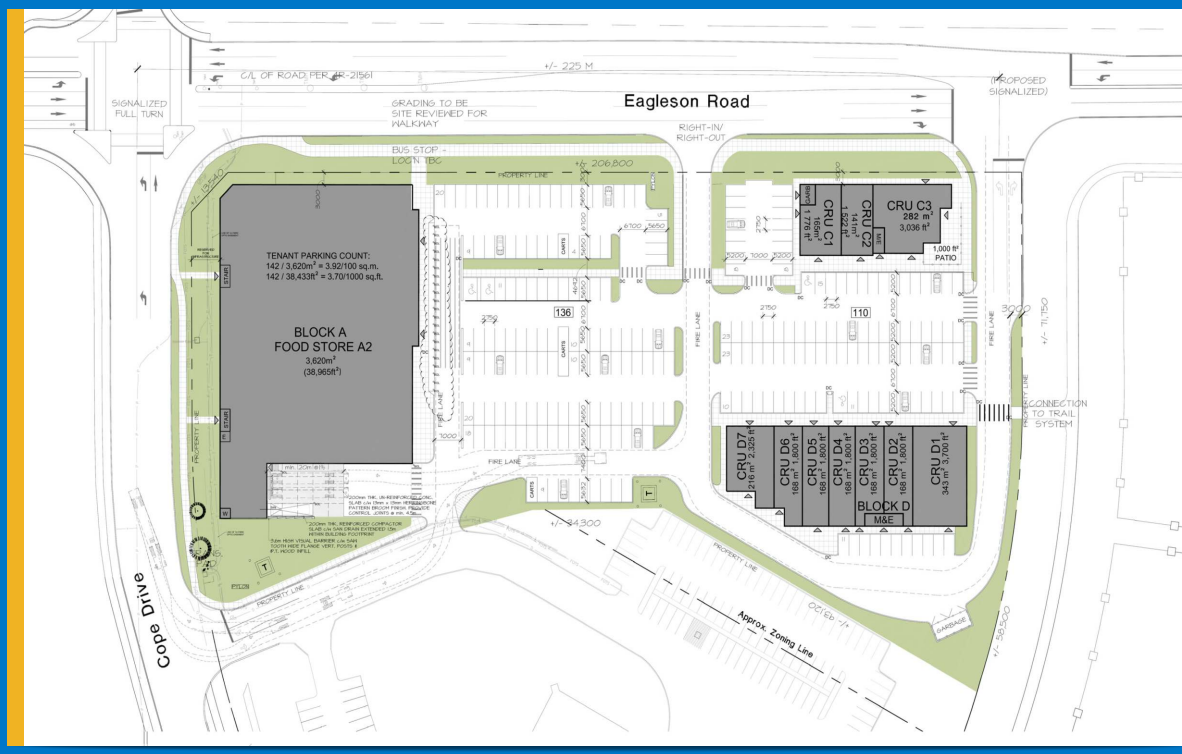
August 2018

TAGGART REALTY MANAGEMENT

Transportation Impact Assessment

10 Cope Drive



10 Cope Drive

Transportation Impact Assessment

prepared for:

Taggart Realty Management
225 Metcalfe Street, Suite 708
Ottawa, Ontario
K2P 1P9

prepared by:

PARSONS
1223 Michael Street
Suite 100
Ottawa, ON K1J 7T2

August 16, 2018

476575-01000

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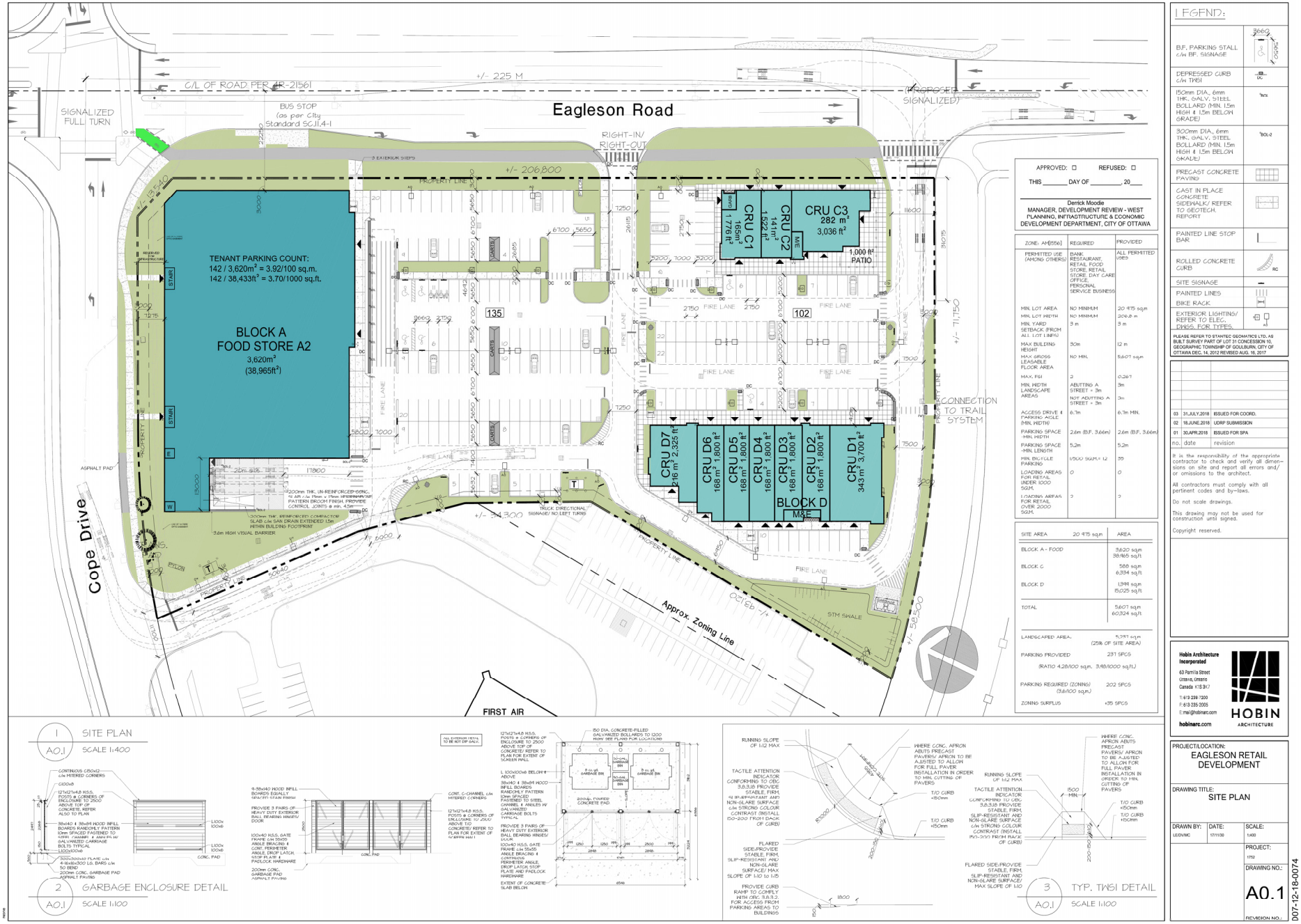
Transportation Impact Assessment

1. INTRODUCTION

Taggart (Eagleson) Corporation is proposing to develop the property located at the southwest quadrant of the Eagleson/Cope intersection (10 Cope Drive) within the South Kanata Community of Ottawa. We understand the proposed development will consist of an approximate 3,620 m^2 grocery store, and 1,982 m^2 of additional commercial retail including a restaurant, dental/medical office, and other retail stores. A total of approximately 246 parking spaces are proposed. With regard to vehicular site access/egress, an all-movement connection already exists to Cope Drive (serving the adjacent First Air) approximately 120 m west of the signalized Eagleson/Cope intersection. A right-in/right-out only access is proposed to Eagleson Road approximately 120 m south of the Eagleson/Cope intersection, and a new signalized full-movement access is proposed a further 100 m south on Eagleson Road. The site's local context is depicted in Figure 1 and the Site Plan is depicted in Figure 2.

Figure 1: Local Context

As part of the Site Plan Approval process, the City of Ottawa requires a submission of a formal Transportation Impact Assessment (TIA) consistent with their updated 2017 guidelines. With respect to these guidelines, this Strategy Report has been prepared.



APPROVED: ☐ REFUSED: ☐

THIS _____ DAY OF _____, 20___

Derrick Moodie
MANAGER, DEVELOPMENT REVIEW - WEST
PLANNING, INFRASTRUCTURE & ECONOMIC DEVELOPMENT DEPARTMENT, CITY OF OTTAWA

ZONE: AM[1556]	REQUIRED	PROVIDED
PERMITTED USE (AMONG OTHERS)	BANK, RESTAURANT, RETAIL FOOD STORE, RETAIL STORE, DAY CARE, OFFICE, PERSONAL SERVICE BUSINESS	ALL PERMITTED USES
MIN. LOT AREA	NO MINIMUM	20 975 sq.m
MIN. LOT WIDTH	NO MINIMUM	206.8 m
MIN. YARD SETBACK (FROM ALL LOT LINES)	3 m	3 m
MAX BUILDING HEIGHT	30m	12 m
MAX GROSS LEASABLE FLOOR AREA	NO MIN.	5607 sq.m
MAX. FSI	2	0.267
MIN. WIDTH LANDSCAPE AREAS	ABUTTING A STREET = 3m NOT ABUTTING A STREET = 3m	3m 3m
ACCESS DRIVE & PARKING AISLE (MIN. WIDTH)	6.7m	6.7m MIN.
PARKING SPACE - MIN. WIDTH	2.6m (B.F. 3.66m)	2.6m (B.F. 3.66m)
PARKING SPACE - MIN. LENGTH	5.2m	5.2m
MIN. BICYCLE PARKING	1/500 SQM.= 12	33
LOADING AREAS FOR RETAIL UNDER 1000 SQM.	0	0
LOADING AREAS FOR RETAIL OVER 2000 SQM.	1	1

SITE AREA	20 975 sq.m	AREA
BLOCK A - FOOD		3620 sq.m 38,965 sq.ft
BLOCK C		586 sq.m 6,334 sq.ft
BLOCK D		1,398 sq.m 15,025 sq.ft
TOTAL		5607 sq.m 60,324 sq.ft
LANDSCAPED AREA:		5,237 sq.m (25% OF SITE AREA)
PARKING PROVIDED		231 SPCS (RATIO 4.28/100 sq.m. 3.48/1000 sq.ft.)
PARKING REQUIRED (ZONING) (3.6/100 sq.m.)		202 SPCS
ZONING SURPLUS		+35 SPCS

LEGEND:

B.F. PARKING STALL c/w BF. SIGNAGE	3660 / 5500
DEPRESSED CURB c/w TWSI	DC
150mm DIA., 6mm THK. GALV. STEEL BOLLARD (MIN. 1.5m HIGH & 1.5m BELOW GRADE)	BOL
300mm DIA., 6mm THK. GALV. STEEL BOLLARD (MIN. 1.5m HIGH & 1.5m BELOW GRADE)	BOL-2
PRECAST CONCRETE PAVING	
CAST IN PLACE CONCRETE SIDEWALK/ REFER TO GEOTECH. REPORT	
PAINTED LINE STOP BAR	
ROLLED CONCRETE CURB	RC
SITE SIGNAGE	
PAINTED LINES	
BIKE RACK	
EXTERIOR LIGHTING/ REFER TO ELEC. DWGS. FOR TYPES	

PLEASE REFER TO STANTEC GEOMATICS LTD. AS BUILT SURVEY PART OF LOT 31 CONCESSION 10, GEOGRAPHIC TOWNSHIP OF GOULBURN, CITY OF OTTAWA DEC. 14, 2012 REVISED AUG. 16, 2017

no.	date	revision
03	31.JULY.2018	ISSUED FOR COORD.
02	18.JUNE.2018	UDRP SUBMISSION
01	30.APR.2018	ISSUED FOR SPA

It is the responsibility of the appropriate contractor to check and verify all dimensions on site and report all errors and/or omissions to the architect.

All contractors must comply with all pertinent codes and by-laws.

Do not scale drawings.

This drawing may not be used for construction until signed.

Hobin Architecture Incorporated
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Ottawa, Ontario
Canada K1S 3K7
T: 613 238-7200
F: 613 235-2005
E: mail@hobinarc.com
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HOBIN ARCHITECTURE

PROJECT/LOCATION:
EAGLESON RETAIL DEVELOPMENT

DRAWING TITLE:
SITE PLAN

DRAWN BY:	DATE:	SCALE:
LE/DV/MC	17/11/30	1:400

PROJECT: 1752

DRAWING NO.: A0.1

REVISION NO.:

007-12-18-0074

#17689

1 SITE PLAN
A0.1 SCALE 1:400

2 GARBAGE ENCLOSURE DETAIL
A0.1 SCALE 1:100

3 TYP. TWSI DETAIL
A0.1 SCALE 1:100

PARSONS

Figure 2: Proposed Site Plan

2. SCOPING REPORT

The TIA and ensuing analysis includes the signalized Eagleson/Cope, Eagleson/Fernbank and unsignalized Cope/Site (First Air) Driveway intersections. The proposed signalized access and right-in/right-out access to Eagleson Road will also be assessed.

2.1. EXISTING AND PLANNED CONDITIONS

2.1.1. PROPOSED DEVELOPMENT

The existing land is zoned as Arterial Mainstreet Zone. The proposed development will consist of an approximate 5,602m^2 of retail with an anchor grocery store. The estimated date of occupancy is 2019. A total of approximately 246 parking spaces are proposed. A right-in/right-out only access is proposed to Eagleson Road approximately 120 m south of the Eagleson/Cope intersection, and a new signalized full-movement access is proposed a further 100 m south on Eagleson Road.

2.1.2. EXISTING CONDITIONS

Area Road Network

Cope Drive is an City-owned east-west collector road, which extends from Eagleson Road in the east to Terry Fox Drive in the west. Within the study area, Cope Drive has a two-lane cross section and a posted speed limit of 50 km/h (40 km/h approaching Eagleson).

Eagleson Road is a major City-owned north-south arterial, which extends from Brophy Drive in the south (where it continues south as McCordick Road) to the Hwy 417 in the north (where it continues north as March Road). Within the study area, Eagleson Road has a four-lane divided cross section with auxiliary turn lanes at major intersections. The speed limit within the study area is posted at 60 km/h.

Note that Eagleson Road transitions from a four-lane divided to a two-lane undivided cross-section just south of the subject site. The widening of Eagleson Road to four lanes from this transition point to Hope Side Road is identified in the TMP as a Phase 2 Road Project (2016-2022).

Fernbank Road is a major City-owned east-west arterial road, which extends from Eagleson Road in the east, through Stittsville, to Dwyer Hill Road in the west. Within the study area, Fernbank Road has a two-lane cross section with auxiliary turn lanes at major intersections, on-road cycling lanes, and a posted speed limit of 60 km/h.

Akerson Road/Carronbridge Circle is a City-owned north-south local road that links Michael Cowpland Drive in the north to Cope Drive in the south, where it continues as Carronbridge Circle. The cross-section is two-lanes and the unposted speed limit is understood to be 50 km/h. A multi-use path (MUP) was recently constructed from Carronbridge Circle to Eagleson Road.

Adjacent Private Driveways

Along Eagleson Road there are no private driveways located within 200 m of the proposed site's driveways.

Along Cope Drive, the proposed site driveway will use a portion of the existing driveway to the First Air development.

Along the north side of Cope Drive there are two driveways to the Real Canadian Superstore development, located approximately 35 and 50 m from the existing First Air/proposed site driveway.

Pedestrian/Cycling Network

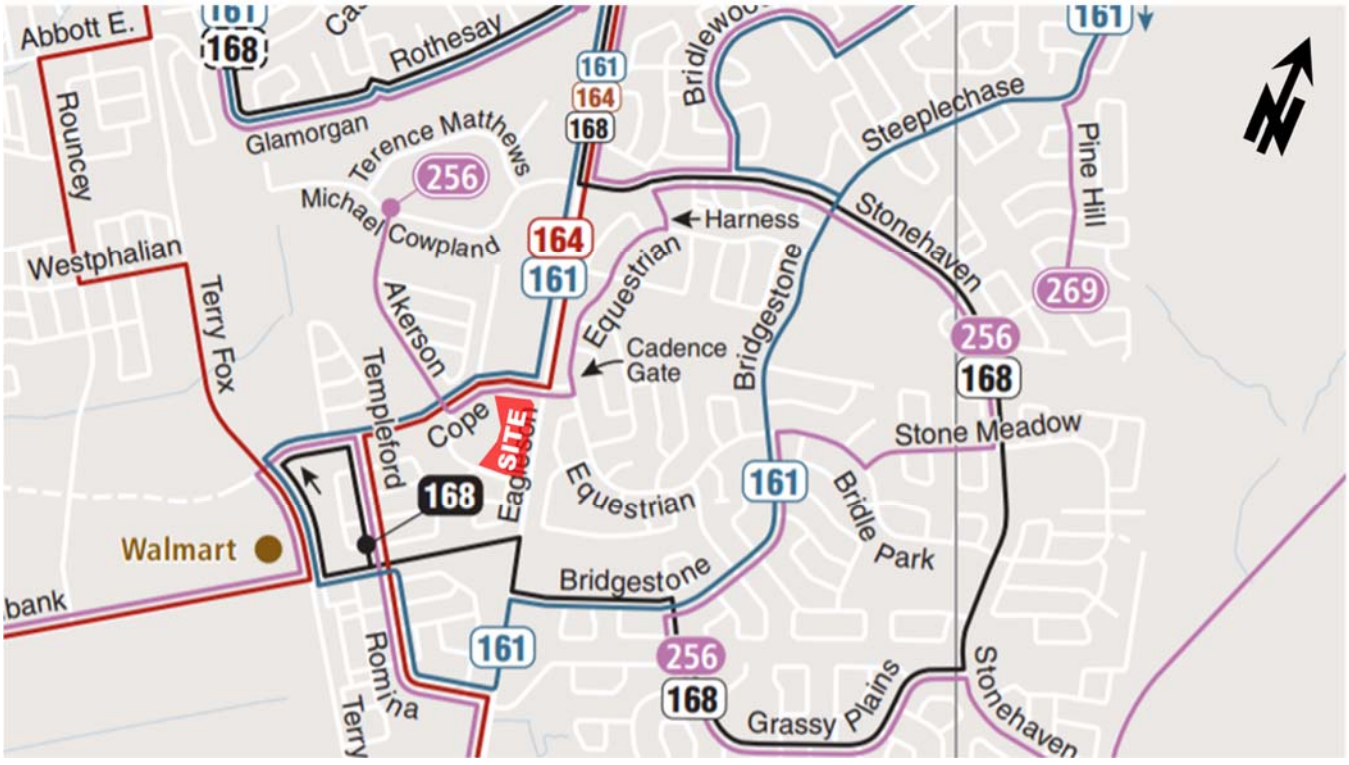
With regard to pedestrian facilities adjacent to the site, sidewalks are provided on the both sides of Cope Drive, Akerson Road and Eagleson Road (north of Cope). South of Cope Drive, an asphalt sidewalk is provided along the east side of Eagleson Road which connects to a pathway approximately 150 m south of the Cope/Eagleson intersection. As mentioned previously, a MUP is provided south of the site between Carronbridge Circle and Eagleson Road. The notable deficiencies in the pedestrian network are: the lack of a sidewalk facility on the west side of Eagleson Road along the site's frontage; and the lack of a protected crossing of Eagleson Road for users of recreational pathway between Cope Drive and Fernbank Road.

According to the Ottawa Cycling Plan, Eagleson Road, north of Flewellyn Road, and Fernbank Road are identified as Spine Cycling Routes and Cope Drive and Akerson Road are identified as Local Cycling Routes. Bicycle lanes are currently provided along the west side of Eagleson Road, between Cope Drive and the southern access to Eagleson Place shopping centre. Bicycle lanes are also provided along Fernbank Road between Terry Fox Drive and Eagleson Road. Cope Drive and Akerson Road are identified as 'suggested routes' and MUPs are provided south of the site between Carronbridge Circle and Eagleson Road and west of the site, serving the adjacent residential community.

Transit Network

Transit service within the vicinity of the site, as shown in Figure 3, is provided by OC Transpo Routes #161, 164 and 256. Bus stops for all three Routes are provided at the Cope/Akerson intersection approximately 200 to 400 m walking distance from the subject site. Bus stops are also located along Eagleson Road in the northbound direction at the Eagleson/Cope intersection and in the north and southbound directions at the signalized Eagleson/Real Canadian Superstore intersection approximately 250 m north of the Eagleson/Cope intersection. Route #161 is a local route, which provides frequent all-day service. Route #164 is a peak route, which provides service during the weekday peak hours only. Route #256 is a Connexion Routes, which also provides weekday peak hour service only.

Figure 3: Area Transit Network



Existing Transit Capacity

Based on the information provided by OC Transpo, the following Table 1 provides the number of boarding and alighting passengers during the peak periods for an average day at the bus stops within the vicinity of the site. In addition, it provides the average number of persons on board busses leaving the stops.

Table 1: Existing Boarding and Alighting Passengers

Sept 2017 Data			AM PEAK PERIOD			PM PEAK PERIOD		
Intersection	STOP	Route	Average Boarding (6am-9am)	Average Alighting (6am-9am)	Average Load at Departure	Average Boarding (3pm-6pm)	Average Alighting (3pm-6pm)	Average Load at Departure
Akerson/Cope	6936	161	0	0	1	0	2	6
		164				0	1	6
	6935	161	1	0	5	0	0	2
		164	2	0	12			
		256	Not Available			Not Available		

We have been informed by OC Transpo that Route #256 did not extend to Stop 6935 until January 2018 and as such, there is no boarding/alighting data for this route at this stop. We are advised that there are currently overload issues on Route #256 and the issues are under review by OC Transpo. As mentioned previously, Route #164 is a peak direction route and as such there is boarding/alighting data in only one direction during the peak hours.

As shown in Table 1, there is significant spare capacity on Routes #161 and 164 within the vicinity of the site. Capacity of busses is understood to be 55 persons per bus for regular busses, 75 persons per bus for articulated busses and 90 persons per bus for double decker busses.

Existing Study Area Intersection

Eagleson/Cope (signalized)
Northbound

- two through lanes
- single 60m left-turn lane

Southbound

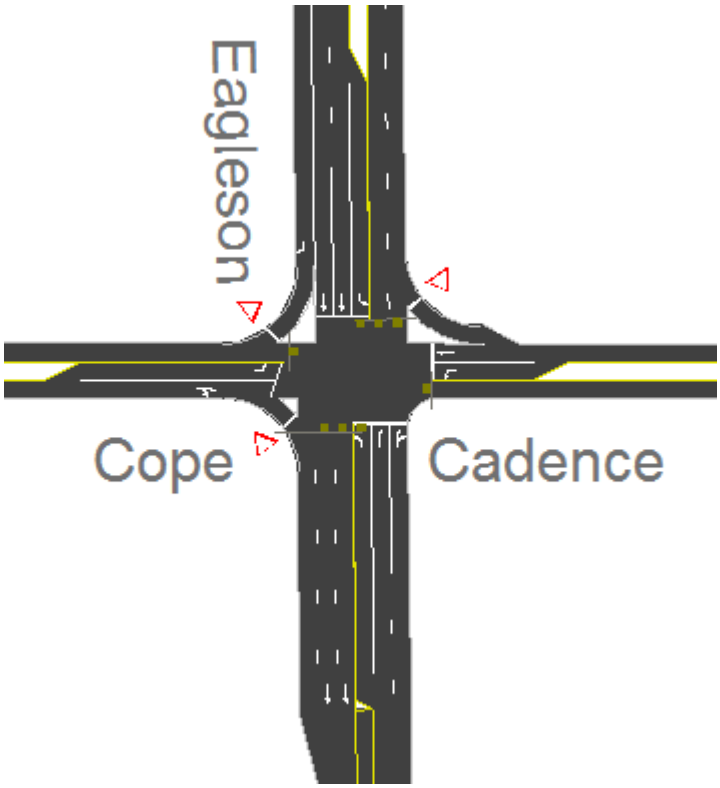
- two through lanes
- single 50m left-turn lane
- single 100m+ right-turn lane (channelized)
- cycling lane

Eastbound

- single through/right-turn lane (channelized)
- single 40m left-turn lane

Westbound

- single through/right turn lane (channelized)
- single 20m left-turn lane



Eagleson/Fernbank (signalized)
Northbound

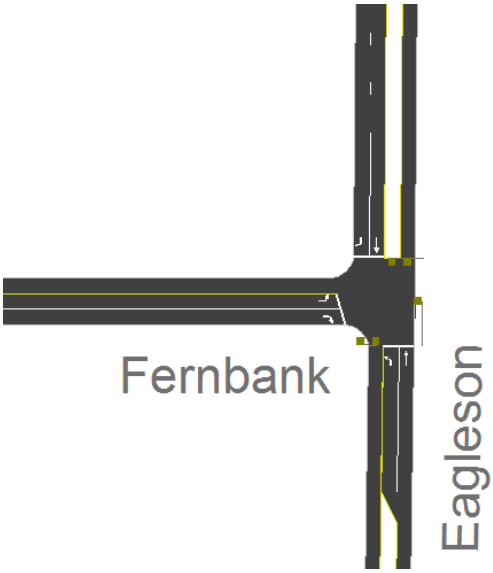
- single through lane
- single 30m left-turn lane

Southbound

- single through lane
- single right-turn lane
- pocket cycling lane

Eastbound

- single left-turn lane
- single right-turn lane
- cycling lane



Cope/Site (uncontrolled)
Northbound

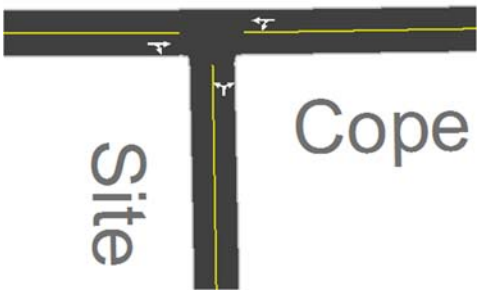
- single all-movement lane

Eastbound

- single through right-turn lane

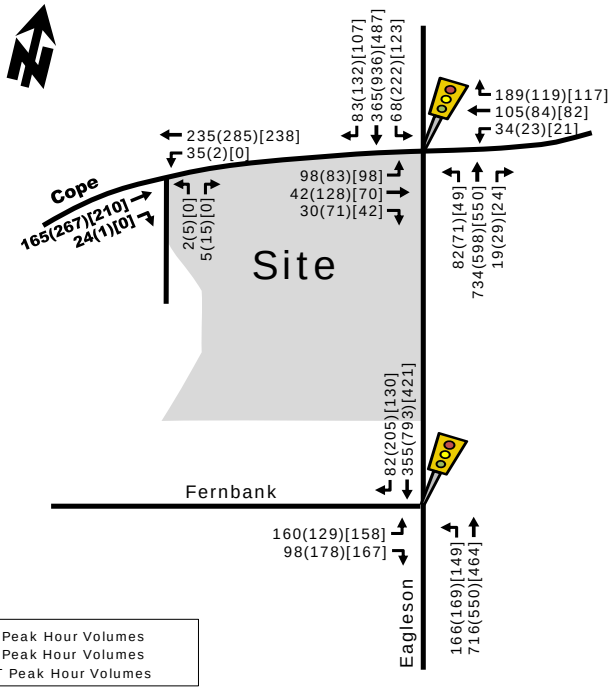
Westbound

- single through left-turn lane



Illustrated as Figure 4, are the most recent weekday morning and afternoon peak hour traffic volumes obtained from the City of Ottawa at the Eagleson/Cope, Eagleson/Fernbank intersections and collected by Parsons at the Cope/Site intersection (First Air driveway). Saturday peak hour counts (collected by Parsons) are also included in Figure 4. All peak hour traffic volumes are included as Appendix A.

Figure 4: Existing Peak Hour Traffic Volumes



Existing Road Safety Conditions

Collision history for the Eagleson/Cope and Eagleson/Fernbank intersections (2012 to 2016, inclusive) was obtained from the City of Ottawa and most collisions (69%) involved only property damage, indicating low impact speeds, and 29% involved personal injuries. There was one fatal accident at the Eagleson/Fernbank intersection in 2016 that involved a passenger vehicle and a motorcycle. The primary causes of collisions cited by police include; rear end (35%), angle (24%), and turning movement (22%) type collisions.

A standard unit of measure for assessing collisions at an intersection is based on the number of collisions per million entering vehicles (MEV). At intersections within the study area, reported collisions have historically take place at a rate of:

- 0.44/MEV at the Eagleson/Cope intersection; and
- 0.67/MEV at the Eagleson/Fernbank intersection.

It is noteworthy that within the 5-years of recorded collision data, no collisions involved pedestrians or cyclists. The source collision data as provided by the City of Ottawa and related analysis is provided as Appendix B.

2.1.3. PLANNED CONDITIONS

Planned Study Area Transportation Network Changes

Roadways
As noted previously, the widening of Eagleson Road (Cadence Gate to Hope Side Road) from the current two lanes to four lanes is identified in the TMP as a Phase 2 Road Project (2016-2022).

Transit
Identified in the 2031 Affordable Concept is Transit Priority (isolated measures) along Eagleson Road, north of Hazeldean Road.

Other Area Development

According to the City's development application search tool, the following developments are planned within close proximity of the site.

80, 110, 140, 151, 180 Cope Drive
Thomas Cavanagh Construction Ltd. is proposing to construct 260 residential units at the above noted addresses. The Transportation Impact Study (prepared by Stantec) projected an increase in vehicle trips of approximately 75 veh/h during the peak hours.

800 Eagleson Road/5264 Fernbank Road
A car dealership is proposed at the above noted address with approximately 100 parking spaces (34 for display vehicles and 64 for customers and staff). No transportation impact assessment was submitted with the application.

