

3285, 3288 & 3305 Borrisokane Road Transportation Impact Assessment

Step 1 Screening Report

Step 2 Scoping Report

Step 3 Forecasting Report

Step 4 Strategy Report

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PN: 2018-04

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DRAFT

1 Screening

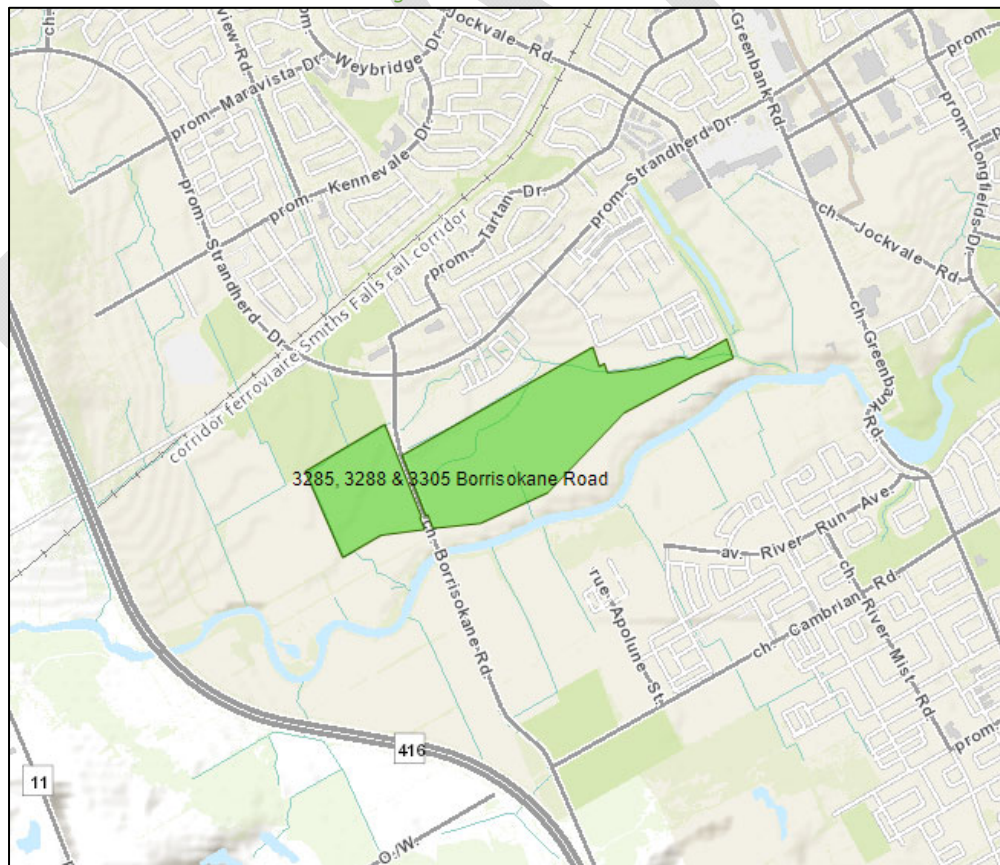
This study has been prepared according to the City of Ottawa's 2017 Transportation Impact Assessment (TIA) Guidelines. Accordingly, a Step 1 Screening Form has been prepared and is included as Appendix A, along with the Certification Form for TIA Study PM. As shown in the Screening Form, a TIA is required. As this is a zoning bylaw amendment and plan of subdivision application, the Design Review and Network Impact Components will be completed.

2 Existing and Planned Conditions

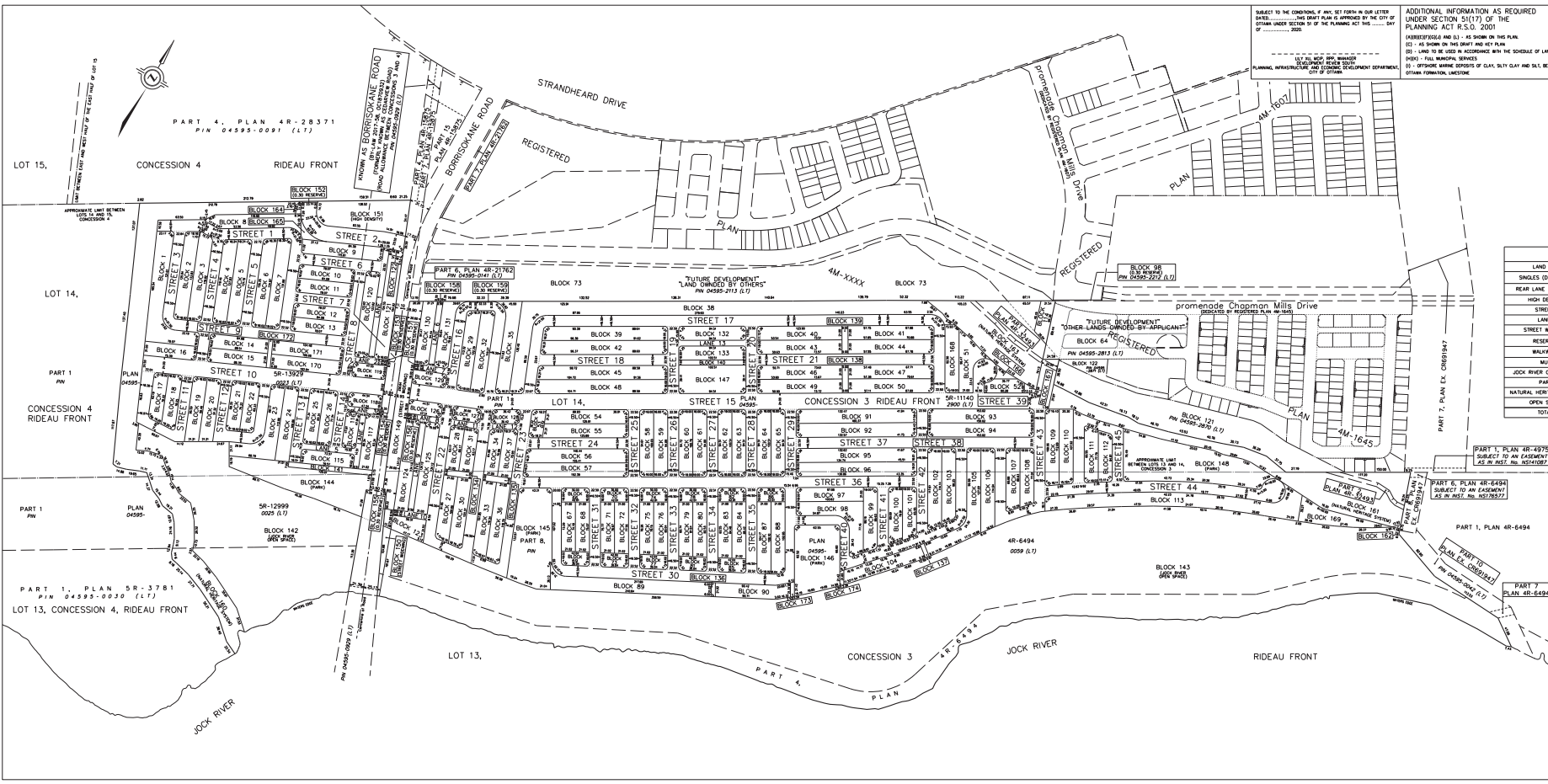
2.1 Proposed Development

The proposed development is composed 3285 and 3305 Borrisokane Road and a portion of 3288 Borrisokane Road. These properties are currently greenfield lots that are currently zoned DR – Development Reserve Zone and are within both the Nepean South 8 and South 10 secondary plan areas. The proposed residential development includes a mixture of detached homes, townhouses (row and rear lane) and a high-density block totalling approximately 1,500 units, with split of 700 single detached homes, 750 townhomes and 50 apartments. The anticipated full build-out and occupancy horizon is 2029. Access to the proposed development will include a collector road intersection with Borrisokane Road, a connection to the extension of Chapman Mills Drive, and the future intersection of the BRT and Borrisokane Road. Figure 1 illustrates the Study Area Context and Figure 2 illustrates the proposed concept plan.

Figure 1: Area Context Plan

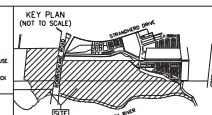


Source: <http://maps.ottawa.ca/geoOttawa/> Accessed: May 24, 2020



SUBJECT TO THE CONDITIONS, IF ANY, SET FORTH IN OUR LETTER DATED _____ THIS DRAFT PLAN IS APPROVED BY THE CITY OF OTTAWA UNDER SECTION 51(17) OF THE PLANNING ACT, R.S.O. 2001 (1990) _____ 2000

PLANNING, INFRASTRUCTURE AND ECONOMIC DEVELOPMENT DEPARTMENT
CITY OF OTTAWA



DRAFT PLAN OF SUBDIVISION
PART OF LOTS 13 AND 14
CONCESSION 3 (RIDEAU FRONT)
PART OF LOTS 13 AND 14
CONCESSION 4 (RIDEAU FRONT)
GEOGRAPHIC TOWNSHIP OF NEPEAN
CITY OF OTTAWA
SCALE 1:2000

J.D. BARNES LIMITED
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METRIC DIMENSIONS AND CONVERSION SYSTEMS: DIMENSIONS IN METERS

SCHEDULE OF LAND USE		
LAND USE	BLOCKS	AREA (ha.)
SINGLES (DETACHED)	1 TO 114, BOTH INCLUSIVE, AND 115 TO 133, BOTH INCLUSIVE	28.04
REAR LANE TOWNHOME	115 TO 133, BOTH INCLUSIVE	3.24
HIGH DENSITY	151	0.63
STREETS	STREET 1 TO 43, BOTH INCLUSIVE	18.64
LANES	LANES 1 TO 13, BOTH INCLUSIVE	0.86
STREET WIDENING	149 AND 150	0.74
RESERVES	152 TO 156, BOTH INCLUSIVE	0.0036
ALLEYS	134 TO 138, BOTH INCLUSIVE, AND 139, 142 AND 143	0.224
MUP	149 AND 141	0.174
JOCK RIVER OPEN SPACE	142 AND 143	25.61
PARK	144 TO 148, BOTH INCLUSIVE	4.01
NATURAL HERITAGE SYSTEM	149 TO 163, BOTH INCLUSIVE	5.64
OPEN SPACE	164 TO 169, BOTH INCLUSIVE	0.554
TOTAL:		68.14

OWNER'S CERTIFICATE
I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LAND TO BE SUBDIVIDED AS SHOWN ON THIS DRAFT PLAN OF SUBDIVISION ARE CORRECTLY SHOWN.

SURVEYOR'S CERTIFICATE
I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LAND TO BE SUBDIVIDED AS SHOWN ON THIS DRAFT PLAN OF SUBDIVISION ARE CORRECTLY SHOWN.

PRELIMINARY
CITY OF OTTAWA
OCTOBER 14, 2000

J.D. BARNES LIMITED
1000 SHEPPARD AVENUE EAST, SUITE 100
OTTAWA, ONTARIO K1T 4R1
TEL: 416-461-1111 FAX: 416-461-1112

2.2 Existing Conditions

2.2.1 Area Road Network

Borrisokane Road: Borrisokane Road is a City of Ottawa arterial road with a two-lane rural cross-section including gravel shoulders and an 80 km/h posted speed limit along the frontage of the site. South Cambrian Road, Borrisokane Road becomes a collector road, the cross section does not change. The Ottawa Official Plan reserves a 37.5 metre right of way through the subject site.

Strandherd Drive: Strandherd Drive is a City of Ottawa Arterial road with a two-lane rural cross-section including paved shoulders and an 80 km/h posted speed limit within the study area. The Ottawa Official Plan reserves a 44.5 metre right of way. No sidewalks are provided along the section of Strandherd Drive within the study area.

Cambrian Road: Cambrian Road is a City of Ottawa arterial road with a two-lane rural cross-section including gravel shoulders and a 70 km/h posted speed limit. The Ottawa Official Plan reserves a 37.5 metre right of way from Cedarview (now Borrisokane Road) to Jockvale Road.

Greenbank Road: Greenbank Road is a City of Ottawa arterial road with a four-lane urban cross-section, transitioning to two-lanes south of Jockvale Road. Sidewalks are provided on the east side of the road and transition to a paved shoulder on the east side. The posted speed limit is 60 km/h. The Ottawa Official Plan reserves a 37.5 metre right of way between Strandherd Drive and future Chapman Mills Drive, and 44.5 metre south of Chapman Mills Drive.

Chapman Mills Drive: The future extension of Chapman Mills Drive will abut the previously approved Phase 1 of the Conservancy Development. A section of the planned future collector road portion of Chapman Mills Drive is planned as part of the construction of the development to the North of Phase 1 of the Conservancy development. This north-south collector road will serve as the connection for the first phases of the overall Conservancy.

Kennevale Drive: Kennevale Road is a City of Ottawa collector road with a urban two-lane cross-section permitting parking on both sides of the roadway. Sidewalks are provided on both sides of the road and the posted speed limit is 40 km/h. The right-of-way is 20.0m.

Dealership Way: Dealership Way is a City of Ottawa collector road with a urban two-lane cross-section permitting parking on both sides of the roadway. Sidewalks are provided on both sides of the road and the posted speed limit is 40 km/h. The right-of-way is 24.0m.

Tartan Drive: Tartan Drive is a City of Ottawa collector road with a two-lane rural cross-section including gravel shoulders and a 40 km/h posted speed limit, near Strandherd Drive.

Fraser Fields Way: Fraser Fields Way is a City of Ottawa local road with a two-lane urban cross-section including sidewalks on both sides of the road and a 50 km/h unposted speed limit.

2.2.2 Existing Intersections

<p><i>Strandherd Drive at Kennevale Drive/Dealership Way</i></p>	<p>The intersection of Strandherd Drive and Kennevale Drive/Dealership Way is a signalized intersection. The northbound, southbound and eastbound approaches consist of an auxiliary left-turn lane, through lane and an auxiliary right-turn lane. The westbound approach consists of an auxiliary left-turn lane and a shared through/right-turn lane. Bike pockets are provided on the north and south bound approaches. No turn restrictions are present.</p>
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Strandherd Drive at Borrisokane Road/Tartan Drive

The intersection of Strandherd Drive at Borrisokane Road/Tartan Drive is a signalized intersection with left turn auxiliary lanes on all approaches. Crosswalks are present on each leg of the intersection; however, these do not connect to sidewalks. West of the intersection an at grade cycling lane is provided alongside an auxiliary right turn lane into an adjacent development. Further east and west of the intersection paved shoulders are provided. No turn restrictions are present.

Strandherd Drive at Fraser Fields Way/Chapman Mills Drive

The intersection of Strandherd Drive at Fraser Fields Way/Chapman Mills Drive is an unsignalized intersection. The eastbound approach consists of an auxiliary left-turn lane and shared through/right-turn lane, the westbound approach consists of a through lane and auxiliary right-turn lane, the southbound approach consists of a shared left-turn/right-turn lane and the northbound approach consists of a right-out only. The temporary median on the south side of the intersection restricts left-turns in and out of Chapman Mills Drive. A westbound auxiliary left-turn lane has been gored out as an interim measure.

Strandherd Drive at Greenbank Road

The intersection of Strandherd Dive and Greenbank Road is a signalized intersection. The eastbound and westbound approaches consist of an auxiliary left-turn lane, two through lanes and an auxiliary right-turn lane. The northbound approach consists of dual left-turn lanes, a through lane and shared through/right-turn lane, and the southbound approach consists of dual left-turn lanes, a two through lanes and an auxiliary right-turn lane. No turn restrictions are present.

Cambrian Road at Borrisokane Road

The intersection of Cambrian Road at Borrisokane Road is an unsignalized intersection with no auxiliary lanes. The intersection is stop controlled on the Cambrian Road (minor) leg of the road. No crosswalks are present, and none of the legs of the intersection have sidewalks. No cycling facilities are present on any of the legs of the intersection. No turn restrictions are present.

Chapman Mills Drive at Point Prim Crescent

The intersection of Chapman Mills Drive at Point Prim Crescent is a minor stop-controlled intersection. Chapman Mills Drive dead ends at this location and the northbound approach has the stop control. No turn restrictions are present.

Chapman Mills Drive at Chapman Mills Drive

The intersection of Chapman Mills Drive at Chapman Mills Drive is a minor stop-controlled intersection. No turn restrictions are present.

2.2.3 Existing Driveways

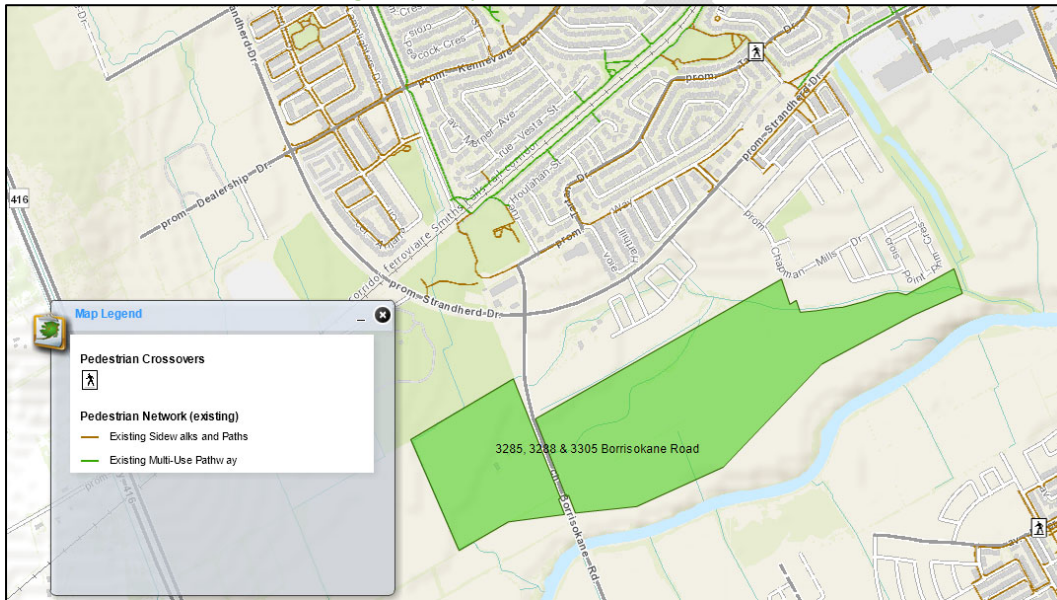
There are existing field entrances along Borriskane Road, and private driveways for 3231 Borriskane Road north of the site and 3288 Borriskane Road that will be removed once the subject site is developed.

2.2.4 Cycling and Pedestrian Facilities

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

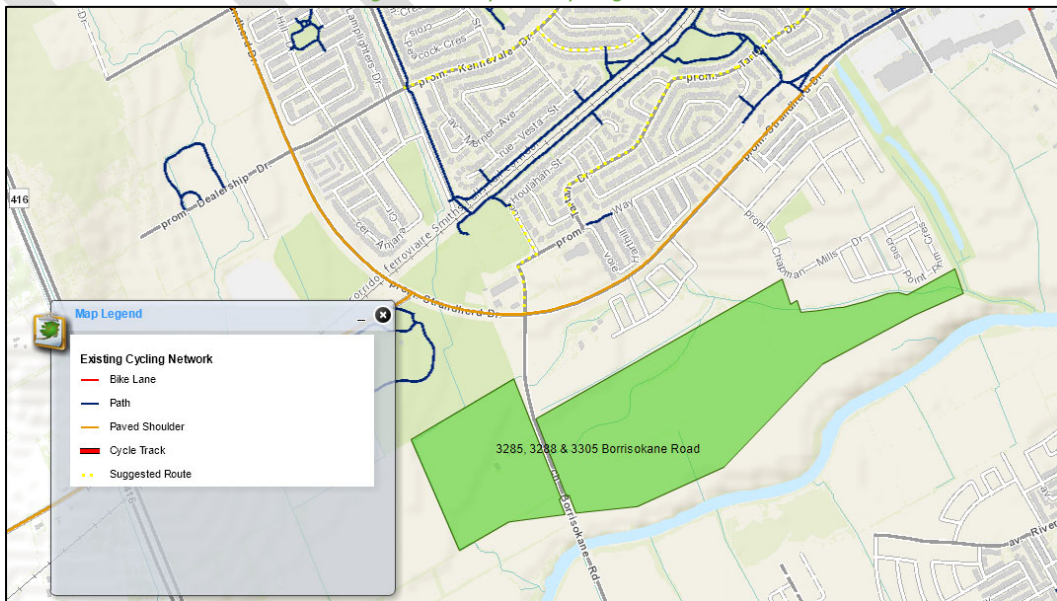
Strandherd Drive is noted on the City of Ottawa’s Existing Cycling Network as a “Paved Shoulder”. No pedestrian facilities are provided along either Strandherd Drive or Borriskane Road. Both networks are developing in the area and will include sidewalks and cycling tracks along Strandherd Drive and Chapman Mills Drive, and future pathways are planned along the Jock River and Chapman Mills BRT corridor.

Figure 3: Study Area Pedestrian Facilities



Source: <http://maps.ottawa.ca/geoOttawa/> Accessed: May 24, 2020

Figure 4: Study Area Cycling Facilities



Source: <http://maps.ottawa.ca/geoOttawa/> Accessed: May 24, 2020

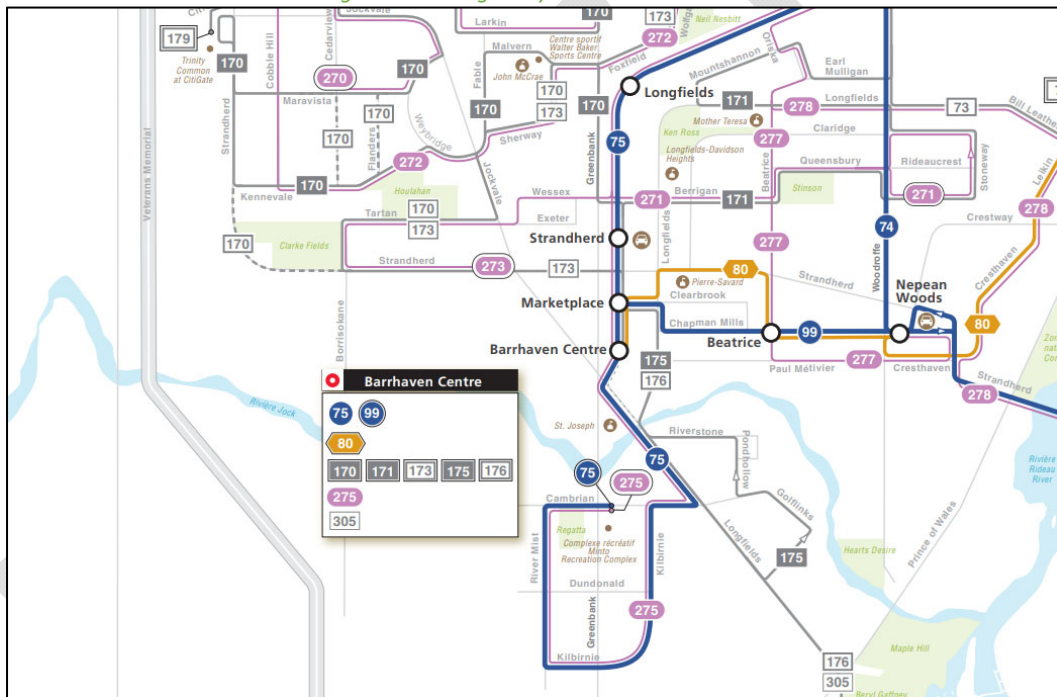
2.2.5 Existing Transit

Within the study area, the routes #170, 173 and 273 provide service within 400 metres of the proposed site. Stops are located on Strandherd Drive at Andora Avenue, Madrid Avenue and Chapman Mills Drive, and on Tartan Drive north of Strandherd Drive. The frequency of these routes within proximity of the proposed site currently are:

- Route #170 – 30-minute service all day
- Route #173 – 1-hour service during the day (assumed reduced service from typical 30-minute service during peak hour)
- Route #273 – Peak hour service only, with trips starting at 6:00 to 8:35 AM every 15-20 minutes to downtown, returned 3:30 to 6:25 PM to Strandherd Drive and Jockvale Road

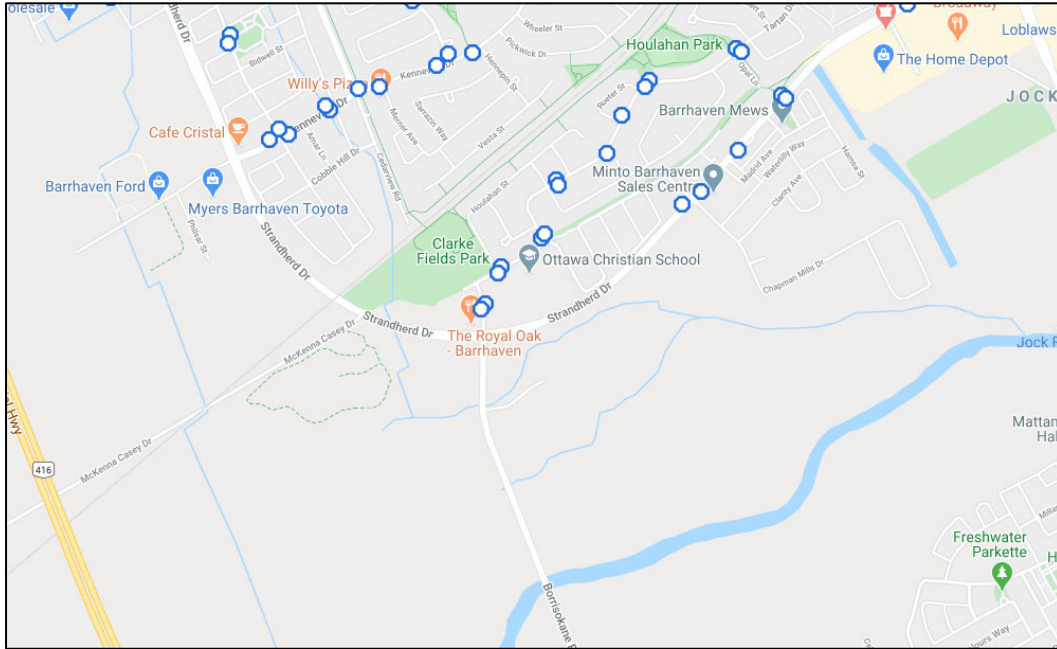
Figure 5 illustrates the transit system map in the study area and Figure 6 illustrates nearby transit stops.

Figure 5: Existing Study Area Transit Service



Source: <http://www.octranspo.com/> Accessed: May 24, 2020

Figure 6: Existing Study Area Transit Stops



Source: <http://www.octranspo.com/> Accessed: May 24, 2020

2.2.6 Existing Area Traffic Management Measures

There are no existing area traffic management measures within the Study Area.

2.2.7 Existing Peak Hour Travel Demand

Existing turning movement counts were acquired from the City of Ottawa and from previous studies in the Study Area for the existing intersections. The intersections were also balanced and the Minto Harmony and Caivan Conservancy Phase 1 developments have been included to account for additional turning movements at Chapman Mills Drive and volumes distributed from Strandherd Drive. Table 1 summarizes the intersection count dates.

Table 1: Intersection Count Date

Intersection	Count Date
Kennevale Drive at Strandherd Drive	January 18, 2018
Borrisokane Road at Strandherd Drive	January 18, 2018
Fraser Fields Way at Strandherd Drive	January 18, 2018
Greenbank Road at Strandherd Drive	August 16, 2016
Borrisokane Road at Cambrian Road	February 15, 2018

Figure 7 illustrates the existing traffic counts and Table 2 summarizes the existing intersection operations. The level of service for signalized intersections is based on the TIA Guidelines for volume to capacity ratio of the lane movements and HCM average delay for the overall intersection, and HCM average delay for unsignalized intersections. Detailed turning movement count data is included in Appendix B and the Synchro worksheets are provided in Appendix C.

Figure 7: Existing Traffic Counts

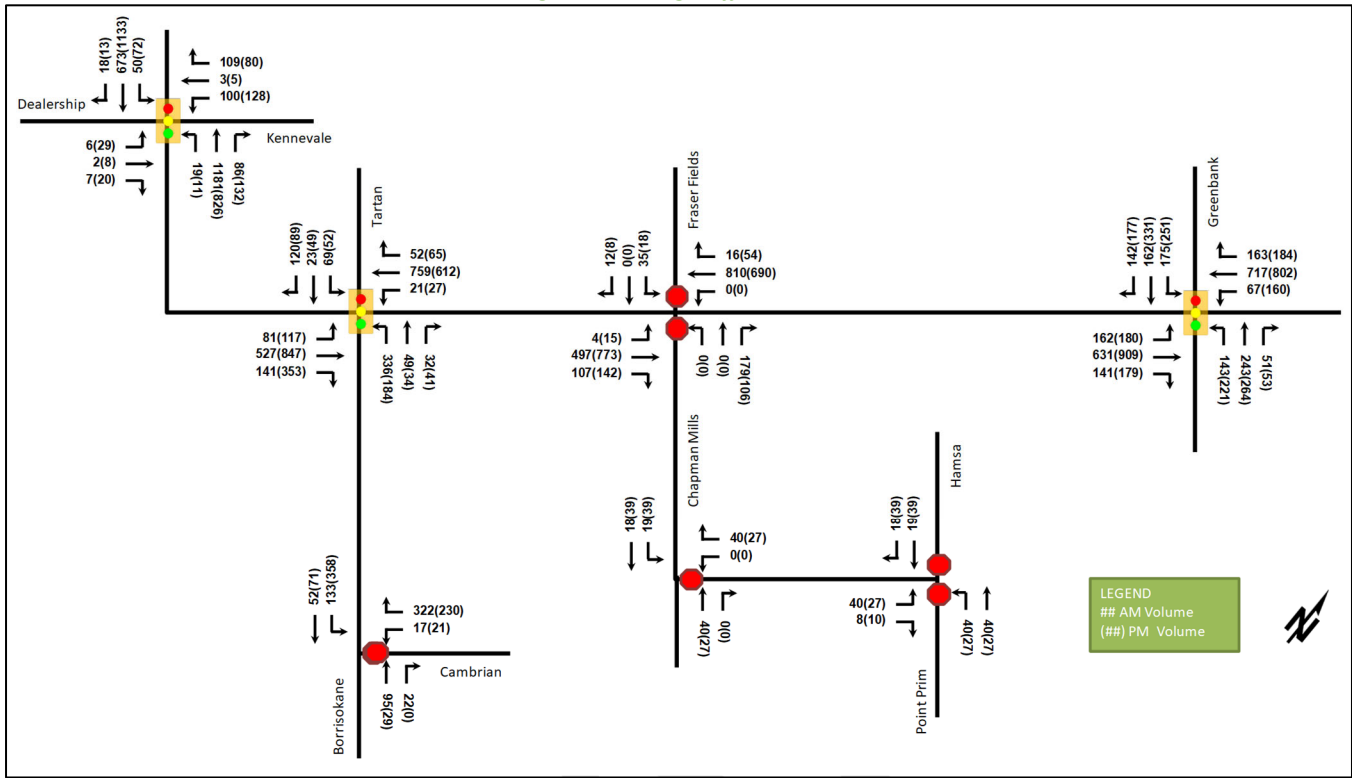


Table 2: Existing Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
Strandherd Drive & Dealership Way/Kennevale Drive <i>Signalized</i>	EBL	A	0.05	43.0	5.5	A	0.17	43.6	14.7
	EBT	A	0.01	41.5	2.7	A	0.03	39.5	6.0
	EBR	A	0.03	0.1	0.0	A	0.08	0.5	0.0
	WBL	B	0.65	66.6	41.3	C	0.72	67.7	49.7
	WBT/R	A	0.42	12.5	16.4	A	0.32	12.3	14.7
	NBL	A	0.05	9.9	5.7	A	0.16	19.4	6.0
	NBT	F	1.15	100.1	#474.6	D	0.84	27.8	#292.9
	NBR	A	0.10	2.6	7.4	A	0.16	5.0	15.0
	SBL	A	0.38	16.7	12.5	A	0.30	8.3	11.0
	SBT	A	0.58	9.1	115.0	E	1.00	43.5	#409.4
SBR	A	0.02	0.9	1.3	A	0.01	0.5	0.7	
Overall		E	-	59.4	-	C	-	34.6	-
Strandherd Drive & Borriskane Road/Tartan Drive <i>Signalized</i>	EBL	F	1.29	230.3	#39.0	A	0.49	19.6	35.0
	EBT	B	0.66	21.6	113.6	E	0.90	30.3	#248.2
	EBR	A	0.19	2.7	8.9	A	0.38	2.3	12.3
	WBL	A	0.09	13.1	6.3	A	0.21	14.5	8.8
	WBT/R	F	1.02	60.4	#252.4	C	0.73	18.5	#166.8
	NBL	E	0.96	67.9	#120.0	C	0.75	46.2	51.2
	NBT/R	A	0.15	14.3	16.7	A	0.20	13.7	14.4
	SBL	A	0.18	22.8	20.0	A	0.20	25.5	15.9
	SBT/R	A	0.26	7.6	17.0	A	0.34	12.0	19.9
Overall		D	-	48.1	-	C	-	22.0	-

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
Strandherd Drive & Chapman Mills Drive/Fraser Fields Way <i>Unsignalized</i>	EBL	A	0.01	9.9	0.0	A	0.02	9.6	0.8
	EBT/R	-	-	-	-	-	-	-	-
	WBT	-	-	-	-	-	-	-	-
	WBR	-	-	-	-	-	-	-	-
	NBR	B	0.40	17.2	14.3	A	0.37	22.6	12.0
	SBL	F	0.79	200.5	24.0	F	0.51	170.2	13.5
	SBR	B	0.04	16.1	0.8	A	0.02	14.2	0.8
Overall	A	-	6.2	-	A	-	3.2	-	
Strandherd Drive & Greenbank Road <i>Signalized</i>	EBL	C	0.78	47.8	#58.7	E	0.95	81.6	#77.7
	EBT	B	0.67	39.4	98.6	F	1.08	94.8	#178.1
	EBR	A	0.28	6.2	15.0	A	0.36	6.4	16.7
	WBL	A	0.30	23.5	18.9	D	0.85	62.1	#64.9
	WBT	E	0.90	55.8	#119.0	E	0.96	63.1	#147.1
	WBR	A	0.35	6.7	16.1	A	0.36	6.6	17.6
	NBL	A	0.53	58.0	28.4	B	0.65	58.5	40.5
	NBT/R	A	0.34	32.8	44.4	A	0.40	35.7	48.3
	SBL	A	0.58	58.1	33.1	B	0.69	59.3	45.5
	SBT	A	0.18	31.9	26.4	A	0.40	37.2	52.5
	SBR	A	0.28	6.5	15.5	A	0.36	6.9	17.5
	Overall	D	-	39.5	-	E	-	58.3	-
Cambrian Road & Borrisokane Road <i>Unsignalized</i>	WB	B	0.42	11.9	15.8	B	0.35	11.9	12.0
	NB	-	-	-	-	-	-	-	-
	SB/R	A	0.10	7.8	2.3	A	0.25	8.0	7.5
	Overall	A	-	7.9	-	A	-	8.3	-
Chapman Mills Drive & Hamsa Street/Prim Point Crescent <i>Unsignalized</i>	EB	-	-	-	-	-	-	-	-
	NB	-	-	-	-	-	-	-	-
	SB	-	-	-	-	-	-	-	-
	Overall	-	-	-	-	-	-	-	-
Chapman Mills Drive & Chapman Mills Drive <i>Unsignalized</i>	WB	A	0.04	8.8	0.8	A	0.03	8.6	0.8
	NB	-	-	-	-	-	-	-	-
	SB	A	0.01	7.4	0.0	A	0.03	7.4	0.8
	Overall	A	-	4.2	-	A	-	3.9	-

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

m = metered queue
= queue exceeds storage or mid-block length

The existing intersection operations illustrate capacity issues in the peak direction of travel along Strandherd Drive intersections during the peak hours.

At the Dealership/Kennevale intersection, the northbound through is over capacity during the AM peak and the southbound through is at capacity during the PM peak, with extended queuing during both peaks and high delays during the AM peak. The northbound through also has long queues during the PM peak.

During the AM peak, the Tartan/Borrisokane intersection eastbound left-turn and westbound through lanes are over capacity, with high delays noted for the eastbound left-turn and extended queues for the eastbound left-turn, westbound through, and northbound left-turn lanes. During the PM peak, extended queues are noted for the eastbound through and westbound through lanes.

The southbound left-turn from Fraser Fields also experiences high delays during the peak hours.

At the Greenbank Road intersection, the westbound through queues are noted to extend past the adjacent turning lanes during the AM peak. During the PM peak, the eastbound through lanes are over capacity and both the eastbound left-turn and through lanes experience high delays. Extended queuing is noted for the eastbound left-turn and through, and the westbound left-turn and through.

