1139	2379
% App. Total	57.3	22.9	15.1	4.6		2.6	93.9	1.6	1.8		2.4	26.1	68.8	2.7		19	62.2	17.3	1.5		
PHF	.845	.568	.917	.625	.801	.571	.945	.625	.917	.944	.833	.750	.838	.550	.900	.711	.877	.879	.531	.845	.922
Cars	117	50	32	10	209	16	557	10	11	594	10	105	264	11	390	193	682	194	17	1086	2279
% Cars	93.6	100	97.0	100	95.9	100	97.5	100	100	97.7	100	97.2	92.6	100	94.2	89.4	96.2	98.5	100	95.3	95.8
Trucks	1	0	0	0	1	0	7	0	0	7	0	2	7	0	9	7	11	0	0	18	35
% Trucks	0.8	0	0	0	0.5	0	1.2	0	0	1.2	0	1.9	2.5	0	2.2	3.2	1.6	0	0	1.6	1.5
Heavys	7	0	1	0	8	0	6	0	0	6	0	1	14	0	15	15	16	3	0	34	63
% Heavys	5.6	0	3.0	0	3.7	0	1.1	0	0	1.0	0	0.9	4.9	0	3.6	6.9	2.3	1.5	0	3.0	2.6
Cyclists	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	0	1	2
% Cyclists	0	0	0	0	0	0	0.2	0	0	0.2	0	0	0	0	0	0.5	0	0	0	0.1	0.1

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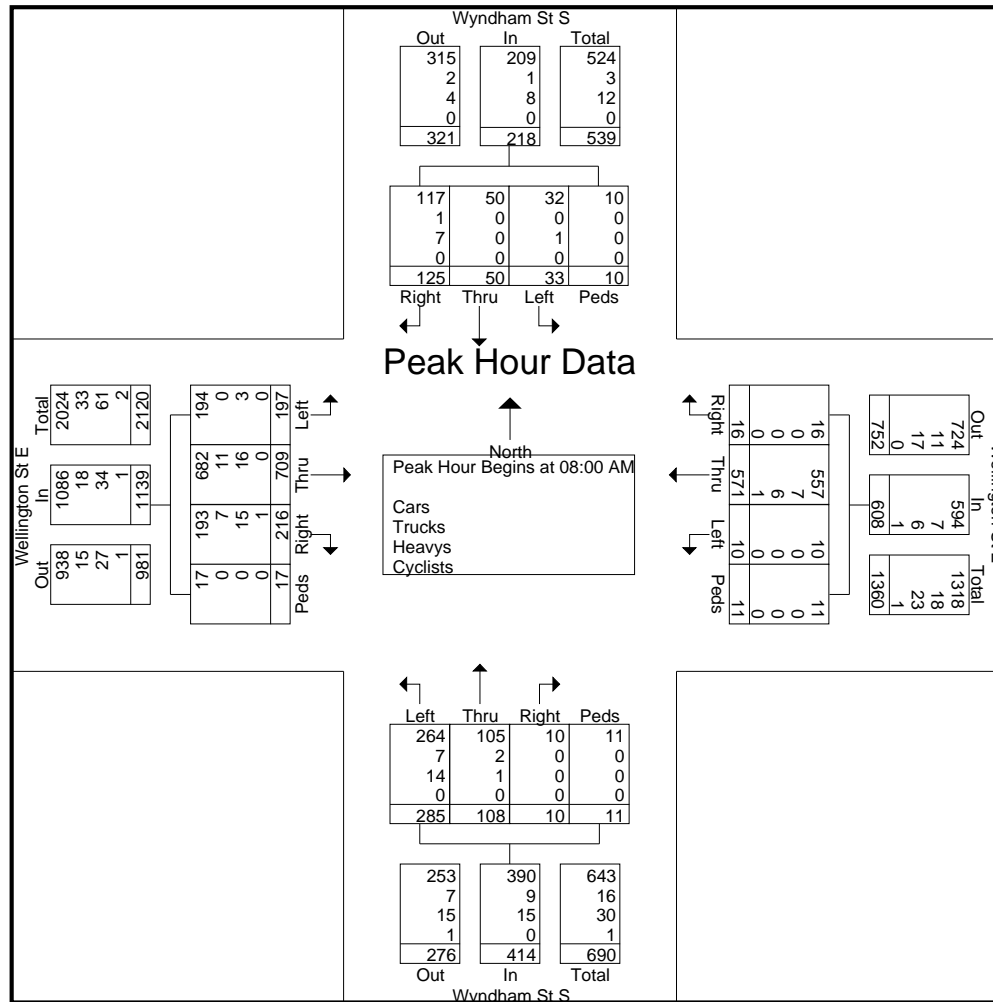
"we always count...never estimated"

