6038 Ottawa Street

Transportation Impact Assessment

Step 1 Screening Report

Step 2 Scoping Report

Step 3 Forecasting Report

Step 4 Strategy Report

Prepared for:

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1 Screening

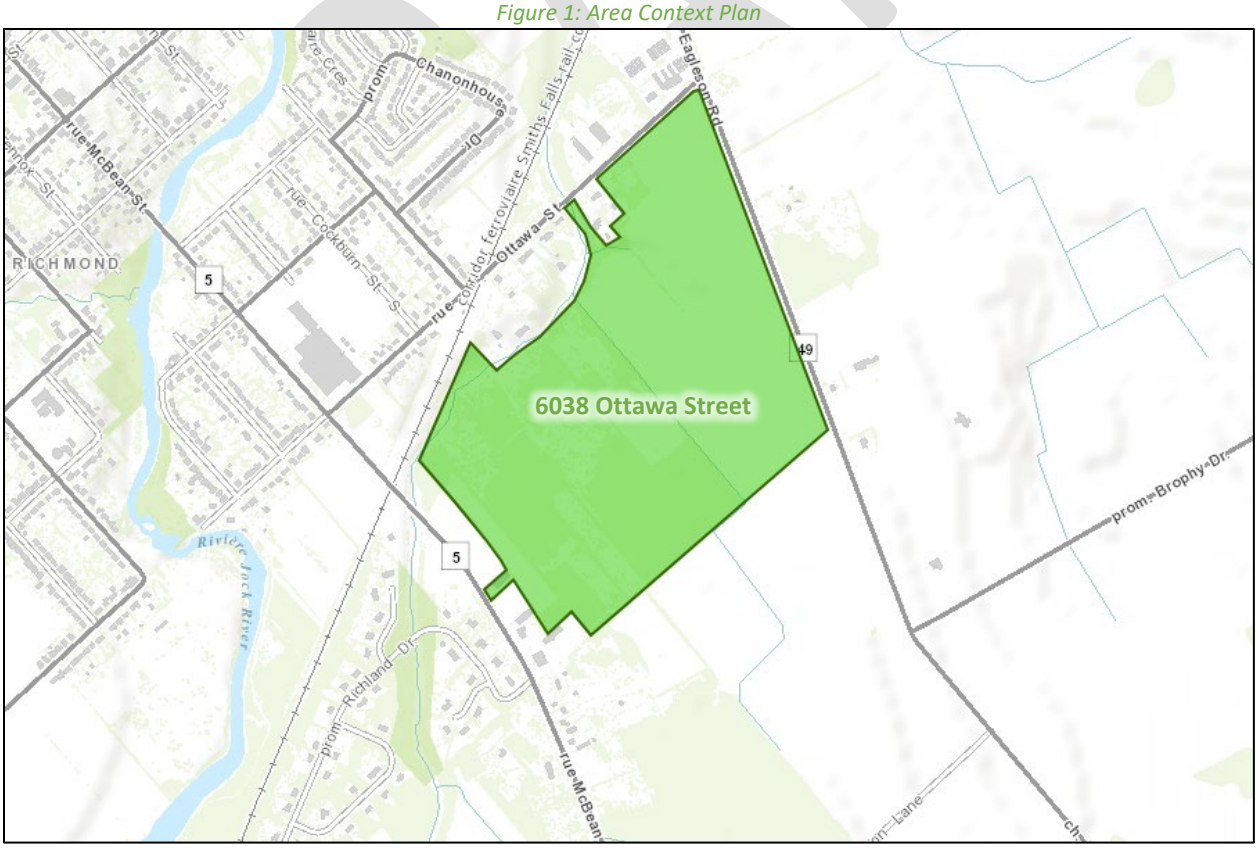
This study has been prepared according to the City of Ottawa's 2017 Transportation Impact Assessment (TIA) Guidelines. Accordingly, a Step 1 Screening Form has been prepared and is included as Appendix A, along with the Certification Form for the TIA Study PM. As shown in the Screening Form, the trip generation, location, and safety triggers were met, and a TIA is required. This report is for a Zoning By-law Amendment and Official Plan Amendment, and as such, will include what level of detail is appropriate to the conceptual plan, including portions of the design review component which are presented for high-level context only.

2 Existing and Planned Conditions

2.1 Proposed Development

The proposed site is located at 6038 Ottawa Street, currently zoned as Rural General Industrial Zone 3 (RG3). It is planned to include a total of either: 1,129 homes, split between 504 single family homes, 106 semi-detached homes, and 519 townhomes and a 2.8-hectare village commercial lot; or 703 homes, split between 306 single family homes, 54 semi-detached homes, and 343 townhomes, with a 2.8-hectare village commercial lot, and 18.5 hectares of employment lands. A new collector road connection to Eagleson Road, new local road connection to Eagleson Road, new local road connection to Ottawa Street, and new collector road connection to McBean Street are proposed as all-movement intersections, stop controlled on the minor approaches. The existing site is farm fields. The anticipated full build-out and occupancy horizon is 2032, and no phases have been confirmed and TIAs for individual phases or site plans will be required. The site is within the Village of Richmond Community Design Plan Area. Figure 1 illustrates the Study Area Context. Figure 2 illustrates the proposed concept plan.

Figure 1: Area Context Plan



Source: http://maps.ottawa.ca/geoOttawa/ Accessed: November 25, 2020

DRAFT

PRELIMINARY LAND USE

LAND USE	BLOCKS	AREA (ha)
Residential Area *min. 30m Lot Depth*	-	36.6
Elementary School	Block A	2.9
Parks	Blocks B-C	3.1
Village Commercial	Block D	2.8
Stormwater Management Facility	Block E	2.3
Richmond By-Pass Drain *incl. 30m setback*	Block F	4.0
Open Space	Block G	0.16
Roads	-	14.9
APPROXIMATE TOTAL AREA		**66.8ha**

RESIDENTIAL UNITS	AREA (ha)	UNITS	%	Singles
11.58m (38ft) Single Detached Unit	9.4	237	21	(47%)
13.72m (45ft) Single Detached Unit	10.1	217	19	(43%)
15.24m (50ft) Single Detached Unit	2.7	50	4	(10%)
15.15m (50ft) Semi-Detached Unit	2.9	106	9	
3-5 Unit Townhouse Blocks	11.6	519	46	
APPROXIMATE NUMBER OF UNITS	**36.6**	**1,129**	**100**	

APPROXIMATE ROAD LENGTH **8,561m**

Includes 14.0m Window Streets; 16.5m Local Roads; 20.0m & 24.0m Collector Road

EMPLOYMENT LANDS (18.5ha)

BICYCLE ROUTE

Note: Concept plan is preliminary and land use areas are approximately only; Not based on a survey

PRELIMINARY CONCEPT PLAN

Ottawa Street and Eagleson Road

City of Ottawa

Not to Scale March 13, 2020 18.549

WND associates planning + urban design

2.2 Existing Conditions

2.2.1 Area Road Network

Eagleson Road: Eagleson Road is a City of Ottawa arterial road with a two-lane rural cross-section with gravel shoulders and a posted speed limit of 80 km/h. The measured right-of-way is 26.0 to 27.0 metres. Eagleson Road is a truck route north of Brophy Drive.

McBean Street: McBean Street is a City of Ottawa arterial road with a two-lane rural cross-section with paved shoulders north of the rail tracks and gravel shoulders to the south. The posted speed limit is 50 km/h north of the rail tracks and 70 km/h to the south. The City protected right-of-way is 23.0 metres north of Ottawa Street and the measured right-of-way is 26.0-30.0 metres south of Ottawa Street. McBean Street is a truck route.

Brophy Drive: Brophy Drive is a City of Ottawa arterial road with a two-lane rural cross-section with gravel shoulders and a posted speed limit of 80 km/h. The measured right-of-way is 40.0 metres. Brophy Drive is a truck route.

Ottawa Street: Ottawa Street is a City of Ottawa collector road with a two-lane rural cross-section with gravel shoulders and a posted speed limit of 50 km/h. The measured right-of-way is 20.0 metres to the west of the rail tracks and 26.0 metres to the east.

King Street: King Street is a City of Ottawa collector road with a two-lane rural cross-section with gravel shoulders and an unposted speed limit of 50km/h. The measured right-of-way is 20.0 metres.

Cockburn Street: Cockburn Street is a City of Ottawa local road with a two-lane rural cross-section with gravel shoulders and an unposted speed limit of 50km/h. The measured right-of-way is 20.0 metres.

Richland Drive: Richland Drive is a City of Ottawa local road with a two-lane rural cross-section with no shoulders and an unposted speed limit of 50km/h. The measured right-of-way is 22.0 metres.

2.2.2 Existing Intersections

The existing area intersections adjacent to the proposed site and additional signalized intersections within 1,000 metres of the site have been summarized below:

Eagleson Road & Ottawa Street	The intersection of Eagleson Road and Ottawa Street is an unsignalized intersection with stop-control on Ottawa Street. The northbound approach consists of a shared left-turn/through lane, the southbound approach consists of a shared through/right-turn lane, and the eastbound approach consists of a shared left-turn/right-turn lane. No turn restrictions are noted.
Eagleson Road & Brophy Drive	The intersection of Eagleson Road and Brophy Drive is an all-way stop-controlled intersection. The northbound approach consists of a shared through/right-turn lane, the southbound approach consists of a shared left-turn/through lane, the westbound approach consists of a shared left-turn/right-turn lane, and the eastbound approach is a private driveway. No turn restrictions are noted.
McBean Street & Ottawa Street	The intersection of McBean Street and Ottawa Street is an unsignalized intersection with stop control on Ottawa Street. All approaches consist of shared all-movement lanes. No turn restrictions are noted.

King Street & Ottawa Street

The intersection of King Street and Ottawa Street is an unsignalized intersection with stop control on King Street. All approaches consist of shared movement lanes. No turn restrictions are noted. *Note, this intersection has been included by City request and for descriptive purposes only.*

2.2.3 Existing Driveways

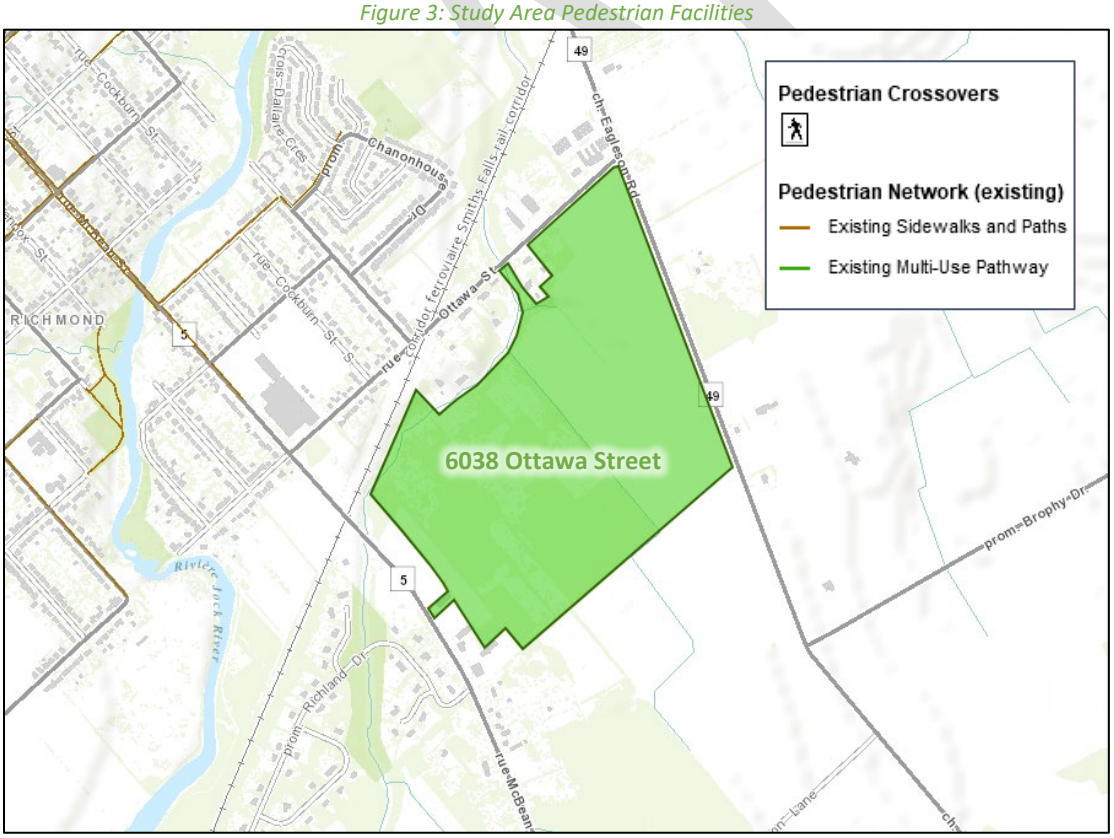
Within 200 metres of the proposed site, a number of private access are located along Eagleson Road, Ottawa Street, and McBean Street. Along Eagleson Road, private accesses for residential and field accesses are located on the east side of the road and fields accesses and the private approach for Richie Feed and Seed Inc is located on the west side of the road. Private accesses for residential and light industrial land uses are located on both sides of Ottawa Street and the east side of McBean Street. Residential accesses are also located on the west side of McBean Street. These accesses are minor in nature and not considered to impact the TIA analysis.

2.2.4 Cycling and Pedestrian Facilities

Figure 3 illustrates the pedestrian facilities in the study area and Figure 4 illustrates the cycling facilities.

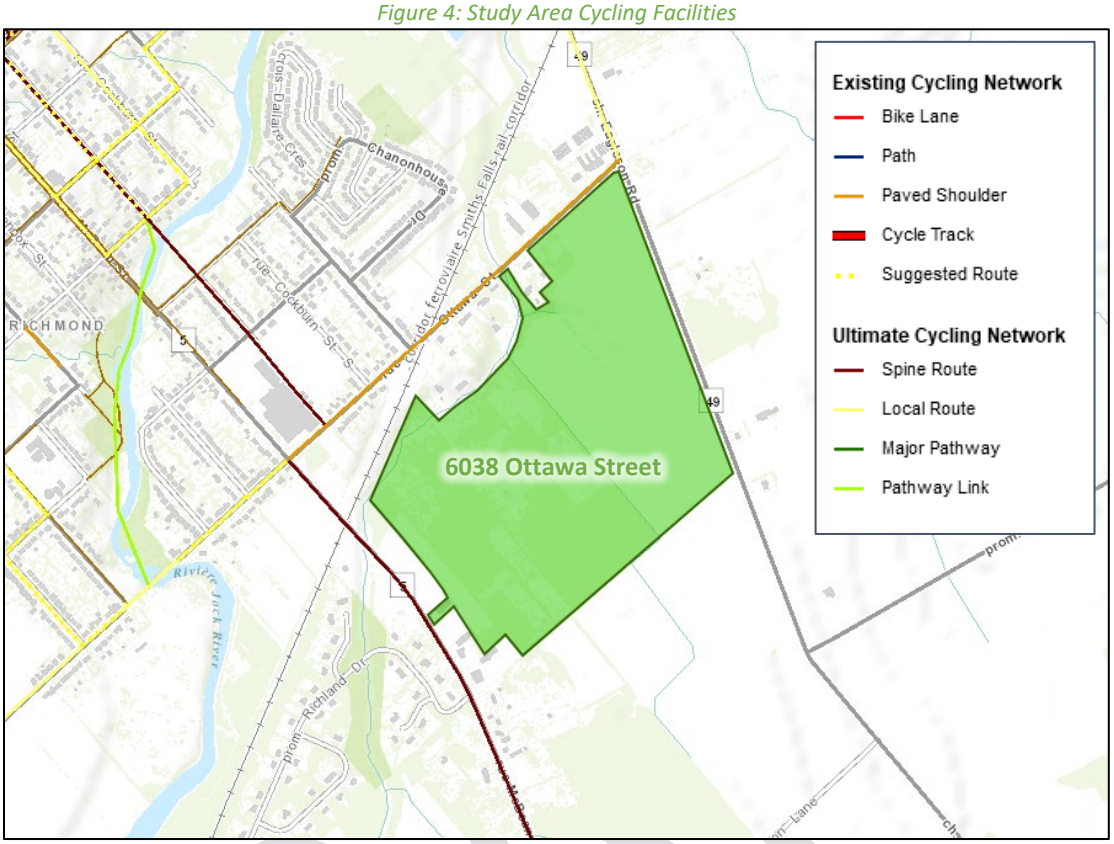
Sidewalks are provided along the east side of McBean Street to the north of the South Carleton High School and on a few local streets to the north of the study area. Ottawa Street provides paved shoulders between McBean Street and Eagleson Road and is a suggested bike route to the west of McBean Street. Eagleson Road and Ottawa Street are planned local routes, and Colonel Murray Street north of Ottawa Street and McBean Street south of Ottawa Street are spine cycling routes. No cycling or pedestrian facilities are provided on King Street.

Figure 3: Study Area Pedestrian Facilities



Source: http://maps.ottawa.ca/geoOttawa/ Accessed: November 25, 2020

Figure 4: Study Area Cycling Facilities



Source: http://maps.ottawa.ca/geoOttawa/ Accessed: November 25, 2020

Additionally, the collected intersection counts also provided existing pedestrian and cyclist demands at the three Study Area intersections for both AM and PM peak periods. Figure 5 illustrates the existing pedestrian volumes and Figure 6 illustrates the existing cyclist volumes at the Study Area intersections.

Figure 5: Existing Pedestrian Volumes

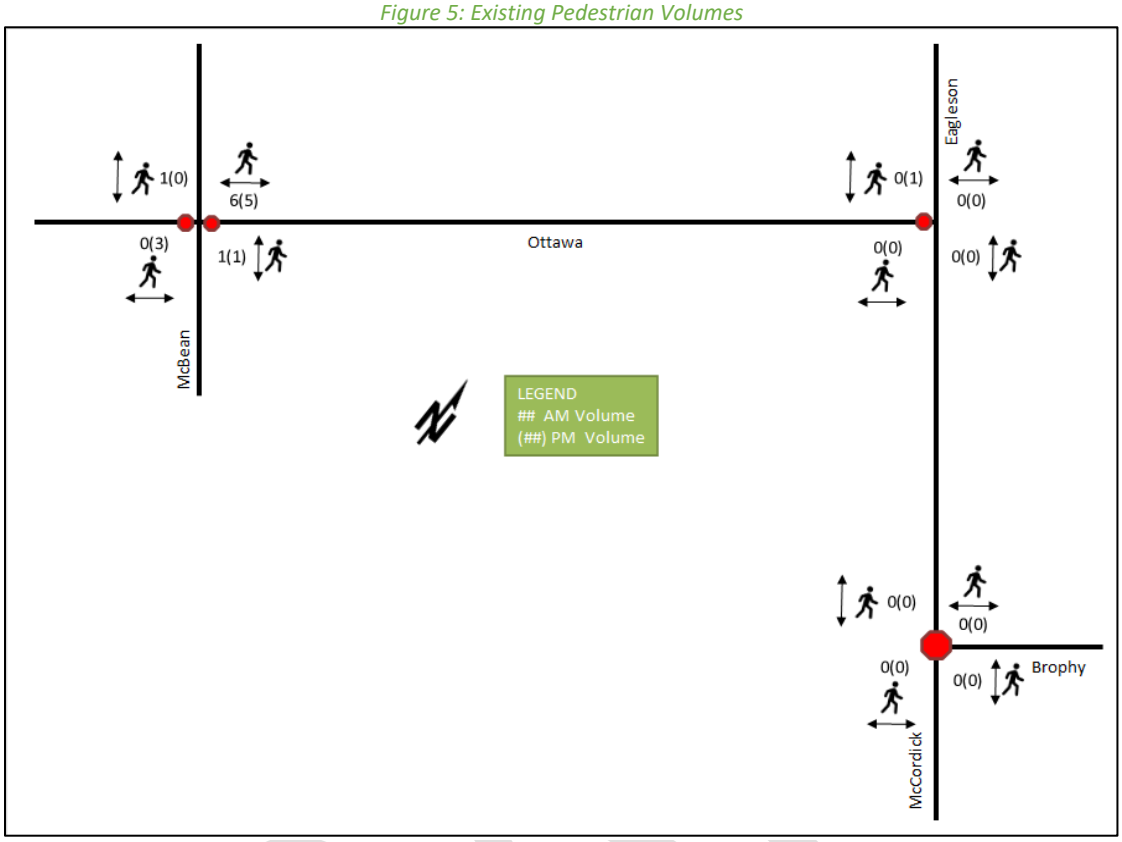
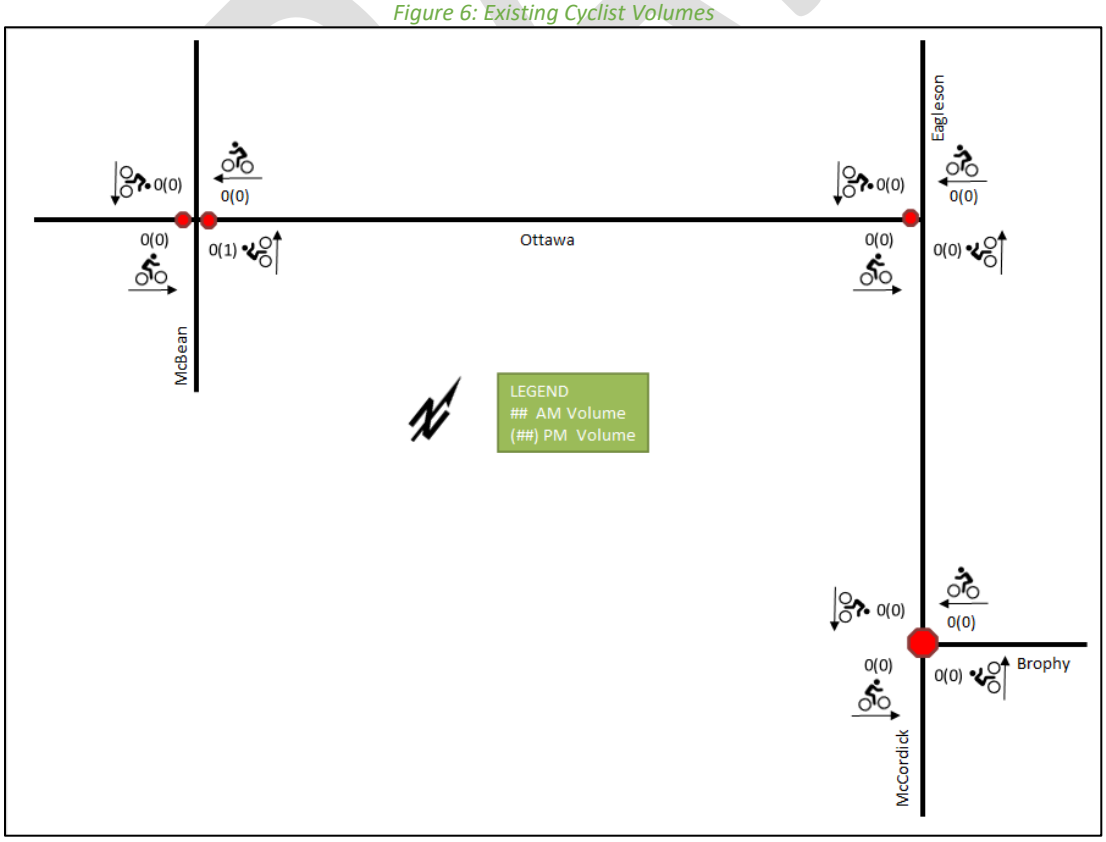


Figure 6: Existing Cyclist Volumes



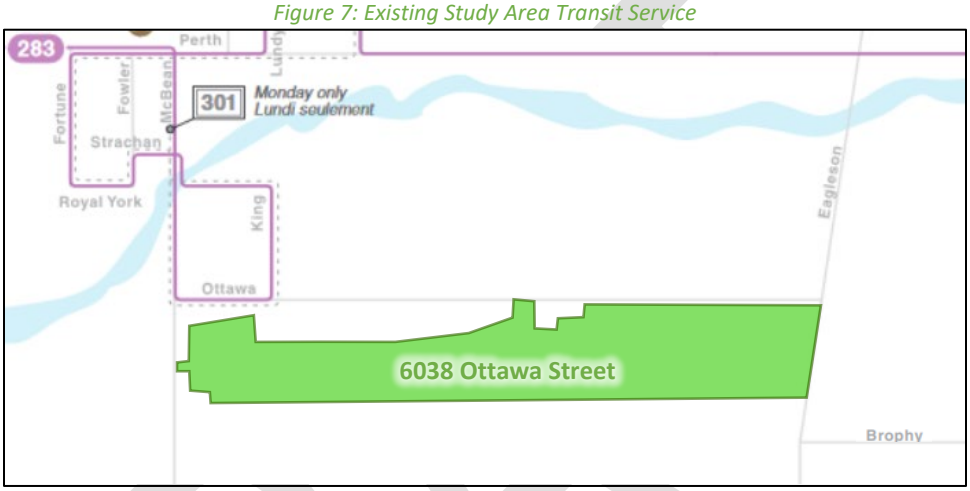
2.2.5 Existing Transit

Within the study area, the routes #283 and #301 travel along McBean Street, Ottawa Street, and King Street. Stops are located on Ottawa Street at McBean Street and Cockburn Street and on King Street at Burke Street and Royal York Street. The frequency of these routes within proximity of the proposed site currently are:

- Route #283 –30-minute service during the peak hours, with a total of four trips during each of the AM peak and PM peak to the area
- Route #301 – Monday only service, with a single AM trip starting at 8:50 AM, and a single returning trip ending at 3:40 PM

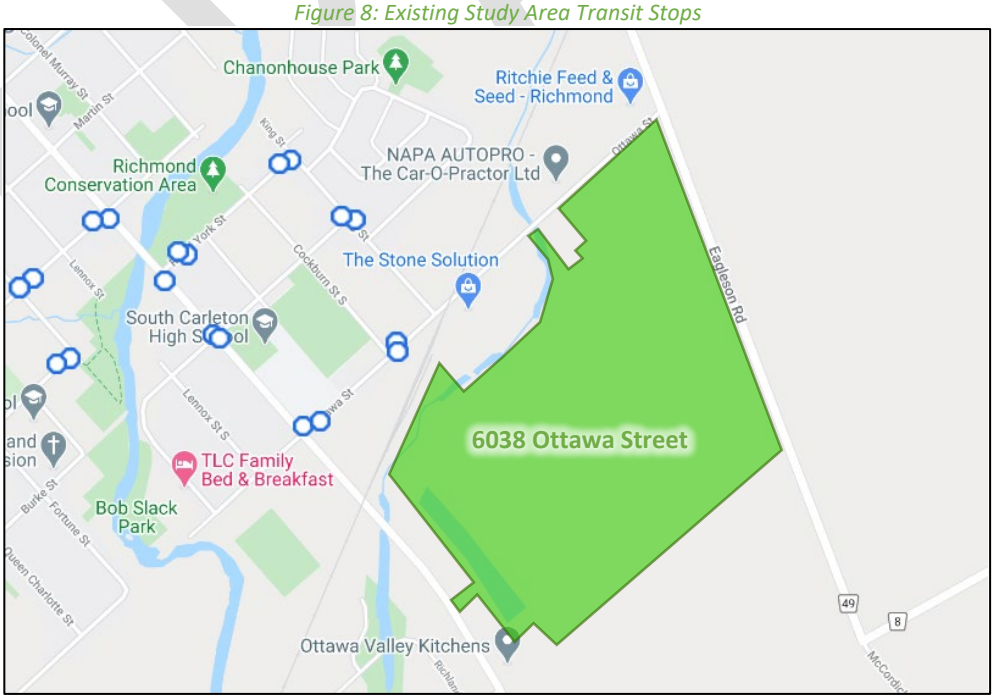
Figure 7 illustrates the transit system map in the study area and Figure 8 illustrates nearby transit stops.

Figure 7: Existing Study Area Transit Service



Source: http://www.octranspo.com/ Accessed: November 25, 2020

Figure 8: Existing Study Area Transit Stops



Source: http://www.octranspo.com/ Accessed: November 25, 2020

2.2.6 Existing Area Traffic Management Measures

No traffic calming measures are noted in the study area. McBean Street and Ottawa Street are signed school zones in the vicinity of the South Carleton High School.

2.2.7 Existing Peak Hour Travel Demand

Existing turning movement counts were acquired from The Traffic Specialist for the existing Study Area intersection. Table 1 summarizes the intersection count dates and sources.

Table 1: Intersection Count Date

Intersection	Count Date	Source
Eagleson Road & Ottawa Street	Thursday October 11, 2018	The Traffic Specialist
Eagleson Road & Brophy Drive	Thursday October 11, 2018	The Traffic Specialist
McBean Street & Ottawa Street	Thursday October 11, 2018	The Traffic Specialist

Figure 9 illustrates the existing traffic counts and Table 2 summarizes the existing intersection operations. The level of service is based on the HCM criteria for average delay at unsignalized intersections. Detailed turning movement count data is included in Appendix B and the Synchro worksheets are provided in Appendix C.

