Appendix B

Traffic and Transportation Assessment

Final Traffic Report

GUELPH LINE (REGIONAL ROAD 1) AT HARVESTER ROAD, INTERSECTION IMPROVEMENTS – MUNICIPAL CLASS EA (SCHEDULE B), PR-28929A

Prepared for Halton Region
by IBI Group
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ACRONYMS AND ABBREVIATIONS

MTO	Ministry of Transportation, Ontario
QEW	Queen Elizabeth Way
SSR	South Service Road
EA	Environmental Assessment
TMC	Turning Movement Count
ATR	Automatic Traffic Recorder
HCM	Highway Capacity Manual

LANE CONFIGURATIONS

WBL / WBR	Westbound Left / Westbound Right
WBT / WBTR	Westbound Through / Westbound Shared Through and Right
EBL / EBR	Eastbound Left / Eastbound Right
EBT / EBTR	Eastbound Through / Eastbound Shared Through and Right
NBL / NBR	Northbound Left / Northbound Right
NBT / NBTR	Northbound Through / Northbound Shared Through and Right
SBL / SBR	Southbound Left / Southbound Right
SBT / SBTR	Southbound Through / Southbound Shared Through and Right

1 Introduction

IBI Group has been retained by Halton Region (herein referred to as the "Region") to undertake a Schedule "B" Municipal Class Environmental Assessment for the intersection of Guelph Line / Harvester Road. This study is focused on the need to provide localized, short-term (i.e. 5 year) improvements to address existing operational and safety deficiencies at the Guelph Line - Harvester Road intersection. The City of Burlington has recently initiated the "QEW Prosperity Corridor Block Planning Process and Implementation Study" which is expected to provide guidance on longer term solutions for future growth of the area. This approach will allow for minor improvements at the intersection to proceed ahead of any planning solutions to support additional demands associated with future development.

This report summarizes the analysis of existing and future traffic operations based on a 2023 (5-year) horizon, as well as a 2031 horizon for comparison purposes, and identifies potential interim solutions to improve existing operating conditions at the Guelph Line – Harvester Road intersection. Exhibit 1-1 illustrates the Guelph Line-Harvester Road intersection study area and extended study area for the purposes of traffic data collection.

Exhibit 1-1: Study Area

2 Existing Conditions

2.1 Road Network

The following provides a description of the corridor network:

Guelph Line (Regional Road 1) is a north-south major arterial road under the jurisdiction of Halton Region. Within the study limits, it is a six-lane urban roadway posted at 60 km/hr. Sidewalks are provided along both sides of Guelph Line. There are current no cycling facilities along the corridor, within the study limits. The Region's Active Transportation Plan identifies a future cycling network with buffered bike lanes along Guelph Line north of Harvester Road.

North Service Road is an east-west minor arterial road under the jurisdiction of the City of Burlington (60 km/h posted speed). It is grade separated at Guelph Line; however connected by the **North Service Road Link**, which intersects Guelph Line at a signalized intersection at the 403/QEW westbound off-ramp. The North Service Road Link is a four lane two-way road which runs adjacent to the 403/QEW within the study area.

Harvester Road / Queensway Drive is an east-west minor arterial road under the jurisdiction of the City of Burlington (60 km/h posted speed). It intersects Guelph Line as a signalized intersection. To the west of Guelph Line, Queensway Drive is generally a two-lane urban roadway with on-road cycling facilities provided through mixture of designated bike lanes and wide traffic lanes with sharrow pavement markings. East of Guelph Line, Harvester Road exists as a four-lane urban roadway with a posted speed limit of 60 km/h.

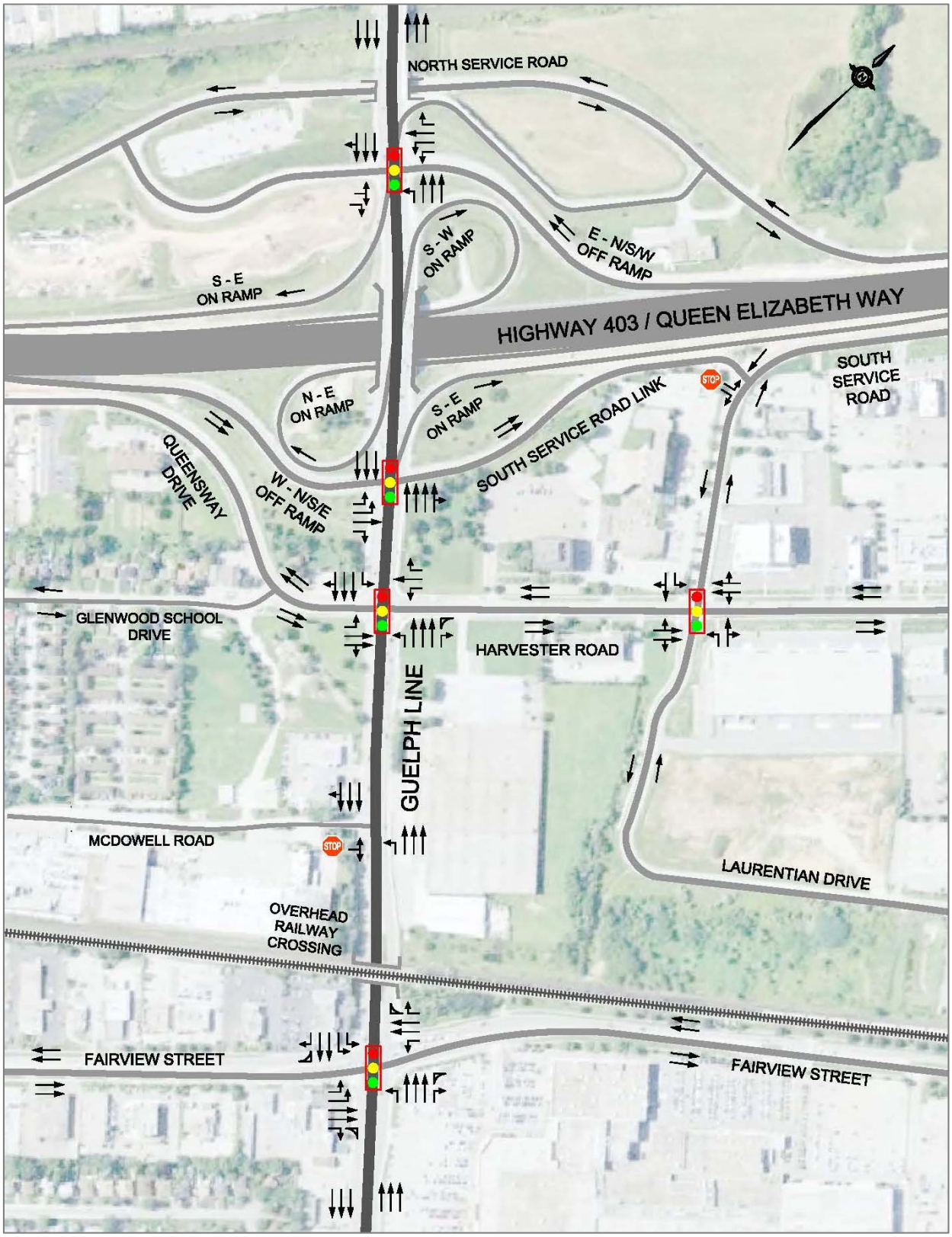
South Service Road is an east-west collector road under the jurisdiction of the City of Burlington (50 km/h posted speed), which runs parallel to 403/QEW. It intersects Harvester Road approximately 300 metres east of Guelph Line. The **South Service Road Link** is a one-way (eastbound only), two lane road which intersects Guelph Line opposite the 403/QEW eastbound off-ramp and connects to the South Service Road approximately 350m further east.

McDowell Road is a two-lane (private) road on the west side of Guelph Line (posted at 20km/h). It intersects Guelph Line as an unsignalized, stop-controlled intersection that serves as an access road for Hood Packaging Corporation (a gravel road connection to Queensway Park and Glen School Drive is currently in place through private lands).

Fairview Street is an east-west arterial road under the jurisdiction of the City of Burlington. Fairview Street begins near Appleby GO station to the east and ends as it intersects with the QEW, where it continues west as Plains Road East. Fairview Street exists is generally a four-lane urban roadway, but is 6 lanes where it intersects with Guelph Line. The posted speed limit on Fairview Street is 60 km/hr.

Existing lane configurations are illustrated in Exhibit 2-1.

Exhibit 2-1: Existing Road Network



2.2 Public Transit

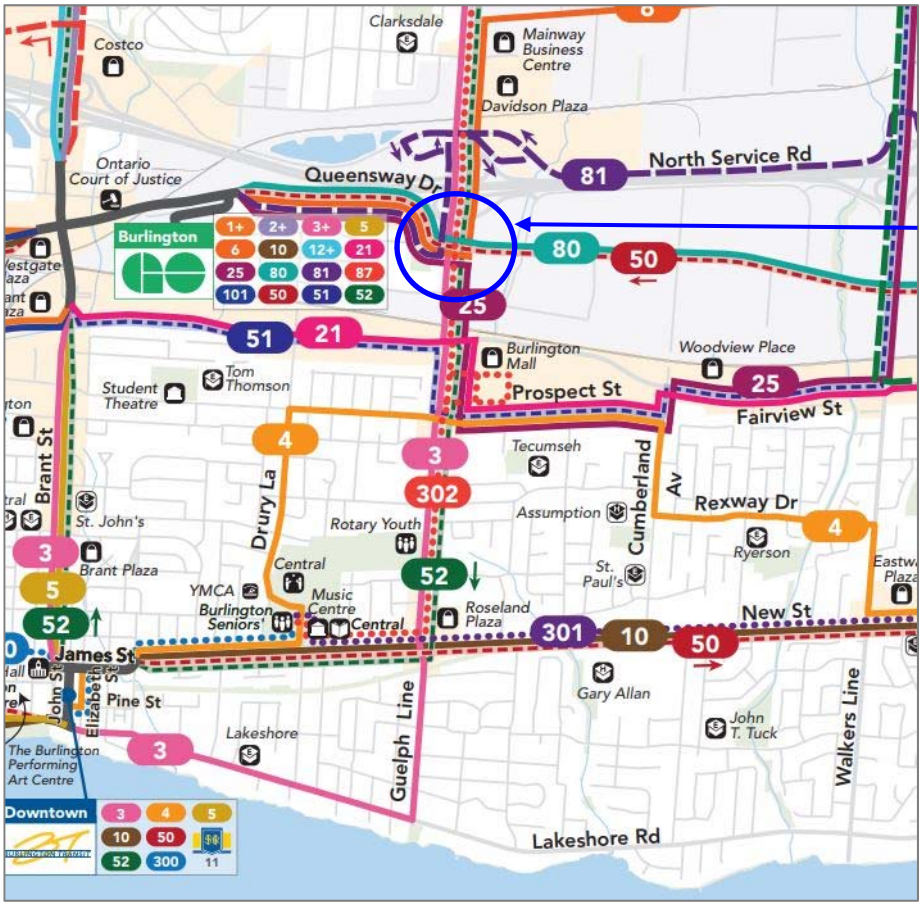
From the Burlington Transit website, a total of seven bus routes operate within the study area. Bus Transit services along Guelph Line include Burlington Transit Routes 3, 6, 52, and 302. Burlington Transit Route 81 passes through the study area, however only travels along Guelph Line between Queensway Drive and North Service Road. Harvester Road and Queensway Drive are serviced by Route 50 and 80 in the east west direction. Exhibits 2-2 and 2-3 present the transit peak period headways and the transit route map, respectively.

Exhibit 2-2: Peak Period Headways of Existing Transit Services

ROUTE	WEEKDAY PEAK HEADYWAY (MINUTES)		
	AM	PM	OTHER
3 - Guelph Downtown	30	30	-
6 - Headon	30	30	-
50 - Burlington South	-	-	60*
52 - Burlington Northwest	-	-	60*
80 - Harvester	30	30	-
81 - North Service	30	30	-
302 - Tansley Woods	-	-	60**

Note: * - denotes late night service only
** - denotes mid-day service only

Exhibit 2-3: Burlington Transit Route Map (March 2019)



INTERSECTION STUDY AREA

2.3 Pedestrian and Cycling Facilities

Within the study area, pedestrian sidewalks are present on:

- Both sides of Guelph Line, Harvester Road and Fairview Street;
- The south side of Queensway Drive;
- The east side of South Service Road; and
- The west side of Laurentian Drive.

The signalized intersections including the off-ramps have crosswalks equipped with pedestrian push-buttons. No dedicated cycling facilities exist within the study area.

2.4 Existing Traffic Volumes

2.4.1 Data Collection

Turning movement counts (TMCs) for the majority of signalized and unsignalized intersections within the study area were provided by the Region of Halton with one count conducted by IBI Group. Counts for the QEW On-ramps were obtained from Ministry of Transportation (MTO), as identified in Exhibit 2-4.

Exhibit 2-4: Intersection Turning Movement Counts (TMCs)

INTERSECTION	DATE OF COUNT	COUNTED BY
Guelph Line & North Service Road Link / E–N/S/W Off-Ramp	September 28, 2017 (Thursday)	Halton
Guelph Line & South Service Road Link / W–N/S/E Off-Ramp	September 27, 2017 (Wednesday)	Halton
Guelph Line & Harvester Road / Queensway Drive	September 25, 2017 (Monday)	Halton
Guelph Line & McDowell Road (Unsignalized)	April 5, 2018 (Thursday)	Halton
Guelph Line & Fairview Street	May 2, 2018 (Wednesday)	Halton
South Service Road & South Service Road Link (Unsignalized)	October 23, 2012 (Tuesday)	IBI
Harvester Road & South Service Road / Laurentian Drive	October 31, 2017 (Tuesday)	Halton
QEW Eastbound On-ramp	September 27, 2017 (Wednesday)	MTO
QEW Westbound On-ramp	September 27, 2017 (Wednesday)	MTO

While volumes for South Service Road and South Service Road Link were not provided by either jurisdiction, volumes were approximated by balancing 2012 counts between adjacent intersections (2018 counts). Balancing traffic volumes is further discussed in the subsequent Section 2.4.2

Automated traffic recorder (ATR) counts were also obtained at three mid-block locations along Guelph Line. The location, date, and two-way peak hour volumes are summarized in Exhibit 2-5.

Exhibit 2-5: Automated Traffic Recorder (ATR) Counts – 24 Hours

LOCATION	DATE	2-WAY PEAK HOUR VOLUME (VEH/HR)	
		AM	PM
Guelph Line - between North Service Road and Mountainside Drive	September 7, 2017 (Thursday)	3334	3992
Guelph Line - between Harvester Road and South Service Road Link	September 7, 2017 (Thursday)	2362	3310
Guelph Line - between Fairview Street and McDowell Road	November 30, 2017 (Thursday)	2417	2900

Based on the TMC and ATR data, traffic volumes along Guelph Line are highest during the weekday PM peak hour. Detailed intersection TMCs are provided in Appendix A.

2.4.2 Volume Balancing

The counts provided by the Region and MTO volumes appear to fluctuate between intersections, particularly northbound and southbound through volumes along Guelph Line. This may be a result of seasonal factors, or other variables that were not consistent over the various count periods. In an effort to limit the degree of outliers (such as counts collected on non-representative days) and to represent the worst-case scenario, a running total procedure in reference to the highest through movements was used by adding volumes to through movements. This process was continued until the entire study area was balanced (including eastbound and westbound through movements). A summary of the balancing volumes is provided in Exhibit 2-6.

Exhibit 2-6: Balancing Traffic Volumes (Weekday)

LOCATION	MOVEMENTS	BALANCING VOLUMES - WEEKDAY	
		AM	PM
Guelph Line & North Service Road Link / E–N/S/W Off-Ramp	NBT SBT	 168	 255
Guelph Line & South Service Road Link / W–N/S/E Off-Ramp	NBT SBT EBR	67 **165** **158**	**568** 11
Guelph Line & Harvester Road / Queensway Drive	NBT SBT	**443** **220**	**445** **321**
Guelph Line & McDowell Road (Unsignalized)	NBT SBT	309	164 125
Guelph Line & Fairview Street	NBT SBT	241 56	194
South Service Road & South Service Road Link (Unsignalized)	NBT SBT	15 26	 -146*
Harvester Road & South Service Road / Laurentian Drive	NBT EBT WBT		24 2 169

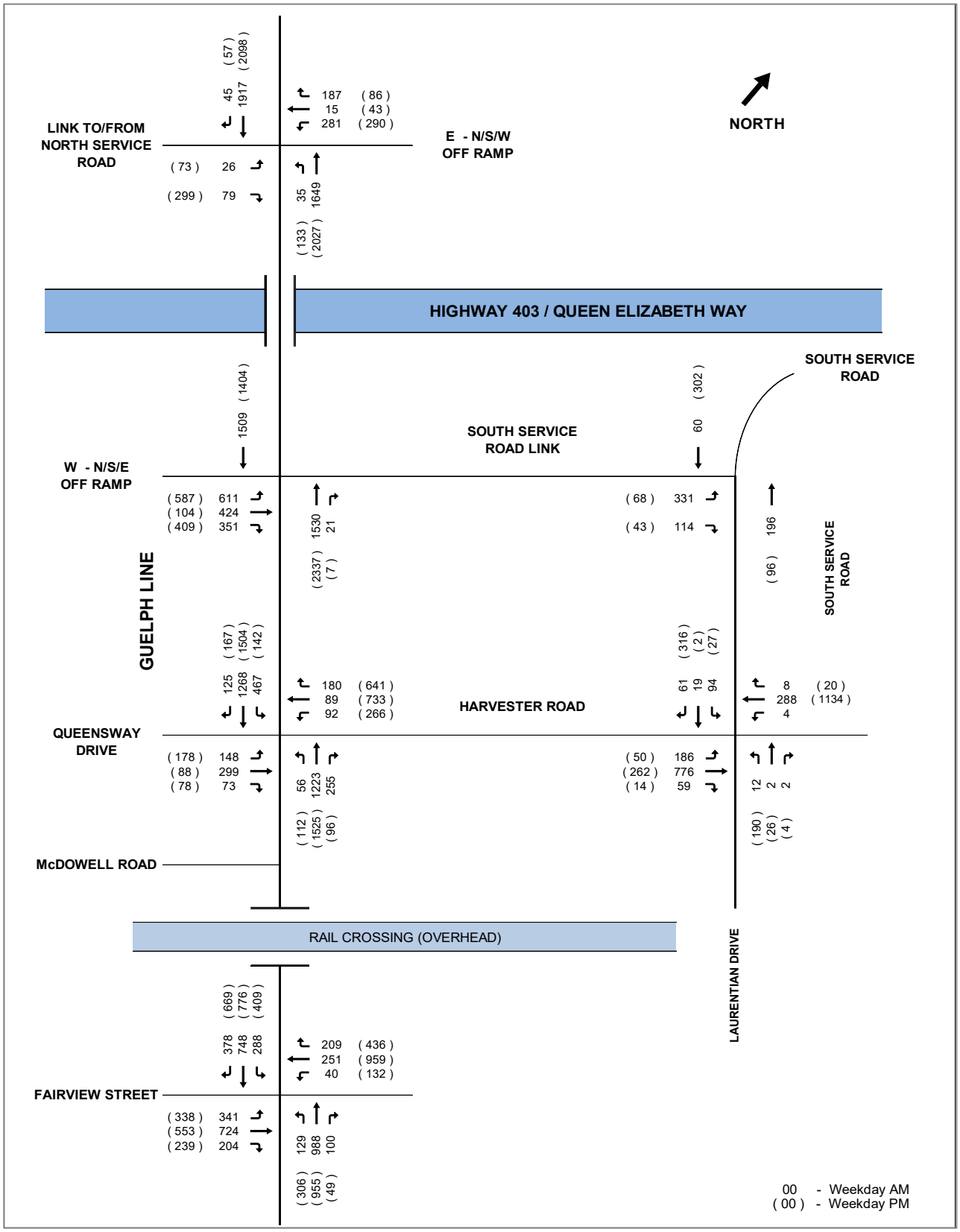
Note: *Volumes were subtracted due to use of 2012 TMCs

As illustrated in the above exhibit, volumes at Guelph Line at South Service Road Link and Harvester Road appear to yield noticeably lower link volumes than those observed along the rest of the corridor and study area. A comparison of 2012 and recent balanced volumes indicate that the majority of all movements at these two intersections drop significantly from year 2012 to 2018 for both peak

periods. This suggest that the counts conducted on these two days are not representative of average conditions and therefore it was considered appropriate that they be increased (as required) in order to balance volumes along the corridor.

All balanced volumes were subsequently carried forward for the future alternatives. A summary of the existing balanced traffic volumes is shown in Exhibit 2-7.

Exhibit 2-7: Existing Traffic – 2018 (Base Year Traffic – Balanced)



2.5 Existing Traffic Operations (2018)

Traffic analysis was conducted using Synchro (Version 9.2) and following Highway Capacity Manual (HCM 2000) methodologies of intersection operation analysis. Analysis periods are limited to the weekday a.m. and p.m. peak hours, when background traffic will be highest.

All critical traffic movements identified in the Synchro analysis for signalized intersections will be outlined and discussed, as per following conditions based on Halton Region's Traffic Impact Study (TIS) guidelines:

- Volume/capacity (v/c) ratios for overall intersection operations, through movements or shared through/turning movements increased to 0.85 or above;
- V/C ratios for exclusive movements increased to 0.95 or above; or
- Queues for an individual movement are projected to exceed available turning lane storage.

Level-of-service (LOS) is a measure of performance based on control delay, as defined in Exhibit 2-8.

Exhibit 2-8: Intersection LOS Reference (Highway Capacity Manual)

LEVEL OF SERVICE (LOS)	CONTROL DELAY PER VEHICLE (SEC) SIGNALIZED INTERSECTION
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

For the purposes of the analysis the following default parameters were assumed: ideal saturation flow rate of 1900 vehicles per hour (vph); peak hour factor of 0.95; lane width for Regional Road of 3.7 metres and lane width for intersecting streets/accesses of 3.5 meters.

Operational concerns or deficiencies noted in the studied horizon years are identified and addressed through recommendations on potential mitigation measures and/or operational improvements.

A summary of intersection performances under existing conditions is provided in Exhibit 2-9, with detailed Synchro reports provided in Appendix B. The analysis is based on signal timing details provided by the Region. Heavy vehicle (truck traffic) percentages and pedestrian volumes were extracted from the existing TMCs.

Exhibit 2-9: Synchro: Intersection LOS Analysis, Existing Conditions (2018)

	INTERSECTION	LOS	V/C	DELAY (SEC)	CRITICAL MOVEMENT (V/C ≥0.85)
AM PEAK	**Guelph Line & North Service Road Link / E–N/S/E Off-Ramp ***	C	0.73	20.1	-
	Guelph Line & South Service Road Link / W–N/S/E Off-Ramp	B	0.61	15.6	-
	Guelph Line & Harvester Road / Queensway Drive	C	0.77	32.8	NBT (V/C = 0.88) SBL (V/C = 0.86, QL ≥ 158 m) **
PM PEAK	**Guelph Line & North Service Road/ E–N/S/E Off-Ramp ***	E	0.98	74.1	**EBR (V/C = 1.0)** **SBTR (V/C = 1.16)**
	Guelph Line & South Service Road Link / W–N/S/E Off-Ramp	B	0.70	14.2	EBR (V/C = 0.85, QL ≥ 136 m) **
	Guelph Line & Harvester Road / Queensway Drive	E	1.04	74.3	NBT (V/C = 0.86) SBTR (V/C = 0.91) **WBT (V/C = 1.26)** **WBR (V/C = 1.17)** EBL (V/C = 0.89, QL ≥ 69 m) **

* Guelph Line & North Service Road Link / E–N/S/E Off-Ramp included for information purposes only
** Movement v/c ≥ 0.85, remains below critical threshold for exclusive turn lane (v/c ≥ 0.95) but 95th percentile queue reaches or exceeds available storage.

Based on the existing condition analysis, the p.m. peak is generally more critical than the a.m. peak. The study intersections are currently operating as follows:

- Guelph Line & Harvester Road / Queensway Drive operates at LOS C in the a.m. peak hour. The northbound through (NBT) movement operates at v/c = 0.88 and the southbound left (SBL) turn movement operates at v/c = 0.86. During this period, SBL queues (95th percentile) exceed available storage and extend to/beyond the upstream intersection.
- Guelph Line & Harvester Road / Queensway Drive operates at LOS E (V/C = 1.04) in the p.m. peak hour. The heavy northbound and southbound movements along Guelph Line limit the green time available for the heavy westbound through (WBT) and westbound right (WBR) movements along Harvester Road, which operate over capacity at v/c = 1.26 and v/c = 1.17 respectively. As a result, queues on Harvester Road frequently extend from the Guelph Line intersection to/beyond the South Service Road/ Laurentian Road intersection. The heavy westbound demands exceed the single lane capacity available at the intersection, and limit gap opportunities for the opposing eastbound left (EBL) turn during permitted phasing.
- Guelph Line & South Service Road Link / W-N/S/E Off-ramp operates well during both peak periods. In the p.m. peak, the heavy eastbound right (EBR) turn movement operates at v/c = 0.85 and EBR queues extend the length of the right turn lane. Field observations confirm that despite existing signing on the right shoulder of the QEW W-N/S/E Off-ramp advising drivers destined to Harvester Road to continue straight through the intersection, a significant number of vehicles turn right onto Guelph Line and weave across the southbound lanes to access the southbound left turn at Harvester Road.

2.6 Collision Analysis

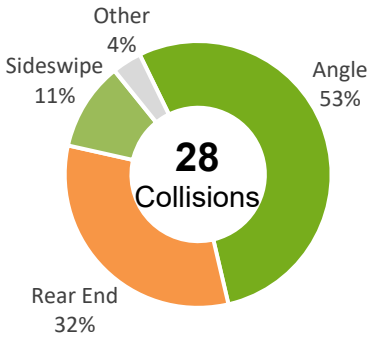
The data was provided by Halton Region and reflects the most recent collisions under the five year study period (2013-2017).

2.6.1 Guelph Line at South Service Road Link

There were a total of 28 reported collisions that occurred at Guelph Line at South Service Road Link. This intersection serves as the off-ramp for QEW on the west and as a link connection to various developments to the east. Exhibit 2-10 shows the collision distributions by initial impact type for this intersection. The most common impact type was angle collisions (53%) followed by rear-end (32%), sideswipe (11%), and other collisions (4%).

Exhibit 2-10: Guelph Line at South Service Road Link - Collisions by Initial Impact Type

COLLISION TYPE	FREQUENCY
Angle	15
Rear End	9
Sideswipe	3
Other	1



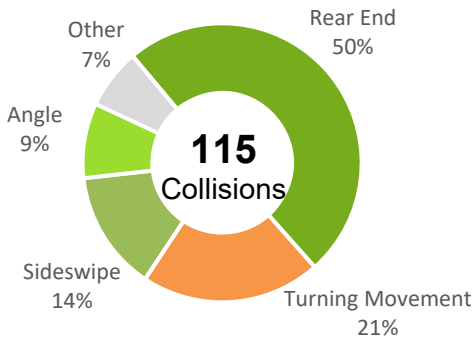
2.6.2 Guelph Line at Harvester Road

There were a total of 115 reported collisions that occurred at Guelph Line at Harvester Road for the five year period. Exhibit 2-11 presents the collision distributions by initial impact type for this intersection. The most prominent collision types were rear-end (50%), followed by turning (21%), sideswipe (14%), angle (9%) and other collisions (7%).

The hourly collision distribution follows a typical commuter pattern, with higher collisions during the a.m. and p.m. peak hours. The collision data show a slightly earlier p.m. peak period which makes sense given the commuters making their way to the QEW.

Exhibit 2-11: Guelph Line at Harvester Road - Collisions by Initial Impact Type

COLLISION TYPE	FREQUENCY
Rear End	57
Turning	24
Sideswipe	16
Angle	10
Other	8



2.7 Summary of Existing Conditions

The intersection of Guelph Line & Harvester Road operates over capacity (LOS E, overall V/C = 1.04) during the p.m. peak; and although operating below capacity during the a.m. peak operation occasionally results in back-ups along Guelph Line.

During the a.m. peak hour, the heavy southbound through and left volumes often exceed the intersection spacing (95 m) available between Harvester Road and the upstream intersection (i.e. Guelph Line & QEW Eastbound Off-Ramp / SSR-Link). Given the existing single SBL lane configuration, this space is only able to accommodate 50th percentile of the through and left turn queue lengths during this period.

During the p.m. peak hour, the northbound and southbound movements on Guelph Line also operate above capacity and contribute to excessive queuing along Guelph Line and Harvester Road. The most critical movements during this period are the westbound through and right turn movements along Harvester Road, both of which exceed capacity and commonly result in queues extending to/beyond the upstream intersection (i.e. Harvester Road & South Service Road / Laurentian Drive).

Given the above, there is a need to undertake intersection improvements to accommodate existing traffic demands. These are independent of any improvements required to accommodate local development which will be addressed through the "QEW Prosperity Corridor Block Planning Process and Implementation Study" which is expected to provide guidance on longer term solutions for future growth of the area.

3 Future Conditions

3.1 Background Growth

To establish future background growth projections for 2023 and 2031, historical growth along the corridor was considered. Based on a review of corridor volumes, as reflected in Exhibit 3-1 and further illustrated in Exhibit 3-2, there has been little to no change in volumes since year 2011, suggesting that growth in the study area over the last 5-6 years has been relatively stable.

As a result, a 0.5% per year (compounded) growth rate was considered appropriate and uniformly applied to turning all movements at all intersections within the study area, with the exception of the QEW Off-ramps (Ramp W-N/S/E & Ramp E-N/S/W) where a background growth rate of 2.0% per year (compounded) was applied to existing volumes to establish projects for years 2023 and 2031, as advised by MTO.

The estimated future background traffic volumes for the years 2023 and 2031 are shown in Exhibit 3-3 and Exhibit 3-4 respectively.

Exhibit 3-1: Historic Traffic Counts along Guelph Line, 2011 – 2017

LOCATION	COUNT DATE	TWO- WAY VOLUMES				85TH PERCENTILE SPEED
		24 HR	AM PEAK HR	PM PEAK HR	8 HR	
Section 1	7-Sep-17	40,480	2,362	3,310	21,855	58
Section 2	30-Nov-17	40,022	2,417	2,900	21,431	66
Section 1	21-Apr-15	41,238	2,351	3,604	22,921	63
Section 2	21-Apr-15	36,635	2,380	2,870	20,424	70
Section 1	18-Apr-13	42,709	2,252	3,688	23,442	65
Section 2	18-Apr-13	39,110	2,354	3,054	21,451	67
Section 1	15-Apr-11	40,783	2,098	3,578	22,179	60
Section 2	15-Apr-11	39,660	2,300	2,968	21,282	69

Notes: Section 1: Guelph Line - Harvester Road to SSR Link (ATR Count Station 100100)
Section 2: Guelph Line - Fairview Street to McDowell Road (ATR Count Station 100099)
Posted Speed = 60km/h

Exhibit 3-2: Historic Traffic Counts along Guelph Line, 2011 – 2017 (Two-Way)

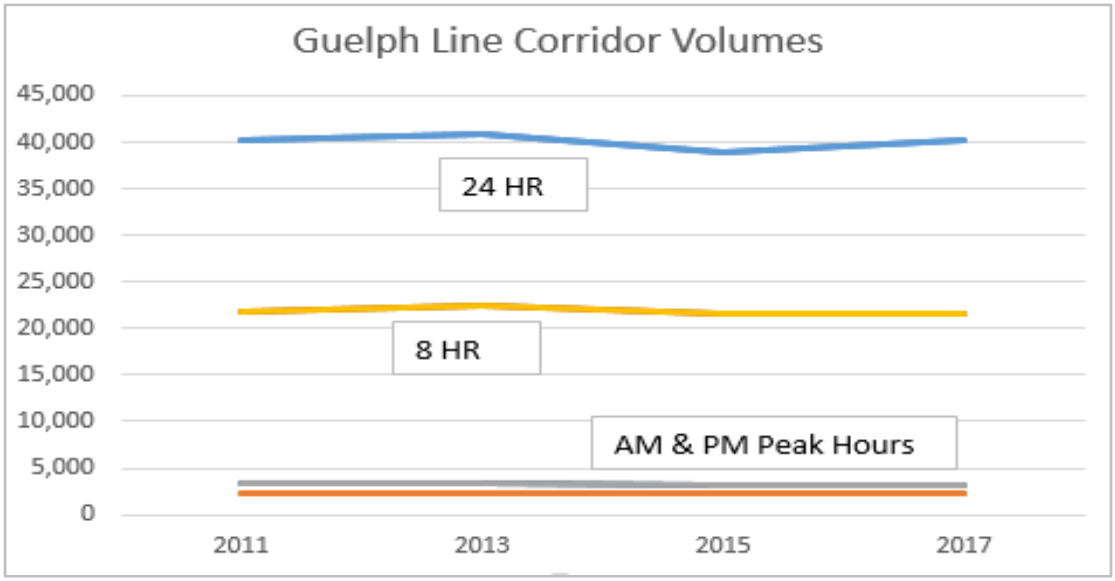


Exhibit 3-3: Future Background Traffic – Horizon Year 2023

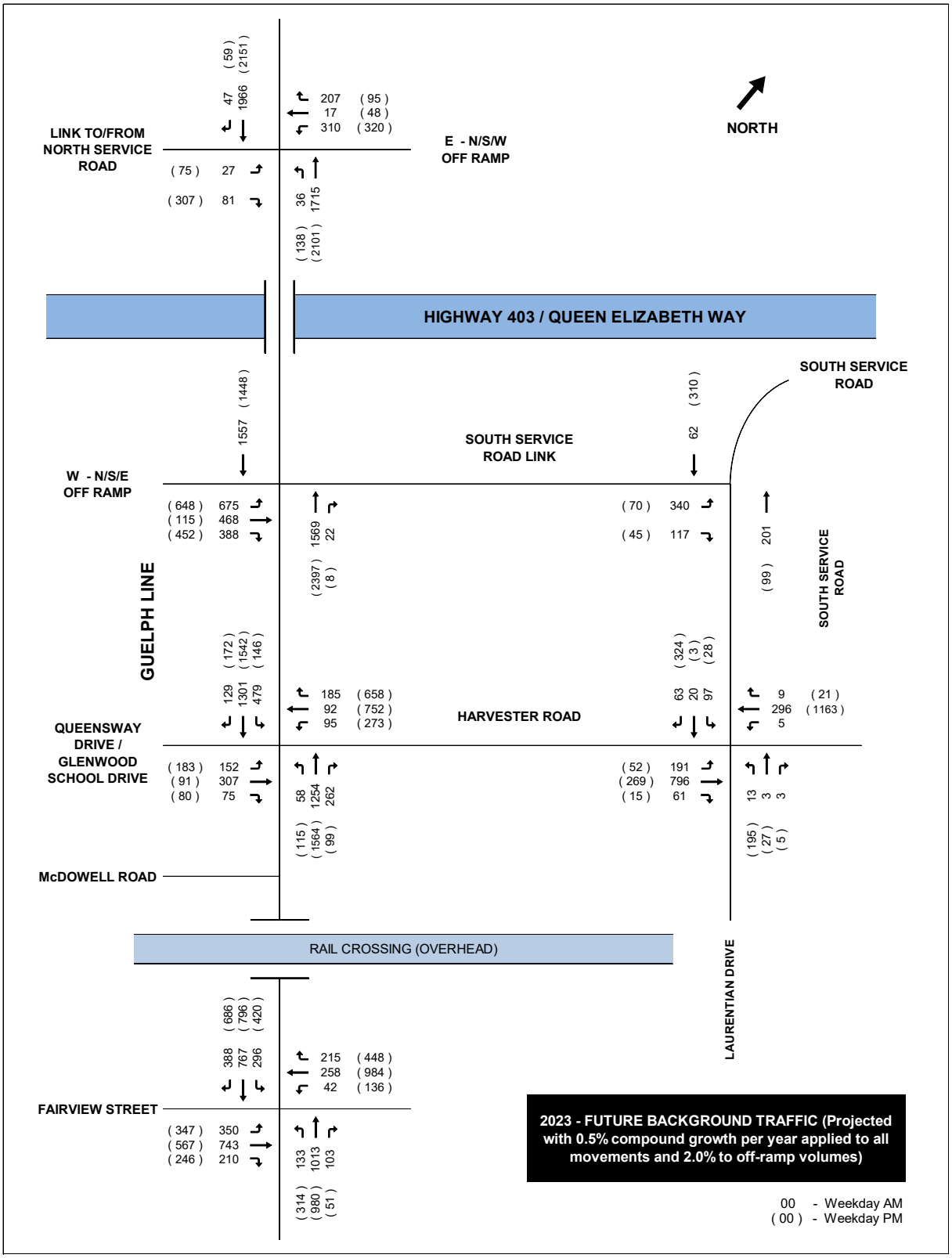
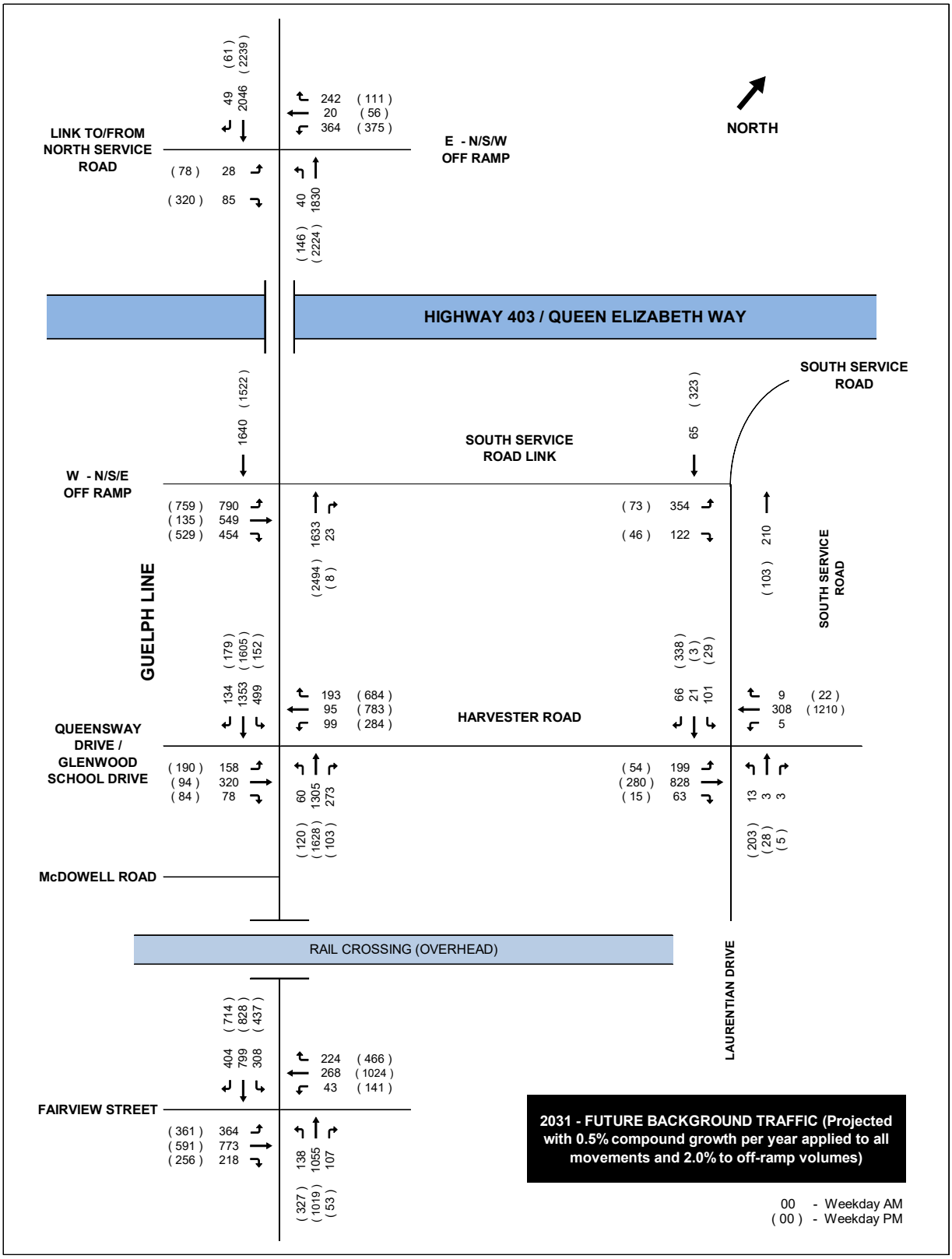


Exhibit 3-4: Future Background Traffic – Horizon Year 2031



3.2 Future Background Operations

Based on the estimated background traffic volumes for year 2023 and 2031 horizons (illustrated in Exhibit 3-3 and 3-4), the study intersections are expected to operate as follows:

Year 2023

- Guelph Line & Harvester Road / Queensway Drive intersection is expected to operate at LOS C (v/c = 0.79) in the a.m. peak hour. There continues to be heavy NBT and SBL opposing movements, which compete for available green time. These movements remain below capacity, however 95th percentile SBL queues are expected to continue to exceed the available left turn lane length and extend to/beyond the South Service Road Link / W-N/S/E Off-Ramp.
- During the p.m. peak hour, the Guelph Line & Harvester Road / Queensway Drive intersection is expected to operate at LOS E (v/c = 1.07). The overall traffic demands are higher and the WBT and WBR movements along Harvester Road operate over capacity, with 95th percentile queues extending past the South Service Road.
- Guelph Line & South Service Road Link / W-N/S/E Off-Ramp is expected to operate well during both peak periods (i.e. LOS B, v/c = 0.65 during the a.m. peak; and LOS B, v/c = 0.75 during the p.m. peak hour). In the p.m. peak, the heavy eastbound right (EBR) turn movement operates at v/c = 0.91 and 95th percentile queues are expected to reach/exceed the length of the existing right turn lane.

A summary of the intersection performances for the future background condition (2023 and 2031) is shown in Exhibit 3-5 and 3-6, with detailed Synchro reports provided in Appendix C.

Exhibit 3-5: Synchro: Intersection LOS Analysis, Future Background Conditions (2023)

	INTERSECTION	LOS	V/C	DELAY (SEC)	CRITICAL MOVEMENT (V/C ≥0.85)
AM PEAK	**Guelph Line & North Service Road Link / E–N/S/E Off-Ramp ***	C	0.75	23.3	--
	Guelph Line & South Service Road Link / W–N/S/E Off-ramp	B	0.65	17.0	--
	Guelph Line & Harvester Road / Queensway Drive	C	0.79	34.3	NBT (V/C = 0.90) SBL (V/C = 0.89, QL ≥ 166 m) **
PM PEAK	**Guelph Line & North Service Road Link / E–N/S/E Off-Ramp ***	F	1.01	82.7	**EBR (V/C = 1.03)** NBT (V/C = 0.85) **SBTR (V/C = 1.21)**
	Guelph Line & South Service Road Link / W–N/S/E Off-ramp	B	0.75	15.6	EBR (V/C = 0.91, QL ≥ 161 m) **
	Guelph Line & Harvester Road / Queensway Drive	E	1.07	79.1	NBT (V/C = 0.88) SBTR (V/C = 0.93) **WBT (V/C = 1.29)** **WBR (V/C = 1.21)** EBL (V/C = 0.92, QL ≥ 72 m) **

* Guelph Line & North Service Road Link / E–N/S/E Off-Ramp included for information purposes only

** Movement v/c ≥ 0.85, remains below critical threshold for exclusive turn lane (v/c ≥ 0.95) but 95th percentile queue exceeds available storage..

Year 2031

- By year 2031, traffic operations at the Guelph Line & Harvester Road / Queensway Drive intersection will slightly worsen and the intersection is expected to operate at LOS D (v/c = 0.82) in the a.m. peak hour and LOS F (v/c = 1.11) in the p.m. peak hour. Overall intersection delays are expected to increase by 5-10%. Other than the WBT and WBR movements during the p.m. peak hour, all movements will remain below capacity.
- Guelph Line & South Service Road Link / W-N/S/E Off-Ramp is expected to continue to operate at LOS B (v/c = 0.72 and 0.82 during the a.m. and p.m. peak hours respectively)

Exhibit 3-6: Synchro: Intersection LOS Analysis, Future Background Conditions (2031)

	INTERSECTION	LOS	V/C	DELAY (SEC)	CRITICAL MOVEMENT (V/C ≥0.85)
AM PEAK	**Guelph Line & North Service Road Link / E–N/S/E Off-Ramp ***	C	0.80	27.9	--
	Guelph Line & South Service Road Link / W–N/S/E Off-Ramp	B	0.72	19.3	--
	Guelph Line & Harvester Road / Queensway Drive	D	0.82	35.8	NBT (V/C = 0.93) SBL (V/C = 0.94, QL ≥ 179 m) **
PM PEAK	**Guelph Line & North Service Road Link / E–N/S/E Off-Ramp ***	F	1.07	96.3	**EBR (V/C = 1.07)** NBT (V/C = 0.91) **SBTR (V/C = 1.28)**
	Guelph Line & South Service Road Link / W–N/S/E Off-Ramp	B	0.82	20.2	**EBR (V/C = 1.04, QL ≥ 204 m)**
	Guelph Line & Harvester Road / Queensway Drive	F	1.11	87.3	NBT (V/C = 0.92) SBTR (V/C = 0.97) **WBT (V/C = 1.34)** **WBR (V/C = 1.27)** EBL (V/C = 0.95, QL ≥ 76 m)

* Guelph Line & North Service Road Link / E–N/S/E Off-Ramp included for information purposes only
** Movement v/c ≥ 0.85, remains below critical threshold for exclusive turn lane (v/c ≥ 0.95) but 95th percentile queue exceeds available storage.

The results of the traffic analysis confirm that roadway improvements will be required to accommodate background growth and provide acceptable traffic operations within the study area within the 2023 (5 year) horizon and continues in 2031.

4 Origin-Destination Survey

An Origin-Destination (license-plate survey) study was conducted in 2012 assist in determining whether the South Service Road Link was being underutilized as a connection to the South Service Road and if improvements such as signing to increase driver awareness and/or the introduction of a SBL could help in relieving the heavy southbound left demands at Guelph Line at Harvester Road. Although the study was conducted several years ago, it is expected that the findings remain valid given that no significant changes have occurred to the underlying assumptions (such as changes to lane configurations). The results of survey suggests:

- If a SBL lane was provided on Guelph Line at the South Service Road Link, it is expected that 13% (or more) of the vehicles turning left at Harvester Road will be diverted to this new movement. If applied to the observed counts, it is estimated that 61 veh/hr would be diverted during the a.m. peak hour; reducing the SBL turn demands at Harvester Road.
- If enhanced signage were provided on the QEW W-N/S/E Off-ramp, resulting in improved use of South Service Road Link, it is expected that approximately 5% of SBL turns at Harvester Road would be diverted (equivalent to the percentage of the traffic in the SBL at Harvester Road which originates from the Ramp W-N/S/E and travels to the South Service Road, based on the licence plate trace). This diversion would shift another 21 veh/hr from to the SBL movement and add it to the EBT movement at the QEW Off-ramp.
- If South Service Road Link is converted to two-way traffic (new WBR movement), it is expected that approximately 16% of WBR turns at Harvester Road would be diverted to this new movement. If applied to the observed counts, it is estimated that 103 veh/hr would be diverted during the p.m. peak hour; reducing the WBR turn demands at Harvester Road.

The methodology of the license-plate survey is detailed in Appendix D (including a summary of existing signing on the QEW Ramp W-N/S/E, approaching Guelph Line). The findings of the study were incorporated into the development and analysis of Design Alternatives.

5 Development of Alternatives

5.1 Objective and Methodology

The primary objective of this study is to identify localized intersection improvements to increase capacity, manage existing capacity, and enhance vehicle and pedestrian safety at the Guelph Line – Harvester Road intersection. An interim 2023 year horizon was assessed, as well as a 2031 horizon for comparison purposes.

5.2 Evaluation of Alternative Solutions

To accommodate a.m. peak hour demands, additional southbound left turn opportunities are required along Guelph Line (i.e. dual SBL at Harvester and/or a new SBL at the South Service Road Link). To accommodate the p.m. peak hour demands, additional westbound through lane and right turn opportunities are required at the Guelph Line and Harvester Road intersection (i.e. second WBT and/or dual WBR turn lane).

Based on the above, the following five Alternative Design Solutions were developed to improve traffic operations (refer to Exhibit 5-1):

- **Alternative I** – Provide a dual SBL at Harvester Road and add a WBT on Harvester Road;
- **Alternative II** – Add a SBL at the SSR Link and a WBT on Harvester Road;
- **Alternative III** – Add a SBL at the SSR Link and a SBL and WBT at Harvester Road; and,
- **Alternative IV** – Add both a dual SBL and add WBT and second (dual) WBR at Harvester Road (limiting improvements to the Harvester Road intersection).
- **Alternative V** – Add WBT on Harvester Road;

These alternatives are illustrated in detail in **Appendix E.**

Exhibit 5-1: Description of Alternative Design Solutions

SCENARIO	HARVESTER ROAD / GUELPH LINE INTERSECTION			GUELPH LINE /SOUTH SERVICE ROAD LINK INTERSECTION
	DUAL SBL	DUAL WBR	WBT	NEW SBL
Alternative I	√	-	√	-
Alternative II	-	-	√	√
Alternative III	√	-	√	√
Alternative IV	√	√	√	-
Alternative V	-	-	√	-

Consideration was also given to converting the SSR Link to two-way traffic flow allowing for a portion of the heavy WBR turn volumes to be diverted away from the Guelph Line and Harvester Road intersection. However, this configuration is more restrictive to the critical northbound movements on Guelph Line, due to signal phasing requirements. The reduction in available green time in the northbound direction results in less opportunity for northbound queues between the intersections to clear and in turn increases blockage of northbound and westbound right turn movements at the Guelph Line – Harvester Road intersection. For these reasons, this option was not considered within any of the Alternative Design Solutions.

5.2.1 Summary of Traffic Operations for each Design Alternative

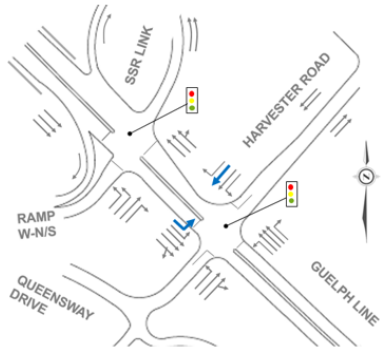
As noted in Section 5.1, the primary objective of this study which is to identify localized intersection improvements to increase capacity, manage existing demand and enhance vehicle and pedestrian safety at the Guelph Line –Harvester Road intersection To assist in the comparison of alternatives, a summary of traffic operations is provided in Exhibits 5-2 to Exhibit 5-6. Detailed Synchro (Version 9.2) output and similar (larger scale) summary tables are also available in **Appendix F.**

Exhibit 5-2: Traffic Operations Summary for Design Alternative I

ALTERNATIVE I

Overview:

- Provide dual SBL at Harvester Road
- Add WBT on Harvester Road



Future 2023 (2031) Operations Analysis:

INTERSECTION	AM PEAK HOUR			PM PEAK HOUR		
	V/C	Delay (s)	LOS	V/C	Delay (s)	LOS
Guelph Line & W-N/S/E Off Ramp / South Service Road Link	0.65 (0.72)	17.1 (18.9)	B (B)	0.67 (0.76)	13.8 (15.9)	B (B)
Critical Movements (v/c)	--			EBR = (0.86)		
Guelph Line & Harvester Road / Queensway Drive	0.71 (0.74)	30.1 (30.9)	C (C)	0.98 **(1.02)**	54.1 (57.2)	D (E)
Critical Movements (v/c)	EBL = 0.86 (0.88) QL > 70 m (73 m)			**EBL = 1.08 (1.12),** QL ≥ 96 m (100 m) WBT = 0.90 (0.93) **WBR = 1.02 (1.06),** QL ≥ 225 m (240 m) NBT = 0.90 (0.94)		

Notes: () bracketed values represent 2031 conditions

Incorporate signal modifications at Guelph Line – W-N/S/E Off-Ramp (add NB Advance /EB RT overlap phase during PM, i.e. 65 sec N/S, 45 sec EB, plus 10 sec NB Advance /EB RT overlap)

Remarks

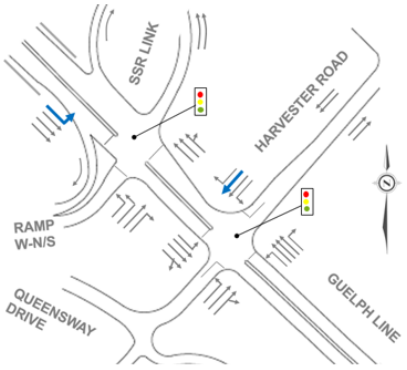
- Guelph Line - Harvester Road intersection and several key movements operate at/overcapacity during PM peak hour
- Introduction of second SBL will provide additional storage and accommodate left turn queues (i.e. QL > 75 m per lane), however dual SBL is more restrictive from a signal phasing perspective and less desirable during PM and off-peak periods.
- During the AM peak hour, SBL queues (95th percentile) at Harvester Road will exceed storage available and on occasion extend to/beyond the upstream intersection (i.e. up to 70m beyond the intersection by 2023 and 80m by 2031)
- Guelph Line - W-N/S/E Off Ramp / South Service Road Link intersection operates acceptable; however the EBR is expected to reach/exceed critical threshold level (i.e. v/c >0.85) during the PM peak hour and 95th percentile queues are expected to reach/exceed the available right turn lane storage.

Exhibit 5-3: Traffic Operations Summary for Design Alternative II

ALTERNATIVE II

Overview:

- Add SBL at the South Service Road Link
- Add WBT on Harvester Road



Future 2023 (2031) Operations Analysis:

INTERSECTION	AM PEAK HOUR			PM PEAK HOUR		
	V/C	Delay (s)	LOS	V/C	Delay (s)	LOS
Guelph Line & W-N/S/E Off Ramp / South Service Road Link	0.68 (0.73)	20.6 (21.6)	C (C)	0.67 (0.76)	14.0 (16.1)	B (B)
Critical Movements (v/c)	--			EBR = (0.86)		
Guelph Line & Harvester Road / Queensway Drive	0.74 (0.75)	29.3 (30.8)	C (C)	0.94 (0.98)	49.6 (52.4)	D (D)
Critical Movements (v/c)	None			EBL = 0.98 **(1.02)** QL ≥ 75 m (79 m) WBT = 0.90 (0.93) WBR = 1.00 **(1.02)** QL ≥ 220 m (234 m) NBT = 0.86 (0.92)		

Notes: () bracketed values represent 2031 conditions

Incorporate signal modifications at Guelph Line – W-N/S/E Off-Ramp (add NB Advance /EB RT overlap phase during PM, i.e. 65 sec N/S, 45 sec EB, plus 10 sec NB Advance /EB RT overlap)

Remarks

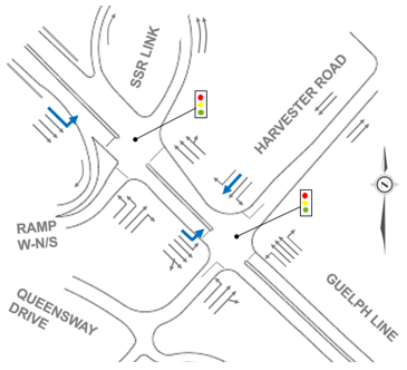
- Guelph Line – Harvester Road intersection and all movements operate at/under capacity during 2023 conditions
- Provides additional westbound capacity with additional through lane and dedicated WBR.
- Introduction of SBL upstream of Harvester Road (reducing queuing between intersections). SBL will continue to operate under permissive phasing. During the AM peak hour, SBL queues (95th percentile) at Harvester Road potentially extending to/beyond the upstream intersection (i.e. up to 25m beyond the intersection by 2023 and 35m by 2031) may be accommodated by the upstream SBL.
- Guelph Line - W-N/S/E Off-Ramp/SSR Link intersection operates well and experiences minor delays in both the AM and PM peak hours.

Exhibit 5-4: Traffic Operations Summary for Design Alternative III

ALTERNATIVE III

Overview:

- Add SBL at the South Service Road Link and SBL (dual) at Harvester Road
- Add WBT on Harvester Road



Future 2023 (2031) Operations Analysis:

INTERSECTION	AM PEAK HOUR			PM PEAK HOUR		
	V/C	Delay (s)	LOS	V/C	Delay (s)	LOS
Guelph Line & W-N/S/E Off Ramp / South Service Road Link	0.68 (0.73)	20.8 (21.9)	C (C)	0.67 (0.76)	14.0 (16.1)	B (B)
Critical Movements (v/c)	--			EBR = (0.86)		
Guelph Line & Harvester Road / Queensway Drive	0.63 (0.66)	26.1 (26.8)	C (C)	0.94 (0.98)	49.9 (52.8)	D (D)
Critical Movements (v/c)	None			EBL = 0.98 (**1.02**) QL ≥ 75 m (79 m) WBT = 0.90 (0.93) WBR = 0.99 (**1.01**) QL ≥ 217 m (231 m) NBT = 0.87 (0.93)		

Notes: () bracketed values represent 2031 conditions

Incorporates signal modifications at Guelph Line – W-N/S/E Off-Ramp (add NB Advance /EB RT overlap phase during PM, i.e. 65 sec N/S, 45 sec EB, plus 10 sec NB Advance /EB RT overlap)

Remarks

- Guelph Line – Harvester Road intersection and all movements operate at/under capacity during 2023 conditions
- Provides additional westbound capacity with additional through lane and dedicated WBR.
- Introduction of second SBL, as well as SBL upstream of Harvester Road, will provide additional storage and accommodate left turn queues (i.e. QL > 60 m per lane), however dual SBL is more restrictive from a signal phasing perspective and less desirable during PM and off-peak periods.
- Guelph Line - W-N/S/E Off-Ramp/SSR Link intersection operates well and experiences minor delays in both the AM and PM peak hours.

Exhibit 5-5: Traffic Operations Summary for Design Alternative IV

ALTERNATIVE IV

Overview:

- Add SBL (dual) at Harvester Road
- Add WBT on Harvester Road

Future 2023 (2031) Operations Analysis:

INTERSECTION	AM PEAK HOUR			PM PEAK HOUR		
	V/C	Delay (s)	LOS	V/C	Delay (s)	LOS
Guelph Line & W-N/S/E Off Ramp / South Service Road Link	0.65 (0.72)	17.6 (19.4)	B (B)	0.67 (0.76)	14.6 (16.8)	B (B)
Critical Movements (v/c)	--			EBR = (0.86)		
Guelph Line & Harvester Road / Queensway Drive	0.71 (0.74)	28.8 (29.5)	C (C)	0.85 (0.89)	40.7 (42.7)	(D) (D)
Critical Movements (v/c)	None			EBL = 0.89 (0.90) QL ≥ 86 m (90 m) WBT = 0.89 (0.93) SBTR = 0.86 (0.89)		

Notes: () bracketed values represent 2031 conditions

Incorporates signal modifications at Guelph Line – W-N/S/E Off-Ramp (add NB Advance /EB RT overlap phase during PM, i.e. 65 sec N/S, 45 sec EB, plus 10 sec NB Advance /EB RT overlap

Remarks

- Guelph Line – Harvester Road intersection and all movements operate at/under capacity during 2023 and 2031 conditions
- Provides additional westbound capacity with additional through lane and dedicated (dual) WBR; however dual WBR is more restrictive from a signal phasing and pedestrian crossing perspective, and introduces potential weaving concerns on Guelph Line. Requires EBL at Harvester Road be restricted to protect phase only. Potentially requires eliminating the pedestrian crossing from the north side of the Guelph Line – Harvester Road intersection.
- Introduction of second SBL will provide additional storage and accommodate left turn queues (i.e. QL > 75 m per lane), however dual SBL is more restrictive from a signal phasing perspective and less desirable during PM and off-peak periods.
- Guelph Line - W-N/S/E Off-Ramp/SSR Link intersection operates well and experiences minor delays in both the AM and PM peak hours.

Exhibit 5-6: Traffic Operations Summary for Design Alternative V

ALTERNATIVE V

Overview:

- Add WBT on Harvester Road

Future 2023 (2031) Operations Analysis:

INTERSECTION	AM PEAK HOUR			PM PEAK HOUR		
	V/C	Delay (s)	LOS	V/C	Delay (s)	LOS
Guelph Line & W-N/S/E Off Ramp / South Service Road Link	0.65 (0.72)	17.1 (18.9)	B (B)	0.67 (0.76)	14.0 (16.0)	B (B)
Critical Movements (v/c)	--			EBR = (0.86)		
Guelph Line & Harvester Road / Queensway Drive	0.78 (0.81)	33.4 (35.6)	C (D)	0.94 (0.98)	49.6 (52.5)	D (D)
Critical Movements (v/c)	NBT = 0.92 (0.96) SBL = 0.85 (0.90) QL ≥ 160 m (172 m)			EBL = 0.98 (0.95) QL ≥ 75 m (75 m) WBT = 0.90 (0.93) WBR = 1.00 **(1.01)** QL ≥ 220 m (231 m) NBT = 0.86 (0.95)		

Notes: () bracketed values represent 2031 conditions

Incorporate signal modifications at Guelph Line – W-N/S/E Off-Ramp (add NB Advance /EB RT overlap phase during PM, i.e. 65 sec N/S, 45 sec EB, plus 10 sec NB Advance /EB RT overlap)

Remarks

- Intersection operates near capacity during 2023 conditions, with westbound right turn operating at capacity during the PM peak hour.
- Provides additional westbound capacity with additional through lane and dedicated WBR.
- Maintains single SB left turn at Harvester Road with protected permissive phasing (operates at v/c = 0.85 during AM peak hour). Operates similar to existing condition. During the AM peak hour, SBL queues (95th percentile) at Harvester Road will exceed storage available and on occasion extend to/beyond the upstream intersection (i.e. up to 60m beyond the intersection).

5.2.2 Comparison of Alternative IV with Alternatives I, II, III, and V

Alternative IV largely differs from the four other design alternatives with respect to the measures introduced to accommodate the heavy westbound demands on Harvester Road during the p.m. peak hour. Specifically,

- Alternatives I, II, III, and V – Provide for an additional westbound capacity with additional through lane (WBT) and dedicated right turn lane (WBR) on Harvester Road; and,
- Alternative IV – Provides for a widening to accommodate dual WBR and additional WBT on Harvester at Guelph Line.

A comparison of these alternatives from a traffic operations perspective reflects the following:

- **Alternatives I, II, III, and V** will improve overall intersection operations during the p.m. peak period. The addition of the WBT lane will significantly improve operations at the intersection (improving from LOS E to LOS D and reducing the overall intersection V/C ratio from 1.07 to between 0.98 and 0.94). As a result of the improvements, queue lengths on the westbound approach will be reduced, improving access to the WBR lane. The WBR (single) will operate under permissive phasing with protected overlap.
- **Alternative IV** will operate at a LOS D and V/C ratio 0.85 during the p.m. peak period. This alternative provides additional westbound capacity with additional through lane and dedicated (dual) WBR; however dual WBR is more restrictive from a signal phasing and pedestrian crossing perspective, and introduces potential weaving concerns on Guelph Line. Requires EBL at Harvester Road be restricted to protect phase only. Potentially requires eliminating the pedestrian crossing from the north side of the Guelph Line – Harvester Road intersection.

  MTO is not supportive of dual right lanes from Harvester to Guelph Line (Alternative IV) as this will potentially create a weaving concern along Guelph Line (even if partially mitigated through signing), and would also require a protected phase affecting signal timing.

Since Alternative IV does not significantly improve upon meeting the primary objectives of the project, introduces additional operational concerns compared to the other Design Alternatives, and is not supported by MTO, **Alternative IV was not carried forward**.

5.2.3 Comparison of Alternatives I, II, III, and V

Alternatives I, II, III, and V largely differ with regards to the measures introduced to accommodate the heavy NBT and SBL movements during the a.m. peak hour at the Guelph Line - Harvester Road intersection. Specifically,

- Alternative I – Adds a SBL (dual) at Harvester Road;
- Alternative II – Adds a SBL at Ramp W-N/S/E (SSR Link);
- Alternative III – Adds a SBL at Ramp W-N/S/E (SSR Link) and dual SBL at Harvester Road; and,
- Alternative V – Maintains a single SBL at Harvester Road (w/ adjusted signal timing).

All alternatives reflect a similar treatment at the Guelph Line - W-N/S/E Off-Ramp/SSR Link intersection, which operates well and experiences minor delays in both the AM and PM peak hours.

A comparison of these alternatives from a traffic operations perspective, focusing on the Guelph Line - Harvester Road intersection, is provided in Exhibit 5-7.

Exhibit 5-7: Comparison of Traffic Operations for Design Alternatives I, II, III, and V

DESIGN ALTERNATIVE	EXTERNAL AGENCY (MTO) COMMENTS
ALTERNATIVE I • Several key movements operate ***at/over capacity*** during PM peak hour • Introduction of second SBL will provide additional storage and accommodate left turn queues (i.e. QL > 75 m per lane), however dual SBL is more restrictive from a signal phasing perspective and less desirable during PM and off-peak periods. • During the AM peak hour, SBL queues (95th percentile) at Harvester Road will exceed storage available and on occasion extend to/beyond the upstream intersection (i.e. up to 70m beyond the intersection by 2023 and 80m by 2031.	MTO is supportive of dual left proposal as long as it is in accordance with the TAC standards and MTO's TAC design supplement. A raised concrete median should be constructed at the end of SBL lane(s) at Harvester Rd, instead of hatched pavement markings
ALTERNATIVE II • All movements operate ***at/under capacity*** during 2023 conditions • Introduction of SBL upstream of Harvester Road (reducing queuing between intersections). SBL will continue to operate under permissive phasing. During the AM peak hour, SBL queues (95th percentile) at Harvester Road potentially extending to/beyond the upstream intersection (i.e. up to 25m beyond the intersection by 2023 and 35m by 2031) may be accommodated by the upstream SBL.	MTO is not supportive of a new SBL to the SSR link.
ALTERNATIVE III • All movements operate ***at/under capacity*** during 2023 conditions • Introduction of second SBL, as well as SBL upstream of Harvester Road, will provide additional storage and accommodate left turn queues (i.e. QL > 60 m per lane), however dual SBL is more restrictive from a signal phasing perspective and less desirable during PM and off-peak periods.	MTO is not supportive of a new SBL to the SSR link.
ALTERNATIVE V • All movements operate ***at/ under capacity*** near during 2023 conditions, with westbound right turn operating at capacity during the PM peak hour. • Maintains single SBL at Harvester Road with protected permissive phasing (operates at v/c = 0.85 during AM peak hour). Operates similar to existing condition. During the AM peak hour, SBL queues (95th percentile) at Harvester Road will exceed storage available and on occasion extend to/beyond the upstream intersection (i.e. up to 60m beyond the intersection).	----

In comparing the above Design Alternatives, specifically Alternatives II and Alternative III:

- **Alternative II** provides for a new SBL at the Ramp W-N/S/E (SSR Link) and therefore will reduce the SBL storage demands between the Harvester Road and Ramp W-N/S/E intersections.
- **Alternative III** combines the improvements of Alternatives I and II and results in the largest improvement to operations during the a.m. peak hour. During the p.m. peak hour, Alternative II and Alternative III will operate at a similar level of service.

With that said, MTO is not supportive of new southbound left turn to the SSR link new left turn lane to the SSR link. On this basis, **Alternatives II and III were not carried forward**. In addition to reducing capacity at the Ramp W-N/S/E (SSR Link), MTO concerns related to constraints to the left turn lane width across the QEW structure (3.0m width) and potential impacts to the longitudinal expansion joint on the bridge.

In comparing the remaining design alternative, the following is noted:

- **Alternative I** will operate marginally better than Alternative V during a.m. peak hour; however the dual SBL treatment at Harvester Road is more restrictive from a signal phasing perspective and is less desirable during the critical PM peak off-peak periods. Several key movements will continue to exceed capacity during 2023 p.m. peak hour conditions.

  Furthermore, a dual left alternative may become throwaway in the future depending on the outcome of the Prosperity Corridor Study (i.e. potential options currently being considered include eliminating left turn lanes at adjacent municipal intersections to the interchange).
- Since operations are only marginally improved during the a.m. peak when compared to Alternative V, and p.m. peak conditions are worsened, **Alternative I was not carried forward**.

Overall, **Alternative V** is preferred to accommodate 2023 horizon year traffic demands for the following reasons:

- The proposed changes will significantly improve operations at the Guelph Line – Harvester Road intersection during the p.m. peak and ensure all movements operate at or below capacity (improving from LOS E to LOS D and reducing the overall intersection V/C ratio from 1.07 to 0.94). Queue lengths on the westbound approach will be reduced;
- Maintains a single westbound right turn lane which can operate under permissive phasing with (protected) overlap. The westbound through and right turn movements are expected to operate at v/c = 0.90 and v/c = 1.00 respectively during the p.m. peak.
- Desirable from pedestrian accessibility perspective, as it maintains the pedestrian crossing on the north side of the Guelph Line – Harvester Road intersection;
- Reflects a cost beneficial alternative which can be accommodated within the existing right-of-way along Guelph Line and will keep property requirements along Harvester Road to a minimum.

Although operating under capacity, the heavy southbound left turn movements along Guelph Line will continue to be critical (95th percentile queue lengths exceeding available storage length). Therefore, in addition to the above, it is recommended signal timing constraints at the Guelph Line / Harvester Road intersection be further reviewed and, if possible, adjusted to increase SBL green time and minimize the queue between intersections.

- For example: Add 10 sec (+18 protected – 8 sec permissive) during AM peak hour by making the following adjustments:
  - Exclude NBL protected phase during AM peak (apply permissive phasing only).
  - Reduce vehicle green time for opposing EB/WB phase from 8 sec (min) to 5 sec (min); no change to amber and red times

- Reduce pedestrian 'Walk' time from 8 &12 sec (min) to 5 sec (min); no change to 16 sec 'Don't Walk', amber and red times

With these modifications, the 95th percentile SBL queue is expected to be maintained between intersections in the short-term (i.e. 2023).

Detailed results of the traffic operations are outlined in Exhibit 5-8. Detailed Synchro output reports are also available in **Appendix F.**

Exhibit 5-8: Alternative V - Traffic Operations Summary (2023)

	INTERSECTION	LOS	V/C	DELAY (SEC)	CRITICAL MOVEMENT (V/C ≥0.85)
2023 BACKGROUND CONDITIONS (DO NOTHING)					
AM PEAK	**Guelph Line & North Service Road Link / E–N/S/E Off-Ramp ***	C	0.75	22.1	--
	Guelph Line & South Service Road Link / W–N/S/E Off-Ramp	B	0.65	16.8	--
	Guelph Line & Harvester Road / Queensway Drive	C	0.79	34.1	NBT (V/C = 0.90) SBL (V/C = 0.89, QL ≥ 166 m)
PM PEAK	**Guelph Line & North Service Road Link / E–N/S/E Off-Ramp ***	F	1.01	82.7	**EBR (V/C = 1.03)** NBT (V/C = 0.85) **SBTR (V/C = 1.21)**
	Guelph Line & South Service Road Link / W–N/S/E Off-Ramp	B	0.75	15.6	EBR (V/C = 0.91, QL ≥ 161 m)
	Guelph Line & Harvester Road / Queensway Drive	E	1.07	79.1	NBT (V/C = 0.88) SBTR (V/C = 0.93) **WBT (V/C = 1.29)** **WBR (V/C = 1.21)** EBL (V/C = 0.92, QL ≥ 72 m) **
RECOMMENDED DESIGN ALTERNATIVE V					
AM PEAK	**Guelph Line & North Service Road Link / E–N/S/E Off-Ramp ***	C	*0.75*	*22.9*	--
	Guelph Line & South Service Road Link / W–N/S/E Off-Ramp	B	0.65	19.2	-
	Guelph Line & Harvester Road / Queensway Drive	C	*0.84*	*24.2*	*SBL (V/C = 0.94, QL = 92 m)*
PM PEAK	**Guelph Line & North Service Road Link / E–N/S/E Off-Ramp ***	F	1.01	81.4	**EBR (V/C = 1.03)** NBT (V/C = 0.85) **SBTR (V/C = 1.21)**
	Guelph Line & South Service Road Link / W–N/S/E Off-Ramp	B	0.67	14.0	-
	Guelph Line & Harvester Road / Queensway Drive	D	0.94	49.6	NBT (V/C = 0.86) **WBT (V/C = 0.90)** **WBR (V/C = 1.00)** EBL (V/C = 0.98)

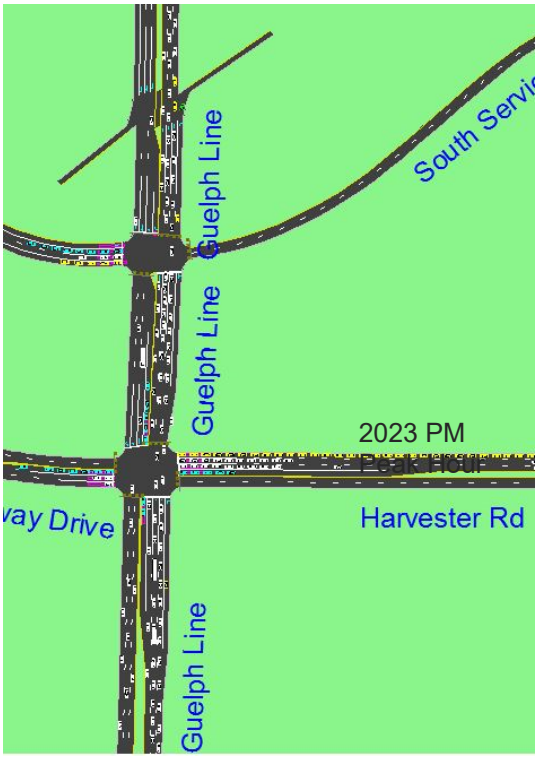
* Guelph Line & North Service Road Link / E–N/S/E Off-Ramp included for information purposes only

To confirm potential queuing impacts a SimTraffic analysis was undertaken for future 2023 traffic conditions. The simulation was completed for a 1 hour period, and repeated for five runs. Seeding time was calibrated in order to ensure that the amount of vehicles entering and exiting the model were approximately equal in the overall simulation period. It is noted that SimTraffic performance is known to decline in congested conditions, which is the case for the p.m. peak period.

The SimTraffic results indicate the following:

- In general, queue lengths are similar to the background conditions.
- At the Guelph Line & W-N/S/E Off Ramp / South Service Road Link intersection, queuing on the ramp will remain largely unchanged.
- At the Guelph Line & Harvester Road / Queensway Drive intersection, the southbound queue is largely expected to be contained within the available intersection spacing.