1039 Terry Fox Drive/5331 Fernbank Road
The application for these lands (known as the Van Gaal Lands) includes a proposal for the construction of 255 townhouses, approximately 100,000 ft^2 of commercial and 600,000 ft^2 of office. The Community Transportation Study (prepared by Novatech) projected an increase in vehicle volumes of approximately 900 to 1,000 veh/h during the weekday peak hours and 630 veh/h during the Saturday peak hour.

25 Overberg Way/5306 Fernbank Road
A 72 unit residential development is proposed at the above noted address with approximately 100 parking spaces. No transportation impact assessment was submitted with the application.

895 Eagleson Road
The South Kanata Development Corporation is proposing to construct a residential development at the above noted address consisting of approximately 141 townhouses. The Transportation Impact Study (prepared by Stantec) projected an increase in traffic volumes of 50 to 60 veh/h during the peak hours.

630 Eagleson Road
A residential care facility, consisting of approximately 66 units is proposed at the above-noted address. The Transportation Brief (prepared by Parsons) projected an increase in vehicle volumes of approximately 15 veh/h during peak hours.

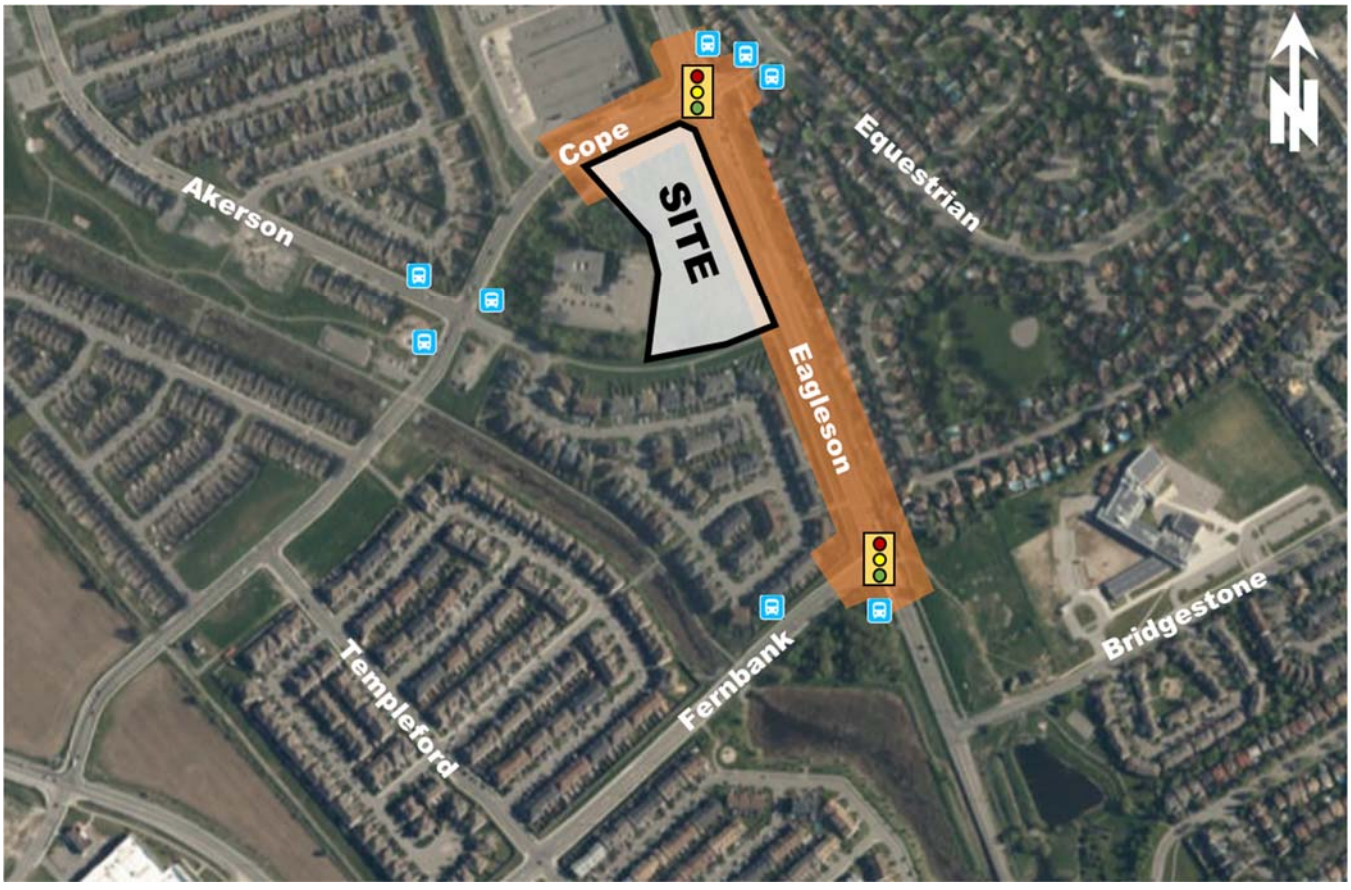
2.2. STUDY AREA AND TIME PERIODS

2.2.1. STUDY AREA

The proposed study area is outlined below and highlighted in Figure 5.

- Eagleson/Cope intersection;
- Eagleson/Fernbank intersection;
- Cope/Site (First Air) intersection;
- Eagleson Road – adjacent to the site;
- Cope Drive – adjacent to the site.

Figure 5: Study Area



2.2.2. TIME PERIODS

The time periods to be assessed are the weekday afternoon commuter peak hour and Saturday peak hour. Depending on the results of the forecasting report and the site-trip generation, the weekday morning peak hour traffic may be required as part of the assessment. This will be determined during the Forecasting stage of the TIA.

2.2.3. HORIZON YEARS

The expected build out date for the proposed development is year 2020. The horizon year 2025, representing 5-years beyond site build out will also be assessed.

2.3. EXEMPTION REVIEW

Based on the City's TIA guidelines and the proposed development, the following sections of the TIA process will be exempt, unless otherwise directed.

Module	Element	Exemption Consideration
4.1 Development Design	4.1.3 New Street Networks	Not required for applications involving site plans.
4.2 Parking	4.2.2 Spillover Parking	Parking is proposed to exceed By-Law requirements.
4.8 Review of Network Concept	All elements	This development is not expected to generate 200 person trips more than the permitted zoning for the site.

3. FORECASTING REPORT

3.1. DEVELOPMENT-GENERATED TRAVEL DEMAND

3.1.1. TRIP GENERATION AND MODE SHARES

The proposed development will consist of a number of commercial retail units totaling approximately 60,325 ft^2, including a grocery store, a restaurant, two health/dental offices and other retail uses within the shopping centre. Appropriate trip generation rates for the proposed retail development were obtained from the 10th Edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual, which are summarized in Table 2.

Table 2: ITE Trip Generation Rates

Land Use	Data Source	Trip Rates		
		AM Peak	PM Peak	SAT Peak
Shopping Centre	ITE 820	T = 0.94(X)	T = 3.81(X)	T = 4.50(X)
High Quality Restaurant	ITE 931	T = 0.73(X)	T = 7.80(X)	T = 10.68(X)
Medical/Dental Office	ITE 720	T = 2.78(X); Ln(T) = 0.89 Ln(X) + 1.31	T = 3.46(X); T = 3.39(X) + 2.02	T = 3.10(X)
Supermarket	ITE 850	T = 3.82(X)	T = 9.24(X); Ln(T) = 0.75Ln(X) + 3.21	T = 10.34(X); Ln(T) = 0.69Ln(X) + 3.61

Notes: T = Average Vehicle Trip Ends
X = 1000 ft^2 Gross Floor Area

As ITE trip generation surveys only record vehicle trips and typically reflect highly suburban locations (with little to no access by travel modes other than private automobiles), adjustment factors appropriate to the more urban study area context

were applied to attain estimates of person trips for the proposed car dealership and retail components of the development. This approach is considered appropriate within the industry for urban infill developments.

To convert ITE vehicle trip rates to person trips, an auto occupancy factor and a non-auto trip factor were applied to the ITE vehicle trip rates. Our review of available literature suggests that a combined factor of approximately 1.28 is considered reasonable to account for typical North American auto occupancy values of approximately 1.15 and combined transit and non-motorized modal shares of less than 10%. The person trip generation for the proposed shopping centre, restaurant, medical/dental offices and supermarket are summarized in Table 3.

Table 3: Modified Person Trip Generation

Land Use	Area	AM Peak (Person Trips/h)			PM Peak (Person Trips/h)			SAT Peak (Person Trips/h)		
		In	Out	Total	In	Out	Total	In	Out	Total
Shopping Centre	12,847 ft²	9	7	16	30	34	64	39	36	75
High Quality Restaurant	3,035 ft²	1	2	3	20	11	31	24	18	42
Pharmacy	5,476 ft²	17	5	22	7	20	27	12	10	22
Supermarket	38,965 ft²	120	74	194	256	246	502	307	295	602
Person Trips		135	85	220	322	311	634	392	377	769
Less 10% Multi-purpose trips		*-14*	*-8*	*-22*	*-32*	*-31*	*-63*	*-39*	*-38*	*-77*
Total Person Trips		**122**	**76**	**198**	**290**	**280**	**570**	**352**	**339**	**692**

Note: 1.28 factor to account for typical North American auto occupancy values of approximately 1.15 and combined transit and non-motorized modal shares of less than 10%

The person trips shown in Table 3 for the proposed retail developments were reduced by a 10% multi-purpose rate to account for trips to more than one of the retail pads within the development. The person trips were then reduced by modal share and pass-by values based on the site's location and proximity to adjacent communities, employment, shopping uses and transit availability. Modal share and pass-by values for the proposed general retail, restaurant, medical/dental office and grocery store are summarized in Tables 4, 5, 6, and 7, respectively.

Table 4: General Retail Modal Site Trip Generation (10% multi-purpose reduction)

Travel Mode	Mode Share	AM Peak (Person Trips/h)			PM Peak (Person Trips/h)			SAT Peak (Person Trips/h)		
		In	Out	In	Out	Total	Total	Out	Total	Total
Auto Driver	60%	4	4	8	17	19	36	21	20	41
Auto Passenger	15%	1	1	2	4	4	8	5	4	9
Transit	15%	2	1	3	4	4	8	6	5	11
Non-motorized	10%	1	0	1	2	4	6	3	3	6
Total Person Trips	100%	8	6	14	27	31	58	35	32	67
Less Pass-by (25%)		-1	-1	-2	-5	-5	-10	-5	-5	-10
Total 'New' Auto Trips		**3**	**3**	**6**	**12**	**14**	**26**	**16**	**15**	**31**

Table 5: Restaurant Modal Site Trip Generation (10% multi-purpose reduction)

Travel Mode	Mode Share	AM Peak (Person Trips/h)			PM Peak (Person Trips/h)			SAT Peak (Person Trips/h)		
		In	Out	In	Out	Total	Total	Out	Total	Total
Auto Driver	60%	1	2	3	11	6	17	14	10	24
Auto Passenger	15%	0	0	0	2	1	3	3	2	5
Transit	15%	0	0	0	3	2	5	3	3	6
Non-motorized	10%	0	0	0	2	1	3	2	1	3
Total Person Trips	100%	1	2	3	18	10	28	22	16	38
Less Pass-by (25%)		0	0	0	-2	-2	-4	-3	-3	-6
Total 'New' Auto Trips		**1**	**2**	**3**	**9**	**4**	**13**	**11**	**7**	**18**

Table 6: Medical/Dental Office Modal Site Trip Generation (10% multi-purpose reduction)

Travel Mode	Mode Share	AM Peak (Person Trips/h)			PM Peak (Person Trips/h)			SAT Peak (Person Trips/h)		
		In	Out	In	Out	Total	Total	Out	Total	Total
Auto Driver	60%	9	3	12	4	11	15	7	6	13
Auto Passenger	15%	2	0	2	0	2	2	1	1	2
Transit	15%	2	1	3	1	3	4	1	2	3
Non-motorized	10%	2	1	3	1	2	3	2	0	2
Total Person Trips	100%	15	5	20	6	18	24	11	9	20
Total 'New' Auto Trips		**9**	**3**	**12**	**4**	**11**	**15**	**7**	**6**	**13**

Table 7: Grocery Store Modal Site Trip Generation (10% multi-purpose reduction)

Travel Mode	Mode Share	AM Peak (Person Trips/h)			PM Peak (Person Trips/h)			SAT Peak (Person Trips/h)		
		In	Out	In	Out	Total	Total	Out	Total	Total
Auto Driver	60%	65	41	106	138	133	271	166	160	326
Auto Passenger	15%	16	10	26	34	33	67	41	39	80
Transit	15%	17	10	27	35	33	68	42	40	82
Non-motorized	10%	10	6	16	23	22	45	27	27	54
Total Person Trips	100%	108	67	175	230	221	451	276	266	542
Less Pass-by (35%)		-19	-19	-38	-47	-47	-94	-57	-57	-114
Total 'New' Auto Trips		**46**	**22**	**68**	**91**	**86**	**177**	**109**	**103**	**212**

The total site-generated vehicle trips are summarized in Table 8.

Table 8: Site Vehicle Trip Generation

Vehicle Trip Generation	AM Peak (veh/hr)			PM Peak (veh/hr)			SAT Peak (veh/hr)		
	In	Out	Total	In	Out	Total	In	Out	Total
Shopping Centre	4	4	8	17	19	36	21	20	41
High Quality Restaurant	1	2	3	11	6	17	14	10	24
Medical/Dental Office	9	3	12	4	11	15	7	6	13
Supermarket	65	41	106	138	133	271	166	160	326
Less Shopping Centre Pass-by (25%)	-1	-1	-2	-5	-5	-10	-5	-5	-10
Less Restaurant Pass-by (25%)	0	0	0	-2	-2	-4	-3	-3	-6
Less Supermarket Pass-by (35%)	-19	-19	-38	-47	-47	-94	-57	-57	-114
Total 'New' Auto Trips	**59**	**30**	**89**	**116**	**115**	**231**	**143**	**131**	**274**

As shown in Table 8, the total number of new vehicle trips projected to be generated by the proposed development is approximately 90, 230 and 275 veh/h during the weekday morning, afternoon and Saturday peak hours. The increase in

transit trips is projected to be approximately 85 to 100 persons per hour during the weekday afternoon and Saturday peak hours. The increase in active modes travelling to/from the development is projected to be 55 to 65 persons per hour during critical peak hours. The critical peak hours are considered the weekday afternoon and Saturday peak hours and will be the focus of the assessment provided herein.

Mode Shares

The existing mode shares outlined in Tables 4 to 7 above were derived from the 2011 OD Survey for the Kanata/Stittsville area, which are shown in Table 9 below.

Table 9: OD Survey Trips by Primary Travel Mode – Hunt Club

Time Period	24 Hours			AM Peak Hour			PM Peak Hour			Average	Selected Split
Mode	From District	To District	Within District	From District	To District	Within District	From District	To District	Within District		
Driver	67%	67%	57%	59%	74%	45%	73%	61%	57%	62%	60%
Passenger	16%	16%	20%	9%	7%	17%	17%	15%	23%	16%	15%
Transit	13%	13%	3%	24%	8%	4%	7%	21%	2%	11%	15%
Bike/Walk	0%	0%	14%	0%	1%	20%	0%	0%	13%	5%	10%
Other	4%	4%	7%	7%	10%	15%	3%	3%	6%	7%	-

These existing modal shares are used to calculate the projected traffic to/from the proposed development for the build-out year and 5-years beyond build-out. Given the planned transportation network within the vicinity of the site does not provide any significant non-auto transportation improvements, there is no rationale that the future modal splits will be different than existing.

3.1.2. TRIP DISTRIBUTION

Based on the existing traffic volume counts and the location of adjacent arterial roadways and neighbourhoods, the distribution of site-generated traffic volumes is as follows:

- 40% to/from the north/northeast via Eagleson;
- 15% to/from the south/southwest via Eagleson and/or Fernbank;
- 30% to/from the east via Cope; and
- 15% to/from the northwest via Cope.

3.1.3. TRIP ASSIGNMENT

A full movement driveway connection and a right-in/right-out driveway connection to Eagleson Road are proposed to serve the subject development as well as a full-movement driveway connection to Cope Drive (via the existing First Air driveway). The full-movement driveway to Eagleson Road is proposed to be signalized and is located approximately 225 m south of the Eagleson/Cope intersection. Given these proposed driveways, 'new' and 'pass-by' site-generated vehicle trips for the proposed development are assigned to the study area network and illustrated as Figures 6 and 7, respectively.

Figure 6: 'New' Site-Generated Traffic

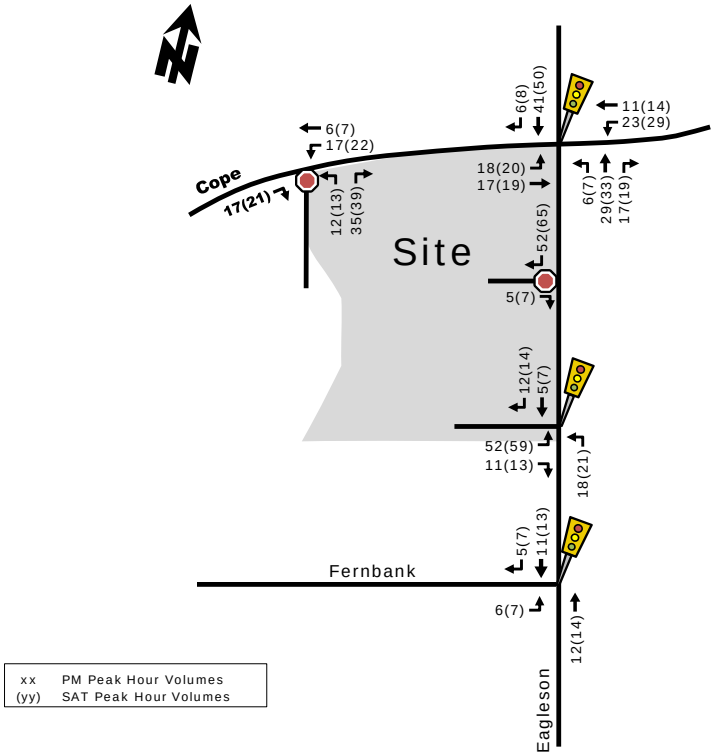
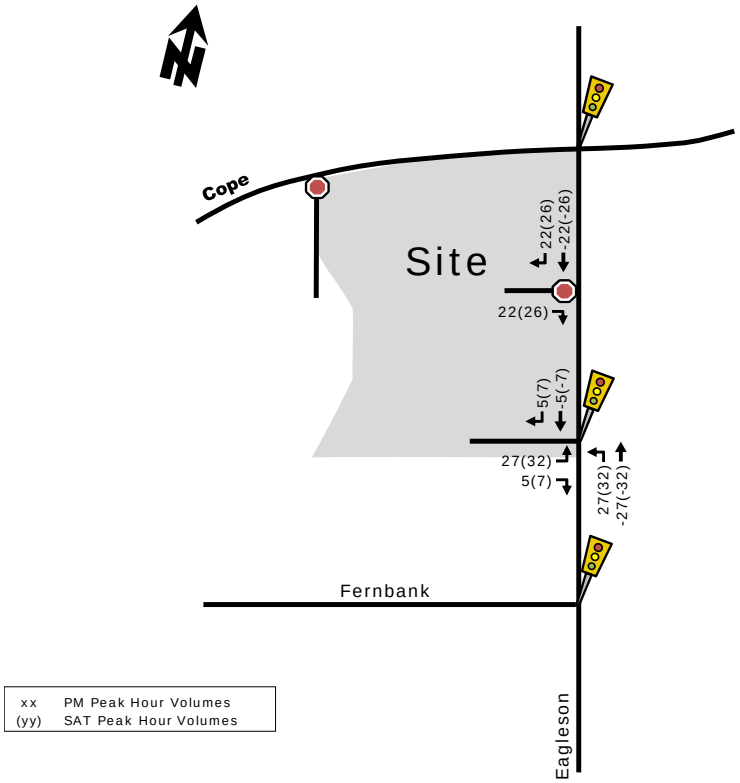


Figure 7: 'Pass-by' Site-Generated Traffic



3.2. BACKGROUND NETWORK TRAVEL DEMANDS

3.2.1. TRANSPORTATION NETWORK PLANS

Refer to section 2.1.3 Planned Conditions – Planned Study Area Transportation Network Changes.

3.2.2. BACKGROUND GROWTH

The following background traffic growth through the immediate study area (summarized in Table 10) was calculated based on historical traffic count data (years 2010, 2014, and 2017) provided by the City of Ottawa at the Eagleson/Fernbank intersection. Detailed background traffic growth analysis is included as Appendix C.

Table 10: Eagleson/Fernbank Historical Background Growth (2010 – 2017)

Time Period	Percent Annual Change			
	North Leg	South Leg	West Leg	Overall
8 hrs	0.46%	1.42%	-0.69%	0.40%
AM Peak	0.14%	1.85%	-4.55%	-0.85%
PM Peak	0.34%	0.85%	0.42%	0.54%

As shown in Table 10, the Eagleson/Fernbank intersection traffic volumes overall have remained relatively constant over the years. The overall traffic growth rates through the Eagleson/Fernbank intersection are approximately 0.5% to 2%. For the purpose of this study, the subsequent analysis of future conditions will assume 1% annual growth rate to account for area development along Eagleson Road, Fernbank Road and the surrounding area. The resulting future background traffic for the year 2019 (when the site is expected to be fully occupied) and for the horizon year 2024 (5 years after build-out) are depicted in Figures 8 and 9, respectively. For the horizon year 2024, the projected traffic volumes related to the Van Gaal Lands were included as background traffic.

Figure 8: Projected 2019 Baseline Traffic Volumes

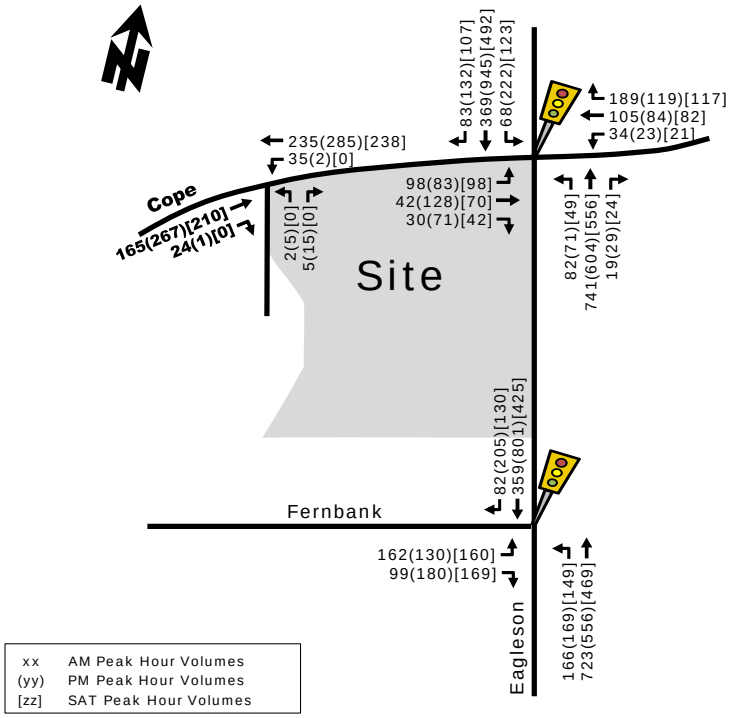
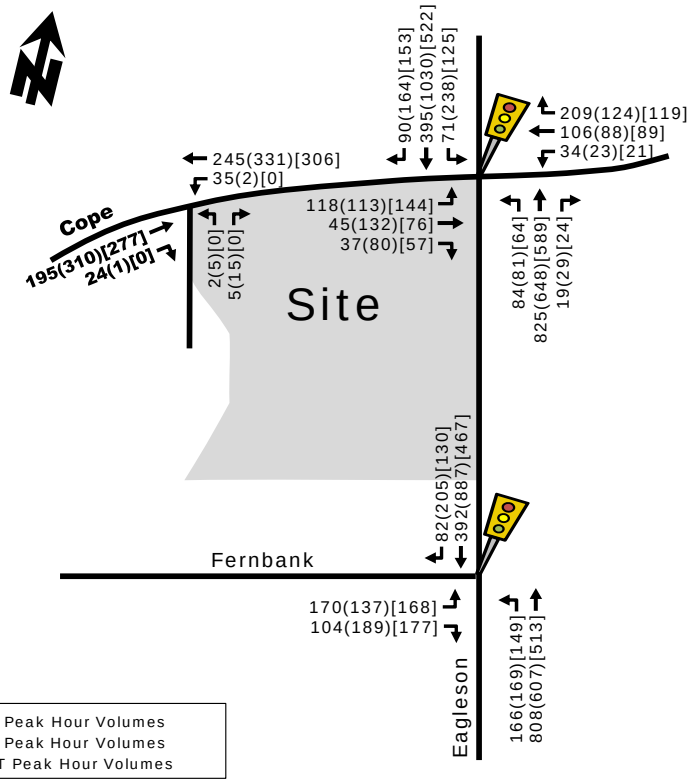


Figure 9: Projected 2024 Baseline Traffic Volumes



3.2.3. OTHER DEVELOPMENTS

Refer to section 2.1.3 Planned Conditions – Other Area Developments.

4. STRATEGY REPORT

4.1. DEVELOPMENT DESIGN

4.1.1. DESIGN FOR SUSTAINABLE MODES

Vehicle and Bicycle Parking
Vehicle parking is proposed within surface parking lots. The parking space dimensions are noted to be 5.2 to 5.65 m in length and 2.75 m in width, which meets the City's By-Law requirements. Drive aisle widths are noted to be 6.7 to 7.4 m, which meets the City's By-Law requirements.

With regard to bicycle parking, according to the City's By-Law requirements, bicycle parking should be provided at a rate of 1 per 250 m^2. Bicycle parking should be located in well-lit areas and close to main entrances.

Pedestrians and Transit
Sidewalks are provided on-site fronting all buildings and cross-walks/curb bulb-outs are provided crossing drive aisles. Sidewalks are proposed along Eagleson Road fronting the site connecting to on-site sidewalks. A cross-walk and pedestrian pathway is proposed at the southern portion of the site to connect to the newly constructed MUP south of the site, which also provides connection to Eagleson Road and the neighbourhoods to the south and west. A 1.8 m sidewalk is proposed

fronting the site along the existing First Air driveway to connect pedestrians to existing sidewalks along Cope Drive. Existing sidewalks are provided along both sides of Cope Drive, Fernbank Road and Eagleson Road (north of Cope Drive) and along the east side of Eagleson Road (south of Cope Drive). A 3.0 MUP is proposed along the site's Eagleson Road frontage as shown in the Site Plan (Figure 2).

Bus stops for OC Transpo routes within the vicinity of the site are located at the Cope/Akerson intersection, along Eagleson Road in the northbound direction at the Eagleson/Cope intersection and in the north and southbound directions at the signalized Eagleson/Real Canadian Superstore intersection. Walking distance to/from these bus stops ranges from 200m to 550m. Bus pads are proposed along Eagleson Road just south of Cope Drive and along Cope Drive adjacent to the site. These bus pads are shown on the attached Site Plan.

4.1.2. CIRCULATION AND ACCESS

As shown on the proposed Site Plan (Figure 2), trucks will access the site via the full-movement driveway connection to the First Air driveway and sufficient space is provided for trucks to access the grocery store loading bays. To exit the site, trucks can continue around the site, behind Block D, to the proposed signalized full-movement intersection along Eagleson Road. All loading will occur on-site. The truck turning templates are provided as Appendix D.

4.2. PARKING

4.2.1. PARKING SUPPLY

Vehicle and Bicycle Parking
A total of 246 surface parking spaces are proposed to serve the retail development. This amount of parking exceeds the City's minimum By-Law requirement and there is no maximum amount of parking for this site given its location. Based on the bicycle parking minimum rates, a minimum of 23 bicycle parking spaces should be provided for the retail development.

4.3. BOUNDARY STREET DESIGN

4.3.1. EXISTING CONDITIONS

The boundary streets for the development are Eagleson Road and Cope Drive. At this time, there has not been any complete street concepts prepared for Eagleson Road or Cope Drive. The existing roadways' geometries consist of the following features:

Eagleson Road:

- 2 vehicle travel lanes in each direction;
- Raised median along the site's frontage;
- 2 m asphalt sidewalk on the east side of the roadway;
- No sidewalk on the west side of the roadway;
- More than 3,000 vehicles per day along Eagleson Road;
- Posted speed limit of 60 km/h, assumed operating speed of 60 to 70 km/h;
- 3.3 – 3.5 m wide centre lanes and 3.7 m wide curb lanes;
- Designated an Arterial Mainstreet;
- No dedicated cycling facilities adjacent to the site;
- No dedicated transit facilities; and
- No on-street parking.

Cope Drive:

- Single vehicle travel lane in each direction;
- 2 m concrete sidewalk along both sides of the roadway with 2 m boulevard;
- More than 3,000 vehicles per day along Cope Drive;
- Posted speed limit of 40 km/h increasing to 50 km/h, assumed operating speed of 40 to 50 km/h;
- >3.7 m wide travel lanes;
- No dedicated cycling facilities;
- No dedicated transit facilities; and
- No on-street parking.

The multi-modal level of service analysis for the road segments along Eagleson Road and Cope Drive adjacent to the site are summarized in Table 11, with detailed analyses provided in Appendix E.

