2780 Eagleson Road

Transportation Impact Assessment

Step 1 Screening Report

Step 2 Scoping Report

Step 3 Strategy Report (Revision #1)

Prepared for:

1470424 Ontario Inc.
301 Moodie Drive Suite 100
Ottawa, ON K2H 9C4

Prepared by:

6 Plaza Court
Ottawa, ON K2H 7W1

September 2024

PN: 2020-22

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1 Screening

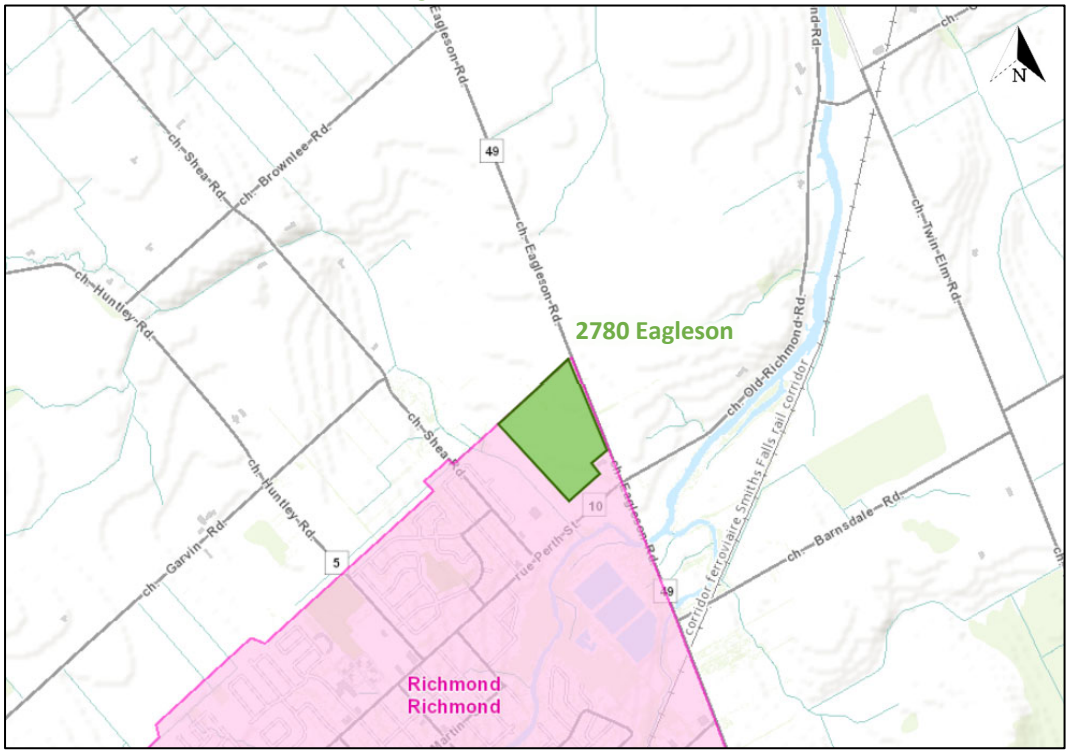
This study has been prepared according to the City of Ottawa's 2017 Transportation Impact Assessment (TIA) Guidelines, incorporating the 2023 Revision to Transportation Impact Assessment Guidelines. This update occurred between this version and the previous version of this report, and has been incorporated into the revisions. 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, a TIA is required, and this study has been prepared to support a zoning amendment and draft plan of subdivision application.

2 Existing and Planned Conditions

2.1 Proposed Development

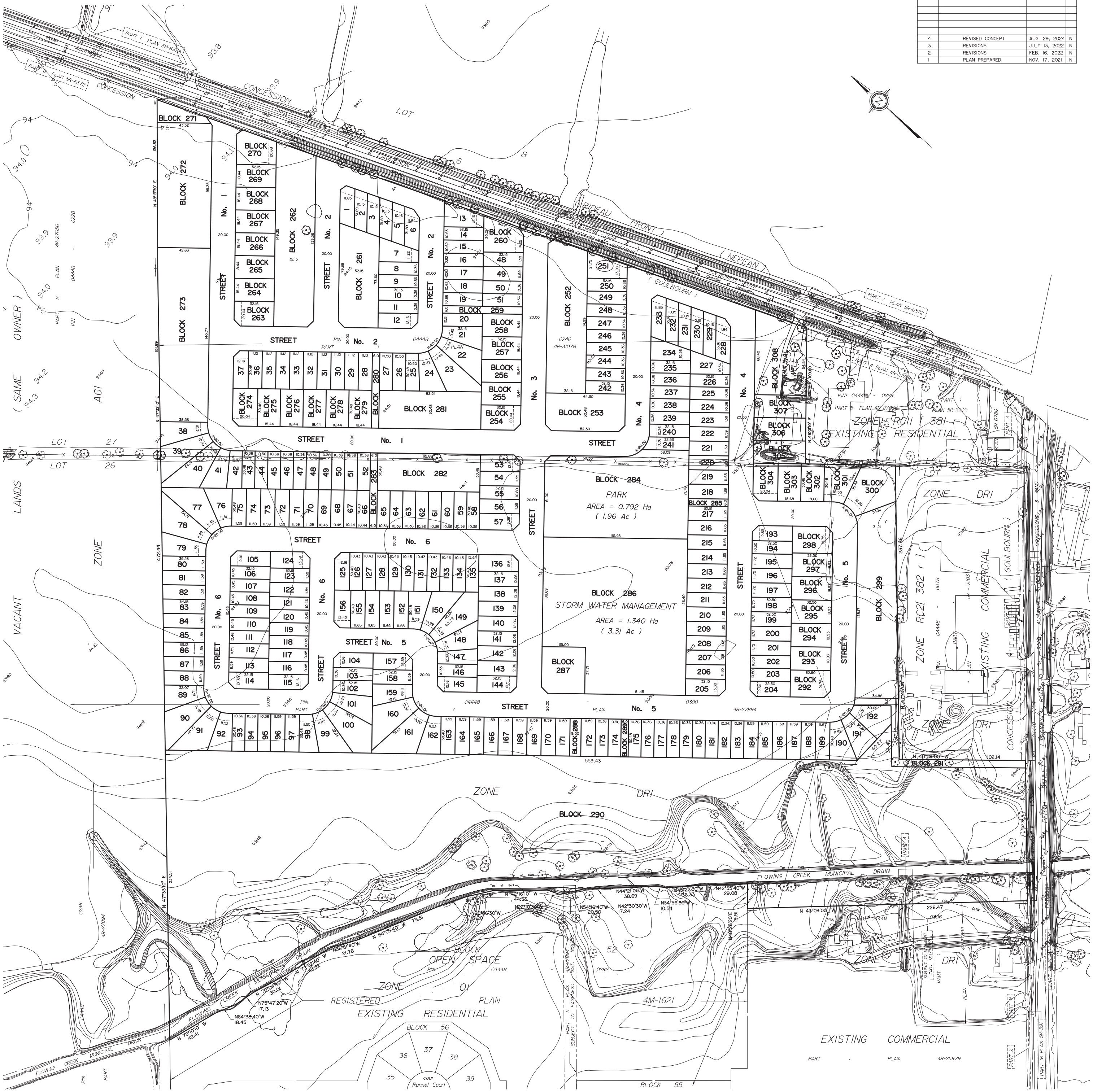
The proposed development, located at 2780 Eagleson Road, is currently a greenfield property within the area treated by the Richmond CDP, and is zoned as Development Reserve (DR1). The proposed development would include 135 townhouses, 70 semi-detached dwellings, and 251 detached single-family dwellings to be built out by 2027 and include two new local roads providing access to Eagleson Road. The proposed site is located within the Richmond Village CDP area. Figure 1 illustrates the study area context. Figure 2 illustrates the proposed concept plan.

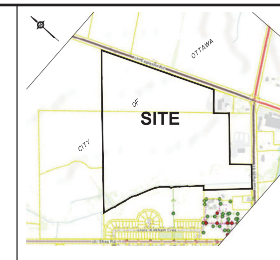
Figure 1: Area Context Plan



Source: http://maps.ottawa.ca/geoOttawa/ Accessed: September 3, 2024

REVISION SCHEDULE			
NO.	REVISION	DATE	BY
4	REVISED CONCEPT	AUG. 29, 2024	N
3	REVISIONS	JULY 13, 2022	N
2	REVISIONS	FEB. 16, 2022	N
1	PLAN PREPARED	NOV. 17, 2021	N





KEY MAP

NOT TO SCALE

DRAFT PLAN OF SUBDIVISION OF

PART OF LOTS 26 and **27**

CONCESSION 4

Geographic Township of Goulbourn

CITY OF OTTAWA

Prepared by Annis , O'Sullivan , Vollebekk Ltd.

Scale 1 : 1250

50 37.5 25 12.5 0 25 50 Metres

Metric

DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

SURVEYOR'S CERTIFICATE

I CERTIFY THAT :
The boundaries of the lands to be subdivided and their relationship to adjoining lands have been accurately and correctly shown.

Date

Mirel Aradau
ONTARIO LAND SURVEYOR

OWNER'S CERTIFICATE

This is to certify that I am the owner / agent of the lands to be subdivided and that this plan was prepared in accordance with my instructions.

Date

Greg Graham
1470424 Ontario Inc.
Cardel Group of Companies
I have authority to bind the corporation

ADDITIONAL INFORMATION REQUIRED UNDER SECTION 51-17 OF THE PLANNING ACT

(a) see plan
(b) see plan
(c) see plan
(d) single and multi-family residential housing, park land, storm water management
(e) see plan
(f) see plan
(g) see plan
(h) City of Ottawa
(i) see soils report
(j) see plan
(k) sanitary, storm sewers, municipal water, bell, hydro, cable and gas to be available
(l) see plan

PROPOSED LAND USE TABLE			
PROPOSED USE	LOTS / BLOCKS	NUMBER OF UNITS	AREA (sqm)
SINGLE DETACHED	1 - 251	251	98 192
TOWNHOMES	252, 253, 261, 262, 272, 273, 281, 282, 299	135	33 155
SEMI DETACHED	254-258, 260, 263-270, 274-279, 292-298, 300-307	70	22 651
STREETS	1 - 6		63 359
PARK LAND	284		7 918
WALKWAYS	259, 280, 283, 285, 289, 291		2 613
STORM WATER LANDS	286		13 400
PUMPING STATION	287		1 307
OTHER	271		474
	288		274
	290		91 430
	308		2 561
TOTAL		456	337 334

ANNIS, O'SULLIVAN, VOLLEBEKK LTD.
14 Concourse Gate, Suite 500
Nepean, Ont. K2E 7S6
Phone: (613) 727-0850 / Fax: (613) 727-1079
Email: Nepean@aovltd.com
Ontario Land Surveyors

Job No. 22024-20 Cardel Pt Lt26 C4 GO DPS D4 | N

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. The posted speed limit is 80 km/h and the right of way within varies between 26.0 metres and 28.0 metres within the study area. Eagleson Road is a truck route.

Perth Street: Perth Street is a City of Ottawa arterial road with a two-lane cross-section east of Shea Road, and a four-lane cross-section west of Shea Road. West of Shea Road, the cross-section is urban and includes sidewalks on both sides of the road. East of Shea Road for 125 metres, the cross-section is semi-urban, with a curb, a bike lane, and a sidewalk on the north side of the road and a paved shoulder on the south side. Between this point and Eagleson Road, Perth Street has a rural cross-section with paved shoulders on both sides of the road. The posted speed limit is 50 km/h west of Shea Road and is 60 km/h east of Shea Road. The Ottawa Official Plan reserves a 30.0 metre right of way between the village boundary to the west and Eagleson Road to the east. Perth Street is a truck route.

Old Richmond Road: Old Richmond Road is a City of Ottawa arterial road with a two-lane rural cross-section and paved shoulders on both sides of the road within the study area. The posted speed limit is 60 km/h west of a point 300 metres east of Eagleson Road, and 80 km/h to the east of this point. The City reserves a right of way of 37.5 metres in the study area. Old Richmond Road is a truck route.

2.2.2 Existing Intersections

The existing signalized area intersections within one kilometre of the site have been summarized below:

Eagleson Road & Perth Street/Old Richmond Road	The intersection of Eagleson Road and Perth Street/Old Richmond Road is a signalized intersection. The northbound approach and southbound approaches each consist of an auxiliary left-turn lane and a shared through/right-turn lane. The eastbound approach consists of an auxiliary left-turn lane and a shared through/right-turn lane, and the westbound approach consists of shared left-turn/through lane and an auxiliary right-turn lane. No turn restrictions are noted.

2.2.3 Existing Driveways

Driveways exist on the east side of Eagleson Road within 200 metres of proposed site accesses in the form of gravel accesses to farmers' fields. South of the site on the west side of Eagleson Road, two driveways for a commercial land use and one driveway to a gas station are present.

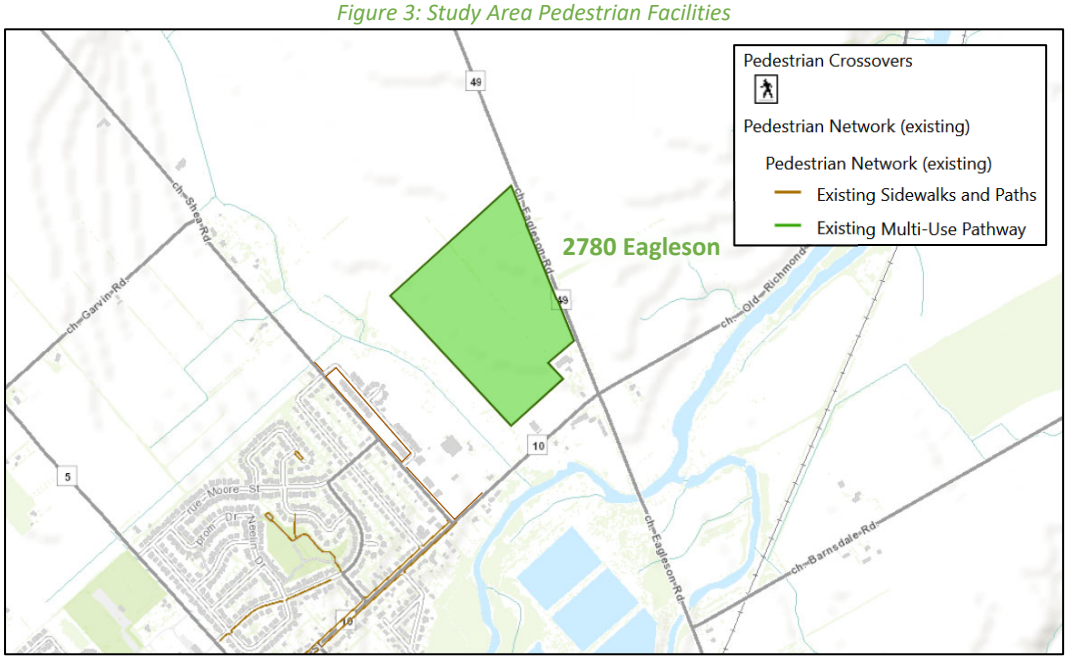
2.2.4 Cycling and Pedestrian Facilities

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

Sidewalks are provided along both sides of Perth Street west of Shea Road and on the north side of Perth Street for 125 metres east of Shea Road. Cycling facilities include paved shoulders along Perth Street/Old Richmond Road east of Shea Road, with Perth Street west of Shea Road designated as a suggested route.

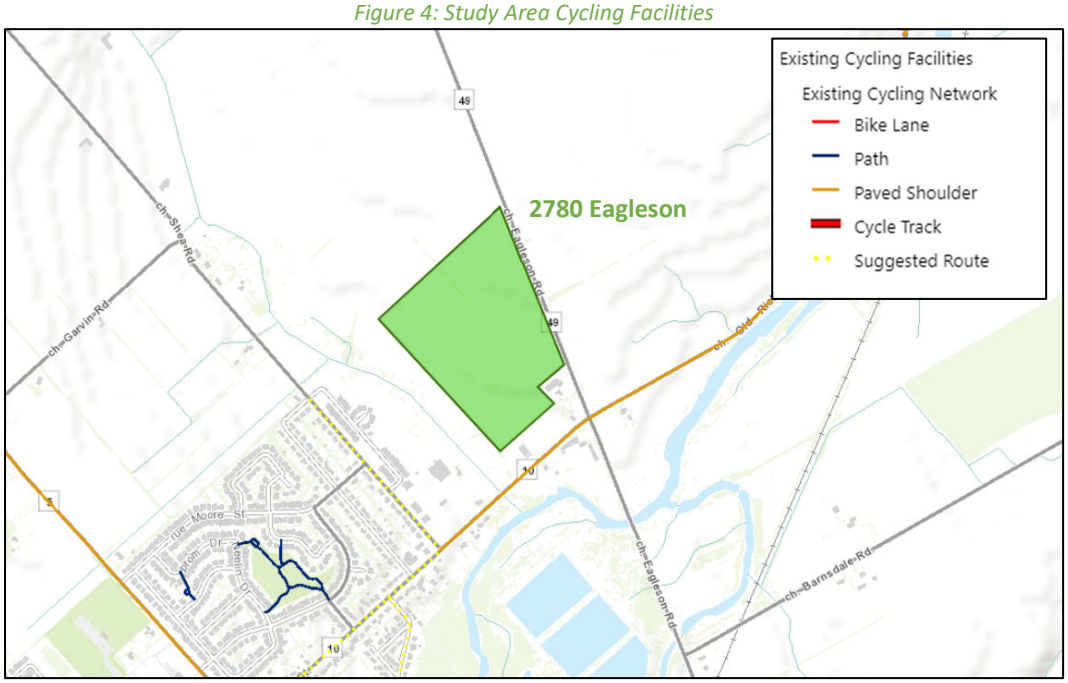
From the traffic counts presented in Section 2.2.7, no pedestrian or cyclists were captured at the study area intersection during the AM and PM peak hours.

Figure 3: Study Area Pedestrian Facilities



Source: http://maps.ottawa.ca/geoOttawa/ Accessed: September 3, 2024

Figure 4: Study Area Cycling Facilities



Source: http://maps.ottawa.ca/geoOttawa/ Accessed: September 3, 2024

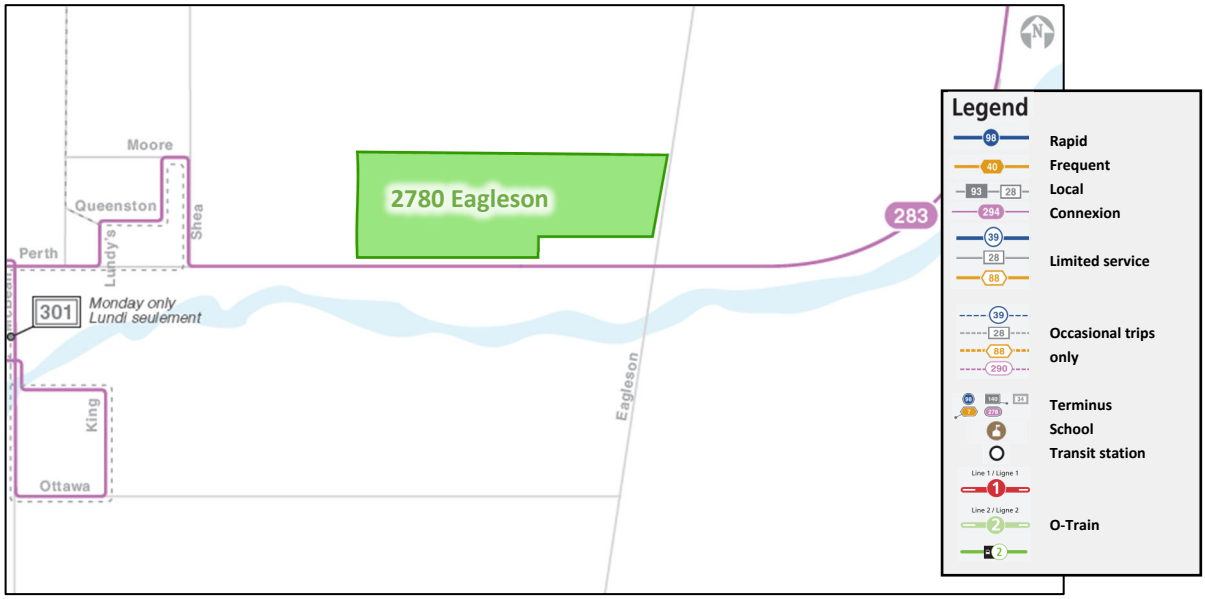
2.2.5 Existing Transit

Figure 5 illustrates the transit system map in the study area and Figure 6 illustrates nearby transit stops. All transit information is from September 12, 2024 and is included for general information purposes and context to the surrounding area.

Within the study area, the route #283 travels along Perth Street/Old Richmond Road, and the route #301 loops along Perth Street at Shea Road west of the study area. The frequency of these routes within proximity of the proposed site based on September 12, 2024 service levels are:

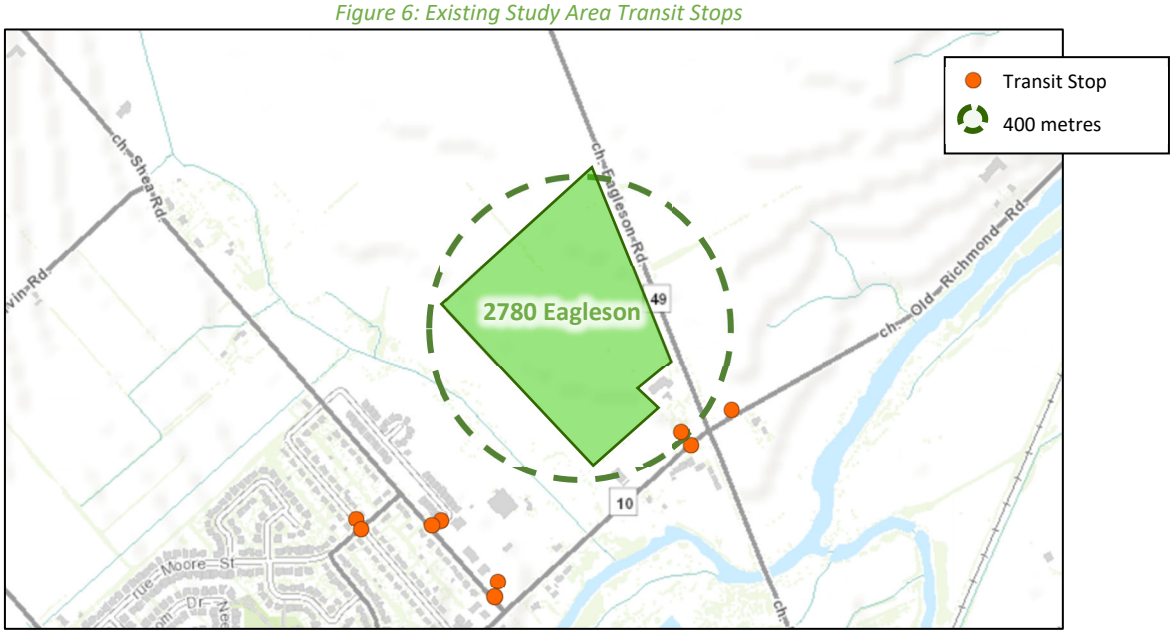
- Route #283 – Three AM buses to Tunney's Pasture and four PM return buses
- Route #301 – One AM bus to Carlingwood and one PM return bus – Mondays only

Figure 5: Existing Study Area Transit Service



Source: http://www.octranspo.com/ Accessed: September 10, 2024

Figure 6: Existing Study Area Transit Stops



Source: http://www.octranspo.com/ Accessed: September 10, 2024

2.2.6 Existing Area Traffic Management Measures

There are no existing area traffic management measures within the study area.

2.2.7 Existing Peak Hour Travel Demand

Existing turning movement counts were acquired from the City of Ottawa for the existing study area intersection. Table 1 summarizes the intersection count dates. Newer counts were not available for incorporation into the report given the ongoing closure of Eagleson Road disrupting travel patterns.

Table 1: Intersection Count Date

Intersection	Count Date
Eagleson Road & Perth Street/ Old Richmond Road	Wednesday, November 21, 2018 Wednesday, December 3, 2014

Comparing the 2018 counts at this intersection to those from 2014, the total growth shown was on par with the growth rate calculated from the TRANS models. The 2018 count is noted to have captured detour volumes from a McBean Street bridge closure/replacement, and additional detour volumes are consequently noted on the northbound left and eastbound right movements. To adjust for these detour volumes, the 2014 counts on those specific movements were grown at a rate of 2.5% per year to 2018 and were substituted for the 2018 counts for those movements. Further, as the intersection was count was two years prior to the study commencement date, a 2.5% per annum compound growth rate has been applied to estimate the 2020 adjusted traffic counts. Figure 7 illustrates the adjusted traffic counts and Table 2 summarizes the existing intersection operations. The level of service for signalized intersections is based on volume to capacity ratio (v/c) calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection. Detailed turning movement count data is included in Appendix B and the Synchro worksheets are provided in Appendix C.

Figure 7: Existing Traffic Counts (Adjusted)

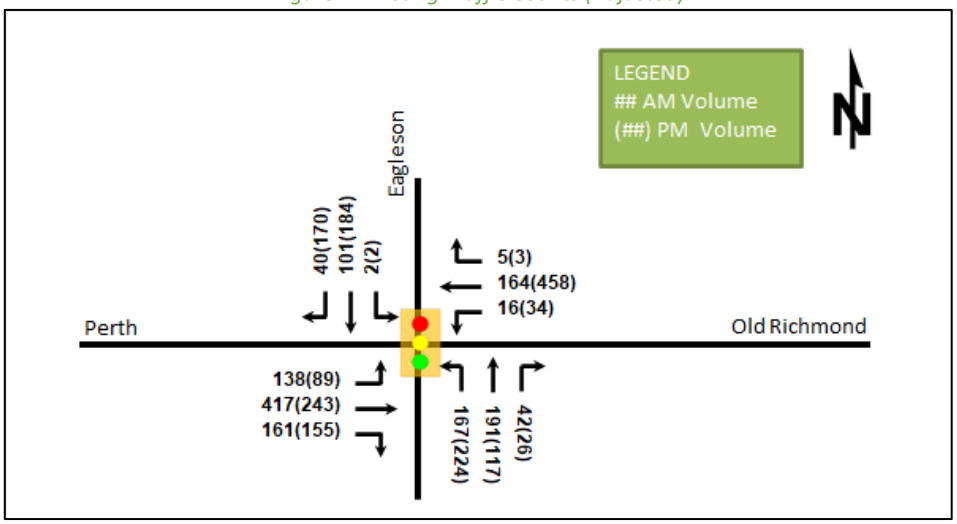


Table 2: Existing Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay (s)	Q (95th)	LOS	V/C	Delay (s)	Q (95th)
Eagleson Road & Perth Street/Old Richmond Road *Signalized*	EBL	A	0.29	11.3	21.8	A	0.41	26.1	30.9
	EBT/R	C	0.70	17.1	79.0	A	0.55	21.4	83.0
	WBL/T	A	0.21	10.0	20.4	B	0.69	27.8	117.9
	WBR	A	0.01	0.0	0.1	A	0.00	0.0	0.0
	NBL	A	0.53	23.4	36.6	C	0.75	35.8	75.5
	NBT/R	A	0.50	19.2	44.0	A	0.22	14.7	32.1
	SBL	A	0.01	15.0	1.5	A	0.00	15.0	1.7
	SBT/R	A	0.30	15.0	25.1	A	0.54	17.9	79.5
	Overall	**C**	**0.72**	**16.6**	**-**	**D**	**0.88**	**23.9**	**-**

Notes: Saturation flow rate of 1800 veh/h/lane
Queue is measured in metres
Peak Hour Factor = 0.90
Delay = average vehicle delay in seconds
m = metered queue
# = volume for the 95th %ile cycle exceeds capacity

During both the AM and PM peak hours, the study area intersection operates well. No capacity issues are noted.

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 area road network. Table 3 summarizes the collision types and conditions in the study area, Figure 8 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, 2018-2022

		Number	%
Total Collisions		**18**	**100%**
Classification	**Fatality**	0	0%
	Non-Fatal Injury	4	22%
	Property Damage Only	14	78%
Initial Impact Type	**Approaching**	2	11%
	Angle	1	6%
	Rear end	5	28%
	Sideswipe	1	6%
	Turning Movement	2	11%
	SMV Unattended	0	0%
	SMV Other	7	39%
	Other	0	0%
Road Surface Condition	**Dry**	10	56%
	Wet	2	11%
	Loose Snow	2	11%
	Slush	0	0%
	Packed Snow	2	11%
	Ice	2	11%
	Unknown	0	0%
Pedestrian Involved		0	0%
Cyclists Involved		0	0%

Figure 8: Study Area Collision Records

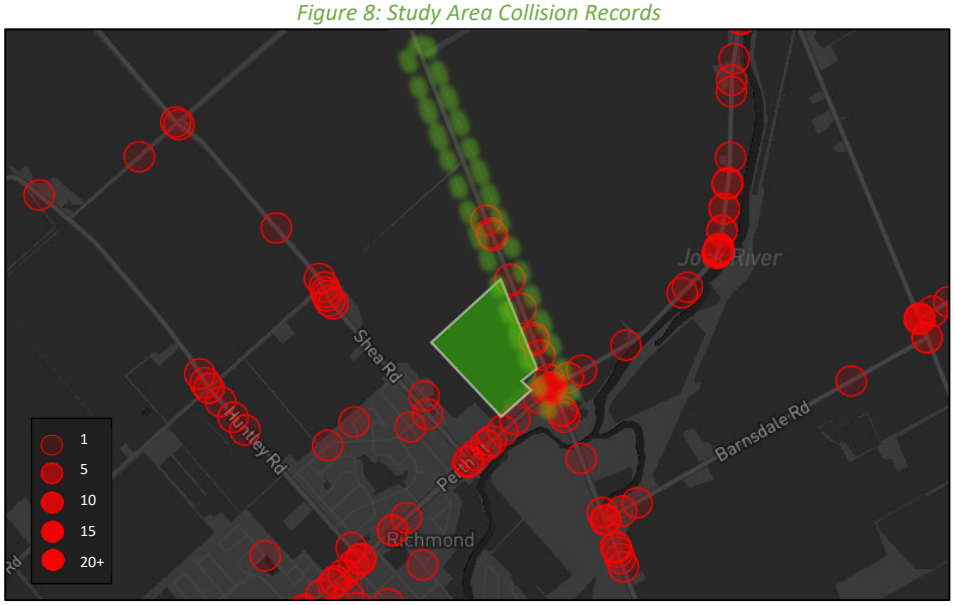


Table 4: Summary of Collision Locations, 2018-2022

	Number	%
Intersections / Segments	**18**	**100%**
Eagleson Rd btwn Cambrian Rd & Perth St	10	56%
Eagleson Rd @ Perth St/Old Richmond Rd	8	44%

Within the study area, the segment of Eagleson Road between Cambrian Road and Perth Street is noted to have experienced an average of two collision per year within the last five years. Table 5 summarizes the collision types and conditions for this location.

Table 5: Eagleson Road between Cambrian Road and Perth Street Collision Summary

		Number	%
Total Collisions		**10**	**100%**
Classification	**Fatality**	0	0%
	Non-Fatal Injury	3	30%
	Property Damage Only	7	70%
Initial Impact Type	**Approaching**	2	20%
	Rear end	1	10%
	SMV Other	7	70%
Road Surface Condition	**Dry**	5	50%
	Wet	1	10%
	Loose Snow	1	10%
	Packed Snow	1	10%
	Ice	2	20%
Pedestrian Involved		0	0%
Cyclists Involved		0	0%

The segment of Eagleson Road between Cambrian Road and Perth Street had a total of 10 collisions during the 2018-2022 time period, with seven involving property damage only and the remaining three having non-fatal injuries. The collision types are most represented by SMV (other) with seven collisions followed by approaching with two and rear end with one. This section of roadway is straight and relatively flat with no hazards noted. Single motor vehicle collisions are commonly observed along rural arterials such as this section of Eagleson Road.

Weather conditions may affect collisions at this location. No concerns are noted for this segment and no further review of collisions at this location is required as part of this study.

2.3 Planned Conditions

2.3.1 Changes to the Area Transportation Network

2.3.1.1 Transportation Master Plan (2013)

Within the Transportation Master Plan (2013), the Road Network's Network Concept identifies the segment of Perth Street between Shea Road and Eagleson Road as a "widened arterial," however it is not included in the Affordable Network.

2.3.1.2 Transportation Master Plan – Part 1

The City of Ottawa's Transportation Master Plan (TMP) – Part 1 includes a list of planned Active Transportation projects for implementation by 2046. While separated cycling facilities are planned along McBean Street and pedestrian facilities on Huntley Road, no active transportation projects are listed within the study area.