  Although continuing to spill back to the South Service Road/ Laurentian Drive intersection, westbound queue lengths will be reduced with the addition of an overlapping right turn phase and the addition of a second westbound through lane (thus allowing through vehicles to avoid being blocked by the right turn queue).



The SimTraffic evaluation supports the recommendation to carry forward Alternative V.

6 Conclusions and Recommendations

Alternative V is recommended to be carried forward as the preferred alternative (subject to an overall evaluation of Alternatives I-V taking into account key factors including: Social-Economic and Cultural Environment, Natural Environment, and Technical/ Engineering).

Alternative V largely addresses the primary objective of the study which is provide short-term (i.e. 5 year) improvements to address existing operational and safety deficiencies at the Guelph Line - Harvester Road intersection, by providing additional capacity for the WBT and WBR movements. All movements are proposed to operate at/below capacity based on 2023 background traffic demands.

Implementing **Alternative V**, will include the following:

- A new WBT at the Guelph Line and Harvester Road intersection;
- Signal improvements / optimization, including:
  - Add WBR (Green Arrow) overlap phase at the Guelph Line / Harvester Road intersection (to operate in conjunction with the Opposing SBL/NBL and/or SB Advance phases during the a.m. peak hour).

  - Add EBR (Green Arrow) overlap phase at the Guelph Line / Ramp W-N/S/E intersection (to operate in conjunction with the NB advance phase during the p.m. peak hour).
  - Reduce minimum vehicle green times for opposing EB/WB phases and pedestrian 'Walk' times at the Guelph Line / Harvester Road intersection (if possible).
- Based on the findings in Section 4 (Origin Destination Survey), provide additional signing along the Ramp W-N/S/E to enhance driver awareness of the eastbound through movement as a connection to the South Service Road.

The above measures are independent of any improvements that may be identified as part of the "QEW Prosperity Corridor Block Planning Process and Implementation Study", which is expected to provide guidance on longer term solutions for future growth of the area.

APPENDIX

APPENDIX A

TURNING MOVEMENT COUNTS

Guelph Line @ North Service Rd

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 7:45:00
To: 8:45:00

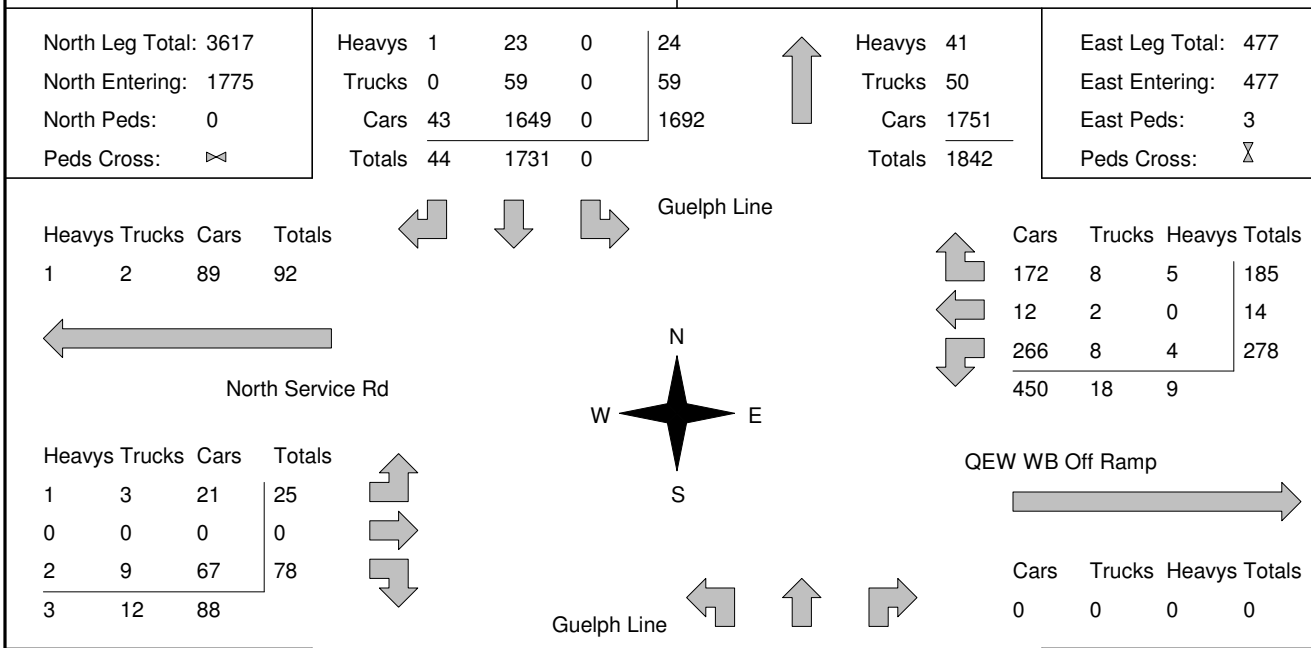
Municipality: Halton Region
Site #: 0000002989
Intersection: Guelph Line & North Service Rd
TFR File #: 4
Count date: 28-Sep-2017

Weather conditions:
Overcast/Dry

Person(s) who counted:
Armando

**** Signalized Intersection ****

Major Road: Guelph Line runs N/S



Comments

Guelph Line @ North Service Rd

Mid-day Peak Diagram

Specified Period
From: 11:00:00
To: 14:00:00

One Hour Peak
From: 11:30:00
To: 12:30:00

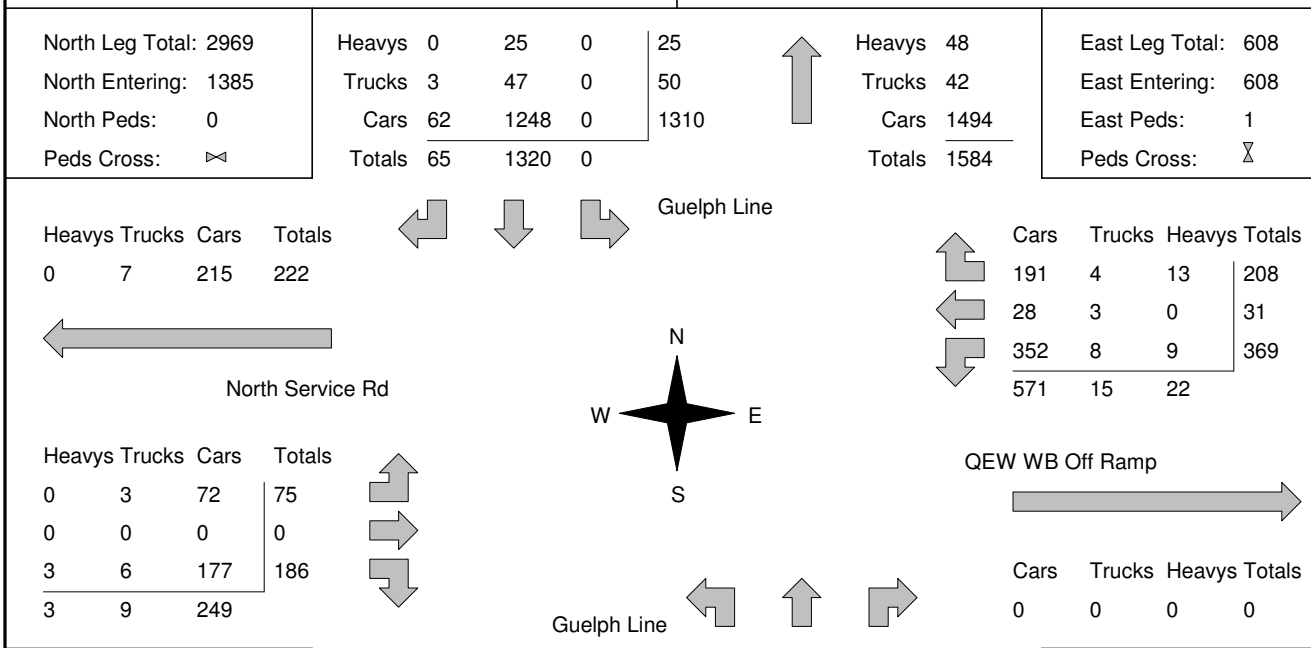
Municipality: Halton Region
Site #: 0000002989
Intersection: Guelph Line & North Service Rd
TFR File #: 4
Count date: 28-Sep-2017

Weather conditions:
Overcast/Dry

Person(s) who counted:
Armando

**** Signalized Intersection ****

Major Road: Guelph Line runs N/S



Comments

Guelph Line @ North Service Rd

Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 16:45:00
To: 17:45:00

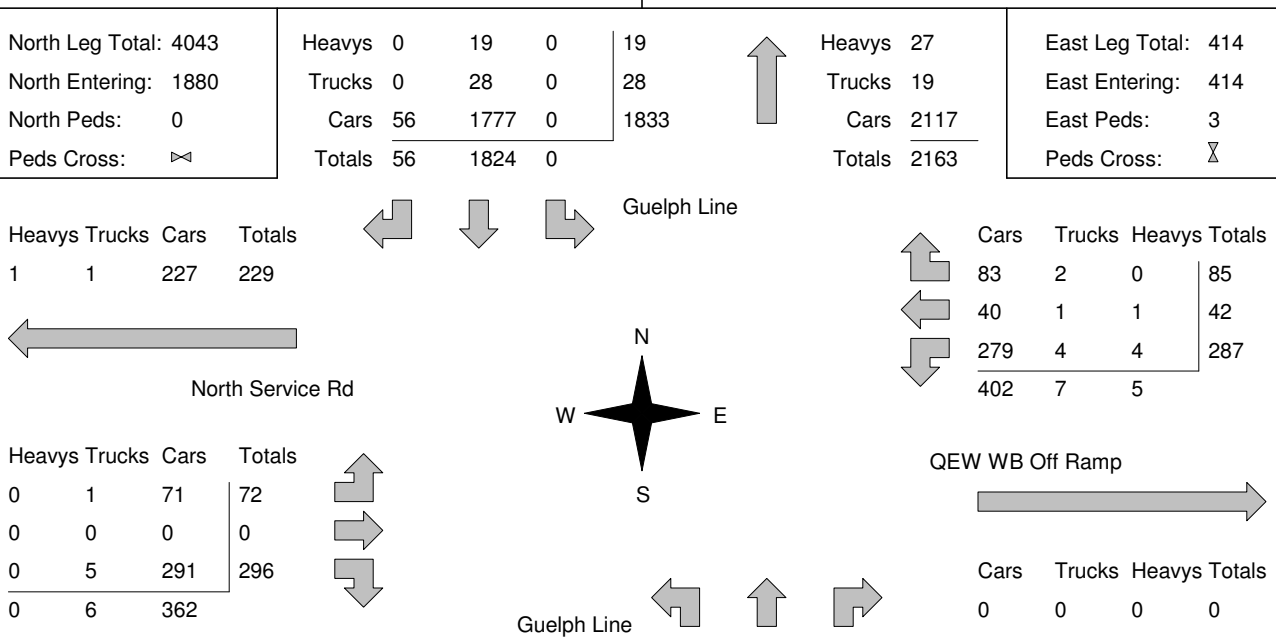
Municipality: Halton Region
Site #: 0000002989
Intersection: Guelph Line & North Service Rd
TFR File #: 4
Count date: 28-Sep-2017

Weather conditions:
Overcast/Dry

Person(s) who counted:
Armando

**** Signalized Intersection ****

Major Road: Guelph Line runs N/S



Comments

Guelph Line @ North Service Rd

Total Count Diagram

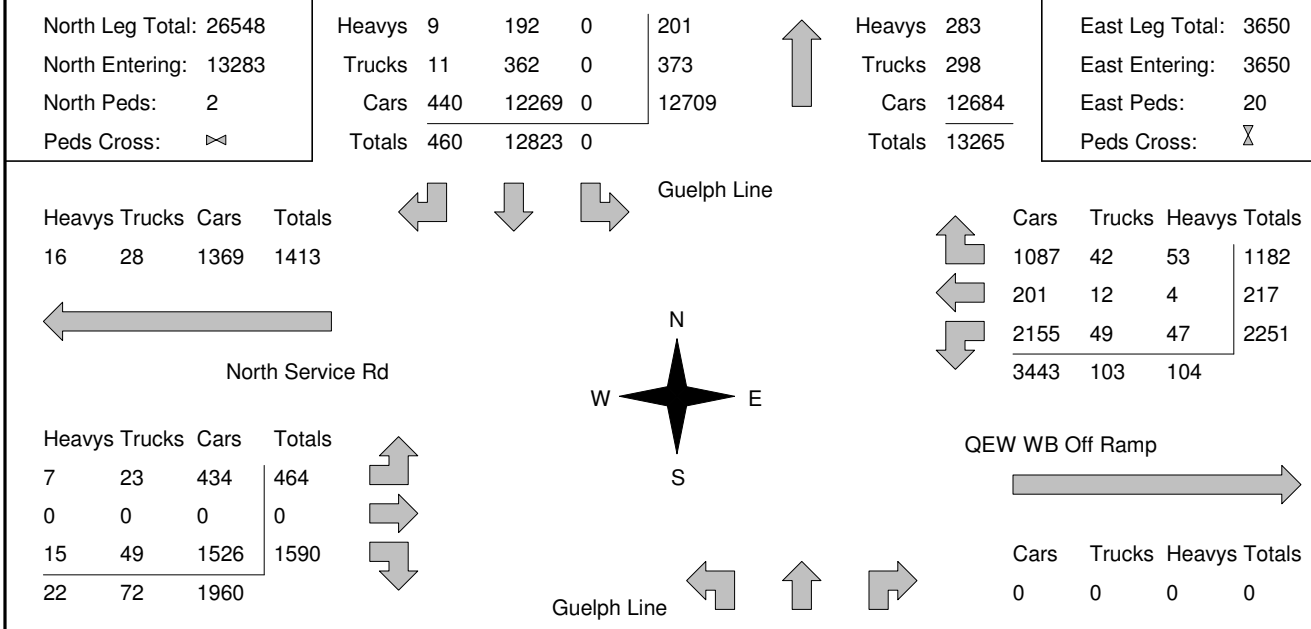
Municipality: Halton Region
Site #: 0000002989
Intersection: Guelph Line & North Service Rd
TFR File #: 4
Count date: 28-Sep-2017

Weather conditions:
Overcast/Dry

Person(s) who counted:
Armando

**** Signalized Intersection ****

Major Road: Guelph Line runs N/S



Comments

Guelph Line @ South Service Rd

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 8:00:00
To: 9:00:00

Municipality: Halton Region
Site #: 0000002988
Intersection: Guelph Line & South Service Rd
TFR File #: 3
Count date: 27-Sep-2017

Weather conditions:
Sunny/Dry

Person(s) who counted:
Armando

**** Signalized Intersection ****

Major Road: Guelph Line runs N/S

North Leg Total:	3527			
North Entering:	1475			
North Peds:	0			
Peds Cross:	⋈			
Heavys	1	8	0	9
Trucks	6	38	0	44
Cars	138	1284	0	1422
Totals	145	1330	0	
Heavys	57			
Trucks	45			
Cars	1950			
Totals	2052			
East Leg Total:	437			
East Entering:	0			
East Peds:	1			
Peds Cross:	⧖			

Guelph Line

Heavys	Trucks	Cars	Totals
1	6	138	145

QEW EB Off Ramp

Heavys	Trucks	Cars	Totals
8	22	574	604
1	0	416	417
7	7	177	191
16	29	1167	

Cars	Trucks	Heavys	Totals
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	

N
W E
S

South Service Rd

Cars	Trucks	Heavys	Totals
436	0	1	437

Guelph Line

Peds Cross:	⧖			
West Peds:	4			
West Entering:	1212			
West Leg Total:	1357			
Cars	1461			
Trucks	45			
Heavys	15			
Totals	1521			
Cars	0	1376	20	1396
Trucks	0	23	0	23
Heavys	0	49	0	49
Totals	0	1448	20	
Peds Cross:	⋈			
South Peds:	0			
South Entering:	1468			
South Leg Total:	2989			

Comments

Guelph Line @ South Service Rd

Mid-day Peak Diagram

Specified Period
From: 11:00:00
To: 14:00:00

One Hour Peak
From: 12:00:00
To: 13:00:00

Municipality: Halton Region
Site #: 0000002988
Intersection: Guelph Line & South Service Rd
TFR File #: 3
Count date: 27-Sep-2017

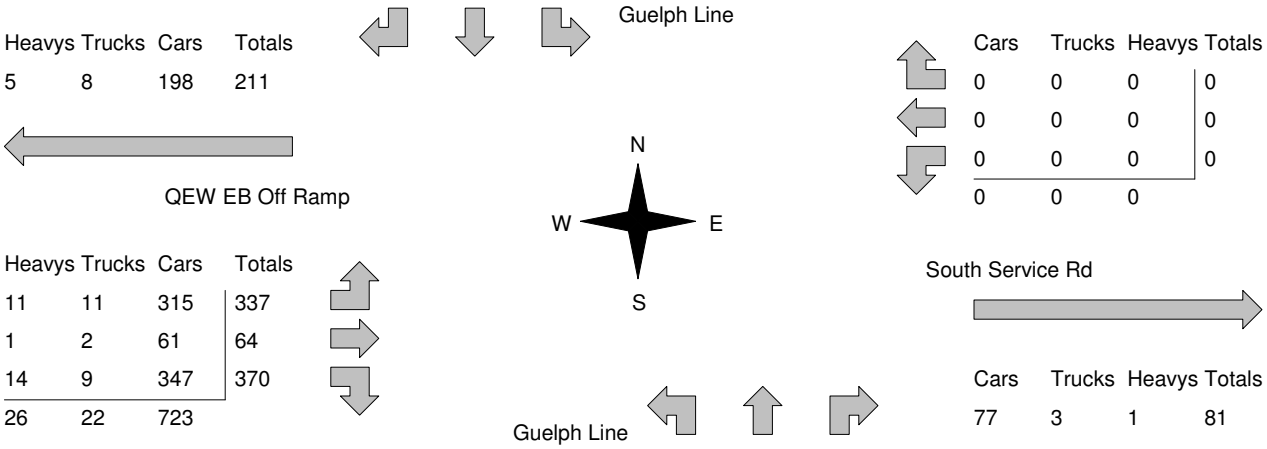
Weather conditions:
Sunny/Dry

Person(s) who counted:
Armando

**** Signalized Intersection ****

Major Road: Guelph Line runs N/S

North Leg Total:	3629			
North Entering:	1596			
North Peds:	0			
Peds Cross:	⋈			
Heavys	5	18	0	23
Trucks	8	29	0	37
Cars	198	1338	0	1536
Totals	211	1385	0	
Heavys	49			
Trucks	56			
Cars	1928			
Totals	2033			
East Leg Total:	81			
East Entering:	0			
East Peds:	0			
Peds Cross:	⧖			



Peds Cross:	⧖			
West Peds:	3			
West Entering:	771			
West Leg Total:	982			
Cars	1685			
Trucks	38			
Heavys	32			
Totals	1755			
Cars	0	1613	16	1629
Trucks	0	45	1	46
Heavys	0	38	0	38
Totals	0	1696	17	
Peds Cross:	⋈			
South Peds:	0			
South Entering:	1713			
South Leg Total:	3468			

Comments

Guelph Line @ South Service Rd

Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 16:30:00
To: 17:30:00

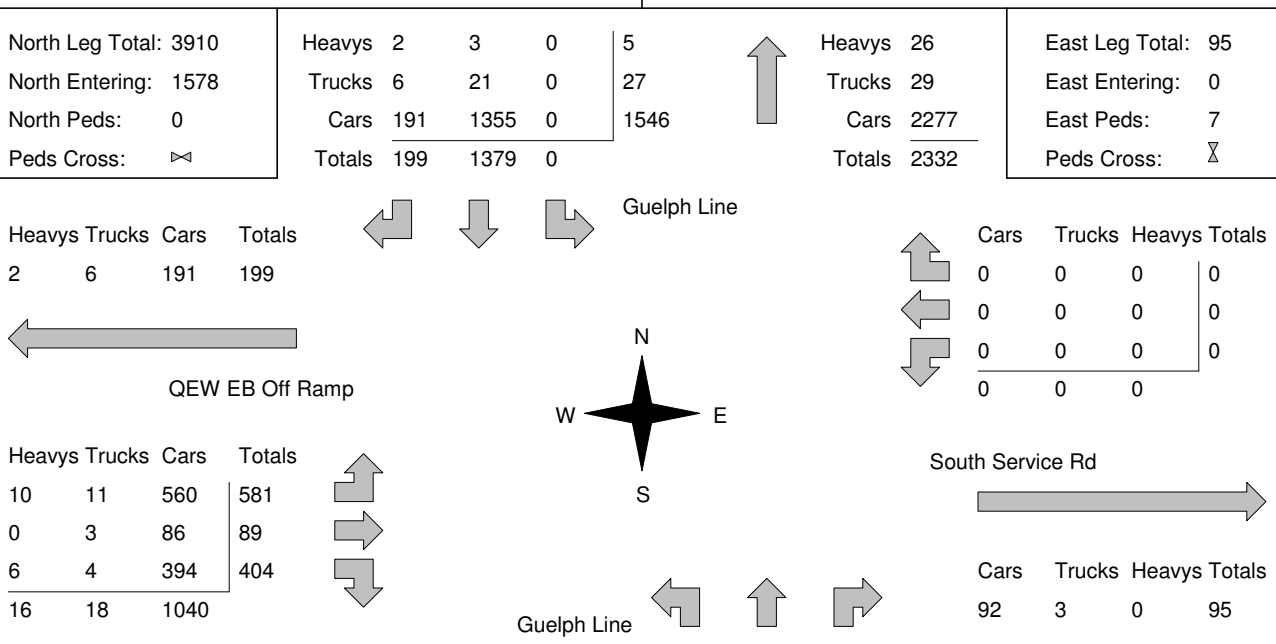
Municipality: Halton Region
Site #: 0000002988
Intersection: Guelph Line & South Service Rd
TFR File #: 3
Count date: 27-Sep-2017

Weather conditions:
Sunny/Dry

Person(s) who counted:
Armando

**** Signalized Intersection ****

Major Road: Guelph Line runs N/S



Comments

Guelph Line @ South Service Rd

Total Count Diagram

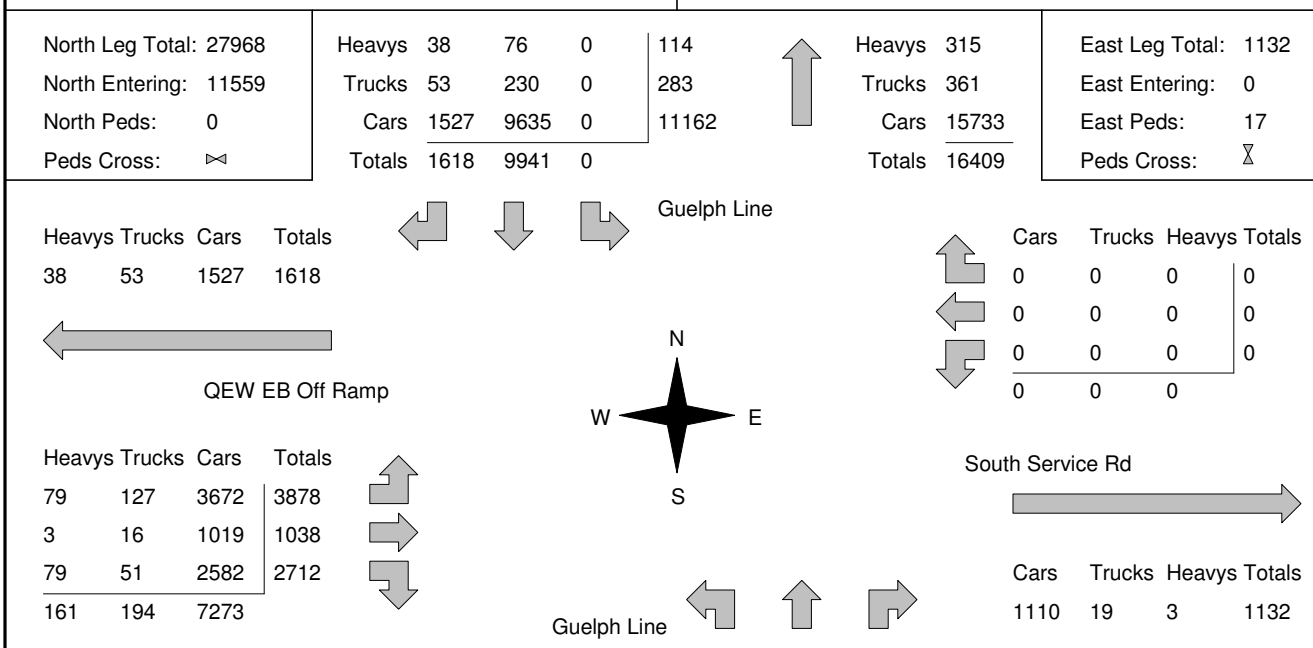
Municipality: Halton Region
Site #: 0000002988
Intersection: Guelph Line & South Service Rd
TFR File #: 3
Count date: 27-Sep-2017

Weather conditions:
Sunny/Dry

Person(s) who counted:
Armando

**** Signalized Intersection ****

Major Road: Guelph Line runs N/S



Comments

Guelph Line @ Harvester Rd

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 8:00:00
To: 9:00:00

Municipality: Halton Region
Site #: 0000002987
Intersection: Guelph Line & Harvester Rd
TFR File #: 1
Count date: 25-Sep-2017

Weather conditions:
Clear/Dry

Person(s) who counted:
Diane

**** Signalized Intersection ****

Major Road: Guelph Line runs N/S

North Leg Total: 2671
North Entering: 1609
North Peds: 6
Peds Cross: ⋈

Heavys	6	14	4	24
Trucks	1	17	9	27
Cars	116	1006	436	1558
Totals	123	1037	449	

Heavys	13
Trucks	28
Cars	1021
Totals	1062

East Leg Total: 1320
East Entering: 323
East Peds: 3
Peds Cross: ⧖

Guelph Line

Heavys	Trucks	Cars	Totals
12	6	248	266

Queensway Dr

Heavys	Trucks	Cars	Totals
3	8	135	146
0	5	291	296
0	2	70	72
3	15	496	

Cars	Trucks	Heavys	Totals
129	9	6	144
80	2	6	88
87	2	2	91
296	13	14	

N
W E
S

Harvester Rd

Cars	Trucks	Heavys	Totals
975	18	4	997

Guelph Line

Peds Cross: ⧖
West Peds: 11
West Entering: 514
West Leg Total: 780

Cars	1163			
Trucks	21			
Heavys	16			
Totals	1200			

Cars	52	757	248	1057
Trucks	3	11	4	18
Heavys	0	4	0	4
Totals	55	772	252	

Peds Cross: ⋈
South Peds: 4
South Entering: 1079
South Leg Total: 2279

Comments

Guelph Line @ Harvester Rd

Mid-day Peak Diagram

Specified Period
From: 11:00:00
To: 14:00:00

One Hour Peak
From: 13:00:00
To: 14:00:00

Municipality: Halton Region
Site #: 0000002987
Intersection: Guelph Line & Harvester Rd
TFR File #: 1
Count date: 25-Sep-2017

Weather conditions:
Clear/Dry

Person(s) who counted:
Diane

**** Signalized Intersection ****

Major Road: Guelph Line runs N/S

North Leg Total:	2732			
North Entering:	1216			
North Peds:	1			
Peds Cross:	⋈			
Heavys	3	7	8	18
Trucks	2	27	6	35
Cars	94	857	212	1163
Totals	99	891	226	
Heavys	22			
Trucks	38			
Cars	1456			
Totals	1516			
East Leg Total:	1266			
East Entering:	621			
East Peds:	0			
Peds Cross:	⧖			

Guelph Line

Heavys	Trucks	Cars	Totals
5	7	277	289

Queensway Dr

Heavys	Trucks	Cars	Totals
3	5	99	107
1	5	136	142
0	2	98	100
4	12	333	

Cars	Trucks	Heavys	Totals
311	7	11	329
108	2	2	112
176	3	1	180
595	12	14	

N
W E
S

Harvester Rd

Cars	Trucks	Heavys	Totals
620	15	10	645

Guelph Line

Peds Cross:	⧖			
West Peds:	0			
West Entering:	349			
West Leg Total:	638			
Cars	1131			
Trucks	32			
Heavys	8			
Totals	1171			
Cars	75	1046	272	1393
Trucks	3	26	4	33
Heavys	0	8	1	9
Totals	78	1080	277	
Peds Cross:	⋈			
South Peds:	7			
South Entering:	1435			
South Leg Total:	2606			

Comments

Guelph Line @ Harvester Rd

Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 16:30:00
To: 17:30:00

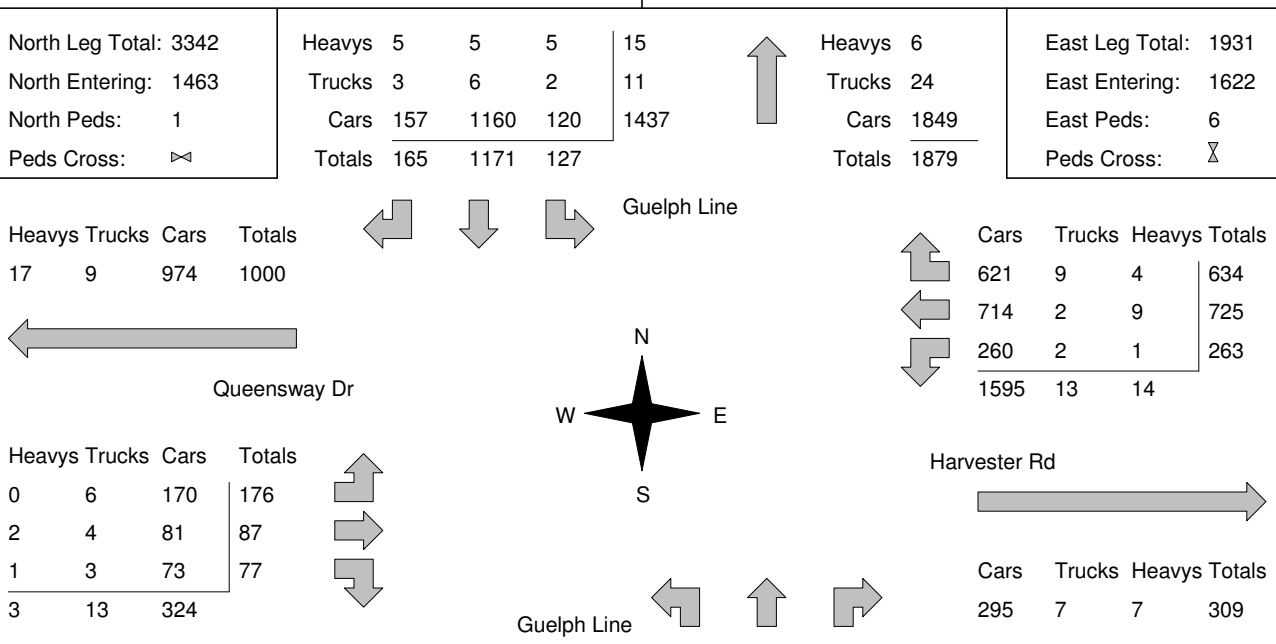
Municipality: Halton Region
Site #: 0000002987
Intersection: Guelph Line & Harvester Rd
TFR File #: 1
Count date: 25-Sep-2017

Weather conditions:
Clear/Dry

Person(s) who counted:
Diane

**** Signalized Intersection ****

Major Road: Guelph Line runs N/S



Comments

Guelph Line @ Harvester Rd

Total Count Diagram

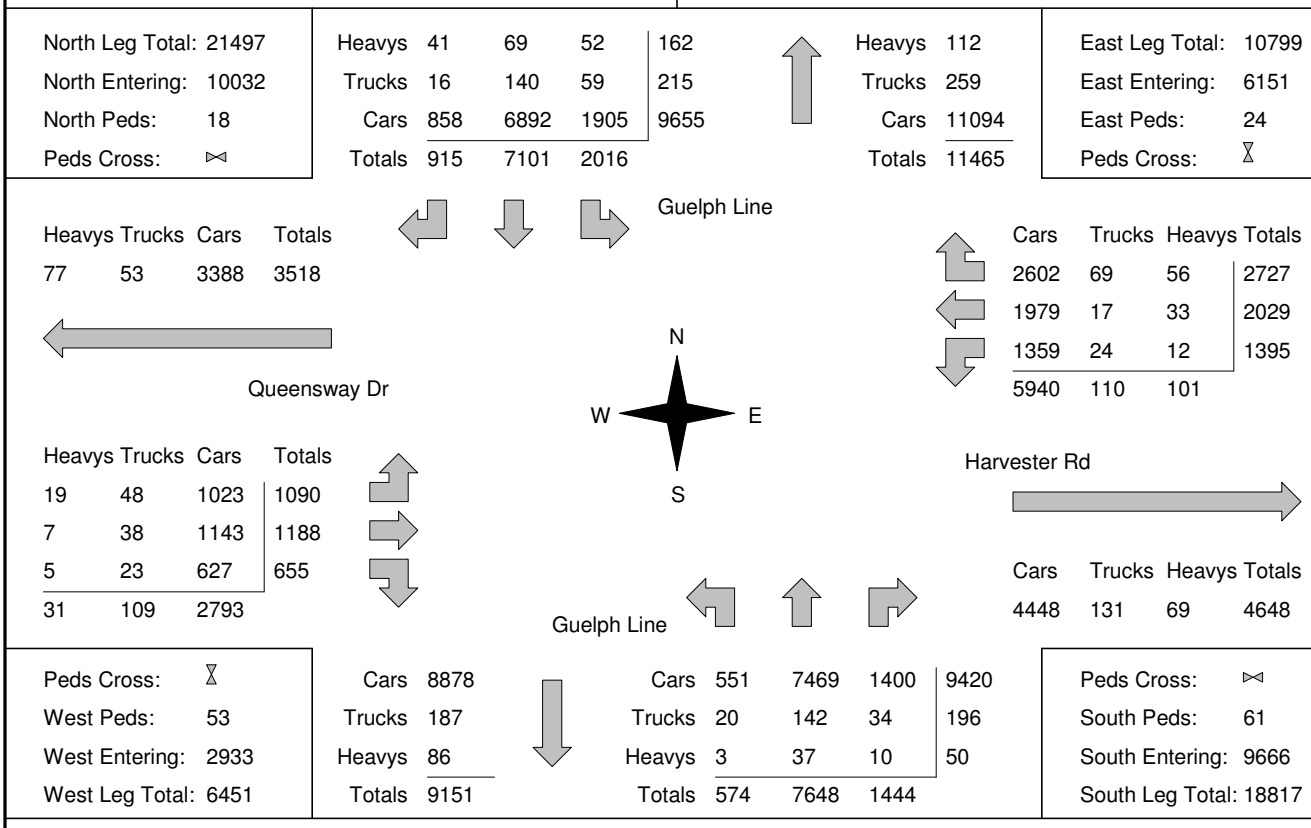
Municipality: Halton Region
Site #: 0000002987
Intersection: Guelph Line & Harvester Rd
TFR File #: 1
Count date: 25-Sep-2017

Weather conditions:
Clear/Dry

Person(s) who counted:
Diane

**** Signalized Intersection ****

Major Road: Guelph Line runs N/S



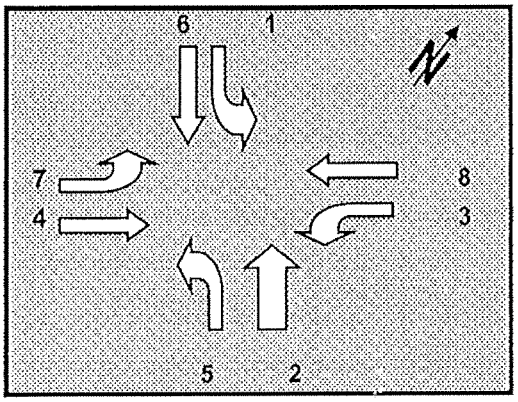
Comments

CITY OF BURLINGTON
TRAFFIC SIGNAL CONTROL SYSTEM

INT: **Guelph Ln @ Harvester Rd** INT: **731** EFFECTIVE DATE: August / 27 / 2012

GROUP NO: **1008**

NEMA PHASE MOVEMENTS



CYCLE DEFINITION TABLE:

PHASE	VEH MIN	PED WLK	PED CLR	AMB	ALL RED	SP	MIN
1	7			3	1		12
2	8	12	16	4	3	C	36
3	7			3	1		12
4	8	8	16	4	3	E	34
5	7			3	1		12
6	8	12	16	4	3	C	36
7	7			3	1		12
8	8	8	16	4	3	E	34
					Min Cycle =		94

AM PEAK: 110 sec Cycle

PHASE MOVEMENTS

SPLIT 1		1	2	3	4	5	6	7	8
	in %	26	33	11	30	11	48	11	30
	in sec	27	37	13	33	11	53	13	33

NOON PEAK: 110 sec Cycle

PHASE MOVEMENTS

SPLIT 2		1	2	3	4	5	6	7	8
	in %	17	39	14	30	11	45	11	33
	in sec	18	43	16	33	12	50	12	36

PM PEAK: 120 sec Cycle

PHASE MOVEMENTS

SPLIT 3		1	2	3	4	5	6	7	8
	in %	12	40	11	37	10	42	11	37
	in sec	13	48	14	45	11	51	14	44

OFF PEAK: 90 sec Cycle

PHASE MOVEMENTS

SPLIT 4		1	2	3	4	5	6	7	8
	in %	16	45	14	25	16	45	14	25
	in sec	14	41	13	22	14	41	13	22

Guelph Line @ McDowell Rd

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 8:00:00
To: 9:00:00

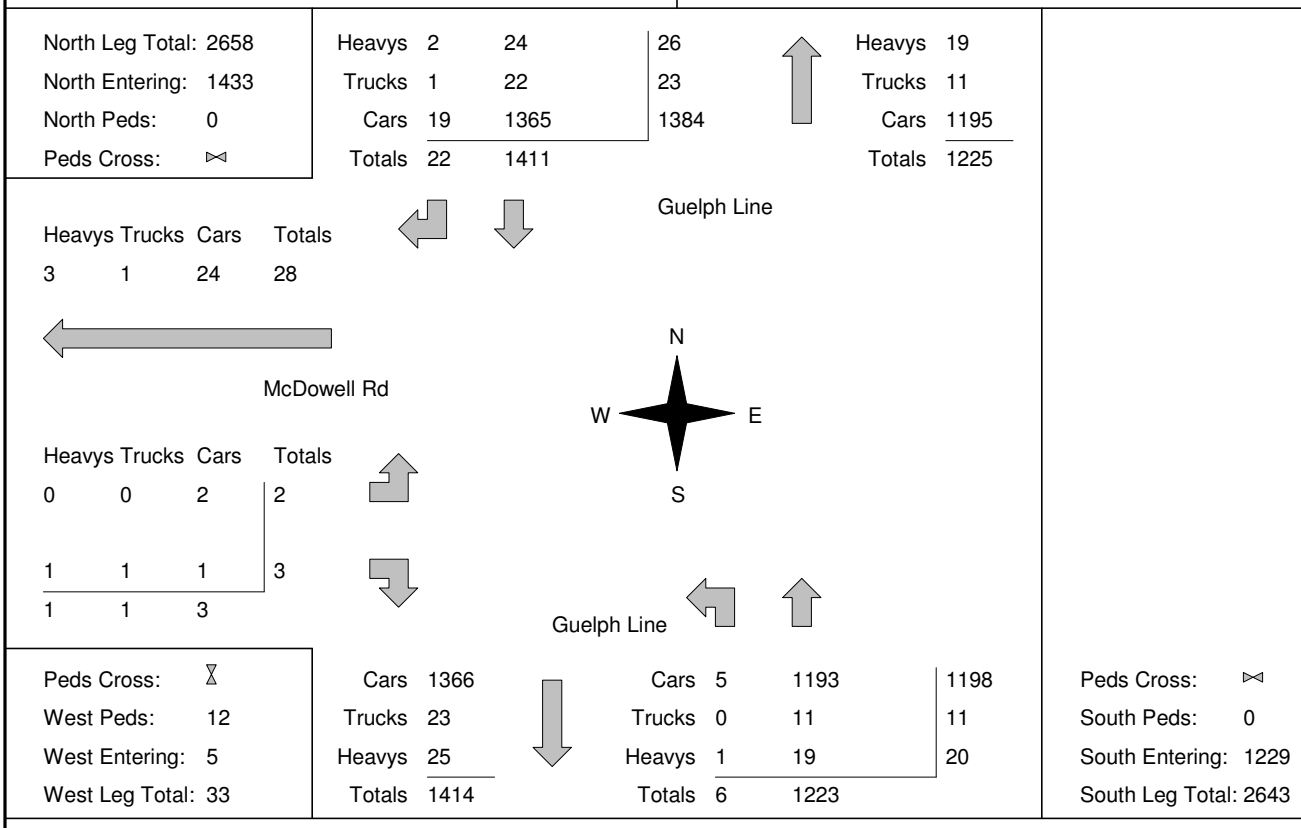
Municipality: Halton Region
Site #: 1022970100
Intersection: Guelph Line & McDowell Rd
TFR File #: 16
Count date: 5-Apr-2018

Weather conditions:
Cloudy/Dry

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Guelph Line runs N/S



Comments

Guelph Line @ McDowell Rd

Mid-day Peak Diagram

Specified Period
From: 11:00:00
To: 14:00:00

One Hour Peak
From: 12:00:00
To: 13:00:00

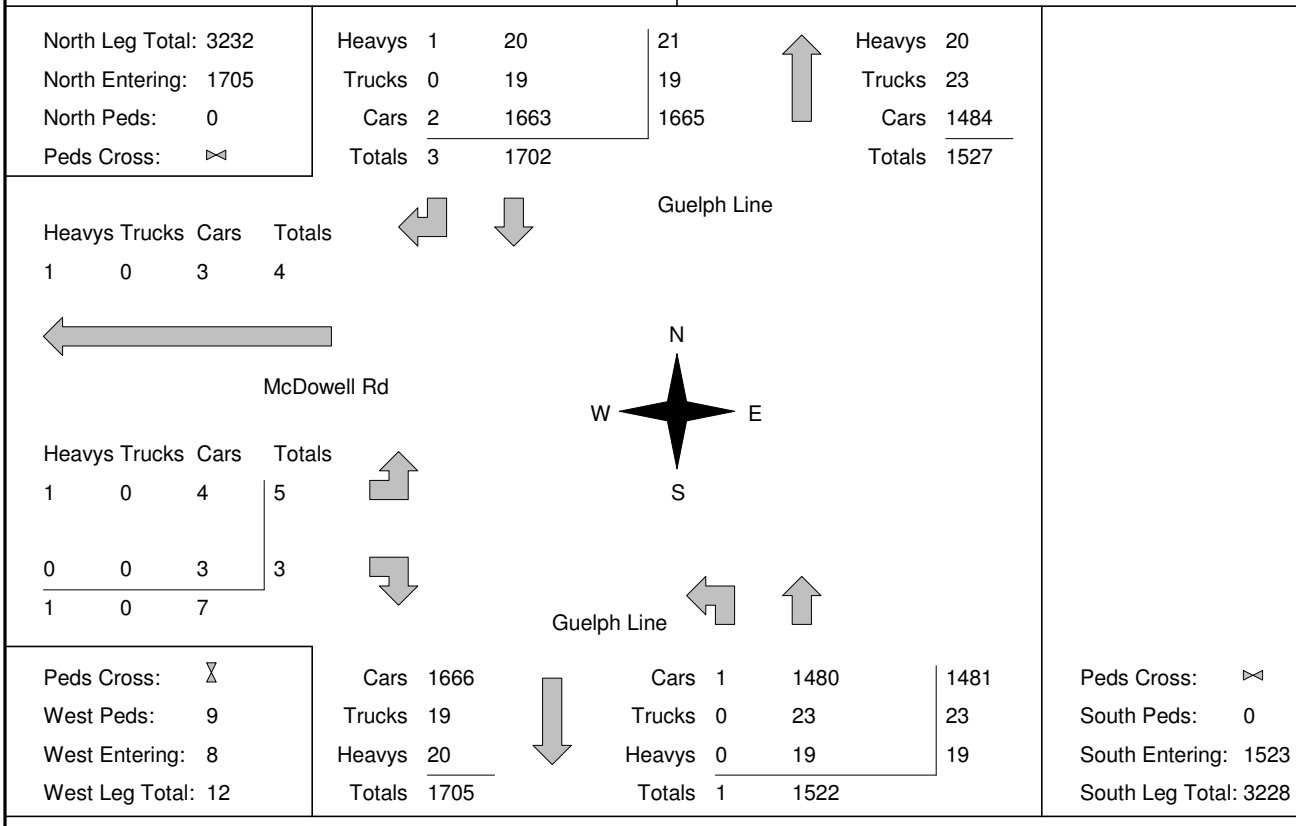
Municipality: Halton Region
Site #: 1022970100
Intersection: Guelph Line & McDowell Rd
TFR File #: 16
Count date: 5-Apr-2018

Weather conditions:
Cloudy/Dry

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Guelph Line runs N/S



Comments

Guelph Line @ McDowell Rd

Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 16:30:00
To: 17:30:00

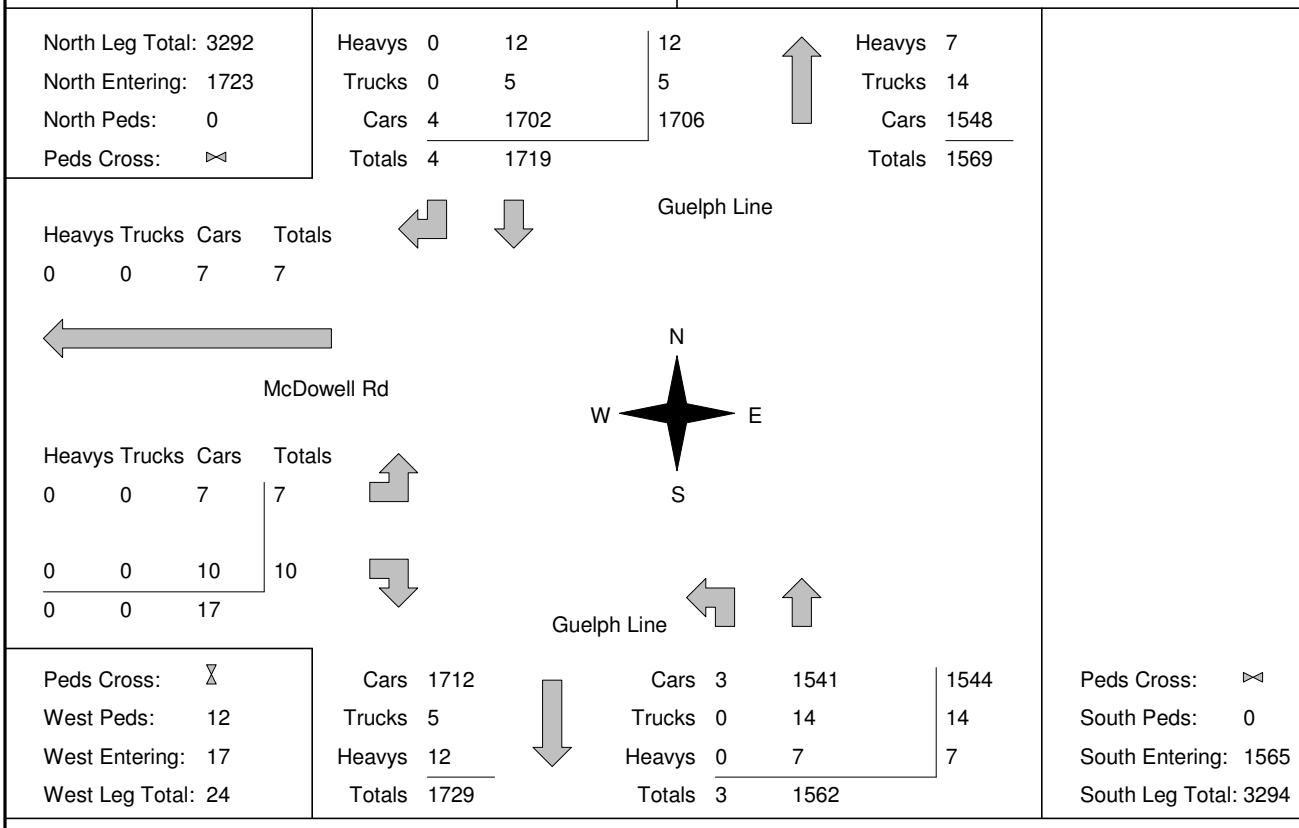
Municipality: Halton Region
Site #: 1022970100
Intersection: Guelph Line & McDowell Rd
TFR File #: 16
Count date: 5-Apr-2018

Weather conditions:
Cloudy/Dry

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Guelph Line runs N/S



Comments

Guelph Line @ McDowell Rd

Total Count Diagram

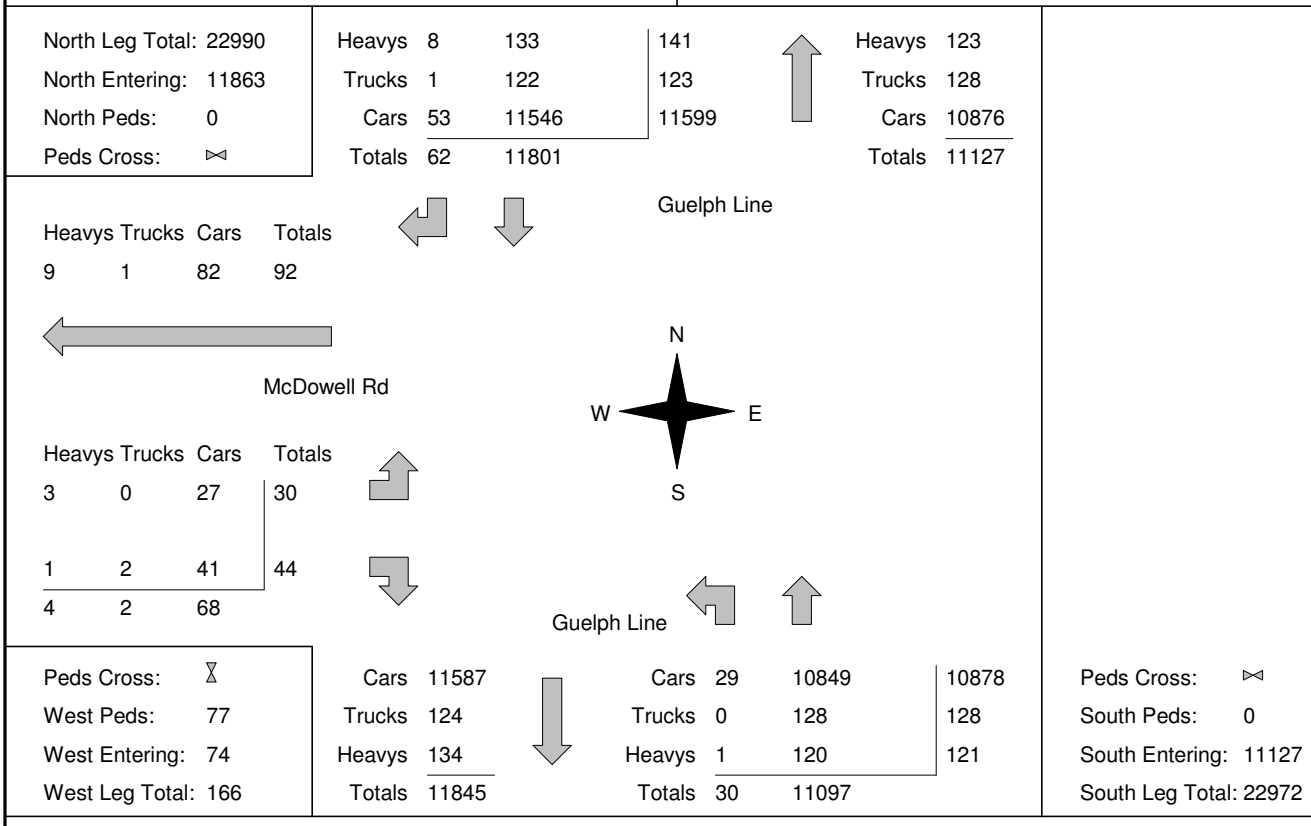
Municipality: Halton Region
Site #: 1022970100
Intersection: Guelph Line & McDowell Rd
TFR File #: 16
Count date: 5-Apr-2018

Weather conditions:
Cloudy/Dry

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Guelph Line runs N/S



Comments

Guelph Line @ Fairview St

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 8:00:00
To: 9:00:00

Municipality: Halton Region
Site #: 1022950100
Intersection: Guelph Line & Fairview St
TFR File #: 5
Count date: 2-May-2018

Weather conditions:
Clear/Dry

Person(s) who counted:
Cam

**** Signalized Intersection ****

Major Road: Guelph Line runs N/S

North Leg Total: 2655
North Entering: 1358
North Peds: 4
Peds Cross: ⋈

Heavys	3	13	4	20
Trucks	9	19	8	36
Cars	366	660	276	1302
Totals	378	692	288	

Heavys	15
Trucks	15
Cars	1267
Totals	1297

East Leg Total: 1612
East Entering: 500
East Peds: 8
Peds Cross: ⧖

Guelph Line

Heavys	Trucks	Cars	Totals
16	12	730	758

Fairview St

Cars	Trucks	Heavys	Totals
207	2	0	209
241	3	7	251
36	0	4	40
484	5	11	

N
W E
S

Heavys	Trucks	Cars	Totals
4	3	334	341
4	12	708	724
3	4	197	204
11	19	1239	

Fairview St

Cars	Trucks	Heavys	Totals
1082	22	8	1112

Guelph Line

Peds Cross: ⧖
West Peds: 18
West Entering: 1269
West Leg Total: 2027

Cars	893
Trucks	23
Heavys	20
Totals	936

Cars	123	726	98	947
Trucks	0	10	2	12
Heavys	6	11	0	17
Totals	129	747	100	

Peds Cross: ⋈
South Peds: 19
South Entering: 976
South Leg Total: 1912

Comments

Guelph Line @ Fairview St

Mid-day Peak Diagram

Specified Period
From: 11:00:00
To: 14:00:00

One Hour Peak
From: 12:30:00
To: 13:30:00

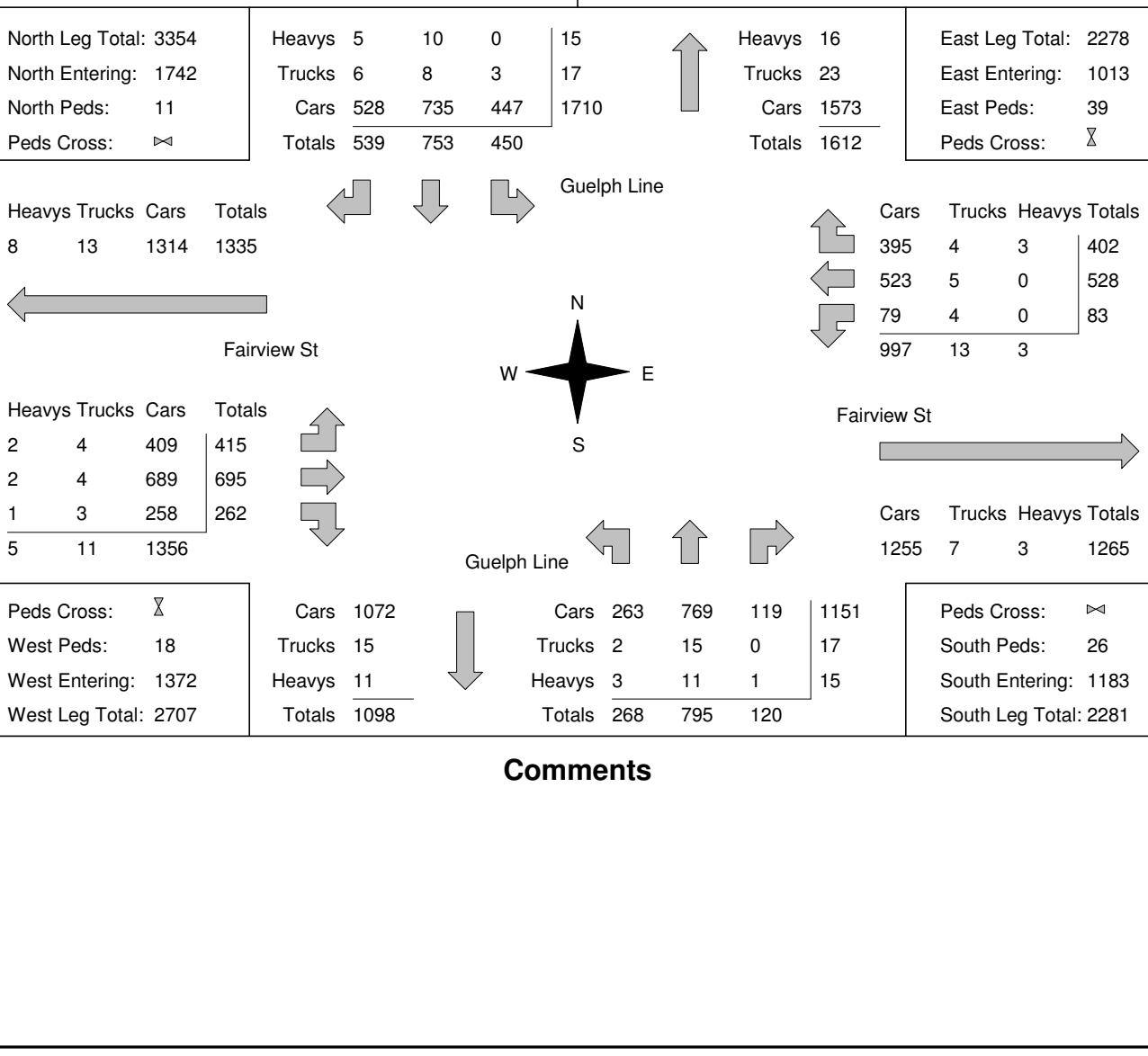
Municipality: Halton Region
Site #: 1022950100
Intersection: Guelph Line & Fairview St
TFR File #: 5
Count date: 2-May-2018

Weather conditions:
Clear/Dry

Person(s) who counted:
Cam

**** Signalized Intersection ****

Major Road: Guelph Line runs N/S



Comments

Guelph Line @ Fairview St

Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 17:00:00
To: 18:00:00

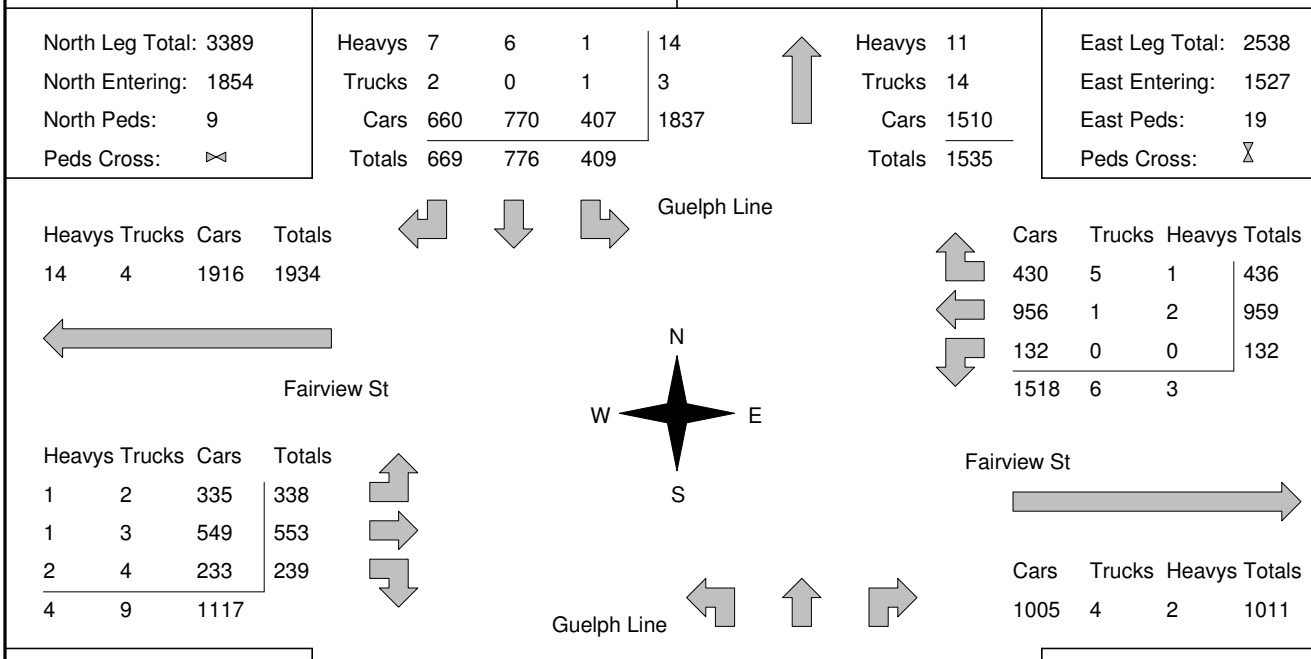
Municipality: Halton Region
Site #: 1022950100
Intersection: Guelph Line & Fairview St
TFR File #: 5
Count date: 2-May-2018

Weather conditions:
Clear/Dry

Person(s) who counted:
Cam

**** Signalized Intersection ****

Major Road: Guelph Line runs N/S



Comments

Guelph Line @ Fairview St

Total Count Diagram

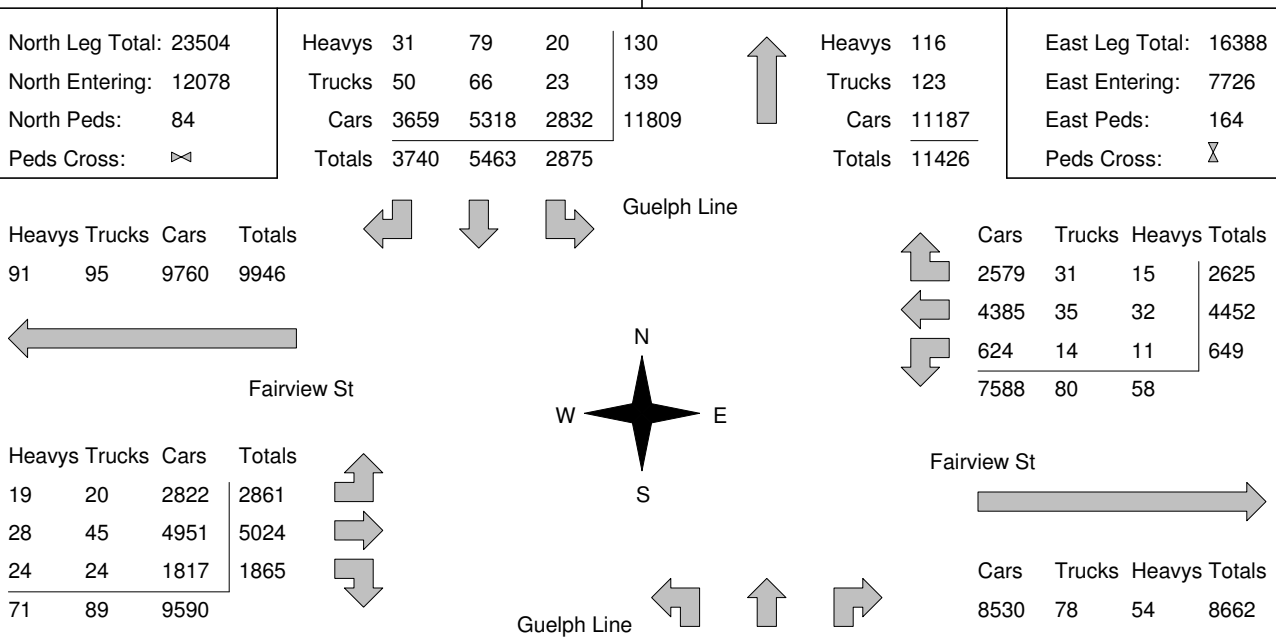
Municipality: Halton Region
Site #: 1022950100
Intersection: Guelph Line & Fairview St
TFR File #: 5
Count date: 2-May-2018

Weather conditions:
Clear/Dry

Person(s) who counted:
Cam

**** Signalized Intersection ****

Major Road: Guelph Line runs N/S



Comments

Harvester Rd @ S S. Rd/Laurentian Dr

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 8:00:00
To: 9:00:00

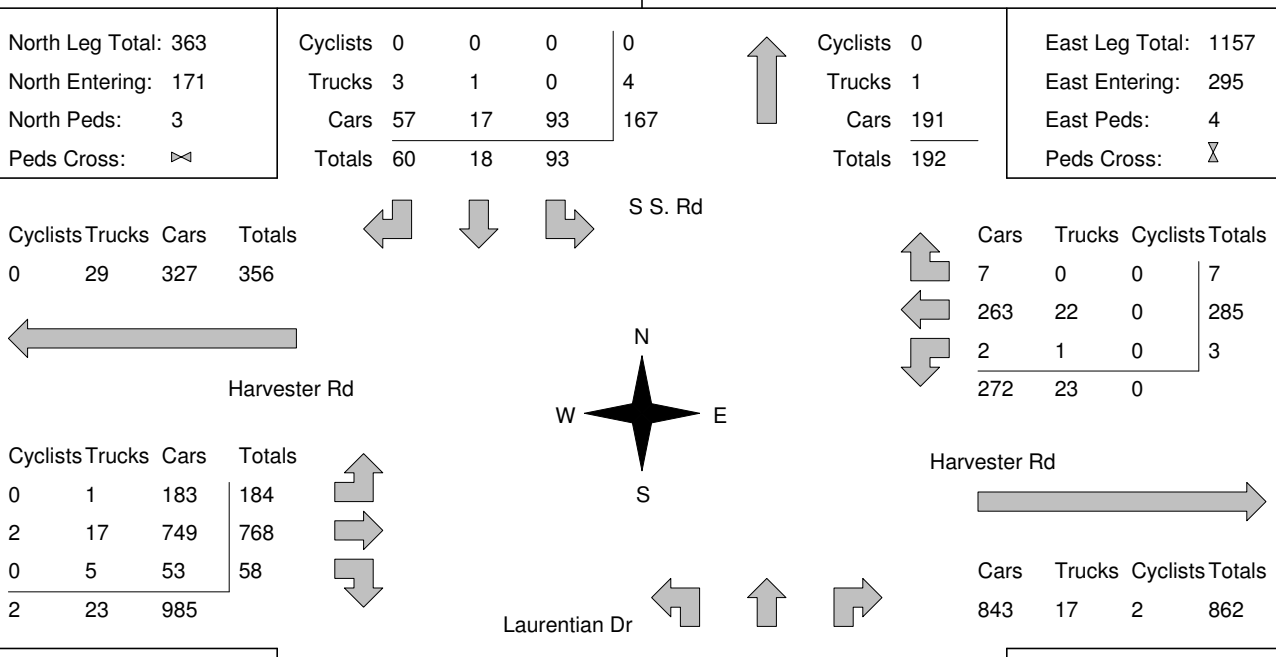
Municipality: Burlington
Site #: 0000202703
Intersection: Harvester Rd & S S. Rd/Laurentian
TFR File #: 1
Count date: 31-Oct-2017

Weather conditions:
Cloudy

Person(s) who counted:
Nikola

**** Signalized Intersection ****

Major Road: Harvester Rd runs W/E



Comments

Harvester Rd @ S S. Rd/Laurentian Dr

Mid-day Peak Diagram

Specified Period
From: 11:00:00
To: 14:00:00

One Hour Peak
From: 12:00:00
To: 13:00:00

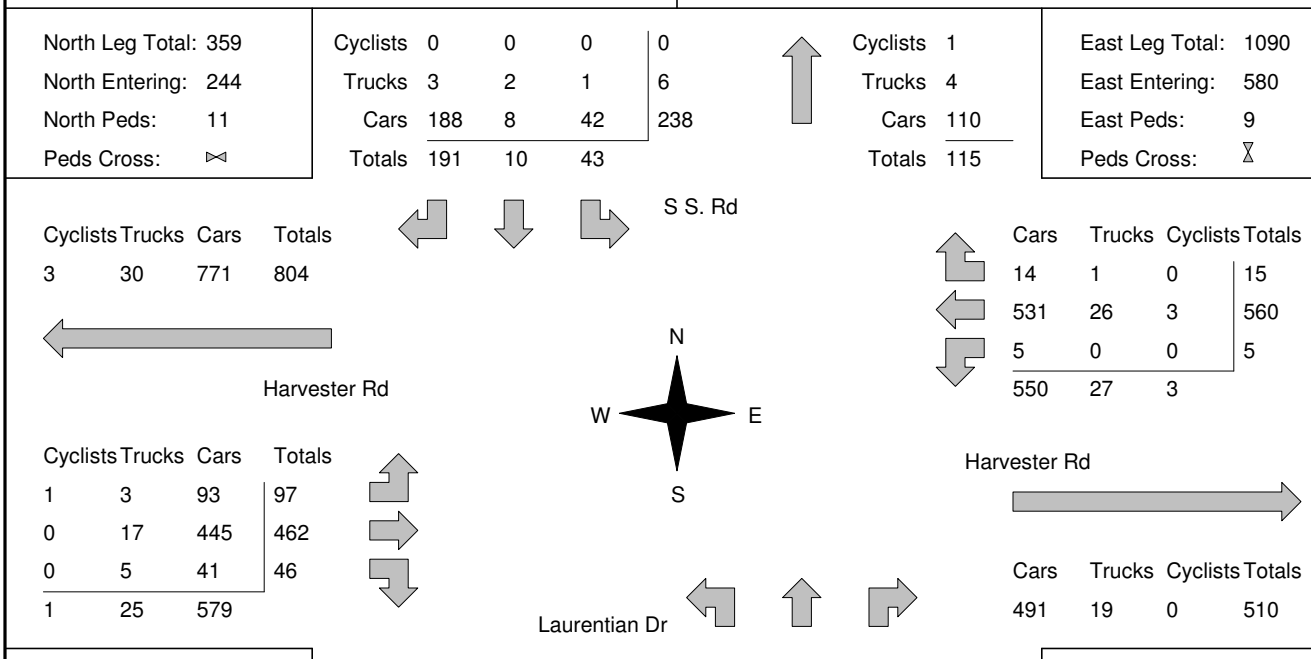
Municipality: Burlington
Site #: 0000202703
Intersection: Harvester Rd & S S. Rd/Laurentian
TFR File #: 1
Count date: 31-Oct-2017

Weather conditions:
Cloudy

Person(s) who counted:
Nikola

**** Signalized Intersection ****

Major Road: Harvester Rd runs W/E



Comments

Harvester Rd @ S S. Rd/Laurentian Dr

Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 16:00:00
To: 17:00:00

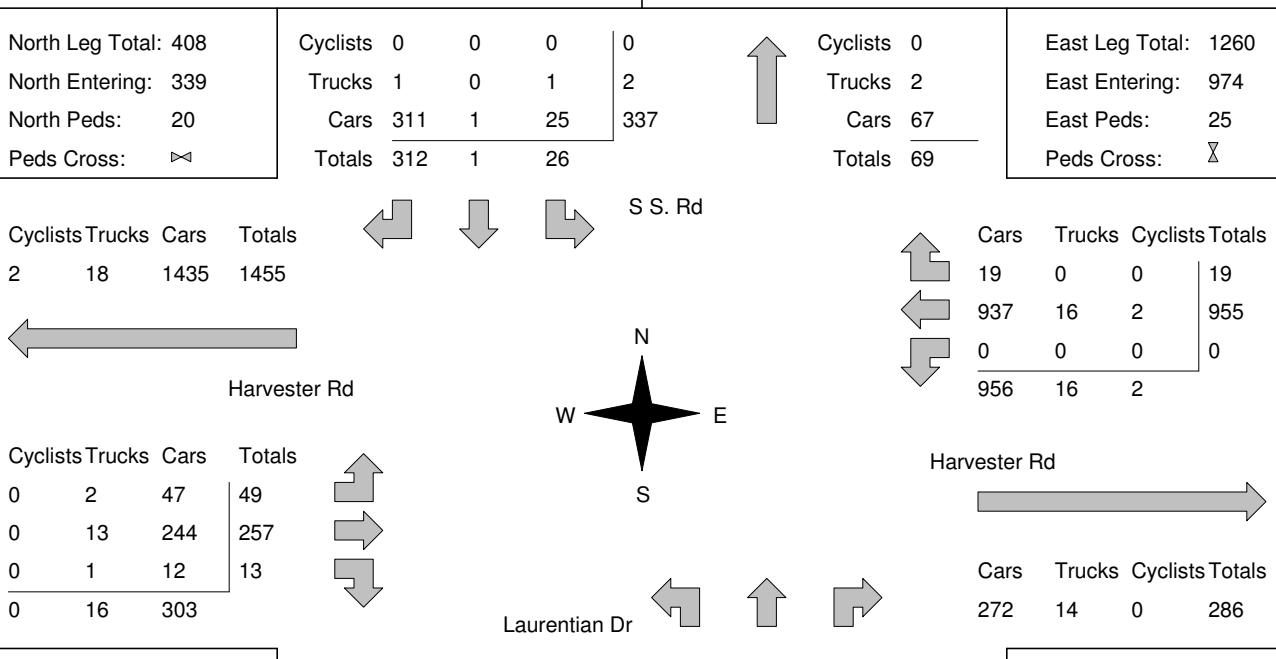
Municipality: Burlington
Site #: 0000202703
Intersection: Harvester Rd & S S. Rd/Laurentian
TFR File #: 1
Count date: 31-Oct-2017

Weather conditions:
Cloudy

Person(s) who counted:
Nikola

**** Signalized Intersection ****

Major Road: Harvester Rd runs W/E



Comments

Harvester Rd @ S S. Rd/Laurentian Dr

Total Count Diagram

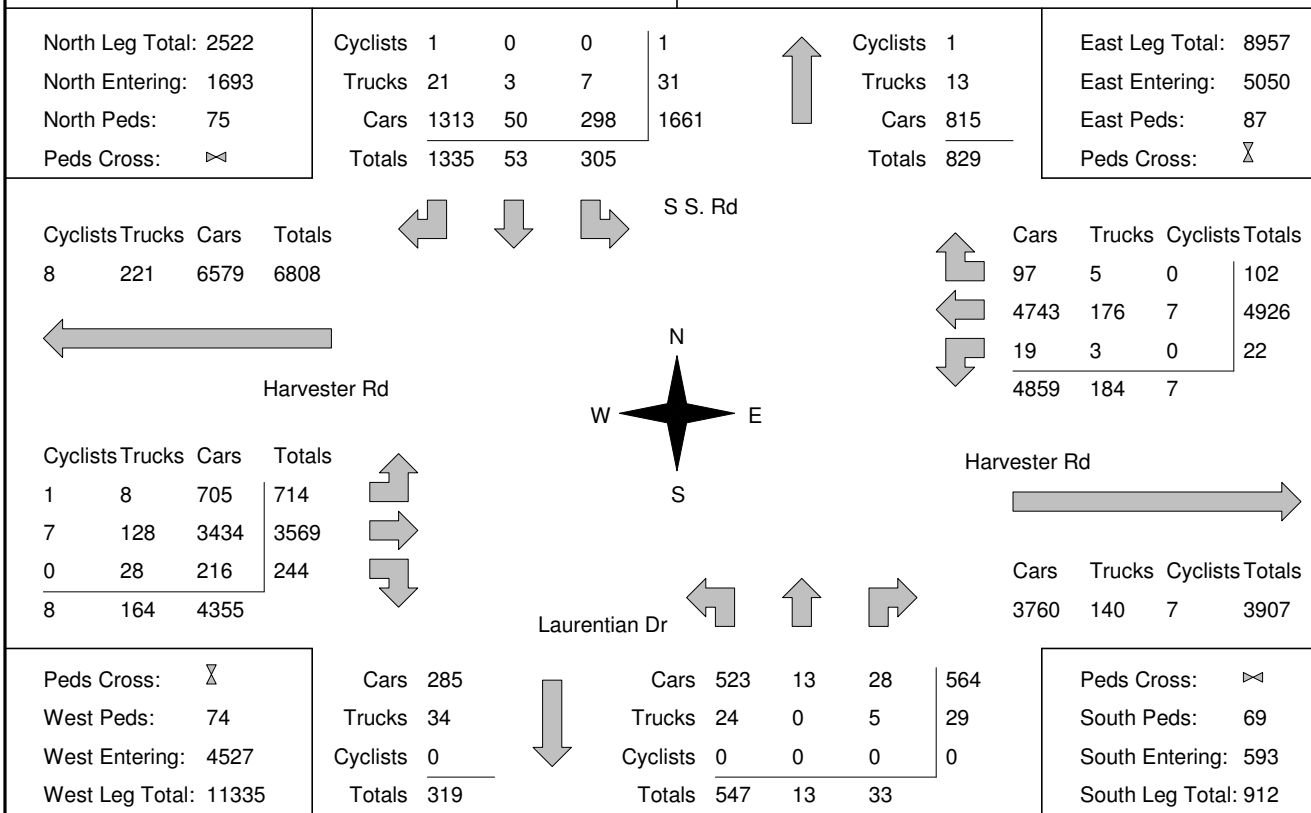
Municipality: Burlington
Site #: 0000202703
Intersection: Harvester Rd & S S. Rd/Laurentian
TFR File #: 1
Count date: 31-Oct-2017

Weather conditions:
Cloudy

Person(s) who counted:
Nikola

**** Signalized Intersection ****

Major Road: Harvester Rd runs W/E



Comments

Harvester Rd @ S S. Rd/Laurentian Dr
Traffic Count Summary

Intersection: Harvester Rd & S S. Rd/Laurentian | **Count Date:** 31-Oct-2017 | **Municipality:** Burlington

North Approach Totals

Hour Ending	Includes Cars, Trucks, & Cyclists: Left	Thru	Right	Grand Total	Total Peds	North/South Total Approaches
7:00:00	0	0	0	0	0	0
8:00:00	45	11	59	115	1	139
9:00:00	93	18	60	171	3	184
11:00:00	0	0	0	0	0	0
12:00:00	25	3	102	130	4	163
13:00:00	43	10	191	244	11	305
14:00:00	32	7	150	189	4	234
15:00:00	0	0	0	0	0	0
16:00:00	17	2	213	232	12	302
17:00:00	26	1	312	339	20	531
18:00:00	24	1	248	273	20	428
Totals:	305	53	1335	1693	75	2286

South Approach Totals

Hour Ending	Includes Cars, Trucks, & Cyclists: Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	0	0	0	0
8:00:00	24	0	0	24	8
9:00:00	11	1	1	13	29
11:00:00	0	0	0	0	0
12:00:00	23	3	7	33	10
13:00:00	53	3	5	61	10
14:00:00	39	1	5	45	6
15:00:00	0	0	0	0	0
16:00:00	64	1	5	70	3
17:00:00	188	1	3	192	2
18:00:00	145	3	7	155	1
Totals:	547	13	33	593	69

East Approach Totals

Hour Ending	Includes Cars, Trucks, & Cyclists: Left	Thru	Right	Grand Total	Total Peds	East/West Total Approaches
7:00:00	0	0	0	0	0	0
8:00:00	2	207	9	218	4	1033
9:00:00	3	285	7	295	4	1305
11:00:00	0	0	0	0	0	0
12:00:00	3	506	17	526	3	1053
13:00:00	5	560	15	580	9	1185
14:00:00	3	496	16	515	8	1161
15:00:00	0	0	0	0	0	0
16:00:00	4	932	10	946	15	1307
17:00:00	0	955	19	974	25	1293
18:00:00	2	985	9	996	19	1240
Totals:	22	4926	102	5050	87	9577

West Approach Totals

Hour Ending	Includes Cars, Trucks, & Cyclists: Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	0	0	0	0
8:00:00	103	670	42	815	15
9:00:00	184	768	58	1010	24
11:00:00	0	0	0	0	0
12:00:00	72	435	20	527	10
13:00:00	97	462	46	605	6
14:00:00	105	508	33	646	8
15:00:00	0	0	0	0	0
16:00:00	42	303	16	361	4
17:00:00	49	257	13	319	4
18:00:00	62	166	16	244	3
Totals:	714	3569	244	4527	74

Calculated Values for Traffic Crossing Major Street

Hours Ending:	8:00	9:00	12:00	13:00	14:00	16:00	17:00	18:00
Crossing Values:	99	150	64	121	94	102	244	194

Ministry of Transportation
Ministère des Transports

Intersection Layout Sheet

Version: 1.0 Feb 1, 2016

Contract # 9015-E-0009
Work Order # 040

2016

Date: June 02 Day: Thurs. Hrs: 15 -19 + 6 -10 + - -

Location: HWY 1 @ Guelph Line Rd IC-102-SSR N. Ramps Ramps: NRT /

Reg/Mun: CR Town/City: Burlington Area:

File Name: 1101230000 Device: Gretch / Jamar Unit # 6 / Interval 1: AM / NN / (PM)

Observer: Veyezhsal Olga Weather: Clear / Clear Road Condition: good /

LHRS & O/S: 10123 O

GPS: G-Star IV

Datum: WGS 84 (Y) / N

Lat: 43.53108

Long: -79.80266

Comments:

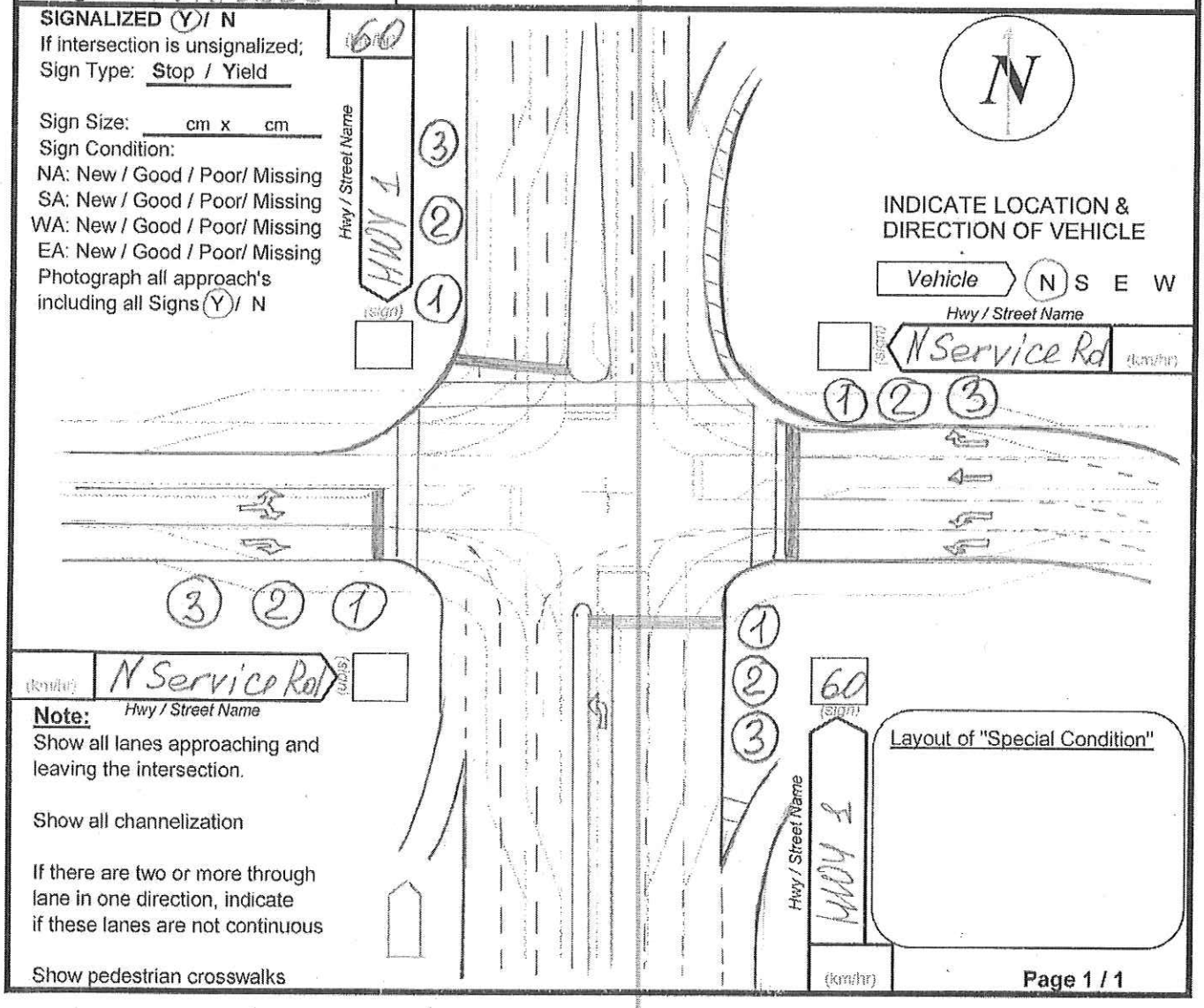
SIGNALIZED (Y) / N

If intersection is unsignalized;
Sign Type: Stop / Yield

Sign Size: cm x cm

Sign Condition:
NA: New / Good / Poor / Missing
SA: New / Good / Poor / Missing
WA: New / Good / Poor / Missing
EA: New / Good / Poor / Missing

Photograph all approach's including all Signs (Y) / N



Note:
Show all lanes approaching and leaving the intersection.