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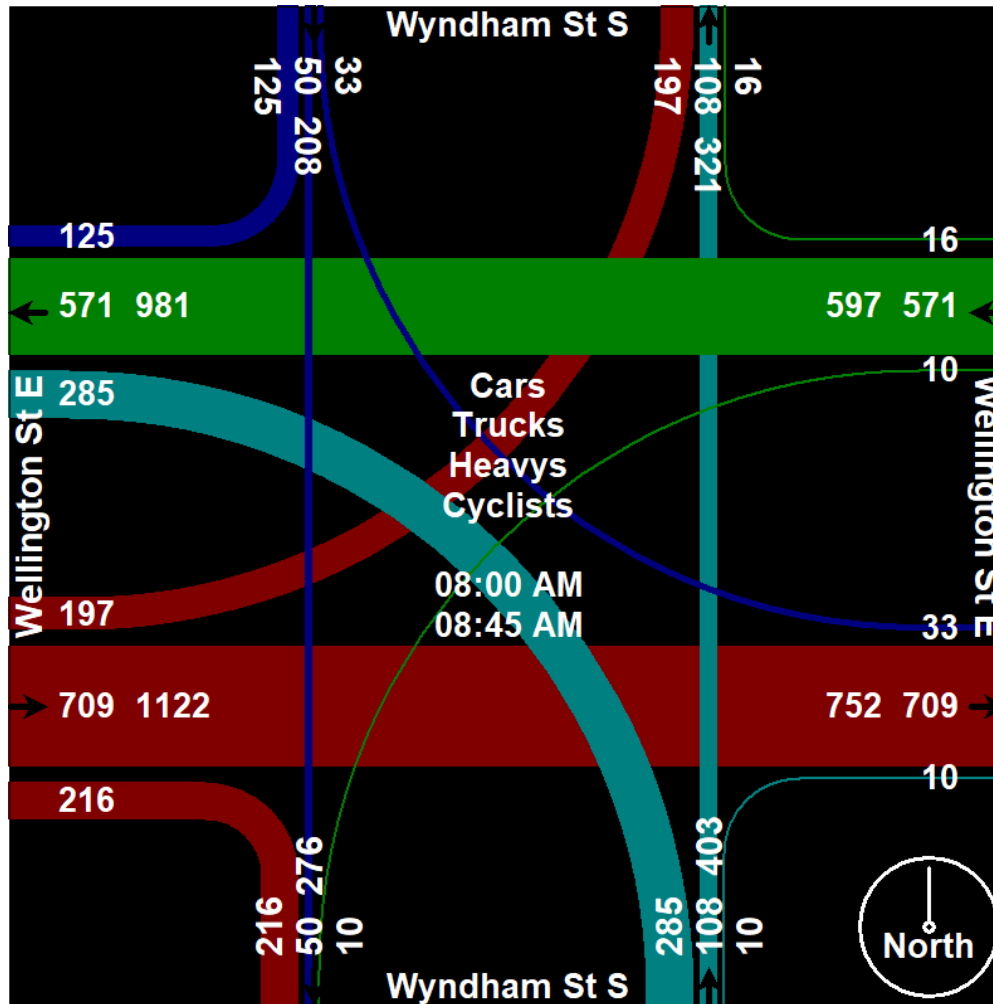