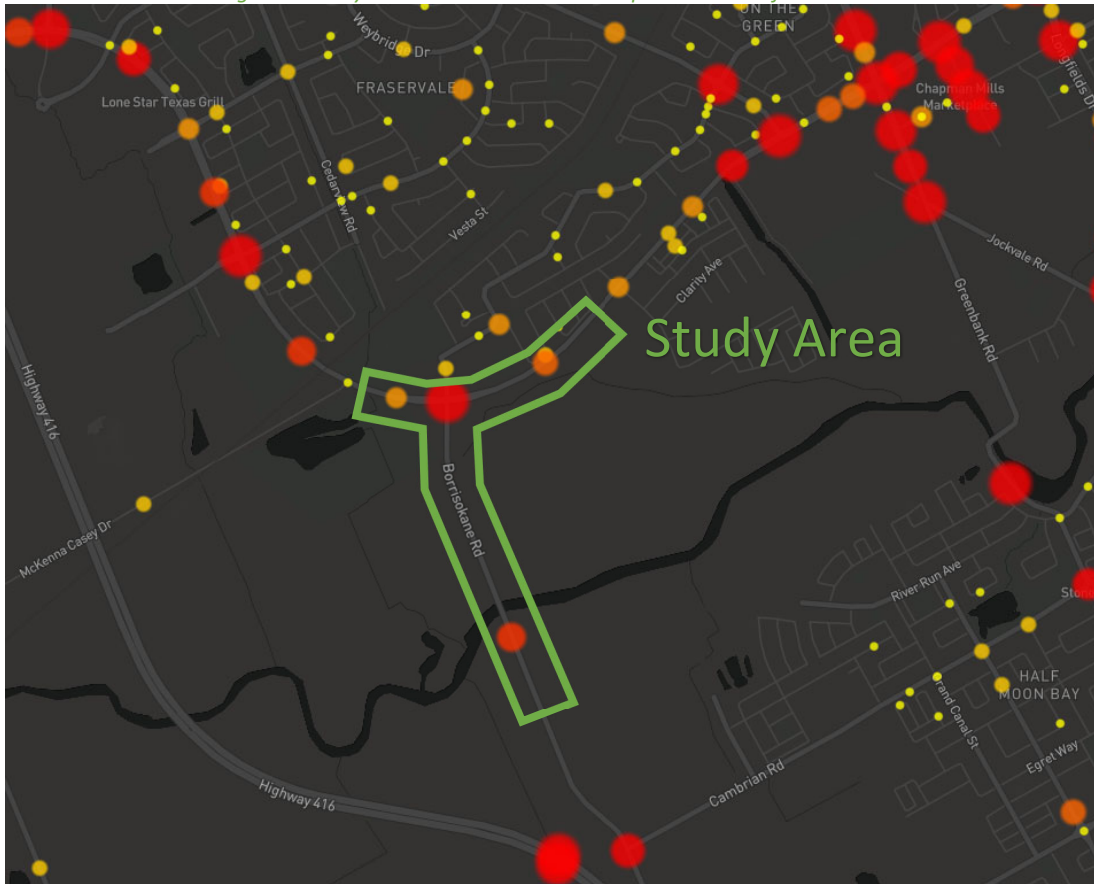
2.2.8 Collision Analysis

Collision data have been acquired from the City of Ottawa open data website (data.ottawa.ca) for five years prior to the commencement of this TIA for the surrounding study area road network. Table 3: Study Area Collision Summary, 2014-2018 Table 3 summarizes the collisions types and conditions in the study area, Figure 8 illustrates the intersections and segments analyzed, and Table 4 summarizes the total collisions for each of these locations. Collision data are included in Appendix D.

Table 3: Study Area Collision Summary, 2014-2018

		Number	%
Total Collisions		83	100%
Classification	Fatality	0	0%
	Non-Fatal Injury	19	23%
	Property Damage Only	64	77%
Initial Impact Type	Angled	8	10%
	Rear end	36	43%
	Sideswipe	2	2%
	Turning Movement	13	16%
	SMV Unattended	1	1%
	SMV Other	22	27%
	Other	1	1%
	Road Surface Condition	Dry	47
Wet		27	33%
Loose Snow		4	5%
Slush		1	1%
Packed Snow		1	1%
Ice		3	4%
Pedestrian Involved		0	0%
Cyclists Involved	0	0%	

Figure 8: Study Area Collision Records – Representation of 2014-2016



Source: <https://maps.bikeottawa.ca/collisions/> Accessed: May 24, 2020

Table 4: Summary of Collision Locations, 2014-2018

Intersections / Segments	Number	%
Intersections / Segments	83	100%
Strandherd Dr @ Borriskane Rd/Tartan Dr	39	47%
Fraser Fields Way @ Strandherd Dr	7	8%
Strandherd Dr btwn Borriskane Rd & McKenna Casey Dr	5	6%
Strandherd Dr btwn Borriskane Rd & Madrid Ave	12	14%
Borriskane Rd btwn Cambrian Rd & Strandherd Dr	20	24%

Overall, no fatal collisions, or collisions involving cyclist or pedestrians were documented in the study area. The intersections of Strandherd Drive and Borriskane Road/Tartan Drive, and the segments of Strandherd Drive between Borriskane Road and McKenna Casey Drive and Borriskane Rod between Cambrian Road and Strandherd Drive are noted to have higher collision rates than the rest of the study area and will be examined in greater detail in Table 5, Table 6 and Table 7 respectively.

Table 5: Collision Summary – Strandherd Drive at Borriskane Road/Tartan Drive

		Number	%
Total Collisions		39	100%
Classification	Fatality	0	0%
	Non-Fatal Injury	5	13%
	Property Damage Only	34	87%
Initial Impact Type	Angled	3	8%
	Rear end	27	69%
	Sideswipe	1	3%
	Turning Movement	6	15%
	SMV Unattended	2	5%
Road Surface Condition	Dry	20	51%
	Wet	19	49%
Pedestrian Involved		0	0%
Cyclists Involved		0	0%

The Strandherd Drive and Borriskane Road intersection had a total of 39 collisions during the 2014-2018 time period, with five involving property damage only and the remaining 34 having non-fatal injuries. The collision types are most represented by rear end with 27 collisions, turning movements with six collisions and the remaining angled, sideswipe and SMV unattended with three or less. The rear end collisions are typical of congested conditions, although the weather conditions are balanced between wet and dry. This neither directly supports nor discounts the congestion rationale.

Table 6: Collision Summary – Strandherd Drive between Borriskane Road and Madrid Avenue

		Number	%
Total Collisions		12	100%
Classification	Fatality	0	0%
	Non-Fatal Injury	6	50%
	Property Damage Only	6	50%
Initial Impact Type	Rear end	5	42%
	Turning Movement	5	42%
	SMV Other	2	17%
Road Surface Condition	Dry	8	67%
	Wet	4	33%
Pedestrian Involved		0	0%
Cyclists Involved		0	0%

The segment of Strandherd Drive between Borriskane Road and Madrid Avenue had a total of 12 collisions during the 2014-2018 time period, with a split between property damage only and non-fatal injuries. The collision types are most represented by rear end and turning movement with five collisions each, and the remaining collisions as SMV other. These collisions may be the result of construction activities or turning movements from Tartan Drive along this stretch. The data does not suggest any patterns and the widening of Strandherd Drive will likely address the cause of them in the future. Weather/road conditions are not considered a contributing factor.

Table 7: Collision Summary – Borriskane Road Between Strandherd Drive and Cambrian Road

		Number	%
Total Collisions		20	100%
Classification	Fatality	0	0%
	Non-Fatal Injury	5	33%
	Property Damage Only	15	67%
Initial Impact Type	Rear end	1	5%
	SMV Other	18	90%
	Other	1	5%
Road Surface Condition	Dry	11	55%
	Wet	2	10%
	Loose Snow	3	15%
	Packed Snow	1	5%
	Ice	3	15%
Pedestrian Involved		0	0%
Cyclists Involved		0	0%

The segment of Borriskane Road between Strandherd Drive and Cambrian Road had a total of 20 collisions during the 2014-2018 time period, with a 15-property damage only and five non-fatal injuries. The collision types are most represented by SMV Other with 18 collisions and a single collision for rear end and other. The rural nature of the roadway may be the cause of these collisions, from running off the road or animal strikes. Weather/road conditions are not considered a contributing factor.

2.3 Planned Conditions

2.3.1 Changes to the Area Transportation Network

Strandherd Drive Widening (Maravista Drive to Jockvale Road)

The detail design of the widening of Strandherd Drive from two to four lanes is currently underway. It is anticipated that this will be completed by 2022. This will include the reconstruction of the intersection of Borriskane Road at Strandherd Drive.

Chapman Mills Drive Extension

As part of the construction of 4025 Strandherd Drive the section of Chapman Mills Drive extension that runs north-south will be constructed. As part of the Phase 1 construction a portion of the east-west section of the Chapman Mills Drive extension. An environmental assessment study has been completed for the Chapman Mills Drive Extensions and Bus Rapid Transit corridor. This study was completed in December 2016 and, while construction is planned in the TMP by 2025, it is anticipated to be completed by 2031. This project will include a new four-lane road between Strandherd Drive and Longfields Drive as well as a provision for a centre median Bus Rapid Transit facility that is anticipated to be constructed post 2031.

Greenbank Road Re-Alignment

While not directly within the study area, Greenbank Road is planned to be re-aligned from near the existing Jockvale Road intersection with a new bridge crossing to the north of the existing Jock River crossing, and loop around Mattamy's Half Moon Bay North development and connect to Cambrian Road approximately 1.1km to the west of the existing alignment. The construction for Greenbank Road has been delayed as to advance the Strandherd Drive widening, likely to beyond 2031.

Barnsdale Road Highway 416 Interchange

A new interchange at Barnsdale Road to Highway 416 is currently being negotiated with the Ministry of Transportation Ontario to support the existing and future growth within Barrhaven, specifically south of the Jock River and adjacent to the Fallowfield Drive interchange. The interchange is anticipated to be completed post 2031.

2.3.2 Other Study Area Developments

3195 Jockvale Road

The development is proposed to be a mix of 210 stacked townhome units and approximately 200,000 sq. ft. of retail space, located between the Barrhaven Towncentre and the On The Green golf range. The development will extend Jockvale Road south of the Barrhaven Towncentre and include a new signalized intersection on Greenbank Road. It is estimated that the development will be constructed by 2026.

3232 Jockvale Road

This development is proposed to include a total of 310 apartment units and 602 townhome units and is located on the west side of Greenbank Road, south of the future Chapman Mills Drive corridor. It is estimated that the development will be constructed by 2025.

3201 Greenbank Road

Recently constructed, approximately 11,000 ft² of retail and an 8,000 ft² restaurant space will be incorporated into the existing retail development of the Loblaws and Home Sense.

3288 Greenbank Road

The development is proposed to be a mix of 310 apartment units and 602 townhome units, located between the future Chapman Mills Drive alignment on the north and the Claridge development (3370 Greenbank Road) to the south. It is estimated that the development will be constructed by 2025.

3370 Greenbank Road

This development is proposed to include 177 townhomes in Phase 1, 70 townhomes in Phase 2 and 720 condo units in Phase 3. Originally proposed to be completed by 2020, the plan of subdivision application is currently pending, and the Official Plan and Zoning By-Law Amendment have been adopted.

Riversbend – 3311 Greenbank Road

A residential subdivision is under construction south of St Joseph High School, in conjunction with the City of Ottawa. A total 144 townhome units (25 within City lands), and 64 mid-rise units (City) will ultimately be constructed within the proposed lands.

Half Moon Bay South Phase 5

The Mattamy Development of Half Moon Bay South Phase 5 is located east of Re-Aligned Greenbank Road and south of Dundonald Drive and is expected to be built-out during 2020. The development will consist of 164 single detached home units and 97 townhouse units. This development is expected to produce 180 two-way AM peak period auto trips and 207 two-way PM peak period auto trips. (CGH 2019)

Half Moon Bay West

The Mattamy Development of Half Moon Bay West is located north of Cambrian Road and east of Borrisokane Road and is expected to be built-out during 2024. This development will include 552 single family homes and 464 townhomes. This development is expected to produce 786 two-way AM peak period auto trips and 1193 two-way PM peak period auto trips. (Stantec 2016)

Half Moon Bay North Phase 9

North of the proposed development is the Half Moon Bay North Phase 9 development which is expected to be built-out during 2019. This development will consist of 60 stacked townhouses. This development is expected to produce 74 two-way AM peak period auto trips and 80 two-way PM peak period auto trips. (Stantec 2018)

Quinn's Pointe 2

The Minto Development of Quinn's Pointe 2 is located west of Greenbank Road and north of Barnsdale Road. This development will include 536 single-family dwelling units, 493 townhomes, 100 apartment units, and two elementary schools, anticipated over 2 phases of construction for the horizon year of 2024. A total of 749 two-way AM peak period auto trips and 813 two-way PM peak period auto trips are expected from this development (Stantec 2018)

The Meadows Phase 4

Phase 4 of the Meadows Tamarack Development was expected to be built out during 2019 and is located south of Cambrian Road on the east side of Re-Aligned Greenbank Road. Phase 4 will have 136 townhouse units and 50 single family units. This development is anticipated to produce 142 two-way AM peak period auto trips and 171 two-way PM peak period auto trips. (IBI 2018)

The Meadows Phase 5

Phase 5 of the Meadows Tamarack Development is located south of Cambrian Road on the west side of Re-Aligned Greenbank Road. However, it is understood that while this application is on the City of Ottawa's Development Applications site, the TIA has not been approved.

3387 Borrisokane Road

North of Cambrian Road is the Glenview Development of 3387 Borrisokane Road which is expected to be built-out during 2022. The development is expected to have 179 single family units and 109 townhouses. The development is anticipated to produce 137 two-way AM peak period auto trips and 174 two-way PM peak period auto trips. (Stantec 2016)

Citi-Gate Development

North of the proposed development is the Citi Gate Corporate Campus. This development will include 32,516 square metres allocated towards a shopping centre, 165,600 square metres allocated towards business parks and 105,000 square metres allocated towards car dealerships. The full build-out year is 2029 and is expected to produce 4,267 two-way AM peak period auto trips and 4,848 two-way PM peak period auto trips. (Novatech 2012)

The new phase of CitiGate has not been incorporated as it will address the issues north of Kennevale Drive to the Highway 416 interchange as part of its scope.

4401 Fallowfield Road Development

This development will not have shared accesses or traffic cross-over but will impact the Study Area intersections. The site trips generated by this site will be accounted for in the traffic projections using the 3285 Borrisokane Road TIS for Phase 1 of the Conservancy Development documenting the 4401 Fallowfield Road traffic volumes.

Harmony Development – 4025 Strandherd Drive

The Minto Communities development of 4025 Strandherd Drive has been constructed and the traffic for this site has been included within the existing conditions.

Conservancy Phase 1 – 3285 Borrisokane Road

On the south side of the Chapman Mills Drive corridor is 3285 Borrisokane Road which is expected to be built-out during 2020. This development will include 125 single family homes and 75 townhouses. This development is

expected to produce 129 two-way AM peak period auto trips and 146 two-way PM peak period auto trips. (Parsons 2018)

The Ridge/Brazeau – 3809 Borrisokane Road

The proposed development includes 590 residential units, split between townhouse units and detached home units. The site is located on the west side of Re-Aligned Greenbank Road and is expected to produce 401 two-way AM peak period auto trips and 457 two-way PM peak period auto trips. (CGH 2019)

Drummond Subdivision – 3713 Borrisokane Road

Located west of Re-Aligned Greenbank Road is the proposed residential development of 3713 Borrisokane Road. The development will include approximately 123 detached homes and 439 townhouses and is expected to be built-out during 2024. This development is expected to produce 349 two-way AM peak period auto trips and 407 two-way PM peak period auto trips. (CGH 2020)

ABIC Manufacturing – 3713 Borrisokane Road

A light industrial parcel will be developed at 3713 Borrisokane Road along Borrisokane Road and include approximately 3,250 square metres of general office space and 9,385 square metres of industrial buildings and is expected to be built-out during 2022. This development is expected to produce 122 two-way AM peak period auto trips and 172 two-way PM peak period auto trips. (CGH 2020)

3 Study Area and Time Periods

3.1 Study Area

The study area will include the intersection will include:

- Strandherd Drive
 - Dealership Way/Kennevale Drive
 - Tartan Road/Borrisokane Road
 - Fraser Fields Drive/Chapman Mills Drive
 - Greenbank Road
- Cambrian Road at Borrisokane Road
- Chapman Mills Drive
 - Chapman Mills Drive
 - Hamsa Street/Point Prim Crescent
 - Greenbank Road (Future Intersection)

The boundary roads are Borrisokane Road. No screenlines are present near the proposed site and any screenline analysis would need extend across Barrhaven to capture each of the north/south or east-west corridors. Therefore, no screenline analysis is included within this TIA study.

3.2 Time Periods

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

3.3 Horizon Years

The anticipated build-out year is 2029 and the full build-out plus five years horizon year is 2034.

4 Exemption Review

Table 8 summarizes the exemptions for this TIA.

Table 8: Exemption Review

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

5 Development-Generated Travel Demand

5.1 Trip Generation and Mode Shares

This TIA has been prepared using the vehicle and person trip rates for the residential units using the TRANS Trip Generation Study Report (2009). Table 9 summarizes the person trip rates for the proposed land uses.

Table 9: TRANS Trip Generation Person Trip Rates

Dwelling Type	Land Use Code	Peak Hour	Vehicle Trip Rate	Person Trip Rates
Single Detached	210 (TRANS)	AM	0.70	1.27
		PM	0.90	1.41
Townhouse	224 (TRANS)	AM	0.54	0.98
		PM	0.71	1.16
Mid-Rise	223 (TRANS)	AM	0.29	0.66
		PM	0.37	0.84

Using the above Person Trip rates, the total person trip generation has been estimates. Table 10 below illustrates the total person trip generation by dwelling type.

Table 10: Total Person Trip Generation

Land Use	Units	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Single Detached	700	276	677	953	645	413	1,058
Townhouse	750	199	340	539	430	382	812
Mid-Rise	50	8	25	33	22	13	35
Total Person Trips		538	1,134	1,672	1,097	808	1,905

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

Table 11: Mode Shares Comparison

Travel Mode	South Nepean (average)	South Nepean (AM from/within)	South Nepean (PM to/within)	BRT Area	South Nepean (blended)
Auto Driver	65%	62%	60%	45%	60%
Auto Passenger	15%	12%	15%	15%	15%
Transit	15%	18%	15%	30%	15%
Cycling	0%	1%	0%	1%	1%
Walking	5%	7%	10%	9%	9%
Total	100%	100%	100%	100%	100%

The widening of Strandherd Drive and the construction of Chapman Mills Drive are scheduled to be constructed within the Study Area by the future horizons of this TIA. The BRT lanes within Chapman Mills Drive are not included in the Affordable Network (2031) and no bus facilities are proposed along Strandherd Drive. Beyond the 2031 horizon, the Chapman Mills BRT is assumed to be in place and provide access to a transit station within a 5-10 minute walk. Therefore, the blended BRT mode shares will be generated and subject to the demand rationalization in Section 7, the targets will be recommended and later assessed in Sections 10.3 and 15.2.

Using the above mode shares and person trip rates the person trips by mode have been projected. Table 12 summarizes the trip generation by mode for the site.

Table 12: Trip Generation by Mode

Travel Mode	Mode Share	In	Out	Total	In	Out	Total
Blended							
Auto Driver	60%	323	680	1,004	658	485	1,143
Auto Passenger	15%	80	171	251	165	121	286
Transit	15%	80	171	251	165	121	286
Cycling	1%	6	11	17	10	8	19
Walking	9%	49	102	151	99	72	171
Total	100%	538	1,134	1,672	1,097	808	1,905
BRT							
Auto Driver	45%	242	510	753	494	364	857
Auto Passenger	15%	80	171	251	165	121	286
Transit	30%	161	341	502	330	243	572
Cycling	1%	6	11	17	10	8	19
Walking	9%	49	102	151	99	72	171
Total	100%	538	1,134	1,672	1,097	808	1,905

As shown above, the proposed subdivision is forecasted to generate approximately 1,672 AM and 1,905 PM peak hour two-way people trips. The auto trips decrease from 1,004 AM and 1,143 PM peak two-way trips to 753 AM and 857 PM peak two-way trips for BRT transit modal share targets.

No trip reductions factors (i.e. synergy, pass-by, etc.) have been applied as the subject development is composed entirely of residential units.

5.2 Trip Distribution

To understand the travel patterns of the subject development the OD Survey has been reviewed to determine the existing travel patterns. Table 13 below summarizes the distribution.

Table 13: OD Survey Distribution – South Nepean

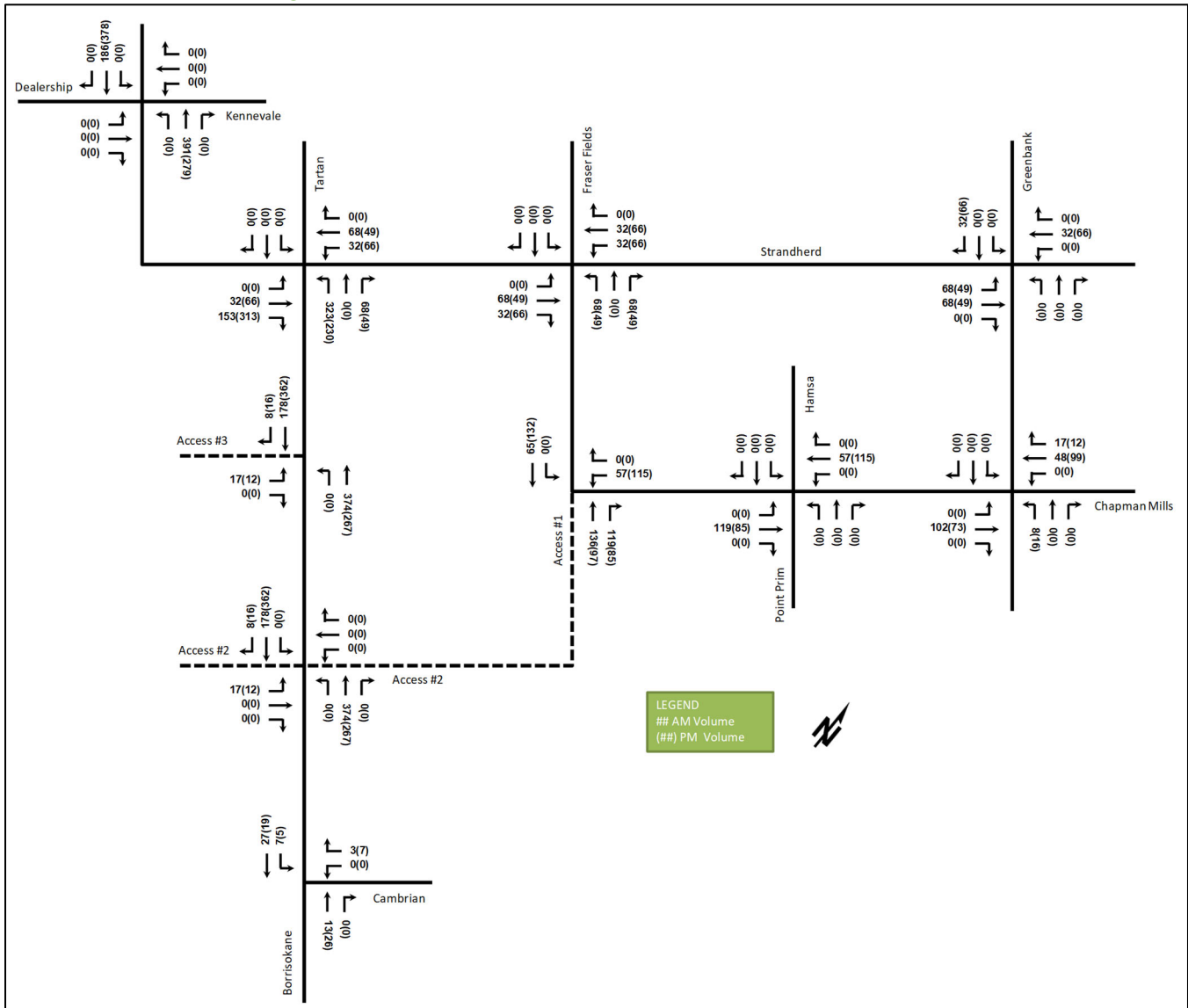
To/From	Percent of Trips
North	80%
South	5%
East	10%
West	5%
Total	100%

5.3 Trip Assignment

Using the distribution outlined above, turning movement splits, and access to major transportation infrastructure, the trips generated by the site have been assigned to the Study Area road network. Figure 9 and Figure 10 illustrate the new site generated volumes.

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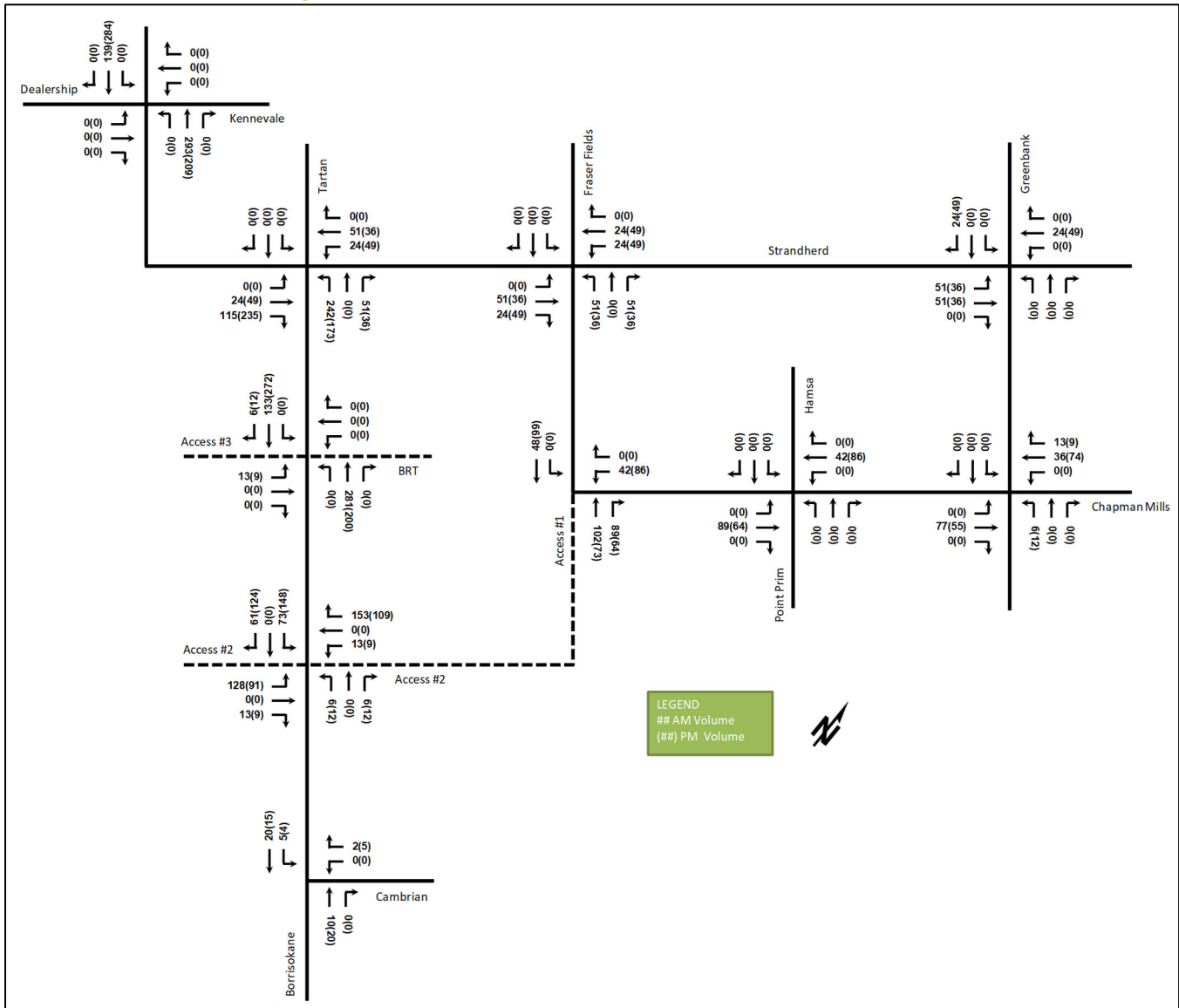
Figure 9: New Site Generation Auto Volumes – Blended Rate Mode Shares



LEGEND
 ## AM Volume
 (##) PM Volume



Figure 10: New Site Generation Auto Volumes – BRT Rate Mode Shares



6 Background Network Travel Demand

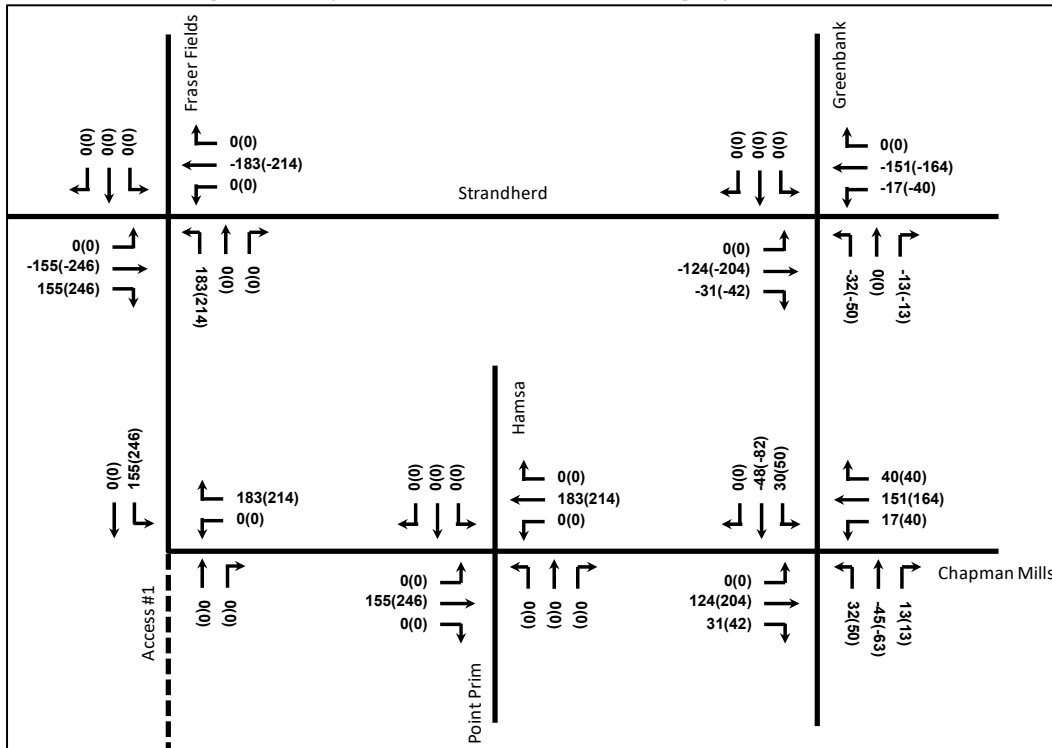
6.1 Transportation Network Plans

The study area transportation network plans were discussed in Section 2.3.1.

For the future horizons, the Strandherd Drive widening, Chapman Mills Drive extension and the widening of Greenbank Road to Chapman Mills Drive have been assumed in all horizons and is assumed within the traffic model and background development volumes/assignment. As Re-Aligned Greenbank Road has an undetermined construction date, it has not been explicitly included in the analysis. Should it be completed, it will have minimal impact on the study area intersections as it occurs south of Chapman Mills Drive.

Figure 11 illustrates the trip assignment for the East Phase once Chapman Mills Drive has been extended. A simple 25% has been shifted from Greenbank Road to the Chapman Mills Drive corridor, and the remaining volumes will be factored in with background development volumes adjustments.

Figure 11: Chapman Mills Drive Extension – Existing Trip Redistribution



6.2 Background Growth

A large amount of background traffic has been accounted for through the other developments that have been documented in Section 2.3.2. This is particularly important along Cambrian Road, where most of the developments have been built or planned. This growth around results in over 11% annual growth along Borriskane Road, or 320% of the existing volumes. Therefore, a nominal amount of additional background growth has been accounted for along Strandherd Drive, Greenbank Road, Borriskane Road and Cambrian Road. To account for background growth along this corridor a 1.5%/annum background growth rate has been applied for the primary intersection movements.

Figure 12: 2029 Background Growth

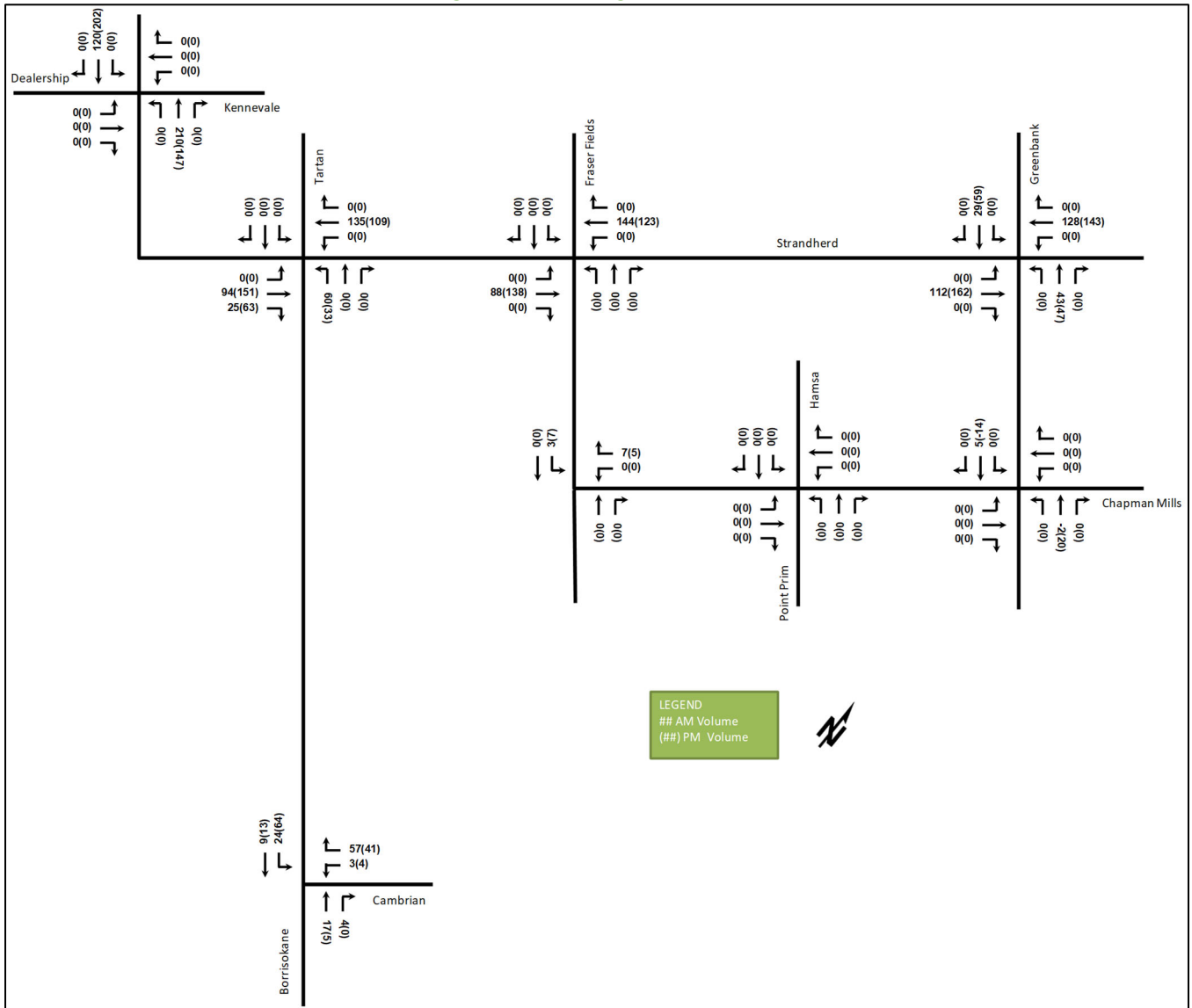
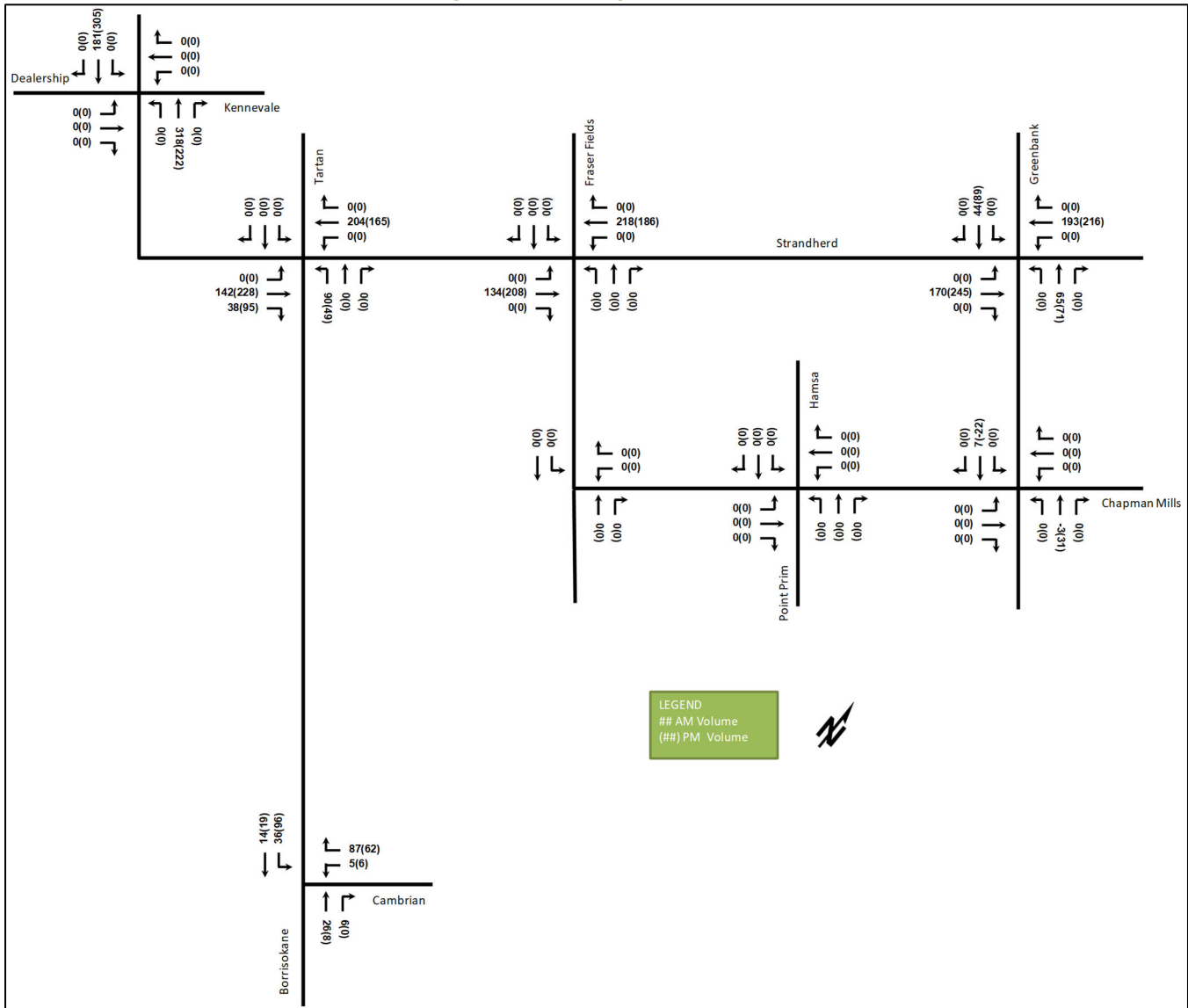


Figure 13: 2034 Background Growth



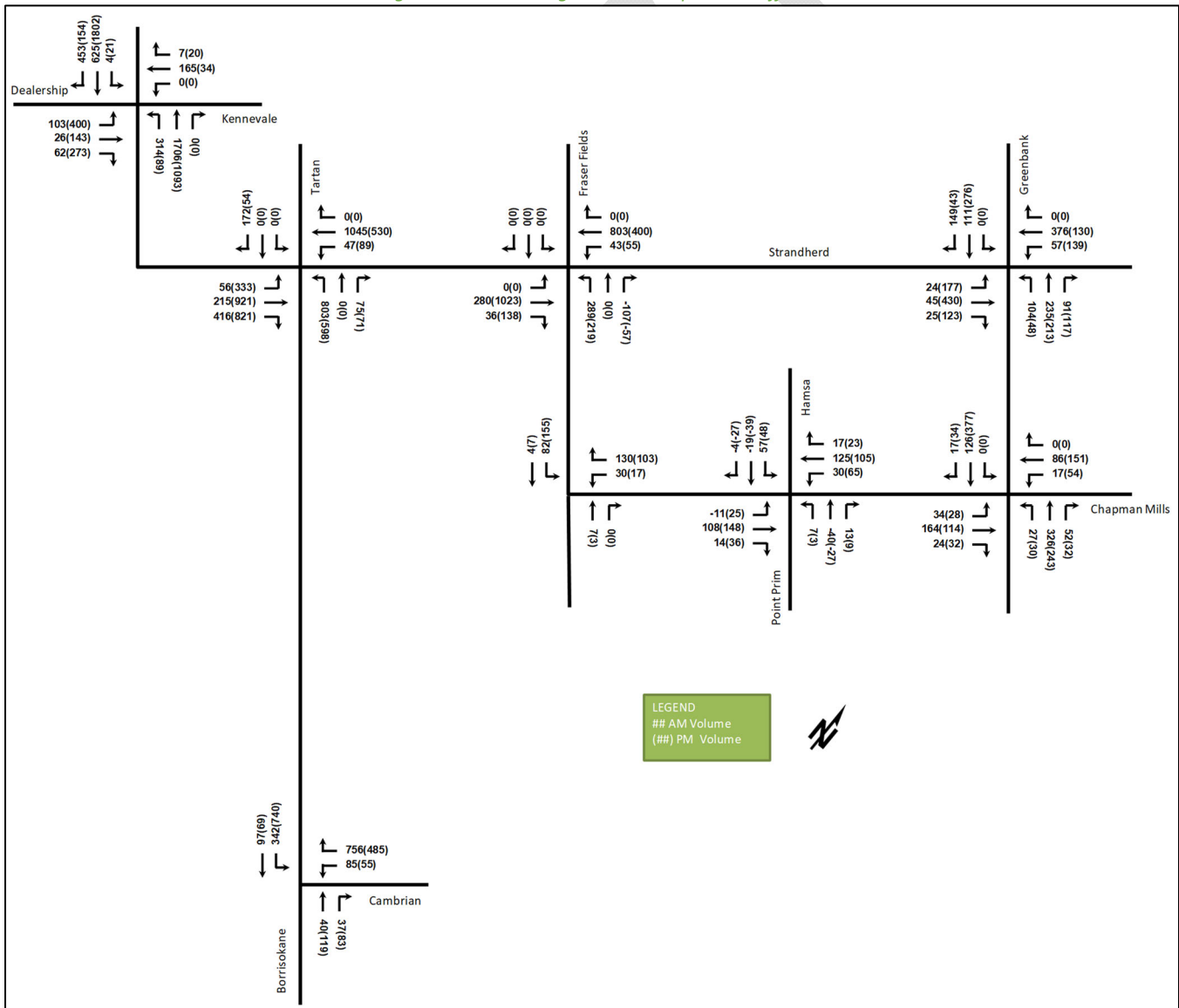
6.3 Other Developments

As detailed in Section 2.3.2, the following developments have been included in the background traffic forecasts, and Figure 14 illustrates the total background development volumes for the study area, adjusted for the above noted transportation network plans.