Show all channelization

If there are two or more through lane in one direction, indicate if these lanes are not continuous

Show pedestrian crosswalks

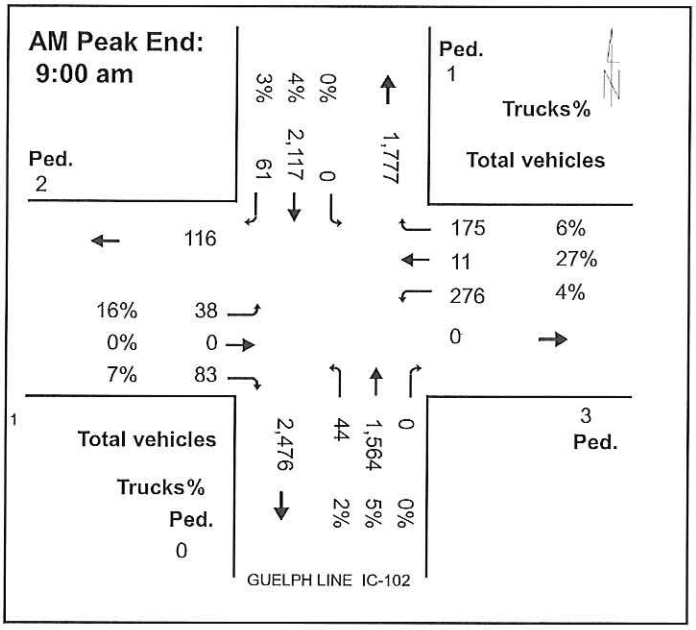
Layout of "Special Condition"

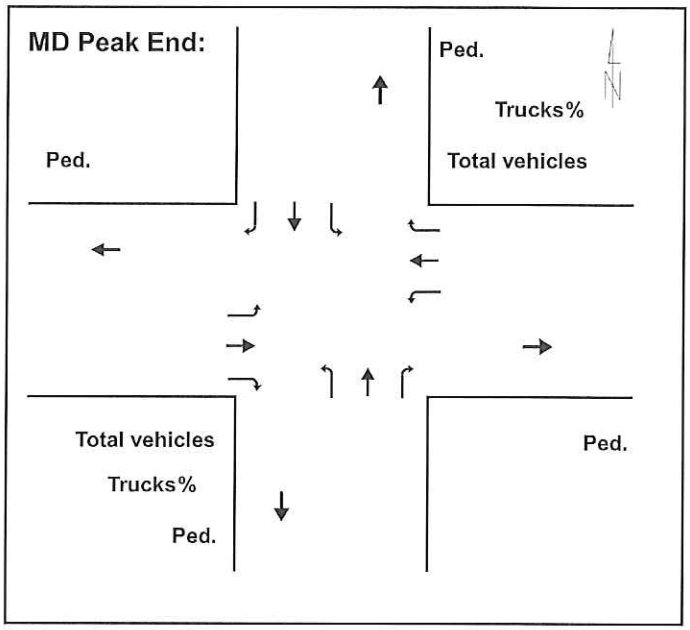
Ontario

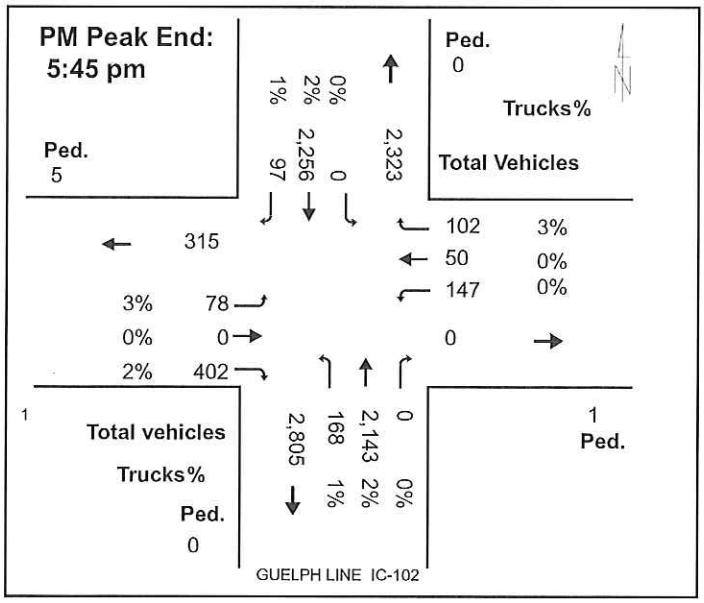
HWY 1 @ GUELPH LINE IC-102

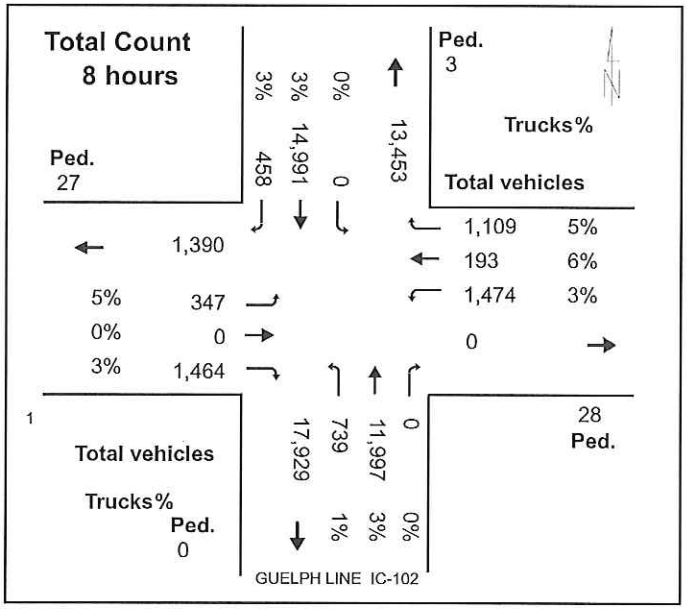
Central

Intersection ID:101230000(--N--) **Count Day: Thursday** **Count Date: 02-Jun-2016**









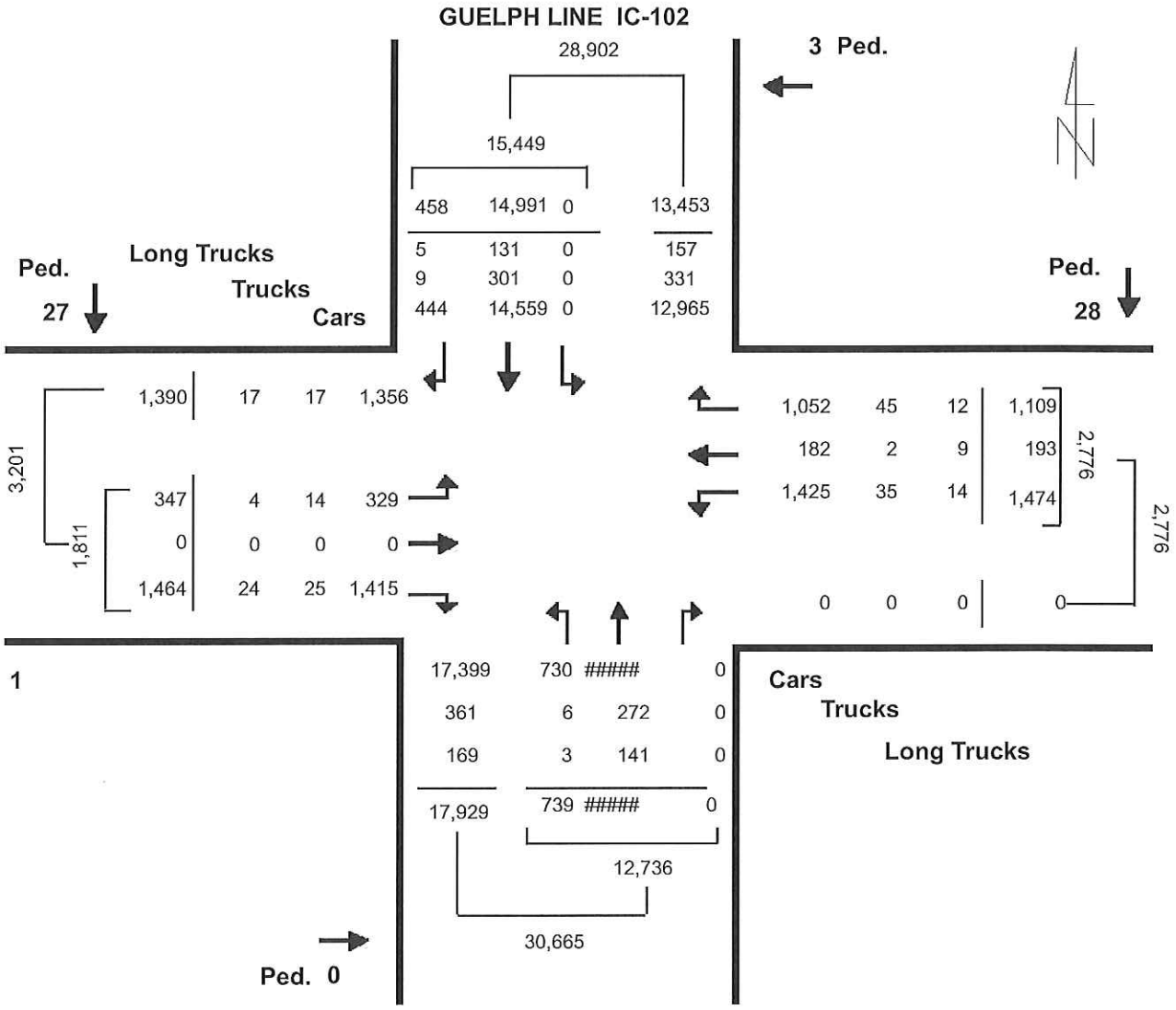
Traffic
Engineering
Software

COUNT TOTAL

HWY 1 @ GUELPH LINE IC-102

Central

Intersection ID:101230000(--N--) **Date: 02-Jun-2016**



15 MIN REPORT

Intersection ID:101230000(--N--) **HWY 1 @ GUELPH LINE IC-102** **Municipality: Central** **Date: 02-Jun-2016**

	NORTH APPROACH											EAST APPROACH												SOUTH APPROACH												WEST APPROACH												
Time	Cars			Trucks			Heavies			Ped		Cars			Trucks			Heavies			Ped		Cars			Trucks			Heavies			Ped		Cars			Trucks			Heavies			Ped	Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right			Left	Thru	Right	Left	Thru	Right	Left	Thru	Right			Left	Thru	Right	Left	Thru	Right	Left	Thru	Right			Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		
Period1																																															
15:15	0	573	0	0	10	0	0	3	0	0		53	4	43	1	0	3	0	0	0	1		28	337	0	1	5	0	1	8	0	0		18	0	47	1	0	1	0	0	0	2		1140
15:30	0	557	11	0	13	0	0	5	0	1		43	6	30	0	0	0	1	1	0	1		26	397	0	0	8	0	0	6	0	0		16	0	41	0	0	1	0	0	1	0		1165
15:45	0	647	18	0	10	1	0	6	4	0		46	8	30	2	1	1	0	0	0	0		34	334	0	0	9	0	0	8	0	0		12	0	65	1	0	0	0	0	0	4		1241
16:00	0	616	31	0	12	0	0	12	0	0		39	13	25	0	0	1	0	0	0	1		30	416	0	0	5	0	0	4	0	0		12	0	70	0	0	0	0	0	0	0		1287
16:15	0	572	10	0	7	1	0	4	0	0		44	11	27	1	0	1	1	0	0	0		27	373	0	0	11	0	0	5	0	0		20	0	88	0	0	1	2	0	3	3		1212
16:30	0	495	15	0	8	0	0	6	0	1		34	11	17	1	0	1	0	0	0	0		20	440	0	0	7	0	0	4	0	0		16	0	59	0	0	0	1	0	1	2		1139
16:45	0	565	18	0	13	0	0	6	0	0		43	7	16	0	0	2	1	0	0	1		48	396	0	0	3	0	0	7	0	0		18	0	85	0	0	1	0	0	0	1		1231
17:00	0	614	28	0	12	0	0	9	0	0		25	11	23	1	0	1	0	0	1	1		36	485	0	1	8	0	0	2	0	0		15	0	71	1	0	1	0	0	0	1		1347
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Period2																																															
6:15	0	136	3	0	5	0	0	1	0	0		14	0	11	0	0	1	0	0	1	0		8	115	0	0	0	0	0	4	0	0		1	0	2	0	0	0	0	0	0	0		302
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9:30	0	395	7	0	14	0	0	3	0	0		70	2	62	2	0	2	1	1	1	2		3	293	0	0	12	0	0	3	0	0		6	0	17	1	0	1	0	0	1	2		901
9:45	0	390	9	0	21	0	0	2	0	0		54	3	40	6	0	5	1	1	1	2		14	291	0	1	12	0	0	3	0	0		10	0	20	0	0	3	0	0	0	1		890
10:00	0	391	14	0	17	1	0	2	0	0		83	4	55	0	0	4	0	1	0	2		16	262	0	2	9	0	0	5	0	0		8	0	31	0	0	0	0	0	2	0		909

Ministry of Transportation
Ministère des Transports

Version: 1.0 Feb 1, 2016

Intersection Layout Sheet

Contract # 9015-E-0009
Work Order # 039

2016

Date: June 21 Day: Thurs. Hrs: 15 - 19 + 6 - 10 + ___ - ___

Location: HWY 1 @ Guelph Line Rd IC-102-SSP West Ramp Ramps: SRT /

Reg/Mun: CR Town/City: Burlington Area: ___

File Name: 21012300000 Device: Gretch / Jamar Unit # 6 / Interval 1: AM / NN / (PM)

Observer: Noyezhoal Olga Weather: Clear / Clear Road Condition: good /

LHRS & O/S: 0123 0

GPS: Q-Star IV

Datum: WGS 84 (Y) / N

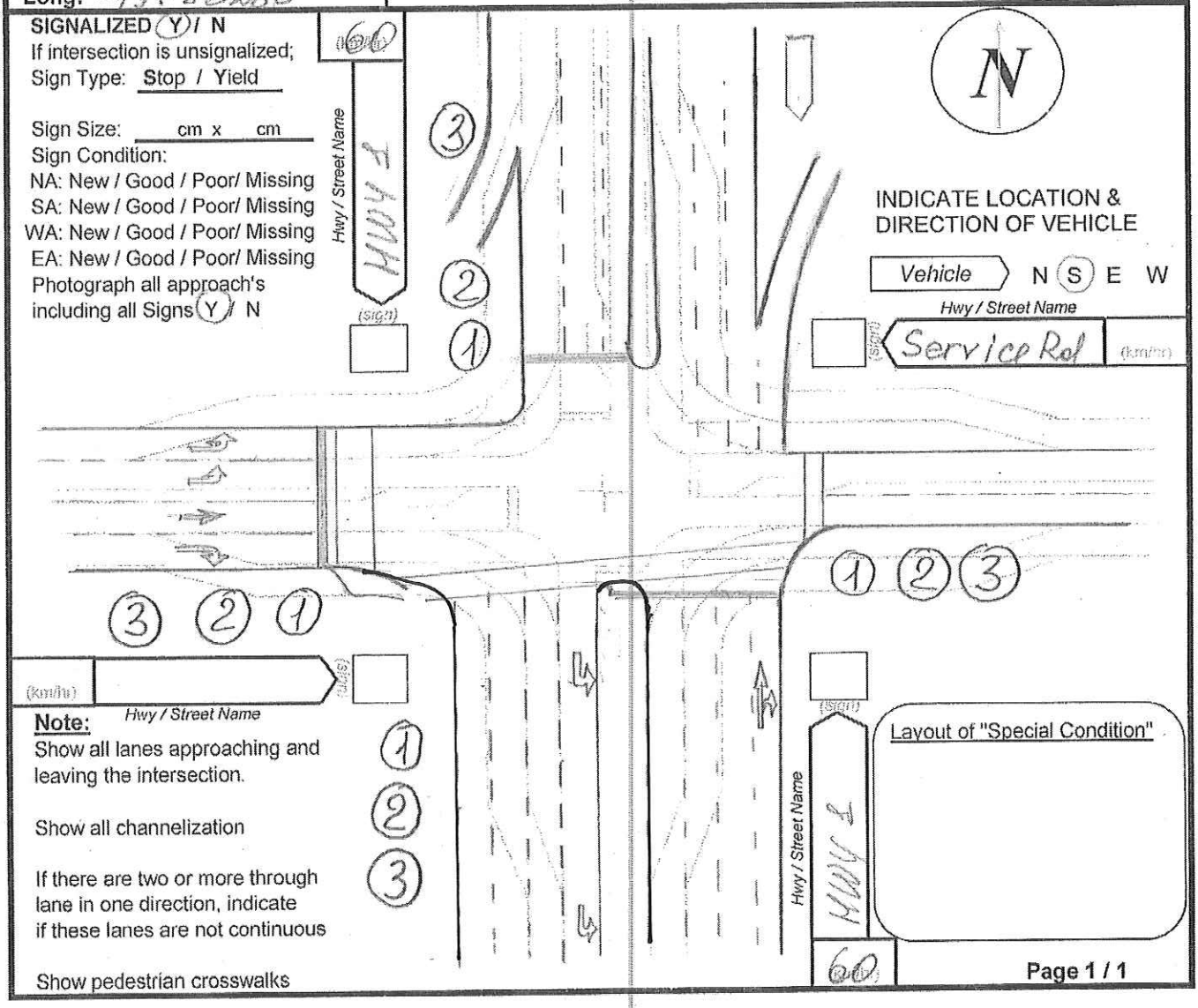
Lat: 43.35108

Long: -79.80266

Comments:

SIGNALIZED (Y) / N
If intersection is unsignalized;
Sign Type: Stop / Yield

Sign Size: ___ cm x ___ cm
Sign Condition:
NA: New / Good / Poor/ Missing
SA: New / Good / Poor/ Missing
WA: New / Good / Poor/ Missing
EA: New / Good / Poor/ Missing
Photograph all approach's including all Signs (Y) / N



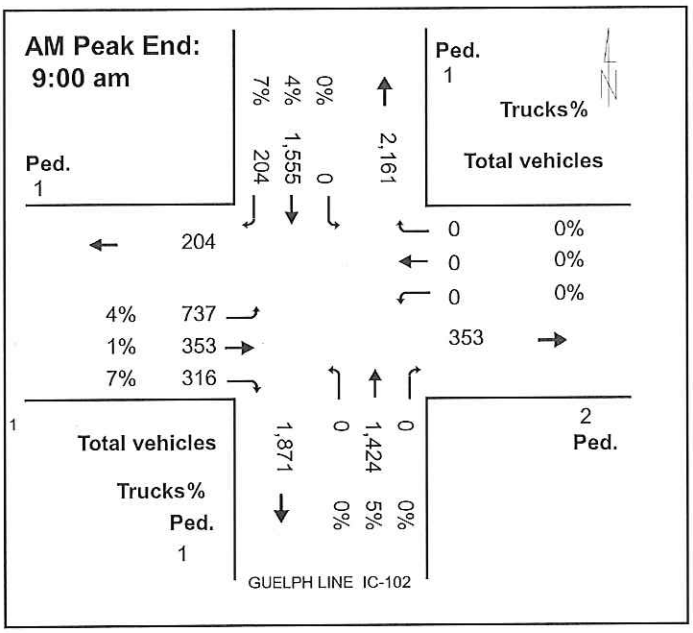
Layout of "Special Condition"

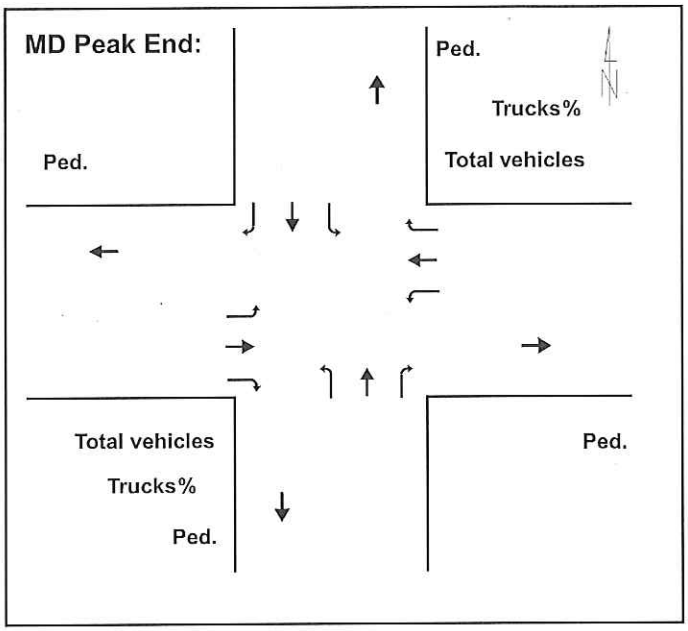
Ontario

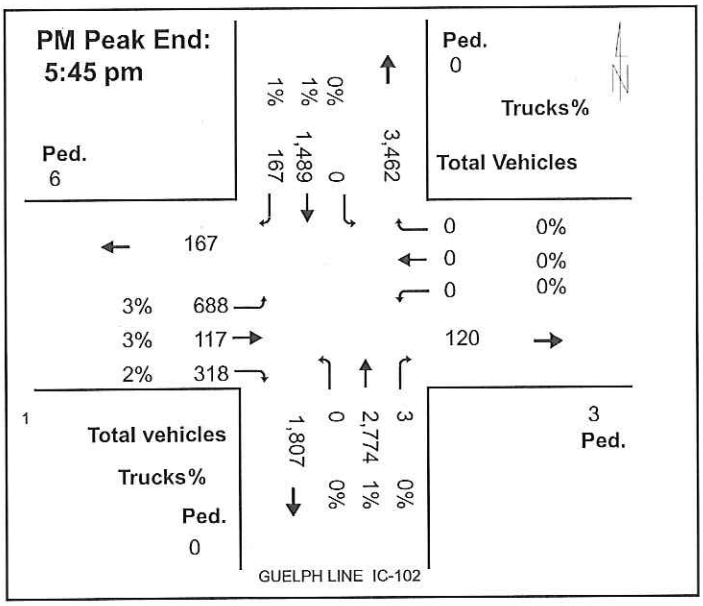
HWY 1 @ GUELPH LINE IC-102

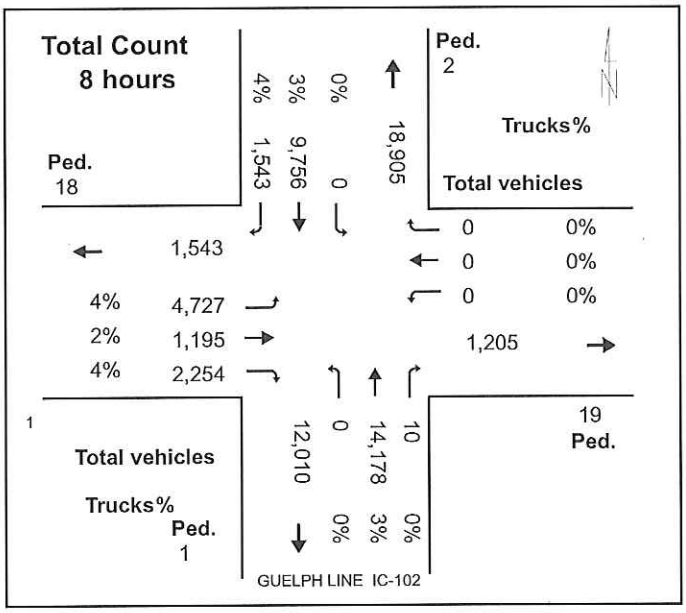
Central

Intersection ID:101230000(--S--) **Count Day: Thursday** **Count Date: 02-Jun-2016**









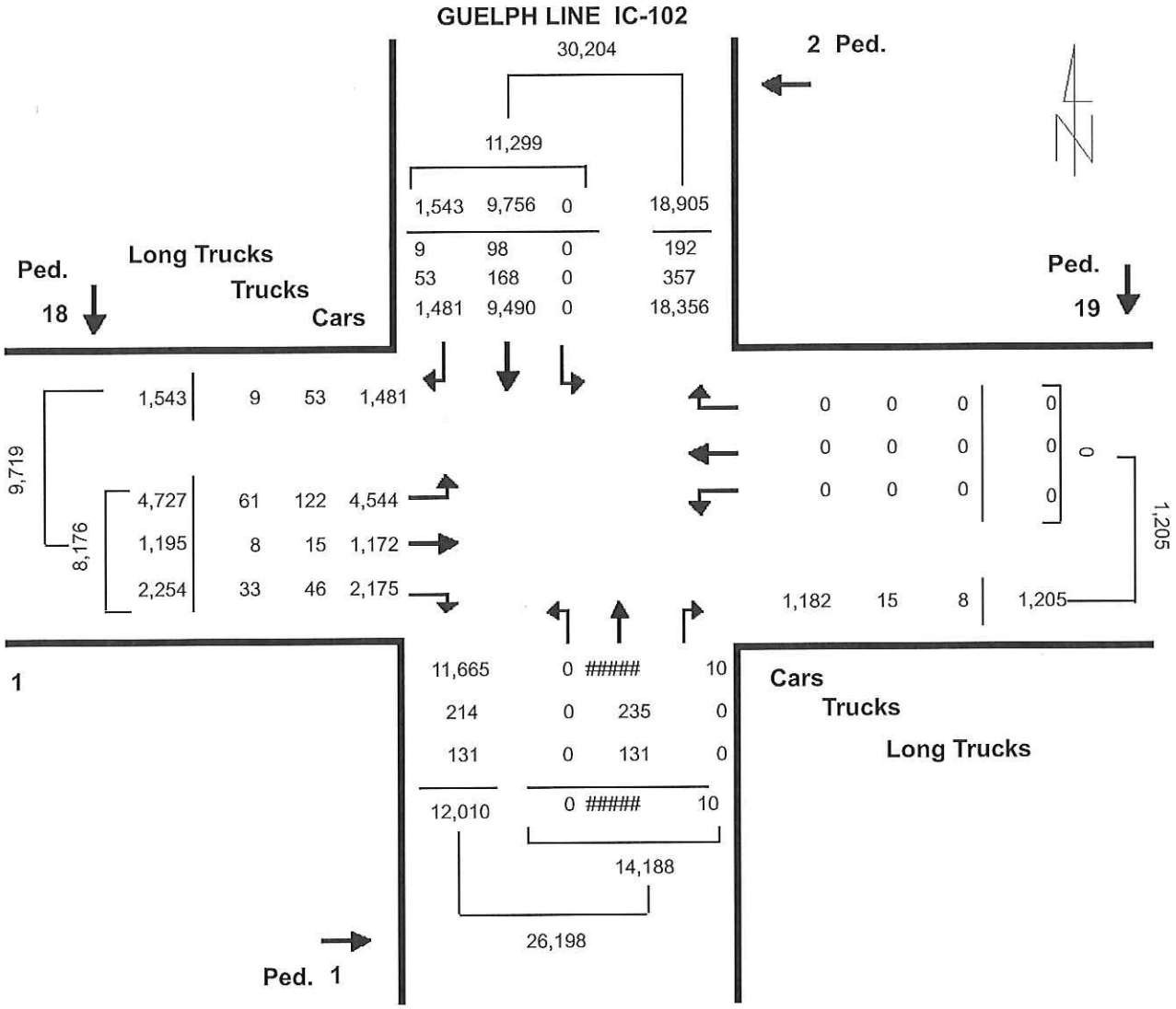
Traffic
Engineering
Software

COUNT TOTAL

HWY 1 @ GUELPH LINE IC-102

Central

Intersection ID:101230000(--S--) **Date: 02-Jun-2016**



15 MIN REPORT

Intersection ID:101230000(--S--) HWY 1 @ GUELPH LINE IC-102 **Municipality: Central** **Date: 02-Jun-2016**

	NORTH APPROACH										EAST APPROACH										SOUTH APPROACH										WEST APPROACH										
Time	Cars			Trucks			Heavies			Ped	Cars			Trucks			Heavies			Ped	Cars			Trucks			Heavies			Ped	Cars			Trucks			Heavies			Ped	Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		
Period1																																									
15:15	0	326	44	0	5	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	539	0	0	7	0	0	6	0	0	98	12	76	5	0	2	3	0	2	2	1130
15:30	0	318	64	0	8	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	543	0	0	6	0	0	6	0	0	145	15	79	1	0	0	2	0	2	0	1193
15:45	0	327	43	0	6	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	534	0	0	9	0	0	8	0	0	132	32	21	4	0	4	3	0	0	2	1128
16:00	0	381	43	0	2	6	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	611	0	0	5	0	0	2	0	0	106	55	31	2	0	4	3	1	0	0	1254
16:15	0	265	26	0	4	0	0	5	2	0	0	0	0	0	0	0	0	0	0	0	0	583	0	0	2	0	0	5	0	0	105	33	25	8	0	1	2	1	3	3	1073
16:30	0	335	45	0	4	0	0	8	0	0	0	0	0	0	0	0	0	0	0	2	0	618	0	0	4	0	0	9	0	0	124	39	25	4	0	0	1	3	0	1	1222
16:45	0	326	38	0	2	2	0	3	0	0	0	0	0	0	0	0	0	0	0	1	0	599	0	0	7	0	0	4	0	0	162	39	31	5	3	0	6	0	0	0	1228
17:00	0	387	42	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	658	0	0	4	0	0	0	0	0	152	27	77	4	2	0	1	0	1	2	1365
17:15	0	367	39	0	2	0	0	2	1	0	0	0	0	0	0	0	0	0	0	2	0	683	1	0	6	0	0	3	0	0	198	37	71	2	1	3	2	0	1	2	1423
17:30	0	340	37	0	2	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	682	2	0	5	0	0	5	0	0	189	27	98	4	0	1	2	0	0	0	1396
17:45	0	378	47	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	1	0	723	0	0	2	0	0	3	0	0	130	23	66	1	0	0	3	0	0	2	1381
18:00	0	340	38	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	595	0	0	5	0	0	3	0	0	144	24	61	5	0	1	0	0	0	0	1222
18:15	0	339	47	0	3	1	0	3	0	0	0	0	0	0	0	0	0	0	0	1	0	588	0	0	4	0	0	3	0	0	92	12	60	0	0	0	1	0	0	0	1154
18:30	0	325	59	0	0	1	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	574	0	0	4	0	0	2	0	0	110	9	85	1	0	0	1	0	0	0	1174
18:45	0	377	61	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	550	2	0	2	0	0	1	0	0	81	10	57	1	0	0	0	1	0	0	1144
19:00	0	342	56	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	441	0	0	0	0	0	1	0	0	107	10	59	2	0	0	0	0	0	0	1021
Period2																																									
6:15	0	48	62	0	4	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	146	1	0	1	0	0	3	0	0	78	14	23	0	0	2	1	0	0	0	385
6:30	0	73	45	0	2	4	0	3	0	0	0	0	0	0	0	0	0	0	0	1	0	164	1	0	3	0	0	1	0	0	106	9	53	2	0	2	2	0	1	0	472
6:45	0	102	49	0	0	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	164	1	0	4	0	0	4	0	0	146	13	71	0	0	0	4	0	1	0	563
7:00	0	135	46	0	4	2	0	4	0	0	0	0	0	0	0	0	0	0	0	1	0	196	0	0	3	0	0	1	0	0	147	31	80	2	1	1	1	0	2	1	658
7:15	0	145	48	0	2	3	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	235	1	0	6	0	0	3	0	0	159	30	76	9	0	0	1	0	0	0	720
7:30	0	240	42	0	6	2	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	204	0	0	15	0	0	2	0	0	247	60	112	6	1	3	2	0	0	0	946
7:45	0	237	38	0	4	1	0	5	0	0	0	0	0	0	0	0	0	0	0	3	0	274	0	0	13	0	0	5	0	0	235	62	90	5	0	1	2	0	1	0	976
8:00	0	349	40	0	6	3	0	3	0	0	0	0	0	0	0	0	0	0	0	1	0	313	0	0	10	0	0	6	0	0	202	64	77	3	2	3	2	0	3	0	1087
8:15	0	295	54	0	17	3	0	4	1	0	0	0	0	0	0	0	0	0	0	1	0	342	0	0	10	0	0	9	0	0	179	93	79	5	1	7	0	0	0	0	1100
8:30	0	384	60	0	13	6	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	364	0	0	11	0	0	4	0	0	156	96	72	6	0	1	2	0	4	0	1183
8:45	0	361	32	0	10	1	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	288	0	0	14	0	0	6	0	0	211	86	90	8	1	3	4	0	1	0	1120
9:00	0	449	44	0	8	1	0	6	2	1	0	0	0	0	0	0	0	0	0	1	0	353	0	0	17	0	0	6	0	1	159	75	52	5	0	2	2	1	5	1	1191
9:15	0	302	52	0	11	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	294	0	0	23	0	0	8	0	0	136	46	82	4	1	1	3	0	2	1	969
9:30	0	309	51	0	7	4	0	4	0	0	0	0	0	0	0	0	0	0	0	1	0	288	0	0	9	0	0	4	0	0	107	33	108	5	1	2	2	0	0	1	936
9:45	0	282	49	0	19	2	0	3	1	0	0	0	0	0	0	0	0	0	0	2	0	347	1	0	12	0	0	3	0	0	103	31	87	8	0	2	1	0	3	0	956
10:00	0	306	40	0	10	4	0	2	0	0	0	0	0	0	0	0	0	0	0	1	0	319	0	0	12	0	0	5	0	0	98	25	101	5	1	0	2	1	1	0	933

SEVEN DAY HOURLY REPORT

Station 1: QEWDE0295DSR

HIGHWAY: QEW STREAM: OTHER DIRECTION: OTHER

LHRS / OFFSET: 10123 / 0 LOCATION: (43.350, -79.806) DESCRIPTION: QEW TORONTO BOUND - GUELPH LINE

Station 2: QEWDE0060DER

HIGHWAY: QEW STREAM: OTHER DIRECTION: OTHER

LHRS / OFFSET: 10123 / 0 LOCATION: (43.353, -79.802) DESCRIPTION: GUELPH LINE NB - QEW TORONTO BOUND

CONFIDENCE LEVEL: 95%

	WED		THU		FRI		SAT		SUN		MON		TUE	
	27-Sep-17		28-Sep-17		29-Sep-17		30-Sep-17		01-Oct-17		02-Oct-17		03-Oct-17	
	VDS1	VDS2	VDS1	VDS2	VDS1	VDS2	VDS1	VDS2	VDS1	VDS2	VDS1	VDS2	VDS1	VDS2
HOUR-ENDING	Loops	Loops	Loops	Loops	Loops	Loops	Loops	Loops	Loops	Loops	Loops	Loops	Loops	Loops
01:00	45	24	61	30	53	30	129	58	161	63	58	12	56	29
02:00	37	24	33	17	40	26	70	39	74	45	26	11	28	14
03:00	24	14	35	14	25	11	59	31	64	35	26	17	33	13
04:00	37	24	27	14	30	24	33	16	48	23	27	12	39	10
05:00	96	35	95	38	103	42	27	18	31	22	106	34	90	40
06:00	346	158	341	170	303	150	88	49	57	29	354	163	370	151
07:00	728	191	956	203	885	193	251	75	120	40	1032	186	993	188
08:00	1289	186	1702	164	1318	186	374	126	193	86	1507	141	1403	158
09:00	1576	145	1743	138	1280	181	568	196	359	107	1949	137	1670	145
10:00	1202	177	1242	205	834	228	651	265	516	158	1270	182	1291	170
11:00	891	261	746	269	609	256	687	277	678	179	639	265	739	236
12:00	756	298	676	270	609	273	745	293	652	313	694	264	675	292
13:00	694	305	699	328	648	303	717	345	689	443	711	299	755	298
14:00	763	303	711	282	617	316	702	361	703	271	648	284	710	306
15:00	676	339	736	307	810	302	783	334	646	297	766	272	1173	266
16:00	810	259	853	275	869	252	725	340	652	315	815	280	1150	331
17:00	968	253	1044	237	839	211	807	390	754	362	954	239	1014	761
18:00	1015	222	1069	199	899	244	652	365	615	283	1803	190	1115	571
19:00	738	258	743	254	768	295	585	359	520	234	662	238	866	426
20:00	610	251	602	246	605	238	483	228	420	205	520	231	507	225
21:00	385	228	438	229	409	181	390	185	349	178	349	199	349	180
22:00	301	177	320	217	338	170	316	147	275	108	276	151	272	188
23:00	218	105	197	89	258	139	376	130	185	70	173	75	192	103
23:59	126	42	123	51	190	114	281	111	88	56	76	58	110	50
24 Hr Total	14,331	4,279	15,192	4,246	13,339	4,365	10,499	4,738	8,849	3,922	15,441	3,940	15,600	5,151
A.M. Total	7,027	1,537	7,657	1,532	6,089	1,600	3,682	1,443	2,953	1,100	7,688	1,424	7,387	1,446
P.M. Total	7,304	2,742	7,535	2,714	7,250	2,765	6,817	3,295	5,896	2,822	7,753	2,516	8,213	3,705
Noon-Noon			14,961	4,274	13,624	4,314	10,932	4,208	9,770	4,395	13,584	4,246	15,140	3,962
Highest Hour Starting	08:00	14:00	08:00	12:00	07:00	13:00	16:00	16:00	16:00	12:00	08:00	12:00	08:00	16:00
Highest Hour Volume	1,576	339	1,743	328	1,318	316	807	390	754	443	1,949	299	1,670	761

VDS 1 ADT = 13,322 VDS 2 ADT = 4,377 VDS1 AWD = 14,327 VDS2 AWD = 4,199

ADT (Average Daily Traffic)-The average daily volume of the days being displayed LHRS (Linear Highway Reference

AWD (Average Weekday Traffic) - The average weekday traffic based on data taken from Monday @noon to Friday @noon.

Jun 22, 2018 10:17:12

SEVEN DAY HOURLY REPORT

Station 1: QEWDE0310DNR

HIGHWAY: QEW STREAM: OTHER DIRECTION: OTHER

LHRS / OFFSET: 10123 / 0 LOCATION: (43.354, -79.803) DESCRIPTION: QEW F. ERIE BOUND - GUELPH LINE

Station 2: QEWDE0050DWR

HIGHWAY: QEW STREAM: OTHER DIRECTION: OTHER

LHRS / OFFSET: 10123 / 0 LOCATION: (43.349, -79.808) DESCRIPTION: GUELPH LINE SB - QEW F. ERIE BOUND CONFIDENCE LEVEL: 95%

	WED		THU		FRI		SAT		SUN		MON		TUE	
	27-Sep-17		28-Sep-17		29-Sep-17		30-Sep-17		01-Oct-17		02-Oct-17		03-Oct-17	
	VDS1	VDS2	VDS1	VDS2	VDS1	VDS2	VDS1	VDS2	VDS1	VDS2	VDS1	VDS2	VDS1	VDS2
HOUR-ENDING	Loops	Loops	Loops	Loops	Loops	Loops	Loops	Loops	Loops	Loops	Loops	Loops	Loops	Loops
01:00	77	56	65	59	87	57	136	104	118	78	45	35	58	55
02:00	43	21	42	32	46	33	80	48	71	51	17	12	30	35
03:00	38	21	26	19	32	22	55	43	55	32	16	6	23	19
04:00	28	13	23	13	25	16	34	19	36	20	13	10	24	18
05:00	23	43	29	40	28	44	13	19	31	23	15	31	29	42
06:00	54	109	67	109	63	106	24	28	17	32	53	110	64	91
07:00	154	220	156	230	141	207	89	85	49	53	143	222	135	232
08:00	283	493	249	465	236	454	183	161	111	98	261	500	254	511
09:00	381	602	390	564	481	486	295	276	198	156	369	590	391	576
10:00	339	363	326	399	459	308	357	314	400	252	348	361	385	416
11:00	337	379	342	356	331	376	635	482	247	330	291	358	337	327
12:00	407	406	399	431	300	438	276	626	311	382	326	357	330	322
13:00	388	378	417	420	284	407	487	456	361	426	416	395	406	398
14:00	404	440	425	451	249	421	462	485	441	442	358	416	385	429
15:00	331	507	369	500	223	621	433	461	458	403	331	479	638	606
16:00	235	804	191	894	203	827	392	478	413	426	268	765	193	1159
17:00	253	1055	194	1084	172	1048	340	520	364	441	225	1069	1	1319
18:00	272	933	228	1037	224	961	317	498	335	372	269	932	134	1375
19:00	307	588	322	667	289	698	304	460	279	292	416	569	488	806
20:00	440	474	420	433	449	394	320	263	313	313	391	391	359	427
21:00	342	358	353	335	355	308	250	193	235	246	333	310	263	282
22:00	231	229	253	236	222	251	214	182	190	183	227	215	261	230
23:00	164	177	175	154	203	138	203	167	125	119	139	167	190	122
23:59	128	114	150	101	152	160	159	144	68	58	107	92	123	104
24 Hr Total	5,659	8,783	5,611	9,029	5,254	8,781	6,058	6,512	5,226	5,228	5,377	8,392	5,501	9,901
A.M. Total	2,164	2,726	2,114	2,717	2,229	2,547	2,177	2,205	1,644	1,507	1,897	2,592	2,060	2,644
P.M. Total	3,495	6,057	3,497	6,312	3,025	6,234	3,881	4,307	3,582	3,721	3,480	5,800	3,441	7,257
Noon-Noon			5,609	8,774	5,726	8,859	5,202	8,439	5,525	5,814	5,479	6,313	5,540	8,444
Highest Hour Starting	19:00	16:00	13:00	16:00	08:00	16:00	10:00	11:00	14:00	13:00	18:00	16:00	14:00	17:00
Highest Hour Volume	440	1,055	425	1,084	481	1,048	635	626	458	442	416	1,069	638	1,375

VDS 1 ADT = 5,527 VDS 2 ADT = 8,089 VDS1 AWD = 5,588 VDS2 AWD = 8,098

ADT (Average Daily Traffic)-The average daily volume of the days being displayed LHRS (Linear Highway Reference

AWD (Average Weekday Traffic) - The average weekday traffic based on data taken from Monday @noon to Friday @noon.

Jun 22, 2018 10:56:40

SEVEN DAY HOURLY REPORT

Station 1:	QEWDE0060DWR				
HIGHWAY:	QEW	STREAM:	OTHER	DIRECTION:	OTHER
LHRS / OFFSET:	10123 / 0	LOCATION:	(43.353, -79.804)	CONFIDENCE LEVEL:	95%
DESCRIPTION	GUELPH LINE NB - QEW F. ERIE BOUND				

HOUR-ENDING	WED	THU	FRI	SAT	SUN	MON	TUE
	27-Sep-17	28-Sep-17	29-Sep-17	30-Sep-17	01-Oct-17	02-Oct-17	03-Oct-17
	Loops	Loops	Loops	Loops	Loops	Loops	Loops
01:00	55	56	55	95	107	35	44
02:00	29	25	33	80	95	22	22
03:00	16	11	17	31	115	17	12
04:00	18	9	17	27	26	13	8
05:00	21	19	23	13	24	24	12
06:00	42	47	39	29	23	55	49
07:00	158	146	141	47	31	135	121
08:00	295	293	298	162	147	297	319
09:00	311	297	244	155	121	259	325
10:00	246	275	153	252	187	249	273
11:00	310	286	184	257	230	263	276
12:00	379	338	181	392	354	364	314
13:00	374	383	226	385	348	375	398
14:00	388	370	255	355	340	353	389
15:00	468	391	413	380	308	377	255
16:00	513	556	487	395	313	526	277
17:00	507	527	445	415	360	528	361
18:00	477	456	404	349	319	441	458
19:00	399	426	418	360	243	388	549
20:00	415	404	382	313	269	370	428
21:00	299	329	316	252	190	285	284
22:00	267	309	315	203	128	221	267
23:00	146	153	182	178	107	119	127
23:59	72	90	135	133	53	88	107
24 Hr Total	6,205	6,196	5,363	5,258	4,438	5,804	5,675
A.M. Total	1,880	1,802	1,385	1,540	1,460	1,733	1,775
P.M. Total	4,325	4,394	3,978	3,718	2,978	4,071	3,900
Noon-Noon		6,127	5,779	5,518	5,178	4,711	5,846
Highest Hour Starting	15:00	15:00	15:00	16:00	16:00	16:00	18:00
Highest Hour Volume	513	556	487	415	360	528	549

ADT =	5,563	AWD =	5,616

ADT (Average Daily Traffic)-The average daily volume of the days being displayed LHRS (Linear Highway Reference

AWD (Average Weekday Traffic) - The average weekday traffic based on data taken from Monday @noon to Friday @noon.

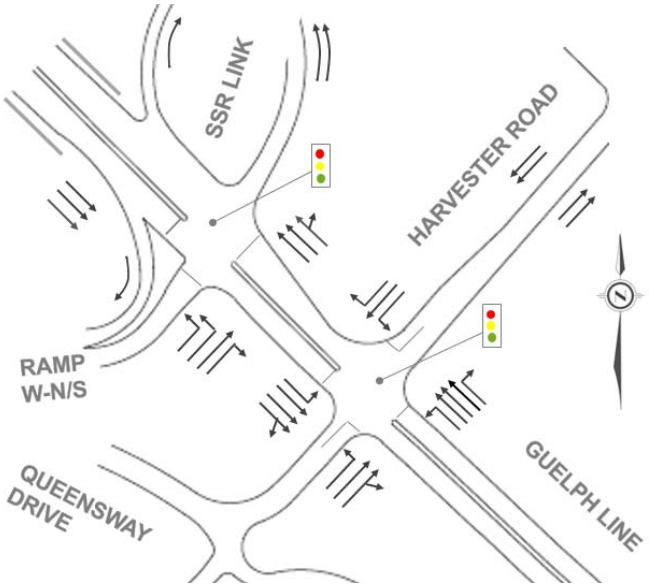
APPENDIX B

EXISTING CONDITIONS (2018)

EXISTING CONDITIONS

Overview:

Maintain existing lane configuration



Existing (2018) Operations Analysis:

INTERSECTION	AM PEAK HOUR			PM PEAK HOUR		
	V/C	Delay (s)	LOS	V/C	Delay (s)	LOS
Guelph Line & E-N/S/E Off Ramp/ North Service Road Link	0.73	20.1	C	0.98	74.1	E
Critical Movements (v/c)	--			EBR = 1.0 SBTR = 1.16		
Guelph Line & W-N/S/E Off Ramp / South Service Road Link	0.61	15.6	B	0.70	14.2	B
Critical Movements (v/c)	None			EBR = 0.85 (QL ≥ 136m)		
Guelph Line & Harvester Road / Queensway Drive	0.77	32.8	C	**1.04**	74.3	E
Critical Movements (v/c)	NBT = 0.88 SBL = 0.86 (QL ≥ 158m)			EBL = 0.89 (QL ≥ 69m) **WBT = 1.26** **WBR = 1.17** NBT = 0.86 SBTR = 0.91		

Remarks

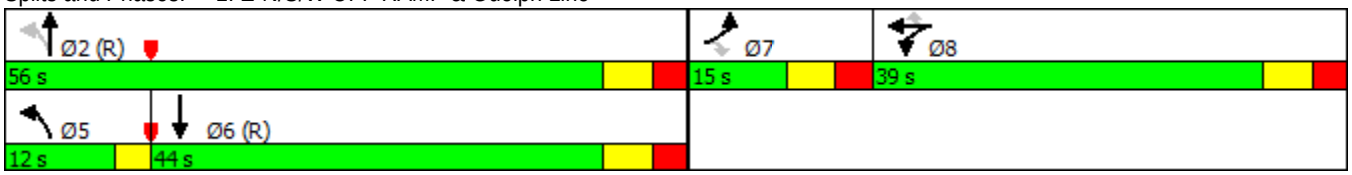
- The Guelph Line at Harvester Road currently operates overcapacity during the PM peak hour (V/C = 1.04)
- Several intersection movements exceed critical thresholds (i.e. v/c >0.85) during both the AM and PM peak hours
- During the AM peak hour, SBL queues (95th percentile) at Harvester Road exceed storage available and extend up to 60m beyond the upstream intersection
- The Guelph Line - W-N/S/E Off Ramp / South Service Road Link intersection operates acceptable.

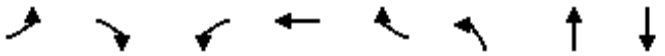
APPENDIX B1 – 2018 AM PEAK (Synchro Output)

Lane Group	EBL	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Configurations								
Traffic Volume (vph)	26	79	281	15	187	35	1649	1917
Future Volume (vph)	26	79	281	15	187	35	1649	1917
Turn Type	Prot	Perm	Split	NA	Perm	pm+pt	NA	NA
Protected Phases	7		8	8		5	2	6
Permitted Phases		7			8	2		
Detector Phase	7	7	8	8	8	5	2	6
Switch Phase								
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	6.0	8.0	8.0
Minimum Split (s)	15.0	15.0	39.0	39.0	39.0	10.0	40.0	40.0
Total Split (s)	15.0	15.0	39.0	39.0	39.0	12.0	56.0	44.0
Total Split (%)	13.6%	13.6%	35.5%	35.5%	35.5%	10.9%	50.9%	40.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0
Lost Time Adjust (s)	-3.0	-1.0	-3.0	-3.0	-3.0	0.0	-4.0	-4.0
Total Lost Time (s)	4.0	6.0	4.0	4.0	4.0	3.0	3.0	3.0
Lead/Lag	Lead	Lead	Lag	Lag	Lag	Lead		Lag
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	None	None	C-Max	C-Max
Act Effct Green (s)	11.0	9.0	17.9	17.9	17.9	70.1	70.1	64.1
Actuated g/C Ratio	0.10	0.08	0.16	0.16	0.16	0.64	0.64	0.58
v/c Ratio	0.16	0.78	0.54	0.06	0.54	0.23	0.56	0.79
Control Delay	47.8	92.2	45.5	37.7	19.3	16.2	9.0	22.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	47.8	92.2	45.5	37.7	19.3	16.2	9.0	22.2
LOS	D	F	D	D	B	B	A	C
Approach Delay				35.1			9.2	22.2
Approach LOS				D			A	C

Intersection Summary	
Cycle Length: 110	
Actuated Cycle Length: 110	
Offset: 24 (22%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Natural Cycle: 115	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.79	
Intersection Signal Delay: 20.0	Intersection LOS: B
Intersection Capacity Utilization 64.4%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 1: E-N/S/W OFF RAMP & Guelph Line

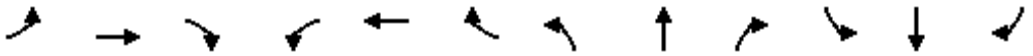




Lane Group	EBL	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	27	83	296	16	197	37	1736	2065
v/c Ratio	0.16	0.78	0.54	0.06	0.54	0.23	0.56	0.79
Control Delay	47.8	92.2	45.5	37.7	19.3	16.2	9.0	22.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	47.8	92.2	45.5	37.7	19.3	16.2	9.0	22.2
Queue Length 50th (m)	5.4	17.8	30.4	2.9	11.0	1.0	16.5	127.8
Queue Length 95th (m)	13.9	#44.0	41.8	8.7	31.6	m9.7	94.3	168.9
Internal Link Dist (m)				228.8			44.4	357.0
Turn Bay Length (m)			140.0		130.0			
Base Capacity (vph)	171	107	1078	532	577	197	3076	2615
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.78	0.27	0.03	0.34	0.19	0.56	0.79

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	0	79	281	15	187	35	1649	0	0	1917	45
Future Volume (vph)	26	0	79	281	15	187	35	1649	0	0	1917	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.4	3.4	3.1	3.4	3.4	3.4	3.0	3.4	3.1	3.0	3.4	3.4
Grade (%)		0%			0%			0%			15%	
Total Lost time (s)	4.0		6.0	4.0	4.0	4.0	3.0	3.0			3.0	
Lane Util. Factor	1.00		1.00	0.97	1.00	1.00	1.00	0.91			0.91	
Frpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	1.00	1.00			1.00	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	1.00	1.00			1.00	
Frt	1.00		0.85	1.00	1.00	0.85	1.00	1.00			1.00	
Flt Protected	0.95		1.00	0.95	1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)	1713		1315	3390	1674	1518	1652	4830			4487	
Flt Permitted	0.95		1.00	0.95	1.00	1.00	0.06	1.00			1.00	
Satd. Flow (perm)	1713		1315	3390	1674	1518	112	4830			4487	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	27	0	83	296	16	197	37	1736	0	0	2018	47
RTOR Reduction (vph)	0	0	0	0	0	116	0	0	0	0	1	0
Lane Group Flow (vph)	27	0	83	296	16	81	37	1736	0	0	2064	0
Confl. Peds. (#/hr)							3		3	3		3
Heavy Vehicles (%)	3%	2%	16%	1%	11%	4%	2%	5%	2%	2%	4%	11%
Turn Type	Prot		Perm	Split	NA	Perm	pm+pt	NA			NA	
Protected Phases	7			8	8		5	2			6	
Permitted Phases			7			8	2					
Actuated Green, G (s)	8.0		8.0	14.9	14.9	14.9	66.1	66.1			58.9	
Effective Green, g (s)	11.0		9.0	17.9	17.9	17.9	66.1	70.1			62.9	
Actuated g/C Ratio	0.10		0.08	0.16	0.16	0.16	0.60	0.64			0.57	
Clearance Time (s)	7.0		7.0	7.0	7.0	7.0	3.0	7.0			7.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)	171		107	551	272	247	126	3078			2565	
v/s Ratio Prot	0.02			c0.09	0.01		0.01	c0.36			c0.46	
v/s Ratio Perm			c0.06			0.05	0.16					
v/c Ratio	0.16		0.78	0.54	0.06	0.33	0.29	0.56			0.80	
Uniform Delay, d1	45.3		49.5	42.2	38.9	40.7	15.2	11.3			18.7	
Progression Factor	1.00		1.00	1.00	1.00	1.00	1.60	0.71			1.00	
Incremental Delay, d2	0.4		28.9	1.0	0.1	0.8	1.2	0.7			2.8	
Delay (s)	45.7		78.4	43.3	39.0	41.5	25.5	8.7			21.5	
Level of Service	D		E	D	D	D	C	A			C	
Approach Delay (s)		70.4			42.4			9.0			21.5	
Approach LOS		E			D			A			C	

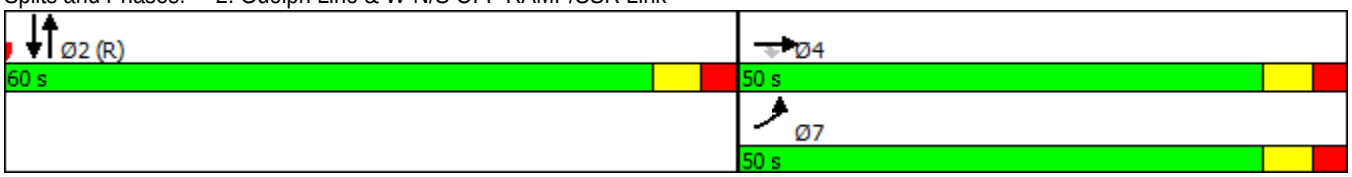
Intersection Summary			
HCM 2000 Control Delay	20.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	64.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	NBT	SBT
Lane Configurations					
Traffic Volume (vph)	611	424	351	1530	1509
Future Volume (vph)	611	424	351	1530	1509
Turn Type	Prot	NA	Perm	NA	NA
Protected Phases	7	4		2	2
Permitted Phases		4	4	2	2
Detector Phase	7	4	4	2	2
Switch Phase					
Minimum Initial (s)	4.0	8.0	8.0	8.0	8.0
Minimum Split (s)	11.0	38.0	38.0	43.0	43.0
Total Split (s)	50.0	50.0	50.0	60.0	60.0
Total Split (%)	45.5%	45.5%	45.5%	54.5%	54.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	-4.0	-4.0	-4.0	-4.0	-4.0
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	None	C-Max	C-Max
Act Effct Green (s)	38.0	38.0	38.0	66.0	66.0
Actuated g/C Ratio	0.35	0.35	0.35	0.60	0.60
v/c Ratio	0.58	0.73	0.68	0.45	0.54
Control Delay	30.9	38.0	33.1	10.9	5.8
Queue Delay	0.0	0.0	0.9	0.6	0.0
Total Delay	30.9	38.0	34.0	11.5	5.8
LOS	C	D	C	B	A
Approach Delay		33.9		11.5	5.8
Approach LOS		C		B	A

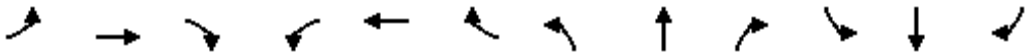
Intersection Summary	
Cycle Length: 110	
Actuated Cycle Length: 110	
Offset: 29 (26%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 85	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.73	
Intersection Signal Delay: 16.5	Intersection LOS: B
Intersection Capacity Utilization 58.1%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 2: Guelph Line & W-N/S OFF RAMP/SSR Link



Lane Group	EBL	EBT	EBR	NBT	SBT
Lane Group Flow (vph)	643	446	369	1633	1588
v/c Ratio	0.58	0.73	0.68	0.45	0.54
Control Delay	30.9	38.0	33.1	10.9	5.8
Queue Delay	0.0	0.0	0.9	0.6	0.0
Total Delay	30.9	38.0	34.0	11.5	5.8
Queue Length 50th (m)	57.4	82.6	60.0	93.5	21.5
Queue Length 95th (m)	65.4	104.0	81.2	108.1	23.8
Internal Link Dist (m)		328.8		96.5	49.4
Turn Bay Length (m)	180.0		160.0		
Base Capacity (vph)	1371	759	661	3646	2926
Starvation Cap Reductn	0	0	0	1434	0
Spillback Cap Reductn	0	0	108	0	177
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.47	0.59	0.67	0.74	0.58

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	611	424	351	0	0	0	0	1530	21	0	1509	0
Future Volume (vph)	611	424	351	0	0	0	0	1530	21	0	1509	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.1	3.1	3.1	3.4	3.1	3.4	3.1	3.4	3.1	3.1	3.4	3.1
Total Lost time (s)	3.0	3.0	3.0					3.0			3.0	
Lane Util. Factor	0.97	1.00	1.00					0.86			0.91	
Frpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	
Flpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	
Frt	1.00	1.00	0.85					1.00			1.00	
Flt Protected	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (prot)	3211	1777	1495					6075			4877	
Flt Permitted	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (perm)	3211	1777	1495					6075			4877	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	643	446	369	0	0	0	0	1611	22	0	1588	0
RTOR Reduction (vph)	0	0	26	0	0	0	0	1	0	0	0	0
Lane Group Flow (vph)	643	446	343	0	0	0	0	1632	0	0	1588	0
Confl. Peds. (#/hr)							4		1	1		
Heavy Vehicles (%)	3%	1%	2%	2%	2%	2%	2%	5%	2%	2%	4%	2%
Turn Type	Prot	NA	Perm					NA			NA	
Protected Phases	7	4						2			2	
Permitted Phases		4	4					2			2	
Actuated Green, G (s)	34.0	34.0	34.0					62.0			62.0	
Effective Green, g (s)	38.0	38.0	38.0					66.0			66.0	
Actuated g/C Ratio	0.35	0.35	0.35					0.60			0.60	
Clearance Time (s)	7.0	7.0	7.0					7.0			7.0	
Vehicle Extension (s)	3.0	3.0	3.0					3.0			3.0	
Lane Grp Cap (vph)	1109	613	516					3645			2926	
v/s Ratio Prot	0.20	c0.25						0.27			c0.33	
v/s Ratio Perm			0.23									
v/c Ratio	0.58	0.73	0.66					0.45			0.54	
Uniform Delay, d1	29.5	31.5	30.6					12.0			13.0	
Progression Factor	1.00	1.00	1.00					0.82			0.37	
Incremental Delay, d2	0.7	4.3	3.2					0.2			0.5	
Delay (s)	30.2	35.8	33.8					10.1			5.3	
Level of Service	C	D	C					B			A	
Approach Delay (s)		32.8			0.0			10.1			5.3	
Approach LOS		C			A			B			A	

Intersection Summary			
HCM 2000 Control Delay	15.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	58.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations										
Traffic Volume (vph)	148	299	92	89	180	56	1223	255	467	1268
Future Volume (vph)	148	299	92	89	180	56	1223	255	467	1268
Turn Type	pm+pt	NA	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Protected Phases	7	4	3	8		5	2		1	6
Permitted Phases	4	4	8	8	8	2	2	2	6	6
Detector Phase	7	4	3	8	8	5	2	2	1	6
Switch Phase										
Minimum Initial (s)	7.0	8.0	7.0	8.0	8.0	7.0	8.0	8.0	7.0	8.0
Minimum Split (s)	12.0	34.0	12.0	34.0	34.0	12.0	36.0	36.0	12.0	36.0
Total Split (s)	13.0	33.0	13.0	33.0	33.0	11.0	37.0	37.0	27.0	53.0
Total Split (%)	11.8%	30.0%	11.8%	30.0%	30.0%	10.0%	33.6%	33.6%	24.5%	48.2%
Yellow Time (s)	3.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0
All-Red Time (s)	1.0	3.0	1.0	3.0	3.0	1.0	3.0	3.0	1.0	3.0
Lost Time Adjust (s)	-1.0	-4.0	-1.0	-4.0	-4.0	-1.0	-4.0	-4.0	-1.0	-4.0
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	None	C-Max	C-Max	None	C-Max
Act Effct Green (s)	31.7	21.8	30.9	21.4	21.4	42.5	34.0	34.0	69.7	60.4
Actuated g/C Ratio	0.29	0.20	0.28	0.19	0.19	0.39	0.31	0.31	0.63	0.55
v/c Ratio	0.45	0.59	0.39	0.28	0.44	0.27	0.87	0.42	0.85	0.56
Control Delay	32.5	40.6	31.3	38.6	8.4	12.8	34.7	4.7	41.9	28.6
Queue Delay	0.7	0.0	0.0	0.0	0.0	0.0	0.2	0.0	9.9	1.4
Total Delay	33.2	40.6	31.3	38.6	8.5	12.8	34.9	4.7	51.8	30.0
LOS	C	D	C	D	A	B	C	A	D	C
Approach Delay		38.5		21.8			29.1			35.5
Approach LOS		D		C			C			D

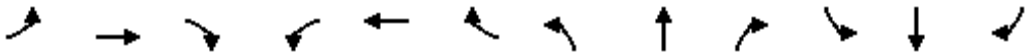
Intersection Summary	
Cycle Length: 110	
Actuated Cycle Length: 110	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green, Master Intersection	
Natural Cycle: 105	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.87	
Intersection Signal Delay: 32.4	Intersection LOS: C
Intersection Capacity Utilization 80.5%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 3: Guelph Line & Queensway Drive/Harvester Rd

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	156	392	97	94	189	59	1287	268	492	1467
v/c Ratio	0.45	0.59	0.39	0.28	0.44	0.27	0.87	0.42	0.85	0.56
Control Delay	32.5	40.6	31.3	38.6	8.4	12.8	34.7	4.7	41.9	28.6
Queue Delay	0.7	0.0	0.0	0.0	0.0	0.0	0.2	0.0	9.9	1.4
Total Delay	33.2	40.6	31.3	38.6	8.5	12.8	34.9	4.7	51.8	30.0
Queue Length 50th (m)	25.2	37.7	15.1	17.3	0.0	3.7	100.1	4.6	91.1	90.7
Queue Length 95th (m)	39.7	50.3	25.9	30.2	17.0	m6.7	86.1	m9.1	#158.4	132.4
Internal Link Dist (m)		110.7		287.5			189.1			96.5
Turn Bay Length (m)	45.0		110.0			60.0		80.0	100.0	
Base Capacity (vph)	349	901	254	476	528	215	1473	634	578	2607
Starvation Cap Reductn	0	0	0	0	0	0	0	0	68	871
Spillback Cap Reductn	49	0	0	0	10	0	11	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.52	0.44	0.38	0.20	0.36	0.27	0.88	0.42	0.96	0.85