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Start Time	Wyndham St S From North					Wellington St E From East					Wyndham St S From South					Wellington St E From West					Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
Peak Hour Analysis From 11:00 AM to 01:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 12:15 PM																					
12:15 PM	43	28	14	3	88	7	100	3	5	115	9	22	70	6	107	53	120	35	10	218	528
12:30 PM	48	16	14	7	85	5	98	4	6	113	4	25	74	7	110	66	128	27	6	227	535
12:45 PM	30	16	14	11	71	5	97	1	2	105	7	31	61	5	104	60	156	32	5	253	533
01:00 PM	46	19	14	8	87	6	138	3	8	155	3	26	62	9	100	66	142	25	0	233	575
Total Volume	167	79	56	29	331	23	433	11	21	488	23	104	267	27	421	245	546	119	21	931	2171
% App. Total	50.5	23.9	16.9	8.8		4.7	88.7	2.3	4.3		5.5	24.7	63.4	6.4		26.3	58.6	12.8	2.3		
PHF	.870	.705	1.00	.659	.940	.821	.784	.688	.656	.787	.639	.839	.902	.750	.957	.928	.875	.850	.525	.920	.944
Cars	161	76	55	29	321	21	421	11	21	474	22	99	235	27	383	225	525	115	21	886	2064
% Cars	96.4	96.2	98.2	100	97.0	91.3	97.2	100	100	97.1	95.7	95.2	88.0	100	91.0	91.8	96.2	96.6	100	95.2	95.1
Trucks	1	0	1	0	2	2	4	0	0	6	0	2	4	0	6	8	12	2	0	22	36
% Trucks	0.6	0	1.8	0	0.6	8.7	0.9	0	0	1.2	0	1.9	1.5	0	1.4	3.3	2.2	1.7	0	2.4	1.7
Heavys	5	1	0	0	6	0	7	0	0	7	1	1	26	0	28	12	8	2	0	22	63
% Heavys	3.0	1.3	0	0	1.8	0	1.6	0	0	1.4	4.3	1.0	9.7	0	6.7	4.9	1.5	1.7	0	2.4	2.9
Cyclists	0	2	0	0	2	0	1	0	0	1	0	2	2	0	4	0	1	0	0	1	8
% Cyclists	0	2.5	0	0	0.6	0	0.2	0	0	0.2	0	1.9	0.7	0	1.0	0	0.2	0	0	0.1	0.4