- 3195 Jockvale Road
- Harmony Phase 5 – 3232 Jockvale Road
- 3201 Greenbank Road
- S3288 Greenbank Road
- 3370 Greenbank Road
- Riversbend – 3311 Greenbank Road
- Half Moon Bay South Phase 5
- Half Moon Bay West

- Half Moon Bay North Phase 9
- Quinn’s Pointe 2
- The Meadows Phase 4
- The Meadows Phase 5
- 3387 Borriskane Road
- Citi-Gate Development
- 4401 Fallowfield Road Development
- Harmony Development – 4025 Strandherd Drive
- Conservancy Phase 1 – 3285 Borriskane Road
- The Ridge/Brazeau – 3809 Borriskane Road
- Drummond Subdivision – 3713 Borriskane Road
- ABIC Manufacturing – 3713 Borriskane Road

Figure 14: Total Background Development Traffic



7 Demand Rationalization

7.1 2029 Future Background Operations

Figure 15 illustrates the 2029 future background traffic volumes and Table 14 summarizes the 2029 forecasted intersection operations. The level of service for signalized intersections is based on the TIA Guidelines for volume to capacity ratio of the lane movements and HCM average delay for the overall intersection, and HCM average delay for unsignalized intersections.

The study area intersections have been modified to include the following improvements previously noted in Section 2.3.1.

- Strandherd Drive and Dealership Way/Kennevale Drive
 - Widening of Strandherd Drive to a 4-lane divided roadway
- Strandherd Drive and Borrisokane Road/Tartan Drive
 - Widening of Strandherd Drive to a 4-lane divided roadway
 - Eastbound left-turn lane with 105m of storage
 - Eastbound right-turn lane with 110 m of storage
 - Westbound left-turn lane with 55m of storage (reduced)
 - Westbound right-turn lane with 30m of storage (new)
 - Northbound dual left-turn lanes with 100m of storage each (extension from 69m)
- Strandherd Drive and Chapman Mills Drive/Fraser Fields Way
 - Widening of Strandherd Drive to a 4-lane divided roadway
 - Signalization of the intersection (new)
 - Eastbound left-turn lane with 40m of storage (new)
 - Eastbound right-turn lane with 145 m of storage (new)
 - Westbound left-turn lane maintaining current 40m of storage
 - Northbound dual left-turn lanes with 105m of storage (new)
 - Northbound shared through/right-turn lane (new)
 - Southbound left-turn lane with 40m of storage (new)
- Chapman Mills Drive and Greenbank Road
 - Widening of Greenbank Road to a 4-lane divided roadway
 - Signalization of the intersection (new)
 - Eastbound and westbound left-turn lanes with 40m of storage
 - Eastbound right-turn lane with 60m of storage
 - Westbound right-turn lane with 30m of storage
 - Northbound and southbound left-turn lanes with 60m of storage
- Chapman Mills Drive and Hamsa Street/Point Prim Crescent
 - Chapman Mills Drive corridor constructed, excluding BRT
 - Minor stop-controlled
 - Shared all movement northbound and southbound approaches
 - Eastbound and westbound left-turn lanes with 38m of storage (new)
- Chapman Mills Drive and Chapman Mills Drive
 - Chapman Mills Drive corridor constructed, excluding BRT
 - Minor stop-controlled
 - Northbound through lane (new)
 - Northbound right-turn lane with 15m of storage (new)

- Southbound through lane (new)
- Southbound left-turn lane with 38m of storage (new)
- Westbound right-turn lane
- Westbound left-turn lane with 38m of storage (new)
- Cambrian Road and Borriskane Road
 - Signalization of the intersection (new)
 - Southbound dual left-turn lanes with 150.0m of storage (new)
 - Westbound left-turn lane with 38.0m of storage (new)
 - Northbound right-turn with a 30m of storage (new)
- All signalized intersections optimized for new lane arrangements, as approximations of future signal coordination and sequencing

Figure 15: 2029 Future Background Traffic Volumes

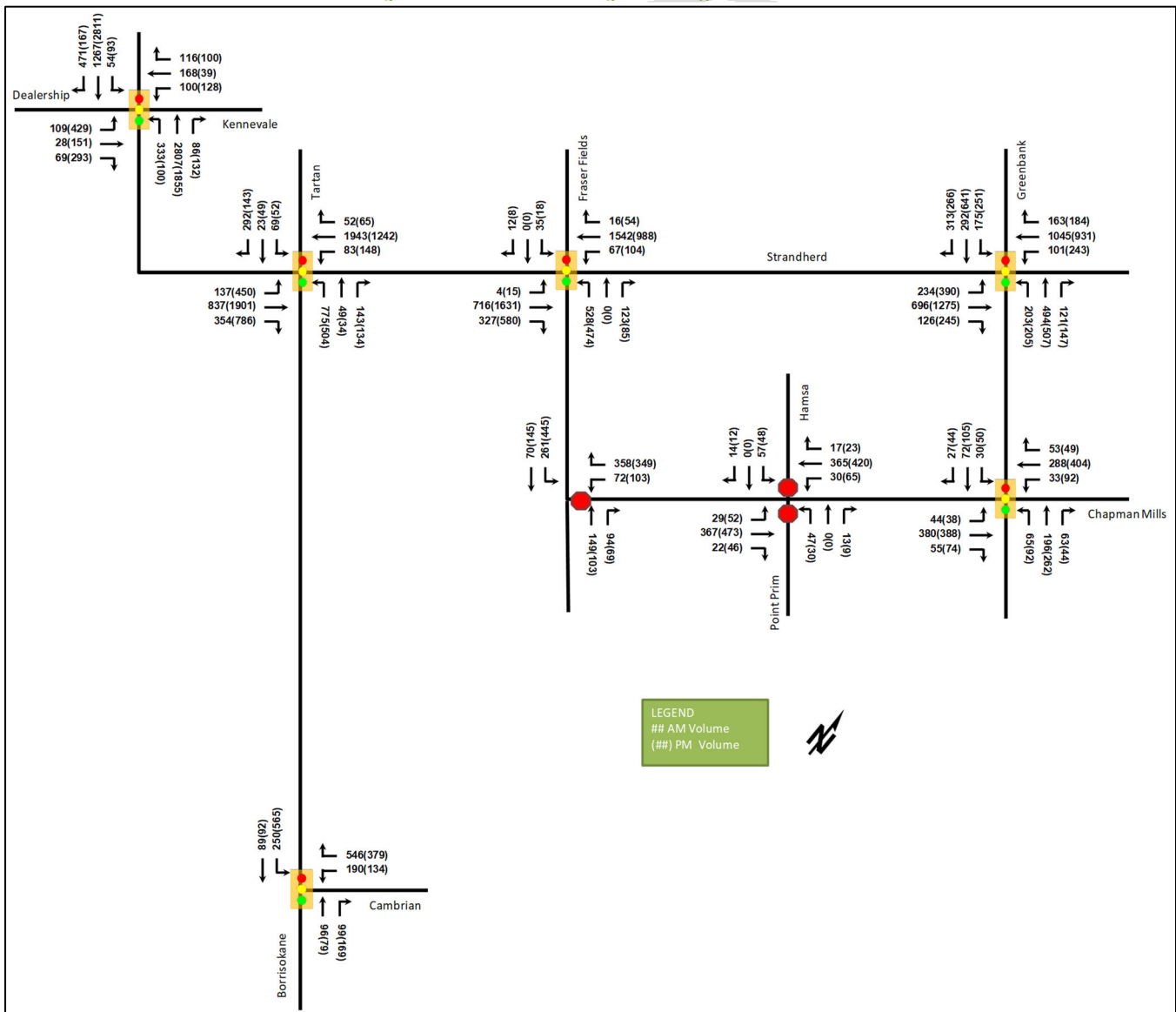


Table 14: 2029 Future Background Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
Strandherd Drive & Dealership Way/Kennevale Drive <i>Signalized</i>	EBL	F	1.03	152.4	#70.6	F	1.42	244.9	#233.8
	EBT	A	0.08	46.6	15.2	A	0.32	44.8	55.0
	EBR	A	0.23	50.2	30.6	C	0.73	60.9	113.0
	WBL	A	0.38	54.6	42.9	A	0.44	49.9	51.5
	WBT/R	D	0.85	79.5	#119.2	A	0.33	45.3	52.0
	NBL	D	0.84	56.3	m32.7	E	0.96	80.0	m13.7
	NBT/R	F	1.59	287.2	m#340.0	F	1.26	138.3	m#308.0
	SBL	D	0.84	143.6	#42.4	F	1.31	262.1	#72.0
	SBT	D	0.82	34.9	218.8	F	1.75	364.7	#748.2
	SBR	B	0.61	29.2	134.9	A	0.21	17.7	37.2
Overall	F	-	174.1	-	F	-	237.9	-	
Strandherd Drive & Borriskane Road/Tartan Drive <i>Signalized</i>	EBL	F	1.67	370.7	m#78.9	F	1.96	464.5	m#125.4
	EBT	A	0.59	22.2	113.4	F	1.12	71.7	m77.8
	EBR	E	0.91	45.0	#237.6	F	1.61	295.1	m#261.6
	WBL	D	0.87	104.9	m#24.0	F	1.63	368.7	m#84.0
	WBT/R	F	1.41	215.9	#450.4	E	0.95	52.2	#238.6
	NBL	F	2.38	654.5	#338.2	F	2.43	679.6	#242.5
	NBT/R	A	0.35	46.6	59.5	A	0.44	55.9	58.7
	SBL	A	0.59	86.9	36.0	A	0.54	88.9	29.5
	SBT/R	F	1.15	153.4	#167.3	D	0.82	87.2	80.9
	Overall	F	-	257.3	-	F	-	225.1	-
Strandherd Drive & Chapman Mills Drive/Fraser Fields Way <i>Signalized</i>	EBL	A	0.07	46.0	m2.1	A	0.24	44.7	m4.9
	EBT	A	0.43	10.2	42.9	F	1.05	41.9	m91.8
	EBR	A	0.42	11.3	39.2	C	0.74	8.4	m20.8
	WBL	A	0.47	105.4	m15.7	A	0.59	100.8	m#25.5
	WBT/R	D	0.86	16.4	#301.7	A	0.59	6.1	m53.6
	NBL	D	0.81	70.0	#105.5	C	0.77	68.2	#102.2
	NBT/R	A	0.19	44.0	29.0	A	0.12	42.6	21.8
	SBL	A	0.49	92.2	22.5	A	0.29	81.6	13.9
	SBT/R	A	0.08	56.1	9.1	A	0.05	55.0	7.0
	Overall	C	-	25.2	-	C	-	31.6	-
Strandherd Drive & Greenbank Road <i>Signalized</i>	EBL	D	0.81	81.6	#73.5	D	0.87	44.5	m81.2
	EBT	A	0.49	26.0	43.0	F	1.02	39.1	m143.5
	EBR	A	0.20	3.1	2.9	A	0.38	1.4	m4.2
	WBL	A	0.36	23.1	25.4	F	1.04	119.6	#120.9
	WBT	E	0.92	58.5	183.1	D	0.89	60.6	155.7
	WBR	A	0.26	4.9	13.8	A	0.31	3.5	10.0
	NBL	C	0.77	83.0	#49.2	E	0.91	109.6	#58.2
	NBT/R	C	0.73	52.8	114.8	E	0.94	79.6	#140.4
	SBL	C	0.73	85.6	#41.2	E	0.96	113.1	#65.8
	SBT	A	0.35	46.9	53.4	D	0.88	69.9	#131.3
SBR	A	0.57	24.6	62.4	A	0.44	8.4	21.4	
Overall	D	-	47.3	-	E	-	58.2	-	

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
Chapman Mills Drive & Greenbank Road <i>Signalized</i>	EBL	A	0.44	68.0	23.4	A	0.41	79.8	m15.5
	EBT	D	0.81	66.5	116.7	D	0.84	51.4	125.2
	EBR	A	0.18	41.7	28.8	A	0.23	27.3	m21.9
	WBL	A	0.37	78.3	21.1	B	0.63	82.9	44.6
	WBT	B	0.69	64.3	89.4	B	0.68	55.5	106.8
	WBR	A	0.13	46.5	19.0	A	0.10	39.0	16.8
	NBL	A	0.51	81.1	31.4	A	0.58	82.2	39.4
	NBT/R	A	0.19	21.8	46.5	A	0.25	29.8	58.0
	SBL	A	0.34	74.1	12.4	A	0.46	91.4	m18.5
	SBT/R	A	0.09	17.8	25.4	A	0.19	12.2	m19.4
Overall	D	-	48.6	-	-	D	-	45.3	-
Cambrian Road & Borrisokane Road <i>Signalized</i>	WBL	A	0.10	8.9	15.7	A	0.23	28.9	25.2
	WBR	F	1.02	44.3	#310.7	D	0.84	12.1	38.4
	NBT	A	0.34	38.0	46.9	A	0.15	7.3	23.4
	NBR	A	0.15	9.1	10.5	A	0.09	2.2	5.8
	SBL	E	0.94	70.7	#89.3	D	0.87	21.5	#151.7
	SBT	A	0.35	38.3	48.5	A	0.15	7.3	23.4
	Overall	D	-	46.9	-	-	B	-	16.3
Chapman Mills Drive & Hamsa Street/Prim Point Crescent <i>Unsignalized</i>	EBL	A	0.02	8.0	0.8	A	0.04	8.1	0.8
	EBT/R	-	-	-	-	-	-	-	-
	WBL	A	0.02	7.9	0.8	A	0.06	8.4	1.5
	WBT/R	-	-	-	-	-	-	-	-
	NB	C	0.16	16.7	4.5	C	0.16	22.8	4.5
	SB	C	0.20	17.4	5.3	D	0.25	25.3	7.5
	Overall	A	-	3.3	-	-	A	-	3.3
Chapman Mills Drive & Chapman Mills Drive <i>Unsignalized</i>	WBR	C	0.08	15.1	2.3	C	0.09	24.9	2.3
	WBL	B	0.36	10.5	12.0	B	0.34	10.2	11.3
	NBT	-	-	-	-	-	-	-	-
	NBR	-	-	-	-	-	-	-	-
	SBL	A	0.17	7.8	4.5	A	0.29	8.2	9.0
	SBT	-	-	-	-	-	-	-	-
	Overall	A	-	8.7	-	-	A	-	8.6

Notes: Saturation flow rate of 1800 veh/h/lane
PHF = 1.00

m = metered queue
= queue exceeds storage or mid-block length

The 2029 future background operations summarized above identify significant capacity constraints along Strandherd Drive. High delays and extended queueing is noted for the entire corridor, both along the mainline of Strandherd Drive and on turning movements from that side streets. The volumes illustrated in Figure 15 outline an unconstrained demand for 2-3 lanes in each directions between Borrisokane Road and Greenbank Road, and 4 lanes from Borrisokane Road to Kennevale Road. As this is not a feasible option for Strandherd Drive and accepted City arterial road policies, alternative solutions for Barrhaven will need to be examined by the City.

Beyond Strandherd Drive, the intersection of Cambrian Road and Borrisokane Road is anticipated to experience capacity constraints and extended queuing during the AM peak hour in the westbound right-turn and southbound left-turn movements. During the PM peak, the southbound left-turn queues may exceed the available storage. The Chapman Mills Drive corridor is expected to operate well, although it is noted as Strandherd Drive operations degrade, additional traffic will utilize Chapman Mills Drive even to short cut a portion of Strandherd Drive. This will ultimately result in capacity constraints being stressed on Chapman Mills Drive as well. This is not examined

in this analysis as it would extensive sensitivity testing and encompass analysis that is assumed to be completed by the City's team during the EA study.

7.2 Background Transportation Infrastructure Scenarios

Due to the unconstrained demand capacity constraints noted in the future 2029 background conditions, a rationalization exercise will be completed prior to the analysis of the 2034 future background conditions. Without additional regional transportation infrastructure being advanced in Barrhaven and Barrhaven South, it is unlikely to see any change in the network operations to achieve any meaningful improvement to "acceptable" level of service standards. Neither will any modal shifts be realized to help achieve an overall vehicle trip reduction in a multifaceted approach.

A list of potential regional solutions was compiled from infrastructure items approved through the Transportation Master Plan, the Development Charge Bylaw, various EAs and noted within various Barrhaven Community Design Plans:

1. New Re-Aligned Greenbank Road, from Chapman Mills Drive to Cambrian Road
2. Re-Aligned Greenbank Road extension south of Cambrian Road
3. Widening of Cambrian Road from the Re-Aligned Greenbank Road to the existing Greenbank Road
4. Widening of Jockvale Road from Cambrian Road to Prince of Wales Drive
5. Widening of Barnsdale Road between Highway 416 and Prince of Wales Drive
6. New interchange at Barnsdale Road and Highway 416
7. Chapman Mills Drive BRT Corridor

Of these items, only the new interchange at Barnsdale Road and Highway 416, and the BRT component of the Re-Aligned Greenbank Road are considered viable to reducing vehicle volume along the area road network. The remaining items would increase capacity to the already congested corridors and exacerbate the problems noted at bottle neck locations.

Therefore, to assess the impact and potential mitigation of each, both will be summarized individually and together to illustrate the benefits of the City advancing these projects.

7.2.1 New Barnsdale Road and Highway 416 Interchange

The Barrhaven South Community Design Plan (2006) identified two possible interchange locations for Highway 416, at Cambrian Road and at Barnsdale Road. The TMP also notes a new interchange being required for Barnsdale Road as the road is widened to 4-lanes between the Highway and Prince of Wales Drive. Preliminary concepts presented to the MTO, prior to the road widening, include a northbound on-ramp from Borrisokane Drive and a southbound off-ramp on Barnsdale Road, shifting Trail Road to the west and replacing the north leg of the Barnsdale-Trail-William McEwen intersection.

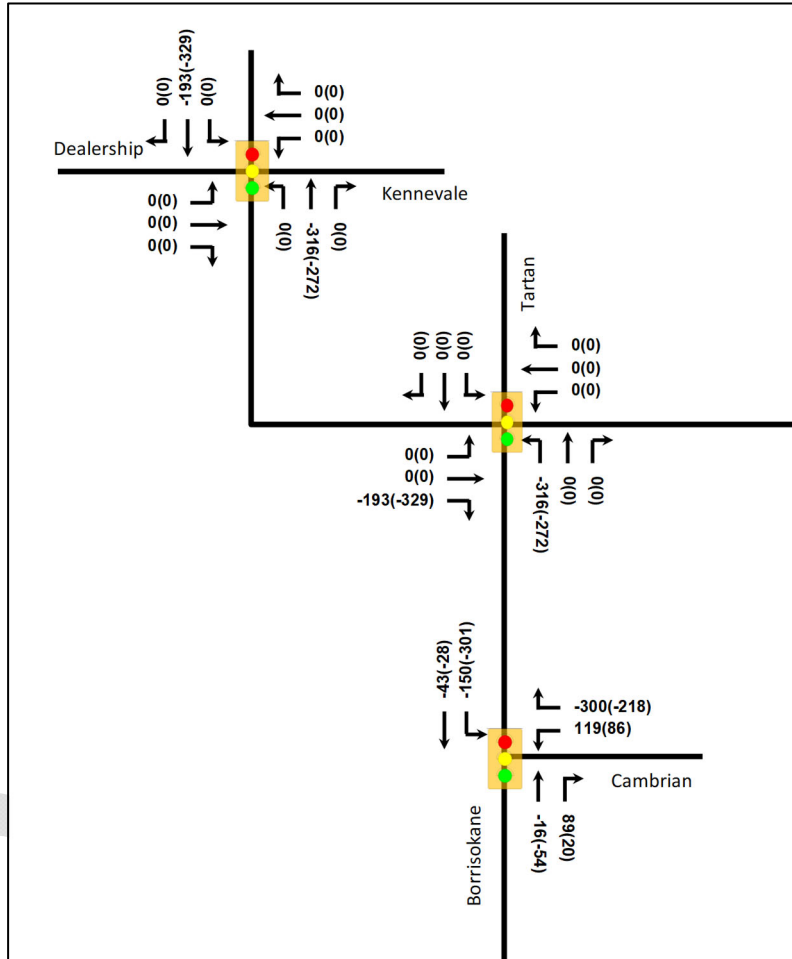
As a general impact to the Barrhaven South area traffic, the interchange would represent the following travel shifts:

- The new developments located along the future Re-Aligned Greenbank Road and west to Borrisokane Road have been assumed to shift 50% of the projected travel demand from Borrisokane Road to the new interchange. This is based on the northbound left-turn and eastbound right-turn at the Strandherd Drive and Borrisokane Road intersection.
- Additionally, a minor shift of travel from the existing volumes at the Borrisokane Road and Cambrian Road travel to/from the north to the south along Borrisokane Road

- No existing traffic reduction is explicitly considered. The broad application of the percent shift above is assumed to capture varying levels of travel shifts each development would be expected to see due to proximity to Borriskane Road, effectively balancing existing and new development volumes.

Figure 16 illustrates the assumed redistribution that may be realized from the Barnsdale Road Interchange.

Figure 16: Barnsdale Road Interchange Redistribution



7.2.2 Re-Aligned Greenbank Road – BRT Corridor

The EA studies have been completed for the Southwest Transitway extensions from the Barrhaven Towncentre to Cambrian Road, and Cambrian Road to Barnsdale Road. The bus rapid transit corridor is comprised of median bus lanes along Re-Aligned Greenbank Road to a park and ride at Kilbirnie Drive. Whether the BRT corridor or increased service with the park and ride are completed, the following generalized impacts to the Barrhaven South area traffic are outlined below:

- A shift from 60-80% auto travel to upwards of 30% transit travel would represent a 20% reduction on all auto volumes projected from the new developments proposed within Barrhaven South.
- No existing traffic reduction is explicitly considered. The broad application of the percent shift above is assumed to capture varying levels of travel shifts each development would be expected to see due to proximity to Borriskane Road, effectively balancing existing and new development volumes.

Figure 18: 2029 Future Background Traffic Volumes – Mitigated Conditions

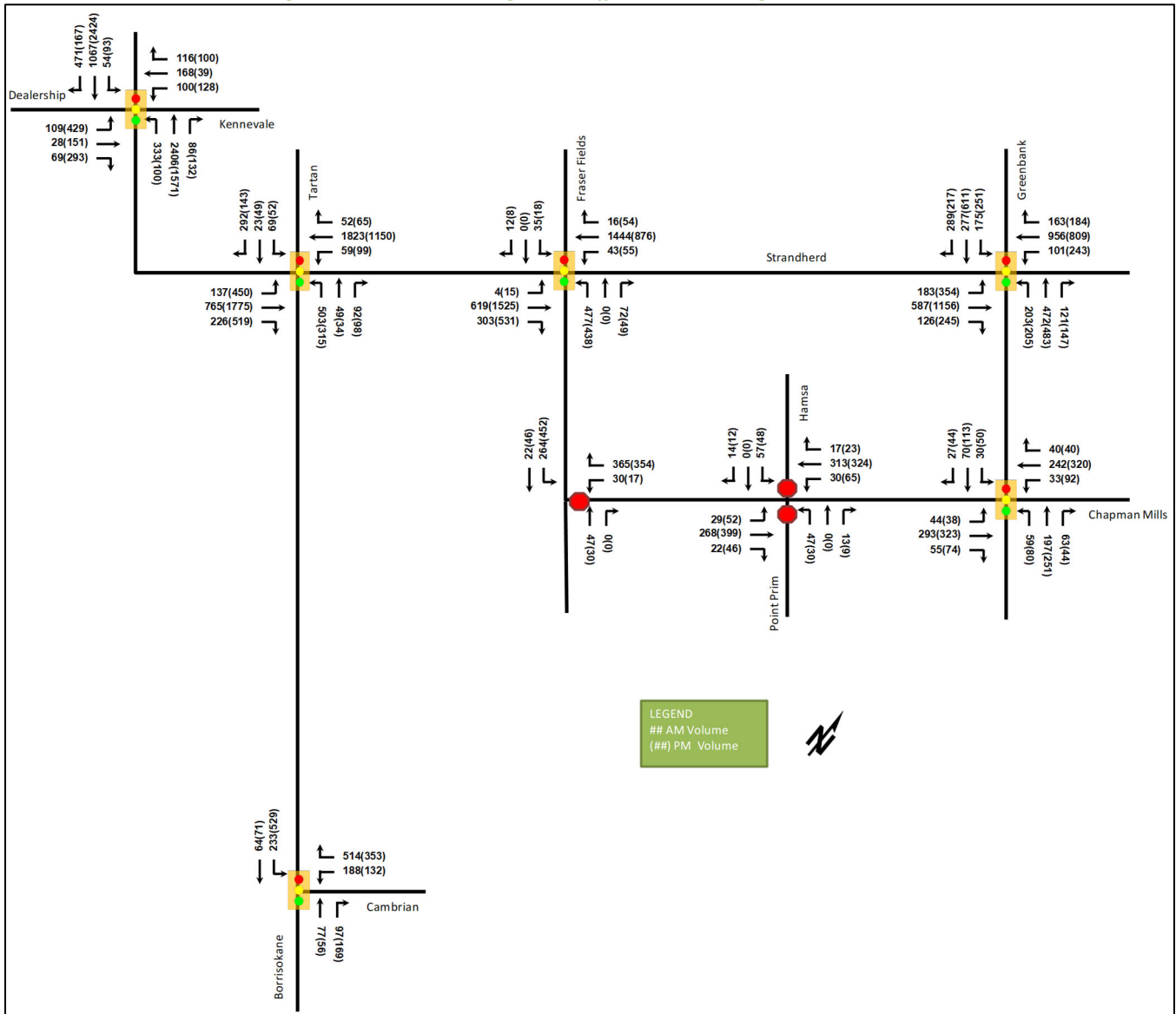


Table 15: 2029 Future Background Intersection Operations – Barrhaven Improvements

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
Strandherd Drive & Dealership Way/Kennevale Drive Signalized	EBL	F	1.02	146.9	#69.0	F	1.31	200.2	#226.3
	EBT	A	0.08	45.5	14.8	A	0.29	42.2	53.4
	EBR	A	0.23	49.0	30.0	B	0.68	55.5	109.7
	WBL	A	0.38	53.4	42.0	A	0.40	46.4	49.9
	WBT/R	D	0.85	78.0	#117.8	A	0.30	42.7	50.5
	NBL	C	0.77	70.7	m35.4	E	0.96	102.5	m16.2
	NBT/R	F	1.24	127.8	m#328.9	F	1.04	45.3	m251.4
	SBL	E	0.98	184.0	#44.5	F	1.01	164.3	#65.5
	SBT	B	0.63	28.5	146.2	F	1.40	213.4	#535.6
SBR	B	0.63	31.2	142.0	A	0.22	19.3	39.0	
Overall		F	-	88.9	-	F	-	132.1	-

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
Strandherd Drive & Borrisokane Road/Tartan Drive <i>Signalized</i>	EBL	F	1.44	292.2	#95.0	F	1.12	107.9	m#104.1
	EBT	A	0.49	12.3	27.7	F	1.00	19.2	m80.1
	EBR	A	0.32	11.2	14.3	B	0.65	7.7	m27.3
	WBL	A	0.52	64.4	m19.5	F	1.21	207.4	m#65.1
	WBT/R	F	1.22	129.0	#382.2	F	1.08	88.2	#246.3
	NBL	F	1.56	306.3	#138.9	F	1.25	196.2	#89.7
	NBT/R	A	0.39	52.5	57.0	A	0.46	59.6	55.7
	SBL	A	0.58	83.8	35.2	A	0.54	88.9	29.5
	SBT/R	F	1.12	142.5	#161.7	D	0.82	87.2	80.9
	Overall	F	-	124.6	-	E	-	64.3	-
Strandherd Drive & Chapman Mills Drive/Fraser Fields Way <i>Signalized</i>	EBL	A	0.07	50.0	m2.4	A	0.24	48.7	m5.1
	EBT	A	0.38	12.4	37.1	E	0.94	18.6	m139.6
	EBR	A	0.42	13.7	38.4	C	0.73	11.4	m47.4
	WBL	A	0.46	82.2	25.0	B	0.60	102.7	m#25.9
	WBT/R	D	0.80	30.6	#264.3	A	0.51	5.4	50.5
	NBL	D	0.82	69.6	#101.1	C	0.79	70.4	#98.9
	NBT/R	A	0.19	42.5	28.1	A	0.13	49.3	25.0
	SBL	A	0.47	88.7	21.8	A	0.13	61.3	12.3
	SBT/R	A	0.07	54.1	8.8	A	0.05	55.0	7.0
	Overall	C	-	33.1	-	C	-	22.6	-
Strandherd Drive & Greenbank Road <i>Signalized</i>	EBL	E	0.90	67.7	#64.6	D	0.80	41.7	m89.9
	EBT	A	0.54	31.9	69.8	E	0.96	32.3	m#166.6
	EBR	A	0.22	2.6	6.7	A	0.37	2.0	m4.9
	WBL	A	0.35	21.1	22.0	E	0.94	97.4	#108.1
	WBT	E	0.95	56.1	#142.7	D	0.88	62.6	139.8
	WBR	A	0.29	5.8	14.2	A	0.33	3.9	10.5
	NBL	D	0.82	75.0	#40.7	D	0.84	89.2	#50.0
	NBT/R	B	0.64	36.3	73.8	D	0.85	58.3	#86.1
	SBL	C	0.72	66.4	#33.2	D	0.87	96.0	#61.9
	SBT	A	0.30	31.8	35.4	C	0.77	60.1	110.8
	SBR	A	0.54	17.2	45.6	A	0.42	8.1	20.7
Overall	D	-	41.1	-	D	-	50.0	-	
Chapman Mills Drive & Greenbank Road <i>Signalized</i>	EBL	A	0.45	64.7	#26.0	A	0.41	99.2	m16.6
	EBT	B	0.68	41.3	79.6	D	0.84	55.1	100.0
	EBR	A	0.15	30.0	18.0	A	0.23	31.4	m16.7
	WBL	A	0.36	60.7	#18.7	B	0.62	82.6	43.6
	WBT	B	0.63	41.5	65.4	B	0.68	55.6	106.7
	WBR	A	0.12	30.7	14.1	A	0.10	39.0	16.8
	NBL	A	0.49	62.5	#30.7	A	0.58	82.2	39.4
	NBT/R	A	0.18	20.7	32.1	A	0.21	29.2	47.7
	SBL	A	0.27	54.6	16.1	A	0.46	84.7	m20.6
	SBT/R	A	0.07	22.6	13.8	A	0.12	31.5	m19.1
Overall	D	-	37.1	-	D	-	51.2	-	

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
Cambrian Road & Borrisokane Road <i>Signalized</i>	WBL	A	0.35	11.4	21.8	A	0.27	12.4	17.8
	WBR	B	0.62	5.2	14.3	A	0.51	4.8	13.1
	NBT	A	0.14	9.6	10.1	A	0.09	8.3	7.8
	NBR	A	0.18	3.8	6.3	A	0.26	3.2	7.9
	SBL	A	0.31	10.5	12.5	B	0.60	13.0	28.5
	SBT	A	0.12	9.4	8.8	A	0.11	8.5	9.3
	Overall	A	-	7.6	-	A	-	9.0	-
Chapman Mills Drive & Hamsa Street/Prim Point Crescent <i>Unsignalized</i>	EBL	A	0.02	8.0	0.8	A	0.04	8.1	0.8
	EBT/R	-	-	-	-	-	-	-	-
	WBL	A	0.02	7.9	0.8	A	0.06	8.4	1.5
	WBT/R	-	-	-	-	-	-	-	-
	NB	C	0.16	16.7	4.5	C	0.16	22.8	4.5
	SB	C	0.20	17.4	5.3	D	0.25	25.3	7.5
	Overall	A	-	3.3	-	A	-	3.3	-
Chapman Mills Drive & Chapman Mills Drive <i>Unsignalized</i>	WBR	C	0.08	15.1	2.3	C	0.09	24.9	2.3
	WBL	B	0.36	10.5	12.0	B	0.34	10.2	11.3
	NBT	-	-	-	-	-	-	-	-
	NBR	-	-	-	-	-	-	-	-
	SBL	A	0.17	7.8	4.5	A	0.29	8.2	9.0
	SBT	-	-	-	-	-	-	-	-
	Overall	A	-	8.7	-	A	-	8.6	-

Notes: Saturation flow rate of 1800 veh/h/lane
PHF = 1.00

m = metered queue

= queue may exceed storage or mid-block length

The traffic redistributions and mode shift to transit produce a noticeable benefit to the Strandherd Drive corridor, reducing the capacity demands on most movements. There are still capacity, delay and queuing constraints along Strandherd Drive from Borrisokane Road north to Kennevale Drive, and delay and queuing constraints east of Borrisokane Road.

At the Kennevale Drive intersection, the eastbound left-turn and northbound through/right-turn movements will be over capacity during the AM peak, with high delays noted for the eastbound left-turn, northbound through/right-turn and southbound left-turn movements, and may experience extended queuing for the eastbound left-turn, westbound through/right-turn, northbound through/right-turn and southbound left-turn movements. During the PM peak, the eastbound left-turn, northbound through/right-turn and southbound left-turn and through movements will be over capacity. High delays are noted for the eastbound left-turn, northbound left-turn, and southbound left-turn and through movements, and may experience extended queuing for the eastbound left-turn and southbound left-turn and through movements.

During the AM peak, the Strandherd Drive and Borrisokane Road intersection will be over capacity in the eastbound left-turn, westbound through/right-turn, northbound left-turn, and southbound through/right-turn movements. These movements are also noted to have high delays and may experience extended queuing, with the southbound left-turn also experiencing high delays. During the PM peak, eastbound left-turn, westbound left-turn and through/right-turn, and northbound left-turn movements will be over capacity, experience high delays and have may experience extended queuing. The southbound left-turn and through/right-turn movements are also noted to have high delays.

The Strandherd Drive and Chapman Mills Drive intersection will see high delays for the southbound left-turn movement and may experience extended queuing for the westbound through/right-turn and northbound left-turn movements during the AM peak. The westbound left-turn will experience high delays and the eastbound through, westbound left-turn and northbound left-turn movements may experience extended queuing during the PM peak.