2.3.1.3 Transportation Master Plan – Part 2

The City of Ottawa's TMP – Part 2 will recommend road and transit projects up to 2046 and is currently in the consultation phase. No recommendations, planned projects, or timing of previously planned projects is currently available as part of this forthcoming document.

2.3.2 Other Study Area Developments

5969 Ottawa Street

The proposed development application includes a site plan for the construction of a two-storey building and surface parking to be used as a dog kennel. No TIA was required for this application.

3315 Shea Road

The proposed development application includes a zoning amendment to allow the construction of 54 new freehold detached residential lots on a new public street. No TIA is available for this development.

3244 Shea Road

This application includes a plan of subdivision to permit the development of eight new detached residential lots. No TIA is available for this development.

3152 Shea Road

This application includes zoning bylaw amendment to prohibit future residential development on its subject lands to protect the agricultural resource.

Fox Run Phase 1 – Caivan

The first Phase of the Fox Run development is currently under construction. In total, the subdivision will include a total of 214 single family homes. A new intersection on Perth Street will be provided at Meynell Road.

Fox Run Phase 2 – Caivan

The second Phases of Fox Run have been termed Phase 2 North and South and include 386 residential units split on the north side of Perth Street and on the west side of the Phase 1 lands. Servicing is underway and it is expected that this phase will be completed by 2024.

Fox Run Phase 4/5 – Caivan

The final two phases of the Fox Run development are planned but have not been initiated with planning applications to the City of Ottawa. It is envisioned that a total of 205 single family homes will be included within the remaining Fox Run lands and is located north of the Phase 2 lands.

6038 Ottawa Street – Tamarack
A zoning by-law amendment and plan of subdivision application has been submitted for the construction of 1,129 residential units anticipated to be built-out by 2032. This development is anticipated to be built-out at or shortly after the horizons examined within this TIA.

6240-6431 Ottawa Street – Mattamy Richmond Subdivision
A plan of subdivision application has been submitted for a new residential subdivision along Ottawa Street with 848 single family homes and 252 townhomes. Originally assumed to be under construction already, the file is progressing, and it is estimated to be built-out by 2029 with approximately 100-150 units per year. The proposed site will extend Meynell Road, connect to Ottawa Street, and include additional future connections to Royal York Street and Burke Street.

6295, 6363-6409 Perth Street, 6305 Ottawa Street – Caivan
A zoning by-law amendment and draft plan of subdivision application has been submitted for the construction of 577 residential units. Given the rezoning, subsequent planning submissions and servicing capacity within Richmond, it is anticipated that construction may be initiated by 2026 and completed by 2031. The proposed sites will have connections to Perth Street through existing collectors.

Samara Square
Phase 2 of the Hyde Park Senior Development will include two buildings with 35 rental apartments, 124 senior retirement apartments, and supporting commercial/retail. While not currently included in the development planning, Phase 3 will include an additional 122 apartment units in eight buildings.

3 Study Area and Time Periods

3.1 Study Area

The study area will include the intersection of Eagleson Road and Perth Street/Old Richmond Road, and the intersection of site accesses and Eagleson Road.

The only boundary road is Eagleson Road and no screenlines are present within proximity to the site.

3.2 Time Periods

As the proposed development is composed entirely of residential units the AM and PM peak hours will be examined.

3.3 Horizon Years

The anticipated build-out year of 2027 is assumed for the subject site. As a result, the full build-out plus five years horizon year is 2032.

4 Development-Generated Travel Demand

4.1 Mode Shares

Examining the mode shares recommended in the TRANS Trip Generation Manual (2020) for the subject district, derived from the most recent National Capital Region Origin-Destination survey (OD Survey), the existing average district mode shares by land use for Rural Districts Including Southwest have been summarized in Table 6.

Table 6: TRANS Trip Generation Manual Recommended Mode Shares – Rural Districts Including Southwest

Travel Mode	Single-Detached		Multi-Unit (Low-Rise)	
	AM	PM	AM	PM
Auto Driver	60%	67%	66%	62%
Auto Passenger	14%	17%	13%	19%
Transit	24%	14%	21%	16%
Cycling	2%	2%	1%	3%
Walking	0%	0%	0%	0%
Total	**100%**	**100%**	**100%**	**100%**

OC Transpo has indicated through other development applications in Richmond Village that no intent to increase the number or diversity of bus routes is currently planned by area development build-out horizons. As there are no inbound transit routes to village in the AM peak period and no outbound transit routes from the village in the PM peak period, the off-peak directional transit mode shares will be reassigned to the auto mode shares. Consistent with City feedback and other studies in the area, the peak directional transit mode shares will be reduced and reassigned to the auto mode shares. Table 7 summarizes the directional mode share targets to be applied to the subject development by peak hour.

Table 7: Proposed Development Mode Shares – Rural Districts Including Southwest

Travel Mode	Single-Detached				Multi-Unit (Low-Rise)			
	AM		PM		AM		PM	
	In	Out	In	Out	In	Out	In	Out
Auto Driver	84%	79%	76%	81%	87%	82%	73%	78%
Auto Passenger	14%	14%	17%	17%	13%	13%	19%	19%
Transit	0%	5%	5%	0%	0%	5%	5%	0%
Bicycle	2%	2%	2%	2%	1%	1%	3%	3%
Walk	0%	0%	0%	0%	0%	0%	0%	0%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

4.2 Trip Generation

This TIA has been prepared using the vehicle and person trip rates for the residential dwellings using the TRANS Trip Generation Manual (2020). Table 8 summarizes the person trip rates for the proposed residential land uses for each peak period.

Table 8: Trip Generation Person Trip Rates by Peak Period

Land Use	Land Use Code	Peak Period	Person Trip Rates
Single-Detached	210 (TRANS)	AM	2.05
		PM	2.48
Multi-Unit (Low-Rise)	220 (TRANS)	AM	1.35
		PM	1.58

Using the above person trip rates, the total person trip generation has been estimated. Table 9 summarizes the total person trip generation for the residential land uses.

Table 9: Total Residential Person Trip Generation by Peak Period

Land Use	Units	AM Peak Period			PM Peak Period		
		In	Out	Total	In	Out	Total
Single-Detached	251	155	361	515	386	236	622
Multi-Unit (Low-Rise)	205	83	194	277	181	143	324

Using the above mode share targets and the person trip rates, the person trips by mode have been projected. Trip generation by peak hour has been forecasted using the prescribed peak period conversion factors presented in the TRANS Trip Generation Manual (2020) for the residential component. Table 10 summarizes the residential trip generation by mode and peak hour.

Table 10: Trip Generation by Mode

Travel Mode		AM Peak Hour				PM Peak Hour			
		Mode Share	In	Out	Total	Mode Share	In	Out	Total
Single-Detached	Auto Driver	**84%/79%**	62	137	199	**76%/81%**	129	84	213
	Auto Passenger	**14%**	11	24	35	**17%**	29	18	47
	Transit	**0%/5%**	0	10	10	**5%/0%**	9	0	9
	Cycling	**2%**	2	4	6	**2%**	4	2	6
	Walking	**0%**	0	0	0	**0%**	0	0	0
	Total	**100%**	**78**	**181**	**258**	**100%**	**170**	**104**	**274**
Multi-Unit (Low-Rise)	Auto Driver	**87%/82%**	35	76	111	**73%/78%**	58	49	107
	Auto Passenger	**13%**	5	12	17	**19%**	15	12	27
	Transit	**0%/5%**	0	6	6	**5%/0%**	4	0	4
	Cycling	**1%**	1	1	2	**3%**	2	2	5
	Walking	**0%**	0	0	0	**0%**	0	0	0
	Total	**100%**	**42**	**97**	**139**	**100%**	**80**	**63**	**143**
Total	Auto Driver	-	97	213	310	-	187	133	320
	Auto Passenger	-	16	36	52	-	44	30	74
	Transit	-	0	16	16	-	13	0	13
	Cycling	-	3	5	8	-	6	4	11
	Walking	-	0	0	0	-	0	0	0
	Total	-	**120**	**278**	**397**	-	**250**	**167**	**417**

As shown above, a total of 310 AM and 320 PM new peak hour two-way vehicle trips are projected as a result of the proposed development.

4.3 Trip Distribution

To understand the travel patterns of the subject development the OD Survey has been reviewed to determine the travel for the residential development and these patterns were applied based on the build-out of Rural Southwest. Table 11 below summarizes the distributions.

Table 11: OD Survey Distribution – Rural Southwest

To/From	Residential % of Trips
North	40%
South	5%
East	25%
West	30%
Total	100%

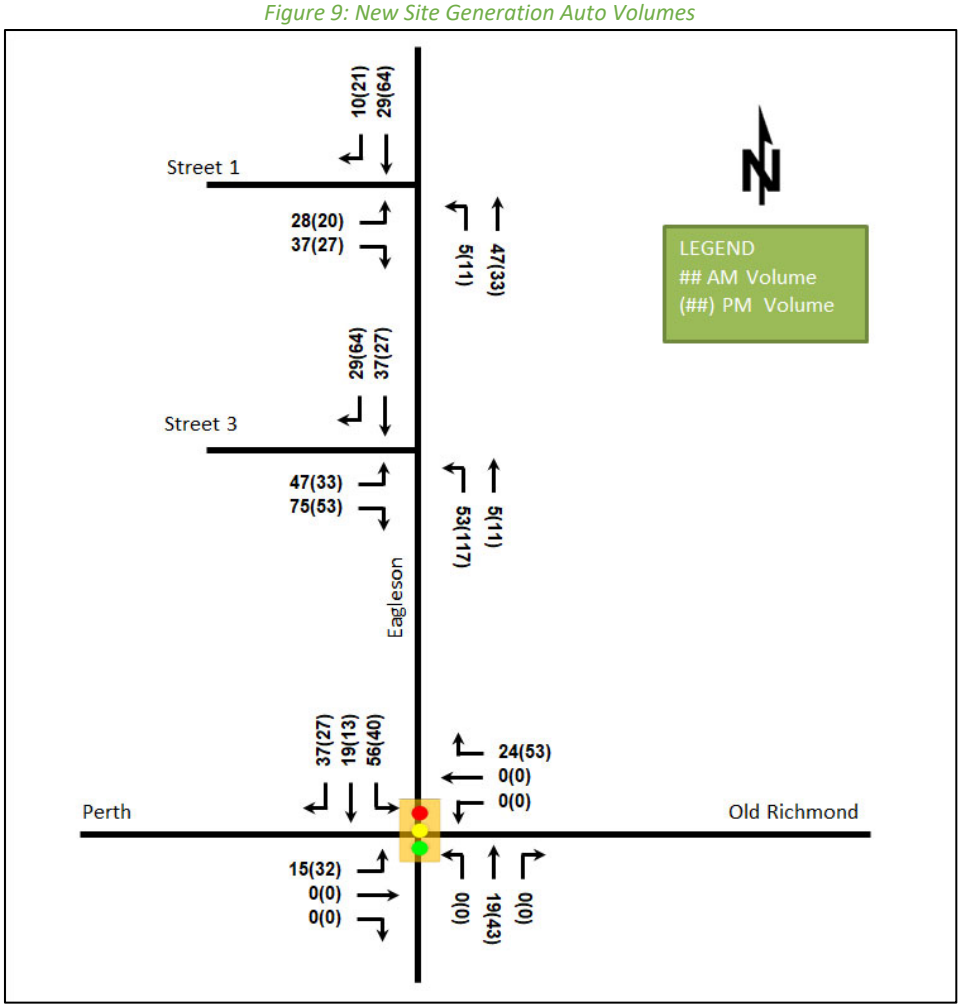
4.4 Trip Assignment

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. Table 12 summarizes the proportional assignment to the study area roadways, and Figure 9 illustrates the new site generated volumes.

Table 12: Trip Assignment

To/From	Inbound Via	Outbound Via
North	35% Eagleson Rd N, 5% Old Richmond Rd	35% Eagleson Rd N, 5% Old Richmond Rd
South	Eagleson Rd S	Eagleson Rd S
East	20% Old Richmond Rd, 5% Eagleson Rd S	Old Richmond Rd
West	15% Perth St, 5% Eagleson Rd N, 10% Eagleson Rd S	20% Perth St 5% Eagleson Rd N, 5% Eagleson Rd S
Total	**100%**	**100%**

Figure 9: New Site Generation Auto Volumes



5 Exemption Review

Table 13 summarizes the exemptions for this TIA.

Table 13: Exemption Review

Module	Element	Explanation	Exempt/Required
Site Design and TDM			
4.1 Development Design	4.1.2 Circulation and Access	Only required for site plan and zoning by-law applications	Exempt

Module	Element	Explanation	Exempt/Required
	4.1.3 New Street Networks	Only required for plans of subdivision	Required
4.2 Parking	4.2.1 Parking Supply	Only required for site plan and zoning by-law applications	Exempt
4.3 Boundary Street Design		All applications	Required
4.5 Transportation Demand Management	All Elements	Only required when the development generates more than 60 person-trips	Required
Network Impact			
3.2 Background Network Travel Demand	All Elements	Only required when one or more other Network Impact Modules are triggered	Required
3.3 Demand Rationalization		Only required when one or more other Network Impact Modules are triggered	Required
4.6 Neighbourhood Traffic Calming	4.6.1 Adjacent Neighbourhoods	If the development meets all of the following criteria along the route(s) site generated traffic is expected to utilize between an arterial road and the site's access: 1. Access to Collector or Local; 2. "Significant sensitive land use presence" exists, where there is at least two of the following adjacent to the subject street segment: • School (within 250m walking distance); • Park; • Retirement / Older Adult Facility (i.e. long-term care and retirement homes); • Licenced Child Care Centre; • Community Centre; or • 50%, or greater, of adjacent property along the route(s) is occupied by residential • lands and a minimum of 10 occupied residential units are present on the route. 3. Application is for Zoning By-Law Amendment or Draft Plan of Subdivision; 4. At least 75 site-generated auto trips; 5. Site Trip Infiltration is expected. Site traffic will increase peak hour vehicle volumes along the route by 50% or more.	Exempt
4.7 Transit	4.7.1 Transit Route Capacity	Only required when the development generates more than 75 transit trips	Exempt

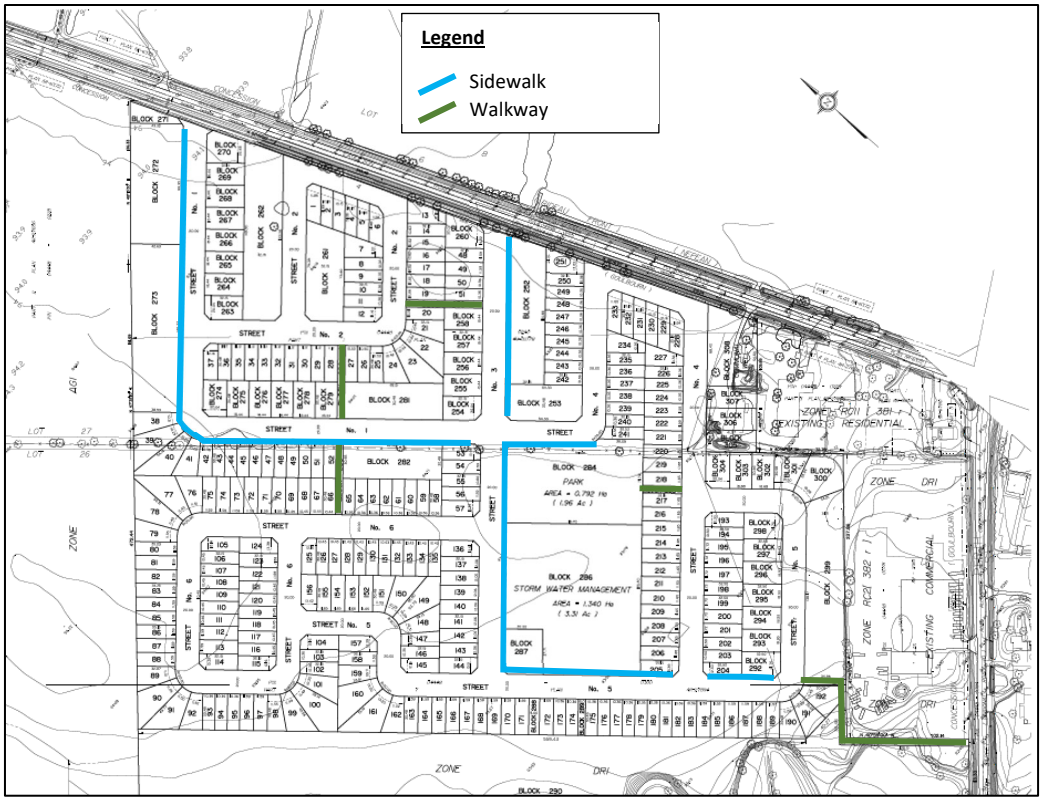
Module	Element	Explanation	Exempt/Required
	4.7.2 Transit Priority Requirements	Only required when the development generates more than 75 auto trips	Required
4.8 Network Concept		Only required when proposed development generates more than 200 person-trips during the peak hour in excess of equivalent volume permitted by established zoning	Exempt
4.9 Intersection Design	4.9.1 Intersection Control	Only required when the development generates more than 75 auto trips	Required
	4.9.2 Intersection Design	Only required when the development generates more than 75 auto trips	Required

6 Development Design

6.1 Design for Sustainable Modes

The proposed development is a residential subdivision where each dwelling will include a driveway and garage providing vehicular parking. Bicycle parking is assumed to be within the individual units. Walkway blocks are provided within the subdivision and on the southwest boundary for a direct connection to Perth Street from the development. The recommended minimum pedestrian network is illustrated in Figure 10. Transit stops are within a 1.2-kilometre walking distance of all site dwellings. No dedicated cycling facilities are proposed within the community.

Figure 10: Concept Pedestrian and Cycling Network



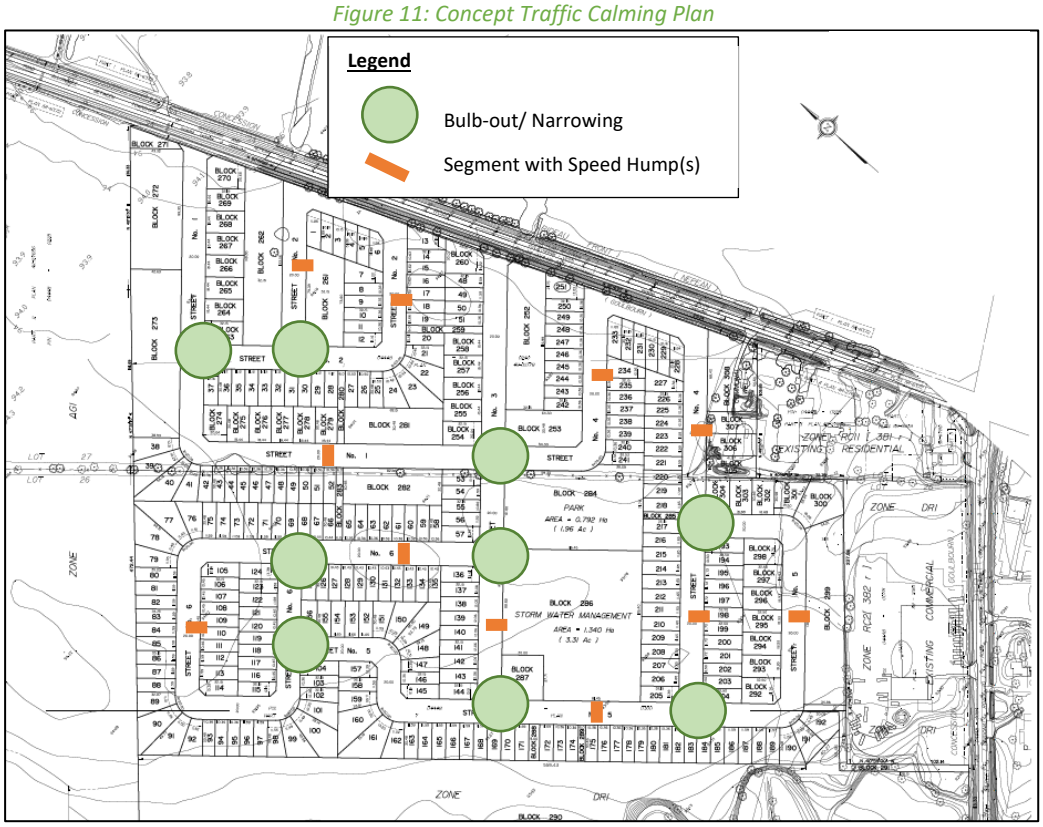
6.2 New Street Networks

The planned street network will include 20.0-metre local roads with an 8.5-metre pavement width. Two 14.75-metre window streets are also proposed along Eagleson Road with an 8.5-metre pavement width. The local roads are proposed to be posted as 30 km/h, consistent with Ottawa's 30 km/h Policy framework.

Traffic calming elements are recommended at the internal intersections, including bulb-outs to narrow each approach to the intersection (e.g. reduced crossing distance). Figure 17 illustrates the concept traffic calming plan.

The internal road intersections are recommended to be stop-controlled on the minor approaches of all intersections.

Figure 11: Concept Traffic Calming Plan



7 Boundary Street Design

Table 14 summarizes the MMLOS analysis for the boundary streets of Eagleson Road. The existing and future conditions for the street will be the same and are considered in one row. The boundary street analysis is based on the policy area of Village. The MMLOS worksheets have been provided in Appendix E.

Table 14: Boundary Street MMLOS Analysis

Segment	Pedestrian LOS		Bicycle LOS		Transit LOS		Truck LOS	
	PLOS	Target	BLOS	Target	TLOS	Target	TrLOS	Target
Eagleson Road	**F**	C	**F**	D	-	-	D	D

Eagleson Road does not meet the pedestrian and bicycle LOS targets. To meet the pedestrian LOS target, at least a two-metre-wide sidewalk with a greater than two-metre-wide boulevard would be required. To meet the bicycle LOS target, physically separated facilities or the reduction of operating speed to less or equal to 40 km/h would be required. The urbanization of Eagleson Road is not currently planned and no designs have been produced for

this. Given the provision of a sidewalk would require urbanization and replacement of the ditch line along the west side of Eagleson Road, no improvements to Eagleson Road are required as part of the subject development. An alternate pedestrian connection will be provided directly to Perth Street, creating a more direct connection and shorter walking distance to Richmond proper.

8 Transportation Demand Management

8.1 Context for TDM

The mode shares used within the TIA represent a reduction to transit from the typical rural districts mode shares in the peak direction and with no transit trips in the off-peak directions. Overall, these modal shares are likely to be achieved, however, given the stated intention of not expanding bus service in the Village, limited opportunity to provide supporting TDM measures exists to encourage shifts towards sustainable modes.

The subject site is within the Richmond Village CDP area. The total bedroom count within the development is subject to the final unit count and layout selections by purchasers. No age restrictions are noted.

8.2 Need and Opportunity

The subject site has been assumed to rely predominantly on auto travel, and assumptions have been carried through the analysis. Given the high auto mode share, there is negligible risk of not meeting the applied modal shares.

8.3 TDM Program

The "suite of post occupancy TDM measures" has been summarized in the TDM checklist. The checklist is provided in Appendix F. Given the transit limitations previously discussed, the only TDM measure recommended is the provision of a multimodal travel option information package to new residents. It is recommended that the City revisit its transit strategy in the Village of Richmond given the forecasted population increase and therefore potential ridership base.

9 Background Network Travel Demands

9.1 Transportation Network Plans

The transportation network plans were discussed in Section 2.3 and no projects have currently been confirmed within the horizons of this TIA. It is noted that the TMP Part 2 is currently in consultation and road and transit projects may yet be planned for implementation by 2032.

9.2 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 15 summarizes the results of the AM peak hour model, and the model plots are provided in Appendix G.

Table 15: 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
Perth St/Old Richmond Rd	2.02%	0.78%	2.03%	-3.16%
	Northbound	**Southbound**	**Northbound**	**Southbound**
Eagleson Rd	0.38%	2.44%	-6.25%	2.93%

Forecasted growth in the study area has evidently been achieved in the northbound/westbound directions and generally not yet achieved in the southbound/eastbound directions during the AM peak hour. Growth rates from

existing will be rounded to the nearest 0.25% and will be applied to the mainline volumes on the appropriate links during the AM peak hour and reversed during the PM peak hour. Negative growth rates will be taken as zero growth. The applied annual growth rates are summarized in Table 16.

Table 16: Applied Annual Growth Rates

Street	AM Peak Hour		PM Peak Hour	
	Eastbound	Westbound	Eastbound	Westbound
Perth St/Old Richmond Rd	2.00%	-	-	2.00%
	Northbound	**Southbound**	**Northbound**	**Southbound**
Eagleson Rd	-	3.00%	3.00%	-

9.3 Other Developments

The background developments explicitly considered in the background conditions (Section 9.2) include:

- Fox Run Phase 1 – Caivan
- Fox Run Phase 2/3 – Caivan
- Fox Run Phase 4/5 – Caivan
- 6240-6431 Ottawa Street – Mattamy Richmond Subdivision
- 6295, 6363-6409 Perth Street, 6305 Ottawa Street – Caivan
- Samara Square
- 6038 Ottawa Street

Where appropriate, the traffic associated with the area developments have been reassigned using the area road network.

The City has updated its preferred methodology for forecasting trips generated by developments, as outlined in TRANS Trip Generation Manual (2020). Given the high proportion of forecasted volumes expected to add onto existing traffic on the study area road network, a comparison of the trips rates was completed to generate a conversion factor to be applied to previously forecasted traffic volumes.

The conversion factors were determined by comparing the unit trip generation by land use from the Trip Generation Study Report (2009) and the TRANS Trip Generation Manual (2020). In general, the result is a reduction of person trips when trip generation is updated to the 2020 methodology. The background development TIAs were inspected for unit breakdowns and averaged conversion rates were applied to their traffic. The unit conversion factors are summarized in Table 17.

Table 17: TRANS Trip Generation Report Method Conversion Factors, 2009 to 2020

Land Use	Peak Hour Auto Trip Conversion Factor	
	AM	PM
Single Detached Dwellings	0.67	0.79
Townhouses	0.59	0.63
Low Rise Apartments	0.87	0.55
Mid Rise Apartments	0.62	0.40
High Rise Apartments	0.62	0.42
Retail Area	1.02	1.07
Office Area	1.00	1.13

As only peak-direction bus service was available, the derived factors were only applied to the background development traffic volumes in the peak directions.

Figure 12 and Figure 13 illustrate the 2027 and 2032 horizons total background development volumes for the study area, respectively, adjusted for the use of the local road network and trip generation refinement.

Figure 12: 2027 Background Development Total Volumes

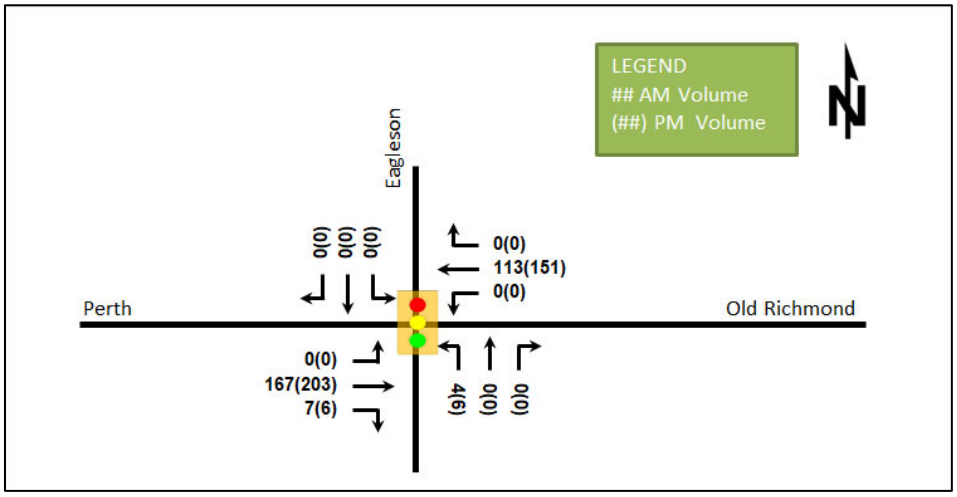
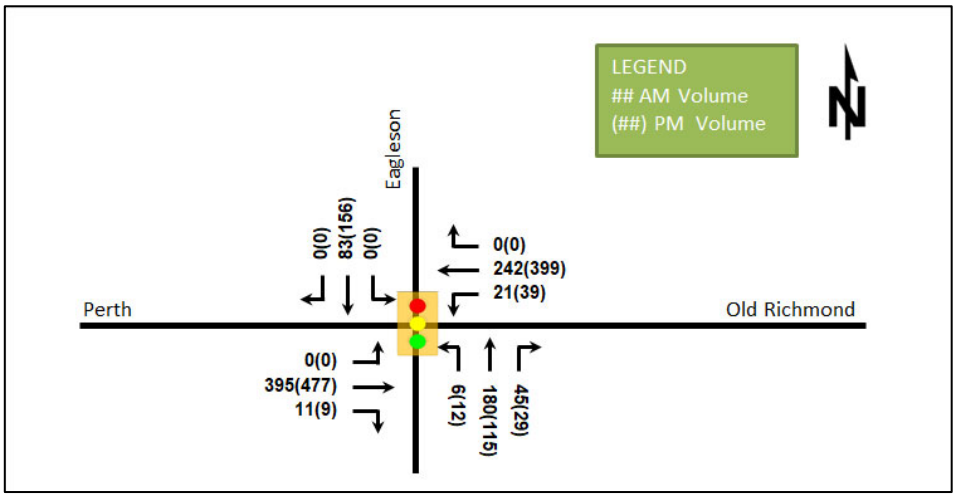


Figure 13: 2032 Background Development Total Volumes



10 Demand Rationalization

10.1 2027 Future Background Intersection Operations

Figure 14 illustrates the 2027 background volumes and Table 18 summarizes the 2027 background intersection operations. The level of service for signalized intersections is based on v/c calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection. The synchro worksheets for the 2027 future background horizon are provided in Appendix H.

Figure 14: 2027 Future Background Volumes

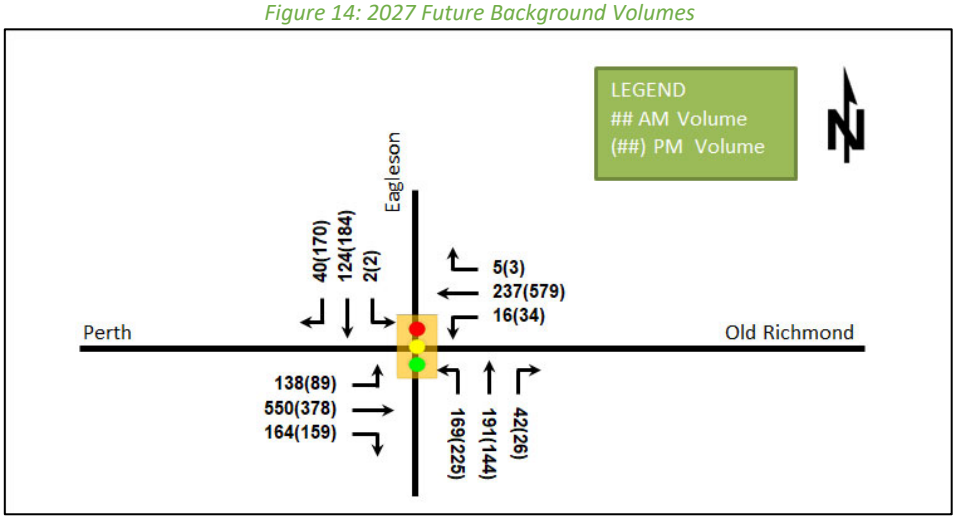


Table 18: 2027 Future Background Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Eagleson Road & Perth Street/Old Richmond Road ***Signalized***	EBL	A	0.25	10.0	22.3	A	0.47	28.1	28.6
	EBT/R	C	0.79	19.7	135.7	B	0.69	24.2	122.7
	WBL/T	A	0.29	9.7	36.1	D	0.82	32.2	159.0
	WBR	A	0.01	0.0	0.0	A	0.00	0.0	0.0
	NBL	A	0.56	32.6	49.2	C	0.76	43.6	**#83.3**
	NBT/R	A	0.51	27.1	59.3	A	0.26	20.3	40.9
	SBL	A	0.01	23.5	2.0	A	0.00	20.5	2.0
	SBT/R	A	0.36	23.9	41.1	A	0.54	22.8	83.3
	Overall	**B**	**0.70**	**20.1**	-	**C**	**0.78**	**28.4**	-

Notes: Saturation flow rate of 1800 veh/h/lane
Queue is measured in metres
Peak Hour Factor = 1.00
Delay = average vehicle delay in seconds
m = metered queue
# = volume for the 95th %ile cycle exceeds capacity

During both the AM and PM peak hours, the 2027 future background intersection operates well, and similarly to the existing conditions. The northbound left movement may exhibit extended queues at this horizon.