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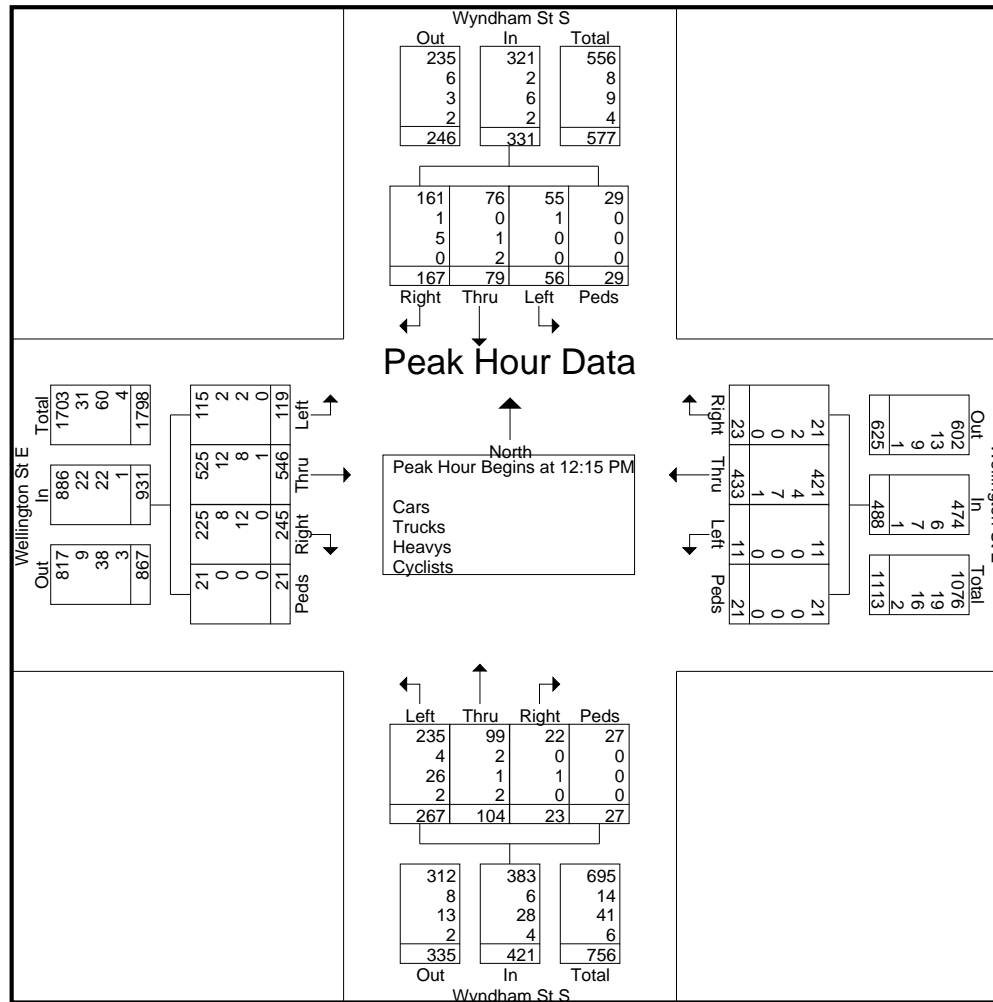
"we always count...never