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Traffic Brief Technical Memorandum

To: Niki Dwyer, Director of Development Services
Date: May 11, 2022
From: Basel Ansari P.Eng.; Austin Shih P.Eng.
Reference: 478279 – 01000

Subject: **254 Lake Ave Site Plan Application – Traffic Brief Technical Memorandum**

The following Traffic Brief memo has been prepared in support of a Site Plan Application, for a proposed development located at 254 Lake Ave in the Town of Carleton Place. Town staff requested the Traffic Brief to identify potential traffic implications triggered by the proposed development in the future, and to recommend appropriate mitigation if required.

Proposed Development

Escape Homes Consulting is proposing to construct four new quadplexes and a single detached dwelling unit, with a total of 17 residential units. The development will be located at 254 Lake Ave and is expected to reach full-buildout within five-years. The Site Plan illustrating the proposed development is provided in **Appendix A**. The local site context is illustrated in **Figure 1** below.

Figure 1: Local Site Context

The proposed development is anticipated to result in minimal impacts to the study area intersections. For the purposes of this memo, only the intersection of Lake/Mississippi will be analyzed based on existing conditions and the full-buildout horizon year (assumed 2027).

Existing and Future Conditions

Existing Conditions

Existing Road Network

Lake Ave is an east-west urban collector road that is under the jurisdiction of the Town of Carleton Place. The roadway extends from its eastern cul-de-sac terminus approximately 1 km east of McNeely Ave, to its western terminus at Boundary

Rd approximately 450 m west of Mississippi Rd. The roadway within the study area consists of a two-lane cross-section and posted speed limits of 40 km/h, with on-street parking permitted on the north side only.

Mississippi Rd is a north-south urban collector road that is under the jurisdiction of the Town of Carleton Place. The roadway extends from Highway 7 in the south to Lake Ave in the north, serving as an access to residential areas. The roadway consists of a two-lane cross section and has an unposted speed limit of 50 km/h.

Existing Active Transportation Facilities

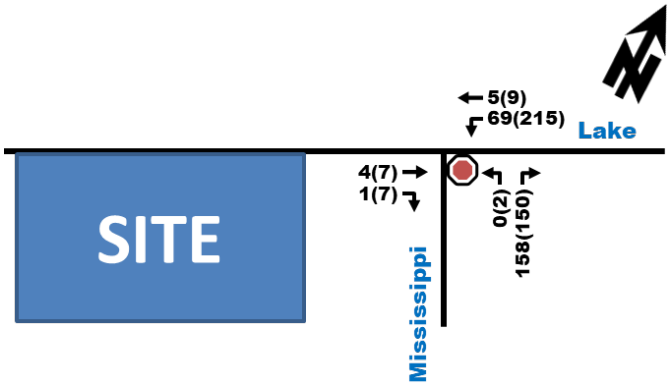
Sidewalks are currently provided on the west side of Mississippi Rd and on both sides of Lake Ave, east of Mississippi Rd. Lake Ave to the west of Mississippi Rd, sidewalks are provided on the north side of Lake Ave for approximately 75m, where they connect to the Riverside Park Trail. No pedestrian facilities are currently provided on Lake Ave along the frontage of the proposed development.

Existing Intersection Capacity Analysis

The development will be located near the southwest corner of the intersection of Lake/Mississippi, which is an unsignalized three-legged intersection. All approaches of the intersection consist of a single shared movement lane, with STOP control at the northbound movement only and free flow for the eastbound and westbound movements.

Existing 2017 traffic volumes at the intersection of Lake/Mississippi were obtained from the approved Bodnar Lands Transportation Impact Study (Stantec, May 2017). A 1% growth rate was applied to the 2017 volumes to estimate traffic volumes in 2022. It is important to note that this growth factor represents a conservative adjustment given the effects of the COVID-19 pandemic.

Figure 2: Existing Traffic Volumes (Increased to 2022)



The traffic volumes were then analyzed using industry standard intersection analysis software Synchro v11, with results summarized in **Table 1**. Detailed existing conditions Synchro reports are provided in **Appendix B**. Based on the Highway Capacity Manual (HCM) 6th edition, Level of Service (LOS) is used to evaluate traffic operations and range from LOS 'A', indicating low delays, to LOS 'F', indicating high delays. Additionally, a v/c ratio greater than 1.00 indicates heavily congested traffic operations. Typically, a LOS 'D' or better and a v/c ratio less than 1.00 are considered the acceptable threshold for intersection traffic operations.