10.2 2032 Future Background Intersection Operations

Figure 15 illustrates the 2032 background volumes and Table 19 summarizes the 2032 background intersection operations. The level of service for signalized intersections is based on v/c calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection. The synchro worksheets for the 2032 future background horizon are provided in Appendix I.

Figure 15: 2032 Future Background Volumes

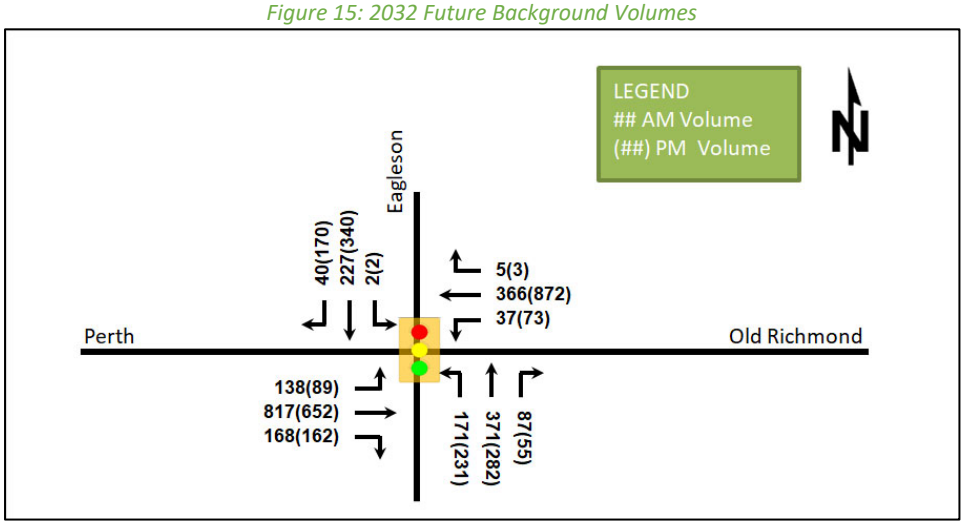


Table 19: 2032 Future Background Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Eagleson Road & Perth Street/Old Richmond Road *Signalized*	EBL	A	0.27	10.7	22.1	**F**	**1.56**	**348.2**	**#49.9**
	EBT/R	E	0.94	36.2	**#264.4**	E	0.91	41.1	**#251.4**
	WBL/T	B	0.67	19.4	82.8	**F**	**2.42**	**667.5**	**#356.7**
	WBR	A	0.01	0.0	0.0	A	0.00	0.0	0.0
	NBL	C	0.80	67.7	**#81.5**	**F**	**1.57**	**316.5**	**#126.2**
	NBT/R	E	0.97	75.8	**#185.4**	A	0.53	32.1	88.0
	SBL	A	0.03	36.0	2.7	A	0.01	24.0	2.1
	SBT/R	A	0.56	40.9	84.1	C	0.80	43.3	**#150.2**
	Overall	**E**	**0.95**	**42.1**	-	**F**	**2.07**	**273.4**	-

Notes: Saturation flow rate of 1800 veh/h/lane
Queue is measured in metres
Peak Hour Factor = 1.00
Delay = average vehicle delay in seconds
m = metered queue
# = volume for the 95th %ile cycle exceeds capacity

The 2032 future background intersection operates poorly during the PM peak hour with a forecasted overall v/c ratio of 2.07. During the AM peak hour, the eastbound through/right, northbound left, and northbound through/right movements may exhibit extended queues. During the PM peak hour, the eastbound through/right and southbound through/right may exhibit extended queues, and the eastbound left, westbound left/through, and northbound left movements are all forecasted to be over theoretical capacity and may be subject to high delays and extended queues.

Based on the high opposing volumes for the westbound left turn movement, the modest westbound left turn volumes waiting for gaps are anticipated to prevent the forecasted westbound through vehicles from being processed by the intersection. Separating the through vehicles from the left-turning vehicles through the addition of an auxiliary left-turn lane on the westbound approach would help mitigate this issue, however the entire intersection and multiple conflicting movements would remain over theoretical capacity. To address the capacity issues, an additional through lane on the east-west corridor would be required to permit the required splits between the conflicting phases to process the requisite volumes on the east-west corridor.

Looking to address the residual capacity issues on the north-south corridor after a potential widening of the east-west one, the operations on the northbound approach would benefit from protected/permitted phasing for the northbound left-turn, however the total southbound volumes are too high to remain at or under capacity with

the additional split required by the introduction of such a phase. A southbound right-turn lane would allow southbound right-turns to be processed at the intersection simultaneously with the through movements, and thus provide the capacity required to process the forecasted vehicles on the approach given a reduction in split from a protected northbound left turn phase.

The following section details the technical and design aspects of the discussed modifications required to mitigate the operations at the intersection in the 2032 future background conditions.

10.3 Demand Rationalization

10.3.1 Network Improvements

The warrants for the turn lanes at the intersection of Eagleson Road at Perth Street/Old Richmond Road are provided in Appendix J. As shown, the left-turn warrants are met on the northbound, eastbound, and westbound approaches at this intersection at the existing horizon. The existing configuration includes left-turn lanes on all but the westbound approach, where the roadway alignment through the intersection results in a shared left-turn/through lane.

Storage length requirements for all turning movements at the intersection were calculated for the furthest study horizon of 2032 in the background conditions based upon both upon the equation 9.14.1 from Chapter 9 of the Geometric Design Guide for Canadian Roads manual (TAC, 2017) and from the TIA guidelines. A cycle length of 90 seconds was assumed in both the AM and PM peak hours. The calculated storage lengths and are summarized in Table 20, where the resultant length applicable to traffic modeling is additionally presented.

Table 20: Turn Lane Storage Lengths – Future Background 2032

Movement	AM Peak Hour		PM Peak Hour		Modeled Length (m)
	Length Per TIA Guidelines (m)	Length Per TAC Manual (m)	Length Per TIA Guidelines (m)	Length Per TAC Manual (m)	
NBL	44.9	39.9	60.6	53.9	65
NBR	22.8	20.3	14.4	12.8	-
SBL	0.5	0.5	0.5	0.5	38
SBR	10.5	9.3	44.6	39.7	45
EBL	36.2	32.2	23.4	20.8	40
EBR	44.1	39.2	42.5	37.8	-
WBL	9.7	8.6	19.2	17.0	38
WBR	1.3	1.2	0.8	0.7	-

The intersection improvements for the Eagleson Road & Perth Street/Old Richmond Road intersection would be completed in conjunction with the City's Perth Street widening project from the Transportation Master Plan. In addition to the left-turn lanes warrants and storage length requirements, a southbound right-turn lane would also be required. The southbound right-turn movement comprises approximately 34% of the advancing volumes (170 PM turning vehicles in total). The eastbound right-turn is within the range of a right-turn lane being considered (approximately 18% of the advancing volumes or 168 AM turning vehicles and 162 PM turning vehicles) and can be explored by the City once they initiate the design process for the Perth Street and intersection improvements.

Table 21 summarizes the intersection operations for the 2032 background horizon with the above-described left-turn and southbound right-turn lane modifications. The level of service is based on v/c calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection. Given the proposed geometric changes, and changes to the proportions of volumes on the intersection approaches, signal optimization has been performed and includes the addition of protected turn phases, and an increase in the all-red clearance interval given the widened geometry. The synchro worksheets for the mitigated 2032 horizon are provided in Appendix K.

Table 21: 2032 Future Background Intersection Operations with Perth Street Widening

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Eagleson Road & Perth Street/Old Richmond Road *Signalized*	EBL	A	0.33	15.2	22.6	A	0.49	25.4	17.5
	EBT/R	D	0.83	29.4	103.2	D	0.81	33.7	86.6
	WBL	A	0.18	13.7	7.9	A	0.37	20.6	15.0
	WBT/R	A	0.35	20.9	34.5	D	0.86	37.8	**#99.7**
	NBL	A	0.53	26.8	36.1	C	0.71	32.0	**#48.5**
	NBT/R	C	0.71	29.0	101.8	A	0.45	19.9	62.8
	SBL	A	0.01	27.5	2.1	A	0.01	27.0	2.0
	SBT	B	0.64	38.6	58.2	D	0.85	52.5	**#100.1**
	SBR	A	0.09	0.4	0.0	A	0.34	5.2	11.1
	Overall	**D**	**0.87**	**27.2**	**-**	**D**	**0.83**	**33.2**	**-**

Notes: Saturation flow rate of 1800 veh/h/lane
Queue is measured in metres
Peak Hour Factor = 1.00
Delay = average vehicle delay in seconds
m = metered queue
# = volume for the 95th %ile cycle exceeds capacity

The study area intersection is forecasted to operate well at the 2032 future background horizon with the intersection improvements. Extended queueing may be observed on the westbound shared through/right, northbound left, and southbound through movements during the PM peak hour.
While addressing the operational and lane deficiencies, the isolated improvement of the intersection would require the City to undertake a larger study and design for the widening of Perth Street from Eagleson Road to Shea Road to address property, access, and utility constraints. The timing of these improvements should be assessed and prioritized within the recommended project list of the TMP Part 2.

10.4 Modal Share Sensitivity

The mode shares employed within this report represent the recommended Rural Southwest shares from the TRANS Trip Generation Report, modified in the off-peak direction based upon the lack of existing off-peak transit service in the Village. Given that the population of Richmond Village is expected to more than double from its 2011 value by 2032, a higher transit mode share could be realized if the City provided additional transit service for the expanded potential ridership base.

10.5 Demand Rationalization Conclusions

The village context coupled with the limited existing and planned transit service do not permit the reduction of auto trips beyond the recommended rates from the subject or background Richmond Village developments.

Site traffic is anticipated to comprise almost all of the future traffic on the westbound right and southbound left movements, given their low existing and forecasted background volumes. Site traffic is anticipated to comprise 27% or less of traffic on the eastbound left movement (15 AM and 32 PM vehicles), 14% or less on the northbound through movement (19 AM and 43 PM vehicles), 8% or less of traffic on the southbound through movement 19 AM and 13 PM vehicles), and 48% or less of traffic on the southbound right movement (37 AM and 27 PM vehicles) in the 2032 future total conditions. With the exception of the eastbound left movement during the PM peak hour, site these site-impacted movements each have residual capacity.

The City's planned Perth Street widening could potentially reduce the 2032 background v/c of the intersection of Eagleson Road at Perth Street/Old Richmond Road to 0.83 or less and on individual movements to 0.86 or less during both peak hours.

11 Transit

11.1 Transit Priority

At both future horizons, assuming the intersection improvements are employed at the 2032 horizon, the site traffic is anticipated to increase average delay on existing transit movements by no more than 5.2 seconds. Assuming existing intersection geometry, the site traffic is anticipated to increase average delay on transit movements by no more than 11.4 seconds. No transit mitigation is required for this development.

12 Intersection Design

12.1 Location and Design of Access

The internal road network will connect to the adjacent arterial road network via two local road connections (Street 1 and Street 3) to Eagleson Road. Within the subdivision, no turn lanes are proposed for the internal intersections which will be controlled by minor stop control.

Turn-lane warrants for the northbound left turn on Eagleson Road at Street 3 are provided in Appendix L. The volumes at this intersection were found to warrant a northbound left-turn lane as of the 2027 total conditions. Consequently, it is recommended that the intersection operations be analyzed to determine whether a necessary improvement in level of service is achieved for the given intersection volumes by providing an auxiliary northbound left turn lane. Based upon equation 9.14.1 in the TAC Geometric Design Guide (2017), the modeled conditions will include the minimum storage length of 37.5 metres given the highest forecasted turning volume of 117 vehicles in the PM peak hour at the Street 3 intersection.

Turn-lane warrants for the northbound left turn on Eagleson Road at Street 1 are provided in Appendix L. The volumes at the access intersections were found to warrant a northbound left-turn lane as of the 2032 total conditions. However, it is noted that a single turning vehicle would meet the warrant nomograph based on the number of opposing volumes. Given the recommendation of a turn lane at Street 3, no turn lane is recommended for
Street 1.

12.2 Intersection Control

Phasing changes to the signal control are recommended for the network intersection and support proposed geometric changes, each to address background conditions.

Signalization warrants for the site accesses are provided in Appendix M. As the intersections of Eagleson Road at Street 1 and Eagleson Road at Street 3 do not warrant signalization per OTM Justification 7, the site accesses are proposed as having stop-control on the minor approaches, with Eagleson Road operating under free-flow conditions.

12.3 Intersection Design

12.3.1 2027 Future Total Intersection Operations

The 2027 future total intersection volumes are illustrated in Figure 16 and the intersection operations without the inclusion of a northbound left-turn lane at either site access are summarized below in Table 22. The level of service is based on v/c calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection for signalized intersections, and on HCM 2010 delay for individual movements and the overall intersection for unsignalized intersections. The synchro worksheets for the 2027 future total horizon have been provided in Appendix N.

Figure 16: 2027 Future Total Volumes

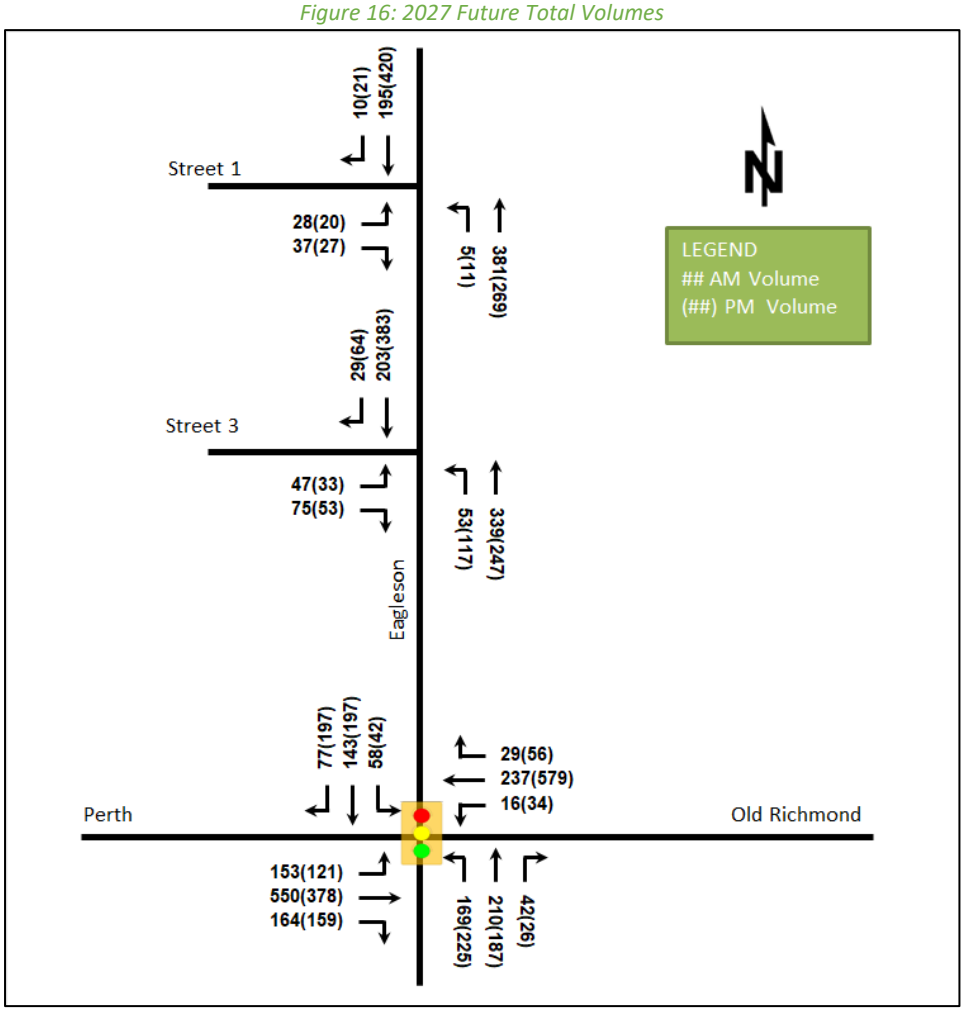


Table 22: 2027 Future Total Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Eagleson Road at Street 1 ***Unsignalized***	EB	B	0.10	11.4	2.3	B	0.10	13.0	2.3
	NB	A	0.00	7.6	0.0	A	0.01	8.2	0.0
	SB	-	-	-	-	-	-	-	-
	Overall	**A**	**-**	**1.2**	**-**	**A**	**-**	**0.9**	**-**
Eagleson Road at Street 3 ***Unsignalized***	EB	B	0.21	12.7	6.0	C	0.20	15.7	6.0
	NB	A	0.04	7.8	0.8	A	0.11	8.6	3.0
	SB	-	-	-	-	-	-	-	-
	Overall	**A**	**-**	**2.7**	**-**	**A**	**-**	**2.6**	**-**

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Eagleson Road & Perth Street/Old Richmond Road ***Signalized***	EBL	A	0.29	10.4	22.7	B	0.66	39.7	**#42.9**
	EBT/R	D	0.82	21.0	123.6	C	0.71	23.1	104.0
	WBL/T	A	0.30	9.8	32.9	D	0.85	33.1	**#150.3**
	WBR	A	0.04	2.4	2.6	A	0.08	7.0	7.9
	NBL	A	0.57	31.5	45.1	D	0.82	48.6	**#71.6**
	NBT/R	A	0.54	25.6	57.2	A	0.32	18.0	39.3
	SBL	A	0.21	23.4	17.3	A	0.10	16.9	10.7
	SBT/R	A	0.47	22.3	46.9	A	0.60	20.1	69.6
	Overall	**C**	**0.72**	**20.1**	**-**	**D**	**0.83**	**27.9**	**-**

Notes: Saturation flow rate of 1800 veh/h/lane
Queue is measured in metres
Peak Hour Factor = 1.00
Delay = average vehicle delay in seconds
m = metered queue
# = volume for the 95th %ile cycle exceeds capacity

The network intersection at the 2027 future total horizon is forecasted to operate similarly to the 2027 background conditions. With the addition of site traffic, the eastbound left and westbound through/left movements may exhibit extended queues during the PM peak hour at the intersection.

The access intersections operate well at this horizon without the inclusion of the northbound left-turn lanes. The northbound lane at each intersection is anticipated to operate with a level of service A.

12.3.1.1 2027 Access Intersection Sensitivity Analysis

To determine the effect of the inclusion of the warranted northbound left-turn lane on Eagleson Road at Street 3, a sensitivity analysis will be performed. The operations of the intersection of Eagleson Road at Street 3 with a northbound left-turn lane at the 2027 future total conditions are summarized below in Table 23. The synchro worksheets have been provided in Appendix O.

Table 23: 2027 Future Total Operations with NB LTL - Eagleson Road at Street 3

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Eagleson Road at Street 3 ***Unsignalized***	EB	B	0.21	12.7	6.0	C	0.20	15.6	5.3
	NBL	A	0.04	7.8	0.8	A	0.11	8.6	3.0
	NBT	-	-	-	-	-	-	-	-
	SB	-	-	-	-	-	-	-	-
	Overall	**A**	**-**	**2.7**	**-**	**A**	**-**	**2.6**	**-**

Notes: Saturation flow rate of 1800 veh/h/lane
Queue is measured in metres
Peak Hour Factor = 1.00
Delay = average vehicle delay in seconds
m = metered queue
# = volume for the 95th %ile cycle exceeds capacity

The intersection of Eagleson Road at Street 3 with a northbound left-turn lane operates similarly to without the lane. As would be expected, the low delay and queue has shifted to the left-turn lane, with the northbound through movement operating under a free-flow condition.

12.3.2 2032 Future Total Access Intersection Operations

The 2032 future total intersection volumes are illustrated in Figure 17 and the intersection operations without the inclusion of a northbound left-turn lane at either access intersection and based upon existing intersection geometry at the intersection of Eagleson Road & Perth Street/Old Richmond Road are summarized below in Table 24. The level of service is based on v/c calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection for signalized intersections, and on HCM 2010 delay for individual movements and the overall intersection for unsignalized intersections. The synchro worksheets for the 2032 future total horizon have been provided in Appendix P.

Figure 17: 2032 Future Total Volumes

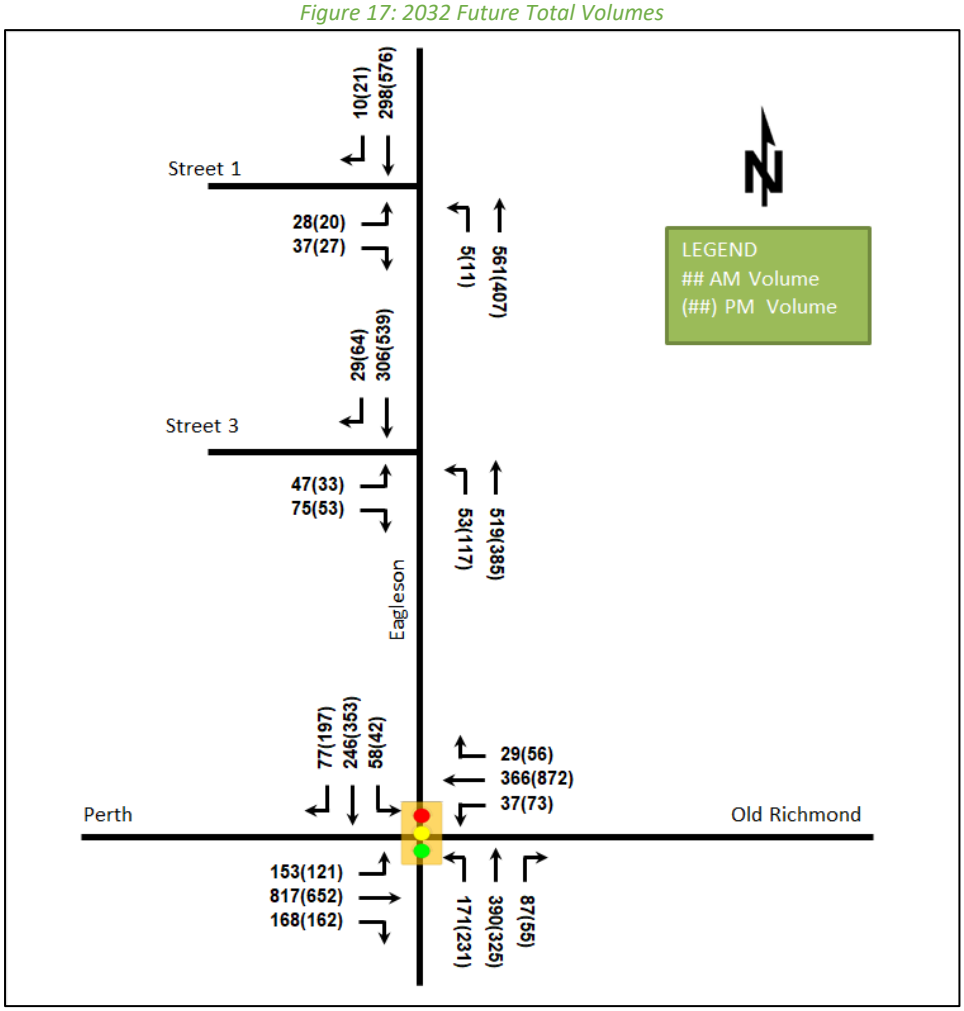


Table 24: 2032 Future Total Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Eagleson Road at Street 1 ***Unsignalized***	EB	B	0.14	13.9	3.8	C	0.13	16.4	3.0
	NB	A	0.00	7.9	0.0	A	0.01	8.7	0.0
	SB	-	-	-	-	-	-	-	-
	Overall	**A**	**-**	**1.0**	**-**	**A**	**-**	**0.8**	**-**
Eagleson Road at Street 3 ***Unsignalized***	EB	C	0.28	16.3	8.3	C	0.29	22.1	9.0
	NB	A	0.04	8.1	0.8	A	0.12	9.2	3.0
	SB	-	-	-	-	-	-	-	-
	Overall	**A**	**-**	**2.3**	**-**	**A**	**-**	**2.5**	**-**

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Eagleson Road & Perth Street/Old Richmond Road *Signalized*	EBL	A	0.32	12.1	24.7	**F**	**1.92**	**489.6**	**#64.2**
	EBT/R	E	0.99	47.6	**#249.3**	D	0.90	38.4	**#233.2**
	WBL/T	C	0.78	27.9	**#106.5**	**F**	**2.29**	**607.0**	**#321.3**
	WBR	A	0.03	2.2	2.6	A	0.07	7.1	8.3
	NBL	D	0.87	71.9	**#64.6**	**F**	**2.12**	**555.9**	**#105.2**
	NBT/R	E	0.96	64.9	**#139.6**	B	0.61	33.1	95.9
	SBL	B	0.70	73.2	**#29.4**	A	0.18	26.7	14.8
	SBT/R	B	0.65	33.8	74.3	D	0.89	50.3	**#169.2**
	Overall	**E**	**0.98**	**45.6**	-	**F**	**2.21**	**265.8**	-

Notes: Saturation flow rate of 1800 veh/h/lane
Queue is measured in metres
Peak Hour Factor = 1.00
Delay = average vehicle delay in seconds
m = metered queue
# = volume for the 95th %ile cycle exceeds capacity

The 2032 future total access intersections operate well without the inclusion of a northbound left-turn lane at either access intersection. The northbound lanes are anticipated to continue to operate with a level of service A.

The network intersection at the 2032 future total horizon is forecasted to operate similarly to the 2032 background conditions, with the existing geometry, where the eastbound left and northbound left movements further worsening due to the addition of site traffic given the exaggerated effects of adding volumes to overcapacity intersections. Extended queues may be exhibited on the westbound left/through and southbound left movements during the AM peak hour. It is noted that site traffic most heavily relies on the southbound left movement for outbound traffic and the westbound right movement for inbound traffic, which are presently underutilized movements at the intersection, and these movements operate with LOS B or better during the AM peak hour and LOS A during the PM peak hour.

12.3.2.1 Future Total 2032 Network Intersection Operations with Modifications

The 2032 future total network intersection operations assuming the inclusion of intersection improvements associated with the City's planned Perth Street widening are summarized below in Table 25. Protected left-turn phases have been included in the phasing and the signal timing has been optimized for the 2032 future total horizon. The synchro worksheets have been provided in Appendix Q.

Table 25: 2032 Future Total Network Intersection Operations with Perth Street Improvements

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Eagleson Road & Perth Street/Old Richmond Road *Signalized*	EBL	A	0.38	16.4	26.1	B	0.67	36.1	**#30.2**
	EBT/R	D	0.81	29.8	**#114.9**	C	0.72	29.0	84.5
	WBL	A	0.20	15.7	8.3	A	0.34	19.1	14.6
	WBT/R	A	0.47	26.1	40.1	D	0.90	41.2	**#111.9**
	NBL	A	0.52	25.0	34.7	D	0.82	45.3	**#58.2**
	NBT/R	C	0.72	28.8	103.4	A	0.54	23.1	74.5
	SBL	A	0.34	34.9	19.3	A	0.20	31.2	14.7
	SBT	B	0.70	41.9	62.6	E	0.91	62.3	**#107.3**
	SBR	A	0.17	0.8	0.0	A	0.41	7.4	16.4
	Overall	**D**	**0.88**	**28.2**	-	**D**	**0.88**	**35.6**	-

Notes: Saturation flow rate of 1800 veh/h/lane
Queue is measured in metres
Peak Hour Factor = 1.00
Delay = average vehicle delay in seconds
m = metered queue
# = volume for the 95th %ile cycle exceeds capacity

The network intersection at the 2032 future total horizon is forecasted to operate similarly to the 2032 background conditions including the widening of Perth Street and the modifications proposed.

With the additional site traffic, extended queues may be exhibited by the eastbound through/right movement during AM peak hour and eastbound left during PM peak hour. None of the forecasted queue lengths extends to adjacent intersections or past the available storage modeled at the total conditions or assumed within the background conditions.

12.3.2.2 2032 Access Intersection Sensitivity

As in the 2027 conditions, an operational sensitivity analysis will be performed based upon the inclusion of the warranted northbound left-turn lane at the intersection of Eagleson Road at Street 3. The operations the intersection of Eagleson Road at Street 3 with a northbound left-turn lane at the 2032 future total conditions are summarized below in Table 23. The synchro worksheets have been provided in Appendix R.

Table 26: 2032 Future Total Operations with NB LTL - Eagleson Road at Street 3

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Eagleson Road at Street 3 ***Unsignalized***	EB	C	0.27	16.0	8.3	C	0.28	21.4	8.3
	NBL	A	0.04	8.1	0.8	A	0.12	9.2	3.0
	NBT	-	-	-	-	-	-	-	-
	SB	-	-	-	-	-	-	-	-
	Overall	**A**	**-**	**2.3**	**-**	**A**	**-**	**2.4**	**-**

Notes: Saturation flow rate of 1800 veh/h/lane; Queue is measured in metres; Peak Hour Factor = 1.00; Delay = average vehicle delay in seconds; m = metered queue; # = volume for the 95th %ile cycle exceeds capacity

As with the 2027 access intersection operations, the intersection of Eagleson Road at Street 3 with a northbound left-turn lane operates similarly to the conditions without the lane. Again, the low impacts of the development turning volumes are shifted to the left-turn lanes, with the through lanes operating under free-flow conditions.

12.3.3 Intersection MMLOS

Table 27 summarizes the MMLOS analysis for the network intersections of Eagleson Road and Perth Street/Old Richmond Road. It is assumed that the intersection of Eagleson Road & Perth Street/Old Richmond Road will have pedestrian and cyclist facilities in future conditions as part of the City's Perth Street widening, including standard transverse crosswalk markings, pocket bike lanes, and bike boxes on all approaches. The intersection analysis is based on the policy area of Village. The MMLOS worksheets has been provided in Appendix E.

Table 27: Study Area 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 & Perth Street/Old Richmond Road (Existing)	**F**	C	**F**	B	N/A	N/A	C	D	D	D
Eagleson Road & Perth Street/Old Richmond Road (Future)	**F**	C	B	B	N/A	N/A	C	D	D	D

The pedestrian LOS will not be met at Eagleson Road and Perth Street/Old Richmond Road intersection in both existing and future conditions. To meet the pedestrian targets, the maximum crossing distance on all pedestrian crossings would need to be reduced to three lane-widths, which would require a narrowing of the intersection approaches. Given the rural context at the edge of the Village, the prioritization of auto LOS is considered appropriate and the City's focus should be providing high quality pedestrian landings and waiting areas at the

intersection corners instead of reducing crossing distances to achieve a certain calculated score. To the extent that the City is looking to improve future pedestrian crossing conditions, ladder markings on the south and west crossings may be explored as negligible pedestrian demand is associated with the northeast quadrant of the intersection.

The bicycle LOS will not be met at Eagleson Road and Perth Street/Old Richmond Road intersection in existing conditions due to the mixed traffic approaches and will be met in future conditions under the assumed conditions.

The access intersection is unsignalized, and therefore no access intersection MMLOS analysis is required.

12.3.4 Recommended Design Elements

12.3.4.1 Access Intersection Design Elements

The design elements for the site access intersections will be typical for urban local road intersections with rural arterial roads, subject to the civil design.

As summarized, the northbound Eagleson Road operates well without the inclusion of the northbound left-turn lanes. Although warranted, these lanes are not required to support the site operations.

To further understand the queuing conditions without the left-turn lane, SimTraffic was used to perform a queuing/delay analysis during the critical PM peak hour at the 2032 total horizon for the intersection of Eagleson Road at Street 3. The 95th percentile queue on a shared northbound left-turn/through movement was found to be 3.0 metres in the PM peak hour at the 2032 future total horizon. The average queue was found to be 7.7 metres, or approximately one car-length, during this analysis period. As such, while queues may be slightly longer that represented within the Synchro analysis, they do not represent a significant impact to Eagleson Road. The SimTraffic report is provided in Appendix S.

As previously noted, warrants have been met for possible northbound left-turn lanes at both site access intersections. Street 3 is considered the optimal location for an inbound left-turn lane given it provides the most direct access to the majority of the subdivision. The location, design, and supportability of an inbound left-turn lane on Eagleson Road will need to be determined through consultation with City staff, given recent construction works, the low inbound volumes. The minor delays and queues on the off-peak movement on Eagleson Road may enable the roadway to function acceptably without a turn lane. Should the northbound left turn lane at Street 3 be deemed required, an RMA would be initiated to satisfy the resulting subdivision conditions. Irrespective of the outcome of these discussions, no left-turn lane is recommended at Street 1.

12.3.4.2 Network Intersection Design Elements

With respect to the increases in volumes at the intersection of Eagleson Road and Perth Street/Old Richmond Road due to site traffic, the geometric recommendations will be once again examined. The calculated values for the storage lengths for auxiliary lanes at the study area intersection for the 2032 total conditions are summarized in Table 28. The calculations are based both upon the equation 9.14.1 from Chapter 9 of the Geometric Design Guide for Canadian Roads manual (TAC, 2017) and from the TIA guidelines assuming a 90-second cycle length in both peak hours. The lengths modeled for the 2032 future total operational analysis are included in the final row of the table.