Figure 9: Existing Traffic Counts

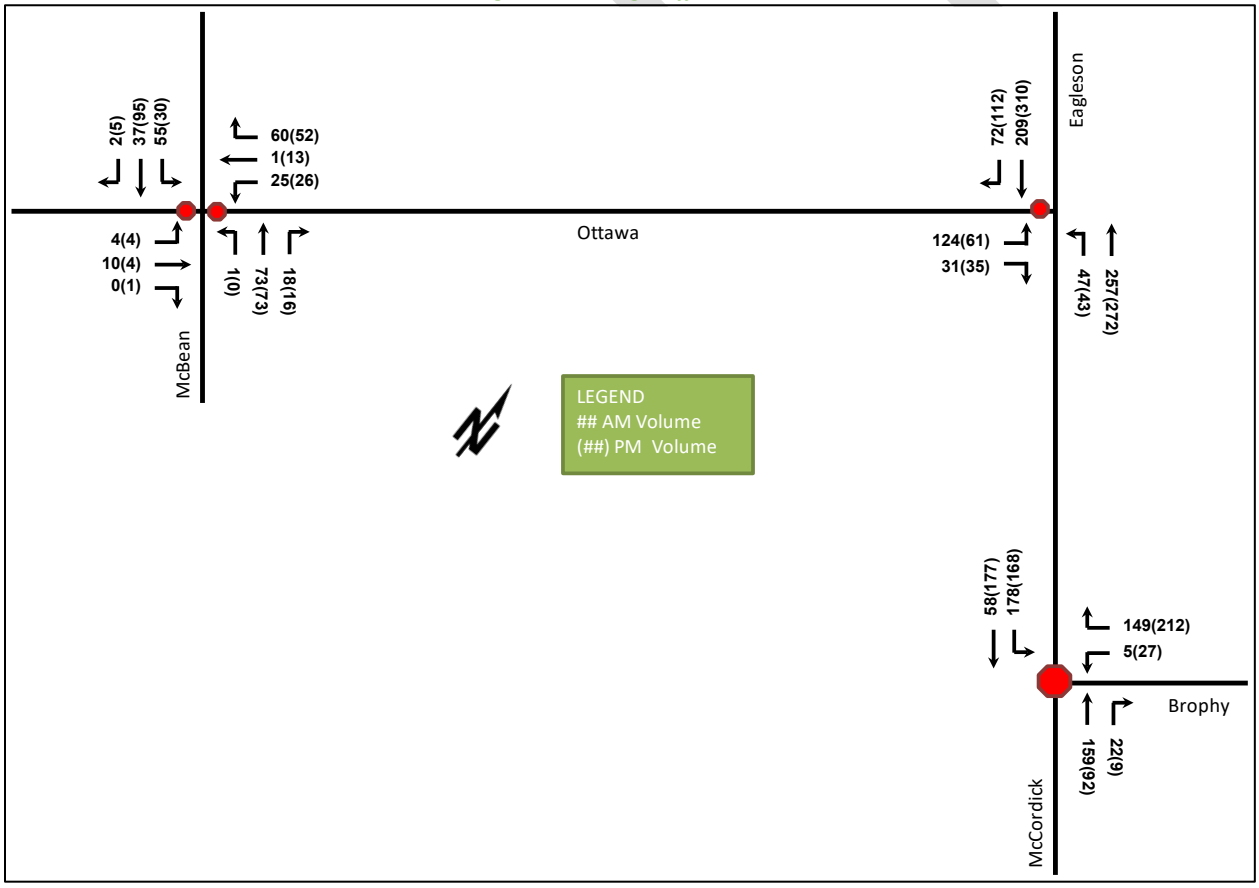


Table 2: Existing Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Eagleson Road & Ottawa Street *Unsignalized*	EB	C	0.38	18.0	13.5	C	0.26	17.1	7.5
	NB	A	0.04	1.2	0.8	A	0.04	1.2	0.8
	SB	-	-	-	-	-	-	-	-
	Overall	**A**	**-**	**4.3**	**-**	**A**	**-**	**2.4**	**-**
Eagleson Road & Brophy Drive *Unsignalized*	WB	A	0.05	7.7	0.8	A	0.34	10.0	11.5
	NB	A	0.24	8.5	6.8	A	0.16	9.0	3.8
	SB	A	0.32	9.3	9.8	B	0.51	12.8	21.8
	Overall	**A**	**-**	**8.9**	**-**	**B**	**-**	**11.3**	**-**
McBean Street & Ottawa Street *Unsignalized*	EB	B	0.03	11.1	0.8	A	0.02	1.7	0.0
	WB	A	0.11	9.8	3.0	B	0.13	10.1	3.0
	NB	A	0.00	0.1	0.0	A	0.00	0.0	0.0
	SB	A	0.04	4.4	0.8	B	0.02	10.8	0.8
	Overall	**A**	**-**	**5.0**	**-**	**A**	**-**	**3.9**	**-**

Notes: Saturation flow rate of 1800 veh/h/lane
PHF = 0.90

The operational analysis of existing intersection conditions shows good performance during both peak hours.

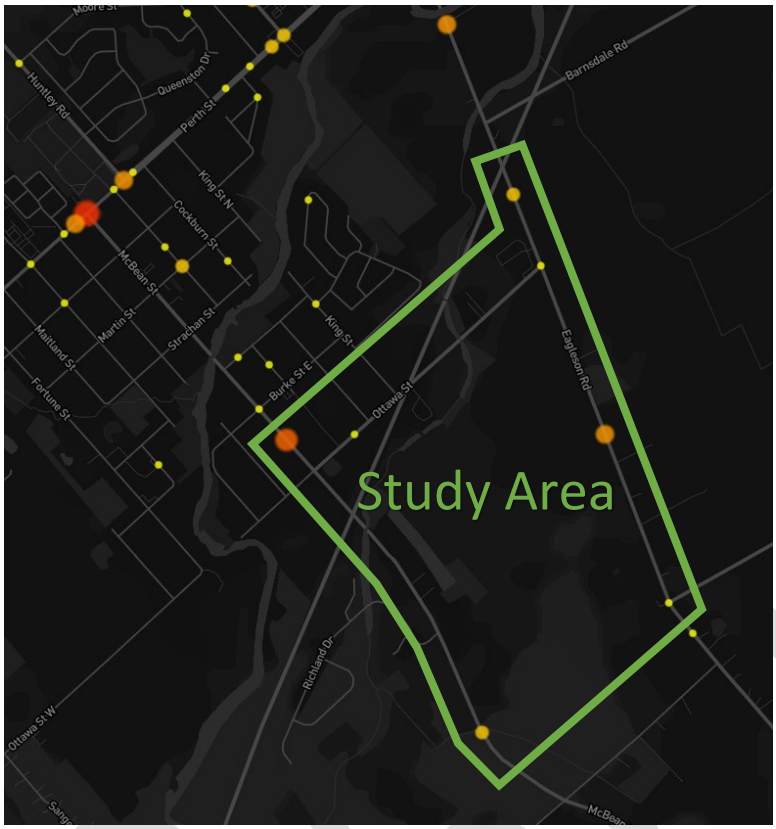
2.2.8 Collision Analysis

Collision data have been acquired from the City of Ottawa open data website (data.ottawa.ca) for five years prior to the commencement of this TIA for the surrounding study are road network. Table 3 summarizes the collisions types and conditions in the study area, Figure 10 illustrates the intersections and segments analyzed, and Table 4 summarizes the total collisions for each of these locations. Collision data are included in Appendix D.

Table 3: Study Area Collision Summary, 2014-2018

		Number	%
Total Collisions		**24**	**100%**
Classification	**Fatality**	0	0%
	Non-Fatal Injury	8	33%
	Property Damage Only	16	67%
Initial Impact Type	**Approaching**	1	4%
	Angled	2	8%
	Rear end	1	4%
	Sideswipe	3	13%
	Turning Movement	3	13%
	SMV Unattended	1	4%
	SMV Other	13	54%
Road Surface Condition	**Dry**	19	79%
	Wet	2	8%
	Packed Snow	1	4%
	Ice	2	8%
Pedestrian Involved		1	4%
Cyclists Involved		0	0%

Figure 10: Study Area Collision Records – Representation of 2014-2016



Source: https://maps.bikeottawa.ca/collisions/ Accessed: November 4, 2019

Table 4: Summary of Collision Locations, 2014-2018

	Number	%
Intersections / Segments	**24**	**100%**
Eagleson Rd @ Ottawa St	1	4%
Eagleson Rd/McCordick Rd @ Brophy Dr	3	13%
McBean St @ Ottawa St	3	13%
Eagleson Rd btwn Barnsdale Rd & Ottawa St	3	13%
Eagleson Rd btwn Ottawa St & Brophy Dr	5	21%
McBean St btwn Burke St & Ottawa St	4	17%
McBean St btwn Richland Dr & Dobson Lane	3	13%
Ottawa St btwn Colonel Murray St & Cockburn St	1	4%
Ottawa St btwn King St & Eagleson Rd	1	4%

Within the study area, no locations are noted to have elevated collision amounts. It is noted that single motor vehicle other is the most common accounting for over half (13 of 24) of the collision in the last 5 years. These collisions have predominantly been during the day (9 of 13), in dry conditions (11 of 13) and on clear days (12 of 13). The majority have of collisions occurred along Eagleson Road between Barnsdale Road and Brophy Drive (7 of 13) but it is unknown if speed, animals or other non-geometric factors contributed to these collisions. Therefore, no specific mitigation is recommended or required in the area.

2.3 Planned Conditions

2.3.1 Changes to the Area Transportation Network

No roadway improvements are included within the Ottawa TMP for the Study Area road network. The Village of Richmond CDP identifies a collector road between McBean Street and Eagleson Road, a gateway feature to the southeast corner of the development lands on Eagleson Road, and local road connections to Ottawa Street and Eagleson Road. The collector road is noted to be a rural collector with a sidewalk on a single side. McBean Street is classified as a rural arterial with a sidewalk on a single side, transitioning to a village arterial north of the rail tracks to include an urban cross-section, sidewalks on both sides, on-street parking during the off-peak hours and trees in the boulevards. Eagleson Road remains as the existing rural arterial.

2.3.2 Other Study Area Developments

3785 McBean Street

The development includes nine self storage buildings for a total of 3,700 sq. m., six parking spaces and one loading space. Two accesses will be provided along McBean Street and a stormwater pond will be constructed on site. No TIA is available for the site.

5511 McCordick Road

The proposed zoning by-law amendment applies to the retained farmland associated with surplus farm dwelling severance, with intent of prohibiting residential uses. No TIA is available for the site.

2780 Eagleson Road

The development is an extension of Cardel Homes Creekside and is proposed to include 249 single detached dwellings, 76 semi-detached dwellings, and 130 townhouses. Two accesses onto Eagleson Road are proposed north of Richmond Road. The TIA is in process and includes preliminary trip generation. (CGH, pending)

3 Study Area and Time Periods

3.1 Study Area

The study area will include the following intersections:

- Eagleson Road at:
  - Ottawa Street
  - New Local Road
  - New Collector
  - Brophy Drive
- McBean Street at:
  - Ottawa Street
  - New Collector

The King Street and Ottawa Street intersection is not considered a study area intersection of note and will only be noted if the cycling route along Ottawa Street has any cycling facility recommendations resulting from this study.

The boundary roads are Eagleson Road, Ottawa Street and McBean Street. No screenlines are present near the proposed site and none will be reviewed as part of this study.

3.2 Time Periods

The AM and PM peak hours will be examined for the proposed development.

3.3 Horizon Years

The anticipated build-out year is 2032. As a result, the full build-out plus five years horizon year is 2037.

4 Exemption Review

Table 5 summarizes the exemptions for this TIA.

Table 5: Exemption Review

Module	Element	Explanation	Exempt/Required
Design Review Component			
4.1 Development Design	4.1.2 Circulation and Access	Only required for site plans	Exempt
	4.2.3 New Street Networks	Only required for plans of subdivision	Exempt – to be completed at Plan of Subdivision
4.2 Parking	4.2.1 Parking Supply	Only required for site plans	Exempt
	4.2.2 Spillover Parking	Only required for site plans where parking supply is 15% below unconstrained demand	Exempt
Network Impact Component			
4.5 Transportation Demand Management	All Elements	Not required for site plans expected to have fewer than 60 employees and/or students on location at any given time	Required
4.6 Neighbourhood Traffic Management	4.6.1 Adjacent Neighbourhoods	Only required when the development relies on local or collector streets for access and total volumes exceed ATM capacity thresholds	Required
4.8 Network Concept		Only required when proposed development generates more than 200 person-trips during the peak hour in excess of equivalent volume permitted by established zoning	Required

5 Development-Generated Travel Demand

5.1 Trip Generation and Mode Shares

This TIA has been prepared using the vehicle and person trip rates for the residential components using the TRANS Trip Generation Study Report (2009) and for the commercial component using the converted person trip values of the average vehicle trip rate from the ITE Trip Generation Manual 10th Edition (2017). Table 6 summarizes the person trip rates for the proposed land uses.

Table 6: Trip Generation Person Trip Rates

Dwelling Type	Land Use Code	Peak Hour	Vehicle Trip Rate	Person Trip Rates
Single Detached	210 (TRANS)	AM	0.62	1.03
		PM	0.92	1.26
Semi-Detached	224 (TRANS)	AM	0.62	0.97
		PM	0.67	0.87
Townhouse	224 (TRANS)	AM	0.62	0.85
		PM	0.67	0.91

Dwelling Type	Land Use Code	Peak Hour	Vehicle Trip Rate	Person Trip Rates
Shopping Centre	820 (ITE)	AM	0.94	1.20
		PM	3.81	4.88
General Office	710 (ITE)	AM	1.16	1.48
		PM	1.15	1.47
General Light Industrial	110 (ITE)	AM	0.70	0.90
		PM	0.63	1.81

Using the above Person Trip rates, the total person trip generation has been estimated. Table 7 below illustrates the total person trip generation for the single detached, semi-detached, and townhouse dwelling types, and for the village commercial component assuming a footprint for commercial buildings of 15% of the total lot area, similar to other area retail plazas within Richmond. While an elementary school block is reserved within the proposed development, the OCDSB will decide solely at their discretion if a school is ultimately constructed on this block. At that time, a TIA, if triggered by the TIA Guidelines, will be completed. Additionally, an elementary school is not anticipated to generate AM or PM peak hour trips at the boundary road intersections. Student drop-offs and pick-ups will be within the development and will not impact the study area intersections. Staff trips are anticipated to be minimal and are likely to occur prior to the AM and PM peak hours. Therefore, as is typical for a ZBA/OPA for a residential subdivision, the elementary school has not been included in the trip generation.

For the scenario including the employment area, the footprint of that area was assumed to be 15%, similar to the developments surrounding Walgreen Road, Westbrook Road, and Willowlea Road in northwest Stittsville, and a mixture of 70% light industrial and 30% office was used. The more conservative average trip generation rate was used in lieu of the fitted curve rate.

Table 7: Total Person Trip Generation - Residential

Land Use	Units / GFA	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Single Detached	504	151	368	519	387	248	635
Semi-Detached	106	101	2	103	49	43	92
Townhouse	519	163	278	441	250	222	472
Shopping Centre	45,200 ft^2	33	21	54	106	115	221
Total	-	**448**	**669**	**1117**	**792**	**628**	**1420**

Table 8: Total Person Trip Generation - Employment

Land Use	Units / GFA	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Single Detached	306	91	224	315	235	151	386
Semi-Detached	54	50	2	52	25	22	47
Townhouse	343	108	184	292	165	147	312
Shopping Centre	45,200 ft^2	33	21	54	106	115	221
General Office	89,600 ft^2	114	19	133	21	111	132
Light Industrial	209,100 ft^2	165	23	188	22	147	169
Total	-	**561**	**473**	**1034**	**574**	**693**	**1267**

As the residential scenario generates both more total trips and more trips in the peak directions, the residential scenario is assumed to be the conservative scenario and further analysis will be based upon it.

Using the most recent National Capital Region Origin-Destination survey (OD Survey), the existing mode shares for Rural Southwest have been determined and compared to various modes share breakdowns identified by City Staff as potential interpretations of the data. Table 9 summarizes these modal shares.

Table 9: Mode Shares

Travel Mode	Rural Southwest (average)	Rural Southwest (AM from/within)	Rural Southwest (PM to/within)
Auto Driver	75%	85%	75%
Auto Passenger	15%	10%	15%
Transit	5%	5%	5%
Cycling	1%	0%	0%
Walking	4%	0%	5%
Total	100%	100%	100%

Internal capture rates from the ITE Trip Generation Handbook 3rd Edition have been assigned to the development for the retail component for mixed-use developments. The rates summarized in Table 10 represent the percentage of trips to/from the retail use based on the residential component. As internal trips may be made through the subdivision network as either walk, bike, or auto trips, the reduction based upon walking distance has not been applied.

Table 10: Internal Capture Rates

Land Use	AM		PM	
	In	Out	In	Out
Residential to/from Shopping Centre	17%	14%	10%	26%

Pass-by reductions applied to the retail trip generation at a rate of 35% have been included, a value taken as a moderately conservative interpretation from the rates presented in the ITE Trip Generation Handbook 3rd Edition.

Using the above mode share targets for the AM from/within and PM to/within shares, and the person trip rates, the person trips by mode, internal capture, and pass-by reductions have been projected. Table 11 summarizes the trip generation by mode and the appropriate reductions.

Table 11: Trip Generation by Mode

Travel Mode	AM Mode Share	AM Peak Hour			PM Mode Share	PM Peak Hour		
		In	Out	Total		In	Out	Total
Auto Driver	**85%**	368	561	929	**75%**	562	426	987
Auto Passenger	**10%**	43	66	109	**15%**	112	84	198
Transit	**5%**	22	33	54	**5%**	37	28	67
Cycling	**0%**	0	0	0	**0%**	0	0	0
Walking	**0%**	0	0	0	**5%**	37	28	67
Internal Capture	**(varies)**	6	3	9	**(varies)**	11	30	41
Pass-by	**-35%**	9	6	16	**-35%**	33	30	63
Total	**100%**	**433**	**660**	**1092**	**100%**	**748**	**568**	**1317**

As shown above, 929 AM and 987 PM new peak hour two-way vehicle trips are projected as a result of the proposed development.

5.2 Trip Distribution

To understand the travel patterns of the subject development the OD Survey has been reviewed to determine the travel for the residential component patterns were applied based on the build-out of Rural Southwest. Table 12 below summarizes the distributions.

Table 12: OD Survey Distribution – Rural Southwest

To/From	Residential % of Trips	Via
North	55%	30% Eagleson Rd, 25% McBean St
South	5%	3% Eagleson Rd, 2% McBean St
East	25%	10% Brophy Dr, 15% Eagleson Rd (north)
West	15%	McBean St (north)
Total	100%	-

5.3 Trip Assignment

Using the distribution outlined above, turning movement splits, and access to major transportation infrastructure, the trips generated by the site have been assigned to the Study Area road network. Figure 11 illustrates the new site generated volumes and Figure 12 illustrates the forecasted pass-by trips.

Figure 11: New Site Generation Auto Volumes

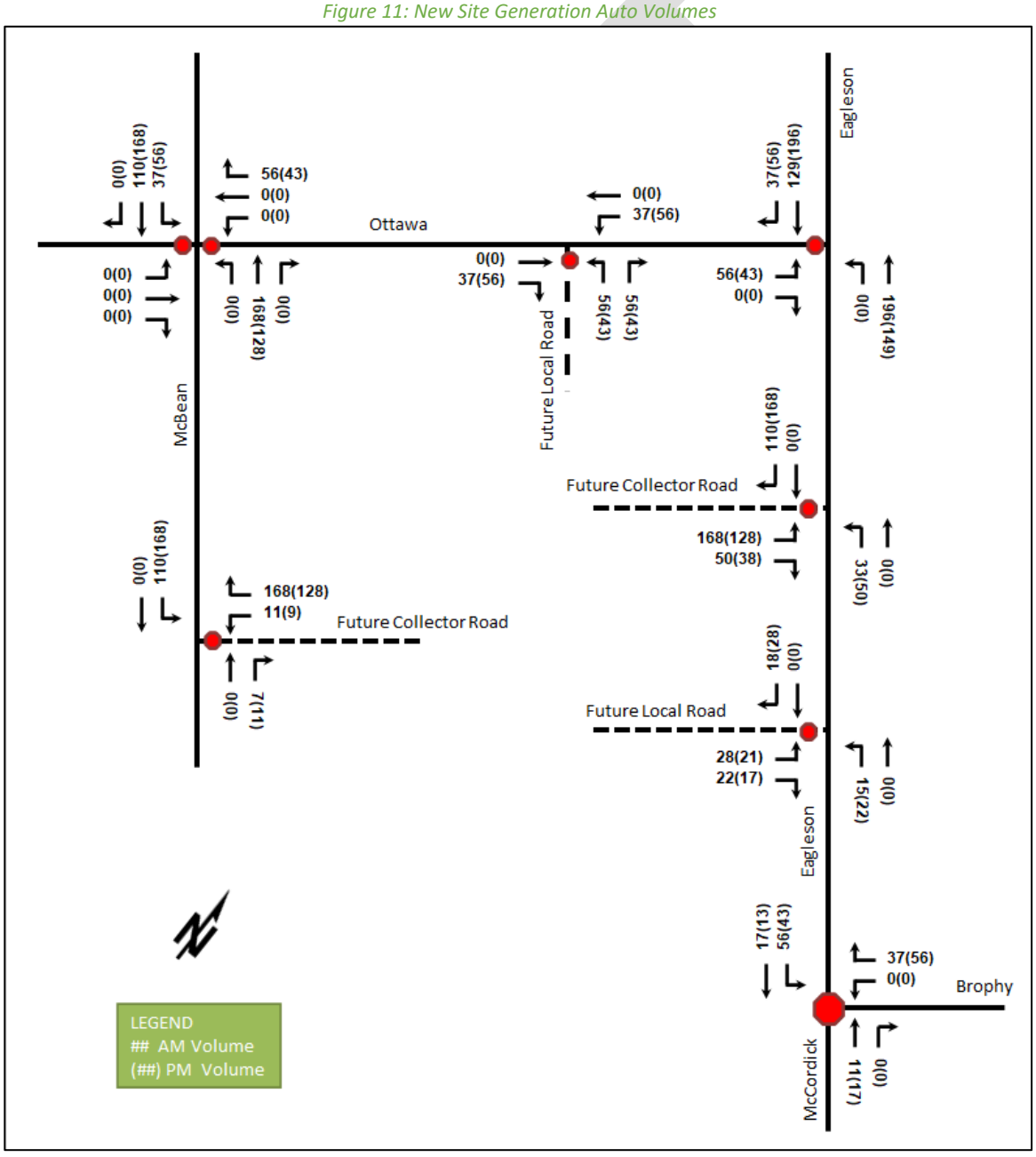
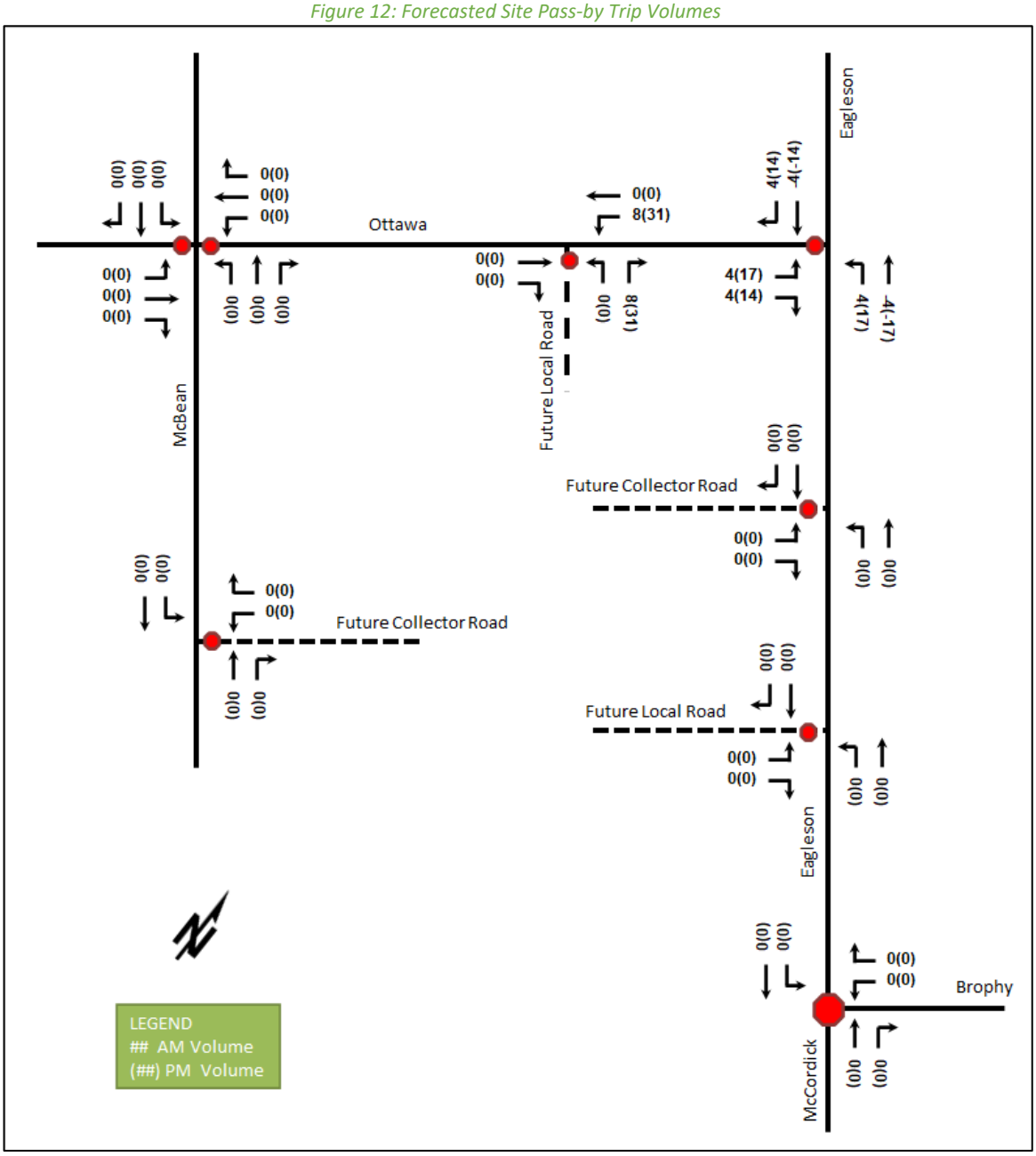


Figure 12: Forecasted Site Pass-by Trip Volumes



6 Background Network Travel Demands

6.1 Transportation Network Plans

The transportation network plans were discussed in Section 2.3. None of the listed CDP features will have any notable impact on the study area traffic volumes and travel patterns.

6.2 Background Growth

A review of the background projections from the City's TRANS Regional Model for the 2011 and 2031 horizons was completed to determine the background growth for each of the study area roadways. Table 13 summarizes the results of the model and the projections are provided in Appendix E.

Table 13: TRANS Regional Model Projections – Study Area Growth Rates

Street	Direction Growth % from 2011 to 2031		Direction Growth % from Existing to 2031	
	Eastbound	Westbound	Eastbound	Westbound
Ottawa St	-	-	-	-
Brophy Dr	1.48%	-0.13%	-1.10%	-6.45%
	Northbound	**Southbound**	**Northbound**	**Southbound**
Eagleson Rd	0.06%	1.70%	-11.92%	-2.84%
McBean St	-0.24%	-0.12%	5.06%	12.19%
McBean + Eagleson	-0.15%	0.54%	-4.31%	2.97%

TRANS model growth rates are a function of the road capacities and route directness. As these variables change on account of in-situ factors, the volumes redistribute. Due to construction affecting McBean Street and Eagleson Road taking place over the last five years, traffic disruption is captured in the counts. As traffic redistributes naturally once construction pressures ease, the two roads' relative volumes may rebalance, or remain the same as captured over time. Consequently, a growth factor of 3.0% in the southbound direction and 1.0% in the northbound direction will be applied to each Eagleson Road and McBean Street in the AM peak hour and reversed in the PM. Correspondingly, a growth rate of 3.0% in the eastbound direction and 1.0% in the westbound direction will be applied to Brophy Drive in the AM peak hour and reversed in the PM. Future TIAs may need to reconfirm the existing volumes after planned construction are completed and the pandemic conditions are not affecting travel patterns.

6.3 Other Developments

As the only study area development listed with a TIA, the volumes from the 2780 Eagleson Road TIA will be considered explicitly in the background growth. The remaining developments will be considered as part of the background growth applied to the study area network.

7 Demand Rationalization

7.1 2032 Future Background Operations

Figure 13 illustrates the 2032 background volumes and Table 14 summarizes the 2032 background intersection operations. The level of service is based on HCM average delay for unsignalized intersections. The Synchro worksheets for the 2032 future background horizon are provided in Appendix F.