estimated"

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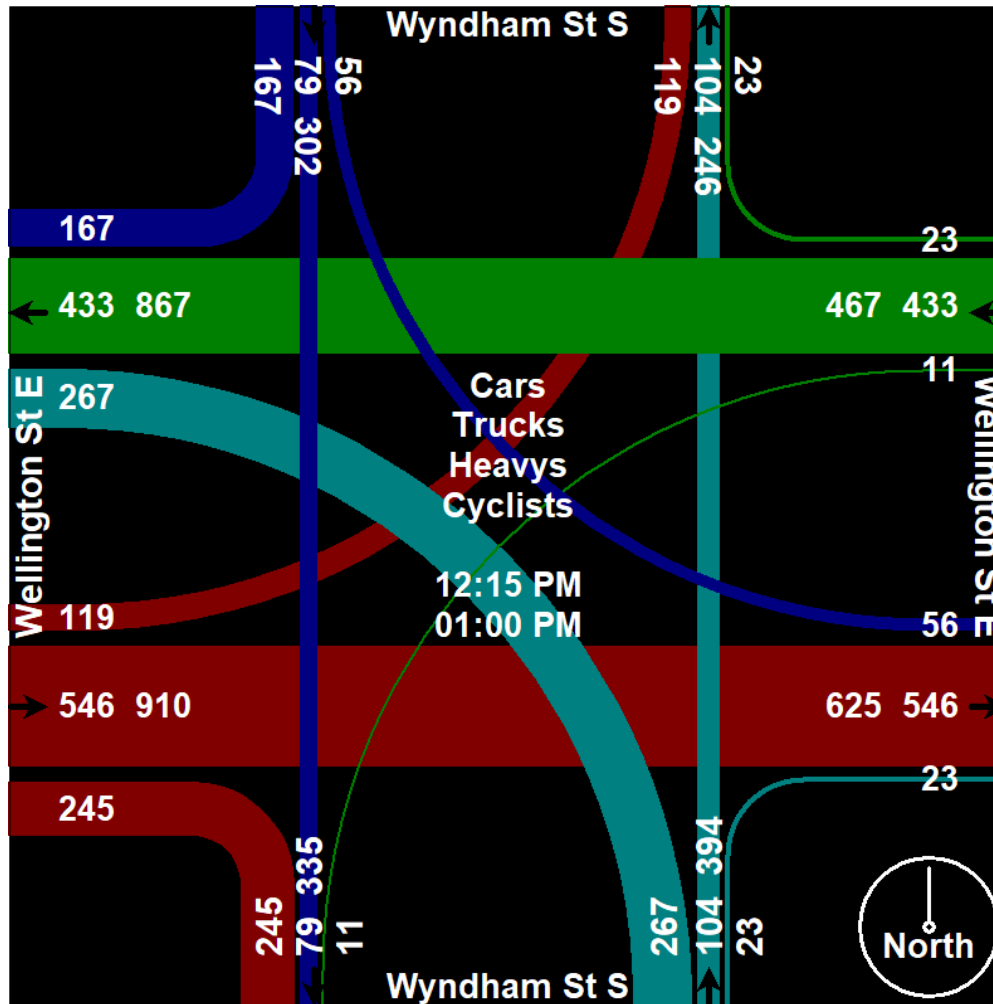