Table 1: Existing Intersection Capacity Analysis (Synchro v11)

Intersection	Weekday AM Peak (PM Peak)		
	Intersection Delay		Max v/c Ratio
	LOS	Average Delay (s)	
Lake Ave/Mississippi Rd	A(A)	8.1(7.8)	0.16(0.16)
Note: Analysis of signalized intersections assumes a Peak Hour Factor of 0.90 and a saturation flow rate of 1900 veh/h/lane.			

As shown in **Table 1**, there are no traffic operational issues at the intersection of Lake/Mississippi in existing conditions, as the intersection operates at a LOS 'A' during both the morning and afternoon peak hours.

Queuing analysis was also completed to help understand existing congestion, particularly for the NBR and WBL movements, which are the most heavily used movements at the Lake/Mississippi intersection. The 95th percentile queue length indicate no significant traffic queues, with queues not exceeding 15m on either the NBR or WBL movements.

Planned Future Study Area Conditions

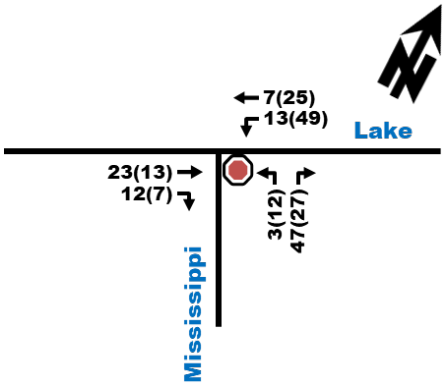
Carleton Place TMP

The Town of Carleton Place initiated its first ever Transportation Master Plan (TMP) in late 2020. The findings and recommendations of the TMP were presented to the Committee of the Whole on March 22, 2022. At this time, the draft TMP Report is in the 30-day review period. The TMP is a roadmap that will guide future planning and investments for the entire transportation network of the Town of Carleton Place to meet the needs of the current and future residents, visitors, and businesses. The TMP Report is expected to be finalized and approved later in 2022. This memo acknowledges the vision of a complete street, accommodating pedestrians and cyclists, along the entire length of Lake Ave. The proposed development is not expected to impinge this long-term plan.

Future Bodnar Lands Development

Bodnar Lands is a large-scale residential development proposed to take place in vacant lands west of Mississippi Rd, between Lake Ave and Highway 7. The development will consist of a total of 605 residential units, of which are 205 single family homes, 325 are townhomes and 72 are apartment units. Full buildout of the proposed development was estimated to be 2029. For the purpose of this traffic brief, it will be conservatively assumed that Bodnar Lands will already be at full buildout in conjunction with the full buildout of the development at 254 Lake Ave (i.e. 2027). Bodnar Lands anticipated site-generated traffic volumes at full buildout are illustrated in **Figure 3**.

Figure 3: Bodnar Lands Development Site-Generated Traffic



Trip Generation and Background Growth

Trip Generation

The proposed development will consist of a total of 17 new residential units within a single detached unit and four quadplex buildings. Peak hour vehicle trip generation rates were derived from the Institute of Transportation Engineers (ITE) Trip Generation Manual (10th edition), assuming "Single-Family Detached Housing" and "Multi-family Housing (Low-Rise)" land uses for the single residential unit and the quadplexes, respectively. The trip rates are presented in **Table 2**.