Figure 13: 2032 Future Background Volumes

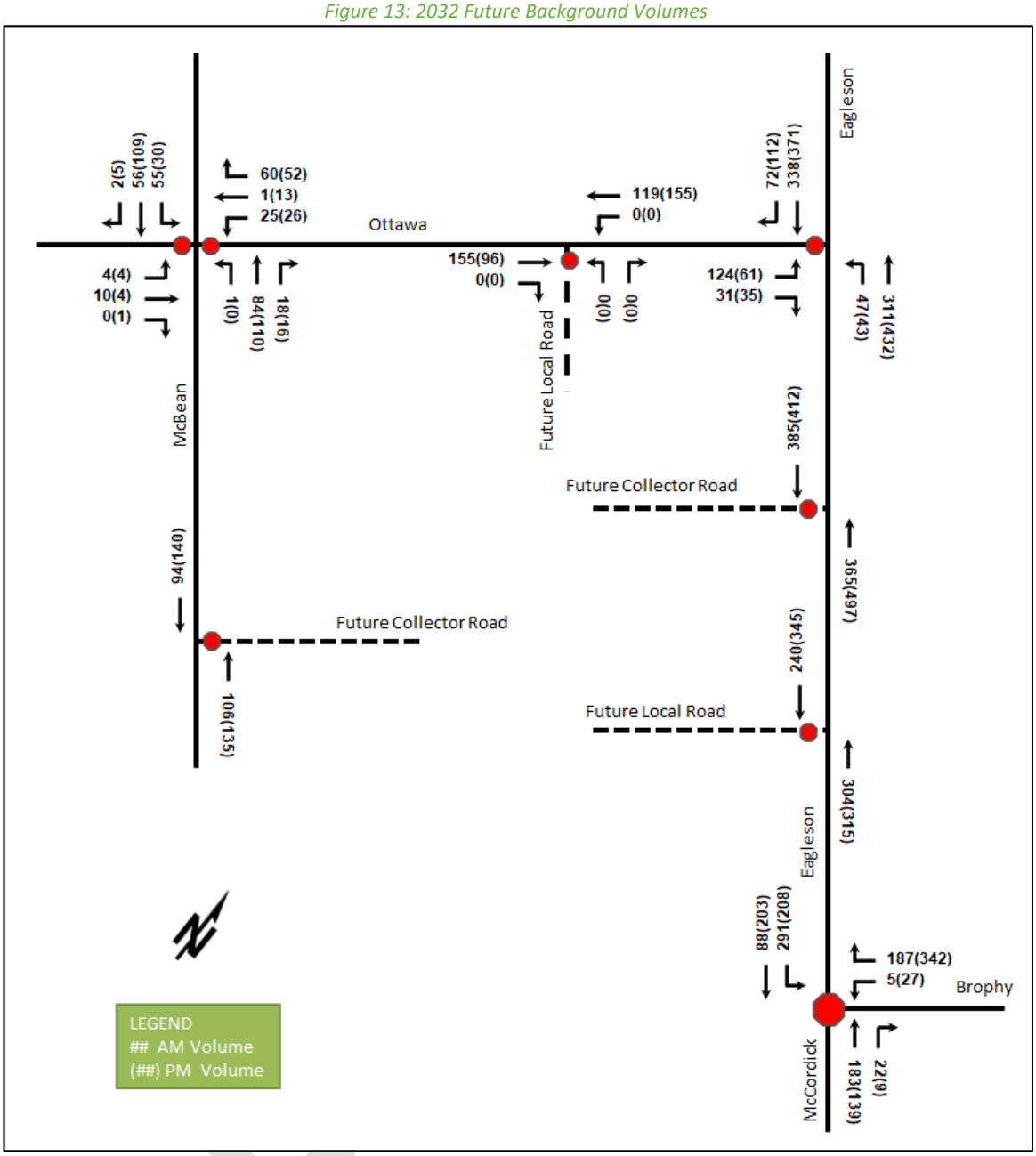


Table 14: 2032 Future Background Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Eagleson Road & Ottawa Street *Unsignalized*	EBL/R	C	0.41	20.6	14.3	C	0.28	19.3	8.3
	NBL/T	A	0.04	8.3	0.8	A	0.04	8.5	0.8
	SBT/R	-	-	-	-	-	-	-	-
	Overall	**A**	**-**	**3.9**	**-**	**A**	**-**	**2.1**	**-**

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Eagleson Road & Brophy Drive *Unsignalized*	WBL/R	A	0.25	9.4	7.5	B	0.50	12.7	21.0
	NBT/R	A	0.28	9.6	8.3	B	0.23	10.1	6.8
	SBT/L	B	0.51	12.7	21.8	C	0.60	15.7	30.0
	Overall	**B**	**-**	**11.1**	**-**	**B**	**-**	**13.6**	**-**
McBean Street & Ottawa Street *Unsignalized*	EB	B	0.02	11.1	0.8	B	0.02	11.0	0.0
	WB	A	0.10	9.7	2.3	B	0.12	10.3	3.0
	NB	A	0.00	7.3	0.0	A	0.00	0.0	0.0
	SB	A	0.04	7.5	0.8	A	0.02	7.5	0.8
	Overall	**A**	**-**	**4.5**	**-**	**A**	**-**	**3.4**	**-**

Notes: Saturation flow rate of 1800 veh/h/lane
PHF = 1.00
m = metered queue
# = queue exceeds storage or mid-block length

During both the AM and PM peak hours, the study area intersections operate similarly to existing conditions. No capacity issues are noted.

7.2 2037 Future Background Operations

Figure 14 illustrates the 2037 background volumes and Table 15 summarizes the 2037 background intersection operations. The level of service is based on HCM average delay for unsignalized intersections. The Synchro worksheets for the 2037 future background horizon are provided in Appendix G.

Figure 14: 2037 Future Background Volumes

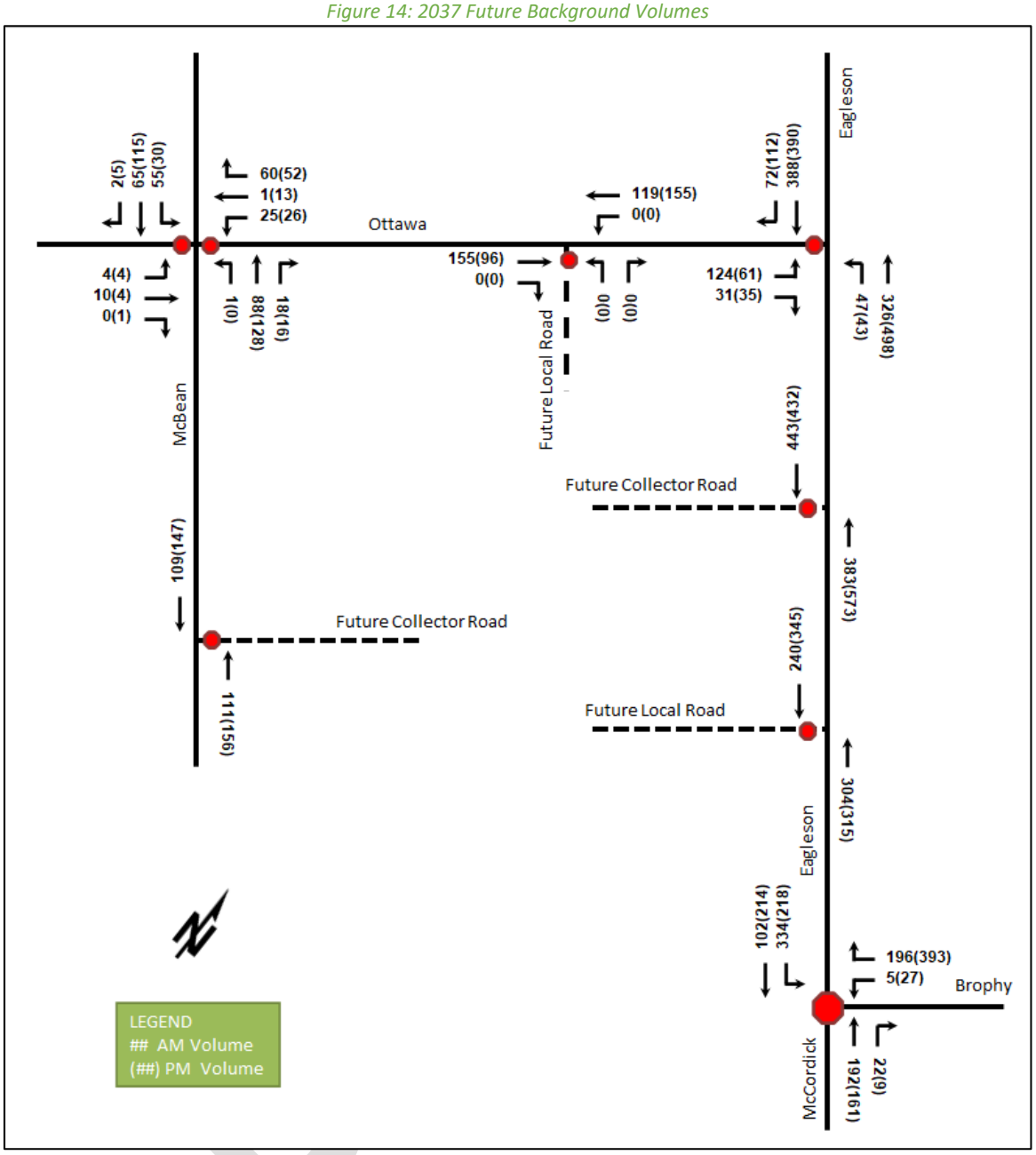


Table 15: 2037 Future Background Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Eagleson Road & Ottawa Street *Unsignalized*	EBL/R	C	0.44	23.0	16.5	C	0.31	21.5	9.8
	NBL/T	A	0.04	8.4	0.8	A	0.04	8.5	0.8
	SBT/R	-	-	-	-	-	-	-	-
	Overall	**A**	**-**	**4.0**	**-**	**A**	**-**	**2.1**	**-**

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Eagleson Road & Brophy Drive *Unsignalized*	WBL/R	A	0.28	9.8	8.3	B	0.59	14.9	28.5
	NBT/R	A	0.29	10.0	9.0	B	0.27	10.9	8.3
	SBT/L	B	0.59	14.6	28.5	C	0.65	18.2	36.0
	Overall	**B**	**-**	**12.3**	**-**	**C**	**-**	**15.6**	**-**
McBean Street & Ottawa Street *Unsignalized*	EB	B	0.02	11.2	0.8	B	0.02	11.2	0.0
	WB	A	0.10	9.8	2.3	B	0.12	10.4	3.0
	NB	A	0.00	7.3	0.0	A	-	0.0	0.0
	SB	A	0.04	7.5	0.8	A	0.02	7.6	0.8
	Overall	**A**	**-**	**4.3**	**-**	**A**	**-**	**3.2**	**-**

Notes: Saturation flow rate of 1800 veh/h/lane
PHF = 1.00
m = metered queue
# = queue exceeds storage or mid-block length

During both the AM and PM peak hours, the study area intersections operate similarly to 2032 background conditions. No capacity issues are noted.

7.3 Modal Share Sensitivity

As the unmodified modal share targets for Rural Southwest have been applied to the development, the village and rural contexts are maintained, and no capacity constraints are noted within the study area, rationalization for adjusted demand is not required for this TIA.

8 Development Design

8.1 Design for Sustainable Modes

The Richmond CDP and Secondary Plan show a pathway from the subject lands through the north of the site continuing along the railway line terminating at Ottawa Street. It is recommended that this pathway be given further consideration as part of subsequent iterations of the development concept.

8.2 New Street Networks

This element will be completed at plan of subdivision application.

9 Boundary Street Design

Table 16 summarizes the MMLOS analysis for the boundary streets of McBean Street, Eagleson Road, and Ottawa Street. The existing conditions are presented below, and future conditions will be determined at plan of subdivision. The boundary street analysis is based on the policy area of Village. The MMLOS worksheets has been provided in Appendix H.

Table 16: Boundary Street MMLOS Analysis

Segment	Pedestrian LOS		Bicycle LOS		Transit LOS		Truck LOS	
	PLOS	Target	BLOS	Target	TLOS	Target	TrLOS	Target
McBean Street	F	C	F	C	N/A	N/A	C	D
Eagleson Road	F	C	F	D	N/A	N/A	B	D
Ottawa Street	F	C	E	B	N/A	N/A	B	N/A

Pedestrian and bicycle LOS targets are not being met along the boundary streets due partly to the operating speeds associated with rural arterial and collector roads and partly to the absence of dedicated active facilities.

McBean Street would require a sidewalk of 1.8 metres with more than a two-metre boulevard or a two-metre sidewalk with more than a 0.5-metre boulevard to meet pedestrian LOS targets, Ottawa Street would require a

sidewalk of 1.8 metres to meet pedestrian LOS targets, and Eagleson Road cannot meet pedestrian LOS due to traffic volumes and operating speeds.

To meet bicycle LOS targets, McBean Street and Eagleson Road would require physically separated facilities due to operating speeds and Ottawa Street would require a bike lane.

Given the surrounding rural context of the subject lands, as the subject lands lie at the boundary of the village, limited connectivity could be achieved by improving the boundary street active facilities, and considerations for such are furthermore beyond the level of detail appropriate to the present application.

10 Access Intersections Design

10.1 Location and Design of Access

The concept plan shows connections to the adjacent arterial road network via a new collector road intersecting McBean Street, a new collector road and a new local road each intersecting Eagleson Road, and a new local road intersecting Ottawa Street collector road. No auxiliary lanes are proposed within the subdivision.

10.2 Intersection Control

Given the volumes associated with the traffic assignment on the conceptual access arrangement to the subject development, all access intersections are assumed to be stop-controlled on the minor approach. The intersection of Eagleson Road at the new collector road is identified as signalized on the concept plan, however, signal warrants are not quite met at this location and operations are may or may not require one. The control at this intersection should be further investigated at plan of subdivision. The signal warrant is provided in Appendix I.

10.3 Access Intersection Design

10.3.1 2032 Future Total Access Intersection Operations

The 2032 future total intersection volumes are illustrated in Figure 15 and the access intersection operations are summarized below in Table 17. The level of service is based on HCM average delay for unsignalized intersections. The Synchro worksheets have been provided in Appendix J.

Figure 15: 2032 Future Total Volumes

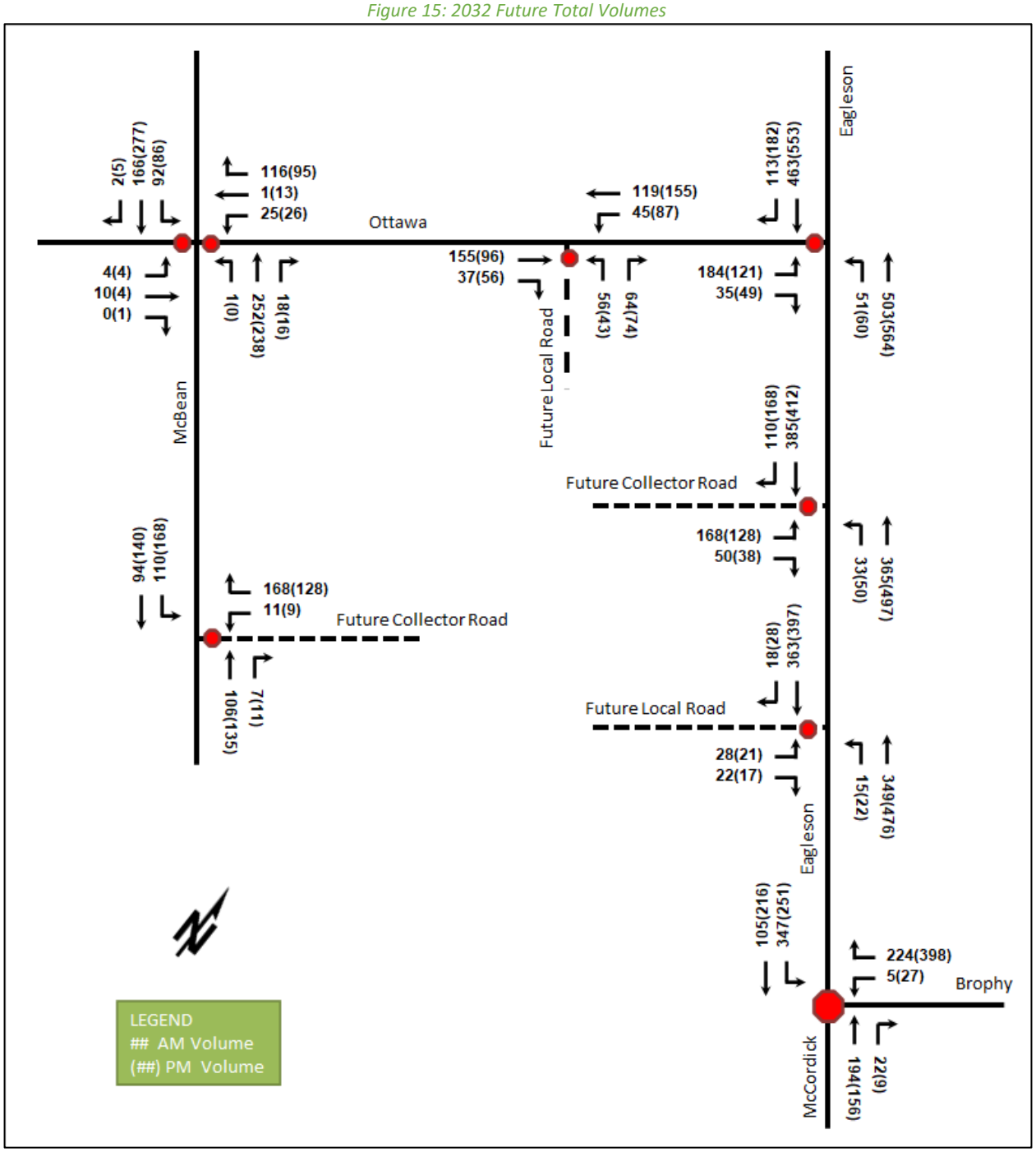


Table 17: 2032 Future Total Access Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Ottawa Street at Future Local *Unsignalized*	EBT/R	-	-	-	-	-	-	-	-
	WBL/T	A	0.03	7.7	0.8	A	0.06	7.7	1.5
	NBL/R	B	0.17	11.0	4.5	B	0.16	10.9	4.5
	Overall	**A**	**-**	**3.5**	**-**	**A**	**-**	**3.8**	**-**

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Eagleson Road at Future Collector *Unsignalized*	EBL/R	D	0.62	30.5	29.3	E	0.64	40.1	29.3
	NBL	A	0.03	8.5	0.8	A	0.05	8.8	1.5
	NBT	-	-	-	-	-	-	-	-
	SBT/R	-	-	-	-	-	-	-	-
	Overall	**A**	**-**	**6.2**	**-**	**A**	**-**	**5.5**	**-**
Eagleson Road at Future Local *Unsignalized*	EBL/R	B	0.11	13.7	3.0	C	0.10	15.5	2.3
	NBL/T	A	0.01	8.1	0.0	A	0.02	8.2	0.8
	SBT/R	-	-	-	-	-	-	-	-
	Overall	**A**	**-**	**1.0**	**-**	**A**	**-**	**0.8**	**-**
McBean Street at Future Collector *Unsignalized*	WBL/R	B	0.20	10.0	5.3	B	0.16	10.1	4.5
	NBT/R	-	-	-	-	-	-	-	-
	SBL	A	0.08	7.6	1.5	A	0.12	7.8	3.0
	SBT/R	-	-	-	-	-	-	-	-
	Overall	**A**	**-**	**5.3**	**-**	**A**	**-**	**4.6**	**-**

Notes: Saturation flow rate of 1800 veh/h/lane
PHF = 1.00
m = metered queue
# = queue exceeds storage or mid-block length

The access intersection operations for the 2032 future total horizon operate satisfactorily. The delay on the eastbound movement at the intersection of Eagleson Road and the future collector during the PM peak hour is over 35 seconds, scoring the approach a LOS of E.

10.3.2 2037 Future Total Access Intersection Operations

The 2037 future total intersection volumes are illustrated in Figure 16 and the access intersection operations are summarized below in Table 18. The level of service is based on HCM average delay for unsignalized intersections. The Synchro worksheets have been provided in Appendix K.

Figure 16: 2037 Future Total Volumes

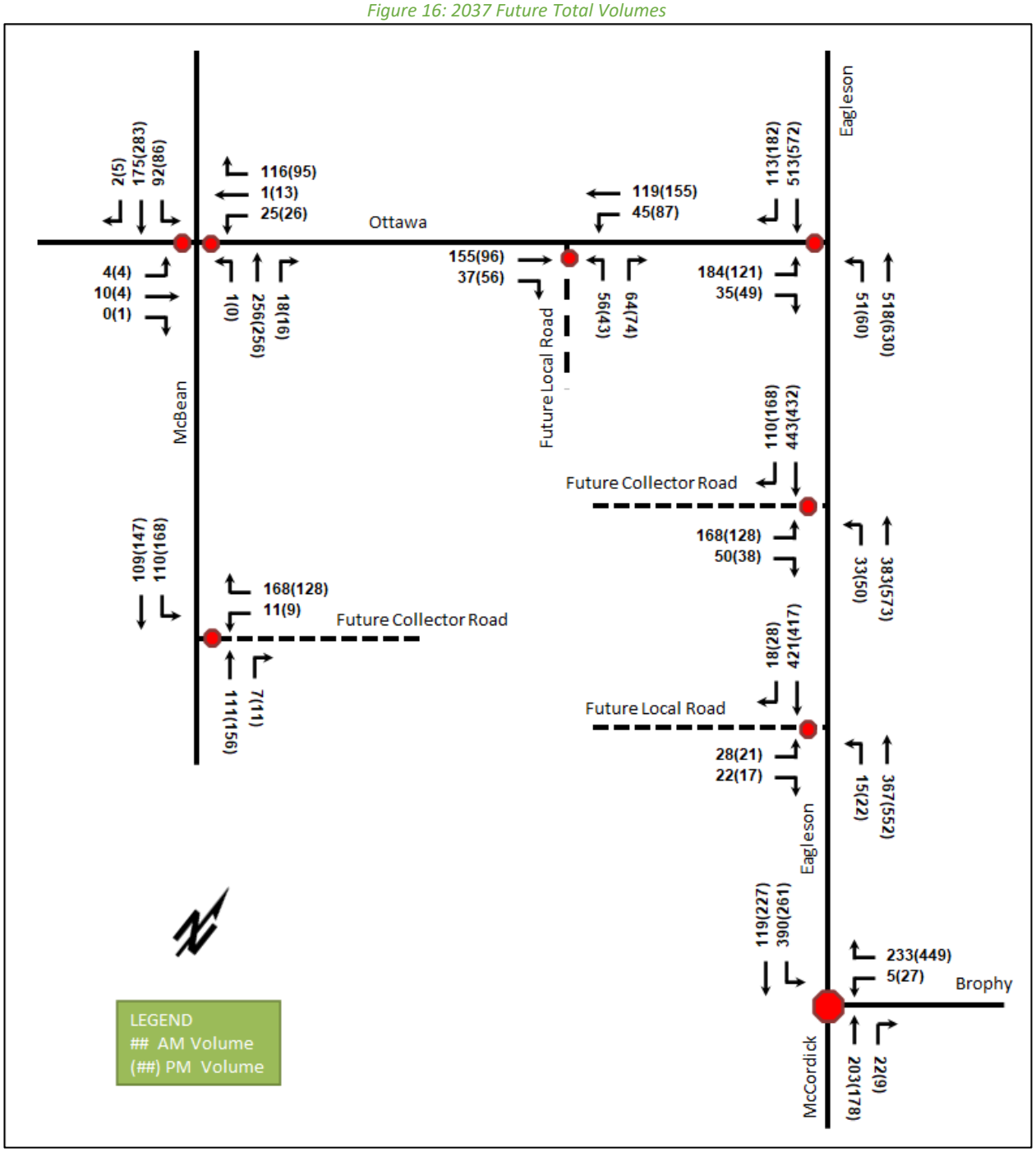


Table 18: 2037 Future Total Access Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Ottawa Street at Future Local *Unsignalized*	EBT/R	-	-	-	-	-	-	-	-
	WBL/T	A	0.03	7.7	0.8	A	0.06	7.7	1.5
	NBL/R	B	0.17	11.0	4.5	B	0.16	10.9	4.5
	Overall	**A**	**-**	**3.5**	**-**	**A**	**-**	**3.8**	**-**

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Eagleson Road at Future Collector *Unsignalized*	EBL/R	E	0.69	37.8	35.3	**F**	**0.70**	**50.5**	**34.5**
	NBL	A	0.03	8.7	0.8	A	0.05	8.9	1.5
	NBT	-	-	-	-	-	-	-	-
	SBT/R	-	-	-	-	-	-	-	-
	Overall	**A**	**-**	**7.2**	**-**	**A**	**-**	**6.2**	**-**
Eagleson Road at Future Local *Unsignalized*	EBL/R	B	0.12	14.7	3.0	C	0.11	16.7	3.0
	NBL/T	A	0.01	8.3	0.0	A	0.02	8.3	0.8
	SBT/R	-	-	-	-	-	-	-	-
	Overall	**A**	**-**	**1.0**	**-**	**A**	**-**	**0.8**	**-**
McBean Street at Future Collector *Unsignalized*	WBL/R	B	0.20	10.0	5.3	B	0.16	10.2	4.5
	NBT/R	-	-	-	-	-	-	-	-
	SBL	A	0.08	7.6	1.5	A	0.12	7.9	3.0
	SBT/R	-	-	-	-	-	-	-	-
	Overall	**A**	**-**	**5.1**	**-**	**A**	**-**	**4.4**	**-**

Notes: Saturation flow rate of 1800 veh/h/lane
PHF = 1.00
m = metered queue
# = queue exceeds storage or mid-block length

The forecasted access intersection conditions at the 2032 future total horizon operate satisfactorily. The delay on the eastbound movement at the intersection of Eagleson Road and the future collector during the AM peak hour is over 35 seconds, scoring the approach a LOS of E, and is 0.5 seconds over the threshold of 50 seconds during the PM peak hour, scoring the approach a LOS of F. Potential mitigation measures could include the inclusion of an auxiliary right-turn lane on the eastbound approach, which would reduce the eastbound left-turn movement to a LOS to E, or the future signalization of the intersection, which, while not meeting warrants under the current access arrangement, may meet them should the accesses change from those depicted in the concept plan.

10.3.3 Access Intersection MMLOS

The access intersections are not signalized and therefore no access intersection MMLOS has been performed.

10.3.4 Recommended Design Elements

The intersection of McBean Street and the new collector is proposed as including a new auxiliary southbound left-turn lane and the intersection of Eagleson Road and the new collector is proposed as including a new auxiliary northbound left-turn lane. Turn warrants are provided in Appendix L.

11 Transportation Demand Management

11.1 Context for TDM

The mode shares used within the TIA are representative of the area and no major improvements are anticipated to shift these modes.

The subject site is not within a design priority area.

Total bedrooms within the development is subject to the final unit count and layout selections by purchasers. No age restrictions are noted.

11.2 Need and Opportunity

The subject site has been assumed to rely predominantly on auto travel. Given the transit share is taken from the average for the entire rural district, and the context of the site is within a transit-serviced village, transit share at build-out may be higher than those used herein, especially if transit service is increased in the area. This scenario

is additionally likely given the amount of development anticipated to occur in the village of Richmond in advance of the subject lands being developed, and its potential in driving transit improvements.

11.3 TDM Program

The "suite of post occupancy TDM measures" has been summarized in the TDM checklists for the residential land uses only. The commercial land use TDM program recommendations will be made at site plan application. The checklist is provided in Appendix M. The key TDM measures recommended include:

- Contract with OC Transpo to provide early transit services until regular services are warranted by occupancy levels (subdivision)
- Provide a multimodal travel option information package to new residents
- Offer personalized trip planning to new residents

The OC Transpo early service recommendation will not be required should the City not consider changing the transit service in Richmond Village.

12 Neighbourhood Traffic Management

The proposed development will connect to the arterial road network through new collector and local roads to Eagleson Road and McBean Street, and will additionally connect via a local road to Ottawa Street, which is a collector road that access both of these arterials. Table 19 summarizes the peak hour volumes for the proposed development as well as existing volumes.

Table 19: 6038 Ottawa Street Volumes – NTM Review

	Ottawa Street – East of Access					
	AM Peak			**PM Peak**		
	East	**West**	**Two-Way**	**East**	**West**	**Two-Way**
Existing	155	119	274	96	155	251
Site-Generated	64	45	109	73	86	159
Total	**219**	**164**	**383**	**169**	**241**	**410**

	Ottawa Street – West of Access					
	AM Peak			**PM Peak**		
	East	**West**	**Two-Way**	**East**	**West**	**Two-Way**
Existing	83	86	170	50	91	141
Site-Generated	37	56	93	55	42	97
Total	**120**	**142**	**263**	**105**	**133**	**238**

The existing volumes along Ottawa Street east of the proposed site access are already nearing the thresholds in the existing conditions with only one side of the road being relatively developed. The segment of road affected by this increase in volume, furthermore, is only approximately 40 metres long and contains one driveway for a detached single-family dwelling, and a secondary access to a feed and seed establishment. To the west of the proposed site access, the thresholds are not being exceeded with the addition of site traffic.

13 Transit

13.1 Route Capacity

In Section 5.1 the trip generation by mode was estimated, including an estimate of the number of transit trips that will be generated by the proposed development. Table 20 summarizes the transit trip generation.