Table 11: MMLOS – Existing Eagleson Road and Cope Drive Segments (adjacent to the site)

Road Segment	Level of Service							
	Pedestrian (PLoS)		Bicycle (BLoS)		Transit (TLoS)		Truck (TkLoS)	
	PLoS	Target	BLoS	Target	TLoS	Target	TkLoS	Target
Eagleson Road (west side of road)	F	C	F	C	N/A	No target	A	D
Cope Drive (south side of road)	C	C	B	B	N/A	No target	B	No target

Given the development's location within a general urban area and along an Arterial Mainstreet (Eagleson Road), the target levels of service for pedestrians is PLoS 'C' and for cyclists BLoS 'C' along Eagleson Road and BLoS 'B' along Cope Drive. There are no transit priority plans for Eagleson Road or Cope Drive identified within the City's Affordable Network in this area and as such there is no TLoS target. As Eagleson Road forms part of the truck route, the truck target level of service is TkLoS 'D' and Cope Drive does not form part of the truck route and as such, there is no truck level of service target. As shown in Table 11 in red text, the pedestrian and cycling level of service targets are not met along Eagleson Road.

With regard to pedestrians, the combination of high traffic volumes and vehicle speeds along Eagleson Road and lack of pedestrian facilities results in a score of PLoS 'F'. With regard to cyclists, there are currently no dedicated cycling facilities along this portion of Eagleson Road. To achieve the target level of service for cyclists along this road segment of BLoS 'C', bicycle lanes would need to be implemented. As part of the road widening EA for Eagleson Road from Cope Drive to Hope Side Road, bike lanes are shown on the drawings for this segment of Eagleson Road, however, bicycle lanes are not currently provided along the widened portion of Eagleson (between Cope and the site's proposed signalized access).

4.3.2. PROJECTED CONDITIONS

As shown on the Site Plan (Figure 2), a 3.0 m wide MUP is proposed along the site's Eagleson frontage. There is a planned 1.2 to 2.0 m wide boulevard between the MUP and the side of Eagleson Road. This facility is planned to connect from the Eagleson/Cope intersection to the proposed Eagleson/Site signalized intersection and will accommodate both pedestrians and cyclists in the north and southbound directions. Given this proposed design, the projected pedestrian and cycling levels of service are provided in the following Table 12.

Table 12: MMLOS – Projected Eagleson Road Segment (adjacent to the site)

Road Segment	Level of Service			
	Pedestrian (PLoS)		Bicycle (BLoS)	
	PLoS	Target	BLoS	Target
Eagleson Road (west side of road)	D	C	A	C

As shown in Table 12, the PLoS is increased from PLoS 'F' to PLoS 'D' with the proposed MUP and boulevard. The target PLoS 'C' is not achievable unless the vehicle speeds or volumes are reduced along Eagleson Road. The bicycle level of service target is met and exceeded by providing the proposed MUP along the site's frontage.

4.4. ACCESS INTERSECTION DESIGN

4.4.1. LOCATION AND DESIGN OF ACCESS

There are three proposed accesses to the subject development; one full-movement driveway to Cope Drive (via the First Air driveway), one right-in/right-out driveway connection to Eagleson Road and one proposed signalized full-movement driveway connection to Eagleson Road. The right-in/right-out access is located approximately 130 m south of the existing Eagleson/Cope intersection and approximately 65 m north of the proposed signalized Eagleson/Site intersection. The site driveway connection to the First Air driveway is located approximately 60 m south of Cope Drive. The proposed signalized full-movement access to Eagleson Road is located approximately 225 m south of the signalized Eagleson/Cope intersection. The location and number of site driveways meets the City's Private Approach By-Law requirements.

At the First Air/Cope intersection, a westbound left-turn lane warrant analysis was performed and a left-turn lane is not warranted at this location. The warrant analysis is included as Appendix G.

Eagleson Road is divided by an existing centre median adjacent to the proposed site. To provide full-movement access to the site, a median break is required and based on operational analysis (SYNCHRO model), signalization is appropriate for the full-movement driveway.

4.4.2. INTERSECTION CONTROL

Signal warrant analysis was performed at the proposed Eagleson/Site intersection and is included as Appendix F. Based on the total projected traffic volumes outlined in Section 4.9, signalization is not warranted at this location. However, the SYNCHRO analysis indicates delays of over one minute (LoS 'F') for vehicle turning left out of the site during the weekday afternoon peak hour if the full-movement access is unsignalized. Given the SYNCHRO analysis, signalization is recommended at this location. As the signal is not warranted, it is our understanding the developer will be responsible for construction and maintenance of the signal through an agreement with the City.

Turn Lane Requirements

Left-turn storage lane warrant analysis was performed and is included as Appendix G. Based on the projected traffic volumes, a northbound left-turn lane is warranted at this location with a recommended storage length of 35 m.

With regard to an auxiliary southbound right-turn lane, the 'rule-of-thumb' for right-turn lane recommendations is that a right-turn lane is required when there are approximately 60 veh/h or more during the peak hour or if 10% or more of the traffic in the curb lane is turning right. Based on the projected vehicle volumes, an auxiliary southbound right-turn lane is recommended at the right-in/right-out driveway connection to Eagleson Road. An auxiliary southbound right-turn lane is not required at the proposed signalized Eagleson/Site driveway however an eastbound right-turn lane exiting the site is recommended to accommodate truck turning movements out of the site.

The Transportation Association of Canada (TAC) recommended minimum storage length for the southbound right-turn lane at the right-in/right-out driveway is 32 m. There is an existing southbound acceleration lane at the Eagleson/Cope intersection which ends approximately 35 m north of the site driveway. It is recommended that the acceleration lane be removed from the Eagleson/Cope intersection by extending the curb at the intersection. By removing the acceleration lane, the potential weaving movement between eastbound right-turn traffic from Cope and southbound traffic on Eagleson (destined to the site driveway) is eliminated, and the southbound auxiliary right-turn lane serving the site can be accommodated. This is considered the safest configuration, with negligible impact to operations given modest eastbound right-turn volumes of less than 100 veh/h during peak hours (see Figure 10).

The functional drawing (attached as Appendix H) illustrates the proposed configuration of the site driveway and auxiliary turn lanes, resulting storage and taper lengths, as well as existing utility information. Likely need to relocate several catch basins and a valve chamber subject to additional design work.

4.4.3. INTERSECTION DESIGN - MMLOS

The MMLOS analysis for the proposed signalized intersection is outlined in Table 13 and included as Appendix I.

Table 13: MMLOS – Proposed Eagleson/Site Intersection

Intersection	Level of Service									
	Pedestrian (PLoS)		Bicycle (BLoS)		Transit (TLoS)		Truck (TkLoS)		Vehicle (LoS)	
	PLoS	Target	BLoS	Target	TLoS	Target	TkLoS	Target	LoS	Target
Eagleson/Site	D	C	F	C	N/A	No target	C	Not a truck route intersection	A	D

As shown in Table 13, the pedestrian and bicycle level of service targets are not met for the proposed intersection. Similar to the other study area intersections, the width of Eagleson Road and the long cycle lengths result in low scores for pedestrian level of service. It is noteworthy that PLoS 'D' is the resulting level of service based on the delay score for pedestrians crossing Eagleson Road, the PETSI (Pedestrian Exposure to Traffic at Signalized Intersection) score for all three legs of the intersection results in PLoS 'C', which meets the target.

With regard to cyclists, a bi-directional cross-ride is proposed crossing the west leg of the intersection to connect to the north and southbound MUP. Northbound cyclists along Eagleson Road can use the intersection to turn-left to access this MUP or can dismount their bikes and walk across Eagleson Road at this intersection to access the MUP. The BLoS 'F' score is a result of the south leg having no existing cycling facilities. The north leg of the intersection results in a BLoS 'A' and the west leg experiences a BLoS 'D'.

4.5. TRANSPORTATION DEMAND MANAGEMENT

The proposed retail development is located within walking distance to transit stops, sidewalks are provided along all study area roadways and there are cycle lanes along some of the study area roadways. The Transportation Demand Management checklist is provided as Appendix J and highlighted below:

- Sidewalks provided fronting all buildings;
- Pedestrian crosswalks connecting to on-site and off-site pathways;
- Proposed sidewalks along Cope Drive and Eagleson Road frontages;
- Bicycle parking should be provided, however, is not identified on the current Site Plan;
- Buildings located adjacent to streets;
- Safe and direct connections for pedestrians to nearby transit stops;

Given the type of development and its location, the number of TDM strategies are limited for the subject site.

4.6. NEIGHBOURHOOD TRAFFIC MANAGEMENT

Site access is proposed to connect to Eagleson Road and Cope Drive. Eagleson Road is designated an arterial roadway and Cope Drive is designated as a collector roadway. Based on the existing volumes travelling along Cope Drive today (450 to 550 veh/h during the peak hours) and the TIA Guidelines for road classifications, Cope Drive should be designated a major collector today (maximum of 600 veh/h during the peak hours) The projected increase in traffic volumes along Cope Drive travelling to/from the proposed development is estimated to be 35 to 44 two-way veh/h during the weekday afternoon and Saturday peak hours. This increase in traffic results in total two-way vehicle volumes of approximately 480 to 600 two-way veh/h during the peak hours, which reinforces that the roadway should ideally be designated as a major collector.

4.7. TRANSIT

Transit service within the vicinity of the site is provided by OC Transpo Routes #161, 164 and 256. Bus stops for all three Routes are provided at the Cope/Akerson intersection approximately 200 to 400 m walking distance from the subject site. Bus stops are also located along Eagleson Road in the northbound direction north of the Eagleson/Cope intersection and in the north and southbound directions at the signalized Eagleson/Real Canadian Superstore intersection approximately 250 m north of the Eagleson/Cope intersection.

New bus pads are proposed along Eagleson Road and Cope Drive adjacent to the site as shown on the attached Site Plan.

As shown in Section 2.1.2, the existing bus routes within the vicinity of the site have significant spare capacity. The total number of transit trips projected to travel to/from the proposed development within the peak hours is approximately 85 to 100 persons per hour during the peak hours. This amount of transit trips can be accommodated on the existing network.

4.8. REVIEW OF NETWORK CONCEPT

Exempt – See Section 2.3.

4.9. INTERSECTION DESIGN

4.9.1. EXISTING CONDITIONS

The following Table 14 provides a summary of the existing traffic operations at the study area intersections based on the SYNCHRO (V9) traffic analysis software and the existing traffic volumes (Figure 4). The subject signalized intersections were assessed in terms of the volume-to-capacity (v/c) ratio and the corresponding Level of Service (LoS) for the critical movement(s). The subject signalized intersections 'as a whole' were assessed based on weighted v/c ratio. The SYNCHRO model output of existing conditions is provided within Appendix K.

Table 14: Existing Intersection Performance

Intersection	Weekday AM Peak (PM Peak) [Saturday]					
	Critical Movement			Intersection 'as a whole'		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
Eagleson/Fernbank	A (B) [A]	0.58 (0.70) [0.46]	NBT (SBT) [EBL]	12.1 (12.3) [8.8]	A (B) [A]	0.57 (0.64) [0.42]
Eagleson/Cope/Cadence	A (C) [B]	0.59 (0.77) [0.65]	EBL (EBL) [EBL]	14.3 (18.1) [14.7]	A (A) [A]	0.36 (0.48) [0.38]
Cope/First Air Driveway	B (B)	10.1 (10.6)	NBL (NBL)	0.8 (0.4)	-	-
Note: Analysis of signalized intersections assumes a PHF of 0.95 and a saturation flow rate of 1800 veh/h/lane.						

As shown in Table 14, the study area intersections 'as a whole' are currently operating at an acceptable LoS 'B' or better during the weekday morning, afternoon and Saturday peak hours. The critical movements at study area intersections are also operating at an acceptable LoS 'C' or better during the peak hours.

Queues along Eagleson Road at Fernbank Road range between 50 to 100 m in the northbound direction during the morning peak hour and 135 to 220 m in the southbound direction during the afternoon peak hour. During the Saturday peak hour queues range between 20 to 55 m in both directions. Queues along Eagleson Road at Cope Drive range between 25 to 90 m in both directions during the morning, afternoon, and Saturday peak hours.

Multi-Modal Level of Service – Existing Conditions

The MMLoS analysis for the two signalized intersections within the vicinity of the proposed site, Eagleson/Cope and Eagleson/Fernbank, is summarized in Table 15. The existing detailed MMLoS analysis is provided as Appendix K.

Table 15: MMLOS – Signalized Study Area Intersections

Intersection	Level of Service									
	Pedestrian (PLoS)		Bicycle (BLoS)		Transit (TLoS)		Truck (TkLoS)		Vehicle (LoS)	
	PLoS	Target	BLoS	Target	TkLoS	TkLoS	TkLoS	Target	LoS	Target
Eagleson/Cope	F	C	F	C	F	No target	C	D	C	D
Eagleson/Fernbank	E	C	F	C	F	No target	C	D	B	D

The letters identified in red text in Table 15 do not meet the MMLoS targets for their designated area (Arterial Main Street). Within the study area there are no plans for transit priority measures identified in the TMP, as such, there is no target TLoS for these intersections. At both intersections, the pedestrian and bicycle target levels of service are not met. The following discussion regarding these modes is provided:

- Eagleson/Cope:
  - Pedestrian – High pedestrian level of service is difficult to achieve (PLoS 'A' is impossible to achieve) at signalized intersections. At the Eagleson/Cope intersection, pedestrians cross 6 to 7 lanes of traffic across Eagleson Road. Without significant geometric and signal timing changes to this intersection, the pedestrian level of service cannot be improved, and as such, no mitigative measures to improve the PLoS at this intersection are recommended.

- Based on the PETSI scoring system and the delay scoring system, the PLoS will remain 'F' at intersection even with the implementation of fully-protected left-turn lanes, no-right-turn-on-red restrictions, smart channelized right-turn lanes and tighter corner radii. The PLoS could be improved if the number of lanes on Eagleson was reduced.

- Bicycles –Pocket bike lanes are provided along the north leg of the intersection only. Given the high speeds and multiple travel lanes along Eagleson Road, there are limited opportunities to improve the bicycle level of service at this location. The December 2017 traffic count data shows a total of 2 cyclists travelling through this intersection during the 8-hour count (0 cyclists in 8-hours in the August 2012 count). As shown on the Site Plan, a cross-ride is proposed crossing the eastbound channelized right-turn lane to connect to the proposed MUP.
  - To improve cycling level of service at this intersection, left-turn bike boxes or two-stage left-turn facility could be implemented as well as cycle lanes or cycle tracks along all four approaches.
  - The proponent is proposing to construct the cross-ride along the right-turn channel and the MUP along the south leg only.

- Eagleson/Fernbank:
  - At the Eagleson/Fernbank intersection, the Pedestrian Exposure to Traffic at Signalized Intersections (PETSI) score is PLoS 'C', which meets the City's target level of service. The delay score for pedestrians crossing Eagleson Road is PLoS 'E', which governs the overall intersection score. To improve the delay score, signal timing would have to be adjusted to provide more time to Fernbank Road. This is not recommended as it will increase delays and queues for vehicles (including trucks and buses) along Eagleson Road and the pedestrian demand crossing Eagleson Road at Fernbank is low (1 to 3 peds per hour).
  - Bicycles –Pocket bike lanes are provided along the north and west legs of the intersection only. Given the high speeds and multiple travel lanes along Eagleson Road, there are limited opportunities to improve the bicycle level of service at this location. The April 2017 traffic count data shows a total of 6 cyclists travelling through this intersection during the 8-hour count (4 cyclists in 8-hours in the June 2014 count).

4.9.2. TOTAL PROJECTED 2019 CONDITIONS – FULL-SITE BUILD OUT

The total projected 2019 traffic volumes were derived by superimposing the site-generated traffic volumes (Figures 6 and 7) onto projected 2019 background traffic volumes (Figure 8). The resulting total projected 2019 traffic volumes are illustrated in Figure 10.

The following Table 16 provides a summary of the total projected 2019 operations at the study area intersection based on the SYNCHRO (V10) traffic analysis software. The SYNCHRO model output of total projected conditions is provided within Appendix L.

Table 16: Total Projected 2019 Performance at Study Area Intersections

Intersection	Weekday PM Peak [SAT Peak]					
	Critical Movement			Intersection 'as a whole'		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
Eagleson/Fernbank	C[A]	0.72[0.48]	SBT[EBL]	12.3[9.0]	B[A]	0.66[0.44]
Eagleson/Cope/Cadence	D[C]	0.85[0.72]	EBL[EBL]	19.9[15.8]	A[A]	0.51[0.43]
Eagleson/Site (signalized)	A[A]	0.48[0.45]	NBT[NBT]	5.1[6.7]	A[A]	0.47[0.43]
Eagleson/Site (right-in/right-out)	A[A]	9.6[9.2]	EBR[EBR]	0.1[0.2]	-	-
Cope/First Air Driveway	B[B]	13.6[12.5]	NBL[NBL]	1.4[1.4]	-	-
Note: Analysis of signalized intersections assumes a PHF of 0.95 and a saturation flow rate of 1800 veh/h/lane.						

Similar to the existing conditions, the study area intersections 'as a whole' are project to operate at acceptable levels of service of LoS 'B' or better during the weekday afternoon and Saturday peak hours. The critical movements are also

projected to operate acceptably at LoS 'D' or better. Projected queues at study area intersections are summarized in Table 17.

Figure 10: Total Projected 2019 Traffic Volumes

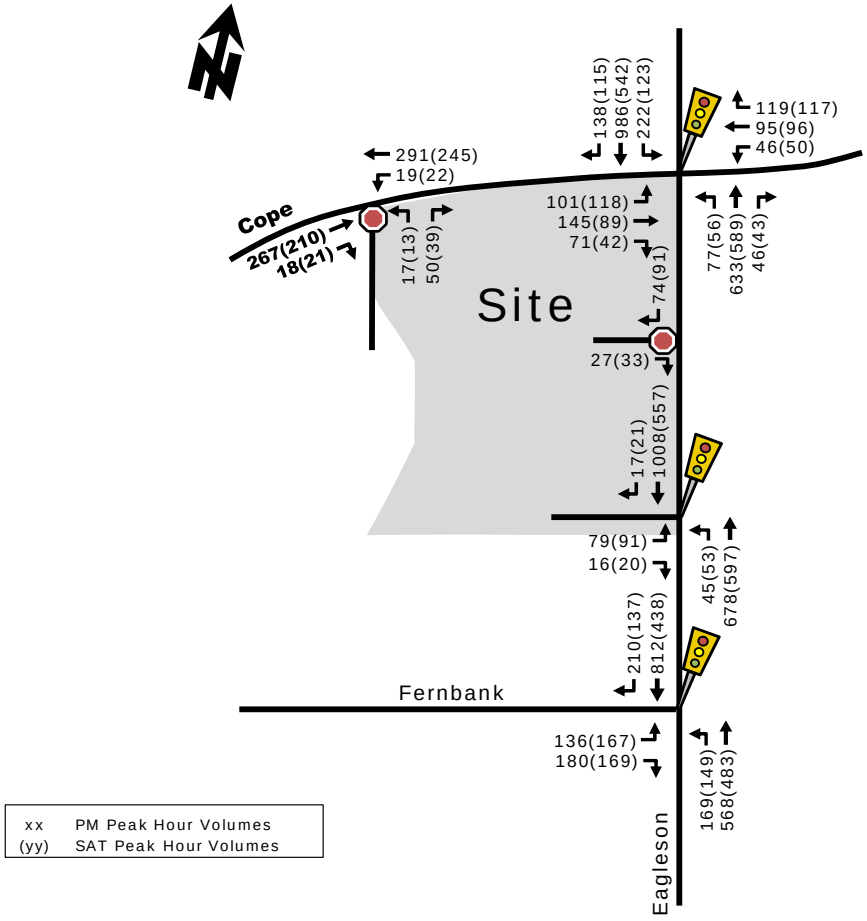


Table 17: Projected 2019 Queues at Study Area Intersections

Intersection	Northbound		Southbound		Eastbound Left-Turn		Westbound	
	95th Percentile Queue	Average Queue	95th Percentile Queue	Average Queue	95th Percentile Queue	Average Queue	95th Percentile Queue	Average Queue
Eagleson/Cope	105 m	60 m	45 m	30 m	#45 m	25 m	55 m	35 m
Eagleson/Site	90 m	30 m	10 m	5 m	30 m	20 m	-	-
Eagleson/Fernbank	65 m	35 m	240 m	140 m	50 m	30 m	-	-
Note: # symbol indicates the queue is operating above capacity and queues may not clear intersection during one signal cycle.								

As shown in Table 16, the projected average queues at the Eagleson/Cope and Eagleson/Site intersections range between 5m to 60m and 95th percentile queues range from 45m to 100m. At the Eagleson/Fernbank intersection, the southbound queues are projected to be approximately 140m on average during the afternoon peak hour and on occasion may extend back to the proposed development's signalized access, located approximately 240m away. When Eagleson Road is widened at this location, this queue is expected to be shorter.

The eastbound left-turn queue at the Eagleson/Cope intersection occasionally may not clear the intersection during one signal cycle. The 95th percentile queue is projected to extend approximately 50 to 60 m back from the intersection. This queue is not expected to block the site driveway (located approximately 120 m from the signal).

According to the SYNCHRO analysis, drivers turning left into the First Air/site driveway experience minimal delays (less than 1 second) on Cope Drive. In addition, Cope Drive at the site driveway is wide (approximately 14 m) and westbound through vehicles would likely have space to pass westbound left-turn vehicles to avoid delay. As such, queues along Cope Drive at the site driveway are not expected to be problematic.

With regard to the signalized site driveway, according to SYNCHRO analysis, if this driveway was unsignalized, the delays for vehicles turning left-out of the site would be over 1 minute (LoS 'F') during the afternoon peak hour. Based on the projected site driveway performance, signalization of the Eagleson/Site intersection is recommended. As mentioned in section 4.4.2, signalization at this location is not warranted based on projected traffic volumes generated by the proposed Site Plan, but is recommended based on the SYNCHRO results. The signalized intersection is projected to operate overall at an acceptable LoS 'A' during the afternoon and Saturday peak hours.

Previous transportation analysis for the proposed site access to Eagleson Road was completed in 2016 and is summarized in a Technical Memorandum, attached as Appendix M. The Tech Memo assessed the appropriate location and traffic control for the proposed driveway and it was determined that if the access was to be signalized, the appropriate location is at the southern boundary of the site. This is consistent with the proposed Site Plan (Figure 2).

Multi-Modal Level of Service – Projected Conditions

Given there are no significant proposed geometric changes to the Eagleson/Cope or Eagleson/Fernbank intersections for the 2019 conditions, the multi-model level of service for these intersections remains the same as existing conditions, outlined in Table 15.

4.9.3. TOTAL PROJECTED 2024 CONDITIONS – 5-YEARS BEYOND SITE BUILD-OUT

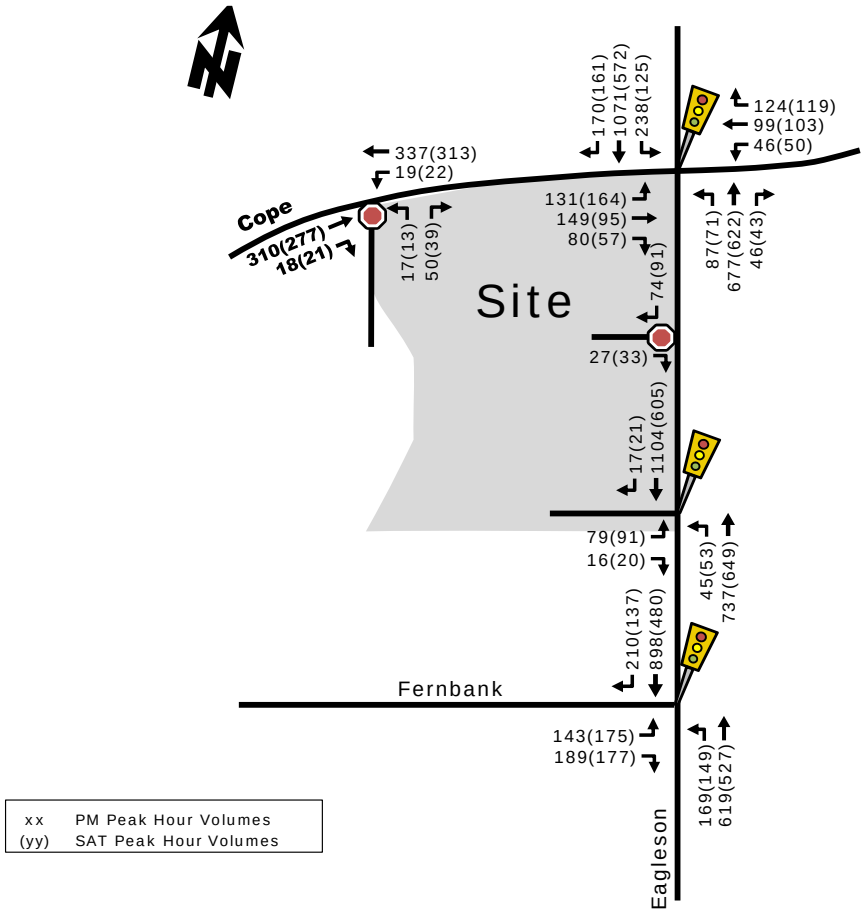
The total projected 2024 traffic volumes were derived by superimposing the site-generated traffic volumes (Figures 6 and 7) onto projected 2024 background traffic volumes (Figure 9), which include the Van Gaal Lands traffic projections. The resulting total projected 2024 traffic volumes are illustrated in Figure 11.

The following Table 18 provides a summary of the total projected 2024 operations at the study area intersection based on the SYNCHRO (V9) traffic analysis software. Given the widening of Eagleson Road is a Phase 2 City Project, it is expected to be completed by 2022. As such, the total projected 2024 conditions assumed a four-lane cross-section along Eagleson Road throughout the entire study area. The SYNCHRO model outputs of total projected 2024 conditions is provided within Appendix N.

Table 18: Total Projected 2024 Performance at Study Area Intersections

Intersection	Weekday PM Peak [SAT Peak]					
	Critical Movement			Intersection 'as a whole'		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
Eagleson/Fernbank	A[A]	0.60[0.50]	EBL[EBL]	7.7[8.0]	A[A]	0.44[0.29]
Eagleson/Cope/Cadence	D[D]	0.88[0.84]	EBL[EBL]	21.5[18.8]	A[A]	0.57[0.48]
Eagleson/Site (signalized)	A[A]	0.41[0.33]	SBT[EBL]	4.3[6.0]	A[A]	0.40[0.27]
Eagleson/Site (unsignalized)	A[A]	9.4[9.3]	EBR[EBR]	0.1[0.2]	-	-
Cope/First Air Driveway	B[B]	14.9[14.1]	NBL[NBL]	1.3[1.2]	-	-
Note: Analysis of signalized intersections assumes a PHF of 0.95 and a saturation flow rate of 1800 veh/h/lane.						

Figure 11: Total Projected 2024 Traffic Volumes



As shown in Table 18, all study area intersections are projected to operate acceptably during the weekday afternoon and Saturday peak hours. The queues along Eagleson Road are not projected to spill back into adjacent intersections.

Multi-Modal Level of Service – Projected Conditions

The MMLOS analysis for the Eagleson/Fernbank intersection assuming the widened four-lane cross-section is provided in Table 19. The analysis was completed using the Environmental Assessment drawing, included as Appendix N.

Table 19: MMLOS – Widened Fernbank/Eagleson Intersection

Intersection	Level of Service									
	Pedestrian (PLoS)		Bicycle (BLoS)		Transit (TLoS)		Truck (TkLoS)		Vehicle (LoS)	
	PLoS	Target	BLoS	Target	TkLoS	TkLoS	TkLoS	Target	LoS	Target
Eagleson/Fernbank	E	C	F	C	D	No target	C	D	A	D

As shown, the multi-modal levels of service for the widened Fernbank/Eagleson intersection are similar to the existing levels of service.