Table 2: Proposed Development Trip Rates

Land Use	Data Source	Vehicle Trip Rates	
		AM Peak (Vehicle Trips/h)	PM Peak (Vehicle Trips/h)
Single-Family Detached Housing	ITE 210	T = 0.74(du); T = 0.71(du) + 4.80;	T = 0.99(du); Ln(T) = 0.96Ln(du) + 0.20;
Multifamily Housing (Low-Rise)	ITE 220	T = 0.46(du); Ln(T) = 0.95Ln(du) - 0.51;	T = 0.56(du); Ln(T) = 0.89Ln(du) - 0.02;
Notes: *T = Average Vehicle Trip Ends* *du = Dwelling unit*			

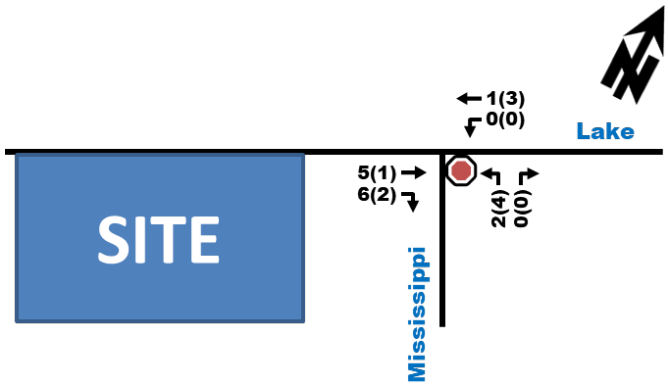
Using the trip rates provided in **Table 2**, the number of vehicle trips anticipated to be generated by the proposed development are summarized in **Table 3**.

Table 3: Proposed Development's Vehicle Trips

Land Use	Units	AM Peak (Person Trips/h)			PM Peak (Person Trips/h)		
		In	Out	Total	In	Out	Total
Single-Family Detached Housing	1	1	5	6	1	0	1
Multifamily Housing (Low-Rise)	16	2	6	8	6	3	9
Total		3	11	14	7	3	10

As shown in **Table 3**, the proposed development is forecasted to generate a combined total of up to 14 vehicle trips during weekday peak hours. The site-generated vehicle trips of the proposed development were then assigned to the road network as shown in **Figure 4**, where a traffic distribution of approximately 50% was assumed to/from Highway 7 via Mississippi Rd and 50% to/from Carleton Place via Lake Ave.

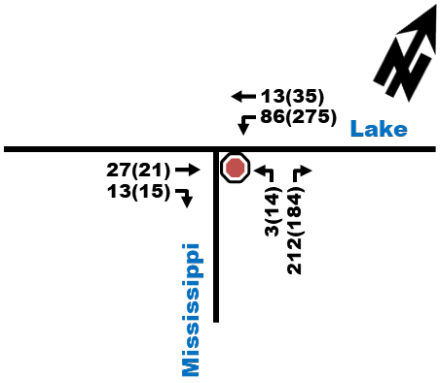
Figure 4: Proposed Development Site-Generated Traffic



Background Growth

The addition of the Bodnar Lands site-generated traffic volumes is expected to account for the majority of the expected future traffic growth at the intersection of Lake/Mississippi. To be conservative, the previously noted 1% growth rate was applied to all intersection movements up to the 2027 horizon year. The total future background 2027 traffic volume are illustrated in **Figure 5**, which includes both the Bodnar Lands development volumes in **Figure 3** and the assumed background growth rate.

Figure 5: Total Future Background 2027 Traffic Volumes



Projected Future Conditions

On-Site Design

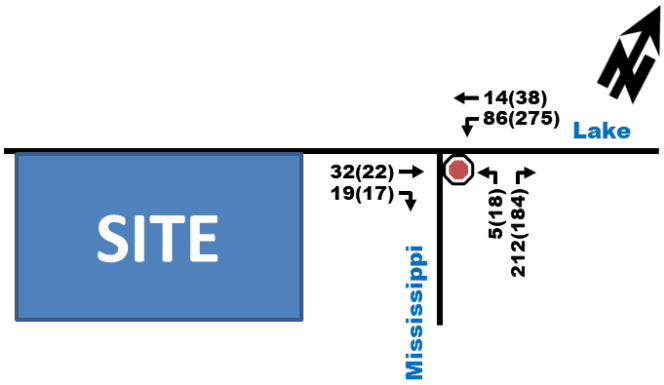
As shown on the Site Plan (**Appendix A**), three new driveways are proposed to provide vehicle access to the new residential units. The single detached dwelling unit will have a 3.0m wide driveway. For the four quadplexes, two 6.0m wide two-way driveways will provide access to the buildings, where each driveway will serve two quadplex buildings. For each quadplex building, 5 vehicle parking spaces will be provided in covered parking areas at the back of the buildings, with 1 visitor parking space outside each of the covered parking areas.