Table 20: Trip Generation by Transit Mode

Travel Mode	Mode Share	AM Peak Period			PM Peak Period		
		In	Out	Total	In	Out	Total
Transit	5%	22	33	54	37	28	67

The proposed development is anticipated to generate an additional 54 AM peak hour transit trips and 67 PM peak hour transit trips. Of these trips, 33 outbound AM trips and 37 inbound PM trips are anticipated. Given the area routes, which travel along Perth Street, it is likely majority of these trips will be to the east. It is unlikely any trips will be west to Munster.

Overall, the forecasted new transit trips would result in the need for up to one additional single bus (55-person capacity) during the AM and PM peak hours for local service. Should transit service increase in the village, the transit share may additionally increase and thus the need for additional buses may result.

13.2 Transit Priority

No transit priority is required explicitly for this study.

14 Network Concept

The Village of Richmond's Secondary Plan depicts the southern portion of the site area as industrial lands, and the CDP Demonstration Plan includes the east-west collector road from McBean Street to Eagleson Road and a local road connecting to Ottawa Street. The functional classifications and locations of connections to the existing road network are conserved by the subject development, where the conceptual plan additionally includes a local connection to Eagleson Road, and the lane capacities on the boundary road network will not be exceeded with the addition of site traffic.

15 Network Intersection Design

15.1 Network Intersection Control

The intersection of Eagleson Road and Ottawa Street will meet signal warrants in 2032 with the addition of site-generated traffic. Given the existing and forecasted approach volume discrepancies, a roundabout is not recommended at this location. Signal Warrants are provided in Appendix I.

15.2 Network Intersection Design

15.2.1 2032 Future Total Network Intersection Operations

The 2032 future total network intersection operations are summarized below in Table 21. The level of service for signalized intersections is based on HCM 2010 v/c calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection, and HCM average delay for unsignalized intersections. The Synchro worksheets have been provided in Appendix J.

Table 21: 2032 Future Total Network Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Eagleson Road & Ottawa Street *Unsignalized*	EBL/R	**F**	**0.94**	**87.7**	**61.5**	**F**	**0.89**	**89.4**	**51.0**
	NBL/T	A	0.05	8.8	1.5	A	0.07	9.4	1.5
	SBT/R	-	-	-	-	-	-	-	-
	Overall	**B**	**-**	**14.6**	**-**	**B**	**-**	**10.3**	**-**
Eagleson Road & Ottawa Street *Signalized*	EBL	A	0.44	16.7	23.1	A	0.29	14.2	15.9
	EBR	A	0.09	6.0	4.2	A	0.12	5.6	5.1
	NBL	A	0.10	6.4	5.4	A	0.12	6.3	6.4
	NBT	A	0.49	9.1	42.1	A	0.47	8.1	50.0
	SBT	A	0.45	8.6	37.6	A	0.46	7.9	48.3
	SBR	A	0.12	2.1	4.7	A	0.17	1.8	6.0
	Overall	**A**	**0.54**	**9.2**	**-**	**A**	**0.53**	**7.6**	**-**
Eagleson Road & Brophy Drive *Unsignalized*	WBL/R	B	0.32	10.3	9.8	C	0.60	15.7	30.8
	NBT/R	B	0.30	10.2	9.8	B	0.27	11.0	8.3
	SBT/L	C	0.62	15.7	32.3	C	0.71	20.9	44.3
	Overall	**B**	**-**	**13.0**	**-**	**C**	**-**	**17.3**	**-**
McBean Street & Ottawa Street *Unsignalized*	EB	C	0.04	15.9	0.8	C	0.03	16.8	0.8
	WB	B	0.22	12.1	6.0	B	0.24	13.4	6.8
	NB	A	0.00	7.6	0.0	A	0.00	0.0	0.0
	SB	A	0.07	8.0	1.5	A	0.07	7.9	1.5
	Overall	**A**	**-**	**3.9**	**-**	**A**	**-**	**3.5**	**-**

Notes: Saturation flow rate of 1800 veh/h/lane
PHF = 1.00
m = metered queue
# = queue exceeds storage or mid-block length

At the intersection of Eagleson Road and Ottawa Street during both peak hours, the eastbound left/right movement exhibits capacity issues and high delays. Mitigation of these issues will be achieved through the signalization of the intersection, which has been shown to be warranted with the forecasted traffic. Once signalized, the intersection performs well with no capacity issues.

15.2.2 2037 Future Total Network Intersection Operations

The 2037 future total network intersection operations are summarized below in Table 22. The level of service for signalized intersections is based on HCM 2010 v/c calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection, and HCM average delay for unsignalized intersections. The Synchro worksheets have been provided in Appendix K.

Table 22: 2037 Future Total Network Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Eagleson Road & Ottawa Street *Unsignalized*	EBL/R	**F**	**1.03**	**116.9**	**70.5**	**F**	**0.98**	**118.3**	**58.5**
	NBL/T	A	0.05	9.0	1.5	A	0.07	9.5	1.5
	SBT/R	-	-	-	-	-	-	-	-
	Overall	**B**	**-**	**18.4**	**-**	**B**	**-**	**12.8**	**-**

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Eagleson Road & Ottawa Street *Signalized*	EBL	A	0.44	16.7	23.1	A	0.33	17.6	18.3
	EBR	A	0.09	6.0	4.2	A	0.13	6.6	5.7
	NBL	A	0.11	6.6	5.5	A	0.14	6.2	6.2
	NBT	A	0.50	9.3	44.1	A	0.56	9.4	56.4
	SBT	A	0.50	9.2	43.2	A	0.51	8.6	48.4
	SBR	A	0.12	2.1	4.7	A	0.18	1.6	5.5
	Overall	**A**	**0.55**	**9.5**	-	**A**	**0.56**	**8.6**	-
Eagleson Road & Brophy Drive *Unsignalized*	WBL/R	B	0.34	10.9	11.3	C	0.69	19.5	42.0
	NBT/R	B	0.33	10.8	10.5	B	0.32	11.9	9.8
	SBT/L	C	0.71	20.0	46.5	D	0.77	25.5	54.0
	Overall	**C**	-	**15.6**	-	**C**	-	**20.8**	-
McBean Street & Ottawa Street *Unsignalized*	EB	C	0.04	16.1	0.8	C	0.03	17.1	0.8
	WB	B	0.22	12.2	6.0	B	0.24	13.6	6.8
	NB	A	0.00	7.6	0.0	A	0.00	0.0	0.0
	SB	A	0.07	8.0	1.5	A	0.07	8.0	1.5
	Overall	**A**	-	**3.8**	-	**A**	-	**3.4**	-

Notes: Saturation flow rate of 1800 veh/h/lane
PHF = 1.00
m = metered queue
# = queue exceeds storage or mid-block length

The network intersection operations for the 2037 future total horizon operate similarly to the 2032 future total conditions, with the capacity issues on the eastbound movement mitigated through signalization of the intersection, which will continue to perform well on this horizon.

15.2.3 Network Intersection MMLOS

Table 23 summarizes the MMLOS analysis for the network intersection of Eagleson Road and Ottawa Street. The existing conditions are unsignalized and thus were not analyzed. The intersection analysis is based on the policy area of Village. The MMLOS worksheets has been provided in Appendix H.

Table 23: Access Intersection MMLOS Analysis

Intersection	Pedestrian LOS		Bicycle LOS		Transit LOS		Truck LOS		Auto LOS	
	PLOS	Target	BLOS	Target	TLOS	Target	TrLOS	Target	ALOS	Target
Eagleson Road at Ottawa Street (Future)	C	C	**C**	B	N/A	N/A	N/A	N/A	A	D

The MMLOS targets for bicycle due to the operating speeds along the rural arterial road. The governing approach is from the south, however, and the local cycling route which governs the LOS target is only present on the west and north legs of the intersection. In order to meet targets, a two-stage left-turn would need to be implemented, however it should be noted that no east leg of the intersection exists.

15.2.4 Recommended Design Elements

As part of the recommended signalization of the intersection of Eagleson Road and Ottawa Street, an auxiliary eastbound right-turn lane, an auxiliary northbound left-turn lane, and an auxiliary southbound right-turn lane are proposed on Eagleson Road.

16 Summary of Improvements Indicated and Modifications Options

The following summarizes the analysis and results presented in this TIA report:

Proposed Site and Screening

- The proposed site includes up to 1,129 homes, with up to 504 single family homes, 106 semi-detached homes, 519 townhomes, and with a 2.8-hectare village commercial lot, and includes the option for the southern portion of the subject lands to be developed as employment lands, reducing the residential counts
- Accesses will be provided along the internal road network, connecting to Eagleson Road via a local and collector road, to McBean Street via a collector road, and to Ottawa Street via a local road
- The development is proposed to be completed through an unconfirmed number of phases by 2032
- The trip generation, location, and safety triggers were met for the TIA Screening
- This report is part of a zoning by-law amendment and official plan amendment

Existing Conditions

- Eagleson Road, McBean Street, and Brophy Drive are arterial roads, and Ottawa Street is a collector road in the study area
- Pedestrian facilities are present within the study area only on the east side of Ottawa Street north of the South Carleton High School
- The following cycling facilities are provided within the study area:
    - Ottawa Street
        - Paved shoulder
        - Local cycling route
    - Eagleson Road
        - Local route north of Ottawa Street
    - McBean Street
        - Spine cycling route south of Ottawa Street
    - Colonel Murray Street
        - Spine cycling route
- One regular and one special transit route service the study area with stops at the northwest extent of the site
- No areas of high collisions exist within the study area, with SMV other collisions, typical of rural arterials, accounting for a slight majority of collisions within the study area
- Study area intersections operate well during the peak hours

Development Generated Travel Demand

- Two development scenarios were examined, a nominally full-residential scenario, and a scenario including employment lands, where the more conservative, fully-residential scenario was evaluated
- The proposed development is forecasted produce 1117 two-way people trips during the AM peak hour and 1420 two-way people trips during the PM peak hour
- Of the forecasted people trips, 929 two-way trips will be vehicle trips during the AM peak hour and 987 two-way trips will be vehicle trips during the PM peak hour based on a 75%-85% auto mode share
- Of the forecasted trips, 55% are anticipated to travel to/from the north, 5% to/from the south, 25% to/from the east, and 15% to/from the west

Background Conditions

- The listed background developments were explicitly included in the background conditions, along with a total background growth of 3.0% per annum in the peak direction and 1.0% per annum in the off-peak direction along the mainline arterial volumes
- The study area intersections at the 2032 and 2037 horizons will operate similarly to the existing conditions

Development Design

- A pathway is depicted on the CDP and Secondary plan that should be considered in future iterations of the concept plan

Boundary Street Design

- Pedestrian and bicycle LOS targets are not being met on boundary roads
- To meet pedestrian targets, McBean Street and Ottawa Street would require a sidewalks, and Eagleson Road cannot meet targets
- To meet bicycle targets, McBean Street and Eagleson Road would require physically separated facilities and Ottawa Street would require a bike lane
- Surrounding rural context should be considered with respect to the appropriateness of improvements

Access Intersections Design

- Accesses are proposed as a collector road onto Eagleson Road, a local road onto Eagleson Road, a collector onto McBean Street, and a collector onto Ottawa Street
- An auxiliary left-turn lane is recommended and warranted on the northbound approach of Eagleson Road at the proposed collector and on the southbound approach of McBean Street at the proposed collector
- The access intersections are recommended to be stop-controlled on the minor approach
- The intersection of the proposed collector road and Eagleson Road exhibits high delays on the eastbound approach during the PM peak hour
- Possible mitigation of the capacity issues at the Eagleson Road / collector road access might include signalization or the inclusion of an auxiliary right-turn lane
- An auxiliary northbound left-turn lane on Eagleson Road at the proposed collector and an auxiliary southbound left-turn lane on McBean Street at the proposed collector are warranted and recommended for inclusion

TDM

- Depending on the City's plans for transit service in The Village of Richmond, supportive TDM measures to be included within the proposed development should include:
    - Contract with OC Transpo to provide early transit services until regular services are warranted by occupancy levels (subdivision)
    - Provide a multimodal travel option information package to new residents
    - Offer personalized trip planning to new residents

Neighbourhood Traffic Management

- The section of Ottawa Street between the proposed local road and Eagleson Road is over the collector road thresholds, east of the site access, however the segment of road is only approximately 40 metres and any increase in traffic would have limited impacts

Transit

- Transit trips at the existing mode share result in 33 outbound AM trips and 37 inbound PM trips, resulting in the need for one additional peak-direction bus during each peak hour
- No specific transit priority measures were considered as part of this development

Network Concept

- The Secondary Plan depicts industrial lands on the southern portion of the site, the CDP includes a conceptual collector running east-west through the subject lands connecting McBean Street and Eagleson Road
- The development's concept plan additionally includes a local connection to Eagleson Road
- The boundary road network lane capacities will not be exceeded with the addition of site traffic

Network Intersection Design

- Signal warrants are met for the intersection of Eagleson Road and Ottawa Street at the 2032 horizon with the addition of site traffic
- The network intersections operate well during the peak hours, with the eastbound approach of the intersection of Eagleson Road and Ottawa Street experiencing high delays and capacity issues during both peak hours at both study horizons
- Possible mitigation for the performance issues at the intersection of Eagleson Road and Ottawa Street would be its signalization, where the intersection would perform well once installed
- The MMLOS targets will not be met for the bicycle LOS at the intersection of Eagleson Road and Ottawa Street should it be signalized
- An auxiliary northbound left-turn lane, and an auxiliary southbound and eastbound right-turn lane are recommended at the intersection of Eagleson Road and Ottawa Street at signalization

The proposed development will function within the Study Area Road Network. It is recommended that, from a transportation perspective, the proposed development application proceeds.

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Appendix A

TIA Screening Form and PM Certification Form

13 Markham Avenue
Ottawa ON K2G 3Z1

City of Ottawa 2017 TIA Guidelines
Step 1 - Screening Form

Date: Nov. 4, 2019
Project Number: 2018-03
Project Reference: Richmond - 6038 Ottawa St

1.1 Description of Proposed Development	
Municipal Address	6038 Ottawa Street
Description of Location	PLAN D24 PT UNIT 19 RP;4R-3057 PART 1
Land Use Classification	Residential
Development Size	903 single family homes, 260 townhomes
Accesses	Collector road connection to McBean and Eagleson, Local road connection to Eagleson
Phase of Development	Estimated 100 units per year
Buildout Year	2032
TIA Requirement	Full TIA Required

1.2 Trip Generation Trigger		
Land Use Type	Single-family homes	
Development Size	903	Units
Trip Generation Trigger	Yes	

1.3 Location Triggers	
Does the development propose a new driveway to a boundary street that is designated as part of the City's Transit Priority, Rapid Transit or Spine Bicycle Networks?	Yes
Is the development in a Design Priority Area (DPA) or Transit-oriented Development (TOD) zone?	No
Location Trigger	Yes

1.4. Safety Triggers	
Are posted speed limits on a boundary street 80 km/hr or greater?	Yes
Are there any horizontal/vertical curvatures on a boundary street limits sight lines at a proposed driveway?	No
Is the proposed driveway within the area of influence of an adjacent traffic signal or roundabout (i.e. within 300 m of intersection in rural conditions, or within 150 m of intersection in urban/ suburban conditions)?	Yes
Is the proposed driveway within auxiliary lanes of an intersection?	No
Does the proposed driveway make use of an existing median break that serves an existing site?	No
Is there is a documented history of traffic operations or safety concerns on the boundary streets within 500 m of the development?	No
Does the development include a drive-thru facility?	No
Safety Trigger	Yes

TIA Plan Reports

On 14 June 2017, the Council of the City of Ottawa adopted new Transportation Impact Assessment (TIA) Guidelines. In adopting the guidelines, Council established a requirement for those preparing and delivering transportation impact assessments and reports to sign a letter of certification.

Individuals submitting TIA reports will be responsible for all aspects of development-related transportation assessment and reporting, and undertaking such work, in accordance and compliance with the City of Ottawa's Official Plan, the Transportation Master Plan and the Transportation Impact Assessment (2017) Guidelines.

By submitting the attached TIA report (and any associated documents) and signing this document, the individual acknowledges that s/he meets the four criteria listed below.

CERTIFICATION

1. I have reviewed and have a sound understanding of the objectives, needs and requirements of the City of Ottawa's Official Plan, Transportation Master Plan and the Transportation Impact Assessment (2017) Guidelines;
2. I have a sound knowledge of industry standard practice with respect to the preparation of transportation impact assessment reports, including multi modal level of service review;
3. I have substantial experience (more than 5 years) in undertaking and delivering transportation impact studies (analysis, reporting and geometric design) with strong background knowledge in transportation planning, engineering or traffic operations; and
4. I am either a licensed[1] or registered[2] professional in good standing, whose field of expertise [check √ appropriate field(s)] is either transportation engineering √ or transportation planning □.

[1,2] License of registration body that oversees the profession is required to have a code of conduct and ethics guidelines that will ensure appropriate conduct and representation for transportation planning and/or transportation engineering works.

City Of Ottawa
Infrastructure Services and Community Sustainability
Planning and Growth Management
110 Laurier Avenue West, 4th fl.
Ottawa, ON K1P 1J1
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Télécopieur: 613-560-6006

Dated at Newmarket (City) this 28 day of June, 2018.

Name: Mark Crockford
(Please Print)

Professional Title: Professional Engineer

Signature of Individual certifier that s/he meets the above four criteria

Office Contact Information (Please Print)
Address: 628 Haines Road
City / Postal Code: Newmarket / L3Y 6V5
Telephone / Extension: (905) 251-4070
E-Mail Address: Mark.Crockford@CGHTransportation.com

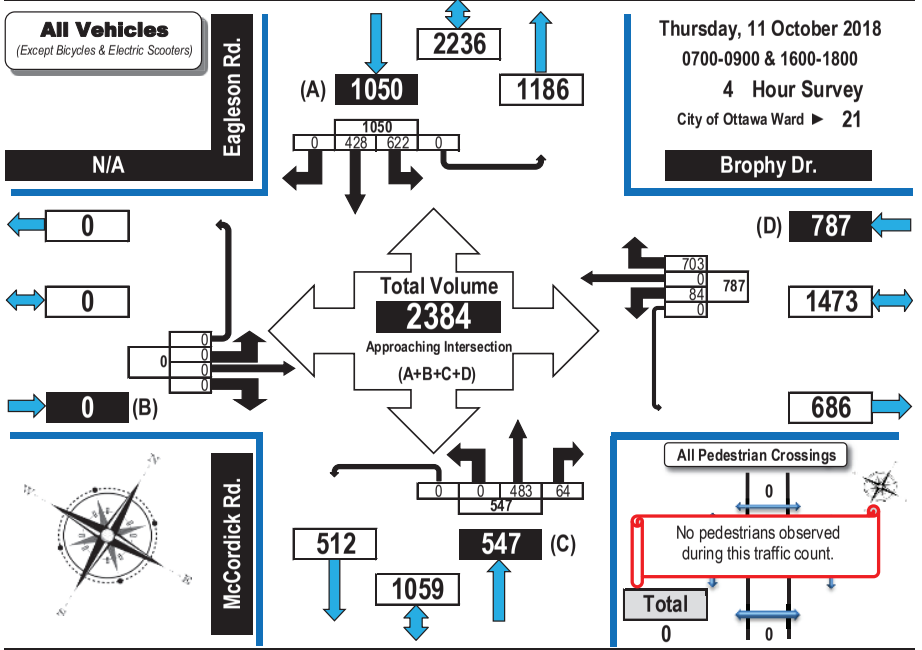
Appendix B

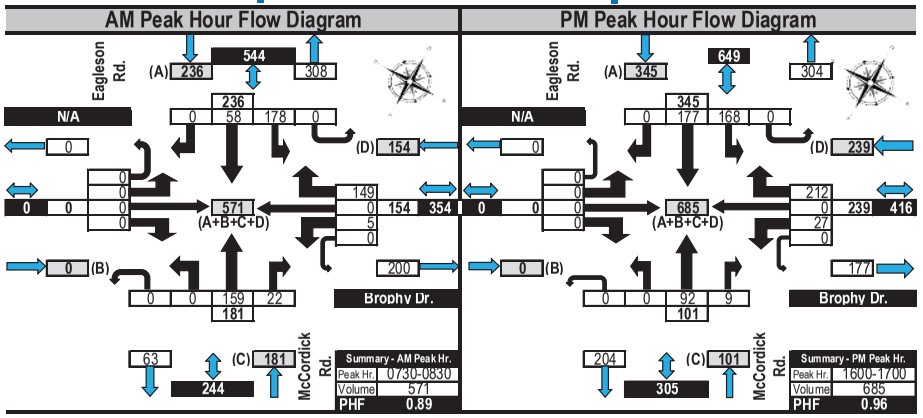
Turning Movement Counts

Turning Movement Count
Summary, AM and PM Peak Hour Flow Diagrams

Automobiles, Taxis, Light Trucks, Vans, SUV's, Motorcycles, Heavy Trucks, Buses, and School Buses

Brophy Drive & Eagleson Road/McCordick Road — Richmond, ON





Printed on: 10/14/2018 | Prepared by: thetrafficspecialist@gmail.com | Flow Diagram AM PM Peak

Turning Movement Count
Summary Report Including AM/PM Peak Hours, PHF, AADT and Expansion Factors

Automobiles, Taxis, Light Trucks, Vans, SUV's, Motorcycles, Heavy Trucks, Buses, and School Buses

Brophy Drive & Eagleson Road/McCordick Road — Richmond, ON

Survey Date: Thursday, 11 October 2018 **Start Time:** 0700 **AADT Factor:** 0.9
Weather-AM/PM Light Rain 9C/Overcast 13C **Survey Duration:** 4 Hrs. **Survey Hours:** 0700-0900 & 1600-1800

	N/A Eastbound					Brophy Dr. Westbound						McCordick Rd. Northbound					Eagleson Rd. Southbound						
Time Period	LT	ST	RT	UT	E/B Tot	LT	ST	RT	UT	W/B Tot	Street Total	LT	ST	RT	UT	N/B Tot	LT	ST	RT	UT	S/B Tot	Street Total	Grand Total
0700-0800	0	0	0	0	0	5	0	136	0	141	141	0	142	29	0	171	171	55	0	0	226	397	538
0800-0900	0	0	0	0	0	8	0	145	0	153	153	0	155	18	0	173	138	61	0	0	199	372	525
1600-1700	0	0	0	0	0	27	0	212	0	239	239	0	92	9	0	101	168	177	0	0	345	446	685
1700-1800	0	0	0	0	0	44	0	210	0	254	254	0	94	8	0	102	145	135	0	0	280	382	636
Totals	0	0	0	0	0	84	0	703	0	787	787	0	483	64	0	547	622	428	0	0	1050	1597	2384

Equivalent 12 & 24-hour Vehicle Volumes Including the Annual Average Daily Traffic (AADT) Factor Applicable to the Day and Month of the Turning Movement Count

➡ Expansion factors are applied exclusively to standard weekday 8-hour turning movement counts ⬅

Equivalent 12-hour vehicle volumes. These volumes are calculated by multiplying the 8-hour totals by the 8 ➡12 expansion factor of 1.39

Equ. 12 Hr	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Average daily 12-hour vehicle volumes. These volumes are calculated by multiplying the equivalent 12-hour totals by the AADT factor of: 0.9

AADT 12-hr	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

24-Hour AADT. These volumes are calculated by multiplying the average daily 12-hour vehicle volumes by the 12 ➡24 expansion factor of 1.31

AADT 24 Hr	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

AM Peak Hour Factor ➡ 0.89 — Highest Hourly Vehicle Volume between 0700h & 1000h

AM Peak Hr	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	G.TOT
0730-0830	0	0	0	0	0	5	0	149	0	154	154	0	159	22	0	181	178	58	0	0	236	417	571

OFF Peak Hour Factor ➡ ### — Highest Hourly Vehicle Volume between 1130h & 1330h

Off Peak Hr	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	G.TOT
N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

PM Peak Hour Factor ➡ 0.96 — Highest Hourly Vehicle Volume between 1500h & 1800h

PM Peak Hr	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	G.TOT
1600-1700	0	0	0	0	0	27	0	212	0	239	239	0	92	9	0	101	168	177	0	0	345	446	685

Comments
Construction on McBean Street with alternating flow over Jock River bridge. Eagleson Road is the designated detour route for heavy trucks.

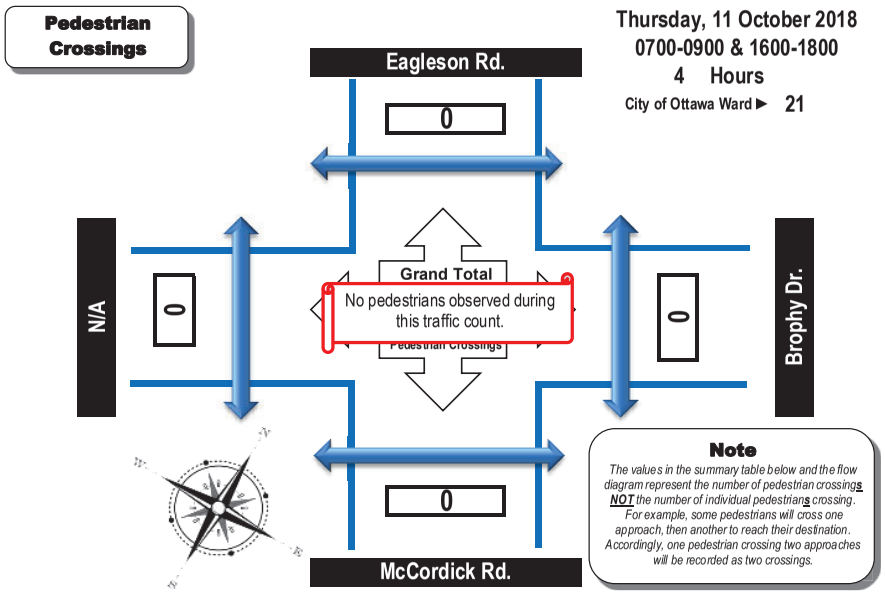
Notes:
1. Includes all vehicle types except bicycles and electric scooters.
2. Expansion factors are not applied to turning movement counts if they are less than 8-hours in duration.
3. When expansion and AADT factors are applied, the results will differ slightly due to rounding.

Disclaimer:

Printed on: 10/14/2018 | Prepared by: thetrafficspecialist@gmail.com | Summary All Veh

Turning Movement Count
Pedestrian Crossings Summary and Flow Diagram

Brophy Drive & Eagleson Road/McCordick Road — **Richmond, ON**



Brophy Drive & Eagleson Road/McCordick Road — **Richmond, ON**

Survey Date: Thursday, 11 October 2018 **Start Time:** 0700
Weather: Light Rain 9C/Overcast 13C **Survey Duration:** 4 Hrs. **Survey Hours:** 0700-0900 & 1600-1800
(AM/PM)

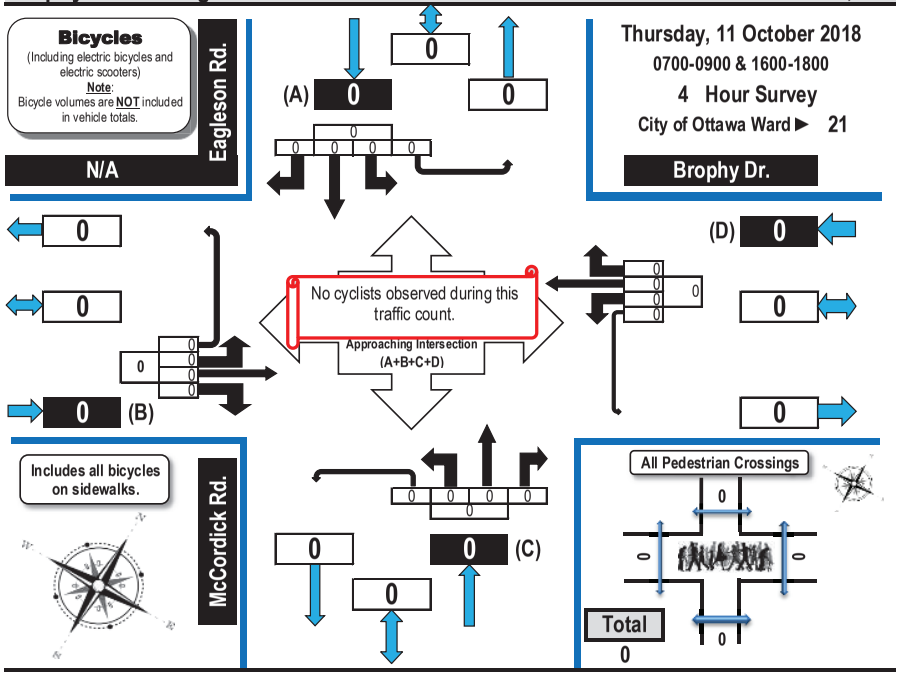
Time Period	West Side Crossing N/A	East Side Crossing Brophy Dr.	Street Total	South Side Crossing McCordick Rd.	North Side Crossing Eagleson Rd.	Street Total	Grand Total
0700-0800	0	0	0	0	0	0	0
0800-0900	0	0	0	0	0	0	0
1600-1700	0	0	0	0	0	0	0
1700-1800	0	0	0	0	0	0	0
Totals	0	0	0	0	0	0	0

No pedestrians observed during this traffic count.