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	148	299	73	92	89	180	56	1223	255	467	1268	125
Future Volume (vph)	148	299	73	92	89	180	56	1223	255	467	1268	125
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.2	3.1	3.3	3.2	3.0	3.2	3.2	3.0	3.2	3.2	3.1
Total Lost time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	1.00	1.00	1.00	0.91	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1605	3234		1677	1746	1434	1627	4766	1455	1708	4732	
Flt Permitted	0.61	1.00		0.30	1.00	1.00	0.17	1.00	1.00	0.12	1.00	
Satd. Flow (perm)	1028	3234		524	1746	1434	288	4766	1455	212	4732	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	156	315	77	97	94	189	59	1287	268	492	1335	132
RTOR Reduction (vph)	0	22	0	0	0	152	0	0	185	0	9	0
Lane Group Flow (vph)	156	370	0	97	94	37	59	1287	83	492	1458	0
Confl. Peds. (#/hr)	6		4	4		6	11		3	3		11
Heavy Vehicles (%)	7%	2%	8%	4%	4%	3%	6%	4%	2%	1%	3%	4%
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4	4		8	8	8	2	2	2	6	6	
Actuated Green, G (s)	26.9	17.9		25.9	17.4	17.4	36.0	29.9	29.9	65.6	55.5	
Effective Green, g (s)	28.9	21.9		27.9	21.4	21.4	38.0	33.9	33.9	66.6	59.5	
Actuated g/C Ratio	0.26	0.20		0.25	0.19	0.19	0.35	0.31	0.31	0.61	0.54	
Clearance Time (s)	4.0	7.0		4.0	7.0	7.0	4.0	7.0	7.0	4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	322	643		232	339	278	185	1468	448	573	2559	
v/s Ratio Prot	c0.04	c0.11		0.04	0.05		0.02	c0.27		c0.26	0.31	
v/s Ratio Perm	0.08			0.07		0.03	0.09		0.06	0.26		
v/c Ratio	0.48	0.58		0.42	0.28	0.13	0.32	0.88	0.18	0.86	0.57	
Uniform Delay, d1	33.1	39.8		32.8	37.7	36.6	24.5	36.1	27.9	28.2	16.8	
Progression Factor	1.00	1.00		1.00	1.00	1.00	0.81	0.78	0.85	1.07	1.59	
Incremental Delay, d2	1.2	1.3		1.2	0.4	0.2	0.8	6.3	0.7	10.5	0.8	
Delay (s)	34.3	41.1		34.1	38.2	36.8	20.7	34.5	24.4	40.6	27.5	
Level of Service	C	D		C	D	D	C	C	C	D	C	
Approach Delay (s)		39.2			36.5			32.3			30.8	
Approach LOS		D			D			C			C	

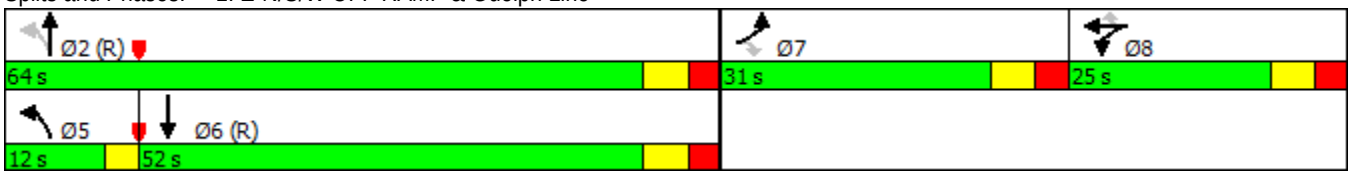
Intersection Summary			
HCM 2000 Control Delay	32.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	80.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

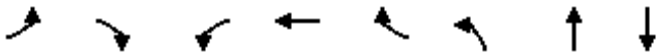
APPENDIX B2 – 2018 PM PEAK (Synchro Output)

Lane Group	EBL	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Configurations								
Traffic Volume (vph)	73	299	290	43	86	133	2027	2098
Future Volume (vph)	73	299	290	43	86	133	2027	2098
Turn Type	Prot	Perm	Split	NA	Perm	pm+pt	NA	NA
Protected Phases	7		8	8		5	2	6
Permitted Phases		7			8	2		
Detector Phase	7	7	8	8	8	5	2	6
Switch Phase								
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	6.0	8.0	8.0
Minimum Split (s)	15.0	15.0	39.0	39.0	39.0	10.0	40.0	40.0
Total Split (s)	31.0	31.0	25.0	25.0	25.0	12.0	64.0	52.0
Total Split (%)	25.8%	25.8%	20.8%	20.8%	20.8%	10.0%	53.3%	43.3%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0
Lost Time Adjust (s)	-3.0	-1.0	-3.0	-3.0	-3.0	0.0	-4.0	-4.0
Total Lost Time (s)	4.0	6.0	4.0	4.0	4.0	3.0	3.0	3.0
Lead/Lag	Lead	Lead	Lag	Lag	Lag	Lead		Lag
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	None	None	C-Max	C-Max
Act Effct Green (s)	27.0	25.0	18.6	18.6	18.6	63.4	63.4	51.0
Actuated g/C Ratio	0.22	0.21	0.16	0.16	0.16	0.53	0.53	0.42
v/c Ratio	0.20	1.00	0.59	0.16	0.26	0.73	0.81	1.16
Control Delay	39.4	99.5	51.7	44.3	4.7	48.4	36.8	113.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.4	99.5	51.7	44.3	4.7	48.4	36.8	113.0
LOS	D	F	D	D	A	D	D	F
Approach Delay				41.2			37.5	113.0
Approach LOS				D			D	F

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 98 (82%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Natural Cycle: 115	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.16	
Intersection Signal Delay: 73.3	Intersection LOS: E
Intersection Capacity Utilization 80.3%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 1: E-N/S/W OFF RAMP & Guelph Line



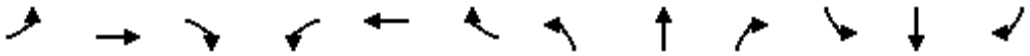


Lane Group	EBL	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	77	315	305	45	91	140	2134	2268
v/c Ratio	0.20	1.00	0.59	0.16	0.26	0.73	0.81	1.16
Control Delay	39.4	99.5	51.7	44.3	4.7	48.4	36.8	113.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.4	99.5	51.7	44.3	4.7	48.4	36.8	113.0
Queue Length 50th (m)	14.8	~75.0	34.6	9.3	0.0	23.5	153.3	~240.0
Queue Length 95th (m)	28.0	#132.7	48.0	19.7	6.4	#49.1	183.0	#269.0
Internal Link Dist (m)				228.8			44.4	357.0
Turn Bay Length (m)			140.0		130.0			
Base Capacity (vph)	389	314	587	318	375	194	2626	1947
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.20	1.00	0.52	0.14	0.24	0.72	0.81	1.16

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	73	0	299	290	43	86	133	2027	0	0	2098	57
Future Volume (vph)	73	0	299	290	43	86	133	2027	0	0	2098	57
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.4	3.4	3.1	3.4	3.4	3.4	3.0	3.4	3.1	3.0	3.4	3.4
Grade (%)		0%			0%			0%			15%	
Total Lost time (s)	4.0		6.0	4.0	4.0	4.0	3.0	3.0			3.0	
Lane Util. Factor	1.00		1.00	0.97	1.00	1.00	1.00	0.91			0.91	
Frpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	1.00	1.00			1.00	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	1.00	1.00			1.00	
Frt	1.00		0.85	1.00	1.00	0.85	1.00	1.00			1.00	
Flt Protected	0.95		1.00	0.95	1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)	1730		1510	3357	1821	1548	1652	4972			4579	
Flt Permitted	0.95		1.00	0.95	1.00	1.00	0.08	1.00			1.00	
Satd. Flow (perm)	1730		1510	3357	1821	1548	139	4972			4579	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	77	0	315	305	45	91	140	2134	0	0	2208	60
RTOR Reduction (vph)	0	0	0	0	0	77	0	0	0	0	2	0
Lane Group Flow (vph)	77	0	315	305	45	14	140	2134	0	0	2266	0
Confl. Peds. (#/hr)							6		3	3		6
Heavy Vehicles (%)	2%	2%	1%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Prot		Perm	Split	NA	Perm	pm+pt	NA			NA	
Protected Phases	7			8	8		5	2			6	
Permitted Phases			7			8	2					
Actuated Green, G (s)	24.0		24.0	15.6	15.6	15.6	59.4	59.4			47.0	
Effective Green, g (s)	27.0		25.0	18.6	18.6	18.6	59.4	63.4			51.0	
Actuated g/C Ratio	0.22		0.21	0.16	0.16	0.16	0.49	0.53			0.42	
Clearance Time (s)	7.0		7.0	7.0	7.0	7.0	3.0	7.0			7.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)	389		314	520	282	239	187	2626			1946	
v/s Ratio Prot	0.04			c0.09	0.02		0.06	c0.43			c0.49	
v/s Ratio Perm			c0.21			0.01	0.31					
v/c Ratio	0.20		1.00	0.59	0.16	0.06	0.75	0.81			1.16	
Uniform Delay, d1	37.7		47.5	47.1	43.9	43.2	26.5	23.4			34.5	
Progression Factor	1.00		1.00	1.00	1.00	1.00	1.45	1.43			1.00	
Incremental Delay, d2	0.3		51.6	1.7	0.3	0.1	12.2	2.3			80.0	
Delay (s)	38.0		99.1	48.8	44.2	43.3	50.5	35.8			114.5	
Level of Service	D		F	D	D	D	D	D			F	
Approach Delay (s)		87.1			47.2			36.7			114.5	
Approach LOS		F			D			D			F	

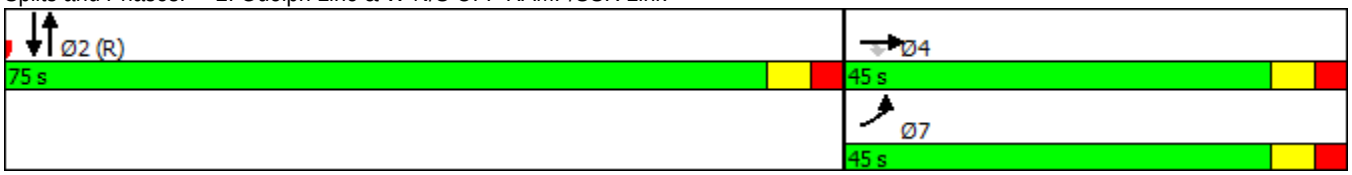
Intersection Summary			
HCM 2000 Control Delay	74.1	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	80.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	NBT	SBT
Lane Configurations					
Traffic Volume (vph)	587	104	409	2337	1404
Future Volume (vph)	587	104	409	2337	1404
Turn Type	Prot	NA	Perm	NA	NA
Protected Phases	7	4		2	2
Permitted Phases		4	4	2	2
Detector Phase	7	4	4	2	2
Switch Phase					
Minimum Initial (s)	4.0	8.0	8.0	8.0	8.0
Minimum Split (s)	11.0	38.0	38.0	43.0	43.0
Total Split (s)	45.0	45.0	45.0	75.0	75.0
Total Split (%)	37.5%	37.5%	37.5%	62.5%	62.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	-4.0	-4.0	-4.0	-4.0	-4.0
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	None	C-Max	C-Max
Act Effct Green (s)	39.2	39.2	39.2	74.8	74.8
Actuated g/C Ratio	0.33	0.33	0.33	0.62	0.62
v/c Ratio	0.59	0.19	0.86	0.63	0.47
Control Delay	35.9	29.0	52.2	7.5	5.3
Queue Delay	0.0	0.0	0.1	0.3	0.1
Total Delay	35.9	29.0	52.3	7.8	5.4
LOS	D	C	D	A	A
Approach Delay		41.4		7.8	5.4
Approach LOS		D		A	A

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 96 (80%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 85	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.86	
Intersection Signal Delay: 14.7	Intersection LOS: B
Intersection Capacity Utilization 59.4%	ICU Level of Service B
Analysis Period (min) 15	

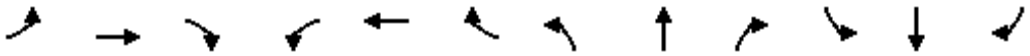
Splits and Phases: 2: Guelph Line & W-N/S OFF RAMP/SSR Link



Lane Group	EBL	EBT	EBR	NBT	SBT
Lane Group Flow (vph)	618	109	431	2467	1478
v/c Ratio	0.59	0.19	0.86	0.63	0.47
Control Delay	35.9	29.0	52.2	7.5	5.3
Queue Delay	0.0	0.0	0.1	0.3	0.1
Total Delay	35.9	29.0	52.3	7.8	5.4
Queue Length 50th (m)	59.9	17.7	84.6	48.4	29.9
Queue Length 95th (m)	77.8	31.1	#135.8	m66.9	m26.7
Internal Link Dist (m)		328.8		96.5	49.4
Turn Bay Length (m)	180.0		160.0		
Base Capacity (vph)	1123	609	534	3946	3132
Starvation Cap Reductn	0	0	0	663	0
Spillback Cap Reductn	0	0	2	0	489
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.55	0.18	0.81	0.75	0.56

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



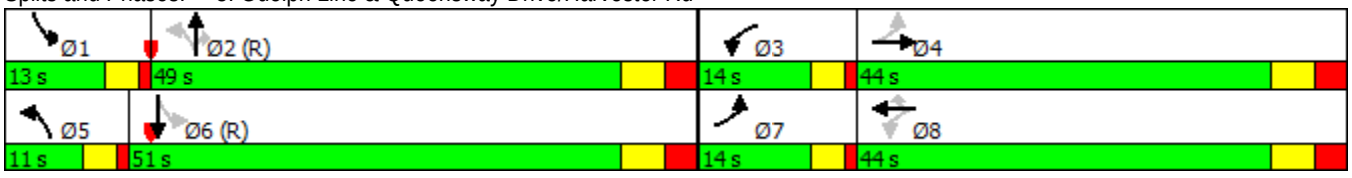
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	587	104	409	0	0	0	0	2337	7	0	1404	0
Future Volume (vph)	587	104	409	0	0	0	0	2337	7	0	1404	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.1	3.1	3.1	3.4	3.1	3.4	3.1	3.4	3.1	3.1	3.4	3.1
Total Lost time (s)	3.0	3.0	3.0					3.0			3.0	
Lane Util. Factor	0.97	1.00	1.00					0.86			0.91	
Frpb, ped/bikes	1.00	1.00	0.99					1.00			1.00	
Flpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	
Frt	1.00	1.00	0.85					1.00			1.00	
Flt Protected	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (prot)	3211	1742	1460					6324			5022	
Flt Permitted	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (perm)	3211	1742	1460					6324			5022	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	618	109	431	0	0	0	0	2460	7	0	1478	0
RTOR Reduction (vph)	0	0	24	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	618	109	407	0	0	0	0	2467	0	0	1478	0
Confl. Peds. (#/hr)			2				20		7	7		20
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	2%	1%	2%	2%	1%	2%
Turn Type	Prot	NA	Perm					NA			NA	
Protected Phases	7	4						2			2	
Permitted Phases		4	4					2			2	
Actuated Green, G (s)	35.2	35.2	35.2					70.8			70.8	
Effective Green, g (s)	39.2	39.2	39.2					74.8			74.8	
Actuated g/C Ratio	0.33	0.33	0.33					0.62			0.62	
Clearance Time (s)	7.0	7.0	7.0					7.0			7.0	
Vehicle Extension (s)	3.0	3.0	3.0					3.0			3.0	
Lane Grp Cap (vph)	1048	569	476					3941			3130	
v/s Ratio Prot	0.19	0.06						c0.39			0.29	
v/s Ratio Perm			c0.28									
v/c Ratio	0.59	0.19	0.85					0.63			0.47	
Uniform Delay, d1	33.7	29.0	37.7					14.0			12.1	
Progression Factor	1.00	1.00	1.00					0.50			0.42	
Incremental Delay, d2	0.9	0.2	13.9					0.3			0.0	
Delay (s)	34.5	29.2	51.7					7.3			5.1	
Level of Service	C	C	D					A			A	
Approach Delay (s)		40.4			0.0			7.3			5.1	
Approach LOS		D			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	14.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	59.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations										
Traffic Volume (vph)	178	88	266	733	641	112	1525	96	142	1504
Future Volume (vph)	178	88	266	733	641	112	1525	96	142	1504
Turn Type	pm+pt	NA	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Protected Phases	7	4	3	8		5	2		1	6
Permitted Phases	4	4	8	8	8	2	2	2	6	6
Detector Phase	7	4	3	8	8	5	2	2	1	6
Switch Phase										
Minimum Initial (s)	7.0	8.0	7.0	8.0	8.0	7.0	8.0	8.0	7.0	8.0
Minimum Split (s)	12.0	34.0	12.0	34.0	34.0	12.0	36.0	36.0	12.0	36.0
Total Split (s)	14.0	44.0	14.0	44.0	44.0	11.0	49.0	49.0	13.0	51.0
Total Split (%)	11.7%	36.7%	11.7%	36.7%	36.7%	9.2%	40.8%	40.8%	10.8%	42.5%
Yellow Time (s)	3.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0
All-Red Time (s)	1.0	3.0	1.0	3.0	3.0	1.0	3.0	3.0	1.0	3.0
Lost Time Adjust (s)	-1.0	-4.0	-1.0	-4.0	-4.0	-1.0	-4.0	-4.0	-1.0	-4.0
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	None	C-Max	C-Max	None	C-Max
Act Effct Green (s)	52.0	41.0	52.0	41.0	41.0	54.1	46.1	46.1	57.9	48.0
Actuated g/C Ratio	0.43	0.34	0.43	0.34	0.34	0.45	0.38	0.38	0.48	0.40
v/c Ratio	0.87	0.16	0.52	1.26	1.14	0.67	0.86	0.17	0.75	0.91
Control Delay	63.3	14.8	25.7	163.4	110.2	51.2	64.5	22.3	49.6	32.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8
Total Delay	63.3	14.8	25.7	163.4	110.2	51.2	64.5	22.3	49.6	33.3
LOS	E	B	C	F	F	D	E	C	D	C
Approach Delay		39.8		120.3			61.3			34.6
Approach LOS		D		F			E			C

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green, Master Intersection	
Natural Cycle: 115	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.26	
Intersection Signal Delay: 68.7	Intersection LOS: E
Intersection Capacity Utilization 100.8%	ICU Level of Service G
Analysis Period (min) 15	

Splits and Phases: 3: Guelph Line & Queensway Drive/Harvester Rd



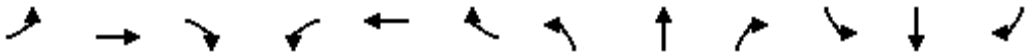
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	187	175	280	772	675	118	1605	101	149	1759
v/c Ratio	0.87	0.16	0.52	1.26	1.14	0.67	0.86	0.17	0.75	0.91
Control Delay	63.3	14.8	25.7	163.4	110.2	51.2	64.5	22.3	49.6	32.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8
Total Delay	63.3	14.8	25.7	163.4	110.2	51.2	64.5	22.3	49.6	33.3
Queue Length 50th (m)	28.0	7.7	41.7	~227.8	~159.5	25.9	146.1	7.2	21.1	115.1
Queue Length 95th (m)	#68.9	15.7	62.4	#300.3	#230.7	m34.4	162.6	m15.3	m#46.0	142.3
Internal Link Dist (m)		110.7		287.5			189.1			96.5
Turn Bay Length (m)	45.0		110.0			60.0		80.0	100.0	
Base Capacity (vph)	214	1120	542	614	593	176	1866	604	200	1937
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	46
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.87	0.16	0.52	1.26	1.14	0.67	0.86	0.17	0.74	0.93

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	178	88	78	266	733	641	112	1525	96	142	1504	167
Future Volume (vph)	178	88	78	266	733	641	112	1525	96	142	1504	167
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.2	3.1	3.3	3.2	3.0	3.2	3.2	3.0	3.2	3.2	3.1
Total Lost time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	1.00	1.00	1.00	0.91	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.93		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1658	3120		1725	1798	1431	1691	4859	1400	1658	4816	
Flt Permitted	0.11	1.00		0.62	1.00	1.00	0.09	1.00	1.00	0.09	1.00	
Satd. Flow (perm)	184	3120		1126	1798	1431	165	4859	1400	155	4816	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	187	93	82	280	772	675	118	1605	101	149	1583	176
RTOR Reduction (vph)	0	54	0	0	0	105	0	0	62	0	11	0
Lane Group Flow (vph)	187	121	0	280	772	570	118	1605	39	149	1748	0
Confl. Peds. (#/hr)	20		2	2		20	4		25	25		4
Heavy Vehicles (%)	4%	3%	1%	1%	1%	1%	2%	2%	3%	4%	1%	3%
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4	4		8	8	8	2	2	2	6	6	
Actuated Green, G (s)	47.0	37.0		47.0	37.0	37.0	49.1	42.1	42.1	52.9	44.0	
Effective Green, g (s)	49.0	41.0		49.0	41.0	41.0	51.1	46.1	46.1	54.9	48.0	
Actuated g/C Ratio	0.41	0.34		0.41	0.34	0.34	0.43	0.38	0.38	0.46	0.40	
Clearance Time (s)	4.0	7.0		4.0	7.0	7.0	4.0	7.0	7.0	4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	210	1066		514	614	488	171	1866	537	194	1926	
v/s Ratio Prot	c0.08	0.04		0.05	c0.43		0.05	0.33		c0.06	c0.36	
v/s Ratio Perm	0.28			0.17		0.40	0.25		0.03	0.29		
v/c Ratio	0.89	0.11		0.54	1.26	1.17	0.69	0.86	0.07	0.77	0.91	
Uniform Delay, d1	29.5	27.1		25.4	39.5	39.5	27.2	34.0	23.4	25.8	33.9	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.97	1.78	5.54	1.32	0.76	
Incremental Delay, d2	34.0	0.0		1.2	128.7	96.1	7.6	3.7	0.2	14.3	6.7	
Delay (s)	63.5	27.1		26.6	168.2	135.6	61.2	64.0	129.8	48.3	32.3	
Level of Service	E	C		C	F	F	E	E	F	D	C	
Approach Delay (s)		45.9			132.5			67.5			33.6	
Approach LOS		D			F			E			C	

Intersection Summary			
HCM 2000 Control Delay	74.3	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	100.8%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

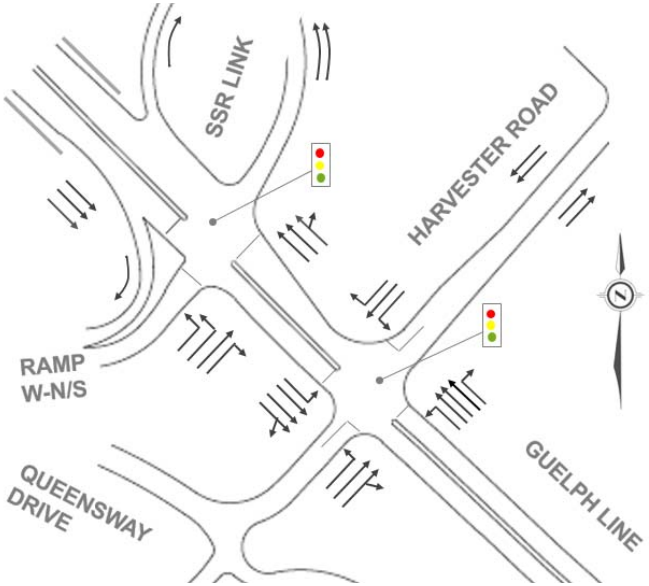
APPENDIX C

FUTURE BACKGROUND CONDITIONS (2023 & 2031)

DO NOTHING – FUTURE BACKGROUND

Overview:

Maintain existing lane configuration



Future 2023 (2031) Operations Analysis:

INTERSECTION	AM PEAK HOUR			PM PEAK HOUR		
	V/C	Delay (s)	LOS	V/C	Delay (s)	LOS
Guelph Line & E-N/S/E Off Ramp	0.75 (0.80)	22.1 (25.7)	C (C)	1.01 (1.07)	82.7 (96.3)	F (F)
Critical Movements (v/c)	SBTR = (0.92)			EBR = 1.03 (1.07) NBT = 0.85 (0.91) SBTR = 1.21 (1.28)		
Guelph Line & W-N/S/E Off Ramp / South Service Road Link	0.65 (0.72)	16.8 (19.0)	B (B)	0.75 (0.82)	15.6 (20.2)	B (B)
Critical Movements (v/c)	None			EBR = 0.91 **(1.04)** QL ≥ 161 m (204 m)		
Guelph Line & Harvester Road / Queensway Drive	0.79 (0.82)	34.1 (35.3)	C (D)	**1.07 (1.11)**	79.1 (87.3)	E (F)
Critical Movements (v/c)	NBT = 0.90 (0.93) SBL = 0.89 (0.94) QL ≥ 166 m (179 m)			EBL = 0.92 (0.95) QL ≥ 72 m (76 m) **WBT = 1.29 (1.34)** **WBR = 1.21 (1.27)** NBT = 0.88 (0.92) SBTR = 0.93 (0.97)		

Notes: () bracketed values represent 2031 conditions

Remarks

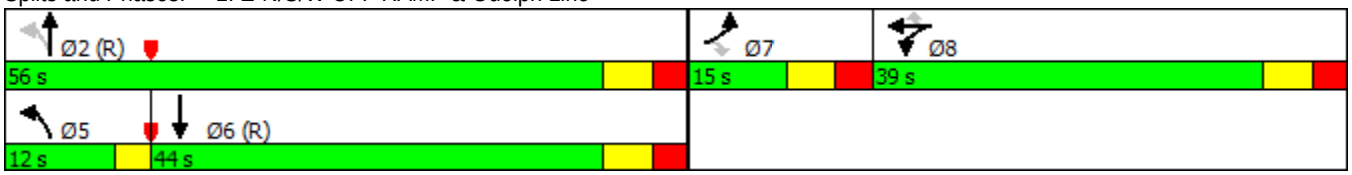
- Guelph Line - Harvester Road intersection operates overcapacity during the 2023 and 2031 PM peak hour (V/C = 1.07 and 1.11 respectively)
- Several key movements are expected to exceed critical thresholds (i.e. v/c >0.85) during both the AM and PM peak hours
- During the AM peak hour, SBL queues (95th percentile) at Harvester Road will exceed storage available and on occasion extend to/beyond the upstream intersection (i.e. up to 70m beyond the intersection by 2023 and 80m by 2031)
- Guelph Line - W-N/S/E Off Ramp / South Service Road Link intersection operates acceptable; however the EBR is expected to reach/exceed critical threshold level (i.e. v/c >0.85) during the PM peak hour and 95th percentile queues are expected to reach/exceed the available right turn lane storage.

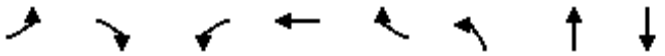
APPENDIX C1 – 2023 AM PEAK (Synchro Output)

Lane Group	EBL	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Configurations								
Traffic Volume (vph)	27	81	310	17	207	36	1715	1966
Future Volume (vph)	27	81	310	17	207	36	1715	1966
Turn Type	Prot	Perm	Split	NA	Perm	pm+pt	NA	NA
Protected Phases	7		8	8		5	2	6
Permitted Phases		7			8	2		
Detector Phase	7	7	8	8	8	5	2	6
Switch Phase								
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	6.0	8.0	8.0
Minimum Split (s)	15.0	15.0	39.0	39.0	39.0	10.0	40.0	40.0
Total Split (s)	15.0	15.0	39.0	39.0	39.0	12.0	56.0	44.0
Total Split (%)	13.6%	13.6%	35.5%	35.5%	35.5%	10.9%	50.9%	40.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0
Lost Time Adjust (s)	-3.0	-1.0	-3.0	-3.0	-3.0	0.0	-4.0	-4.0
Total Lost Time (s)	4.0	6.0	4.0	4.0	4.0	3.0	3.0	3.0
Lead/Lag	Lead	Lead	Lag	Lag	Lag	Lead		Lag
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	None	None	C-Max	C-Max
Act Effct Green (s)	11.0	9.0	19.1	19.1	19.1	68.9	68.9	62.8
Actuated g/C Ratio	0.10	0.08	0.17	0.17	0.17	0.63	0.63	0.57
v/c Ratio	0.16	0.79	0.55	0.06	0.58	0.23	0.60	0.83
Control Delay	47.9	95.1	44.8	36.5	21.6	17.2	11.2	24.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	47.9	95.1	44.8	36.5	21.6	17.2	11.2	24.4
LOS	D	F	D	D	C	B	B	C
Approach Delay				35.5			11.3	24.4
Approach LOS				D			B	C

Intersection Summary	
Cycle Length: 110	
Actuated Cycle Length: 110	
Offset: 24 (22%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Natural Cycle: 115	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.83	
Intersection Signal Delay: 22.0	Intersection LOS: C
Intersection Capacity Utilization 66.2%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 1: E-N/S/W OFF RAMP & Guelph Line

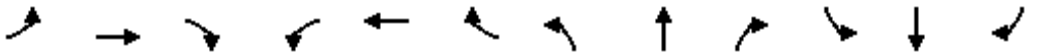




Lane Group	EBL	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	28	85	326	18	218	38	1805	2118
v/c Ratio	0.16	0.79	0.55	0.06	0.58	0.23	0.60	0.83
Control Delay	47.9	95.1	44.8	36.5	21.6	17.2	11.2	24.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	47.9	95.1	44.8	36.5	21.6	17.2	11.2	24.4
Queue Length 50th (m)	5.6	18.2	33.4	3.3	15.0	1.8	31.1	137.1
Queue Length 95th (m)	14.3	#45.3	44.6	9.1	36.7	m8.8	104.3	#199.2
Internal Link Dist (m)				228.8			44.4	357.0
Turn Bay Length (m)			140.0		130.0			
Base Capacity (vph)	171	107	1078	532	577	197	3024	2565
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.79	0.30	0.03	0.38	0.19	0.60	0.83

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	27	0	81	310	17	207	36	1715	0	0	1966	47
Future Volume (vph)	27	0	81	310	17	207	36	1715	0	0	1966	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.4	3.4	3.1	3.4	3.4	3.4	3.0	3.4	3.1	3.0	3.4	3.4
Grade (%)		0%			0%			0%			15%	
Total Lost time (s)	4.0		6.0	4.0	4.0	4.0	3.0	3.0			3.0	
Lane Util. Factor	1.00		1.00	0.97	1.00	1.00	1.00	0.91			0.91	
Frpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	1.00	1.00			1.00	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	1.00	1.00			1.00	
Frt	1.00		0.85	1.00	1.00	0.85	1.00	1.00			1.00	
Flt Protected	0.95		1.00	0.95	1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)	1713		1315	3390	1674	1518	1652	4830			4487	
Flt Permitted	0.95		1.00	0.95	1.00	1.00	0.07	1.00			1.00	
Satd. Flow (perm)	1713		1315	3390	1674	1518	115	4830			4487	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	28	0	85	326	18	218	38	1805	0	0	2069	49
RTOR Reduction (vph)	0	0	0	0	0	115	0	0	0	0	2	0
Lane Group Flow (vph)	28	0	85	326	18	103	38	1805	0	0	2116	0
Confl. Peds. (#/hr)							3		3	3		3
Heavy Vehicles (%)	3%	2%	16%	1%	11%	4%	2%	5%	2%	2%	4%	11%
Turn Type	Prot		Perm	Split	NA	Perm	pm+pt	NA			NA	
Protected Phases	7			8	8		5	2			6	
Permitted Phases			7			8	2					
Actuated Green, G (s)	8.0		8.0	16.1	16.1	16.1	64.9	64.9			57.6	
Effective Green, g (s)	11.0		9.0	19.1	19.1	19.1	64.9	68.9			61.6	
Actuated g/C Ratio	0.10		0.08	0.17	0.17	0.17	0.59	0.63			0.56	
Clearance Time (s)	7.0		7.0	7.0	7.0	7.0	3.0	7.0			7.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)	171		107	588	290	263	127	3025			2512	
v/s Ratio Prot	0.02			c0.10	0.01		0.01	c0.37			c0.47	
v/s Ratio Perm			c0.06			0.07	0.16					
v/c Ratio	0.16		0.79	0.55	0.06	0.39	0.30	0.60			0.84	
Uniform Delay, d1	45.3		49.6	41.6	38.0	40.3	16.5	12.3			20.2	
Progression Factor	1.00		1.00	1.00	1.00	1.00	1.60	0.81			1.00	
Incremental Delay, d2	0.5		32.1	1.1	0.1	1.0	1.2	0.8			3.6	
Delay (s)	45.7		81.7	42.7	38.1	41.3	27.6	10.7			23.8	
Level of Service	D		F	D	D	D	C	B			C	
Approach Delay (s)		72.8			42.0			11.1			23.8	
Approach LOS		E			D			B			C	

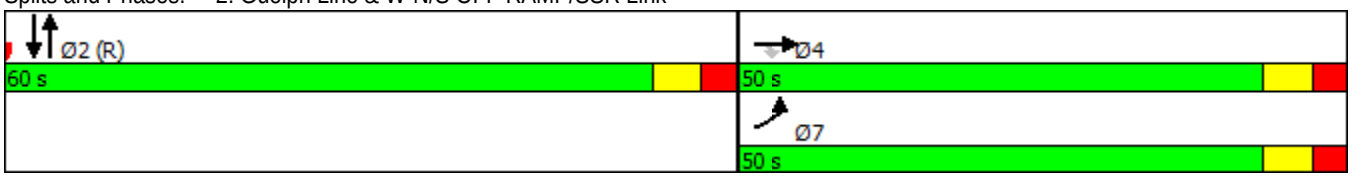
Intersection Summary			
HCM 2000 Control Delay	22.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	66.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	NBT	SBT
Lane Configurations					
Traffic Volume (vph)	675	468	388	1569	1557
Future Volume (vph)	675	468	388	1569	1557
Turn Type	Prot	NA	Perm	NA	NA
Protected Phases	7	4		2	2
Permitted Phases		4	4	2	2
Detector Phase	7	4	4	2	2
Switch Phase					
Minimum Initial (s)	4.0	8.0	8.0	8.0	8.0
Minimum Split (s)	11.0	38.0	38.0	43.0	43.0
Total Split (s)	50.0	50.0	50.0	60.0	60.0
Total Split (%)	45.5%	45.5%	45.5%	54.5%	54.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	-4.0	-4.0	-4.0	-4.0	-4.0
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	None	C-Max	C-Max
Act Effct Green (s)	40.2	40.2	40.2	63.8	63.8
Actuated g/C Ratio	0.37	0.37	0.37	0.58	0.58
v/c Ratio	0.61	0.76	0.71	0.48	0.58
Control Delay	30.2	38.2	33.6	12.9	6.6
Queue Delay	0.0	0.0	7.2	0.7	0.1
Total Delay	30.2	38.2	40.9	13.5	6.7
LOS	C	D	D	B	A
Approach Delay		35.3		13.5	6.7
Approach LOS		D		B	A

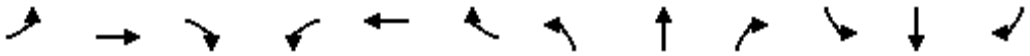
Intersection Summary	
Cycle Length: 110	
Actuated Cycle Length: 110	
Offset: 29 (26%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 85	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.76	
Intersection Signal Delay: 18.4	Intersection LOS: B
Intersection Capacity Utilization 61.4%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 2: Guelph Line & W-N/S OFF RAMP/SSR Link



Lane Group	EBL	EBT	EBR	NBT	SBT
Lane Group Flow (vph)	711	493	408	1675	1639
v/c Ratio	0.61	0.76	0.71	0.48	0.58
Control Delay	30.2	38.2	33.6	12.9	6.6
Queue Delay	0.0	0.0	7.2	0.7	0.1
Total Delay	30.2	38.2	40.9	13.5	6.7
Queue Length 50th (m)	62.0	89.9	66.0	97.1	23.2
Queue Length 95th (m)	73.5	118.0	92.9	111.3	25.8
Internal Link Dist (m)		328.8		96.5	49.4
Turn Bay Length (m)	180.0		160.0		
Base Capacity (vph)	1371	759	661	3525	2828
Starvation Cap Reductn	0	0	0	1332	0
Spillback Cap Reductn	0	0	205	0	174
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.52	0.65	0.89	0.76	0.62

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	675	468	388	0	0	0	0	1569	22	0	1557	0
Future Volume (vph)	675	468	388	0	0	0	0	1569	22	0	1557	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.1	3.1	3.1	3.4	3.1	3.4	3.1	3.4	3.1	3.1	3.4	3.1
Total Lost time (s)	3.0	3.0	3.0					3.0			3.0	
Lane Util. Factor	0.97	1.00	1.00					0.86			0.91	
Frpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	
Flpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	
Frt	1.00	1.00	0.85					1.00			1.00	
Flt Protected	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (prot)	3211	1777	1495					6075			4877	
Flt Permitted	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (perm)	3211	1777	1495					6075			4877	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	711	493	408	0	0	0	0	1652	23	0	1639	0
RTOR Reduction (vph)	0	0	25	0	0	0	0	1	0	0	0	0
Lane Group Flow (vph)	711	493	383	0	0	0	0	1674	0	0	1639	0
Confl. Peds. (#/hr)							4		1	1		
Heavy Vehicles (%)	3%	1%	2%	2%	2%	2%	2%	5%	2%	2%	4%	2%
Turn Type	Prot	NA	Perm					NA			NA	
Protected Phases	7	4						2			2	
Permitted Phases		4	4					2			2	
Actuated Green, G (s)	36.2	36.2	36.2					59.8			59.8	
Effective Green, g (s)	40.2	40.2	40.2					63.8			63.8	
Actuated g/C Ratio	0.37	0.37	0.37					0.58			0.58	
Clearance Time (s)	7.0	7.0	7.0					7.0			7.0	
Vehicle Extension (s)	3.0	3.0	3.0					3.0			3.0	
Lane Grp Cap (vph)	1173	649	546					3523			2828	
v/s Ratio Prot	0.22	c0.28						0.28			c0.34	
v/s Ratio Perm			0.26									
v/c Ratio	0.61	0.76	0.70					0.48			0.58	
Uniform Delay, d1	28.4	30.7	29.8					13.4			14.6	
Progression Factor	1.00	1.00	1.00					0.89			0.39	
Incremental Delay, d2	0.9	5.1	4.0					0.3			0.6	
Delay (s)	29.3	35.8	33.8					12.1			6.2	
Level of Service	C	D	C					B			A	
Approach Delay (s)		32.4			0.0			12.1			6.2	
Approach LOS		C			A			B			A	

Intersection Summary			
HCM 2000 Control Delay	16.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	61.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations										
Traffic Volume (vph)	152	307	95	92	185	58	1254	262	479	1301
Future Volume (vph)	152	307	95	92	185	58	1254	262	479	1301
Turn Type	pm+pt	NA	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Protected Phases	7	4	3	8		5	2		1	6
Permitted Phases	4	4	8	8	8	2	2	2	6	6
Detector Phase	7	4	3	8	8	5	2	2	1	6
Switch Phase										
Minimum Initial (s)	7.0	8.0	7.0	8.0	8.0	7.0	8.0	8.0	7.0	8.0
Minimum Split (s)	12.0	34.0	12.0	34.0	34.0	12.0	36.0	36.0	12.0	36.0
Total Split (s)	13.0	33.0	13.0	33.0	33.0	11.0	37.0	37.0	27.0	53.0
Total Split (%)	11.8%	30.0%	11.8%	30.0%	30.0%	10.0%	33.6%	33.6%	24.5%	48.2%
Yellow Time (s)	3.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0
All-Red Time (s)	1.0	3.0	1.0	3.0	3.0	1.0	3.0	3.0	1.0	3.0
Lost Time Adjust (s)	-1.0	-4.0	-1.0	-4.0	-4.0	-1.0	-4.0	-4.0	-1.0	-4.0
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	None	C-Max	C-Max	None	C-Max
Act Effct Green (s)	32.1	22.1	31.2	21.7	21.7	42.6	34.0	34.0	69.3	60.0
Actuated g/C Ratio	0.29	0.20	0.28	0.20	0.20	0.39	0.31	0.31	0.63	0.55
v/c Ratio	0.46	0.60	0.41	0.28	0.44	0.29	0.90	0.43	0.88	0.58
Control Delay	32.5	40.6	31.5	38.4	8.3	13.1	35.8	4.6	43.7	31.1
Queue Delay	0.7	0.0	0.0	0.0	0.0	0.0	0.5	0.0	13.5	2.4
Total Delay	33.2	40.6	31.5	38.4	8.3	13.1	36.3	4.6	57.1	33.4
LOS	C	D	C	D	A	B	D	A	E	C
Approach Delay		38.5		21.7			30.2			39.4
Approach LOS		D		C			C			D

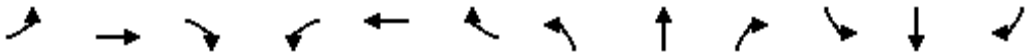
Intersection Summary	
Cycle Length: 110	
Actuated Cycle Length: 110	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green, Master Intersection	
Natural Cycle: 105	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.90	
Intersection Signal Delay: 34.5	Intersection LOS: C
Intersection Capacity Utilization 82.0%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 3: Guelph Line & Queensway Drive/Harvester Rd

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	160	402	100	97	195	61	1320	276	504	1505
v/c Ratio	0.46	0.60	0.41	0.28	0.44	0.29	0.90	0.43	0.88	0.58
Control Delay	32.5	40.6	31.5	38.4	8.3	13.1	35.8	4.6	43.7	31.1
Queue Delay	0.7	0.0	0.0	0.0	0.0	0.0	0.5	0.0	13.5	2.4
Total Delay	33.2	40.6	31.5	38.4	8.3	13.1	36.3	4.6	57.1	33.4
Queue Length 50th (m)	25.9	38.7	15.5	17.8	0.0	3.8	103.4	4.8	93.6	105.0
Queue Length 95th (m)	40.2	51.5	26.4	30.8	17.1	m6.7	#99.0	m9.3	#165.8	134.0
Internal Link Dist (m)		110.7		287.5			189.1			96.5
Turn Bay Length (m)	45.0		110.0			60.0		80.0	100.0	
Base Capacity (vph)	351	901	251	476	532	211	1473	640	573	2587
Starvation Cap Reductn	0	0	0	0	0	0	0	0	64	911
Spillback Cap Reductn	49	0	0	0	11	0	24	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.53	0.45	0.40	0.20	0.37	0.29	0.91	0.43	0.99	0.90

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	152	307	75	95	92	185	58	1254	262	479	1301	129
Future Volume (vph)	152	307	75	95	92	185	58	1254	262	479	1301	129
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.2	3.1	3.3	3.2	3.0	3.2	3.2	3.0	3.2	3.2	3.1
Total Lost time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	1.00	1.00	1.00	0.91	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1605	3234		1677	1746	1434	1627	4766	1455	1708	4732	
Flt Permitted	0.61	1.00		0.29	1.00	1.00	0.16	1.00	1.00	0.12	1.00	
Satd. Flow (perm)	1024	3234		505	1746	1434	276	4766	1455	211	4732	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	160	323	79	100	97	195	61	1320	276	504	1369	136
RTOR Reduction (vph)	0	22	0	0	0	157	0	0	191	0	9	0
Lane Group Flow (vph)	160	380	0	100	97	38	61	1320	85	504	1496	0
Confl. Peds. (#/hr)	6		4	4		6	11		3	3		11
Heavy Vehicles (%)	7%	2%	8%	4%	4%	3%	6%	4%	2%	1%	3%	4%
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4	4		8	8	8	2	2	2	6	6	
Actuated Green, G (s)	27.1	18.1		26.3	17.7	17.7	36.2	30.0	30.0	65.3	55.1	
Effective Green, g (s)	29.1	22.1		28.3	21.7	21.7	38.2	34.0	34.0	66.3	59.1	
Actuated g/C Ratio	0.26	0.20		0.26	0.20	0.20	0.35	0.31	0.31	0.60	0.54	
Clearance Time (s)	4.0	7.0		4.0	7.0	7.0	4.0	7.0	7.0	4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	323	649		232	344	282	184	1473	449	566	2542	
v/s Ratio Prot	c0.04	c0.12		0.04	0.06		0.02	c0.28		c0.26	0.32	
v/s Ratio Perm	0.09			0.07		0.03	0.09		0.06	0.27		
v/c Ratio	0.50	0.59		0.43	0.28	0.14	0.33	0.90	0.19	0.89	0.59	
Uniform Delay, d1	33.1	39.8		32.6	37.5	36.4	24.3	36.3	27.9	29.0	17.2	
Progression Factor	1.00	1.00		1.00	1.00	1.00	0.81	0.77	0.83	1.02	1.68	
Incremental Delay, d2	1.2	1.4		1.3	0.5	0.2	0.8	7.2	0.7	13.6	0.8	
Delay (s)	34.3	41.2		33.9	38.0	36.6	20.7	35.3	23.9	43.3	29.8	
Level of Service	C	D		C	D	D	C	D	C	D	C	
Approach Delay (s)		39.2			36.3			32.8			33.2	
Approach LOS		D			D			C			C	

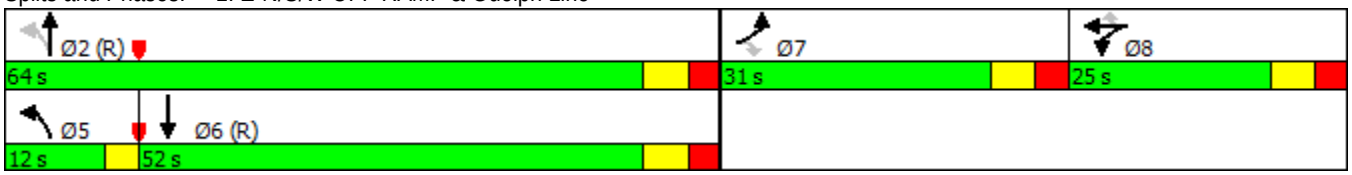
Intersection Summary			
HCM 2000 Control Delay	34.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	82.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

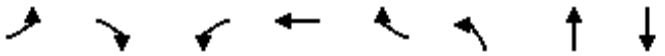
APPENDIX C2 – 2023 PM PEAK (Synchro Output)

Lane Group	EBL	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Configurations								
Traffic Volume (vph)	75	307	320	48	95	138	2101	2151
Future Volume (vph)	75	307	320	48	95	138	2101	2151
Turn Type	Prot	Perm	Split	NA	Perm	pm+pt	NA	NA
Protected Phases	7		8	8		5	2	6
Permitted Phases		7			8	2		
Detector Phase	7	7	8	8	8	5	2	6
Switch Phase								
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	6.0	8.0	8.0
Minimum Split (s)	15.0	15.0	39.0	39.0	39.0	10.0	40.0	40.0
Total Split (s)	31.0	31.0	25.0	25.0	25.0	12.0	64.0	52.0
Total Split (%)	25.8%	25.8%	20.8%	20.8%	20.8%	10.0%	53.3%	43.3%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0
Lost Time Adjust (s)	-3.0	-1.0	-3.0	-3.0	-3.0	0.0	-4.0	-4.0
Total Lost Time (s)	4.0	6.0	4.0	4.0	4.0	3.0	3.0	3.0
Lead/Lag	Lead	Lead	Lag	Lag	Lag	Lead		Lag
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	None	None	C-Max	C-Max
Act Effct Green (s)	27.0	25.0	19.3	19.3	19.3	62.7	62.7	50.4
Actuated g/C Ratio	0.22	0.21	0.16	0.16	0.16	0.52	0.52	0.42
v/c Ratio	0.20	1.03	0.63	0.17	0.28	0.76	0.85	1.21
Control Delay	39.5	105.3	52.3	44.3	5.8	50.0	37.9	131.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.5	105.3	52.3	44.3	5.8	50.0	37.9	131.1
LOS	D	F	D	D	A	D	D	F
Approach Delay				41.9			38.6	131.1
Approach LOS				D			D	F

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 98 (82%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Natural Cycle: 115	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.21	
Intersection Signal Delay: 81.4	Intersection LOS: F
Intersection Capacity Utilization 82.7%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 1: E-N/S/W OFF RAMP & Guelph Line





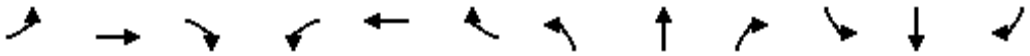
Lane Group	EBL	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	79	323	337	51	100	145	2212	2326
v/c Ratio	0.20	1.03	0.63	0.17	0.28	0.76	0.85	1.21
Control Delay	39.5	105.3	52.3	44.3	5.8	50.0	37.9	131.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.5	105.3	52.3	44.3	5.8	50.0	37.9	131.1
Queue Length 50th (m)	15.2	~81.2	38.2	10.4	0.0	24.3	203.8	~250.6
Queue Length 95th (m)	28.6	#137.1	52.8	21.6	8.9	m#49.2	214.2	#279.6
Internal Link Dist (m)				228.8			44.4	357.0
Turn Bay Length (m)			140.0		130.0			
Base Capacity (vph)	389	314	587	318	375	193	2599	1925
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.20	1.03	0.57	0.16	0.27	0.75	0.85	1.21

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	75	0	307	320	48	95	138	2101	0	0	2151	59
Future Volume (vph)	75	0	307	320	48	95	138	2101	0	0	2151	59
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.4	3.4	3.1	3.4	3.4	3.4	3.0	3.4	3.1	3.0	3.4	3.4
Grade (%)		0%			0%			0%			15%	
Total Lost time (s)	4.0		6.0	4.0	4.0	4.0	3.0	3.0			3.0	
Lane Util. Factor	1.00		1.00	0.97	1.00	1.00	1.00	0.91			0.91	
Frpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	1.00	1.00			1.00	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	1.00	1.00			1.00	
Frt	1.00		0.85	1.00	1.00	0.85	1.00	1.00			1.00	
Flt Protected	0.95		1.00	0.95	1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)	1730		1510	3357	1821	1548	1652	4972			4579	
Flt Permitted	0.95		1.00	0.95	1.00	1.00	0.08	1.00			1.00	
Satd. Flow (perm)	1730		1510	3357	1821	1548	141	4972			4579	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	79	0	323	337	51	100	145	2212	0	0	2264	62
RTOR Reduction (vph)	0	0	0	0	0	84	0	0	0	0	2	0
Lane Group Flow (vph)	79	0	323	337	51	16	145	2212	0	0	2324	0
Confl. Peds. (#/hr)							6		3	3		6
Heavy Vehicles (%)	2%	2%	1%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Prot		Perm	Split	NA	Perm	pm+pt	NA			NA	
Protected Phases	7			8	8		5	2			6	
Permitted Phases			7			8	2					
Actuated Green, G (s)	24.0		24.0	16.3	16.3	16.3	58.7	58.7			46.4	
Effective Green, g (s)	27.0		25.0	19.3	19.3	19.3	58.7	62.7			50.4	
Actuated g/C Ratio	0.22		0.21	0.16	0.16	0.16	0.49	0.52			0.42	
Clearance Time (s)	7.0		7.0	7.0	7.0	7.0	3.0	7.0			7.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)	389		314	539	292	248	186	2597			1923	
v/s Ratio Prot	0.05			c0.10	0.03		0.06	c0.44			c0.51	
v/s Ratio Perm			c0.21			0.01	0.32					
v/c Ratio	0.20		1.03	0.63	0.17	0.06	0.78	0.85			1.21	
Uniform Delay, d1	37.8		47.5	47.0	43.5	42.7	27.3	24.7			34.8	
Progression Factor	1.00		1.00	1.00	1.00	1.00	1.41	1.38			1.00	
Incremental Delay, d2	0.3		58.4	2.3	0.3	0.1	14.5	2.9			98.9	
Delay (s)	38.0		105.9	49.2	43.8	42.8	52.9	37.0			133.7	
Level of Service	D		F	D	D	D	D	D			F	
Approach Delay (s)		92.5			47.3			38.0			133.7	
Approach LOS		F			D			D			F	

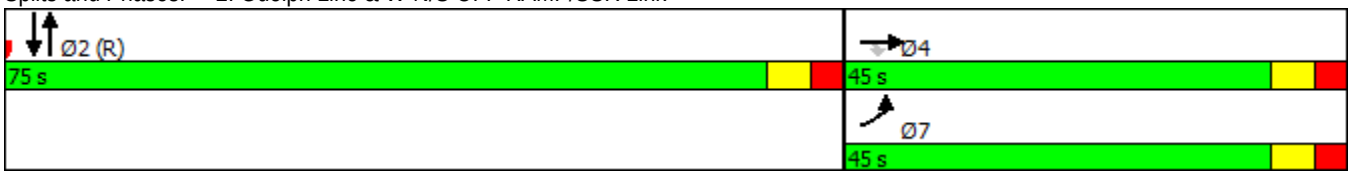
Intersection Summary			
HCM 2000 Control Delay	82.7	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	82.7%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	NBT	SBT
Lane Configurations					
Traffic Volume (vph)	648	115	452	2397	1448
Future Volume (vph)	648	115	452	2397	1448
Turn Type	Prot	NA	Perm	NA	NA
Protected Phases	7	4		2	2
Permitted Phases		4	4	2	2
Detector Phase	7	4	4	2	2
Switch Phase					
Minimum Initial (s)	4.0	8.0	8.0	8.0	8.0
Minimum Split (s)	11.0	38.0	38.0	43.0	43.0
Total Split (s)	45.0	45.0	45.0	75.0	75.0
Total Split (%)	37.5%	37.5%	37.5%	62.5%	62.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	-4.0	-4.0	-4.0	-4.0	-4.0
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	None	C-Max	C-Max
Act Effct Green (s)	40.9	40.9	40.9	73.1	73.1
Actuated g/C Ratio	0.34	0.34	0.34	0.61	0.61
v/c Ratio	0.62	0.20	0.92	0.66	0.50
Control Delay	35.9	28.7	58.6	8.2	5.6
Queue Delay	0.0	0.0	0.3	0.4	0.2
Total Delay	35.9	28.7	58.9	8.6	5.8
LOS	D	C	E	A	A
Approach Delay		43.8		8.6	5.8
Approach LOS		D		A	A

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 96 (80%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 85	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.92	
Intersection Signal Delay: 16.2	Intersection LOS: B
Intersection Capacity Utilization 62.9%	ICU Level of Service B
Analysis Period (min) 15	

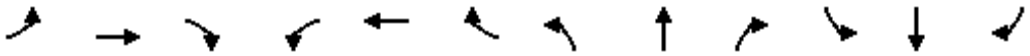
Splits and Phases: 2: Guelph Line & W-N/S OFF RAMP/SSR Link



Lane Group	EBL	EBT	EBR	NBT	SBT
Lane Group Flow (vph)	682	121	476	2531	1524
v/c Ratio	0.62	0.20	0.92	0.66	0.50
Control Delay	35.9	28.7	58.6	8.2	5.6
Queue Delay	0.0	0.0	0.3	0.4	0.2
Total Delay	35.9	28.7	58.9	8.6	5.8
Queue Length 50th (m)	67.8	19.8	98.5	50.5	31.6
Queue Length 95th (m)	86.9	34.0	#160.7	m68.8	m27.5
Internal Link Dist (m)		328.8		96.5	49.4
Turn Bay Length (m)	180.0		160.0		
Base Capacity (vph)	1123	609	534	3856	3061
Starvation Cap Reductn	0	0	0	664	0
Spillback Cap Reductn	0	0	3	0	571
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.61	0.20	0.90	0.79	0.61

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



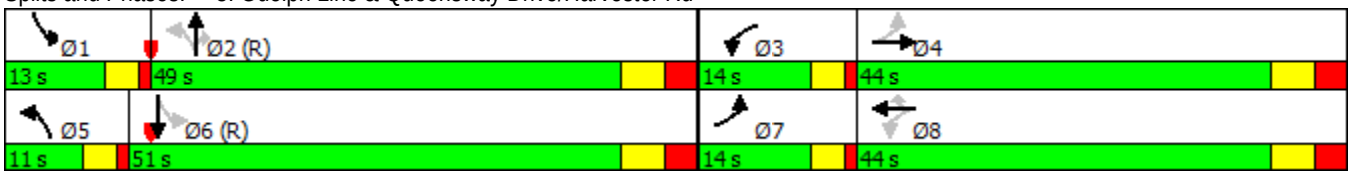
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	648	115	452	0	0	0	0	2397	8	0	1448	0
Future Volume (vph)	648	115	452	0	0	0	0	2397	8	0	1448	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.1	3.1	3.1	3.4	3.1	3.4	3.1	3.4	3.1	3.1	3.4	3.1
Total Lost time (s)	3.0	3.0	3.0					3.0			3.0	
Lane Util. Factor	0.97	1.00	1.00					0.86			0.91	
Frpb, ped/bikes	1.00	1.00	0.99					1.00			1.00	
Flpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	
Frt	1.00	1.00	0.85					1.00			1.00	
Flt Protected	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (prot)	3211	1742	1460					6324			5022	
Flt Permitted	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (perm)	3211	1742	1460					6324			5022	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	682	121	476	0	0	0	0	2523	8	0	1524	0
RTOR Reduction (vph)	0	0	24	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	682	121	452	0	0	0	0	2531	0	0	1524	0
Confl. Peds. (#/hr)			2				20		7	7		20
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	2%	1%	2%	2%	1%	2%
Turn Type	Prot	NA	Perm					NA			NA	
Protected Phases	7	4						2			2	
Permitted Phases		4	4					2			2	
Actuated Green, G (s)	36.9	36.9	36.9					69.1			69.1	
Effective Green, g (s)	40.9	40.9	40.9					73.1			73.1	
Actuated g/C Ratio	0.34	0.34	0.34					0.61			0.61	
Clearance Time (s)	7.0	7.0	7.0					7.0			7.0	
Vehicle Extension (s)	3.0	3.0	3.0					3.0			3.0	
Lane Grp Cap (vph)	1094	593	497					3852			3059	
v/s Ratio Prot	0.21	0.07						c0.40			0.30	
v/s Ratio Perm			c0.31									
v/c Ratio	0.62	0.20	0.91					0.66			0.50	
Uniform Delay, d1	33.1	28.0	37.8					15.3			13.2	
Progression Factor	1.00	1.00	1.00					0.51			0.42	
Incremental Delay, d2	1.1	0.2	20.4					0.3			0.1	
Delay (s)	34.2	28.2	58.2					8.1			5.5	
Level of Service	C	C	E					A			A	
Approach Delay (s)		42.6			0.0			8.1			5.5	
Approach LOS		D			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	15.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	62.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations										
Traffic Volume (vph)	183	91	273	752	658	115	1564	99	146	1542
Future Volume (vph)	183	91	273	752	658	115	1564	99	146	1542
Turn Type	pm+pt	NA	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Protected Phases	7	4	3	8		5	2		1	6
Permitted Phases	4	4	8	8	8	2	2	2	6	6
Detector Phase	7	4	3	8	8	5	2	2	1	6
Switch Phase										
Minimum Initial (s)	7.0	8.0	7.0	8.0	8.0	7.0	8.0	8.0	7.0	8.0
Minimum Split (s)	12.0	34.0	12.0	34.0	34.0	12.0	36.0	36.0	12.0	36.0
Total Split (s)	14.0	44.0	14.0	44.0	44.0	11.0	49.0	49.0	13.0	51.0
Total Split (%)	11.7%	36.7%	11.7%	36.7%	36.7%	9.2%	40.8%	40.8%	10.8%	42.5%
Yellow Time (s)	3.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0
All-Red Time (s)	1.0	3.0	1.0	3.0	3.0	1.0	3.0	3.0	1.0	3.0
Lost Time Adjust (s)	-1.0	-4.0	-1.0	-4.0	-4.0	-1.0	-4.0	-4.0	-1.0	-4.0
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	None	C-Max	C-Max	None	C-Max
Act Effct Green (s)	52.0	41.0	52.0	41.0	41.0	54.0	46.0	46.0	58.0	48.0
Actuated g/C Ratio	0.43	0.34	0.43	0.34	0.34	0.45	0.38	0.38	0.48	0.40
v/c Ratio	0.90	0.16	0.53	1.29	1.17	0.69	0.88	0.17	0.77	0.93
Control Delay	68.6	14.8	26.2	176.6	122.6	51.7	65.4	22.5	50.6	34.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5
Total Delay	68.6	14.8	26.2	176.6	122.6	51.7	65.4	22.5	50.6	36.2
LOS	E	B	C	F	F	D	E	C	D	D
Approach Delay		42.6		131.1			62.1			37.4
Approach LOS		D		F			E			D

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green, Master Intersection	
Natural Cycle: 115	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.29	
Intersection Signal Delay: 73.3	Intersection LOS: E
Intersection Capacity Utilization 103.1%	ICU Level of Service G
Analysis Period (min) 15	

Splits and Phases: 3: Guelph Line & Queensway Drive/Harvester Rd



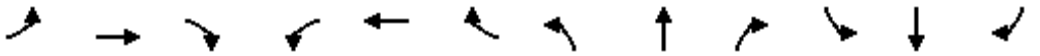
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	193	180	287	792	693	121	1646	104	154	1804
v/c Ratio	0.90	0.16	0.53	1.29	1.17	0.69	0.88	0.17	0.77	0.93
Control Delay	68.6	14.8	26.2	176.6	122.6	51.7	65.4	22.5	50.6	34.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5
Total Delay	68.6	14.8	26.2	176.6	122.6	51.7	65.4	22.5	50.6	36.2
Queue Length 50th (m)	29.6	8.0	42.9	~237.6	~169.1	26.5	150.1	7.5	22.4	124.4
Queue Length 95th (m)	#72.4	16.1	64.0	#310.6	#240.9	m34.3	166.7	m15.3	m#46.7	#160.4
Internal Link Dist (m)		110.7		287.5			189.1			96.5
Turn Bay Length (m)	45.0		110.0			60.0		80.0	100.0	
Base Capacity (vph)	214	1121	539	614	592	176	1864	604	200	1937
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	48
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.90	0.16	0.53	1.29	1.17	0.69	0.88	0.17	0.77	0.96

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	183	91	80	273	752	658	115	1564	99	146	1542	172
Future Volume (vph)	183	91	80	273	752	658	115	1564	99	146	1542	172
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.2	3.1	3.3	3.2	3.0	3.2	3.2	3.0	3.2	3.2	3.1
Total Lost time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	1.00	1.00	1.00	0.91	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.93		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1658	3121		1725	1798	1431	1691	4859	1400	1658	4816	
Flt Permitted	0.11	1.00		0.61	1.00	1.00	0.09	1.00	1.00	0.09	1.00	
Satd. Flow (perm)	184	3121		1117	1798	1431	166	4859	1400	155	4816	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	193	96	84	287	792	693	121	1646	104	154	1623	181
RTOR Reduction (vph)	0	55	0	0	0	103	0	0	64	0	11	0
Lane Group Flow (vph)	193	125	0	287	792	590	121	1646	40	154	1793	0
Confl. Peds. (#/hr)	20		2	2		20	4		25	25		4
Heavy Vehicles (%)	4%	3%	1%	1%	1%	1%	2%	2%	3%	4%	1%	3%
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4	4		8	8	8	2	2	2	6	6	
Actuated Green, G (s)	47.0	37.0		47.0	37.0	37.0	49.0	42.0	42.0	53.0	44.0	
Effective Green, g (s)	49.0	41.0		49.0	41.0	41.0	51.0	46.0	46.0	55.0	48.0	
Actuated g/C Ratio	0.41	0.34		0.41	0.34	0.34	0.42	0.38	0.38	0.46	0.40	
Clearance Time (s)	4.0	7.0		4.0	7.0	7.0	4.0	7.0	7.0	4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	210	1066		511	614	488	172	1862	536	196	1926	
v/s Ratio Prot	c0.08	0.04		0.05	c0.44		0.05	0.34		c0.07	c0.37	
v/s Ratio Perm	0.29			0.18		0.41	0.25		0.03	0.29		
v/c Ratio	0.92	0.12		0.56	1.29	1.21	0.70	0.88	0.07	0.79	0.93	
Uniform Delay, d1	30.4	27.1		25.6	39.5	39.5	27.7	34.5	23.5	26.2	34.4	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.94	1.77	5.30	1.28	0.77	
Incremental Delay, d2	39.8	0.0		1.4	142.4	111.7	7.9	4.3	0.2	15.3	8.1	
Delay (s)	70.2	27.1		27.0	181.9	151.2	61.7	65.3	124.7	49.0	34.5	
Level of Service	E	C		C	F	F	E	E	F	D	C	
Approach Delay (s)		49.4			144.8			68.3			35.7	
Approach LOS		D			F			E			D	

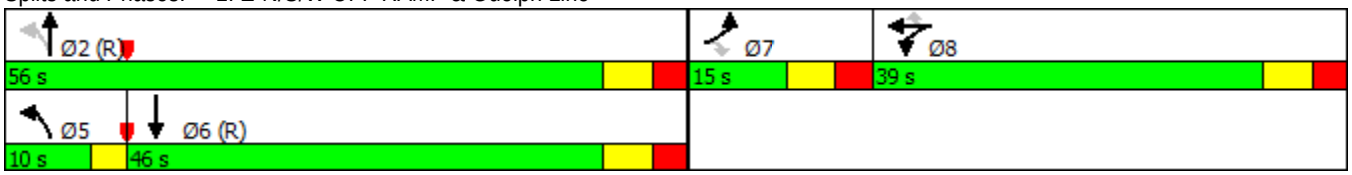
Intersection Summary			
HCM 2000 Control Delay	79.1	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	103.1%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

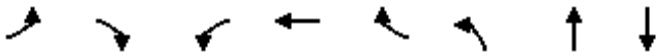
APPENDIX C3 – 2031 AM PEAK (Synchro Output)

Lane Group	EBL	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Configurations								
Traffic Volume (vph)	28	85	364	20	242	40	1830	2046
Future Volume (vph)	28	85	364	20	242	40	1830	2046
Turn Type	Prot	Perm	Split	NA	Perm	pm+pt	NA	NA
Protected Phases	7		8	8		5	2	6
Permitted Phases		7			8	2		
Detector Phase	7	7	8	8	8	5	2	6
Switch Phase								
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	6.0	8.0	8.0
Minimum Split (s)	15.0	15.0	39.0	39.0	39.0	10.0	40.0	40.0
Total Split (s)	15.0	15.0	39.0	39.0	39.0	10.0	56.0	46.0
Total Split (%)	13.6%	13.6%	35.5%	35.5%	35.5%	9.1%	50.9%	41.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0
Lost Time Adjust (s)	-3.0	-1.0	-3.0	-3.0	-3.0	0.0	-4.0	-4.0
Total Lost Time (s)	4.0	6.0	4.0	4.0	4.0	3.0	3.0	3.0
Lead/Lag	Lead	Lead	Lag	Lag	Lag	Lead		Lag
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	None	None	C-Max	C-Max
Act Effct Green (s)	11.0	9.0	21.2	21.2	21.2	66.8	66.8	60.5
Actuated g/C Ratio	0.10	0.08	0.19	0.19	0.19	0.61	0.61	0.55
v/c Ratio	0.17	0.83	0.59	0.07	0.63	0.25	0.66	0.89
Control Delay	48.0	101.3	43.6	34.5	24.8	18.5	13.5	29.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.0	101.3	43.6	34.5	24.8	18.5	13.5	29.5
LOS	D	F	D	C	C	B	B	C
Approach Delay				36.0			13.6	29.5
Approach LOS				D			B	C

Intersection Summary	
Cycle Length: 110	
Actuated Cycle Length: 110	
Offset: 24 (22%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Natural Cycle: 115	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.89	
Intersection Signal Delay: 25.5	Intersection LOS: C
Intersection Capacity Utilization 69.3%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 1: E-N/S/W OFF RAMP & Guelph Line

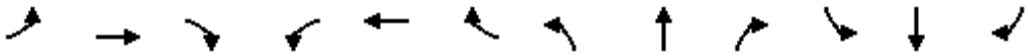




Lane Group	EBL	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	29	89	383	21	255	42	1926	2206
v/c Ratio	0.17	0.83	0.59	0.07	0.63	0.25	0.66	0.89
Control Delay	48.0	101.3	43.6	34.5	24.8	18.5	13.5	29.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.0	101.3	43.6	34.5	24.8	18.5	13.5	29.5
Queue Length 50th (m)	5.8	19.2	39.1	3.7	22.4	2.7	71.8	155.4
Queue Length 95th (m)	14.8	#47.6	49.8	9.7	45.6	m8.2	112.1	#227.8
Internal Link Dist (m)				228.8			44.4	357.0
Turn Bay Length (m)			140.0		130.0			
Base Capacity (vph)	171	107	1078	532	577	173	2931	2469
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.17	0.83	0.36	0.04	0.44	0.24	0.66	0.89

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	0	85	364	20	242	40	1830	0	0	2046	49
Future Volume (vph)	28	0	85	364	20	242	40	1830	0	0	2046	49
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.4	3.4	3.1	3.4	3.4	3.4	3.0	3.4	3.1	3.0	3.4	3.4
Grade (%)		0%			0%			0%			15%	
Total Lost time (s)	4.0		6.0	4.0	4.0	4.0	3.0	3.0			3.0	
Lane Util. Factor	1.00		1.00	0.97	1.00	1.00	1.00	0.91			0.91	
Frpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	1.00	1.00			1.00	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	1.00	1.00			1.00	
Frt	1.00		0.85	1.00	1.00	0.85	1.00	1.00			1.00	
Flt Protected	0.95		1.00	0.95	1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)	1713		1315	3390	1674	1518	1652	4830			4486	
Flt Permitted	0.95		1.00	0.95	1.00	1.00	0.07	1.00			1.00	
Satd. Flow (perm)	1713		1315	3390	1674	1518	119	4830			4486	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	29	0	89	383	21	255	42	1926	0	0	2154	52
RTOR Reduction (vph)	0	0	0	0	0	112	0	0	0	0	2	0
Lane Group Flow (vph)	29	0	89	383	21	143	42	1926	0	0	2204	0
Confl. Peds. (#/hr)							3		3	3		3
Heavy Vehicles (%)	3%	2%	16%	1%	11%	4%	2%	5%	2%	2%	4%	11%
Turn Type	Prot		Perm	Split	NA	Perm	pm+pt	NA			NA	
Protected Phases	7			8	8		5	2			6	
Permitted Phases			7			8	2					
Actuated Green, G (s)	8.0		8.0	18.2	18.2	18.2	62.8	62.8			55.4	
Effective Green, g (s)	11.0		9.0	21.2	21.2	21.2	62.8	66.8			59.4	
Actuated g/C Ratio	0.10		0.08	0.19	0.19	0.19	0.57	0.61			0.54	
Clearance Time (s)	7.0		7.0	7.0	7.0	7.0	3.0	7.0			7.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)	171		107	653	322	292	129	2933			2422	
v/s Ratio Prot	0.02			c0.11	0.01		0.01	c0.40			c0.49	
v/s Ratio Perm			c0.07			0.09	0.17					
v/c Ratio	0.17		0.83	0.59	0.07	0.49	0.33	0.66			0.91	
Uniform Delay, d1	45.3		49.8	40.4	36.3	39.6	19.0	14.1			22.9	
Progression Factor	1.00		1.00	1.00	1.00	1.00	1.53	0.84			1.00	
Incremental Delay, d2	0.5		39.7	1.4	0.1	1.3	1.2	1.0			6.5	
Delay (s)	45.8		89.5	41.8	36.4	40.9	30.3	12.8			29.4	
Level of Service	D		F	D	D	D	C	B			C	
Approach Delay (s)		78.7			41.2			13.2			29.4	
Approach LOS		E			D			B			C	

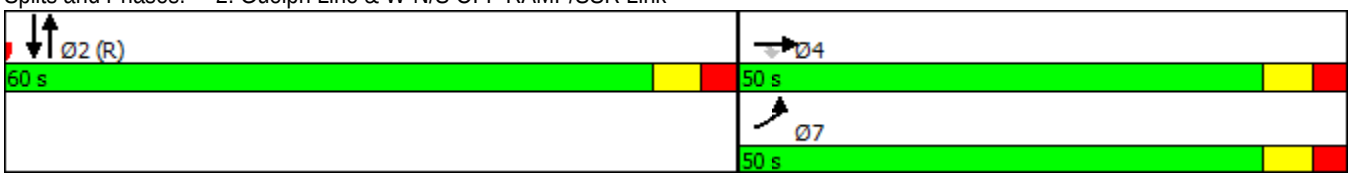
Intersection Summary			
HCM 2000 Control Delay	25.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	69.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	NBT	SBT
Lane Configurations					
Traffic Volume (vph)	790	549	454	1633	1640
Future Volume (vph)	790	549	454	1633	1640
Turn Type	Prot	NA	Perm	NA	NA
Protected Phases	7	4		2	2
Permitted Phases		4	4	2	2
Detector Phase	7	4	4	2	2
Switch Phase					
Minimum Initial (s)	4.0	8.0	8.0	8.0	8.0
Minimum Split (s)	11.0	38.0	38.0	43.0	43.0
Total Split (s)	50.0	50.0	50.0	60.0	60.0
Total Split (%)	45.5%	45.5%	45.5%	54.5%	54.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	-4.0	-4.0	-4.0	-4.0	-4.0
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	None	C-Max	C-Max
Act Effct Green (s)	43.7	43.7	43.7	60.3	60.3
Actuated g/C Ratio	0.40	0.40	0.40	0.55	0.55
v/c Ratio	0.65	0.82	0.77	0.52	0.65
Control Delay	29.3	39.9	35.4	16.0	8.1
Queue Delay	0.0	0.0	55.1	0.8	0.3
Total Delay	29.3	39.9	90.6	16.9	8.4
LOS	C	D	F	B	A
Approach Delay		48.1		16.9	8.4
Approach LOS		D		B	A

Intersection Summary	
Cycle Length: 110	
Actuated Cycle Length: 110	
Offset: 29 (26%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 85	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.82	
Intersection Signal Delay: 25.1	Intersection LOS: C
Intersection Capacity Utilization 67.2%	ICU Level of Service C
Analysis Period (min) 15	

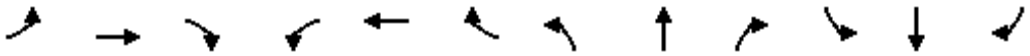
Splits and Phases: 2: Guelph Line & W-N/S OFF RAMP/SSR Link