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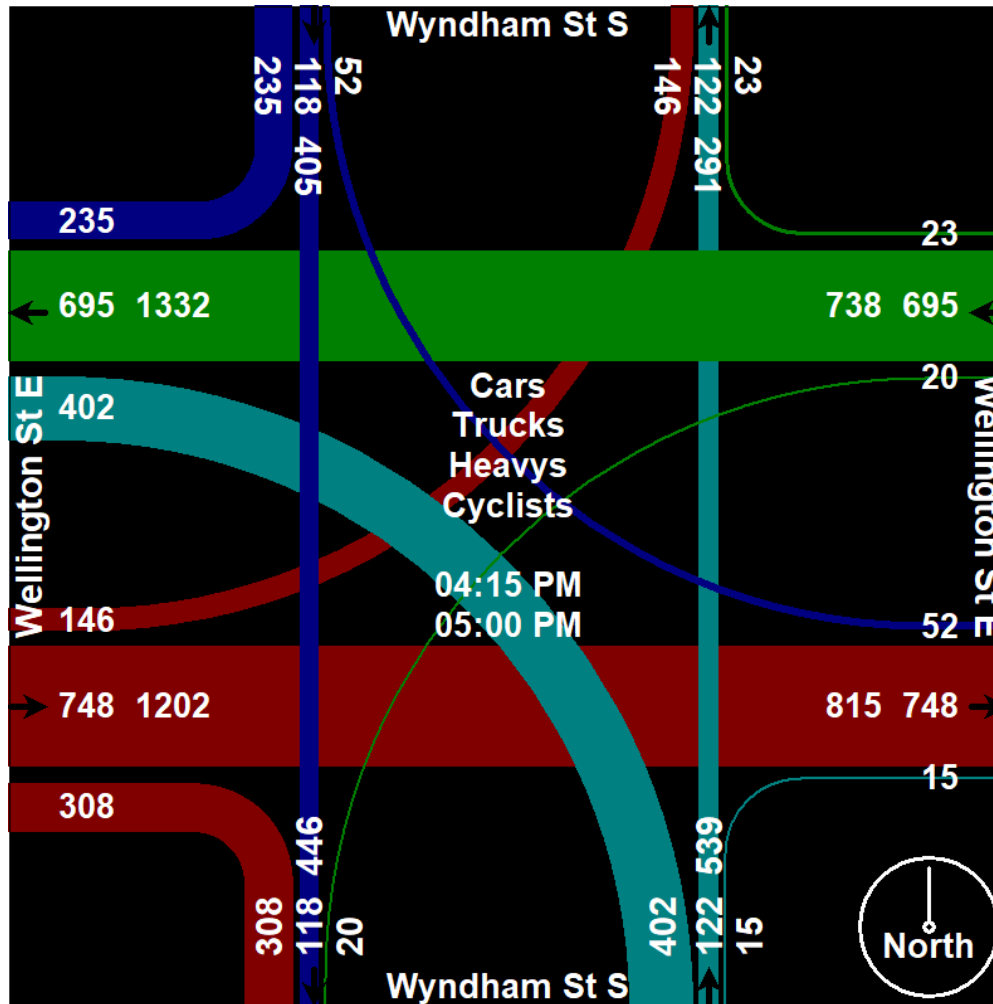
Start Time	Wyndham St S From North					Wellington St E From East					Wyndham St S From South					Wellington St E From West					Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	56	28	14	3	101	6	163	4	6	179	5	27	103	7	142	79	175	41	2	297	719
04:30 PM	68	32	11	5	116	6	189	4	9	208	3	35	102	11	151	63	173	29	6	271	746
04:45 PM	49	28	17	1	95	7	163	8	6	184	3	33	105	6	147	77	197	41	4	319	745
05:00 PM	62	30	10	5	107	4	180	4	6	194	4	27	92	0	123	89	203	35	1	328	752
Total Volume	235	118	52	14	419	23	695	20	27	765	15	122	402	24	563	308	748	146	13	1215	2962
% App. Total	56.1	28.2	12.4	3.3		3	90.8	2.6	3.5		2.7	21.7	71.4	4.3		25.3	61.6	12	1.1		
PHF	.864	.922	.765	.700	.903	.821	.919	.625	.750	.919	.750	.871	.957	.545	.932	.865	.921	.890	.542	.926	.985
Cars	227	116	52	14	409	23	687	19	27	756	14	121	390	24	549	296	732	144	13	1185	2899
% Cars	96.6	98.3	100	100	97.6	100	98.8	95.0	100	98.8	93.3	99.2	97.0	100	97.5	96.1	97.9	98.6	100	97.5	97.9
Trucks	2	0	0	0	2	0	3	0	0	3	0	1	4	0	5	3	6	0	0	9	19
% Trucks	0.9	0	0	0	0.5	0	0.4	0	0	0.4	0	0.8	1.0	0	0.9	1.0	0.8	0	0	0.7	0.6
Heavys	5	1	0	0	6	0	5	0	0	5	1	0	8	0	9	9	9	2	0	20	40
% Heavys	2.1	0.8	0	0	1.4	0	0.7	0	0	0.7	6.7	0	2.0	0	1.6	2.9	1.2	1.4	0	1.6	1.4
Cyclists	1	1	0	0	2	0	0	1	0	1	0	0	0	0	0	0	1	0	0	1	4
% Cyclists	0.4	0.8	0	0	0.5	0	0	5.0	0	0.1	0	0	0	0	0	0	0.1	0	0	0.1	0.1