Turning Movement Count
Bicycle Summary Flow Diagram

Bicycles, Electric Bicycles, and Electric Scooters

Brophy Drive & Eagleson Road/McCordick Road — **Richmond, ON**



Brophy Drive & Eagleson Road/McCordick Road — **Richmond, ON**

Survey Date: Thursday, 11 October 2018 **Start Time:** 0700
Weather: Light Rain 9C/Overcast 13C **Survey Duration:** 4 Hrs. **Survey Hours:** 0700-0900 & 1600-1800
(AM/PM)

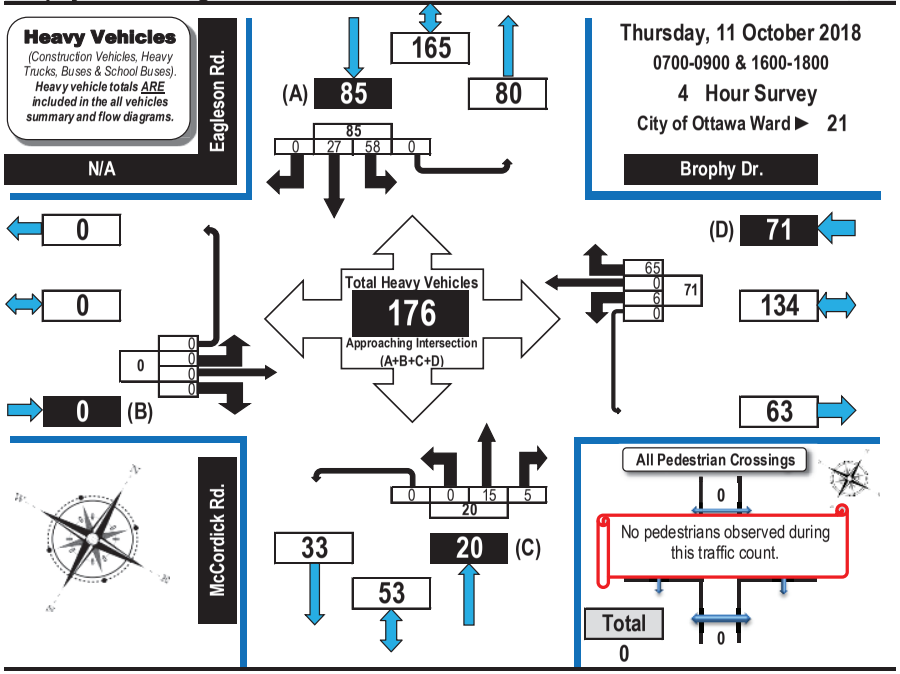
	N/A Eastbound					Brophy Dr. Westbound					McCordick Rd. Northbound					Eagleson Rd. Southbound					
Time Period	LT	ST	RT	UT	S. Tot	LT	ST	RT	UT	S. Tot	LT	ST	RT	UT	S. Tot	LT	ST	RT	UT	S. Tot	G.Tot.
0700-0800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0800-0900	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1600-1700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1700-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

No cyclists observed during this traffic count.

Turning Movement Count
Heavy Vehicle Summary
Flow Diagram

Heavy Trucks, Buses, and School Buses

Brophy Drive & Eagleson Road/McCordick Road — Richmond, ON



Brophy Drive & Eagleson Road/McCordick Road — Richmond, ON

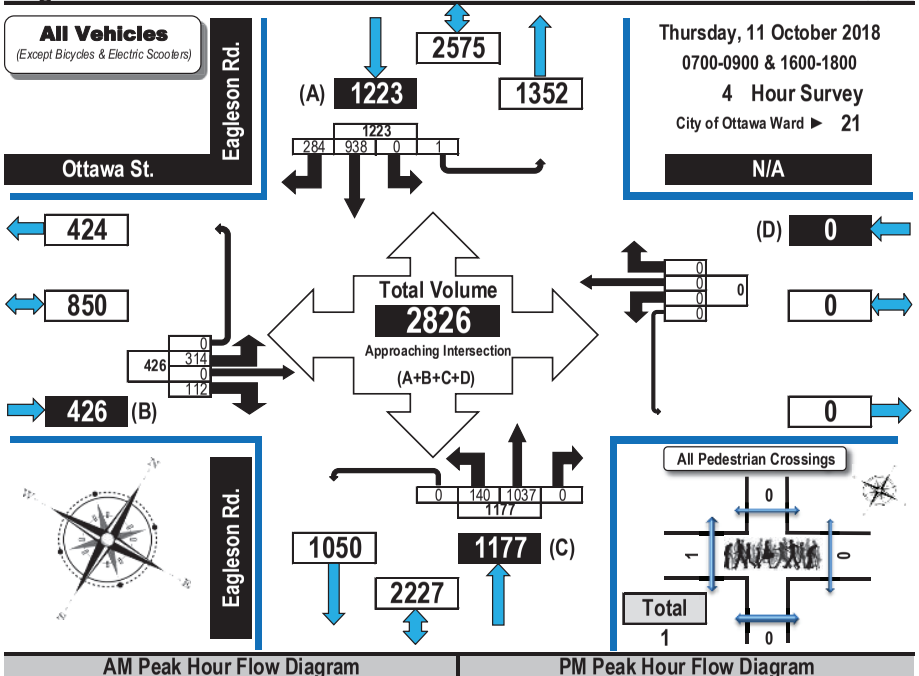
Survey Date: Thursday, 11 October 2018 **Start Time:** 0700
Weather: Light Rain 9C/Overcast 13C **Survey Duration:** 4 Hrs. **Survey Hours:** 0700-0900 & 1600-1800
(AM/PM)

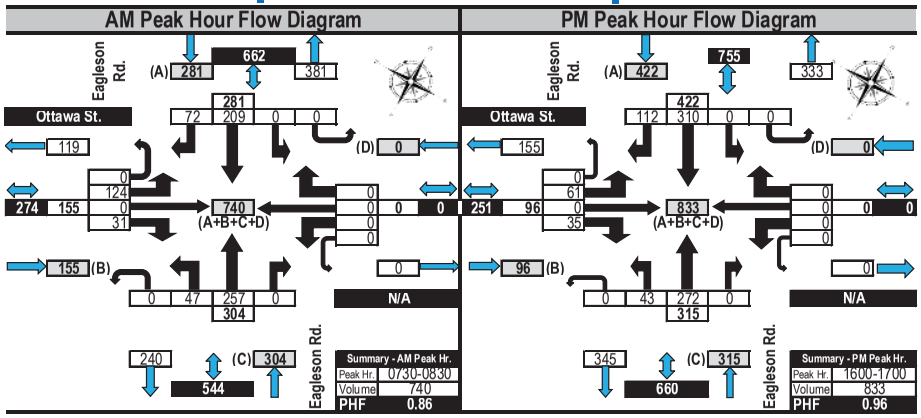
	N/A (Eastbound)					Brophy Dr. (Westbound)					McCordick Rd. (Northbound)					Eagleson Rd. (Southbound)					
Time Period	LT	ST	RT	UT	S. Tot	LT	ST	RT	UT	S. Tot	LT	ST	RT	UT	S. Tot	LT	ST	RT	UT	S. Tot	G.Tot.
0700-0800	0	0	0	0	0	0	0	19	0	19	0	7	4	0	11	13	6	0	0	19	49
0800-0900	0	0	0	0	0	1	0	20	0	21	0	4	1	0	5	20	8	0	0	28	54
1600-1700	0	0	0	0	0	5	0	15	0	20	0	3	0	0	3	14	4	0	0	18	41
1700-1800	0	0	0	0	0	0	0	11	0	11	0	1	0	0	1	11	9	0	0	20	32
Totals	0	0	0	0	0	6	0	65	0	71	0	15	5	0	20	58	27	0	0	85	176

Turning Movement Count
Summary, AM and PM Peak Hour
Flow Diagrams

Automobiles, Taxis, Light Trucks, Vans, SUV's, Motorcycles, Heavy Trucks, Buses, and School Buses

Eagleson Road & Ottawa Street — Richmond, ON





Turning Movement Count

Summary Report Including AM/PM Peak Hours, PHF, AADT and Expansion Factors

Automobiles, Taxis, Light Trucks, Vans, SUV's, Motorcycles, Heavy Trucks, Buses, and School Buses

Eagleson Road & Ottawa Street — Richmond, ON

Survey Date: Thursday, 11 October 2018 **Start Time:** 0700 **AADT Factor:** 0.9

Weather-AM/PM Light Rain 9C/Overcast 13C **Survey Duration:** 4 Hrs. **Survey Hours:** 0700-0900 & 1600-1800

	Ottawa St.					N/A						Eagleson Rd.					Eagleson Rd.					
	Eastbound					Westbound						Northbound					Southbound					
Time Period	LT	ST	RT	UT	E/B Tot	LT	ST	RT	UT	W/B Tot	Street Total	LT	ST	RT	UT	N/B Tot	LT	ST	RT	UT	S/B Tot	Street Total	Grand Total
0700-0800	127	0	39	0	166	0	0	0	0	0	166	46	220	0	0	266	0	191	69	0	260	526	692
0800-0900	79	0	22	0	101	0	0	0	0	0	101	27	272	0	0	299	0	171	32	0	203	502	603
1600-1700	61	0	35	0	96	0	0	0	0	0	96	43	272	0	0	315	0	310	112	0	422	737	833
1700-1800	47	0	16	0	63	0	0	0	0	0	63	24	273	0	0	297	0	266	71	1	338	635	698
Totals	314	0	112	0	426	0	0	0	0	0	426	140	1037	0	0	1177	0	938	284	1	1223	2400	2826

Equivalent 12 & 24-hour Vehicle Volumes Including the Annual Average Daily Traffic (AADT) Factor Applicable to the Day and Month of the Turning Movement Count

➡ Expansion factors are applied exclusively to standard weekday 8-hour turning movement counts ⬅

Equivalent 12-hour vehicle volumes. These volumes are calculated by multiplying the 8-hour totals by the 8 ➡12 expansion factor of 1.39

Equ. 12 Hr	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Average daily 12-hour vehicle volumes. These volumes are calculated by multiplying the equivalent 12-hour totals by the AADT factor of: 0.9

AADT 12-hr	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

24-Hour AADT. These volumes are calculated by multiplying the average daily 12-hour vehicle volumes by the 12 ➡24 expansion factor of 1.31

AADT 24 Hr	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

AM Peak Hour Factor ➡ 0.86 — Highest Hourly Vehicle Volume between 0700h & 1000h

AM Peak Hr	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	G.TOT
0730-0830	124	0	31	0	155	0	0	0	0	0	155	47	257	0	0	304	0	209	72	0	281	585	740

OFF Peak Hour Factor ➡ ### — Highest Hourly Vehicle Volume between 1130h & 1330h

Off Peak Hr	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	G.TOT
N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

PM Peak Hour Factor ➡ 0.96 — Highest Hourly Vehicle Volume between 1500h & 1800h

PM Peak Hr	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	G.TOT
1600-1700	61	0	35	0	96	0	0	0	0	0	96	43	272	0	0	315	0	310	112	0	422	737	833

Comments

Construction on McBean Street with alternating flow over Jock River bridge. Eagleson Road is the designated detour route for heavy trucks.

Notes:

1. Includes all vehicle types except bicycles and electric scooters.
2. Expansion factors are not applied to turning movement counts if they are less than 8-hours in duration.
3. When expansion and AADT factors are applied, the results will differ slightly due to rounding.

Disclaimer:

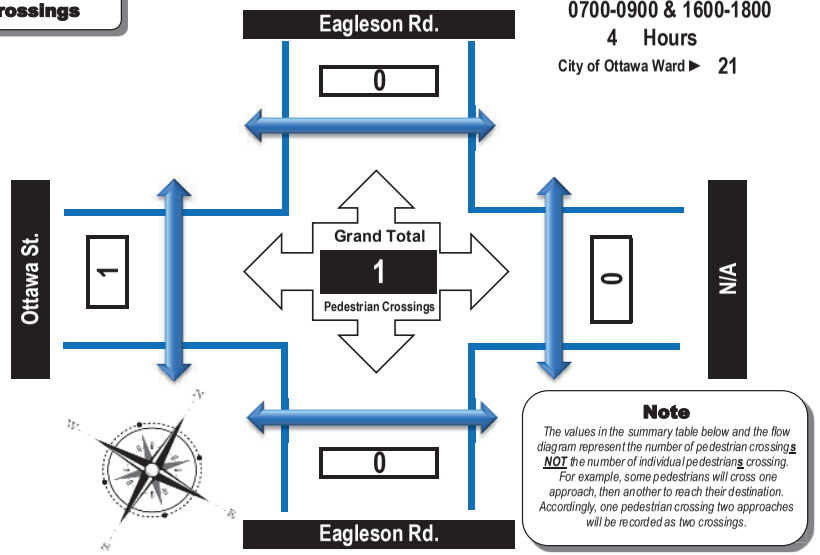
Turning Movement Count

Pedestrian Crossings Summary and Flow Diagram

Eagleson Road & Ottawa Street — Richmond, ON

Pedestrian Crossings

Thursday, 11 October 2018
0700-0900 & 1600-1800
4 Hours
City of Ottawa Ward ► 21



Note

*The values in the summary table below and the flow diagram represent the number of pedestrian crossing**s** **NOT** the number of individual pedestrian**s** crossing. For example, some pedestrians will cross one approach, then another to reach their destination. Accordingly, one pedestrian crossing two approaches will be recorded as two crossings.*

Eagleson Road & Ottawa Street — Richmond, ON

Survey Date: Thursday, 11 October 2018 **Start Time:** 0700

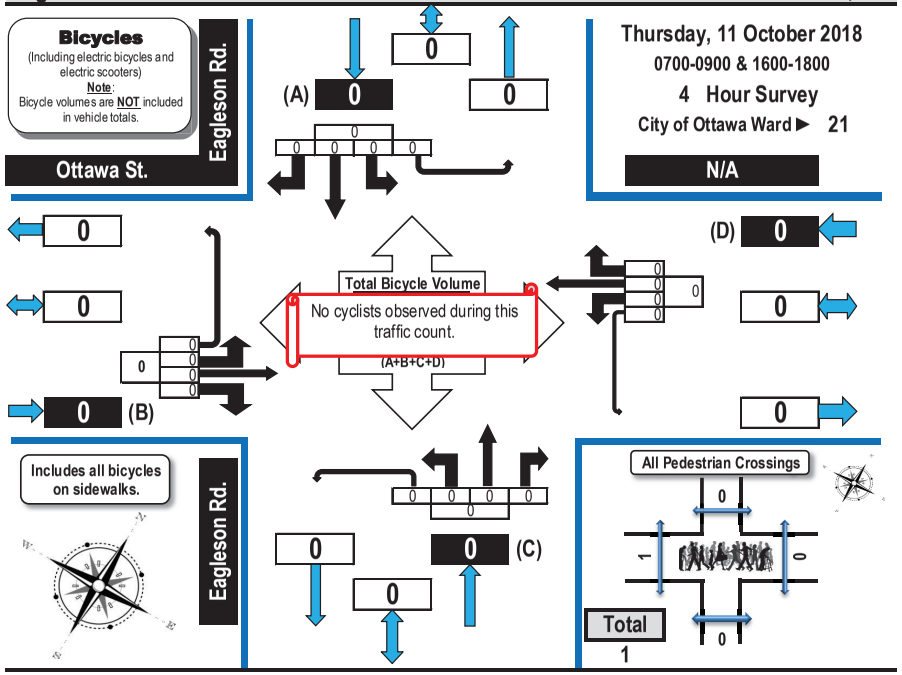
Weather: Light Rain 9C/Overcast 13C **Survey Duration:** 4 Hrs. **Survey Hours:** 0700-0900 & 1600-1800
(AM/PM)

Time Period	West Side Crossing Ottawa St.	East Side Crossing N/A	Street Total	South Side Crossing Eagleson Rd.	North Side Crossing Eagleson Rd.	Street Total	Grand Total
0700-0800	0	0	0	0	0	0	0
0800-0900	0	0	0	0	0	0	0
1600-1700	1	0	1	0	0	0	1
1700-1800	0	0	0	0	0	0	0
Totals	1	0	1	0	0	0	1

Turning Movement Count
Bicycle Summary
Flow Diagram

Bicycles, Electric Bicycles, and Electric Scooters

Eagleson Road & Ottawa Street — Richmond, ON



Eagleson Road & Ottawa Street — Richmond, ON

Survey Date: Thursday, 11 October 2018 **Start Time:** 0700
Weather: Light Rain 9C/Overcast 13C **Survey Duration:** 4 Hrs. **Survey Hours:** 0700-0900 & 1600-1800
(AM/PM)

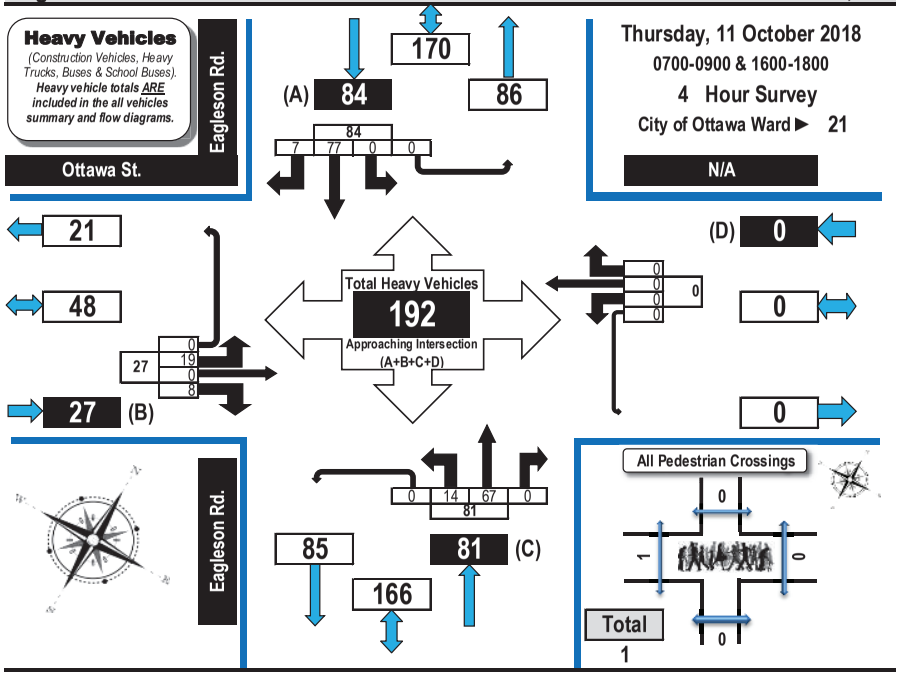
	Ottawa St. Eastbound					N/A Westbound					Eagleson Rd. Northbound					Eagleson Rd. Southbound					
Time Period	LT	ST	RT	UT	S. Tot	LT	ST	RT	UT	S. Tot	LT	ST	RT	UT	S. Tot	LT	ST	RT	UT	S. Tot	G.Tot.
0700-0800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0800-0900	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1600-1700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1700-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

No cyclists observed during this traffic count.

Turning Movement Count
Heavy Vehicle Summary
Flow Diagram

Heavy Trucks, Buses, and School Buses

Eagleson Road & Ottawa Street — Richmond, ON



Eagleson Road & Ottawa Street — Richmond, ON

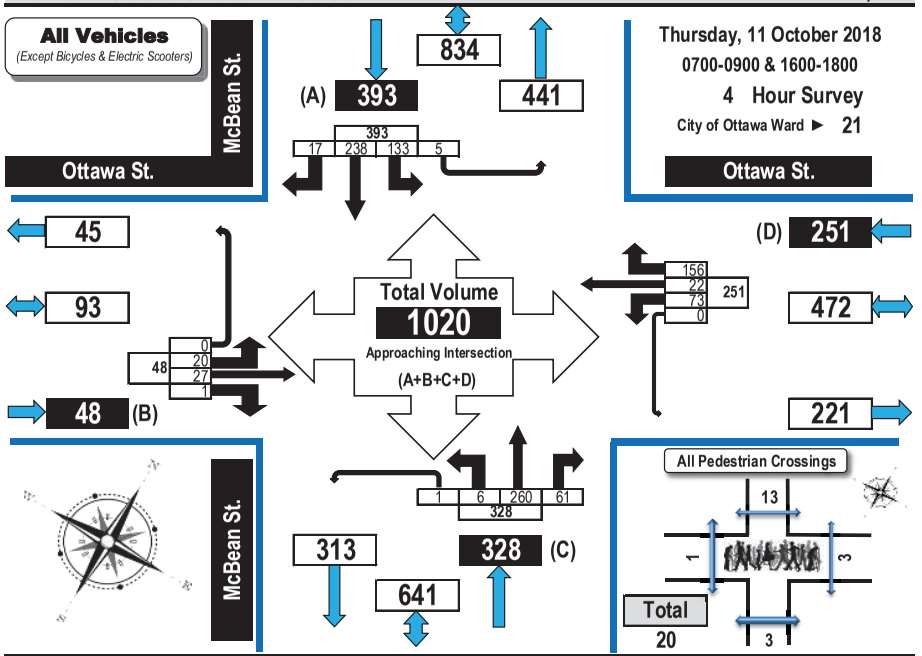
Survey Date: Thursday, 11 October 2018 **Start Time:** 0700
Weather: Light Rain 9C/Overcast 13C **Survey Duration:** 4 Hrs. **Survey Hours:** 0700-0900 & 1600-1800
(AM/PM)

	Ottawa St. Eastbound					N/A Westbound					Eagleson Rd. Northbound					Eagleson Rd. Southbound					
Time Period	LT	ST	RT	UT	S. Tot	LT	ST	RT	UT	S. Tot	LT	ST	RT	UT	S. Tot	LT	ST	RT	UT	S. Tot	G.Tot.
0700-0800	16	0	6	0	22	0	0	0	0	0	7	19	0	0	26	0	13	2	0	15	63
0800-0900	0	0	0	0	0	0	0	0	0	0	3	21	0	0	24	0	27	2	0	29	53
1600-1700	2	0	2	0	4	0	0	0	0	0	3	17	0	0	20	0	17	2	0	19	43
1700-1800	1	0	0	0	1	0	0	0	0	0	1	10	0	0	11	0	20	1	0	21	33
Totals	19	0	8	0	27	0	0	0	0	0	14	67	0	0	81	0	77	7	0	84	192

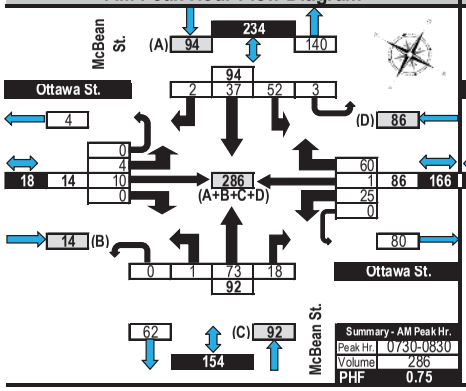
Turning Movement Count
Summary, AM and PM Peak Hour Flow Diagrams

Automobiles, Taxis, Light Trucks, Vans, SUV's, Motorcycles, Heavy Trucks, Buses, and School Buses

McBean Street & Ottawa Street — Richmond, ON

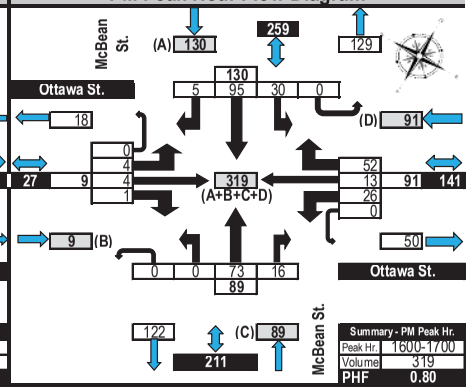


AM Peak Hour Flow Diagram



Summary - AM Peak Hr.	
Peak Hr.	0730-0830
Volume	286
PHF	0.75

PM Peak Hour Flow Diagram



Summary - PM Peak Hr.	
Peak Hr.	1600-1700
Volume	319
PHF	0.80

Turning Movement Count
Summary Report Including AM/PM Peak Hours, PHF, AADT and Expansion Factors

Automobiles, Taxis, Light Trucks, Vans, SUV's, Motorcycles, Heavy Trucks, Buses, and School Buses

McBean Street & Ottawa Street — Richmond, ON

Survey Date: Thursday, 11 October 2018 **Start Time:** 0700 **AADT Factor:** 0.9
Weather-AM/PM Light Rain 9C/Overcast 13C **Survey Duration:** 4 Hrs. **Survey Hours:** 0700-0900 & 1600-1800

	Ottawa St. Eastbound					Ottawa St. Westbound						McBean St. Northbound					McBean St. Southbound						
Time Period	LT	ST	RT	UT	E/B Tot	LT	ST	RT	UT	W/B Tot	Street Total	LT	ST	RT	UT	N/B Tot	LT	ST	RT	UT	S/B Tot	Street Total	Grand Total
0700-0800	5	8	0	0	13	19	0	53	0	72	85	2	73	18	0	93	55	37	1	1	94	187	272
0800-0900	5	7	0	0	12	12	1	22	0	35	47	3	58	15	0	76	31	39	5	2	77	153	200
1600-1700	4	4	1	0	9	26	13	52	0	91	100	0	73	16	0	89	30	95	5	0	130	219	319
1700-1800	6	8	0	0	14	16	8	29	0	53	67	1	56	12	1	70	17	67	6	2	92	162	229
Totals	20	27	1	0	48	73	22	156	0	251	299	6	260	61	1	328	133	238	17	5	393	721	1020

Equivalent 12 & 24-hour Vehicle Volumes Including the Annual Average Daily Traffic (AADT) Factor Applicable to the Day and Month of the Turning Movement Count

➡ Expansion factors are applied exclusively to standard weekday 8-hour turning movement counts ⬅

Equivalent 12-hour vehicle volumes. These volumes are calculated by multiplying the 8-hour totals by the 8 ➡12 expansion factor of 1.39

Equ. 12 Hr	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Average daily 12-hour vehicle volumes. These volumes are calculated by multiplying the equivalent 12-hour totals by the AADT factor of: 0.9

AADT 12-hr	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

24-Hour AADT. These volumes are calculated by multiplying the average daily 12-hour vehicle volumes by the 12 ➡24 expansion factor of 1.31

AADT 24 Hr	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

AM Peak Hour Factor ➡ 0.75																	Highest Hourly Vehicle Volume between 0700h & 1000h						
AM Peak Hr	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	G.TOT
0730-0830	4	10	0	0	14	25	1	60	0	86	100	1	73	18	0	92	52	37	2	3	94	186	286
OFF Peak Hour Factor ➡ ###																	Highest Hourly Vehicle Volume between 1130h & 1330h						
Off Peak Hr	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	G.TOT
N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM Peak Hour Factor ➡ 0.80																	Highest Hourly Vehicle Volume between 1500h & 1800h						
PM Peak Hr	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	G.TOT
1600-1700	4	4	1	0	9	26	13	52	0	91	100	0	73	16	0	89	30	95	5	0	130	219	319

Comments

Construction on McBean Street with alternating flow over Jock River bridge. Eagleson Road is the designated detour route for heavy trucks. Several southbound U-turns occurred north of Ottawa Street in addition to the five that are recorded above. The majority of heavy vehicle traffic consists of school buses. There was one vehicle/vehicle conflict at 1637H involving and E/B straight versus a N/B straight.

Notes:

1. Includes all vehicle types except bicycles and electric scooters.
2. Expansion factors are not applied to turning movement counts if they are less than 8-hours in duration.
3. When expansion and AADT factors are applied, the results will differ slightly due to rounding.