During the AM peak, the Strandherd Drive and Greenbank Road intersection will experience high delays in the northbound left-turn and southbound left-turn movements, and may experience extended queuing in the westbound through, northbound left-turn and through/right-turn, and southbound left-turn movements. During the PM peak, the westbound left-turn and southbound left-turn movements will be over capacity with high delays noted for these and the northbound left-turn movements. Extended queuing may be experienced in the eastbound left-turn, westbound left-turn, northbound left-turn and through/right-turn, and southbound left-turn and through movements.

High delays are noted for the westbound left-turn at the Chapman Mills Drive and Greenbank Road intersection during the PM peak.

The remaining intersections operate satisfactorily.

Overall, the infrastructure improvements of the additional interchange at Barnsdale Road and enhanced transit service south of the Jock River shows significant improvements at the study area intersections. A commitment from the City is required to advance these items and continue to look for continual mode shifting within Barrhaven to further reduce the auto dependency currently observed.

7.3 2034 Future Background Operations

Figure 19 illustrates the 2034 future background traffic volumes and Table 16 summarizes the 2034 forecasted intersection operations. The level of service for signalized intersections is based on the TIA Guidelines for volume to capacity ratio of the lane movements and HCM average delay for the overall intersection, and HCM average delay for unsignalized intersections. Previous intersection modifications have been carried forward, traffic mitigations outlined in Section 7.1, and timing optimization have been included in the operational analysis.

Figure 19: 2034 Future Background Traffic Volumes – Mitigated Conditions

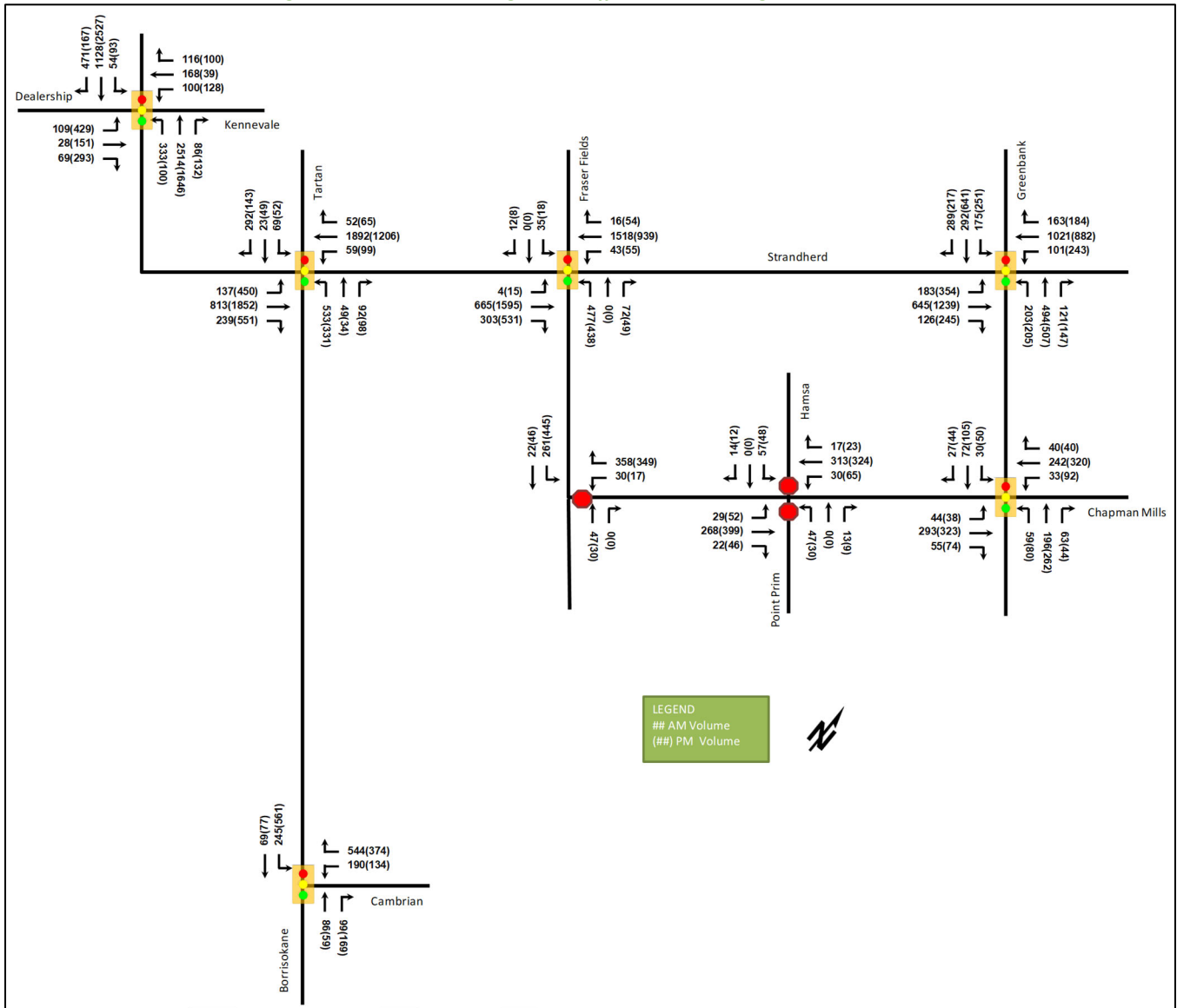


Table 16: 2034 Future Background Intersection Operations– Barrhaven Improvements

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
Strandherd Drive & Dealership Way/Kennevale Drive Signalized	EBL	F	1.01	146.3	#71.4	F	1.31	200.2	#226.3
	EBT	A	0.08	47.2	15.4	A	0.29	42.2	53.4
	EBR	A	0.23	50.7	30.9	B	0.68	55.5	109.7
	WBL	A	0.38	55.0	43.3	A	0.40	46.4	49.9
	WBT/R	D	0.84	78.8	#122.8	A	0.30	42.7	50.5
	NBL	C	0.77	72.7	m36.0	E	0.96	100.0	m15.8
	NBT	F	1.29	149.9	m#344.3	F	1.06	51.7	m259.2
	SBL	F	1.00	191.7	#45.6	F	1.31	262.1	#72.0
	SBT	B	0.67	29.6	158.9	F	1.46	239.1	#567.7
SBR	B	0.62	31.1	142.2	A	0.22	19.3	39.0	
Overall		F	-	100.7	-	F	-	147.1	-

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
Strandherd Drive & Borrisokane Road/Tartan Drive <i>Signalized</i>	EBL	F	1.49	308.9	#95.7	F	1.18	134.5	#107.8
	EBT	A	0.51	12.8	47.5	F	1.04	34.2	m79.0
	EBR	A	0.34	11.2	23.1	B	0.69	7.9	m27.5
	WBL	A	0.52	62.8	m19.6	F	1.21	207.3	#66.0
	WBT/R	F	1.24	138.2	#409.6	F	1.09	90.9	#257.8
	NBL	F	1.59	320.2	#150.3	F	1.32	219.1	#95.4
	NBT/R	A	0.39	53.8	58.3	A	0.46	59.6	55.7
	SBL	A	0.59	86.9	36.0	A	0.54	88.9	29.5
	SBT/R	F	1.15	153.4	#167.3	D	0.82	87.2	80.9
Overall	F	-	131.9	-	E	-	74.3	-	
Strandherd Drive & Chapman Mills Drive/Fraser Fields Way <i>Signalized</i>	EBL	A	0.07	52.0	m2.5	A	0.24	47.7	m4.9
	EBT	A	0.41	13.2	42.8	E	0.98	23.3	m141.0
	EBR	A	0.42	14.3	42.0	C	0.73	10.5	m40.2
	WBL	A	0.47	106.2	m16.3	B	0.60	102.3	#24.7
	WBT/R	D	0.83	15.5	#284.1	A	0.55	5.3	m50.4
	NBL	D	0.81	70.0	#105.5	C	0.79	70.4	#98.9
	NBT/R	A	0.19	44.0	29.0	A	0.13	49.3	25.0
	SBL	A	0.49	92.2	22.5	A	0.13	61.3	12.3
	SBT/R	A	0.08	56.1	9.1	A	0.05	55.0	7.0
Overall	C	-	26.1	-	C	-	24.1	-	
Strandherd Drive & Greenbank Road <i>Signalized</i>	EBL	C	0.79	76.4	#67.6	D	0.83	44.5	m88.1
	EBT	A	0.48	20.9	38.2	E	0.98	31.8	#159.7
	EBR	A	0.19	1.7	1.6	A	0.36	1.6	m4.1
	WBL	A	0.34	23.3	24.2	E	0.98	107.0	#110.9
	WBT	E	0.90	57.3	171.2	D	0.89	61.7	152.2
	WBR	A	0.26	5.0	13.8	A	0.31	3.7	10.2
	NBL	C	0.73	81.5	44.2	E	0.90	100.4	#52.7
	NBT/R	B	0.67	49.4	106.8	E	0.91	66.5	#124.5
	SBL	C	0.70	82.7	#40.5	E	0.92	103.5	#63.9
	SBT	A	0.32	45.6	51.7	D	0.83	64.5	118.0
	SBR	A	0.55	22.9	60.0	A	0.43	8.2	20.9
Overall	D	-	44.8	-	D	-	52.8	-	
Chapman Mills Drive & Greenbank Road <i>Signalized</i>	EBL	A	0.44	63.5	23.6	A	0.41	100.9	m16.9
	EBT	D	0.82	69.9	116.5	D	0.84	56.6	99.5
	EBR	A	0.18	43.5	28.7	A	0.23	32.9	m17.0
	WBL	A	0.36	78.2	20.5	B	0.62	82.6	43.6
	WBT	C	0.70	65.3	89.6	B	0.68	55.6	106.7
	WBR	A	0.14	46.9	19.0	A	0.10	39.0	16.8
	NBL	A	0.51	81.1	31.4	A	0.58	82.2	39.4
	NBT/R	A	0.15	21.3	36.6	A	0.21	29.3	49.3
	SBL	A	0.34	76.1	11.9	A	0.46	82.6	m19.6
SBT/R	A	0.06	17.5	19.5	A	0.12	36.4	m18.6	
Overall	D	-	52.2	-	D	-	52.0	-	

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
Cambrian Road & Borrisokane Road <i>Signalized</i>	WBL	A	0.35	11.3	22.0	A	0.27	12.9	18.7
	WBR	B	0.64	5.3	14.5	A	0.54	5.1	13.7
	NBT	A	0.16	9.9	11.4	A	0.09	8.2	8.0
	NBR	A	0.19	3.9	6.6	A	0.26	3.1	7.8
	SBL	A	0.33	10.9	13.6	B	0.63	13.3	30.5
	SBT	A	0.13	9.7	9.6	A	0.12	8.4	9.8
	Overall	A	-	7.8	-	A	-	9.3	-
Chapman Mills Drive & Hamsa Street/Prim Point Crescent <i>Unsignalized</i>	EBL	A	0.02	8.0	0.8	A	0.04	8.1	0.8
	EBT/R	-	-	-	-	-	-	-	-
	WBL	A	0.02	7.9	0.8	A	0.06	8.4	1.5
	WBT/R	-	-	-	-	-	-	-	-
	NB	C	0.16	16.7	4.5	C	0.16	22.8	4.5
	SB	C	0.20	17.4	5.3	D	0.25	25.3	7.5
	Overall	A	-	3.3	-	A	-	3.3	-
Chapman Mills Drive & Chapman Mills Drive <i>Unsignalized</i>	WBR	B	0.08	14.9	1.5	C	0.08	24.3	2.3
	WBL	B	0.35	10.4	12.0	B	0.33	10.2	11.3
	NBT	-	-	-	-	-	-	-	-
	NBR	-	-	-	-	-	-	-	-
	SBL	A	0.17	7.8	4.5	A	0.28	8.2	9.0
	SBT	-	-	-	-	-	-	-	-
	Overall	A	-	8.6	-	A	-	8.6	-

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

The 2034 background operations are expected to be similar to the 2029 background mitigated operations at most study area intersections. The Strandherd Drive intersections at Kennevale Drive and at Borrisokane Road will continue to have significant capacity constraints, delay, and queuing concerns for many of the movements and will see incremental decrease in operations due to the background growth.

7.4 Demand Rationalization Conclusions

As outlined through the existing conditions and 2029 future background analysis, Barrhaven has significant auto volume demands on Strandherd Drive, both from north and south of the Jock River. These demands are along the mainline of Strandherd Drive itself, and on the turning movements to and from the corridor, all competing to limited time available at each intersection.

Through the TIA process, the City requires transportation demand measures be considered for each development to ease the burden on the road network. These measures will be included in this development, such as active mode connectivity and supporting programs within the community. It will also be assumed that the Chapman Mills BRT will be extended to support this development and the BRT modal shares will be applied to the future conditions. Ultimately, this will only serve to ease the impacts of this development but does not address the existing systemic issues in Barrhaven.

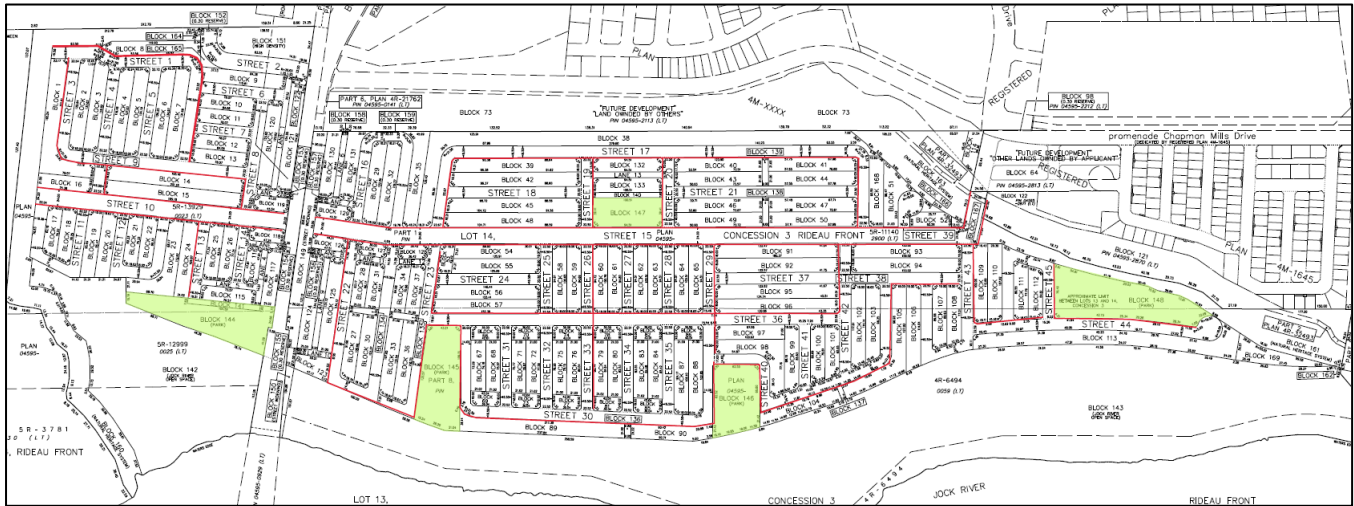
To address the systemic issues noted in the existing and background conditions, the deferral of planned infrastructure, such as the Re-Aligned Greenbank Road corridor being shifted to beyond 2031, will need to be reassessed and additional regional TDM programs or infrastructure will be needed from the City of Ottawa. The minimum needs have been highlighted above with the new Barnsdale Road Interchange and transit corridor to Barrhaven South, but still leaves capacity and queuing concerns along Strandherd Drive.

8 Development Design

8.1 Design for Sustainable Modes

The proposed development is a residential subdivision and the auto parking and bicycle parking will be located at each of the individual units. Figure 20 illustrates the proposed pedestrian network. The plan incorporates the adjacent developments and planned routes on geoOttawa. Street 10 and 15 will include cycle tracks.

Figure 20: Concept Pedestrian and Cycling Network



The active mode network will also connect to the future Chapman Mills BRT stops at the Chapman Mills Drive and Chapman Mills Drive intersection, and a stop near Borrisokane Road, either on the east side of the roadway or at the park and ride to the north.

8.2 New Street Networks

The new streets proposed as part of the plan of subdivision internal local roads with 14.0 (single loaded), 16.5 metre right of ways and 24.0m for the collector roads. Traffic calming elements will be included at the pedestrian and cycle track crossing locations, with limited applications within the internal local road intersections. Vertical measures will not be implemented beyond the collector road pedestrian/cycling crossing due to site servicing constraints and cost implications for future City maintenance of underground infrastructure.

Once the internal road network is finalized, including input from all disciplines involved in plan of subdivision approvals, include urban planning and parks, a geometric road design drawing will be prepared to outline the above traffic calming measures. The City should endeavour to confirm all input from the various departments is discussed holistically to reduce competing design commentary when preparing the geometric road design.

9 Boundary Streets

Table 17 summarizes the MMLOS analysis for the boundary road of Borrisokane Road. The existing and future conditions have been summarized in separate rows, with the future assuming a 2-lane arterial road cross-section with curb side bike lanes. The targets are based on the policy area of developing community and within 600m of a rapid transit station. The MMLOS worksheet has been provided in Appendix H.

Table 17: Boundary Street MMLOS Analysis

Segment	Pedestrian LOS		Bicycle LOS		Transit LOS		Truck LOS	
	PLOS	Target	BLOS	Target	TLOS	Target	TrLOS	Target
Borrisokane Road – Existing (developing community)	F	C	F	B	D	D	B	N/A
Borrisokane Road – Future (600m of rapid transit)	C	A	C	B	D	D	B	E

The existing Borrisokane Road corridor does not provide and pedestrian or cycling facilities beyond a gravel shoulders, therefore failing for MMLOS targets.

The future corridor with sidewalks will still fall short of the pedestrian LOS target of A, which is a function of both vehicle speeds and volumes along Borrisokane Road. The City would need to reduce the speeds to below 30 km/h or reduce the volumes along Borrisokane Road to less than 3000 vehicles per day to reach a LOS A. For cycling, a physically separated facility or reducing Borrisokane Road speeds to less than 50 km/h would achieve the MMLOS targets.

10 Access Intersections

10.1 Location and Design of Access

The residential accesses will connect via new collector roads to Borrisokane Road and Chapman Mills Drive. Within the subdivision, no turn lanes are proposed for the intersections and will be controlled by minor stop control. The collector road intersections with Borrisokane Road will be signalized intersections, with Access #2 being full movements on each leg, and Access #3 will include the BRT access on the east leg of the intersection. The summary of the lane arrangements are as follows:

- Access #2
 - Northbound left-turn, through and right-turn lanes (right-turn can be converted for future widens and reduces queue conflicts with through movement)
 - Southbound left-turn, through and right-turn lanes (right-turn can be converted for future widens and reduces queue conflicts with through movement)
 - Eastbound left-turn and shared through/right-turn lanes
 - Westbound left-turn and shared through/right-turn lanes
- Access #3
 - Northbound left-turn and through lanes
 - Southbound through and right-turn lanes (need for left-turn to be confirmed with OC Transpo)
 - Eastbound shared left-turn/through lane (need for future dedicated left-turn protection or separate through lane for transit to be confirmed with OC Transpo)
 - Westbound transit only through lane

The connection to Chapman Mills Drive (Access #1) will remain consistent with the proposed EA study intersection and modifications resulting from Phase 1 of the Conservancy area.

10.2 Access Intersection Control

The three access intersections will be signalized intersections, one at the Chapman Mills Drive/BRT and two along Borrisokane Road.

10.3 Access Intersection Design

10.3.1 2029 Future Total Operations

Figure 21 illustrates the 2029 future total traffic volumes and Table 18 summarizes the 2029 forecasted future total access intersection operations. The level of service for signalized intersections is based on the TIA Guidelines for volume to capacity ratio of the lane movements and HCM average delay for the overall intersection. The signalized intersections have been optimized and coordinated. Detailed turning movement count data is included in Appendix I

Figure 21: 2029 Future Total Traffic Volumes – Mitigated Conditions

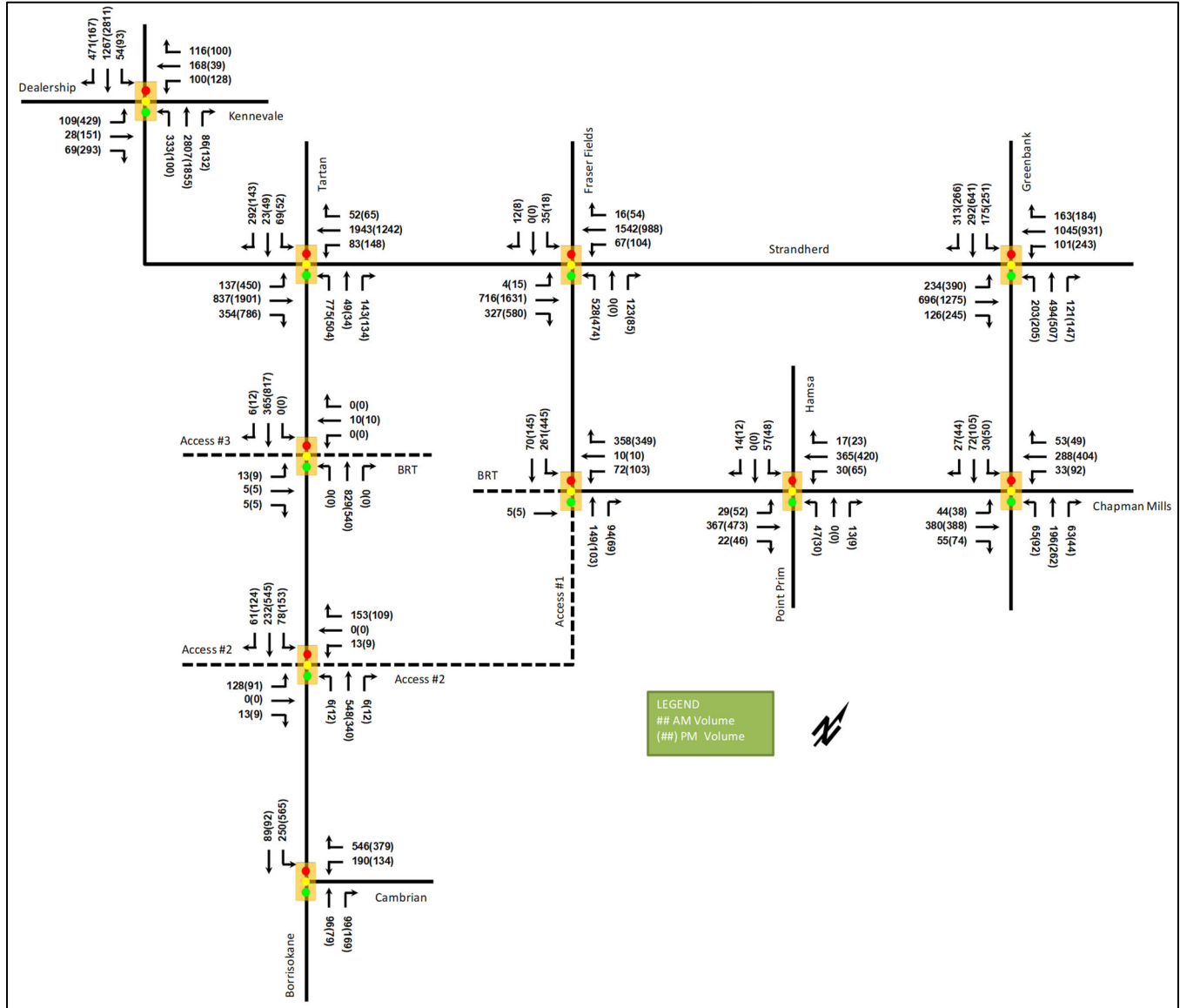


Table 18: 2029 Future Total Access Intersection Operations– Barrhaven Improvements

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
Chapman Mills Drive & Access #1 <i>Signalized</i>	EB	A	0.01	50.2	5.5	A	0.02	57.8	5.6
	WBL	A	0.15	25.3	21.1	A	0.24	22.4	37.9
	WBT	A	0.02	60.7	m8.7	A	0.04	62.7	m6.7
	WBR	D	0.85	53.5	80.7	E	0.91	58.1	#145.4
	NBT	A	0.31	41.7	46.6	A	0.13	24.0	29.0
	NBR	A	0.23	39.8	31.7	A	0.10	23.7	20.9
	SBL	E	0.90	57.8	77.0	D	0.84	35.3	#182.4
	SBT	A	0.14	21.2	11.8	A	0.19	11.1	m21.5
Overall	D	-	47.5	-	D	-	36.6	-	
Access #2 & Borrisokane Road <i>Signalized</i>	EBL	E	0.90	112.1	57.7	A	0.43	32.4	20.4
	EBT/R	A	0.02	0.1	0.0	A	0.02	0.1	0.0
	WBL	A	0.06	48.8	8.9	A	0.04	22.3	3.9
	WBT/R	A	0.27	1.2	0.0	A	0.16	0.5	0.0
	NBL	A	0.10	74.8	m3.8	A	0.10	33.8	m4.2
	NBT	A	0.59	20.8	161.0	A	0.45	16.1	78.1
	NBR	A	0.01	0.0	m0.0	A	0.02	0.0	m0.0
	SBL	A	0.46	53.2	35.0	B	0.69	45.3	#35.6
	SBT	A	0.21	0.7	2.1	A	0.52	11.5	#127.0
	SBR	A	0.06	0.1	0.1	A	0.12	3.0	10.7
Overall	C	-	24.4	-	B	-	15.9	-	
Access #3 & Borrisokane Road <i>Signalized</i>	EB	A	0.16	50.8	13.4	A	0.13	47.9	11.4
	WB	A	0.06	57.4	8.2	A	0.06	57.4	8.2
	NB	B	0.60	3.0	27.1	A	0.39	5.5	95.6
	SBT	A	0.26	0.7	m5.4	A	0.59	0.7	m0.7
	SBR	A	0.00	0.0	m0.0	A	0.01	0.0	m0.0
	Overall	A	-	3.5	-	A	-	3.5	-

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

The 2029 future total operations at the access intersections generally operate well during both peak hours. During the AM peak, a high delay is noted for the eastbound left-turn at the Access #2 intersection. During the PM peak, extended queuing may be experienced at the Chapman Mills Drive and Access #1 intersection for the westbound right-turn and southbound left-turn movements, and for the southbound left-turn and through movements at the Borrisokane Road and Access #2 intersection. The signal optimization was weighted towards improving the mainline movements, so additional refinements are likely to achieve a reduction in the AM delay and the PM queues with the exception of the Chapman Mills Drive intersection. As the major movements reflective of other study are intersections where the primary movements are pushed to turning movements (e.g. Borrisokane Road at Cambrian Road and at Strandherd Drive) it is expected to produce reduce operational efficiency. This specific intersection will also require additional coordination due to the BRT corridor.

10.3.2 2034 Future Total Operations

Figure 22 illustrates the 2034 future total traffic volumes and Table 19 summarizes the 2034 forecasted future total access intersection operations. The level of service for signalized intersections is based on the TIA Guidelines for volume to capacity ratio of the lane movements and HCM average delay for the overall intersection. The signalized intersections have been optimized and coordinated. Detailed turning movement count data is included in Appendix J

Figure 22: 2034 Future Total Traffic Volumes – Mitigated Conditions

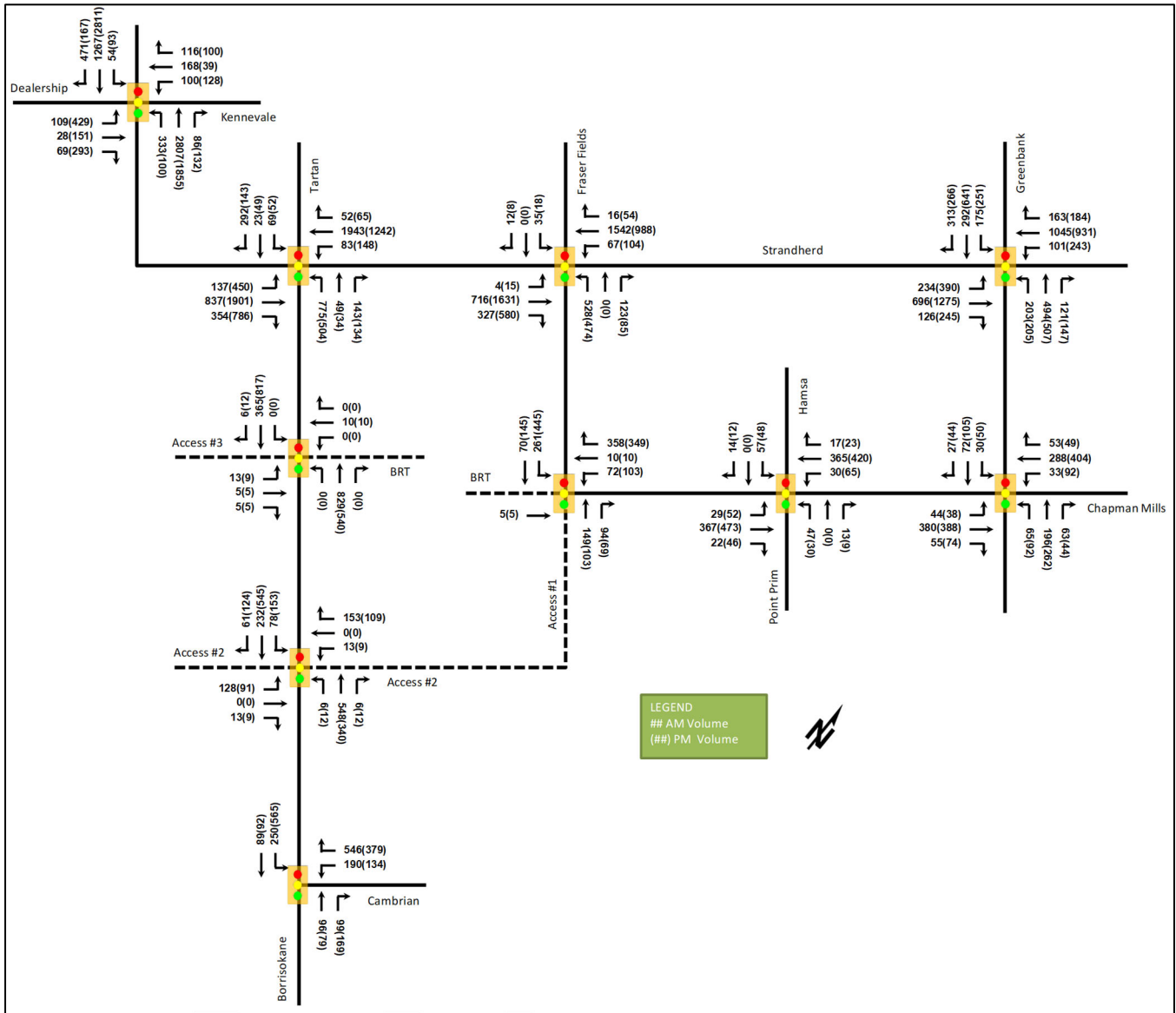


Table 19: 2034 Future Total Access Intersection Operations– Barrhaven Improvements

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
Chapman Mills Drive & Access #1 <i>Signalized</i>	EB	A	0.01	50.2	5.5	A	0.02	57.8	5.6
	WBL	A	0.15	25.3	21.1	A	0.24	22.4	37.9
	WBT	A	0.02	60.7	m8.7	A	0.04	62.7	m6.7
	WBR	D	0.85	53.5	80.7	E	0.91	58.1	#145.4
	NBT	A	0.31	41.7	46.6	A	0.13	24.0	29.0
	NBR	A	0.23	39.8	31.7	A	0.10	23.7	20.9
	SBL	E	0.90	57.8	77.0	D	0.84	35.3	#182.4
	SBT	A	0.14	21.2	11.8	A	0.19	11.1	m21.5
Overall		D	-	47.5	-	D	-	36.6	-

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
Access #2 & Borrisokane Road <i>Signalized</i>	EBL	E	0.90	112.1	57.7	A	0.43	32.4	20.4
	EBT/R	A	0.02	0.1	0.0	A	0.02	0.1	0.0
	WBL	A	0.06	48.8	8.9	A	0.04	22.3	3.9
	WBT/R	A	0.27	1.2	0.0	A	0.16	0.5	0.0
	NBL	A	0.10	74.8	m3.8	A	0.10	33.8	m4.2
	NBT	A	0.59	20.8	161.0	A	0.45	16.1	78.1
	NBR	A	0.01	0.0	m0.0	A	0.02	0.0	m0.0
	SBL	A	0.46	53.2	35.0	B	0.69	45.3	#35.6
	SBT	A	0.21	0.7	2.1	A	0.52	11.5	#127.0
	SBR	A	0.06	0.1	0.1	A	0.12	3.0	10.7
Overall	C	-	24.4	-	B	-	15.9	-	
Access #3 & Borrisokane Road <i>Signalized</i>	EB	A	0.16	50.8	13.4	A	0.13	47.9	11.4
	WB	A	0.06	57.4	8.2	A	0.06	57.4	8.2
	NB	B	0.60	3.0	27.1	A	0.39	5.5	95.6
	SBT	A	0.26	0.7	m5.4	A	0.59	0.7	m0.7
	SBR	A	0.00	0.0	m0.0	A	0.01	0.0	m0.0
	Overall	A	-	3.5	-	A	-	3.5	-

Notes: Saturation flow rate of 1800 veh/h/lane
PHF = 1.00

m = metered queue
= queue exceeds storage or mid-block length

The 2034 total future operations are expected to be similar to the 2029 future total operations.

10.3.3 Access Intersection MMLoS

Table 20 summarizes the MMLoS analysis for the access intersections for the development. The targets are based on the policy area of developing community and within 600m of a rapid transit station. The MMLoS worksheet has been provided in Appendix H.

Table 20: Access Intersection MMLoS Analysis

Intersection	Pedestrian LOS		Bicycle LOS		Transit LOS		Truck LOS		Auto LOS	
	PLOS	Target	BLOS	Target	TLOS	Target	TrLOS	Target	ALOS	Target
Chapman Mills Drive & Access #1 (future)	F	A	A	B	E	A	-	N/A	B	E
Borrisokane Road & Access #2	D	A	A	B	E	D	E	E	B	E
Borrisokane Road & Access #3 (future)	C	A	A	B	F	A	E	E	B	E

The MMLoS targets for the pedestrian and transit LOS will not be met at the development access intersections. The pedestrian level of service would require a maximum of four lanes at a crossing to meet a LOS C.

For transit, the BRT corridor at Access #1 and #3 is assumed to pre-empt the signal timing to allow transit to proceed and would operate closer to the targets. It is noted that transit LOS A requires zero seconds average delay for the approach, which is unlikely to be achievable. A LOS B with less than 10 seconds delay may be a more realistic target for the Chapman Mills Drive corridor. At the Access #2 intersection, this service would be mixed flow for local routes and is a function of the east and west legs having higher delays to allow the major flows north and south along Borrisokane Road.

10.3.4 Recommended Design Elements

The intersection lane requirements have been noted in Section 10.1. The final design for Borrisokane Road and the associated intersections will require consultation with the City and OC Transpo.

11 Transportation Demand Management

11.1 Context for TDM

The mode shares used within the TIA represent this area of the City and typical mode shares for BRT areas. The modal shares are likely to be achieved.

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

11.2 Need and Opportunity

The subject site has been assumed to rely on a higher transit modal share than typically found within Nepean, requiring increase transit service and rapid adoption of transit ridership. These assumptions have been carried through the analysis. The opportunity for the City to extend transit infrastructure elsewhere within Barrhaven and Barrhaven South exists and will help encourage this modal shift to greater areas of Barrhaven than the localized targets for this development. The development can provide the internal connectivity to transit and adjacent non-auto infrastructure, although this will be underutilized until other City infrastructure is constructed to support the development potential in Barrhaven.

11.3 TDM Program

The “suite of post occupancy TDM measures” has been summarized in the TDM checklists for the residential land uses. The checklist is provided in Appendix K.

The key TDM measures recommended include:

- Enhanced connectivity of pedestrians and cyclists to the adjacent network
- Posting of pedestrian and cycling wayfinding signage within the community
- Organize community cycling course for new residents
- Early service agreement with OC Transpo to support higher adoption of transit ridership
- Conduct semi-annual community surveys for 2 years to collect travel pattern and behaviour data (in conjunction with City TDM coordinator)

12 Neighbourhood Traffic Management

The proposed development will connect to the arterial road network at Borrisokane Road, and to Chapman Mills Drive which is a collector road. Prior to the connection of Chapman Mills Drive across the Kennedy-Burnett SWM Pond, the background developments (see Section 2.3.2) will be the only traffic accessing Chapman Mills Drive. The forecasted volumes along Chapman Mills Drive between Strandherd Drive and the east-west segment is in the range of 7,000-9,000 two-way vehicles per day. These volumes exceed the TIA Guidelines threshold of 2,500 vehicles per day or 300 vehicles during the peak hour, equivalent to 5 cars per minute in both directions total. In general, the TIA thresholds are too low for collector roadways of this nature, in areas of the City that is currently under served by both the collector and arterial road network. For example, the Minto Harmony development consumes this entire threshold prior to any additional development in the area or the connection east to Greenbank Road.

13 Transit

13.1 Route Capacity

The proposed development will require additional transit service to be provided to support the area. It is forecasted that approximately 250-290 two-way peak hour transit trips will be generated with the existing modal shares in Nepean and up to 500-575 two-way peak hour transit trips for BRT level modal shares are achieved. Table 21 summarizes the forecasted peak direction transit trips to estimate the minimum bus type and service required to support Conservancy.