Lane Group	EBL	EBT	EBR	NBT	SBT
Lane Group Flow (vph)	832	578	478	1743	1726
v/c Ratio	0.65	0.82	0.77	0.52	0.65
Control Delay	29.3	39.9	35.4	16.0	8.1
Queue Delay	0.0	0.0	55.1	0.8	0.3
Total Delay	29.3	39.9	90.6	16.9	8.4
Queue Length 50th (m)	70.3	104.0	77.4	109.9	30.3
Queue Length 95th (m)	89.3	147.1	117.1	m113.0	31.7
Internal Link Dist (m)		328.8		96.5	49.4
Turn Bay Length (m)	180.0		160.0		
Base Capacity (vph)	1371	759	661	3333	2674
Starvation Cap Reductn	0	0	0	1159	0
Spillback Cap Reductn	0	0	279	0	335
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.61	0.76	1.25	0.80	0.74

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	790	549	454	0	0	0	0	1633	23	0	1640	0
Future Volume (vph)	790	549	454	0	0	0	0	1633	23	0	1640	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.1	3.1	3.1	3.4	3.1	3.4	3.1	3.4	3.1	3.1	3.4	3.1
Total Lost time (s)	3.0	3.0	3.0					3.0			3.0	
Lane Util. Factor	0.97	1.00	1.00					0.86			0.91	
Frpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	
Flpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	
Frt	1.00	1.00	0.85					1.00			1.00	
Flt Protected	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (prot)	3211	1777	1495					6075			4877	
Flt Permitted	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (perm)	3211	1777	1495					6075			4877	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	832	578	478	0	0	0	0	1719	24	0	1726	0
RTOR Reduction (vph)	0	0	24	0	0	0	0	1	0	0	0	0
Lane Group Flow (vph)	832	578	454	0	0	0	0	1742	0	0	1726	0
Confl. Peds. (#/hr)							4		1	1		
Heavy Vehicles (%)	3%	1%	2%	2%	2%	2%	2%	5%	2%	2%	4%	2%
Turn Type	Prot	NA	Perm					NA			NA	
Protected Phases	7	4						2			2	
Permitted Phases		4	4					2			2	
Actuated Green, G (s)	39.7	39.7	39.7					56.3			56.3	
Effective Green, g (s)	43.7	43.7	43.7					60.3			60.3	
Actuated g/C Ratio	0.40	0.40	0.40					0.55			0.55	
Clearance Time (s)	7.0	7.0	7.0					7.0			7.0	
Vehicle Extension (s)	3.0	3.0	3.0					3.0			3.0	
Lane Grp Cap (vph)	1275	705	593					3330			2673	
v/s Ratio Prot	0.26	c0.33						0.29			c0.35	
v/s Ratio Perm			0.30									
v/c Ratio	0.65	0.82	0.77					0.52			0.65	
Uniform Delay, d1	27.0	29.6	28.7					15.7			17.4	
Progression Factor	1.00	1.00	1.00					0.96			0.41	
Incremental Delay, d2	1.2	7.4	5.9					0.3			0.7	
Delay (s)	28.2	37.0	34.6					15.5			7.8	
Level of Service	C	D	C					B			A	
Approach Delay (s)		32.5			0.0			15.5			7.8	
Approach LOS		C			A			B			A	

Intersection Summary			
HCM 2000 Control Delay	19.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	67.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations										
Traffic Volume (vph)	158	320	99	95	193	60	1305	273	499	1353
Future Volume (vph)	158	320	99	95	193	60	1305	273	499	1353
Turn Type	pm+pt	NA	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Protected Phases	7	4	3	8		5	2		1	6
Permitted Phases	4	4	8	8	8	2	2	2	6	6
Detector Phase	7	4	3	8	8	5	2	2	1	6
Switch Phase										
Minimum Initial (s)	7.0	8.0	7.0	8.0	8.0	7.0	8.0	8.0	7.0	8.0
Minimum Split (s)	12.0	34.0	12.0	34.0	34.0	12.0	36.0	36.0	12.0	36.0
Total Split (s)	13.0	33.0	13.0	33.0	33.0	11.0	37.0	37.0	27.0	53.0
Total Split (%)	11.8%	30.0%	11.8%	30.0%	30.0%	10.0%	33.6%	33.6%	24.5%	48.2%
Yellow Time (s)	3.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0
All-Red Time (s)	1.0	3.0	1.0	3.0	3.0	1.0	3.0	3.0	1.0	3.0
Lost Time Adjust (s)	-1.0	-4.0	-1.0	-4.0	-4.0	-1.0	-4.0	-4.0	-1.0	-4.0
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	None	C-Max	C-Max	None	C-Max
Act Effct Green (s)	32.6	22.6	31.8	22.2	22.2	42.6	34.0	34.0	68.8	59.3
Actuated g/C Ratio	0.30	0.21	0.29	0.20	0.20	0.39	0.31	0.31	0.63	0.54
v/c Ratio	0.47	0.61	0.43	0.28	0.45	0.30	0.93	0.44	0.93	0.61
Control Delay	32.4	40.6	31.5	38.0	8.1	13.6	37.6	4.1	47.9	32.8
Queue Delay	2.8	0.0	0.0	0.0	0.1	0.0	2.1	0.0	20.6	5.9
Total Delay	35.1	40.6	31.5	38.0	8.2	13.6	39.7	4.1	68.4	38.7
LOS	D	D	C	D	A	B	D	A	E	D
Approach Delay		39.0		21.5			32.8			46.2
Approach LOS		D		C			C			D

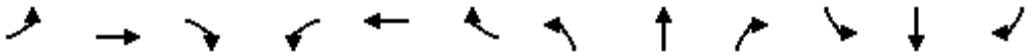
Intersection Summary	
Cycle Length: 110	
Actuated Cycle Length: 110	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green, Master Intersection	
Natural Cycle: 115	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.93	
Intersection Signal Delay: 38.4	Intersection LOS: D
Intersection Capacity Utilization 84.5%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 3: Guelph Line & Queensway Drive/Harvester Rd

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	166	419	104	100	203	63	1374	287	525	1565
v/c Ratio	0.47	0.61	0.43	0.28	0.45	0.30	0.93	0.44	0.93	0.61
Control Delay	32.4	40.6	31.5	38.0	8.1	13.6	37.6	4.1	47.9	32.8
Queue Delay	2.8	0.0	0.0	0.0	0.1	0.0	2.1	0.0	20.6	5.9
Total Delay	35.1	40.6	31.5	38.0	8.2	13.6	39.7	4.1	68.4	38.7
Queue Length 50th (m)	26.7	40.4	16.0	18.2	0.0	3.9	108.7	5.0	97.8	118.9
Queue Length 95th (m)	41.2	53.4	27.0	31.4	17.4	m6.5	#130.2	m9.3	#178.8	136.1
Internal Link Dist (m)		110.7		287.5			189.1			96.5
Turn Bay Length (m)	45.0		110.0			60.0		80.0	100.0	
Base Capacity (vph)	355	901	250	476	538	207	1473	648	564	2560
Starvation Cap Reductn	0	0	0	0	0	0	0	0	55	934
Spillback Cap Reductn	104	0	0	0	22	0	40	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.66	0.47	0.42	0.21	0.39	0.30	0.96	0.44	1.03	0.96

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	158	320	78	99	95	193	60	1305	273	499	1353	134
Future Volume (vph)	158	320	78	99	95	193	60	1305	273	499	1353	134
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.2	3.1	3.3	3.2	3.0	3.2	3.2	3.0	3.2	3.2	3.1
Total Lost time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	1.00	1.00	1.00	0.91	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1606	3234		1677	1746	1434	1627	4766	1455	1708	4732	
Flt Permitted	0.60	1.00		0.27	1.00	1.00	0.15	1.00	1.00	0.12	1.00	
Satd. Flow (perm)	1017	3234		485	1746	1434	259	4766	1455	211	4732	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	166	337	82	104	100	203	63	1374	287	525	1424	141
RTOR Reduction (vph)	0	21	0	0	0	162	0	0	198	0	9	0
Lane Group Flow (vph)	166	398	0	104	100	41	63	1374	89	525	1556	0
Confl. Peds. (#/hr)	6		4	4		6	11		3	3		11
Heavy Vehicles (%)	7%	2%	8%	4%	4%	3%	6%	4%	2%	1%	3%	4%
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4	4		8	8	8	2	2	2	6	6	
Actuated Green, G (s)	27.6	18.6		26.8	18.2	18.2	36.2	30.0	30.0	64.8	54.6	
Effective Green, g (s)	29.6	22.6		28.8	22.2	22.2	38.2	34.0	34.0	65.8	58.6	
Actuated g/C Ratio	0.27	0.21		0.26	0.20	0.20	0.35	0.31	0.31	0.60	0.53	
Clearance Time (s)	4.0	7.0		4.0	7.0	7.0	4.0	7.0	7.0	4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	327	664		231	352	289	179	1473	449	558	2520	
v/s Ratio Prot	c0.05	c0.12		0.04	0.06		0.02	c0.29		c0.27	0.33	
v/s Ratio Perm	0.09			0.08		0.03	0.10		0.06	0.29		
v/c Ratio	0.51	0.60		0.45	0.28	0.14	0.35	0.93	0.20	0.94	0.62	
Uniform Delay, d1	32.8	39.6		32.4	37.2	36.1	24.4	36.9	28.0	30.4	17.9	
Progression Factor	1.00	1.00		1.00	1.00	1.00	0.83	0.74	0.71	0.94	1.70	
Incremental Delay, d2	1.2	1.5		1.4	0.4	0.2	0.9	9.5	0.7	19.8	0.9	
Delay (s)	34.0	41.1		33.7	37.6	36.3	21.2	36.9	20.7	48.3	31.3	
Level of Service	C	D		C	D	D	C	D	C	D	C	
Approach Delay (s)		39.1			36.0			33.6			35.6	
Approach LOS		D			D			C			D	

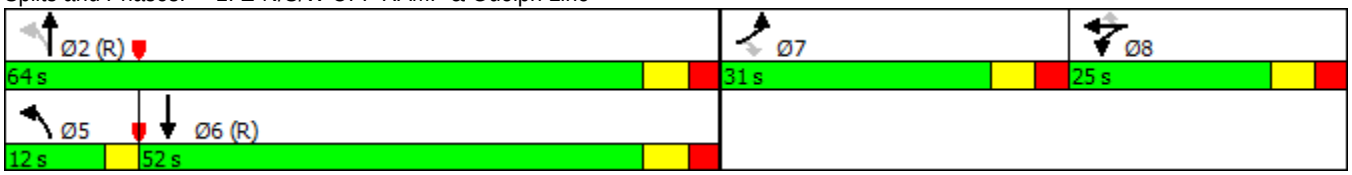
Intersection Summary			
HCM 2000 Control Delay	35.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	84.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

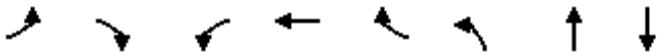
APPENDIX C4 – 2031 PM PEAK (Synchro Output)

Lane Group	EBL	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Configurations								
Traffic Volume (vph)	78	320	375	56	111	146	2224	2239
Future Volume (vph)	78	320	375	56	111	146	2224	2239
Turn Type	Prot	Perm	Split	NA	Perm	pm+pt	NA	NA
Protected Phases	7		8	8		5	2	6
Permitted Phases		7			8	2		
Detector Phase	7	7	8	8	8	5	2	6
Switch Phase								
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	6.0	8.0	8.0
Minimum Split (s)	15.0	15.0	39.0	39.0	39.0	10.0	40.0	40.0
Total Split (s)	31.0	31.0	25.0	25.0	25.0	12.0	64.0	52.0
Total Split (%)	25.8%	25.8%	20.8%	20.8%	20.8%	10.0%	53.3%	43.3%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0
Lost Time Adjust (s)	-3.0	-1.0	-3.0	-3.0	-3.0	0.0	-4.0	-4.0
Total Lost Time (s)	4.0	6.0	4.0	4.0	4.0	3.0	3.0	3.0
Lead/Lag	Lead	Lead	Lag	Lag	Lag	Lead		Lag
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	None	None	C-Max	C-Max
Act Effct Green (s)	27.0	25.0	20.1	20.1	20.1	61.9	61.9	49.7
Actuated g/C Ratio	0.22	0.21	0.17	0.17	0.17	0.52	0.52	0.41
v/c Ratio	0.21	1.07	0.70	0.19	0.32	0.81	0.91	1.28
Control Delay	39.6	117.0	54.4	44.3	8.6	54.1	40.4	160.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.6	117.0	54.4	44.3	8.6	54.1	40.4	160.2
LOS	D	F	D	D	A	D	D	F
Approach Delay				44.0			41.2	160.2
Approach LOS				D			D	F

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 98 (82%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Natural Cycle: 115	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.28	
Intersection Signal Delay: 94.6	Intersection LOS: F
Intersection Capacity Utilization 86.8%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 1: E-N/S/W OFF RAMP & Guelph Line





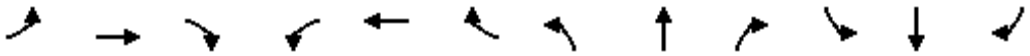
Lane Group	EBL	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	82	337	395	59	117	154	2341	2421
v/c Ratio	0.21	1.07	0.70	0.19	0.32	0.81	0.91	1.28
Control Delay	39.6	117.0	54.4	44.3	8.6	54.1	40.4	160.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.6	117.0	54.4	44.3	8.6	54.1	40.4	160.2
Queue Length 50th (m)	15.8	~88.1	45.3	12.0	0.0	25.5	216.2	~267.9
Queue Length 95th (m)	29.7	#144.4	61.8	24.1	13.6	m#47.8	231.2	#296.6
Internal Link Dist (m)				228.8			44.4	357.0
Turn Bay Length (m)			140.0		130.0			
Base Capacity (vph)	389	314	587	318	375	189	2563	1897
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.21	1.07	0.67	0.19	0.31	0.81	0.91	1.28

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	78	0	320	375	56	111	146	2224	0	0	2239	61
Future Volume (vph)	78	0	320	375	56	111	146	2224	0	0	2239	61
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.4	3.4	3.1	3.4	3.4	3.4	3.0	3.4	3.1	3.0	3.4	3.4
Grade (%)		0%			0%			0%			15%	
Total Lost time (s)	4.0		6.0	4.0	4.0	4.0	3.0	3.0			3.0	
Lane Util. Factor	1.00		1.00	0.97	1.00	1.00	1.00	0.91			0.91	
Frpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	1.00	1.00			1.00	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	1.00	1.00			1.00	
Frt	1.00		0.85	1.00	1.00	0.85	1.00	1.00			1.00	
Flt Protected	0.95		1.00	0.95	1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)	1730		1510	3357	1821	1548	1652	4972			4579	
Flt Permitted	0.95		1.00	0.95	1.00	1.00	0.08	1.00			1.00	
Satd. Flow (perm)	1730		1510	3357	1821	1548	143	4972			4579	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	82	0	337	395	59	117	154	2341	0	0	2357	64
RTOR Reduction (vph)	0	0	0	0	0	97	0	0	0	0	2	0
Lane Group Flow (vph)	82	0	337	395	59	20	154	2341	0	0	2419	0
Confl. Peds. (#/hr)							6		3	3		6
Heavy Vehicles (%)	2%	2%	1%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Prot		Perm	Split	NA	Perm	pm+pt	NA			NA	
Protected Phases	7			8	8		5	2			6	
Permitted Phases			7			8	2					
Actuated Green, G (s)	24.0		24.0	17.1	17.1	17.1	57.9	57.9			45.7	
Effective Green, g (s)	27.0		25.0	20.1	20.1	20.1	57.9	61.9			49.7	
Actuated g/C Ratio	0.22		0.21	0.17	0.17	0.17	0.48	0.52			0.41	
Clearance Time (s)	7.0		7.0	7.0	7.0	7.0	3.0	7.0			7.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)	389		314	562	305	259	184	2564			1896	
v/s Ratio Prot	0.05			c0.12	0.03		0.06	c0.47			c0.53	
v/s Ratio Perm			c0.22			0.01	0.34					
v/c Ratio	0.21		1.07	0.70	0.19	0.08	0.84	0.91			1.28	
Uniform Delay, d1	37.8		47.5	47.1	43.0	42.1	28.9	26.6			35.1	
Progression Factor	1.00		1.00	1.00	1.00	1.00	1.34	1.32			1.00	
Incremental Delay, d2	0.3		71.6	4.0	0.3	0.1	20.2	4.6			128.3	
Delay (s)	38.1		119.1	51.1	43.3	42.2	58.9	39.8			163.4	
Level of Service	D		F	D	D	D	E	D			F	
Approach Delay (s)		103.3			48.5			41.0			163.4	
Approach LOS		F			D			D			F	

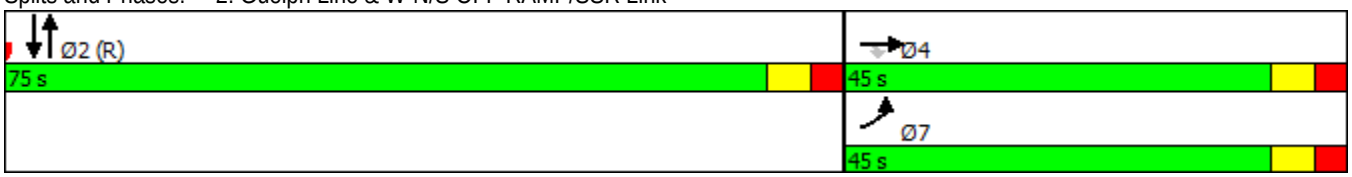
Intersection Summary			
HCM 2000 Control Delay	96.3	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	86.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	NBT	SBT
Lane Configurations					
Traffic Volume (vph)	759	135	529	2494	1522
Future Volume (vph)	759	135	529	2494	1522
Turn Type	Prot	NA	Perm	NA	NA
Protected Phases	7	4		2	2
Permitted Phases		4	4	2	2
Detector Phase	7	4	4	2	2
Switch Phase					
Minimum Initial (s)	4.0	8.0	8.0	8.0	8.0
Minimum Split (s)	11.0	38.0	38.0	43.0	43.0
Total Split (s)	45.0	45.0	45.0	75.0	75.0
Total Split (%)	37.5%	37.5%	37.5%	62.5%	62.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	-4.0	-4.0	-4.0	-4.0	-4.0
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	None	C-Max	C-Max
Act Effct Green (s)	42.0	42.0	42.0	72.0	72.0
Actuated g/C Ratio	0.35	0.35	0.35	0.60	0.60
v/c Ratio	0.71	0.23	1.04	0.69	0.53
Control Delay	38.0	28.9	86.9	8.8	5.9
Queue Delay	0.0	0.0	3.4	0.6	0.5
Total Delay	38.0	28.9	90.2	9.4	6.4
LOS	D	C	F	A	A
Approach Delay		56.6		9.4	6.4
Approach LOS		E		A	A

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 96 (80%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 85	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.04	
Intersection Signal Delay: 20.9	Intersection LOS: C
Intersection Capacity Utilization 69.0%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 2: Guelph Line & W-N/S OFF RAMP/SSR Link



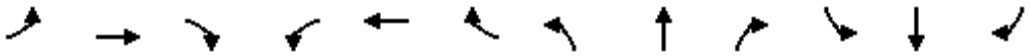
Lane Group	EBL	EBT	EBR	NBT	SBT
Lane Group Flow (vph)	799	142	557	2633	1602
v/c Ratio	0.71	0.23	1.04	0.69	0.53
Control Delay	38.0	28.9	86.9	8.8	5.9
Queue Delay	0.0	0.0	3.4	0.6	0.5
Total Delay	38.0	28.9	90.2	9.4	6.4
Queue Length 50th (m)	83.3	23.5	~136.3	58.6	34.9
Queue Length 95th (m)	105.6	39.1	#204.0	m71.4	m27.2
Internal Link Dist (m)		328.8		96.5	49.4
Turn Bay Length (m)	180.0		160.0		
Base Capacity (vph)	1123	609	534	3796	3013
Starvation Cap Reductn	0	0	0	665	0
Spillback Cap Reductn	0	0	5	0	832
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.71	0.23	1.05	0.84	0.73

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.



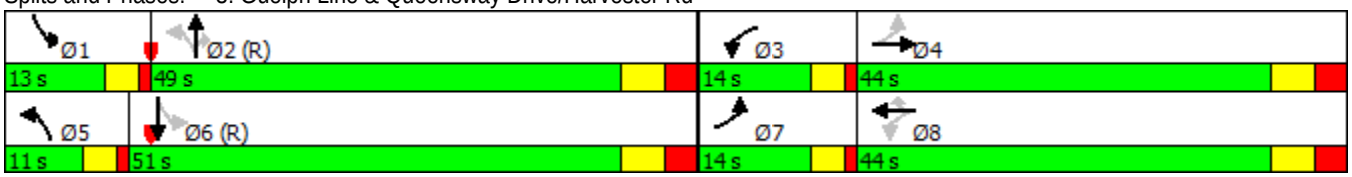
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	759	135	529	0	0	0	0	2494	8	0	1522	0
Future Volume (vph)	759	135	529	0	0	0	0	2494	8	0	1522	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.1	3.1	3.1	3.4	3.1	3.4	3.1	3.4	3.1	3.1	3.4	3.1
Total Lost time (s)	3.0	3.0	3.0					3.0			3.0	
Lane Util. Factor	0.97	1.00	1.00					0.86			0.91	
Frpb, ped/bikes	1.00	1.00	0.99					1.00			1.00	
Flpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	
Frt	1.00	1.00	0.85					1.00			1.00	
Flt Protected	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (prot)	3211	1742	1460					6324			5022	
Flt Permitted	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (perm)	3211	1742	1460					6324			5022	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	799	142	557	0	0	0	0	2625	8	0	1602	0
RTOR Reduction (vph)	0	0	23	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	799	142	534	0	0	0	0	2633	0	0	1602	0
Confl. Peds. (#/hr)			2				20		7	7		20
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	2%	1%	2%	2%	1%	2%
Turn Type	Prot	NA	Perm					NA			NA	
Protected Phases	7	4						2			2	
Permitted Phases		4	4					2			2	
Actuated Green, G (s)	38.0	38.0	38.0					68.0			68.0	
Effective Green, g (s)	42.0	42.0	42.0					72.0			72.0	
Actuated g/C Ratio	0.35	0.35	0.35					0.60			0.60	
Clearance Time (s)	7.0	7.0	7.0					7.0			7.0	
Vehicle Extension (s)	3.0	3.0	3.0					3.0			3.0	
Lane Grp Cap (vph)	1123	609	511					3794			3013	
v/s Ratio Prot	0.25	0.08						c0.42			0.32	
v/s Ratio Perm			c0.37									
v/c Ratio	0.71	0.23	1.04					0.69			0.53	
Uniform Delay, d1	33.8	27.6	39.0					16.4			14.1	
Progression Factor	1.00	1.00	1.00					0.53			0.41	
Incremental Delay, d2	2.2	0.2	51.8					0.1			0.1	
Delay (s)	35.9	27.8	90.8					8.7			5.9	
Level of Service	D	C	F					A			A	
Approach Delay (s)		55.6			0.0			8.7			5.9	
Approach LOS		E			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	20.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	69.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations										
Traffic Volume (vph)	190	94	284	783	684	120	1628	103	152	1605
Future Volume (vph)	190	94	284	783	684	120	1628	103	152	1605
Turn Type	pm+pt	NA	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Protected Phases	7	4	3	8		5	2		1	6
Permitted Phases	4	4	8	8	8	2	2	2	6	6
Detector Phase	7	4	3	8	8	5	2	2	1	6
Switch Phase										
Minimum Initial (s)	7.0	8.0	7.0	8.0	8.0	7.0	8.0	8.0	7.0	8.0
Minimum Split (s)	12.0	34.0	12.0	34.0	34.0	12.0	36.0	36.0	12.0	36.0
Total Split (s)	14.0	44.0	14.0	44.0	44.0	11.0	49.0	49.0	13.0	51.0
Total Split (%)	11.7%	36.7%	11.7%	36.7%	36.7%	9.2%	40.8%	40.8%	10.8%	42.5%
Yellow Time (s)	3.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0
All-Red Time (s)	1.0	3.0	1.0	3.0	3.0	1.0	3.0	3.0	1.0	3.0
Lost Time Adjust (s)	-1.0	-4.0	-1.0	-4.0	-4.0	-1.0	-4.0	-4.0	-1.0	-4.0
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	None	C-Max	C-Max	None	C-Max
Act Effct Green (s)	52.0	41.0	52.0	41.0	41.0	54.0	46.0	46.0	58.0	48.0
Actuated g/C Ratio	0.43	0.34	0.43	0.34	0.34	0.45	0.38	0.38	0.48	0.40
v/c Ratio	0.93	0.17	0.56	1.34	1.22	0.72	0.92	0.18	0.80	0.97
Control Delay	75.4	14.8	27.0	198.0	142.3	52.3	67.4	22.7	51.2	40.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.6
Total Delay	75.4	14.8	27.0	198.0	142.3	52.3	67.4	22.7	51.2	47.8
LOS	E	B	C	F	F	D	E	C	D	D
Approach Delay		46.1		148.5			63.9			48.1
Approach LOS		D		F			E			D

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green, Master Intersection	
Natural Cycle: 115	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.34	
Intersection Signal Delay: 82.7	Intersection LOS: F
Intersection Capacity Utilization 106.8%	ICU Level of Service G
Analysis Period (min) 15	

Splits and Phases: 3: Guelph Line & Queensway Drive/Harvester Rd



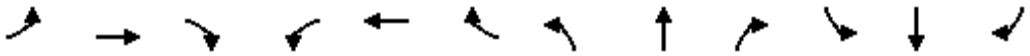
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	200	187	299	824	720	126	1714	108	160	1877
v/c Ratio	0.93	0.17	0.56	1.34	1.22	0.72	0.92	0.18	0.80	0.97
Control Delay	75.4	14.8	27.0	198.0	142.3	52.3	67.4	22.7	51.2	40.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.6
Total Delay	75.4	14.8	27.0	198.0	142.3	52.3	67.4	22.7	51.2	47.8
Queue Length 50th (m)	31.5	8.3	45.1	~253.3	~183.2	27.5	156.9	8.2	23.5	139.7
Queue Length 95th (m)	#76.3	16.5	67.1	#327.2	#256.0	m33.8	#175.3	m14.5	m#45.8	m#167.1
Internal Link Dist (m)		110.7		287.5			189.1			96.5
Turn Bay Length (m)	45.0		110.0			60.0		80.0	100.0	
Base Capacity (vph)	214	1123	535	614	590	176	1862	603	200	1937
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	77
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.93	0.17	0.56	1.34	1.22	0.72	0.92	0.18	0.80	1.01

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	190	94	84	284	783	684	120	1628	103	152	1605	179
Future Volume (vph)	190	94	84	284	783	684	120	1628	103	152	1605	179
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.2	3.1	3.3	3.2	3.0	3.2	3.2	3.0	3.2	3.2	3.1
Total Lost time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	1.00	1.00	1.00	0.91	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.93		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1658	3119		1725	1798	1431	1691	4859	1400	1658	4816	
Flt Permitted	0.11	1.00		0.61	1.00	1.00	0.09	1.00	1.00	0.09	1.00	
Satd. Flow (perm)	184	3119		1104	1798	1431	166	4859	1400	155	4816	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	200	99	88	299	824	720	126	1714	108	160	1689	188
RTOR Reduction (vph)	0	58	0	0	0	102	0	0	67	0	11	0
Lane Group Flow (vph)	200	129	0	299	824	618	126	1714	41	160	1866	0
Confl. Peds. (#/hr)	20		2	2		20	4		25	25		4
Heavy Vehicles (%)	4%	3%	1%	1%	1%	1%	2%	2%	3%	4%	1%	3%
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4	4		8	8	8	2	2	2	6	6	
Actuated Green, G (s)	47.0	37.0		47.0	37.0	37.0	49.0	42.0	42.0	53.0	44.0	
Effective Green, g (s)	49.0	41.0		49.0	41.0	41.0	51.0	46.0	46.0	55.0	48.0	
Actuated g/C Ratio	0.41	0.34		0.41	0.34	0.34	0.42	0.38	0.38	0.46	0.40	
Clearance Time (s)	4.0	7.0		4.0	7.0	7.0	4.0	7.0	7.0	4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	210	1065		507	614	488	172	1862	536	196	1926	
v/s Ratio Prot	c0.09	0.04		0.05	c0.46		0.05	0.35		c0.07	c0.39	
v/s Ratio Perm	0.30			0.19		0.43	0.26		0.03	0.31		
v/c Ratio	0.95	0.12		0.59	1.34	1.27	0.73	0.92	0.08	0.82	0.97	
Uniform Delay, d1	31.4	27.1		26.0	39.5	39.5	28.3	35.3	23.5	27.6	35.3	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.90	1.76	4.99	1.23	0.80	
Incremental Delay, d2	48.4	0.1		1.8	164.7	135.4	9.0	5.6	0.2	17.4	11.7	
Delay (s)	79.8	27.2		27.7	204.2	174.9	62.8	67.5	117.4	51.3	39.8	
Level of Service	E	C		C	F	F	E	E	F	D	D	
Approach Delay (s)		54.4			164.1			70.0			40.7	
Approach LOS		D			F			E			D	

Intersection Summary			
HCM 2000 Control Delay	87.3	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.11		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	106.8%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

APPENDIX D

ORIGIN-DESTINATION SURVEY METHODOLOGY

Origin-Destination Survey Methodology

Traffic Survey Analysis (TSA) Inc. was contracted to conduct a vehicle license plate trace to determine southbound traffic patterns from north of Harvester Road to east of Guelph Line along Harvester Road. Two surveys were conducted as follows:

For the first survey:

- Six locations and traffic patterns between the locations were surveyed, as illustrated in Figure 1**.** Locations 1 through 4 were selected to determine the southbound left turn traffic on Guelph Line at Harvester Road that could potentially be diverted to the South Service Road Link, if southbound left turn was provided on Guelph Line at the intersection, as well as record any additional traffic from the QEW W-N/S/E off-ramp that could be using the SSR Link.
- Locations 5 and 6 were selected to observe westbound traffic on Harvester Road, coming from the South Service Road. The traffic that turns right from the South Service Road to Harvester Road, and again to Guelph Line northbound, could potentially be diverted to the South Service Road Link if westbound traffic flow were enabled on the Link.
- The survey was conducted on November 7-8, 2012 at the six locations, during the 3 hr AM and 3 hr PM peak periods from 6:30-9:30 and 15:30-18:30. Locations 5 and 6 were surveyed on November 7th, while Locations 1, 2, 3 and 4 were surveyed on November 8th.

For the second survey:

- Four locations and traffic patterns between the locations were surveyed, as illustrated in Figure 2**.** Locations A through D were selected to determine the level of utilization of the westbound right lane options based on the proportion of vehicles destined towards the Queen Elizabeth Way eastbound and westbound, and North Service Road.
- The survey was conducted on January 15, 2013 at the four locations, during the 3 hr PM peak period from 15:45-18:45.
- The license plates were traced by the first three characters.
- Each location was assigned 1 or 2 surveyors depending on the volume of traffic. License plates were recorded manually on paper.

It is noteworthy that an incident may have occurred on the QEW on November 8th, resulting in a blockage of two lanes of traffic eastbound on the QEW for a short period of time; however there is no indication that it affected the results of the license plate trace.

The results of the license plate survey is summarized in Figure 3 and Figure 4.

Figure 1. Survey 1 – Origin & Destination Traffic Flow and Count Locations

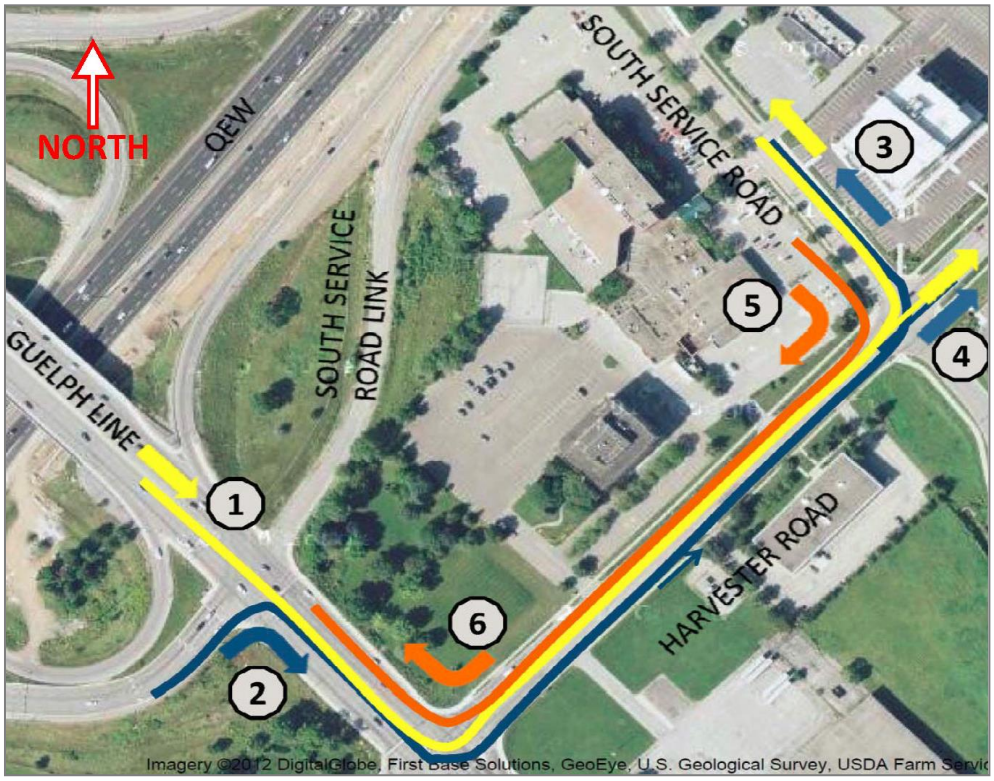


Figure 2. Survey 2 – Origin & Destination Traffic Flow and Count Locations

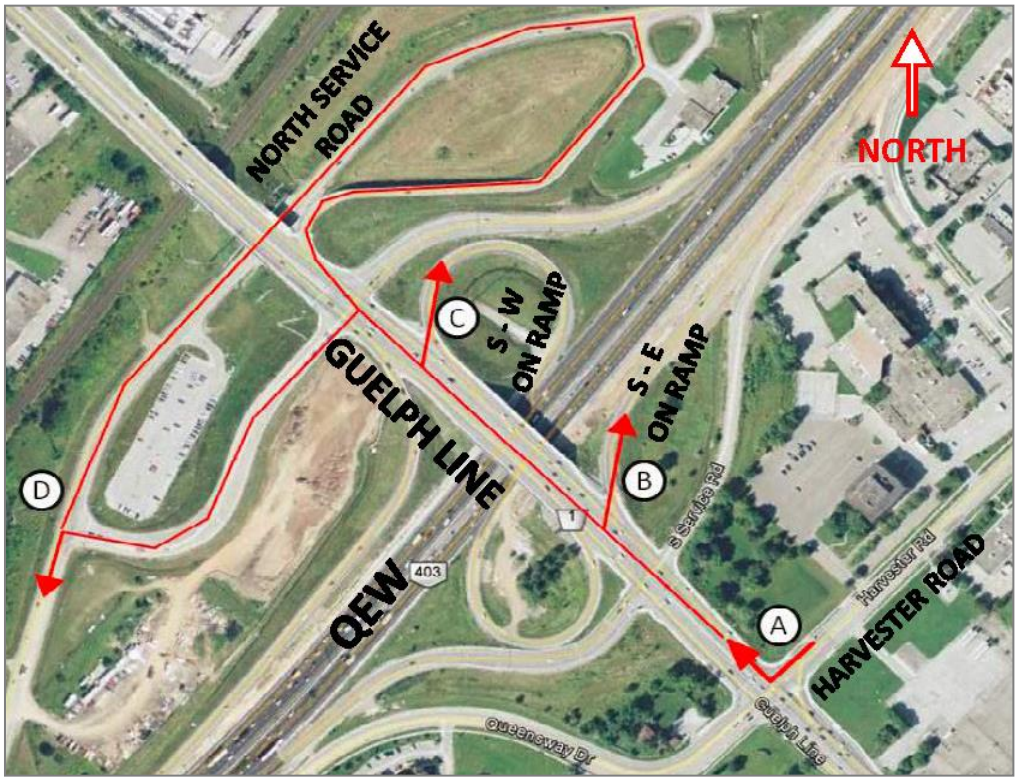


Figure 3. Survey 1 – Origin & Destination Survey Results

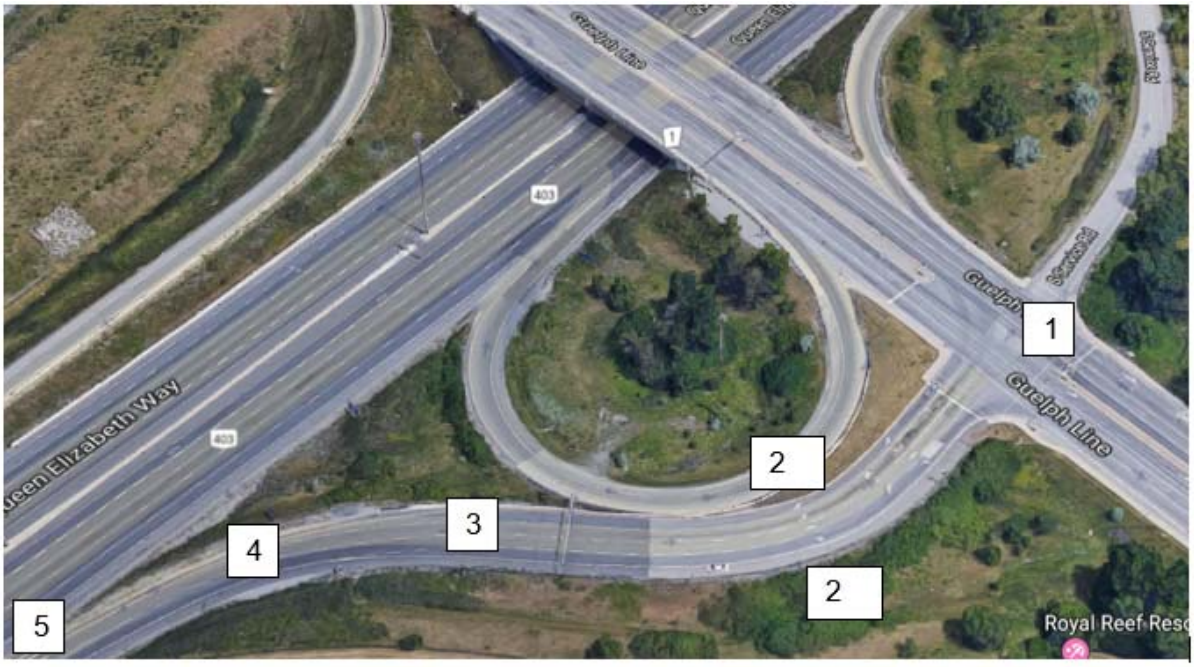
Origin	Destination	AM Peak			PM Peak		
		O-D Vehicle Matches	Total SBL	%	O-D Vehicle Matches	Total SBL	%
North of QEW (1)	South Service Road (3)	100	766 (SBL at Guelph Line / Harvester Road)	13%	33	275 (SBL at Guelph Line / Harvester Road)	12%
QEW Ramp W-N/S (2)	South Service Road (3)	41		5%	25		9%
North of QEW (1)	East of Laurentian Dr along Harvester Rd (4)	258		34%	121		44%
QEW Ramp W-N/S (2)	East of Laurentian Dr along Harvester Rd (4)	271		35%	96		35%
North of QEW (1) or Ramp W-N/S (2)	Other (incl. north on Laurentian Drive or entry to Commercial Developments)	96		13%	0		0%
South Service Road, North of Laurentian Drive (5)	Westbound Right at Guelph Line/Harvester Road (6)	81	502 (Total WBR at Guelph Line /Harvester Road)	16%	203	1,300 (Total WBR at Guelph Line / Harvester Road)	16%

Figure 4. Survey 2 – Origin & Destination Survey Results

Origin	Destination	O-D Vehicle Matches	Total WBR at Guelph Lane / Harvester Rd	%
WBR at Guelph Lane / Harvester Rd (A)	QEW Ramp S-E (B)	306	1,754	18%
	QEW Ramp S-W (C)	737		42%
	North Service Rd (D)	428		24%
	Other (incl. northbound on Guelph Line)	283		16%

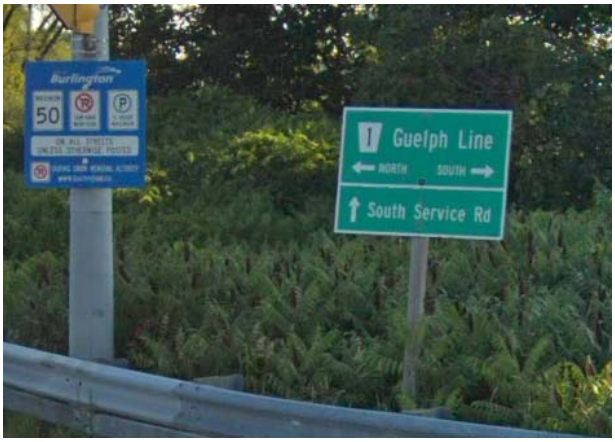
SUMMARY OF EXISTING SIGNING ON QEW

RAMP W-N/S/E, APPROACHING GUELPH LINE



Location 1 - At the intersection (looking east)

Guide signing for the South Service Road located is located in the south – east quadrant of the Guelph Line - Ramp W-N/S/E intersection



Location 2 - Approaching the intersection (looking east)

Location 2A - Ground mounted signing for the South Service Road is in place along the left side of the Ramp W-N/S/E, approximately 45m in advance of the intersection (stop bar)

Location 2B - Ground mounted signing for 'Harvester Road' is in place along the right side of the Ramp W-N/S/E, approximately 60m in advance of the intersection.

Location 3 - Approaching the intersection (looking east)

Location 4 - Approaching the intersection (looking east)

Location 5 - Approaching the intersection (looking east)

General Comments

- The Ramp W-N/S/E is approximately 250m in length (from bullnose to stop bar)
- Pavement width transitions from 2 - 4 lanes approx. 150m in advance of the intersection
- Overhead lane designation signing is approximately 115m in advance of intersection
- **Signing for the South Service Road (SSR) is located on the left side of the ramp, approximately 45m in advance of the intersection. This sign is located well into the 4 lane section of the ramp and adjacent to two left turn lanes. The through lane to the SSR is 3rd lane from the left**.
- Advance signing for Harvester Road is approximately 60m in advance of stop bar.

To help capture traffic which originates from the Ramp E-N/S/E and is destined to the South Service Road, but does so via Harvester Road (estimated to be 5% of the SBL turn volume at Harvester), it is recommended that additional signing be provided along the ramp.

- Consider relocating the existing sign on the left from 45m to approximately 150m in advance of the intersection (approx. 100m beyond the bullnose), prior to fully transitioning to 4 lanes.
- Consider additional guide signing on the right side for the South Service Road. Combine with the Harvester Road signing (possible relocate the sign from 60m to approximately 90m in advance of the intersection).

APPENDIX E

CONCEPT PLANS FOR ALTERNATIVES I, II, III, IV, and V

SOUTH SERVICE RD.

LINK

HARVESTER ROAD

70m RT TAPER

60m(MIN.) RT PARALLEL

P/L

GUELPH LINE

McDOWELL RD.

RAMP N-E

RAMP W-N/S/E

R=18

R=20

R=30

R=15

2.0m S/W

1.5m S/W

3.50

3.25

2.00

602

605

610

642

641

644

648

649

652

653

956

ALTERNATIVE I

SCALE 1:1000

DRAWING NAME: J:\24RX12.0315_Halton-Guelph-Line-Improvements\5.0 Design (Work) Phase\04_Preliminary Design\Design Alternatives\Guelph Line_Alternative 1.dwg
CREATED:
MODIFIED: BILJANA.STOJANOVA Apr 29, 2019

QUEEN ELIZABETH WAY WB

RAMP S-E

SOUTH SERVICE RD.

LINK

GUELPH LINE

HARVESTER ROAD

70m RT TAPER

60m(MIN.) RT PARALLEL

2.0m S/W

R=25

4.20
3.50
3.50
3.00

MATCH EX ISLAND

2.0 ISLAND

4.20
3.50
3.50

2.00 ISLAND 3.00

2.00 ISLAND

3.00

130m LEFT TURN TAPER

68m(PARALLEL+STORAGE)

QUEEN ELIZABETH WAY EB

RAMP N-E

RAMP W-N/S/E

GLENWOOD SCHOOL DR.

602
605
610
641
642
644
648
649
956

ALTERNATIVE II

SCALE 1:1000

DRAWING NAME: J:\24RAI12.0315_Halton-Guelph-Line-Improvements\5.0 Design (Work) Phase\04_Preliminary Design\Design Alternatives\Guelph Line_Alternative II.dwg
CREATED:
MODIFIED: BILJANA.STOJANOVA Apr 29, 2019

QUEEN ELIZABETH WAY WB

SOUTH SERVICE RD. LINK

HARVESTER ROAD

70m RT TAPER

60m(MIN.) RT PARALLEL

GUELPH LINE

MATCHLEX ISLAND

68m(PARALLEL+STORAGE)

130m LEFT TURN TAPER

68m(PARALLEL+STORAGE)

QUEEN ELIZABETH WAY EB

RAMP N-E

RAMP W-N/S/E

QUEENSWAY DRIVE

ALTERNATIVE III

SCALE 1:1500

DRAWING NAME: z:\24RXT2.0315_Halton-Guelph-Line-Improvements\5.0 Design (Work) Phase\04_Preliminary Design\Design Alternatives\Guelph Line_Alternative III.dwg
CREATED:
MODIFIED: BILJANA.STOJANOVA Apr 29, 2019

ALTERNATIVE IV

SCALE 1:1500

RAMP S-E

SOUTH SERVICE RD.

QUEEN ELIZABETH WAY EB

RAMP W-N/S/E

HARVESTER ROAD

GUELPH LINE

70m RT TAPER

70m RT TAPER

60m(MIN.) RT PARALLEL

R=1400

R=2200

DRAWING NAME: x:\24RX12.0315_Halton-Guelph-Line-Improvements\5.0 Design (Work) Phase\04_Preliminary Design\Design Alternatives\Guelph Line_Alternative IV.dwg
CREATED:
MODIFIED: BILJANA.STOJANOVA Apr 30, 2019

QUEEN ELIZABETH WAY WB

RAMP S-E

SOUTH SERVICE RD.

LINK

GUELPH LINE

QUEEN ELIZABETH WAY EB

RAMP N-E

RAMP W-N/S/E

HARVESTER ROAD

GLENWOOD SCHOOL DR.

70m RT TAPER

60m(MIN.) RT PARALLEL

2.0m S/W

R=15

602

605

610

956

642

641

644

648

649

ALTERNATIVE V

SCALE 1:1000

DRAWING NAME: z:\24RX12.0315_Halton-Guelph-Line-Improvements\5.0 Design (Work) Phase\04_Preliminary Design\Design Alternatives\Guelph Line_Alternative II.dwg
CREATED:
MODIFIED: BILJANA.STOJANOVA Apr 29, 2019

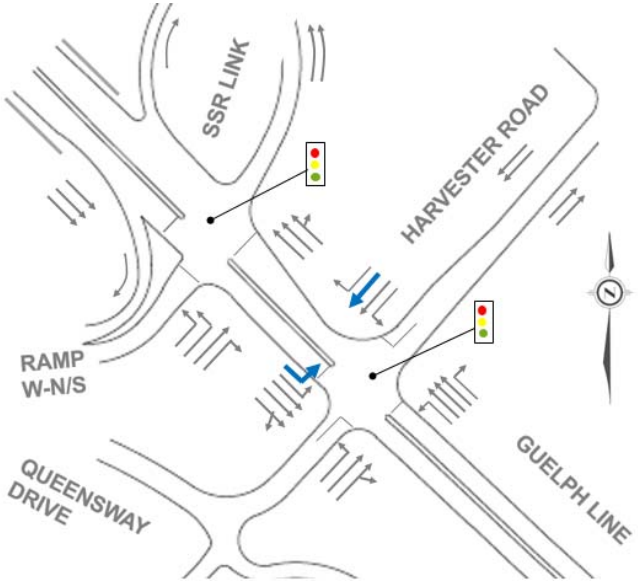
APPENDIX F

SYNCHRO OUTPUT FOR ALTERNATIVES I, II, III, IV, and V

ALTERNATIVE I

Overview:

- Provide dual SBL at Harvester Road
- Add WBT on Harvester Road



Future 2023 (2031) Operations Analysis:

INTERSECTION	AM PEAK HOUR			PM PEAK HOUR		
	V/C	Delay (s)	LOS	V/C	Delay (s)	LOS
Guelph Line & W-N/S/E Off Ramp / South Service Road Link	0.65 (0.72)	17.1 (18.9)	B (B)	0.67 (0.76)	13.8 (15.9)	B (B)
Critical Movements (v/c)	--			EBR = (0.86)		
Guelph Line & Harvester Road / Queensway Drive	0.71 (0.74)	30.1 (30.9)	C (C)	0.98 **(1.02)**	54.1 (57.2)	D (E)
Critical Movements (v/c)	EBL = 0.86 (0.88) QL > 70 m (73 m)			**EBL = 1.08 (1.12),** QL ≥ 96 m (100 m) WBT = 0.90 (0.93) **WBR = 1.02 (1.06),** QL ≥ 225 m (240 m) NBT = 0.90 (0.94)		

Notes: () bracketed values represent 2031 conditions

Incorporate signal modifications at Guelph Line – W-N/S/E Off-Ramp (add NB Advance /EB RT overlap phase during PM, i.e. 65 sec N/S, 45 sec EB, plus 10 sec NB Advance /EB RT overlap)

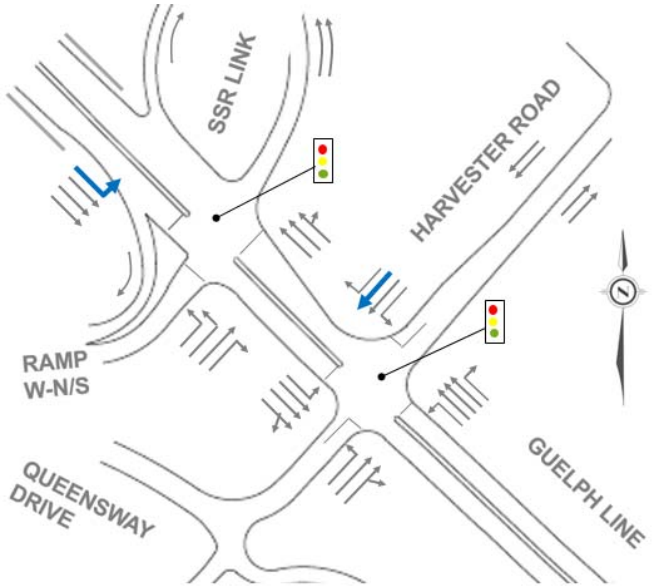
Remarks

- Guelph Line - Harvester Road intersection and several key movements operate at/overcapacity during PM peak hour
- Introduction of second SBL will provide additional storage and accommodate left turn queues (i.e. QL > 75 m per lane), however dual SBL is more restrictive from a signal phasing perspective and less desirable during PM and off-peak periods.
- During the AM peak hour, SBL queues (95th percentile) at Harvester Road will exceed storage available and on occasion extend to/beyond the upstream intersection (i.e. up to 70m beyond the intersection by 2023 and 80m by 2031)
- Guelph Line - W-N/S/E Off Ramp / South Service Road Link intersection operates acceptable; however the EBR is expected to reach/exceed critical threshold level (i.e. v/c >0.85) during the PM peak hour and 95th percentile queues are expected to reach/exceed the available right turn lane storage.

ALTERNATIVE II

Overview:

- Add SBL at the South Service Road Link
- Add WBT on Harvester Road



Future 2023 (2031) Operations Analysis:

INTERSECTION	AM PEAK HOUR			PM PEAK HOUR		
	V/C	Delay (s)	LOS	V/C	Delay (s)	LOS
Guelph Line & W-N/S/E Off Ramp / South Service Road Link	0.68 (0.73)	20.6 (21.6)	C (C)	0.67 (0.76)	14.0 (16.1)	B (B)
Critical Movements (v/c)	--			EBR = (0.86)		
Guelph Line & Harvester Road / Queensway Drive	0.74 (0.75)	29.3 (30.8)	C (C)	0.94 (0.98)	49.6 (52.4)	D (D)
Critical Movements (v/c)	None			EBL = 0.98 **(1.02)** QL ≥ 75 m (79 m) WBT = 0.90 (0.93) WBR = 1.00 **(1.02)** QL ≥ 220 m (234 m) NBT = 0.86 (0.92)		

Notes: () bracketed values represent 2031 conditions

Incorporate signal modifications at Guelph Line – W-N/S/E Off-Ramp (add NB Advance /EB RT overlap phase during PM, i.e. 65 sec N/S, 45 sec EB, plus 10 sec NB Advance /EB RT overlap)

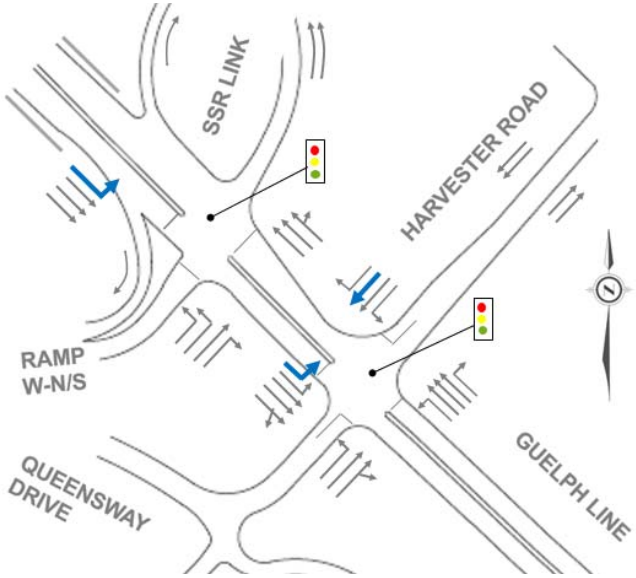
Remarks

- Guelph Line – Harvester Road intersection and all movements operate at/under capacity during 2023 conditions
- Provides additional westbound capacity with additional through lane and dedicated WBR.
- Introduction of SBL upstream of Harvester Road (reducing queuing between intersections). SBL will continue to operate under permissive phasing. During the AM peak hour, SBL queues (95th percentile) at Harvester Road potentially extending to/beyond the upstream intersection (i.e. up to 25m beyond the intersection by 2023 and 35m by 2031) may be accommodated by the upstream SBL.
- Guelph Line - W-N/S/E Off-Ramp/SSR Link intersection operates well and experiences minor delays in both the AM and PM peak hours.

ALTERNATIVE III

Overview:

- Add SBL at the South Service Road Link and SBL (dual) at Harvester Road
- Add WBT on Harvester Road



Future 2023 (2031) Operations Analysis:

INTERSECTION	AM PEAK HOUR			PM PEAK HOUR		
	V/C	Delay (s)	LOS	V/C	Delay (s)	LOS
Guelph Line & W-N/S/E Off Ramp / South Service Road Link	0.68 (0.73)	20.8 (21.9)	C (C)	0.67 (0.76)	14.0 (16.1)	B (B)
Critical Movements (v/c)	--			EBR = (0.86)		
Guelph Line & Harvester Road / Queensway Drive	0.63 (0.66)	26.1 (26.8)	C (C)	0.94 (0.98)	49.9 (52.8)	D (D)
Critical Movements (v/c)	None			EBL = 0.98 (**1.02**) QL ≥ 75 m (79 m) WBT = 0.90 (0.93) WBR = 0.99 (**1.01**) QL ≥ 217 m (231 m) NBT = 0.87 (0.93)		

Notes: () bracketed values represent 2031 conditions

Incorporates signal modifications at Guelph Line – W-N/S/E Off-Ramp (add NB Advance /EB RT overlap phase during PM, i.e. 65 sec N/S, 45 sec EB, plus 10 sec NB Advance /EB RT overlap)

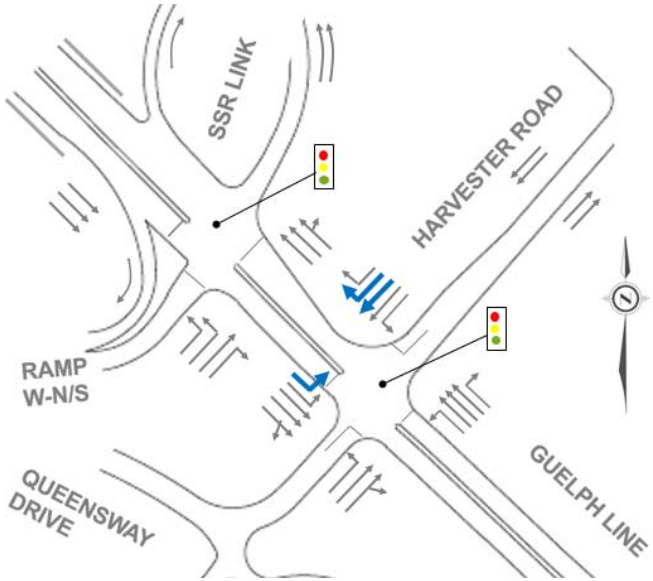
Remarks

- Guelph Line – Harvester Road intersection and all movements operate at/under capacity during 2023 conditions
- Provides additional westbound capacity with additional through lane and dedicated WBR.
- Introduction of second SBL, as well as SBL upstream of Harvester Road, will provide additional storage and accommodate left turn queues (i.e. QL > 60 m per lane), however dual SBL is more restrictive from a signal phasing perspective and less desirable during PM and off-peak periods.
- Guelph Line - W-N/S/E Off-Ramp/SSR Link intersection operates well and experiences minor delays in both the AM and PM peak hours.

ALTERNATIVE IV

Overview:

- Add SBL (dual) at Harvester Road
- Add WBT on Harvester Road



Future 2023 (2031) Operations Analysis:

INTERSECTION	AM PEAK HOUR			PM PEAK HOUR		
	V/C	Delay (s)	LOS	V/C	Delay (s)	LOS
Guelph Line & W-N/S/E Off Ramp / South Service Road Link	0.65 (0.72)	17.6 (19.4)	B (B)	0.67 (0.76)	14.6 (16.8)	B (B)
Critical Movements (v/c)	--			EBR = (0.86)		
Guelph Line & Harvester Road / Queensway Drive	0.71 (0.74)	28.8 (29.5)	C (C)	0.85 (0.89)	40.7 (42.7)	(D) (D)
Critical Movements (v/c)	None			EBL = 0.89 (0.90) QL ≥ 86 m (90 m) WBT = 0.89 (0.93) SBTR = 0.86 (0.89)		

Notes: () bracketed values represent 2031 conditions

Incorporates signal modifications at Guelph Line – W-N/S/E Off-Ramp (add NB Advance /EB RT overlap phase during PM, i.e. 65 sec N/S, 45 sec EB, plus 10 sec NB Advance /EB RT overlap

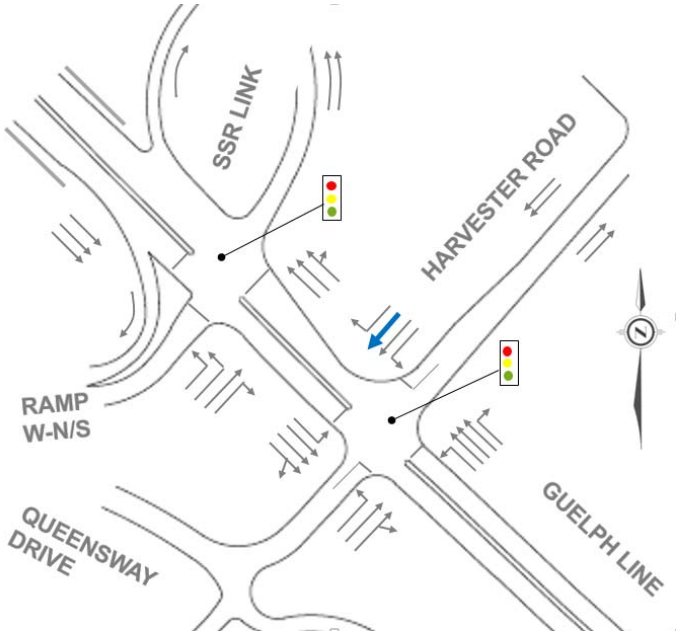
Remarks

- Guelph Line – Harvester Road intersection and all movements operate at/under capacity during 2023 and 2031 conditions
- Provides additional westbound capacity with additional through lane and dedicated (dual) WBR; however dual WBR is more restrictive from a signal phasing and pedestrian crossing perspective, and introduces potential weaving concerns on Guelph Line. Requires EBL at Harvester Road be restricted to protect phase only. Potentially requires eliminating the pedestrian crossing from the north side of the Guelph Line – Harvester Road intersection.
- Introduction of second SBL will provide additional storage and accommodate left turn queues (i.e. QL > 75 m per lane), however dual SBL is more restrictive from a signal phasing perspective and less desirable during PM and off-peak periods.
- Guelph Line - W-N/S/E Off-Ramp/SSR Link intersection operates well and experiences minor delays in both the AM and PM peak hours.

ALTERNATIVE V

Overview:

- Add WBT on Harvester Road



Future 2023 (2031) Operations Analysis:

INTERSECTION	AM PEAK HOUR			PM PEAK HOUR		
	V/C	Delay (s)	LOS	V/C	Delay (s)	LOS
Guelph Line & W-N/S/E Off Ramp / South Service Road Link	0.65 (0.72)	17.1 (18.9)	B (B)	0.67 (0.76)	14.0 (16.0)	B (B)
Critical Movements (v/c)	--			EBR = (0.86)		
Guelph Line & Harvester Road / Queensway Drive	0.78 (0.81)	33.4 (35.6)	C (D)	0.94 (0.98)	49.6 (52.5)	D (D)
Critical Movements (v/c)	NBT = 0.92 (0.96) SBL = 0.85 (0.90) QL ≥ 160 m (172 m)			EBL = 0.98 (0.95) QL ≥ 75 m (75 m) WBT = 0.90 (0.93) WBR = 1.00 **(1.01)** QL ≥ 220 m (231 m) NBT = 0.86 (0.95)		

Notes: () bracketed values represent 2031 conditions

Incorporate signal modifications at Guelph Line – W-N/S/E Off-Ramp (add NB Advance /EB RT overlap phase during PM, i.e. 65 sec N/S, 45 sec EB, plus 10 sec NB Advance /EB RT overlap)

Remarks

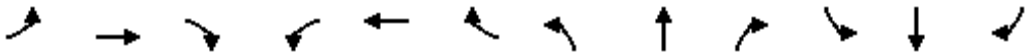
- Intersection operates near capacity during 2023 conditions, with westbound right turn operating at capacity during the PM peak hour.
- Provides additional westbound capacity with additional through lane and dedicated WBR.
- Maintains single SB left turn at Harvester Road with protected permissive phasing (operates at v/c = 0.85 during AM peak hour). Operates similar to existing condition. During the AM peak hour, SBL queues (95th percentile) at Harvester Road will exceed storage available and on occasion extend to/beyond the upstream intersection (i.e. up to 60m beyond the intersection).
- Guelph Line - W-N/S/E Off-Ramp/SSR Link intersection operates well and experiences minor delays in both the AM and PM peak hours.

APPENDIX F1 – 2023 AM PEAK (Synchro Output)

2: Guelph Line & W-N/S OFF RAMP/SSR Link

Lane Group	EBL	EBT	EBR	NBT	SBT
Lane Group Flow (vph)	711	493	408	1675	1639
v/c Ratio	0.61	0.76	0.71	0.48	0.58
Control Delay	30.2	38.2	33.6	3.1	17.6
Queue Delay	0.0	0.0	0.0	0.2	0.0
Total Delay	30.2	38.2	33.6	3.3	17.6
Queue Length 50th (m)	62.0	89.9	66.0	9.2	71.6
Queue Length 95th (m)	73.5	118.0	92.9	12.5	98.5
Internal Link Dist (m)		328.8		96.5	49.4
Turn Bay Length (m)	180.0		160.0		
Base Capacity (vph)	1371	759	661	3525	2828
Starvation Cap Reductn	0	0	0	858	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.52	0.65	0.62	0.63	0.58

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	675	468	388	0	0	0	0	1569	22	0	1557	0
Future Volume (vph)	675	468	388	0	0	0	0	1569	22	0	1557	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.1	3.1	3.1	3.4	3.1	3.4	3.1	3.4	3.1	3.1	3.4	3.1
Total Lost time (s)	3.0	3.0	3.0					3.0			3.0	
Lane Util. Factor	0.97	1.00	1.00					0.86			0.91	
Frpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	
Flpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	
Frt	1.00	1.00	0.85					1.00			1.00	
Flt Protected	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (prot)	3211	1777	1495					6075			4877	
Flt Permitted	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (perm)	3211	1777	1495					6075			4877	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	711	493	408	0	0	0	0	1652	23	0	1639	0
RTOR Reduction (vph)	0	0	25	0	0	0	0	1	0	0	0	0
Lane Group Flow (vph)	711	493	383	0	0	0	0	1674	0	0	1639	0
Confl. Peds. (#/hr)							4		1	1		
Heavy Vehicles (%)	3%	1%	2%	2%	2%	2%	2%	5%	2%	2%	4%	2%
Turn Type	Prot	NA	Perm					NA			NA	
Protected Phases	7	4						2			2	
Permitted Phases		4	4					2			2	
Actuated Green, G (s)	36.2	36.2	36.2					59.8			59.8	
Effective Green, g (s)	40.2	40.2	40.2					63.8			63.8	
Actuated g/C Ratio	0.37	0.37	0.37					0.58			0.58	
Clearance Time (s)	7.0	7.0	7.0					7.0			7.0	
Vehicle Extension (s)	3.0	3.0	3.0					3.0			3.0	
Lane Grp Cap (vph)	1173	649	546					3523			2828	
v/s Ratio Prot	0.22	c0.28						0.28			c0.34	
v/s Ratio Perm			0.26									
v/c Ratio	0.61	0.76	0.70					0.48			0.58	
Uniform Delay, d1	28.4	30.7	29.8					13.4			14.6	
Progression Factor	1.00	1.00	1.00					0.19			1.09	
Incremental Delay, d2	0.9	5.1	4.0					0.3			0.6	
Delay (s)	29.3	35.8	33.8					2.9			16.5	
Level of Service	C	D	C					A			B	
Approach Delay (s)		32.4			0.0			2.9			16.5	
Approach LOS		C			A			A			B	

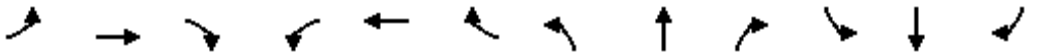
Intersection Summary			
HCM 2000 Control Delay	17.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	61.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

3: Guelph Line & Queensway Drive/Harvester Rd

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	160	402	100	97	195	61	1320	276	504	1505
v/c Ratio	0.86	0.60	0.37	0.16	0.28	0.28	0.72	0.38	0.74	0.60
Control Delay	85.4	40.6	29.1	36.5	11.0	17.5	27.3	6.7	54.9	18.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Total Delay	85.4	40.6	29.1	36.5	11.0	17.5	27.3	6.7	54.9	18.9
Queue Length 50th (m)	34.1	38.7	15.2	9.2	14.2	4.7	42.8	4.8	57.9	70.5
Queue Length 95th (m)	#69.7	51.5	25.2	15.4	25.9	m11.3	69.5	m22.5	75.3	67.6
Internal Link Dist (m)		110.7		287.5			189.1			96.5
Turn Bay Length (m)	45.0		110.0		200.0	60.0		80.0	100.0	
Base Capacity (vph)	190	931	298	934	691	229	1827	728	688	2523
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	264
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.84	0.43	0.34	0.10	0.28	0.27	0.72	0.38	0.73	0.67

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	152	307	75	95	92	185	58	1254	262	479	1301	129
Future Volume (vph)	152	307	75	95	92	185	58	1254	262	479	1301	129
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.2	3.1	3.3	3.2	3.0	3.2	3.2	3.0	3.2	3.2	3.1
Total Lost time (s)	3.0	3.0		3.0	3.0	0.0	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	0.91	1.00	0.97	0.91	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1612	3234		1676	3317	1450	1627	4766	1455	3313	4732	
Flt Permitted	0.95	1.00		0.31	1.00	1.00	0.14	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1612	3234		546	3317	1450	243	4766	1455	3313	4732	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	160	323	79	100	97	195	61	1320	276	504	1369	136
RTOR Reduction (vph)	0	22	0	0	0	46	0	0	170	0	9	0
Lane Group Flow (vph)	160	380	0	100	97	149	61	1320	106	504	1496	0
Confl. Peds. (#/hr)	6		4	4		6	11		3	3		11
Heavy Vehicles (%)	7%	2%	8%	4%	4%	3%	6%	4%	2%	1%	3%	4%
Turn Type	Prot	NA		pm+pt	NA	pm+ov	pm+pt	NA	Perm	Prot	NA	
Protected Phases	7	4		3	8	1	5	2		1	6	
Permitted Phases		4		8	8	8	2	2	2		6	
Actuated Green, G (s)	11.8	18.1		26.3	16.3	38.1	44.4	38.1	38.1	21.8	53.6	
Effective Green, g (s)	12.8	22.1		28.3	20.3	46.1	46.4	42.1	42.1	22.8	57.6	
Actuated g/C Ratio	0.12	0.20		0.26	0.18	0.42	0.42	0.38	0.38	0.21	0.52	
Clearance Time (s)	4.0	7.0		4.0	7.0	4.0	4.0	7.0	7.0	4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	187	649		253	612	607	194	1824	556	686	2477	
v/s Ratio Prot	c0.10	c0.12		0.04	0.03	0.06	0.02	c0.28		c0.15	0.32	
v/s Ratio Perm				0.06		0.05	0.11		0.07			
v/c Ratio	0.86	0.59		0.40	0.16	0.25	0.31	0.72	0.19	0.73	0.60	
Uniform Delay, d1	47.7	39.8		32.5	37.7	20.7	19.2	29.0	22.6	40.8	18.3	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.23	0.82	1.57	1.21	0.93	
Incremental Delay, d2	29.7	1.4		1.0	0.1	0.2	0.7	2.0	0.6	3.3	0.9	
Delay (s)	77.4	41.2		33.5	37.8	20.9	24.4	25.8	36.2	52.5	17.8	
Level of Service	E	D		C	D	C	C	C	D	D	B	
Approach Delay (s)		51.5			28.3			27.5			26.5	
Approach LOS		D			C			C			C	

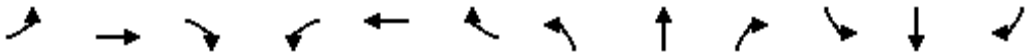
Intersection Summary			
HCM 2000 Control Delay	30.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	69.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

2: Guelph Line & W-N/S OFF RAMP/SSR Link

Lane Group	EBL	EBT	EBR	NBT	SBL	SBT
Lane Group Flow (vph)	711	493	408	1675	92	1547
v/c Ratio	0.61	0.76	0.68	0.63	0.35	0.52
Control Delay	30.2	38.2	29.0	21.6	23.3	7.6
Queue Delay	0.0	0.0	1.5	2.0	0.0	0.0
Total Delay	30.2	38.2	30.5	23.7	23.3	7.6
Queue Length 50th (m)	62.0	89.9	58.3	102.6	5.7	29.8
Queue Length 95th (m)	73.5	118.0	84.9	112.8	m13.6	42.7
Internal Link Dist (m)		328.8		96.5		49.4
Turn Bay Length (m)	180.0		160.0		100.0	
Base Capacity (vph)	1371	759	684	2638	266	2961
Starvation Cap Reductn	0	0	0	770	0	0
Spillback Cap Reductn	0	0	131	0	0	32
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.52	0.65	0.74	0.90	0.35	0.53

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	675	468	388	0	0	0	0	1569	22	87	1470	0
Future Volume (vph)	675	468	388	0	0	0	0	1569	22	87	1470	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.1	3.1	3.1	3.4	3.1	3.4	3.1	3.4	3.1	3.1	3.4	3.1
Total Lost time (s)	3.0	3.0	3.0					3.0		3.0	0.0	
Lane Util. Factor	0.97	1.00	1.00					0.86		1.00	0.91	
Frpb, ped/bikes	1.00	1.00	1.00					1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00					1.00		1.00	1.00	
Frt	1.00	1.00	0.85					1.00		1.00	1.00	
Flt Protected	0.95	1.00	1.00					1.00		0.95	1.00	
Satd. Flow (prot)	3211	1777	1495					6075		1671	4877	
Flt Permitted	0.95	1.00	1.00					1.00		0.09	1.00	
Satd. Flow (perm)	3211	1777	1495					6075		157	4877	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	711	493	408	0	0	0	0	1652	23	92	1547	0
RTOR Reduction (vph)	0	0	50	0	0	0	0	2	0	0	0	0
Lane Group Flow (vph)	711	493	358	0	0	0	0	1673	0	92	1547	0
Confl. Peds. (#/hr)							4		1	1		
Heavy Vehicles (%)	3%	1%	2%	2%	2%	2%	2%	5%	2%	2%	4%	2%
Turn Type	Prot	NA	Perm					NA		pm+pt	NA	
Protected Phases	7	4						2		1	1 2	
Permitted Phases		4	4					2		1 2	2	
Actuated Green, G (s)	36.2	36.2	36.2					43.7		55.8	59.8	
Effective Green, g (s)	40.2	40.2	40.2					47.7		57.8	63.8	
Actuated g/C Ratio	0.37	0.37	0.37					0.43		0.53	0.58	
Clearance Time (s)	7.0	7.0	7.0					7.0		4.0		
Vehicle Extension (s)	3.0	3.0	3.0					3.0		3.0		
Lane Grp Cap (vph)	1173	649	546					2634		262	2828	
v/s Ratio Prot	0.22	c0.28						c0.28		0.04	c0.32	
v/s Ratio Perm			0.24							0.14		
v/c Ratio	0.61	0.76	0.66					0.64		0.35	0.55	
Uniform Delay, d1	28.4	30.7	29.1					24.4		15.8	14.2	
Progression Factor	1.00	1.00	1.00					0.84		1.56	0.53	
Incremental Delay, d2	0.9	5.1	2.8					0.9		0.5	0.1	
Delay (s)	29.3	35.8	32.0					21.4		25.3	7.7	
Level of Service	C	D	C					C		C	A	
Approach Delay (s)		32.0			0.0			21.4			8.7	
Approach LOS		C			A			C			A	

Intersection Summary			
HCM 2000 Control Delay	20.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	62.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

3: Guelph Line & Queensway Drive/Harvester Rd

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	160	402	100	97	195	61	1320	276	413	1505
v/c Ratio	0.44	0.60	0.43	0.15	0.25	0.27	0.78	0.40	0.82	0.57
Control Delay	32.9	40.6	32.8	35.6	6.6	14.8	29.8	6.8	40.4	23.6
Queue Delay	0.5	0.0	0.0	0.0	0.0	0.0	0.1	0.0	7.1	0.7
Total Delay	33.5	40.6	32.8	35.6	6.6	14.8	29.9	6.8	47.5	24.3
Queue Length 50th (m)	26.2	38.7	15.7	9.1	8.5	4.7	43.4	4.8	75.3	97.3
Queue Length 95th (m)	40.8	51.5	26.8	15.4	19.4	m11.2	69.5	m22.5	#123.6	113.6
Internal Link Dist (m)		110.7		287.5			189.1			96.5
Turn Bay Length (m)	45.0		110.0		200.0	60.0		80.0	100.0	
Base Capacity (vph)	363	931	236	934	789	234	1701	696	502	2620
Starvation Cap Reductn	0	0	0	0	0	0	0	0	58	685
Spillback Cap Reductn	45	0	0	0	8	0	36	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.50	0.43	0.42	0.10	0.25	0.26	0.79	0.40	0.93	0.78

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

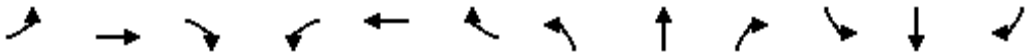
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	152	307	75	95	92	185	58	1254	262	392	1301	129
Future Volume (vph)	152	307	75	95	92	185	58	1254	262	392	1301	129
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.2	3.1	3.3	3.2	3.0	3.2	3.2	3.0	3.2	3.2	3.1
Total Lost time (s)	3.0	3.0		3.0	3.0	0.0	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1604	3234		1677	3317	1451	1627	4766	1455	1708	4732	
Flt Permitted	0.68	1.00		0.28	1.00	1.00	0.16	1.00	1.00	0.10	1.00	
Satd. Flow (perm)	1155	3234		500	3317	1451	276	4766	1455	183	4732	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	160	323	79	100	97	195	61	1320	276	413	1369	136
RTOR Reduction (vph)	0	22	0	0	0	58	0	0	177	0	9	0
Lane Group Flow (vph)	160	380	0	100	97	137	61	1320	99	413	1496	0
Confl. Peds. (#/hr)	6		4	4		6	11		3	3		11
Heavy Vehicles (%)	7%	2%	8%	4%	4%	3%	6%	4%	2%	1%	3%	4%
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8	1	5	2		1	6	
Permitted Phases	4	4		8	8	8	2	2	2	6	6	
Actuated Green, G (s)	26.1	18.1		25.7	17.9	44.7	41.4	35.3	35.3	66.1	56.0	
Effective Green, g (s)	28.1	22.1		27.7	21.9	52.7	43.4	39.3	39.3	67.1	60.0	
Actuated g/C Ratio	0.26	0.20		0.25	0.20	0.48	0.39	0.36	0.36	0.61	0.55	
Clearance Time (s)	4.0	7.0		4.0	7.0	4.0	4.0	7.0	7.0	4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	331	649		220	660	695	196	1702	519	497	2581	
v/s Ratio Prot	c0.04	c0.12		0.04	0.03	0.06	0.02	0.28		c0.21	0.32	
v/s Ratio Perm	0.08			0.08		0.04	0.10		0.07	c0.30		
v/c Ratio	0.48	0.59		0.45	0.15	0.20	0.31	0.78	0.19	0.83	0.58	
Uniform Delay, d1	33.9	39.8		33.1	36.3	16.5	20.9	31.4	24.4	29.0	16.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.03	0.82	1.57	1.04	1.31	
Incremental Delay, d2	1.1	1.4		1.5	0.1	0.1	0.7	2.8	0.6	9.8	0.8	
Delay (s)	35.0	41.2		34.6	36.4	16.6	22.4	28.5	39.0	40.0	22.6	
Level of Service	C	D		C	D	B	C	C	D	D	C	
Approach Delay (s)		39.4			26.1			30.0			26.4	
Approach LOS		D			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	29.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	77.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	NBT	SBL	SBT
Lane Group Flow (vph)	711	493	408	1675	92	1547
v/c Ratio	0.61	0.76	0.68	0.63	0.35	0.52
Control Delay	30.2	38.2	29.0	22.1	23.3	7.6
Queue Delay	0.0	0.0	0.8	1.9	0.0	0.0
Total Delay	30.2	38.2	29.9	24.0	23.3	7.6
Queue Length 50th (m)	62.0	89.9	58.3	97.3	5.7	29.8
Queue Length 95th (m)	73.5	118.0	84.9	108.6	m13.6	42.7
Internal Link Dist (m)		328.8		96.5		49.4
Turn Bay Length (m)	180.0		160.0		100.0	
Base Capacity (vph)	1371	759	684	2638	266	2961
Starvation Cap Reductn	0	0	0	758	0	0
Spillback Cap Reductn	0	0	93	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.52	0.65	0.69	0.89	0.35	0.52

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	675	468	388	0	0	0	0	1569	22	87	1470	0
Future Volume (vph)	675	468	388	0	0	0	0	1569	22	87	1470	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.1	3.1	3.1	3.4	3.1	3.4	3.1	3.4	3.1	3.1	3.4	3.1
Total Lost time (s)	3.0	3.0	3.0					3.0		3.0	0.0	
Lane Util. Factor	0.97	1.00	1.00					0.86		1.00	0.91	
Frpb, ped/bikes	1.00	1.00	1.00					1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00					1.00		1.00	1.00	
Frt	1.00	1.00	0.85					1.00		1.00	1.00	
Flt Protected	0.95	1.00	1.00					1.00		0.95	1.00	
Satd. Flow (prot)	3211	1777	1495					6075		1671	4877	
Flt Permitted	0.95	1.00	1.00					1.00		0.09	1.00	
Satd. Flow (perm)	3211	1777	1495					6075		157	4877	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	711	493	408	0	0	0	0	1652	23	92	1547	0
RTOR Reduction (vph)	0	0	50	0	0	0	0	2	0	0	0	0
Lane Group Flow (vph)	711	493	358	0	0	0	0	1673	0	92	1547	0
Confl. Peds. (#/hr)							4		1	1		
Heavy Vehicles (%)	3%	1%	2%	2%	2%	2%	2%	5%	2%	2%	4%	2%
Turn Type	Prot	NA	Perm					NA		pm+pt	NA	
Protected Phases	7	4						2		1	1 2	
Permitted Phases		4	4					2		1 2	2	
Actuated Green, G (s)	36.2	36.2	36.2					43.7		55.8	59.8	
Effective Green, g (s)	40.2	40.2	40.2					47.7		57.8	63.8	
Actuated g/C Ratio	0.37	0.37	0.37					0.43		0.53	0.58	
Clearance Time (s)	7.0	7.0	7.0					7.0		4.0		
Vehicle Extension (s)	3.0	3.0	3.0					3.0		3.0		
Lane Grp Cap (vph)	1173	649	546					2634		262	2828	
v/s Ratio Prot	0.22	c0.28						c0.28		0.04	c0.32	
v/s Ratio Perm			0.24							0.14		
v/c Ratio	0.61	0.76	0.66					0.64		0.35	0.55	
Uniform Delay, d1	28.4	30.7	29.1					24.4		15.8	14.2	
Progression Factor	1.00	1.00	1.00					0.86		1.56	0.53	
Incremental Delay, d2	0.9	5.1	2.8					1.0		0.5	0.1	
Delay (s)	29.3	35.8	32.0					21.9		25.3	7.7	
Level of Service	C	D	C					C		C	A	
Approach Delay (s)		32.0			0.0			21.9			8.7	
Approach LOS		C			A			C			A	

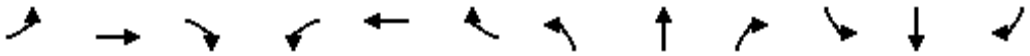
Intersection Summary			
HCM 2000 Control Delay	20.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	62.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

3: Guelph Line & Queensway Drive/Harvester Rd

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	160	402	100	195	97	61	1320	276	413	1505
v/c Ratio	0.51	0.60	0.43	0.30	0.16	0.27	0.64	0.35	0.70	0.57
Control Delay	35.1	40.6	32.8	18.8	4.2	14.8	20.7	4.4	45.1	22.5
Queue Delay	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
Total Delay	36.1	40.6	32.8	18.8	4.2	14.8	20.7	4.4	45.1	22.9
Queue Length 50th (m)	26.2	38.7	15.7	9.5	0.7	4.3	39.1	4.8	44.8	91.4
Queue Length 95th (m)	40.8	51.5	26.8	18.6	9.4	m9.4	58.2	m16.2	61.1	105.2
Internal Link Dist (m)		110.7		287.5			189.1			96.5
Turn Bay Length (m)	45.0		110.0		200.0	60.0		80.0	100.0	
Base Capacity (vph)	312	931	236	894	630	237	2064	786	617	2622
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	586
Spillback Cap Reductn	41	0	0	2	3	0	44	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.59	0.43	0.42	0.22	0.15	0.26	0.65	0.35	0.67	0.74

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.