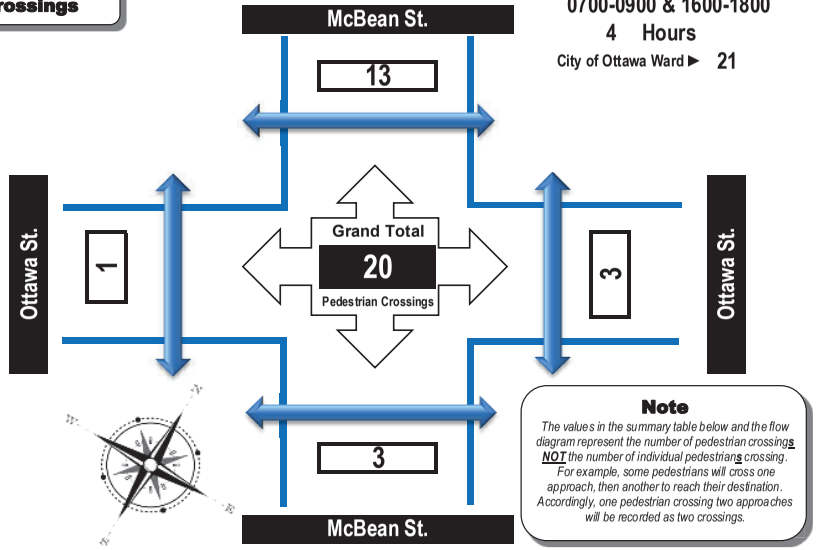
Disclaimer:

Turning Movement Count
Pedestrian Crossings Summary
and Flow Diagram

McBean Street & Ottawa Street — Richmond, ON

Pedestrian Crossings

Thursday, 11 October 2018
0700-0900 & 1600-1800
4 Hours
City of Ottawa Ward ► 21



Note
*The values in the summary table below and the flow diagram represent the number of pedestrian crossings **NOT** the number of individual pedestrians crossing. For example, some pedestrians will cross one approach, then another to reach their destination. Accordingly, one pedestrian crossing two approaches will be recorded as two crossings.*

McBean Street & Ottawa Street — Richmond, ON

Survey Date: Thursday, 11 October 2018 **Start Time:** 0700
Weather: Light Rain 9C/Overcast 13C **Survey Duration:** 4 Hrs. **Survey Hours:** 0700-0900 & 1600-1800
(AM/PM)

Time Period	West Side Crossing Ottawa St.	East Side Crossing Ottawa St.	Street Total	South Side Crossing McBean St.	North Side Crossing McBean St.	Street Total	Grand Total
0700-0800	1	1	2	0	6	6	8
0800-0900	0	1	1	0	1	1	2
1600-1700	0	1	1	3	5	8	9
1700-1800	0	0	0	0	1	1	1
Totals	1	3	4	3	13	16	20

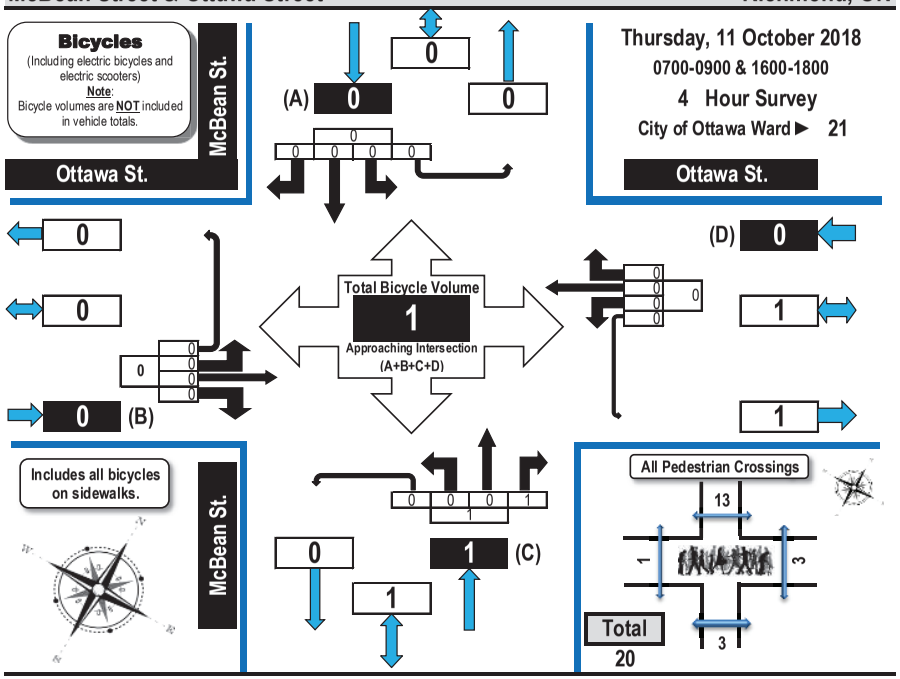
Turning Movement Count
Bicycle Summary
Flow Diagram

Bicycles, Electric Bicycles, and Electric Scooters

McBean Street & Ottawa Street — Richmond, ON

Bicycles
(Including electric bicycles and electric scooters)
Note:
Bicycle volumes are NOT included in vehicle totals.

Thursday, 11 October 2018
0700-0900 & 1600-1800
4 Hour Survey
City of Ottawa Ward ► 21



McBean Street & Ottawa Street — Richmond, ON

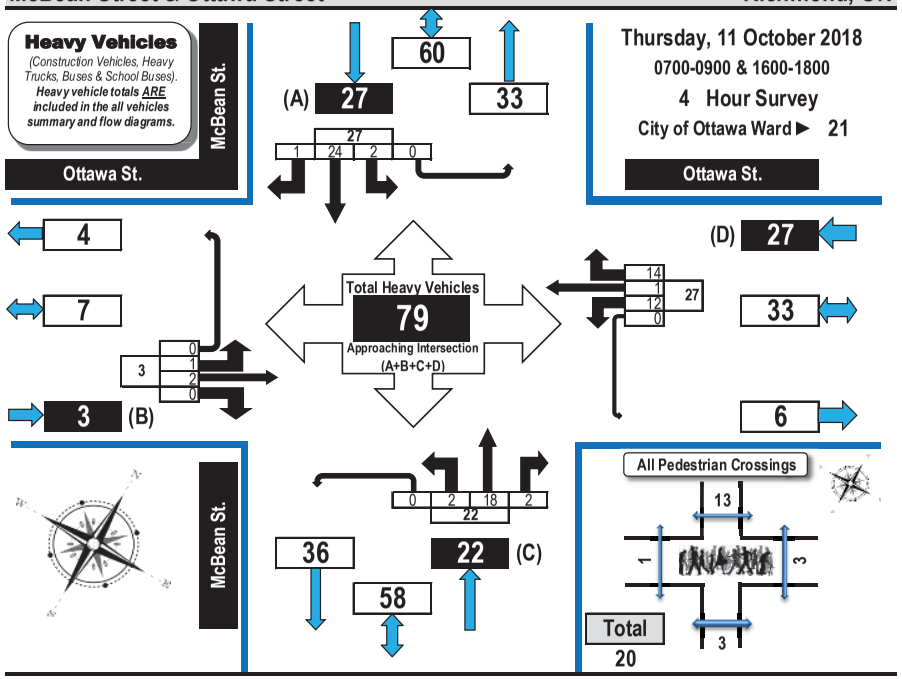
Survey Date: Thursday, 11 October 2018 **Start Time:** 0700
Weather: Light Rain 9C/Overcast 13C **Survey Duration:** 4 Hrs. **Survey Hours:** 0700-0900 & 1600-1800
(AM/PM)

	Ottawa St. Eastbound					Ottawa St. Westbound					McBean St. Northbound					McBean St. Southbound					
Time Period	LT	ST	RT	UT	S. Tot	LT	ST	RT	UT	S. Tot	LT	ST	RT	UT	S. Tot	LT	ST	RT	UT	S. Tot	G.Tot.
0700-0800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0800-0900	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1600-1700	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1
1700-1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1

Turning Movement Count
Heavy Vehicle Summary
Flow Diagram

Heavy Trucks, Buses, and School Buses

McBean Street & Ottawa Street — **Richmond, ON**



McBean Street & Ottawa Street — **Richmond, ON**

Survey Date: Thursday, 11 October 2018 **Start Time:** 0700
Weather: Light Rain 9C/Overcast 13C **Survey Duration:** 4 Hrs. **Survey Hours:** 0700-0900 & 1600-1800
(AM/PM)

	Ottawa St. Eastbound					Ottawa St. Westbound					McBean St. Northbound					McBean St. Southbound					
Time Period	LT	ST	RT	UT	S. Tot	LT	ST	RT	UT	S. Tot	LT	ST	RT	UT	S. Tot	LT	ST	RT	UT	S. Tot	G.Tot.
0700-0800	0	0	0	0	0	4	0	9	0	13	2	9	1	0	12	1	1	0	0	2	27
0800-0900	1	0	0	0	1	3	0	1	0	4	0	5	0	0	5	0	2	1	0	3	13
1600-1700	0	2	0	0	2	5	1	2	0	8	0	4	0	0	4	1	14	0	0	15	29
1700-1800	0	0	0	0	0	0	0	2	0	2	0	0	1	0	1	0	7	0	0	7	10
Totals	1	2	0	0	3	12	1	14	0	27	2	18	2	0	22	2	24	1	0	27	79

Appendix C

Synchro Intersection Worksheets – Existing Conditions

Intersection	
Int Delay, s/veh	4.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	124	31	47	257	209	72
Future Vol, veh/h	124	31	47	257	209	72
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	138	34	52	286	232	80

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	662	272	312	0	-	0
Stage 1	272	-	-	-	-	-
Stage 2	390	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	427	767	1248	-	-	-
Stage 1	774	-	-	-	-	-
Stage 2	684	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	406	767	1248	-	-	-
Mov Cap-2 Maneuver	406	-	-	-	-	-
Stage 1	735	-	-	-	-	-
Stage 2	684	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	18	1.2	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1248	-	448	-	-
HCM Lane V/C Ratio	0.042	-	0.384	-	-
HCM Control Delay (s)	8	0	18	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.1	-	1.8	-	-

Intersection	
Intersection Delay, s/veh	8.9
Intersection LOS	A

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	27	159	22	178	58
Future Vol, veh/h	5	27	159	22	178	58
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	6	30	177	24	198	64
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	7.7	8.5	9.3
HCM LOS	A	A	A

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	16%	75%
Vol Thru, %	88%	0%	25%
Vol Right, %	12%	84%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	181	32	236
LT Vol	0	5	178
Through Vol	159	0	58
RT Vol	22	27	0
Lane Flow Rate	201	36	262
Geometry Grp	1	1	1
Degree of Util (X)	0.23	0.044	0.313
Departure Headway (Hd)	4.121	4.467	4.3
Convergence, Y/N	Yes	Yes	Yes
Cap	857	806	829
Service Time	2.214	2.467	2.368
HCM Lane V/C Ratio	0.235	0.045	0.316
HCM Control Delay	8.5	7.7	9.3
HCM Lane LOS	A	A	A
HCM 95th-tile Q	0.9	0.1	1.3

Intersection	
Int Delay, s/veh	5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	10	0	25	1	60	1	73	18	55	37	2
Future Vol, veh/h	4	10	0	25	1	60	1	73	18	55	37	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	11	0	28	1	67	1	81	20	61	41	2

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	291	267	42	263	258	91	43	0	0	101	0	0
Stage 1	164	164	-	93	93	-	-	-	-	-	-	-
Stage 2	127	103	-	170	165	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	661	639	1029	690	646	967	1566	-	-	1491	-	-
Stage 1	838	762	-	914	818	-	-	-	-	-	-	-
Stage 2	877	810	-	832	762	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	594	612	1029	658	618	967	1566	-	-	1491	-	-
Mov Cap-2 Maneuver	594	612	-	658	618	-	-	-	-	-	-	-
Stage 1	837	730	-	913	817	-	-	-	-	-	-	-
Stage 2	815	809	-	785	730	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.1	9.8	0.1	4.4
HCM LOS	B	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1566	-	-	607	846	1491	-	-
HCM Lane V/C Ratio	0.001	-	-	0.026	0.113	0.041	-	-
HCM Control Delay (s)	7.3	0	-	11.1	9.8	7.5	0	-
HCM Lane LOS	A	A	-	B	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.4	0.1	-	-

Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰			↑	↑	
Traffic Vol, veh/h	61	35	43	272	310	112
Future Vol, veh/h	61	35	43	272	310	112
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	68	39	48	302	344	124

Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	804	406	468	0	-	0
Stage 1	406	-	-	-	-	-
Stage 2	398	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	352	645	1094	-	-	-
Stage 1	673	-	-	-	-	-
Stage 2	678	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	333	645	1094	-	-	-
Mov Cap-2 Maneuver	333	-	-	-	-	-
Stage 1	637	-	-	-	-	-
Stage 2	678	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	17.1	1.2	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1094	-	404	-	-
HCM Lane V/C Ratio	0.044	-	0.264	-	-
HCM Control Delay (s)	8.4	0	17.1	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.1	-	1	-	-

Intersection	
Intersection Delay, s/veh	11.3
Intersection LOS	B

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	27	212	92	9	168	177
Future Vol, veh/h	27	212	92	9	168	177
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	30	236	102	10	187	197
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	10	9	12.8
HCM LOS	A	A	B

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	11%	49%
Vol Thru, %	91%	0%	51%
Vol Right, %	9%	89%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	101	239	345
LT Vol	0	27	168
Through Vol	92	0	177
RT Vol	9	212	0
Lane Flow Rate	112	266	383
Geometry Grp	1	1	1
Degree of Util (X)	0.155	0.34	0.51
Departure Headway (Hd)	4.972	4.609	4.792
Convergence, Y/N	Yes	Yes	Yes
Cap	715	775	748
Service Time	3.049	2.664	2.855
HCM Lane V/C Ratio	0.157	0.343	0.512
HCM Control Delay	9	10	12.8
HCM Lane LOS	A	A	B
HCM 95th-tile Q	0.5	1.5	2.9

Intersection	
Int Delay, s/veh	3.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	4	1	26	13	52	0	73	16	30	95	5
Future Vol, veh/h	4	4	1	26	13	52	0	73	16	30	95	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	4	1	29	14	58	0	81	18	33	106	6

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	301	274	109	268	268	90	112	0	0	99	0	0
Stage 1	175	175	-	90	90	-	-	-	-	-	-	-
Stage 2	126	99	-	178	178	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	651	633	945	685	638	968	1478	-	-	1494	-	-
Stage 1	827	754	-	917	820	-	-	-	-	-	-	-
Stage 2	878	813	-	824	752	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	590	618	945	668	623	968	1478	-	-	1494	-	-
Mov Cap-2 Maneuver	590	618	-	668	623	-	-	-	-	-	-	-
Stage 1	827	736	-	917	820	-	-	-	-	-	-	-
Stage 2	811	813	-	798	734	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.8	10.1	0	1.7
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1478	-	-	629	802	1494	-	-
HCM Lane V/C Ratio	-	-	-	0.016	0.126	0.022	-	-
HCM Control Delay (s)	0	-	-	10.8	10.1	7.5	0	-
HCM Lane LOS	A	-	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.4	0.1	-	-

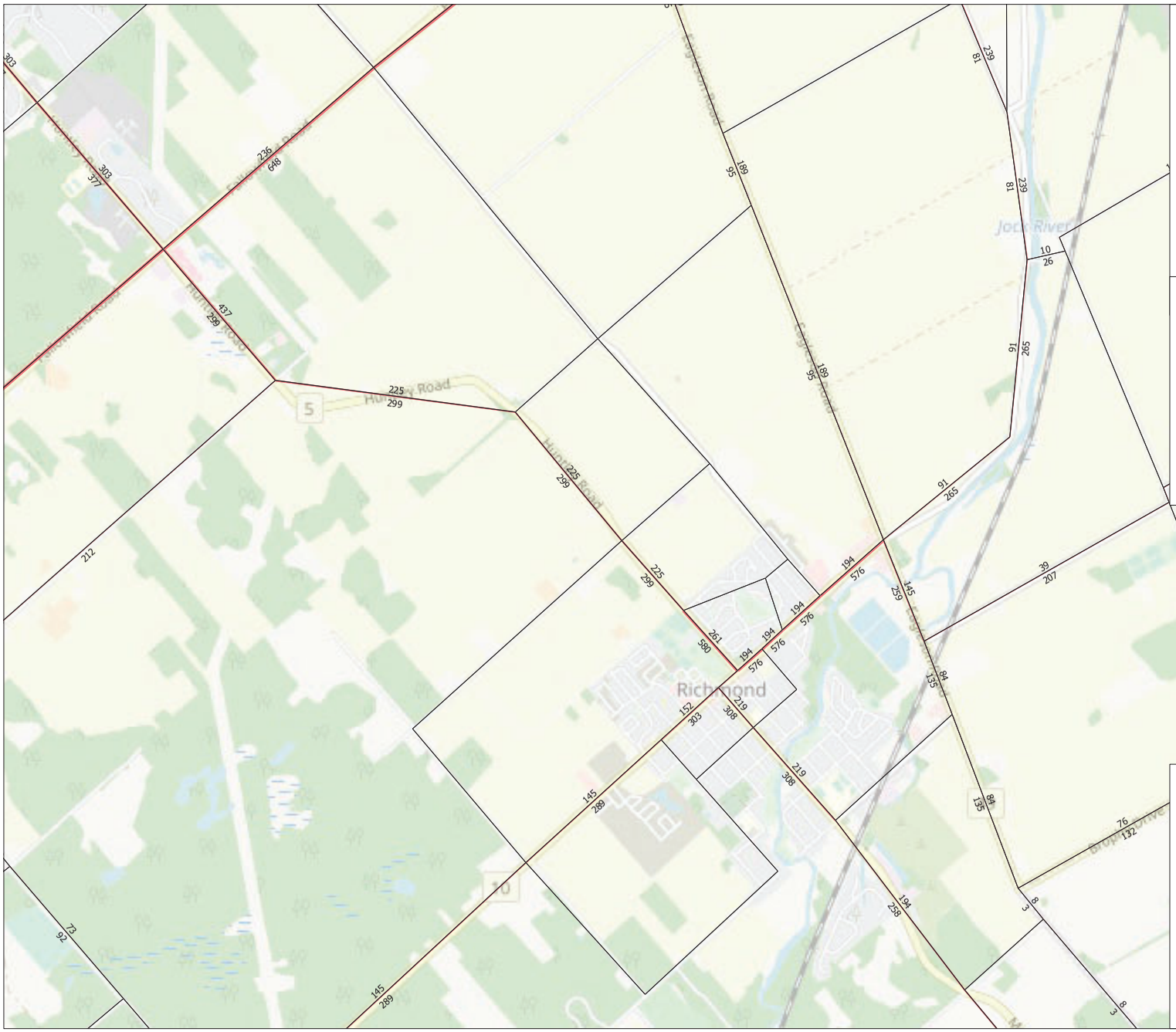
Appendix D

Collision Data

Record	Location	X	Y	Date	Time	Environment	Road_Surface	Traffic_Control	Collision_Location	Light	Collision_Classification	Impact_type	
287	EAGLESON RD/MCCORDICK RD @ BROPHY DR	359087.428	5004726.052	2014-02-16	10:18	01 - Clear	05 - Packed snow	02 - Stop sign	02 - Intersection related	01 - Daylight	02 - Non-fatal injury	07 - SMV other	
10657	MCBEAN ST btwn RICHLAND DR & DOBSON LANE	358342.4968	5004225.451	2014-10-07	20:34	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	07 - Dark	03 - P.D. only	07 - SMV other	
988	MCBEAN ST btwn BURKE ST & OTTAWA ST	357583.7675	5005326.074	2015-03-23	14:37	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	01 - Daylight	02 - Non-fatal injury	07 - SMV other	
3276	EAGLESON RD btwn OTTAWA ST & BROPHY DR	358990.6882	5004974.852	2015-02-08	12:14	01 - Clear	06 - Ice	10 - No control	01 - Non intersection	01 - Daylight	03 - P.D. only	04 - Sideswipe	
6553	MCBEAN ST btwn BURKE ST & OTTAWA ST	357465.1034	5005451.823	2015-01-13	14:15	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	01 - Daylight	03 - P.D. only	06 - SMV unattended vehicle	
7723	EAGLESON RD btwn BARNSDALE RD & OTTAWA ST	358395.9861	5006483.818	2015-02-28	13:09	01 - Clear	01 - Dry	08 - Traffic gate	05 - At railway crossing	01 - Daylight	03 - P.D. only	07 - SMV other	
7740	EAGLESON RD @ OTTAWA ST	358562.626	5006062.705	2015-05-13	9:19	01 - Clear	01 - Dry	02 - Stop sign	03 - At intersection	01 - Daylight	03 - P.D. only	05 - Turning movement	
10745	MCBEAN ST btwn BURKE ST & OTTAWA ST	357590.8399	5005317.951	2015-09-19	4:28	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	07 - Dark	03 - P.D. only	07 - SMV other	
12430	EAGLESON RD btwn BARNSDALE RD & OTTAWA ST	358423.3082	5006426.684	2015-11-20	7:31	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	01 - Daylight	03 - P.D. only	07 - SMV other	
4569	EAGLESON RD btwn OTTAWA ST & BROPHY DR	359058.0046	5004793.654	2016-03-26	22:18	01 - Clear	01 - Dry	10 - No control	04 - At/near private drive	07 - Dark	03 - P.D. only	03 - Rear end	
4570	EAGLESON RD btwn OTTAWA ST & BROPHY DR	358572.9443	5006036.22	2016-10-07	6:44	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	03 - Dawn	03 - P.D. only	07 - SMV other	
9489	MCBEAN ST btwn BURKE ST & OTTAWA ST	357513.4063	5005401.197	2016-05-30	18:27	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	01 - Daylight	03 - P.D. only	04 - Sideswipe	
9490	MCBEAN ST btwn RICHLAND DR & DOBSON LANE	358266.7522	5004368.355	2016-04-19	15:53	01 - Clear	01 - Dry	10 - No control	04 - At/near private drive	01 - Daylight	02 - Non-fatal injury	05 - Turning movement	
10681	OTTAWA ST btwn COLONEL MURRAY ST & COCKBURN ST	357855.2994	5005409.021	2016-11-29	0:21	07 - Fog, mist, sm	02 - Wet	10 - No control	01 - Non intersection	07 - Dark	02 - Non-fatal injury	05 - Turning movement	
4748	EAGLESON RD btwn OTTAWA ST & BROPHY DR	358976.37643	5005004.90015	2017-07-29	3:10	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	07 - Dark	02 - Non-fatal injury	04 - Sideswipe	
4749	EAGLESON RD btwn OTTAWA ST & BROPHY DR	358634.75715	5005877.09920	2017-01-04	8:24	03 - Snow	06 - Ice	10 - No control	01 - Non intersection	01 - Daylight	02 - Non-fatal injury	01 - Approaching	
10001	MCBEAN ST @ OTTAWA ST	357662.29504	5005236.34540	2017-04-25	7:58	01 - Clear	01 - Dry	02 - Stop sign	03 - At intersection	01 - Daylight	03 - P.D. only	07 - SMV other	
10002	MCBEAN ST @ OTTAWA ST	357661.10070	5005236.10645	2017-09-21	11:00	01 - Clear	01 - Dry	02 - Stop sign	03 - At intersection	01 - Daylight	03 - P.D. only	02 - Angle	
10005	MCBEAN ST btwn RICHLAND DR & DOBSON LANE	358235.18338	5004430.38716	2017-11-29	16:06	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	01 - Daylight	03 - P.D. only	07 - SMV other	
11197	OTTAWA ST btwn KING ST & EAGLESON RD	358064.28616	5005611.93193	2017-06-13	16:37	01 - Clear	01 - Dry	10 - No control	05 - At railway crossing	01 - Daylight	03 - P.D. only	07 - SMV other	
7202	MCBEAN ST @ OTTAWA ST	357660.62252	5005236.34584	2018-08-08	13:01	01 - Clear	01 - Dry	02 - Stop sign	03 - At intersection	01 - Daylight	02 - Non-fatal injury	02 - Angle	0
8326	EAGLESON RD/MCCORDICK RD @ BROPHY DR	359085.50590	5004722.36158	2018-09-15	14:19	01 - Clear	01 - Dry	02 - Stop sign	02 - Intersection related	01 - Daylight	02 - Non-fatal injury	07 - SMV other	0
8895	EAGLESON RD/MCCORDICK RD @ BROPHY DR	359085.62755	5004722.32553	2018-09-29	20:30	01 - Clear	01 - Dry	02 - Stop sign	02 - Intersection related	07 - Dark	03 - P.D. only	07 - SMV other	0
9166	EAGLESON RD btwn BARNSDALE RD & OTTAWA ST	358411.66237	5006441.12126	2018-10-09	7:56	07 - Fog, mist, sm	02 - Wet	10 - No control	05 - At railway crossing	01 - Daylight	03 - P.D. only	07 - SMV other	0

Appendix E

TRANS Model Plots



TRANS Regional Model

Version 2.13 - Assigned December 11, 2019

AM Peak Hour Total Traffic Volume

Richmond Area

2011 Model - Base Scenario

No Modifications from Base Version

User Initials: MM
Plot Prepared: April 21, 2020
EMME Scenario: 21311

Legend

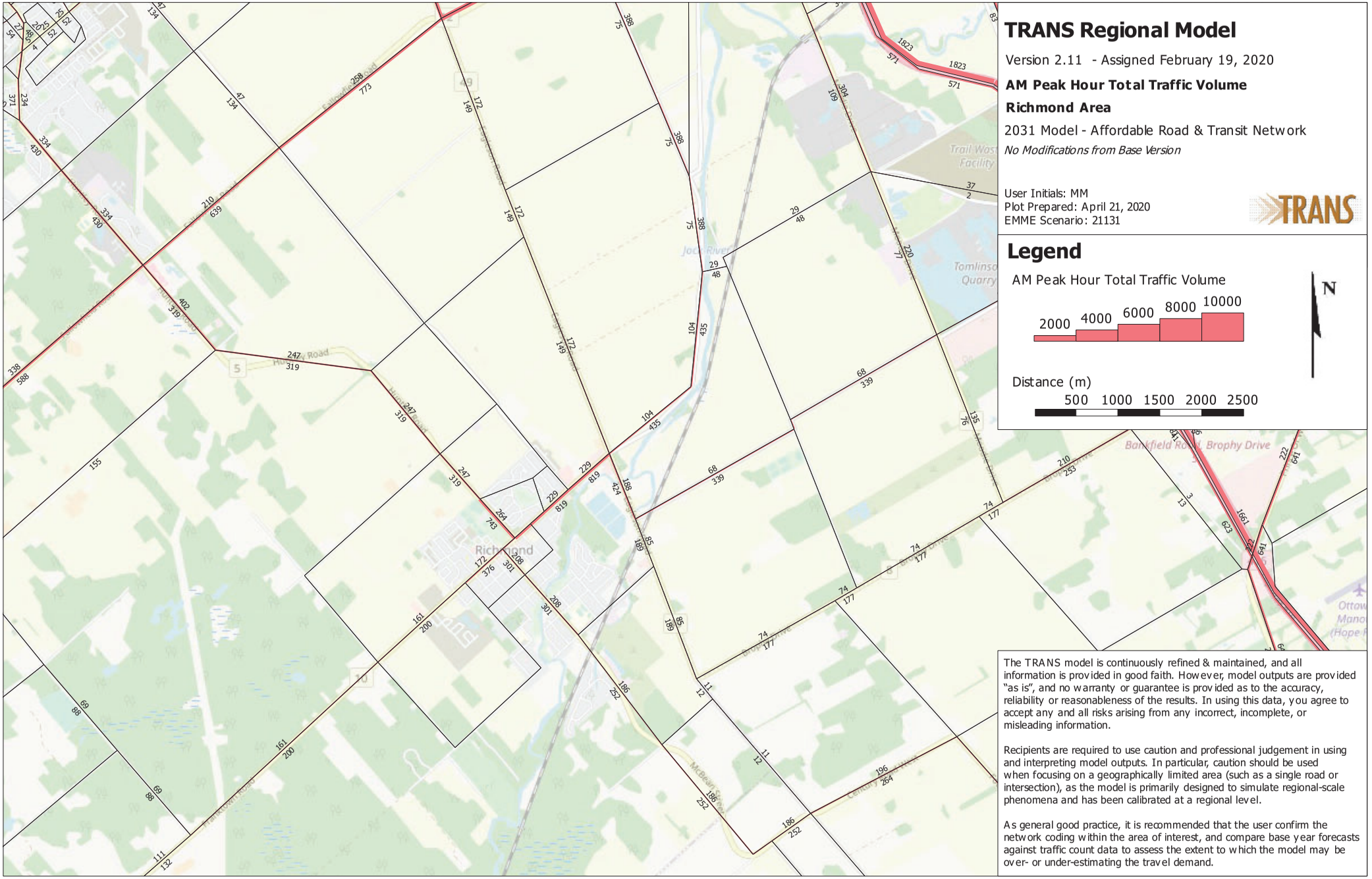
AM Peak Hour Total Traffic Volume

2000 4000 6000 8000 10000

Distance (m)

500 1000 1500 2000

N



TRANS Regional Model

Version 2.11 - Assigned February 19, 2020

AM Peak Hour Total Traffic Volume

Richmond Area

2031 Model - Affordable Road & Transit Network

No Modifications from Base Version

User Initials: MM
Plot Prepared: April 21, 2020
EMME Scenario: 21131

Legend

AM Peak Hour Total Traffic Volume

2000 4000 6000 8000 10000

N

Distance (m)

500 1000 1500 2000 2500

The TRANS model is continuously refined & maintained, and all information is provided in good faith. However, model outputs are provided "as is", and no warranty or guarantee is provided as to the accuracy, reliability or reasonableness of the results. In using this data, you agree to accept any and all risks arising from any incorrect, incomplete, or misleading information.

Recipients are required to use caution and professional judgement in using and interpreting model outputs. In particular, caution should be used when focusing on a geographically limited area (such as a single road or intersection), as the model is primarily designed to simulate regional-scale phenomena and has been calibrated at a regional level.

As general good practice, it is recommended that the user confirm the network coding within the area of interest, and compare base year forecasts against traffic count data to assess the extent to which the model may be over- or under-estimating the travel demand.