Table 21: Forecasted Transit Service – Minimum Bus Requirements

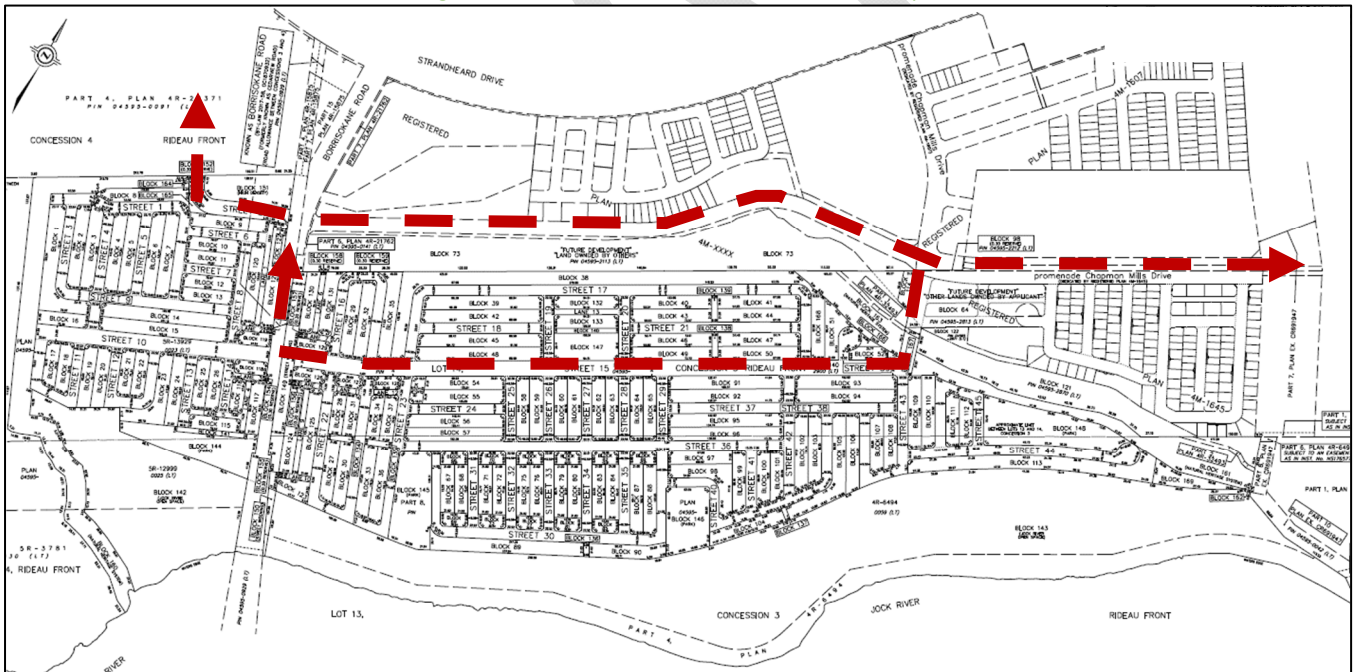
Phase	Trips in Peak Direction	Minimum Buses Required By Type		
		Single Capacity: 55	Articulated Capacity: 75	Double Decker Capacity: 95
East – Auto Focus	170	3-4 buses	2-3 buses	2-3 buses
East – Transit Focus	340	7-8 buses	5-6 buses	4-5 buses

Note: capacity assessed at 80% for bus number calculations

With the numbers above, the route frequencies would be required to achieve the forecasted transit mode shares would require 15-20 minute service with lower transit modal shares and 5-15 minute service to achieve BRT level modal shares. If the higher adoption of transit is to be achieved, it is recommended that the higher service is provided prior to the implementation of the Chapman Mills BRT.

Figure 23 illustrates the potential transit service options with the existing network and future networks in place.

Figure 23: Local Bus Service – Potential Service Loop



13.2 Transit Priority

No transit priority was considered within the development. The Chapman Mills Drive EA proposed a transit only left-turn lane at the Strandherd Drive intersection and provided transit signals for buses to enter and exit the BRT as Chapman Mills Drive transitioned from the centre median cross-section along the east-west portion, to a

divided two-lane collector on the north-south portion. A transit signal will need to be incorporated into the signalized intersection once the BRT is extended to Borrisokane Road.

14 Review of Network Concept

The existing and background volumes forecasted along Strandherd Drive and accessing Strandherd Drive from the south, are exceeding the existing lane capacities and will continue to do so once the widening is completed. Extensive infrastructure projects have been planned for Barrhaven, and overall a minimum number of these projects have been implemented and many continue to be pushed farther into the future. As identified previously, the following projects are required to support Barrhaven as a whole, and additional projects that would begin to bring the transportation network to the level of other suburban areas of Ottawa are also listed and support the growth potential of Barrhaven:

- Currently required projects:
 - Barnsdale-Highway 417 interchange (interim)
 - Chapman Mills BRT extension to Borrisokane Road
 - Re-Aligned Greenbank Road BRT Corridor, Towncentre to Kilbirnie Drive
- Barrhaven supportive projects:
 - Re-Aligned Greenbank Road, to Cambrian Road
 - LRT extension to the Towncentre

15 Network Intersection Design

15.1 Network Intersection Control

The study area intersections are all assumed to be signalized, through the Strandherd Drive widening, extension of Chapman Mills Drive and the BRT corridor, and development related improvements at Cambrian Road and Borrisokane Road. These changes have been noted in Section 7.1.

15.2 Network Intersection Design

15.2.1 2029 Future Total Operations

Figure 21 illustrates the 2029 future total traffic volumes and Table 22 summarizes the 2029 forecasted future total intersection operations. The level of service for signalized intersections is based on the TIA Guidelines for volume to capacity ratio of the lane movements and HCM average delay for the overall intersection. The signalized intersections have been optimized and coordinated. Detailed turning movement count data is included in Appendix I

Table 22: 2029 Future Total Intersection Operations– Barrhaven Improvements

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
Strandherd Drive & Dealership Way/Kennevale Drive <i>Signalized</i>	EBL	F	1.01	146.3	#71.4	F	1.34	213.6	#228.7
	EBT	A	0.08	47.2	15.4	A	0.30	43.1	53.9
	EBR	A	0.23	50.7	30.9	C	0.70	57.2	110.8
	WBL	A	0.38	55.0	43.3	A	0.41	47.5	50.4
	WBT/R	D	0.84	78.8	#122.8	A	0.31	43.5	51.0
	NBL	C	0.79	54.7	m39.5	E	0.96	93.9	m15.5
	NBT/R	F	1.38	191.9	m#354.2	F	1.13	78.6	m#301.7
	SBL	E	1.00	191.7	#45.6	F	1.31	262.1	#72.0
	SBT	C	0.71	30.2	166.6	F	1.54	275.7	#620.3
	SBR	B	0.62	30.0	134.8	A	0.21	18.7	38.4
Overall	F	-	121.8	-	F	-	173.4	-	
Strandherd Drive & Borriskane Road/Tartan Drive <i>Signalized</i>	EBL	F	1.49	295.0	m#89.2	F	1.24	159.2	m87.2
	EBT	A	0.58	31.1	141.3	F	1.07	49.2	m56.6
	EBR	A	0.56	32.3	132.9	E	0.99	22.1	m41.4
	WBL	A	0.53	66.2	m27.4	F	1.18	174.6	m#78.0
	WBT/R	F	1.29	161.2	#414.2	F	1.03	64.0	m#220.6
	NBL	F	1.87	430.8	#209.8	F	1.23	169.9	#128.2
	NBT/R	B	0.60	51.2	71.8	A	0.55	62.2	72.4
	SBL	A	0.36	66.1	35.6	C	0.70	113.0	#37.2
	SBT/R	F	1.15	153.4	#167.3	F	1.19	186.6	#117.6
	Overall	F	-	168.7	-	E	-	78.7	-
Strandherd Drive & Chapman Mills Drive/Fraser Fields Way <i>Signalized</i>	EBL	A	0.07	46.0	m2.2	A	0.24	47.5	m4.9
	EBT	A	0.43	8.6	36.7	E	0.97	20.4	m#207.8
	EBR	A	0.47	10.3	40.1	D	0.81	13.7	m88.8
	WBL	A	0.57	64.3	m27.3	B	0.66	87.0	m#43.2
	WBT/R	D	0.82	15.3	#277.5	A	0.51	11.5	177.3
	NBL	D	0.84	47.1	#110.8	F	1.08	130.6	#117.0
	NBT/R	A	0.31	26.7	33.7	A	0.27	69.4	m35.5
	SBL	A	0.46	89.0	22.5	A	0.14	62.1	12.4
	SBT/R	A	0.08	56.1	9.1	A	0.05	55.0	7.0
	Overall	C	-	21.0	-	C	-	34.1	-
Strandherd Drive & Greenbank Road <i>Signalized</i>	EBL	D	0.83	77.6	#84.2	E	0.91	43.8	m#107.6
	EBT	A	0.46	15.4	31.7	E	0.97	43.6	m136.0
	EBR	A	0.18	1.1	1.1	A	0.36	5.2	m11.2
	WBL	A	0.33	22.7	23.4	E	0.95	98.0	#108.3
	WBT	E	0.90	59.7	167.2	D	0.89	61.8	147.5
	WBR	A	0.27	5.3	14.3	A	0.32	3.7	10.3
	NBL	C	0.73	81.0	42.4	D	0.82	90.0	#51.8
	NBT/R	B	0.68	53.8	108.5	D	0.88	64.9	#123.7
	SBL	C	0.71	83.5	#41.2	D	0.87	96.0	#61.9
	SBT	A	0.32	47.3	50.1	D	0.80	62.8	112.1
SBR	A	0.57	17.3	50.8	A	0.49	8.3	23.1	
Overall	D	-	45.0	-	D	-	53.5	-	

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
Chapman Mills Drive & Greenbank Road <i>Signalized</i>	EBL	A	0.44	82.8	26.8	A	0.43	62.1	m18.5
	EBT	D	0.84	54.4	146.3	D	0.86	65.3	147.2
	EBR	A	0.14	28.0	20.2	A	0.19	37.9	36.5
	WBL	A	0.39	81.5	20.9	B	0.64	85.0	44.3
	WBT	B	0.66	56.9	99.6	C	0.75	55.1	130.9
	WBR	A	0.14	41.7	21.9	A	0.11	35.1	18.3
	NBL	A	0.53	81.5	33.6	B	0.63	84.3	44.1
	NBT/R	A	0.17	25.4	39.8	A	0.22	32.1	48.3
	SBL	A	0.34	108.3	21.0	A	0.50	51.0	m21.0
	SBT/R	A	0.07	17.5	16.4	A	0.13	41.1	m28.8
Overall	D	-	49.0	-	D	-	54.0	-	
Cambrian Road & Borrisokane Road <i>Signalized</i>	WBL	A	0.57	32.8	36.9	A	0.49	33.8	29.5
	WBR	C	0.73	9.2	21.4	B	0.66	9.7	19.4
	NBT	A	0.08	6.8	11.6	A	0.07	5.1	8.6
	NBR	A	0.10	2.2	5.8	A	0.16	1.5	6.3
	SBL	A	0.16	4.0	7.9	A	0.34	1.4	0.4
	SBT	A	0.08	4.1	6.5	A	0.07	0.6	0.2
	Overall	B	-	10.8	-	A	-	6.9	-
Chapman Mills Drive & Hamsa Street/Prim Point Crescent <i>Signalized</i>	EBL	A	0.22	40.7	m8.3	A	0.50	65.0	m21.8
	EBT/R	A	0.35	15.0	#162.7	A	0.57	3.8	m9.2
	WBL	A	0.25	30.4	m10.5	A	0.46	72.6	m32.9
	WBT/R	A	0.35	11.7	#92.8	A	0.47	7.4	55.0
	NB	A	0.25	24.8	10.9	A	0.11	43.9	18.9
	SB	A	0.29	25.8	12.5	A	0.17	44.7	26.6
	Overall	B	-	16.3	-	B	-	15.1	-

Notes: Saturation flow rate of 1800 veh/h/lane
PHF = 1.00

m = metered queue
= queue exceeds storage or mid-block length

The study area network intersections operate with similar capacity constraints, delays and queuing as the 2029 future background conditions. The optimization of the network for the development volumes has changed a number of movements, summarized below:

- Strandherd Drive at Kennevale Drive/Dealership Way
 - Increase in northbound delays and queues during the AM peak and southbound during the PM peak
- Strandherd Drive at Borrisokane Road/Tartan Drive
 - Decrease in operations, specifically the northbound left-turn and opposing movements during both peak hours
- Strandherd Drive at Chapman Mills Drive/Fraser Fields Way
 - Northbound left-turn increases during PM peak
- Strandherd Drive at Greenbank Road
 - AM delays increase
- Chapman Mills Drive at Greenbank Road
 - AM queuing reduces while delays increase
 - PM peak delays reduce and queues are metered
- Chapman Mills Drive at Hamsa Street/Point Prim Crescent
 - East and west bound queues increase during the AM peak

As noted in the background conditions, a commitment from the City is required to advance new infrastructure within Barrhaven and continue to look for continual mode shifting to further reduce the auto dependency currently observed.

15.2.2 2034 Future Total Operations

Figure 22 illustrates the 2034 future total traffic volumes and Table 23 summarizes the 2034 forecasted future total intersection operations. The level of service for signalized intersections is based on the TIA Guidelines for volume to capacity ratio of the lane movements and HCM average delay for the overall intersection. The signalized intersections have been optimized and coordinated. Detailed turning movement count data is included in Appendix J.

Table 23: 2034 Future Total Intersection Operations– Barrhaven Improvements

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
Strandherd Drive & Dealership Way/Kennevale Drive <i>Signalized</i>	EBL	F	1.01	146.3	#71.4	F	1.34	213.6	#228.7
	EBT	A	0.08	47.2	15.4	A	0.30	43.1	53.9
	EBR	A	0.23	50.7	30.9	C	0.70	57.2	110.8
	WBL	A	0.38	55.0	43.3	A	0.41	47.5	50.4
	WBT/R	D	0.84	78.8	#122.8	A	0.31	43.5	51.0
	NBL	C	0.79	54.7	m39.5	E	0.96	93.9	m15.5
	NBT/R	F	1.38	191.9	m#354.2	F	1.13	78.6	m#301.7
	SBL	F	1.00	191.7	#45.6	F	1.31	262.1	#72.0
	SBT	C	0.71	30.2	166.6	F	1.54	275.7	#620.3
	SBR	B	0.62	30.0	134.8	A	0.21	18.7	38.4
Overall	F	-	121.8	-	F	-	173.4	-	
Strandherd Drive & Borriskane Road/Tartan Drive <i>Signalized</i>	EBL	F	1.49	295.0	m#89.2	F	1.24	159.2	m87.2
	EBT	A	0.58	31.1	141.3	F	1.07	49.2	m56.6
	EBR	A	0.56	32.3	132.9	E	0.99	22.1	m41.4
	WBL	A	0.53	66.2	m27.4	F	1.18	174.6	m#78.0
	WBT/R	F	1.29	161.2	#414.2	F	1.03	64.0	m#220.6
	NBL	F	1.87	430.8	#209.8	F	1.23	169.9	#128.2
	NBT/R	B	0.60	51.2	71.8	A	0.55	62.2	72.4
	SBL	A	0.36	66.1	35.6	C	0.70	113.0	#37.2
	SBT/R	F	1.15	153.4	#167.3	F	1.19	186.6	#117.6
Overall	F	-	168.7	-	E	-	78.7	-	
Strandherd Drive & Chapman Mills Dive/Fraser Fields Way <i>Signalized</i>	EBL	A	0.07	46.0	m2.2	A	0.24	47.5	m4.9
	EBT	A	0.43	8.6	36.7	E	0.97	20.4	m#207.8
	EBR	A	0.47	10.3	40.1	D	0.81	13.7	m88.8
	WBL	A	0.57	64.3	m27.3	B	0.66	87.0	m#43.2
	WBT/R	D	0.82	15.3	#277.5	A	0.51	11.5	177.3
	NBL	D	0.84	47.1	#110.8	F	1.08	130.6	#117.0
	NBT/R	A	0.31	26.7	33.7	A	0.27	69.4	m35.5
	SBL	A	0.46	89.0	22.5	A	0.14	62.1	12.4
	SBT/R	A	0.08	56.1	9.1	A	0.05	55.0	7.0
	Overall	C	-	21.0	-	C	-	34.1	-

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
Strandherd Drive & Greenbank Road <i>Signalized</i>	EBL	D	0.83	77.6	#84.2	E	0.91	43.8	m#107.6
	EBT	A	0.46	15.4	31.7	E	0.97	43.6	m136.0
	EBR	A	0.18	1.1	1.1	A	0.36	5.2	m11.2
	WBL	A	0.33	22.7	23.4	E	0.95	98.0	#108.3
	WBT	E	0.90	59.7	167.2	D	0.89	61.8	147.5
	WBR	A	0.27	5.3	14.3	A	0.32	3.7	10.3
	NBL	C	0.73	81.0	42.4	D	0.82	90.0	#51.8
	NBT/R	B	0.68	53.8	108.5	D	0.88	64.9	#123.7
	SBL	C	0.71	83.5	#41.2	D	0.87	96.0	#61.9
	SBT	A	0.32	47.3	50.1	D	0.80	62.8	112.1
SBR	A	0.57	17.3	50.8	A	0.49	8.3	23.1	
Overall	D	-	45.0	-	D	-	53.5	-	
Chapman Mills Drive & Greenbank Road <i>Signalized</i>	EBL	A	0.44	82.8	26.8	A	0.43	62.1	m18.5
	EBT	D	0.84	54.4	146.3	D	0.86	65.3	147.2
	EBR	A	0.14	28.0	20.2	A	0.19	37.9	36.5
	WBL	A	0.39	81.5	20.9	B	0.64	85.0	44.3
	WBT	B	0.66	56.9	99.6	C	0.75	55.1	130.9
	WBR	A	0.14	41.7	21.9	A	0.11	35.1	18.3
	NBL	A	0.53	81.5	33.6	B	0.63	84.3	44.1
	NBT/R	A	0.17	25.4	39.8	A	0.22	32.1	48.3
	SBL	A	0.34	108.3	21.0	A	0.50	51.0	m21.0
	SBT/R	A	0.07	17.5	16.4	A	0.13	41.1	m28.8
Overall	D	-	49.0	-	D	-	54.0	-	
Cambrian Road & Borriskane Road <i>Signalized</i>	WBL	A	0.57	32.8	36.9	A	0.49	33.8	29.5
	WBR	C	0.73	9.2	21.4	B	0.66	9.7	19.4
	NBT	A	0.08	6.8	11.6	A	0.07	5.1	8.6
	NBR	A	0.10	2.2	5.8	A	0.16	1.5	6.3
	SBL	A	0.16	4.0	7.9	A	0.34	1.4	0.4
	SBT	A	0.08	4.1	6.5	A	0.07	0.6	0.2
Overall	B	-	10.8	-	A	-	6.9	-	
Chapman Mills Drive & Hamsa Street/Prim Point Crescent <i>Signalized</i>	EBL	A	0.22	40.7	m8.3	A	0.50	65.0	m21.8
	EBT/R	A	0.35	15.0	#162.7	A	0.57	3.8	m9.2
	WBL	A	0.25	30.4	m10.5	A	0.46	72.6	m32.9
	WBT/R	A	0.35	11.7	#92.8	A	0.47	7.4	55.0
	NB	A	0.25	24.8	10.9	A	0.11	43.9	18.9
	SB	A	0.29	25.8	12.5	A	0.17	44.7	26.6
Overall	B	-	16.3	-	B	-	15.1	-	

Notes: Saturation flow rate of 1800 veh/h/lane
PHF = 1.00

m = metered queue
= queue exceeds storage or mid-block length

The operations noted are similar to the 2029 future total conditions with a slight decrease in network operations due to background growth. The need for the City to provide wider Barrhaven improvements continues to be the major constraint to decrease the impact on Strandherd Drive.

15.3 Network Intersection MMLOS

Table 24 summarizes the MMLOS analysis for the study area network intersections. The targets are based on the policy area of employment area (Kennevale), developing community (existing Borriskane, future Cambrian) and within 600m of a rapid transit station. The MMLOS worksheet has been provided in Appendix H.

Table 24: Network Intersection MMLOS Analysis

Intersection	Pedestrian LOS		Bicycle LOS		Transit LOS		Truck LOS		Auto LOS	
	PLOS	Target	BLOS	Target	TLOS	Target	TrLOS	Target	ALOS	Target
Strandherd Drive & Kennevale Drive/Dealership Way (existing)	E	C	E	C	F	D	E	B	E	D
Strandherd Drive & Kennevale Drive/Dealership Way (future)	F	C	E	C	F	D	E	B	F	D
Strandherd Drive & Borrisokane Road/Tartan Drive (existing)	D	C	F	C	E	D	F	D	E	D
Strandherd Drive & Borrisokane Road/Tartan Drive (future)	F	A	A	C	F	A	F	D	F	E
Strandherd Drive & Chapman Mills Drive/Fraser Fields Way (future)	F	A	B	C	F	C	E	D	D	E
Strandherd Drive & Greenbank Road (existing/future)	F	A	F	C	F	D	A	D	E	D
Chapman Mills Drive & Greenbank Road (future)	F	A	A	B	F	A	F	n/a	A	E
Chapman Mills Drive & Hamsa Street/Point Prim Crescent (future)	E	A	D	B	D	A	F	n/a	A	E
Chapman Mills Drive & Chapman Mills Drive (future)	F	A	A	B	E	A	F	n/a	B	E
Cambrian Road & Borrisokane Road (future)	C	C	E	D	C	D	E	n/a	A	D

The MMLOS targets for the pedestrian and transit LOS are currently not met and will continue to not meet the targets at the network intersections. The pedestrian level of service would require a maximum of four lanes at a crossing to meet a LOS C or two lanes to achieve a level of service A. This is a limitation of the MMLOS framework. For example, the protected intersections proposed for the Strandherd Drive widening will be comfortable for pedestrians but still result in a level of service F. Due to the traffic congestion in Barrhaven, the intersection delays cannot be reduced to increase the transit level of service. It is assumed that the BRT will pre-empt the signal timing to allow transit to proceed and would operate closer to the targets. It is noted that transit LOS A requires zero seconds average delay for the approach, which is unlikely to be achievable. A LOS B with less than 10 seconds delay may be a more realistic target for the Chapman Mills Drive corridor.

The bicycle LOS will not meet targets along Strandherd Drive and Chapman Mills Drive due to the side street geometry having mixed use operations and lacking separated crossings for left turns. The incorporation of bike boxes or protected crossings at the intersections would improve the operations and meet the targets. It is assumed that the City conducted a MMLOS assessment of the Strandherd Drive widening and is providing a balanced solution weighing the trade-offs on all the intersections.

The truck LOS will not be met on any side street with a single receiving lane, as typical of the MMLOS framework but is not considered a cause for mitigation.

The auto level of service will not be met along Strandherd Drive as the area congestion will have high capacity constraints. The signal timing will require a corridor study along the widened Strandherd Drive to balance the demands of the mainline, turning movements at Borrisokane Road, and side street operations.

Overall, the study area network intersections highlight limitations in the MMLOS framework that require no mitigation as part of this plan of subdivision, illustrate that transit services along Strandherd Drive will result in poor service times, and high congestion is anticipated and reflected in the capacity constraints. The auto level of service will require investment in Barrhaven, beyond the transit and interchange options already assumed to be in place, to mitigate the demands on the network, and BRT corridors and park and rides will be required to remove the need for transit to operate on Strandherd Drive.

16 Summary of Improvements Indicated and Modifications Options

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

Proposed Site and Screening

- The proposed development includes approximately 1,500 residential homes, with 700 single detached, 750 townhomes and 50 apartment units
- Two new intersections are proposed along Borrisokane Road and a connection through the Chapman Mills Drive and Chapman Mills Drive intersection will provide access to the community
- The development is proposed to be completed by 2029
- The Trip Generation, Location and Safety triggers were met for the TIA Screening

Existing Conditions

- Borrisokane Road, Strandherd Drive, Cambrian Road and Greenbank Road are arterial roads, and Chapman Mills Drive, Kennevale Drive, Dealership Way and Tartan Drive are collector roads in the study area
- It is noted that the only signalized intersection within 1.0km of the subdivision is the Strandherd Drive and Borrisokane Road/Tartan Drive intersection, and additional intersections were included per City request to include the signals on Strandherd Drive at Kennevale Drive/Dealership Way and Greenbank Road, and additional stop controlled intersections that will become signalized in the future, such as at Cambrian Road and along Chapman Mills Drive
- Sidewalks/MUPS are generally planned to the north and east of the site, with Strandherd Drive and Borrisokane current existing as rural cross-sections without active mode facilities
- No significant collision issues were noted in the vicinity of the site, although it is anticipated that with the Strandherd Drive widening and Borrisokane Road improvements subject to this development may improve the single motor vehicle collisions on Borrisokane Road south of Strandherd Drive

Development Generated Travel Demand

- The proposed development as forecasted produces 1,672 two-way people trips during the AM peak hour and 1,905 two-way people trips during the PM peak hour
- Two mode share scenarios were developed to reflect the existing area travel modes and a transit focused development based on BRT modal shares
- The resulting auto trips for these two scenarios were 1,004 AM and 1,143 PM peak two-way trips for the existing mode shares and 753 AM and 857 PM peak for the BRT mode shares
- Of the forecasted trips, 80% are anticipated to travel north, 10% to the east, and 5% to both the west and south
- Due to the background conditions, the transit focused targets were used for the future total analysis

Background Conditions

- A total of 20 Barrhaven developments were included in the background conditions, including all new developments in Barrhaven South west of Greenbank Road, along Strandherd Drive and along Chapman Mills Drive
- A background growth rate of 1.5% annually was considered along the mainline volumes, as adjacent developments were explicitly considered within the study area, as the explicit consideration of the above background developments results in a relative growth rate of approximately 11% per annum, or 320% over existing volumes along Borrisokane Road
- Significant capacity constraints are noted along Strandherd Drive at Borrisokane Road/Tartan Drive and at Kennevale Drive/Dealership Way, with delays and queuing constraints to the Strandherd Drive intersections to the east in the 2029 background horizon
- As a result of the constraints noted, infrastructure improvements planned in Barrhaven were examined for possible area improvements, resulting in the Barnsdale Road and enhanced transit service to Barrhaven South (assumed to be achieved through the Greenbank Road BRT corridor and park and ride) being assessed
- These infrastructure improvements would provide significant benefit to the Borrisokane Road corridor, but would not totally mitigate the background development impacts along Strandherd Drive
- The mitigated 2029 and 2034 future background horizons identify capacity constraints for the Strandherd Drive at Borrisokane Road/Tartan Drive and at Kennevale Drive/Dealership Way intersections
- Therefore, a commitment from the City is required to advance these items and continue to look for continual mode shifting within Barrhaven to further reduce the auto dependency currently observed
- The Chapman Mills BRT will be considered in place for the build-out of Conservancy (2029) to support this development, using the BRT mode share targets and planning for additional TDM measures

Development Design

- The bike and auto parking will be provided at each unit
- Pedestrian connections will be made through the community along key local roads, bordering parks and along the collector roads Street 10 and 15
- The new streets proposed as part of the plan of subdivision include local roads only, including 14.0 metre (single loaded) and 16.5 metre local road and 24.0 metre collector road right-of-ways
- Horizontal traffic calming elements are proposed to be included along the collector roads and at pedestrian crossing locations, to reduce underground infrastructure requirements

- Once the road network is confirmed, the measures will be prepared in a geometric road design drawing
- No vertical measures are proposed with the exception of the combined sidewalk/cycle track crossings along the collector roads

Boundary Street Design

- The boundary street of Borrisokane Road does not meet MMLOS targets currently for the area or in the future for pedestrian and bicycle levels of service
- The pedestrian LOS cannot be achieved due to the speeds and volumes along Borrisokane Road and a cycle track facility would be required to meet the bicycle LOS targets

Access Intersections Design

- The new intersections along Borrisokane Road will be signalized at the new collector road (Access #2) and the BRT connection (Access #3), and the connection to the Chapman Mills Drive and Chapman Mills Drive intersection (Access #1) will be signalized once the BRT is extended
- Access #1 would be consistent with the modifications to the Chapman Mills Drive EA concept to support development on the south side of the intersection
- Access #2 is proposed to include left-turn auxiliary lanes on all approached and north and south bound approaches are proposed to include right-turn lanes as reserve for future widening (would become shared through/right-turn lanes)
- Access #3 lane requirements will require further consultation with signals and OC Transpo to determine in additional auxiliary lanes are required to support the future BRT corridor
- Generally, the access intersections will operate well during the total future horizons, with high eastbound left-turn delays at Access #2 during the AM peak and extended queuing during the PM peak southbound of Borrisokane Road, and for the southbound left-turn and westbound right-turn movements on Chapman Mills Drive
- The MMLOS targets for the pedestrian and transit LOS cannot be met at the access intersections due to the crossing widths of the roadways, and the delays are too high for the transit targets
- While it is assumed the BRT will pre-empt the signal timing along the BRT corridor, a zero second delay for a LOS target of A would still not be achievable
- No additional intersection design elements are proposed

Transportation Demand Management

- The key TDM measures recommended include:
 - Enhanced connectivity of pedestrians and cyclists to the adjacent network
 - Posting of pedestrian and cycling wayfinding signage within the community
 - Organize community cycling course for new residents
 - Early service agreement with OC Transpo to support higher adoption of transit ridership
 - Conduct semi-annual community surveys for 2 years to collect travel pattern and behaviour data (in conjunction with City TDM coordinator)

Neighbourhood Traffic Management

- As Chapman Mills Drive will exceed the TIA thresholds for a collector road, it is not considered applicable the demands a new collector road that spans most of Barrhaven will need to accommodate

- Regardless of the above, Chapman Mills Drive is anticipated to operate acceptable during the peak hours, with the limitations being the Strandherd Drive corridor

Transit

- To meet forecasted transit use, it is anticipated that a 5-15 minute service will be required to the area to support the community and the aggressive adoption of transit
- This service is required by the City to justify the BRT corridor extension and limit auto dependency of the area
- No specific transit priority measures were considered as part of this development, and the BRT related measures along Chapman Mills Drive are beyond the scope of this study

Network Intersection Design

- Overall, the study area intersections continue to outline the capacity constraints along Strandherd Drive at Borrisokane Road and at Kennevale Drive
- The development traffic will have noticeable impacts on the northbound left-turn movement during the AM peak at the Strandherd Drive and Borrisokane Road/Tartan Drive intersection and decrease operations at opposing movements requiring time within the cycle length
- Throughout the study area, the ability to meet the MMLoS targets is severely limited due to the geometric constraints along the roadways:
 - Pedestrian LOS will not be met due to width of crossings, roadway speeds and volumes, even at protected intersections along Strandherd Drive
 - Cycling LOS will not be met along the side street and can be met by providing separate left-turn arrangements for cyclists (e.g. bike boxes)
 - Transit LOS will not be met along at the study area network intersections, although it is assumed that the BRT will pre-empt the signal timing to allow transit to proceed and would operate closer to the targets
 - While it is assumed the BRT will pre-empt the signal timing along the BRT corridor, a zero second delay for a LOS target of A would still not be achievable
 - Truck LOS will not be met within the study are on the side streets due to single receiving lanes and is not recommended for mitigation
 - Auto LOS will not be met due to capacity constraints along Strandherd Drive
- No mitigation or intersection design elements are proposed beyond the Strandherd Drive widening design and Chapman Mills EA concept

17 Next Steps

Following the circulation and review of this Strategy Report, any outstanding comments will be documented within the context of the ZBA and SP application and, if required, a revised Step 4 Report. Once remaining TIA Steps are completed and sign-off has been received from City Transportation Project Manager, a signed and stamped final report will be provided to City staff.

As part of Next Steps, critical regional transportation infrastructure noted throughout the report, such as the Barnsdale Interchange EA and Detail Design should be undertaken by MTO with potential inclusion of the Borrisokane Road corridor EA. While the Detail Design for Greenbank Road is commencing (spring 2020), its implementation timelines should be considered in the upcoming TMP review and in the subsequent Development Charge Bylaw.

DRAFT

Appendix A

TIA Screening Form and PM Certification Form

DRAFT

City of Ottawa 2017 TIA Guidelines
Step 1 - Screening Form

Date: 22-May-20
Project Number: 2018-24
Project Reference: Caivan Conservancy East

1.1 Description of Proposed Development	
Municipal Address	3285, 3288, 3305 Borrisokane Road
Description of Location	Existing farmer fields, north of the Jock River, west of Highway 416
Land Use Classification	Residential
Development Size	1,500 homes
Accesses	Two on Borrisokane Road, one connection to Chapman Mills Drive
Phase of Development	Multiple phases, to be determined
Buildout Year	2029
TIA Requirement	Full TIA Required

1.2 Trip Generation Trigger	
Land Use Type	Townhomes or apartments
Development Size	1500 Units
Trip Generation Trigger	Yes

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

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



TIA Plan Reports

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

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

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

CERTIFICATION

1. I have reviewed and have a sound understanding of the objectives, needs and requirements of the City of Ottawa's Official Plan, Transportation Master Plan and the Transportation Impact Assessment (2017) Guidelines;
2. I have a sound knowledge of industry standard practice with respect to the preparation of transportation impact assessment reports, including multi modal level of service review;
3. I have substantial experience (more than 5 years) in undertaking and delivering transportation impact studies (analysis, reporting and geometric design) with strong background knowledge in transportation planning, engineering or traffic operations; and
4. I am either a licensed¹ or registered² professional in good standing, whose field of expertise [check appropriate field(s)] is either transportation engineering or transportation planning .

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

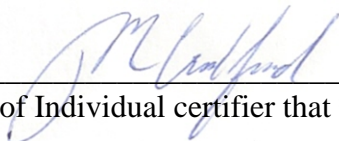
City Of Ottawa
Infrastructure Services and Community
Sustainability
Planning and Growth Management
110 Laurier Avenue West, 4th fl.
Ottawa, ON K1P 1J1
Tel. : 613-580-2424
Fax: 613-560-6006

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

Dated at Newmarket this 17 day of August 2018.
(City)

Name: Mark Crockford

Professional Title: Professional Engineer



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

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



Appendix B

Turning Movement Counts

DRAFT

FRASER FIELDS WAY @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018

Total Observed U-Turns

Northbound: 0 Southbound: 0
Eastbound: 3 Westbound: 3

FRASER FIELDS WAY

STRANDHERD DR

Table with columns for Time Period, Northbound (LT, ST, RT, TOT), Eastbound (LT, ST, RT, TOT), Southbound (LT, ST, RT, TOT), Westbound (LT, ST, RT, TOT), and Grand Total.

TOTAL: 0 0 0 0 160 0 81 241 54 4870 0 4827 0 5183 203 5389 10316 10557

Note: U-Turns are included in Totals.

FRASER FIELDS WAY @ STRANDHERD DR

Count Date: Thursday, January 18, 2018

Start Time: 07:00

FRASER FIELDS WAY

STRANDHERD DR

Table with columns for Time Period, Northbound, Southbound, Eastbound, Westbound, Street Total, and Grand Total.

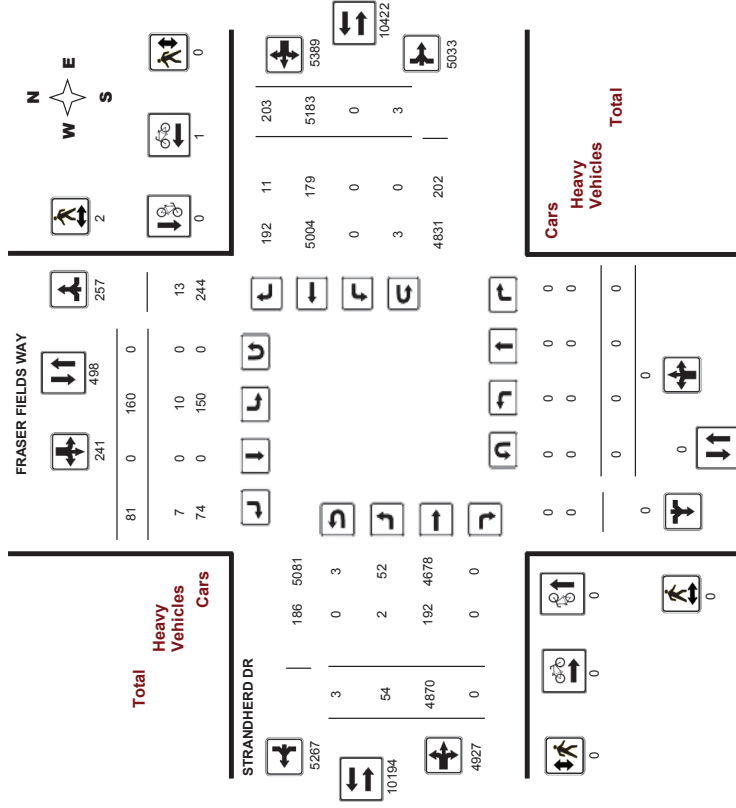
Comment:

Note: These volumes consists of bicycles only (no mopeds or motorcycles) and ARE NOT included in the Turning Movement Count Summary.

FRASER FIELDS WAY @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018

WO#: 37498
Device: Miovision



Comments

FRASER FIELDS WAY @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018

Time Period	FRASER FIELDS WAY											STRANDHERD DR											Grand Total																						
	Northbound				Southbound				Eastbound				Westbound				W TOT	STR TOT	RT																										
	LT	ST	RT	TOT	N	LT	ST	RT	TOT	S	LT	ST	RT	TOT	E	LT				ST	RT	TOT																							
07:00-08:00	0	0	0	0	0	0	0	0	1	1	0	0	31	0	31	0	27	0	27	0	28	1	29	60	61																				
08:00-09:00	0	0	0	0	0	0	0	0	1	3	0	1	3	0	27	0	27	0	27	0	28	4	31	58	61																				
09:00-10:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34	0	34	0	34	0	34	0	34	68	68																				
11:30-12:30	0	0	0	0	0	0	0	0	1	1	0	0	1	1	21	0	22	0	23	0	23	0	23	45	46																				
12:30-13:30	0	0	0	0	0	0	0	0	1	1	0	0	1	0	30	0	30	0	30	0	30	4	34	52	53																				
15:00-16:00	0	0	0	0	0	0	0	0	3	3	0	3	6	6	14	0	15	0	15	0	19	1	20	35	41																				
16:00-17:00	0	0	0	0	0	0	0	0	3	2	0	2	5	5	21	0	21	0	21	0	20	1	21	42	47																				
17:00-18:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	14	0	14	0	10	0	10	24	24																				
Sub Total	0	0	0	0	0	0	0	0	7	17	17	2	192	0	194	0	184	0	184	0	179	11	190	384	401																				
U-Turns (Heavy Vehicles)																						0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Total																						0	0	0	0	0	0	0	7	17	17	2	192	0	194	0	184	0	184	0	179	11	190	384	401

Heavy Vehicles include Buses, Single-Unit Trucks and Articulated Trucks. Further, they ARE included in the Turning Movement Count Summary.