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APPENDIX B: STAMSON Calculations

POR1

Segment Leq : 64.62 dBA

Total Leq All Segments: 64.62 dBA

↑

Results segment # 1: Wyndham St S (night)

Source height = 1.44 m

ROAD (0.00 + 58.10 + 0.00) = 58.10 dBA

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

-90	90	0.39	59.91	0.00	-0.84	-0.96	0.00	0.00	0.00	58.10
-----	----	------	-------	------	-------	-------	------	------	------	-------

Segment Leq : 58.10 dBA

Total Leq All Segments: 58.10 dBA

↑

TOTAL Leq FROM ALL SOURCES (DAY): 64.62

(NIGHT): 58.10

↑

↑

POR2

Segment Leq : 64.02 dBA

Total Leq All Segments: 64.02 dBA

↑

Results segment # 1: Wyndham St S (night)

Source height = 1.44 m

ROAD (0.00 + 57.50 + 0.00) = 57.50 dBA

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

-90	90	0.39	59.91	0.00	-1.44	-0.96	0.00	0.00	0.00	57.50
-----	----	------	-------	------	-------	-------	------	------	------	-------

Segment Leq : 57.50 dBA

Total Leq All Segments: 57.50 dBA

↑

TOTAL Leq FROM ALL SOURCES (DAY): 64.02

(NIGHT): 57.50

↑

↑

Filename: por3.te Time Period: Day/Night 16/8 hours
 Description:

Road data, segment # 1: Wyndham St S (day/night)

```
-----
Car traffic volume : 10713/1190 veh/TimePeriod *
Medium truck volume : 165/18 veh/TimePeriod *
Heavy truck volume : 483/54 veh/TimePeriod *
Posted speed limit : 50 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): 12623
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.45
Heavy Truck % of Total Volume : 4.25
Day (16 hrs) % of Total Volume : 90.00
```

Data for Segment # 1: Wyndham St S (day/night)

```
-----
Angle1 Angle2 : -90.00 deg 0.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 29.50 / 29.50 m
Receiver height : 10.50 / 10.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00
```

↑
 Results segment # 1: Wyndham St S (day)

 Source height = 1.44 m

ROAD (0.00 + 58.37 + 0.00) = 58.37 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.39	66.43	0.00	-4.09	-3.98	0.00	0.00	0.00	58.37

Segment Leq : 58.37 dBA

Total Leq All Segments: 58.37 dBA

↑

Results segment # 1: Wyndham St S (night)

Source height = 1.44 m

ROAD (0.00 + 51.85 + 0.00) = 51.85 dBA

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

-90	0	0.39	59.91	0.00	-4.09	-3.98	0.00	0.00	0.00	51.85
-----	---	------	-------	------	-------	-------	------	------	------	-------

Segment Leq : 51.85 dBA

Total Leq All Segments: 51.85 dBA

↑

TOTAL Leq FROM ALL SOURCES (DAY): 58.37

(NIGHT): 51.85

↑

↑

POR4

Segment Leq : 64.39 dBA

Total Leq All Segments: 64.39 dBA

↑

Results segment # 1: Wyndham St S (night)

Source height = 1.44 m

ROAD (0.00 + 57.87 + 0.00) = 57.87 dBA

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

-90	90	0.48	59.91	0.00	-0.90	-1.14	0.00	0.00	0.00	57.87
-----	----	------	-------	------	-------	-------	------	------	------	-------

Segment Leq : 57.87 dBA

Total Leq All Segments: 57.87 dBA

↑

TOTAL Leq FROM ALL SOURCES (DAY): 64.39

(NIGHT): 57.87

↑

↑

POR5

Segment Leq : 64.39 dBA

Total Leq All Segments: 64.39 dBA

↑

Results segment # 1: Wyndham St S (night)

Source height = 1.44 m

ROAD (0.00 + 57.87 + 0.00) = 57.87 dBA

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

-90	90	0.48	59.91	0.00	-0.90	-1.14	0.00	0.00	0.00	57.87
-----	----	------	-------	------	-------	-------	------	------	------	-------

Segment Leq : 57.87 dBA

Total Leq All Segments: 57.87 dBA

↑

TOTAL Leq FROM ALL SOURCES (DAY): 64.39

(NIGHT): 57.87

↑

↑

Segment Leq : 59.95 dBA

Total Leq All Segments: 59.95 dBA

↑

Results segment # 1: Wyndham St S (night)

Source height = 1.44 m

ROAD (0.00 + 53.43 + 0.00) = 53.43 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.48	59.91	0.00	-2.33	-4.15	0.00	0.00	0.00	53.43

Segment Leq : 53.43 dBA

Total Leq All Segments: 53.43 dBA

↑

TOTAL Leq FROM ALL SOURCES (DAY): 59.95

(NIGHT): 53.43

↑

↑