Table 28: Turn Lane Storage Lengths

Movement	AM Peak Hour		PM Peak Hour		Modeled Length (m)
	Length Per TIA Guidelines (m)	Length Per TAC Manual (m)	Length Per TIA Guidelines (m)	Length Per TAC Manual (m)	
NBL	44.9	39.9	60.6	53.9	65
NBR	22.8	20.3	14.4	12.8	-
SBL	15.2	13.5	11.0	9.8	38
SBR	20.2	18.0	51.7	46.0	55
EBL	40.2	35.7	31.8	28.2	45
EBR	44.1	39.2	42.5	37.8	-
WBL	9.7	8.6	19.2	17.0	38
WBR	7.6	6.8	14.7	13.1	-

The calculated storage length requirements increased primarily for the southbound left-turn lane and the westbound right movement, each having previously been subject to low volumes. An increase in calculated storage for the southbound right-turn lane of 7.1 metres in the PM peak hour resulted in an increase in the modeled length of ten metres to become 55 metres. It is noted that the 95th percentile queue on the movement is anticipated to be a maximum of 11.1 metres in the background conditions and 16.4 metres in the total conditions. An increase in the calculated storage for the eastbound left-turn lane was noted in the AM peak hour of 4.0 metres which resulted in an increase of the modeled length of five metres to become 45 metres. It is noted that the 95th percentile queue on the movement is anticipated to be a maximum of 22.6 metres in the background conditions and 30.2 metres in the total conditions.

These values have been presented to discuss relative anticipated impacts to design elements at the intersection. Ultimately, the City will need to consider turning movement counts taken at a later date as part of an EA for the widening and intersection modifications that accounts for the realized traffic from the development within Richmond.

13 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 135 townhouses, 70 semi-detached dwellings, and 251 detached single-family dwellings units
- Two new local roads are proposed to provide access to Eagleson Road
- The development is proposed to be completed by 2027

TIA Screening and Exemptions

- The TIA Screening form indicated a full TIA was required due to the trip generation and safety triggers
- The exemption review for the TIA did not require circulation and access, parking supply, neighbourhood traffic calming, network concept, and transit route capacity

Existing Conditions

- Eagleson Road, Perth Street, and Old Richmond Road are arterial roads in the study area
- Sidewalks are provided along both sides of Perth Street to Shea Road and on the north side for 125 metres east of Shea Road

- Paved shoulders are provided along Perth Street/Old Richmond Road east of Shea Road, with Perth Street west of Shea Road designated as a suggested route
- The high volumes roadways have produced a high number of collisions at the segment of Eagleson Road between Cambrian Road and Perth Street, which has ten collisions within the study area
- Single motor vehicle collisions were noted along Eagleson Road between Cambrian Road and Perth Street and this collision type is commonly observed along rural arterials
- During both the AM and PM peak hours, the study area intersection operates well in existing conditions

Planned Conditions

- The Road Network's Network Concept diagram shows the segment of Perth Street between Shea Road and Eagleson Road as a widened arterial, however it is not included in the Affordable Network within the Transportation Master Plan (2013)

Development Generated Travel Demand

- The proposed development is forecasted produce 397 two-way people trips during the AM peak hour and 417 two-way people trips during the PM peak hour
- Of the forecasted people trips, 310 two-way trips will be vehicle trips during the AM peak hour and 320 two-way trips will be vehicle trips during the PM peak hour, based upon no bus service in the off-peak directions
- Of the forecasted people trips, 16 two-way trips will be transit trips during the AM peak hour and 13 two-way trips will be transit trips during the PM peak hour, based upon no bus service in the off-peak directions
- Of the forecasted trips, 40% are anticipated to travel north, 5% to the south, 25% to the east, and 30% to both the west

Development Design

- The bike and auto parking areas are to be located at each dwelling unit
- Pedestrian connections are recommended to be provided to connect residents to the park and storm water management pond and to the walkway block connecting to Perth Street on the southwest corner of the development
- The planned street network will include 20.0-metre local roads and 14.75-metre window streets each with an 8.5-metre pavement widths
- Traffic calming elements including bulb-outs at internal road intersections are recommended to be included in the design to support a 30 km/h posted speed limit

Boundary Street Design

- The boundary streets will not meet the pedestrian and bicycle LOS, which require at least a two-metre-wide sidewalk, larger than two-meter boulevard width, and either a physically separated bike facility or operating speeds of less or equal to 40 km/h
- The urbanization of Eagleson Road is not currently planned and no designs have been produced for this
- Given the provision of a sidewalk would require urbanization and replacement of the ditch line along the west side of Eagleson Road, no improvements to Eagleson Road are required as part of the subject development and an alternate pedestrian connection will be provided directly to Perth Street

TDM

- Limited opportunity for employing TDM measures exists given no addition of transit routes are planned
- Supportive TDM measures to be included within the proposed development should consist of the provision a multimodal travel option information package to new residents
- It is recommended that the City revisit its transit strategy in the Village of Richmond given the forecasted population increase and therefore potential ridership base

Background Conditions

- The background growth rates derived from the 2011 and 2031 TRANS model horizons and to the appropriate roadway's mainline volumes and to the appropriate major turning movements at the intersections
- The traffic associated with the area developments have been reassigned using the area road network, and an overall peak-direction reduction in forecasted trips has been applied to the subject developments based upon updated trip generation methodology
- The City's TMP project of the widening of Perth Street is recommended for implementation by the 2032 future background horizon as the capacity issues are forecasted to be present to a high degree at the study area intersection
- Based on the patterns of capacity issues at the intersection, a westbound left-turn lane and a southbound right-turn lane are recommended to be included as part of future intersection upgrades, and protected/permissive phasing of the northbound left-turn movement is recommended to be implemented
- The intersection of Eagleson Road at Perth Street/Old Richmond Road warrants auxiliary left-turn lanes on the eastbound, westbound, and northbound approaches
- The future conditions at the network intersection have been analyzed with the warranted turn lanes, the southbound right-turn lane, and with the addition of through lanes on the eastbound and westbound approaches as part of the TMP widening
- The study area intersection is anticipated to operate well at the 2032 background horizon assuming these improvements are implemented
- OC Transpo has indicated no additional routes will be added for Richmond Village by the buildout horizon, and no transit will be assumed in the off-peak direction

Transit

- Delays on existing transit movements are anticipated to be 5.2 seconds or seconds or less assuming intersection improvements are implemented and 11.4 seconds assuming they are not implemented

Access Intersection Design

- The internal road network will connect to the adjacent arterial road network of Eagleson Road via two local road connections (Street 1 and Street 3)
- The site accesses are proposed to be stop-controlled on the minor approaches
- The 2027 and 2032 future total access intersections operate well
- The northbound left-turn lane volume warrants are met on Eagleson Road at both access intersections
- The requirement for a northbound-left turn lane at Street 3 will be determined through discussion with the City, and if required, and RMA will be initiated subsequent to the TIA approval

- While Eagleson Road at Street 1 would meet the left-turn warrants with a single turning vehicle, no turn lane is recommended at Street 1 due to low volume and primary access being provided through Street 3
- Both access intersections operate well with no turn lane provided on Eagleson Road at either access

Network Intersection Design

- Generally, the network intersections at the 2027 future total horizon will operate similarly to the 2027 background conditions
- Under the existing conditions, operations at the 2032 horizon are anticipated to further worsen on the eastbound left and northbound left movements given the exaggerated effects of adding volumes to overcapacity intersections
- The site is anticipated to rely most heavily on the westbound right and southbound left movements, which are currently underutilized movements at the network intersection
- Assuming the City implements the Perth Street widening project, the operations are the intersection is forecasted to operate well where the addition of site traffic may result in an increase in queueing on the eastbound through/right during the AM peak hour and the eastbound left during the PM peak hour
- The pedestrian LOS will not be met at the Eagleson Road and Perth Street/Old Richmond Road intersection in both existing and future conditions, which require crossing distances to be equal or less than three-lane widths
- The bicycle LOS will not be met at the Eagleson Road and Perth Street/Old Richmond Road intersection in existing condition, but will be met in the assumed future conditions of pocket bike lanes and bike boxes on each approach
- Given the context of the rural edge of the Village, prioritization of auto modes is considered appropriate, although improved pedestrian conditions should be applied through the City's future design of the intersection, despite not having the potential to improve the pedestrian LOS score
- The storage lengths identified as being required within this study for the City's future design of the auxiliary turn lanes at the intersection of the Eagleson Road and Perth Street/Old Richmond Road are:
    - NBL: 65 metres
    - SBL: 38 metres
    - SBR: 55 metres
    - EBL: 45 metres
    - WBL: 38 metres
- These lengths will need to be studied further as part of the future design exercise, and include realized traffic volumes from the current and planned developments within the Village of Richmond

14 Conclusion

It is recommended that, from a transportation perspective, the proposed development applications proceed.

Prepared By:

John Kingsley
Transportation Engineering-Intern

Reviewed By:

Andrew Harte, P.Eng.
Senior Transportation Engineer

Appendix A

TIA Screening Form and PM Certification Form

6 Plaza Court
Ottawa ON K2H 7W1

City of Ottawa 2017 TIA Guidelines
Step 1 - Screening Form

Date: 21-Apr-20
Project Number: 2020-22
Project Reference: Cardel Creekside 2

1.1 Description of Proposed Development	
Municipal Address	2780 Eagleson Road
Description of Location	Composite of 11.1 ha trapezoid fronting Eagleson Rd and 13.8 ha rectangle ~100m north of Perth St
Land Use Classification	Development Reserve (DR1)
Development Size	163 singles and 159 townhomes (422 units)
Accesses	2 all-movement accesses onto Eagleson Rd
Phase of Development	One Phase
Buildout Year	2025
TIA Requirement	Full TIA Required

1.2 Trip Generation Trigger		
Land Use Type	Single-family homes	
Development Size	422	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?	No
Is the development in a Design Priority Area (DPA) or Transit-oriented Development (TOD) zone?	No
Location Trigger	No

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)?	No
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
Tel. : 613-580-2424
Fax: 613-560-6006

Ville d'Ottawa
Services d 'infrastructure et Viabilité des collectivités
Urbanisme et Gestion de la croissance
110, avenue Laurier Ouest
Ottawa (Ontario) K1P 1J1
Tél. : 613-580-2424
Télécopieur: 613-560-6006

Dated at ___Ottawa_____ this __20__ day of _____September_____, 2018.
(City)

Name: _____Andrew Harte_____
(Please Print)

Professional Title: _____Professional Engineer_____

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

Office Contact Information (Please Print)
Address: 13 Markham Avenue
City / Postal Code: Ottawa / K2G 3Z1
Telephone / Extension: (613) 697-3797
E-Mail Address: Andrew.Harte@CGHTransportation.com

Appendix B

Turning Movement Counts

Transportation Services - Traffic Services

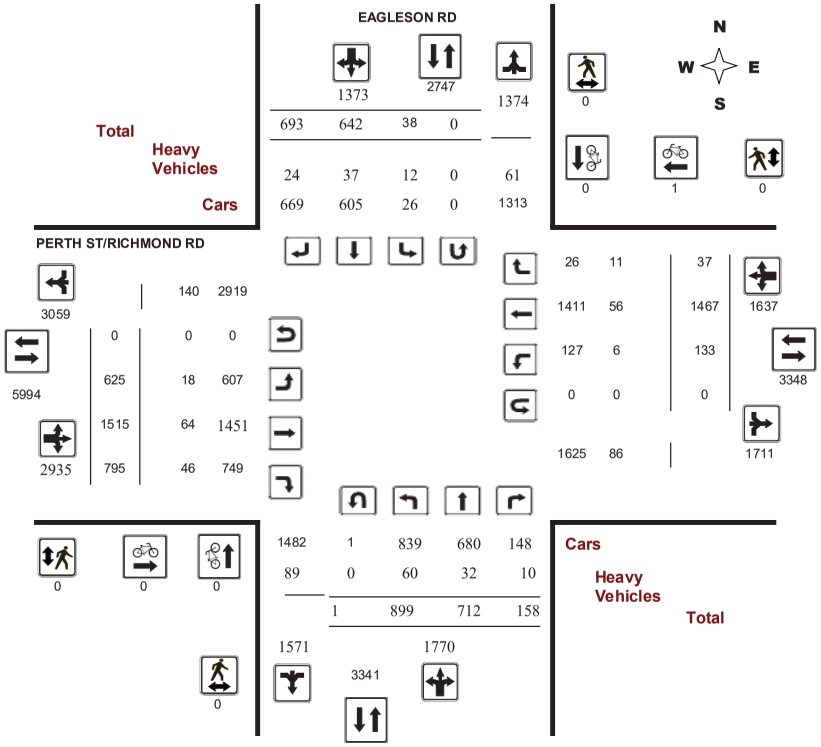
Turning Movement Count - Study Results

EAGLESON RD @ PERTH ST/RICHMOND RD

Survey Date: Wednesday, December 03, 2014 **WO No:** 34040

Start Time: 07:00 **Device:** Miovision

Full Study Diagram



Transportation Services - Traffic Services

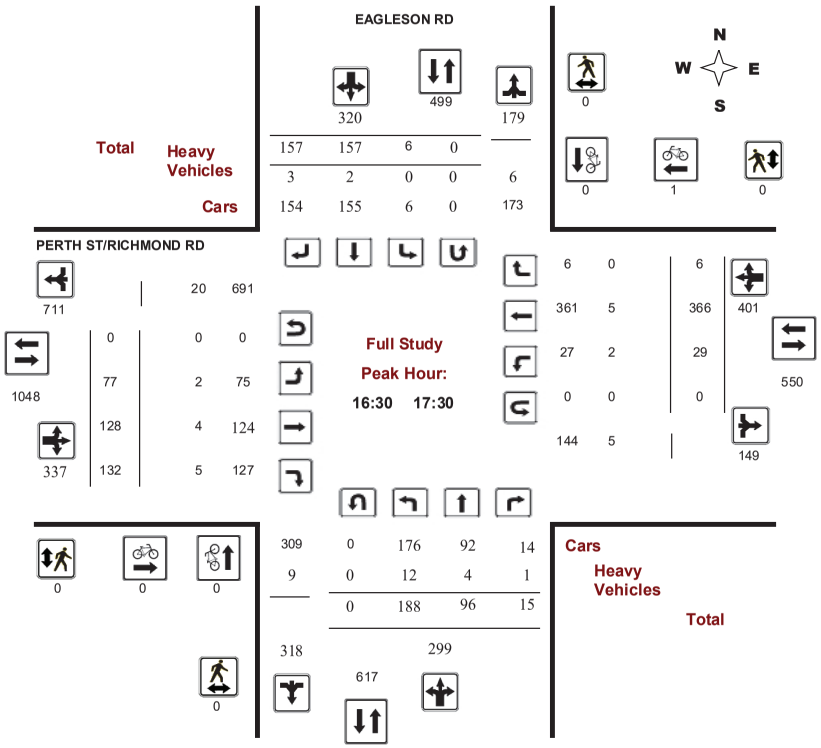
Turning Movement Count - Study Results

EAGLESON RD @ PERTH ST/RICHMOND RD

Survey Date: Wednesday, December 03, 2014 **WO No:** 34040

Start Time: 07:00 **Device:** Miovision

Full Study Peak Hour Diagram



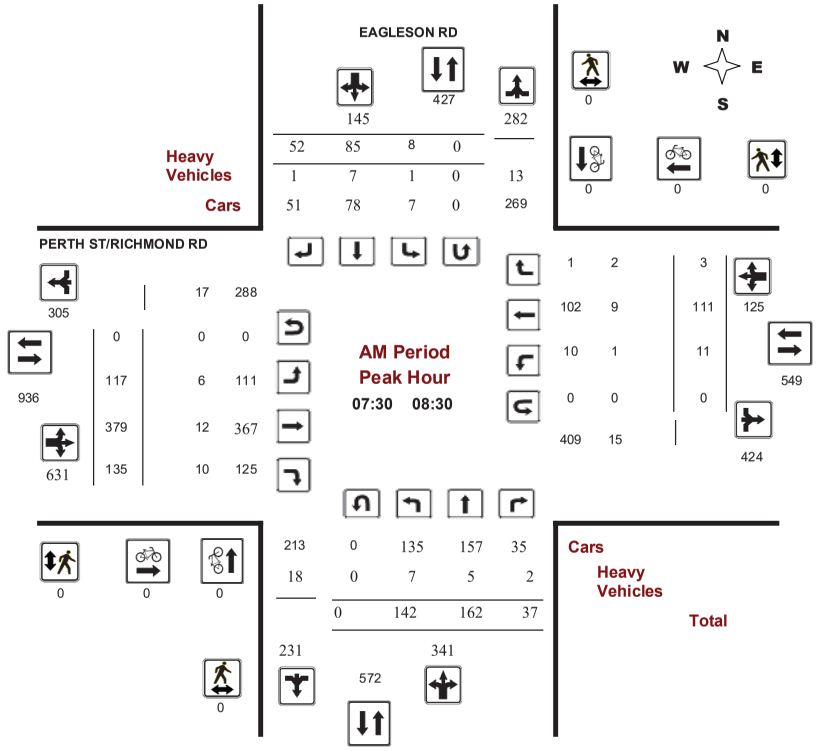
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

EAGLESON RD @ PERTH ST/RICHMOND RD

Survey Date: Wednesday, December 03, 2014 **WO No:** 34040

Start Time: 07:00 **Device:** Miovision



Comments

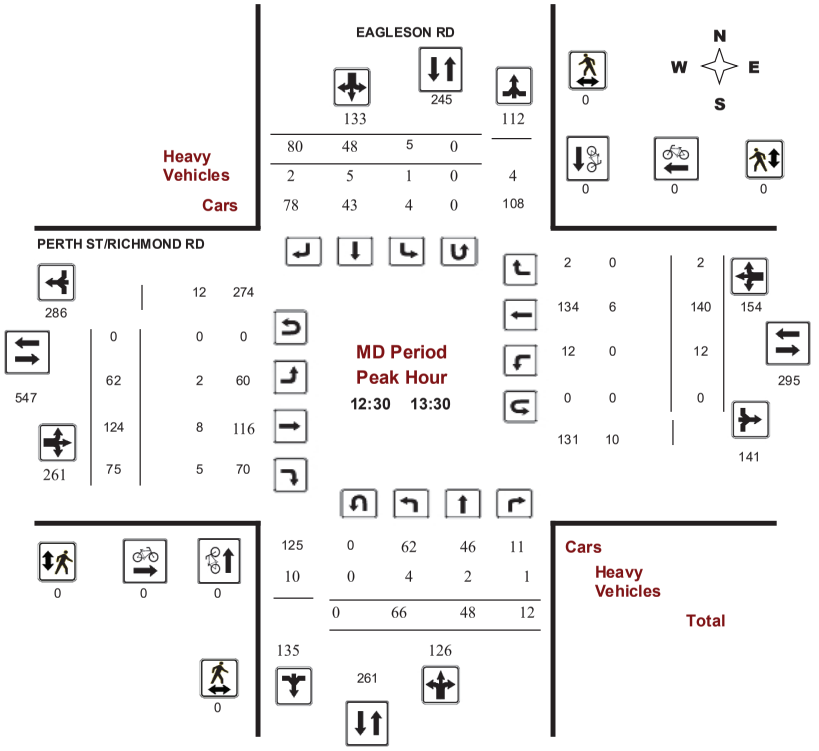
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

EAGLESON RD @ PERTH ST/RICHMOND RD

Survey Date: Wednesday, December 03, 2014 **WO No:** 34040

Start Time: 07:00 **Device:** Miovision



Comments

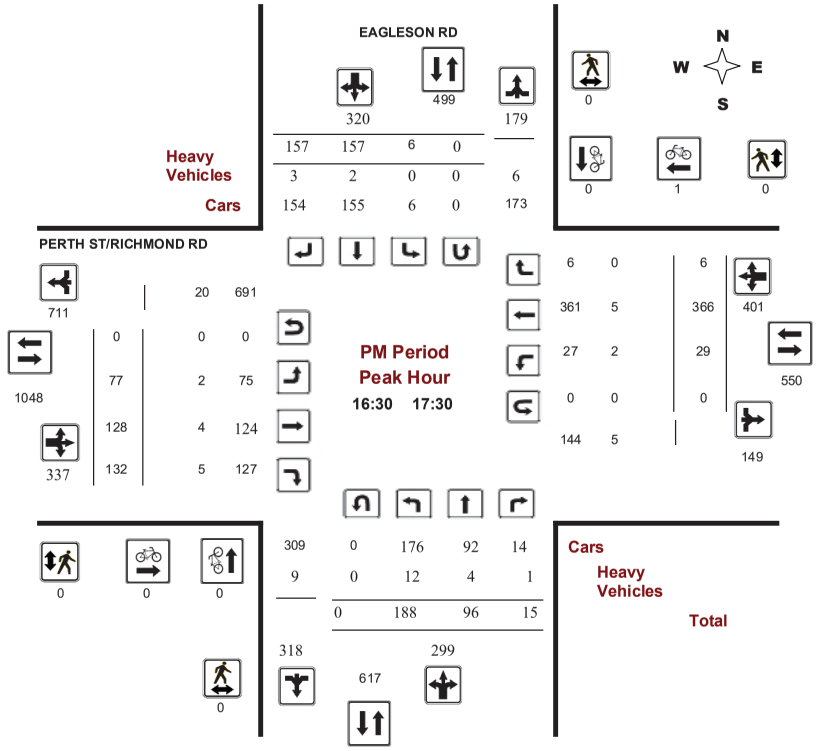
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

EAGLESON RD @ PERTH ST/RICHMOND RD

Survey Date: Wednesday, December 03, 2014 **WO No:** 34040

Start Time: 07:00 **Device:** Miovision



Comments

Transportation Services - Traffic Services

Turning Movement Count - Study Results

EAGLESON RD @ PERTH ST/RICHMOND RD

Survey Date: Wednesday, December 03, 2014 **WO No:** 34040

Start Time: 07:00 **Device:** Miovision

Full Study Summary (8 HR Standard)

Survey Date: Wednesday, December 03, 2014

Total Observed U-Turns

Northbound: 1 Southbound: 0

Eastbound: 0 Westbound: 0

AADT Factor 1.00

	EAGLESON RD								PERTH ST/RICHMOND RD								
	Northbound				Southbound				Eastbound				Westbound				
Period	LT	ST	RT	NB TOT	LT	ST	RT	SB TOT	STR TOT	LT	ST	RT	EB TOT	LT	ST	RT	WB TOT	STR TOT	Grand Total
07:00 08:00	117	141	32	**290**	4	76	37	**117**	**407**	103	400	116	**619**	14	92	5	**111**	**730**	**1137**
08:00 09:00	116	148	35	**299**	10	65	52	**127**	**426**	105	295	119	**519**	7	111	3	**121**	**640**	**1066**
09:00 10:00	91	77	23	**191**	4	49	40	**93**	**284**	91	196	80	**367**	8	80	5	**93**	**460**	**744**
11:30 12:30	77	56	11	**144**	2	37	73	**112**	**256**	57	129	64	**250**	9	98	5	**112**	**362**	**618**
12:30 13:30	66	48	12	**126**	5	48	80	**133**	**259**	62	124	75	**261**	12	140	2	**154**	**415**	**674**
15:00 16:00	102	67	17	**186**	4	88	123	**215**	**401**	61	129	90	**280**	23	264	8	**295**	**575**	**976**
16:00 17:00	182	94	19	**295**	7	146	160	**313**	**608**	70	127	143	**340**	37	363	3	**403**	**743**	**1351**
17:00 18:00	148	81	9	**238**	2	133	128	**263**	**501**	76	115	108	**299**	23	319	6	**348**	**647**	**1148**
Sub Total	899	712	158	**1769**	38	642	693	**1373**	**3142**	625	1515	795	**2935**	133	1467	37	**1637**	**4572**	**7714**
U Turns				**1**				**0**	**1**				**0**				**0**	**0**	**1**
Total	899	712	158	**1770**	38	642	693	**1373**	**3143**	625	1515	795	**2935**	133	1467	37	**1637**	**4572**	**7715**
EQ 12Hr	1250	990	220	**2460**	53	892	963	**1908**	**4369**	869	2106	1105	**4080**	185	2039	51	**2275**	**6355**	**10724**
Note: These values are calculated by multiplying the totals by the appropriate expansion factor.														**1.39**					
AVG 12Hr	1178	933	207	**2319**	50	841	908	**1799**	**4369**	819	1985	1041	**3845**	174	1922	48	**2144**	**6355**	**10724**
Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor.														**1**					
AVG 24Hr	1543	1222	271	**3037**	65	1102	1189	**2356**	**5393**	1073	2600	1364	**5037**	228	2518	63	**2809**	**7846**	**13239**
Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor.														**1.31**					

Note: U-Turns provided for approach totals. Refer to 'U-Turn' Report for specific breakdown.

Transportation Services - Traffic Services

Turning Movement Count - Study Results

EAGLESON RD @ PERTH ST/RICHMOND RD

Survey Date: Wednesday, December 03, 2014 **WO No:** 34040

Start Time: 07:00 **Device:** Miovision

Full Study 15 Minute Increments

		EAGLESON RD									PERTH ST/RICHMOND RD									
		Northbound				Southbound					Eastbound				Westbound					
Time Period		LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total
07:00	07:15	16	33	7	56	1	12	4	17	5	22	101	21	144	2	19	3	24	5	241
07:15	07:30	26	19	6	51	1	15	5	21	3	17	86	30	133	4	23	1	28	3	233
07:30	07:45	30	49	11	90	1	31	13	45	7	29	106	35	170	4	30	0	34	7	339
07:45	08:00	45	40	8	93	1	18	15	34	4	35	107	30	172	4	20	1	25	4	324
08:00	08:15	30	28	13	71	3	26	12	41	7	30	101	36	167	3	35	1	39	7	318
08:15	08:30	37	45	5	87	3	10	12	25	5	23	65	34	122	0	26	1	27	5	261
08:30	08:45	29	50	8	88	2	17	13	32	9	33	77	22	132	2	22	0	24	9	276
08:45	09:00	20	25	9	54	2	12	15	29	11	19	52	27	98	2	28	1	31	11	212
09:00	09:15	24	23	11	58	2	15	6	23	8	22	43	26	91	2	27	2	31	8	203
09:15	09:30	25	24	4	53	1	9	10	20	12	26	66	15	107	2	19	1	22	12	202
09:30	09:45	17	21	5	43	1	13	11	25	5	21	47	22	90	3	15	0	18	5	176
09:45	10:00	25	9	3	37	0	12	13	25	3	22	40	17	79	1	19	2	22	3	163
11:30	11:45	23	24	1	48	0	8	17	25	7	12	38	13	63	2	16	3	21	7	157
11:45	12:00	19	14	0	33	1	12	15	28	6	22	24	20	66	1	26	1	28	6	155
12:00	12:15	21	12	4	37	1	6	25	32	4	9	31	19	59	6	34	1	41	4	169
12:15	12:30	14	6	6	26	0	11	16	27	4	14	36	12	62	0	22	0	22	4	137
12:30	12:45	21	16	3	40	0	10	27	37	6	27	30	12	69	7	30	0	37	6	183
12:45	13:00	10	11	3	24	1	15	15	31	3	7	35	23	65	0	50	0	50	3	170
13:00	13:15	13	13	0	26	1	9	22	32	3	17	34	13	64	1	28	2	31	3	153
13:15	13:30	22	8	6	36	3	14	16	33	3	11	25	27	63	4	32	0	36	3	168
15:00	15:15	24	13	8	45	1	15	28	44	7	19	23	15	57	4	47	0	51	7	197
15:15	15:30	24	17	4	45	0	21	29	50	5	17	33	26	76	2	59	4	65	5	236
15:30	15:45	29	17	3	49	1	31	35	67	4	11	37	25	73	5	74	2	81	4	270
15:45	16:00	25	20	2	47	2	21	31	54	4	14	36	24	74	12	84	2	98	4	273
16:00	16:15	49	20	4	73	1	30	31	62	8	15	34	33	82	8	97	0	105	8	322
16:15	16:30	41	24	5	70	2	32	36	70	8	19	32	34	85	11	76	0	87	8	312
16:30	16:45	51	29	6	86	1	44	47	92	11	17	37	39	93	11	100	1	112	11	383
16:45	17:00	41	21	4	66	3	40	46	89	3	19	24	37	80	7	90	2	99	3	334
17:00	17:15	46	21	1	68	0	40	34	74	7	22	36	33	91	4	82	2	88	7	321
17:15	17:30	50	25	4	79	2	33	30	65	1	19	31	23	73	7	94	1	102	1	319
17:30	17:45	20	16	2	38	0	31	32	63	0	23	28	25	76	6	76	3	85	0	262
17:45	18:00	32	19	2	53	0	29	32	61	2	12	20	27	59	6	67	0	73	2	246
Total:		899	712	158	1770	38	642	693	1373	175	625	1515	795	2935	133	1467	37	1637	175	7,715

Note: U-Turns are included in Totals.