It is expected that garbage and fire services for the quadplexes will be limited to Lake Ave. Fire trucks typically require a minimum 6.0m road width, which is provided. However, the rear laneways are not expected to be connected, which will require trucks to reverse back onto Lake Ave if rear access is in fact needed.

Traffic Impacts

The total projected future traffic volumes at the intersection of Lake/Mississippi are illustrated in **Figure 6**, where the anticipated site-generated traffic volumes (**Figure 4**) are added to the total future background 2027 traffic volumes (**Figure 5**).

Figure 6: Projected Future Traffic Volumes at Full Buildout (2027)



Synchro analysis was then conducted using the future projected traffic volumes in **Figure 6**, with the analysis results summarized in **Table 4**. Detailed Synchro analysis reports have been provided in **Appendix C**.

Table 4: Projected Intersection Capacity Analysis (Synchro v11)

Intersection	Weekday AM Peak (PM Peak)		
	Intersection Delay		Max v/c Ratio
	LOS	Average Delay (s)	
Lake Ave/Mississippi Rd	A(A)	7.5(7.9)	0.24(0.26)
Note: Analysis of signalized intersections assumes a PHF of 0.90 and a saturation flow rate of 1900 veh/h/lane.			

The analysis results indicate similar intersection delays as existing conditions, with slightly higher max v/c ratios. The intersection of Lake/Mississippi is anticipated to continue operating at LOS 'A' during both the morning and afternoon peak hours. Therefore, the proposed development will have negligible impact on the long-term road network operations.

Additionally, queuing analysis indicated that a 95th percentile queue length did not exceed 25m (or roughly 4 to 5 passenger cars) on either the NBR or WBL movements during peak hours – the most heavily used movements at the Lake/Mississippi intersection. These results are slightly higher compared to existing conditions, but are well within acceptable levels.

Conclusions

Based on the information provided in this traffic brief, the proposed development can be accommodated by the adjacent road network in the future. A summary of the general findings and conclusions is presented below:

- A new residential development is proposed to be located at 254 Lake Ave in the Town of Carleton Place. The development will consist of 1 single detached dwelling unit and 16 quadplex units, for a total of 17 units.
- A total of 24 vehicle parking spaces are proposed for the quadplex buildings, where 5 covered parking spaces and 1 visitor parking space will be provided for each of the quadplex buildings.
- Full buildout of the proposed development is assumed to be within five-years (i.e. 2027). The development is anticipated to generate up to 14 new vehicle trips during the weekday peak hours.
- Synchro analysis of existing traffic operations at Lake/Mississippi indicate the intersection operates at LOS 'A' during peak hours. Queuing analysis indicate the vehicle queues do not generally exceed 15m on the NBR and WBL movements during the peak hours. Both results suggest there are no vehicular capacity issues.
- Local conditions are expected to change with construction of the Bodnar Lands residential development. The Bodnar Lands development was assumed to be fully constructed and occupied by 2027.
- A 1% background growth rate was conservatively applied to all movements at the intersection of Lake/Mississippi to account for any potential additional traffic growth.
- A 3.0m wide driveway will be provided for the single detached unit, while two 6.0m wide two-way driveways will provide access to the four quadplex buildings, which meet minimum width requirements for fire trucks. However, it is expected that garbage and fire services for the quadplexes will be limited to Lake Ave.
- Projected future Synchro analysis of the intersection of Lake/Mississippi indicate the intersection will continue to operate at LOS 'A' in the future. Queuing analysis also indicate future vehicle queues are not expected to exceed 25m on the NBR and WBL movements during peak hours, which is well within acceptable limits. These results suggest the intersection will continue to operate well in the future with anticipated traffic growth.