5. CONCLUSIONS

Based on the results summarized herein, the following transportation related conclusions are offered for each travel mode:

Pedestrians

- The transportation network surrounding the site includes sidewalks along both sides of Cope Drive and along the east side of Eagleson Road. As part of the proposed development, a MUP is planned along the west side of Eagleson Road, fronting the site;
- The existing MMLoS analysis at the signalized Eagleson/Cope and Eagleson/Fernbank intersections indicates that the pedestrian level of service at both intersections does not meeting the City's target level of service for the area. Given the wide crossings and long cycle lengths at study area intersections, the only mitigative measures that would improve the level of service for pedestrians is to reduce the number of lanes the pedestrians cross;
- The proposed signalized Eagleson/Site intersection does not meet the City's level of service targets for pedestrians, however it is close at PLoS 'D' (target is PLoS 'C'). Similar to the other study area intersections, the long cycle lengths and wide cross section results in lower scores for pedestrian level of service. It is noteworthy that all three legs of the proposed intersection meet the PETSI target PLoS 'C' and the delay score achieves the governing PLoS 'D';
- Eagleson Road, adjacent to the site, does not currently meet the target multi-modal levels of service for pedestrians. Cope Drive, adjacent to the site, does meet the target PLoS;
- The planned MUP and boulevard proposed adjacent to the site along Eagleson Road will improve the pedestrian level of service from PLoS 'F' to PLoS 'D';
- On-site crosswalks are provided at key intersections and sidewalks are provided throughout the site. A cross-walk connecting to the MUP south of the site is also provided as well as sidewalks to the study area roadways;

Cycling

- Bicycle lanes exist along Fernbank Road and along parts of Eagleson Road. A multi-use pathway (MUP) is provided south of the site;
- Eagleson Road is identified as a Spine Cycling Route, and as part of the road widening EA, cycle lanes were planned along both sides of the roadway, however there are currently no cycle lanes adjacent to the site;
- The existing MMLoS analysis at the signalized Eagleson/Cope and Eagleson/Fernbank intersections indicates that the cycling level of service at both intersections does not meeting the City's target level of service for the area;
- The proposed signalized Eagleson/Site intersection does not meet the City's level of service targets for cyclist, however, a bi-directional cross-ride is proposed crossing the west leg of the intersection to connect to the north and southbound MUP;
- At the Eagleson/Cope intersection, a cross-ride is proposed crossing the eastbound right-turn lane channel to connect to the proposed MUP;
- The proposed MUP along Eagleson Road, adjacent to the site, provides a north/south bi-directional cycling facility which meets the BLoS target for cycling. The target cycling level of service for Cope Drive is currently met;
- Bicycle parking is required and should be planned to meet the City's By-Law requirements;

Transit

- There are two new planned bus pads located adjacent to the site along Eagleson Road and along Cope Drive;
- There are no plans to provide transit priority along Eagleson Road in the City's Affordable Network, and as such, there are no transit level of service targets;

Vehicles

- The existing study area intersections are all currently operating at acceptable levels of service of LoS 'D' or better;
- The net increase in vehicle demand generated by the proposed development is approximately 230 and 275 veh/h during the weekday afternoon and Saturday peak hours, respectively;
- Based on the development within the area and historic traffic counts, a 1% per annum growth rate was applied to existing traffic volumes for the horizon years. In addition, the site-generated traffic volumes associated with the Van Gaal Lands were added to the existing traffic volumes for Horizon year 2024;
- Based on the forecasted traffic volumes for Horizon year 2019 and Horizon year 2024, the study area intersections are projected to operate with acceptable levels of service during the weekday afternoon and Saturday peak hours;

Site Plan

- Vehicle access is proposed via a signalized full-movement access to Eagleson Road, a right-in/right-out connection to Eagleson Road, and a full-movement connection to Cope Drive (via the First Air driveway);
    - An auxiliary southbound right-turn lane is recommended at the right-in/right-out connection to Eagleson Road;
    - There is an existing southbound acceleration lane at the Eagleson/Cope intersection which ends approximately 35 m north of the site driveway. It is recommended that the acceleration lane be removed from the Eagleson/Cope intersection by extending the curb at the intersection. By removing the acceleration lane, a potential weaving situation can be avoided and the southbound right-turn lane at the right-in/right-out access can be accommodated;
    - A 35 m northbound left-turn lane is warranted at the proposed Eagleson/Site access intersection;
    - The proposed full-movement driveway connection to Eagleson Road is located approximately 270 m south of the Eagleson/Cope intersection. Signalization is not warranted based on the total projected traffic volumes, but is appropriate based on the SYNCHRO analysis. As the signal is not warranted, the cost of construction and maintenance of the signalized intersection is understood to be the responsibility of the proponent (until such time the signal is warranted);
- A total of 246 surface parking spaces are proposed to serve the retail development. This amount of parking exceeds the City's minimum By-Law requirement and there is no maximum amount of parking for this site given its location. Based on the bicycle parking minimum rates, a minimum of 23 bicycle parking spaces should be provided for the retail development;
- An Roadway Modification Application will be required for the Site Plan Application. A functional drawing of the proposed signalized intersection and auxiliary turn lanes at site accesses is provided as Appendix I; and
- No monitoring plan is required.

Based on the foregoing, the proposed development is recommended from a transportation perspective.

Prepared By:

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Reviewed By:

Mark Baker, P.Eng.
Senior Transportation Project Manager

Appendix A

Traffic Count Data

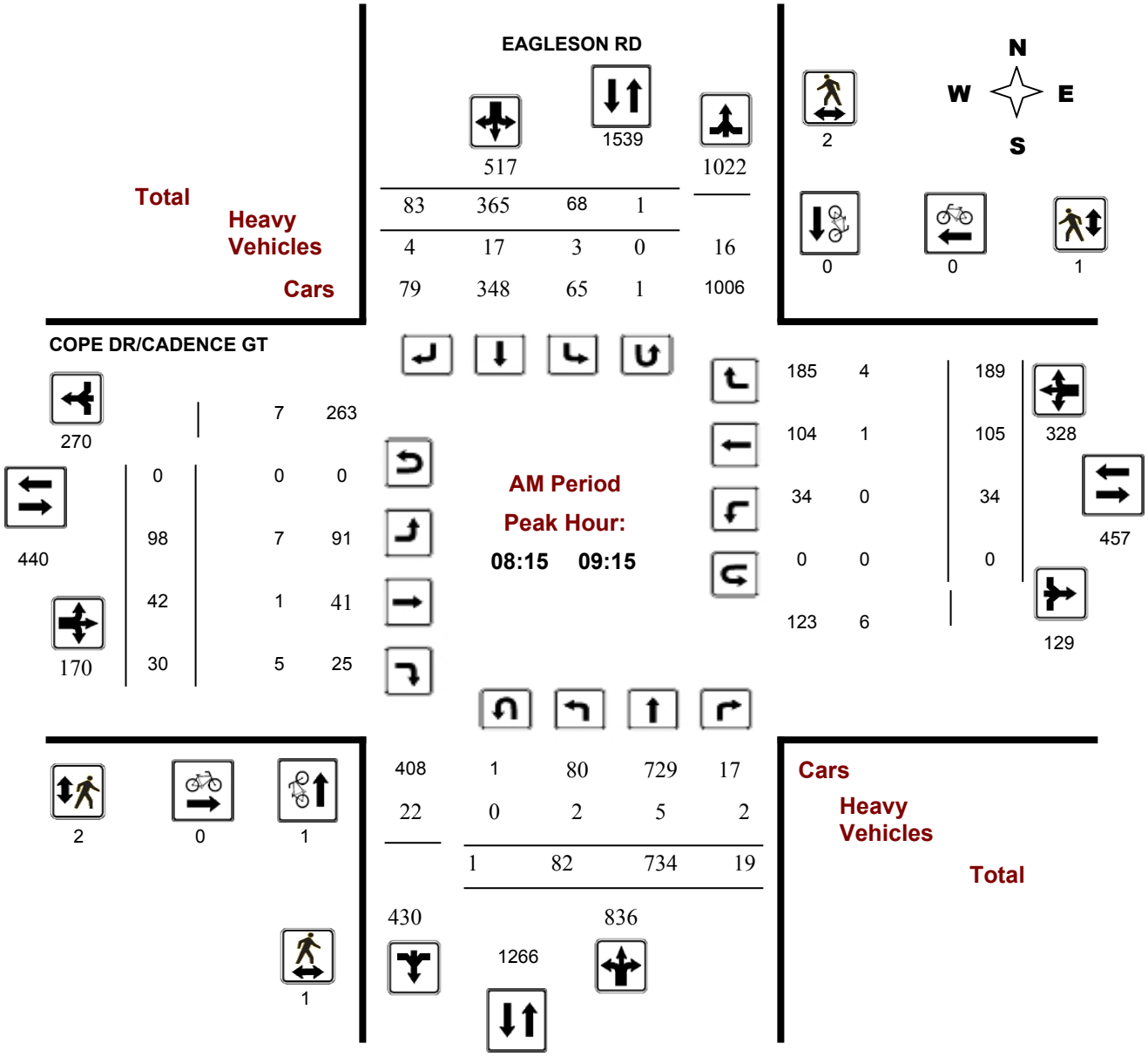
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

EAGLESON RD @ COPE DR/CADENCE GT

Survey Date: Thursday, December 21, 2017
Start Time: 07:00

WO No: 37390
Device: Miovision



Comments

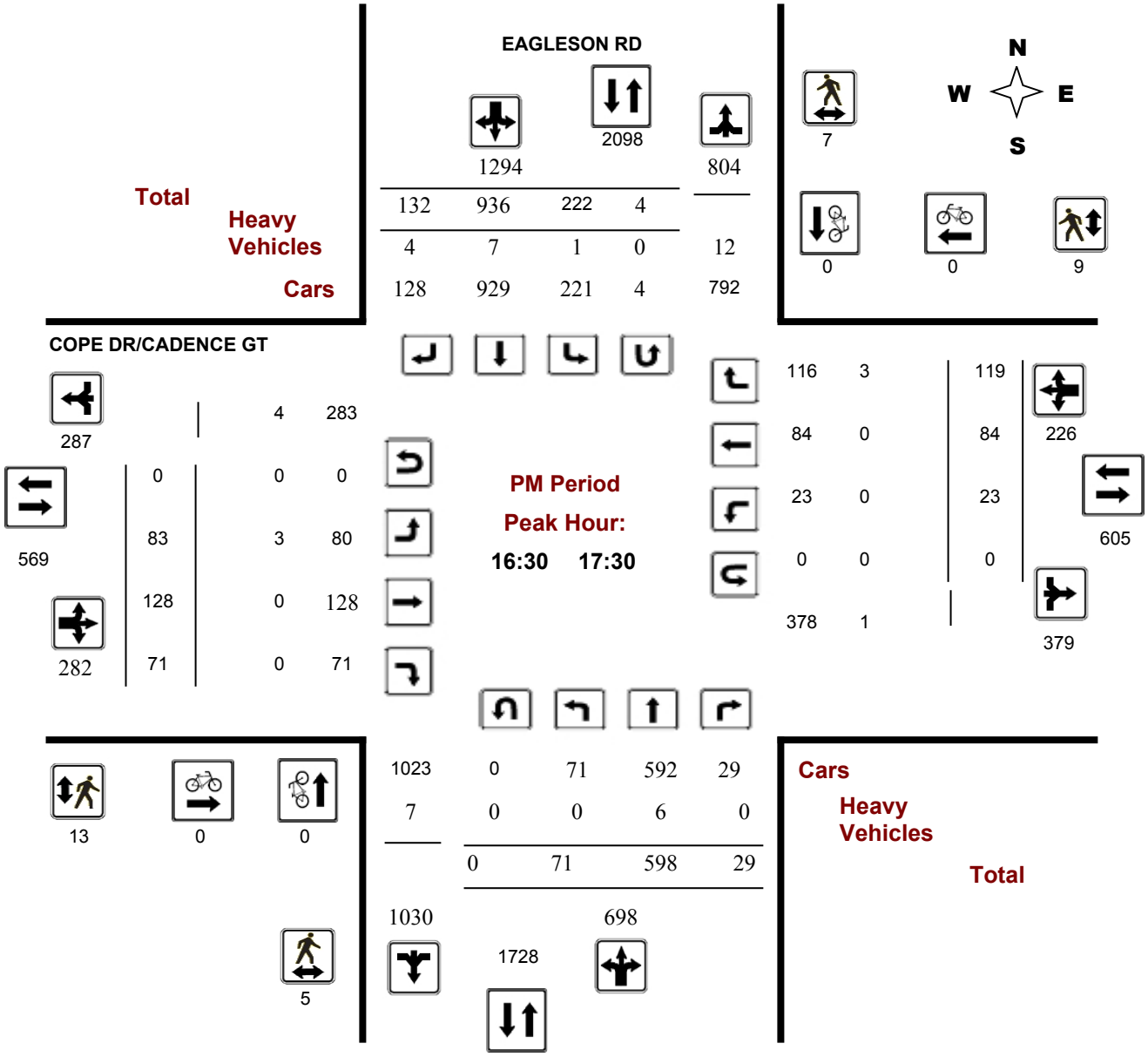
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

EAGLESON RD @ COPE DR/CADENCE GT

Survey Date: Thursday, December 21, 2017 **WO No:** 37390

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



Comments

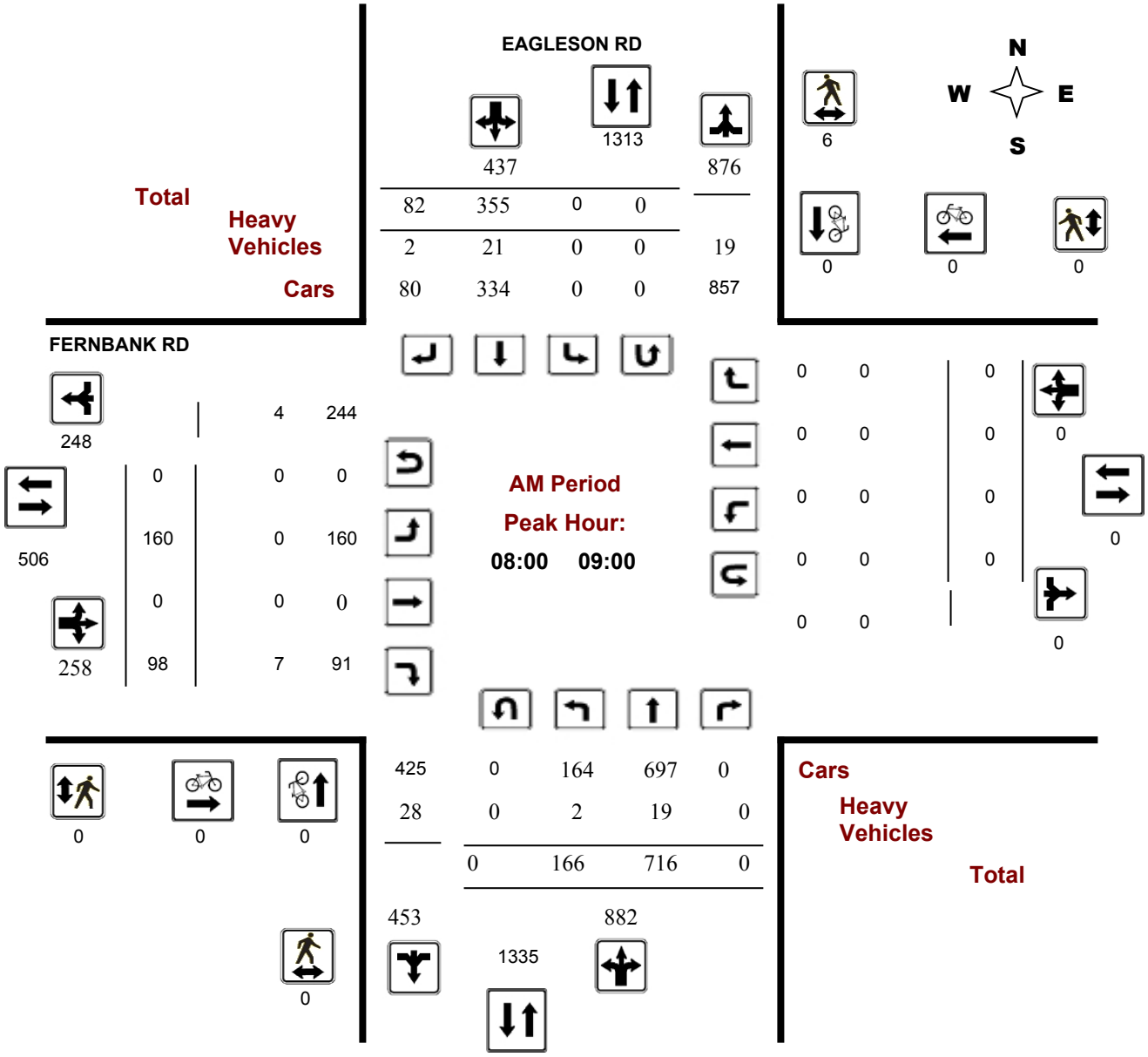
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

EAGLESON RD @ FERNBANK RD

Survey Date: Tuesday, April 11, 2017 **WO No:** 36906

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



Comments

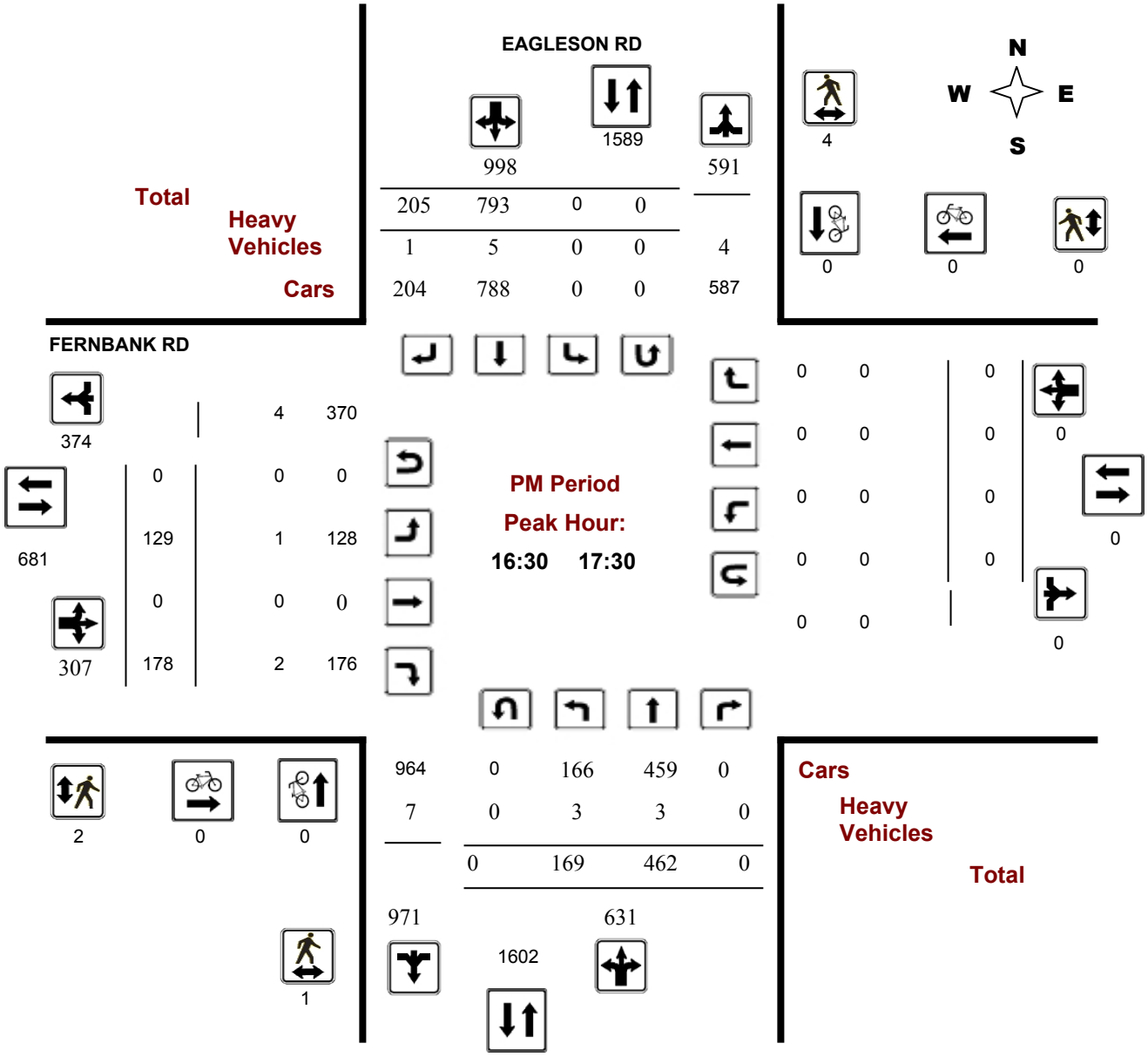
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

EAGLESON RD @ FERNBANK RD

Survey Date: Tuesday, April 11, 2017
Start Time: 07:00

WO No: 36906
Device: Miovision



Comments

Appendix B

Collision Data and Analysis

Total Area

Classification of Accident	Rear End	Turning Movement	Sideswipe	Angle	Approaching	Single Vehicle (other)	Single vehicle (Unattended vehicle)	Other	Total	
P.D. only	15	3	3	7	0	5	0	1	34	69%
Non-fatal injury	2	7	0	5	0	0	0	0	14	29%
Fatal injury	0	1	0	0	0	0	0	0	1	2%
Non reportable	0	0	0	0	0	0	0	0	0	0%
Total	**17**	**11**	**3**	**12**	**0**	**5**	**0**	**1**	**49**	100%
	#1 or 35%	#3 or 22%	#5 or 6%	#2 or 24%	#7 or 0%	#4 or 10%	#7 or 0%	#6 or 2%		

CADENCE GT/COPE DR

Years	Total # Collisions	24 Hr AADT Veh Volume	Days	Collisions/MEV
2013-2013	22	27,095	1825	**0.44**

Classification of Accident	Rear End	Turning Movement	Sideswipe	Angle	Approaching	Single Vehicle (other)	Single vehicle (Unattended vehicle)	Other	Total	
P.D. only	3	2	2	4	0	2	0	1	14	64%
Non-fatal injury	0	4	0	4	0	0	0	0	8	36%
Non reportable	0	0	0	0	0	0	0	0	0	0%
Total	**3**	**6**	**2**	**8**	**0**	**2**	**0**	**1**	**22**	100%
	14%	27%	9%	36%	0%	9%	0%	5%		

EAGLESON RD/FERNBANK

Years	Total # Collisions	24 Hr AADT Veh Volume	Days	Collisions/MEV
2013-2013	23	18,695	1825	**0.67**

Classification of Accident	Rear End	Turning Movement	Sideswipe	Angle	Approaching	Single Vehicle (other)	Single vehicle (Unattended vehicle)	Other	Total	
P.D. only	11	1	0	3	0	3	0	0	18	78%
Non-fatal injury	1	3	0	1	0	0	0	0	5	22%
Non reportable	0	0	0	0	0	0	0	0	0	0%
Total	**12**	**4**	**0**	**4**	**0**	**3**	**0**	**0**	**23**	100%
	52%	17%	0%	17%	0%	13%	0%	0%		

Collision Main Detail Summary

OnTRAC Reporting System

FROM: 2012-01-01 TO: 2014-01-01

CADENCE GT & COPE DR

Former Municipality: **Kanata** Traffic Control: **Traffic signal** Number of Collisions: **10**

	DATE	DAY	TIME	ENV	LIGHT	IMPACT TYPE	CLASS	DIR	SURFACE COND'N	VEHICLE MANOEUVRE	VEHICLE TYPE	FIRST EVENT	No. PED
1	2012-01-18	We	07:35	Clear	Dawn	Other	P.D. only	V1 E	Ice	Reversing	Snow plow	Other motor vehicle	0
								V2 W	Ice	Turning left	Automobile, station	Other motor vehicle	
2	2012-06-01	Fri	21:17	Rain	Dark	Angle	P.D. only	V1 N	Wet	Going ahead	Automobile, station	Other motor vehicle	0
								V2 E	Wet	Going ahead	Automobile, station	Other motor vehicle	
3	2012-06-08	Fri	21:12	Clear	Dusk	Turning	P.D. only	V1 S	Dry	Turning left	Automobile, station	Other motor vehicle	0
								V2 N	Dry	Going ahead	Pick-up truck	Other motor vehicle	
4	2012-10-14	Sun	18:30	Clear	Dark	Rear end	P.D. only	V1 N	Wet	Slowing or	Automobile, station	Other motor vehicle	0
								V2 N	Wet	Slowing or	Automobile, station	Other motor vehicle	
								V3 N	Wet	Slowing or	Automobile, station	Other motor vehicle	
5	2012-12-10	Mo	06:24	Freezin	Dark	Angle	P.D. only	V1 S	Ice	Slowing or	Pick-up truck	Other motor vehicle	0
								V2 W	Slush	Going ahead	Pick-up truck	Other motor vehicle	
6	2013-05-12	Sun	16:45	Rain	Daylight	Angle	P.D. only	V1 E	Wet	Turning right	Automobile, station	Other motor vehicle	0
								V2 S	Wet	Unknown	Automobile, station	Other motor vehicle	
7	2013-08-07	We	17:00	Rain	Daylight	Rear end	P.D. only	V1 S	Wet	Going ahead	Passenger van	Other motor vehicle	0
								V2 S	Wet	Going ahead	Pick-up truck	Other motor vehicle	
8	2013-09-06	Fri	03:35	Clear	Dark	Single vehicle	P.D. only	V1 S	Dry	Turning right	Automobile, station	Ran off road	0
9	2013-09-22	Sun	19:03	Clear	Daylight	Angle	Non-fatal	V1 S	Dry	Going ahead	Automobile, station	Other motor vehicle	0
								V2 W	Dry	Going ahead	Passenger van	Other motor vehicle	
10	2013-10-11	Fri	01:06	Clear	Dark	Single vehicle	P.D. only	V1 S	Dry	Turning left	Automobile, station	Curb	0

EAGLESON RD, CADENCE GT to FERNBANK RD

Former Municipality: **Kanata** Traffic Control: **No control** Number of Collisions: **3**

	DATE	DAY	TIME	ENV	LIGHT	IMPACT TYPE	CLASS	DIR	SURFACE COND'N	VEHICLE MANOEUVRE	VEHICLE TYPE	FIRST EVENT	No. PED

(Note: Time of Day = "00:00" represents unknown collision time

11	2012-06-18	Mo	16:20	Clear	Daylight	Rear end	P.D. only	V1	S	Dry	Going ahead	Automobile, station	Other motor vehicle	0
								V2	S	Dry	Stopped	Automobile, station	Other motor vehicle	
								V3	S	Dry	Stopped	Passenger van	Other motor vehicle	
12	2012-09-14	Fri	16:25	Rain	Daylight	Rear end	Non-fatal	V1	S	Wet	Going ahead	Automobile, station	Other motor vehicle	0
								V2	S	Wet	Going ahead	Automobile, station	Other motor vehicle	
								V3	S	Wet	Going ahead	Pick-up truck	Other motor vehicle	
13	2013-02-24	Sun	17:52	Clear	Dark	Sideswipe	P.D. only	V1	S	Wet	Changing lanes	Unknown	Other motor vehicle	0
								V2	S	Wet	Going ahead	Automobile, station	Other motor vehicle	

EAGLESON RD & FERNBANK RD

Former Municipality: **Kanata** Traffic Control: **Traffic signal** Number of Collisions: **10**

	DATE	DAY	TIME	ENV	LIGHT	IMPACT TYPE	CLASS	DIR		SURFACE COND'N	VEHICLE MANOEUVRE	VEHICLE TYPE	FIRST EVENT	No. PED
14	2012-02-25	Sat	14:11	Drifting	Daylight	Rear end	P.D. only	V1	S	Wet	Slowing or	Passenger van	Other motor vehicle	0
								V2	S	Wet	Slowing or	Passenger van	Other motor vehicle	
15	2012-06-25	Mo	15:35	Rain	Daylight	Rear end	P.D. only	V1	S	Wet	Going ahead	Automobile, station	Other motor vehicle	0
								V2	S	Wet	Slowing or	Automobile, station	Other motor vehicle	
								V3	S	Wet	Stopped	Pick-up truck	Other motor vehicle	
16	2012-07-13	Fri	12:51	Clear	Daylight	Single vehicle	P.D. only	V1	N	Dry	Going ahead	Truck - closed	Pole (utility, tower)	0
17	2012-10-23	Tue	16:53	Clear	Daylight	Turning	Non-fatal	V1	N	Dry	Turning left	Pick-up truck	Other motor vehicle	0
								V2	S	Dry	Going ahead	Automobile, station	Other motor vehicle	
18	2013-01-05	Sat	18:28	Clear	Dark	Single vehicle	P.D. only	V1	E	Dry	Going ahead	Passenger van	Ran off road	0
19	2013-03-13	We	15:48	Clear	Daylight	Angle	P.D. only	V1	E	Dry	Turning right	Pick-up truck	Other motor vehicle	0
								V2	S	Dry	Going ahead	Automobile, station	Other motor vehicle	
								V3	N	Dry	Turning left	Pick-up truck	Other motor vehicle	
20	2013-06-16	Sun	14:30	Rain	Daylight	Rear end	P.D. only	V1	E	Wet	Slowing or	Pick-up truck	Other motor vehicle	0
								V2	E	Wet	Turning right	Passenger van	Other motor vehicle	
21	2013-07-06	Sat	12:33	Clear	Daylight	Turning	Non-fatal	V1	N	Dry	Turning left	Pick-up truck	Other motor vehicle	0
								V2	S	Dry	Going ahead	Automobile, station	Other motor vehicle	
22	2013-08-26	Mo	19:39	Clear	Dusk	Rear end	P.D. only	V1	S	Wet	Going ahead	Automobile, station	Other motor vehicle	0
								V2	S	Wet	Stopped	Automobile, station	Other motor vehicle	

(Note: Time of Day = "00:00" represents unknown collision time

23		2013-12-18	We	17:18	Clear	Dark	Rear end	P.D. only	V1	S	Wet	Going ahead	Automobile, station	Other motor vehicle		0
									V2	S	Wet	Slowing or	Automobile, station	Other motor vehicle		

(Note: Time of Day = "00:00" represents unknown collision time

City Operations - Transportation Services

Collision Details Report - Public Version

From: January 1, 2014 **To:** December 31, 2016

Location: EAGLESON RD @ COPE DR/CADENCE GT

Traffic Control: Traffic signal

Total Collisions: 12

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2014-Feb-07, Fri,20:45	Clear	Turning movement	Non-fatal injury	Dry	North	Turning left	Automobile, station wagon	Other motor vehicle	
					South	Going ahead	Automobile, station wagon	Other motor vehicle	
2014-Jan-10, Fri,09:23	Snow	Angle	P.D. only	Slush	South	Turning right	Automobile, station wagon	Other motor vehicle	
					East	Stopped	Pick-up truck	Other motor vehicle	
					East	Stopped	Automobile, station wagon	Other motor vehicle	
2014-Jun-22, Sun,09:30	Clear	Rear end	P.D. only	Dry	West	Turning right	Pick-up truck	Other motor vehicle	
					West	Turning right	Passenger van	Other motor vehicle	
2014-Jun-17, Tue,14:59	Clear	Angle	Non-fatal injury	Dry	North	Going ahead	Pick-up truck	Other motor vehicle	
					West	Turning left	Pick-up truck	Other motor vehicle	
2014-Jul-24, Thu,14:50	Clear	Sideswipe	P.D. only	Dry	South	Unknown	Unknown	Other motor vehicle	
					South	Stopped	Pick-up truck	Other motor vehicle	