Transportation Services - Traffic Services
Turning Movement Count - Full Study Summary Report

Work Order
37498

Survey Date: Thursday, January 18, 2018

Total Observed U-Turns
 Northbound: 0 Southbound: 0
 Eastbound: 3 Westbound: 3
 AADT Factor
 1.00

FRASER FIELDS WAY @ STRANDHERD DR

Period	FRASER FIELDS WAY										STRANDHERD DR						Grand Total							
	Northbound					Southbound					Eastbound			Westbound										
	LT	ST	RT	TOT	NB	LT	ST	RT	TOT	SB	LT	ST	RT	TOT	EB	LT		ST	RT	TOT	WB	STR	WB	STR
07:00-08:00	0	0	0	0	0	35	0	26	61	61	4	506	0	510	0	639	4	643	1153	1214				
08:00-09:00	0	0	0	0	0	35	0	11	46	46	7	501	0	508	0	754	19	773	1281	1327				
09:00-10:00	0	0	0	0	0	15	0	8	23	23	3	453	0	456	0	628	7	635	1091	1114				
11:30-12:30	0	0	0	0	0	10	0	6	16	16	2	522	0	524	0	536	19	555	1079	1095				
12:30-13:30	0	0	0	0	0	9	0	0	9	9	3	620	0	623	0	544	20	564	1187	1196				
15:00-16:00	0	0	0	0	0	23	0	9	32	32	8	726	0	734	0	695	33	728	1462	1494				
16:00-17:00	0	0	0	0	0	19	0	10	29	29	13	782	0	795	0	710	47	757	1552	1581				
17:00-18:00	0	0	0	0	0	14	0	11	25	25	14	760	0	774	0	677	54	731	1505	1530				
Sub Total	0	0	0	0	0	160	0	81	241	241	54	4870	0	4924	0	5183	203	5386	10310	10551				
U Turns	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	6	6				
Total	0	0	0	0	0	160	0	81	241	241	54	4870	0	4927	0	5183	203	5389	10316	10557				
EQ 12Hr	0	0	0	0	0	222	0	113	335	335	75	6769	0	6849	0	7204	282	7491	14340	14675				

Note: These volumes are calculated by multiplying the totals by the appropriate expansion factor.
 Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor.
 Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor.

Comments:

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



Transportation Services - Traffic Services
Turning Movement Count - Pedestrian Volume Report

Work Order
37498

Count Date: Thursday, January 18, 2018

Start Time: 07:00

FRASER FIELDS WAY @ STRANDHERD DR

Time Period	NB Approach (E or W Crossing)	SB Approach (E or W Crossing)	EB Approach (N or S Crossing)	WB Approach (N or S Crossing)	Total	Grand Total
07:00-07:15	0	0	0	0	0	0
07:15-07:30	0	0	0	0	0	0
07:30-07:45	0	0	0	0	0	0
07:45-08:00	0	0	0	0	0	0
07:00-08:00	0	0	0	0	0	0
08:00-08:15	0	0	0	0	0	0
08:15-08:30	1	0	0	0	1	1
08:30-08:45	0	0	0	0	0	0
08:45-09:00	0	0	0	0	0	0
08:00-09:00	0	0	0	0	0	0
09:00-09:15	0	0	0	0	0	0
09:15-09:30	1	0	0	0	1	1
09:30-09:45	0	0	0	0	0	0
09:45-10:00	0	0	0	0	0	0
09:00-10:00	0	0	0	0	0	0
11:30-11:45	0	0	0	0	0	0
11:45-12:00	0	0	0	0	0	0
12:00-12:15	0	0	0	0	0	0
12:15-12:30	0	0	0	0	0	0
11:30-12:30	0	0	0	0	0	0
12:30-12:45	0	0	0	0	0	0
12:45-13:00	0	0	0	0	0	0
13:00-13:15	0	0	0	0	0	0
13:15-13:30	0	0	0	0	0	0
12:30-13:30	0	0	0	0	0	0
15:00-15:15	0	0	0	0	0	0
15:15-15:30	0	0	0	0	0	0
15:30-15:45	0	0	0	0	0	0
15:45-16:00	0	0	0	0	0	0
15:00-16:00	0	0	0	0	0	0
16:00-16:15	0	0	0	0	0	0
16:15-16:30	0	0	0	0	0	0
16:30-16:45	0	0	0	0	0	0
16:45-17:00	0	0	0	0	0	0
16:00-17:00	0	0	0	0	0	0
17:00-17:15	0	0	0	0	0	0
17:15-17:30	0	0	0	0	0	0
17:30-17:45	0	0	0	0	0	0
17:45-18:00	0	0	0	0	0	0
17:00-18:00	0	0	0	0	0	0
Total	0	2	0	0	2	2

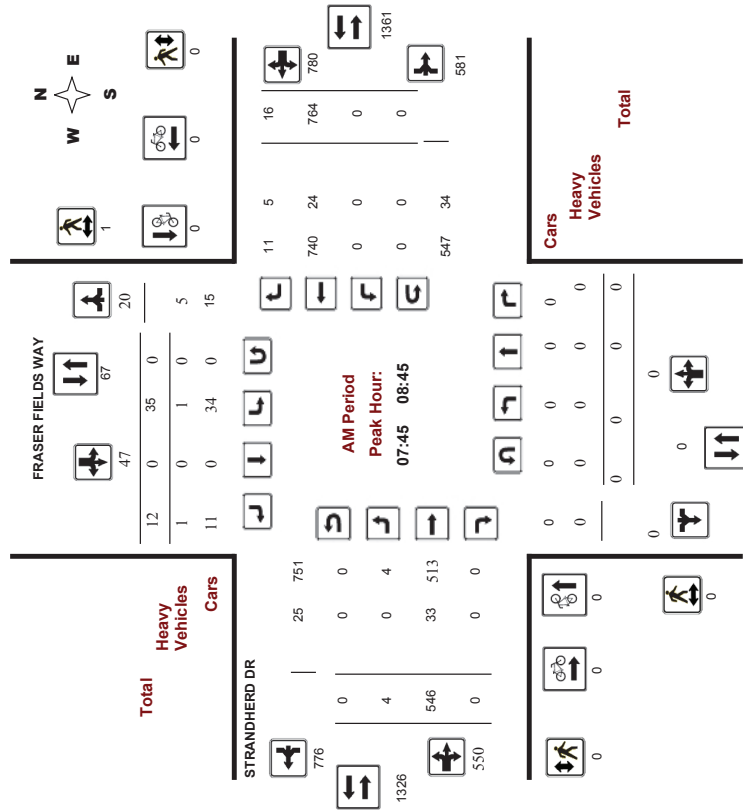
Comment:



Transportation Services - Traffic Services
Turning Movement Count - Full Study Peak Hour Diagram
FRASER FIELDS WAY @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018
 Start Time: 07:00

WO No: 37498
 Device: Miovision



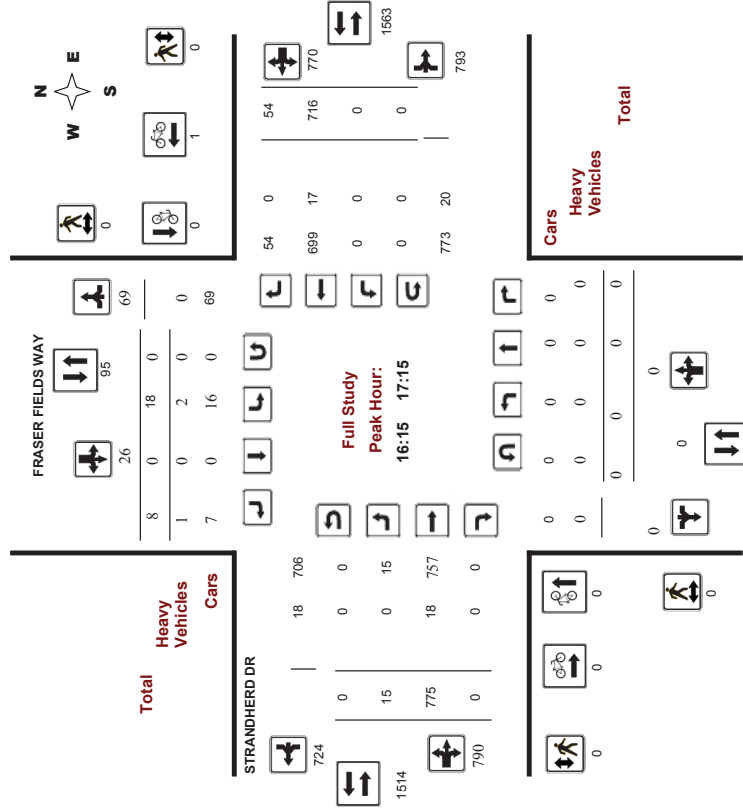
Comments



Transportation Services - Traffic Services
Turning Movement Count - Full Study Peak Hour Diagram
FRASER FIELDS WAY @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018
 Start Time: 07:00

WO No: 37498
 Device: Miovision



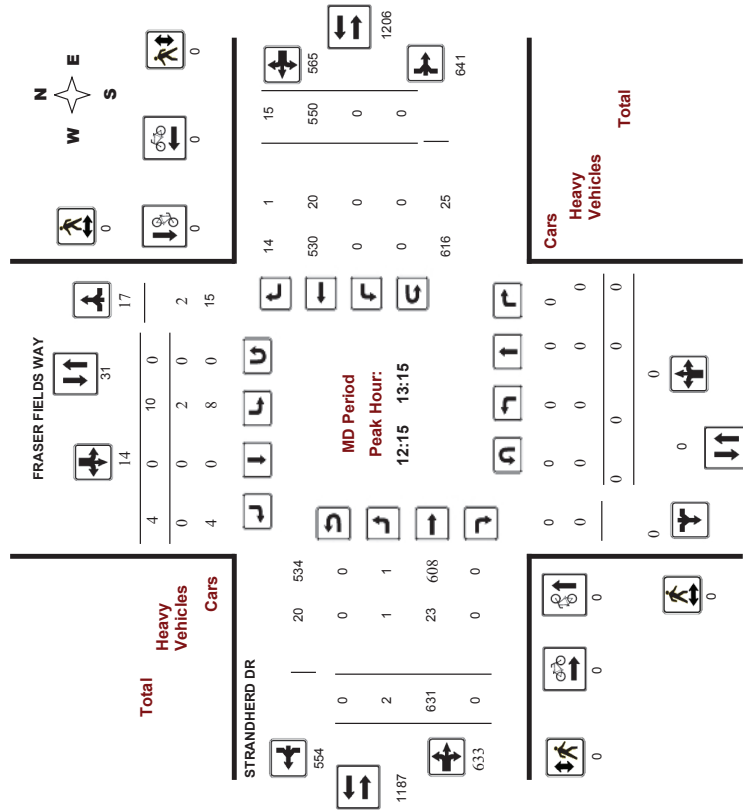
Comments



Transportation Services - Traffic Services
Turning Movement Count - Full Study Peak Hour Diagram
FRASER FIELDS WAY @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018
 Start Time: 07:00

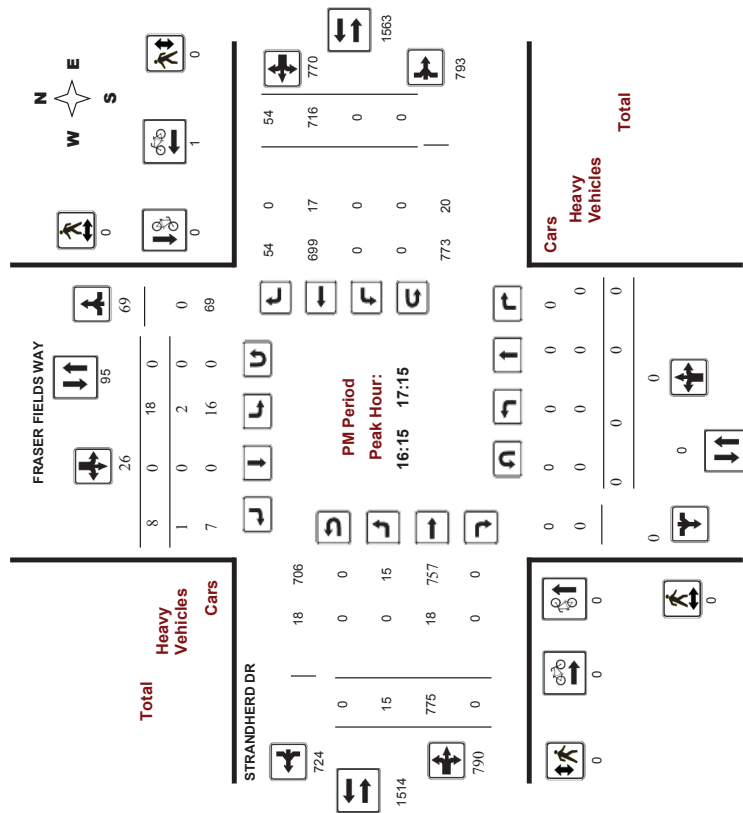
WO No: 37498
 Device: Miovision



Transportation Services - Traffic Services
Turning Movement Count - Full Study Peak Hour Diagram
FRASER FIELDS WAY @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018
 Start Time: 07:00

WO No: 37498
 Device: Miovision





Transportation Services - Traffic Services

Work Order
37498

Turning Movement Count - 15 Min U-Turn Total Report FRASER FIELDS WAY @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018

Time Period	Northbound U-Turn Total	Southbound U-Turn Total	Eastbound U-Turn Total	Westbound U-Turn Total	Total
07:00	0	0	1	1	2
07:15	0	0	0	0	0
07:30	0	0	0	0	0
07:45	0	0	0	0	0
08:00	0	0	0	0	0
08:15	0	0	0	0	0
08:30	0	0	0	0	0
08:45	0	0	0	0	0
09:00	0	0	0	0	0
09:15	0	0	0	0	0
09:30	0	0	1	0	1
09:45	0	0	0	0	0
10:00	0	0	0	1	1
11:30	0	0	0	0	0
11:45	0	0	0	0	0
12:00	0	0	0	0	0
12:15	0	0	1	0	1
12:30	0	0	0	0	0
12:45	0	0	0	0	0
13:00	0	0	0	0	0
13:15	0	0	0	0	0
13:30	0	0	0	1	1
15:00	0	0	0	0	0
15:15	0	0	0	0	0
15:30	0	0	0	0	0
15:45	0	0	0	0	0
16:00	0	0	0	0	0
16:15	0	0	0	0	0
16:30	0	0	0	0	0
16:45	0	0	0	0	0
17:00	0	0	0	0	0
17:15	0	0	0	0	0
17:30	0	0	0	0	0
17:45	0	0	0	0	0
18:00	0	0	0	0	0
Total	0	0	3	3	6



Transportation Services - Traffic Services

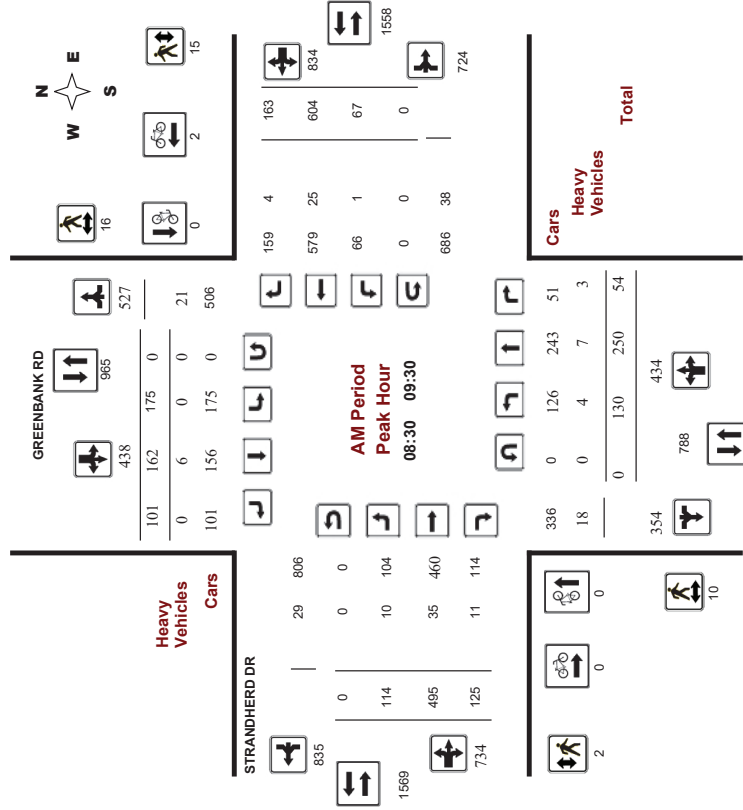
Turning Movement Count - Peak Hour Diagram GREENBANK RD @ STRANDHERD DR

Survey Date: Tuesday, August 16, 2016

WO No: 36175

Device: Miovision

Start Time: 07:00





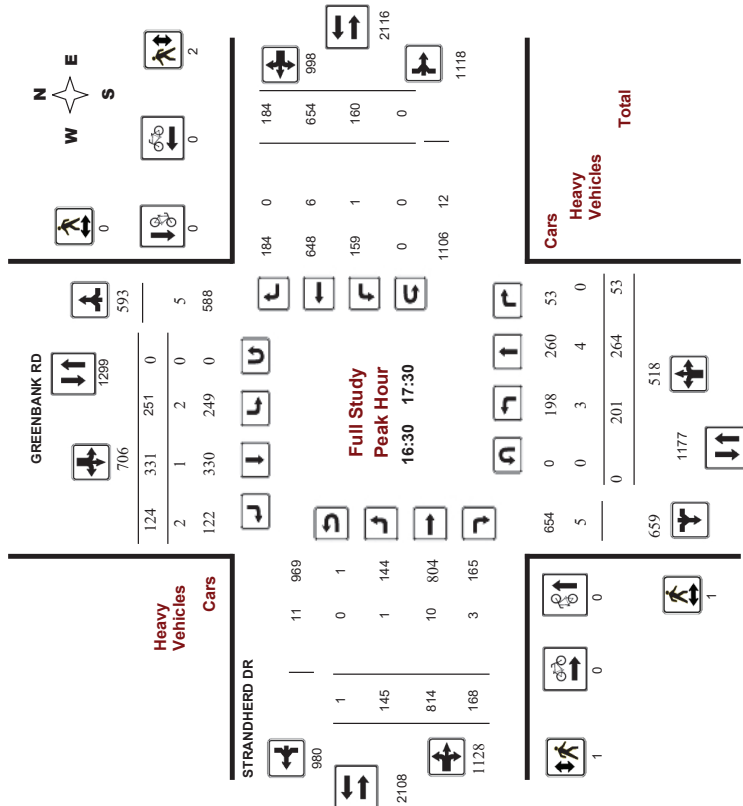
Transportation Services - Traffic Services
Turning Movement Count - Peak Hour Diagram
GREENBANK RD @ STRANDHERD DR



Transportation Services - Traffic Services
Turning Movement Count - Peak Hour Diagram
GREENBANK RD @ STRANDHERD DR

Survey Date: Tuesday, August 16, 2016
 Start Time: 07:00

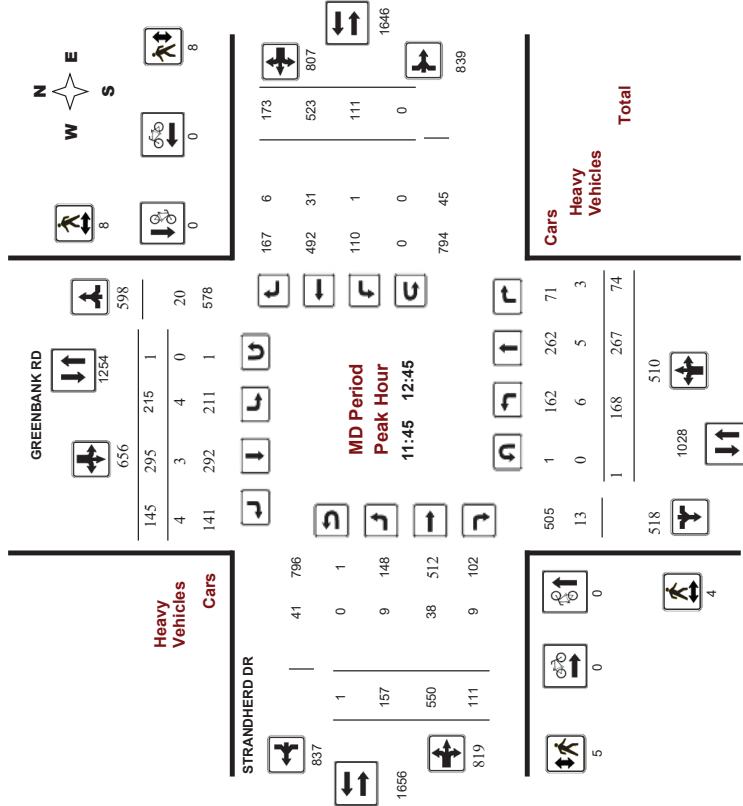
WO No: 36175
 Device: Miovision



Comments

Survey Date: Tuesday, August 16, 2016
 Start Time: 07:00

WO No: 36175
 Device: Miovision



Comments

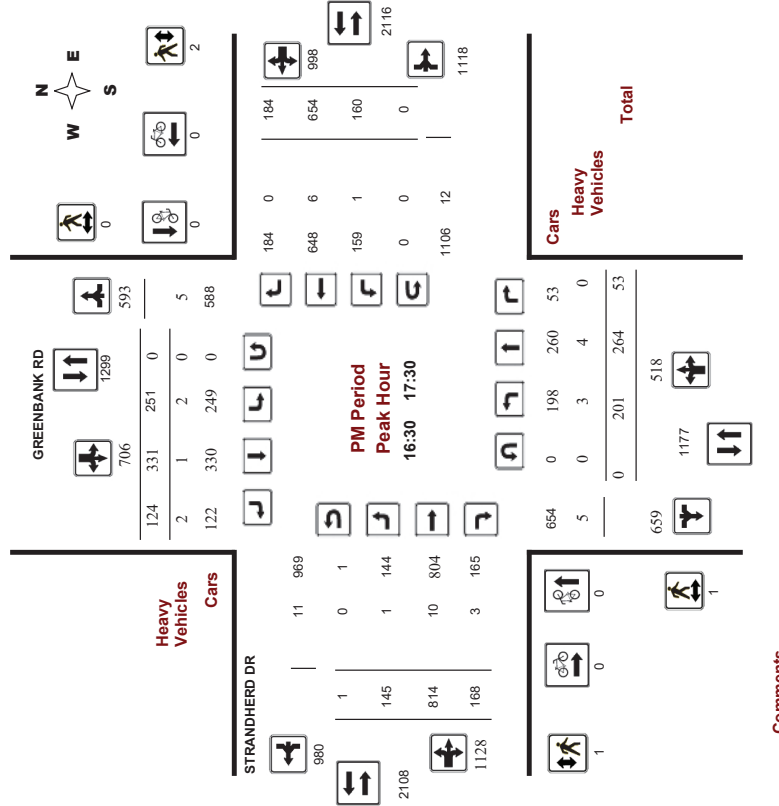


Transportation Services - Traffic Services
Turning Movement Count - Peak Hour Diagram

GREENBANK RD @ STRANDHERD DR

Survey Date: Tuesday, August 16, 2016
 Start Time: 07:00

WO No: 36175
 Device: Miovision



Comments

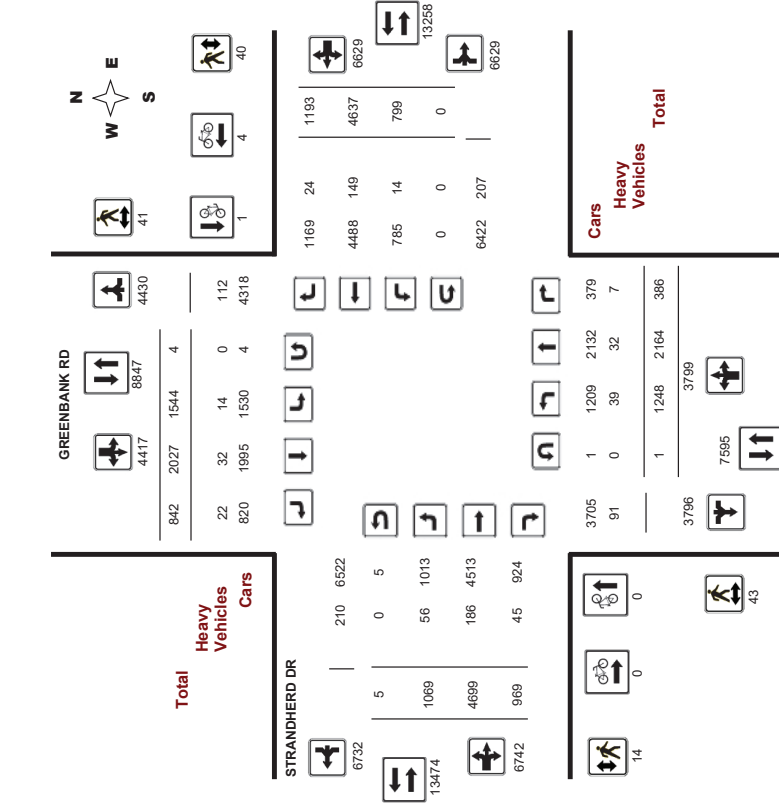


Transportation Services - Traffic Services
Turning Movement Count - Full Study Diagram

GREENBANK RD @ STRANDHERD DR

Survey Date: Tuesday, August 16, 2016

WO#: 36175
 Device: Miovision



Comments



Transportation Services - Traffic Services
Turning Movement Count - Full Study Summary Report
GREENBANK RD @ STRANDHERD DR

Work Order
36175



Transportation Services - Traffic Services
Turning Movement Count - 15 Minute Summary Report
GREENBANK RD @ STRANDHERD DR

W.O.
36175

Survey Date: Tuesday, August 16, 2016

Total Observed U-Turns
Northbound: 1 Southbound: 4
Eastbound: 5 Westbound: 0

AA DT Factor
.90

Period	GREENBANK RD								STRANDHERD DR								Grand Total			
	Northbound				Southbound				Eastbound				Westbound							
	LT	ST	RT	TOT	LT	ST	RT	TOT	LT	ST	RT	TOT	LT	ST	RT	TOT				
07:00-08:00	108	379	19	506	95	120	69	284	790	112	471	77	660	36	526	120	682	1342	2192	
08:00-09:00	129	257	49	435	149	139	95	383	818	109	472	116	697	47	684	188	919	1616	2434	
09:00-10:00	146	247	38	431	181	207	106	494	925	110	518	99	727	77	512	125	714	1441	2386	
11:30-12:30	181	262	69	512	213	287	135	635	1147	155	581	116	852	101	518	169	788	1640	2787	
12:30-13:30	153	287	58	498	198	250	135	583	1081	170	551	115	836	108	521	172	801	1637	2718	
15:00-16:00	151	222	45	418	240	322	97	659	1077	123	605	123	851	126	590	116	832	1683	2760	
16:00-17:00	190	259	56	505	228	322	96	646	1151	147	708	164	1019	142	658	161	961	1990	3131	
17:00-18:00	190	251	52	493	240	380	109	729	1222	143	793	159	1095	162	628	142	932	2027	3249	
Sub Total	1248	2164	386	3798	1544	2027	842	4413	8211	1069	4699	969	6737	799	4637	1193	6629	13366	21577	
U-Turns	1	5	4	10	4	5	5	14	5	5	5	15	5	5	5	15	0	5	10	20
Total	1248	2164	386	3799	1544	2027	842	4417	8216	1069	4699	969	6742	799	4637	1193	6629	13371	21587	
EQ 12hr	1735	3008	537	5281	2146	2818	1170	6140	11421	1486	6532	1347	9371	1111	6445	1658	9214	18585	30006	
Note: These values are calculated by multiplying the totals by the appropriate expansion factor.																				
AVG 12hr	1561	2707	483	4753	1932	2536	1053	5526	10279	1337	5878	1212	8434	1000	5801	1492	8293	16727	27006	
Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor.																				
AVG 24hr	2045	3546	633	6226	2530	3322	1380	7239	13465	1752	7701	1588	11049	1309	7598	1955	10864	21913	35378	
Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor.																				

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

Survey Date: Tuesday, August 16, 2016

Total Observed U-Turns
Northbound: 1 Southbound: 4
Eastbound: 5 Westbound: 0

Time Period	GREENBANK RD								STRANDHERD DR								Grand Total		
	Northbound				Southbound				Eastbound				Westbound						
	LT	ST	RT	TOT	LT	ST	RT	TOT	LT	ST	RT	TOT	LT	ST	RT	TOT			
07:00-07:15	24	87	6	117	18	28	14	60	177	26	95	17	138	8	93	23	124	262	439
07:15-07:30	24	89	4	117	25	31	21	78	195	27	115	12	154	9	125	32	166	320	515
07:30-07:45	33	106	6	145	28	23	13	64	209	31	142	15	188	10	153	33	196	384	593
07:45-08:00	27	97	3	127	24	38	21	83	210	28	119	33	180	9	155	32	196	376	586
08:00-08:15	33	64	14	111	29	28	19	76	187	14	130	24	169	10	176	48	234	403	590
08:15-08:30	33	70	6	109	35	38	29	102	211	33	110	20	163	10	163	39	212	375	586
08:30-08:45	25	68	11	104	33	27	16	76	180	34	122	37	193	9	201	52	262	455	635
08:45-09:00	38	55	18	111	52	46	31	129	240	28	110	35	173	18	144	49	211	384	624
09:00-09:15	37	65	11	113	41	41	20	102	215	28	146	23	197	24	119	34	177	374	589
09:15-09:30	30	62	14	106	49	48	34	131	237	24	117	30	171	16	140	28	184	355	592
09:30-09:45	33	61	2	96	40	71	26	137	233	27	118	24	169	15	132	25	172	341	574
09:45-10:00	46	59	11	116	51	47	26	124	240	31	137	22	191	22	121	38	181	372	612
11:30-11:45	42	77	14	133	50	53	27	130	263	37	160	28	226	20	135	32	187	413	676
11:45-12:00	50	60	16	127	50	74	35	159	286	44	142	36	223	32	118	40	190	413	699
12:00-12:15	43	61	17	121	50	87	30	167	288	34	138	29	201	24	141	50	215	416	704
12:15-12:30	46	64	22	132	63	73	43	179	311	40	141	23	204	25	124	47	196	400	711
12:30-12:45	29	82	19	130	52	61	37	151	281	39	129	23	191	30	140	36	206	397	678
12:45-13:00	45	85	20	150	41	45	38	124	274	41	112	33	186	33	129	46	208	394	668
13:00-13:15	33	60	8	101	52	62	30	144	245	46	177	31	254	19	126	47	192	446	691
13:15-13:30	46	60	11	117	53	82	30	165	282	44	133	28	205	26	126	43	195	400	682
15:00-15:15	43	58	10	111	69	80	31	180	291	24	129	30	183	34	118	33	185	368	659
15:15-15:30	40	54	13	107	55	98	26	179	286	44	148	26	218	20	145	25	190	408	694
15:30-15:45	29	59	10	98	54	77	21	153	251	26	177	33	236	35	138	36	209	445	696
15:45-16:00	39	51	12	102	62	67	19	149	251	29	151	34	214	37	189	22	248	462	713
16:00-16:15	44	60	15	119	62	89	11	162	281	28	167	39	234	39	145	45	229	463	744
16:15-16:30	47	63	14	124	46	91	26	163	287	44	149	39	232	30	183	31	244	476	763
16:30-16:45	51	79	11	141	67	76	27	170	311	38	215	41	294	41	159	46	246	540	851
16:45-17:00	48	57	16	121	53	66	32	151	272	37	177	45	260	32	171	39	242	502	774
17:00-17:15	47	80	19	146	65	91	38	194	340	24	197	40	261	40	152	52	244	505	845
17:15-17:30	55	48	7	110	66	98	27	191	301	46	225	42	313	47	172	47	266	579	880
17:30-17:45	38	72	14	124	55	93	28	176	300	39	199	41	279	41	131	27	199	478	778
17:45-18:00	50	51	12	113	54	98	16	168	281	34	172	36	242	34	173	16	223	465	746
TOTAL:	1248	2164	386	3799	1544	2027	842	4417	8216	1069	4699	969	6742	799	4637	1193	6629	13371	21587

Note: U-Turns are included in Totals. Comment:



Transportation Services - Traffic Services
Turning Movement Count - Cyclist Volume Report

Work Order
36175

Count Date: Tuesday, August 16, 2016

Start Time: 07:00

Time Period	GREENBANK RD		STRAHDHERD DR		Grand Total
	Northbound	Southbound	Street Total	Westbound	
07:00 08:00	0	1	1	0	1
08:00 09:00	0	0	0	2	2
09:00 10:00	0	0	0	1	1
11:30 12:30	0	0	0	1	1
12:30 13:30	0	0	0	0	0
15:00 16:00	0	0	0	0	0
16:00 17:00	0	0	0	0	0
17:00 18:00	0	0	0	0	0
Total	0	1	1	4	5

Comment:



Transportation Services - Traffic Services
Turning Movement Count - Heavy Vehicle Report

W.O.
36175

Survey Date: Tuesday, August 16, 2016

Time Period	GREENBANK RD										STRAHDHERD DR										Grand Total
	Northbound					Southbound					Eastbound					Westbound					
	LT	ST	RT	N TOT	LT	ST	RT	S TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT					
07:00 08:00	5	1	0	6	0	3	7	10	16	8	22	7	37	3	16	2	21	58	74		
08:00 09:00	6	10	3	19	0	3	1	4	23	12	25	7	44	0	26	7	33	77	100		
09:00 10:00	6	3	0	9	2	11	4	17	26	12	39	7	58	6	25	4	35	93	119		
11:30 12:30	7	2	2	11	3	2	3	8	19	8	34	8	50	1	34	9	44	94	113		
12:30 13:30	4	8	1	13	5	7	4	16	29	9	34	7	50	2	19	1	22	72	101		
15:00 16:00	4	0	0	4	2	1	1	4	8	1	16	3	20	1	14	0	15	35	43		
16:00 17:00	3	3	0	6	0	2	2	4	10	4	10	3	17	0	9	1	10	27	37		
17:00 18:00	4	5	1	10	2	3	0	5	15	2	6	3	11	1	6	0	7	18	33		
Sub Total	39	32	7	78	14	32	22	68	146	56	186	45	287	14	149	24	187	474	620		
U-Turns (Heavy Vehicles)																					
				0					0					0					0	0	0
Total				39	32	7	0	14	32	22	68	56	186	45	287	14	149	24	187	474	620

Heavy Vehicles include Buses, Single-Unit Trucks and Articulated Trucks. Further, they ARE included in the Turning Movement Count Summary.