Appendix F

Synchro Intersection Worksheets – 2032 Future Background Conditions

Intersection	
Int Delay, s/veh	3.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	124	31	47	311	338	72
Future Vol, veh/h	124	31	47	311	338	72
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	124	31	47	311	338	72

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	779	374	410	0	-	0
Stage 1	374	-	-	-	-	-
Stage 2	405	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	364	672	1149	-	-	-
Stage 1	696	-	-	-	-	-
Stage 2	673	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	346	672	1149	-	-	-
Mov Cap-2 Maneuver	346	-	-	-	-	-
Stage 1	662	-	-	-	-	-
Stage 2	673	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	20.6	1.1	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1149	-	383	-	-
HCM Lane V/C Ratio	0.041	-	0.405	-	-
HCM Control Delay (s)	8.3	0	20.6	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.1	-	1.9	-	-

Intersection	
Intersection Delay, s/veh	11.1
Intersection LOS	B

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	187	183	22	291	88
Future Vol, veh/h	5	187	183	22	291	88
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	187	183	22	291	88
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	9.4	9.6	12.7
HCM LOS	A	A	B

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	3%	77%
Vol Thru, %	89%	0%	23%
Vol Right, %	11%	97%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	205	192	379
LT Vol	0	5	291
Through Vol	183	0	88
RT Vol	22	187	0
Lane Flow Rate	205	192	379
Geometry Grp	1	1	1
Degree of Util (X)	0.272	0.251	0.504
Departure Headway (Hd)	4.775	4.709	4.784
Convergence, Y/N	Yes	Yes	Yes
Cap	746	758	750
Service Time	2.838	2.77	2.84
HCM Lane V/C Ratio	0.275	0.253	0.505
HCM Control Delay	9.6	9.4	12.7
HCM Lane LOS	A	A	B
HCM 95th-tile Q	1.1	1	2.9

Intersection	
Int Delay, s/veh	4.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	10	0	25	1	60	1	84	18	55	56	2
Future Vol, veh/h	4	10	0	25	1	60	1	84	18	55	56	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	10	0	25	1	60	1	84	18	55	56	2

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	293	271	57	267	263	93	58	0	0	102	0	0
Stage 1	167	167	-	95	95	-	-	-	-	-	-	-
Stage 2	126	104	-	172	168	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	659	636	1009	686	642	964	1546	-	-	1490	-	-
Stage 1	835	760	-	912	816	-	-	-	-	-	-	-
Stage 2	878	809	-	830	759	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	599	611	1009	657	617	964	1546	-	-	1490	-	-
Mov Cap-2 Maneuver	599	611	-	657	617	-	-	-	-	-	-	-
Stage 1	834	731	-	911	815	-	-	-	-	-	-	-
Stage 2	822	808	-	788	730	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.1	9.7	0.1	3.7
HCM LOS	B	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1546	-	-	608	844	1490	-	-
HCM Lane V/C Ratio	0.001	-	-	0.023	0.102	0.037	-	-
HCM Control Delay (s)	7.3	0	-	11.1	9.7	7.5	0	-
HCM Lane LOS	A	A	-	B	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.3	0.1	-	-

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰			↑	↑	
Traffic Vol, veh/h	61	35	43	432	371	112
Future Vol, veh/h	61	35	43	432	371	112
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	61	35	43	432	371	112

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	945	427	483	0	-	0
Stage 1	427	-	-	-	-	-
Stage 2	518	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	291	628	1080	-	-	-
Stage 1	658	-	-	-	-	-
Stage 2	598	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	276	628	1080	-	-	-
Mov Cap-2 Maneuver	276	-	-	-	-	-
Stage 1	624	-	-	-	-	-
Stage 2	598	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	19.3	0.8	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1080	-	347	-	-
HCM Lane V/C Ratio	0.04	-	0.277	-	-
HCM Control Delay (s)	8.5	0	19.3	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.1	-	1.1	-	-

Intersection	
Intersection Delay, s/veh	13.6
Intersection LOS	B

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	27	342	139	9	208	203
Future Vol, veh/h	27	342	139	9	208	203
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	27	342	139	9	208	203
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	12.7	10.1	15.7
HCM LOS	B	B	C

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	7%	51%
Vol Thru, %	94%	0%	49%
Vol Right, %	6%	93%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	148	369	411
LT Vol	0	27	208
Through Vol	139	0	203
RT Vol	9	342	0
Lane Flow Rate	148	369	411
Geometry Grp	1	1	1
Degree of Util (X)	0.225	0.502	0.597
Departure Headway (Hd)	5.472	4.9	5.231
Convergence, Y/N	Yes	Yes	Yes
Cap	656	742	690
Service Time	3.512	2.9	3.262
HCM Lane V/C Ratio	0.226	0.497	0.596
HCM Control Delay	10.1	12.7	15.7
HCM Lane LOS	B	B	C
HCM 95th-tile Q	0.9	2.8	4

Intersection	
Int Delay, s/veh	3.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	4	1	26	13	52	0	110	16	30	109	5
Future Vol, veh/h	4	4	1	26	13	52	0	110	16	30	109	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	4	1	26	13	52	0	110	16	30	109	5

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	323	298	112	292	292	118	114	0	0	126	0	0
Stage 1	172	172	-	118	118	-	-	-	-	-	-	-
Stage 2	151	126	-	174	174	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	630	614	941	660	619	934	1475	-	-	1460	-	-
Stage 1	830	756	-	887	798	-	-	-	-	-	-	-
Stage 2	851	792	-	828	755	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	575	600	941	645	605	934	1475	-	-	1460	-	-
Mov Cap-2 Maneuver	575	600	-	645	605	-	-	-	-	-	-	-
Stage 1	830	739	-	887	798	-	-	-	-	-	-	-
Stage 2	791	792	-	805	738	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11	10.3	0	1.6
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1475	-	-	613	775	1460	-	-
HCM Lane V/C Ratio	-	-	-	0.015	0.117	0.021	-	-
HCM Control Delay (s)	0	-	-	11	10.3	7.5	0	-
HCM Lane LOS	A	-	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.4	0.1	-	-

Appendix G

Synchro Intersection Worksheets – 2037 Future Background Conditions

HCM 6th TWSC
1: Eagleson & Ottawa 01-06-2021

Intersection	
Int Delay, s/veh	4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	124	31	47	326	388	72
Future Vol, veh/h	124	31	47	326	388	72
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	124	31	47	326	388	72

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	844	424	460	0	-	0
Stage 1	424	-	-	-	-	-
Stage 2	420	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	334	630	1101	-	-	-
Stage 1	660	-	-	-	-	-
Stage 2	663	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	317	630	1101	-	-	-
Mov Cap-2 Maneuver	317	-	-	-	-	-
Stage 1	626	-	-	-	-	-
Stage 2	663	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	23	1.1	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1101	-	352	-	-
HCM Lane V/C Ratio	0.043	-	0.44	-	-
HCM Control Delay (s)	8.4	0	23	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.1	-	2.2	-	-

HCM 6th AWSC
2: McCordick/Eagleson & Brophy 01-06-2021

Intersection	
Intersection Delay, s/veh	12.3
Intersection LOS	B

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	196	192	22	334	102
Future Vol, veh/h	5	196	192	22	334	102
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	196	192	22	334	102
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	9.8	10	14.6
HCM LOS	A	A	B

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	2%	77%
Vol Thru, %	90%	0%	23%
Vol Right, %	10%	98%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	214	201	436
LT Vol	0	5	334
Through Vol	192	0	102
RT Vol	22	196	0
Lane Flow Rate	214	201	436
Geometry Grp	1	1	1
Degree of Util (X)	0.29	0.272	0.585
Departure Headway (Hd)	4.883	4.866	4.831
Convergence, Y/N	Yes	Yes	Yes
Cap	728	732	741
Service Time	2.963	2.939	2.9
HCM Lane V/C Ratio	0.294	0.275	0.588
HCM Control Delay	10	9.8	14.6
HCM Lane LOS	A	A	B
HCM 95th-tile Q	1.2	1.1	3.8

Intersection	
Int Delay, s/veh	4.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	10	0	25	1	60	1	88	18	55	65	2
Future Vol, veh/h	4	10	0	25	1	60	1	88	18	55	65	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	10	0	25	1	60	1	88	18	55	65	2

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	306	284	66	280	276	97	67	0	0	106	0	0
Stage 1	176	176	-	99	99	-	-	-	-	-	-	-
Stage 2	130	108	-	181	177	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	646	625	998	672	632	959	1535	-	-	1485	-	-
Stage 1	826	753	-	907	813	-	-	-	-	-	-	-
Stage 2	874	806	-	821	753	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	587	601	998	644	607	959	1535	-	-	1485	-	-
Mov Cap-2 Maneuver	587	601	-	644	607	-	-	-	-	-	-	-
Stage 1	825	724	-	906	812	-	-	-	-	-	-	-
Stage 2	817	805	-	779	724	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.2	9.8	0.1	3.4
HCM LOS	B	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1535	-	-	597	835	1485	-	-
HCM Lane V/C Ratio	0.001	-	-	0.023	0.103	0.037	-	-
HCM Control Delay (s)	7.3	0	-	11.2	9.8	7.5	0	-
HCM Lane LOS	A	A	-	B	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.3	0.1	-	-

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰			↑	↑	
Traffic Vol, veh/h	61	35	43	498	390	112
Future Vol, veh/h	61	35	43	498	390	112
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	61	35	43	498	390	112

Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	1030	446	502	0	-	0
Stage 1	446	-	-	-	-	-
Stage 2	584	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	259	612	1062	-	-	-
Stage 1	645	-	-	-	-	-
Stage 2	557	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	244	612	1062	-	-	-
Mov Cap-2 Maneuver	244	-	-	-	-	-
Stage 1	609	-	-	-	-	-
Stage 2	557	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	21.5	0.7	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1062	-	313	-	-
HCM Lane V/C Ratio	0.04	-	0.307	-	-
HCM Control Delay (s)	8.5	0	21.5	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.1	-	1.3	-	-

Intersection	
Intersection Delay, s/veh	15.6
Intersection LOS	C

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	27	393	161	9	218	214
Future Vol, veh/h	27	393	161	9	218	214
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	27	393	161	9	218	214
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	14.9	10.9	18.2
HCM LOS	B	B	C

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	6%	50%
Vol Thru, %	95%	0%	50%
Vol Right, %	5%	94%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	170	420	432
LT Vol	0	27	218
Through Vol	161	0	214
RT Vol	9	393	0
Lane Flow Rate	170	420	432
Geometry Grp	1	1	1
Degree of Util (X)	0.27	0.585	0.654
Departure Headway (Hd)	5.715	5.017	5.446
Convergence, Y/N	Yes	Yes	Yes
Cap	627	718	661
Service Time	3.764	3.062	3.483
HCM Lane V/C Ratio	0.271	0.585	0.654
HCM Control Delay	10.9	14.9	18.2
HCM Lane LOS	B	B	C
HCM 95th-tile Q	1.1	3.8	4.8

Intersection	
Int Delay, s/veh	3.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	4	1	26	13	52	0	128	16	30	115	5
Future Vol, veh/h	4	4	1	26	13	52	0	128	16	30	115	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	4	1	26	13	52	0	128	16	30	115	5

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	347	322	118	316	316	136	120	0	0	144	0	0
Stage 1	178	178	-	136	136	-	-	-	-	-	-	-
Stage 2	169	144	-	180	180	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	607	595	934	637	600	913	1468	-	-	1438	-	-
Stage 1	824	752	-	867	784	-	-	-	-	-	-	-
Stage 2	833	778	-	822	750	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	554	582	934	622	587	913	1468	-	-	1438	-	-
Mov Cap-2 Maneuver	554	582	-	622	587	-	-	-	-	-	-	-
Stage 1	824	735	-	867	784	-	-	-	-	-	-	-
Stage 2	773	778	-	799	734	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.2	10.4	0	1.5
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1468	-	-	594	753	1438	-	-
HCM Lane V/C Ratio	-	-	-	0.015	0.121	0.021	-	-
HCM Control Delay (s)	0	-	-	11.2	10.4	7.6	0	-
HCM Lane LOS	A	-	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.4	0.1	-	-

Appendix H

MMLOS Analysis

Multi-Modal Level of Service - Intersections Form

Consultant	CGH Transportation Inc.	Project	2018-03
Scenario	Existing/Future	Date	2020-12-24
Comments			

INTERSECTIONS		Eagleson Road at Ottawa Street			
	Crossing Side	NORTH	SOUTH	EAST	WEST
Pedestrian	Lanes				3
	Median				No Median - 2.4 m
	Conflicting Left Turns				Permissive
	Conflicting Right Turns				Permissive or yield control
	Right Turns on Red (RToR) ?				RTOR allowed
	Ped Signal Leading Interval?				No
	Right Turn Channel				No Channel
	Corner Radius				3-5m
	Crosswalk Type				Std transverse markings
	PETSI Score				72
	Ped. Exposure to Traffic LoS	-	-	-	C
	Cycle Length				
	Effective Walk Time				
	Average Pedestrian Delay				
	Pedestrian Delay LoS	-	-	-	-
	Level of Service	-	-	-	C
		C			
	Approach From	NORTH	SOUTH	EAST	WEST
Bicycle	Bicycle Lane Arrangement on Approach	Pocket Bike Lane			
	Right Turn Lane Configuration	≤ 50 m Introduced right turn lane			
	Right Turning Speed	≤ 25 km/h			
	Cyclist relative to RT motorists	B	A	-	-
	Separated or Mixed Traffic	Separated	-	-	-
	Left Turn Approach		No lane crossed		
	Operating Speed		≥ 60 km/h		
	Left Turning Cyclist	A	C	-	-
	Level of Service	B	C	-	-
		C			
Transit	Average Signal Delay				
	Level of Service	-	-	-	-
		-			
Truck	Effective Corner Radius	< 10 m			< 10 m
	Number of Receiving Lanes on Departure from Intersection	1			1
	Level of Service	F	-	-	F
		F			
Auto	Volume to Capacity Ratio		0.0 - 0.60		
	Level of Service		A		

Multi-Modal Level of Service - Segments Form

Consultant	CGH Transportation Inc.	Project	2018-03
Scenario	Existing/Future	Date	2020-12-24
Comments			

SEGMENTS		Street A	McBean	Eagleson	Ottawa
			1	2	3
Pedestrian	Sidewalk Width Boulevard Width	-	no sidewalk n/a	no sidewalk n/a	no sidewalk n/a
	Avg Daily Curb Lane Traffic Volume		≤ 3000	> 3000	≤ 3000
	Operating Speed On-Street Parking		> 60 km/h no	> 60 km/h no	> 50 to 60 km/h no
	Exposure to Traffic PLoS		F	F	F
	Effective Sidewalk Width				
	Pedestrian Volume				
	Crowding PLoS		-	-	-
	Level of Service		-	-	-
Bicycle	Type of Cycling Facility	F	Mixed Traffic	Mixed Traffic	Mixed Traffic
	Number of Travel Lanes		2-3 lanes total	2-3 lanes total	2-3 lanes total
	Operating Speed		≥ 60 km/h	≥ 60 km/h	≥ 50 to 60 km/h
	# of Lanes & Operating Speed LoS		F	F	E
	Bike Lane (+ Parking Lane) Width				
	Bike Lane Width LoS		-	-	-
	Bike Lane Blockages				
	Blockage LoS		-	-	-
	Median Refuge Width (no median = < 1.8 m)		< 1.8 m refuge	< 1.8 m refuge	< 1.8 m refuge
	No. of Lanes at Unsignalized Crossing		≤ 3 lanes	≤ 3 lanes	≤ 3 lanes
	Sidestreet Operating Speed		>40 to 50 km/h	≤ 40 km/h	≤ 40 km/h
	Unsignalized Crossing - Lowest LoS		B	A	A
	Level of Service		F	F	E
Transit	Facility Type	-			
	Friction or Ratio Transit:Posted Speed				
	Level of Service		-	-	-
Truck	Truck Lane Width	C	≤ 3.5 m	> 3.7 m	> 3.7 m
	Travel Lanes per Direction		1	1	1
	Level of Service		C	B	B

Appendix I

Signal Warrants

Eagleson Rd @ Ottawa St
2032 FT

Justification #7

Justification	Description	Minimum Requirement 1 Lane Highway		Minimum Requirement 2 or More Lanes		Compliance Sectional		Compliance Entire %	Signal
		Free Flow	Restr. Flow	Free Flow	Restr. Flow	Numerical	%		
1. Minimum Vehicular Volume	A. Vehicle volume, all approaches (average hour)	480	720	600	900	720	150%	122%	Yes
	B. Vehicle volume, along minor streets (average hour)	120	170	120	170	146	122%		
2. Delay to Cross Traffic	A. Vehicle volumes, major street (average hour)	480	720	600	900	622	130%	130%	Yes
	B. Combined vehicle and pedestrian volume crossing artery from minor streets (average hour)	50	75	50	75	76	153%		

Notes
1. Refer to OTM Book 12, pg 88, Nov 2007
2. Lowest section percentage governs justification
3. Average hourly volumes estimated from peak hour volumes, AHV = PM/2 or (AM + PM) / 4
4. T-intersection factor corrected, applies only to 1B

Eagleson Rd @ New Collector
2037 FT

Justification #7

Justification	Description	Minimum Requirement 1 Lane Highway		Minimum Requirement 2 or More Lanes		Compliance Sectional		Compliance Entire %	Signal
		Free Flow	Restr. Flow	Free Flow	Restr. Flow	Numerical	%		
1. Minimum Vehicular Volume	A. Vehicle volume, all approaches (average hour)	480	720	600	900	644	134%	120%	No
	B. Vehicle volume, along minor streets (average hour)	120	170	120	170	144	120%		
2. Delay to Cross Traffic	A. Vehicle volumes, major street (average hour)	480	720	600	900	548	114%	114%	No
	B. Combined vehicle and pedestrian volume crossing artery from minor streets (average hour)	50	75	50	75	74	148%		

Notes
1. Refer to OTM Book 12, pg 88, Nov 2007
2. Lowest section percentage governs justification
3. Average hourly volumes estimated from peak hour volumes, AHV = PM/2 or (AM + PM) / 4
4. T-intersection factor corrected, applies only to 1B

Appendix J

Synchro Intersection Worksheets – 2032 Future Total Conditions

Intersection	
Int Delay, s/veh	14.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	184	35	51	503	463	113
Future Vol, veh/h	184	35	51	503	463	113
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	184	35	51	503	463	113

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1125	520	576	0	-	0
Stage 1	520	-	-	-	-	-
Stage 2	605	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	227	556	997	-	-	-
Stage 1	597	-	-	-	-	-
Stage 2	545	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	211	556	997	-	-	-
Mov Cap-2 Maneuver	211	-	-	-	-	-
Stage 1	555	-	-	-	-	-
Stage 2	545	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	87.7	0.8	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	997	-	234	-	-
HCM Lane V/C Ratio	0.051	-	0.936	-	-
HCM Control Delay (s)	8.8	0	87.7	-	-
HCM Lane LOS	A	A	F	-	-
HCM 95th %tile Q(veh)	0.2	-	8.2	-	-

Intersection	
Intersection Delay, s/veh	13
Intersection LOS	B

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	224	194	22	347	105
Future Vol, veh/h	5	224	194	22	347	105
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	224	194	22	347	105
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	10.3	10.2	15.7
HCM LOS	B	B	C

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	2%	77%
Vol Thru, %	90%	0%	23%
Vol Right, %	10%	98%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	216	229	452
LT Vol	0	5	347
Through Vol	194	0	105
RT Vol	22	224	0
Lane Flow Rate	216	229	452
Geometry Grp	1	1	1
Degree of Util (X)	0.299	0.313	0.617
Departure Headway (Hd)	4.989	4.922	4.913
Convergence, Y/N	Yes	Yes	Yes
Cap	711	721	728
Service Time	3.086	3.007	2.995
HCM Lane V/C Ratio	0.304	0.318	0.621
HCM Control Delay	10.2	10.3	15.7
HCM Lane LOS	B	B	C
HCM 95th-tile Q	1.3	1.3	4.3

Intersection	
Int Delay, s/veh	3.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	10	0	25	1	116	1	252	18	92	166	2
Future Vol, veh/h	4	10	0	25	1	116	1	252	18	92	166	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	10	0	25	1	116	1	252	18	92	166	2

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	673	623	167	619	615	261	168	0	0	270	0	0
Stage 1	351	351	-	263	263	-	-	-	-	-	-	-
Stage 2	322	272	-	356	352	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	369	402	877	401	407	778	1410	-	-	1293	-	-
Stage 1	666	632	-	742	691	-	-	-	-	-	-	-
Stage 2	690	685	-	661	632	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	294	370	877	369	375	778	1410	-	-	1293	-	-
Mov Cap-2 Maneuver	294	370	-	369	375	-	-	-	-	-	-	-
Stage 1	665	583	-	741	690	-	-	-	-	-	-	-
Stage 2	586	684	-	599	583	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	15.9	12.1	0	2.8
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1410	-	-	345	647	1293	-	-
HCM Lane V/C Ratio	0.001	-	-	0.041	0.219	0.071	-	-
HCM Control Delay (s)	7.6	0	-	15.9	12.1	8	0	-
HCM Lane LOS	A	A	-	C	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.8	0.2	-	-

Intersection	
Int Delay, s/veh	3.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↕			↕	↕	
Traffic Vol, veh/h	155	37	45	119	56	64
Future Vol, veh/h	155	37	45	119	56	64
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	155	37	45	119	56	64

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	192	0	383	174
Stage 1	-	-	-	-	174	-
Stage 2	-	-	-	-	209	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1381	-	620	869
Stage 1	-	-	-	-	856	-
Stage 2	-	-	-	-	826	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1381	-	598	869
Mov Cap-2 Maneuver	-	-	-	-	598	-
Stage 1	-	-	-	-	856	-
Stage 2	-	-	-	-	797	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.1	11
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	717	-	-	1381	-
HCM Lane V/C Ratio	0.167	-	-	0.033	-
HCM Control Delay (s)	11	-	-	7.7	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.6	-	-	0.1	-

Intersection						
Int Delay, s/veh	6.2					

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	168	50	33	365	385	110
Future Vol, veh/h	168	50	33	365	385	110
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	500	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	168	50	33	365	385	110

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	871	440	495	0	-	0
Stage 1	440	-	-	-	-	-
Stage 2	431	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	322	617	1069	-	-	-
Stage 1	649	-	-	-	-	-
Stage 2	655	-	-	-	-	-
Platoon blocked, %					-	-
Mov Cap-1 Maneuver	312	617	1069	-	-	-
Mov Cap-2 Maneuver	312	-	-	-	-	-
Stage 1	629	-	-	-	-	-
Stage 2	655	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	30.5	0.7	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1069	-	352	-	-
HCM Lane V/C Ratio	0.031	-	0.619	-	-
HCM Control Delay (s)	8.5	-	30.5	-	-
HCM Lane LOS	A	-	D	-	-
HCM 95th %tile Q(veh)	0.1	-	3.9	-	-

Intersection						
Int Delay, s/veh	5.3					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	11	168	106	7	110	94
Future Vol, veh/h	11	168	106	7	110	94
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	500	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	168	106	7	110	94

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	424	110	0	0	113	0
Stage 1	110	-	-	-	-	-
Stage 2	314	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	587	943	-	-	1476	-
Stage 1	915	-	-	-	-	-
Stage 2	741	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	543	943	-	-	1476	-
Mov Cap-2 Maneuver	543	-	-	-	-	-
Stage 1	915	-	-	-	-	-
Stage 2	685	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10	0	4.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	902	1476	-
HCM Lane V/C Ratio	-	-	0.198	0.075	-
HCM Control Delay (s)	-	-	10	7.6	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.7	0.2	-

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	28	22	15	349	363	18
Future Vol, veh/h	28	22	15	349	363	18
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	28	22	15	349	363	18

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	751	372	381	0	-	0
Stage 1	372	-	-	-	-	-
Stage 2	379	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	378	674	1177	-	-	-
Stage 1	697	-	-	-	-	-
Stage 2	692	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	372	674	1177	-	-	-
Mov Cap-2 Maneuver	372	-	-	-	-	-
Stage 1	686	-	-	-	-	-
Stage 2	692	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.7	0.3	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1177	-	463	-	-
HCM Lane V/C Ratio	0.013	-	0.108	-	-
HCM Control Delay (s)	8.1	0	13.7	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.4	-	-

Intersection	
Int Delay, s/veh	10.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	121	49	60	564	553	182
Future Vol, veh/h	121	49	60	564	553	182
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	121	49	60	564	553	182

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1328	644	735	0	-	0
Stage 1	644	-	-	-	-	-
Stage 2	684	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	171	473	870	-	-	-
Stage 1	523	-	-	-	-	-
Stage 2	501	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	154	473	870	-	-	-
Mov Cap-2 Maneuver	154	-	-	-	-	-
Stage 1	471	-	-	-	-	-
Stage 2	501	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	89.4	0.9	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	870	-	191	-	-
HCM Lane V/C Ratio	0.069	-	0.89	-	-
HCM Control Delay (s)	9.4	0	89.4	-	-
HCM Lane LOS	A	A	F	-	-
HCM 95th %tile Q(veh)	0.2	-	6.8	-	-

Intersection	
Intersection Delay, s/veh	17.3
Intersection LOS	C

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	27	398	156	9	251	216
Future Vol, veh/h	27	398	156	9	251	216
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	27	398	156	9	251	216
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	15.7	11	20.9
HCM LOS	C	B	C

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	6%	54%
Vol Thru, %	95%	0%	46%
Vol Right, %	5%	94%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	165	425	467
LT Vol	0	27	251
Through Vol	156	0	216
RT Vol	9	398	0
Lane Flow Rate	165	425	467
Geometry Grp	1	1	1
Degree of Util (X)	0.266	0.603	0.711
Departure Headway (Hd)	5.809	5.106	5.482
Convergence, Y/N	Yes	Yes	Yes
Cap	617	706	658
Service Time	3.865	3.156	3.523
HCM Lane V/C Ratio	0.267	0.602	0.71
HCM Control Delay	11	15.7	20.9
HCM Lane LOS	B	C	C
HCM 95th-tile Q	1.1	4.1	5.9

Intersection	
Int Delay, s/veh	3.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	4	1	26	13	95	0	238	16	86	277	5
Future Vol, veh/h	4	4	1	26	13	95	0	238	16	86	277	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	4	1	26	13	95	0	238	16	86	277	5

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	752	706	280	700	700	246	282	0	0	254	0	0
Stage 1	452	452	-	246	246	-	-	-	-	-	-	-
Stage 2	300	254	-	454	454	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	327	361	759	354	363	793	1280	-	-	1311	-	-
Stage 1	587	570	-	758	703	-	-	-	-	-	-	-
Stage 2	709	697	-	586	569	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	263	333	759	330	335	793	1280	-	-	1311	-	-
Mov Cap-2 Maneuver	263	333	-	330	335	-	-	-	-	-	-	-
Stage 1	587	526	-	758	703	-	-	-	-	-	-	-
Stage 2	613	697	-	535	525	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	16.8	13.4	0	1.9
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1280	-	-	315	564	1311	-	-
HCM Lane V/C Ratio	-	-	-	0.029	0.238	0.066	-	-
HCM Control Delay (s)	0	-	-	16.8	13.4	7.9	0	-
HCM Lane LOS	A	-	-	C	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.9	0.2	-	-

Intersection	
Int Delay, s/veh	3.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	96	56	87	155	43	74
Future Vol, veh/h	96	56	87	155	43	74
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	96	56	87	155	43	74

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	152	0	453	124
Stage 1	-	-	-	-	124	-
Stage 2	-	-	-	-	329	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1429	-	565	927
Stage 1	-	-	-	-	902	-
Stage 2	-	-	-	-	729	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1429	-	527	927
Mov Cap-2 Maneuver	-	-	-	-	527	-
Stage 1	-	-	-	-	902	-
Stage 2	-	-	-	-	680	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.8	10.9
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	725	-	-	1429	-
HCM Lane V/C Ratio	0.161	-	-	0.061	-
HCM Control Delay (s)	10.9	-	-	7.7	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.6	-	-	0.2	-

Intersection	
Int Delay, s/veh	5.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	128	38	50	497	412	168
Future Vol, veh/h	128	38	50	497	412	168
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	500	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	128	38	50	497	412	168

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1093	496	580	0	-	0
Stage 1	496	-	-	-	-	-
Stage 2	597	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	237	574	994	-	-	-
Stage 1	612	-	-	-	-	-
Stage 2	550	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	225	574	994	-	-	-
Mov Cap-2 Maneuver	225	-	-	-	-	-
Stage 1	581	-	-	-	-	-
Stage 2	550	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	40.1	0.8	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	994	-	261	-	-
HCM Lane V/C Ratio	0.05	-	0.636	-	-
HCM Control Delay (s)	8.8	-	40.1	-	-
HCM Lane LOS	A	-	E	-	-
HCM 95th %tile Q(veh)	0.2	-	3.9	-	-

Intersection	
Int Delay, s/veh	4.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	9	128	135	11	168	140
Future Vol, veh/h	9	128	135	11	168	140
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	9	128	135	11	168	140

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	617	141	0	0	146	0
Stage 1	141	-	-	-	-	-
Stage 2	476	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	453	907	-	-	1436	-
Stage 1	886	-	-	-	-	-
Stage 2	625	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	395	907	-	-	1436	-
Mov Cap-2 Maneuver	395	-	-	-	-	-
Stage 1	886	-	-	-	-	-
Stage 2	546	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.1	0	4.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	836	1436	-
HCM Lane V/C Ratio	-	-	0.164	0.117	-
HCM Control Delay (s)	-	-	10.1	7.8	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.6	0.4	-

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	21	17	22	476	397	28
Future Vol, veh/h	21	17	22	476	397	28
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	21	17	22	476	397	28