Transportation Services - Traffic Services

Turning Movement Count - Study Results

EAGLESON RD @ PERTH ST/RICHMOND RD

Survey Date: Wednesday, December 03, 2014 **WO No:** 34040

Start Time: 07:00 **Device:** Miovision

Full Study Cyclist Volume

		EAGLESON RD			PERTH ST/RICHMOND RD			
Time Period		Northbound	Southbound	Street Total	Eastbound	Westbound	Street Total	Grand Total
07:00	07:15	0	0	0	0	0	0	0
07:15	07:30	0	0	0	0	0	0	0
07:30	07:45	0	0	0	0	0	0	0
07:45	08:00	0	0	0	0	0	0	0
08:00	08:15	0	0	0	0	0	0	0
08:15	08:30	0	0	0	0	0	0	0
08:30	08:45	0	0	0	0	0	0	0
08:45	09:00	0	0	0	0	0	0	0
09:00	09:15	0	0	0	0	0	0	0
09:15	09:30	0	0	0	0	0	0	0
09:30	09:45	0	0	0	0	0	0	0
09:45	10:00	0	0	0	0	0	0	0
11:30	11:45	0	0	0	0	0	0	0
11:45	12:00	0	0	0	0	0	0	0
12:00	12:15	0	0	0	0	0	0	0
12:15	12:30	0	0	0	0	0	0	0
12:30	12:45	0	0	0	0	0	0	0
12:45	13:00	0	0	0	0	0	0	0
13:00	13:15	0	0	0	0	0	0	0
13:15	13:30	0	0	0	0	0	0	0
15:00	15:15	0	0	0	0	0	0	0
15:15	15:30	0	0	0	0	0	0	0
15:30	15:45	0	0	0	0	0	0	0
15:45	16:00	0	0	0	0	0	0	0
16:00	16:15	0	0	0	0	0	0	0
16:15	16:30	0	0	0	0	0	0	0
16:30	16:45	0	0	0	0	0	0	0
16:45	17:00	0	0	0	0	0	0	0
17:00	17:15	0	0	0	0	1	1	1
17:15	17:30	0	0	0	0	0	0	0
17:30	17:45	0	0	0	0	0	0	0
17:45	18:00	0	0	0	0	0	0	0
Total		0	0	**0**	0	1	1	1

Transportation Services - Traffic Services

Turning Movement Count - Study Results

EAGLESON RD @ PERTH ST/RICHMOND RD

Survey Date: Wednesday, December 03, 2014 **WO No:** 34040

Start Time: 07:00 **Device:** Miovision

Full Study Pedestrian Volume

	EAGLESON RD			PERTH ST/RICHMOND RD			
Time Period	NB Approach (E or W Crossing)	SB Approach (E or W Crossing)	Total	EB Approach (N or S Crossing)	WB Approach (N or S Crossing)	Total	Grand Total
07:00 07:15	0	0	**0**	0	0	**0**	**0**
07:15 07:30	0	0	**0**	0	0	**0**	**0**
07:30 07:45	0	0	**0**	0	0	**0**	**0**
07:45 08:00	0	0	**0**	0	0	**0**	**0**
08:00 08:15	0	0	**0**	0	0	**0**	**0**
08:15 08:30	0	0	**0**	0	0	**0**	**0**
08:30 08:45	0	0	**0**	0	0	**0**	**0**
08:45 09:00	0	0	**0**	0	0	**0**	**0**
09:00 09:15	0	0	**0**	0	0	**0**	**0**
09:15 09:30	0	0	**0**	0	0	**0**	**0**
09:30 09:45	0	0	**0**	0	0	**0**	**0**
09:45 10:00	0	0	**0**	0	0	**0**	**0**
11:30 11:45	0	0	**0**	0	0	**0**	**0**
11:45 12:00	0	0	**0**	0	0	**0**	**0**
12:00 12:15	0	0	**0**	0	0	**0**	**0**
12:15 12:30	0	0	**0**	0	0	**0**	**0**
12:30 12:45	0	0	**0**	0	0	**0**	**0**
12:45 13:00	0	0	**0**	0	0	**0**	**0**
13:00 13:15	0	0	**0**	0	0	**0**	**0**
13:15 13:30	0	0	**0**	0	0	**0**	**0**
15:00 15:15	0	0	**0**	0	0	**0**	**0**
15:15 15:30	0	0	**0**	0	0	**0**	**0**
15:30 15:45	0	0	**0**	0	0	**0**	**0**
15:45 16:00	0	0	**0**	0	0	**0**	**0**
16:00 16:15	0	0	**0**	0	0	**0**	**0**
16:15 16:30	0	0	**0**	0	0	**0**	**0**
16:30 16:45	0	0	**0**	0	0	**0**	**0**
16:45 17:00	0	0	**0**	0	0	**0**	**0**
17:00 17:15	0	0	**0**	0	0	**0**	**0**
17:15 17:30	0	0	**0**	0	0	**0**	**0**
17:30 17:45	0	0	**0**	0	0	**0**	**0**
17:45 18:00	0	0	**0**	0	0	**0**	**0**
Total	0	0	**0**	0	0	**0**	**0**

Transportation Services - Traffic Services

Turning Movement Count - Study Results

EAGLESON RD @ PERTH ST/RICHMOND RD

Survey Date: Wednesday, December 03, 2014 **WO No:** 34040

Start Time: 07:00 **Device:** Miovision

Full Study Heavy Vehicles

		EAGLESON RD									PERTH ST/RICHMOND RD									
		Northbound				Southbound					Eastbound				Westbound					
Time Period		LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total
07:00	07:15	0	3	0	**3**	0	2	0	**2**	**5**	0	3	3	**6**	0	2	0	**2**	**8**	**13**
07:15	07:30	1	1	1	**3**	0	0	0	**0**	**3**	0	2	3	**5**	0	1	0	**1**	**6**	**9**
07:30	07:45	2	2	1	**5**	0	2	0	**2**	**7**	1	5	2	**8**	0	3	0	**3**	**11**	**18**
07:45	08:00	3	1	0	**4**	0	0	0	**0**	**4**	3	2	3	**8**	1	2	1	**4**	**12**	**16**
08:00	08:15	1	0	1	**2**	0	4	1	**5**	**7**	0	2	2	**4**	0	2	1	**3**	**7**	**14**
08:15	08:30	1	2	0	**3**	1	1	0	**2**	**5**	2	3	3	**8**	0	2	0	**2**	**10**	**15**
08:30	08:45	4	1	0	**5**	1	3	0	**4**	**9**	1	3	1	**5**	1	1	0	**2**	**7**	**16**
08:45	09:00	3	3	0	**6**	2	2	1	**5**	**11**	1	2	1	**4**	0	3	1	**4**	**8**	**19**
09:00	09:15	4	1	0	**5**	2	1	0	**3**	**8**	1	1	0	**2**	0	1	1	**2**	**4**	**12**
09:15	09:30	3	4	0	**7**	1	1	3	**5**	**12**	0	4	0	**4**	0	4	1	**5**	**9**	**21**
09:30	09:45	1	1	0	**2**	1	2	0	**3**	**5**	0	4	0	**4**	0	2	0	**2**	**6**	**11**
09:45	10:00	2	0	1	**3**	0	0	0	**0**	**3**	0	2	2	**4**	0	3	1	**4**	**8**	**11**
11:30	11:45	3	1	0	**4**	0	1	2	**3**	**7**	2	3	0	**5**	0	1	2	**3**	**8**	**15**
11:45	12:00	2	0	0	**2**	1	2	1	**4**	**6**	0	0	4	**4**	0	5	0	**5**	**9**	**15**
12:00	12:15	2	0	0	**2**	0	0	2	**2**	**4**	0	2	1	**3**	0	0	0	**0**	**3**	**7**
12:15	12:30	2	0	0	**2**	0	1	1	**2**	**4**	0	3	1	**4**	0	0	0	**0**	**4**	**8**
12:30	12:45	4	0	0	**4**	0	2	0	**2**	**6**	1	3	0	**4**	0	0	0	**0**	**4**	**10**
12:45	13:00	0	0	0	**0**	0	2	1	**3**	**3**	1	1	2	**4**	0	6	0	**6**	**10**	**13**
13:00	13:15	0	2	0	**2**	1	0	0	**1**	**3**	0	1	1	**2**	0	0	0	**0**	**2**	**5**
13:15	13:30	0	0	1	**1**	0	1	1	**2**	**3**	0	3	2	**5**	0	0	0	**0**	**5**	**8**
15:00	15:15	1	2	1	**4**	0	2	1	**3**	**7**	0	1	0	**1**	0	1	0	**1**	**2**	**9**
15:15	15:30	1	1	0	**2**	0	2	1	**3**	**5**	2	2	0	**4**	0	3	2	**5**	**9**	**14**
15:30	15:45	2	0	0	**2**	1	0	1	**2**	**4**	1	1	0	**2**	0	3	1	**4**	**6**	**10**
15:45	16:00	1	0	1	**2**	1	0	1	**2**	**4**	0	0	3	**3**	0	1	0	**1**	**4**	**8**
16:00	16:15	1	2	0	**3**	0	3	2	**5**	**8**	0	1	1	**2**	1	2	0	**3**	**5**	**13**
16:15	16:30	3	1	2	**6**	0	0	2	**2**	**8**	0	3	3	**6**	1	1	0	**2**	**8**	**16**
16:30	16:45	7	2	1	**10**	0	0	1	**1**	**11**	0	1	2	**3**	2	2	0	**4**	**7**	**18**
16:45	17:00	1	0	0	**1**	0	1	1	**2**	**3**	1	1	1	**3**	0	2	0	**2**	**5**	**8**
17:00	17:15	4	1	0	**5**	0	1	1	**2**	**7**	1	1	2	**4**	0	1	0	**1**	**5**	**12**
17:15	17:30	0	1	0	**1**	0	0	0	**0**	**1**	0	1	0	**1**	0	0	0	**0**	**1**	**2**
17:30	17:45	0	0	0	**0**	0	0	0	**0**	**0**	0	2	2	**4**	0	1	0	**1**	**5**	**5**
17:45	18:00	1	0	0	**1**	0	1	0	**1**	**2**	0	1	1	**2**	0	1	0	**1**	**3**	**5**
Total:	None	60	32	10	**102**	12	37	24	**73**	**175**	18	64	46	**128**	6	56	11	**73**	**201**	**376**

Transportation Services - Traffic Services

Turning Movement Count - Study Results

EAGLESON RD @ PERTH ST/RICHMOND RD

Survey Date: Wednesday, December 03, 2014 **WO No:** 34040

Start Time: 07:00 **Device:** Miovision

Full Study 15 Minute U-Turn Total

Time Period		EAGLESON RD Northbound U-Turn Total	EAGLESON RD Southbound U-Turn Total	PERTH ST/RICHMOND RD Eastbound U-Turn Total	PERTH ST/RICHMOND RD Westbound U-Turn Total	Total
07:00	07:15	0	0	0	0	0
07:15	07:30	0	0	0	0	0
07:30	07:45	0	0	0	0	0
07:45	08:00	0	0	0	0	0
08:00	08:15	0	0	0	0	0
08:15	08:30	0	0	0	0	0
08:30	08:45	1	0	0	0	1
08:45	09:00	0	0	0	0	0
09:00	09:15	0	0	0	0	0
09:15	09:30	0	0	0	0	0
09:30	09:45	0	0	0	0	0
09:45	10:00	0	0	0	0	0
11:30	11:45	0	0	0	0	0
11:45	12:00	0	0	0	0	0
12:00	12:15	0	0	0	0	0
12:15	12:30	0	0	0	0	0
12:30	12:45	0	0	0	0	0
12:45	13:00	0	0	0	0	0
13:00	13:15	0	0	0	0	0
13:15	13:30	0	0	0	0	0
15:00	15:15	0	0	0	0	0
15:15	15:30	0	0	0	0	0
15:30	15:45	0	0	0	0	0
15:45	16:00	0	0	0	0	0
16:00	16:15	0	0	0	0	0
16:15	16:30	0	0	0	0	0
16:30	16:45	0	0	0	0	0
16:45	17:00	0	0	0	0	0
17:00	17:15	0	0	0	0	0
17:15	17:30	0	0	0	0	0
17:30	17:45	0	0	0	0	0
17:45	18:00	0	0	0	0	0
Total		1	0	0	0	1

Transportation Services - Traffic Services

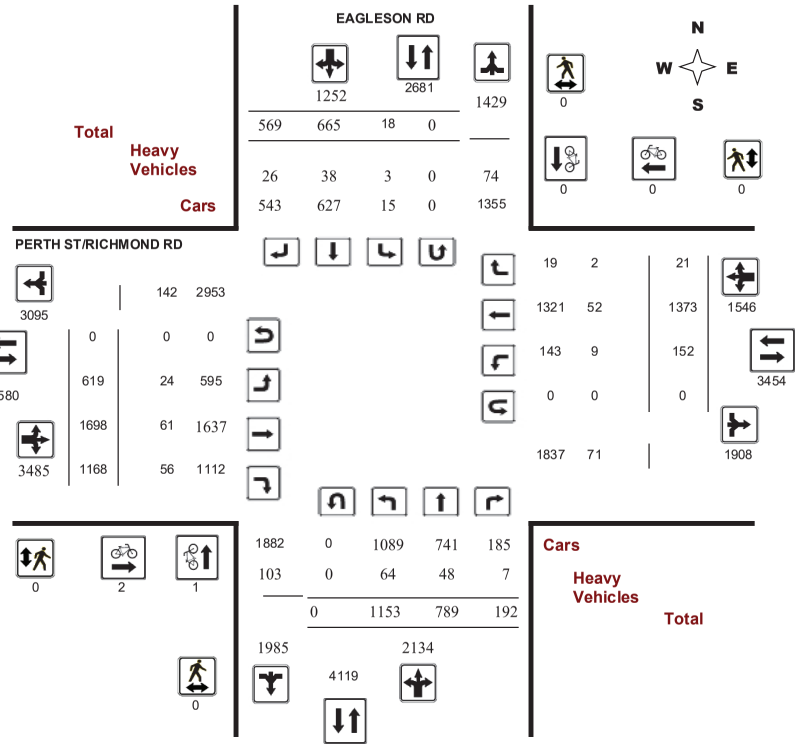
Turning Movement Count - Study Results

EAGLESON RD @ PERTH ST/RICHMOND RD

Survey Date: Wednesday, November 21, 2018 **WO No:** 38146

Start Time: 07:00 **Device:** Miovision

Full Study Diagram



Transportation Services - Traffic Services

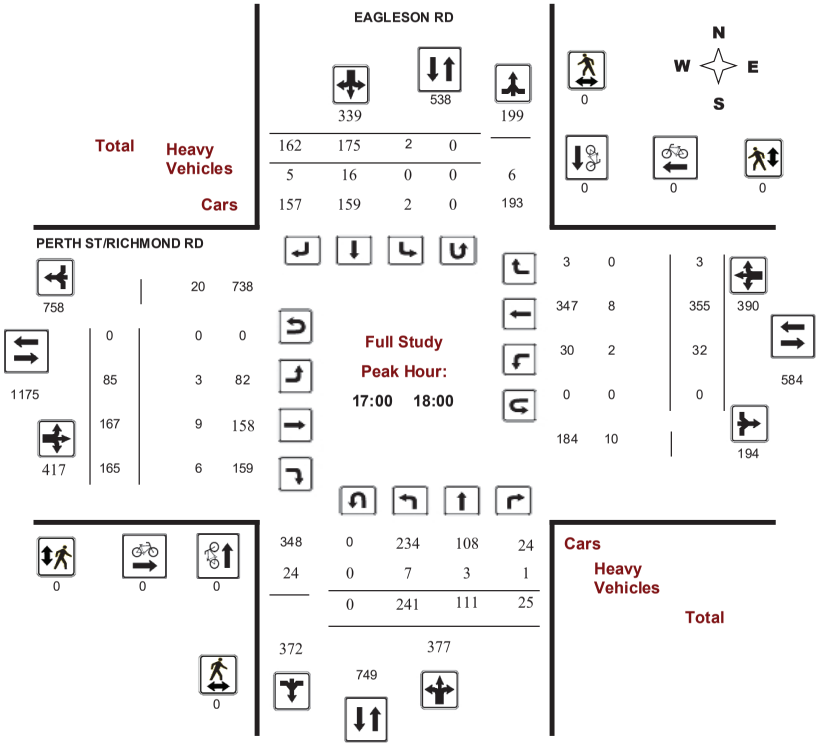
Turning Movement Count - Study Results

EAGLESON RD @ PERTH ST/RICHMOND RD

Survey Date: Wednesday, November 21, 2018 **WO No:** 38146

Start Time: 07:00 **Device:** Miovision

Full Study Peak Hour Diagram



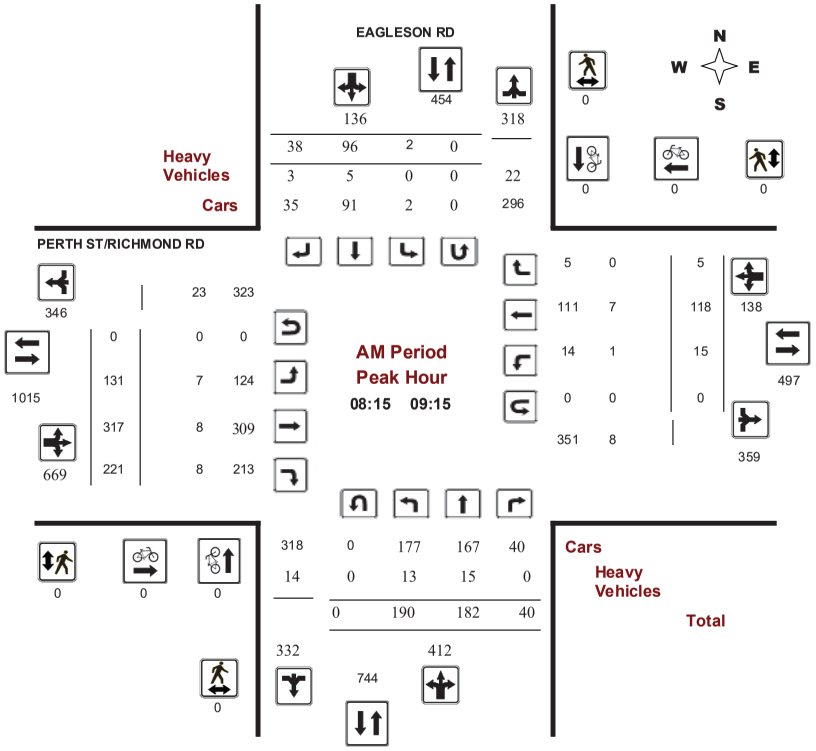
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

EAGLESON RD @ PERTH ST/RICHMOND RD

Survey Date: Wednesday, November 21, 2018 **WO No:** 38146

Start Time: 07:00 **Device:** Miovision



Comments

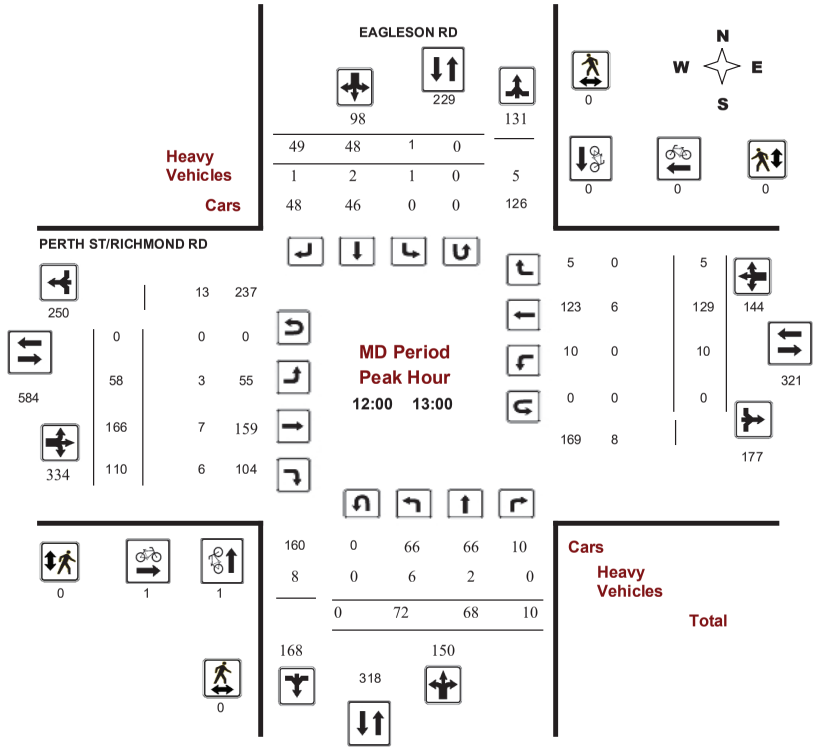
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

EAGLESON RD @ PERTH ST/RICHMOND RD

Survey Date: Wednesday, November 21, 2018 **WO No:** 38146

Start Time: 07:00 **Device:** Miovision



Comments

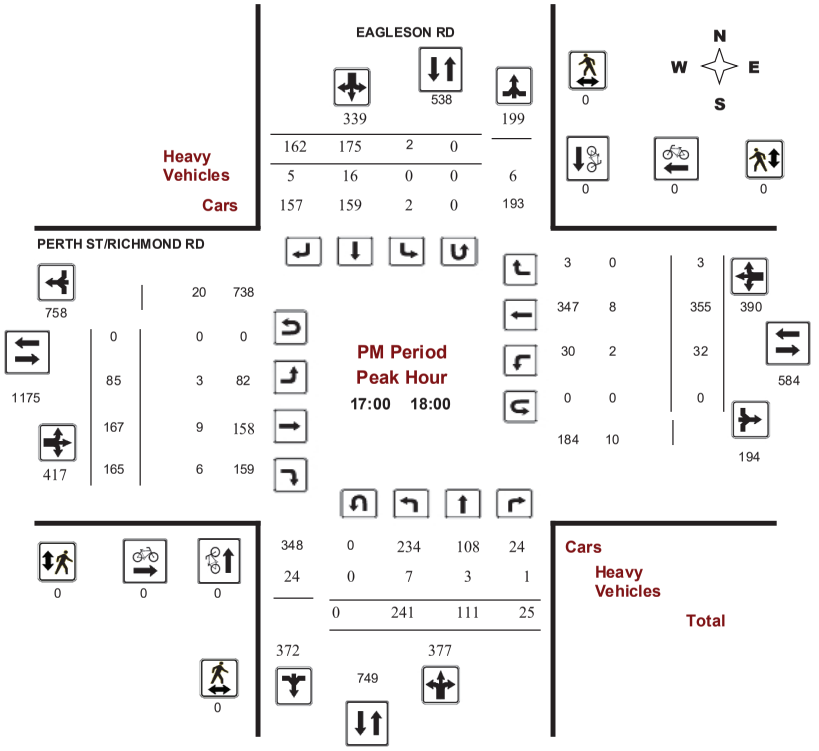
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

EAGLESON RD @ PERTH ST/RICHMOND RD

Survey Date: Wednesday, November 21, 2018 **WO No:** 38146

Start Time: 07:00 **Device:** Miovision



Comments

Transportation Services - Traffic Services

Turning Movement Count - Study Results

EAGLESON RD @ PERTH ST/RICHMOND RD

Survey Date: Wednesday, November 21, 2018 **WO No:** 38146

Start Time: 07:00 **Device:** Miovision

Full Study Summary (8 HR Standard)

Survey Date: Wednesday, November 21, 2018

Total Observed U-Turns

Northbound: 0 Southbound: 0

Eastbound: 0 Westbound: 0

AADT Factor

.90

	EAGLESON RD									PERTH ST/RICHMOND RD									
	Northbound				Southbound					Eastbound				Westbound					
Period	LT	ST	RT	NB TOT	LT	ST	RT	SB TOT	STR TOT	LT	ST	RT	EB TOT	LT	ST	RT	WB TOT	STR TOT	Grand Total
07:00 08:00	89	95	31	**215**	1	32	27	**60**	**275**	67	372	148	**587**	3	57	0	**60**	**647**	**922**
08:00 09:00	186	161	35	**382**	2	84	34	**120**	**502**	127	356	222	**705**	16	125	3	**144**	**849**	**1351**
09:00 10:00	155	148	31	**334**	5	88	59	**152**	**486**	110	235	156	**501**	18	134	3	**155**	**656**	**1142**
11:30 12:30	99	70	21	**190**	1	43	34	**78**	**268**	52	161	85	**298**	11	120	0	**131**	**429**	**697**
12:30 13:30	72	54	17	**143**	0	45	58	**103**	**246**	55	172	98	**325**	15	126	6	**147**	**472**	**718**
15:00 16:00	125	68	24	**217**	6	70	74	**150**	**367**	47	113	135	**295**	23	178	2	**203**	**498**	**865**
16:00 17:00	186	82	8	**276**	1	128	121	**250**	**526**	76	122	159	**357**	34	278	4	**316**	**673**	**1199**
17:00 18:00	241	111	25	**377**	2	175	162	**339**	**716**	85	167	165	**417**	32	355	3	**390**	**807**	**1523**
Sub Total	1153	789	192	**2134**	18	665	569	**1252**	**3386**	619	1698	1168	**3485**	152	1373	21	**1546**	**5031**	**8417**
U Turns				**0**				**0**	**0**				**0**				**0**	**0**	**0**
Total	1153	789	192	**2134**	18	665	569	**1252**	**3386**	619	1698	1168	**3485**	152	1373	21	**1546**	**5031**	**8417**
EQ 12Hr	1603	1097	267	**2966**	25	924	791	**1740**	**4707**	860	2360	1624	**4844**	211	1908	29	**2149**	**6993**	**11700**
Note: These values are calculated by multiplying the totals by the appropriate expansion factor.														**1.39**					
AVG 12Hr	1359	930	226	**2516**	21	784	671	**1476**	**4236**	730	2002	1377	**4109**	179	1619	25	**1823**	**6294**	**10530**
Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor.														**0.9**					
AVG 24Hr	1781	1219	297	**3296**	28	1027	879	**1934**	**5230**	956	2623	1804	**5383**	235	2121	32	**2388**	**7771**	**13001**
Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor.														**1.31**					

Note: U-Turns provided for approach totals. Refer to 'U-Turn' Report for specific breakdown.

Transportation Services - Traffic Services

Turning Movement Count - Study Results

EAGLESON RD @ PERTH ST/RICHMOND RD

Survey Date: Wednesday, November 21, 2018 **WO No:** 38146

Start Time: 07:00 **Device:** Miovision

Full Study 15 Minute Increments

		EAGLESON RD										PERTH ST/RICHMOND RD										
		Northbound				Southbound						Eastbound				Westbound						
Time Period		LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT		LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT		Grand Total
07:00	07:15	8	14	14	36	0	1	4	5	2		11	78	32	121	1	2	0	3	2		165
07:15	07:30	18	23	10	51	1	9	6	16	5		16	102	35	153	0	13	0	13	5		233
07:30	07:45	30	31	3	64	0	11	7	18	3		21	95	41	157	0	15	0	15	3		254
07:45	08:00	33	27	4	64	0	11	10	21	8		19	97	40	156	2	27	0	29	8		270
08:00	08:15	39	27	7	73	0	17	3	20	4		27	106	50	183	5	35	0	40	4		316
08:15	08:30	43	30	10	83	1	25	9	35	6		29	92	52	173	4	32	1	37	6		328
08:30	08:45	56	45	8	109	0	22	8	30	9		37	84	49	170	3	31	0	34	9		343
08:45	09:00	48	59	10	117	1	20	14	35	8		34	74	71	179	4	27	2	33	8		364
09:00	09:15	43	48	12	103	0	29	7	36	13		31	67	49	147	4	28	2	34	13		320
09:15	09:30	40	31	8	79	2	25	15	42	8		24	62	44	130	10	33	0	43	8		294
09:30	09:45	40	41	6	87	1	19	18	38	8		29	54	34	117	1	39	0	40	8		282
09:45	10:00	32	28	5	65	2	15	19	36	6		26	52	29	107	3	34	1	38	6		246
11:30	11:45	20	20	12	52	0	8	4	12	4		10	50	19	79	2	21	0	23	4		166
11:45	12:00	37	11	4	52	0	10	9	19	4		11	32	15	58	3	38	0	41	4		170
12:00	12:15	24	13	2	39	0	11	8	19	4		13	48	25	86	3	33	0	36	4		180
12:15	12:30	18	26	3	47	1	14	13	28	5		18	31	26	75	3	28	0	31	5		181
12:30	12:45	16	11	3	30	0	13	14	27	3		16	52	26	94	4	34	1	39	3		190
12:45	13:00	14	18	2	34	0	10	14	24	0		11	35	33	79	0	34	4	38	0		175
13:00	13:15	18	17	8	43	0	14	14	28	4		8	43	19	70	3	22	1	26	4		167
13:15	13:30	24	8	4	36	0	8	16	24	3		20	42	20	82	8	36	0	44	3		186
15:00	15:15	23	15	7	45	4	11	12	27	4		12	37	41	90	7	40	1	48	4		210
15:15	15:30	42	24	8	74	0	14	20	34	6		15	27	24	66	8	44	1	53	6		227
15:30	15:45	28	13	5	46	2	13	23	38	5		8	19	32	59	7	39	0	46	5		189
15:45	16:00	32	16	4	52	0	32	19	51	4		12	30	38	80	1	55	0	56	4		239
16:00	16:15	30	15	3	48	0	24	27	51	4		20	34	37	91	10	51	0	61	4		251
16:15	16:30	53	18	3	74	0	33	32	65	8		19	30	39	88	3	71	1	75	8		302
16:30	16:45	57	25	0	82	0	29	29	58	8		18	22	41	81	9	69	1	79	8		300
16:45	17:00	46	24	2	72	1	42	33	76	8		19	36	42	97	12	87	2	101	8		346
17:00	17:15	59	26	6	91	0	37	35	72	10		23	37	40	100	7	85	2	94	10		357
17:15	17:30	61	31	6	98	1	54	51	106	8		21	46	49	116	10	100	0	110	8		430
17:30	17:45	47	26	10	83	1	45	43	89	6		27	47	43	117	7	90	1	98	6		387
17:45	18:00	74	28	3	105	0	39	33	72	8		14	37	33	84	8	80	0	88	8		349
Total:		1153	789	192	2134	18	665	569	1252	186		619	1698	1168	3485	152	1373	21	1546	186		8,417

Note: U-Turns are included in Totals.

Transportation Services - Traffic Services

Turning Movement Count - Study Results

EAGLESON RD @ PERTH ST/RICHMOND RD

Survey Date: Wednesday, November 21, 2018 **WO No:** 38146

Start Time: 07:00 **Device:** Miovision

Full Study Cyclist Volume

Time Period		EAGLESON RD			PERTH ST/RICHMOND RD			
		Northbound	Southbound	Street Total	Eastbound	Westbound	Street Total	Grand Total
07:00	07:15	0	0	0	0	0	0	0
07:15	07:30	0	0	0	0	0	0	0
07:30	07:45	0	0	0	0	0	0	0
07:45	08:00	0	0	0	0	0	0	0
08:00	08:15	0	0	0	0	0	0	0
08:15	08:30	0	0	0	0	0	0	0
08:30	08:45	0	0	0	0	0	0	0
08:45	09:00	0	0	0	0	0	0	0
09:00	09:15	0	0	0	0	0	0	0
09:15	09:30	0	0	0	0	0	0	0
09:30	09:45	0	0	0	0	0	0	0
09:45	10:00	0	0	0	0	0	0	0
11:30	11:45	0	0	0	0	0	0	0
11:45	12:00	0	0	0	0	0	0	0
12:00	12:15	0	0	0	0	0	0	0
12:15	12:30	0	0	0	0	0	0	0
12:30	12:45	0	0	0	0	0	0	0
12:45	13:00	1	0	1	1	0	1	2
13:00	13:15	0	0	0	0	0	0	0
13:15	13:30	0	0	0	1	0	1	1
15:00	15:15	0	0	0	0	0	0	0
15:15	15:30	0	0	0	0	0	0	0
15:30	15:45	0	0	0	0	0	0	0
15:45	16:00	0	0	0	0	0	0	0
16:00	16:15	0	0	0	0	0	0	0
16:15	16:30	0	0	0	0	0	0	0
16:30	16:45	0	0	0	0	0	0	0
16:45	17:00	0	0	0	0	0	0	0
17:00	17:15	0	0	0	0	0	0	0
17:15	17:30	0	0	0	0	0	0	0
17:30	17:45	0	0	0	0	0	0	0
17:45	18:00	0	0	0	0	0	0	0
Total		1	0	1	2	0	2	3

Transportation Services - Traffic Services

Turning Movement Count - Study Results

EAGLESON RD @ PERTH ST/RICHMOND RD

Survey Date: Wednesday, November 21, 2018 **WO No:** 38146

Start Time: 07:00 **Device:** Miovision

Full Study Pedestrian Volume

Time Period	EAGLESON RD			PERTH ST/RICHMOND RD			
	NB Approach (E or W Crossing)	SB Approach (E or W Crossing)	Total	EB Approach (N or S Crossing)	WB Approach (N or S Crossing)	Total	Grand Total
07:00 07:15	0	0	**0**	0	0	**0**	**0**
07:15 07:30	0	0	**0**	0	0	**0**	**0**
07:30 07:45	0	0	**0**	0	0	**0**	**0**
07:45 08:00	0	0	**0**	0	0	**0**	**0**
08:00 08:15	0	0	**0**	0	0	**0**	**0**
08:15 08:30	0	0	**0**	0	0	**0**	**0**
08:30 08:45	0	0	**0**	0	0	**0**	**0**
08:45 09:00	0	0	**0**	0	0	**0**	**0**
09:00 09:15	0	0	**0**	0	0	**0**	**0**
09:15 09:30	0	0	**0**	0	0	**0**	**0**
09:30 09:45	0	0	**0**	0	0	**0**	**0**
09:45 10:00	0	0	**0**	0	0	**0**	**0**
11:30 11:45	0	0	**0**	0	0	**0**	**0**
11:45 12:00	0	0	**0**	0	0	**0**	**0**
12:00 12:15	0	0	**0**	0	0	**0**	**0**
12:15 12:30	0	0	**0**	0	0	**0**	**0**
12:30 12:45	0	0	**0**	0	0	**0**	**0**
12:45 13:00	0	0	**0**	0	0	**0**	**0**
13:00 13:15	0	0	**0**	0	0	**0**	**0**
13:15 13:30	0	0	**0**	0	0	**0**	**0**
15:00 15:15	0	0	**0**	0	0	**0**	**0**
15:15 15:30	0	0	**0**	0	0	**0**	**0**
15:30 15:45	0	0	**0**	0	0	**0**	**0**
15:45 16:00	0	0	**0**	0	0	**0**	**0**
16:00 16:15	0	0	**0**	0	0	**0**	**0**
16:15 16:30	0	0	**0**	0	0	**0**	**0**
16:30 16:45	0	0	**0**	0	0	**0**	**0**
16:45 17:00	0	0	**0**	0	0	**0**	**0**
17:00 17:15	0	0	**0**	0	0	**0**	**0**
17:15 17:30	0	0	**0**	0	0	**0**	**0**
17:30 17:45	0	0	**0**	0	0	**0**	**0**
17:45 18:00	0	0	**0**	0	0	**0**	**0**
Total	0	0	**0**	0	0	**0**	**0**