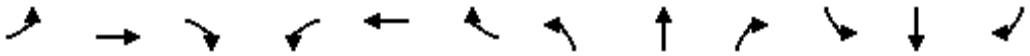
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	152	307	75	95	92	185	58	1254	262	392	1301	129
Future Volume (vph)	152	307	75	95	92	185	58	1254	262	392	1301	129
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.2	3.1	3.3	3.2	3.0	3.2	3.2	3.0	3.2	3.2	3.1
Total Lost time (s)	3.0	3.0		3.0	3.0	0.0	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	0.91	0.91	1.00	0.91	1.00	0.97	0.91	
Frpb, ped/bikes	1.00	1.00		1.00	0.99	0.99	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.97		1.00	0.92	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1607	3234		1677	2922	1319	1627	4766	1455	3313	4732	
Flt Permitted	0.53	1.00		0.28	1.00	1.00	0.14	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	902	3234		500	2922	1319	235	4766	1455	3313	4732	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	160	323	79	100	97	195	61	1320	276	413	1369	136
RTOR Reduction (vph)	0	22	0	0	78	54	0	0	157	0	9	0
Lane Group Flow (vph)	160	380	0	100	117	43	61	1320	119	413	1496	0
Confl. Peds. (#/hr)	6		4	4		6	11		3	3		11
Heavy Vehicles (%)	7%	2%	8%	4%	4%	3%	6%	4%	2%	1%	3%	4%
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	pm+pt	NA	Perm	Prot	NA	
Protected Phases	7	4		3	8	1	5	2		1	6	
Permitted Phases	4	4		8	8	8	2	2	2		6	
Actuated Green, G (s)	26.1	18.1		25.7	17.9	36.4	49.7	43.6	43.6	18.5	56.0	
Effective Green, g (s)	28.1	22.1		27.7	21.9	44.4	51.7	47.6	47.6	19.5	60.0	
Actuated g/C Ratio	0.26	0.20		0.25	0.20	0.40	0.47	0.43	0.43	0.18	0.55	
Clearance Time (s)	4.0	7.0		4.0	7.0	4.0	4.0	7.0	7.0	4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	288	649		220	581	532	200	2062	629	587	2581	
v/s Ratio Prot	c0.05	c0.12		0.04	0.04	0.02	0.02	c0.28		c0.12	0.32	
v/s Ratio Perm	0.10			0.08		0.02	0.12		0.08			
v/c Ratio	0.56	0.59		0.45	0.20	0.08	0.30	0.64	0.19	0.70	0.58	
Uniform Delay, d1	33.9	39.8		33.1	36.7	20.2	16.3	24.5	19.3	42.5	16.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.21	0.75	1.12	0.92	1.25	
Incremental Delay, d2	2.3	1.4		1.5	0.2	0.1	0.7	1.2	0.5	3.3	0.8	
Delay (s)	36.2	41.2		34.6	36.9	20.3	20.4	19.6	22.2	42.6	21.6	
Level of Service	D	D		C	D	C	C	B	C	D	C	
Approach Delay (s)		39.8			32.2			20.1			26.1	
Approach LOS		D			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	26.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	66.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

2: Guelph Line & W-N/S OFF RAMP/SSR Link

Lane Group	EBL	EBT	EBR	NBT	SBT
Lane Group Flow (vph)	711	493	408	1675	1639
v/c Ratio	0.61	0.76	0.71	0.48	0.58
Control Delay	30.2	38.2	33.6	4.5	17.6
Queue Delay	0.0	0.0	0.0	0.2	0.0
Total Delay	30.2	38.2	33.6	4.7	17.6
Queue Length 50th (m)	62.0	89.9	66.0	12.7	71.6
Queue Length 95th (m)	73.5	118.0	92.9	16.9	98.5
Internal Link Dist (m)		328.8		96.5	49.4
Turn Bay Length (m)	180.0		160.0		
Base Capacity (vph)	1371	759	661	3525	2828
Starvation Cap Reductn	0	0	0	811	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.52	0.65	0.62	0.62	0.58

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	675	468	388	0	0	0	0	1569	22	0	1557	0
Future Volume (vph)	675	468	388	0	0	0	0	1569	22	0	1557	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.1	3.1	3.1	3.4	3.1	3.4	3.1	3.4	3.1	3.1	3.4	3.1
Total Lost time (s)	3.0	3.0	3.0					3.0			3.0	
Lane Util. Factor	0.97	1.00	1.00					0.86			0.91	
Frpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	
Flpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	
Frt	1.00	1.00	0.85					1.00			1.00	
Flt Protected	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (prot)	3211	1777	1495					6075			4877	
Flt Permitted	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (perm)	3211	1777	1495					6075			4877	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	711	493	408	0	0	0	0	1652	23	0	1639	0
RTOR Reduction (vph)	0	0	25	0	0	0	0	1	0	0	0	0
Lane Group Flow (vph)	711	493	383	0	0	0	0	1674	0	0	1639	0
Confl. Peds. (#/hr)							4		1	1		
Heavy Vehicles (%)	3%	1%	2%	2%	2%	2%	2%	5%	2%	2%	4%	2%
Turn Type	Prot	NA	Perm					NA			NA	
Protected Phases	7	4						2			2	
Permitted Phases		4	4					2			2	
Actuated Green, G (s)	36.2	36.2	36.2					59.8			59.8	
Effective Green, g (s)	40.2	40.2	40.2					63.8			63.8	
Actuated g/C Ratio	0.37	0.37	0.37					0.58			0.58	
Clearance Time (s)	7.0	7.0	7.0					7.0			7.0	
Vehicle Extension (s)	3.0	3.0	3.0					3.0			3.0	
Lane Grp Cap (vph)	1173	649	546					3523			2828	
v/s Ratio Prot	0.22	c0.28						0.28			c0.34	
v/s Ratio Perm			0.26									
v/c Ratio	0.61	0.76	0.70					0.48			0.58	
Uniform Delay, d1	28.4	30.7	29.8					13.4			14.6	
Progression Factor	1.00	1.00	1.00					0.30			1.09	
Incremental Delay, d2	0.9	5.1	4.0					0.3			0.6	
Delay (s)	29.3	35.8	33.8					4.3			16.5	
Level of Service	C	D	C					A			B	
Approach Delay (s)		32.4			0.0			4.3			16.5	
Approach LOS		C			A			A			B	

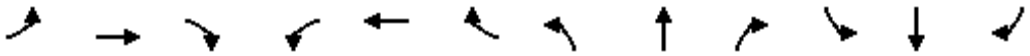
Intersection Summary			
HCM 2000 Control Delay	17.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	61.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

3: Guelph Line & Queensway Drive/Harvester Rd

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	160	402	100	97	195	61	1320	276	504	1505
v/c Ratio	0.81	0.60	0.42	0.19	0.17	0.27	0.74	0.38	0.65	0.57
Control Delay	76.2	40.2	32.7	39.9	18.0	13.9	26.4	5.6	51.8	17.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Total Delay	76.2	40.2	32.7	39.9	18.0	13.9	26.4	5.6	51.8	17.6
Queue Length 50th (m)	33.8	38.5	15.7	9.6	13.8	4.5	41.4	4.8	57.6	66.9
Queue Length 95th (m)	#66.5	51.1	26.7	16.4	20.2	m10.3	63.8	m19.7	74.5	67.1
Internal Link Dist (m)		110.7		287.5			189.1			96.5
Turn Bay Length (m)	45.0		110.0		200.0	60.0		80.0	100.0	
Base Capacity (vph)	205	1078	241	934	1152	238	1786	718	777	2618
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	292
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.78	0.37	0.41	0.10	0.17	0.26	0.74	0.38	0.65	0.65

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	152	307	75	95	92	185	58	1254	262	479	1301	129
Future Volume (vph)	152	307	75	95	92	185	58	1254	262	479	1301	129
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.2	3.1	3.3	3.2	3.0	3.2	3.2	3.0	3.2	3.2	3.1
Total Lost time (s)	3.0	3.0		3.0	3.0	0.0	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	0.88	1.00	0.91	1.00	0.97	0.91	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1612	3234		1676	3317	2576	1627	4766	1455	3313	4732	
Flt Permitted	0.95	1.00		0.38	1.00	1.00	0.16	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1612	3234		663	3317	2576	273	4766	1455	3313	4732	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	160	323	79	100	97	195	61	1320	276	504	1369	136
RTOR Reduction (vph)	0	23	0	0	0	0	0	0	173	0	8	0
Lane Group Flow (vph)	160	379	0	100	97	195	61	1320	103	504	1497	0
Confl. Peds. (#/hr)	6		4	4		6	11		3	3		11
Heavy Vehicles (%)	7%	2%	8%	4%	4%	3%	6%	4%	2%	1%	3%	4%
Turn Type	Prot	NA		pm+pt	NA	pt+ov	pm+pt	NA	Perm	Prot	NA	
Protected Phases	7	4		3	8	1 8	5	2		1	6	
Permitted Phases		4		8	8		2	2	2		6	
Actuated Green, G (s)	12.6	18.2		21.2	13.4	45.2	43.3	37.2	37.2	24.8	55.9	
Effective Green, g (s)	13.6	22.2		23.2	17.4	46.2	45.3	41.2	41.2	25.8	59.9	
Actuated g/C Ratio	0.12	0.20		0.21	0.16	0.42	0.41	0.37	0.37	0.23	0.54	
Clearance Time (s)	4.0	7.0		4.0	7.0		4.0	7.0	7.0	4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	199	652		220	524	1081	199	1785	544	777	2576	
v/s Ratio Prot	c0.10	c0.12		0.04	0.03	0.08	0.02	c0.28		c0.15	0.32	
v/s Ratio Perm				0.06			0.11		0.07			
v/c Ratio	0.80	0.58		0.45	0.19	0.18	0.31	0.74	0.19	0.65	0.58	
Uniform Delay, d1	46.9	39.7		36.5	40.2	20.0	19.8	29.8	23.2	38.0	16.7	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.04	0.79	1.33	1.26	0.96	
Incremental Delay, d2	20.5	1.3		1.5	0.2	0.1	0.7	2.2	0.6	1.5	0.8	
Delay (s)	67.4	41.0		38.0	40.3	20.1	21.3	25.7	31.4	49.4	16.8	
Level of Service	E	D		D	D	C	C	C	C	D	B	
Approach Delay (s)		48.5			29.7			26.5			25.0	
Approach LOS		D			C			C			C	

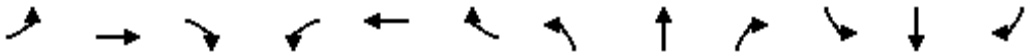
Intersection Summary			
HCM 2000 Control Delay	28.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	69.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

2: Guelph Line & W-N/S OFF RAMP/SSR Link

Lane Group	EBL	EBT	EBR	NBT	SBT
Lane Group Flow (vph)	711	493	408	1675	1639
v/c Ratio	0.61	0.76	0.71	0.48	0.58
Control Delay	30.2	38.2	33.6	3.0	17.6
Queue Delay	0.0	0.0	1.4	0.3	0.0
Total Delay	30.2	38.2	35.0	3.3	17.6
Queue Length 50th (m)	62.0	89.9	66.0	8.1	71.6
Queue Length 95th (m)	73.5	118.0	92.9	m14.2	98.5
Internal Link Dist (m)		328.8		96.5	49.4
Turn Bay Length (m)	180.0		160.0		
Base Capacity (vph)	1371	759	661	3525	2828
Starvation Cap Reductn	0	0	0	974	0
Spillback Cap Reductn	0	0	108	0	56
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.52	0.65	0.74	0.66	0.59

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	675	468	388	0	0	0	0	1569	22	0	1557	0
Future Volume (vph)	675	468	388	0	0	0	0	1569	22	0	1557	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.1	3.1	3.1	3.4	3.1	3.4	3.1	3.4	3.1	3.1	3.4	3.1
Total Lost time (s)	3.0	3.0	3.0					3.0			3.0	
Lane Util. Factor	0.97	1.00	1.00					0.86			0.91	
Frpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	
Flpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	
Frt	1.00	1.00	0.85					1.00			1.00	
Flt Protected	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (prot)	3211	1777	1495					6075			4877	
Flt Permitted	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (perm)	3211	1777	1495					6075			4877	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	711	493	408	0	0	0	0	1652	23	0	1639	0
RTOR Reduction (vph)	0	0	25	0	0	0	0	1	0	0	0	0
Lane Group Flow (vph)	711	493	383	0	0	0	0	1674	0	0	1639	0
Confl. Peds. (#/hr)							4		1	1		
Heavy Vehicles (%)	3%	1%	2%	2%	2%	2%	2%	5%	2%	2%	4%	2%
Turn Type	Prot	NA	Perm					NA			NA	
Protected Phases	7	4						2			2	
Permitted Phases		4	4					2			2	
Actuated Green, G (s)	36.2	36.2	36.2					59.8			59.8	
Effective Green, g (s)	40.2	40.2	40.2					63.8			63.8	
Actuated g/C Ratio	0.37	0.37	0.37					0.58			0.58	
Clearance Time (s)	7.0	7.0	7.0					7.0			7.0	
Vehicle Extension (s)	3.0	3.0	3.0					3.0			3.0	
Lane Grp Cap (vph)	1173	649	546					3523			2828	
v/s Ratio Prot	0.22	c0.28						0.28			c0.34	
v/s Ratio Perm			0.26									
v/c Ratio	0.61	0.76	0.70					0.48			0.58	
Uniform Delay, d1	28.4	30.7	29.8					13.4			14.6	
Progression Factor	1.00	1.00	1.00					0.19			1.09	
Incremental Delay, d2	0.9	5.1	4.0					0.3			0.6	
Delay (s)	29.3	35.8	33.8					2.8			16.5	
Level of Service	C	D	C					A			B	
Approach Delay (s)		32.4			0.0			2.8			16.5	
Approach LOS		C			A			A			B	

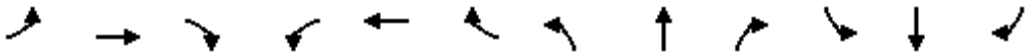
Intersection Summary			
HCM 2000 Control Delay	17.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	61.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

3: Guelph Line & Queensway Drive/Harvester Rd

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	160	402	100	97	195	61	1320	276	504	1505
v/c Ratio	0.44	0.60	0.43	0.15	0.22	0.29	0.92	0.44	0.84	0.57
Control Delay	32.9	40.6	32.8	35.6	5.6	16.1	42.4	8.5	49.6	17.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.8	0.2
Total Delay	32.9	40.6	32.8	35.6	5.6	16.1	42.4	8.5	64.3	17.9
Queue Length 50th (m)	26.2	38.7	15.7	9.1	7.4	4.8	45.2	4.8	99.7	70.5
Queue Length 95th (m)	40.8	51.5	26.8	15.4	17.8	m12.0	#122.1	m25.3	#160.4	71.6
Internal Link Dist (m)		110.7		287.5			189.1			96.5
Turn Bay Length (m)	45.0		110.0		200.0	60.0		80.0	100.0	
Base Capacity (vph)	363	931	236	934	868	218	1429	629	600	2620
Starvation Cap Reductn	0	0	0	0	0	0	0	0	90	300
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.44	0.43	0.42	0.10	0.22	0.28	0.92	0.44	0.99	0.65

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	152	307	75	95	92	185	58	1254	262	479	1301	129
Future Volume (vph)	152	307	75	95	92	185	58	1254	262	479	1301	129
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.2	3.1	3.3	3.2	3.0	3.2	3.2	3.0	3.2	3.2	3.1
Total Lost time (s)	3.0	3.0		3.0	3.0	0.0	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1604	3234		1677	3317	1453	1627	4766	1455	1708	4732	
Flt Permitted	0.68	1.00		0.28	1.00	1.00	0.16	1.00	1.00	0.12	1.00	
Satd. Flow (perm)	1155	3234		500	3317	1453	276	4766	1455	218	4732	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	160	323	79	100	97	195	61	1320	276	504	1369	136
RTOR Reduction (vph)	0	22	0	0	0	54	0	0	193	0	9	0
Lane Group Flow (vph)	160	380	0	100	97	141	61	1320	83	504	1496	0
Confl. Peds. (#/hr)	6		4	4		6	11		3	3		11
Heavy Vehicles (%)	7%	2%	8%	4%	4%	3%	6%	4%	2%	1%	3%	4%
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8	1	5	2		1	6	
Permitted Phases	4	4		8	8	8	2	2	2	6	6	
Actuated Green, G (s)	26.1	18.1		25.7	17.9	51.0	35.1	29.0	29.0	66.1	56.0	
Effective Green, g (s)	28.1	22.1		27.7	21.9	59.0	37.1	33.0	33.0	67.1	60.0	
Actuated g/C Ratio	0.26	0.20		0.25	0.20	0.54	0.34	0.30	0.30	0.61	0.55	
Clearance Time (s)	4.0	7.0		4.0	7.0	4.0	4.0	7.0	7.0	4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	331	649		220	660	779	180	1429	436	594	2581	
v/s Ratio Prot	c0.04	c0.12		0.04	0.03	0.06	0.02	c0.28		c0.26	0.32	
v/s Ratio Perm	0.08			0.08		0.04	0.09		0.06	0.25		
v/c Ratio	0.48	0.59		0.45	0.15	0.18	0.34	0.92	0.19	0.85	0.58	
Uniform Delay, d1	33.9	39.8		33.1	36.3	13.1	25.1	37.3	28.6	27.5	16.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.02	0.87	1.85	1.50	0.98	
Incremental Delay, d2	1.1	1.4		1.5	0.1	0.1	0.9	9.4	0.8	9.1	0.8	
Delay (s)	35.0	41.2		34.6	36.4	13.2	26.5	41.9	53.5	50.3	17.0	
Level of Service	C	D		C	D	B	C	D	D	D	B	
Approach Delay (s)		39.4			24.4			43.3			25.4	
Approach LOS		D			C			D			C	

Intersection Summary			
HCM 2000 Control Delay	33.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	82.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

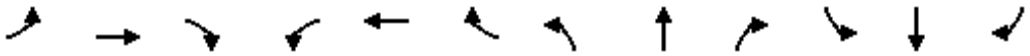
APPENDIX F2 – 2023 PM PEAK (Synchro Output)

2: Guelph Line & W-N/S OFF RAMP/SSR Link

Lane Group	EBL	EBT	EBR	NBT	SBT
Lane Group Flow (vph)	682	121	476	2531	1524
v/c Ratio	0.72	0.23	0.71	0.61	0.59
Control Delay	42.0	31.9	31.6	5.5	8.6
Queue Delay	0.0	0.0	0.0	0.4	0.0
Total Delay	42.0	31.9	31.6	5.9	8.6
Queue Length 50th (m)	73.8	21.5	81.5	39.7	33.7
Queue Length 95th (m)	86.9	34.0	121.4	m48.2	m25.2
Internal Link Dist (m)		328.8		96.5	49.4
Turn Bay Length (m)	180.0		160.0		
Base Capacity (vph)	1123	609	667	4139	2594
Starvation Cap Reductn	0	0	0	867	0
Spillback Cap Reductn	0	0	0	0	40
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.61	0.20	0.71	0.77	0.60

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	648	115	452	0	0	0	0	2397	8	0	1448	0
Future Volume (vph)	648	115	452	0	0	0	0	2397	8	0	1448	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.1	3.1	3.1	3.4	3.1	3.4	3.1	3.4	3.1	3.1	3.4	3.1
Total Lost time (s)	3.0	3.0	1.0					3.0			3.0	
Lane Util. Factor	0.97	1.00	1.00					0.86			0.91	
Frpb, ped/bikes	1.00	1.00	0.99					1.00			1.00	
Flpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	
Frt	1.00	1.00	0.85					1.00			1.00	
Flt Protected	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (prot)	3211	1742	1466					6324			5022	
Flt Permitted	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (perm)	3211	1742	1466					6324			5022	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	682	121	476	0	0	0	0	2523	8	0	1524	0
RTOR Reduction (vph)	0	0	21	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	682	121	455	0	0	0	0	2531	0	0	1524	0
Confl. Peds. (#/hr)			2				20		7	7		20
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	2%	1%	2%	2%	1%	2%
Turn Type	Split	NA	custom					NA			NA	
Protected Phases	4	4	3					2 3			2	
Permitted Phases		4	4					2			2	
Actuated Green, G (s)	31.5	31.5	43.0					74.5			58.0	
Effective Green, g (s)	35.5	35.5	51.0					77.5			62.0	
Actuated g/C Ratio	0.30	0.30	0.42					0.65			0.52	
Clearance Time (s)	7.0	7.0	5.0								7.0	
Vehicle Extension (s)	3.0	3.0	3.0								3.0	
Lane Grp Cap (vph)	949	515	623					4084			2594	
v/s Ratio Prot	0.21	0.07	c0.09					c0.40			0.30	
v/s Ratio Perm			0.22									
v/c Ratio	0.72	0.23	0.73					0.62			0.59	
Uniform Delay, d1	37.8	32.0	28.8					12.5			20.1	
Progression Factor	1.00	1.00	1.00					0.42			0.42	
Incremental Delay, d2	2.6	0.2	4.4					0.1			0.1	
Delay (s)	40.4	32.2	33.2					5.3			8.5	
Level of Service	D	C	C					A			A	
Approach Delay (s)		36.9			0.0			5.3			8.5	
Approach LOS		D			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	13.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	7.0
Intersection Capacity Utilization	62.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

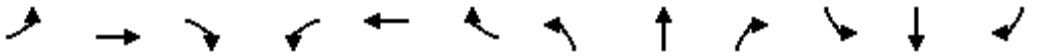
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	193	180	287	792	693	121	1646	104	154	1804
v/c Ratio	1.08	0.21	0.62	0.90	0.97	0.65	0.90	0.17	0.31	0.81
Control Delay	139.9	19.0	34.2	57.2	56.0	41.2	66.6	16.2	61.5	18.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Total Delay	139.9	19.0	34.2	57.2	56.0	41.2	66.6	16.2	61.5	18.6
Queue Length 50th (m)	~50.6	9.1	48.7	95.1	140.0	25.3	150.4	5.8	19.1	60.7
Queue Length 95th (m)	#96.2	18.3	72.7	#128.9	#225.4	m32.8	166.9	m10.2	m28.2	67.2
Internal Link Dist (m)		110.7		287.5			189.1			96.5
Turn Bay Length (m)	45.0		110.0		200.0	60.0		80.0	100.0	
Base Capacity (vph)	179	868	465	882	717	190	1830	617	509	2226
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	64
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.08	0.21	0.62	0.90	0.97	0.64	0.90	0.17	0.30	0.83

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	183	91	80	273	752	658	115	1564	99	146	1542	172
Future Volume (vph)	183	91	80	273	752	658	115	1564	99	146	1542	172
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.2	3.1	3.3	3.2	3.0	3.2	3.2	3.0	3.2	3.2	3.1
Total Lost time (s)	3.0	3.0		3.0	3.0	0.0	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	0.91	1.00	0.97	0.91	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.98	1.00	1.00	0.96	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.93		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1658	3121		1725	3415	1456	1691	4859	1400	3217	4816	
Flt Permitted	0.95	1.00		0.59	1.00	1.00	0.09	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1658	3121		1079	3415	1456	169	4859	1400	3217	4816	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	193	96	84	287	792	693	121	1646	104	154	1623	181
RTOR Reduction (vph)	0	62	0	0	0	41	0	0	65	0	11	0
Lane Group Flow (vph)	193	118	0	287	792	652	121	1646	39	154	1793	0
Confl. Peds. (#/hr)	20		2	2		20	4		25	25		4
Heavy Vehicles (%)	4%	3%	1%	1%	1%	1%	2%	2%	3%	4%	1%	3%
Turn Type	Prot	NA		pm+pt	NA	pm+ov	pm+pt	NA	Perm	Prot	NA	
Protected Phases	7	4		3	8	1	5	2		1	6	
Permitted Phases		4		8	8	8	2	2	2		6	
Actuated Green, G (s)	12.0	27.0		39.0	27.0	44.8	49.0	41.2	41.2	17.8	51.2	
Effective Green, g (s)	13.0	31.0		41.0	31.0	52.8	51.0	45.2	45.2	18.8	55.2	
Actuated g/C Ratio	0.11	0.26		0.34	0.26	0.44	0.42	0.38	0.38	0.16	0.46	
Clearance Time (s)	4.0	7.0		4.0	7.0	4.0	4.0	7.0	7.0	4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	179	806		438	882	640	183	1830	527	503	2215	
v/s Ratio Prot	c0.12	0.04		0.07	0.23	c0.18	0.05	c0.34		0.05	0.37	
v/s Ratio Perm				0.15		0.26	0.23		0.03			
v/c Ratio	1.08	0.15		0.66	0.90	1.02	0.66	0.90	0.07	0.31	0.81	
Uniform Delay, d1	53.5	34.3		31.6	43.0	33.6	25.0	35.3	24.0	44.8	27.9	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.47	1.74	11.05	1.34	0.56	
Incremental Delay, d2	89.6	0.1		3.5	11.8	40.4	5.5	5.0	0.2	0.3	2.6	
Delay (s)	143.1	34.4		35.1	54.8	74.0	42.1	66.5	265.2	60.2	18.3	
Level of Service	F	C		D	D	E	D	E	F	E	B	
Approach Delay (s)		90.7			59.1			76.0			21.6	
Approach LOS		F			E			E			C	

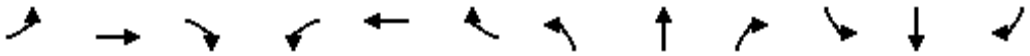
Intersection Summary			
HCM 2000 Control Delay	54.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	93.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

2: Guelph Line & W-N/S OFF RAMP/SSR Link

Lane Group	EBL	EBT	EBR	NBT	SBL	SBT
Lane Group Flow (vph)	682	121	476	2531	28	1496
v/c Ratio	0.72	0.23	0.71	0.61	0.47	0.58
Control Delay	42.0	31.9	31.6	6.0	17.0	8.5
Queue Delay	0.0	0.0	0.0	0.3	0.0	0.0
Total Delay	42.0	31.9	31.6	6.3	17.0	8.5
Queue Length 50th (m)	73.8	21.5	81.5	43.9	1.4	32.2
Queue Length 95th (m)	86.9	34.0	121.4	m52.0	m1.4	m24.2
Internal Link Dist (m)		328.8		96.5		49.4
Turn Bay Length (m)	180.0		160.0		100.0	
Base Capacity (vph)	1123	609	667	4139	59	2594
Starvation Cap Reductn	0	0	0	840	0	0
Spillback Cap Reductn	0	0	0	0	0	6
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.61	0.20	0.71	0.77	0.47	0.58

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.



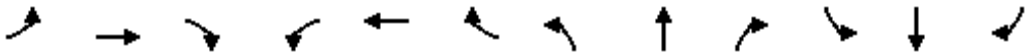
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	648	115	452	0	0	0	0	2397	8	27	1421	0
Future Volume (vph)	648	115	452	0	0	0	0	2397	8	27	1421	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.1	3.1	3.1	3.4	3.1	3.4	3.1	3.4	3.1	3.1	3.4	3.1
Total Lost time (s)	3.0	3.0	1.0					3.0		6.0	3.0	
Lane Util. Factor	0.97	1.00	1.00					0.86		1.00	0.91	
Frpb, ped/bikes	1.00	1.00	0.99					1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00					1.00		1.00	1.00	
Frt	1.00	1.00	0.85					1.00		1.00	1.00	
Flt Protected	0.95	1.00	1.00					1.00		0.95	1.00	
Satd. Flow (prot)	3211	1742	1466					6324		1671	5022	
Flt Permitted	0.95	1.00	1.00					1.00		0.07	1.00	
Satd. Flow (perm)	3211	1742	1466					6324		119	5022	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	682	121	476	0	0	0	0	2523	8	28	1496	0
RTOR Reduction (vph)	0	0	21	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	682	121	455	0	0	0	0	2531	0	28	1496	0
Confl. Peds. (#/hr)			2				20		7	7		20
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	2%	1%	2%	2%	1%	2%
Turn Type	Split	NA	custom					NA		Perm	NA	
Protected Phases	4	4	3					2 3			2	
Permitted Phases		4	4					2		2	2	
Actuated Green, G (s)	31.5	31.5	43.0					74.5		58.0	58.0	
Effective Green, g (s)	35.5	35.5	51.0					77.5		59.0	62.0	
Actuated g/C Ratio	0.30	0.30	0.42					0.65		0.49	0.52	
Clearance Time (s)	7.0	7.0	5.0							7.0	7.0	
Vehicle Extension (s)	3.0	3.0	3.0							3.0	3.0	
Lane Grp Cap (vph)	949	515	623					4084		58	2594	
v/s Ratio Prot	0.21	0.07	c0.09					c0.40			0.30	
v/s Ratio Perm			0.22							0.23		
v/c Ratio	0.72	0.23	0.73					0.62		0.48	0.58	
Uniform Delay, d1	37.8	32.0	28.8					12.5		20.3	20.0	
Progression Factor	1.00	1.00	1.00					0.45		0.51	0.42	
Incremental Delay, d2	2.6	0.2	4.4					0.1		2.6	0.1	
Delay (s)	40.4	32.2	33.2					5.7		12.9	8.4	
Level of Service	D	C	C					A		B	A	
Approach Delay (s)		36.9			0.0			5.7			8.5	
Approach LOS		D			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	14.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	7.0
Intersection Capacity Utilization	62.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	193	180	287	792	693	121	1646	104	125	1804
v/c Ratio	0.96	0.21	0.68	0.90	0.95	0.65	0.86	0.16	0.37	0.77
Control Delay	84.3	19.0	40.1	57.2	51.6	39.7	63.8	16.2	32.4	15.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Total Delay	84.3	19.0	40.1	57.2	51.6	39.7	63.8	16.2	32.4	15.8
Queue Length 50th (m)	32.3	9.1	50.9	95.1	135.2	25.1	150.1	5.8	16.5	58.2
Queue Length 95th (m)	#75.1	18.3	75.9	#128.9	#219.7	m32.1	166.7	m10.2	m32.2	64.0
Internal Link Dist (m)		110.7		287.5			189.1			96.5
Turn Bay Length (m)	45.0		110.0		200.0	60.0		80.0	100.0	
Base Capacity (vph)	202	868	422	882	741	189	1909	638	350	2347
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	55
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.96	0.21	0.68	0.90	0.94	0.64	0.86	0.16	0.36	0.79

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



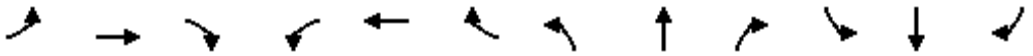
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	183	91	80	273	752	658	115	1564	99	119	1542	172
Future Volume (vph)	183	91	80	273	752	658	115	1564	99	119	1542	172
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.2	3.1	3.3	3.2	3.0	3.2	3.2	3.0	3.2	3.2	3.1
Total Lost time (s)	3.0	3.0		3.0	3.0	0.0	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.98	1.00	1.00	0.96	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.93		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1658	3121		1725	3415	1457	1691	4859	1400	1658	4816	
Flt Permitted	0.14	1.00		0.59	1.00	1.00	0.09	1.00	1.00	0.08	1.00	
Satd. Flow (perm)	249	3121		1079	3415	1457	161	4859	1400	148	4816	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	193	96	84	287	792	693	121	1646	104	125	1623	181
RTOR Reduction (vph)	0	62	0	0	0	40	0	0	63	0	11	0
Lane Group Flow (vph)	193	118	0	287	792	653	121	1646	41	125	1793	0
Confl. Peds. (#/hr)	20		2	2		20	4		25	25		4
Heavy Vehicles (%)	4%	3%	1%	1%	1%	1%	2%	2%	3%	4%	1%	3%
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8	1	5	2		1	6	
Permitted Phases	4	4		8	8	8	2	2	2	6	6	
Actuated Green, G (s)	36.0	27.0		36.0	27.0	45.8	51.0	43.2	43.2	66.0	54.2	
Effective Green, g (s)	38.0	31.0		38.0	31.0	53.8	53.0	47.2	47.2	67.0	58.2	
Actuated g/C Ratio	0.32	0.26		0.32	0.26	0.45	0.44	0.39	0.39	0.56	0.49	
Clearance Time (s)	4.0	7.0		4.0	7.0	4.0	4.0	7.0	7.0	4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	196	806		395	882	653	183	1911	550	331	2335	
v/s Ratio Prot	c0.08	0.04		0.06	0.23	c0.19	0.05	c0.34		0.06	0.37	
v/s Ratio Perm	0.23			0.17		0.26	0.24		0.03	0.15		
v/c Ratio	0.98	0.15		0.73	0.90	1.00	0.66	0.86	0.07	0.38	0.77	
Uniform Delay, d1	35.8	34.3		34.9	43.0	33.1	23.4	33.4	22.7	19.6	25.4	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.34	1.78	11.34	2.00	0.54	
Incremental Delay, d2	59.4	0.1		6.5	11.8	34.8	5.5	3.5	0.2	0.6	2.0	
Delay (s)	95.2	34.4		41.4	54.8	67.9	36.8	63.0	258.1	39.7	15.7	
Level of Service	F	C		D	D	E	D	E	F	D	B	
Approach Delay (s)		65.8			57.7			72.2			17.2	
Approach LOS		E			E			E			B	

Intersection Summary			
HCM 2000 Control Delay	49.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	93.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	NBT	SBL	SBT
Lane Group Flow (vph)	682	121	476	2531	28	1496
v/c Ratio	0.72	0.23	0.71	0.61	0.47	0.58
Control Delay	42.0	31.9	31.6	5.9	17.0	8.5
Queue Delay	0.0	0.0	0.0	0.4	0.0	0.0
Total Delay	42.0	31.9	31.6	6.3	17.0	8.5
Queue Length 50th (m)	73.8	21.5	81.5	43.8	1.4	32.2
Queue Length 95th (m)	86.9	34.0	121.4	m51.0	m1.4	m24.2
Internal Link Dist (m)		328.8		96.5		49.4
Turn Bay Length (m)	180.0		160.0		100.0	
Base Capacity (vph)	1123	609	667	4139	59	2594
Starvation Cap Reductn	0	0	0	867	0	0
Spillback Cap Reductn	0	0	0	0	0	2
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.61	0.20	0.71	0.77	0.47	0.58

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	648	115	452	0	0	0	0	2397	8	27	1421	0
Future Volume (vph)	648	115	452	0	0	0	0	2397	8	27	1421	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.1	3.1	3.1	3.4	3.1	3.4	3.1	3.4	3.1	3.1	3.4	3.1
Total Lost time (s)	3.0	3.0	1.0					3.0		6.0	3.0	
Lane Util. Factor	0.97	1.00	1.00					0.86		1.00	0.91	
Frpb, ped/bikes	1.00	1.00	0.99					1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00					1.00		1.00	1.00	
Frt	1.00	1.00	0.85					1.00		1.00	1.00	
Flt Protected	0.95	1.00	1.00					1.00		0.95	1.00	
Satd. Flow (prot)	3211	1742	1466					6324		1671	5022	
Flt Permitted	0.95	1.00	1.00					1.00		0.07	1.00	
Satd. Flow (perm)	3211	1742	1466					6324		119	5022	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	682	121	476	0	0	0	0	2523	8	28	1496	0
RTOR Reduction (vph)	0	0	21	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	682	121	455	0	0	0	0	2531	0	28	1496	0
Confl. Peds. (#/hr)			2				20		7	7		20
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	2%	1%	2%	2%	1%	2%
Turn Type	Split	NA	custom					NA		Perm	NA	
Protected Phases	4	4	3					2 3			2	
Permitted Phases		4	4					2		2	2	
Actuated Green, G (s)	31.5	31.5	43.0					74.5		58.0	58.0	
Effective Green, g (s)	35.5	35.5	51.0					77.5		59.0	62.0	
Actuated g/C Ratio	0.30	0.30	0.42					0.65		0.49	0.52	
Clearance Time (s)	7.0	7.0	5.0							7.0	7.0	
Vehicle Extension (s)	3.0	3.0	3.0							3.0	3.0	
Lane Grp Cap (vph)	949	515	623					4084		58	2594	
v/s Ratio Prot	0.21	0.07	c0.09					c0.40			0.30	
v/s Ratio Perm			0.22							0.23		
v/c Ratio	0.72	0.23	0.73					0.62		0.48	0.58	
Uniform Delay, d1	37.8	32.0	28.8					12.5		20.3	20.0	
Progression Factor	1.00	1.00	1.00					0.44		0.51	0.42	
Incremental Delay, d2	2.6	0.2	4.4					0.1		2.6	0.1	
Delay (s)	40.4	32.2	33.2					5.7		12.9	8.4	
Level of Service	D	C	C					A		B	A	
Approach Delay (s)		36.9			0.0			5.7			8.5	
Approach LOS		D			A			A			A	

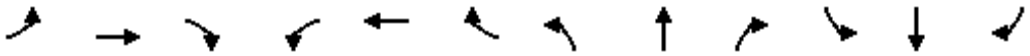
Intersection Summary			
HCM 2000 Control Delay	14.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	7.0
Intersection Capacity Utilization	62.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

3: Guelph Line & Queensway Drive/Harvester Rd

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	193	180	287	792	693	121	1646	104	125	1804
v/c Ratio	0.96	0.21	0.68	0.90	0.94	0.65	0.87	0.16	0.23	0.77
Control Delay	84.3	19.0	40.1	57.2	49.1	39.1	64.5	16.2	57.7	16.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Total Delay	84.3	19.0	40.1	57.2	49.1	39.1	64.5	16.2	57.7	16.3
Queue Length 50th (m)	32.3	9.1	50.9	95.1	132.7	24.8	150.4	5.8	15.0	60.1
Queue Length 95th (m)	#75.1	18.3	75.9	#128.9	#216.9	m31.6	166.9	m10.2	m23.1	65.8
Internal Link Dist (m)		110.7		287.5			189.1			96.5
Turn Bay Length (m)	45.0		110.0		200.0	60.0		80.0	100.0	
Base Capacity (vph)	202	868	422	882	753	190	1883	631	589	2347
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	55
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.96	0.21	0.68	0.90	0.92	0.64	0.87	0.16	0.21	0.79

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	183	91	80	273	752	658	115	1564	99	119	1542	172
Future Volume (vph)	183	91	80	273	752	658	115	1564	99	119	1542	172
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.2	3.1	3.3	3.2	3.0	3.2	3.2	3.0	3.2	3.2	3.1
Total Lost time (s)	3.0	3.0		3.0	3.0	0.0	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	0.91	1.00	0.97	0.91	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.98	1.00	1.00	0.96	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.93		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1658	3121		1725	3415	1457	1691	4859	1400	3217	4816	
Flt Permitted	0.14	1.00		0.59	1.00	1.00	0.09	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	249	3121		1079	3415	1457	164	4859	1400	3217	4816	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	193	96	84	287	792	693	121	1646	104	125	1623	181
RTOR Reduction (vph)	0	62	0	0	0	40	0	0	64	0	11	0
Lane Group Flow (vph)	193	118	0	287	792	653	121	1646	40	125	1793	0
Confl. Peds. (#/hr)	20		2	2		20	4		25	25		4
Heavy Vehicles (%)	4%	3%	1%	1%	1%	1%	2%	2%	3%	4%	1%	3%
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	pm+pt	NA	Perm	Prot	NA	
Protected Phases	7	4		3	8	1	5	2		1	6	
Permitted Phases	4	4		8	8	8	2	2	2		6	
Actuated Green, G (s)	36.0	27.0		36.0	27.0	46.5	50.3	42.5	42.5	19.5	54.2	
Effective Green, g (s)	38.0	31.0		38.0	31.0	54.5	52.3	46.5	46.5	20.5	58.2	
Actuated g/C Ratio	0.32	0.26		0.32	0.26	0.45	0.44	0.39	0.39	0.17	0.49	
Clearance Time (s)	4.0	7.0		4.0	7.0	4.0	4.0	7.0	7.0	4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	196	806		395	882	661	183	1882	542	549	2335	
v/s Ratio Prot	c0.08	0.04		0.06	0.23	c0.19	0.05	c0.34		0.04	0.37	
v/s Ratio Perm	0.23			0.17		0.25	0.24		0.03			
v/c Ratio	0.98	0.15		0.73	0.90	0.99	0.66	0.87	0.07	0.23	0.77	
Uniform Delay, d1	35.8	34.3		34.9	43.0	32.4	23.6	34.0	23.2	42.9	25.4	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.30	1.76	11.05	1.34	0.56	
Incremental Delay, d2	59.4	0.1		6.5	11.8	31.7	5.5	3.9	0.2	0.2	2.0	
Delay (s)	95.2	34.4		41.4	54.8	64.1	36.3	63.8	256.3	57.8	16.2	
Level of Service	F	C		D	D	E	D	E	F	E	B	
Approach Delay (s)		65.8			56.2			72.7			18.9	
Approach LOS		E			E			E			B	

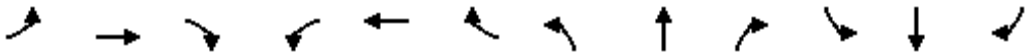
Intersection Summary			
HCM 2000 Control Delay	49.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	93.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

2: Guelph Line & W-N/S OFF RAMP/SSR Link

Lane Group	EBL	EBT	EBR	NBT	SBT
Lane Group Flow (vph)	682	121	476	2531	1524
v/c Ratio	0.72	0.23	0.71	0.61	0.59
Control Delay	42.0	31.9	31.6	7.4	8.6
Queue Delay	0.0	0.0	0.0	0.2	0.2
Total Delay	42.0	31.9	31.6	7.6	8.7
Queue Length 50th (m)	73.8	21.5	81.5	58.7	33.7
Queue Length 95th (m)	86.9	34.0	121.4	65.9	m25.2
Internal Link Dist (m)		328.8		96.5	49.4
Turn Bay Length (m)	180.0		160.0		
Base Capacity (vph)	1123	609	667	4139	2594
Starvation Cap Reductn	0	0	0	689	0
Spillback Cap Reductn	0	0	1	0	278
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.61	0.20	0.71	0.73	0.66

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.



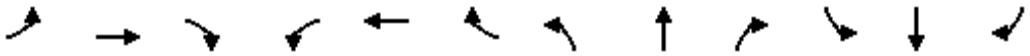
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	648	115	452	0	0	0	0	2397	8	0	1448	0
Future Volume (vph)	648	115	452	0	0	0	0	2397	8	0	1448	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.1	3.1	3.1	3.4	3.1	3.4	3.1	3.4	3.1	3.1	3.4	3.1
Total Lost time (s)	3.0	3.0	1.0					3.0			3.0	
Lane Util. Factor	0.97	1.00	1.00					0.86			0.91	
Frpb, ped/bikes	1.00	1.00	0.99					1.00			1.00	
Flpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	
Frt	1.00	1.00	0.85					1.00			1.00	
Flt Protected	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (prot)	3211	1742	1466					6324			5022	
Flt Permitted	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (perm)	3211	1742	1466					6324			5022	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	682	121	476	0	0	0	0	2523	8	0	1524	0
RTOR Reduction (vph)	0	0	21	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	682	121	455	0	0	0	0	2531	0	0	1524	0
Confl. Peds. (#/hr)			2				20		7	7		20
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	2%	1%	2%	2%	1%	2%
Turn Type	Split	NA	custom					NA			NA	
Protected Phases	4	4	3					2 3			2	
Permitted Phases		4	4					2			2	
Actuated Green, G (s)	31.5	31.5	43.0					74.5			58.0	
Effective Green, g (s)	35.5	35.5	51.0					77.5			62.0	
Actuated g/C Ratio	0.30	0.30	0.42					0.65			0.52	
Clearance Time (s)	7.0	7.0	5.0								7.0	
Vehicle Extension (s)	3.0	3.0	3.0								3.0	
Lane Grp Cap (vph)	949	515	623					4084			2594	
v/s Ratio Prot	0.21	0.07	c0.09					c0.40			0.30	
v/s Ratio Perm			0.22									
v/c Ratio	0.72	0.23	0.73					0.62			0.59	
Uniform Delay, d1	37.8	32.0	28.8					12.5			20.1	
Progression Factor	1.00	1.00	1.00					0.55			0.42	
Incremental Delay, d2	2.6	0.2	4.4					0.2			0.1	
Delay (s)	40.4	32.2	33.2					7.1			8.5	
Level of Service	D	C	C					A			A	
Approach Delay (s)		36.9			0.0			7.1			8.5	
Approach LOS		D			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	14.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	7.0
Intersection Capacity Utilization	62.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	193	180	287	792	693	121	1646	104	154	1804
v/c Ratio	0.89	0.20	0.57	0.89	0.69	0.65	0.78	0.16	0.64	0.86
Control Delay	88.5	18.1	30.6	56.5	35.2	44.9	50.7	17.8	80.0	18.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
Total Delay	88.5	18.1	30.6	56.5	35.2	44.9	50.7	17.8	80.0	19.2
Queue Length 50th (m)	45.2	8.8	46.5	95.1	76.8	25.2	132.0	5.7	19.7	101.2
Queue Length 95th (m)	#86.0	17.9	69.4	#128.9	100.2	m32.9	150.6	m12.5	m29.6	106.5
Internal Link Dist (m)		110.7		287.5			189.1			96.5
Turn Bay Length (m)	45.0		110.0		200.0	60.0		80.0	100.0	
Base Capacity (vph)	221	919	502	887	1011	190	2106	668	241	2105
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	57
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.87	0.20	0.57	0.89	0.69	0.64	0.78	0.16	0.64	0.88

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	183	91	80	273	752	658	115	1564	99	146	1542	172
Future Volume (vph)	183	91	80	273	752	658	115	1564	99	146	1542	172
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.2	3.1	3.3	3.2	3.0	3.2	3.2	3.0	3.2	3.2	3.1
Total Lost time (s)	3.0	3.0		3.0	3.0	0.0	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	0.88	1.00	0.91	1.00	0.97	0.91	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.93		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1658	3121		1725	3415	2627	1691	4859	1400	3217	4816	
Flt Permitted	0.95	1.00		0.64	1.00	1.00	0.08	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1658	3121		1158	3415	2627	145	4859	1400	3217	4816	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	193	96	84	287	792	693	121	1646	104	154	1623	181
RTOR Reduction (vph)	0	61	0	0	0	0	0	0	59	0	11	0
Lane Group Flow (vph)	193	119	0	287	792	693	121	1646	45	154	1793	0
Confl. Peds. (#/hr)	20		2	2		20	4		25	25		4
Heavy Vehicles (%)	4%	3%	1%	1%	1%	1%	2%	2%	3%	4%	1%	3%
Turn Type	Prot	NA		pm+pt	NA	pt+ov	pm+pt	NA	Perm	Prot	NA	
Protected Phases	7	4		3	8	1 8	5	2		1	6	
Permitted Phases		4		8	8		2	2	2		6	
Actuated Green, G (s)	14.8	29.0		40.2	27.2	42.2	55.8	48.0	48.0	8.0	48.2	
Effective Green, g (s)	15.8	33.0		42.2	31.2	43.2	57.8	52.0	52.0	9.0	52.2	
Actuated g/C Ratio	0.13	0.28		0.35	0.26	0.36	0.48	0.43	0.43	0.08	0.44	
Clearance Time (s)	4.0	7.0		4.0	7.0		4.0	7.0	7.0	4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	218	858		473	887	945	183	2105	606	241	2094	
v/s Ratio Prot	c0.12	0.04		0.07	c0.23	c0.26	0.05	0.34		0.05	c0.37	
v/s Ratio Perm				0.14			0.27		0.03			
v/c Ratio	0.89	0.14		0.61	0.89	0.73	0.66	0.78	0.07	0.64	0.86	
Uniform Delay, d1	51.2	32.8		30.3	42.8	33.4	24.3	29.1	19.9	53.9	30.5	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.77	1.66	4.96	1.29	0.49	
Incremental Delay, d2	31.8	0.1		2.2	11.3	3.0	5.5	1.9	0.1	4.3	3.8	
Delay (s)	83.1	32.9		32.5	54.1	36.4	48.7	50.2	98.8	73.9	18.8	
Level of Service	F	C		C	D	D	D	D	F	E	B	
Approach Delay (s)		58.8			43.7			52.8			23.1	
Approach LOS		E			D			D			C	

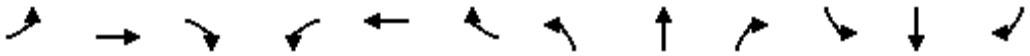
Intersection Summary			
HCM 2000 Control Delay	40.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	84.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

2: Guelph Line & W-N/S OFF RAMP/SSR Link

Lane Group	EBL	EBT	EBR	NBT	SBT
Lane Group Flow (vph)	682	121	476	2531	1524
v/c Ratio	0.72	0.23	0.71	0.61	0.59
Control Delay	42.0	31.9	31.6	6.0	8.6
Queue Delay	0.0	0.0	0.0	0.3	0.0
Total Delay	42.0	31.9	31.6	6.3	8.6
Queue Length 50th (m)	73.8	21.5	81.5	43.9	33.7
Queue Length 95th (m)	86.9	34.0	121.4	m52.0	m25.2
Internal Link Dist (m)		328.8		96.5	49.4
Turn Bay Length (m)	180.0		160.0		
Base Capacity (vph)	1123	609	667	4139	2594
Starvation Cap Reductn	0	0	0	840	0
Spillback Cap Reductn	0	0	0	0	2
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.61	0.20	0.71	0.77	0.59

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	648	115	452	0	0	0	0	2397	8	0	1448	0
Future Volume (vph)	648	115	452	0	0	0	0	2397	8	0	1448	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.1	3.1	3.1	3.4	3.1	3.4	3.1	3.4	3.1	3.1	3.4	3.1
Total Lost time (s)	3.0	3.0	1.0					3.0			3.0	
Lane Util. Factor	0.97	1.00	1.00					0.86			0.91	
Frpb, ped/bikes	1.00	1.00	0.99					1.00			1.00	
Flpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	
Frt	1.00	1.00	0.85					1.00			1.00	
Flt Protected	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (prot)	3211	1742	1466					6324			5022	
Flt Permitted	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (perm)	3211	1742	1466					6324			5022	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	682	121	476	0	0	0	0	2523	8	0	1524	0
RTOR Reduction (vph)	0	0	21	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	682	121	455	0	0	0	0	2531	0	0	1524	0
Confl. Peds. (#/hr)			2				20		7	7		20
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	2%	1%	2%	2%	1%	2%
Turn Type	Split	NA	custom					NA			NA	
Protected Phases	4	4	3					2 3			2	
Permitted Phases		4	4					2			2	
Actuated Green, G (s)	31.5	31.5	43.0					74.5			58.0	
Effective Green, g (s)	35.5	35.5	51.0					77.5			62.0	
Actuated g/C Ratio	0.30	0.30	0.42					0.65			0.52	
Clearance Time (s)	7.0	7.0	5.0								7.0	
Vehicle Extension (s)	3.0	3.0	3.0								3.0	
Lane Grp Cap (vph)	949	515	623					4084			2594	
v/s Ratio Prot	0.21	0.07	c0.09					c0.40			0.30	
v/s Ratio Perm			0.22									
v/c Ratio	0.72	0.23	0.73					0.62			0.59	
Uniform Delay, d1	37.8	32.0	28.8					12.5			20.1	
Progression Factor	1.00	1.00	1.00					0.45			0.42	
Incremental Delay, d2	2.6	0.2	4.4					0.1			0.1	
Delay (s)	40.4	32.2	33.2					5.7			8.5	
Level of Service	D	C	C					A			A	
Approach Delay (s)		36.9			0.0			5.7			8.5	
Approach LOS		D			A			A			A	

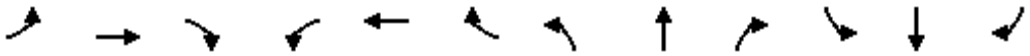
Intersection Summary			
HCM 2000 Control Delay	14.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	7.0
Intersection Capacity Utilization	62.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

3: Guelph Line & Queensway Drive/Harvester Rd

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	193	180	287	792	693	121	1646	104	154	1804
v/c Ratio	0.96	0.21	0.68	0.90	0.95	0.65	0.86	0.16	0.46	0.77
Control Delay	84.3	19.0	40.1	57.2	51.6	39.7	63.8	16.2	37.9	15.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Total Delay	84.3	19.0	40.1	57.2	51.6	39.7	63.8	16.2	37.9	15.7
Queue Length 50th (m)	32.3	9.1	50.9	95.1	135.2	25.1	150.1	5.8	23.9	57.8
Queue Length 95th (m)	#75.1	18.3	75.9	#128.9	#219.7	m32.1	166.7	m10.2	m41.3	63.5
Internal Link Dist (m)		110.7		287.5			189.1			96.5
Turn Bay Length (m)	45.0		110.0		200.0	60.0		80.0	100.0	
Base Capacity (vph)	202	868	422	882	741	189	1909	638	350	2347
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	71
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.96	0.21	0.68	0.90	0.94	0.64	0.86	0.16	0.44	0.79

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	183	91	80	273	752	658	115	1564	99	146	1542	172
Future Volume (vph)	183	91	80	273	752	658	115	1564	99	146	1542	172
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.2	3.1	3.3	3.2	3.0	3.2	3.2	3.0	3.2	3.2	3.1
Total Lost time (s)	3.0	3.0		3.0	3.0	0.0	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.98	1.00	1.00	0.96	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.93		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1658	3121		1725	3415	1457	1691	4859	1400	1658	4816	
Flt Permitted	0.14	1.00		0.59	1.00	1.00	0.09	1.00	1.00	0.08	1.00	
Satd. Flow (perm)	249	3121		1079	3415	1457	161	4859	1400	148	4816	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	193	96	84	287	792	693	121	1646	104	154	1623	181
RTOR Reduction (vph)	0	62	0	0	0	40	0	0	63	0	11	0
Lane Group Flow (vph)	193	118	0	287	792	653	121	1646	41	154	1793	0
Confl. Peds. (#/hr)	20		2	2		20	4		25	25		4
Heavy Vehicles (%)	4%	3%	1%	1%	1%	1%	2%	2%	3%	4%	1%	3%
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8	1	5	2		1	6	
Permitted Phases	4	4		8	8	8	2	2	2	6	6	
Actuated Green, G (s)	36.0	27.0		36.0	27.0	45.8	51.0	43.2	43.2	66.0	54.2	
Effective Green, g (s)	38.0	31.0		38.0	31.0	53.8	53.0	47.2	47.2	67.0	58.2	
Actuated g/C Ratio	0.32	0.26		0.32	0.26	0.45	0.44	0.39	0.39	0.56	0.49	
Clearance Time (s)	4.0	7.0		4.0	7.0	4.0	4.0	7.0	7.0	4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	196	806		395	882	653	183	1911	550	331	2335	
v/s Ratio Prot	c0.08	0.04		0.06	0.23	c0.19	0.05	c0.34		0.08	0.37	
v/s Ratio Perm	0.23			0.17		0.26	0.24		0.03	0.18		
v/c Ratio	0.98	0.15		0.73	0.90	1.00	0.66	0.86	0.07	0.47	0.77	
Uniform Delay, d1	35.8	34.3		34.9	43.0	33.1	23.4	33.4	22.7	21.1	25.4	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.34	1.78	11.34	1.92	0.54	
Incremental Delay, d2	59.4	0.1		6.5	11.8	34.8	5.5	3.5	0.2	0.8	2.0	
Delay (s)	95.2	34.4		41.4	54.8	67.9	36.8	63.0	258.1	41.3	15.6	
Level of Service	F	C		D	D	E	D	E	F	D	B	
Approach Delay (s)		65.8			57.7			72.2			17.6	
Approach LOS		E			E			E			B	

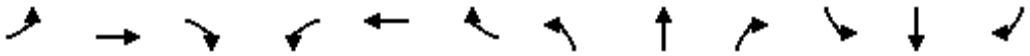
Intersection Summary			
HCM 2000 Control Delay	49.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	93.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

APPENDIX F3 – 2031 AM PEAK (Synchro Output)

2: Guelph Line & W-N/S OFF RAMP/SSR Link

Lane Group	EBL	EBT	EBR	NBT	SBT
Lane Group Flow (vph)	832	578	478	1743	1726
v/c Ratio	0.65	0.82	0.77	0.52	0.65
Control Delay	29.3	39.9	35.4	3.5	20.6
Queue Delay	0.0	0.0	0.0	0.3	0.0
Total Delay	29.3	39.9	35.4	3.8	20.6
Queue Length 50th (m)	70.3	104.0	77.4	10.2	85.2
Queue Length 95th (m)	89.3	147.1	117.1	13.1	110.4
Internal Link Dist (m)		328.8		96.5	49.4
Turn Bay Length (m)	180.0		160.0		
Base Capacity (vph)	1371	759	661	3333	2674
Starvation Cap Reductn	0	0	0	820	0
Spillback Cap Reductn	0	0	0	0	19
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.61	0.76	0.72	0.69	0.65

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	790	549	454	0	0	0	0	1633	23	0	1640	0
Future Volume (vph)	790	549	454	0	0	0	0	1633	23	0	1640	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.1	3.1	3.1	3.4	3.1	3.4	3.1	3.4	3.1	3.1	3.4	3.1
Total Lost time (s)	3.0	3.0	3.0					3.0			3.0	
Lane Util. Factor	0.97	1.00	1.00					0.86			0.91	
Frpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	
Flpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	
Frt	1.00	1.00	0.85					1.00			1.00	
Flt Protected	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (prot)	3211	1777	1495					6075			4877	
Flt Permitted	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (perm)	3211	1777	1495					6075			4877	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	832	578	478	0	0	0	0	1719	24	0	1726	0
RTOR Reduction (vph)	0	0	24	0	0	0	0	1	0	0	0	0
Lane Group Flow (vph)	832	578	454	0	0	0	0	1742	0	0	1726	0
Confl. Peds. (#/hr)							4		1	1		
Heavy Vehicles (%)	3%	1%	2%	2%	2%	2%	2%	5%	2%	2%	4%	2%
Turn Type	Prot	NA	Perm					NA			NA	
Protected Phases	7	4						2			2	
Permitted Phases		4	4					2			2	
Actuated Green, G (s)	39.7	39.7	39.7					56.3			56.3	
Effective Green, g (s)	43.7	43.7	43.7					60.3			60.3	
Actuated g/C Ratio	0.40	0.40	0.40					0.55			0.55	
Clearance Time (s)	7.0	7.0	7.0					7.0			7.0	
Vehicle Extension (s)	3.0	3.0	3.0					3.0			3.0	
Lane Grp Cap (vph)	1275	705	593					3330			2673	
v/s Ratio Prot	0.26	c0.33						0.29			c0.35	
v/s Ratio Perm			0.30									
v/c Ratio	0.65	0.82	0.77					0.52			0.65	
Uniform Delay, d1	27.0	29.6	28.7					15.7			17.4	
Progression Factor	1.00	1.00	1.00					0.19			1.10	
Incremental Delay, d2	1.2	7.4	5.9					0.4			0.7	
Delay (s)	28.2	37.0	34.6					3.4			19.7	
Level of Service	C	D	C					A			B	
Approach Delay (s)		32.5			0.0			3.4			19.7	
Approach LOS		C			A			A			B	

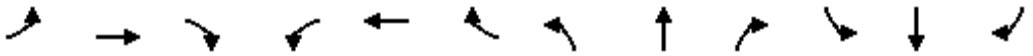
Intersection Summary			
HCM 2000 Control Delay	18.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	67.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

3: Guelph Line & Queensway Drive/Harvester Rd

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	166	419	104	100	203	63	1374	287	525	1565
v/c Ratio	0.88	0.61	0.39	0.16	0.29	0.30	0.77	0.40	0.75	0.63
Control Delay	88.5	40.5	28.9	36.0	11.1	19.5	29.2	7.1	53.8	18.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Total Delay	88.5	40.5	28.9	36.0	11.1	19.5	29.2	7.1	53.8	19.0
Queue Length 50th (m)	35.6	40.4	15.7	9.4	14.7	4.9	44.9	5.0	59.4	68.2
Queue Length 95th (m)	#72.9	53.3	25.7	15.6	27.4	m11.4	#87.5	m24.4	77.3	75.8
Internal Link Dist (m)		110.7		287.5			189.1			96.5
Turn Bay Length (m)	45.0		110.0		200.0	60.0		80.0	100.0	
Base Capacity (vph)	190	931	297	934	701	219	1780	723	697	2490
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	283
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.87	0.45	0.35	0.11	0.29	0.29	0.77	0.40	0.75	0.71

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	158	320	78	99	95	193	60	1305	273	499	1353	134
Future Volume (vph)	158	320	78	99	95	193	60	1305	273	499	1353	134
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.2	3.1	3.3	3.2	3.0	3.2	3.2	3.0	3.2	3.2	3.1
Total Lost time (s)	3.0	3.0		3.0	3.0	0.0	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	0.91	1.00	0.97	0.91	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1612	3234		1677	3317	1450	1627	4766	1455	3313	4732	
Flt Permitted	0.95	1.00		0.30	1.00	1.00	0.13	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1612	3234		525	3317	1450	219	4766	1455	3313	4732	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	166	337	82	104	100	203	63	1374	287	525	1424	141
RTOR Reduction (vph)	0	21	0	0	0	45	0	0	180	0	9	0
Lane Group Flow (vph)	166	398	0	104	100	158	63	1374	107	525	1556	0
Confl. Peds. (#/hr)	6		4	4		6	11		3	3		11
Heavy Vehicles (%)	7%	2%	8%	4%	4%	3%	6%	4%	2%	1%	3%	4%
Turn Type	Prot	NA		pm+pt	NA	pm+ov	pm+pt	NA	Perm	Prot	NA	
Protected Phases	7	4		3	8	1	5	2		1	6	
Permitted Phases		4		8	8	8	2	2	2		6	
Actuated Green, G (s)	11.9	18.7		27.0	16.9	39.1	43.3	37.0	37.0	22.2	52.9	
Effective Green, g (s)	12.9	22.7		29.0	20.9	47.1	45.3	41.0	41.0	23.2	56.9	
Actuated g/C Ratio	0.12	0.21		0.26	0.19	0.43	0.41	0.37	0.37	0.21	0.52	
Clearance Time (s)	4.0	7.0		4.0	7.0	4.0	4.0	7.0	7.0	4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	189	667		254	630	620	183	1776	542	698	2447	
v/s Ratio Prot	c0.10	c0.12		0.04	0.03	0.06	0.02	c0.29		c0.16	0.33	
v/s Ratio Perm				0.07		0.05	0.12		0.07			
v/c Ratio	0.88	0.60		0.41	0.16	0.25	0.34	0.77	0.20	0.75	0.64	
Uniform Delay, d1	47.8	39.5		32.1	37.2	20.2	20.0	30.4	23.4	40.7	19.1	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.33	0.83	1.73	1.18	0.88	
Incremental Delay, d2	33.7	1.4		1.1	0.1	0.2	0.8	2.5	0.6	3.4	0.9	
Delay (s)	81.5	40.9		33.2	37.3	20.4	27.4	27.7	41.1	51.5	17.8	
Level of Service	F	D		C	D	C	C	C	D	D	B	
Approach Delay (s)		52.4			27.8			29.9			26.3	
Approach LOS		D			C			C			C	

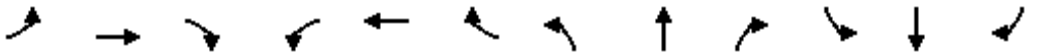
Intersection Summary			
HCM 2000 Control Delay	30.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	71.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

2: Guelph Line & W-N/S OFF RAMP/SSR Link

Lane Group	EBL	EBT	EBR	NBT	SBL	SBT
Lane Group Flow (vph)	832	578	478	1743	95	1632
v/c Ratio	0.65	0.82	0.75	0.67	0.42	0.58
Control Delay	29.3	39.9	31.0	21.2	25.1	9.2
Queue Delay	0.0	0.0	10.9	4.2	0.0	0.0
Total Delay	29.3	39.9	41.9	25.5	25.1	9.2
Queue Length 50th (m)	70.3	104.0	69.8	107.9	6.4	34.2
Queue Length 95th (m)	89.3	147.1	108.3	117.4	m13.6	48.2
Internal Link Dist (m)		328.8		96.5		49.4
Turn Bay Length (m)	180.0		160.0		100.0	
Base Capacity (vph)	1371	759	684	2597	225	2807
Starvation Cap Reductn	0	0	0	763	0	0
Spillback Cap Reductn	0	0	180	0	0	41
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.61	0.76	0.95	0.95	0.42	0.59

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	790	549	454	0	0	0	0	1633	23	90	1550	0
Future Volume (vph)	790	549	454	0	0	0	0	1633	23	90	1550	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.1	3.1	3.1	3.4	3.1	3.4	3.1	3.4	3.1	3.1	3.4	3.1
Total Lost time (s)	3.0	3.0	3.0					3.0		3.0	0.0	
Lane Util. Factor	0.97	1.00	1.00					0.86		1.00	0.91	
Frpb, ped/bikes	1.00	1.00	1.00					1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00					1.00		1.00	1.00	
Frt	1.00	1.00	0.85					1.00		1.00	1.00	
Flt Protected	0.95	1.00	1.00					1.00		0.95	1.00	
Satd. Flow (prot)	3211	1777	1495					6075		1671	4877	
Flt Permitted	0.95	1.00	1.00					1.00		0.09	1.00	
Satd. Flow (perm)	3211	1777	1495					6075		160	4877	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	832	578	478	0	0	0	0	1719	24	95	1632	0
RTOR Reduction (vph)	0	0	48	0	0	0	0	2	0	0	0	0
Lane Group Flow (vph)	832	578	430	0	0	0	0	1741	0	95	1632	0
Confl. Peds. (#/hr)							4		1	1		
Heavy Vehicles (%)	3%	1%	2%	2%	2%	2%	2%	5%	2%	2%	4%	2%
Turn Type	Prot	NA	Perm					NA		pm+pt	NA	
Protected Phases	7	4						2		1	1 2	
Permitted Phases		4	4					2		1 2	2	
Actuated Green, G (s)	39.7	39.7	39.7					43.0		52.3	56.3	
Effective Green, g (s)	43.7	43.7	43.7					47.0		54.3	60.3	
Actuated g/C Ratio	0.40	0.40	0.40					0.43		0.49	0.55	
Clearance Time (s)	7.0	7.0	7.0					7.0		4.0		
Vehicle Extension (s)	3.0	3.0	3.0					3.0		3.0		
Lane Grp Cap (vph)	1275	705	593					2595		220	2673	
v/s Ratio Prot	0.26	c0.33						c0.29		0.04	c0.33	
v/s Ratio Perm			0.29							0.17		
v/c Ratio	0.65	0.82	0.73					0.67		0.43	0.61	
Uniform Delay, d1	27.0	29.6	28.1					25.3		18.0	16.9	
Progression Factor	1.00	1.00	1.00					0.80		1.49	0.56	
Incremental Delay, d2	1.2	7.4	4.4					0.9		0.8	0.2	
Delay (s)	28.2	37.0	32.5					21.1		27.6	9.7	
Level of Service	C	D	C					C		C	A	
Approach Delay (s)		32.0			0.0			21.1			10.6	
Approach LOS		C			A			C			B	

Intersection Summary			
HCM 2000 Control Delay	21.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	67.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

3: Guelph Line & Queensway Drive/Harvester Rd

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	166	419	104	100	203	63	1374	287	431	1565
v/c Ratio	0.45	0.61	0.45	0.15	0.25	0.29	0.86	0.42	0.82	0.60
Control Delay	32.7	40.5	32.9	35.1	6.9	16.2	33.3	7.4	38.6	24.1
Queue Delay	1.4	0.0	0.0	0.0	0.0	0.0	0.6	0.0	6.2	1.4
Total Delay	34.1	40.5	32.9	35.1	6.9	16.2	33.9	7.4	44.9	25.5
Queue Length 50th (m)	27.1	40.4	16.2	9.3	9.6	4.9	45.4	5.0	79.2	97.5
Queue Length 95th (m)	41.7	53.3	27.4	15.6	21.3	m11.3	#87.5	m24.4	#133.1	116.6
Internal Link Dist (m)		110.7		287.5			189.1			96.5
Turn Bay Length (m)	45.0		110.0		200.0	60.0		80.0	100.0	
Base Capacity (vph)	369	931	235	934	814	223	1605	680	527	2591
Starvation Cap Reductn	0	0	0	0	0	0	0	0	60	757
Spillback Cap Reductn	84	0	0	0	12	0	53	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.58	0.45	0.44	0.11	0.25	0.28	0.89	0.42	0.92	0.85

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	158	320	78	99	95	193	60	1305	273	409	1353	134
Future Volume (vph)	158	320	78	99	95	193	60	1305	273	409	1353	134
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.2	3.1	3.3	3.2	3.0	3.2	3.2	3.0	3.2	3.2	3.1
Total Lost time (s)	3.0	3.0		3.0	3.0	0.0	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1604	3234		1677	3317	1451	1627	4766	1455	1708	4732	
Flt Permitted	0.69	1.00		0.27	1.00	1.00	0.15	1.00	1.00	0.11	1.00	
Satd. Flow (perm)	1158	3234		480	3317	1451	259	4766	1455	194	4732	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	166	337	82	104	100	203	63	1374	287	431	1424	141
RTOR Reduction (vph)	0	21	0	0	0	54	0	0	190	0	9	0
Lane Group Flow (vph)	166	398	0	104	100	150	63	1374	97	431	1556	0
Confl. Peds. (#/hr)	6		4	4		6	11		3	3		11
Heavy Vehicles (%)	7%	2%	8%	4%	4%	3%	6%	4%	2%	1%	3%	4%
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8	1	5	2		1	6	
Permitted Phases	4	4		8	8	8	2	2	2	6	6	
Actuated Green, G (s)	26.7	18.7		26.5	18.6	47.0	39.2	33.0	33.0	65.4	55.2	
Effective Green, g (s)	28.7	22.7		28.5	22.6	55.0	41.2	37.0	37.0	66.4	59.2	
Actuated g/C Ratio	0.26	0.21		0.26	0.21	0.50	0.37	0.34	0.34	0.60	0.54	
Clearance Time (s)	4.0	7.0		4.0	7.0	4.0	4.0	7.0	7.0	4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	338	667		221	681	725	186	1603	489	521	2546	
v/s Ratio Prot	c0.04	c0.12		0.04	0.03	0.06	0.02	c0.29		c0.22	0.33	
v/s Ratio Perm	0.09			0.08		0.04	0.10		0.07	0.28		
v/c Ratio	0.49	0.60		0.47	0.15	0.21	0.34	0.86	0.20	0.83	0.61	
Uniform Delay, d1	33.5	39.5		32.6	35.8	15.3	22.4	34.0	25.9	28.5	17.5	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.10	0.82	1.73	1.04	1.28	
Incremental Delay, d2	1.1	1.4		1.6	0.1	0.1	0.8	4.7	0.7	8.5	0.9	
Delay (s)	34.6	40.9		34.2	35.9	15.5	25.3	32.4	45.6	38.1	23.2	
Level of Service	C	D		C	D	B	C	C	D	D	C	
Approach Delay (s)		39.2			25.3			34.4			26.4	
Approach LOS		D			C			C			C	

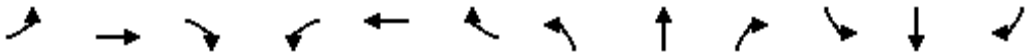
Intersection Summary			
HCM 2000 Control Delay	30.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	79.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

2: Guelph Line & W-N/S OFF RAMP/SSR Link

Lane Group	EBL	EBT	EBR	NBT	SBL	SBT
Lane Group Flow (vph)	832	578	478	1743	95	1632
v/c Ratio	0.65	0.82	0.75	0.67	0.42	0.58
Control Delay	29.3	39.9	31.0	22.1	25.1	9.2
Queue Delay	0.0	0.0	2.1	3.9	0.0	0.0
Total Delay	29.3	39.9	33.1	26.1	25.1	9.2
Queue Length 50th (m)	70.3	104.0	69.8	102.6	6.4	34.2
Queue Length 95th (m)	89.3	147.1	108.3	113.6	m13.6	48.2
Internal Link Dist (m)		328.8		96.5		49.4
Turn Bay Length (m)	180.0		160.0		100.0	
Base Capacity (vph)	1371	759	684	2597	225	2807
Starvation Cap Reductn	0	0	0	755	0	0
Spillback Cap Reductn	0	0	98	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.61	0.76	0.82	0.95	0.42	0.58

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	790	549	454	0	0	0	0	1633	23	90	1550	0
Future Volume (vph)	790	549	454	0	0	0	0	1633	23	90	1550	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.1	3.1	3.1	3.4	3.1	3.4	3.1	3.4	3.1	3.1	3.4	3.1
Total Lost time (s)	3.0	3.0	3.0					3.0		3.0	0.0	
Lane Util. Factor	0.97	1.00	1.00					0.86		1.00	0.91	
Frpb, ped/bikes	1.00	1.00	1.00					1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00					1.00		1.00	1.00	
Frt	1.00	1.00	0.85					1.00		1.00	1.00	
Flt Protected	0.95	1.00	1.00					1.00		0.95	1.00	
Satd. Flow (prot)	3211	1777	1495					6075		1671	4877	
Flt Permitted	0.95	1.00	1.00					1.00		0.09	1.00	
Satd. Flow (perm)	3211	1777	1495					6075		160	4877	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	832	578	478	0	0	0	0	1719	24	95	1632	0
RTOR Reduction (vph)	0	0	48	0	0	0	0	2	0	0	0	0
Lane Group Flow (vph)	832	578	430	0	0	0	0	1741	0	95	1632	0
Confl. Peds. (#/hr)							4		1	1		
Heavy Vehicles (%)	3%	1%	2%	2%	2%	2%	2%	5%	2%	2%	4%	2%
Turn Type	Prot	NA	Perm					NA		pm+pt	NA	
Protected Phases	7	4						2		1	1 2	
Permitted Phases		4	4					2		1 2	2	
Actuated Green, G (s)	39.7	39.7	39.7					43.0		52.3	56.3	
Effective Green, g (s)	43.7	43.7	43.7					47.0		54.3	60.3	
Actuated g/C Ratio	0.40	0.40	0.40					0.43		0.49	0.55	
Clearance Time (s)	7.0	7.0	7.0					7.0		4.0		
Vehicle Extension (s)	3.0	3.0	3.0					3.0		3.0		
Lane Grp Cap (vph)	1275	705	593					2595		220	2673	
v/s Ratio Prot	0.26	c0.33						c0.29		0.04	c0.33	
v/s Ratio Perm			0.29							0.17		
v/c Ratio	0.65	0.82	0.73					0.67		0.43	0.61	
Uniform Delay, d1	27.0	29.6	28.1					25.3		18.0	16.9	
Progression Factor	1.00	1.00	1.00					0.83		1.49	0.56	
Incremental Delay, d2	1.2	7.4	4.4					1.1		0.8	0.2	
Delay (s)	28.2	37.0	32.5					22.0		27.6	9.7	
Level of Service	C	D	C					C		C	A	
Approach Delay (s)		32.0			0.0			22.0			10.6	
Approach LOS		C			A			C			B	

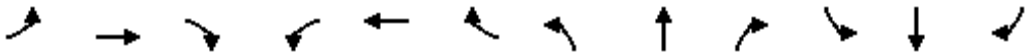
Intersection Summary			
HCM 2000 Control Delay	21.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	67.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

3: Guelph Line & Queensway Drive/Harvester Rd

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	166	419	104	202	101	63	1374	287	431	1565
v/c Ratio	0.53	0.61	0.45	0.30	0.16	0.29	0.68	0.37	0.72	0.60
Control Delay	35.1	40.5	32.9	18.4	4.9	17.4	22.1	4.8	45.3	22.6
Queue Delay	3.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.9
Total Delay	38.2	40.5	32.9	18.4	4.9	17.4	22.2	4.8	45.3	23.4
Queue Length 50th (m)	27.1	40.4	16.2	9.7	1.9	4.5	40.9	5.0	47.1	96.6
Queue Length 95th (m)	41.7	53.3	27.4	19.0	10.7	m9.9	63.0	m19.0	63.9	106.8
Internal Link Dist (m)		110.7		287.5			189.1			96.5
Turn Bay Length (m)	45.0		110.0		200.0	60.0		80.0	100.0	
Base Capacity (vph)	315	931	235	896	635	225	2023	782	621	2593
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	662
Spillback Cap Reductn	76	0	0	3	5	0	70	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.69	0.45	0.44	0.23	0.16	0.28	0.70	0.37	0.69	0.81

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.