2014-Jun-16, Mon,10:03	Clear	Angle	Non-fatal injury	Dry	West	Turning right	Automobile, station wagon	Other motor vehicle
					North	Going ahead	Pick-up truck	Other motor vehicle
2014-Aug-12, Tue,20:41	Rain	Turning movement	P.D. only	Wet	South	Turning left	Automobile, station wagon	Other motor vehicle
					North	Going ahead	Automobile, station wagon	Other motor vehicle
2014-Feb-10, Mon,09:23	Clear	Turning movement	Non-fatal injury	Wet	South	Turning left	Automobile, station wagon	Other motor vehicle
					North	Going ahead	Pick-up truck	Other motor vehicle
2015-Jun-17, Wed,10:02	Clear	Sideswipe	P.D. only	Dry	West	Changing lanes	Pick-up truck	Other motor vehicle
					West	Going ahead	Automobile, station wagon	Other motor vehicle
2016-Mar-12, Sat,19:11	Clear	Turning movement	Non-fatal injury	Dry	North	Turning left	Automobile, station wagon	Other motor vehicle
					South	Going ahead	Automobile, station wagon	Other motor vehicle
2015-Nov-06, Fri,19:38	Clear	Turning movement	Non-fatal injury	Dry	North	Turning left	Pick-up truck	Other motor vehicle
					South	Going ahead	Automobile, station wagon	Other motor vehicle
2016-Jun-29, Wed,08:32	Clear	Angle	Non-fatal injury	Dry	North	Going ahead	Pick-up truck	Other motor vehicle
					West	Turning left	Automobile, station wagon	Other motor vehicle

City Operations - Transportation Services

Collision Details Report - Public Version

From: January 1, 2014 **To:** December 31, 2016

Location: EAGLESON RD @ FERNBANK RD

Traffic Control: Traffic signal **Total Collisions:** 14

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2014-Jan-24, Fri,17:15	Clear	Rear end	P.D. only	Ice	South	Slowing or stopping	Pick-up truck	Other motor vehicle	
					South	Stopped	Passenger van	Other motor vehicle	
					South	Stopped	Automobile, station wagon	Other motor vehicle	
2014-Jan-25, Sat,09:43	Drifting Snow	Angle	Non-fatal injury	Loose snow	South	Going ahead	Automobile, station wagon	Other motor vehicle	
					East	Turning left	Automobile, station wagon	Other motor vehicle	
2014-Apr-01, Tue,07:44	Clear	Rear end	P.D. only	Wet	North	Slowing or stopping	Automobile, station wagon	Other motor vehicle	
					North	Stopped	Truck - open	Other motor vehicle	
2014-Jul-07, Mon,07:24	Rain	Turning movement	P.D. only	Wet	North	Turning left	Automobile, station wagon	Other motor vehicle	
					South	Going ahead	Automobile, station wagon	Other motor vehicle	
2014-Jul-16, Wed,02:25	Clear	SMV other	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Ran off road	
2014-Jul-21, Mon,15:15	Clear	Rear end	P.D. only	Dry	North	Slowing or stopping	Automobile, station wagon	Other motor vehicle	

					North	Stopped	Automobile, station wagon	Other motor vehicle
					North	Stopped	Automobile, station wagon	Other motor vehicle
					North	Stopped	Pick-up truck	Other motor vehicle
2015-Jan-14, Wed,17:24	Clear	Turning movement	Non-fatal injury	Dry	North	Turning left	Automobile, station wagon	Other motor vehicle
					South	Going ahead	Automobile, station wagon	Other motor vehicle
2015-Feb-14, Sat,11:04	Snow	Rear end	P.D. only	Slush	East	Turning left	Automobile, station wagon	Other motor vehicle
					East	Turning left	Passenger van	Other motor vehicle
2015-Feb-14, Sat,13:40	Clear	Angle	P.D. only	Wet	South	Turning right	Snow plow	Other motor vehicle
					East	Stopped	Automobile, station wagon	Other motor vehicle
2015-Jun-24, Wed,11:32	Clear	Rear end	Non-fatal injury	Dry	North	Going ahead	Automobile, station wagon	Other motor vehicle
					North	Stopped	Pick-up truck	Other motor vehicle
2015-Nov-20, Fri,16:53	Clear	Rear end	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle
					East	Stopped	Pick-up truck	Other motor vehicle
2016-Feb-19, Fri,10:21	Snow	Angle	P.D. only	Loose snow	East	Turning right	Automobile, station wagon	Other motor vehicle
					South	Going ahead	Automobile, station wagon	Other motor vehicle

2016-Jul-30, Sat,14:41	Clear	Rear end	P.D. only	Dry	West	Going ahead	Automobile, station wagon	Other motor vehicle
					West	Stopped	Pick-up truck	Other motor vehicle
2016-Oct-30, Sun,17:35	Clear	Turning movement	Fatal injury	Dry	North	Turning left	Automobile, station wagon	Other motor vehicle
					South	Going ahead	Motorcycle	Other motor vehicle

City Operations - Transportation Services

Collision Details Report - Public Version

From: January 1, 2014 **To:** December 31, 2016

Location: EAGLESON RD btwn COPE DR & Continuation of EAGLESON RD

Traffic Control: No control **Total Collisions:** 3

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2014-Dec-28, Sun,12:11	Clear	SMV other	P.D. only	Dry	North	Going ahead	Pick-up truck	Pole (sign, parking meter)	
2016-Jan-12, Tue,17:32	Snow	Rear end	Non-fatal injury	Loose snow	South	Slowing or stopping	Pick-up truck	Other motor vehicle	
					South	Stopped	Automobile, station wagon	Other motor vehicle	
					South	Stopped	Automobile, station wagon	Other motor vehicle	
2016-Feb-18, Thu,17:17	Clear	Rear end	P.D. only	Ice	South	Slowing or stopping	Automobile, station wagon	Other motor vehicle	
					South	Stopped	Automobile, station wagon	Other motor vehicle	

City Operations - Transportation Services

Collision Details Report - Public Version

From: January 1, 2014 **To:** December 31, 2016

Location: EAGLESON RD btwn Continuation of EAGLESON RD & FERNBANK RD

Traffic Control: No control **Total Collisions:** 1

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2014-Jan-15, Wed,05:50	Clear	SMV other	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Curb	

Appendix C

Traffic Growth Analysis

Eagleson / Fernbank
8 hrs

Year	Date	North Leg		South Leg		East Leg		West Leg		Total
		SB	NB	NB	SB	WB	EB	EB	WB	
2010	Monday May 17	4540	4502	4110	4375			2139	1914	21580
2014	Friday June 27	4081	3910	4092	4398			1577	1442	19500
2017	Tuesday April 11	4584	4865	4840	4559			1984	1984	22816

North Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2010	4502	4540	9042	21580				
2014	3910	4081	7991	19500	-13.1%	-10.1%	-11.6%	-9.6%
2017	4865	4584	9449	22816	24.4%	12.3%	18.2%	17.0%

Regression Estimate	2010	4275	4403	8678
Regression Estimate	2017	4563	4401	8963
Average Annual Change		**0.93%**	**-0.01%**	**0.46%**

West Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2010	2139	1914	4053	21580				
2014	1577	1442	3019	19500	-26.3%	-24.7%	-25.5%	-9.6%
2017	1984	1984	3968	22816	25.8%	37.6%	31.4%	17.0%

Regression Estimate	2010	2005	1769	3773
Regression Estimate	2017	1805	1790	3595
Average Annual Change		**-1.49%**	**0.17%**	**-0.69%**

East Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2010				21580				
2014				19500				-9.6%
2017				22816				17.0%

Regression Estimate	2010			
Regression Estimate	2017			
Average Annual Change				

South Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2010	4110	4375	8485	21580				
2014	4092	4398	8490	19500	-0.4%	0.5%	0.1%	-9.6%
2017	4840	4559	9399	22816	18.3%	3.7%	10.7%	17.0%

Regression Estimate	2010	3987	4352	8338
Regression Estimate	2017	4675	4528	9203
Average Annual Change		**2.30%**	**0.57%**	**1.42%**

Eagleson / Fernbank
AM Peak

Year	Date	North Leg		South Leg		East Leg		West Leg		Total
		SB	NB	NB	SB	WB	EB	EB	WB	
2010	Monday May 17	361	908	794	366			380	261	3070
2014	Friday June 27	334	619	628	344			158	157	2240
2017	Tuesday April 11	437	876	882	453			258	248	3154

North Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2010	908	361	1269	3070				
2014	619	334	953	2240	-31.8%	-7.5%	-24.9%	-27.0%
2017	876	437	1313	3154	41.5%	30.8%	37.8%	40.8%

Regression Estimate	2010	831	341	1172
Regression Estimate	2017	774	410	1184
Average Annual Change		**-1.02%**	**2.68%**	**0.14%**

West Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2010	380	261	641	3070				
2014	158	157	315	2240	-58.4%	-39.8%	-50.9%	-27.0%
2017	258	248	506	3154	63.3%	58.0%	60.6%	40.8%

Regression Estimate	2010	337	234	570
Regression Estimate	2017	200	211	412
Average Annual Change		**-7.15%**	**-1.41%**	**-4.55%**

East Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2010				3070				
2014				2240				-27.0%
2017				3154				40.8%

Regression Estimate	2010			
Regression Estimate	2017			
Average Annual Change				

South Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2010	794	366	1160	3070				
2014	628	344	972	2240	-20.9%	-6.0%	-16.2%	-27.0%
2017	882	453	1335	3154	40.4%	31.7%	37.3%	40.8%

Regression Estimate	2010	733	346	1078
Regression Estimate	2017	800	426	1226
Average Annual Change		**1.27%**	**3.03%**	**1.85%**

Eagleson / Fernbank
PM Peak

Year	Date	North Leg		South Leg		East Leg		West Leg		Total
		SB	NB	NB	SB	WB	EB	EB	WB	
2010	Monday May 17	1010	532	563	955			283	369	3712
2014	Friday June 27	915	544	618	1065			317	241	3700
2017	Tuesday April 11	998	591	631	971			307	374	3872

North Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2010	532	1010	1542	3712				
2014	544	915	1459	3700	2.3%	-9.4%	-5.4%	-0.3%
2017	591	998	1589	3872	8.6%	9.1%	8.9%	4.6%

Regression Estimate	2010	526	985	1511
Regression Estimate	2017	583	965	1547
Average Annual Change		**1.48%**	**-0.30%**	**0.34%**

West Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2010	283	369	652	3712				
2014	317	241	558	3700	12.0%	-34.7%	-14.4%	-0.3%
2017	307	374	681	3872	-3.2%	55.2%	22.0%	4.6%

Regression Estimate	2010	289	332	621
Regression Estimate	2017	315	324	639
Average Annual Change		**1.24%**	**-0.32%**	**0.42%**

East Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2010				3712				
2014				3700				-0.3%
2017				3872				4.6%

Regression Estimate	2010			
Regression Estimate	2017			
Average Annual Change				

South Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2010	563	955	1518	3712				
2014	618	1065	1683	3700	9.8%	11.5%	10.9%	-0.3%
2017	631	971	1602	3872	2.1%	-8.8%	-4.8%	4.6%

Regression Estimate	2010	568	984	1551
Regression Estimate	2017	637	1009	1646
Average Annual Change		**1.66%**	**0.37%**	**0.85%**

Appendix D

Truck Turning Templates

EAGLESON ROAD

EAGLESON ROAD

EAGLESON ROAD

COPE DR

STM SWALE

Appendix E

Existing MMLoS Road Segment Analysis

Multi-Modal Level of Service - Segments Form

Consultant	PARSONS	**Project**	10 Cope
Scenario	Existing	**Date**	Mar-18
Comments			

SEGMENTS		Street A	Eagleson West	Eagleson East	Cope South	Cope North	Section 5	Section 6	Section 7	Section 8	Section 9
Pedestrian	Sidewalk Width Boulevard Width		no sidewalk n/a	≥ 2 m < 0.5	≥ 2 m 0.5 - 2 m	≥ 2 m 0.5 - 2 m					
	Avg Daily Curb Lane Traffic Volume		> 3000	> 3000	> 3000	> 3000					
	Operating Speed On-Street Parking		> 60 km/h no	> 60 km/h no	> 30 to 50 km/h no	> 30 to 50 km/h no					
	Exposure to Traffic PLoS	-	F	F	C	C	-	-	-	-	-
	Effective Sidewalk Width										
	Pedestrian Volume										
	Crowding PLoS		-	-	-	-	-	-	-	-	-
	Level of Service		-	-	-	-	-	-	-	-	-
Bicycle	Type of Cycling Facility		Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic					
	Number of Travel Lanes		4-5 lanes total	4-5 lanes total	≤ 2 (no centreline)	≤ 2 (no centreline)					
	Operating Speed		≥ 60 km/h	≥ 60 km/h	>40 to <50 km/h	>40 to <50 km/h					
	# of Lanes & Operating Speed LoS		F	F	B	B	-	-	-	-	-
	Bike Lane (+ Parking Lane) Width										
	Bike Lane Width LoS	-	-	-	-	-	-	-	-	-	-
	Bike Lane Blockages										
	Blockage LoS		-	-	-	-	-	-	-	-	-
	Median Refuge Width (no median = < 1.8 m)										
	No. of Lanes at Unsignalized Crossing										
	Sidestreet Operating Speed										
	Unsignalized Crossing - Lowest LoS		-	-	-	-	-	-	-	-	-
	Level of Service		-	-	-	-	-	-	-	-	-
Transit	Facility Type	D	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic					
	Friction or Ratio Transit:Posted Speed		Vt/Vp ≥ 0.8	Vt/Vp ≥ 0.8	Vt/Vp ≥ 0.8	Vt/Vp ≥ 0.8					
	Level of Service		D	D	D	D	-	-	-	-	-
Truck	Truck Lane Width	B	> 3.7 m	> 3.7 m	> 3.7 m	> 3.7 m					
	Travel Lanes per Direction		> 1	> 1	1	1					
	Level of Service		A	A	B	B	-	-	-	-	-

Appendix F

Signal Warrant Analysis

Eagleson / Site - (peak hour signal warrant)

Signal Warrant		Description		Minimum Requirement for Two Lane Roadways	Compliance		
				Free Flow - Operating Speed Greater Than or Equal to 70 km/h	Sectional %	Entire %	Warrant
Intersection	1. Minimum Vehicular Volume	(1) A	Vehicle Volume, All Approaches for Each of the Heaviest 8 Hours of on Average Day, and	600	132%	17%	**52% No**
		(4) B	Vehicle Volume, Along Minor Streets for Each of the Same 8 Hours	180	17%		
	2. Delay to Cross Traffic	(1) A	Vehicle Volume, Along Major Street for Each of the Heaviest 8 Hours of an Average Day, and	600	127%	52%	
		(2) B	Combined Vehicle and Pedestrian Volume Crossing the Major Street for Each of the Same 8 Hours	50	52%		

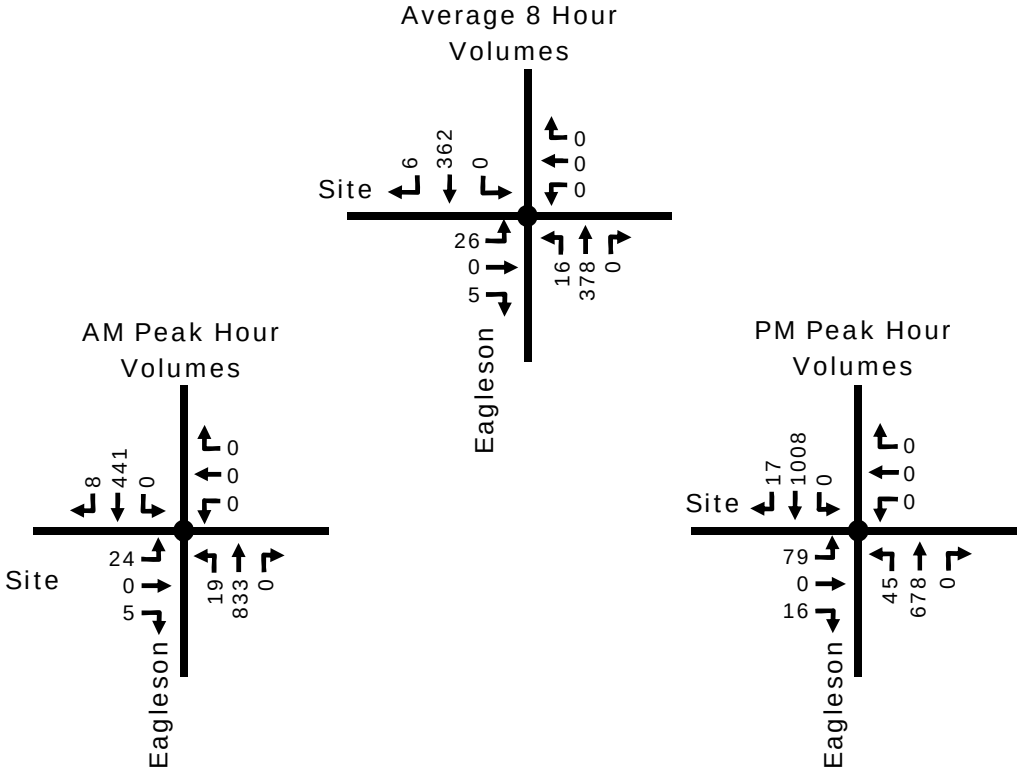
Notes

1 *Vehicle Volume Warrants (1A), (2A) and (5B) for Roadways Having Two or More Moving Lanes in one Direction Should Be 25% Higher Than Values Given Above* **Yes**

2 *For Definition of Crossing Volume Refer to Note 4 on the Signal Warrant Analysis Form B2.03.08*

3 *The Lowest Sectional Percentage Governs the Entire Warrant*

4 *For "T" Intersections the Warrant Values for Minor Street Should be Increased by 50% (Warrant 1B only)* **Yes**

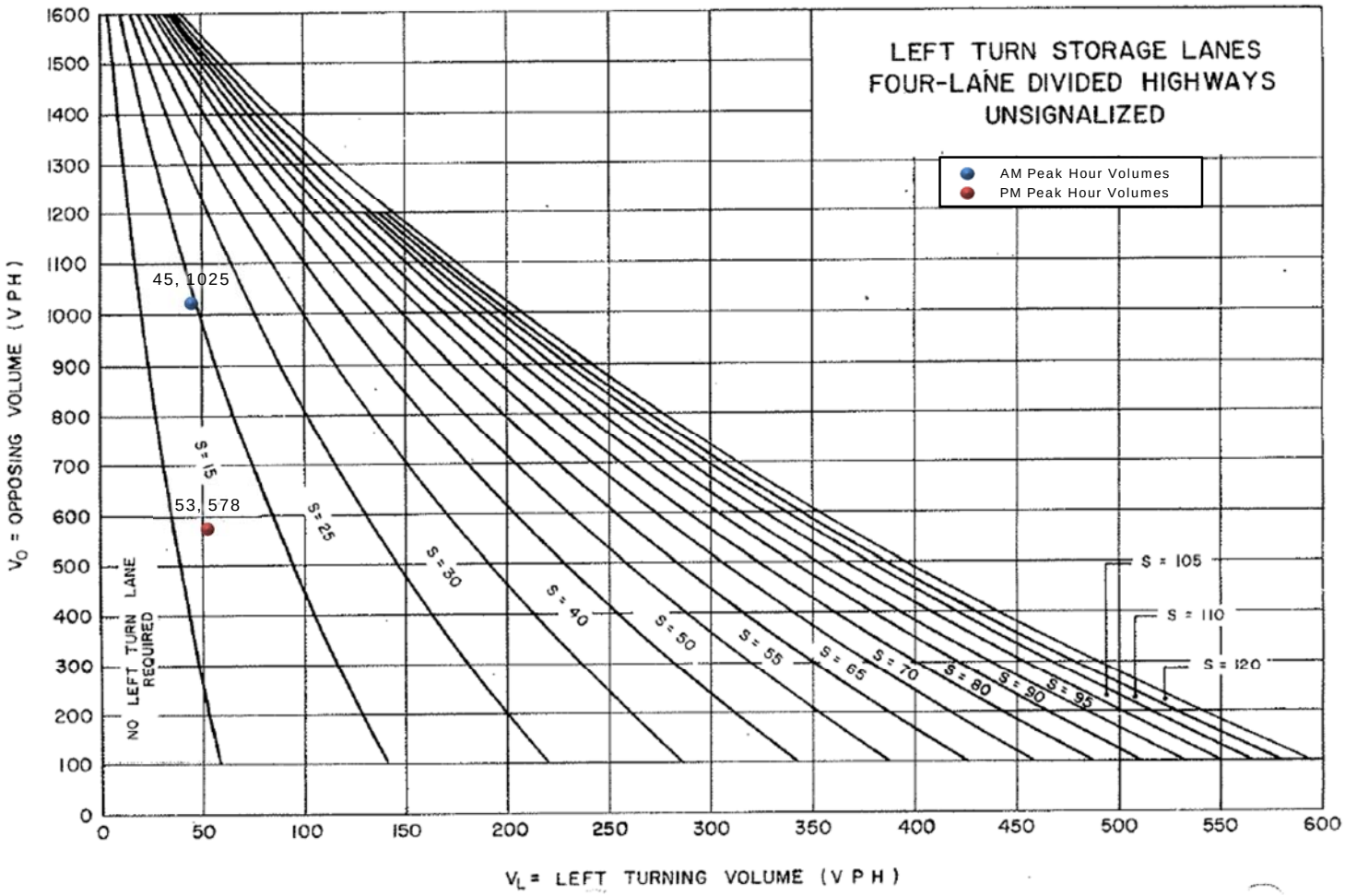


Appendix G

Left-turn Lane Warrant Analysis

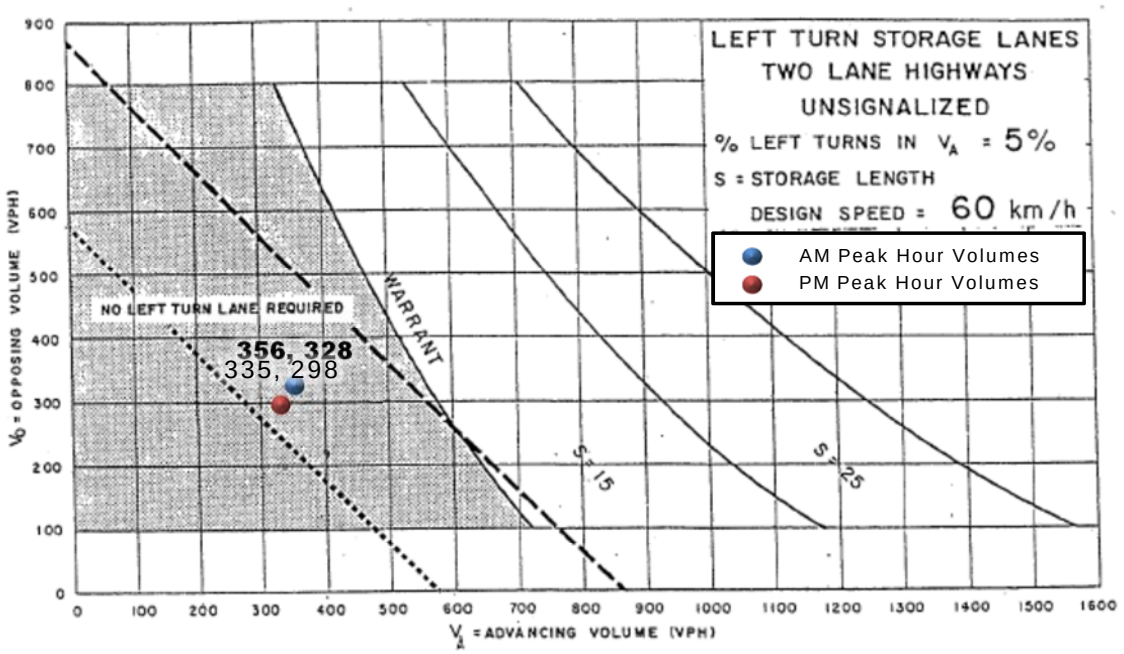
	Design Speed	Advancing Traffic Volume (V_A)		Opposing Traffic Volume (V_O)		Left Turn Traffic Volume (V_L)		% of Left Turning Traffic		Warrant Left Turn Lane
		AM	PM	AM	PM	AM	PM	AM	PM	
Existing										
Eagleson/Site	70	723	650	1025	578	45	53	6%	8%	Yes

Peak	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
	Warrant?											
AM	45	678	0	0	1008	17	79	0	16	0	0	0
PM	53	597	0	0	557	21	91	0	20	0	0	0



	Design Speed	Advancing Traffic Volume (V_A)		Opposing Traffic Volume (V_O)		Left Turn Traffic Volume (V_L)		% of Left Turning Traffic		Warrant Left Turn Lane
		AM	PM	AM	PM	AM	PM	AM	PM	
Existing										
Cope/Site	60	356	335	328	298	19	22	5%	7%	No

Peak	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
										Warrant?		
AM	17	0	50	0	0	0	0	310	18	19	337	0
PM	13	0	39	0	0	0	0	277	21	22	313	0



TRAFFIC SIGNALS MAY BE WARRANTED IN RURAL AREAS OR URBAN AREAS WITH RESTRICTED FLOW

TRAFFIC SIGNALS MAY BE WARRANTED IN "FREE FLOW" URBAN AREAS

Appendix H

Functional Drawing

20 Cope Drive

Functional Design

476575 | Dwg. No. 001

Sheet 1 of 1

PARSONS

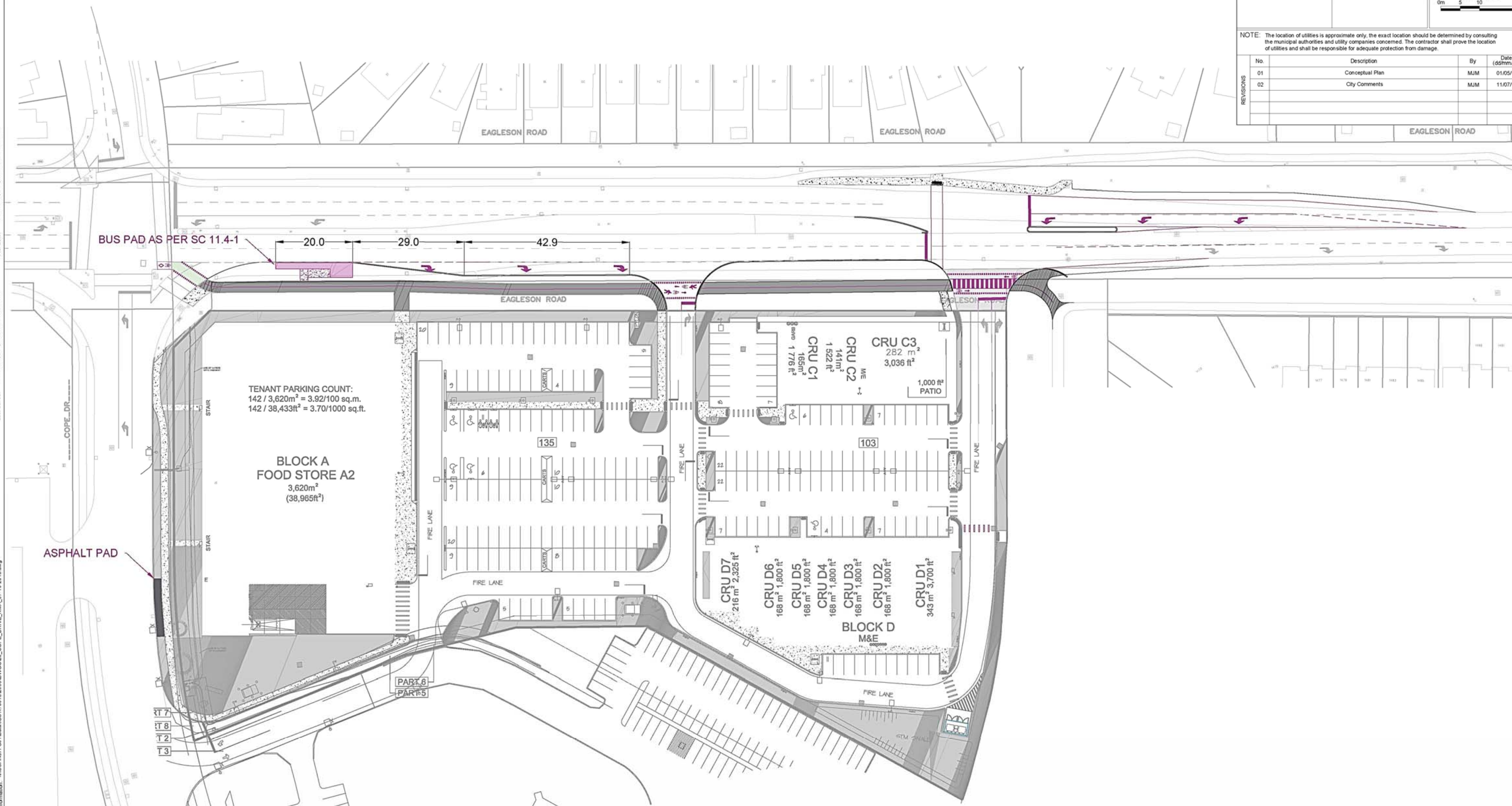
Des. | Chk'd.

Dwn. MJM | Chk'd.

Scale: HORIZONTAL 0m 5 10 20

NOTE: The location of utilities is approximate only, the exact location should be determined by consulting the municipal authorities and utility companies concerned. The contractor shall prove the location of utilities and shall be responsible for adequate protection from damage.