Transportation Services - Traffic Services

Turning Movement Count - Study Results

EAGLESON RD @ PERTH ST/RICHMOND RD

Survey Date: Wednesday, November 21, 2018 **WO No:** 38146

Start Time: 07:00 **Device:** Miovision

Full Study Heavy Vehicles

		EAGLESON RD									PERTH ST/RICHMOND RD									
		Northbound				Southbound					Eastbound				Westbound					
Time Period		LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total
07:00	07:15	0	1	0	**1**	0	0	1	**1**	**2**	0	2	2	**4**	0	0	0	**0**	**4**	**6**
07:15	07:30	1	2	0	**3**	0	1	1	**2**	**5**	0	4	2	**6**	0	0	0	**0**	**6**	**11**
07:30	07:45	2	0	0	**2**	0	1	0	**1**	**3**	0	0	1	**1**	0	0	0	**0**	**1**	**4**
07:45	08:00	5	2	0	**7**	0	1	0	**1**	**8**	0	1	1	**2**	1	1	0	**2**	**4**	**12**
08:00	08:15	3	0	0	**3**	0	0	1	**1**	**4**	2	3	2	**7**	1	4	0	**5**	**12**	**16**
08:15	08:30	4	0	0	**4**	0	1	1	**2**	**6**	0	2	1	**3**	0	2	0	**2**	**5**	**11**
08:30	08:45	2	7	0	**9**	0	0	0	**0**	**9**	2	3	1	**6**	0	4	0	**4**	**10**	**19**
08:45	09:00	2	5	0	**7**	0	1	0	**1**	**8**	3	1	2	**6**	0	0	0	**0**	**6**	**14**
09:00	09:15	5	3	0	**8**	0	3	2	**5**	**13**	2	2	4	**8**	1	1	0	**2**	**10**	**23**
09:15	09:30	4	1	1	**6**	0	1	1	**2**	**8**	2	0	1	**3**	1	0	0	**1**	**4**	**12**
09:30	09:45	2	3	0	**5**	0	1	2	**3**	**8**	2	2	0	**4**	0	5	0	**5**	**9**	**17**
09:45	10:00	2	0	1	**3**	1	0	2	**3**	**6**	0	2	2	**4**	1	3	1	**5**	**9**	**15**
11:30	11:45	1	1	1	**3**	0	1	0	**1**	**4**	0	3	0	**3**	0	1	0	**1**	**4**	**8**
11:45	12:00	2	1	1	**4**	0	0	0	**0**	**4**	0	1	0	**1**	0	4	0	**4**	**5**	**9**
12:00	12:15	2	1	0	**3**	0	1	0	**1**	**4**	1	2	2	**5**	0	0	0	**0**	**5**	**9**
12:15	12:30	3	1	0	**4**	1	0	0	**1**	**5**	0	0	0	**0**	0	2	0	**2**	**2**	**7**
12:30	12:45	1	0	0	**1**	0	1	1	**2**	**3**	0	4	4	**8**	0	3	0	**3**	**11**	**14**
12:45	13:00	0	0	0	**0**	0	0	0	**0**	**0**	2	1	0	**3**	0	1	0	**1**	**4**	**4**
13:00	13:15	2	2	0	**4**	0	0	0	**0**	**4**	0	1	0	**1**	0	1	0	**1**	**2**	**6**
13:15	13:30	2	1	0	**3**	0	0	0	**0**	**3**	2	3	2	**7**	0	1	0	**1**	**8**	**11**
15:00	15:15	0	0	0	**0**	1	2	1	**4**	**4**	1	2	4	**7**	2	0	0	**2**	**9**	**13**
15:15	15:30	0	4	1	**5**	0	0	1	**1**	**6**	0	3	4	**7**	0	2	0	**2**	**9**	**15**
15:30	15:45	1	1	0	**2**	0	2	1	**3**	**5**	1	1	0	**2**	0	2	0	**2**	**4**	**9**
15:45	16:00	0	1	1	**2**	0	1	1	**2**	**4**	1	2	3	**6**	0	1	0	**1**	**7**	**11**
16:00	16:15	4	0	0	**4**	0	0	0	**0**	**4**	0	3	4	**7**	0	1	0	**1**	**8**	**12**
16:15	16:30	3	2	0	**5**	0	2	1	**3**	**8**	0	1	2	**3**	0	4	0	**4**	**7**	**15**
16:30	16:45	3	3	0	**6**	0	1	1	**2**	**8**	0	1	2	**3**	0	1	0	**1**	**4**	**12**
16:45	17:00	1	3	0	**4**	0	1	3	**4**	**8**	0	2	4	**6**	0	0	1	**1**	**7**	**15**
17:00	17:15	1	0	0	**1**	0	5	4	**9**	**10**	1	4	0	**5**	0	2	0	**2**	**7**	**17**
17:15	17:30	2	3	1	**6**	0	2	0	**2**	**8**	1	2	1	**4**	2	4	0	**6**	**10**	**18**
17:30	17:45	0	0	0	**0**	0	5	1	**6**	**6**	1	2	4	**7**	0	2	0	**2**	**9**	**15**
17:45	18:00	4	0	0	**4**	0	4	0	**4**	**8**	0	1	1	**2**	0	0	0	**0**	**2**	**10**
Total:	None	64	48	7	**119**	3	38	26	**67**	**186**	24	61	56	**141**	9	52	2	**63**	**204**	**390**

Transportation Services - Traffic Services

Turning Movement Count - Study Results

EAGLESON RD @ PERTH ST/RICHMOND RD

Survey Date: Wednesday, November 21, 2018 **WO No:** 38146

Start Time: 07:00 **Device:** Miovision

Full Study 15 Minute U-Turn Total

		EAGLESON RD		PERTH ST/RICHMOND RD		
Time Period		Northbound U-Turn Total	Southbound U-Turn Total	Eastbound U-Turn Total	Westbound U-Turn Total	Total
07:00	07:15	0	0	0	0	0
07:15	07:30	0	0	0	0	0
07:30	07:45	0	0	0	0	0
07:45	08:00	0	0	0	0	0
08:00	08:15	0	0	0	0	0
08:15	08:30	0	0	0	0	0
08:30	08:45	0	0	0	0	0
08:45	09:00	0	0	0	0	0
09:00	09:15	0	0	0	0	0
09:15	09:30	0	0	0	0	0
09:30	09:45	0	0	0	0	0
09:45	10:00	0	0	0	0	0
11:30	11:45	0	0	0	0	0
11:45	12:00	0	0	0	0	0
12:00	12:15	0	0	0	0	0
12:15	12:30	0	0	0	0	0
12:30	12:45	0	0	0	0	0
12:45	13:00	0	0	0	0	0
13:00	13:15	0	0	0	0	0
13:15	13:30	0	0	0	0	0
15:00	15:15	0	0	0	0	0
15:15	15:30	0	0	0	0	0
15:30	15:45	0	0	0	0	0
15:45	16:00	0	0	0	0	0
16:00	16:15	0	0	0	0	0
16:15	16:30	0	0	0	0	0
16:30	16:45	0	0	0	0	0
16:45	17:00	0	0	0	0	0
17:00	17:15	0	0	0	0	0
17:15	17:30	0	0	0	0	0
17:30	17:45	0	0	0	0	0
17:45	18:00	0	0	0	0	0
Total		0	0	0	0	0

Appendix C

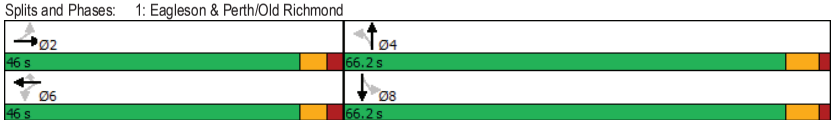
Synchro Intersection Worksheets – Existing Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	138	333	157	16	124	5	165	191	42	2	101	40
Future Volume (vph)	138	333	157	16	124	5	165	191	42	2	101	40
Satd. Flow (prot)	1658	1661	0	0	1735	1483	1658	1698	0	1658	1672	0
Flt Permitted	0.658				0.922		0.658			0.599		
Satd. Flow (perm)	1148	1661	0	0	1609	1483	1148	1698	0	1045	1672	0
Satd. Flow (RTOR)		23				31		15			27	
Lane Group Flow (vph)	153	544	0	0	156	6	183	259	0	2	156	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6		6	4			8		
Detector Phase	2	2		6	6	6	4	4		8	8	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Minimum Split (s)	40.0	40.0		40.0	40.0	40.0	26.2	26.2		26.2	26.2	
Total Split (s)	46.0	46.0		46.0	46.0	46.0	66.2	66.2		66.2	66.2	
Total Split (%)	41.0%	41.0%		41.0%	41.0%	41.0%	59.0%	59.0%		59.0%	59.0%	
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	4.6	4.6		4.6	4.6	
All-Red Time (s)	2.3	2.3		2.3	2.3	2.3	1.6	1.6		1.6	1.6	
Lost Time Adjust (s)	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0			6.0	6.0	6.2	6.2		6.2	6.2	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min	Min	None	None		None	None	
Act Effct Green (s)	24.2	24.2			24.2	24.2	15.9	15.9		15.9	15.9	
Actuated g/C Ratio	0.46	0.46			0.46	0.46	0.30	0.30		0.30	0.30	
v/c Ratio	0.29	0.70			0.21	0.01	0.53	0.50		0.01	0.30	
Control Delay	11.3	17.1			10.0	0.0	23.4	19.2		15.0	15.0	
Queue Delay	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	11.3	17.1			10.0	0.0	23.4	19.2		15.0	15.0	
LOS	B	B			A	A	C	B		B	B	
Approach Delay		15.9			9.6			21.0			15.0	
Approach LOS		B			A			C			B	
Queue Length 50th (m)	8.2	35.6			8.1	0.0	14.1	18.5		0.2	9.1	
Queue Length 95th (m)	21.8	79.0			20.4	0.1	36.6	44.0		1.5	25.1	
Internal Link Dist (m)		324.2			497.1			697.5			911.0	
Turn Bay Length (m)	35.0					35.0	50.0			40.0		
Base Capacity (vph)	896	1301			1255	1164	1114	1648		1014	1623	
Starvation Cap Reductn	0	0			0	0	0	0		0	0	
Spillback Cap Reductn	0	0			0	0	0	0		0	0	
Storage Cap Reductn	0	0			0	0	0	0		0	0	
Reduced v/c Ratio	0.17	0.42			0.12	0.01	0.16	0.16		0.00	0.10	

Intersection Summary
Cycle Length: 112.2
Actuated Cycle Length: 52.9
Natural Cycle: 70
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.70

Intersection Signal Delay: 16.6 Intersection LOS: B
Intersection Capacity Utilization 78.9% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 1: Eagleson & Perth/Old Richmond

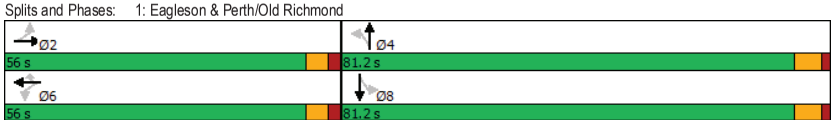


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	89	175	153	34	373	3	219	117	26	2	184	170
Future Volume (vph)	89	175	153	34	373	3	219	117	26	2	184	170
Satd. Flow (prot)	1658	1623	0	0	1738	1483	1658	1698	0	1658	1619	0
Flt Permitted	0.351				0.944		0.438			0.656		
Satd. Flow (perm)	613	1623	0	0	1647	1483	764	1698	0	1145	1619	0
Satd. Flow (RTOR)		36				25		13			54	
Lane Group Flow (vph)	99	364	0	0	452	3	243	159	0	2	393	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6		6	4			8		
Detector Phase	2	2		6	6	6	4	4		8	8	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Minimum Split (s)	30.0	30.0		30.0	30.0	30.0	26.2	26.2		26.2	26.2	
Total Split (s)	56.0	56.0		56.0	56.0	56.0	81.2	81.2		81.2	81.2	
Total Split (%)	40.8%	40.8%		40.8%	40.8%	40.8%	59.2%	59.2%		59.2%	59.2%	
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	4.6	4.6		4.6	4.6	
All-Red Time (s)	2.3	2.3		2.3	2.3	2.3	1.6	1.6		1.6	1.6	
Lost Time Adjust (s)	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0			6.0	6.0	6.2	6.2		6.2	6.2	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min	Min	None	None		None	None	
Act Effct Green (s)	30.7	30.7			30.7	30.7	33.2	33.2		33.2	33.2	
Actuated g/C Ratio	0.40	0.40			0.40	0.40	0.43	0.43		0.43	0.43	
v/c Ratio	0.41	0.55			0.69	0.00	0.75	0.22		0.00	0.54	
Control Delay	26.1	21.4			27.8	0.0	35.8	14.7		15.0	17.9	
Queue Delay	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	26.1	21.4			27.8	0.0	35.8	14.7		15.0	17.9	
LOS	C	C			C	A	D	B		B	B	
Approach Delay		22.4			27.6			27.4			17.9	
Approach LOS		C			C			C			B	
Queue Length 50th (m)	9.8	34.6			51.8	0.0	26.6	11.9		0.2	32.5	
Queue Length 95th (m)	30.9	83.0			117.9	0.0	75.5	32.1		1.7	79.5	
Internal Link Dist (m)		324.2			497.1			697.5			911.0	
Turn Bay Length (m)	35.0					35.0	50.0			40.0		
Base Capacity (vph)	426	1141			1146	1040	680	1512		1019	1447	
Starvation Cap Reductn	0	0			0	0	0	0		0	0	
Spillback Cap Reductn	0	0			0	0	0	0		0	0	
Storage Cap Reductn	0	0			0	0	0	0		0	0	
Reduced v/c Ratio	0.23	0.32			0.39	0.00	0.36	0.11		0.00	0.27	

Intersection Summary
Cycle Length: 137.2
Actuated Cycle Length: 77.6
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.75

Intersection Signal Delay: 23.9 Intersection LOS: C
Intersection Capacity Utilization 96.6% ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 1: Eagleson & Perth/Old Richmond



Appendix D

Collision Data

Accident Date	Accident Year	Accident Time	Location	Environment Condition	Light	Traffic Control	Traffic Control Condition	Classification Of Accident	Initial Impact Type	Road Surface Condition	# Vehicles	# Motorcycles	# Bicycles	# Pedestrians
11/15/2018	2018	14:10	EAGLESON RD @ PERTH ST/RICHMOND RD (0009376)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	03 - Rear end	01 - Dry	0	0	0	0
3/13/2019	2019	18:30	EAGLESON RD @ PERTH ST/RICHMOND RD (0009376)	03 - Snow	05 - Dusk	01 - Traffic signal	0	03 - P.D. only	03 - Rear end	03 - Loose snow	0	0	0	0
8/1/2019	2019	8:20	EAGLESON RD @ PERTH ST/RICHMOND RD (0009376)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	05 - Turning movement	01 - Dry	0	0	0	0
9/21/2020	2020	15:50	EAGLESON RD @ PERTH ST/RICHMOND RD (0009376)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	04 - Sideswipe	01 - Dry	0	0	0	0
11/25/2020	2020	8:00	EAGLESON RD @ PERTH ST/RICHMOND RD (0009376)	03 - Snow	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	03 - Rear end	05 - Packed snow	0	0	0	0
2/12/2021	2021	7:59	EAGLESON RD @ PERTH ST/RICHMOND RD (0009376)	01 - Clear	01 - Daylight	01 - Traffic signal	0	02 - Non-fatal injury	03 - Rear end	01 - Dry	0	0	0	0
11/4/2021	2021	20:30	EAGLESON RD @ PERTH ST/RICHMOND RD (0009376)	01 - Clear	07 - Dark	01 - Traffic signal	0	03 - P.D. only	05 - Turning movement	01 - Dry	0	0	0	0
1/26/2022	2022	8:19	EAGLESON RD @ PERTH ST/RICHMOND RD (0009376)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	02 - Angle	02 - Wet	0	0	0	0
1/12/2018	2018	22:30	EAGLESON RD btwn CAMBRIAN RD & PERTH ST (__3ZA4YC)	03 - Snow	07 - Dark	10 - No control	0	03 - P.D. only	01 - Approaching	05 - Packed snow	0	0	0	0
3/15/2018	2018	22:46	EAGLESON RD btwn CAMBRIAN RD & PERTH ST (__3ZA4YC)	01 - Clear	07 - Dark	10 - No control	0	02 - Non-fatal injury	07 - SMV other	06 - Ice	0	0	0	0
5/11/2018	2018	16:53	EAGLESON RD btwn CAMBRIAN RD & PERTH ST (__3ZA4YC)	01 - Clear	01 - Daylight	10 - No control	0	02 - Non-fatal injury	03 - Rear end	01 - Dry	0	0	0	0
6/4/2019	2019	20:34	EAGLESON RD btwn CAMBRIAN RD & PERTH ST (__3ZA4YC)	02 - Rain	05 - Dusk	10 - No control	0	03 - P.D. only	07 - SMV other	02 - Wet	0	0	0	0
6/17/2019	2019	4:36	EAGLESON RD btwn CAMBRIAN RD & PERTH ST (__3ZA4YC)	01 - Clear	07 - Dark	10 - No control	0	03 - P.D. only	07 - SMV other	01 - Dry	0	0	0	0
11/15/2019	2019	14:17	EAGLESON RD btwn CAMBRIAN RD & PERTH ST (__3ZA4YC)	05 - Drifting Snow	01 - Daylight	10 - No control	0	03 - P.D. only	07 - SMV other	06 - Ice	0	0	0	0
11/15/2019	2019	20:45	EAGLESON RD btwn CAMBRIAN RD & PERTH ST (__3ZA4YC)	05 - Drifting Snow	07 - Dark	10 - No control	0	03 - P.D. only	07 - SMV other	03 - Loose snow	0	0	0	0
12/12/2019	2019	3:12	EAGLESON RD btwn CAMBRIAN RD & PERTH ST (__3ZA4YC)	01 - Clear	07 - Dark	10 - No control	0	03 - P.D. only	07 - SMV other	01 - Dry	0	0	0	0
8/24/2021	2021	19:27	EAGLESON RD btwn CAMBRIAN RD & PERTH ST (__3ZA4YC)	01 - Clear	01 - Daylight	10 - No control	0	02 - Non-fatal injury	01 - Approaching	01 - Dry	0	0	0	0
10/24/2021	2021	21:30	EAGLESON RD btwn CAMBRIAN RD & PERTH ST (__3ZA4YC)	01 - Clear	07 - Dark	10 - No control	0	03 - P.D. only	07 - SMV other	01 - Dry	0	0	0	0

Appendix E

MMLOS Analysis

CGH TRANSPORTATION

Multi-Modal Level of Service - Segments Form

Consultant	**CGH Transportation Inc.**	**Project**	**2020-22**
Scenario	**Existing/Future**	**Date**	**2021-12-03**
Comments			

SEGMENTS			Eagleson Rd		Section
			1	2	3
Pedestrian	Sidewalk Width Boulevard Width	-	no sidewalk n/a		
	Avg Daily Curb Lane Traffic Volume		> 3000		
	Operating Speed On-Street Parking		> 60 km/h no		
	Exposure to Traffic PLoS		**F**	-	-
	Effective Sidewalk Width				
	Pedestrian Volume				
	Crowding PLoS		-	-	-
	Level of Service		**-**	**-**	**-**
Bicycle	Type of Cycling Facility	**F**	Mixed Traffic		
	Number of Travel Lanes		2-3 lanes total		
	Operating Speed		≥ 60 km/h		
	# of Lanes & Operating Speed LoS		**F**	-	-
	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		
	No. of Lanes at Unsignalized Crossing		≤ 3 lanes		
	Sidestreet Operating Speed		≤ 40 km/h		
	Unsignalized Crossing - Lowest LoS		**A**	-	-
	Level of Service		**F**	**-**	**-**
Transit	Facility Type	-			
	Friction or Ratio Transit:Posted Speed				
	Level of Service		**-**	**-**	**-**
Truck	Truck Lane Width	**D**	≤ 3.3 m		
	Travel Lanes per Direction		1		
	Level of Service		**D**	**-**	**-**

Multi-Modal Level of Service - Intersections Form

Consultant	**CGH Transportation Inc.**	**Project**	**2020-22**
Scenario	**Existing/Future**	**Date**	**2021-12-23**
Comments			

	INTERSECTIONS	Eagleson Road & Perth Street/Old Richmond Road (Existing)				Eagleson Road & Perth Street/Old Richmond Road (Future)			
	Crossing Side	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Pedestrian	Lanes	4	5	3	4	5	5	5	6
	Median	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m
	Conflicting Left Turns	Permissive	Permissive	Permissive	Permissive	Protected	Permissive	Protected/ Permissive	Permissive
	Conflicting Right Turns	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control
	Right Turns on Red (RToR) ?	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed
	Ped Signal Leading Interval?	No	No	No	No	No	No	No	No
	Right Turn Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel
	Corner Radius	5-10m	15-25m	15-25m	10-15m	5-10m	15-25m	15-25m	10-15m
	Crosswalk Type					Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings
	PETSI Score					**46**	**35**	**35**	**20**
	Ped. Exposure to Traffic LoS	-	-	-	-	**D**	**E**	**E**	**F**
	Cycle Length	120	120	120	120	90	90	90	90
	Effective Walk Time	47	47	27	27	7	18	21	34
	Average Pedestrian Delay	**22**	**22**	**36**	**36**	**38**	**29**	**26**	**17**
	Pedestrian Delay LoS	**C**	**C**	**D**	**D**	**D**	**C**	**C**	**B**
	Level of Service	**C**	**C**	**D**	**D**	**D**	**E**	**E**	**F**
		D				**F**			
	Approach From	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Bicycle	Bicycle Lane Arrangement on Approach	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic	Pocket Bike Lane	Pocket Bike Lane	Pocket Bike Lane	Pocket Bike Lane
	Right Turn Lane Configuration			≤ 50 m			> 50 m Introduced right turn lane		
	Right Turning Speed			≤ 25 km/h			≤ 25 km/h		
	Cyclist relative to RT motorists	-	-	D	-	-	D	-	-
	Separated or Mixed Traffic	**Mixed Traffic**	**Mixed Traffic**	**Mixed Traffic**	**Mixed Traffic**	**Separated**	**Separated**	**Separated**	**Separated**
	Left Turn Approach	One lane crossed	One lane crossed	No lane crossed	One lane crossed	2-stage, LT box	2-stage, LT box	2-stage, LT box	2-stage, LT box
	Operating Speed	≥ 60 km/h	≥ 60 km/h	≥ 60 km/h	≥ 60 km/h	≥ 60 km/h	≥ 60 km/h	≥ 60 km/h	≥ 60 km/h
	Left Turning Cyclist	F	F	C	F	A	A	A	A
	Level of Service	**F**	**F**	**D**	**-**	**A**	**D**	**A**	**A**
		F				**D**			
Transit	Average Signal Delay			≤ 30 sec	≤ 20 sec			≤ 40 sec	≤ 40 sec
	Level of Service	**-**	**-**	**D**	**C**	**-**	**-**	**E**	**E**
		D				**E**			
Truck	Effective Corner Radius	> 15 m	> 15 m	> 15 m	> 15 m	> 15 m	> 15 m	> 15 m	> 15 m
	Number of Receiving Lanes on Departure from Intersection	1	1	1	1	≥ 2	≥ 2	1	1
	Level of Service	**C**	**C**	**C**	**C**	**A**	**A**	**C**	**C**
		C				**C**			
Auto	Volume to Capacity Ratio	0.81 - 0.90				0.81 - 0.90			
	Level of Service	**D**				**D**			

Appendix F

TDM Checklist

CGH TRANSPORTATION

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

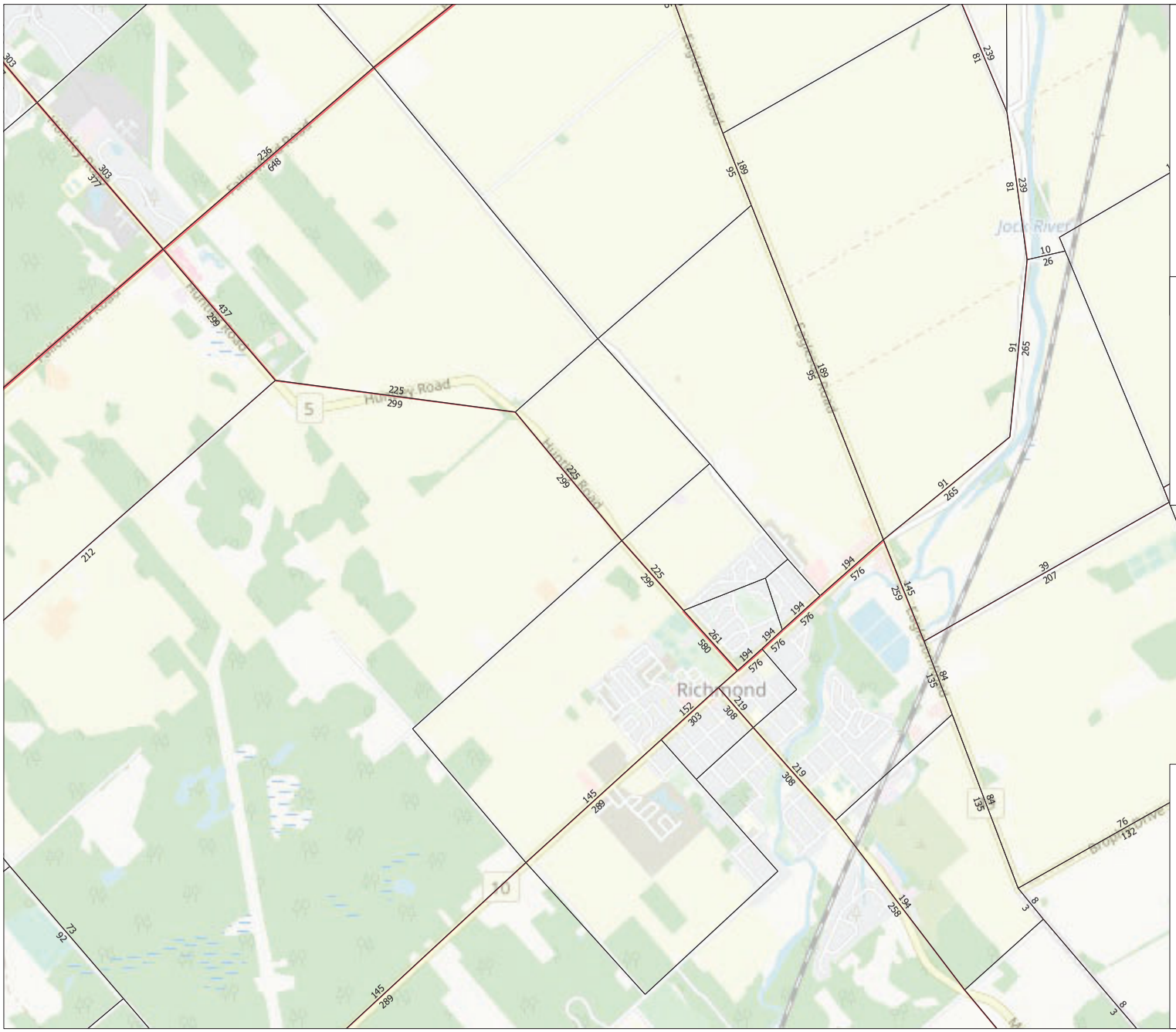
		TDM measures: *Residential developments*	Check if proposed & add descriptions
		1. TDM PROGRAM MANAGEMENT	
		1.1 Program coordinator	
BASIC	★	1.1.1 Designate an internal coordinator, or contract with an external coordinator	☐
		1.2 Travel surveys	
BETTER		1.2.1 Conduct periodic surveys to identify travel-related 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	☐
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	☐

Appendix G

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

TRANS

Legend

AM Peak Hour Total Traffic Volume

2000 4000 6000 8000 10000

N

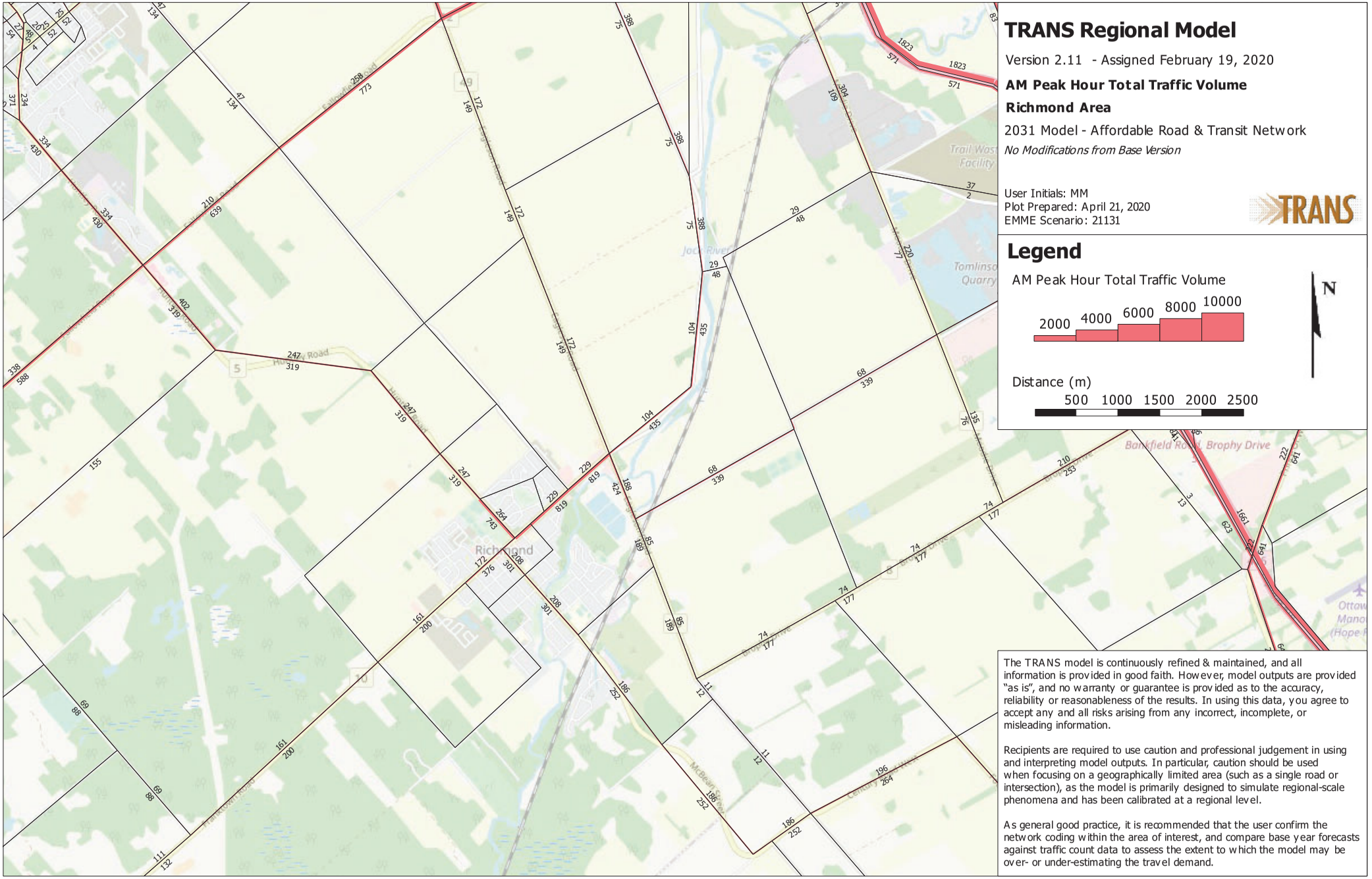
Distance (m)

500 1000 1500 2000

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.