Appendix A – Site Plan

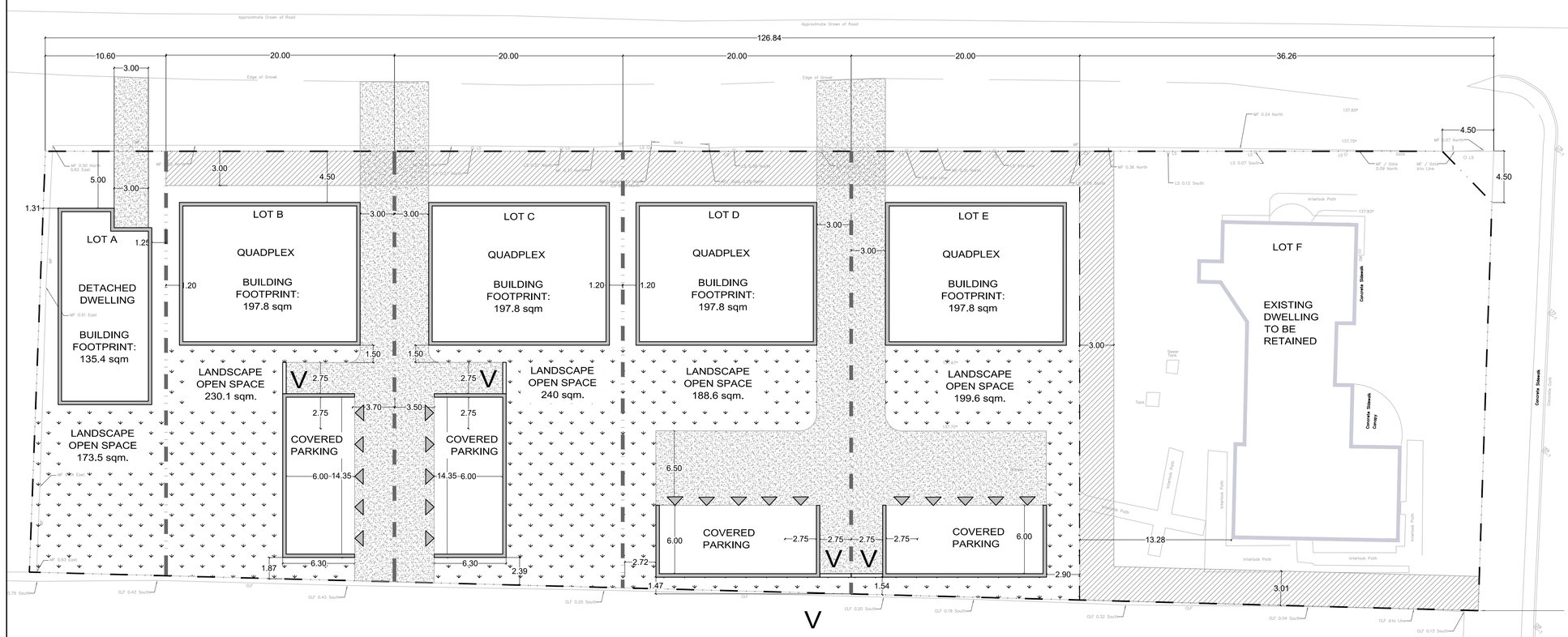
Zoning Table

	Single Detached Dwelling		Quadplex				
	Required	Provided - Lot A	Required	Provided - Lot B	Provided - Lot C	Provided - Lot D	Provided - Lot E
Lot Area (min.)	Nil	416.51	Nil	749.32	759.475	770.19	781.1
Lot coverage (max)	80%	32.50%	60%	26.4	26.04	25.68	25.32
Lot frontage (min)	10.6m	10.6m	15m	20m	20m	20m	20m
Front yard buildin within area	4.5-7.5m	5m	4.5-7.5	4.5m	4.5m	4.5m	4.5m
Interior side yard (min)	1.2m	1.2m	1.2m	1.2m, 1.5m			
Rear yard depth (min)	7.5m	14.9m	9m	20.2m	21.1m	21.3m	21.7m
Useable landscaped open space in the rear yard (min)	50m2	173.5m2	30m2 per dwelling unit, total 120sqm	219.5m2	226.5m2	163.5m2	172.8m2
Building height (max)	11m	-	14m	-	-	-	-
Dwelling unit area (min)	92.9m2	135.4m2	N/A	N/A	N/A	N/A	N/A
No encroachment area from front lot line	2.5m	2.5m	2.5m	2.5m			
Parking Spaces	2 per dwelling unit, one of which may be provided within the garage	2	1.25 per dwelling unit	5	5	5	5
Driveway	Max. 45% of lot frontage	28.30%	N/A	N/A	N/A	N/A	N/A
Main garage foundation	6m from the front lot line	6.7m	N/A	N/A	N/A	N/A	N/A
Visitor parking	-	-	Min. 1 vistor parking space	1	1	1	1

KEY PLAN
N.T.S.