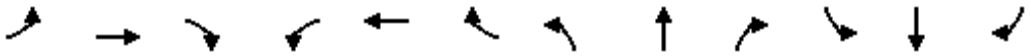
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	158	320	78	99	95	193	60	1305	273	409	1353	134
Future Volume (vph)	158	320	78	99	95	193	60	1305	273	409	1353	134
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.2	3.1	3.3	3.2	3.0	3.2	3.2	3.0	3.2	3.2	3.1
Total Lost time (s)	3.0	3.0		3.0	3.0	0.0	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	0.91	0.91	1.00	0.91	1.00	0.97	0.91	
Frpb, ped/bikes	1.00	1.00		1.00	0.99	0.99	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.97		1.00	0.92	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1607	3234		1677	2921	1318	1627	4766	1455	3313	4732	
Flt Permitted	0.53	1.00		0.27	1.00	1.00	0.12	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	891	3234		482	2921	1318	211	4766	1455	3313	4732	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	166	337	82	104	100	203	63	1374	287	431	1424	141
RTOR Reduction (vph)	0	21	0	0	81	51	0	0	165	0	9	0
Lane Group Flow (vph)	166	398	0	104	121	50	63	1374	122	431	1556	0
Confl. Peds. (#/hr)	6		4	4		6	11		3	3		11
Heavy Vehicles (%)	7%	2%	8%	4%	4%	3%	6%	4%	2%	1%	3%	4%
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	pm+pt	NA	Perm	Prot	NA	
Protected Phases	7	4		3	8	1	5	2		1	6	
Permitted Phases	4	4		8	8	8	2	2	2		6	
Actuated Green, G (s)	26.7	18.7		26.3	18.5	37.3	48.9	42.7	42.7	18.8	55.3	
Effective Green, g (s)	28.7	22.7		28.3	22.5	45.3	50.9	46.7	46.7	19.8	59.3	
Actuated g/C Ratio	0.26	0.21		0.26	0.20	0.41	0.46	0.42	0.42	0.18	0.54	
Clearance Time (s)	4.0	7.0		4.0	7.0	4.0	4.0	7.0	7.0	4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	291	667		219	597	542	190	2023	617	596	2550	
v/s Ratio Prot	c0.05	c0.12		0.04	0.04	0.02	0.02	c0.29		c0.13	0.33	
v/s Ratio Perm	0.10			0.08		0.02	0.13		0.08			
v/c Ratio	0.57	0.60		0.47	0.20	0.09	0.33	0.68	0.20	0.72	0.61	
Uniform Delay, d1	33.7	39.5		32.8	36.3	19.8	16.9	25.6	19.9	42.5	17.4	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.38	0.77	1.28	0.93	1.19	
Incremental Delay, d2	2.7	1.4		1.6	0.2	0.1	0.8	1.4	0.5	3.5	0.9	
Delay (s)	36.3	40.9		34.4	36.5	19.9	24.0	21.0	26.0	43.1	21.7	
Level of Service	D	D		C	D	B	C	C	C	D	C	
Approach Delay (s)		39.6			31.8			21.9			26.3	
Approach LOS		D			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	26.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	68.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

2: Guelph Line & W-N/S OFF RAMP/SSR Link

Lane Group	EBL	EBT	EBR	NBT	SBT
Lane Group Flow (vph)	832	578	478	1743	1726
v/c Ratio	0.65	0.82	0.77	0.52	0.65
Control Delay	29.3	39.9	35.4	5.0	20.6
Queue Delay	0.0	0.0	0.0	0.3	0.0
Total Delay	29.3	39.9	35.4	5.3	20.6
Queue Length 50th (m)	70.3	104.0	77.4	14.1	85.2
Queue Length 95th (m)	89.3	147.1	117.1	17.5	110.4
Internal Link Dist (m)		328.8		96.5	49.4
Turn Bay Length (m)	180.0		160.0		
Base Capacity (vph)	1371	759	661	3333	2674
Starvation Cap Reductn	0	0	0	771	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.61	0.76	0.72	0.68	0.65

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	790	549	454	0	0	0	0	1633	23	0	1640	0
Future Volume (vph)	790	549	454	0	0	0	0	1633	23	0	1640	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.1	3.1	3.1	3.4	3.1	3.4	3.1	3.4	3.1	3.1	3.4	3.1
Total Lost time (s)	3.0	3.0	3.0					3.0			3.0	
Lane Util. Factor	0.97	1.00	1.00					0.86			0.91	
Frpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	
Flpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	
Frt	1.00	1.00	0.85					1.00			1.00	
Flt Protected	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (prot)	3211	1777	1495					6075			4877	
Flt Permitted	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (perm)	3211	1777	1495					6075			4877	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	832	578	478	0	0	0	0	1719	24	0	1726	0
RTOR Reduction (vph)	0	0	24	0	0	0	0	1	0	0	0	0
Lane Group Flow (vph)	832	578	454	0	0	0	0	1742	0	0	1726	0
Confl. Peds. (#/hr)							4		1	1		
Heavy Vehicles (%)	3%	1%	2%	2%	2%	2%	2%	5%	2%	2%	4%	2%
Turn Type	Prot	NA	Perm					NA			NA	
Protected Phases	7	4						2			2	
Permitted Phases		4	4					2			2	
Actuated Green, G (s)	39.7	39.7	39.7					56.3			56.3	
Effective Green, g (s)	43.7	43.7	43.7					60.3			60.3	
Actuated g/C Ratio	0.40	0.40	0.40					0.55			0.55	
Clearance Time (s)	7.0	7.0	7.0					7.0			7.0	
Vehicle Extension (s)	3.0	3.0	3.0					3.0			3.0	
Lane Grp Cap (vph)	1275	705	593					3330			2673	
v/s Ratio Prot	0.26	c0.33						0.29			c0.35	
v/s Ratio Perm			0.30									
v/c Ratio	0.65	0.82	0.77					0.52			0.65	
Uniform Delay, d1	27.0	29.6	28.7					15.7			17.4	
Progression Factor	1.00	1.00	1.00					0.28			1.10	
Incremental Delay, d2	1.2	7.4	5.9					0.4			0.7	
Delay (s)	28.2	37.0	34.6					4.8			19.7	
Level of Service	C	D	C					A			B	
Approach Delay (s)		32.5			0.0			4.8			19.7	
Approach LOS		C			A			A			B	

Intersection Summary			
HCM 2000 Control Delay	19.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	67.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	166	419	104	100	203	63	1374	287	525	1565
v/c Ratio	0.83	0.61	0.44	0.19	0.17	0.29	0.80	0.41	0.65	0.60
Control Delay	78.7	40.2	32.9	39.5	17.4	15.6	28.8	6.1	50.2	17.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Total Delay	78.7	40.2	32.9	39.5	17.4	15.6	28.8	6.1	50.2	17.2
Queue Length 50th (m)	35.2	40.2	16.2	9.8	13.9	4.7	43.4	5.0	59.0	67.2
Queue Length 95th (m)	#69.6	53.0	27.4	16.6	21.0	m10.4	68.7	m21.7	76.5	68.6
Internal Link Dist (m)		110.7		287.5			189.1			96.5
Turn Bay Length (m)	45.0		110.0		200.0	60.0		80.0	100.0	
Base Capacity (vph)	205	1078	239	934	1189	227	1712	706	813	2592
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	328
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.81	0.39	0.44	0.11	0.17	0.28	0.80	0.41	0.65	0.69

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	158	320	78	99	95	193	60	1305	273	499	1353	134
Future Volume (vph)	158	320	78	99	95	193	60	1305	273	499	1353	134
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.2	3.1	3.3	3.2	3.0	3.2	3.2	3.0	3.2	3.2	3.1
Total Lost time (s)	3.0	3.0		3.0	3.0	0.0	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	0.88	1.00	0.91	1.00	0.97	0.91	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1612	3234		1676	3317	2576	1627	4766	1455	3313	4732	
Flt Permitted	0.95	1.00		0.36	1.00	1.00	0.15	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1612	3234		635	3317	2576	253	4766	1455	3313	4732	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	166	337	82	104	100	203	63	1374	287	525	1424	141
RTOR Reduction (vph)	0	23	0	0	0	0	0	0	184	0	8	0
Lane Group Flow (vph)	166	396	0	104	100	203	63	1374	103	525	1557	0
Confl. Peds. (#/hr)	6		4	4		6	11		3	3		11
Heavy Vehicles (%)	7%	2%	8%	4%	4%	3%	6%	4%	2%	1%	3%	4%
Turn Type	Prot	NA		pm+pt	NA	pt+ov	pm+pt	NA	Perm	Prot	NA	
Protected Phases	7	4		3	8	1 8	5	2		1	6	
Permitted Phases		4		8	8		2	2	2		6	
Actuated Green, G (s)	12.7	18.7		21.6	13.8	46.8	41.7	35.5	35.5	26.0	55.3	
Effective Green, g (s)	13.7	22.7		23.6	17.8	47.8	43.7	39.5	39.5	27.0	59.3	
Actuated g/C Ratio	0.12	0.21		0.21	0.16	0.43	0.40	0.36	0.36	0.25	0.54	
Clearance Time (s)	4.0	7.0		4.0	7.0		4.0	7.0	7.0	4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	200	667		219	536	1119	190	1711	522	813	2550	
v/s Ratio Prot	c0.10	c0.12		0.04	0.03	0.08	0.02	c0.29		c0.16	0.33	
v/s Ratio Perm				0.06			0.11		0.07			
v/c Ratio	0.83	0.59		0.47	0.19	0.18	0.33	0.80	0.20	0.65	0.61	
Uniform Delay, d1	47.0	39.5		36.3	39.8	19.1	20.8	31.7	24.3	37.2	17.4	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.12	0.79	1.50	1.24	0.89	
Incremental Delay, d2	23.9	1.4		1.6	0.2	0.1	0.8	3.1	0.6	1.3	0.8	
Delay (s)	70.9	40.9		37.9	40.0	19.2	24.1	28.1	37.0	47.6	16.3	
Level of Service	E	D		D	D	B	C	C	D	D	B	
Approach Delay (s)		49.4			29.1			29.4			24.2	
Approach LOS		D			C			C			C	

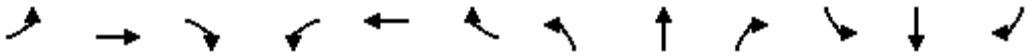
Intersection Summary			
HCM 2000 Control Delay	29.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	71.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

2: Guelph Line & W-N/S OFF RAMP/SSR Link

Lane Group	EBL	EBT	EBR	NBT	SBT
Lane Group Flow (vph)	832	578	478	1743	1726
v/c Ratio	0.65	0.82	0.77	0.52	0.65
Control Delay	29.3	39.9	35.4	3.4	20.6
Queue Delay	0.0	0.0	5.0	0.4	0.0
Total Delay	29.3	39.9	40.5	3.8	20.6
Queue Length 50th (m)	70.3	104.0	77.4	9.4	85.2
Queue Length 95th (m)	89.3	147.1	117.1	m14.7	110.4
Internal Link Dist (m)		328.8		96.5	49.4
Turn Bay Length (m)	180.0		160.0		
Base Capacity (vph)	1371	759	661	3333	2674
Starvation Cap Reductn	0	0	0	933	0
Spillback Cap Reductn	0	0	124	0	55
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.61	0.76	0.89	0.73	0.66

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	790	549	454	0	0	0	0	1633	23	0	1640	0
Future Volume (vph)	790	549	454	0	0	0	0	1633	23	0	1640	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.1	3.1	3.1	3.4	3.1	3.4	3.1	3.4	3.1	3.1	3.4	3.1
Total Lost time (s)	3.0	3.0	3.0					3.0			3.0	
Lane Util. Factor	0.97	1.00	1.00					0.86			0.91	
Frpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	
Flpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	
Frt	1.00	1.00	0.85					1.00			1.00	
Flt Protected	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (prot)	3211	1777	1495					6075			4877	
Flt Permitted	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (perm)	3211	1777	1495					6075			4877	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	832	578	478	0	0	0	0	1719	24	0	1726	0
RTOR Reduction (vph)	0	0	24	0	0	0	0	1	0	0	0	0
Lane Group Flow (vph)	832	578	454	0	0	0	0	1742	0	0	1726	0
Confl. Peds. (#/hr)							4		1	1		
Heavy Vehicles (%)	3%	1%	2%	2%	2%	2%	2%	5%	2%	2%	4%	2%
Turn Type	Prot	NA	Perm					NA			NA	
Protected Phases	7	4						2			2	
Permitted Phases		4	4					2			2	
Actuated Green, G (s)	39.7	39.7	39.7					56.3			56.3	
Effective Green, g (s)	43.7	43.7	43.7					60.3			60.3	
Actuated g/C Ratio	0.40	0.40	0.40					0.55			0.55	
Clearance Time (s)	7.0	7.0	7.0					7.0			7.0	
Vehicle Extension (s)	3.0	3.0	3.0					3.0			3.0	
Lane Grp Cap (vph)	1275	705	593					3330			2673	
v/s Ratio Prot	0.26	c0.33						0.29			c0.35	
v/s Ratio Perm			0.30									
v/c Ratio	0.65	0.82	0.77					0.52			0.65	
Uniform Delay, d1	27.0	29.6	28.7					15.7			17.4	
Progression Factor	1.00	1.00	1.00					0.19			1.10	
Incremental Delay, d2	1.2	7.4	5.9					0.3			0.7	
Delay (s)	28.2	37.0	34.6					3.3			19.7	
Level of Service	C	D	C					A			B	
Approach Delay (s)		32.5			0.0			3.3			19.7	
Approach LOS		C			A			A			B	

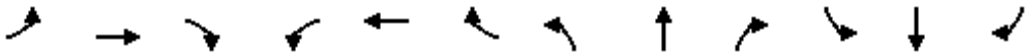
Intersection Summary			
HCM 2000 Control Delay	18.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	67.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

3: Guelph Line & Queensway Drive/Harvester Rd

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	166	419	104	100	203	63	1374	287	525	1565
v/c Ratio	0.45	0.61	0.45	0.15	0.23	0.31	0.96	0.45	0.89	0.60
Control Delay	32.7	40.5	32.9	35.1	6.1	17.4	46.9	8.9	53.6	17.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.6	0.3
Total Delay	32.7	40.5	32.9	35.1	6.1	17.4	46.9	8.9	78.2	17.9
Queue Length 50th (m)	27.1	40.4	16.2	9.3	8.6	5.5	50.5	5.0	105.8	66.9
Queue Length 95th (m)	41.7	53.3	27.4	15.6	19.7	m12.0	#131.5	m27.1	#171.9	77.7
Internal Link Dist (m)		110.7		287.5			189.1			96.5
Turn Bay Length (m)	45.0		110.0		200.0	60.0		80.0	100.0	
Base Capacity (vph)	369	931	235	934	866	213	1429	637	591	2591
Starvation Cap Reductn	0	0	0	0	0	0	0	0	83	404
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.45	0.45	0.44	0.11	0.23	0.30	0.96	0.45	1.03	0.72

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	158	320	78	99	95	193	60	1305	273	499	1353	134
Future Volume (vph)	158	320	78	99	95	193	60	1305	273	499	1353	134
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.2	3.1	3.3	3.2	3.0	3.2	3.2	3.0	3.2	3.2	3.1
Total Lost time (s)	3.0	3.0		3.0	3.0	0.0	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1604	3234		1677	3317	1452	1627	4766	1455	1708	4732	
Flt Permitted	0.69	1.00		0.27	1.00	1.00	0.15	1.00	1.00	0.12	1.00	
Satd. Flow (perm)	1158	3234		480	3317	1452	259	4766	1455	219	4732	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	166	337	82	104	100	203	63	1374	287	525	1424	141
RTOR Reduction (vph)	0	21	0	0	0	52	0	0	201	0	9	0
Lane Group Flow (vph)	166	398	0	104	100	151	63	1374	86	525	1556	0
Confl. Peds. (#/hr)	6		4	4		6	11		3	3		11
Heavy Vehicles (%)	7%	2%	8%	4%	4%	3%	6%	4%	2%	1%	3%	4%
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8	1	5	2		1	6	
Permitted Phases	4	4		8	8	8	2	2	2	6	6	
Actuated Green, G (s)	26.7	18.7		26.5	18.6	51.1	35.1	28.9	28.9	65.4	55.2	
Effective Green, g (s)	28.7	22.7		28.5	22.6	59.1	37.1	32.9	32.9	66.4	59.2	
Actuated g/C Ratio	0.26	0.21		0.26	0.21	0.54	0.34	0.30	0.30	0.60	0.54	
Clearance Time (s)	4.0	7.0		4.0	7.0	4.0	4.0	7.0	7.0	4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	338	667		221	681	780	176	1425	435	585	2546	
v/s Ratio Prot	c0.04	c0.12		0.04	0.03	0.06	0.02	c0.29		c0.27	0.33	
v/s Ratio Perm	0.09			0.08		0.04	0.10		0.06	0.27		
v/c Ratio	0.49	0.60		0.47	0.15	0.19	0.36	0.96	0.20	0.90	0.61	
Uniform Delay, d1	33.5	39.5		32.6	35.8	13.1	25.1	38.0	28.7	28.9	17.5	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.10	0.87	1.99	1.49	0.92	
Incremental Delay, d2	1.1	1.4		1.6	0.1	0.1	0.9	13.6	0.8	12.9	0.8	
Delay (s)	34.6	40.9		34.2	35.9	13.3	28.6	46.8	58.0	55.9	16.9	
Level of Service	C	D		C	D	B	C	D	E	E	B	
Approach Delay (s)		39.2			24.2			48.0			26.7	
Approach LOS		D			C			D			C	

Intersection Summary			
HCM 2000 Control Delay	35.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	84.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

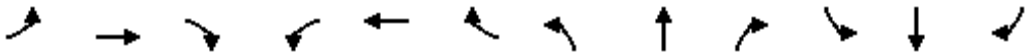
APPENDIX F4 – 2031 PM PEAK (Synchro Output)

2: Guelph Line & W-N/S OFF RAMP/SSR Link

Lane Group	EBL	EBT	EBR	NBT	SBT
Lane Group Flow (vph)	799	142	557	2633	1602
v/c Ratio	0.77	0.25	0.84	0.66	0.62
Control Delay	42.0	30.4	39.8	6.3	9.2
Queue Delay	0.0	0.0	0.0	0.6	0.0
Total Delay	42.0	30.4	39.8	7.0	9.2
Queue Length 50th (m)	85.3	24.1	105.1	45.8	42.0
Queue Length 95th (m)	105.6	39.1	#171.5	m49.7	m28.4
Internal Link Dist (m)		328.8		96.5	49.4
Turn Bay Length (m)	180.0		160.0		
Base Capacity (vph)	1123	609	667	3966	2594
Starvation Cap Reductn	0	0	0	830	0
Spillback Cap Reductn	0	0	0	0	90
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.71	0.23	0.84	0.84	0.64

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	759	135	529	0	0	0	0	2494	8	0	1522	0
Future Volume (vph)	759	135	529	0	0	0	0	2494	8	0	1522	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.1	3.1	3.1	3.4	3.1	3.4	3.1	3.4	3.1	3.1	3.4	3.1
Total Lost time (s)	3.0	3.0	1.0					3.0			3.0	
Lane Util. Factor	0.97	1.00	1.00					0.86			0.91	
Frpb, ped/bikes	1.00	1.00	0.99					1.00			1.00	
Flpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	
Frt	1.00	1.00	0.85					1.00			1.00	
Flt Protected	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (prot)	3211	1742	1465					6324			5022	
Flt Permitted	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (perm)	3211	1742	1465					6324			5022	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	799	142	557	0	0	0	0	2625	8	0	1602	0
RTOR Reduction (vph)	0	0	21	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	799	142	536	0	0	0	0	2633	0	0	1602	0
Confl. Peds. (#/hr)			2				20		7	7		20
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	2%	1%	2%	2%	1%	2%
Turn Type	Split	NA	custom					NA			NA	
Protected Phases	4	4	3					2 3			2	
Permitted Phases		4	4					2			2	
Actuated Green, G (s)	34.8	34.8	43.0					71.2			58.0	
Effective Green, g (s)	38.8	38.8	51.0					74.2			62.0	
Actuated g/C Ratio	0.32	0.32	0.42					0.62			0.52	
Clearance Time (s)	7.0	7.0	5.0								7.0	
Vehicle Extension (s)	3.0	3.0	3.0								3.0	
Lane Grp Cap (vph)	1038	563	622					3910			2594	
v/s Ratio Prot	0.25	0.08	c0.09					c0.42			0.32	
v/s Ratio Perm			0.28									
v/c Ratio	0.77	0.25	0.86					0.67			0.62	
Uniform Delay, d1	36.6	29.9	31.3					15.0			20.6	
Progression Factor	1.00	1.00	1.00					0.41			0.44	
Incremental Delay, d2	3.5	0.2	11.8					0.1			0.1	
Delay (s)	40.1	30.1	43.1					6.3			9.1	
Level of Service	D	C	D					A			A	
Approach Delay (s)		40.3			0.0			6.3			9.1	
Approach LOS		D			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	15.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	7.0
Intersection Capacity Utilization	69.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

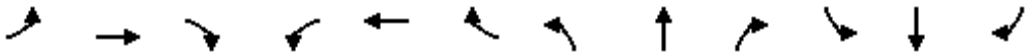
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	200	187	299	824	720	126	1714	108	160	1877
v/c Ratio	1.12	0.21	0.65	0.93	1.00	0.67	0.94	0.18	0.31	0.84
Control Delay	150.9	18.9	35.5	61.9	64.3	41.6	69.3	16.4	60.4	19.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
Total Delay	150.9	18.9	35.5	61.9	64.3	41.6	69.3	16.4	60.4	20.0
Queue Length 50th (m)	~54.0	9.4	51.2	100.2	~152.5	26.2	157.2	6.2	19.1	66.1
Queue Length 95th (m)	#100.1	18.7	76.1	#137.6	#239.8	m32.3	#179.1	m9.6	m27.9	71.9
Internal Link Dist (m)		110.7		287.5			189.1			96.5
Turn Bay Length (m)	45.0		110.0		200.0	60.0		80.0	100.0	
Base Capacity (vph)	179	870	461	882	717	190	1822	615	509	2224
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	102
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.12	0.21	0.65	0.93	1.00	0.66	0.94	0.18	0.31	0.88

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

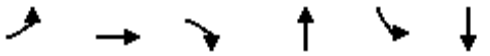
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	190	94	84	284	783	684	120	1628	103	152	1605	179
Future Volume (vph)	190	94	84	284	783	684	120	1628	103	152	1605	179
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.2	3.1	3.3	3.2	3.0	3.2	3.2	3.0	3.2	3.2	3.1
Total Lost time (s)	3.0	3.0		3.0	3.0	0.0	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	0.91	1.00	0.97	0.91	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.98	1.00	1.00	0.96	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.93		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1658	3119		1725	3415	1456	1691	4859	1400	3217	4816	
Flt Permitted	0.95	1.00		0.59	1.00	1.00	0.10	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1658	3119		1063	3415	1456	170	4859	1400	3217	4816	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	200	99	88	299	824	720	126	1714	108	160	1689	188
RTOR Reduction (vph)	0	65	0	0	0	41	0	0	68	0	11	0
Lane Group Flow (vph)	200	122	0	299	824	679	126	1714	41	160	1866	0
Confl. Peds. (#/hr)	20		2	2		20	4		25	25		4
Heavy Vehicles (%)	4%	3%	1%	1%	1%	1%	2%	2%	3%	4%	1%	3%
Turn Type	Prot	NA		pm+pt	NA	pm+ov	pm+pt	NA	Perm	Prot	NA	
Protected Phases	7	4		3	8	1	5	2		1	6	
Permitted Phases		4		8	8	8	2	2	2		6	
Actuated Green, G (s)	12.0	27.0		39.0	27.0	45.0	48.8	41.0	41.0	18.0	51.2	
Effective Green, g (s)	13.0	31.0		41.0	31.0	53.0	50.8	45.0	45.0	19.0	55.2	
Actuated g/C Ratio	0.11	0.26		0.34	0.26	0.44	0.42	0.38	0.38	0.16	0.46	
Clearance Time (s)	4.0	7.0		4.0	7.0	4.0	4.0	7.0	7.0	4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	179	805		434	882	643	183	1822	525	509	2215	
v/s Ratio Prot	c0.12	0.04		0.07	0.24	c0.19	0.05	c0.35		0.05	0.39	
v/s Ratio Perm				0.16		0.27	0.24		0.03			
v/c Ratio	1.12	0.15		0.69	0.93	1.06	0.69	0.94	0.08	0.31	0.84	
Uniform Delay, d1	53.5	34.3		32.1	43.5	33.5	25.7	36.2	24.1	44.7	28.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.44	1.73	10.00	1.31	0.57	
Incremental Delay, d2	102.2	0.1		4.5	16.5	51.3	6.2	7.2	0.2	0.3	3.0	
Delay (s)	155.7	34.4		36.6	60.0	84.8	43.1	69.7	241.6	59.0	19.3	
Level of Service	F	C		D	E	F	D	E	F	E	B	
Approach Delay (s)		97.1			65.9			77.5			22.4	
Approach LOS		F			E			E			C	

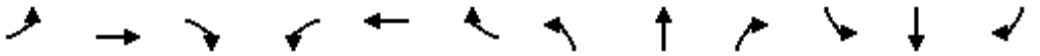
Intersection Summary			
HCM 2000 Control Delay	57.2	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	96.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBL	EBT	EBR	NBT	SBL	SBT
Lane Group Flow (vph)	799	142	557	2633	29	1573
v/c Ratio	0.77	0.25	0.84	0.66	0.49	0.61
Control Delay	42.0	30.4	39.8	6.8	18.2	9.1
Queue Delay	0.0	0.0	0.0	0.6	0.0	0.0
Total Delay	42.0	30.4	39.8	7.4	18.2	9.1
Queue Length 50th (m)	85.3	24.1	105.1	50.1	1.7	40.1
Queue Length 95th (m)	105.6	39.1	#171.5	m53.8	m1.4	m27.3
Internal Link Dist (m)		328.8		96.5		49.4
Turn Bay Length (m)	180.0		160.0		100.0	
Base Capacity (vph)	1123	609	667	3966	59	2594
Starvation Cap Reductn	0	0	0	803	0	0
Spillback Cap Reductn	0	0	0	0	0	26
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.71	0.23	0.84	0.83	0.49	0.61

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



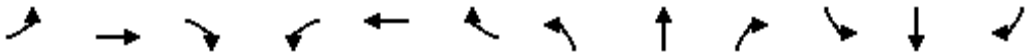
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	759	135	529	0	0	0	0	2494	8	28	1494	0
Future Volume (vph)	759	135	529	0	0	0	0	2494	8	28	1494	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.1	3.1	3.1	3.4	3.1	3.4	3.1	3.4	3.1	3.1	3.4	3.1
Total Lost time (s)	3.0	3.0	1.0					3.0		6.0	3.0	
Lane Util. Factor	0.97	1.00	1.00					0.86		1.00	0.91	
Frpb, ped/bikes	1.00	1.00	0.99					1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00					1.00		1.00	1.00	
Frt	1.00	1.00	0.85					1.00		1.00	1.00	
Flt Protected	0.95	1.00	1.00					1.00		0.95	1.00	
Satd. Flow (prot)	3211	1742	1465					6324		1671	5022	
Flt Permitted	0.95	1.00	1.00					1.00		0.07	1.00	
Satd. Flow (perm)	3211	1742	1465					6324		119	5022	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	799	142	557	0	0	0	0	2625	8	29	1573	0
RTOR Reduction (vph)	0	0	21	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	799	142	536	0	0	0	0	2633	0	29	1573	0
Confl. Peds. (#/hr)			2				20		7	7		20
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	2%	1%	2%	2%	1%	2%
Turn Type	Split	NA	custom					NA		Perm	NA	
Protected Phases	4	4	3					2 3			2	
Permitted Phases		4	4					2		2	2	
Actuated Green, G (s)	34.8	34.8	43.0					71.2		58.0	58.0	
Effective Green, g (s)	38.8	38.8	51.0					74.2		59.0	62.0	
Actuated g/C Ratio	0.32	0.32	0.42					0.62		0.49	0.52	
Clearance Time (s)	7.0	7.0	5.0							7.0	7.0	
Vehicle Extension (s)	3.0	3.0	3.0							3.0	3.0	
Lane Grp Cap (vph)	1038	563	622					3910		58	2594	
v/s Ratio Prot	0.25	0.08	c0.09					c0.42			0.31	
v/s Ratio Perm			0.28							0.24		
v/c Ratio	0.77	0.25	0.86					0.67		0.50	0.61	
Uniform Delay, d1	36.6	29.9	31.3					15.0		20.6	20.4	
Progression Factor	1.00	1.00	1.00					0.44		0.53	0.44	
Incremental Delay, d2	3.5	0.2	11.8					0.2		2.8	0.1	
Delay (s)	40.1	30.1	43.1					6.7		13.6	9.0	
Level of Service	D	C	D					A		B	A	
Approach Delay (s)		40.3			0.0			6.7			9.1	
Approach LOS		D			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	16.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	7.0
Intersection Capacity Utilization	68.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	200	187	299	824	720	126	1714	108	131	1877
v/c Ratio	0.99	0.21	0.72	0.93	0.97	0.67	0.92	0.17	0.37	0.80
Control Delay	92.9	18.9	42.1	61.9	55.4	40.0	67.2	16.4	30.8	16.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Total Delay	92.9	18.9	42.1	61.9	55.4	40.0	67.2	16.4	30.8	16.6
Queue Length 50th (m)	33.6	9.4	53.5	100.2	146.2	26.0	156.9	6.2	16.5	63.6
Queue Length 95th (m)	#78.8	18.7	79.5	#137.6	#234.1	m31.7	#175.3	m9.6	m31.2	67.1
Internal Link Dist (m)		110.7		287.5			189.1			96.5
Turn Bay Length (m)	45.0		110.0		200.0	60.0		80.0	100.0	
Base Capacity (vph)	202	870	418	882	741	190	1865	627	352	2345
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	98
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.99	0.21	0.72	0.93	0.97	0.66	0.92	0.17	0.37	0.84

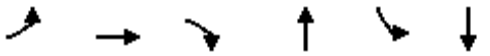
Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	190	94	84	284	783	684	120	1628	103	124	1605	179
Future Volume (vph)	190	94	84	284	783	684	120	1628	103	124	1605	179
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.2	3.1	3.3	3.2	3.0	3.2	3.2	3.0	3.2	3.2	3.1
Total Lost time (s)	3.0	3.0		3.0	3.0	0.0	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.98	1.00	1.00	0.96	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.93		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1658	3119		1725	3415	1458	1691	4859	1400	1658	4816	
Flt Permitted	0.14	1.00		0.59	1.00	1.00	0.09	1.00	1.00	0.09	1.00	
Satd. Flow (perm)	249	3119		1063	3415	1458	165	4859	1400	151	4816	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	200	99	88	299	824	720	126	1714	108	131	1689	188
RTOR Reduction (vph)	0	65	0	0	0	40	0	0	67	0	11	0
Lane Group Flow (vph)	200	122	0	299	824	680	126	1714	41	131	1866	0
Confl. Peds. (#/hr)	20		2	2		20	4		25	25		4
Heavy Vehicles (%)	4%	3%	1%	1%	1%	1%	2%	2%	3%	4%	1%	3%
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8	1	5	2		1	6	
Permitted Phases	4	4		8	8	8	2	2	2	6	6	
Actuated Green, G (s)	36.0	27.0		36.0	27.0	46.9	49.9	42.1	42.1	66.0	54.2	
Effective Green, g (s)	38.0	31.0		38.0	31.0	54.9	51.9	46.1	46.1	67.0	58.2	
Actuated g/C Ratio	0.32	0.26		0.32	0.26	0.46	0.43	0.38	0.38	0.56	0.49	
Clearance Time (s)	4.0	7.0		4.0	7.0	4.0	4.0	7.0	7.0	4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	196	805		391	882	667	183	1866	537	346	2335	
v/s Ratio Prot	c0.08	0.04		0.06	0.24	c0.20	0.05	c0.35		0.07	0.39	
v/s Ratio Perm	0.24			0.18		0.26	0.25		0.03	0.14		
v/c Ratio	1.02	0.15		0.76	0.93	1.02	0.69	0.92	0.08	0.38	0.80	
Uniform Delay, d1	36.1	34.3		35.4	43.5	32.5	24.3	35.2	23.5	20.1	26.0	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.34	1.76	10.28	1.89	0.54	
Incremental Delay, d2	69.7	0.1		8.6	16.5	40.0	6.2	5.5	0.2	0.5	2.2	
Delay (s)	105.8	34.4		44.1	60.0	72.6	38.7	67.3	241.1	38.6	16.3	
Level of Service	F	C		D	E	E	D	E	F	D	B	
Approach Delay (s)		71.3			62.3			75.1			17.7	
Approach LOS		E			E			E			B	

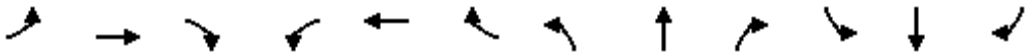
Intersection Summary			
HCM 2000 Control Delay	52.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	96.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBL	EBT	EBR	NBT	SBL	SBT
Lane Group Flow (vph)	799	142	557	2633	29	1573
v/c Ratio	0.77	0.25	0.84	0.66	0.49	0.61
Control Delay	42.0	30.4	39.8	6.7	18.2	9.1
Queue Delay	0.0	0.0	0.0	0.6	0.0	0.0
Total Delay	42.0	30.4	39.8	7.3	18.2	9.1
Queue Length 50th (m)	85.3	24.1	105.1	50.0	1.7	40.1
Queue Length 95th (m)	105.6	39.1	#171.5	m53.1	m1.4	m27.3
Internal Link Dist (m)		328.8		96.5		49.4
Turn Bay Length (m)	180.0		160.0		100.0	
Base Capacity (vph)	1123	609	667	3966	59	2594
Starvation Cap Reductn	0	0	0	830	0	0
Spillback Cap Reductn	0	0	0	0	0	22
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.71	0.23	0.84	0.84	0.49	0.61

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



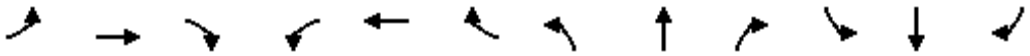
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	759	135	529	0	0	0	0	2494	8	28	1494	0
Future Volume (vph)	759	135	529	0	0	0	0	2494	8	28	1494	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.1	3.1	3.1	3.4	3.1	3.4	3.1	3.4	3.1	3.1	3.4	3.1
Total Lost time (s)	3.0	3.0	1.0					3.0		6.0	3.0	
Lane Util. Factor	0.97	1.00	1.00					0.86		1.00	0.91	
Frpb, ped/bikes	1.00	1.00	0.99					1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00					1.00		1.00	1.00	
Frt	1.00	1.00	0.85					1.00		1.00	1.00	
Flt Protected	0.95	1.00	1.00					1.00		0.95	1.00	
Satd. Flow (prot)	3211	1742	1465					6324		1671	5022	
Flt Permitted	0.95	1.00	1.00					1.00		0.07	1.00	
Satd. Flow (perm)	3211	1742	1465					6324		119	5022	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	799	142	557	0	0	0	0	2625	8	29	1573	0
RTOR Reduction (vph)	0	0	21	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	799	142	536	0	0	0	0	2633	0	29	1573	0
Confl. Peds. (#/hr)			2				20		7	7		20
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	2%	1%	2%	2%	1%	2%
Turn Type	Split	NA	custom					NA		Perm	NA	
Protected Phases	4	4	3					2 3			2	
Permitted Phases		4	4					2		2	2	
Actuated Green, G (s)	34.8	34.8	43.0					71.2		58.0	58.0	
Effective Green, g (s)	38.8	38.8	51.0					74.2		59.0	62.0	
Actuated g/C Ratio	0.32	0.32	0.42					0.62		0.49	0.52	
Clearance Time (s)	7.0	7.0	5.0							7.0	7.0	
Vehicle Extension (s)	3.0	3.0	3.0							3.0	3.0	
Lane Grp Cap (vph)	1038	563	622					3910		58	2594	
v/s Ratio Prot	0.25	0.08	c0.09					c0.42			0.31	
v/s Ratio Perm			0.28							0.24		
v/c Ratio	0.77	0.25	0.86					0.67		0.50	0.61	
Uniform Delay, d1	36.6	29.9	31.3					15.0		20.6	20.4	
Progression Factor	1.00	1.00	1.00					0.43		0.53	0.44	
Incremental Delay, d2	3.5	0.2	11.8					0.2		2.8	0.1	
Delay (s)	40.1	30.1	43.1					6.6		13.6	9.0	
Level of Service	D	C	D					A		B	A	
Approach Delay (s)		40.3			0.0			6.6			9.1	
Approach LOS		D			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	16.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	7.0
Intersection Capacity Utilization	68.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	200	187	299	824	720	126	1714	108	131	1877
v/c Ratio	0.99	0.21	0.72	0.93	0.96	0.67	0.93	0.17	0.23	0.80
Control Delay	92.9	18.9	42.1	61.9	52.9	39.5	68.0	16.4	56.6	16.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Total Delay	92.9	18.9	42.1	61.9	52.9	39.5	68.0	16.4	56.6	17.1
Queue Length 50th (m)	33.6	9.4	53.5	100.2	143.6	25.5	157.2	6.2	15.2	65.4
Queue Length 95th (m)	#78.8	18.7	79.5	#137.6	#231.3	m31.1	#179.1	m9.6	m23.2	68.9
Internal Link Dist (m)		110.7		287.5			189.1			96.5
Turn Bay Length (m)	45.0		110.0		200.0	60.0		80.0	100.0	
Base Capacity (vph)	202	870	418	882	753	190	1842	620	589	2345
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	98
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.99	0.21	0.72	0.93	0.96	0.66	0.93	0.17	0.22	0.84

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	190	94	84	284	783	684	120	1628	103	124	1605	179
Future Volume (vph)	190	94	84	284	783	684	120	1628	103	124	1605	179
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.2	3.1	3.3	3.2	3.0	3.2	3.2	3.0	3.2	3.2	3.1
Total Lost time (s)	3.0	3.0		3.0	3.0	0.0	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	0.91	1.00	0.97	0.91	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.98	1.00	1.00	0.96	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.93		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1658	3119		1725	3415	1458	1691	4859	1400	3217	4816	
Flt Permitted	0.14	1.00		0.59	1.00	1.00	0.09	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	249	3119		1063	3415	1458	168	4859	1400	3217	4816	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	200	99	88	299	824	720	126	1714	108	131	1689	188
RTOR Reduction (vph)	0	65	0	0	0	39	0	0	67	0	11	0
Lane Group Flow (vph)	200	122	0	299	824	681	126	1714	41	131	1866	0
Confl. Peds. (#/hr)	20		2	2		20	4		25	25		4
Heavy Vehicles (%)	4%	3%	1%	1%	1%	1%	2%	2%	3%	4%	1%	3%
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	pm+pt	NA	Perm	Prot	NA	
Protected Phases	7	4		3	8	1	5	2		1	6	
Permitted Phases	4	4		8	8	8	2	2	2		6	
Actuated Green, G (s)	36.0	27.0		36.0	27.0	47.5	49.3	41.5	41.5	20.5	54.2	
Effective Green, g (s)	38.0	31.0		38.0	31.0	55.5	51.3	45.5	45.5	21.5	58.2	
Actuated g/C Ratio	0.32	0.26		0.32	0.26	0.46	0.43	0.38	0.38	0.18	0.49	
Clearance Time (s)	4.0	7.0		4.0	7.0	4.0	4.0	7.0	7.0	4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	196	805		391	882	674	183	1842	530	576	2335	
v/s Ratio Prot	c0.08	0.04		0.06	0.24	c0.21	0.05	c0.35		0.04	0.39	
v/s Ratio Perm	0.24			0.18		0.26	0.24		0.03			
v/c Ratio	1.02	0.15		0.76	0.93	1.01	0.69	0.93	0.08	0.23	0.80	
Uniform Delay, d1	36.1	34.3		35.4	43.5	32.2	24.5	35.7	23.8	42.1	26.0	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.29	1.73	10.00	1.33	0.56	
Incremental Delay, d2	69.7	0.1		8.6	16.5	37.2	6.2	6.3	0.2	0.1	2.2	
Delay (s)	105.8	34.4		44.1	60.0	69.4	37.7	68.3	238.5	56.0	16.8	
Level of Service	F	C		D	E	E	D	E	F	E	B	
Approach Delay (s)		71.3			61.1			75.7			19.3	
Approach LOS		E			E			E			B	

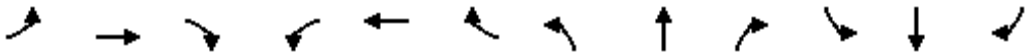
Intersection Summary			
HCM 2000 Control Delay	52.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	96.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

2: Guelph Line & W-N/S OFF RAMP/SSR Link

Lane Group	EBL	EBT	EBR	NBT	SBT
Lane Group Flow (vph)	799	142	557	2633	1602
v/c Ratio	0.77	0.25	0.84	0.66	0.62
Control Delay	42.0	30.4	39.8	8.4	9.2
Queue Delay	0.0	0.0	0.1	0.4	0.2
Total Delay	42.0	30.4	39.9	8.8	9.4
Queue Length 50th (m)	85.3	24.1	105.1	63.5	42.0
Queue Length 95th (m)	105.6	39.1	#171.5	68.6	m28.4
Internal Link Dist (m)		328.8		96.5	49.4
Turn Bay Length (m)	180.0		160.0		
Base Capacity (vph)	1123	609	667	3966	2594
Starvation Cap Reductn	0	0	0	650	0
Spillback Cap Reductn	0	0	2	0	323
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.71	0.23	0.84	0.79	0.71

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	759	135	529	0	0	0	0	2494	8	0	1522	0
Future Volume (vph)	759	135	529	0	0	0	0	2494	8	0	1522	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.1	3.1	3.1	3.4	3.1	3.4	3.1	3.4	3.1	3.1	3.4	3.1
Total Lost time (s)	3.0	3.0	1.0					3.0			3.0	
Lane Util. Factor	0.97	1.00	1.00					0.86			0.91	
Frpb, ped/bikes	1.00	1.00	0.99					1.00			1.00	
Flpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	
Frt	1.00	1.00	0.85					1.00			1.00	
Flt Protected	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (prot)	3211	1742	1465					6324			5022	
Flt Permitted	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (perm)	3211	1742	1465					6324			5022	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	799	142	557	0	0	0	0	2625	8	0	1602	0
RTOR Reduction (vph)	0	0	21	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	799	142	536	0	0	0	0	2633	0	0	1602	0
Confl. Peds. (#/hr)			2				20		7	7		20
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	2%	1%	2%	2%	1%	2%
Turn Type	Split	NA	custom					NA			NA	
Protected Phases	4	4	3					2 3			2	
Permitted Phases		4	4					2			2	
Actuated Green, G (s)	34.8	34.8	43.0					71.2			58.0	
Effective Green, g (s)	38.8	38.8	51.0					74.2			62.0	
Actuated g/C Ratio	0.32	0.32	0.42					0.62			0.52	
Clearance Time (s)	7.0	7.0	5.0								7.0	
Vehicle Extension (s)	3.0	3.0	3.0								3.0	
Lane Grp Cap (vph)	1038	563	622					3910			2594	
v/s Ratio Prot	0.25	0.08	c0.09					c0.42			0.32	
v/s Ratio Perm			0.28									
v/c Ratio	0.77	0.25	0.86					0.67			0.62	
Uniform Delay, d1	36.6	29.9	31.3					15.0			20.6	
Progression Factor	1.00	1.00	1.00					0.53			0.44	
Incremental Delay, d2	3.5	0.2	11.8					0.3			0.1	
Delay (s)	40.1	30.1	43.1					8.2			9.1	
Level of Service	D	C	D					A			A	
Approach Delay (s)		40.3			0.0			8.2			9.1	
Approach LOS		D			A			A			A	

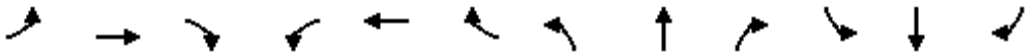
Intersection Summary			
HCM 2000 Control Delay	16.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	7.0
Intersection Capacity Utilization	69.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

3: Guelph Line & Queensway Drive/Harvester Rd

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	200	187	299	824	720	126	1714	108	160	1877
v/c Ratio	0.90	0.20	0.60	0.93	0.71	0.67	0.81	0.16	0.66	0.89
Control Delay	91.9	18.0	31.6	61.9	36.3	45.2	52.0	18.1	79.0	20.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3
Total Delay	91.9	18.0	31.6	61.9	36.3	45.2	52.0	18.1	79.0	22.2
Queue Length 50th (m)	47.1	9.2	48.9	100.2	80.9	26.1	138.8	6.4	20.4	121.7
Queue Length 95th (m)	#89.9	18.3	72.7	#137.6	105.3	m32.3	157.2	m12.1	m29.4	128.3
Internal Link Dist (m)		110.7		287.5			189.1			96.5
Turn Bay Length (m)	45.0		110.0		200.0	60.0		80.0	100.0	
Base Capacity (vph)	221	921	498	882	1007	190	2105	668	241	2104
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	91
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.90	0.20	0.60	0.93	0.71	0.66	0.81	0.16	0.66	0.93

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



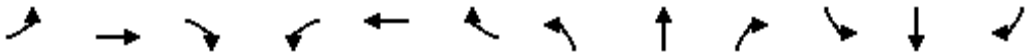
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	190	94	84	284	783	684	120	1628	103	152	1605	179
Future Volume (vph)	190	94	84	284	783	684	120	1628	103	152	1605	179
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.2	3.1	3.3	3.2	3.0	3.2	3.2	3.0	3.2	3.2	3.1
Total Lost time (s)	3.0	3.0		3.0	3.0	0.0	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	0.88	1.00	0.91	1.00	0.97	0.91	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.93		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1658	3119		1725	3415	2627	1691	4859	1400	3217	4816	
Flt Permitted	0.95	1.00		0.63	1.00	1.00	0.08	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1658	3119		1150	3415	2627	145	4859	1400	3217	4816	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	200	99	88	299	824	720	126	1714	108	160	1689	188
RTOR Reduction (vph)	0	64	0	0	0	0	0	0	61	0	11	0
Lane Group Flow (vph)	200	123	0	299	824	720	126	1714	47	160	1866	0
Confl. Peds. (#/hr)	20		2	2		20	4		25	25		4
Heavy Vehicles (%)	4%	3%	1%	1%	1%	1%	2%	2%	3%	4%	1%	3%
Turn Type	Prot	NA		pm+pt	NA	pt+ov	pm+pt	NA	Perm	Prot	NA	
Protected Phases	7	4		3	8	1 8	5	2		1	6	
Permitted Phases		4		8	8		2	2	2		6	
Actuated Green, G (s)	15.0	29.0		40.0	27.0	42.0	55.9	48.0	48.0	8.0	48.1	
Effective Green, g (s)	16.0	33.0		42.0	31.0	43.0	57.9	52.0	52.0	9.0	52.1	
Actuated g/C Ratio	0.13	0.28		0.35	0.26	0.36	0.48	0.43	0.43	0.08	0.43	
Clearance Time (s)	4.0	7.0		4.0	7.0		4.0	7.0	7.0	4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	221	857		469	882	941	184	2105	606	241	2090	
v/s Ratio Prot	c0.12	0.04		0.07	c0.24	c0.27	0.05	0.35		0.05	c0.39	
v/s Ratio Perm				0.15			0.28		0.03			
v/c Ratio	0.90	0.14		0.64	0.93	0.77	0.68	0.81	0.08	0.66	0.89	
Uniform Delay, d1	51.3	32.8		30.7	43.5	34.0	25.0	29.8	19.9	54.0	31.4	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.74	1.66	4.72	1.27	0.51	
Incremental Delay, d2	35.6	0.1		2.8	16.5	3.8	6.0	2.1	0.1	5.0	4.8	
Delay (s)	86.8	32.9		33.6	60.0	37.8	49.6	51.4	94.2	73.5	20.7	
Level of Service	F	C		C	E	D	D	D	F	E	C	
Approach Delay (s)		60.8			47.0			53.7			24.8	
Approach LOS		E			D			D			C	

Intersection Summary			
HCM 2000 Control Delay	42.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	87.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	NBT	SBT
Lane Group Flow (vph)	799	142	557	2633	1602
v/c Ratio	0.77	0.25	0.84	0.66	0.62
Control Delay	42.0	30.4	39.8	6.5	9.2
Queue Delay	0.0	0.0	0.0	0.7	0.0
Total Delay	42.0	30.4	39.8	7.2	9.2
Queue Length 50th (m)	85.3	24.1	105.1	48.6	42.0
Queue Length 95th (m)	105.6	39.1	#171.5	m52.1	m28.4
Internal Link Dist (m)		328.8		96.5	49.4
Turn Bay Length (m)	180.0		160.0		
Base Capacity (vph)	1123	609	667	3966	2594
Starvation Cap Reductn	0	0	0	858	0
Spillback Cap Reductn	0	0	0	0	27
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.71	0.23	0.84	0.85	0.62

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



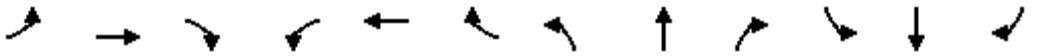
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	759	135	529	0	0	0	0	2494	8	0	1522	0
Future Volume (vph)	759	135	529	0	0	0	0	2494	8	0	1522	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.1	3.1	3.1	3.4	3.1	3.4	3.1	3.4	3.1	3.1	3.4	3.1
Total Lost time (s)	3.0	3.0	1.0					3.0			3.0	
Lane Util. Factor	0.97	1.00	1.00					0.86			0.91	
Frpb, ped/bikes	1.00	1.00	0.99					1.00			1.00	
Flpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	
Frt	1.00	1.00	0.85					1.00			1.00	
Flt Protected	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (prot)	3211	1742	1465					6324			5022	
Flt Permitted	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (perm)	3211	1742	1465					6324			5022	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	799	142	557	0	0	0	0	2625	8	0	1602	0
RTOR Reduction (vph)	0	0	21	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	799	142	536	0	0	0	0	2633	0	0	1602	0
Confl. Peds. (#/hr)			2				20		7	7		20
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	2%	1%	2%	2%	1%	2%
Turn Type	Split	NA	custom					NA			NA	
Protected Phases	4	4	3					2 3			2	
Permitted Phases		4	4					2			2	
Actuated Green, G (s)	34.8	34.8	43.0					71.2			58.0	
Effective Green, g (s)	38.8	38.8	51.0					74.2			62.0	
Actuated g/C Ratio	0.32	0.32	0.42					0.62			0.52	
Clearance Time (s)	7.0	7.0	5.0								7.0	
Vehicle Extension (s)	3.0	3.0	3.0								3.0	
Lane Grp Cap (vph)	1038	563	622					3910			2594	
v/s Ratio Prot	0.25	0.08	c0.09					c0.42			0.32	
v/s Ratio Perm			0.28									
v/c Ratio	0.77	0.25	0.86					0.67			0.62	
Uniform Delay, d1	36.6	29.9	31.3					15.0			20.6	
Progression Factor	1.00	1.00	1.00					0.42			0.44	
Incremental Delay, d2	3.5	0.2	11.8					0.2			0.1	
Delay (s)	40.1	30.1	43.1					6.4			9.1	
Level of Service	D	C	D					A			A	
Approach Delay (s)		40.3			0.0			6.4			9.1	
Approach LOS		D			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	16.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	7.0
Intersection Capacity Utilization	69.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	200	187	299	824	720	126	1714	108	160	1877
v/c Ratio	0.93	0.21	0.69	0.93	0.96	0.67	0.95	0.18	0.45	0.81
Control Delay	75.0	18.9	39.7	61.9	52.9	39.6	69.9	16.4	35.5	17.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
Total Delay	75.0	18.9	39.7	61.9	52.9	39.6	69.9	16.4	35.5	18.4
Queue Length 50th (m)	33.1	9.4	52.7	100.2	143.6	25.6	157.4	6.2	23.6	67.2
Queue Length 95th (m)	#75.3	18.7	78.4	#137.6	#231.3	m31.1	#182.8	m9.6	m39.6	71.2
Internal Link Dist (m)		110.7		287.5			189.1			96.5
Turn Bay Length (m)	45.0		110.0		200.0	60.0		80.0	100.0	
Base Capacity (vph)	216	870	432	882	753	190	1801	610	365	2304
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	110
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.93	0.21	0.69	0.93	0.96	0.66	0.95	0.18	0.44	0.86

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	190	94	84	284	783	684	120	1628	103	152	1605	179
Future Volume (vph)	190	94	84	284	783	684	120	1628	103	152	1605	179
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.2	3.1	3.3	3.2	3.0	3.2	3.2	3.0	3.2	3.2	3.1
Total Lost time (s)	3.0	3.0		3.0	3.0	0.0	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.98	1.00	1.00	0.96	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.93		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1658	3119		1725	3415	1458	1691	4859	1400	1658	4816	
Flt Permitted	0.14	1.00		0.59	1.00	1.00	0.10	1.00	1.00	0.09	1.00	
Satd. Flow (perm)	249	3119		1063	3415	1458	172	4859	1400	157	4816	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	200	99	88	299	824	720	126	1714	108	160	1689	188
RTOR Reduction (vph)	0	65	0	0	0	39	0	0	68	0	11	0
Lane Group Flow (vph)	200	122	0	299	824	681	126	1714	40	160	1866	0
Confl. Peds. (#/hr)	20		2	2		20	4		25	25		4
Heavy Vehicles (%)	4%	3%	1%	1%	1%	1%	2%	2%	3%	4%	1%	3%
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8	1	5	2		1	6	
Permitted Phases	4	4		8	8	8	2	2	2	6	6	
Actuated Green, G (s)	37.0	27.0		37.0	27.0	47.5	48.3	40.5	40.5	65.0	53.2	
Effective Green, g (s)	39.0	31.0		39.0	31.0	55.5	50.3	44.5	44.5	66.0	57.2	
Actuated g/C Ratio	0.32	0.26		0.32	0.26	0.46	0.42	0.37	0.37	0.55	0.48	
Clearance Time (s)	4.0	7.0		4.0	7.0	4.0	4.0	7.0	7.0	4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	210	805		406	882	674	183	1801	519	355	2295	
v/s Ratio Prot	c0.09	0.04		0.07	0.24	c0.21	0.05	c0.35		0.08	0.39	
v/s Ratio Perm	0.22			0.17		0.26	0.24		0.03	0.17		
v/c Ratio	0.95	0.15		0.74	0.93	1.01	0.69	0.95	0.08	0.45	0.81	
Uniform Delay, d1	34.0	34.3		34.3	43.5	32.2	25.2	36.7	24.5	21.4	26.8	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.29	1.70	9.75	1.84	0.58	
Incremental Delay, d2	48.4	0.1		6.8	16.5	37.2	6.2	8.3	0.2	0.7	2.4	
Delay (s)	82.4	34.4		41.1	60.0	69.4	38.8	70.6	238.5	40.1	17.9	
Level of Service	F	C		D	E	E	D	E	F	D	B	
Approach Delay (s)		59.2			60.6			77.8			19.6	
Approach LOS		E			E			E			B	

Intersection Summary			
HCM 2000 Control Delay	52.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	96.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

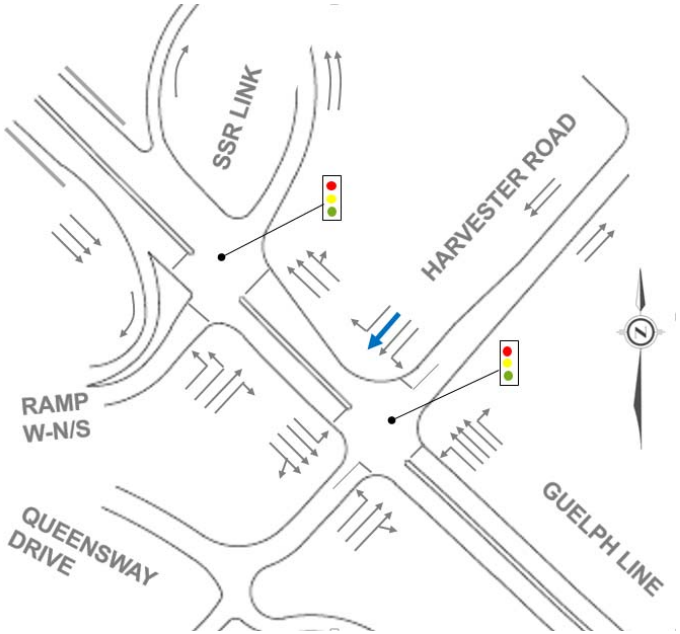
APPENDIX G

RECOMMENDED ALTERNATIVE

ALTERNATIVE V (w/ Modified Phasing) – RECOMMENDED

Overview:

- Add WBT on Harvester Road



Future 2023 (2031) Operations Analysis:

INTERSECTION	AM PEAK HOUR			PM PEAK HOUR		
	V/C	Delay (s)	LOS	V/C	Delay (s)	LOS
Guelph Line & E-N/S/E Off Ramp	0.75 (0.80)	22.9 (24.3)	C (C)	1.01 (1.07)	81.4 (95.3)	F (F)
Critical Movements (v/c)	SBTR = (0.91)			EBR = 1.03 (1.07) NBT = 0.85 (0.91) SBTR = 1.21 (1.28)		
Guelph Line & W-N/S/E Off Ramp / South Service Road Link	0.65 (0.72)	19.2 (19.2)	B (B)	0.67 (0.76)	14.0 (16.0)	B (B)
Critical Movements (v/c)	--			EBR = (0.86)		
Guelph Line & Harvester Road / Queensway Drive	0.84 (0.85)	24.2 (33.6)	C (C)	0.94 (0.98)	49.6 (52.5)	D (D)
Critical Movements (v/c)	SBL = 0.94 (0.94) QL = 92 m (136 m)			EBL = 0.98 (0.95) QL ≥ 75 m (75 m) WBT = 0.90 (0.93) WBR = 1.00 **(1.01)** QL ≥ 220 m (231 m) NBT = 0.86 (0.95)		

Notes: () bracketed values represent 2031 conditions

Incorporate signal modifications at Guelph Line – W-N/S/E Off-Ramp (add NB Advance /EB RT overlap phase during PM, i.e. 65 sec N/S, 45 sec EB, plus 10 sec NB Advance /EB RT overlap)

Remarks

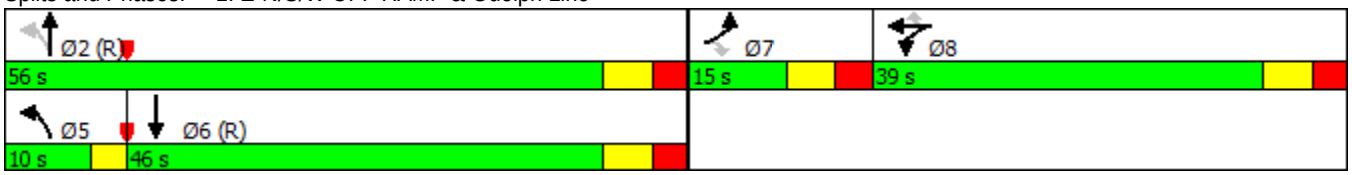
- Intersection operates near capacity during 2023 conditions, with westbound right turn operating at capacity during the PM peak hour.
- Provides additional westbound capacity with additional through lane and dedicated WBR.
- Maintains single SB left turn at Harvester Road with protected permissive phasing.
- Modify signal phasing to increase SBL green time to better accommodate SBL demands and accommodate queue between intersections. For example: Add 10 sec (+18 protected – 8 sec permissive) during AM peak hour by making the following adjustments:
  - Exclude NBL protected phase during AM peak (apply permissive phasing only).
  - Reduce vehicle green time for opposing EB/WB phase from 8 sec (min) to 5 sec (min); no change to amber and red times
  - Reduce pedestrian 'Walk' time from 8 &12 sec (min) to 5 sec (min); no change to 16 sec 'Don't Walk', amber and red times
- With Modified Phasing, the 95th percentile SBL queue is expected to be maintained between intersections in the short-term (i.e. 2023).