Transportation Services - Traffic Services
Turning Movement Count - 15 Min U-Turn Total Report
GREENBANK RD @ STRANDHERD DR

Survey Date: Tuesday, August 16, 2016

Time Period	NB Approach (E or W Crossing)	SB Approach (E or W Crossing)	EB Approach (N or S Crossing)	WB Approach (N or S Crossing)	Total	Grand Total
07:00 07:15	0	1	0	0	1	1
07:15 07:30	2	0	0	2	2	4
07:30 07:45	2	1	1	1	5	5
07:45 08:00	1	0	1	1	3	2
07:00 08:00	5	3	0	4	12	12
08:00 08:15	0	2	0	0	2	2
08:15 08:30	1	1	0	0	2	1
08:30 08:45	0	4	2	0	6	6
08:45 09:00	3	5	0	0	8	8
08:00 09:00	3	12	2	0	17	17
09:00 09:15	6	2	0	7	15	15
09:15 09:30	5	6	0	8	19	14
09:30 09:45	4	2	0	3	9	9
09:45 10:00	3	0	3	1	7	6
09:00 10:00	14	9	2	19	44	44
10:00 11:45	3	1	4	0	8	7
11:45 12:00	2	1	1	1	5	5
12:00 12:15	0	2	2	1	5	5
12:15 12:30	0	3	1	4	8	8
11:30 12:30	5	7	4	9	25	25
12:30 12:45	2	2	1	2	7	7
12:45 13:00	3	2	0	0	5	5
13:00 13:15	1	1	1	1	4	4
13:15 13:30	4	2	1	0	7	7
12:30 13:30	10	7	3	3	23	23
15:00 15:15	0	0	0	0	0	0
15:15 15:30	1	1	0	0	2	1
15:30 15:45	1	0	0	0	1	1
15:45 16:00	1	1	0	0	2	1
15:00 16:00	1	2	0	0	3	3
16:00 16:15	2	0	0	0	2	2
16:15 16:30	0	1	1	1	3	3
16:30 16:45	0	0	0	1	1	1
16:45 17:00	0	0	0	1	1	1
16:00 17:00	2	1	3	3	9	7
17:00 17:15	1	0	1	0	2	1
17:15 17:30	0	0	1	0	1	1
17:30 17:45	0	0	0	2	2	2
17:45 18:00	2	0	1	0	3	3
17:00 18:00	3	0	2	2	7	7
Total	43	41	14	40	138	138

Comment:



Transportation Services - Traffic Services
Turning Movement Count - Pedestrian Volume Report
GREENBANK RD @ STRANDHERD DR

Count Date: Tuesday, August 16, 2016 Start Time: 07:00

Time Period	NB Approach (E or W Crossing)	SB Approach (E or W Crossing)	EB Approach (N or S Crossing)	WB Approach (N or S Crossing)	Total	Grand Total
07:00 07:15	0	1	0	0	1	1
07:15 07:30	2	0	0	2	4	4
07:30 07:45	2	1	1	1	5	5
07:45 08:00	1	0	1	1	3	2
07:00 08:00	5	3	0	4	12	12
08:00 08:15	0	2	0	0	2	2
08:15 08:30	1	1	0	0	2	1
08:30 08:45	0	4	2	0	6	6
08:45 09:00	3	5	0	0	8	8
08:00 09:00	3	12	2	0	17	17
09:00 09:15	6	2	0	7	15	15
09:15 09:30	5	6	0	8	19	14
09:30 09:45	4	2	0	3	9	9
09:45 10:00	3	0	3	1	7	6
09:00 10:00	14	9	2	19	44	44
10:00 11:45	3	1	4	0	8	7
11:45 12:00	2	1	1	1	5	5
12:00 12:15	0	2	2	1	5	5
12:15 12:30	0	3	1	4	8	8
11:30 12:30	5	7	4	9	25	25
12:30 12:45	2	2	1	2	7	7
12:45 13:00	3	2	0	0	5	5
13:00 13:15	1	1	1	1	4	4
13:15 13:30	4	2	1	0	7	7
12:30 13:30	10	7	3	3	23	23
15:00 15:15	0	0	0	0	0	0
15:15 15:30	1	1	0	0	2	1
15:30 15:45	1	0	0	0	1	1
15:45 16:00	1	1	0	0	2	1
15:00 16:00	1	2	0	0	3	3
16:00 16:15	2	0	0	0	2	2
16:15 16:30	0	1	1	1	3	3
16:30 16:45	0	0	0	1	1	1
16:45 17:00	0	0	0	1	1	1
16:00 17:00	2	1	3	3	9	7
17:00 17:15	1	0	1	0	2	1
17:15 17:30	0	0	1	0	1	1
17:30 17:45	0	0	0	2	2	2
17:45 18:00	2	0	1	0	3	3
17:00 18:00	3	0	2	2	7	7
Total	43	41	14	40	138	138

Transportation Services - Traffic Services

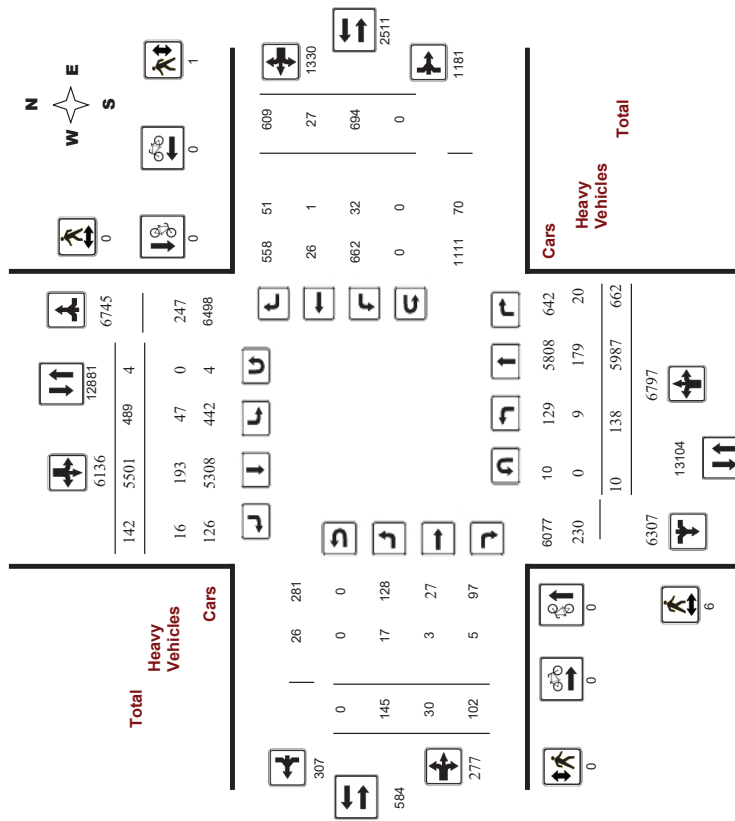
Turning Movement Count - Study Results

KENNEVALE DR @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018
Start Time: 07:00

WO No: 37427
Device: Miovision

Full Study Diagram



Transportation Services - Traffic Services

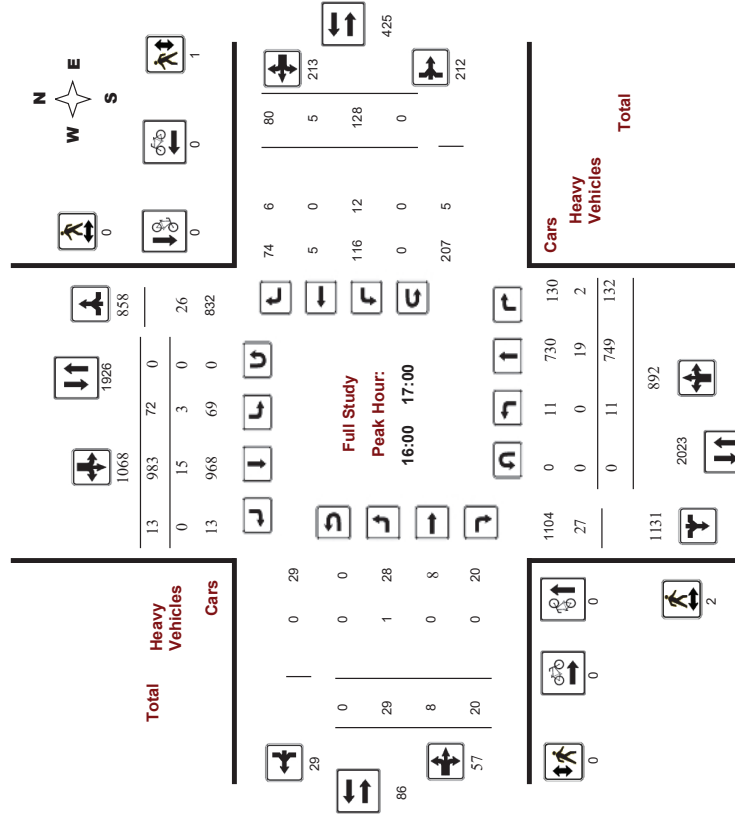
Turning Movement Count - Study Results

KENNEVALE DR @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018
Start Time: 07:00

WO No: 37427
Device: Miovision

Full Study Peak Hour Diagram

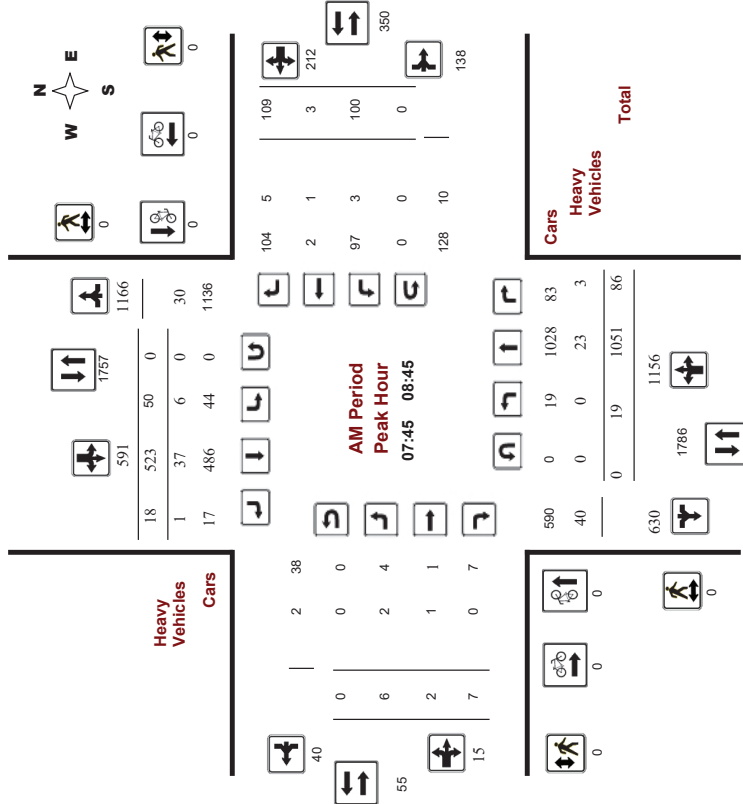




Transportation Services - Traffic Services
Turning Movement Count - Peak Hour Diagram
KENNEVALE DR @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018
 Start Time: 07:00

WO No: 37427
 Device: Miovision



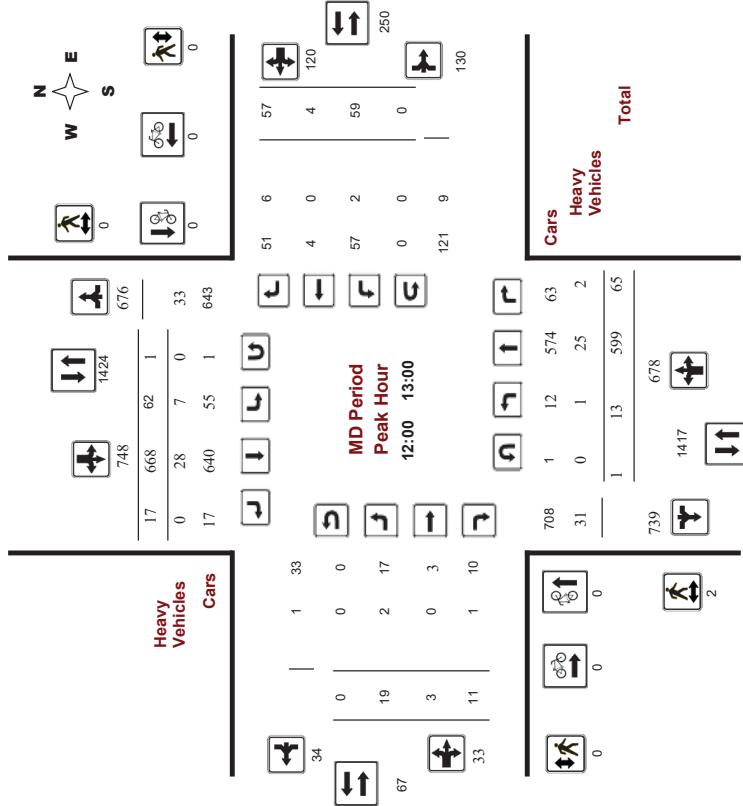
Comments



Transportation Services - Traffic Services
Turning Movement Count - Peak Hour Diagram
KENNEVALE DR @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018
 Start Time: 07:00

WO No: 37427
 Device: Miovision



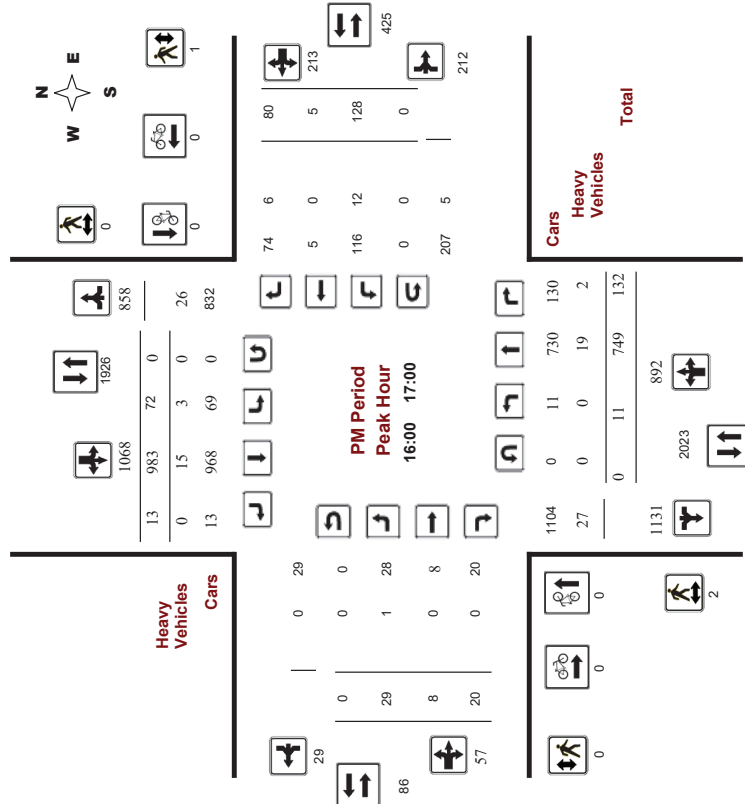
Comments



Transportation Services - Traffic Services
Turning Movement Count - Peak Hour Diagram
KENNEVALE DR @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018
 Start Time: 07:00

WO No: 37427
 Device: Miovision



Comments



Transportation Services - Traffic Services
Turning Movement Count - Study Results
KENNEVALE DR @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018
 Start Time: 07:00

WO No: 37427
 Device: Miovision

Full Study Summary (8 HR Standard)

Survey Date: Thursday, January 18, 2018
 Total Observed U-Turns: 4
 Northbound: 10
 Southbound: 4
 Eastbound: 0
 Westbound: 0
 AADT Factor: 1.39

Period	Northbound			Southbound			Eastbound			Westbound			WB TOT	STR TOT	Grand Total				
	LT	ST	RT	LT	ST	RT	LT	ST	RT	LT	ST	RT							
07:00-08:00	14	945	57	1016	35	466	19	520	1536	4	1	6	11	80	3	100	183	194	1730
08:00-09:00	23	1039	93	1155	53	477	23	553	1708	8	2	8	18	96	2	105	203	221	1929
09:00-10:00	28	686	65	789	47	448	14	509	1298	17	4	10	31	52	1	56	109	140	1438
11:30-12:30	14	603	57	674	69	589	21	679	1353	22	5	15	42	61	5	60	126	168	1521
12:30-13:30	16	567	60	643	60	683	18	761	1404	23	0	6	29	60	1	63	124	153	1557
15:00-16:00	20	670	100	790	83	866	23	972	1762	25	7	20	52	111	5	74	190	242	2004
16:00-17:00	11	749	132	892	72	983	13	1068	1960	29	8	20	57	128	5	80	213	270	2230
17:00-18:00	12	718	98	828	70	989	11	1070	1898	17	3	17	37	106	5	71	182	219	2117
Sub Total	138	5987	662	6787	489	5501	142	6132	12919	145	30	102	277	694	27	609	1330	1607	14526
UTurns	10							4	14				0			0	0	0	14
Total	138	5987	662	6797	489	5501	142	6136	12933	145	30	102	277	694	27	609	1330	1607	14540
EQ 12hr	192	8322	920	9448	680	7646	197	8529	17977	202	42	142	385	965	38	847	1849	2234	20211
AVG 12hr	192	8322	920	9448	680	7646	197	8529	17977	202	42	142	385	965	38	847	1849	2234	20211
AVG 24hr	251	10902	1205	12377	890	10017	259	11173	23550	264	55	186	504	1264	49	1109	2422	2926	26476

Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor. 1.31
 Note: U-Turns provided for approach totals. Refer to 'U-Turn' Report for specific breakdown.

Transportation Services - Traffic Services**Turning Movement Count - Study Results****KENNEVALE DR @ STRANDHERD DR**

Survey Date: Thursday, January 18, 2018

WO No: 37427

Device: Miovision

Start Time: 07:00

Full Study 15 Minute Increments

Time Period	Northbound			Southbound			Eastbound			Westbound			W	STR	Grand Total				
	LT	ST	RT	LT	ST	RT	LT	ST	RT	LT	ST	RT				RT	TOT	TOT	
07:00	1	193	7	201	7	86	3	96	614	1	1	1	3	12	1	24	37	614	337
07:15	3	231	17	251	6	131	6	143	803	1	0	1	2	27	1	18	46	803	442
07:30	4	250	15	270	11	96	4	111	780	2	0	2	4	19	0	29	48	780	433
07:45	6	271	18	295	11	153	6	170	942	0	0	2	2	22	1	29	52	942	519
08:00	7	240	21	268	23	136	6	165	871	1	0	2	3	29	1	30	60	871	486
08:15	1	276	23	300	7	130	2	139	895	2	1	3	6	21	1	24	46	895	491
08:30	5	264	24	293	9	104	4	117	835	3	1	0	4	28	0	26	54	835	468
08:45	10	289	25	294	14	107	11	132	840	2	0	3	5	18	0	25	43	840	474
09:00	8	173	17	199	8	92	2	102	605	2	1	5	8	17	1	14	32	605	341
09:15	6	209	17	234	11	130	5	146	744	4	1	0	5	8	0	11	19	744	404
09:30	10	164	14	189	15	119	2	136	657	8	2	2	12	18	0	20	38	657	375
09:45	4	150	17	171	13	107	5	125	579	3	0	3	6	9	0	11	20	579	322
11:30	3	161	16	181	10	134	4	148	672	7	1	4	12	18	2	18	38	672	379
11:45	5	128	13	146	20	149	5	174	634	5	1	1	7	14	0	17	31	634	368
12:00	2	155	12	169	16	160	3	179	696	4	2	6	12	8	0	15	23	696	383
12:15	4	159	16	180	23	146	9	178	705	6	1	4	11	21	3	10	34	705	403
12:30	2	140	21	163	12	166	4	182	689	4	0	1	5	17	1	16	34	689	384
12:45	5	145	16	166	11	196	1	209	751	5	0	0	5	13	0	16	29	751	409
13:00	5	136	12	153	21	154	6	181	672	7	0	2	9	18	0	21	39	672	382
13:15	4	146	11	161	16	167	7	190	696	7	0	3	10	12	0	20	22	696	383
15:00	5	176	18	200	21	202	6	230	859	7	3	5	15	16	2	21	39	859	484
15:15	3	192	18	215	24	225	8	257	948	4	3	4	11	28	1	21	50	948	533
15:30	9	154	29	192	18	225	5	248	873	13	0	4	17	24	0	13	37	873	494
15:45	3	148	35	186	20	214	4	238	856	1	1	7	9	43	2	19	64	856	487
16:00	1	203	37	241	15	256	1	272	1026	4	1	4	9	24	1	22	47	1026	569
16:15	5	175	24	204	19	251	4	274	973	5	3	7	15	38	1	19	58	973	551
16:30	2	187	36	225	19	262	6	277	1001	12	2	3	17	30	2	15	47	1001	566
16:45	3	184	35	222	19	224	2	245	949	8	2	6	16	36	1	24	61	949	544
17:00	3	156	29	188	19	248	2	269	920	9	0	7	16	24	1	19	44	920	517
17:15	1	177	21	199	18	262	2	274	952	2	1	2	5	31	3	13	47	952	525
17:30	2	196	23	221	21	261	2	284	1017	5	1	6	12	21	0	23	44	1017	561
17:45	6	189	25	220	12	228	5	245	931	1	1	2	4	30	1	16	47	931	516
Total:	138	6987	662	6797	489	5501	142	6136	25985	145	30	102	277	694	27	609	1330	25985	14,540

Note: U-Turns are included in Totals.

Transportation Services - Traffic Services**Turning Movement Count - Study Results****KENNEVALE DR @ STRANDHERD DR**

Survey Date: Thursday, January 18, 2018

WO No: 37427

Device: Miovision

Start Time: 07:00

Full Study Cyclist Volume

Time Period	Northbound	Southbound	Street Total	Eastbound	Westbound	Street Total	Grand Total
07:00	0	0	0	0	0	0	0
07:15	0	0	0	0	0	0	0
07:30	0	0	0	0	0	0	0
07:45	0	0	0	0	0	0	0
08:00	0	0	0	0	0	0	0
08:15	0	0	0	0	0	0	0
08:30	0	0	0	0	0	0	0
08:45	0	0	0	0	0	0	0
09:00	0	0	0	0	0	0	0
09:15	0	0	0	0	0	0	0
09:30	0	0	0	0	0	0	0
09:45	0	0	0	0	0	0	0
10:00	0	0	0	0	0	0	0
11:00	0	0	0	0	0	0	0
11:45	0	0	0	0	0	0	0
12:00	0	0	0	0	0	0	0
12:15	0	0	0	0	0	0	0
12:30	0	0	0	0	0	0	0
12:45	0	0	0	0	0	0	0
13:00	0	0	0	0	0	0	0
13:15	0	0	0	0	0	0	0
15:00	0	0	0	0	0	0	0
15:15	0	0	0	0	0	0	0
15:30	0	0	0	0	0	0	0
15:45	0	0	0	0	0	0	0
16:00	0	0	0	0	0	0	0
16:15	0	0	0	0	0	0	0
16:30	0	0	0	0	0	0	0
16:45	0	0	0	0	0	0	0
17:00	0	0	0	0	0	0	0
17:15	0	0	0	0	0	0	0
17:30	0	0	0	0	0	0	0
17:45	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0



Transportation Services - Traffic Services
Turning Movement Count - Study Results
KENNEVALE DR @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018
Start Time: 07:00

WO No: 37427
Device: Miovision

Full Study Pedestrian Volume

Time Period	NB Approach (E or W Crossing)	SB Approach (E or W Crossing)	Total	EB Approach (N or S Crossing)	WB Approach (N or S Crossing)	Total	Grand Total
07:00 07:15	0	0	0	0	0	0	0
07:15 07:30	0	0	0	0	0	0	0
07:30 07:45	0	0	0	0	0	0	0
07:45 08:00	0	0	0	0	0	0	0
08:00 08:15	0	0	0	0	0	0	0
08:15 08:30	0	0	0	0	0	0	0
08:30 08:45	0	0	0	0	0	0	0
08:45 09:00	1	0	1	0	0	1	1
09:00 09:15	0	0	0	0	0	0	0
09:15 09:30	0	0	0	0	0	0	0
09:30 09:45	0	0	0	0	0	0	0
09:45 10:00	0	0	0	0	0	0	0
11:30 11:45	0	0	0	0	0	0	0
11:45 12:00	0	0	0	0	0	0	0
12:00 12:15	0	0	0	0	0	0	0
12:15 12:30	0	0	0	0	0	0	0
12:30 12:45	0	0	0	0	0	0	0
12:45 13:00	2	0	2	0	0	2	2
13:00 13:15	0	0	0	0	0	0	0
13:15 13:30	0	0	0	0	0	0	0
15:00 15:15	0	0	0	0	0	0	0
15:15 15:30	0	0	0	0	0	0	0
15:30 15:45	0	0	0	0	0	0	0
15:45 16:00	1	0	1	0	0	1	1
16:00 16:15	0	0	0	0	0	0	0
16:15 16:30	1	0	1	0	0	1	1
16:30 16:45	1	0	1	0	1	2	2
16:45 17:00	0	0	0	0	0	0	0
17:00 17:15	0	0	0	0	0	0	0
17:15 17:30	0	0	0	0	0	0	0
17:30 17:45	0	0	0	0	0	0	0
17:45 18:00	0	0	0	0	0	0	0
Total	6	0	6	0	1	7	7



Transportation Services - Traffic Services
Turning Movement Count - Study Results
KENNEVALE DR @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018
Start Time: 07:00

WO No: 37427
Device: Miovision

Full Study Heavy Vehicles

Time Period	Northbound			Southbound			Eastbound			Westbound			W STR TOT	STR TOT	Grand Total				
	LT	ST	RT	N TOT	LT	ST	RT	S TOT	LT	ST	RT	E TOT				LT	ST	RT	
07:00 07:15	1	2	1	12	1	8	0	12	24	0	0	0	1	0	0	1	3	4	14
07:15 07:30	0	4	1	12	2	7	0	14	26	1	0	0	1	0	0	0	3	4	15
07:30 07:45	2	3	0	11	0	5	0	9	20	1	0	0	3	1	0	0	1	4	12
07:45 08:00	0	4	0	13	1	9	0	15	28	0	0	0	0	0	0	1	2	2	15
08:00 08:15	0	6	2	15	4	7	0	20	35	1	0	0	1	0	0	2	8	9	22
08:15 08:30	0	8	0	19	1	8	0	19	38	0	1	0	2	3	1	2	8	10	24
08:30 08:45	0	5	1	19	0	13	1	20	39	1	0	0	2	0	0	0	1	3	21
08:45 09:00	0	10	4	19	3	5	1	24	43	1	0	0	2	0	0	4	11	13	28
09:00 09:15	1	8	1	18	1	5	2	18	36	0	1	4	2	0	0	2	6	10	23
09:15 09:30	1	8	0	22	1	13	1	25	47	1	0	0	3	0	0	1	2	5	26
09:30 09:45	1	7	0	19	2	11	1	27	46	4	1	0	7	0	0	2	5	12	29
09:45 10:00	0	12	0	16	2	4	1	21	37	0	0	0	1	0	0	2	4	5	21
11:30 11:45	0	8	1	17	3	7	1	24	41	1	0	1	3	0	0	4	8	11	26
11:45 12:00	0	6	0	14	3	7	2	22	36	1	1	0	4	1	0	3	8	12	24
12:00 12:15	1	6	0	16	1	9	0	17	33	1	0	0	2	0	0	1	3	18	
12:15 12:30	0	8	1	15	3	4	0	19	34	0	0	1	1	1	0	4	9	10	22
12:30 12:45	0	7	1	15	1	6	0	15	30	0	0	0	0	1	0	1	4	4	17
12:45 13:00	0	4	0	13	2	9	0	17	30	1	0	0	1	0	0	1	3	4	17
13:00 13:15	1	7	1	15	1	5	1	20	35	1	0	0	3	1	0	5	8	11	23
13:15 13:30	1	2	1	14	3	7	1	14	28	1	0	2	5	1	0	0	5	10	19
15:00 15:15	0	8	0	18	2	6	1	18	36	0	0	0	1	4	0	1	7	8	22
15:15 15:30	0	5	0	12	2	4	1	15	27	0	0	0	1	3	0	3	8	9	18
15:30 15:45	0	7	3	14	0	3	0	10	24	0	0	0	0	1	0	0	4	4	14
15:45 16:00	0	3	0	11	3	7	2	18	29	0	0	0	2	1	0	3	7	9	19
16:00 16:15	0	6	1	21	1	7	0	17	38	0	0	0	0	7	0	3	12	12	25
16:15 16:30	0	5	0	11	0	3	0	10	21	0	0	0	0	3	0	2	5	5	13
16:30 16:45	0	2	1	6	2	2	0	7	13	1	0	0	1	1	0	0	4	5	9
16:45 17:00	0	6	0	10	0	3	0	10	20	0	0	0	0	1	0	1	2	2	11
17:00 17:15	0	3	0	5	1	2	0	6	11	0	0	0	0	0	0	1	1	6	6
17:15 17:30	0	3	0	6	0	3	0	7	13	0	0	0	0	0	0	1	1	7	7
17:30 17:45	0	3	0	6	1	3	0	7	13	0	0	0	0	0	0	1	1	7	7
17:45 18:00	0	3	0	4	0	1	0	6	10	0	0	0	0	0	0	2	2	6	6
Total	9	179	20	438	47	193	16	503	941	17	3	5	51	32	1	51	154	205	573



Transportation Services - Traffic Services
Turning Movement Count - Study Results
KENNEVALE DR @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018
Start Time: 07:00

WO No: 37427
Device: Miovision

Full Study 15 Minute U-Turn Total

Time Period	Northbound		Southbound		Eastbound		Westbound		Total
	U-Turn	Total	U-Turn	Total	U-Turn	Total	U-Turn	Total	
07:00	0	0	0	0	0	0	0	0	0
07:15	0	0	0	0	0	0	0	0	0
07:30	1	0	0	0	0	0	0	0	1
07:45	0	0	0	0	0	0	0	0	0
08:00	0	0	0	0	0	0	0	0	0
08:15	0	0	0	0	0	0	0	0	0
08:30	0	0	0	0	0	0	0	0	0
08:45	0	0	0	0	0	0	0	0	0
08:55	0	0	0	0	0	0	0	0	0
09:00	1	0	0	0	0	0	0	0	1
09:15	2	0	0	0	0	0	0	0	2
09:30	1	0	0	0	0	0	0	0	1
09:45	0	0	0	0	0	0	0	0	0
11:30	1	0	0	0	0	0	0	0	1
11:45	0	0	0	0	0	0	0	0	0
12:00	0	0	0	0	0	0	0	0	0
12:15	1	0	0	0	0	0	0	0	1
12:30	0	0	0	0	0	0	0	0	0
12:45	0	1	0	0	0	0	0	0	1
13:00	0	0	0	0	0	0	0	0	0
13:15	0	0	0	0	0	0	0	0	0
15:00	1	1	1	1	0	0	0	0	2
15:15	2	0	0	0	0	0	0	0	2
15:30	0	0	0	0	0	0	0	0	0
15:45	0	0	0	0	0	0	0	0	0
16:00	0	0	0	0	0	0	0	0	0
16:15	0	0	0	0	0	0	0	0	0
16:30	0	0	0	0	0	0	0	0	0
16:45	0	0	0	0	0	0	0	0	0
17:00	0	0	0	0	0	0	0	0	0
17:15	0	2	0	0	0	0	0	0	2
17:30	0	0	0	0	0	0	0	0	0
17:45	0	0	0	0	0	0	0	0	0
Total	10	4	0	0	0	0	0	0	14



Transportation Services - Traffic Services W.O. 37540
Turning Movement Count - 15 Minute Summary Report
STRANDHERD DR @ CEDARVIEW RD/TARTAN DR

Survey Date: Thursday, January 18, 2018

Total Observed U-Turns

Northbound: 0 Southbound: 0
 Eastbound: 2 Westbound: 0

CEDARVIEW RD/TARTAN DR

STRANDHERD DR

Time Period	Northbound				Southbound				Eastbound				Westbound				W STR TOT	S TR TOT	E TR TOT	W STR TOT	S TR TOT	E TR TOT	W STR TOT	S TR TOT	E TR TOT	Grand Total
	L	ST	RT	TOT	L	ST	RT	TOT	L	ST	RT	TOT	L	ST	RT	TOT										
07:00	89	1	3	93	9	2	22	33	126	5	78	23	106	1	124	3	128	234	360							
07:15	81	6	6	93	1	1	15	17	110	14	133	24	171	3	146	4	153	324	434							
07:30	80	3	5	88	11	6	27	44	132	18	108	22	148	1	203	7	211	359	491							
07:45	104	12	7	123	9	4	26	39	162	15	139	25	179	2	148	10	160	339	501							
08:00	85	9	3	97	12	3	26	41	138	22	125	34	181	0	187	16	203	384	522							
08:15	100	27	3	130	37	10	41	88	218	26	111	33	170	1	192	19	212	382	600							
08:30	98	13	4	115	10	3	25	38	153	12	96	28	136	0	184	12	196	332	485							
08:45	82	8	4	94	15	8	21	44	138	19	100	20	139	2	182	12	196	335	473							
09:00	71	10	5	86	6	4	15	25	111	9	83	25	127	2	155	15	172	299	410							
09:15	69	6	1	76	6	3	17	26	102	17	114	20	151	0	140	20	160	311	413							
09:30	47	2	6	55	8	2	12	22	77	21	109	20	150	5	127	14	146	296	373							
09:45	47	6	2	55	14	3	13	30	85	16	100	18	134	4	133	21	158	292	377							
11:30	39	2	3	44	17	1	20	38	82	15	113	36	165	1	126	20	147	312	394							
11:45	35	2	0	37	7	3	13	23	60	22	120	35	177	0	106	15	121	298	368							
12:00	38	2	2	42	14	5	16	35	77	19	127	35	181	1	128	8	137	318	395							
12:15	32	4	3	39	11	2	16	29	68	14	133	29	176	2	136	11	149	325	393							
12:30	40	2	3	45	12	2	11	25	70	18	142	30	190	4	124	14	142	332	402							
12:45	38	0	5	43	13	2	17	32	75	18	162	43	223	0	112	18	130	353	428							
13:00	29	2	1	32	17	2	11	30	62	21	129	37	187	4	129	12	145	332	394							
13:15	35	4	3	42	14	1	14	29	71	16	124	42	182	2	113	7	122	304	375							
15:00	33	5	1	39	13	7	17	37	76	39	141	57	237	2	149	25	176	413	489							
15:15	48	11	2	61	28	17	30	75	136	21	167	66	254	4	160	20	184	438	574							
15:30	36	6	2	44	22	5	32	59	103	25	173	71	269	2	145	15	162	431	534							
15:45	54	3	3	60	15	7	14	36	96	32	168	76	276	2	136	19	157	433	529							
16:00	48	9	5	62	11	14	25	50	112	26	184	79	289	8	169	13	190	479	591							
16:15	47	9	7	63	14	13	21	48	111	36	197	93	327	3	174	19	196	523	634							
16:30	53	5	5	63	13	13	23	49	112	32	170	87	289	3	144	15	162	451	563							
16:45	50	11	7	68	14	9	20	43	111	22	173	99	294	3	161	18	182	476	587							
17:00	38	6	3	47	21	11	18	50	97	28	169	87	284	4	156	15	175	459	556							
17:15	41	11	6	58	17	7	11	35	93	22	180	100	302	5	145	9	159	461	554							
17:30	46	3	2	51	19	9	14	42	93	28	182	92	302	1	148	16	165	467	560							
17:45	45	4	1	50	10	8	12	30	80	24	180	87	291	3	162	19	184	475	555							
TOTAL:	1778	204	113	2095	440	187	615	1242	3337	672	4440	1573	6687	75	4744	461	5280	11987	15304							

Note: U-Turns are included in Totals.

Comment:



Transportation Services - Traffic Services
Turning Movement Count - Cyclist Volume Report

Work Order
37540

Count Date: Thursday, January 18, 2018

Start Time: 07:00

Time Period	CEDARVIEW RD/TARTAN DR			STRANDHERD DR			Grand Total
	Northbound	Southbound	Street Total	Eastbound	Westbound	Street Total	
07:00-08:00	0	0	0	0	0	0	0
08:00-09:00	0	0	0	0	0	0	0
09:00-10:00	0	0	0	0	0	0	0
11:30-12:30	0	0	0	0	0	0	0
12:30-13:30	0	0	0	0	0	0	0
15:00-16:00	0	0	0	0	0	0	0
16:00-17:00	0	0	0	0	0	0	0
17:00-18:00	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0

Comment:



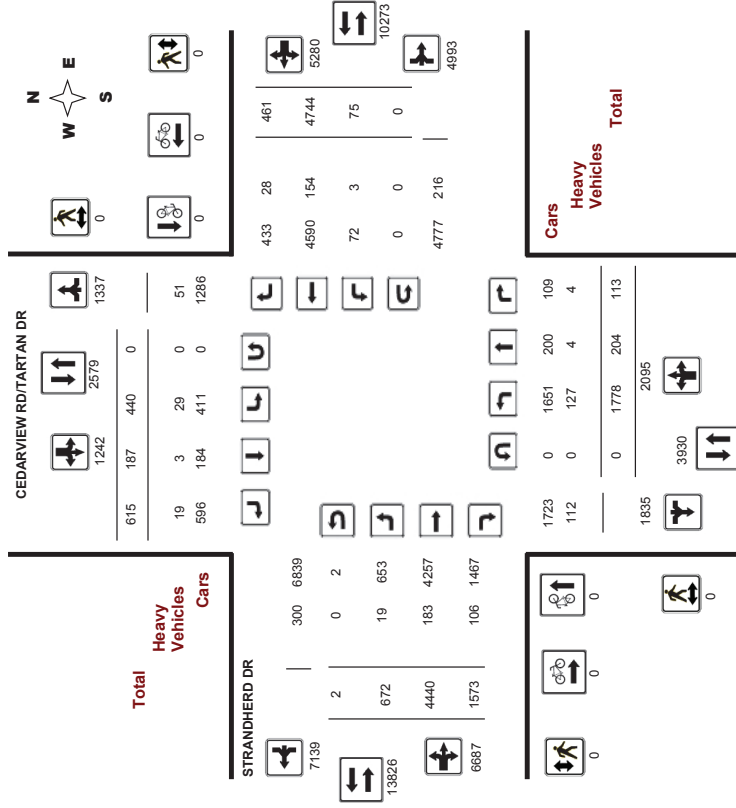
Transportation Services - Traffic Services
Turning Movement Count - Full Study Diagram

STRANDHERD DR @ CEDARVIEW RD/TARTAN DR

Survey Date: Thursday, January 18, 2018

WO#: 37540

Device: Miovision



Note: These volumes consists of bicycles only (no mopeds or motorcycles) and ARE NOT included in the Turning Movement Count Summary.



Transportation Services - Traffic Services

W.O.
37540

Turning Movement Count - Heavy Vehicle Report

STRANDHERD DR @ CEDARVIEW RD/TARTAN DR

Survey Date: Thursday, January 18, 2018

Time Period	Northbound						Eastbound						Westbound						Grand Total
	CEDARVIEW RD/TARTAN DR			STRANDHERD DR			CEDARVIEW RD/TARTAN DR			STRANDHERD DR			CEDARVIEW RD/TARTAN DR			STRANDHERD DR			
	LT	ST	RT	N	LT	ST	RT	S	STR	TOT	LT	ST	RT	E	LT	ST	RT	W	
07:00-08:00	6	1	0	7	3	0	1	4	11	3	30	14	47	0	18	8	26	73	84
08:00-09:00	20	2	0	22	2	1	5	8	30	1	32	15	48	1	25	3	29	77	107
09:00-10:00	27	0	0	27	4	0	1	5	32	2	32	16	50	1	29	4	34	84	116
11:30-12:30	22	0	1	23	4	1	3	8	31	1	24	16	41	0	25	3	28	69	100
12:30-13:30	17	0	0	17	3	0	1	4	21	1	33	18	52	0	14	2	16	68	89
15:00-16:00	16	1	0	17	3	0	2	5	22	7	10	13	30	1	16	4	21	51	73
16:00-17:00	15	0	3	18	5	0	6	11	29	4	13	12	29	0	21	2	23	52	81
17:00-18:00	4	0	0	4	5	1	0	6	10	0	9	2	11	0	6	2	8	19	29
Sub Total	127	4	4	135	29	3	19	51	186	19	183	106	308	3	154	28	185	493	679
U-Turns (Heavy Vehicles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	127	4	4	135	29	3	19	51	186	19	183	106	308	3	154	28	185	493	679

Heavy Vehicles include Buses, Single-Unit Trucks and Articulated Trucks. Further, they ARE included in the Turning Movement Count Summary.