REVISIONS No.	Description	By	Date (dd/mm/yy)
01	Conceptual Plan	MJM	01/05/18
02	City Comments	MJM	11/07/18



Page Setup:

Drawing Frame: 790mm x 534mm City of Ottawa 2008 (Rev.0)

Plot Date: Wednesday, July 25, 2018 9:00:50 AM

Last Saved: Wednesday, July 25, 2018 8:55:56 AM

Appendix I

Proposed Eagleson/Site MMLoS Analysis

Multi-Modal Level of Service - Intersections Form

Consultant	**PARSONS**	**Project**	**10 Cope**
Scenario	**Future**	**Date**	**Mar-18**
Comments			

INTERSECTIONS		Eagleson/Site				Widened Eagleson/Fernbank			
	Crossing Side	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Pedestrian	Lanes	4	4		3	5	5	0 - 2	3
	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
	Conflicting Left Turns	Permissive	No left turn / Prohib.		Permissive	Permissive	No left turn / Prohib.	No left turn / Prohib.	Protected/ Permissive
	Conflicting Right Turns	No right turn	Permissive or yield control		Permissive or yield control	No right turn	Permissive or yield control	No right turn	Permissive or yield control
	Right Turns on Red (RToR) ?	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
	Right Turn Channel	No Channel	No Channel		No Channel	No Channel	No Channel	No Channel	No Channel
	Corner Radius	5-10m	0-3m		5-10m	10-15m	0-3m	0-3m	10-15m
	Crosswalk Type	Zebra stripe hi-vis markings	Std transverse markings		Zebra stripe hi-vis markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings
	PETSI Score	**62**	**64**		**74**	**42**	**48**	**101**	**70**
	Ped. Exposure to Traffic LoS	**C**	**C**	**-**	**C**	**E**	**D**	**A**	**C**
	Cycle Length	120			120	120	120	120	120
	Effective Walk Time	23			53	7	7	120	58
	Average Pedestrian Delay	**39**			**19**	**53**	**53**	**0**	**16**
	Pedestrian Delay LoS	**D**	**-**	**-**	**B**	**E**	**E**	**A**	**B**
	Level of Service	**D**	**C**	**-**	**C**	**E**	**E**	**A**	**C**
		D				**E**			
	Approach From	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Bicycle	Bicycle Lane Arrangement on Approach	Curb Bike Lane, Cycletrack or MUP	Mixed Traffic		Mixed Traffic	Pocket Bike Lane	Curb Bike Lane, Cycletrack or MUP		Pocket Bike Lane
	Right Turn Lane Configuration				≤ 50 m	Bike lane shifts to the left of right turn	Not Applicable		Bike lane shifts to the left of right turn
	Right Turning Speed				≤ 25 km/h	≤ 25 km/h	Not Applicable		≤ 25 km/h
	Cyclist relative to RT motorists	**Not Applicable**	**#N/A**	**-**	**D**	**D**	**Not Applicable**	**-**	**D**
	Separated or Mixed Traffic	**Separated**	**Mixed Traffic**	**-**	**Mixed Traffic**	**Separated**	**Separated**	**-**	**Separated**
	Left Turn Approach		One lane crossed		One lane crossed		≥ 2 lanes crossed		No lane crossed
	Operating Speed		≥ 60 km/h		≤ 40 km/h		≥ 60 km/h		≥ 60 km/h
	Left Turning Cyclist	**-**	**F**	**-**	**B**	**-**	**F**	**-**	**C**
	Level of Service	**-**	**#N/A**	**-**	**D**	**-**	**F**	**-**	**D**
		#N/A				**F**			
Transit	Average Signal Delay	≤ 10 sec	≤ 10 sec			≤ 10 sec	0 sec		≤ 30 sec
	Level of Service	**B**	**B**	**-**	**-**	**B**	**A**	**-**	**D**
		B				**D**			
Truck	Effective Corner Radius	> 15 m			> 15 m	> 15 m			> 15 m
	Number of Receiving Lanes on Departure from Intersection	1			≥ 2	1			≥ 2
	Level of Service	**C**	**-**	**-**	**A**	**C**	**-**	**-**	**A**
		C				**C**			
Auto	Volume to Capacity Ratio	0.0 - 0.60				0.0 - 0.60			
	Level of Service	**A**				**A**			

Appendix J

Transportation Demand Management Checklist

TDM-Supportive Development Design and Infrastructure Checklist:
Non-Residential Developments (office, institutional, retail or industrial)

Legend

REQUIRED	The Official Plan or Zoning By-law provides related guidance that must be followed
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

		TDM-supportive design & infrastructure measures: *Non-residential developments*	Check if completed & add descriptions, explanations or plan/drawing references
	1.	**WALKING & CYCLING: ROUTES**	
	1.1	**Building location & access points**	
BASIC	1.1.1	Locate building close to the street, and do not locate parking areas between the street and building entrances	☑
BASIC	1.1.2	Locate building entrances in order to minimize walking distances to sidewalks and transit stops/stations	☐
BASIC	1.1.3	Locate building doors and windows to ensure visibility of pedestrians from the building, for their security and comfort	☑
	1.2	**Facilities for walking & cycling**	
REQUIRED	1.2.1	Provide convenient, direct access to stations or major stops along rapid transit routes within 600 metres; minimize walking distances from buildings to rapid transit; provide pedestrian-friendly, weather-protected (where possible) environment between rapid transit accesses and building entrances; ensure quality linkages from sidewalks through building entrances to integrated stops/stations *(see Official Plan policy 4.3.3)*	☐ *N/A*
REQUIRED	1.2.2	Provide safe, direct and attractive pedestrian access from public sidewalks to building entrances through such measures as: reducing distances between public sidewalks and major building entrances; providing walkways from public streets to major building entrances; within a site, providing walkways along the front of adjoining buildings, between adjacent buildings, and connecting areas where people may congregate, such as courtyards and transit stops; and providing weather protection through canopies, colonnades, and other design elements wherever possible *(see Official Plan policy 4.3.12)*	☑

		TDM-supportive design & infrastructure measures: *Non-residential developments*	Check if completed & add descriptions, explanations or plan/drawing references
REQUIRED	1.2.3	Provide sidewalks of smooth, well-drained walking surfaces of contrasting materials or treatments to differentiate pedestrian areas from vehicle areas, and provide marked pedestrian crosswalks at intersection sidewalks *(see Official Plan policy 4.3.10)*	☑
REQUIRED	1.2.4	Make sidewalks and open space areas easily accessible through features such as gradual grade transition, depressed curbs at street corners and convenient access to extra-wide parking spaces and ramps *(see Official Plan policy 4.3.10)*	☐
REQUIRED	1.2.5	Include adequately spaced inter-block/street cycling and pedestrian connections to facilitate travel by active transportation. Provide links to the existing or planned network of public sidewalks, multi-use pathways and on-road cycle routes. Where public sidewalks and multi-use pathways intersect with roads, consider providing traffic control devices to give priority to cyclists and pedestrians *(see Official Plan policy 4.3.11)*	☑
BASIC	1.2.6	Provide safe, direct and attractive walking routes from building entrances to nearby transit stops	☑
BASIC	1.2.7	Ensure that walking routes to transit stops are secure, visible, lighted, shaded and wind-protected wherever possible	☐
BASIC	1.2.8	Design roads used for access or circulation by cyclists using a target operating speed of no more than 30 km/h, or provide a separated cycling facility	☐
	1.3	**Amenities for walking & cycling**	
BASIC	1.3.1	Provide lighting, landscaping and benches along walking and cycling routes between building entrances and streets, sidewalks and trails	☐ Unknown
BASIC	1.3.2	Provide wayfinding signage for site access (where required, e.g. when multiple buildings or entrances exist) and egress (where warranted, such as when directions to reach transit stops/stations, trails or other common destinations are not obvious)	☐ N/A

		TDM-supportive design & infrastructure measures: *Non-residential developments*	Check if completed & add descriptions, explanations or plan/drawing references
	2.	**WALKING & CYCLING: END-OF-TRIP FACILITIES**	
	2.1	**Bicycle parking**	
REQUIRED	2.1.1	Provide bicycle parking in highly visible and lighted areas, sheltered from the weather wherever possible *(see Official Plan policy 4.3.6)*	☑ Bicycle parking will be required
REQUIRED	2.1.2	Provide the number of bicycle parking spaces specified for various land uses in different parts of Ottawa; provide convenient access to main entrances or well-used areas *(see Zoning By-law Section 111)*	☐
REQUIRED	2.1.3	Ensure that bicycle parking spaces and access aisles meet minimum dimensions; that no more than 50% of spaces are vertical spaces; and that parking racks are securely anchored *(see Zoning By-law Section 111)*	☐
BASIC	2.1.4	Provide bicycle parking spaces equivalent to the expected number of commuter cyclists (assuming the cycling mode share target is met), plus the expected peak number of customer/visitor cyclists	☐
BETTER	2.1.5	Provide bicycle parking spaces equivalent to the expected number of commuter and customer/visitor cyclists, plus an additional buffer (e.g. 25 percent extra) to encourage other cyclists and ensure adequate capacity in peak cycling season	☐
	2.2	**Secure bicycle parking**	
REQUIRED	2.2.1	Where more than 50 bicycle parking spaces are provided for a single office building, locate at least 25% of spaces within a building/structure, a secure area (e.g. supervised parking lot or enclosure) or bicycle lockers *(see Zoning By-law Section 111)*	☐ N/A – not more than 50 spaces
BETTER	2.2.2	Provide secure bicycle parking spaces equivalent to the expected number of commuter cyclists (assuming the cycling mode share target is met)	☐
	2.3	**Shower & change facilities**	
BASIC	2.3.1	Provide shower and change facilities for the use of active commuters	☐
BETTER	2.3.2	In addition to shower and change facilities, provide dedicated lockers, grooming stations, drying racks and laundry facilities for the use of active commuters	☐
	2.4	**Bicycle repair station**	
BETTER	2.4.1	Provide a permanent bike repair station, with commonly used tools and an air pump, adjacent to the main bicycle parking area (or secure bicycle parking area, if provided)	☐

		TDM-supportive design & infrastructure measures: *Non-residential developments*	Check if completed & add descriptions, explanations or plan/drawing references
	3.	**TRANSIT**	
	3.1	**Customer amenities**	
BASIC	3.1.1	Provide shelters, lighting and benches at any on-site transit stops	☐ N/A
BASIC	3.1.2	Where the site abuts an off-site transit stop and insufficient space exists for a transit shelter in the public right-of-way, protect land for a shelter and/or install a shelter	☐ N/A
BETTER	3.1.3	Provide a secure and comfortable interior waiting area by integrating any on-site transit stops into the building	☐ N/A
	4.	**RIDESHARING**	
	4.1	**Pick-up & drop-off facilities**	
BASIC	4.1.1	Provide a designated area for carpool drivers (plus taxis and ride-hailing services) to drop off or pick up passengers without using fire lanes or other no-stopping zones	☐
	4.2	**Carpool parking**	
BASIC	4.2.1	Provide signed parking spaces for carpools in a priority location close to a major building entrance, sufficient in number to accommodate the mode share target for carpools	☐
BETTER	4.2.2	At large developments, provide spaces for carpools in a separate, access-controlled parking area to simplify enforcement	☐
	5.	**CARSHARING & BIKESHARING**	
	5.1	**Carshare parking spaces**	
BETTER	5.1.1	Provide carshare parking spaces in permitted non-residential zones, occupying either required or provided parking spaces *(see Zoning By-law Section 94)*	☐
	5.2	**Bikeshare station location**	
BETTER	5.2.1	Provide a designated bikeshare station area near a major building entrance, preferably lighted and sheltered with a direct walkway connection	☐

		TDM-supportive design & infrastructure measures: *Non-residential developments*	Check if completed & add descriptions, explanations or plan/drawing references
	6.	**PARKING**	
	6.1	**Number of parking spaces**	
REQUIRED	6.1.1	Do not provide more parking than permitted by zoning, nor less than required by zoning, unless a variance is being applied for	☑
BASIC	6.1.2	Provide parking for long-term and short-term users that is consistent with mode share targets, considering the potential for visitors to use off-site public parking	☐ N/A
BASIC	6.1.3	Where a site features more than one use, provide shared parking and reduce the cumulative number of parking spaces accordingly *(see Zoning By-law Section 104)*	☐ N/A
BETTER	6.1.4	Reduce the minimum number of parking spaces required by zoning by one space for each 13 square metres of gross floor area provided as shower rooms, change rooms, locker rooms and other facilities for cyclists in conjunction with bicycle parking *(see Zoning By-law Section 111)*	☐
	6.2	**Separate long-term & short-term parking areas**	
BETTER	6.2.1	Separate short-term and long-term parking areas using signage or physical barriers, to permit access controls and simplify enforcement (i.e. to discourage employees from parking in visitor spaces, and vice versa)	☐ N/A
	7.	**OTHER**	
	7.1	**On-site amenities to minimize off-site trips**	
BETTER	7.1.1	Provide on-site amenities to minimize mid-day or mid-commute errands	☐ N/A

Appendix K

SYNCHRO and MMLoS Analysis: Existing Conditions

Multi-Modal Level of Service - Intersections Form

Consultant	**PARSONS**	**Project**	**10 Cope**
Scenario	**Existing**	**Date**	**Mar-18**
Comments			

INTERSECTIONS		Eagleson/Cope				Eagleson/Fernbank			
	Crossing Side	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Pedestrian	Lanes	7	6	4	5	3	3	0 - 2	3
	Median	No Median - 2.4 m	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	Protected/ Permissive	Protected/ Permissive	Permissive	No left turn / Prohib.	No left turn / Prohib.	Protected/ Permissive
	Conflicting Right Turns	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	No right turn	Permissive or yield control	No right turn	Permissive or yield control
	Right Turns on Red (RToR) ?	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR prohibited	RTOR allowed
	Ped Signal Leading Interval?	No	No	No	No	No	No	No	No
	Right Turn Channel	Conv'tl without Receiving Lane	No Channel	Conventional with Receiving Lane	Conventional with Receiving Lane	No Channel	No Channel	No Channel	No Channel
	Corner Radius	15-25m	5-10m	10-15m	10-15m	10-15m	0-3m	0-3m	10-15m
	Crosswalk Type	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings
	PETSI Score	**6**	**26**	**54**	**38**	**75**	**81**	**104**	**70**
	Ped. Exposure to Traffic LoS	**F**	**F**	**D**	**E**	**B**	**B**	**A**	**C**
	Cycle Length	120	120	120	120	120	120	120	120
	Effective Walk Time	19	19	29	42	7	7	120	58
	Average Pedestrian Delay	**43**	**43**	**35**	**25**	**53**	**53**	**0**	**16**
	Pedestrian Delay LoS	**E**	**E**	**D**	**C**	**E**	**E**	**A**	**B**
	Level of Service	**F**	**F**	**D**	**E**	**E**	**E**	**A**	**C**
		F				**E**			
	Approach From	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Bicycle	Bicycle Lane Arrangement on Approach	Pocket Bike Lane	Mixed Traffic	Mixed Traffic	Mixed Traffic	Pocket Bike Lane	Mixed Traffic		Pocket Bike Lane
	Right Turn Lane Configuration	Bike lane shifts to the left of right turn	≤ 50 m	≤ 50 m	≤ 50 m	Bike lane shifts to the left of right turn	≤ 50 m		Bike lane shifts to the left of right turn
	Right Turning Speed	≤ 25 km/h	≤ 25 km/h	≤ 25 km/h	≤ 25 km/h	≤ 25 km/h	≤ 25 km/h		≤ 25 km/h
	Cyclist relative to RT motorists	**D**	**D**	**D**	**D**	**D**	**D**	**-**	**D**
	Separated or Mixed Traffic	**Separated**	**Mixed Traffic**	**Mixed Traffic**	**Mixed Traffic**	**Separated**	**Mixed Traffic**	**-**	**Separated**
	Left Turn Approach	≥ 2 lanes crossed	≥ 2 lanes crossed	One lane crossed	One lane crossed	No lane crossed	One lane crossed		No lane crossed
	Operating Speed	≥ 60 km/h	≥ 60 km/h	> 40 to ≤ 50 km/h	> 40 to ≤ 50 km/h	≥ 60 km/h	≥ 60 km/h		≥ 60 km/h
	Left Turning Cyclist	**F**	**F**	**D**	**D**	**C**	**F**	**-**	**C**
	Level of Service	**F**	**F**	**D**	**D**	**D**	**F**	**-**	**D**
		F				**F**			
Transit	Average Signal Delay	≤ 10 sec	≤ 20 sec	≤ 40 sec	> 40 sec	≤ 20 sec	≤ 20 sec		> 40 sec
	Level of Service	**B**	**C**	**E**	**F**	**C**	**C**	**-**	**F**
		F				**F**			
Truck	Effective Corner Radius	> 15 m	> 15 m	> 15 m	> 15 m	> 15 m			> 15 m
	Number of Receiving Lanes on Departure from Intersection	1	1	≥ 2	≥ 2	1			1
	Level of Service	**C**	**C**	**A**	**A**	**C**	**-**	**-**	**C**
		C				**C**			
Auto	Volume to Capacity Ratio	0.71 - 0.80				0.61 - 0.70			
	Level of Service	**C**				**B**			

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	160	98	166	716	355	82
Future Volume (vph)	160	98	166	716	355	82
Lane Group Flow (vph)	168	103	175	754	374	86
Turn Type	Prot	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Detector Phase	4	4	5	2	6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	5.0	10.0	10.0	10.0
Minimum Split (s)	26.0	26.0	11.0	16.0	26.0	26.0
Total Split (s)	30.0	30.0	14.0	60.0	46.0	46.0
Total Split (%)	33.3%	33.3%	15.6%	66.7%	51.1%	51.1%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.3	2.3	2.3	2.3	2.3	2.3
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Recall Mode	None	None	None	C-Max	C-Max	C-Max
Act Effct Green (s)	16.4	16.4	65.6	65.6	51.1	51.1
Actuated g/C Ratio	0.18	0.18	0.73	0.73	0.57	0.57
v/c Ratio	0.54	0.29	0.26	0.58	0.37	0.10
Control Delay	39.5	8.3	5.3	8.6	13.2	3.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.5	8.3	5.3	8.6	13.2	3.2
LOS	D	A	A	A	B	A
Approach Delay	27.6			8.0	11.4	
Approach LOS	C			A	B	
Queue Length 50th (m)	26.7	0.0	7.5	50.2	32.3	0.0
Queue Length 95th (m)	42.9	11.9	16.9	98.1	63.3	7.1
Internal Link Dist (m)	273.1			122.5	263.5	
Turn Bay Length (m)	175.0		35.0			40.0
Base Capacity (vph)	489	511	681	1299	1012	897
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.34	0.20	0.26	0.58	0.37	0.10

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Natural Cycle: 65	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.58	
Intersection Signal Delay: 12.1	Intersection LOS: B
Intersection Capacity Utilization 55.8%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 1: Eagleson & Fernbank

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Configurations										
Traffic Volume (vph)	98	42	34	105	189	82	734	68	365	83
Future Volume (vph)	98	42	34	105	189	82	734	68	365	83
Lane Group Flow (vph)	103	76	36	111	199	86	793	72	384	87
Turn Type	Perm	NA	Perm	NA	Perm	pm+pt	NA	pm+pt	NA	Perm
Protected Phases		4		8		5	2	1	6	
Permitted Phases	4		8		8	2		6		6
Detector Phase	4	4	8	8	8	5	2	1	6	6
Switch Phase										
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	5.0	10.0	5.0	10.0	10.0
Minimum Split (s)	28.5	28.5	28.5	28.5	28.5	11.0	32.0	11.0	32.0	32.0
Total Split (s)	40.0	40.0	40.0	40.0	40.0	13.0	57.0	13.0	57.0	57.0
Total Split (%)	36.4%	36.4%	36.4%	36.4%	36.4%	11.8%	51.8%	11.8%	51.8%	51.8%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	3.5	3.5	3.5	3.5	3.5	2.3	2.3	2.3	2.3	2.3
Lost Time Adjust (s)	-2.5	-2.5	-2.5	-2.5	-2.5	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag						Lead	Lag	Lead	Lag	Lag
Lead-Lag Optimize?						Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	C-Max	None	C-Max	C-Max
Act Effct Green (s)	17.8	17.8	17.8	17.8	17.8	81.2	73.8	80.7	73.5	73.5
Actuated g/C Ratio	0.16	0.16	0.16	0.16	0.16	0.74	0.67	0.73	0.67	0.67
v/c Ratio	0.59	0.26	0.18	0.39	0.48	0.12	0.35	0.14	0.17	0.08
Control Delay	55.7	25.9	39.7	43.9	9.3	4.3	9.5	4.6	8.3	2.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	55.7	25.9	39.7	43.9	9.3	4.3	9.5	4.6	8.3	2.0
LOS	E	C	D	D	A	A	A	A	A	A
Approach Delay		43.0		23.6			9.0		6.8	
Approach LOS		D		C			A		A	
Queue Length 50th (m)	20.8	8.3	6.8	21.6	0.0	3.7	36.7	3.1	15.5	0.0
Queue Length 95th (m)	36.0	19.8	14.9	35.5	18.0	9.6	59.7	8.3	27.5	5.8
Internal Link Dist (m)		120.8		109.6			168.2		158.5	
Turn Bay Length (m)	38.0		20.0		10.0	60.0		47.0		125.0
Base Capacity (vph)	353	568	411	583	630	748	2265	512	2265	1044
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.29	0.13	0.09	0.19	0.32	0.11	0.35	0.14	0.17	0.08

Intersection Summary	
Cycle Length: 110	
Actuated Cycle Length: 110	
Offset: 57 (52%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 75	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.59	
Intersection Signal Delay: 14.1	Intersection LOS: B
Intersection Capacity Utilization 52.7%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 2: Eagleson & Cope/Cadence

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	165	24	35	235	2	5
Future Volume (Veh/h)	165	24	35	235	2	5
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	174	25	37	247	2	5
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				145		
pX, platoon unblocked					0.96	
vC, conflicting volume			199		508	186
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			199		462	186
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		100	99
cM capacity (veh/h)			1373		519	856

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	199	284	7
Volume Left	0	37	2
Volume Right	25	0	5
cSH	1700	1373	722
Volume to Capacity	0.12	0.03	0.01
Queue Length 95th (m)	0.0	0.6	0.2
Control Delay (s)	0.0	1.2	10.0
Lane LOS		A	B
Approach Delay (s)	0.0	1.2	10.0
Approach LOS			B

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	39.1%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	129	178	169	550	793	205
Future Volume (vph)	129	178	169	550	793	205
Lane Group Flow (vph)	136	187	178	579	835	216
Turn Type	Prot	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Detector Phase	4	4	5	2	6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	5.0	10.0	10.0	10.0
Minimum Split (s)	27.0	27.0	11.0	16.0	27.0	27.0
Total Split (s)	27.0	27.0	15.0	93.0	78.0	78.0
Total Split (%)	22.5%	22.5%	12.5%	77.5%	65.0%	65.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.3	2.3	2.3	2.3	2.3	2.3
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Recall Mode	None	None	None	C-Max	C-Max	C-Max
Act Effct Green (s)	17.1	17.1	94.9	94.9	80.7	80.7
Actuated g/C Ratio	0.14	0.14	0.79	0.79	0.67	0.67
v/c Ratio	0.56	0.50	0.44	0.41	0.70	0.20
Control Delay	56.4	10.8	6.8	5.3	13.9	1.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	56.4	10.8	6.8	5.3	13.9	1.0
LOS	E	B	A	A	B	A
Approach Delay	30.0			5.7	11.3	
Approach LOS	C			A	B	
Queue Length 50th (m)	30.3	0.0	8.0	34.3	135.8	1.5
Queue Length 95th (m)	47.8	18.8	16.9	63.1	220.0	0.0
Internal Link Dist (m)	231.7			121.4	193.6	
Turn Bay Length (m)	175.0		35.0			40.0
Base Capacity (vph)	324	441	418	1410	1199	1091
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.42	0.42	0.43	0.41	0.70	0.20

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 29 (24%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Natural Cycle: 80	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.70	
Intersection Signal Delay: 12.1	Intersection LOS: B
Intersection Capacity Utilization 72.3%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 1: Eagleson & Fernbank

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	83	128	23	84	71	598	222	936	132
Future Volume (vph)	83	128	23	84	71	598	222	936	132
Lane Group Flow (vph)	87	210	24	213	75	660	234	985	139
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	pm+pt	NA	Perm
Protected Phases		4		8	5	2	1	6	
Permitted Phases	4		8		2		6		6
Detector Phase	4	4	8	8	5	2	1	6	6
Switch Phase									
Minimum Initial (s)	10.0	10.0	10.0	10.0	5.0	10.0	5.0	10.0	10.0
Minimum Split (s)	28.5	28.5	28.5	28.5	11.0	32.0	11.0	32.0	32.0
Total Split (s)	41.0	41.0	41.0	41.0	12.0	54.0	25.0	67.0	67.0
Total Split (%)	34.2%	34.2%	34.2%	34.2%	10.0%	45.0%	20.8%	55.8%	55.8%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	3.5	3.5	3.5	3.5	2.3	2.3	2.3	2.3	2.3
Lost Time Adjust (s)	-2.5	-2.5	-2.5	-2.5	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag					Lead	Lag	Lead	Lag	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	None	C-Max	C-Max
Act Effct Green (s)	21.4	21.4	21.4	21.4	83.0	74.0	90.2	79.9	79.9
Actuated g/C Ratio	0.18	0.18	0.18	0.18	0.69	0.62	0.75	0.67	0.67
v/c Ratio	0.77	0.66	0.21	0.62	0.18	0.32	0.41	0.44	0.13
Control Delay	85.4	49.5	43.9	39.3	5.3	10.0	7.1	11.7	2.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	85.4	49.5	43.9	39.3	5.3	10.0	7.1	11.7	2.1
LOS	F	D	D	D	A	B	A	B	A
Approach Delay		60.0		39.8		9.6		9.9	
Approach LOS		E		D		A		A	
Queue Length 50th (m)	19.8	41.3	4.9	33.1	3.1	27.7	13.4	55.7	0.0
Queue Length 95th (m)	36.4	61.4	12.1	53.8	8.6	48.6	27.7	88.1	8.4
Internal Link Dist (m)		120.2		75.8		245.0		169.6	
Turn Bay Length (m)	38.0		20.0		60.0		47.0		125.0
Base Capacity (vph)	195	537	199	544	413	2078	652	2258	1057
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	0.45	0.39	0.12	0.39	0.18	0.32	0.36	0.44	0.13

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 14 (12%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 75	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.77	
Intersection Signal Delay: 18.2	Intersection LOS: B
Intersection Capacity Utilization 65.5%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 2: Eagleson & Cope/Candence

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	267	1	2	285	5	15
Future Volume (Veh/h)	267	1	2	285	5	15
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	281	1	2	300	5	16
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				144		
pX, platoon unblocked						
vC, conflicting volume			282		586	282
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			282		586	282
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		99	98
cM capacity (veh/h)			1280		472	757

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	282	302	21
Volume Left	0	2	5
Volume Right	1	0	16
cSH	1700	1280	662
Volume to Capacity	0.17	0.00	0.03
Queue Length 95th (m)	0.0	0.0	0.7
Control Delay (s)	0.0	0.1	10.6
Lane LOS		A	B
Approach Delay (s)	0.0	0.1	10.6
Approach LOS			B

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	27.5%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	158	167	149	464	421	130
Future Volume (vph)	158	167	149	464	421	130
Lane Group Flow (vph)	166	176	157	488	443	137
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases		4	2			6
Detector Phase	4	4	2	2	6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	27.0	27.0	16.0	16.0	27.0	27.0
Total Split (s)	27.0	27.0	53.0	53.0	53.0	53.0
Total Split (%)	33.8%	33.8%	66.3%	66.3%	66.3%	66.3%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.3	2.3	2.3	2.3	2.3	2.3
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	Max	Max	Max	Max
Act Effct Green (s)	15.3	15.3	49.1	49.1	49.1	49.1
Actuated g/C Ratio	0.21	0.21	0.68	0.68	0.68	0.68
v/c Ratio	0.46	0.38	0.28	0.40	0.37	0.13
Control Delay	29.2	6.6	7.1	7.1	6.7	1.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.2	6.6	7.1	7.1	6.7	1.5
LOS	C	A	A	A	A	A
Approach Delay	17.6			7.1	5.5	
Approach LOS	B			A	A	
Queue Length 50th (m)	19.8	0.0	6.6	22.9	20.1	0.0
Queue Length 95th (m)	35.6	13.3	20.6	55.2	48.7	5.8
Internal Link Dist (m)	344.8			208.3	172.6	
Turn Bay Length (m)	175.0		35.0			40.0
Base Capacity (vph)	539	602	567	1209	1209	1072
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.31	0.29	0.28	0.40	0.37	0.13

Intersection Summary			
Cycle Length: 80			
Actuated Cycle Length: 72.5			
Natural Cycle: 55			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.46			
Intersection Signal Delay: 8.8		Intersection LOS: A	
Intersection Capacity Utilization 51.3%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 1: Eagleson & Fernbank

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	98	70	21	82	49	550	123	487	107
Future Volume (vph)	98	70	21	82	49	550	123	487	107
Lane Group Flow (vph)	103	118	22	209	52	604	129	513	113
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	pm+pt	NA	Perm
Protected Phases		4		8	5	2	1	6	
Permitted Phases	4		8		2		6		6
Detector Phase	4	4	8	8	5	2	1	6	6
Switch Phase									
Minimum Initial (s)	10.0	10.0	10.0	10.0	5.0	10.0	5.0	10.0	10.0
Minimum Split (s)	28.5	28.5	28.5	28.5	11.0	32.0	11.0	32.0	32.0
Total Split (s)	31.0	31.0	31.0	31.0	16.0	43.0	16.0	43.0	43.0
Total Split (%)	34.4%	34.4%	34.4%	34.4%	17.8%	47.8%	17.8%	47.8%	47.8%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	3.5	3.5	3.5	3.5	2.3	2.3	2.3	2.3	2.3
Lost Time Adjust (s)	-2.5	-2.5	-2.5	-2.5	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag					Lead	Lag	Lead	Lag	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	None	C-Max	C-Max
Act Effct Green (s)	18.1	18.1	18.1	18.1	58.5	50.1	62.6	56.1	56.1
Actuated g/C Ratio	0.20	0.20	0.20	0.20	0.65	0.56	0.70	0.62	0.62
v/c Ratio	0.66	0.32	0.10	0.53	0.08	0.32	0.23	0.24	0.11
Control Delay	51.9	22.8	27.5	23.3	5.6	12.4	6.0	9.9	2.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	51.9	22.8	27.5	23.3	5.6	12.4	6.0	9.9	2.7
LOS	D	C	C	C	A	B	A	A	A
Approach Delay		36.3		23.7		11.9		8.2	
Approach LOS		D		C		B		A	
Queue Length 50th (m)	16.6	12.4	3.1	19.3	2.2	26.8	5.8	21.4	0.0
Queue Length 95th (m)	30.8	24.2	8.4	36.0	7.0	48.2	14.7	38.3	8.0
Internal Link Dist (m)		117.0		75.8		262.7		169.6	
Turn Bay Length (m)	38.0		20.0		60.0		47.0		125.0
Base Capacity (vph)	234	529	343	545	685	1877	592	2113	989
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	0.44	0.22	0.06	0.38	0.08	0.32	0.22	0.24	0.11