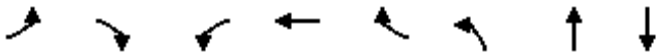
APPENDIX G1 – 2023 AM PEAK (Synchro Output)

Lane Group	EBL	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Configurations								
Traffic Volume (vph)	27	81	310	17	207	36	1715	1966
Future Volume (vph)	27	81	310	17	207	36	1715	1966
Turn Type	Prot	Perm	Split	NA	Perm	pm+pt	NA	NA
Protected Phases	7		8	8		5	2	6
Permitted Phases		7			8	2		
Detector Phase	7	7	8	8	8	5	2	6
Switch Phase								
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	6.0	8.0	8.0
Minimum Split (s)	15.0	15.0	39.0	39.0	39.0	10.0	40.0	40.0
Total Split (s)	15.0	15.0	39.0	39.0	39.0	10.0	56.0	46.0
Total Split (%)	13.6%	13.6%	35.5%	35.5%	35.5%	9.1%	50.9%	41.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0
Lost Time Adjust (s)	-3.0	-1.0	-3.0	-3.0	-3.0	0.0	-4.0	-4.0
Total Lost Time (s)	4.0	6.0	4.0	4.0	4.0	3.0	3.0	3.0
Lead/Lag	Lead	Lead	Lag	Lag	Lag	Lead		Lag
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	None	None	C-Max	C-Max
Act Effct Green (s)	11.0	9.0	19.1	19.1	19.1	68.9	68.9	62.8
Actuated g/C Ratio	0.10	0.08	0.17	0.17	0.17	0.63	0.63	0.57
v/c Ratio	0.16	0.79	0.55	0.06	0.58	0.23	0.60	0.83
Control Delay	47.9	95.1	44.8	36.5	21.6	16.2	13.3	24.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	47.9	95.1	44.8	36.5	21.6	16.2	13.3	24.4
LOS	D	F	D	D	C	B	B	C
Approach Delay				35.5			13.4	24.4
Approach LOS				D			B	C

Intersection Summary	
Cycle Length: 110	
Actuated Cycle Length: 110	
Offset: 107 (97%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Natural Cycle: 115	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.83	
Intersection Signal Delay: 22.8	Intersection LOS: C
Intersection Capacity Utilization 66.2%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 1: E-N/S/W OFF RAMP & Guelph Line

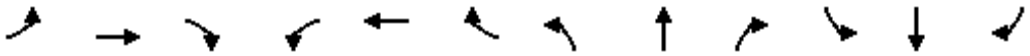




Lane Group	EBL	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	28	85	326	18	218	38	1805	2118
v/c Ratio	0.16	0.79	0.55	0.06	0.58	0.23	0.60	0.83
Control Delay	47.9	95.1	44.8	36.5	21.6	16.2	13.3	24.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	47.9	95.1	44.8	36.5	21.6	16.2	13.3	24.4
Queue Length 50th (m)	5.6	18.2	33.4	3.3	15.0	2.5	49.1	137.1
Queue Length 95th (m)	14.3	#45.3	44.6	9.1	36.7	m9.6	83.6	#199.2
Internal Link Dist (m)				228.8			44.4	357.0
Turn Bay Length (m)			140.0		130.0			
Base Capacity (vph)	171	107	1078	532	577	172	3024	2565
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.79	0.30	0.03	0.38	0.22	0.60	0.83

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	27	0	81	310	17	207	36	1715	0	0	1966	47
Future Volume (vph)	27	0	81	310	17	207	36	1715	0	0	1966	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.4	3.4	3.1	3.4	3.4	3.4	3.0	3.4	3.1	3.0	3.4	3.4
Grade (%)		0%			0%			0%			15%	
Total Lost time (s)	4.0		6.0	4.0	4.0	4.0	3.0	3.0			3.0	
Lane Util. Factor	1.00		1.00	0.97	1.00	1.00	1.00	0.91			0.91	
Frpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	1.00	1.00			1.00	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	1.00	1.00			1.00	
Frt	1.00		0.85	1.00	1.00	0.85	1.00	1.00			1.00	
Flt Protected	0.95		1.00	0.95	1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)	1713		1315	3390	1674	1518	1652	4830			4487	
Flt Permitted	0.95		1.00	0.95	1.00	1.00	0.07	1.00			1.00	
Satd. Flow (perm)	1713		1315	3390	1674	1518	115	4830			4487	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	28	0	85	326	18	218	38	1805	0	0	2069	49
RTOR Reduction (vph)	0	0	0	0	0	115	0	0	0	0	2	0
Lane Group Flow (vph)	28	0	85	326	18	103	38	1805	0	0	2116	0
Confl. Peds. (#/hr)							3		3	3		3
Heavy Vehicles (%)	3%	2%	16%	1%	11%	4%	2%	5%	2%	2%	4%	11%
Turn Type	Prot		Perm	Split	NA	Perm	pm+pt	NA			NA	
Protected Phases	7			8	8		5	2			6	
Permitted Phases			7			8	2					
Actuated Green, G (s)	8.0		8.0	16.1	16.1	16.1	64.9	64.9			57.6	
Effective Green, g (s)	11.0		9.0	19.1	19.1	19.1	64.9	68.9			61.6	
Actuated g/C Ratio	0.10		0.08	0.17	0.17	0.17	0.59	0.63			0.56	
Clearance Time (s)	7.0		7.0	7.0	7.0	7.0	3.0	7.0			7.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)	171		107	588	290	263	127	3025			2512	
v/s Ratio Prot	0.02			c0.10	0.01		0.01	c0.37			c0.47	
v/s Ratio Perm			c0.06			0.07	0.16					
v/c Ratio	0.16		0.79	0.55	0.06	0.39	0.30	0.60			0.84	
Uniform Delay, d1	45.3		49.6	41.6	38.0	40.3	16.5	12.3			20.2	
Progression Factor	1.00		1.00	1.00	1.00	1.00	1.49	0.98			1.00	
Incremental Delay, d2	0.5		32.1	1.1	0.1	1.0	1.2	0.8			3.6	
Delay (s)	45.7		81.7	42.7	38.1	41.3	25.8	12.7			23.8	
Level of Service	D		F	D	D	D	C	B			C	
Approach Delay (s)		72.8			42.0			13.0			23.8	
Approach LOS		E			D			B			C	

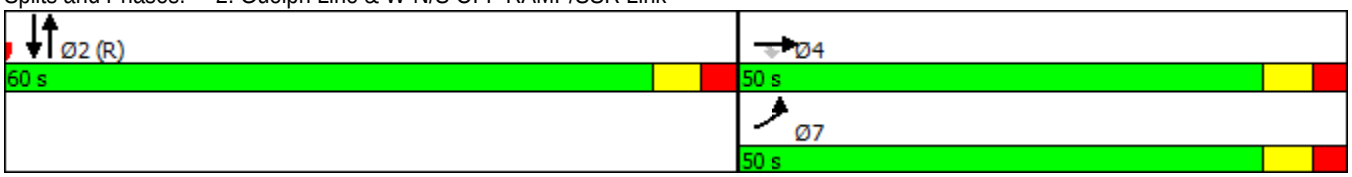
Intersection Summary			
HCM 2000 Control Delay	22.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	66.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	NBT	SBT
Lane Configurations					
Traffic Volume (vph)	675	468	388	1569	1557
Future Volume (vph)	675	468	388	1569	1557
Turn Type	Prot	NA	Perm	NA	NA
Protected Phases	7	4		2	2
Permitted Phases		4	4	2	2
Detector Phase	7	4	4	2	2
Switch Phase					
Minimum Initial (s)	4.0	8.0	8.0	8.0	8.0
Minimum Split (s)	11.0	38.0	38.0	43.0	43.0
Total Split (s)	50.0	50.0	50.0	60.0	60.0
Total Split (%)	45.5%	45.5%	45.5%	54.5%	54.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	-4.0	-4.0	-4.0	-4.0	-4.0
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	None	C-Max	C-Max
Act Effct Green (s)	40.2	40.2	40.2	63.8	63.8
Actuated g/C Ratio	0.37	0.37	0.37	0.58	0.58
v/c Ratio	0.61	0.76	0.71	0.48	0.58
Control Delay	30.2	38.2	33.6	9.8	17.6
Queue Delay	0.0	0.0	0.2	0.1	0.0
Total Delay	30.2	38.2	33.8	9.9	17.6
LOS	C	D	C	A	B
Approach Delay		33.6		9.9	17.6
Approach LOS		C		A	B

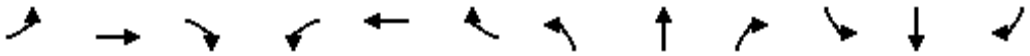
Intersection Summary	
Cycle Length: 110	
Actuated Cycle Length: 110	
Offset: 83 (75%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 85	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.76	
Intersection Signal Delay: 20.2	Intersection LOS: C
Intersection Capacity Utilization 61.4%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 2: Guelph Line & W-N/S OFF RAMP/SSR Link



Lane Group	EBL	EBT	EBR	NBT	SBT
Lane Group Flow (vph)	711	493	408	1675	1639
v/c Ratio	0.61	0.76	0.71	0.48	0.58
Control Delay	30.2	38.2	33.6	9.8	17.6
Queue Delay	0.0	0.0	0.2	0.1	0.0
Total Delay	30.2	38.2	33.8	9.9	17.6
Queue Length 50th (m)	62.0	89.9	66.0	22.7	71.6
Queue Length 95th (m)	73.5	118.0	92.9	36.0	98.5
Internal Link Dist (m)		328.8		96.5	49.4
Turn Bay Length (m)	180.0		160.0		
Base Capacity (vph)	1371	759	661	3525	2828
Starvation Cap Reductn	0	0	0	456	0
Spillback Cap Reductn	0	0	22	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.52	0.65	0.64	0.55	0.58

Intersection Summary



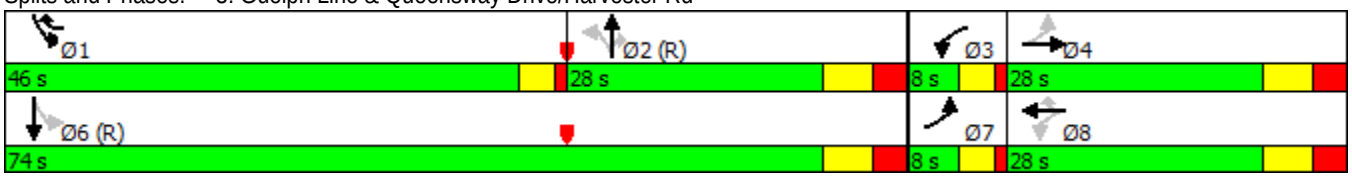
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	675	468	388	0	0	0	0	1569	22	0	1557	0
Future Volume (vph)	675	468	388	0	0	0	0	1569	22	0	1557	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.1	3.1	3.1	3.4	3.1	3.4	3.1	3.4	3.1	3.1	3.4	3.1
Total Lost time (s)	3.0	3.0	3.0					3.0			3.0	
Lane Util. Factor	0.97	1.00	1.00					0.86			0.91	
Frpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	
Flpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	
Frt	1.00	1.00	0.85					1.00			1.00	
Flt Protected	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (prot)	3211	1777	1495					6075			4877	
Flt Permitted	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (perm)	3211	1777	1495					6075			4877	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	711	493	408	0	0	0	0	1652	23	0	1639	0
RTOR Reduction (vph)	0	0	25	0	0	0	0	1	0	0	0	0
Lane Group Flow (vph)	711	493	383	0	0	0	0	1674	0	0	1639	0
Confl. Peds. (#/hr)							4		1	1		
Heavy Vehicles (%)	3%	1%	2%	2%	2%	2%	2%	5%	2%	2%	4%	2%
Turn Type	Prot	NA	Perm					NA			NA	
Protected Phases	7	4						2			2	
Permitted Phases		4	4					2			2	
Actuated Green, G (s)	36.2	36.2	36.2					59.8			59.8	
Effective Green, g (s)	40.2	40.2	40.2					63.8			63.8	
Actuated g/C Ratio	0.37	0.37	0.37					0.58			0.58	
Clearance Time (s)	7.0	7.0	7.0					7.0			7.0	
Vehicle Extension (s)	3.0	3.0	3.0					3.0			3.0	
Lane Grp Cap (vph)	1173	649	546					3523			2828	
v/s Ratio Prot	0.22	c0.28						0.28			c0.34	
v/s Ratio Perm			0.26									
v/c Ratio	0.61	0.76	0.70					0.48			0.58	
Uniform Delay, d1	28.4	30.7	29.8					13.4			14.6	
Progression Factor	1.00	1.00	1.00					0.66			1.09	
Incremental Delay, d2	0.9	5.1	4.0					0.3			0.6	
Delay (s)	29.3	35.8	33.8					9.2			16.5	
Level of Service	C	D	C					A			B	
Approach Delay (s)		32.4			0.0			9.2			16.5	
Approach LOS		C			A			A			B	

Intersection Summary			
HCM 2000 Control Delay	19.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	61.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations										
Traffic Volume (vph)	152	307	95	92	185	58	1254	262	479	1301
Future Volume (vph)	152	307	95	92	185	58	1254	262	479	1301
Turn Type	pm+pt	NA	pm+pt	NA	pm+ov	Perm	NA	Perm	pm+pt	NA
Protected Phases	7	4	3	8	1		2		1	6
Permitted Phases	4	4	8	8	8	2	2	2	6	6
Detector Phase	7	4	3	8	1	2	2	2	1	6
Switch Phase										
Minimum Initial (s)	4.0	1.0	4.0	1.0	4.0	1.0	1.0	1.0	4.0	1.0
Minimum Split (s)	8.0	28.0	8.0	28.0	8.0	28.0	28.0	28.0	8.0	28.0
Total Split (s)	8.0	28.0	8.0	28.0	46.0	28.0	28.0	28.0	46.0	74.0
Total Split (%)	7.3%	25.5%	7.3%	25.5%	41.8%	25.5%	25.5%	25.5%	41.8%	67.3%
Yellow Time (s)	3.0	4.0	3.0	4.0	3.0	4.0	4.0	4.0	3.0	4.0
All-Red Time (s)	1.0	3.0	1.0	3.0	1.0	3.0	3.0	3.0	1.0	3.0
Lost Time Adjust (s)	-1.0	-4.0	-1.0	-4.0	-4.0	-1.0	-4.0	-4.0	-1.0	-4.0
Total Lost Time (s)	3.0	3.0	3.0	3.0	0.0	6.0	3.0	3.0	3.0	3.0
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lag	Lag	Lead	
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	C-Max	C-Max	C-Max	None	C-Max
Act Effct Green (s)	26.7	21.7	26.7	21.7	58.2	37.8	40.8	40.8	74.3	74.3
Actuated g/C Ratio	0.24	0.20	0.24	0.20	0.53	0.34	0.37	0.37	0.68	0.68
v/c Ratio	0.53	0.61	0.58	0.15	0.24	0.65	0.75	0.39	0.93	0.47
Control Delay	40.5	41.6	46.1	36.1	7.0	59.0	26.8	4.1	55.1	7.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.1
Total Delay	40.5	41.6	46.1	36.1	7.0	59.0	26.8	4.1	55.6	7.3
LOS	D	D	D	D	A	E	C	A	E	A
Approach Delay		41.3		24.2			24.2			19.4
Approach LOS		D		C			C			B

Intersection Summary	
Cycle Length: 110	
Actuated Cycle Length: 110	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green, Master Intersection	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.93	
Intersection Signal Delay: 24.2	Intersection LOS: C
Intersection Capacity Utilization 81.1%	ICU Level of Service D
Analysis Period (min) 15	

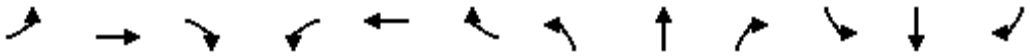
Splits and Phases: 3: Guelph Line & Queensway Drive/Harvester Rd



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	160	402	100	97	195	61	1320	276	504	1505
v/c Ratio	0.53	0.61	0.58	0.15	0.24	0.65	0.75	0.39	0.93	0.47
Control Delay	40.5	41.6	46.1	36.1	7.0	59.0	26.8	4.1	55.1	7.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.1
Total Delay	40.5	41.6	46.1	36.1	7.0	59.0	26.8	4.1	55.6	7.3
Queue Length 50th (m)	27.8	39.0	16.6	9.1	11.9	8.7	94.8	2.8	80.9	39.9
Queue Length 95th (m)	44.6	53.0	29.3	15.8	15.9	m#32.0	#157.5	m17.8	91.7	41.8
Internal Link Dist (m)		110.7		287.5			189.1			96.5
Turn Bay Length (m)	45.0		110.0		200.0	60.0		80.0	100.0	
Base Capacity (vph)	302	754	171	753	961	94	1767	700	717	3204
Starvation Cap Reductn	0	0	0	0	0	0	0	0	40	458
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.53	0.53	0.58	0.13	0.20	0.65	0.75	0.39	0.74	0.55

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	152	307	75	95	92	185	58	1254	262	479	1301	129
Future Volume (vph)	152	307	75	95	92	185	58	1254	262	479	1301	129
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.2	3.1	3.3	3.2	3.0	3.2	3.2	3.0	3.2	3.2	3.1
Total Lost time (s)	3.0	3.0		3.0	3.0	0.0	6.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	0.99	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1603	3233		1677	3317	1451	1624	4766	1453	1708	4730	
Flt Permitted	0.69	1.00		0.27	1.00	1.00	0.16	1.00	1.00	0.10	1.00	
Satd. Flow (perm)	1166	3233		483	3317	1451	276	4766	1453	176	4730	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	160	323	79	100	97	195	61	1320	276	504	1369	136
RTOR Reduction (vph)	0	20	0	0	0	39	0	0	161	0	10	0
Lane Group Flow (vph)	160	382	0	100	97	156	61	1320	115	504	1495	0
Confl. Peds. (#/hr)	6		4	4		6	11		3	3		11
Heavy Vehicles (%)	7%	2%	8%	4%	4%	3%	6%	4%	2%	1%	3%	4%
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	Perm	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8	1		2		1	6	
Permitted Phases	4	4		8	8	8	2	2	2	6	6	
Actuated Green, G (s)	21.7	17.7		21.7	17.7	47.2	36.8	36.8	36.8	70.3	70.3	
Effective Green, g (s)	23.7	21.7		23.7	21.7	55.2	37.8	40.8	40.8	71.3	74.3	
Actuated g/C Ratio	0.22	0.20		0.22	0.20	0.50	0.34	0.37	0.37	0.65	0.68	
Clearance Time (s)	4.0	7.0		4.0	7.0	4.0	7.0	7.0	7.0	4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	271	637		158	654	728	94	1767	538	538	3194	
v/s Ratio Prot	0.03	c0.12		c0.03	0.03	0.07		0.28		c0.26	0.32	
v/s Ratio Perm	0.10			0.11		0.04	0.22		0.08	c0.35		
v/c Ratio	0.59	0.60		0.63	0.15	0.21	0.65	0.75	0.21	0.94	0.47	
Uniform Delay, d1	38.0	40.2		37.1	36.5	15.3	30.5	30.1	23.6	30.8	8.5	
Progression Factor	1.00	1.00		1.00	1.00	1.00	0.76	0.70	0.49	1.24	0.78	
Incremental Delay, d2	3.4	1.5		8.0	0.1	0.1	24.2	2.3	0.7	20.7	0.4	
Delay (s)	41.4	41.7		45.1	36.6	15.4	47.4	23.4	12.4	59.0	7.0	
Level of Service	D	D		D	D	B	D	C	B	E	A	
Approach Delay (s)		41.6			28.2			22.4			20.1	
Approach LOS		D			C			C			C	

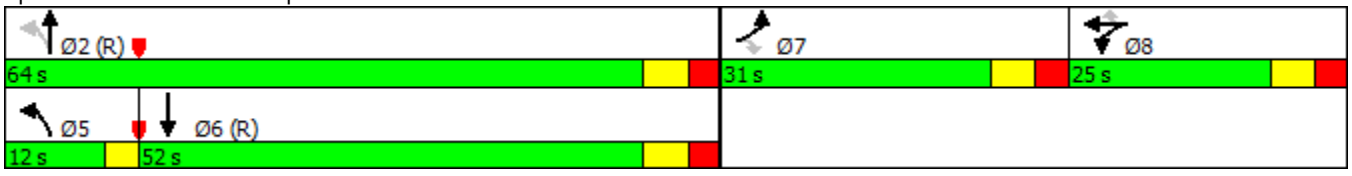
Intersection Summary			
HCM 2000 Control Delay	24.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	81.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

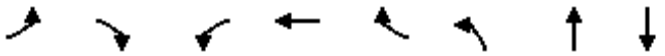
APPENDIX G2 – 2023 PM PEAK (Synchro Output)

Lane Group	EBL	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Configurations								
Traffic Volume (vph)	75	307	320	48	95	138	2101	2151
Future Volume (vph)	75	307	320	48	95	138	2101	2151
Turn Type	Prot	Perm	Split	NA	Perm	pm+pt	NA	NA
Protected Phases	7		8	8		5	2	6
Permitted Phases		7			8	2		
Detector Phase	7	7	8	8	8	5	2	6
Switch Phase								
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	6.0	8.0	8.0
Minimum Split (s)	15.0	15.0	39.0	39.0	39.0	10.0	40.0	40.0
Total Split (s)	31.0	31.0	25.0	25.0	25.0	12.0	64.0	52.0
Total Split (%)	25.8%	25.8%	20.8%	20.8%	20.8%	10.0%	53.3%	43.3%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0
Lost Time Adjust (s)	-3.0	-1.0	-3.0	-3.0	-3.0	0.0	-4.0	-4.0
Total Lost Time (s)	4.0	6.0	4.0	4.0	4.0	3.0	3.0	3.0
Lead/Lag	Lead	Lead	Lag	Lag	Lag	Lead		Lag
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	None	None	C-Max	C-Max
Act Effct Green (s)	27.0	25.0	19.3	19.3	19.3	62.7	62.7	50.4
Actuated g/C Ratio	0.22	0.21	0.16	0.16	0.16	0.52	0.52	0.42
v/c Ratio	0.20	1.03	0.63	0.17	0.28	0.76	0.85	1.21
Control Delay	39.5	105.3	52.3	44.3	5.8	50.1	34.7	131.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.5	105.3	52.3	44.3	5.8	50.1	34.7	131.1
LOS	D	F	D	D	A	D	C	F
Approach Delay				41.9			35.6	131.1
Approach LOS				D			D	F

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 98 (82%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Natural Cycle: 115	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.21	
Intersection Signal Delay: 80.1	Intersection LOS: F
Intersection Capacity Utilization 82.7%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 1: Guelph Line & E-N/S/W OFF RAMP



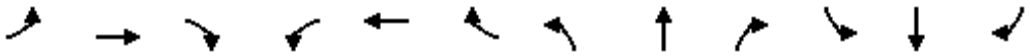


Lane Group	EBL	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	79	323	337	51	100	145	2212	2326
v/c Ratio	0.20	1.03	0.63	0.17	0.28	0.76	0.85	1.21
Control Delay	39.5	105.3	52.3	44.3	5.8	50.1	34.7	131.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.5	105.3	52.3	44.3	5.8	50.1	34.7	131.1
Queue Length 50th (m)	15.2	~81.2	38.2	10.4	0.0	22.1	155.2	~250.6
Queue Length 95th (m)	28.6	#137.1	52.8	21.6	8.9	#51.8	165.0	#279.6
Internal Link Dist (m)				228.8			44.4	357.0
Turn Bay Length (m)			140.0		130.0			
Base Capacity (vph)	389	314	587	318	375	193	2599	1925
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.20	1.03	0.57	0.16	0.27	0.75	0.85	1.21

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	75	0	307	320	48	95	138	2101	0	0	2151	59
Future Volume (vph)	75	0	307	320	48	95	138	2101	0	0	2151	59
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.4	3.4	3.1	3.4	3.4	3.4	3.0	3.4	3.1	3.0	3.4	3.4
Grade (%)		0%			0%			0%			15%	
Total Lost time (s)	4.0		6.0	4.0	4.0	4.0	3.0	3.0			3.0	
Lane Util. Factor	1.00		1.00	0.97	1.00	1.00	1.00	0.91			0.91	
Frpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	1.00	1.00			1.00	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	1.00	1.00			1.00	
Frt	1.00		0.85	1.00	1.00	0.85	1.00	1.00			1.00	
Flt Protected	0.95		1.00	0.95	1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)	1730		1510	3357	1821	1548	1652	4972			4579	
Flt Permitted	0.95		1.00	0.95	1.00	1.00	0.08	1.00			1.00	
Satd. Flow (perm)	1730		1510	3357	1821	1548	141	4972			4579	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	79	0	323	337	51	100	145	2212	0	0	2264	62
RTOR Reduction (vph)	0	0	0	0	0	84	0	0	0	0	2	0
Lane Group Flow (vph)	79	0	323	337	51	16	145	2212	0	0	2324	0
Confl. Peds. (#/hr)							6		3	3		6
Heavy Vehicles (%)	2%	2%	1%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Prot		Perm	Split	NA	Perm	pm+pt	NA			NA	
Protected Phases	7			8	8		5	2			6	
Permitted Phases			7			8	2					
Actuated Green, G (s)	24.0		24.0	16.3	16.3	16.3	58.7	58.7			46.4	
Effective Green, g (s)	27.0		25.0	19.3	19.3	19.3	58.7	62.7			50.4	
Actuated g/C Ratio	0.22		0.21	0.16	0.16	0.16	0.49	0.52			0.42	
Clearance Time (s)	7.0		7.0	7.0	7.0	7.0	3.0	7.0			7.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)	389		314	539	292	248	186	2597			1923	
v/s Ratio Prot	0.05			c0.10	0.03		0.06	c0.44			c0.51	
v/s Ratio Perm			c0.21			0.01	0.32					
v/c Ratio	0.20		1.03	0.63	0.17	0.06	0.78	0.85			1.21	
Uniform Delay, d1	37.8		47.5	47.0	43.5	42.7	27.3	24.7			34.8	
Progression Factor	1.00		1.00	1.00	1.00	1.00	1.37	1.25			1.00	
Incremental Delay, d2	0.3		58.4	2.3	0.3	0.1	15.0	3.0			98.9	
Delay (s)	38.0		105.9	49.2	43.8	42.8	52.4	33.9			133.7	
Level of Service	D		F	D	D	D	D	C			F	
Approach Delay (s)		92.5			47.3			35.0			133.7	
Approach LOS		F			D			D			F	

Intersection Summary			
HCM 2000 Control Delay	81.4	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	82.7%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	NBT	SBT
Lane Configurations					
Traffic Volume (vph)	648	115	452	2397	1448
Future Volume (vph)	648	115	452	2397	1448
Turn Type	Split	NA	custom	NA	NA
Protected Phases	4	4	3	2 3	2
Permitted Phases		4	4	2	2
Detector Phase	4	4	3	2 3	2
Switch Phase					
Minimum Initial (s)	8.0	8.0	4.0		8.0
Minimum Split (s)	38.0	38.0	9.0		43.0
Total Split (s)	45.0	45.0	10.0		65.0
Total Split (%)	37.5%	37.5%	8.3%		54.2%
Yellow Time (s)	4.0	4.0	4.0		4.0
All-Red Time (s)	3.0	3.0	1.0		3.0
Lost Time Adjust (s)	-4.0	-4.0	-4.0		-4.0
Total Lost Time (s)	3.0	3.0	1.0		3.0
Lead/Lag	Lead	Lead	Lag		
Lead-Lag Optimize?					
Recall Mode	None	None	None		C-Max
Act Effct Green (s)	35.5	35.5	53.0	78.5	62.0
Actuated g/C Ratio	0.30	0.30	0.44	0.65	0.52
v/c Ratio	0.72	0.23	0.71	0.61	0.59
Control Delay	42.0	31.9	31.6	6.0	8.6
Queue Delay	0.0	0.0	0.0	0.3	0.0
Total Delay	42.0	31.9	31.6	6.3	8.6
LOS	D	C	C	A	A
Approach Delay		37.2		6.3	8.6
Approach LOS		D		A	A

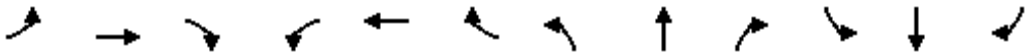
Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 119 (99%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.72	
Intersection Signal Delay: 14.4	Intersection LOS: B
Intersection Capacity Utilization 62.9%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 2: Guelph Line & W-N/S OFF RAMP/SSR Link

Lane Group	EBL	EBT	EBR	NBT	SBT
Lane Group Flow (vph)	682	121	476	2531	1524
v/c Ratio	0.72	0.23	0.71	0.61	0.59
Control Delay	42.0	31.9	31.6	6.0	8.6
Queue Delay	0.0	0.0	0.0	0.3	0.0
Total Delay	42.0	31.9	31.6	6.3	8.6
Queue Length 50th (m)	73.8	21.5	81.5	43.9	33.7
Queue Length 95th (m)	86.9	34.0	121.4	m52.0	m25.2
Internal Link Dist (m)		328.8		96.5	49.4
Turn Bay Length (m)	180.0		160.0		
Base Capacity (vph)	1123	609	667	4139	2594
Starvation Cap Reductn	0	0	0	840	0
Spillback Cap Reductn	0	0	0	0	2
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.61	0.20	0.71	0.77	0.59

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.



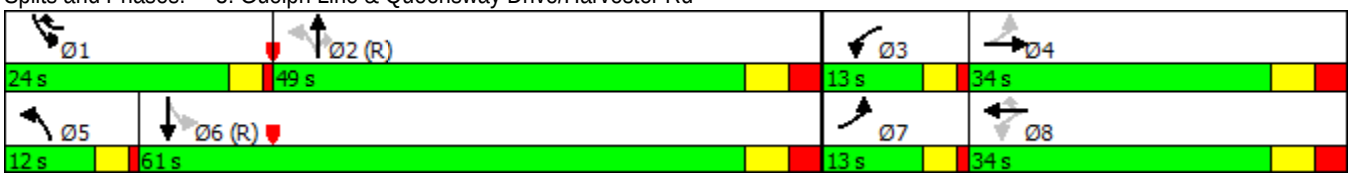
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	648	115	452	0	0	0	0	2397	8	0	1448	0
Future Volume (vph)	648	115	452	0	0	0	0	2397	8	0	1448	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.1	3.1	3.1	3.4	3.1	3.4	3.1	3.4	3.1	3.1	3.4	3.1
Total Lost time (s)	3.0	3.0	1.0					3.0			3.0	
Lane Util. Factor	0.97	1.00	1.00					0.86			0.91	
Frpb, ped/bikes	1.00	1.00	0.99					1.00			1.00	
Flpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	
Frt	1.00	1.00	0.85					1.00			1.00	
Flt Protected	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (prot)	3211	1742	1466					6324			5022	
Flt Permitted	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (perm)	3211	1742	1466					6324			5022	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	682	121	476	0	0	0	0	2523	8	0	1524	0
RTOR Reduction (vph)	0	0	21	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	682	121	455	0	0	0	0	2531	0	0	1524	0
Confl. Peds. (#/hr)			2				20		7	7		20
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	2%	1%	2%	2%	1%	2%
Turn Type	Split	NA	custom					NA			NA	
Protected Phases	4	4	3					2 3			2	
Permitted Phases		4	4					2			2	
Actuated Green, G (s)	31.5	31.5	43.0					74.5			58.0	
Effective Green, g (s)	35.5	35.5	51.0					77.5			62.0	
Actuated g/C Ratio	0.30	0.30	0.42					0.65			0.52	
Clearance Time (s)	7.0	7.0	5.0								7.0	
Vehicle Extension (s)	3.0	3.0	3.0								3.0	
Lane Grp Cap (vph)	949	515	623					4084			2594	
v/s Ratio Prot	0.21	0.07	c0.09					c0.40			0.30	
v/s Ratio Perm			0.22									
v/c Ratio	0.72	0.23	0.73					0.62			0.59	
Uniform Delay, d1	37.8	32.0	28.8					12.5			20.1	
Progression Factor	1.00	1.00	1.00					0.45			0.42	
Incremental Delay, d2	2.6	0.2	4.4					0.1			0.1	
Delay (s)	40.4	32.2	33.2					5.7			8.5	
Level of Service	D	C	C					A			A	
Approach Delay (s)		36.9			0.0			5.7			8.5	
Approach LOS		D			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	14.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	7.0
Intersection Capacity Utilization	62.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations										
Traffic Volume (vph)	183	91	273	752	658	115	1564	99	146	1542
Future Volume (vph)	183	91	273	752	658	115	1564	99	146	1542
Turn Type	pm+pt	NA	pm+pt	NA	pm+ov	pm+pt	NA	Perm	pm+pt	NA
Protected Phases	7	4	3	8	1	5	2		1	6
Permitted Phases	4	4	8	8	8	2	2	2	6	6
Detector Phase	7	4	3	8	1	5	2	2	1	6
Switch Phase										
Minimum Initial (s)	7.0	8.0	7.0	8.0	7.0	7.0	8.0	8.0	7.0	8.0
Minimum Split (s)	12.0	34.0	12.0	34.0	12.0	12.0	36.0	36.0	12.0	36.0
Total Split (s)	13.0	34.0	13.0	34.0	24.0	12.0	49.0	49.0	24.0	61.0
Total Split (%)	10.8%	28.3%	10.8%	28.3%	20.0%	10.0%	40.8%	40.8%	20.0%	50.8%
Yellow Time (s)	3.0	4.0	3.0	4.0	3.0	3.0	4.0	4.0	3.0	4.0
All-Red Time (s)	1.0	3.0	1.0	3.0	1.0	1.0	3.0	3.0	1.0	3.0
Lost Time Adjust (s)	-1.0	-4.0	-1.0	-4.0	-4.0	-1.0	-4.0	-4.0	-1.0	-4.0
Total Lost Time (s)	3.0	3.0	3.0	3.0	0.0	3.0	3.0	3.0	3.0	3.0
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	None	C-Max	C-Max	None	C-Max
Act Effct Green (s)	41.0	31.0	41.0	31.0	56.8	56.0	47.2	47.2	70.0	58.2
Actuated g/C Ratio	0.34	0.26	0.34	0.26	0.47	0.47	0.39	0.39	0.58	0.48
v/c Ratio	0.96	0.21	0.68	0.90	0.95	0.65	0.86	0.16	0.46	0.77
Control Delay	84.3	19.0	40.1	57.2	51.6	39.7	63.8	16.2	37.9	15.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Total Delay	84.3	19.0	40.1	57.2	51.6	39.7	63.8	16.2	37.9	15.7
LOS	F	B	D	E	D	D	E	B	D	B
Approach Delay		52.8		52.2			59.6			17.5
Approach LOS		D		D			E			B

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green, Master Intersection	
Natural Cycle: 95	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.96	
Intersection Signal Delay: 43.2	Intersection LOS: D
Intersection Capacity Utilization 93.0%	ICU Level of Service F
Analysis Period (min) 15	

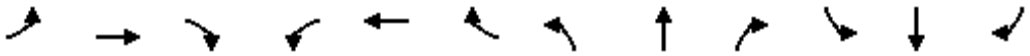
Splits and Phases: 3: Guelph Line & Queensway Drive/Harvester Rd



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	193	180	287	792	693	121	1646	104	154	1804
v/c Ratio	0.96	0.21	0.68	0.90	0.95	0.65	0.86	0.16	0.46	0.77
Control Delay	84.3	19.0	40.1	57.2	51.6	39.7	63.8	16.2	37.9	15.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Total Delay	84.3	19.0	40.1	57.2	51.6	39.7	63.8	16.2	37.9	15.7
Queue Length 50th (m)	32.3	9.1	50.9	95.1	135.2	25.1	150.1	5.8	23.9	57.8
Queue Length 95th (m)	#75.1	18.3	75.9	#128.9	#219.7	m32.1	166.7	m10.2	m41.3	63.5
Internal Link Dist (m)		110.7		287.5			189.1			96.5
Turn Bay Length (m)	45.0		110.0		200.0	60.0		80.0	100.0	
Base Capacity (vph)	202	868	422	882	741	189	1909	638	350	2347
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	71
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.96	0.21	0.68	0.90	0.94	0.64	0.86	0.16	0.44	0.79

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	183	91	80	273	752	658	115	1564	99	146	1542	172
Future Volume (vph)	183	91	80	273	752	658	115	1564	99	146	1542	172
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.2	3.1	3.3	3.2	3.0	3.2	3.2	3.0	3.2	3.2	3.1
Total Lost time (s)	3.0	3.0		3.0	3.0	0.0	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.98	1.00	1.00	0.96	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.93		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1658	3121		1725	3415	1457	1691	4859	1400	1658	4816	
Flt Permitted	0.14	1.00		0.59	1.00	1.00	0.09	1.00	1.00	0.08	1.00	
Satd. Flow (perm)	249	3121		1079	3415	1457	161	4859	1400	148	4816	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	193	96	84	287	792	693	121	1646	104	154	1623	181
RTOR Reduction (vph)	0	62	0	0	0	40	0	0	63	0	11	0
Lane Group Flow (vph)	193	118	0	287	792	653	121	1646	41	154	1793	0
Confl. Peds. (#/hr)	20		2	2		20	4		25	25		4
Heavy Vehicles (%)	4%	3%	1%	1%	1%	1%	2%	2%	3%	4%	1%	3%
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8	1	5	2		1	6	
Permitted Phases	4	4		8	8	8	2	2	2	6	6	
Actuated Green, G (s)	36.0	27.0		36.0	27.0	45.8	51.0	43.2	43.2	66.0	54.2	
Effective Green, g (s)	38.0	31.0		38.0	31.0	53.8	53.0	47.2	47.2	67.0	58.2	
Actuated g/C Ratio	0.32	0.26		0.32	0.26	0.45	0.44	0.39	0.39	0.56	0.49	
Clearance Time (s)	4.0	7.0		4.0	7.0	4.0	4.0	7.0	7.0	4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	196	806		395	882	653	183	1911	550	331	2335	
v/s Ratio Prot	c0.08	0.04		0.06	0.23	c0.19	0.05	c0.34		0.08	0.37	
v/s Ratio Perm	0.23			0.17		0.26	0.24		0.03	0.18		
v/c Ratio	0.98	0.15		0.73	0.90	1.00	0.66	0.86	0.07	0.47	0.77	
Uniform Delay, d1	35.8	34.3		34.9	43.0	33.1	23.4	33.4	22.7	21.1	25.4	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.34	1.78	11.34	1.92	0.54	
Incremental Delay, d2	59.4	0.1		6.5	11.8	34.8	5.5	3.5	0.2	0.8	2.0	
Delay (s)	95.2	34.4		41.4	54.8	67.9	36.8	63.0	258.1	41.3	15.6	
Level of Service	F	C		D	D	E	D	E	F	D	B	
Approach Delay (s)		65.8			57.7			72.2			17.6	
Approach LOS		E			E			E			B	

Intersection Summary			
HCM 2000 Control Delay	49.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	93.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

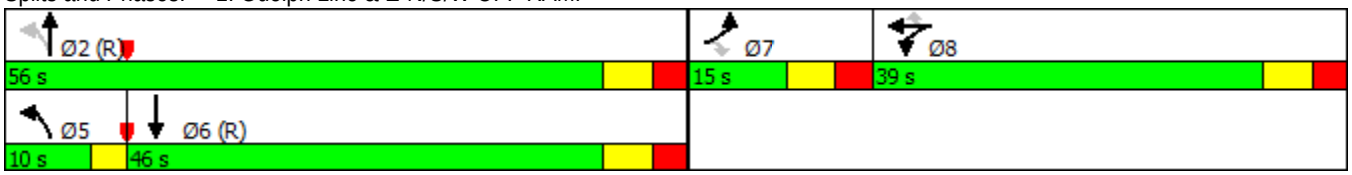
APPENDIX G3 – 2031 AM PEAK (Synchro Output)

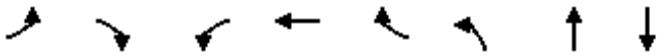
Lane Group	EBL	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Configurations								
Traffic Volume (vph)	28	85	364	20	242	40	1830	2046
Future Volume (vph)	28	85	364	20	242	40	1830	2046
Turn Type	Prot	Perm	Split	NA	Perm	pm+pt	NA	NA
Protected Phases	7		8	8		5	2	6
Permitted Phases		7			8	2		
Detector Phase	7	7	8	8	8	5	2	6
Switch Phase								
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	6.0	8.0	8.0
Minimum Split (s)	15.0	15.0	39.0	39.0	39.0	10.0	40.0	40.0
Total Split (s)	15.0	15.0	39.0	39.0	39.0	10.0	56.0	46.0
Total Split (%)	13.6%	13.6%	35.5%	35.5%	35.5%	9.1%	50.9%	41.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0
Lost Time Adjust (s)	-3.0	-1.0	-3.0	-3.0	-3.0	0.0	-4.0	-4.0
Total Lost Time (s)	4.0	6.0	4.0	4.0	4.0	3.0	3.0	3.0
Lead/Lag	Lead	Lead	Lag	Lag	Lag	Lead		Lag
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	None	None	C-Max	C-Max
Act Effct Green (s)	11.0	9.0	21.2	21.2	21.2	66.8	66.8	60.5
Actuated g/C Ratio	0.10	0.08	0.19	0.19	0.19	0.61	0.61	0.55
v/c Ratio	0.17	0.83	0.59	0.07	0.63	0.25	0.66	0.89
Control Delay	48.0	101.3	43.6	34.5	24.8	14.3	9.9	29.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.0	101.3	43.6	34.5	24.8	14.3	9.9	29.5
LOS	D	F	D	C	C	B	A	C
Approach Delay				36.0			10.0	29.5
Approach LOS				D			A	C

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 110
Offset: 24 (22%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 115
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.89
Intersection Signal Delay: 24.0 — Intersection LOS: C
Intersection Capacity Utilization 69.3% — ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 1: Guelph Line & E-N/S/W OFF RAMP

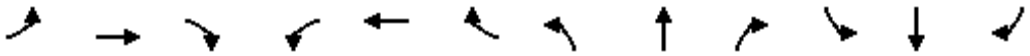




Lane Group	EBL	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	29	89	383	21	255	42	1926	2206
v/c Ratio	0.17	0.83	0.59	0.07	0.63	0.25	0.66	0.89
Control Delay	48.0	101.3	43.6	34.5	24.8	14.3	9.9	29.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.0	101.3	43.6	34.5	24.8	14.3	9.9	29.5
Queue Length 50th (m)	5.8	19.2	39.1	3.7	22.4	2.8	53.7	155.4
Queue Length 95th (m)	14.8	#47.6	49.8	9.7	45.6	m6.2	65.9	#227.8
Internal Link Dist (m)				228.8			44.4	357.0
Turn Bay Length (m)			140.0		130.0			
Base Capacity (vph)	171	107	1078	532	577	173	2931	2469
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.17	0.83	0.36	0.04	0.44	0.24	0.66	0.89

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	0	85	364	20	242	40	1830	0	0	2046	49
Future Volume (vph)	28	0	85	364	20	242	40	1830	0	0	2046	49
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.4	3.4	3.1	3.4	3.4	3.4	3.0	3.4	3.1	3.0	3.4	3.4
Grade (%)		0%			0%			0%			15%	
Total Lost time (s)	4.0		6.0	4.0	4.0	4.0	3.0	3.0			3.0	
Lane Util. Factor	1.00		1.00	0.97	1.00	1.00	1.00	0.91			0.91	
Frpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	1.00	1.00			1.00	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	1.00	1.00			1.00	
Frt	1.00		0.85	1.00	1.00	0.85	1.00	1.00			1.00	
Flt Protected	0.95		1.00	0.95	1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)	1713		1315	3390	1674	1518	1652	4830			4486	
Flt Permitted	0.95		1.00	0.95	1.00	1.00	0.07	1.00			1.00	
Satd. Flow (perm)	1713		1315	3390	1674	1518	119	4830			4486	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	29	0	89	383	21	255	42	1926	0	0	2154	52
RTOR Reduction (vph)	0	0	0	0	0	112	0	0	0	0	2	0
Lane Group Flow (vph)	29	0	89	383	21	143	42	1926	0	0	2204	0
Confl. Peds. (#/hr)							3		3	3		3
Heavy Vehicles (%)	3%	2%	16%	1%	11%	4%	2%	5%	2%	2%	4%	11%
Turn Type	Prot		Perm	Split	NA	Perm	pm+pt	NA			NA	
Protected Phases	7			8	8		5	2			6	
Permitted Phases			7			8	2					
Actuated Green, G (s)	8.0		8.0	18.2	18.2	18.2	62.8	62.8			55.4	
Effective Green, g (s)	11.0		9.0	21.2	21.2	21.2	62.8	66.8			59.4	
Actuated g/C Ratio	0.10		0.08	0.19	0.19	0.19	0.57	0.61			0.54	
Clearance Time (s)	7.0		7.0	7.0	7.0	7.0	3.0	7.0			7.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)	171		107	653	322	292	129	2933			2422	
v/s Ratio Prot	0.02			c0.11	0.01		0.01	c0.40			c0.49	
v/s Ratio Perm			c0.07			0.09	0.17					
v/c Ratio	0.17		0.83	0.59	0.07	0.49	0.33	0.66			0.91	
Uniform Delay, d1	45.3		49.8	40.4	36.3	39.6	19.0	14.1			22.9	
Progression Factor	1.00		1.00	1.00	1.00	1.00	1.11	0.59			1.00	
Incremental Delay, d2	0.5		39.7	1.4	0.1	1.3	1.2	1.0			6.5	
Delay (s)	45.8		89.5	41.8	36.4	40.9	22.4	9.4			29.4	
Level of Service	D		F	D	D	D	C	A			C	
Approach Delay (s)		78.7			41.2			9.6			29.4	
Approach LOS		E			D			A			C	

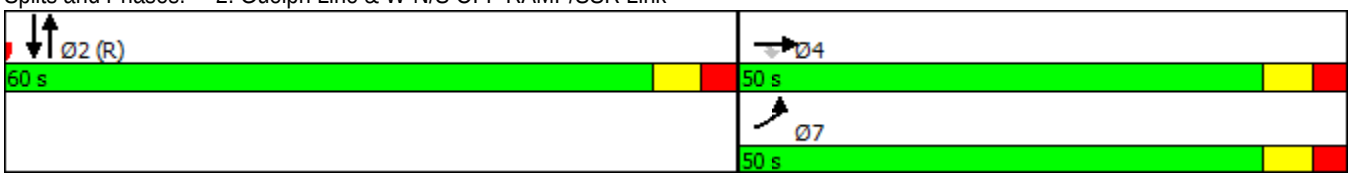
Intersection Summary			
HCM 2000 Control Delay	24.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	69.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	NBT	SBT
Lane Configurations					
Traffic Volume (vph)	790	549	454	1633	1640
Future Volume (vph)	790	549	454	1633	1640
Turn Type	Prot	NA	Perm	NA	NA
Protected Phases	7	4		2	2
Permitted Phases		4	4	2	2
Detector Phase	7	4	4	2	2
Switch Phase					
Minimum Initial (s)	4.0	8.0	8.0	8.0	8.0
Minimum Split (s)	11.0	38.0	38.0	43.0	43.0
Total Split (s)	50.0	50.0	50.0	60.0	60.0
Total Split (%)	45.5%	45.5%	45.5%	54.5%	54.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	-4.0	-4.0	-4.0	-4.0	-4.0
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	None	C-Max	C-Max
Act Effct Green (s)	43.7	43.7	43.7	60.3	60.3
Actuated g/C Ratio	0.40	0.40	0.40	0.55	0.55
v/c Ratio	0.65	0.82	0.77	0.52	0.65
Control Delay	29.3	39.9	35.4	4.5	20.6
Queue Delay	0.0	0.0	2.3	0.8	0.0
Total Delay	29.3	39.9	37.7	5.3	20.7
LOS	C	D	D	A	C
Approach Delay		34.7		5.3	20.7
Approach LOS		C		A	C

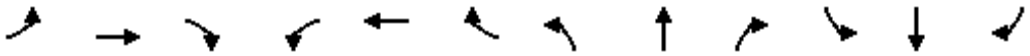
Intersection Summary	
Cycle Length: 110	
Actuated Cycle Length: 110	
Offset: 0 (0%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 85	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.82	
Intersection Signal Delay: 20.6	Intersection LOS: C
Intersection Capacity Utilization 67.2%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 2: Guelph Line & W-N/S OFF RAMP/SSR Link



Lane Group	EBL	EBT	EBR	NBT	SBT
Lane Group Flow (vph)	832	578	478	1743	1726
v/c Ratio	0.65	0.82	0.77	0.52	0.65
Control Delay	29.3	39.9	35.4	4.5	20.6
Queue Delay	0.0	0.0	2.3	0.8	0.0
Total Delay	29.3	39.9	37.7	5.3	20.7
Queue Length 50th (m)	70.3	104.0	77.4	15.2	85.2
Queue Length 95th (m)	89.3	147.1	117.1	8.6	110.4
Internal Link Dist (m)		328.8		96.5	49.4
Turn Bay Length (m)	180.0		160.0		
Base Capacity (vph)	1371	759	661	3333	2674
Starvation Cap Reductn	0	0	0	1139	0
Spillback Cap Reductn	0	0	86	0	67
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.61	0.76	0.83	0.79	0.66

Intersection Summary



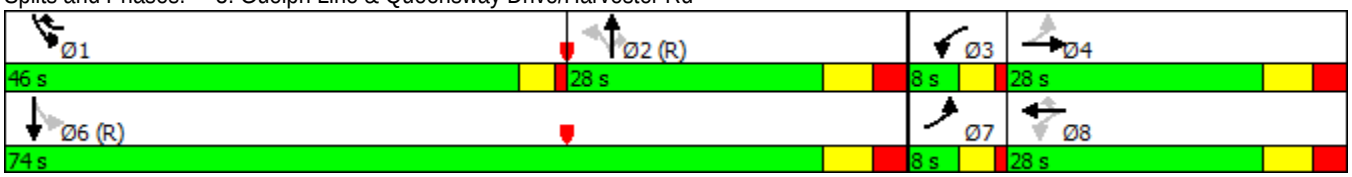
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	790	549	454	0	0	0	0	1633	23	0	1640	0
Future Volume (vph)	790	549	454	0	0	0	0	1633	23	0	1640	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.1	3.1	3.1	3.4	3.1	3.4	3.1	3.4	3.1	3.1	3.4	3.1
Total Lost time (s)	3.0	3.0	3.0					3.0			3.0	
Lane Util. Factor	0.97	1.00	1.00					0.86			0.91	
Frpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	
Flpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	
Frt	1.00	1.00	0.85					1.00			1.00	
Flt Protected	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (prot)	3211	1777	1495					6075			4877	
Flt Permitted	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (perm)	3211	1777	1495					6075			4877	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	832	578	478	0	0	0	0	1719	24	0	1726	0
RTOR Reduction (vph)	0	0	24	0	0	0	0	1	0	0	0	0
Lane Group Flow (vph)	832	578	454	0	0	0	0	1742	0	0	1726	0
Confl. Peds. (#/hr)							4		1	1		
Heavy Vehicles (%)	3%	1%	2%	2%	2%	2%	2%	5%	2%	2%	4%	2%
Turn Type	Prot	NA	Perm					NA			NA	
Protected Phases	7	4						2			2	
Permitted Phases		4	4					2			2	
Actuated Green, G (s)	39.7	39.7	39.7					56.3			56.3	
Effective Green, g (s)	43.7	43.7	43.7					60.3			60.3	
Actuated g/C Ratio	0.40	0.40	0.40					0.55			0.55	
Clearance Time (s)	7.0	7.0	7.0					7.0			7.0	
Vehicle Extension (s)	3.0	3.0	3.0					3.0			3.0	
Lane Grp Cap (vph)	1275	705	593					3330			2673	
v/s Ratio Prot	0.26	c0.33						0.29			c0.35	
v/s Ratio Perm			0.30									
v/c Ratio	0.65	0.82	0.77					0.52			0.65	
Uniform Delay, d1	27.0	29.6	28.7					15.7			17.4	
Progression Factor	1.00	1.00	1.00					0.25			1.10	
Incremental Delay, d2	1.2	7.4	5.9					0.4			0.7	
Delay (s)	28.2	37.0	34.6					4.3			19.7	
Level of Service	C	D	C					A			B	
Approach Delay (s)		32.5			0.0			4.3			19.7	
Approach LOS		C			A			A			B	

Intersection Summary			
HCM 2000 Control Delay	19.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	67.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations										
Traffic Volume (vph)	158	320	99	95	193	60	1305	273	499	1353
Future Volume (vph)	158	320	99	95	193	60	1305	273	499	1353
Turn Type	pm+pt	NA	pm+pt	NA	pm+ov	Perm	NA	Perm	pm+pt	NA
Protected Phases	7	4	3	8	1		2		1	6
Permitted Phases	4	4	8	8	8	2	2	2	6	6
Detector Phase	7	4	3	8	1	2	2	2	1	6
Switch Phase										
Minimum Initial (s)	4.0	1.0	4.0	1.0	4.0	1.0	1.0	1.0	4.0	1.0
Minimum Split (s)	8.0	28.0	8.0	28.0	8.0	28.0	28.0	28.0	8.0	28.0
Total Split (s)	8.0	28.0	8.0	28.0	46.0	28.0	28.0	28.0	46.0	74.0
Total Split (%)	7.3%	25.5%	7.3%	25.5%	41.8%	25.5%	25.5%	25.5%	41.8%	67.3%
Yellow Time (s)	3.0	4.0	3.0	4.0	3.0	4.0	4.0	4.0	3.0	4.0
All-Red Time (s)	1.0	3.0	1.0	3.0	1.0	3.0	3.0	3.0	1.0	3.0
Lost Time Adjust (s)	-1.0	-4.0	-1.0	-4.0	-4.0	-1.0	-4.0	-4.0	-1.0	-4.0
Total Lost Time (s)	3.0	3.0	3.0	3.0	0.0	6.0	3.0	3.0	3.0	3.0
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lag	Lag	Lead	
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	C-Max	C-Max	C-Max	None	C-Max
Act Effct Green (s)	27.1	22.1	27.1	22.1	59.9	36.1	39.1	39.1	73.9	73.9
Actuated g/C Ratio	0.25	0.20	0.25	0.20	0.54	0.33	0.36	0.36	0.67	0.67
v/c Ratio	0.54	0.63	0.62	0.15	0.25	0.75	0.81	0.43	0.93	0.49
Control Delay	40.8	41.8	48.4	35.9	6.8	87.9	42.2	18.2	52.3	12.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.7	0.7
Total Delay	40.8	41.8	48.4	35.9	6.8	87.9	42.2	18.2	57.9	13.4
LOS	D	D	D	D	A	F	D	B	E	B
Approach Delay		41.5		24.6			39.9			24.6
Approach LOS		D		C			D			C

Intersection Summary	
Cycle Length: 110	
Actuated Cycle Length: 110	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green, Master Intersection	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.93	
Intersection Signal Delay: 32.1	Intersection LOS: C
Intersection Capacity Utilization 83.9%	ICU Level of Service E
Analysis Period (min) 15	

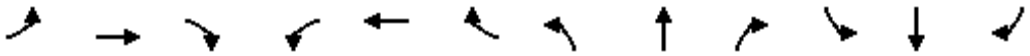
Splits and Phases: 3: Guelph Line & Queensway Drive/Harvester Rd



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	166	419	104	100	203	63	1374	287	525	1565
v/c Ratio	0.54	0.63	0.62	0.15	0.25	0.75	0.81	0.43	0.93	0.49
Control Delay	40.8	41.8	48.4	35.9	6.8	87.9	42.2	18.2	52.3	12.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.7	0.7
Total Delay	40.8	41.8	48.4	35.9	6.8	87.9	42.2	18.2	57.9	13.4
Queue Length 50th (m)	28.7	40.7	17.2	9.3	12.1	10.4	73.8	18.4	102.3	58.9
Queue Length 95th (m)	46.1	55.4	30.2	16.2	16.8	m#30.0	#160.9	m43.9	136.1	79.4
Internal Link Dist (m)		110.7		287.5			189.1			96.5
Turn Bay Length (m)	45.0		110.0		200.0	60.0		80.0	100.0	
Base Capacity (vph)	305	754	168	753	966	84	1694	673	719	3187
Starvation Cap Reductn	0	0	0	0	0	0	0	0	140	1141
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.54	0.56	0.62	0.13	0.21	0.75	0.81	0.43	0.91	0.76

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	158	320	78	99	95	193	60	1305	273	499	1353	134
Future Volume (vph)	158	320	78	99	95	193	60	1305	273	499	1353	134
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.2	3.1	3.3	3.2	3.0	3.2	3.2	3.0	3.2	3.2	3.1
Total Lost time (s)	3.0	3.0		3.0	3.0	0.0	6.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	0.99	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1603	3234		1677	3317	1451	1624	4766	1453	1708	4731	
Flt Permitted	0.69	1.00		0.26	1.00	1.00	0.15	1.00	1.00	0.10	1.00	
Satd. Flow (perm)	1163	3234		460	3317	1451	259	4766	1453	184	4731	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	166	337	82	104	100	203	63	1374	287	525	1424	141
RTOR Reduction (vph)	0	20	0	0	0	38	0	0	157	0	10	0
Lane Group Flow (vph)	166	399	0	104	100	165	63	1374	130	525	1555	0
Confl. Peds. (#/hr)	6		4	4		6	11		3	3		11
Heavy Vehicles (%)	7%	2%	8%	4%	4%	3%	6%	4%	2%	1%	3%	4%
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	Perm	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8	1		2		1	6	
Permitted Phases	4	4		8	8	8	2	2	2	6	6	
Actuated Green, G (s)	22.1	18.1		22.1	18.1	48.9	35.1	35.1	35.1	69.9	69.9	
Effective Green, g (s)	24.1	22.1		24.1	22.1	56.9	36.1	39.1	39.1	70.9	73.9	
Actuated g/C Ratio	0.22	0.20		0.22	0.20	0.52	0.33	0.36	0.36	0.64	0.67	
Clearance Time (s)	4.0	7.0		4.0	7.0	4.0	7.0	7.0	7.0	4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	274	649		156	666	750	84	1694	516	559	3178	
v/s Ratio Prot	0.03	c0.12		c0.03	0.03	0.07		0.29		c0.27	0.33	
v/s Ratio Perm	0.10			0.12		0.04	0.24		0.09	c0.33		
v/c Ratio	0.61	0.61		0.67	0.15	0.22	0.75	0.81	0.25	0.94	0.49	
Uniform Delay, d1	37.8	40.1		37.2	36.2	14.5	32.9	32.1	25.1	30.6	8.8	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.34	1.15	2.28	1.19	1.36	
Incremental Delay, d2	3.8	1.7		10.3	0.1	0.1	36.0	3.3	0.9	19.3	0.4	
Delay (s)	41.6	41.8		47.5	36.3	14.6	80.3	40.0	58.2	55.7	12.4	
Level of Service	D	D		D	D	B	F	D	E	E	B	
Approach Delay (s)		41.7			28.3			44.5			23.3	
Approach LOS		D			C			D			C	

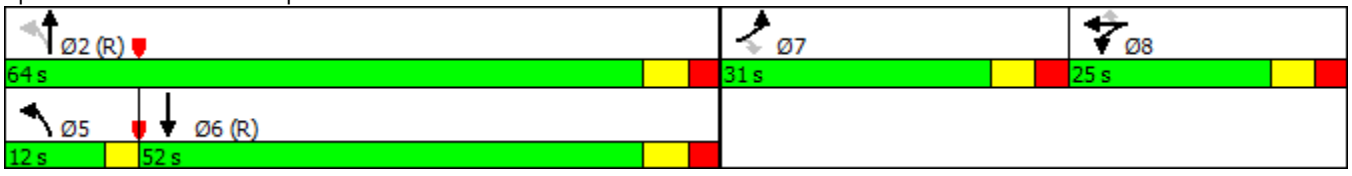
Intersection Summary			
HCM 2000 Control Delay	33.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	83.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

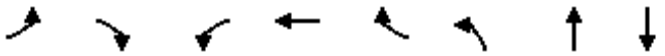
APPENDIX G4 – 2031 PM PEAK (Synchro Output)

Lane Group	EBL	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Configurations								
Traffic Volume (vph)	78	320	375	56	111	146	2224	2239
Future Volume (vph)	78	320	375	56	111	146	2224	2239
Turn Type	Prot	Perm	Split	NA	Perm	pm+pt	NA	NA
Protected Phases	7		8	8		5	2	6
Permitted Phases		7			8	2		
Detector Phase	7	7	8	8	8	5	2	6
Switch Phase								
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	6.0	8.0	8.0
Minimum Split (s)	15.0	15.0	39.0	39.0	39.0	10.0	40.0	40.0
Total Split (s)	31.0	31.0	25.0	25.0	25.0	12.0	64.0	52.0
Total Split (%)	25.8%	25.8%	20.8%	20.8%	20.8%	10.0%	53.3%	43.3%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0
Lost Time Adjust (s)	-3.0	-1.0	-3.0	-3.0	-3.0	0.0	-4.0	-4.0
Total Lost Time (s)	4.0	6.0	4.0	4.0	4.0	3.0	3.0	3.0
Lead/Lag	Lead	Lead	Lag	Lag	Lag	Lead		Lag
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	None	None	C-Max	C-Max
Act Effct Green (s)	27.0	25.0	20.1	20.1	20.1	61.9	61.9	49.7
Actuated g/C Ratio	0.22	0.21	0.17	0.17	0.17	0.52	0.52	0.41
v/c Ratio	0.21	1.07	0.70	0.19	0.32	0.81	0.91	1.28
Control Delay	39.6	117.0	54.4	44.3	8.6	54.8	37.9	160.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.6	117.0	54.4	44.3	8.6	54.8	37.9	160.2
LOS	D	F	D	D	A	D	D	F
Approach Delay				44.0			38.9	160.2
Approach LOS				D			D	F

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 98 (82%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Natural Cycle: 115	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.28	
Intersection Signal Delay: 93.6	Intersection LOS: F
Intersection Capacity Utilization 86.8%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 1: Guelph Line & E-N/S/W OFF RAMP





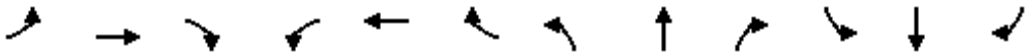
Lane Group	EBL	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	82	337	395	59	117	154	2341	2421
v/c Ratio	0.21	1.07	0.70	0.19	0.32	0.81	0.91	1.28
Control Delay	39.6	117.0	54.4	44.3	8.6	54.8	37.9	160.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.6	117.0	54.4	44.3	8.6	54.8	37.9	160.2
Queue Length 50th (m)	15.8	~88.1	45.3	12.0	0.0	24.9	167.0	~267.9
Queue Length 95th (m)	29.7	#144.4	61.8	24.1	13.6	m#51.8	177.8	#296.6
Internal Link Dist (m)				228.8			44.4	357.0
Turn Bay Length (m)			140.0		130.0			
Base Capacity (vph)	389	314	587	318	375	189	2563	1897
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.21	1.07	0.67	0.19	0.31	0.81	0.91	1.28

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	78	0	320	375	56	111	146	2224	0	0	2239	61
Future Volume (vph)	78	0	320	375	56	111	146	2224	0	0	2239	61
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.4	3.4	3.1	3.4	3.4	3.4	3.0	3.4	3.1	3.0	3.4	3.4
Grade (%)		0%			0%			0%			15%	
Total Lost time (s)	4.0		6.0	4.0	4.0	4.0	3.0	3.0			3.0	
Lane Util. Factor	1.00		1.00	0.97	1.00	1.00	1.00	0.91			0.91	
Frpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	1.00	1.00			1.00	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	1.00	1.00			1.00	
Frt	1.00		0.85	1.00	1.00	0.85	1.00	1.00			1.00	
Flt Protected	0.95		1.00	0.95	1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)	1730		1510	3357	1821	1548	1652	4972			4579	
Flt Permitted	0.95		1.00	0.95	1.00	1.00	0.08	1.00			1.00	
Satd. Flow (perm)	1730		1510	3357	1821	1548	143	4972			4579	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	82	0	337	395	59	117	154	2341	0	0	2357	64
RTOR Reduction (vph)	0	0	0	0	0	97	0	0	0	0	2	0
Lane Group Flow (vph)	82	0	337	395	59	20	154	2341	0	0	2419	0
Confl. Peds. (#/hr)							6		3	3		6
Heavy Vehicles (%)	2%	2%	1%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Prot		Perm	Split	NA	Perm	pm+pt	NA			NA	
Protected Phases	7			8	8		5	2			6	
Permitted Phases			7			8	2					
Actuated Green, G (s)	24.0		24.0	17.1	17.1	17.1	57.9	57.9			45.7	
Effective Green, g (s)	27.0		25.0	20.1	20.1	20.1	57.9	61.9			49.7	
Actuated g/C Ratio	0.22		0.21	0.17	0.17	0.17	0.48	0.52			0.41	
Clearance Time (s)	7.0		7.0	7.0	7.0	7.0	3.0	7.0			7.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)	389		314	562	305	259	184	2564			1896	
v/s Ratio Prot	0.05			c0.12	0.03		0.06	c0.47			c0.53	
v/s Ratio Perm			c0.22			0.01	0.34					
v/c Ratio	0.21		1.07	0.70	0.19	0.08	0.84	0.91			1.28	
Uniform Delay, d1	37.8		47.5	47.1	43.0	42.1	28.9	26.6			35.1	
Progression Factor	1.00		1.00	1.00	1.00	1.00	1.34	1.22			1.00	
Incremental Delay, d2	0.3		71.6	4.0	0.3	0.1	20.8	4.8			128.3	
Delay (s)	38.1		119.1	51.1	43.3	42.2	59.4	37.3			163.4	
Level of Service	D		F	D	D	D	E	D			F	
Approach Delay (s)		103.3			48.5			38.7			163.4	
Approach LOS		F			D			D			F	

Intersection Summary			
HCM 2000 Control Delay	95.3	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	86.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	NBT	SBT
Lane Configurations					
Traffic Volume (vph)	759	135	529	2494	1522
Future Volume (vph)	759	135	529	2494	1522
Turn Type	Split	NA	custom	NA	NA
Protected Phases	4	4	3	2 3	2
Permitted Phases		4	4	2	2
Detector Phase	4	4	3	2 3	2
Switch Phase					
Minimum Initial (s)	8.0	8.0	4.0		8.0
Minimum Split (s)	38.0	38.0	9.0		43.0
Total Split (s)	45.0	45.0	10.0		65.0
Total Split (%)	37.5%	37.5%	8.3%		54.2%
Yellow Time (s)	4.0	4.0	4.0		4.0
All-Red Time (s)	3.0	3.0	1.0		3.0
Lost Time Adjust (s)	-4.0	-4.0	-4.0		-4.0
Total Lost Time (s)	3.0	3.0	1.0		3.0
Lead/Lag	Lead	Lead	Lag		
Lead-Lag Optimize?					
Recall Mode	None	None	None		C-Max
Act Effct Green (s)	38.8	38.8	53.0	75.2	62.0
Actuated g/C Ratio	0.32	0.32	0.44	0.63	0.52
v/c Ratio	0.77	0.25	0.84	0.66	0.62
Control Delay	42.0	30.4	39.8	6.5	9.2
Queue Delay	0.0	0.0	0.0	0.7	0.0
Total Delay	42.0	30.4	39.8	7.2	9.2
LOS	D	C	D	A	A
Approach Delay		40.1		7.2	9.2
Approach LOS		D		A	A

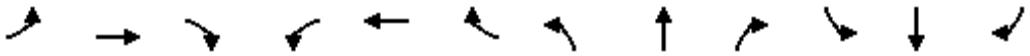
Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 119 (99%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.84	
Intersection Signal Delay: 16.3	Intersection LOS: B
Intersection Capacity Utilization 69.0%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 2: Guelph Line & W-N/S OFF RAMP/SSR Link

Lane Group	EBL	EBT	EBR	NBT	SBT
Lane Group Flow (vph)	799	142	557	2633	1602
v/c Ratio	0.77	0.25	0.84	0.66	0.62
Control Delay	42.0	30.4	39.8	6.5	9.2
Queue Delay	0.0	0.0	0.0	0.7	0.0
Total Delay	42.0	30.4	39.8	7.2	9.2
Queue Length 50th (m)	85.3	24.1	105.1	48.6	42.0
Queue Length 95th (m)	105.6	39.1	#171.5	m52.1	m28.4
Internal Link Dist (m)		328.8		96.5	49.4
Turn Bay Length (m)	180.0		160.0		
Base Capacity (vph)	1123	609	667	3966	2594
Starvation Cap Reductn	0	0	0	858	0
Spillback Cap Reductn	0	0	0	0	27
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.71	0.23	0.84	0.85	0.62

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



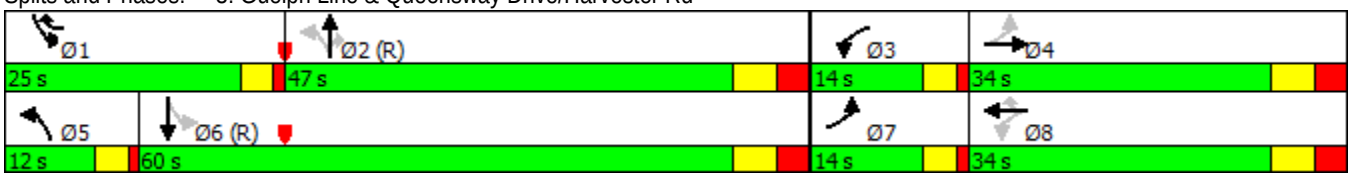
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	759	135	529	0	0	0	0	2494	8	0	1522	0
Future Volume (vph)	759	135	529	0	0	0	0	2494	8	0	1522	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.1	3.1	3.1	3.4	3.1	3.4	3.1	3.4	3.1	3.1	3.4	3.1
Total Lost time (s)	3.0	3.0	1.0					3.0			3.0	
Lane Util. Factor	0.97	1.00	1.00					0.86			0.91	
Frpb, ped/bikes	1.00	1.00	0.99					1.00			1.00	
Flpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	
Frt	1.00	1.00	0.85					1.00			1.00	
Flt Protected	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (prot)	3211	1742	1465					6324			5022	
Flt Permitted	0.95	1.00	1.00					1.00			1.00	
Satd. Flow (perm)	3211	1742	1465					6324			5022	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	799	142	557	0	0	0	0	2625	8	0	1602	0
RTOR Reduction (vph)	0	0	21	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	799	142	536	0	0	0	0	2633	0	0	1602	0
Confl. Peds. (#/hr)			2				20		7	7		20
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	2%	1%	2%	2%	1%	2%
Turn Type	Split	NA	custom					NA			NA	
Protected Phases	4	4	3					2 3			2	
Permitted Phases		4	4					2			2	
Actuated Green, G (s)	34.8	34.8	43.0					71.2			58.0	
Effective Green, g (s)	38.8	38.8	51.0					74.2			62.0	
Actuated g/C Ratio	0.32	0.32	0.42					0.62			0.52	
Clearance Time (s)	7.0	7.0	5.0								7.0	
Vehicle Extension (s)	3.0	3.0	3.0								3.0	
Lane Grp Cap (vph)	1038	563	622					3910			2594	
v/s Ratio Prot	0.25	0.08	c0.09					c0.42			0.32	
v/s Ratio Perm			0.28									
v/c Ratio	0.77	0.25	0.86					0.67			0.62	
Uniform Delay, d1	36.6	29.9	31.3					15.0			20.6	
Progression Factor	1.00	1.00	1.00					0.42			0.44	
Incremental Delay, d2	3.5	0.2	11.8					0.2			0.1	
Delay (s)	40.1	30.1	43.1					6.4			9.1	
Level of Service	D	C	D					A			A	
Approach Delay (s)		40.3			0.0			6.4			9.1	
Approach LOS		D			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	16.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	7.0
Intersection Capacity Utilization	69.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations										
Traffic Volume (vph)	190	94	284	783	684	120	1628	103	152	1605
Future Volume (vph)	190	94	284	783	684	120	1628	103	152	1605
Turn Type	pm+pt	NA	pm+pt	NA	pm+ov	pm+pt	NA	Perm	pm+pt	NA
Protected Phases	7	4	3	8	1	5	2		1	6
Permitted Phases	4	4	8	8	8	2	2	2	6	6
Detector Phase	7	4	3	8	1	5	2	2	1	6
Switch Phase										
Minimum Initial (s)	7.0	8.0	7.0	8.0	7.0	7.0	8.0	8.0	7.0	8.0
Minimum Split (s)	12.0	34.0	12.0	34.0	12.0	12.0	36.0	36.0	12.0	36.0
Total Split (s)	14.0	34.0	14.0	34.0	25.0	12.0	47.0	47.0	25.0	60.0
Total Split (%)	11.7%	28.3%	11.7%	28.3%	20.8%	10.0%	39.2%	39.2%	20.8%	50.0%
Yellow Time (s)	3.0	4.0	3.0	4.0	3.0	3.0	4.0	4.0	3.0	4.0
All-Red Time (s)	1.0	3.0	1.0	3.0	1.0	1.0	3.0	3.0	1.0	3.0
Lost Time Adjust (s)	-1.0	-4.0	-1.0	-4.0	-4.0	-1.0	-4.0	-4.0	-1.0	-4.0
Total Lost Time (s)	3.0	3.0	3.0	3.0	0.0	3.0	3.0	3.0	3.0	3.0
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	None	C-Max	C-Max	None	C-Max
Act Effct Green (s)	42.0	31.0	42.0	31.0	58.5	53.3	44.5	44.5	69.0	57.2
Actuated g/C Ratio	0.35	0.26	0.35	0.26	0.49	0.44	0.37	0.37	0.58	0.48
v/c Ratio	0.93	0.21	0.69	0.93	0.96	0.67	0.95	0.18	0.45	0.81
Control Delay	75.0	18.9	39.7	61.9	52.9	39.6	69.9	16.4	35.5	17.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
Total Delay	75.0	18.9	39.7	61.9	52.9	39.6	69.9	16.4	35.5	18.4
LOS	E	B	D	E	D	D	E	B	D	B
Approach Delay		47.9		54.8			65.0			19.7
Approach LOS		D		D			E			B

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green, Master Intersection	
Natural Cycle: 95	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.96	
Intersection Signal Delay: 46.0	Intersection LOS: D
Intersection Capacity Utilization 96.3%	ICU Level of Service F
Analysis Period (min) 15	

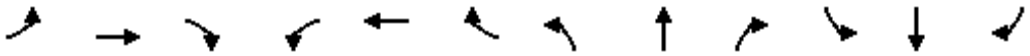
Splits and Phases: 3: Guelph Line & Queensway Drive/Harvester Rd



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	200	187	299	824	720	126	1714	108	160	1877
v/c Ratio	0.93	0.21	0.69	0.93	0.96	0.67	0.95	0.18	0.45	0.81
Control Delay	75.0	18.9	39.7	61.9	52.9	39.6	69.9	16.4	35.5	17.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
Total Delay	75.0	18.9	39.7	61.9	52.9	39.6	69.9	16.4	35.5	18.4
Queue Length 50th (m)	33.1	9.4	52.7	100.2	143.6	25.6	157.4	6.2	23.6	67.2
Queue Length 95th (m)	#75.3	18.7	78.4	#137.6	#231.3	m31.1	#182.8	m9.6	m39.6	71.2
Internal Link Dist (m)		110.7		287.5			189.1			96.5
Turn Bay Length (m)	45.0		110.0		200.0	60.0		80.0	100.0	
Base Capacity (vph)	216	870	432	882	753	190	1801	610	365	2304
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	110
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.93	0.21	0.69	0.93	0.96	0.66	0.95	0.18	0.44	0.86

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	190	94	84	284	783	684	120	1628	103	152	1605	179
Future Volume (vph)	190	94	84	284	783	684	120	1628	103	152	1605	179
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.2	3.1	3.3	3.2	3.0	3.2	3.2	3.0	3.2	3.2	3.1
Total Lost time (s)	3.0	3.0		3.0	3.0	0.0	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.98	1.00	1.00	0.96	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.93		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1658	3119		1725	3415	1458	1691	4859	1400	1658	4816	
Flt Permitted	0.14	1.00		0.59	1.00	1.00	0.10	1.00	1.00	0.09	1.00	
Satd. Flow (perm)	249	3119		1063	3415	1458	172	4859	1400	157	4816	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	200	99	88	299	824	720	126	1714	108	160	1689	188
RTOR Reduction (vph)	0	65	0	0	0	39	0	0	68	0	11	0
Lane Group Flow (vph)	200	122	0	299	824	681	126	1714	40	160	1866	0
Confl. Peds. (#/hr)	20		2	2		20	4		25	25		4
Heavy Vehicles (%)	4%	3%	1%	1%	1%	1%	2%	2%	3%	4%	1%	3%
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8	1	5	2		1	6	
Permitted Phases	4	4		8	8	8	2	2	2	6	6	
Actuated Green, G (s)	37.0	27.0		37.0	27.0	47.5	48.3	40.5	40.5	65.0	53.2	
Effective Green, g (s)	39.0	31.0		39.0	31.0	55.5	50.3	44.5	44.5	66.0	57.2	
Actuated g/C Ratio	0.32	0.26		0.32	0.26	0.46	0.42	0.37	0.37	0.55	0.48	
Clearance Time (s)	4.0	7.0		4.0	7.0	4.0	4.0	7.0	7.0	4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	210	805		406	882	674	183	1801	519	355	2295	
v/s Ratio Prot	c0.09	0.04		0.07	0.24	c0.21	0.05	c0.35		0.08	0.39	
v/s Ratio Perm	0.22			0.17		0.26	0.24		0.03	0.17		
v/c Ratio	0.95	0.15		0.74	0.93	1.01	0.69	0.95	0.08	0.45	0.81	
Uniform Delay, d1	34.0	34.3		34.3	43.5	32.2	25.2	36.7	24.5	21.4	26.8	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.29	1.70	9.75	1.84	0.58	
Incremental Delay, d2	48.4	0.1		6.8	16.5	37.2	6.2	8.3	0.2	0.7	2.4	
Delay (s)	82.4	34.4		41.1	60.0	69.4	38.8	70.6	238.5	40.1	17.9	
Level of Service	F	C		D	E	E	D	E	F	D	B	
Approach Delay (s)		59.2			60.6			77.8			19.6	
Approach LOS		E			E			E			B	

Intersection Summary			
HCM 2000 Control Delay	52.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	96.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			