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

Appendix H

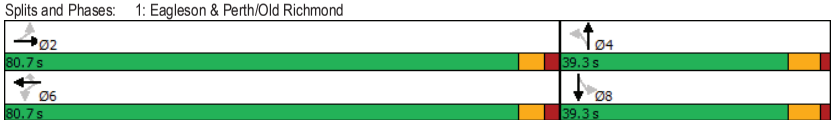
Synchro Intersection Worksheets – 2027 Future Background Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	138	550	164	16	237	5	169	191	42	2	124	40
Future Volume (vph)	138	550	164	16	237	5	169	191	42	2	124	40
Satd. Flow (prot)	1658	1686	0	0	1740	1483	1658	1698	0	1658	1681	0
Flt Permitted	0.602				0.948		0.653			0.585		
Satd. Flow (perm)	1051	1686	0	0	1654	1483	1140	1698	0	1021	1681	0
Satd. Flow (RTOR)		24				29		9			13	
Lane Group Flow (vph)	138	714	0	0	253	5	169	233	0	2	164	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6		6	4			8		
Detector Phase	2	2		6	6	6	4	4		8	8	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Minimum Split (s)	26.0	26.0		26.0	26.0	26.0	26.2	26.2		26.2	26.2	
Total Split (s)	80.7	80.7		80.7	80.7	80.7	39.3	39.3		39.3	39.3	
Total Split (%)	67.3%	67.3%		67.3%	67.3%	67.3%	32.8%	32.8%		32.8%	32.8%	
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	4.6	4.6		4.6	4.6	
All-Red Time (s)	2.3	2.3		2.3	2.3	2.3	1.6	1.6		1.6	1.6	
Lost Time Adjust (s)	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0			6.0	6.0	6.2	6.2		6.2	6.2	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min	Min	None	None		None	None	
Act Effct Green (s)	35.0	35.0			35.0	35.0	17.6	17.6		17.6	17.6	
Actuated g/C Ratio	0.53	0.53			0.53	0.53	0.27	0.27		0.27	0.27	
v/c Ratio	0.25	0.79			0.29	0.01	0.56	0.51		0.01	0.36	
Control Delay	10.0	19.7			9.7	0.0	32.6	27.1		23.5	23.9	
Queue Delay	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	10.0	19.7			9.7	0.0	32.6	27.1		23.5	23.9	
LOS	B	B			A	A	C	C		C	C	
Approach Delay		18.1			9.5			29.4			23.8	
Approach LOS		B			A			C			C	
Queue Length 50th (m)	7.5	55.6			14.0	0.0	16.4	21.3		0.2	13.7	
Queue Length 95th (m)	22.3	135.7			36.1	0.0	49.2	59.3		2.0	41.1	
Internal Link Dist (m)		324.2			497.1			697.5			911.0	
Turn Bay Length (m)	35.0					35.0	50.0			40.0		
Base Capacity (vph)	988	1586			1555	1396	635	951		569	943	
Starvation Cap Reductn	0	0			0	0	0	0		0	0	
Spillback Cap Reductn	0	0			0	0	0	0		0	0	
Storage Cap Reductn	0	0			0	0	0	0		0	0	
Reduced v/c Ratio	0.14	0.45			0.16	0.00	0.27	0.25		0.00	0.17	

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 66.2
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.79

Intersection Signal Delay: 20.1 — Intersection LOS: C
Intersection Capacity Utilization 97.2% — ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 1: Eagleson & Perth/Old Richmond

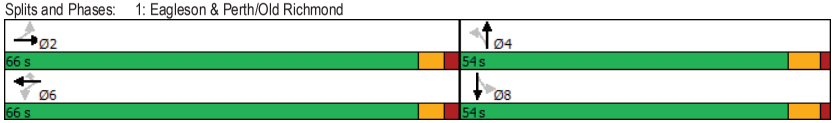


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	89	378	159	34	579	3	225	144	26	2	184	170
Future Volume (vph)	89	378	159	34	579	3	225	144	26	2	184	170
Satd. Flow (prot)	1658	1668	0	0	1740	1483	1658	1705	0	1658	1619	0
Flt Permitted	0.240				0.935		0.443			0.650		
Satd. Flow (perm)	419	1668	0	0	1632	1483	773	1705	0	1134	1619	0
Satd. Flow (RTOR)		25				29		9			46	
Lane Group Flow (vph)	89	537	0	0	613	3	225	170	0	2	354	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6		6	4			8		
Detector Phase	2	2		6	6	6	4	4		8	8	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Minimum Split (s)	30.0	30.0		30.0	30.0	30.0	26.2	26.2		26.2	26.2	
Total Split (s)	66.0	66.0		66.0	66.0	66.0	54.0	54.0		54.0	54.0	
Total Split (%)	55.0%	55.0%		55.0%	55.0%	55.0%	45.0%	45.0%		45.0%	45.0%	
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	4.6	4.6		4.6	4.6	
All-Red Time (s)	2.3	2.3		2.3	2.3	2.3	1.6	1.6		1.6	1.6	
Lost Time Adjust (s)	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0			6.0	6.0	6.2	6.2		6.2	6.2	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min	Min	None	None		None	None	
Act Effct Green (s)	39.5	39.5			39.5	39.5	33.4	33.4		33.4	33.4	
Actuated g/C Ratio	0.46	0.46			0.46	0.46	0.39	0.39		0.39	0.39	
v/c Ratio	0.47	0.69			0.82	0.00	0.76	0.26		0.00	0.54	
Control Delay	28.1	24.2			32.2	0.0	43.6	20.3		20.5	22.8	
Queue Delay	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	28.1	24.2			32.2	0.0	43.6	20.3		20.5	22.8	
LOS	C	C			C	A	D	C		C	C	
Approach Delay		24.7			32.1			33.6			22.8	
Approach LOS		C			C			C			C	
Queue Length 50th (m)	9.6	64.1			83.8	0.0	30.9	17.4		0.2	37.7	
Queue Length 95th (m)	28.6	122.7			159.0	0.0	#83.3	40.9		2.0	83.3	
Internal Link Dist (m)		324.2			497.1			697.5			911.0	
Turn Bay Length (m)	35.0					35.0	50.0			40.0		
Base Capacity (vph)	303	1216			1184	1083	478	1058		701	1019	
Starvation Cap Reductn	0	0			0	0	0	0		0	0	
Spillback Cap Reductn	0	0			0	0	0	0		0	0	
Storage Cap Reductn	0	0			0	0	0	0		0	0	
Reduced v/c Ratio	0.29	0.44			0.52	0.00	0.47	0.16		0.00	0.35	

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 86.6
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.82

Intersection Signal Delay: 28.4 — Intersection LOS: C
Intersection Capacity Utilization 120.1% — ICU Level of Service H
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Eagleson & Perth/Old Richmond



Appendix I

Synchro Intersection Worksheets – 2032 Future Background Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	138	817	168	37	366	5	171	371	87	2	227	40
Future Volume (vph)	138	817	168	37	366	5	171	371	87	2	227	40
Satd. Flow (prot)	1658	1700	0	0	1736	1483	1658	1696	0	1658	1707	0
Flt Permitted	0.477				0.568		0.447			0.155		
Satd. Flow (perm)	832	1700	0	0	991	1483	780	1696	0	270	1707	0
Satd. Flow (RTOR)		18				29		9			7	
Lane Group Flow (vph)	138	985	0	0	403	5	171	458	0	2	267	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6		6	4			8		
Detector Phase	2	2		6	6	6	4	4		8	8	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Minimum Split (s)	26.0	26.0		26.0	26.0	26.0	26.2	26.2		26.2	26.2	
Total Split (s)	85.0	85.0		85.0	85.0	85.0	35.0	35.0		35.0	35.0	
Total Split (%)	70.8%	70.8%		70.8%	70.8%	70.8%	29.2%	29.2%		29.2%	29.2%	
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	4.6	4.6		4.6	4.6	
All-Red Time (s)	2.3	2.3		2.3	2.3	2.3	1.6	1.6		1.6	1.6	
Lost Time Adjust (s)	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0			6.0	6.0	6.2	6.2		6.2	6.2	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min	Min	None	None		None	None	
Act Effct Green (s)	65.1	65.1			65.1	65.1	29.3	29.3		29.3	29.3	
Actuated g/C Ratio	0.61	0.61			0.61	0.61	0.27	0.27		0.27	0.27	
v/c Ratio	0.27	0.94			0.67	0.01	0.80	0.97		0.03	0.56	
Control Delay	10.7	36.2			19.4	0.0	67.7	75.8		36.0	40.9	
Queue Delay	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	10.7	36.2			19.4	0.0	67.7	75.8		36.0	40.9	
LOS	B	D			B	A	E	E		D	D	
Approach Delay		33.1			19.2			73.6			40.9	
Approach LOS		C			B			E			D	
Queue Length 50th (m)	12.2	169.7			50.2	0.0	35.0	~103.8		0.3	49.2	
Queue Length 95th (m)	22.1	#264.4			82.8	0.0	#81.5	#185.4		2.7	84.1	
Internal Link Dist (m)		324.2			497.1			697.5			911.0	
Turn Bay Length (m)	35.0					35.0	50.0			40.0		
Base Capacity (vph)	626	1283			745	1123	214	471		73	473	
Starvation Cap Reductn	0	0			0	0	0	0		0	0	
Spillback Cap Reductn	0	0			0	0	0	0		0	0	
Storage Cap Reductn	0	0			0	0	0	0		0	0	
Reduced v/c Ratio	0.22	0.77			0.54	0.00	0.80	0.97		0.03	0.56	

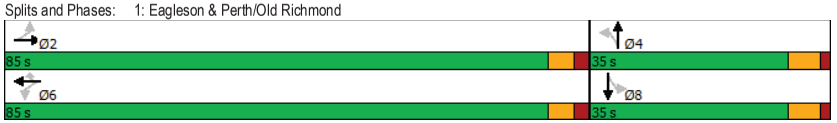
Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 106.8
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.97

Intersection Signal Delay: 42.1 Intersection LOS: D
Intersection Capacity Utilization 133.5% ICU Level of Service H
Analysis Period (min) 15

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

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

Splits and Phases: 1: Eagleson & Perth/Old Richmond



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	89	652	162	73	872	3	231	282	55	2	340	170
Future Volume (vph)	89	652	162	73	872	3	231	282	55	2	340	170
Satd. Flow (prot)	1658	1693	0	0	1738	1483	1658	1703	0	1658	1658	0
Flt Permitted	0.063				0.426		0.226			0.419		
Satd. Flow (perm)	110	1693	0	0	743	1483	394	1703	0	731	1658	0
Satd. Flow (RTOR)		16				29		9			24	
Lane Group Flow (vph)	89	814	0	0	945	3	231	337	0	2	510	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6		6	4			8		
Detector Phase	2	2		6	6	6	4	4		8	8	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Minimum Split (s)	30.0	30.0		30.0	30.0	30.0	26.2	26.2		26.2	26.2	
Total Split (s)	69.0	69.0		69.0	69.0	69.0	51.0	51.0		51.0	51.0	
Total Split (%)	57.5%	57.5%		57.5%	57.5%	57.5%	42.5%	42.5%		42.5%	42.5%	
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	4.6	4.6		4.6	4.6	
All-Red Time (s)	2.3	2.3		2.3	2.3	2.3	1.6	1.6		1.6	1.6	
Lost Time Adjust (s)	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0			6.0	6.0	6.2	6.2		6.2	6.2	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min	Min	None	None		None	None	
Act Effct Green (s)	63.0	63.0			63.0	63.0	44.8	44.8		44.8	44.8	
Actuated g/C Ratio	0.52	0.52			0.52	0.52	0.37	0.37		0.37	0.37	
v/c Ratio	1.56	0.91			2.42	0.00	1.57	0.53		0.01	0.80	
Control Delay	348.2	41.1			667.5	0.0	316.5	32.1		24.0	43.3	
Queue Delay	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	348.2	41.1			667.5	0.0	316.5	32.1		24.0	43.3	
LOS	F	D			F	A	F	C		C	D	
Approach Delay		71.3			665.4			147.7			43.3	
Approach LOS		E			F			F			D	
Queue Length 50th (m)	~29.5	165.2			~279.5	0.0	~77.2	59.6		0.3	102.1	
Queue Length 95th (m)	#49.9	#251.4			#356.7	0.0	#126.2	88.0		2.1	#150.2	
Internal Link Dist (m)		324.2			497.1			697.5			911.0	
Turn Bay Length (m)	35.0					35.0	50.0			40.0		
Base Capacity (vph)	57	896			390	792	147	641		272	634	
Starvation Cap Reductn	0	0			0	0	0	0		0	0	
Spillback Cap Reductn	0	0			0	0	0	0		0	0	
Storage Cap Reductn	0	0			0	0	0	0		0	0	
Reduced v/c Ratio	1.56	0.91			2.42	0.00	1.57	0.53		0.01	0.80	

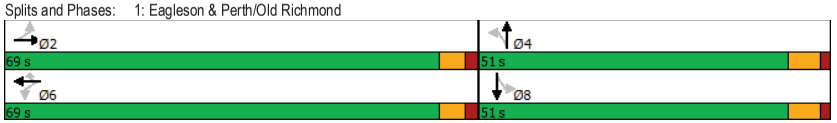
Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Natural Cycle: 140
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 2.42

Intersection Signal Delay: 273.4 Intersection LOS: F
Intersection Capacity Utilization 163.0% ICU Level of Service H
Analysis Period (min) 15

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

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

Splits and Phases: 1: Eagleson & Perth/Old Richmond

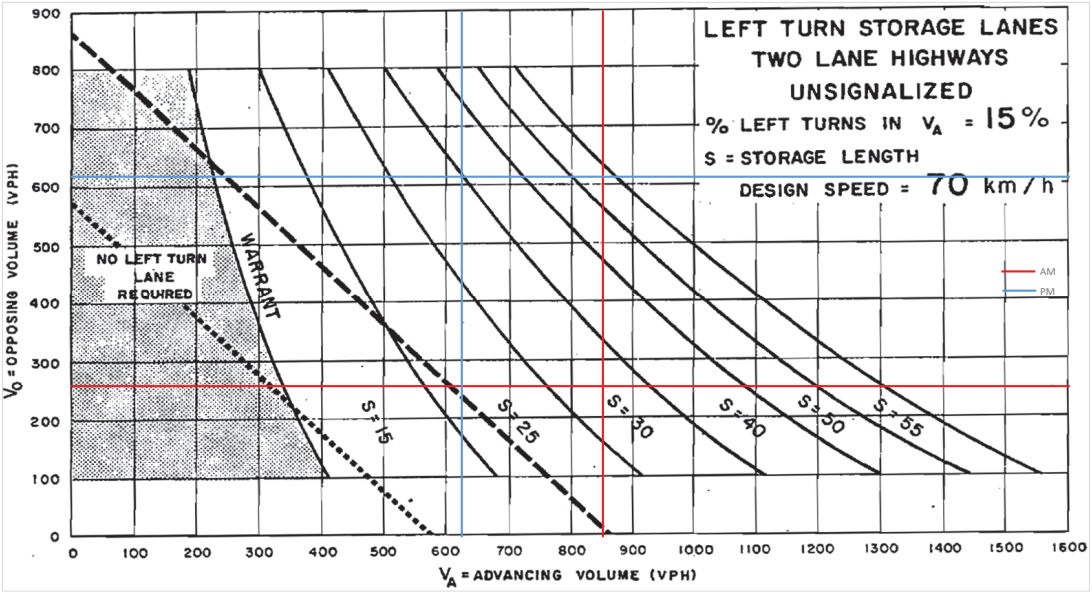


Appendix J

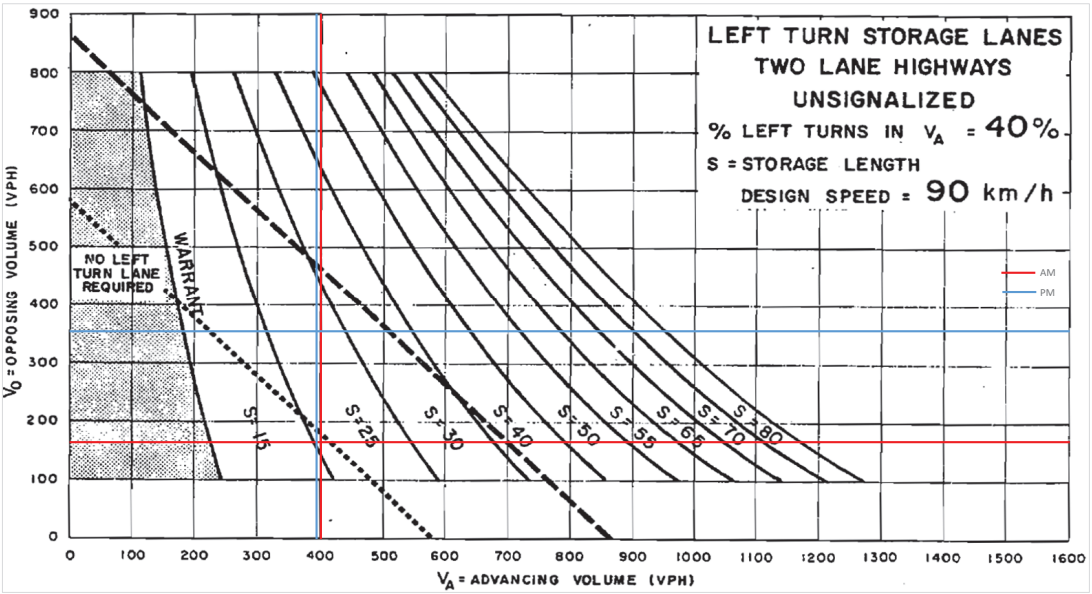
Eagleson Road at Perth Street/Old Richmond Road Turn Lane Warrants

CGH TRANSPORTATION

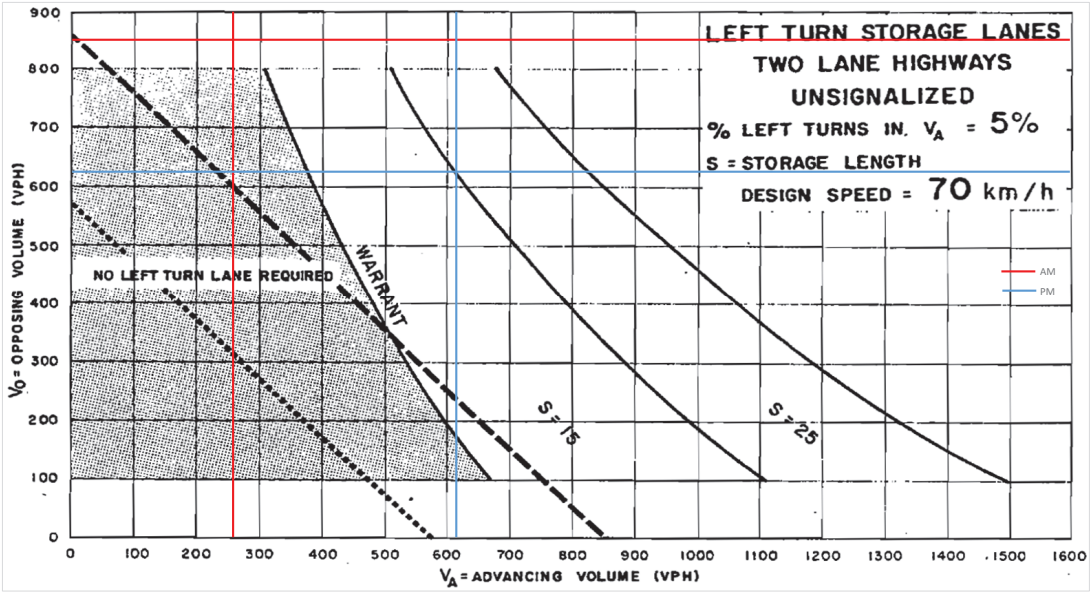
Eastbound Left-Turn Warrants - Eagleson Road at Perth Street/Old Richmond Road



Northbound Left-Turn Warrants - Eagleson Road at Perth Street/Old Richmond Road



Westbound Left-Turn Warrants - Eagleson Road at Perth Street/Old Richmond Road



Appendix K

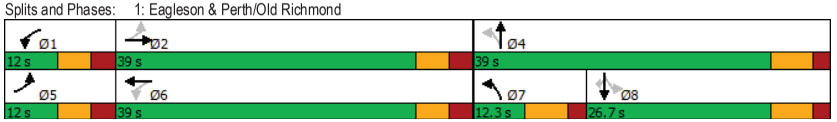
Synchro Intersection Worksheets – 2032 Future Background Conditions with Mitigations

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	138	817	168	37	366	5	171	371	87	2	227	40
Future Volume (vph)	138	817	168	37	366	5	171	371	87	2	227	40
Satd. Flow (prot)	1658	3229	0	1658	3309	0	1658	1696	0	1658	1745	1483
Flt Permitted	0.501			0.154			0.370			0.499		
Satd. Flow (perm)	874	3229	0	269	3309	0	646	1696	0	871	1745	1483
Satd. Flow (RTOR)		30			2			15				196
Lane Group Flow (vph)	138	985	0	37	371	0	171	458	0	2	227	40
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		Perm	NA	Perm
Protected Phases	5	2		1	6		7	4			8	
Permitted Phases	2			6			4			8		8
Detector Phase	5	2		1	6		7	4		8	8	8
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		5.0	10.0		10.0	10.0	10.0
Minimum Split (s)	12.0	26.3		11.3	26.3		11.6	26.6		26.6	26.6	26.6
Total Split (s)	12.0	39.0		12.0	39.0		12.3	39.0		26.7	26.7	26.7
Total Split (%)	13.3%	43.3%		13.3%	43.3%		13.7%	43.3%		29.7%	29.7%	29.7%
Yellow Time (s)	3.7	3.7		3.7	3.7		4.6	4.6		4.6	4.6	4.6
All-Red Time (s)	2.6	2.6		2.6	2.6		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		0.0	0.0	0.0
Total Lost Time (s)	6.3	6.3		6.3	6.3		6.6	6.6		6.6	6.6	6.6
Lead/Lag	Lead	Lag		Lead	Lag		Lead			Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes			Yes	Yes	Yes
Recall Mode	None	Min		None	Min		None	None		None	None	None
Act Effct Green (s)	30.3	27.4		28.7	24.4		28.4	28.4		15.4	15.4	15.4
Actuated g/C Ratio	0.40	0.36		0.38	0.32		0.38	0.38		0.20	0.20	0.20
v/c Ratio	0.33	0.83		0.18	0.35		0.53	0.71		0.01	0.64	0.09
Control Delay	15.2	29.4		13.7	20.9		26.8	29.0		27.5	38.6	0.4
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	15.2	29.4		13.7	20.9		26.8	29.0		27.5	38.6	0.4
LOS	B	C		B	C		C	C		C	D	A
Approach Delay		27.6			20.2			28.4			32.9	
Approach LOS		C			C			C			C	
Queue Length 50th (m)	11.3	72.2		2.8	21.8		20.4	64.7		0.3	34.7	0.0
Queue Length 95th (m)	22.6	103.2		7.9	34.5		36.1	101.8		2.1	58.2	0.0
Internal Link Dist (m)		324.2			497.1			697.5			911.0	
Turn Bay Length (m)	40.0			38.0			65.0			38.0		45.0
Base Capacity (vph)	413	1486		212	1508		323	773		243	488	556
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.33	0.66		0.17	0.25		0.53	0.59		0.01	0.47	0.07

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 75.5
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.83

Intersection Signal Delay: 27.2 — Intersection LOS: C
Intersection Capacity Utilization 89.7% — ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 1: Eagleson & Perth/Old Richmond

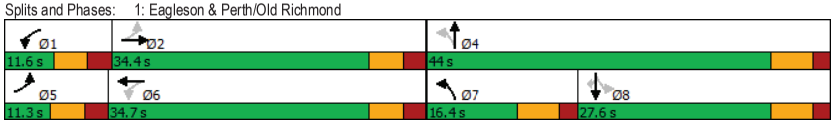


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	89	652	162	73	872	3	231	282	55	2	340	170
Future Volume (vph)	89	652	162	73	872	3	231	282	55	2	340	170
Satd. Flow (prot)	1658	3216	0	1658	3312	0	1658	1703	0	1658	1745	1483
Flt Permitted	0.157			0.177			0.231			0.558		
Satd. Flow (perm)	274	3216	0	309	3312	0	403	1703	0	974	1745	1483
Satd. Flow (RTOR)		35						13				196
Lane Group Flow (vph)	89	814	0	73	875	0	231	337	0	2	340	170
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		Perm	NA	Perm
Protected Phases	5	2		1	6		7	4			8	
Permitted Phases	2			6			4			8		8
Detector Phase	5	2		1	6		7	4		8	8	8
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		5.0	10.0		10.0	10.0	10.0
Minimum Split (s)	11.3	30.0		11.3	30.0		11.6	26.6		26.6	26.6	26.6
Total Split (s)	11.3	34.4		11.6	34.7		16.4	44.0		27.6	27.6	27.6
Total Split (%)	12.6%	38.2%		12.9%	38.6%		18.2%	48.9%		30.7%	30.7%	30.7%
Yellow Time (s)	3.7	3.7		3.7	3.7		4.6	4.6		4.6	4.6	4.6
All-Red Time (s)	2.6	2.6		2.6	2.6		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		0.0	0.0	0.0
Total Lost Time (s)	6.3	6.3		6.3	6.3		6.6	6.6		6.6	6.6	6.6
Lead/Lag	Lead	Lag		Lead	Lag		Lead			Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes			Yes	Yes	Yes
Recall Mode	None	Min		None	Min		None	None		None	None	None
Act Effct Green (s)	29.1	25.4		29.6	25.6		36.1	36.1		19.2	19.2	19.2
Actuated g/C Ratio	0.35	0.30		0.35	0.31		0.43	0.43		0.23	0.23	0.23
v/c Ratio	0.49	0.81		0.37	0.86		0.71	0.45		0.01	0.85	0.34
Control Delay	25.4	33.7		20.6	37.8		32.0	19.9		27.0	52.5	5.2
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	25.4	33.7		20.6	37.8		32.0	19.9		27.0	52.5	5.2
LOS	C	C		C	D		C	B		C	D	A
Approach Delay		32.9			36.5			24.8			36.7	
Approach LOS		C			D			C			D	
Queue Length 50th (m)	8.8	64.4		7.2	73.5		26.4	39.5		0.3	56.2	0.0
Queue Length 95th (m)	17.5	86.6		15.0	#99.7		#48.5	62.8		2.0	#100.1	11.1
Internal Link Dist (m)		324.2			497.1			697.5			911.0	
Turn Bay Length (m)	40.0			38.0			65.0			38.0		45.0
Base Capacity (vph)	180	1135		197	1158		326	791		251	451	528
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.49	0.72		0.37	0.76		0.71	0.43		0.01	0.75	0.32

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 83.4
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.86

Intersection Signal Delay: 33.2 — Intersection LOS: C
Intersection Capacity Utilization 84.6% — ICU Level of Service E
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Eagleson & Perth/Old Richmond



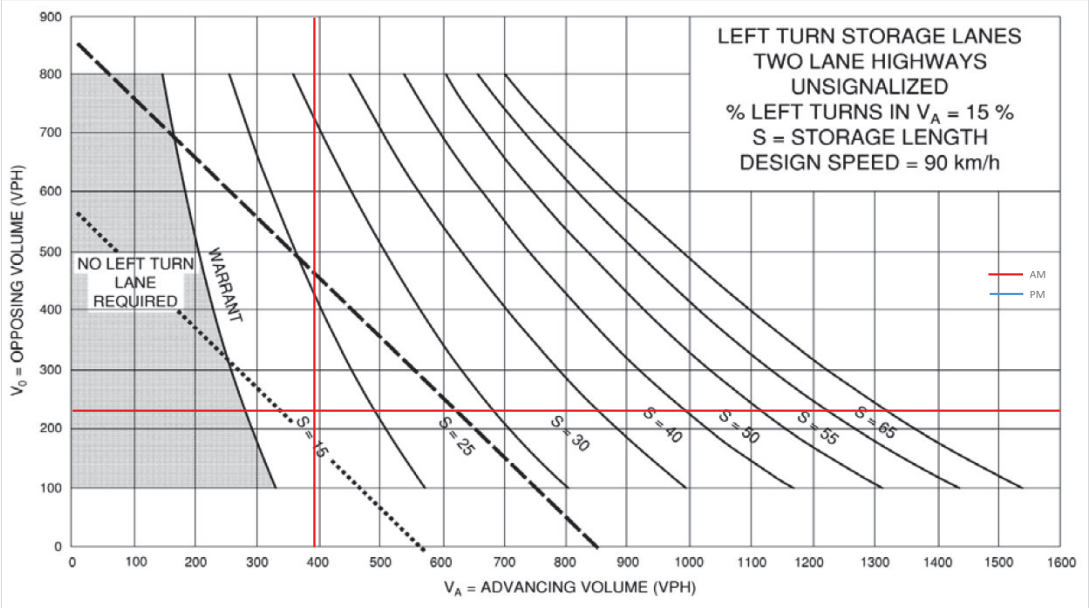
Appendix L

Site Access Turn Lane Warrants

CGH TRANSPORTATION

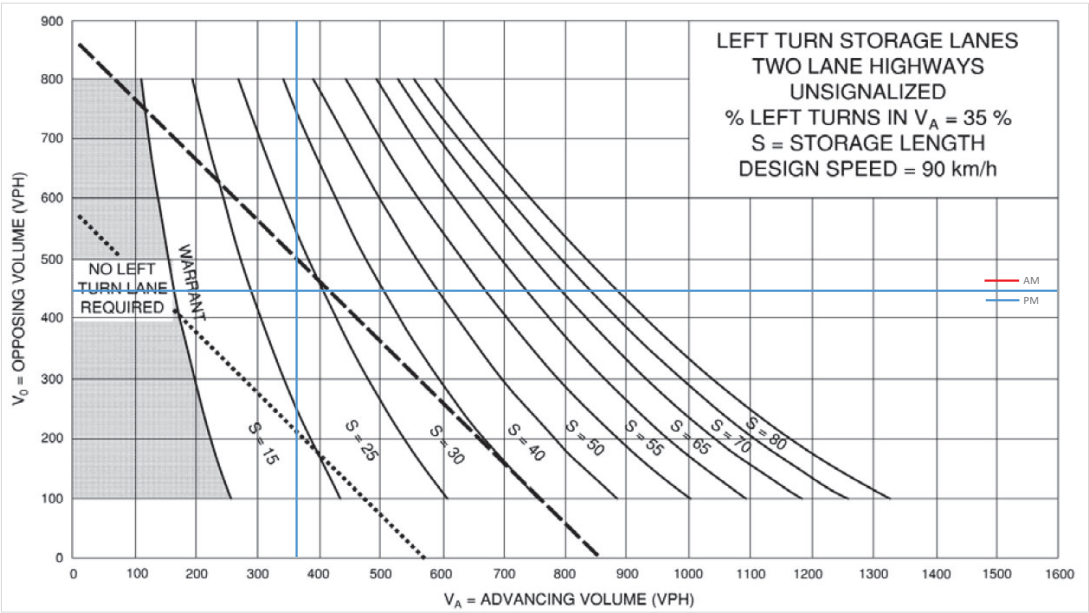
Street 3

Future Total 2027 - Northbound Left



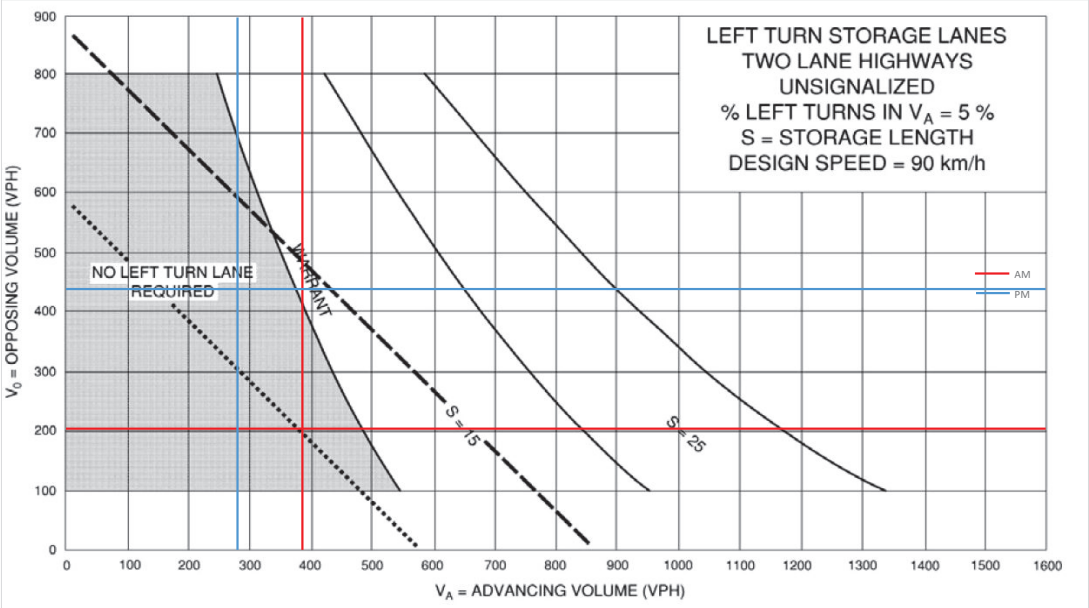
Street 3

Future Total 2027 - Northbound Left



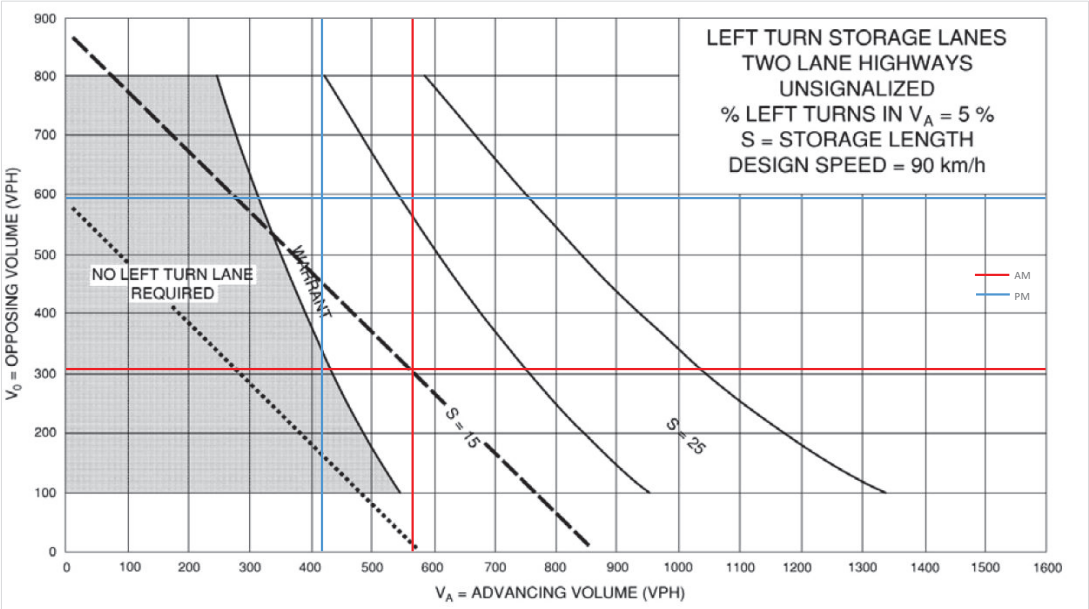
Street 1

Future Total 2027 - Northbound Left



Street 1

Future Total 2032 - Northbound Left



Appendix M

Site Access Signal Warrants

CGH TRANSPORTATION

Eagleson Road @ Street 3
FT2032

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	555	116%	65%	No
	B. Vehicle volume, along minor streets (average hour)	120	170	120	170	78	65%		
2. Delay to Cross Traffic	A. Vehicle volumes, major street (average hour)	480	720	600	900	503	105%	40%	No
	B. Combined vehicle and pedestrian volume crossing artery from minor streets (average hour)	50	75	50	75	20	40%		