Intersection Summary		
Cycle Length: 90		
Actuated Cycle Length: 90		
Offset: 22 (24%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green		
Natural Cycle: 75		
Control Type: Actuated-Coordinated		
Maximum v/c Ratio: 0.66		
Intersection Signal Delay: 14.7	Intersection LOS: B	
Intersection Capacity Utilization 57.8%	ICU Level of Service B	
Analysis Period (min) 15		

Splits and Phases: 2: Eagleson & Cope/Cadence

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	210	2	2	238	2	2
Future Volume (Veh/h)	210	2	2	238	2	2
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	221	2	2	251	2	2
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				141		
pX, platoon unblocked						
vC, conflicting volume			223		477	222
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			223		477	222
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1346		546	818

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	223	253	4
Volume Left	0	2	2
Volume Right	2	0	2
cSH	1700	1346	655
Volume to Capacity	0.13	0.00	0.01
Queue Length 95th (m)	0.0	0.0	0.1
Control Delay (s)	0.0	0.1	10.5
Lane LOS		A	B
Approach Delay (s)	0.0	0.1	10.5
Approach LOS			B

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	24.9%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix L

SYNCHRO Analysis: Projected 2019 Conditions

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	136	180	169	568	812	210
Future Volume (vph)	136	180	169	568	812	210
Lane Group Flow (vph)	143	189	178	598	855	221
Turn Type	Prot	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Detector Phase	4	4	5	2	6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	5.0	10.0	10.0	10.0
Minimum Split (s)	27.0	27.0	11.0	16.0	27.0	27.0
Total Split (s)	27.0	27.0	15.0	93.0	78.0	78.0
Total Split (%)	22.5%	22.5%	12.5%	77.5%	65.0%	65.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.3	2.3	2.3	2.3	2.3	2.3
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Recall Mode	None	None	None	C-Max	C-Max	C-Max
Act Effct Green (s)	17.4	17.4	94.6	94.6	80.4	80.4
Actuated g/C Ratio	0.14	0.14	0.79	0.79	0.67	0.67
v/c Ratio	0.58	0.50	0.45	0.43	0.72	0.20
Control Delay	56.9	10.7	7.2	5.6	13.8	0.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	56.9	10.7	7.2	5.6	13.8	0.8
LOS	E	B	A	A	B	A
Approach Delay	30.6			5.9	11.2	
Approach LOS	C			A	B	
Queue Length 50th (m)	31.9	0.0	8.1	36.9	142.7	0.3
Queue Length 95th (m)	50.1	19.0	16.9	66.3	230.0	0.0
Internal Link Dist (m)	190.5			91.6	231.7	
Turn Bay Length (m)	175.0		35.0			40.0
Base Capacity (vph)	324	443	403	1406	1195	1089
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.44	0.43	0.44	0.43	0.72	0.20

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 29 (24%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Natural Cycle: 80	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.72	
Intersection Signal Delay: 12.3	Intersection LOS: B
Intersection Capacity Utilization 73.3%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 1: Eagleson & Fernbank

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	101	145	46	95	77	633	222	986	138
Future Volume (vph)	101	145	46	95	77	633	222	986	138
Lane Group Flow (vph)	106	228	48	225	81	714	234	1038	145
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	pm+pt	NA	Perm
Protected Phases		4		8	5	2	1	6	
Permitted Phases	4		8		2		6		6
Detector Phase	4	4	8	8	5	2	1	6	6
Switch Phase									
Minimum Initial (s)	10.0	10.0	10.0	10.0	5.0	10.0	5.0	10.0	10.0
Minimum Split (s)	28.5	28.5	28.5	28.5	11.0	32.0	11.0	32.0	32.0
Total Split (s)	41.0	41.0	41.0	41.0	12.0	54.0	25.0	67.0	67.0
Total Split (%)	34.2%	34.2%	34.2%	34.2%	10.0%	45.0%	20.8%	55.8%	55.8%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	3.5	3.5	3.5	3.5	2.3	2.3	2.3	2.3	2.3
Lost Time Adjust (s)	-2.5	-2.5	-2.5	-2.5	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag					Lead	Lag	Lead	Lag	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	None	C-Max	C-Max
Act Effct Green (s)	23.4	23.4	23.4	23.4	80.9	71.7	88.2	77.7	77.7
Actuated g/C Ratio	0.20	0.20	0.20	0.20	0.67	0.60	0.74	0.65	0.65
v/c Ratio	0.85	0.66	0.39	0.62	0.21	0.36	0.44	0.47	0.14
Control Delay	93.9	48.5	49.3	39.9	5.6	9.8	8.3	13.5	2.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	93.9	48.5	49.3	39.9	5.6	9.8	8.3	13.5	2.4
LOS	F	D	D	D	A	A	A	B	A
Approach Delay		62.9		41.5		9.4		11.5	
Approach LOS		E		D		A		B	
Queue Length 50th (m)	24.5	45.8	10.0	37.4	3.2	23.6	14.2	62.6	0.0
Queue Length 95th (m)	#43.4	64.8	20.1	56.7	9.1	42.0	30.9	103.2	9.3
Internal Link Dist (m)		118.1		75.8		118.6		169.6	
Turn Bay Length (m)	38.0		20.0		60.0		47.0		125.0
Base Capacity (vph)	197	537	194	541	384	2007	614	2195	1033
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	0.54	0.42	0.25	0.42	0.21	0.36	0.38	0.47	0.14

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 14 (12%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 75	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.85	
Intersection Signal Delay: 19.9	Intersection LOS: B
Intersection Capacity Utilization 67.9%	ICU Level of Service C
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 2: Eagleson & Cope/Cadence

Lane Group	EBL	EBR	NBL	NBT	SBT
Lane Configurations					
Traffic Volume (vph)	79	16	45	678	1008
Future Volume (vph)	79	16	45	678	1008
Lane Group Flow (vph)	83	17	47	714	1079
Turn Type	Prot	Perm	Perm	NA	NA
Protected Phases	4			2	6
Permitted Phases		4	2		
Detector Phase	4	4	2	2	6
Switch Phase					
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	30.9	30.9	26.9	26.9	23.9
Total Split (s)	47.0	47.0	73.0	73.0	73.0
Total Split (%)	39.2%	39.2%	60.8%	60.8%	60.8%
Yellow Time (s)	3.3	3.3	3.7	3.7	3.7
All-Red Time (s)	2.6	2.6	2.2	2.2	2.2
Lost Time Adjust (s)	-1.9	-1.9	-1.9	-1.9	-1.9
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	C-Max	C-Max	C-Max
Act Effct Green (s)	15.8	15.8	100.2	100.2	100.2
Actuated g/C Ratio	0.13	0.13	0.84	0.84	0.84
v/c Ratio	0.37	0.08	0.13	0.48	0.38
Control Delay	50.8	17.4	3.7	4.3	1.8
Queue Delay	0.0	0.0	0.0	0.1	0.0
Total Delay	50.8	17.4	3.7	4.4	1.8
LOS	D	B	A	A	A
Approach Delay	45.1			4.3	1.8
Approach LOS	D			A	A
Queue Length 50th (m)	18.6	0.0	1.3	27.5	14.0
Queue Length 95th (m)	30.0	6.0	6.0	67.6	17.4
Internal Link Dist (m)	83.5			231.7	59.7
Turn Bay Length (m)		30.0	35.0		
Base Capacity (vph)	607	554	370	1490	2823
Starvation Cap Reductn	0	0	0	91	0
Spillback Cap Reductn	0	0	0	0	73
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.14	0.03	0.13	0.51	0.39

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 10 (8%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Natural Cycle: 65	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.48	
Intersection Signal Delay: 5.1	Intersection LOS: A
Intersection Capacity Utilization 54.5%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 5: Eagleson & Site

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	267	18	19	291	17	50
Future Volume (Veh/h)	267	18	19	291	17	50
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	281	19	20	306	18	53
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				142		
pX, platoon unblocked						
vC, conflicting volume			300		636	290
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			300		636	290
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		96	93
cM capacity (veh/h)			1261		435	749

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total	300	326	18	53
Volume Left	0	20	18	0
Volume Right	19	0	0	53
cSH	1700	1261	435	749
Volume to Capacity	0.18	0.02	0.04	0.07
Queue Length 95th (m)	0.0	0.4	1.0	1.7
Control Delay (s)	0.0	0.6	13.6	10.2
Lane LOS		A	B	B
Approach Delay (s)	0.0	0.6	11.1	
Approach LOS			B	

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	42.6%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	167	169	149	483	438	137
Future Volume (vph)	167	169	149	483	438	137
Lane Group Flow (vph)	176	178	157	508	461	144
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases		4	2			6
Detector Phase	4	4	2	2	6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	27.0	27.0	16.0	16.0	27.0	27.0
Total Split (s)	27.0	27.0	53.0	53.0	53.0	53.0
Total Split (%)	33.8%	33.8%	66.3%	66.3%	66.3%	66.3%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.3	2.3	2.3	2.3	2.3	2.3
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	Max	Max	Max	Max
Act Effct Green (s)	15.6	15.6	49.2	49.2	49.2	49.2
Actuated g/C Ratio	0.21	0.21	0.68	0.68	0.68	0.68
v/c Ratio	0.48	0.38	0.29	0.42	0.38	0.13
Control Delay	29.6	6.6	7.3	7.4	7.0	1.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.6	6.6	7.3	7.4	7.0	1.5
LOS	C	A	A	A	A	A
Approach Delay	18.0			7.4	5.7	
Approach LOS	B			A	A	
Queue Length 50th (m)	21.2	0.0	6.9	24.9	21.8	0.0
Queue Length 95th (m)	37.7	13.4	20.9	58.2	51.3	5.9
Internal Link Dist (m)	344.8			208.3	198.5	
Turn Bay Length (m)	175.0		35.0			40.0
Base Capacity (vph)	537	602	549	1204	1204	1071
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.33	0.30	0.29	0.42	0.38	0.13

Intersection Summary			
Cycle Length: 80			
Actuated Cycle Length: 72.8			
Natural Cycle: 55			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.48			
Intersection Signal Delay: 9.0		Intersection LOS: A	
Intersection Capacity Utilization 52.8%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 1: Eagleson & Fernbank

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	118	89	50	96	56	589	123	542	115
Future Volume (vph)	118	89	50	96	56	589	123	542	115
Lane Group Flow (vph)	124	138	53	224	59	665	129	571	121
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	pm+pt	NA	Perm
Protected Phases		4		8	5	2	1	6	
Permitted Phases	4		8		2		6		6
Detector Phase	4	4	8	8	5	2	1	6	6
Switch Phase									
Minimum Initial (s)	10.0	10.0	10.0	10.0	5.0	10.0	5.0	10.0	10.0
Minimum Split (s)	28.5	28.5	28.5	28.5	11.0	32.0	11.0	32.0	32.0
Total Split (s)	31.0	31.0	31.0	31.0	16.0	43.0	16.0	43.0	43.0
Total Split (%)	34.4%	34.4%	34.4%	34.4%	17.8%	47.8%	17.8%	47.8%	47.8%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	3.5	3.5	3.5	3.5	2.3	2.3	2.3	2.3	2.3
Lost Time Adjust (s)	-2.5	-2.5	-2.5	-2.5	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag					Lead	Lag	Lead	Lag	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	None	C-Max	C-Max
Act Effct Green (s)	20.0	20.0	20.0	20.0	56.8	48.2	60.0	51.7	51.7
Actuated g/C Ratio	0.22	0.22	0.22	0.22	0.63	0.54	0.67	0.57	0.57
v/c Ratio	0.72	0.35	0.22	0.54	0.10	0.37	0.25	0.29	0.13
Control Delay	54.7	24.5	28.6	24.7	5.3	10.9	7.1	12.2	3.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	54.7	24.5	28.6	24.7	5.3	10.9	7.1	12.2	3.1
LOS	D	C	C	C	A	B	A	B	A
Approach Delay		38.8		25.4		10.4		10.0	
Approach LOS		D		C		B		B	
Queue Length 50th (m)	19.9	16.0	7.5	23.1	2.5	24.0	6.5	26.4	0.0
Queue Length 95th (m)	36.0	28.5	15.6	40.3	6.5	30.0	15.6	45.2	8.8
Internal Link Dist (m)		113.9		122.3		99.3		169.6	
Turn Bay Length (m)	38.0		20.0		60.0		47.0		125.0
Base Capacity (vph)	232	528	325	540	631	1800	550	1947	923
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	0.53	0.26	0.16	0.41	0.09	0.37	0.23	0.29	0.13

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 22 (24%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 75	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.72	
Intersection Signal Delay: 15.8	Intersection LOS: B
Intersection Capacity Utilization 60.4%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 2: Eagleson & Cope/Cadence

Lane Group	EBL	EBR	NBL	NBT	SBT
Lane Configurations					
Traffic Volume (vph)	91	20	53	597	557
Future Volume (vph)	91	20	53	597	557
Lane Group Flow (vph)	96	21	56	628	608
Turn Type	Prot	Perm	Perm	NA	NA
Protected Phases	4			2	6
Permitted Phases		4	2		
Detector Phase	4	4	2	2	6
Switch Phase					
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	30.9	30.9	26.9	26.9	26.9
Total Split (s)	32.0	32.0	58.0	58.0	58.0
Total Split (%)	35.6%	35.6%	64.4%	64.4%	64.4%
Yellow Time (s)	3.3	3.3	3.7	3.7	3.7
All-Red Time (s)	2.6	2.6	2.2	2.2	2.2
Lost Time Adjust (s)	-1.9	-1.9	-1.9	-1.9	-1.9
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	C-Max	C-Max	C-Max
Act Effct Green (s)	15.4	15.4	70.6	70.6	70.6
Actuated g/C Ratio	0.17	0.17	0.78	0.78	0.78
v/c Ratio	0.33	0.08	0.10	0.45	0.23
Control Delay	34.3	11.4	5.2	6.7	2.4
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	34.3	11.4	5.2	6.7	2.4
LOS	C	B	A	A	A
Approach Delay	30.2			6.6	2.4
Approach LOS	C			A	A
Queue Length 50th (m)	15.4	0.0	1.8	29.4	7.7
Queue Length 95th (m)	24.0	5.1	8.8	88.6	11.8
Internal Link Dist (m)	96.9			198.5	56.8
Turn Bay Length (m)		30.0	35.0		
Base Capacity (vph)	527	486	584	1398	2645
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.18	0.04	0.10	0.45	0.23

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 19 (21%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.45	
Intersection Signal Delay: 6.7	Intersection LOS: A
Intersection Capacity Utilization 48.2%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 5: Eagleson & Site

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	210	21	22	245	13	39
Future Volume (Veh/h)	210	21	22	245	13	39
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	221	22	23	258	14	41
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				138		
pX, platoon unblocked						
vC, conflicting volume			243		536	232
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			243		536	232
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		97	95
cM capacity (veh/h)			1323		497	807

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total	243	281	14	41
Volume Left	0	23	14	0
Volume Right	22	0	0	41
cSH	1700	1323	497	807
Volume to Capacity	0.14	0.02	0.03	0.05
Queue Length 95th (m)	0.0	0.4	0.7	1.2
Control Delay (s)	0.0	0.8	12.5	9.7
Lane LOS		A	B	A
Approach Delay (s)	0.0	0.8	10.4	
Approach LOS			B	

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	41.2%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix M

Assessment of Site Vehicular Assess Technical Memorandum

PARSONS

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Technical Memorandum

To: Riley Carter (City of Ottawa)
Copy: Jeff Parkes (Taggart)
From: Mark Baker, P.Eng./Amer Al-Merabi (Parsons)

Date: 8 August 2016
Project: 476013 - 01000

Re: Commercial Development 20 Cope Drive
Assessment of Site Vehicular Access

BACKGROUND

In 2013, Parsons (formerly Delcan) prepared a Community Transportation Study (CTS) in support of a rezoning application by Taggart Realty Management for the subject site. At the time, the Site Plan featured a full movement access to the development via Cope Drive (shared with the adjacent First Air Building) and two right-in/right-out connections to Eagleson Road.

Since receiving the approved rezoning, Taggart has been actively seeking prospective tenants for the anchor grocery store. As part of this process, the importance of providing a full movement vehicle connection to Eagleson Drive has emerged. The purpose of the ensuing report is to identify the opportunities and constraints of providing such a full movement connection to/from Eagleson Road, and to identify its ideal placement relative to adjacent signalized intersections. Once this important site access issue is resolved, a formal Transportation Impact Study (TIS) can be prepared, if necessary, to support the Site Plan Application (SPA).

CONTEXT

The subject site is located in the southwest quadrant of the Eagleson/Cope intersection (see Figure 1). The parcel's frontage is approximately 240m along Eagleson Road, whereas the existing site access to First Air via Cope Road is located approximately 120m west of the Eagleson/Cope intersection. The center-to-center spacing between Cope Drive, and the adjacent signalized intersection to the south (at Fernbank Road) is approximately 490m.

The posted speed limit on Eagleson Road is 60 km/h. Note that Eagleson Road transitions from a four-lane divided to a two-lane undivided cross-section just south of the subject site. The widening of Eagleson Road to four lanes from this transition point south to Hope Side Road is identified in the 2013 TMP as a Phase 2 Road Project (2020-2025). The subject EA was completed in 2008.

CONCEPTS CONSIDERED

Based on preliminary discussions, several concepts were identified for providing a vehicle site access to/from Eagleson Road:

1. Signalized, full movement driveway situated about midway along the site's frontage; the resulting intersection spacing would be approximately 150m south of Cope Drive and 340m north of Fernbank Road;
2. Signalized, full movement driveway situated near the southern extent of the site; the resulting intersection spacing would be approximately 225m south of Cope Drive and 265m north of Fernbank Road;
3. Unsignalized, partial movement driveway (no left-turn out of the site) situated about midway along the site's frontage; the resulting intersection spacing would be approximately 150m south of Cope Drive and 340m north of Fernbank Road;

Included as Appendix A are functional plans of Concept 1, 2, and two variations of Concept 3. Concept 3a uses the existing median and maintains two lanes, whereas Concept 3b is widened into three lanes by trimming the median width.

Figure 1: Local Context

DESIGN GUIDANCE

According to the Ontario Traffic Manual (OTM) Book 12, the preferred spacing for traffic signal control is **215m** (setting aside requirements for optimal signal coordination). This distance is considered necessary to allow motorists to recognize and react to each traffic control device. Furthermore, the specified distance of 215m within 60 km/h environments will generally permit adequate left-turn storage to be provided where back-to-back left turns lanes are needed (storage plus adequate taper).

With regards to signal visibility, the OTM specifies the minimum distance from which the signal must be clearly visible for various speeds. For 85th percentile speeds ranging between 60 km/h and 80 km/h, the minimum distance is between 110m and 165m. Although a recent speed survey is currently not available, it is assumed the 85th percentile speed at this location is approximately 70 km/h, in which case the minimum distance for signal visibility is **135m**.

Based on the foregoing design guidance for new signalized intersections, the intersection spacing associated with Concept 1 (150m) does not satisfy the preferred spacing of 215m, and just satisfies the sight distance value of 135m. The intersection spacing associated with Concept 2 (225m) does satisfy both elements.

ANALYSIS

UPDATED TRAFFIC GENERATION/DISTRIBUTION/ASSIGNMENT

The Site Plan contained within the original CTS was comprised of a number of commercial retail units totalling approximately 5,208 m^2 GFA, including a food store, restaurant, bank (with drive-through), and other specialty retail uses. The projected number of "new" auto trips identified in the CTS was 72 veh/h in the AM peak hour and 218 veh/h in the PM peak hour. The assumed modal share was 60% auto driver, 15% passenger, 15% transit and 10% non-motorized (biking & walking).

The updated Site Plan now proposed is comprised of a slightly higher GFA of 5,590 m^2, including a larger food store and adjoining retail, bank (with drive-through), and other specialty retail uses. The number of "new" auto trips, assuming the same modal shares noted above, is projected to be slightly higher at **106 veh/h** in the AM peak hour and **272 veh/h** in the PM peak hour.

For the purposes of this assessment, the vehicle distribution identified in the original CTS was used. However, most of the residential growth communities are located to the south of the subject site, and therefore over time there is likely to be shift in distribution to favour more traffic to/from the south/southwest.

40%	to/from the North/Northeast (via Eagleson)
15%	to/from the South/Southwest (via Eagleson and/or Fernbank)
30%	to/from the East (via Cope)
15%	to/from the Northwest (via Cope)
100%	

The assumed traffic assignment will be influenced by the type of connection provided to Eagleson Road, namely right-in/right-out, full-movement, and some variation. Shown below in Figure 2 and 3 are the total projected traffic volumes associated with two basic configurations: a full movement, signalized connection; and an unsignalized, right-in/right out/left-in connection to Eagleson Road, respectively.

The one notable change as a result of restricting the left-out from the subject site to Eagleson Road is the additional loading to the corresponding eastbound left-turn movement at the Eagleson/Cope/Cadence intersection (+90 veh/h in the critical PM peak hour).

Figure 2: Total Projected Traffic Volumes – Signalized Connection at Eagleson

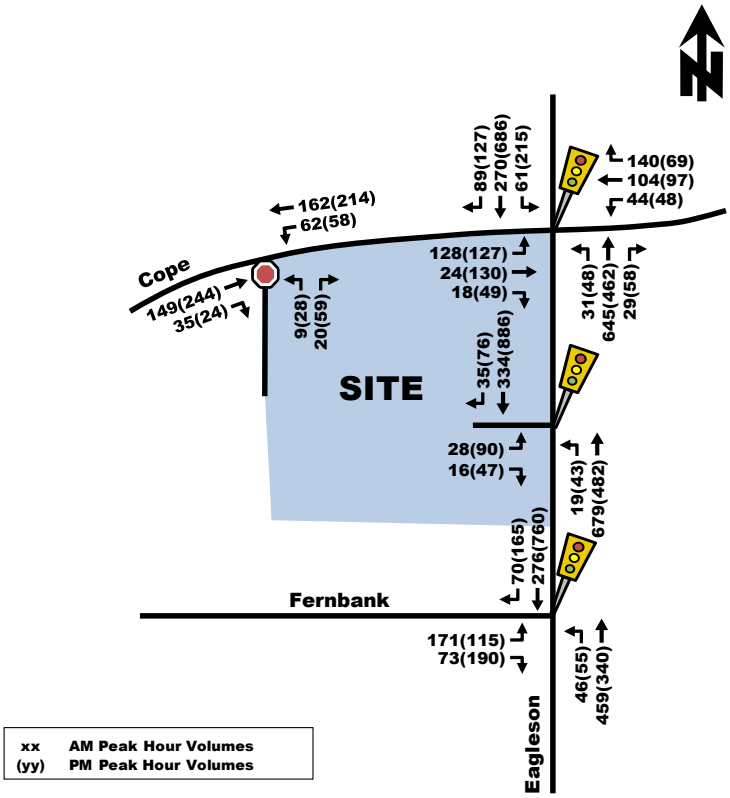
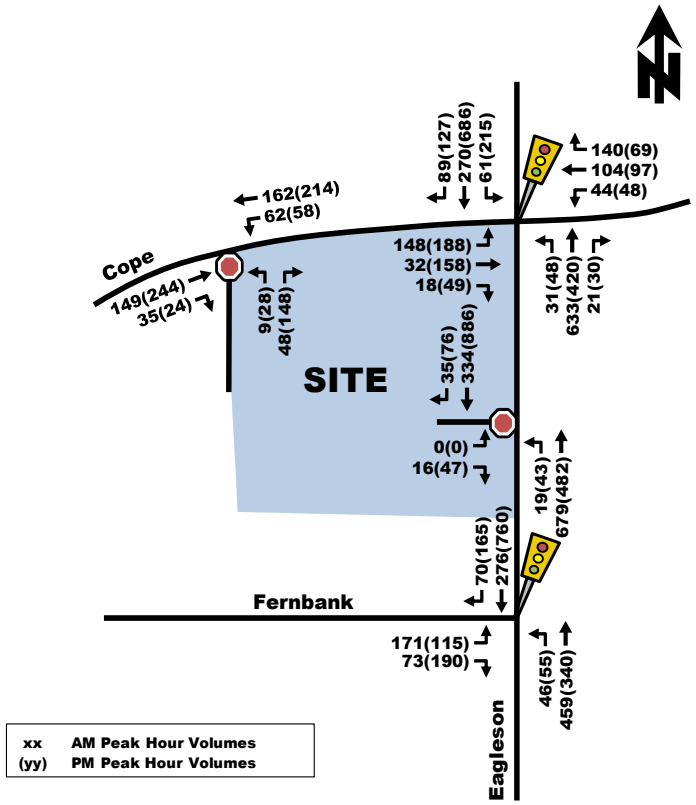


Figure 3: Total Projected Traffic Volumes – Unsignalized Connection at Eagleson



WARRANTS FOR TRAFFIC SIGNAL CONTROL AND AUXILLIARY TURN LANES

Based on the projected traffic volumes identified in Figure 2, warrants for traffic signal control (TSC) at the Eagleson/site intersection are not satisfied (40% warranted). Therefore, any installation of traffic signals, as well as the on-going maintenance, would be at the developer's expense. The traffic signal warrant analysis is provided as Appendix B.

With regards to the need for an auxiliary northbound left-turn lane serving the site driveway, the analysis (based on TAC guidelines) indicates that a short turn lane is warranted. From an operational perspective, however, an auxiliary northbound left-turn lane is not considered necessary. Converting the median lane, of the two existing northbound lanes at this location, to a shared left-through movement lane is adequate as the performance of the intersection is not impacted (see section below). The auxiliary lane warrant analysis is provided as Appendix C.

INTERSECTION CAPACITY ANALYSIS/QUEUING

SYNCHRO (V9) traffic analysis software was used to determine the performance at the four study area intersections, including two adjacent signalized intersections and the site driveway connections to Cope Drive and Eagleson Road, respectively. The results are summarized below in Table 1 (signalized, full-movement site access connection to Eagleson) and Table 2 (unsignalized, no left-turn out of the site to Eagleson).

The subject signalized intersections were assessed in terms of the volume-to-capacity (v/c) ratio and the corresponding Level of Service (LoS) for the critical movement(s). The subject signalized intersections 'as a whole' were assessed based on weighted v/c ratio, whereas the subject unsignalized intersections were assessed in terms of delay and the corresponding Level of Service (LoS) for the critical movement(s). The SYNCHRO model output of existing conditions is provided within Appendix D (signalized alternative) & Appendix E (unsignalized alternative).

Table 1: Projected Intersection Capacity Analysis (Signalized Entrance Concept 1 and 2)

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
Eagleson/Fernbank	A(B)	0.56(0.70)	EBL(SBT)	13.6(16.0)	A(B)	0.43(0.63)
Eagleson/Cope/Cadence	D(B)	0.84(0.68)	EBL(EBL)	17.6(15.7)	A(A)	0.46(0.39)
Eagleson/Site Access[1]	A(A)	0.27(0.38)	NBT(EBL)	3.2(5.8)	A(A)	0.26(0.33)
Eagleson/Site Access[2]	A(A)	0.24(0.38)	NBT(EBL)	3.2(5.8)	A(A)	0.24(0.36)
Cope/Site Access	B(B)	10.2(11.9)	NBL(NBL)	1.9(2.5)	-	-

Note: Analysis of signalized intersections assumes a PHF of 0.95 and a saturation flow rate of 1800 veh/h/lane.
1. No auxiliary northbound left-turn lane
2. Auxiliary northbound left-turn lane provided

Table 2: Projected Intersection Capacity Analysis (Unsignalized Entrance Concept 3)

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
Eagleson/Fernbank	A(B)	0.56(0.70)	EBL(SBT)	13.8(10.9)	A(B)	0.43(0.63)
Eagleson/Cope/Cadence	D(D)	0.88(0.82)	EBL(EBL)	19.4(17.9)	A(A)	0.46(0.42)
Eagleson/Site Access	A(B)	9.3(10.3)	EBR(EBR)	0.3(0.7)	-	-
Cope/Site Access	A(B)	9.9(12.2)	NBL(NBL)	2.4(3.8)	-	-

Note: Analysis of signalized intersections assumes a PHF of 0.95 and a saturation flow rate of 1800 veh/h/lane.

As shown for both signalized and unsignalized alternatives, all study area intersections, on the whole, are projected to operate at LoS 'B' or better during weekday AM and PM peak hours. The eastbound left-turn at the Eagleson/Cope/ Cadence intersection is shown to approach capacity (LoS 'D'; v/c of 0.84 during the AM peak hour) assuming a full movement site connection to Eagleson Road. The same movement is shown to essentially be operating at capacity as a result of restricting the eastbound left-turn out of the site (LoS 'D'; v/c of 0.88 during the AM peak hour). As a mitigation measure, allocating a permitted and protected phase for the eastbound left-turn movement will result in a LoS 'A' for both alternatives with a v/c ratio of 0.37 and 0.43 in the AM and PM peak hours, respectively.