OPEN SPACE

LAKE AVENUE WEST



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Legend

- LANDSCAPE OPEN SPACE
- ASPHALT
- COMMON ELEMENTS CONDOMINIUM
- PROPERTY LINE
- LIMIT OF PARCEL
- V — VISITOR PARKING

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Revision		By	Appd.	YY.MM.DD
File Name: 160410347		CA	SS	SS	21.12.20
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Permit-Seal

Client/Project
ESCAPE HOMES

254 LAKE AVENUE WEST

CARLETON PLACE, ON

Title
PRELIMINARY CONCEPT PLAN

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Appendix B – Existing Conditions Synchro Analysis

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	4	1	69	5	0	158
Future Volume (Veh/h)	4	1	69	5	0	158
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	4	1	77	6	0	176
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			5		164	4
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			5		164	4
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			95		100	84
cM capacity (veh/h)			1616		787	1079

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	5	83	176
Volume Left	0	77	0
Volume Right	1	0	176
cSH	1700	1616	1079
Volume to Capacity	0.00	0.05	0.16
Queue Length 95th (m)	0.0	1.1	4.4
Control Delay (s)	0.0	6.8	9.0
Lane LOS		A	A
Approach Delay (s)	0.0	6.8	9.0
Approach LOS			A

Intersection Summary			
Average Delay	8.1		
Intersection Capacity Utilization	27.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	7	7	215	9	2	150
Future Volume (Veh/h)	7	7	215	9	2	150
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	8	8	239	10	2	167
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			16		500	12
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			16		500	12
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			85		100	84
cM capacity (veh/h)			1602		451	1069

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	16	249	169
Volume Left	0	239	2
Volume Right	8	0	167
cSH	1700	1602	1052
Volume to Capacity	0.01	0.15	0.16
Queue Length 95th (m)	0.0	4.0	4.3
Control Delay (s)	0.0	7.4	9.1
Lane LOS		A	A
Approach Delay (s)	0.0	7.4	9.1
Approach LOS			A

Intersection Summary			
Average Delay	7.8		
Intersection Capacity Utilization	35.1%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix C – Future Conditions Synchro Analysis

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	32	19	86	14	5	212
Future Volume (Veh/h)	32	19	86	14	5	212
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	36	21	96	16	6	236
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			57		254	46
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			57		254	46
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			94		99	77
cM capacity (veh/h)			1547		689	1023

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	57	112	242
Volume Left	0	96	6
Volume Right	21	0	236
cSH	1700	1547	1011
Volume to Capacity	0.03	0.06	0.24
Queue Length 95th (m)	0.0	1.5	7.1
Control Delay (s)	0.0	6.5	9.7
Lane LOS		A	A
Approach Delay (s)	0.0	6.5	9.7
Approach LOS			A

Intersection Summary			
Average Delay		7.5	
Intersection Capacity Utilization		32.2%	ICU Level of Service
Analysis Period (min)		15	

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	22	17	275	38	18	184
Future Volume (Veh/h)	22	17	275	38	18	184
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	24	19	306	42	20	204
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			43		688	34
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			43		688	34
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			80		94	80
cM capacity (veh/h)			1566		332	1040

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	43	348	224
Volume Left	0	306	20
Volume Right	19	0	204
cSH	1700	1566	873
Volume to Capacity	0.03	0.20	0.26
Queue Length 95th (m)	0.0	5.5	7.8
Control Delay (s)	0.0	7.1	10.5
Lane LOS		A	B
Approach Delay (s)	0.0	7.1	10.5
Approach LOS			B

Intersection Summary			
Average Delay	7.9		
Intersection Capacity Utilization	42.9%	ICU Level of Service	A
Analysis Period (min)	15		