Notes
1. Refer to OTM Book 12, pg 92, Mar 2012
2. Lowest section percentage governs justification
3. Average hourly volumes estimated from peak hour volumes, AHV = PM/2 or (AM + PM) / 4, including amplifcation factors
4. T-intersection factor corrected, applies only to 1B

Appendix N

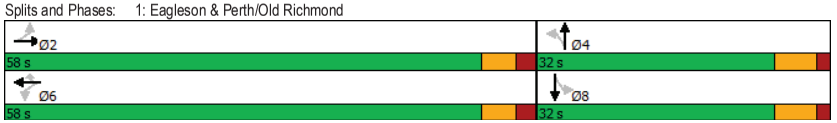
Synchro Intersection Worksheets – 2027 Future Total Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	153	550	164	16	237	29	169	210	42	58	143	77
Future Volume (vph)	153	550	164	16	237	29	169	210	42	58	143	77
Satd. Flow (prot)	1658	1686	0	0	1740	1483	1658	1701	0	1658	1653	0
Flt Permitted	0.602				0.948		0.621			0.570		
Satd. Flow (perm)	1051	1686	0	0	1654	1483	1084	1701	0	995	1653	0
Satd. Flow (RTOR)		28				39		11			30	
Lane Group Flow (vph)	153	714	0	0	253	29	169	252	0	58	220	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6		6	4			8		
Detector Phase	2	2		6	6	6	4	4		8	8	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Minimum Split (s)	30.0	30.0		30.0	30.0	30.0	26.2	26.2		26.2	26.2	
Total Split (s)	58.0	58.0		58.0	58.0	58.0	32.0	32.0		32.0	32.0	
Total Split (%)	64.4%	64.4%		64.4%	64.4%	64.4%	35.6%	35.6%		35.6%	35.6%	
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	4.6	4.6		4.6	4.6	
All-Red Time (s)	2.3	2.3		2.3	2.3	2.3	1.6	1.6		1.6	1.6	
Lost Time Adjust (s)	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0			6.0	6.0	6.2	6.2		6.2	6.2	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min	Min	None	None		None	None	
Act Effct Green (s)	31.5	31.5			31.5	31.5	16.8	16.8		16.8	16.8	
Actuated g/C Ratio	0.51	0.51			0.51	0.51	0.27	0.27		0.27	0.27	
v/c Ratio	0.29	0.82			0.30	0.04	0.57	0.54		0.21	0.47	
Control Delay	10.4	21.0			9.8	2.4	31.5	25.6		23.4	22.3	
Queue Delay	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	10.4	21.0			9.8	2.4	31.5	25.6		23.4	22.3	
LOS	B	C			A	A	C	C		C	C	
Approach Delay		19.1			9.0			28.0			22.5	
Approach LOS		B			A			C			C	
Queue Length 50th (m)	8.4	55.0			13.9	0.0	15.6	21.9		4.8	16.7	
Queue Length 95th (m)	22.7	123.6			32.9	2.6	45.1	57.2		17.3	46.9	
Internal Link Dist (m)		324.2			497.1			697.5			253.9	
Turn Bay Length (m)	35.0					35.0	50.0			40.0		
Base Capacity (vph)	873	1405			1374	1239	498	788		457	776	
Starvation Cap Reductn	0	0			0	0	0	0		0	0	
Spillback Cap Reductn	0	0			0	0	0	0		0	0	
Storage Cap Reductn	0	0			0	0	0	0		0	0	
Reduced v/c Ratio	0.18	0.51			0.18	0.02	0.34	0.32		0.13	0.28	

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 61.8
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.82

Intersection Signal Delay: 20.1 Intersection LOS: C
Intersection Capacity Utilization 98.3% ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 1: Eagleson & Perth/Old Richmond



Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	28	37	5	381	195	10
Future Vol, veh/h	28	37	5	381	195	10
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	37	5	381	195	10

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	591	200	205	0	-	0
Stage 1	200	-	-	-	-	-
Stage 2	391	-	-	-	-	-
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	470	841	1366	-	-	-
Stage 1	834	-	-	-	-	-
Stage 2	683	-	-	-	-	-
Platoon blocked, %					-	-
Mov Cap-1 Maneuver	468	841	1366	-	-	-
Mov Cap-2 Maneuver	468	-	-	-	-	-
Stage 1	830	-	-	-	-	-
Stage 2	683	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.4	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1366	-	626	-	-
HCM Lane V/C Ratio	0.004	-	0.104	-	-
HCM Control Delay (s)	7.6	-	11.4	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.3	-	-

Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	47	75	53	339	203	29
Future Vol, veh/h	47	75	53	339	203	29
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	47	75	53	339	203	29

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	663	218	232	0	-	0
Stage 1	218	-	-	-	-	-
Stage 2	445	-	-	-	-	-
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	426	822	1336	-	-	-
Stage 1	818	-	-	-	-	-
Stage 2	646	-	-	-	-	-
Platoon blocked, %					-	-
Mov Cap-1 Maneuver	405	822	1336	-	-	-
Mov Cap-2 Maneuver	405	-	-	-	-	-
Stage 1	778	-	-	-	-	-
Stage 2	646	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.7	1.1	0
HCM LOS	B		

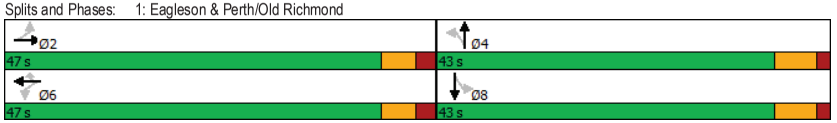
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1336	-	589	-	-
HCM Lane V/C Ratio	0.04	-	0.207	-	-
HCM Control Delay (s)	7.8	0	12.7	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.8	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	121	378	159	34	579	56	225	187	26	42	197	197
Future Volume (vph)	121	378	159	34	579	56	225	187	26	42	197	197
Satd. Flow (prot)	1658	1668	0	0	1740	1483	1658	1714	0	1658	1614	0
Flt Permitted	0.236				0.932		0.409			0.625		
Satd. Flow (perm)	412	1668	0	0	1626	1483	714	1714	0	1091	1614	0
Satd. Flow (RTOR)		31				39		9			68	
Lane Group Flow (vph)	121	537	0	0	613	56	225	213	0	42	394	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6		6	4			8		
Detector Phase	2	2		6	6	6	4	4		8	8	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Minimum Split (s)	30.0	30.0		30.0	30.0	30.0	26.2	26.2		26.2	26.2	
Total Split (s)	47.0	47.0		47.0	47.0	47.0	43.0	43.0		43.0	43.0	
Total Split (%)	52.2%	52.2%		52.2%	52.2%	52.2%	47.8%	47.8%		47.8%	47.8%	
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	4.6	4.6		4.6	4.6	
All-Red Time (s)	2.3	2.3		2.3	2.3	2.3	1.6	1.6		1.6	1.6	
Lost Time Adjust (s)	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0			6.0	6.0	6.2	6.2		6.2	6.2	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min	Min	None	None		None	None	
Act Effct Green (s)	33.1	33.1			33.1	33.1	28.7	28.7		28.7	28.7	
Actuated g/C Ratio	0.44	0.44			0.44	0.44	0.38	0.38		0.38	0.38	
v/c Ratio	0.66	0.71			0.85	0.08	0.82	0.32		0.10	0.60	
Control Delay	39.7	23.1			33.1	7.0	48.6	18.0		16.9	20.1	
Queue Delay	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	39.7	23.1			33.1	7.0	48.6	18.0		16.9	20.1	
LOS	D	C			C	A	D	B		B	C	
Approach Delay		26.1			30.9			33.7			19.8	
Approach LOS		C			C			C			B	
Queue Length 50th (m)	14.6	63.0			83.8	1.5	31.2	22.0		4.2	39.8	
Queue Length 95th (m)	#42.9	104.0			#150.3	7.9	#71.6	39.3		10.7	69.6	
Internal Link Dist (m)		324.2			497.1			697.5			254.0	
Turn Bay Length (m)	35.0					35.0	50.0			40.0		
Base Capacity (vph)	241	991			954	886	376	907		575	882	
Starvation Cap Reductn	0	0			0	0	0	0		0	0	
Spillback Cap Reductn	0	0			0	0	0	0		0	0	
Storage Cap Reductn	0	0			0	0	0	0		0	0	
Reduced v/c Ratio	0.50	0.54			0.64	0.06	0.60	0.23		0.07	0.45	

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 74.9
Natural Cycle: 65
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.85

Intersection Signal Delay: 27.9 Intersection LOS: C
Intersection Capacity Utilization 122.5% ICU Level of Service H
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Eagleson & Perth/Old Richmond



Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	20	27	11	269	420	21
Future Vol, veh/h	20	27	11	269	420	21
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	20	27	11	269	420	21

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	722	431	441	0	-	0
Stage 1	431	-	-	-	-	-
Stage 2	291	-	-	-	-	-
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	394	624	1119	-	-	-
Stage 1	655	-	-	-	-	-
Stage 2	759	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	389	624	1119	-	-	-
Mov Cap-2 Maneuver	389	-	-	-	-	-
Stage 1	647	-	-	-	-	-
Stage 2	759	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13	0.3	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1119	-	496	-	-
HCM Lane V/C Ratio	0.01	-	0.095	-	-
HCM Control Delay (s)	8.2	-	13	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.3	-	-

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	33	53	117	247	383	64
Future Vol, veh/h	33	53	117	247	383	64
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	33	53	117	247	383	64

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	896	415	447	0	-	0
Stage 1	415	-	-	-	-	-
Stage 2	481	-	-	-	-	-
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	311	637	1113	-	-	-
Stage 1	666	-	-	-	-	-
Stage 2	622	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	273	637	1113	-	-	-
Mov Cap-2 Maneuver	273	-	-	-	-	-
Stage 1	585	-	-	-	-	-
Stage 2	622	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	15.7	2.8	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1113	-	421	-	-
HCM Lane V/C Ratio	0.105	-	0.204	-	-
HCM Control Delay (s)	8.6	0	15.7	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.4	-	0.8	-	-

Appendix O

Synchro Worksheets – 2027 Future Total Operations Eagleson Road at Street 3 with NB LTL

Intersection						
Int Delay, s/veh	2.7					

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	47	75	53	339	203	29
Future Vol, veh/h	47	75	53	339	203	29
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	-	37.5	-	-	-
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	47	75	53	339	203	29

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	663	218	232	0	-	0
Stage 1	218	-	-	-	-	-
Stage 2	445	-	-	-	-	-
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	426	822	1336	-	-	-
Stage 1	818	-	-	-	-	-
Stage 2	646	-	-	-	-	-
Platoon blocked, %					-	-
Mov Cap-1 Maneuver	409	822	1336	-	-	-
Mov Cap-2 Maneuver	409	-	-	-	-	-
Stage 1	785	-	-	-	-	-
Stage 2	646	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.7	1.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1336	-	592	-	-
HCM Lane V/C Ratio	0.04	-	0.206	-	-
HCM Control Delay (s)	7.8	-	12.7	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.8	-	-

Intersection						
Int Delay, s/veh	2.6					

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	33	53	117	247	383	64
Future Vol, veh/h	33	53	117	247	383	64
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	-	37.5	-	-	-
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	33	53	117	247	383	64

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	896	415	447	0	-	0
Stage 1	415	-	-	-	-	-
Stage 2	481	-	-	-	-	-
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	311	637	1113	-	-	-
Stage 1	666	-	-	-	-	-
Stage 2	622	-	-	-	-	-
Platoon blocked, %					-	-
Mov Cap-1 Maneuver	278	637	1113	-	-	-
Mov Cap-2 Maneuver	278	-	-	-	-	-
Stage 1	596	-	-	-	-	-
Stage 2	622	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	15.6	2.8	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1113	-	426	-	-
HCM Lane V/C Ratio	0.105	-	0.202	-	-
HCM Control Delay (s)	8.6	-	15.6	-	-
HCM Lane LOS	A	-	C	-	-
HCM 95th %tile Q(veh)	0.4	-	0.7	-	-

Appendix P

Synchro Intersection Worksheets – 2032 Future Total Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	153	817	168	37	366	29	171	390	87	58	246	77
Future Volume (vph)	153	817	168	37	366	29	171	390	87	58	246	77
Satd. Flow (prot)	1658	1700	0	0	1736	1483	1658	1698	0	1658	1682	0
Flt Permitted	0.475				0.512		0.393			0.168		
Satd. Flow (perm)	829	1700	0	0	893	1483	686	1698	0	293	1682	0
Satd. Flow (RTOR)		19				39		13			18	
Lane Group Flow (vph)	153	985	0	0	403	29	171	477	0	58	323	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6		6	4			8		
Detector Phase	2	2		6	6	6	4	4		8	8	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Minimum Split (s)	30.0	30.0		30.0	30.0	30.0	26.2	26.2		26.2	26.2	
Total Split (s)	58.0	58.0		58.0	58.0	58.0	32.0	32.0		32.0	32.0	
Total Split (%)	64.4%	64.4%		64.4%	64.4%	64.4%	35.6%	35.6%		35.6%	35.6%	
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	4.6	4.6		4.6	4.6	
All-Red Time (s)	2.3	2.3		2.3	2.3	2.3	1.6	1.6		1.6	1.6	
Lost Time Adjust (s)	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0			6.0	6.0	6.2	6.2		6.2	6.2	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min	Min	None	None		None	None	
Act Effct Green (s)	52.0	52.0			52.0	52.0	25.8	25.8		25.8	25.8	
Actuated g/C Ratio	0.58	0.58			0.58	0.58	0.29	0.29		0.29	0.29	
v/c Ratio	0.32	0.99			0.78	0.03	0.87	0.96		0.70	0.65	
Control Delay	12.1	47.6			27.9	2.2	71.9	64.9		73.2	33.8	
Queue Delay	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	12.1	47.6			27.9	2.2	71.9	64.9		73.2	33.8	
LOS	B	D			C	A	E	E		E	C	
Approach Delay		42.8			26.2			66.7			39.8	
Approach LOS		D			C			E			D	
Queue Length 50th (m)	12.7	155.0			49.6	0.0	28.0	79.1		8.9	46.2	
Queue Length 95th (m)	24.7	#249.3			#106.5	2.6	#64.6	#139.6		#29.4	74.3	
Internal Link Dist (m)		324.2			497.1			697.5			253.9	
Turn Bay Length (m)	35.0					35.0	50.0			40.0		
Base Capacity (vph)	478	990			515	873	196	496		83	495	
Starvation Cap Reductn	0	0			0	0	0	0		0	0	
Spillback Cap Reductn	0	0			0	0	0	0		0	0	
Storage Cap Reductn	0	0			0	0	0	0		0	0	
Reduced v/c Ratio	0.32	0.99			0.78	0.03	0.87	0.96		0.70	0.65	

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.99

Intersection Signal Delay: 45.6 Intersection LOS: D
Intersection Capacity Utilization 134.6% ICU Level of Service H
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Eagleson & Perth/Old Richmond

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	28	37	5	561	298	10
Future Vol, veh/h	28	37	5	561	298	10
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	37	5	561	298	10

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	874	303	308	0	-	0
Stage 1	303	-	-	-	-	-
Stage 2	571	-	-	-	-	-
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	320	737	1253	-	-	-
Stage 1	749	-	-	-	-	-
Stage 2	565	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	318	737	1253	-	-	-
Mov Cap-2 Maneuver	318	-	-	-	-	-
Stage 1	745	-	-	-	-	-
Stage 2	565	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.9	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1253	-	470	-	-
HCM Lane V/C Ratio	0.004	-	0.138	-	-
HCM Control Delay (s)	7.9	0	13.9	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.5	-	-

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	47	75	53	519	306	29
Future Vol, veh/h	47	75	53	519	306	29
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	47	75	53	519	306	29

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	946	321	335	0	-	0
Stage 1	321	-	-	-	-	-
Stage 2	625	-	-	-	-	-
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	720	1224	-	-	-
Stage 1	735	-	-	-	-	-
Stage 2	534	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	272	720	1224	-	-	-
Mov Cap-2 Maneuver	272	-	-	-	-	-
Stage 1	690	-	-	-	-	-
Stage 2	534	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	16.3	0.7	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1224	-	440	-	-
HCM Lane V/C Ratio	0.043	-	0.277	-	-
HCM Control Delay (s)	8.1	-	16.3	-	-
HCM Lane LOS	A	-	C	-	-
HCM 95th %tile Q(veh)	0.1	-	1.1	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	121	652	162	73	872	56	231	325	55	42	353	197
Future Volume (vph)	121	652	162	73	872	56	231	325	55	42	353	197
Satd. Flow (prot)	1658	1693	0	0	1738	1483	1658	1707	0	1658	1651	0
Flt Permitted	0.069				0.449		0.174			0.367		
Satd. Flow (perm)	120	1693	0	0	784	1483	304	1707	0	640	1651	0
Satd. Flow (RTOR)		17				32		9			29	
Lane Group Flow (vph)	121	814	0	0	945	56	231	380	0	42	550	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6		6	4			8		
Detector Phase	2	2		6	6	6	4	4		8	8	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Minimum Split (s)	30.0	30.0		30.0	30.0	30.0	26.2	26.2		26.2	26.2	
Total Split (s)	64.0	64.0		64.0	64.0	64.0	46.0	46.0		46.0	46.0	
Total Split (%)	58.2%	58.2%		58.2%	58.2%	58.2%	41.8%	41.8%		41.8%	41.8%	
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	4.6	4.6		4.6	4.6	
All-Red Time (s)	2.3	2.3		2.3	2.3	2.3	1.6	1.6		1.6	1.6	
Lost Time Adjust (s)	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0			6.0	6.0	6.2	6.2		6.2	6.2	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min	Min	None	None		None	None	
Act Effct Green (s)	58.0	58.0			58.0	58.0	39.8	39.8		39.8	39.8	
Actuated g/C Ratio	0.53	0.53			0.53	0.53	0.36	0.36		0.36	0.36	
v/c Ratio	1.92	0.90			2.29	0.07	2.12	0.61		0.18	0.89	
Control Delay	489.6	38.4			607.0	7.1	555.9	33.1		26.7	50.3	
Queue Delay	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	489.6	38.4			607.0	7.1	555.9	33.1		26.7	50.3	
LOS	F	D			F	A	F	C		C	D	
Approach Delay		96.7			573.5			230.8			48.6	
Approach LOS		F			F			F			D	
Queue Length 50th (m)	~26.8	148.8			~245.6	2.4	~78.8	64.6		6.1	105.4	
Queue Length 95th (m)	#64.2	#233.2			#321.3	8.3	#105.2	95.9		14.8	#169.2	
Internal Link Dist (m)		324.2			497.1			697.5			254.0	
Turn Bay Length (m)	35.0					35.0	50.0			40.0		
Base Capacity (vph)	63	900			413	797	109	623		231	615	
Starvation Cap Reductn	0	0			0	0	0	0		0	0	
Spillback Cap Reductn	0	0			0	0	0	0		0	0	
Storage Cap Reductn	0	0			0	0	0	0		0	0	
Reduced v/c Ratio	1.92	0.90			2.29	0.07	2.12	0.61		0.18	0.89	

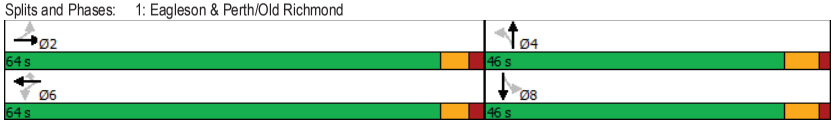
Intersection Summary
Cycle Length: 110
Actuated Cycle Length: 110
Natural Cycle: 120
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 2.29

Intersection Signal Delay: 265.8 Intersection LOS: F
Intersection Capacity Utilization 165.4% ICU Level of Service H
Analysis Period (min) 15

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

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

Splits and Phases: 1: Eagleson & Perth/Old Richmond



Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	20	27	11	407	576	21
Future Vol, veh/h	20	27	11	407	576	21
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	20	27	11	407	576	21

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1016	587	597	0	-	0
Stage 1	587	-	-	-	-	-
Stage 2	429	-	-	-	-	-
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	264	510	980	-	-	-
Stage 1	556	-	-	-	-	-
Stage 2	657	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	260	510	980	-	-	-
Mov Cap-2 Maneuver	260	-	-	-	-	-
Stage 1	548	-	-	-	-	-
Stage 2	657	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	16.4	0.2	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	980	-	362	-	-
HCM Lane V/C Ratio	0.011	-	0.13	-	-
HCM Control Delay (s)	8.7	0	16.4	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0	-	0.4	-	-

Intersection	
Int Delay, s/veh	2.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	33	53	117	385	539	64
Future Vol, veh/h	33	53	117	385	539	64
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	33	53	117	385	539	64

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1190	571	603	0	-	0
Stage 1	571	-	-	-	-	-
Stage 2	619	-	-	-	-	-
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	520	975	-	-	-
Stage 1	565	-	-	-	-	-
Stage 2	537	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	175	520	975	-	-	-
Mov Cap-2 Maneuver	175	-	-	-	-	-
Stage 1	479	-	-	-	-	-
Stage 2	537	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	22.1	2.1	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	975	-	296	-	-
HCM Lane V/C Ratio	0.12	-	0.291	-	-
HCM Control Delay (s)	9.2	-	22.1	-	-
HCM Lane LOS	A	-	C	-	-
HCM 95th %tile Q(veh)	0.4	-	1.2	-	-

Appendix Q

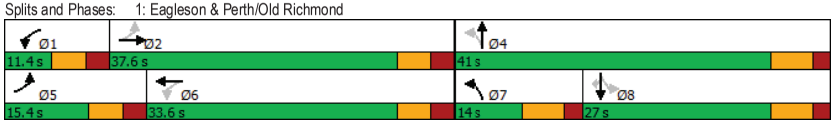
Synchro Intersection Worksheets – 2032 Future Total Conditions with Mitigation

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	153	817	168	37	366	29	171	390	87	58	246	77
Future Volume (vph)	153	817	168	37	366	29	171	390	87	58	246	77
Satd. Flow (prot)	1658	3229	0	1658	3279	0	1658	1698	0	1658	1745	1483
Flt Permitted	0.389			0.180			0.331			0.490		
Satd. Flow (perm)	679	3229	0	314	3279	0	578	1698	0	855	1745	1483
Satd. Flow (RTOR)		29			9			14				196
Lane Group Flow (vph)	153	985	0	37	395	0	171	477	0	58	246	77
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		Perm	NA	Perm
Protected Phases	5	2		1	6		7	4			8	
Permitted Phases	2			6			4			8		8
Detector Phase	5	2		1	6		7	4		8	8	8
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		5.0	10.0		10.0	10.0	10.0
Minimum Split (s)	11.3	30.0		11.3	30.0		11.6	26.6		26.6	26.6	26.6
Total Split (s)	15.4	37.6		11.4	33.6		14.0	41.0		27.0	27.0	27.0
Total Split (%)	17.1%	41.8%		12.7%	37.3%		15.6%	45.6%		30.0%	30.0%	30.0%
Yellow Time (s)	3.7	3.7		3.7	3.7		4.6	4.6		4.6	4.6	4.6
All-Red Time (s)	2.6	2.6		2.6	2.6		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		0.0	0.0	0.0
Total Lost Time (s)	6.3	6.3		6.3	6.3		6.6	6.6		6.6	6.6	6.6
Lead/Lag	Lead	Lag		Lead	Lag		Lead			Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes			Yes	Yes	Yes
Recall Mode	None	Min		None	Min		None	None		None	None	None
Act Effct Green (s)	33.9	29.1		25.2	19.9		30.3	30.3		15.9	15.9	15.9
Actuated g/C Ratio	0.43	0.37		0.32	0.25		0.39	0.39		0.20	0.20	0.20
v/c Ratio	0.38	0.81		0.20	0.47		0.52	0.72		0.34	0.70	0.17
Control Delay	16.4	29.8		15.7	26.1		25.0	28.8		34.9	41.9	0.8
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	16.4	29.8		15.7	26.1		25.0	28.8		34.9	41.9	0.8
LOS	B	C		B	C		C	C		C	D	A
Approach Delay		28.0			25.2			27.8			32.6	
Approach LOS		C			C			C			C	
Queue Length 50th (m)	13.6	75.5		3.1	26.0		20.0	67.2		8.4	38.5	0.0
Queue Length 95th (m)	26.1	#114.9		8.3	40.1		34.7	103.4		19.3	62.6	0.0
Internal Link Dist (m)		324.2			497.1			697.5			238.3	
Turn Bay Length (m)	45.0			38.0			65.0			38.0		55.0
Base Capacity (vph)	409	1338		189	1175		326	771		228	465	539
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.37	0.74		0.20	0.34		0.52	0.62		0.25	0.53	0.14

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 78.7
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.81

Intersection Signal Delay: 28.2 — Intersection LOS: C
Intersection Capacity Utilization 90.7% — ICU Level of Service E
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Eagleson & Perth/Old Richmond

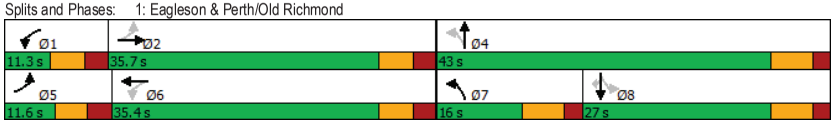


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	121	652	162	73	872	56	231	325	55	42	353	197
Future Volume (vph)	121	652	162	73	872	56	231	325	55	42	353	197
Satd. Flow (prot)	1658	3216	0	1658	3286	0	1658	1707	0	1658	1745	1483
Flt Permitted	0.132			0.217			0.196			0.536		
Satd. Flow (perm)	230	3216	0	379	3286	0	342	1707	0	935	1745	1483
Satd. Flow (RTOR)		36			8			11				196
Lane Group Flow (vph)	121	814	0	73	928	0	231	380	0	42	353	197
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		Perm	NA	Perm
Protected Phases	5	2		1	6		7	4			8	
Permitted Phases	2			6			4			8		8
Detector Phase	5	2		1	6		7	4		8	8	8
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		5.0	10.0		10.0	10.0	10.0
Minimum Split (s)	11.1	30.0		11.3	30.0		11.6	26.6		26.6	26.6	26.6
Total Split (s)	11.6	35.7		11.3	35.4		16.0	43.0		27.0	27.0	27.0
Total Split (%)	12.9%	39.7%		12.6%	39.3%		17.8%	47.8%		30.0%	30.0%	30.0%
Yellow Time (s)	3.5	3.7		3.7	3.7		4.6	4.6		4.6	4.6	4.6
All-Red Time (s)	2.6	2.6		2.6	2.6		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		0.0	0.0	0.0
Total Lost Time (s)	6.1	6.3		6.3	6.3		6.6	6.6		6.6	6.6	6.6
Lead/Lag	Lead	Lag		Lead	Lag		Lead			Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes			Yes	Yes	Yes
Recall Mode	None	Min		None	Min		None	None		None	None	None
Act Effct Green (s)	34.8	30.3		32.5	27.5		35.6	35.6		19.6	19.6	19.6
Actuated g/C Ratio	0.40	0.35		0.37	0.31		0.41	0.41		0.22	0.22	0.22
v/c Ratio	0.67	0.72		0.34	0.90		0.82	0.54		0.20	0.91	0.41
Control Delay	36.1	29.0		19.1	41.2		45.3	23.1		31.2	62.3	7.4
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	36.1	29.0		19.1	41.2		45.3	23.1		31.2	62.3	7.4
LOS	D	C		B	D		D	C		C	E	A
Approach Delay		30.0			39.6			31.5			41.8	
Approach LOS		C			D			C			D	
Queue Length 50th (m)	11.9	62.9		7.0	78.2		27.0	47.6		5.9	59.4	0.1
Queue Length 95th (m)	#30.2	84.5		14.6	#111.9		#58.2	74.5		14.7	#107.3	16.4
Internal Link Dist (m)		324.2			497.1			697.5			226.2	
Turn Bay Length (m)	45.0			38.0			65.0			38.0		55.0
Base Capacity (vph)	180	1138		213	1097		280	716		217	406	495
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.67	0.72		0.34	0.85		0.82	0.53		0.19	0.87	0.40

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 87.7
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.91

Intersection Signal Delay: 35.6 Intersection LOS: D
Intersection Capacity Utilization 88.9% ICU Level of Service E
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Eagleson & Perth/Old Richmond



Appendix R

Synchro Worksheets – 2032 Future Total Operations Eagleson Road at Street 3 with NB LTL

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	47	75	53	519	306	29
Future Vol, veh/h	47	75	53	519	306	29
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	-	37.5	-	-	-
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	47	75	53	519	306	29

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	946	321	335	0	-	0
Stage 1	321	-	-	-	-	-
Stage 2	625	-	-	-	-	-
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	720	1224	-	-	-
Stage 1	735	-	-	-	-	-
Stage 2	534	-	-	-	-	-
Platoon blocked, %					-	-
Mov Cap-1 Maneuver	278	720	1224	-	-	-
Mov Cap-2 Maneuver	278	-	-	-	-	-
Stage 1	703	-	-	-	-	-
Stage 2	534	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	16	0.7	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1224	-	447	-	-
HCM Lane V/C Ratio	0.043	-	0.273	-	-
HCM Control Delay (s)	8.1	-	16	-	-
HCM Lane LOS	A	-	C	-	-
HCM 95th %tile Q(veh)	0.1	-	1.1	-	-

Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	33	53	117	385	539	64
Future Vol, veh/h	33	53	117	385	539	64
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	-	37.5	-	-	-
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	33	53	117	385	539	64

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1190	571	603	0	-	0
Stage 1	571	-	-	-	-	-
Stage 2	619	-	-	-	-	-
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	520	975	-	-	-
Stage 1	565	-	-	-	-	-
Stage 2	537	-	-	-	-	-
Platoon blocked, %					-	-
Mov Cap-1 Maneuver	182	520	975	-	-	-
Mov Cap-2 Maneuver	182	-	-	-	-	-
Stage 1	497	-	-	-	-	-
Stage 2	537	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	21.4	2.1	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	975	-	304	-	-
HCM Lane V/C Ratio	0.12	-	0.283	-	-
HCM Control Delay (s)	9.2	-	21.4	-	-
HCM Lane LOS	A	-	C	-	-
HCM 95th %tile Q(veh)	0.4	-	1.1	-	-

Appendix S

SimTraffic Report – Eagleson Road at Street 3

SimTraffic Simulation Summary
2032 Future Total

09-20-2024

Summary of All Intervals

Run Number	1	2	3	Avg
Start Time	3:45	3:45	3:45	3:45
End Time	5:00	5:00	5:00	5:00
Total Time (min)	75	75	75	75
Time Recorded (min)	60	60	60	60
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	2159	2156	2073	2129
Vehs Exited	2135	2106	2034	2091
Starting Vehs	247	216	237	235
Ending Vehs	271	266	276	271
Travel Distance (km)	2365	2337	2257	2320
Travel Time (hr)	996.6	922.8	999.4	973.0
Total Delay (hr)	952.9	879.7	957.7	930.1
Total Stops	2380	2812	2877	2687
Fuel Used (l)	986.2	919.9	977.0	961.0

Interval #0 Information Seeding

Start Time	3:45
End Time	4:00
Total Time (min)	15

Volumes adjusted by Growth Factors.

No data recorded this interval.

Interval #1 Information Recording

Start Time	4:00
End Time	5:00
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	1	2	3	Avg
Vehs Entered	2159	2156	2073	2129
Vehs Exited	2135	2106	2034	2091
Starting Vehs	247	216	237	235
Ending Vehs	271	266	276	271
Travel Distance (km)	2365	2337	2257	2320
Travel Time (hr)	996.6	922.8	999.4	973.0
Total Delay (hr)	952.9	879.7	957.7	930.1
Total Stops	2380	2812	2877	2687
Fuel Used (l)	986.2	919.9	977.0	961.0

SimTraffic Performance Report
2032 Future Total

09-20-2024

3: Eagleson & Street No.3 Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.2	0.1	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	0.4	0.6	0.1	0.2	1.2	0.1	2.5
Total Del/Veh (s)	40.4	40.7	7.8	3.7	7.5	4.7	9.8
Total Stops	35	51	29	9	59	9	192
Stop/Veh	1.00	0.98	0.59	0.06	0.11	0.13	0.21

Intersection: 3: Eagleson & Street No.3

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (m)	41.8	25.7	39.8
Average Queue (m)	17.2	7.7	10.4
95th Queue (m)	43.2	20.9	52.9
Link Distance (m)	219.8	259.9	182.4
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			