As previously mentioned, the TAC guidelines warrant an auxiliary left-turn lane at the Eagleson/Site access based on the traffic volumes during the PM peak hour, however the Synchro analysis indicates negligible change in the v/c ratio for the critical movement and the intersection 'as a whole'.

With regards to projected vehicle delay, the SYNCHRO analysis indicates approximately 6 seconds of average delay in the PM peak hour for vehicles using the northbound left-turn movement to access the site at the signalized intersection on Eagleson (assume no auxiliary turn lane is provided). The same movement in the unsignalized alternative has an average delay of less than 1 second in the critical PM peak hour.

Concerning projected queueing, the SYNCHRO analysis indicates the following assuming Concept 1 or 2 (signalized, full movement site driveway to/from Eagleson Road):

- northbound 95th percentile queue at the Eagleson/Cope/Cadence intersection – 45m AM peak hour and 40m PM peak hour;
    - both projections are considerably less than the available storage (between Cope and the site driveway) of 150m for Concept 1 or 225m for Concept 2;
    - northbound queue spillback is only expected to be a concern when the northbound volume on Eagleson approaches 1,300 veh/h (compared to 500 to 650 veh/h currently projected);
- southbound 95th percentile queue at the proposed Eagleson/site intersection - 10m AM peak hour and 40m PM peak hour;
    - both projections are considerably less than the available storage (between Cope and the site driveway) of 150m for Concept 1 or 225m for Concept 2;
    - southbound queue spillback is only expected to be a concern when the southbound volume on Eagleson approaches 1,800 veh/h (compared to just under 900 veh/h currently projected);
- eastbound 95th percentile queue at the Eagleson/Cope/Cadence intersection – 50m AM peak hour and 40m;
    - the 95th percentile queue length during the AM peak hour exceeds capacity (i.e. vehicles may not clear during one cycle);
    - as a mitigation measure, allocate a permitted and protected phase to the eastbound left-turn movement, which will allow vehicles to clear out in one cycle thus eliminating any potential spillback issue;
    - eastbound queue spillback is not a major concern due the long storage length available for the left-turning vehicles extending from the Cope/Site Access intersection to the adjacent signalized intersection at Eagleson.

The SYNCHRO analysis indicates the following queuing issues when considering Concept 3 (unsignalized site driveway connection to/from Eagleson Road, with the outbound left-turn from the site restricted):

- eastbound 95th percentile queue at the Eagleson/Cope/Cadence intersection – 60m AM peak hour and 65m PM peak hour;
    - the 95th percentile queue during the AM and PM peak hours exceed capacity (i.e. vehicles may not clear during one cycle), therefore spillback may occur between consecutive cycles;
    - as a mitigation measure, allocate a permitted and protected phase to the eastbound left-turn movement which will allow vehicles to clear out in one cycle thus eliminating any potential spillback issue;
    - eastbound queue spillback is not a major concern due the long storage length available for the left-turning vehicles extending from the Cope/Site Access intersection to the adjacent signalized intersection at Eagleson.

CONCLUSIONS AND RECOMMENDATIONS

Signalized Intersection – Full Movement Site Driveway

- Concept 1 does not satisfy the preferred spacing value of 215m, but the sight distance value of 135m is just satisfied. Based on the projected traffic volumes, there are no forecasted queueing issues that would result in spillback through adjacent signalized intersections.
- Concept 2 does satisfy both the preferred spacing value of 215m and the sight distance value of 135m. Based on the projected traffic volumes, there are no forecasted queueing issues that would result in spillback through adjacent signalized intersections.
- Both Concept 1 and 2 require the installation of unwarranted traffic signal control (40% warranted), as well as on-going maintenance agreements/costs.

- The more southerly placement of the driveway associated with Concept 2 is not centrally located within the site, and not conducive to ideal circulation within the site.
- All study area intersections, 'as a whole' and critical movements, are projected to operate at an excellent LoS 'B' with the exception of the eastbound left-turning movement at Eagleson/Cope/Cadence operating at LoS 'D' in the morning peak hour.
- Projected queue lengths along Eagelson Road are shorter than available storage present between adjacent intersections.

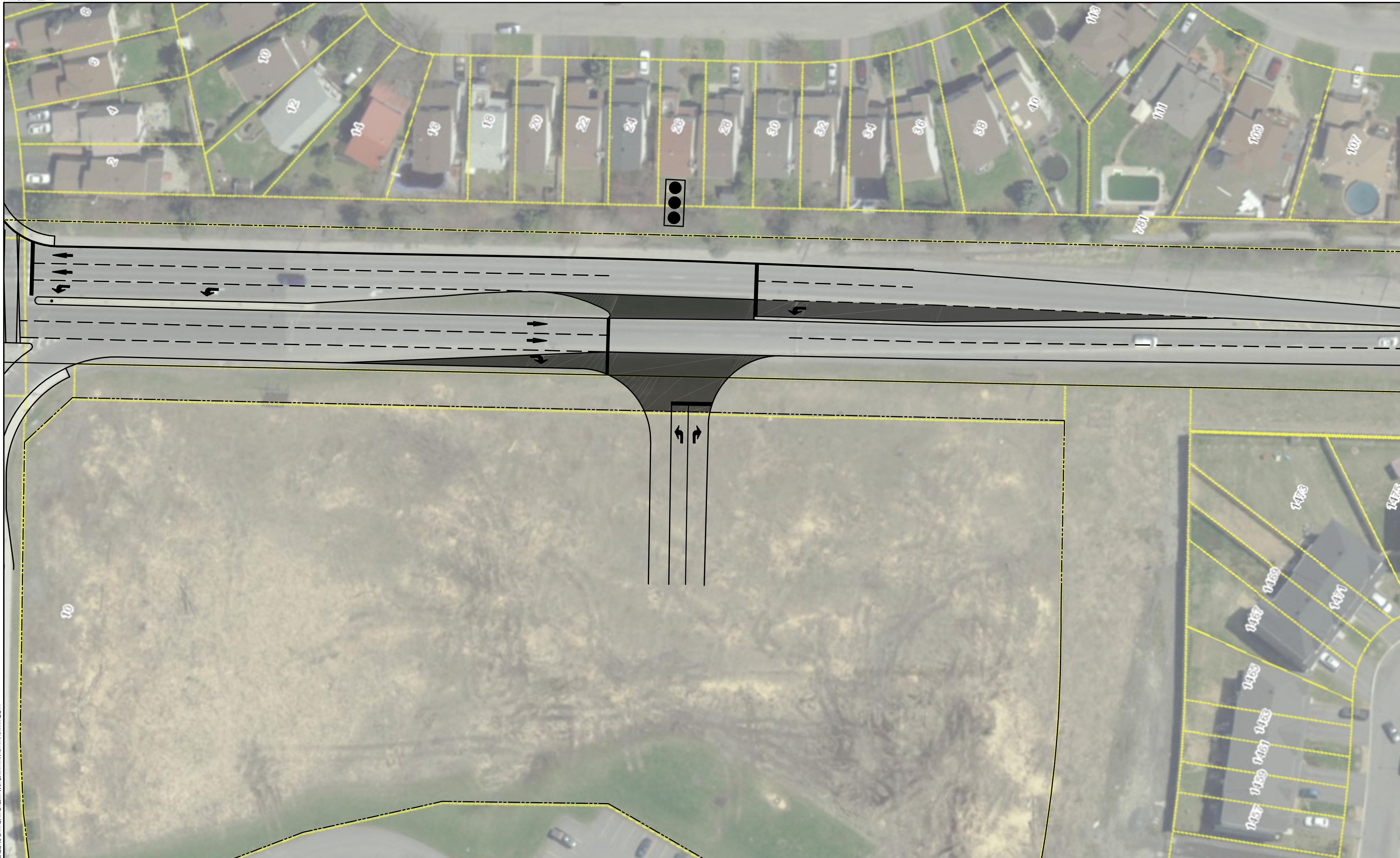
Unsignalized Intersection – Right-in / Right-out / Left-in Site Driveway

- Concept 3 provides inbound movements from both the north and south, as well as the outbound movement to the south. Site traffic destined northbound on Eagleson Road is estimated to be up to 55 veh/h during the critical PM peak hour.
- The eastbound left-turn restriction at the Eagleson site connection results in additional loading of the same movement at the Eagleson/Cope/Cadence intersection.
- All study area intersections, 'as a whole' and critical movements, are projected to operate at an excellent LoS 'B' with the exception of the eastbound left-turning movement at Eagleson/Cope/Cadence operating at LoS 'D' in the morning and afternoon peak hour.
- If no mitigation measures are implemented, the 95th percentile queue length during the afternoon peak hour is projected to be 65m.
    - A potential mitigation measure to reduce the queue length would be to allocate a permitted and protected phase to the eastbound left-turn movement.

Based on the foregoing, Concept 3a is considered the recommended configuration for the site vehicular connection to Eagleson Road. It eliminates the need to install an unwarranted traffic signal and provides very good connectivity to/from the south. Any traffic destined to the north (or east/west on Cope Drive) has a very viable alternative to travel northbound through the site to access Cope Drive and the signalized intersection to Eagleson Road. If a signalized option is selected for the Eagleson Road site driveway, no operational issues are forecasted.

Appendix A

Functional Concept Plans



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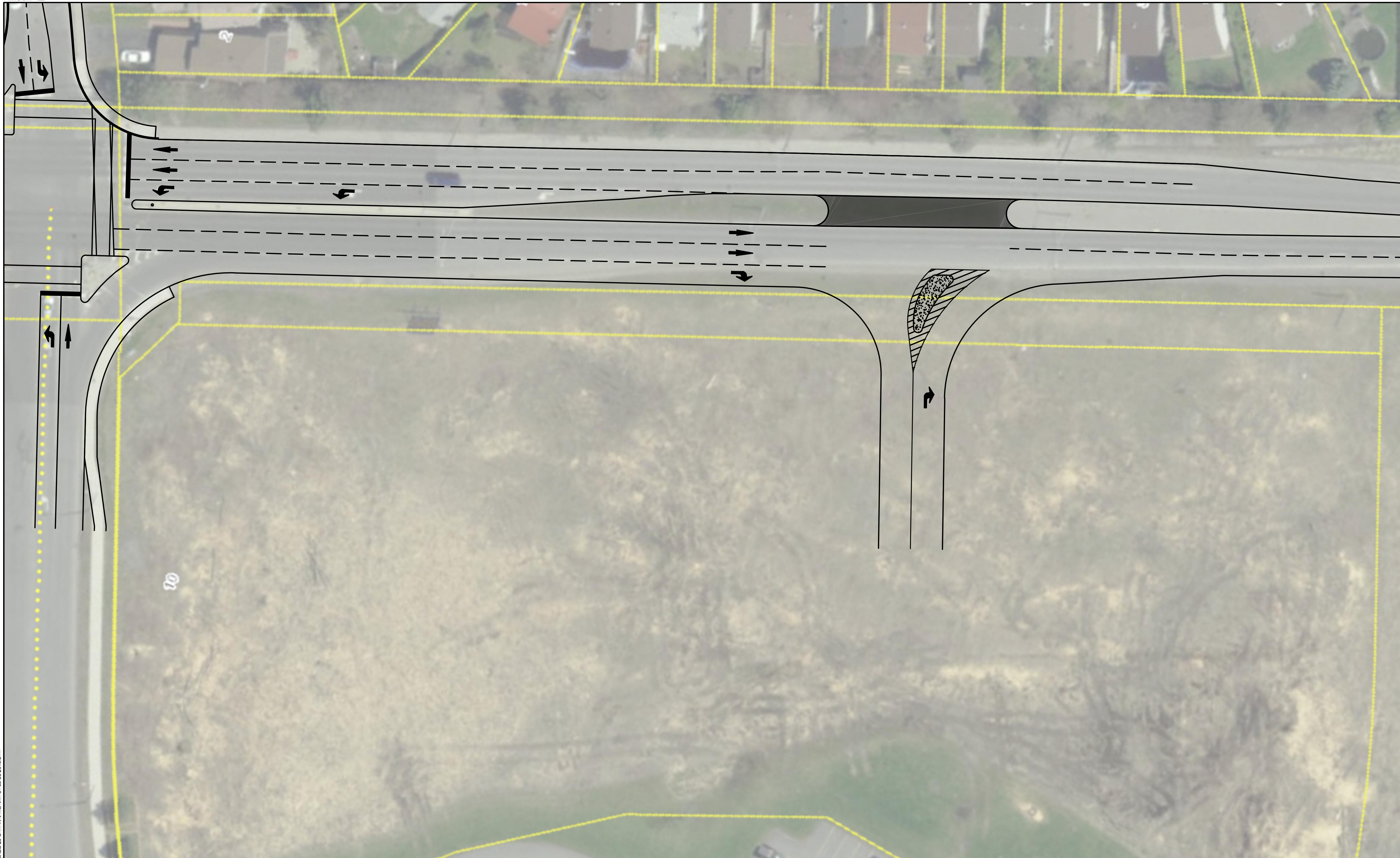

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NOTE: The location of utilities is approximate only, the exact location should be determined by consulting the municipal authorities and utility companies concerned. The contractor shall be responsible for the protection of utilities and shall be responsible for adequate protection from damage.

N

Legend

Area of Recommended Construction

Not to Scale

Drawing Description	Concept 3[illegible]: Unsignalized Connection (No Auxiliary Turn Lanes)	
Client: T[illegible]rt	Date: August 2016	Figure Number: 003
Project Number: 476013	Project Description: 20 C[illegible] Dr[illegible] R[illegible] Development	

Plot Date: Monday, August 08, 2016 10:31:05 AM

Last Saved: Wednesday, August 03, 2016 5:39:56 PM

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NOTE: The location of utilities is approximate only; the exact location should be determined by consultation with municipal authorities and utility companies concerned. The contractor shall prove the location of utilities and shall be responsible for adequate protection from damage.

Legend

Area of Recommended Construction

Not to Scale

Drawing Description	Concept 3[illegible]: Unsignalized Connection (With Auxiliary Turn Lane)
Client	T[illegible]rt
Date	August 2016
Figure Number	004
Project Number	476013
Project Description	20 C[illegible] Drive Retail Development

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Appendix N

SYNCHRO and MMLoS Analysis: Projected 2024 Conditions

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	143	189	169	619	898	210
Future Volume (vph)	143	189	169	619	898	210
Lane Group Flow (vph)	151	199	178	652	945	221
Turn Type	Prot	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Detector Phase	4	4	5	2	6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	5.0	10.0	10.0	10.0
Minimum Split (s)	27.0	27.0	11.0	16.0	27.0	27.0
Total Split (s)	27.0	27.0	15.0	93.0	78.0	78.0
Total Split (%)	22.5%	22.5%	12.5%	77.5%	65.0%	65.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.3	2.3	2.3	2.3	2.3	2.3
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Recall Mode	None	None	None	C-Max	C-Max	C-Max
Act Effct Green (s)	17.7	17.7	94.3	94.3	80.0	80.0
Actuated g/C Ratio	0.15	0.15	0.79	0.79	0.67	0.67
v/c Ratio	0.60	0.51	0.39	0.24	0.42	0.20
Control Delay	57.5	10.6	6.1	4.0	3.6	0.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	57.5	10.6	6.1	4.0	3.6	0.9
LOS	E	B	A	A	A	A
Approach Delay	30.8			4.4	3.1	
Approach LOS	C			A	A	
Queue Length 50th (m)	33.6	0.0	8.4	17.8	13.1	0.0
Queue Length 95th (m)	52.6	19.3	16.9	28.7	16.0	0.0
Internal Link Dist (m)	190.5			91.6	236.6	
Turn Bay Length (m)	175.0		35.0			40.0
Base Capacity (vph)	324	451	464	2663	2260	1084
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.47	0.44	0.38	0.24	0.42	0.20

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 29 (24%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Natural Cycle: 65	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.60	
Intersection Signal Delay: 7.7	Intersection LOS: A
Intersection Capacity Utilization 54.4%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 1: Eagleson & Fernbank

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	131	149	46	99	87	677	238	1071	170
Future Volume (vph)	131	149	46	99	87	677	238	1071	170
Lane Group Flow (vph)	138	241	48	235	92	761	251	1127	179
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	pm+pt	NA	Perm
Protected Phases		4		8	5	2	1	6	
Permitted Phases	4		8		2		6		6
Detector Phase	4	4	8	8	5	2	1	6	6
Switch Phase									
Minimum Initial (s)	10.0	10.0	10.0	10.0	5.0	10.0	5.0	10.0	10.0
Minimum Split (s)	28.5	28.5	28.5	28.5	11.0	32.0	11.0	32.0	32.0
Total Split (s)	41.0	41.0	41.0	41.0	12.0	54.0	25.0	67.0	67.0
Total Split (%)	34.2%	34.2%	34.2%	34.2%	10.0%	45.0%	20.8%	55.8%	55.8%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	3.5	3.5	3.5	3.5	2.3	2.3	2.3	2.3	2.3
Lost Time Adjust (s)	-2.5	-2.5	-2.5	-2.5	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag					Lead	Lag	Lead	Lag	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	None	C-Max	C-Max
Act Effct Green (s)	27.2	27.2	27.2	27.2	75.6	66.6	84.2	71.9	71.9
Actuated g/C Ratio	0.23	0.23	0.23	0.23	0.63	0.56	0.70	0.60	0.60
v/c Ratio	0.88	0.60	0.32	0.57	0.29	0.41	0.51	0.56	0.18
Control Delay	89.4	42.5	41.2	35.3	8.5	13.1	11.0	17.1	2.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	89.4	42.5	41.2	35.3	8.5	13.1	11.0	17.1	2.5
LOS	F	D	D	D	A	B	B	B	A
Approach Delay		59.6		36.3		12.6		14.5	
Approach LOS		E		D		B		B	
Queue Length 50th (m)	31.5	46.1	9.5	37.6	4.4	29.1	18.4	80.8	0.0
Queue Length 95th (m)	#55.4	64.9	18.9	56.7	10.3	34.6	37.0	117.3	10.4
Internal Link Dist (m)		206.5		75.8		117.8		169.6	
Turn Bay Length (m)	38.0		20.0		60.0		47.0		125.0
Base Capacity (vph)	213	537	207	541	322	1868	566	2030	980
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	0.65	0.45	0.23	0.43	0.29	0.41	0.44	0.56	0.18

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 14 (12%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 75	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.88	
Intersection Signal Delay: 21.5	Intersection LOS: C
Intersection Capacity Utilization 71.5%	ICU Level of Service C
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 2: Eagleson & Cope/Cadence

Lane Group	EBL	EBR	NBL	NBT	SBT
Lane Configurations					
Traffic Volume (vph)	79	16	45	737	1104
Future Volume (vph)	79	16	45	737	1104
Lane Group Flow (vph)	83	17	47	776	1180
Turn Type	Prot	Perm	Perm	NA	NA
Protected Phases	4			2	6
Permitted Phases		4	2		
Detector Phase	4	4	2	2	6
Switch Phase					
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	30.9	30.9	26.9	26.9	23.9
Total Split (s)	47.0	47.0	73.0	73.0	73.0
Total Split (%)	39.2%	39.2%	60.8%	60.8%	60.8%
Yellow Time (s)	3.3	3.3	3.7	3.7	3.7
All-Red Time (s)	2.6	2.6	2.2	2.2	2.2
Lost Time Adjust (s)	-1.9	-1.9	-1.9	-1.9	-1.9
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	C-Max	C-Max	C-Max
Act Effct Green (s)	15.8	15.8	100.2	100.2	100.2
Actuated g/C Ratio	0.13	0.13	0.84	0.84	0.84
v/c Ratio	0.37	0.08	0.14	0.27	0.42
Control Delay	50.8	17.4	4.1	2.8	2.4
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	50.8	17.4	4.1	2.8	2.4
LOS	D	B	A	A	A
Approach Delay	45.1			2.8	2.4
Approach LOS	D			A	A
Queue Length 50th (m)	18.6	0.0	1.4	13.1	19.9
Queue Length 95th (m)	30.0	6.0	6.1	31.3	27.5
Internal Link Dist (m)	83.5			204.3	60.9
Turn Bay Length (m)		30.0	35.0		
Base Capacity (vph)	607	554	329	2831	2825
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.14	0.03	0.14	0.27	0.42

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.42	
Intersection Signal Delay: 4.6	Intersection LOS: A
Intersection Capacity Utilization 54.5%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 5: Eagleson & Site

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	310	18	19	337	17	50
Future Volume (Veh/h)	310	18	19	337	17	50
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	326	19	20	355	18	53
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				144		
pX, platoon unblocked					1.00	
vC, conflicting volume			345		730	336
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			345		730	336
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		95	92
cM capacity (veh/h)			1214		383	706

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total	345	375	18	53
Volume Left	0	20	18	0
Volume Right	19	0	0	53
cSH	1700	1214	383	706
Volume to Capacity	0.20	0.02	0.05	0.08
Queue Length 95th (m)	0.0	0.4	1.1	1.8
Control Delay (s)	0.0	0.6	14.9	10.5
Lane LOS		A	B	B
Approach Delay (s)	0.0	0.6	11.6	
Approach LOS			B	

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	45.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	27	0	816	1094	74
Future Volume (Veh/h)	0	27	0	816	1094	74
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	28	0	859	1152	78
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				85	132	
pX, platoon unblocked	0.83	0.81	0.81			
vC, conflicting volume	1582	576	1230			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1016	0	804			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	97	100			
cM capacity (veh/h)	195	874	658			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	28	430	430	576	576	78
Volume Left	0	0	0	0	0	0
Volume Right	28	0	0	0	0	78
cSH	874	1700	1700	1700	1700	1700
Volume to Capacity	0.03	0.25	0.25	0.34	0.34	0.05
Queue Length 95th (m)	0.8	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	9.3	0.0	0.0	0.0	0.0	0.0
Lane LOS	A					
Approach Delay (s)	9.3	0.0		0.0		
Approach LOS	A					

Intersection Summary				
Average Delay	0.1			
Intersection Capacity Utilization	41.9%	ICU Level of Service		A
Analysis Period (min)	15			

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	175	177	149	527	480	137
Future Volume (vph)	175	177	149	527	480	137
Lane Group Flow (vph)	184	186	157	555	505	144
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases		4	2			6
Detector Phase	4	4	2	2	6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	27.0	27.0	16.0	16.0	27.0	27.0
Total Split (s)	27.0	27.0	53.0	53.0	53.0	53.0
Total Split (%)	33.8%	33.8%	66.3%	66.3%	66.3%	66.3%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.3	2.3	2.3	2.3	2.3	2.3
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	Max	Max	Max	Max
Act Effct Green (s)	15.8	15.8	49.2	49.2	49.2	49.2
Actuated g/C Ratio	0.22	0.22	0.67	0.67	0.67	0.67
v/c Ratio	0.50	0.39	0.28	0.24	0.22	0.13
Control Delay	29.9	6.5	7.3	5.5	5.4	1.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.9	6.5	7.3	5.5	5.4	1.5
LOS	C	A	A	A	A	A
Approach Delay	18.1			5.9	4.5	
Approach LOS	B			A	A	
Queue Length 50th (m)	22.2	0.0	6.9	12.4	11.2	0.0
Queue Length 95th (m)	39.4	13.5	20.7	26.0	23.5	5.9
Internal Link Dist (m)	344.8			208.3	204.5	
Turn Bay Length (m)	175.0		35.0			40.0
Base Capacity (vph)	535	606	558	2282	2282	1068
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.34	0.31	0.28	0.24	0.22	0.13

Intersection Summary	
Cycle Length: 80	
Actuated Cycle Length: 73	
Natural Cycle: 55	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.50	
Intersection Signal Delay: 8.0	Intersection LOS: A
Intersection Capacity Utilization 43.0%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 1: Eagleson & Fernbank

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	164	95	50	103	71	622	125	572	161
Future Volume (vph)	164	95	50	103	71	622	125	572	161
Lane Group Flow (vph)	173	160	53	233	75	700	132	602	169
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	pm+pt	NA	Perm
Protected Phases		4		8	5	2	1	6	
Permitted Phases	4		8		2		6		6
Detector Phase	4	4	8	8	5	2	1	6	6
Switch Phase									
Minimum Initial (s)	10.0	10.0	10.0	10.0	5.0	10.0	5.0	10.0	10.0
Minimum Split (s)	28.5	28.5	28.5	28.5	11.0	32.0	11.0	32.0	32.0
Total Split (s)	31.0	31.0	31.0	31.0	16.0	43.0	16.0	43.0	43.0
Total Split (%)	34.4%	34.4%	34.4%	34.4%	17.8%	47.8%	17.8%	47.8%	47.8%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	3.5	3.5	3.5	3.5	2.3	2.3	2.3	2.3	2.3
Lost Time Adjust (s)	-2.5	-2.5	-2.5	-2.5	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag					Lead	Lag	Lead	Lag	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	None	C-Max	C-Max
Act Effct Green (s)	23.2	23.2	23.2	23.2	53.7	44.6	56.7	48.1	48.1
Actuated g/C Ratio	0.26	0.26	0.26	0.26	0.60	0.50	0.63	0.53	0.53
v/c Ratio	0.83	0.35	0.20	0.49	0.14	0.42	0.28	0.33	0.19
Control Delay	61.7	22.3	26.2	22.9	6.3	15.8	8.4	14.4	3.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	61.7	22.3	26.2	22.9	6.3	15.8	8.4	14.4	3.0
LOS	E	C	C	C	A	B	A	B	A
Approach Delay		42.8		23.5		14.9		11.4	
Approach LOS		D		C		B		B	
Queue Length 50th (m)	27.1	16.8	6.9	23.0	4.1	45.0	8.3	33.0	0.0
Queue Length 95th (m)	#57.0	32.2	15.7	43.0	5.0	63.3	16.1	48.5	10.4
Internal Link Dist (m)		114.3		122.3		100.3		169.6	
Turn Bay Length (m)	38.0		20.0		60.0		47.0		125.0
Base Capacity (vph)	244	529	312	538	577	1669	500	1810	889
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	0.71	0.30	0.17	0.43	0.13	0.42	0.26	0.33	0.19

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 22 (24%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.83
Intersection Signal Delay: 18.6 — Intersection LOS: B
Intersection Capacity Utilization 63.2% — ICU Level of Service B
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Eagleson & Cope/Cadence

Lane Group	EBL	EBR	NBL	NBT	SBT
Lane Configurations					
Traffic Volume (vph)	91	20	53	649	605
Future Volume (vph)	91	20	53	649	605
Lane Group Flow (vph)	96	21	56	683	659
Turn Type	Prot	Perm	Perm	NA	NA
Protected Phases	4			2	6
Permitted Phases		4	2		
Detector Phase	4	4	2	2	6
Switch Phase					
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	30.9	30.9	26.9	26.9	26.9
Total Split (s)	31.0	31.0	59.0	59.0	59.0
Total Split (%)	34.4%	34.4%	65.6%	65.6%	65.6%
Yellow Time (s)	3.3	3.3	3.7	3.7	3.7
All-Red Time (s)	2.6	2.6	2.2	2.2	2.2
Lost Time Adjust (s)	-1.9	-1.9	-1.9	-1.9	-1.9
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	C-Max	C-Max	C-Max
Act Effct Green (s)	15.4	15.4	70.6	70.6	70.6
Actuated g/C Ratio	0.17	0.17	0.78	0.78	0.78
v/c Ratio	0.33	0.08	0.10	0.26	0.25
Control Delay	34.3	11.4	5.3	4.5	3.4
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	34.3	11.4	5.3	4.5	3.4
LOS	C	B	A	A	A
Approach Delay	30.2			4.5	3.4
Approach LOS	C			A	A
Queue Length 50th (m)	15.4	0.0	1.8	13.6	10.8
Queue Length 95th (m)	24.0	5.1	8.9	37.0	25.3
Internal Link Dist (m)	96.9			204.5	55.8
Turn Bay Length (m)		30.0	35.0		
Base Capacity (vph)	508	469	552	2657	2645
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.19	0.04	0.10	0.26	0.25

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.33	
Intersection Signal Delay: 6.0	Intersection LOS: A
Intersection Capacity Utilization 45.0%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 5: Eagleson & Site

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	277	21	22	313	13	39
Future Volume (Veh/h)	277	21	22	313	13	39
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	292	22	23	329	14	41
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				138		
pX, platoon unblocked						
vC, conflicting volume			314		678	303
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			314		678	303
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		97	94
cM capacity (veh/h)			1246		410	737

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total	314	352	14	41
Volume Left	0	23	14	0
Volume Right	22	0	0	41
cSH	1700	1246	410	737
Volume to Capacity	0.18	0.02	0.03	0.06
Queue Length 95th (m)	0.0	0.4	0.8	1.3
Control Delay (s)	0.0	0.7	14.1	10.2
Lane LOS		A	B	B
Approach Delay (s)	0.0	0.7	11.2	
Approach LOS			B	

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	46.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	33	0	740	593	91
Future Volume (Veh/h)	0	33	0	740	593	91
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	35	0	779	624	96
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				80	124	
pX, platoon unblocked	0.94	0.91	0.91			
vC, conflicting volume	1014	312	720			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	626	61	507			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	96	100			
cM capacity (veh/h)	392	906	964			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	35	390	390	312	312	96
Volume Left	0	0	0	0	0	0
Volume Right	35	0	0	0	0	96
cSH	906	1700	1700	1700	1700	1700
Volume to Capacity	0.04	0.23	0.23	0.18	0.18	0.06
Queue Length 95th (m)	0.9	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	9.1	0.0	0.0	0.0	0.0	0.0
Lane LOS	A					
Approach Delay (s)	9.1	0.0		0.0		
Approach LOS	A					

Intersection Summary				
Average Delay	0.2			
Intersection Capacity Utilization	27.3%	ICU Level of Service	A	
Analysis Period (min)	15			