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	931	411	425	0	-	0
Stage 1	411	-	-	-	-	-
Stage 2	520	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	296	641	1134	-	-	-
Stage 1	669	-	-	-	-	-
Stage 2	597	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	288	641	1134	-	-	-
Mov Cap-2 Maneuver	288	-	-	-	-	-
Stage 1	652	-	-	-	-	-
Stage 2	597	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	15.5	0.4	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1134	-	382	-	-
HCM Lane V/C Ratio	0.019	-	0.099	-	-
HCM Control Delay (s)	8.2	0	15.5	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.1	-	0.3	-	-

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	184	35	51	503	463	113
Future Volume (vph)	184	35	51	503	463	113
Satd. Flow (prot)	1658	1483	1658	1745	1745	1483
Flt Permitted	0.950		0.477			
Satd. Flow (perm)	1658	1483	832	1745	1745	1483
Satd. Flow (RTOR)		35				113
Lane Group Flow (vph)	184	35	51	503	463	113
Turn Type	Perm	Perm	Perm	NA	NA	Perm
Protected Phases				2	6	
Permitted Phases	4	4	2			6
Detector Phase	4	4	2	2	6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	15.0	15.0	23.5	23.5	15.5	15.5
Total Split (s)	15.0	15.0	25.0	25.0	25.0	25.0
Total Split (%)	37.5%	37.5%	62.5%	62.5%	62.5%	62.5%
Yellow Time (s)	3.0	3.0	3.5	3.5	3.5	3.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.5	5.5	5.5	5.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	Max	Max	Max	Max
Act Effct Green (s)	10.0	10.0	23.6	23.6	23.6	23.6
Actuated g/C Ratio	0.25	0.25	0.59	0.59	0.59	0.59
v/c Ratio	0.44	0.09	0.10	0.49	0.45	0.12
Control Delay	16.7	6.0	6.4	9.1	8.6	2.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.7	6.0	6.4	9.1	8.6	2.1
LOS	B	A	A	A	A	A
Approach Delay	15.0			8.8	7.3	
Approach LOS	B			A	A	
Queue Length 50th (m)	10.5	0.0	1.7	21.7	19.4	0.0
Queue Length 95th (m)	23.1	4.2	5.4	42.1	37.6	4.7
Internal Link Dist (m)	108.8			438.0	591.1	
Turn Bay Length (m)		45.0	50.0			45.0
Base Capacity (vph)	414	397	490	1029	1029	921
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.44	0.09	0.10	0.49	0.45	0.12

Intersection Summary
Cycle Length: 40
Actuated Cycle Length: 40
Natural Cycle: 40
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.49

Intersection Signal Delay: 9.2 Intersection LOS: A
Intersection Capacity Utilization 58.1% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 1: Eagleson & Ottawa

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	121	49	60	564	553	182
Future Volume (vph)	121	49	60	564	553	182
Satd. Flow (prot)	1658	1483	1658	1745	1745	1483
Flt Permitted	0.950		0.425			
Satd. Flow (perm)	1658	1483	742	1745	1745	1483
Satd. Flow (RTOR)		49				182
Lane Group Flow (vph)	121	49	60	564	553	182
Turn Type	Perm	Perm	Perm	NA	NA	Perm
Protected Phases				2	6	
Permitted Phases	4	4	2			6
Detector Phase	4	4	2	2	6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	15.0	15.0	15.5	15.5	23.5	23.5
Total Split (s)	15.0	15.0	25.0	25.0	25.0	25.0
Total Split (%)	37.5%	37.5%	62.5%	62.5%	62.5%	62.5%
Yellow Time (s)	3.0	3.0	3.5	3.5	3.5	3.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.5	5.5	5.5	5.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	Max	Max	Max	Max
Act Effct Green (s)	10.0	10.0	27.2	27.2	27.2	27.2
Actuated g/C Ratio	0.25	0.25	0.69	0.69	0.69	0.69
v/c Ratio	0.29	0.12	0.12	0.47	0.46	0.17
Control Delay	14.2	5.6	6.3	8.1	7.9	1.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.2	5.6	6.3	8.1	7.9	1.8
LOS	B	A	A	A	A	A
Approach Delay	11.7			7.9	6.4	
Approach LOS	B			A	A	
Queue Length 50th (m)	6.6	0.0	2.0	25.5	24.9	0.0
Queue Length 95th (m)	15.9	5.1	6.4	50.0	48.3	6.0
Internal Link Dist (m)	112.3			440.5	591.1	
Turn Bay Length (m)		45.0	50.0			45.0
Base Capacity (vph)	422	414	513	1208	1208	1083
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.29	0.12	0.12	0.47	0.46	0.17

Intersection Summary
Cycle Length: 40
Actuated Cycle Length: 39.3
Natural Cycle: 40
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.47

Intersection Signal Delay: 7.6 Intersection LOS: A
Intersection Capacity Utilization 60.7% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 1: Eagleson & Ottawa

Appendix K

Synchro Intersection Worksheets – 2037 Future Total Conditions

Intersection	
Int Delay, s/veh	18.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	184	35	51	518	513	113
Future Vol, veh/h	184	35	51	518	513	113
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	184	35	51	518	513	113

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1190	570	626	0	-	0
Stage 1	570	-	-	-	-	-
Stage 2	620	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	207	521	956	-	-	-
Stage 1	566	-	-	-	-	-
Stage 2	536	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	191	521	956	-	-	-
Mov Cap-2 Maneuver	191	-	-	-	-	-
Stage 1	524	-	-	-	-	-
Stage 2	536	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	116.9	0.8	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	956	-	213	-	-
HCM Lane V/C Ratio	0.053	-	1.028	-	-
HCM Control Delay (s)	9	0	116.9	-	-
HCM Lane LOS	A	A	F	-	-
HCM 95th %tile Q(veh)	0.2	-	9.4	-	-

Intersection	
Intersection Delay, s/veh	15.6
Intersection LOS	C

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	233	203	22	390	119
Future Vol, veh/h	5	233	203	22	390	119
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	233	203	22	390	119
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	10.9	10.8	20
HCM LOS	B	B	C

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	2%	77%
Vol Thru, %	90%	0%	23%
Vol Right, %	10%	98%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	225	238	509
LT Vol	0	5	390
Through Vol	203	0	119
RT Vol	22	233	0
Lane Flow Rate	225	238	509
Geometry Grp	1	1	1
Degree of Util (X)	0.326	0.343	0.719
Departure Headway (Hd)	5.223	5.183	5.085
Convergence, Y/N	Yes	Yes	Yes
Cap	689	693	718
Service Time	3.255	3.223	3.085
HCM Lane V/C Ratio	0.327	0.343	0.709
HCM Control Delay	10.8	10.9	20
HCM Lane LOS	B	B	C
HCM 95th-tile Q	1.4	1.5	6.2

Intersection	
Int Delay, s/veh	3.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	10	0	25	1	116	1	256	18	92	175	2
Future Vol, veh/h	4	10	0	25	1	116	1	256	18	92	175	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	10	0	25	1	116	1	256	18	92	175	2

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	686	636	176	632	628	265	177	0	0	274	0	0
Stage 1	360	360	-	267	267	-	-	-	-	-	-	-
Stage 2	326	276	-	365	361	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	362	395	867	393	400	774	1399	-	-	1289	-	-
Stage 1	658	626	-	738	688	-	-	-	-	-	-	-
Stage 2	687	682	-	654	626	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	289	363	867	361	368	774	1399	-	-	1289	-	-
Mov Cap-2 Maneuver	289	363	-	361	368	-	-	-	-	-	-	-
Stage 1	657	577	-	737	687	-	-	-	-	-	-	-
Stage 2	583	681	-	592	577	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	16.1	12.2	0	2.7
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1399	-	-	338	640	1289	-	-
HCM Lane V/C Ratio	0.001	-	-	0.041	0.222	0.071	-	-
HCM Control Delay (s)	7.6	0	-	16.1	12.2	8	0	-
HCM Lane LOS	A	A	-	C	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.8	0.2	-	-

Intersection	
Int Delay, s/veh	3.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↕			↕	↕	
Traffic Vol, veh/h	155	37	45	119	56	64
Future Vol, veh/h	155	37	45	119	56	64
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	155	37	45	119	56	64

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	192	0	383	174
Stage 1	-	-	-	-	174	-
Stage 2	-	-	-	-	209	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1381	-	620	869
Stage 1	-	-	-	-	856	-
Stage 2	-	-	-	-	826	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1381	-	598	869
Mov Cap-2 Maneuver	-	-	-	-	598	-
Stage 1	-	-	-	-	856	-
Stage 2	-	-	-	-	797	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.1	11
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	717	-	-	1381	-
HCM Lane V/C Ratio	0.167	-	-	0.033	-
HCM Control Delay (s)	11	-	-	7.7	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.6	-	-	0.1	-

Intersection						
Int Delay, s/veh	7.2					

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	168	50	33	383	443	110
Future Vol, veh/h	168	50	33	383	443	110
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	500	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	168	50	33	383	443	110

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	947	498	553	0	-	0
Stage 1	498	-	-	-	-	-
Stage 2	449	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	290	572	1017	-	-	-
Stage 1	611	-	-	-	-	-
Stage 2	643	-	-	-	-	-
Platoon blocked, %					-	-
Mov Cap-1 Maneuver	281	572	1017	-	-	-
Mov Cap-2 Maneuver	281	-	-	-	-	-
Stage 1	591	-	-	-	-	-
Stage 2	643	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	37.8	0.7	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1017	-	318	-	-
HCM Lane V/C Ratio	0.032	-	0.686	-	-
HCM Control Delay (s)	8.7	-	37.8	-	-
HCM Lane LOS	A	-	E	-	-
HCM 95th %tile Q(veh)	0.1	-	4.7	-	-

Intersection						
Int Delay, s/veh	5.1					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	11	168	111	7	110	109
Future Vol, veh/h	11	168	111	7	110	109
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	500	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	168	111	7	110	109

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	444	115	0	0	118	0
Stage 1	115	-	-	-	-	-
Stage 2	329	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	571	937	-	-	1470	-
Stage 1	910	-	-	-	-	-
Stage 2	729	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	528	937	-	-	1470	-
Mov Cap-2 Maneuver	528	-	-	-	-	-
Stage 1	910	-	-	-	-	-
Stage 2	674	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10	0	3.8
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	894	1470	-
HCM Lane V/C Ratio	-	-	0.2	0.075	-
HCM Control Delay (s)	-	-	10	7.6	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.7	0.2	-

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	28	22	15	367	421	18
Future Vol, veh/h	28	22	15	367	421	18
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	28	22	15	367	421	18

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	827	430	439	0	-	0
Stage 1	430	-	-	-	-	-
Stage 2	397	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	341	625	1121	-	-	-
Stage 1	656	-	-	-	-	-
Stage 2	679	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	335	625	1121	-	-	-
Mov Cap-2 Maneuver	335	-	-	-	-	-
Stage 1	645	-	-	-	-	-
Stage 2	679	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.7	0.3	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1121	-	421	-	-
HCM Lane V/C Ratio	0.013	-	0.119	-	-
HCM Control Delay (s)	8.3	0	14.7	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.4	-	-

Intersection	
Int Delay, s/veh	13.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	121	49	60	630	572	182
Future Vol, veh/h	121	49	60	630	572	182
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	121	49	60	630	572	182

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1413	663	754	0	-	0
Stage 1	663	-	-	-	-	-
Stage 2	750	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	152	461	856	-	-	-
Stage 1	512	-	-	-	-	-
Stage 2	467	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	136	461	856	-	-	-
Mov Cap-2 Maneuver	136	-	-	-	-	-
Stage 1	457	-	-	-	-	-
Stage 2	467	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	121.8	0.8	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	856	-	171	-	-
HCM Lane V/C Ratio	0.07	-	0.994	-	-
HCM Control Delay (s)	9.5	0	121.8	-	-
HCM Lane LOS	A	A	F	-	-
HCM 95th %tile Q(veh)	0.2	-	7.9	-	-

Intersection	
Intersection Delay, s/veh	21
Intersection LOS	C

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	27	449	178	9	261	227
Future Vol, veh/h	27	449	178	9	261	227
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	27	449	178	9	261	227
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	19.6	12	25.7
HCM LOS	C	B	D

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	6%	53%
Vol Thru, %	95%	0%	47%
Vol Right, %	5%	94%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	187	476	488
LT Vol	0	27	261
Through Vol	178	0	227
RT Vol	9	449	0
Lane Flow Rate	187	476	488
Geometry Grp	1	1	1
Degree of Util (X)	0.316	0.696	0.774
Departure Headway (Hd)	6.074	5.265	5.713
Convergence, Y/N	Yes	Yes	Yes
Cap	587	681	630
Service Time	4.152	3.332	3.773
HCM Lane V/C Ratio	0.319	0.699	0.775
HCM Control Delay	12	19.6	25.7
HCM Lane LOS	B	C	D
HCM 95th-tile Q	1.3	5.6	7.3

Intersection	
Int Delay, s/veh	3.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	4	1	26	13	95	0	256	16	86	283	5
Future Vol, veh/h	4	4	1	26	13	95	0	256	16	86	283	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	4	1	26	13	95	0	256	16	86	283	5

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	776	730	286	724	724	264	288	0	0	272	0	0
Stage 1	458	458	-	264	264	-	-	-	-	-	-	-
Stage 2	318	272	-	460	460	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	315	349	753	341	352	775	1274	-	-	1291	-	-
Stage 1	583	567	-	741	690	-	-	-	-	-	-	-
Stage 2	693	685	-	581	566	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	252	321	753	317	324	775	1274	-	-	1291	-	-
Mov Cap-2 Maneuver	252	321	-	317	324	-	-	-	-	-	-	-
Stage 1	583	522	-	741	690	-	-	-	-	-	-	-
Stage 2	597	685	-	530	521	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	17.2	13.7	0	1.8
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1274	-	-	303	548	1291	-	-
HCM Lane V/C Ratio	-	-	-	0.03	0.245	0.067	-	-
HCM Control Delay (s)	0	-	-	17.2	13.7	8	0	-
HCM Lane LOS	A	-	-	C	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	1	0.2	-	-

Intersection	
Int Delay, s/veh	3.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	96	56	87	155	43	74
Future Vol, veh/h	96	56	87	155	43	74
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	96	56	87	155	43	74

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	152	0	453	124
Stage 1	-	-	-	-	124	-
Stage 2	-	-	-	-	329	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1429	-	565	927
Stage 1	-	-	-	-	902	-
Stage 2	-	-	-	-	729	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1429	-	527	927
Mov Cap-2 Maneuver	-	-	-	-	527	-
Stage 1	-	-	-	-	902	-
Stage 2	-	-	-	-	680	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.8	10.9
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	725	-	-	1429	-
HCM Lane V/C Ratio	0.161	-	-	0.061	-
HCM Control Delay (s)	10.9	-	-	7.7	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.6	-	-	0.2	-

Intersection	
Int Delay, s/veh	6.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	128	38	50	573	432	168
Future Vol, veh/h	128	38	50	573	432	168
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	500	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	128	38	50	573	432	168

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1189	516	600	0	-	0
Stage 1	516	-	-	-	-	-
Stage 2	673	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	208	559	977	-	-	-
Stage 1	599	-	-	-	-	-
Stage 2	507	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	197	559	977	-	-	-
Mov Cap-2 Maneuver	197	-	-	-	-	-
Stage 1	568	-	-	-	-	-
Stage 2	507	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	52.4	0.7	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	977	-	231	-	-
HCM Lane V/C Ratio	0.051	-	0.719	-	-
HCM Control Delay (s)	8.9	-	52.4	-	-
HCM Lane LOS	A	-	F	-	-
HCM 95th %tile Q(veh)	0.2	-	4.8	-	-

Intersection	
Int Delay, s/veh	4.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	9	128	156	11	168	147
Future Vol, veh/h	9	128	156	11	168	147
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	9	128	156	11	168	147

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	645	162	0	0	167	0
Stage 1	162	-	-	-	-	-
Stage 2	483	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	437	883	-	-	1411	-
Stage 1	867	-	-	-	-	-
Stage 2	620	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	380	883	-	-	1411	-
Mov Cap-2 Maneuver	380	-	-	-	-	-
Stage 1	867	-	-	-	-	-
Stage 2	539	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.3	0	4.2
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	812	1411	-
HCM Lane V/C Ratio	-	-	0.169	0.119	-
HCM Control Delay (s)	-	-	10.3	7.9	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.6	0.4	-

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	21	17	22	552	417	28
Future Vol, veh/h	21	17	22	552	417	28
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	21	17	22	552	417	28

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1027	431	445	0	-	0
Stage 1	431	-	-	-	-	-
Stage 2	596	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	260	624	1115	-	-	-
Stage 1	655	-	-	-	-	-
Stage 2	550	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	253	624	1115	-	-	-
Mov Cap-2 Maneuver	253	-	-	-	-	-
Stage 1	637	-	-	-	-	-
Stage 2	550	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	16.7	0.3	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1115	-	345	-	-
HCM Lane V/C Ratio	0.02	-	0.11	-	-
HCM Control Delay (s)	8.3	0	16.7	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.1	-	0.4	-	-

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	184	35	51	518	513	113
Future Volume (vph)	184	35	51	518	513	113
Satd. Flow (prot)	1658	1483	1658	1745	1745	1483
Flt Permitted	0.950		0.435			
Satd. Flow (perm)	1658	1483	759	1745	1745	1483
Satd. Flow (RTOR)		35				113
Lane Group Flow (vph)	184	35	51	518	513	113
Turn Type	Perm	Perm	Perm	NA	NA	Perm
Protected Phases				2	6	
Permitted Phases	4	4	2			6
Detector Phase	4	4	2	2	6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	15.0	15.0	23.5	23.5	15.5	15.5
Total Split (s)	15.0	15.0	25.0	25.0	25.0	25.0
Total Split (%)	37.5%	37.5%	62.5%	62.5%	62.5%	62.5%
Yellow Time (s)	3.0	3.0	3.5	3.5	3.5	3.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.5	5.5	5.5	5.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	Max	Max	Max	Max
Act Effct Green (s)	10.0	10.0	23.6	23.6	23.6	23.6
Actuated g/C Ratio	0.25	0.25	0.59	0.59	0.59	0.59
v/c Ratio	0.44	0.09	0.11	0.50	0.50	0.12
Control Delay	16.7	6.0	6.6	9.3	9.2	2.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.7	6.0	6.6	9.3	9.2	2.1
LOS	B	A	A	A	A	A
Approach Delay	15.0			9.0	7.9	
Approach LOS	B			A	A	
Queue Length 50th (m)	10.5	0.0	1.7	22.6	22.3	0.0
Queue Length 95th (m)	23.1	4.2	5.5	44.1	43.2	4.7
Internal Link Dist (m)	108.8			438.0	591.1	
Turn Bay Length (m)		45.0	50.0			45.0
Base Capacity (vph)	414	397	448	1029	1029	921
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.44	0.09	0.11	0.50	0.50	0.12

Intersection Summary
Cycle Length: 40
Actuated Cycle Length: 40
Natural Cycle: 40
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.50

Intersection Signal Delay: 9.5 Intersection LOS: A
Intersection Capacity Utilization 60.9% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 1: Eagleson & Ottawa

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	121	49	60	630	572	182
Future Volume (vph)	121	49	60	630	572	182
Satd. Flow (prot)	1658	1483	1658	1745	1745	1483
Flt Permitted	0.950		0.398			
Satd. Flow (perm)	1658	1483	695	1745	1745	1483
Satd. Flow (RTOR)		49				182
Lane Group Flow (vph)	121	49	60	630	572	182
Turn Type	Perm	Perm	Perm	NA	NA	Perm
Protected Phases				2	6	
Permitted Phases	4	4	2			6
Detector Phase	4	4	2	2	6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	15.0	15.0	15.5	15.5	23.5	23.5
Total Split (s)	15.0	15.0	30.0	30.0	30.0	30.0
Total Split (%)	33.3%	33.3%	66.7%	66.7%	66.7%	66.7%
Yellow Time (s)	3.0	3.0	3.5	3.5	3.5	3.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.5	5.5	5.5	5.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	Max	Max	Max	Max
Act Effct Green (s)	10.0	10.0	28.6	28.6	28.6	28.6
Actuated g/C Ratio	0.22	0.22	0.64	0.64	0.64	0.64
v/c Ratio	0.33	0.13	0.14	0.57	0.52	0.18
Control Delay	17.7	6.6	6.2	9.4	8.6	1.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.7	6.6	6.2	9.4	8.6	1.6
LOS	B	A	A	A	A	A
Approach Delay	14.5			9.2	6.9	
Approach LOS	B			A	A	
Queue Length 50th (m)	8.0	0.0	2.0	30.3	26.0	0.0
Queue Length 95th (m)	18.5	5.7	6.2	56.8	48.7	5.5
Internal Link Dist (m)	112.3			440.5	591.1	
Turn Bay Length (m)		45.0	50.0			45.0
Base Capacity (vph)	368	367	441	1109	1109	1009
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.33	0.13	0.14	0.57	0.52	0.18

Intersection Summary
Cycle Length: 45
Actuated Cycle Length: 45
Natural Cycle: 45
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.57

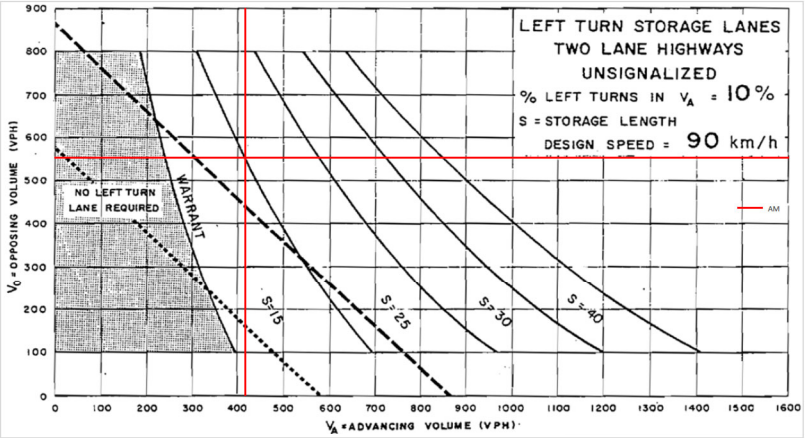
Intersection Signal Delay: 8.7 Intersection LOS: A
Intersection Capacity Utilization 61.8% ICU Level of Service B
Analysis Period (min) 15

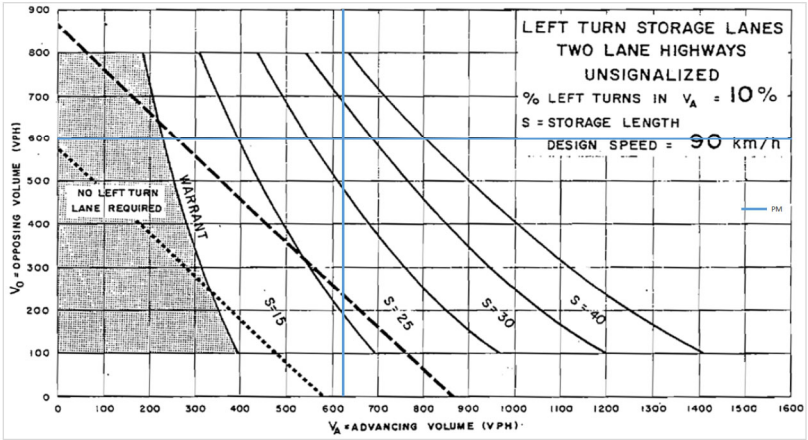
Splits and Phases: 1: Eagleson & Ottawa

Appendix L

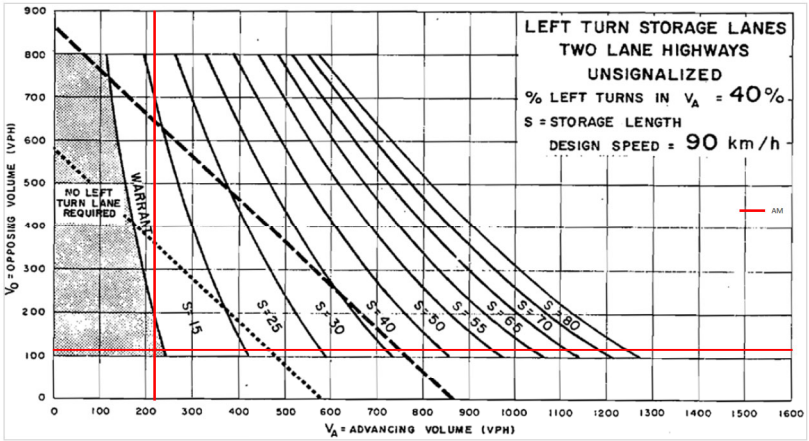
Turn Warrants

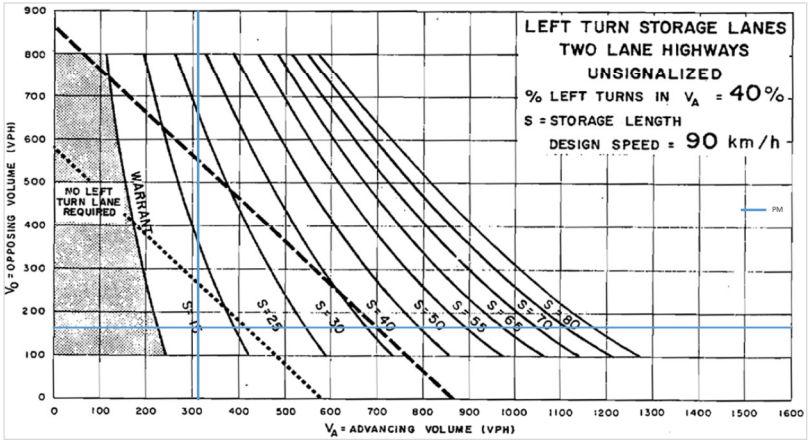
Northbound Left-Turn: Eagleson Road at New Collector





Southbound Left-Turn: McBean Street at New Collector





Appendix M

TDM Checklist

TDM Measures Checklist:
Residential Developments (multi-family, condominium or subdivision)

Legend

BASIC — The measure is generally feasible and effective, and in most cases would benefit the development and its users

BETTER — The measure could maximize support for users of sustainable modes, and optimize development performance

★ — The measure is one of the most dependably effective tools to encourage the use of sustainable modes

		TDM measures: *Residential developments*	Check if proposed & add descriptions
	1.	**TDM PROGRAM MANAGEMENT**	
	1.1	**Program coordinator**	
BASIC ★	1.1.1	Designate an internal coordinator, or contract with an external coordinator	☐
	1.2	**Travel surveys**	
BETTER	1.2.1	Conduct periodic surveys to identify travel-related behaviours, attitudes, challenges and solutions, and to track progress	☐
	2.	**WALKING AND CYCLING**	
	2.1	**Information on walking/cycling routes & destinations**	
BASIC	2.1.1	Display local area maps with walking/cycling access routes and key destinations at major entrances *(multi-family, condominium)*	☐
	2.2	**Bicycle skills training**	
BETTER	2.2.1	Offer on-site cycling courses for residents, or subsidize off-site courses	☐

		TDM measures: *Residential developments*	Check if proposed & add descriptions
	3.	**TRANSIT**	
	3.1	**Transit information**	
BASIC	3.1.1	Display relevant transit schedules and route maps at entrances *(multi-family, condominium)*	☐
BETTER	3.1.2	Provide real-time arrival information display at entrances *(multi-family, condominium)*	☐
	3.2	**Transit fare incentives**	
BASIC ★	3.2.1	Offer PRESTO cards preloaded with one monthly transit pass on residence purchase/move-in, to encourage residents to use transit	☑ Provide as an option for new home owners.
BETTER	3.2.2	Offer at least one year of free monthly transit passes on residence purchase/move-in	☐
	3.3	**Enhanced public transit service**	
BETTER ★	3.3.1	Contract with OC Transpo to provide early transit services until regular services are warranted by occupancy levels *(subdivision)*	☑
	3.4	**Private transit service**	
BETTER	3.4.1	Provide shuttle service for seniors homes or lifestyle communities (e.g. scheduled mall or supermarket runs)	☐
	4.	**CARSHARING & BIKESHARING**	
	4.1	**Bikeshare stations & memberships**	
BETTER	4.1.1	Contract with provider to install on-site bikeshare station *(multi-family)*	☐
BETTER	4.1.2	Provide residents with bikeshare memberships, either free or subsidized *(multi-family)*	☐
	4.2	**Carshare vehicles & memberships**	
BETTER	4.2.1	Contract with provider to install on-site carshare vehicles and promote their use by residents	☐
BETTER	4.2.2	Provide residents with carshare memberships, either free or subsidized	☐
	5.	**PARKING**	
	5.1	**Priced parking**	
BASIC ★	5.1.1	Unbundle parking cost from purchase price *(condominium)*	☐
BASIC ★	5.1.2	Unbundle parking cost from monthly rent *(multi-family)*	☐

			TDM measures: *Residential developments*	Check if proposed & add descriptions
		6.	**TDM MARKETING & COMMUNICATIONS**	
		6.1	**Multimodal travel information**	
BASIC	★	6.1.1	Provide a multimodal travel option information package to new residents	☑
		6.2	**Personalized trip planning**	
BETTER	★	6.2.1	Offer personalized trip planning to new residents	☑