Transportation Services - Traffic Services

Work Order
37540

Turning Movement Count - Pedestrian Volume Report

STRANDHERD DR @ CEDARVIEW RD/TARTAN DR

Count Date: Thursday, January 18, 2018

Start Time: 07:00

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

Comment:

Turning Movement Count - Full Study Summary Report

STRANDHERD DR @ CEDARVIEW RD/TARTAN DR

Survey Date: Thursday, January 18, 2018

Total Observed U-Turns

Northbound: 0 Southbound: 0 AADT Factor 1.00

Eastbound: 2 Westbound: 0

Full Study

Period	CEDARVIEW RD/TARTAN DR				STRANDHERD DR				Grand Total											
	Northbound		Southbound		Eastbound		Westbound													
	LT	ST	RT	TOT	LT	ST	RT	TOT	WB TOT	STR TOT										
07:00-08:00	354	22	21	397	30	13	90	133	530	52	458	94	604	7	621	24	632	1256	1786	
08:00-09:00	365	57	14	436	74	24	113	211	647	79	432	115	626	3	745	59	807	1433	2080	
09:00-10:00	234	24	14	272	34	12	57	103	375	63	416	83	562	11	555	70	636	1198	1573	
11:30-12:30	144	10	8	162	49	11	65	125	287	70	493	135	698	4	496	54	554	1252	1539	
12:30-13:30	142	8	12	162	56	7	53	116	278	73	557	152	782	10	478	51	539	1321	1599	
15:00-16:00	171	25	8	204	78	36	93	207	411	117	649	270	1038	10	590	79	679	1715	2126	
16:00-17:00	198	34	24	256	52	49	89	190	446	116	724	358	1198	17	648	65	730	1928	2374	
17:00-18:00	170	24	12	206	67	35	55	157	363	102	711	366	1179	13	611	59	683	1862	2225	
Sub Total	1778	204	113	2095	440	187	615	1242	3337	672	4440	1573	6685	75	4744	461	5280	11965	15302	
U-Turns	0				0				2				0				2			
Total	1778	204	113	2095	440	187	615	1242	3337	672	4440	1573	6687	75	4744	461	5280	11967	15304	
EQ 12hr	2471	284	157	2912	612	260	855	1726	4638	934	6172	2186	9295	104	6594	641	7339	16634	21272	
Note: These values are calculated by multiplying the totals by the appropriate expansion factor.																				
AVG 12hr	2471	284	157	2912	612	260	855	1726	4638	934	6172	2186	9295	104	6594	641	7339	16634	21272	
Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor.																				
AVG 24hr	3238	371	206	3815	801	341	1120	2262	6077	1224	8085	2864	12176	137	8638	839	9614	21790	27867	
Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor.																				

Comments:

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

Turning Movement Count - Full Study Peak Hour Diagram

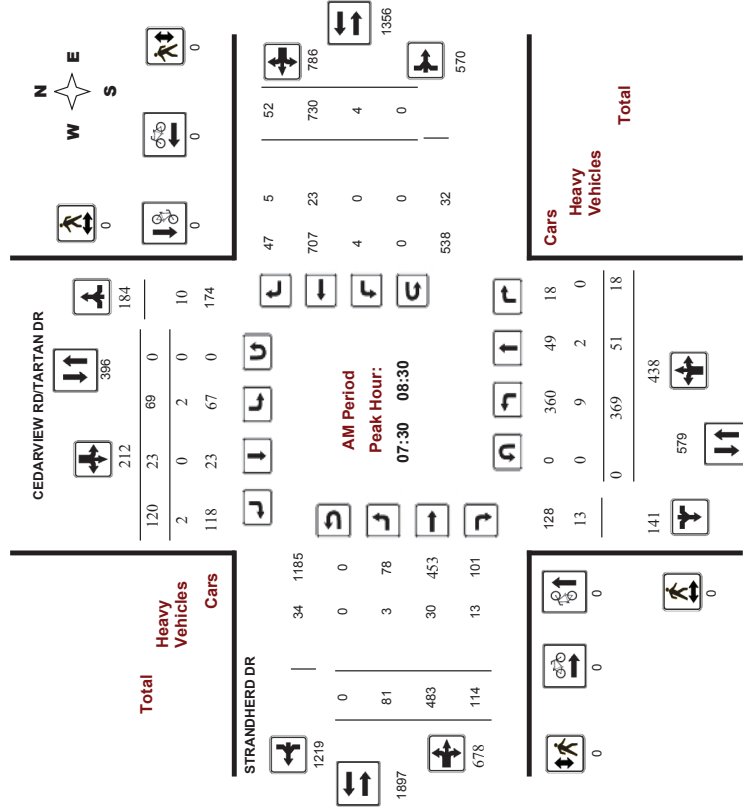
STRANDHERD DR @ CEDARVIEW RD/TARTAN DR

Survey Date: Thursday, January 18, 2018

WO No: 37540

Device: Miovision

Start Time: 07:00



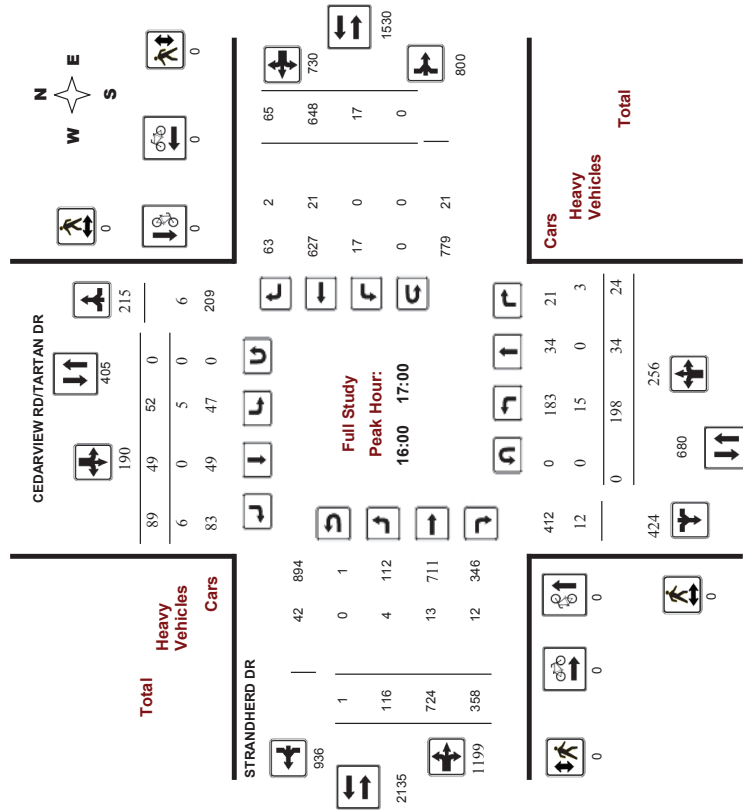
Comments



Transportation Services - Traffic Services
Turning Movement Count - Full Study Peak Hour Diagram
STRANDHERD DR @ CEDARVIEW RD/TARTAN DR

Survey Date: Thursday, January 18, 2018
 Start Time: 07:00

WO No: 37540
 Device: Miovision



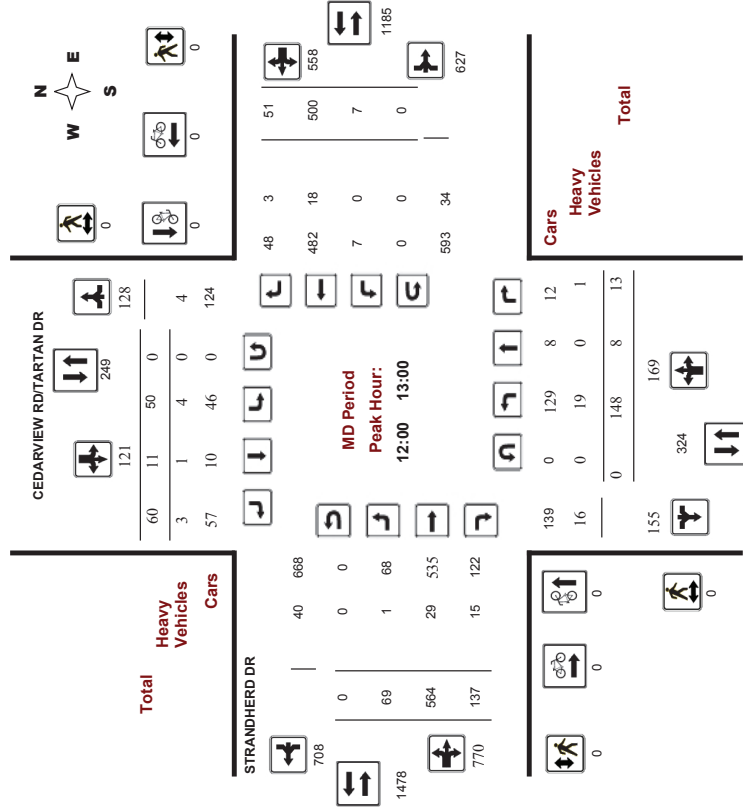
Comments



Transportation Services - Traffic Services
Turning Movement Count - Full Study Peak Hour Diagram
STRANDHERD DR @ CEDARVIEW RD/TARTAN DR

Survey Date: Thursday, January 18, 2018
 Start Time: 07:00

WO No: 37540
 Device: Miovision



Comments

Transportation Services - Traffic Services



Turning Movement Count - 15 Min U-Turn Total Report

STRANDHERD DR @ CEDARVIEW RD/TARTAN DR

Survey Date: Thursday, January 18, 2018

Time Period	Northbound U-Turn Total	Southbound U-Turn Total	Eastbound U-Turn Total	Westbound U-Turn Total	Total
07:00	0	0	0	0	0
07:15	0	0	0	0	0
07:30	0	0	0	0	0
07:45	0	0	0	0	0
08:00	0	0	0	0	0
08:15	0	0	0	0	0
08:30	0	0	0	0	0
08:45	0	0	0	0	0
09:00	0	0	0	0	0
09:15	0	0	0	0	0
09:30	0	0	0	0	0
09:45	0	0	0	0	0
10:00	0	0	0	0	0
11:30	0	0	1	0	1
11:45	0	0	0	0	0
12:00	0	0	0	0	0
12:15	0	0	0	0	0
12:30	0	0	0	0	0
12:45	0	0	0	0	0
13:00	0	0	0	0	0
13:15	0	0	0	0	0
13:30	0	0	0	0	0
15:00	0	0	0	0	0
15:15	0	0	0	0	0
15:30	0	0	0	0	0
15:45	0	0	0	0	0
16:00	0	0	0	0	0
16:15	0	0	1	0	1
16:30	0	0	0	0	0
16:45	0	0	0	0	0
17:00	0	0	0	0	0
17:15	0	0	0	0	0
17:30	0	0	0	0	0
17:45	0	0	0	0	0
18:00	0	0	0	0	0
Total	0	0	2	0	2

Transportation Services - Traffic Services



Turning Movement Count - Full Study Peak Hour Diagram

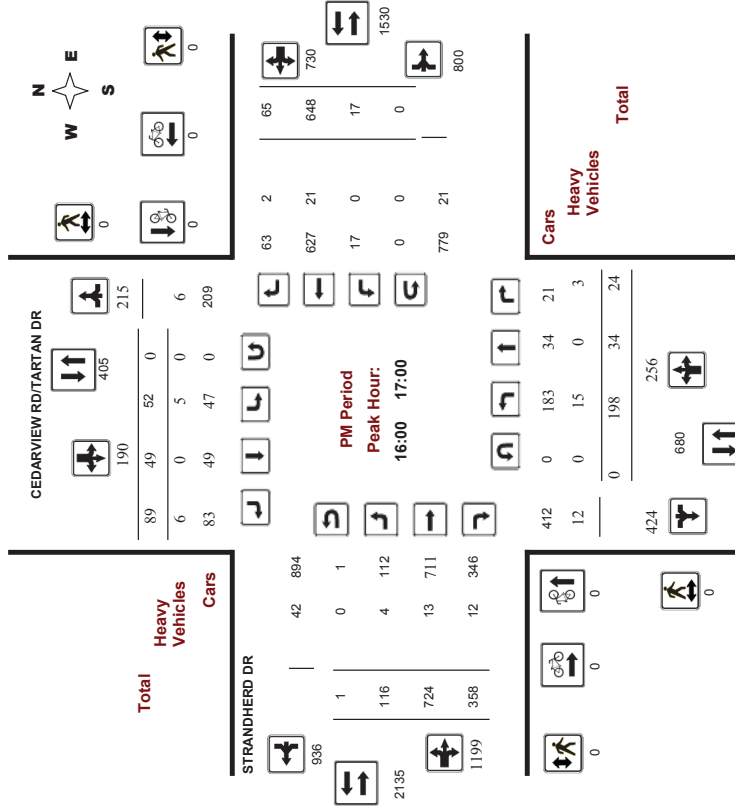
STRANDHERD DR @ CEDARVIEW RD/TARTAN DR

Survey Date: Thursday, January 18, 2018

Start Time: 07:00

WO No: 37540

Device: Miovision



Appendix C

Synchro Intersection Worksheets – Existing Conditions

DRAFT

Lanes, Volumes, Timings Existing
05-12-2020

Lanes, Volumes, Timings Existing
05-12-2020

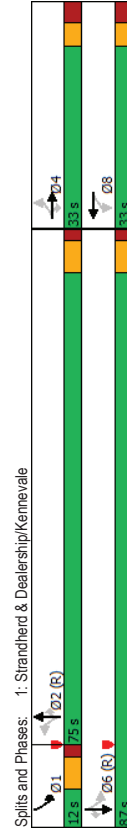
1: Strandherd & Dealership/Kennevale

1: Strandherd & Dealership/Kennevale

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	6	2	7	100	3	109	19	181	86	50	673	18
Traffic Volume (vph)	6	2	7	100	3	109	19	181	86	50	673	18
Future Volume (vph)	1621	1706	1450	1621	1457	0	1621	1706	1450	1621	1706	1450
Satd. Flow (prot)	0.630			0.757			0.372			0.047		
Flt Permitted	1075	1706	1450	1291		0	635	1706	1450	80	1706	1450
Satd. Flow (RTOR)				89		121				91		33
Lane Group Flow (vph)	7	2	8	111	124	0	21	1312	96	56	748	20
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	pm-pt	NA	Perm	Perm
Protected Phases	4	4	4	8	8	2	2	2	2	1	6	6
Permitted Phases	4	4	4	8	8	2	2	2	2	2	6	6
Detector Phase	4	4	4	8	8	2	2	2	2	2	1	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	32.6	32.6	32.6	32.6	32.6	30.4	30.4	30.4	11.4	30.4	30.4	30.4
Total Split (s)	33.0	33.0	33.0	33.0	33.0	75.0	75.0	75.0	12.0	87.0	87.0	87.0
Total Split (%)	27.5%	27.5%	27.5%	27.5%	27.5%	62.5%	62.5%	62.5%	10.0%	72.5%	72.5%	72.5%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	4.6	4.6	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	3.3	3.3	3.3	3.3	3.3	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.6	6.6	6.6	6.6	6.4	6.4	6.4	6.4	6.4	6.4	6.4
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	None	None	None	None	None
Act Effct Green (s)	15.8	15.8	15.8	15.8	15.8	80.3	80.3	80.3	91.2	91.2	91.2	91.2
Actuated G/C Ratio	0.13	0.13	0.13	0.13	0.13	0.67	0.67	0.67	0.76	0.76	0.76	0.76
v/c Ratio	0.05	0.01	0.03	0.65	0.42	0.05	1.15	0.10	0.38	0.58	0.02	0.02
Control Delay	43.0	41.5	0.1	66.6	12.5	9.9	100.1	2.6	16.7	9.1	0.9	0.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	43.0	41.5	0.1	66.6	12.5	9.9	100.1	2.6	16.7	9.1	0.9	0.9
LOS	D	D	A	E	B	A	F	A	B	A	B	A
Approach Delay												
Approach LOS												
Queue Length 50th (m)	1.4	0.4	0.0	24.9	0.6	1.6	~364.6	0.4	2.7	62.9	0.0	0.0
Queue Length 95th (m)	5.5	2.7	0.0	41.3	16.4	5.7	#474.6	7.4	12.5	115.0	1.3	1.3
Internal Link Dist (m)							1040.6			345.0		
Turn Bay Length (m)	70.0	150.0	50.0	177.4		130.0	1040.6		60.0	180.0		60.0
Base Capacity (vph)	236	375	388	284	414	425	1142	1000	148	1296	1109	600
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.01	0.02	0.39	0.30	0.05	1.15	0.10	0.38	0.58	0.02	0.02

Intersection Summary	
Cycle Length:	120
Actuated Cycle Length:	120
Offset:	105 (88%), Referenced to phase 2:NBL and 6:SBTL, Start of Green
Natural Cycle:	130
Control Type:	Actuated-Coordinated

Maximum v/c Ratio:	1.15
Intersection Signal Delay:	59.4
Intersection Capacity Utilization:	89.0%
Analysis Period (min):	15
Intersection LOS:	E
ICU Level of Service:	E
~ Volume exceeds capacity, queue is theoretically infinite.	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	
Queue shown is maximum after two cycles.	



Splits and Phases: 1: Strandherd & Dealership/Kennevale

Lanes, Volumes, Timings Existing
05-12-2020

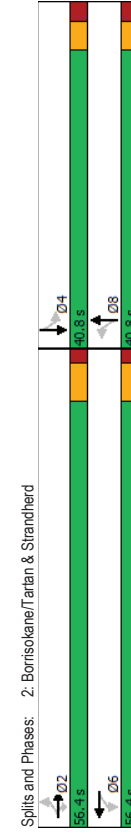
Lanes, Volumes, Timings Existing
05-12-2020

2: Borrisokane/Tartan & Strandherd

2: Borrisokane/Tartan & Strandherd

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	81	527	141	21	759	52	336	49	32	69	23	120
Traffic Volume (vph)	81	527	141	21	759	52	336	49	32	69	23	120
Future Volume (vph)	1621	1706	1450	1621	1689	0	1621	1604	0	1621	1493	0
Satd. Flow (prot)	0.080		0.304		0.652							
Flt Permitted	136	1706	1450	519	1689	0	1112	1604	0	1192	1493	0
Satd. Flow (RTOR)	157		157	5								
Lane Group Flow (vph)	90	586	157	23	901	0	373	90	0	77	159	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases	2	2	2	6	6	6	8	8	8	4	4	4
Detector Phase	2	2	2	6	6	6	8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	56.4	56.4	56.4	56.4	56.4	56.4	23.8	23.8	23.8	23.8	23.8	23.8
Total Split (s)	56.4	56.4	56.4	56.4	56.4	56.4	40.8	40.8	40.8	40.8	40.8	40.8
Total Split (%)	58.0%	58.0%	58.0%	58.0%	58.0%	58.0%	42.0%	42.0%	42.0%	42.0%	42.0%	42.0%
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	1.8	1.8	1.8	1.8	1.8	1.8	2.5	2.5	2.5	2.5	2.5	2.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	6.4	6.4	6.4	6.4	5.8	5.8	5.8	5.8	5.8	5.8
Lead/Lag Optimize?												
Recall Mode	Max	Max	Max	Max	Max	Max	None	None	None	None	None	None
Act Effct Green (s)	50.1	50.1	50.1	50.1	50.1	50.1	33.7	33.7	33.7	33.7	33.7	33.7
Actuated G/C Ratio	0.52	0.52	0.52	0.52	0.52	0.52	0.35	0.35	0.35	0.35	0.35	0.35
v/c Ratio	1.29	0.66	0.19	0.09	1.02	0.96	0.15	0.18	0.18	0.26	0.26	0.26
Control Delay	230.3	216.7	216.7	13.1	60.4	67.9	14.3	22.8	7.6	7.6	7.6	7.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	230.3	216.7	216.7	13.1	60.4	67.9	14.3	22.8	7.6	7.6	7.6	7.6
LOS	F	C	A	B	E	E	B	C	A	C	A	A
Approach Delay		40.6		59.2		57.5						12.6
Approach LOS		D		E		E						B
Queue Length 50th (m)	-21.4	76.6	0.0	2.1	-180.6		65.7	6.6		9.6	4.1	
Queue Length 95th (m)	#39.0	113.6	8.9	6.3	#252.4		#120.0	16.7		20.0	17.0	
Internal Link Dist (m)		1040.6			787.0							103.1
Turn Bay Length (m)		140.0		175.0	150.0		70.0					38.0
Base Capacity (vph)		70	889	831	270	883	405	608		485	624	
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	1.29	0.66	0.19	0.09	1.02	0.92	0.15	0.18	0.18	0.25	0.25	0.25
Intersection Summary												
Cycle Length: 97.2												
Actuated Cycle Length: 96												
Natural Cycle: 95												
Control Type: Actuated-Uncoordinated												
Maximum v/c Ratio: 1.29												

Intersection Signal Delay: 48.1
Intersection LOS: D
Intersection Capacity Utilization 102.9%
ICU Level of Service G
Analysis Period (min) 15
Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Int Delay, s/veh	6.2											
Lane Configurations	4	4	4	4	4	4	4	4	4	4	4	4
Traffic Vol, veh/h	4	497	107	0	810	16	0	0	179	35	0	12
Future Vol, veh/h	4	497	107	0	810	16	0	0	179	35	0	12
Conflicting Peds, #/hr	0	0	0	0	0	0	1	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	-	-	-	-	-	-	-	-	-	-
Storage Length	600	-	-	-	-	750	-	-	0	0	0	0
Veh in Median Storage, #	0	0	0	0	0	0	0	0	0	0	0	0
Grade, %	-	-	-	-	-	-	-	-	-	-	-	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	582	119	0	900	18	0	0	199	39	0	13

Major/Minor	Major1	Major2	Minor1	Minor2
Conflicting Flow All	919	0	0	0
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hwy	412	-	-	-
Critical Hwy Stg 1	-	-	-	-
Critical Hwy Stg 2	-	-	-	-
Follow-up Hwy	2218	-	-	-
Pot Cap-1 Maneuver	743	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	742	-	-	-
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	17.2	153.4
HCM LOS	C	C	F	F
Minor Lane/Major Mvmt Capacity (veh/h)	493	742	-	-
HCM Lane V/C Ratio	0.403	0.006	-	-
HCM Control Delay (s)	17.2	9.9	-	-
HCM Lane LOS	C	A	-	-
HCM 95th %ile Q(veh)	1.9	0	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	162	631	141	67	717	163	143	243	51	175	162	142
Traffic Volume (vph)	162	631	141	67	717	163	143	243	51	175	162	142
Future Volume (vph)	1621	3241	1450	1621	3241	1450	3144	3140	0	3144	3241	1450
Satd. Flow (prot)	0.131	-	-	0.277	-	-	0.950	-	-	0.950	-	-
Flt Permitted	222	3241	1414	471	3241	1400	3134	3140	0	3082	3241	1429
Satd. Flow (RTOR)	157	-	-	181	-	-	20	-	-	158	-	-
Lane Group Flow (vph)	180	701	157	74	797	181	159	327	0	194	180	158
Turn Type	pm-pt	NA	Perm	pm-pt	NA	Perm	Prot	NA	Prot	NA	Perm	Perm
Protected Phases	7	4	4	8	8	8	5	2	1	6	6	6
Permitted Phases	4	4	4	8	8	8	5	2	1	6	6	6
Detector Phase	7	4	4	3	3	3	8	8	5	2	1	6
Switch Phase	-	-	-	-	-	-	-	-	-	-	-	-
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	5.0	10.0	10.0	10.0
Minimum Split (s)	11.6	33.5	33.5	11.6	33.5	33.5	11.3	35.5	11.3	35.5	35.5	35.5
Total Split (s)	19.0	41.0	41.0	19.0	41.0	41.0	24.0	36.0	24.0	36.0	36.0	36.0
Total Split (%)	15.8%	34.2%	34.2%	15.8%	34.2%	34.2%	20.0%	30.0%	20.0%	30.0%	30.0%	30.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.9	2.8	2.8	2.9	2.8	2.8	2.6	2.8	2.6	2.8	2.8	2.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.5	6.5	6.6	6.5	6.5	6.3	6.5	6.3	6.5	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	None	None	None	None	None
Act Effct Green (s)	48.8	38.9	38.9	41.5	32.9	32.9	11.4	36.3	12.7	37.6	37.6	37.6
Actuated G/C Ratio	0.41	0.32	0.32	0.35	0.27	0.27	0.10	0.30	0.11	0.31	0.31	0.31
v/c Ratio	0.78	0.67	0.67	0.78	0.30	0.30	0.53	0.34	0.58	0.18	0.28	0.28
Control Delay	47.8	39.4	39.4	6.2	23.5	23.5	55.8	32.8	58.1	31.9	31.9	31.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	47.8	39.4	39.4	6.2	23.5	23.5	55.8	32.8	58.1	31.9	31.9	31.9
LOS	D	D	D	C	C	C	E	A	E	C	C	A
Approach Delay	35.8	-	-	45.1	-	-	41.1	-	-	33.9	-	-
Approach LOS	D	-	-	D	-	-	D	-	-	C	-	-
Queue Length 50th (m)	25.6	74.3	0.0	9.8	92.1	0.0	18.4	29.7	22.4	16.3	0.0	0.0
Queue Length 95th (m)	#58.7	98.6	15.0	18.9	#119.0	16.1	28.4	44.4	33.1	26.4	15.5	15.5
Internal Link Dist (m)	596.1	-	-	267.5	-	-	273.7	-	-	216.2	-	-
Turn Bay Length (m)	66.0	95.0	120.0	66.0	72.0	66.0	85.0	72.0	85.0	145.0	72.0	72.0
Base Capacity (vph)	234	1051	564	296	931	531	463	964	463	1015	566	566
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.77	0.67	0.67	0.28	0.25	0.25	0.86	0.34	0.34	0.42	0.18	0.28

Maximum v/c Ratio: 0.90
 Intersection Signal Delay: 39.5
 Intersection LOS: D
 Intersection Capacity Utilization 82.1%
 ICU Level of Service E
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.



Intersection	WBL	WBR	NBT	NBR	SBL	SBT
In/Delay, s/veh	7.9					
Movement	W	R	T	R	L	T
Lane Configurations	4					
Traffic Vol, veh/h	17	322	95	22	133	52
Future Vol, veh/h	17	322	95	22	133	52
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	19	358	106	24	148	58
Minor/Minor	Minor1	Major1	Major2			
Conflicting Flow All	472	118	0	0	130	0
Stage 1	118	-	-	-	-	-
Stage 2	354	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3,518	3,318	-	-	2,218	-
Pot Cap-1 Maneuver	551	934	-	-	1455	-
Stage 1	907	-	-	-	-	-
Stage 2	710	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	493	934	-	-	1455	-
Mov Cap-2 Maneuver	493	-	-	-	-	-
Stage 1	907	-	-	-	-	-
Stage 2	635	-	-	-	-	-
Approach	WB	NB	SB			
HCM Control Delay, s	11.9	0	5.6			
HCM LOS	B					
Minor Lane/Major Mvmt	NBT	NBR/WBLn1	SBL	SBT		
Capacity (veh/h)	-	-	894	1455		
HCM Lane V/C Ratio	-	-	0.421	0.102		
HCM Control Delay (s)	-	-	11.9	7.8		
HCM Lane LOS	-	-	B	A		
HCM 95th %tile Q(veh)	-	-	2.1	0.3		

8: Chapman Mills

1: Strandherd & Dealership/Kennevale

Intersection	WBL	WBR	NBT	NBR	SBL	SBT
Int Delay, s/veh	4.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	4	4	4	4	4	4
Traffic Vol, veh/h	0	40	0	0	19	18
Future Vol, veh/h	0	40	0	0	19	18
Conflicting Peds, #/hr	5	5	0	5	5	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	600	0	-	-	300	-
Veh in Median Storage, #	0	0	-	-	0	-
Grade, %	0	-	-	-	-	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	44	44	0	21	20
Major/Minor	Minor1	Major1	Major1	Major2		
Conflicting Flow All	116	54	0	0	49	0
Stage 1	49	-	-	-	-	-
Stage 2	67	-	-	-	-	-
Critical Hwy	6.42	6.22	-	-	4.12	-
Critical Hwy Stg 1	5.42	-	-	-	-	-
Critical Hwy Stg 2	5.42	-	-	-	-	-
Follow-up Hwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	880	1013	-	-	1558	-
Stage 1	973	-	-	-	-	-
Stage 2	956	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	859	1004	-	-	1551	-
Mov Cap-2 Maneuver	859	-	-	-	-	-
Stage 1	968	-	-	-	-	-
Stage 2	938	-	-	-	-	-
Approach	WB	NB	SB			
HCM Control Delay, s	8.8	0	3.8			
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBR	WBL	NWBL	2	SBL
Capacity (veh/h)	-	-	1004	1551	-	-
HCM Lane V/C Ratio	-	-	0.044	0.014	-	-
HCM Control Delay (s)	-	-	0	8.8	7.4	-
HCM Lane LOS	-	-	A	A	A	-
HCM 95th %ile Q(veh)	-	-	0.1	0	-	-

1: Strandherd & Dealership/Kennevale

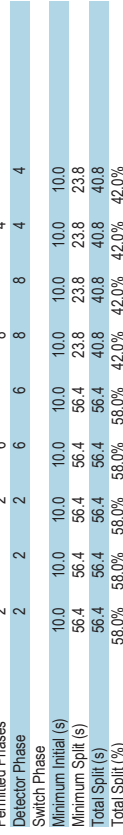
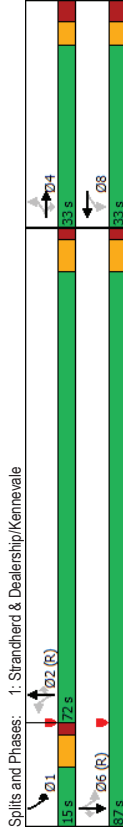
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations	2	2	2	2	2	2	2	2	2	2
Traffic Volume (vph)	29	8	20	128	5	11	826	132	72	1133
Future Volume (vph)	29	8	20	128	5	11	826	132	72	1133
Lane Group Flow (vph)	32	9	22	142	95	12	918	147	80	1259
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	pmt-pt	NA	Perm
Protected Phases	4	4	4	8	8	2	2	2	1	6
Permitted Phases	4	4	4	8	8	2	2	2	1	6
Detector Phase	4	4	4	8	8	2	2	2	1	6
Switch Phase										
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	5.0	10.0
Minimum Split (s)	32.6	32.6	32.6	30.4	30.4	30.4	30.4	11.4	30.4	30.4
Total Split (s)	33.0	33.0	33.0	33.0	33.0	72.0	72.0	72.0	15.0	87.0
Total Split (%)	27.5%	27.5%	27.5%	27.5%	27.5%	60.0%	60.0%	60.0%	12.5%	72.5%
Maximum Green (s)	26.4	26.4	26.4	26.4	26.4	65.6	65.6	65.6	8.6	80.6
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	3.3	3.3	3.3	3.3	3.3	1.8	1.8	1.8	1.8	1.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.6	6.6	6.6	6.6	6.4	6.4	6.4	6.4	6.4
Lead/Lag						Lag	Lag	Lag	Lead	
Lead-Lag Optimize?						Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	C-Max	C-Max	C-Max	None	C-Max
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	19.0	19.0	19.0	19.0	19.0	17.0	17.0	17.0	17.0	17.0
Pedestrian Calls (#/hr)	2	2	2	0	0	2	2	2	0	0
Act Effr Green(s)	18.5	18.5	18.5	18.5	18.5	77.3	77.3	77.3	88.5	88.5
Actuated g/C Ratio	0.15	0.15	0.15	0.15	0.15	0.64	0.64	0.64	0.74	0.74
v/c Ratio	0.17	0.03	0.08	0.72	0.32	0.16	0.84	0.16	0.30	1.00
Control Delay	43.6	39.5	0.5	67.7	12.3	19.4	27.8	5.0	8.3	43.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	43.6	39.5	0.5	67.7	12.3	19.4	27.8	5.0	8.3	43.5
LOS	D	D	A	E	B	B	C	A	A	D
Approach Delay	27.9			45.5		24.6				41.0
Approach LOS	C			D		C				D
Queue Length 50th (m)	6.5	1.8	0.0	31.8	1.2	1.1	162.1	4.4	4.5	~258.7
Queue Length 95th (m)	14.7	6.0	0.0	49.7	14.7	6.0	#232.9	15.0	11.0	#409.4
Internal Link Dist (m)	172.9			177.4		1040.6				345.0
Turn Bay Length (m)	70.0			150.0		130.0				180.0
Base Capacity (vph)	260	375	380	280	391	73	1098	946	281	1257
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	0.12	0.02	0.06	0.51	0.24	0.16	0.84	0.16	0.28	1.00
Intersection Summary										
Cycle Length: 120										
Actuated Cycle Length: 120										
Offset: 57 (48%), Referenced to phase 2/NBTL and 6/SBTL, Start of Green										
Natural Cycle: 130										

1: Strandherd & Dealership/Kennevale

2: Borriskane/Tartan & Strandherd

Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.00
 Intersection Signal Delay: 34.6
 Intersection LOS: C
 ICU Level of Service F
 Intersection Capacity Utilization 96.8%
 Analysis Period (min) 15
 ~ Volume exceeds capacity, queue is theoretically infinite.
 ~ Queue shown is maximum after two cycles.
 # 95th percentile volume exceeds capacity, queue may be longer.
 ~ Queue shown is maximum after two cycles.

Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.00
 Intersection Signal Delay: 34.6
 Intersection LOS: C
 ICU Level of Service F
 Intersection Capacity Utilization 96.8%
 Analysis Period (min) 15
 ~ Volume exceeds capacity, queue is theoretically infinite.
 ~ Queue shown is maximum after two cycles.
 # 95th percentile volume exceeds capacity, queue may be longer.
 ~ Queue shown is maximum after two cycles.



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	117	847	353	27	612	184	34	52	49
Traffic Volume (vph)	117	847	353	27	612	184	34	52	49
Future Volume (vph)	130	941	392	30	752	204	84	58	153
Lane Group Flow (vph)	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm
Turn Type	2	2	2	6	6	6	8	8	4
Protected Phases	2	2	2	6	6	6	8	8	4
Detector Phase	2	2	2	6	6	6	8	8	4
Switch Phase	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Initial (s)	56.4	56.4	56.4	56.4	56.4	23.8	23.8	23.8	23.8
Minimum Split (s)	56.4	56.4	56.4	56.4	56.4	40.8	40.8	40.8	40.8
Total Split (s)	58.0%	58.0%	58.0%	58.0%	58.0%	42.0%	42.0%	42.0%	42.0%
Total Split (%)	50.0	50.0	50.0	50.0	50.0	35.0	35.0	35.0	35.0
Maximum Green (s)	4.6	4.6	4.6	4.6	4.6	3.3	3.3	3.3	3.3
Yellow Time (s)	1.8	1.8	1.8	1.8	1.8	2.5	2.5	2.5	2.5
All-Red Time (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lost Time Adjust (s)	6.4	6.4	6.4	6.4	6.4	5.8	5.8	5.8	5.8
Total Lost Time (s)	6.4	6.4	6.4	6.4	6.4	5.8	5.8	5.8	5.8
Lead/Lag									

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	117	847	353	27	612	184	34	52	49
Traffic Volume (vph)	117	847	353	27	612	184	34	52	49
Future Volume (vph)	130	941	392	30	752	204	84	58	153
Lane Group Flow (vph)	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm
Turn Type	2	2	2	6	6	6	8	8	4
Protected Phases	2	2	2	6	6	6	8	8	4
Detector Phase	2	2	2	6	6	6	8	8	4
Switch Phase	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Initial (s)	56.4	56.4	56.4	56.4	56.4	23.8	23.8	23.8	23.8
Minimum Split (s)	56.4	56.4	56.4	56.4	56.4	40.8	40.8	40.8	40.8
Total Split (s)	58.0%	58.0%	58.0%	58.0%	58.0%	42.0%	42.0%	42.0%	42.0%
Total Split (%)	50.0	50.0	50.0	50.0	50.0	35.0	35.0	35.0	35.0
Maximum Green (s)	4.6	4.6	4.6	4.6	4.6	3.3	3.3	3.3	3.3
Yellow Time (s)	1.8	1.8	1.8	1.8	1.8	2.5	2.5	2.5	2.5
All-Red Time (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lost Time Adjust (s)	6.4	6.4	6.4	6.4	6.4	5.8	5.8	5.8	5.8
Total Lost Time (s)	6.4	6.4	6.4	6.4	6.4	5.8	5.8	5.8	5.8
Lead/Lag									

Vehicle Extension (s)	Max	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	Max	15.0	15.0	15.0	15.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	10.0	10.0	10.0	10.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0	0
Act Effr Green (s)	50.3	50.3	50.3	50.3	19.9	19.9	19.9	19.9	19.9
Actuated g/C Ratio	0.61	0.61	0.61	0.61	0.24	0.24	0.24	0.24	0.24
v/c Ratio	0.49	0.90	0.38	0.21	0.73	0.75	0.20	0.34	0.34
Control Delay	19.6	30.3	2.3	14.5	18.5	46.2	13.7	25.5	12.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.6	30.3	2.3	14.5	18.5	46.2	13.7	25.5	12.0
LOS	B	C	A	B	B	D	B	C	B
Approach Delay	21.9			18.4			36.7		15.7
Approach LOS	C			B			D		B
Queue Length 50th (m)	10.1	113.8	0.0	1.9	72.9	29.2	4.6	7.1	6.6
Queue Length 95th (m)	35.0	#248.2	12.3	8.8	#166.8	51.2	14.4	15.9	19.9
Internal Link Dist (m)	1040.6			787.0			275.6		103.1
Turn Bay Length (m)	140.0			150.0			70.0		38.0
Base Capacity (vph)	264	1040	1037	141	1028	480	694	511	714
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.49	0.90	0.38	0.21	0.73	0.42	0.12	0.11	0.21

Intersection Summary	Cycle Length: 97.2	Actuated Cycle Length: 82.5	Natural Cycle: 85	Control Type: Actuated-Uncoordinated
Caivan Conservancy East PM Peak Hour				

Maximum v/c Ratio: 0.90
 Intersection Signal Delay: 22.0 Intersection LOS: C
 Intersection Capacity Utilization 95.0% ICU Level of Service F
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.



Intersection	3.2													
In/Delay, s/veh														
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR		
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Vol, veh/h	15	773	142	0	690	54	0	0	106	18	0	8	↔	↔
Future Vol, veh/h	15	773	142	0	690	54	0	0	106	18	0	8	↔	↔
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	-	-	-	-	-	-	None	-	None	-	-	None
Storage Length	600	-	-	-	-	-	750	-	0	0	0	0	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	-	0	-	-	0	-	0
Grade, %	-	0	-	-	0	-	-	-	0	-	-	0	-	0
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	17	859	158	0	767	60	0	0	118	20	0	9	↔	↔
Major/Minor	Major1	Major2	Minor1	Minor2										
Conflicting Flow All	827	0	0	-	-	0	-	-	938	1798	-	767		
Stage 1	-	-	-	-	-	-	-	-	-	767	-	-		
Stage 2	-	-	-	-	-	-	-	-	-	1031	-	-		
Critical Hdwy	4.12	-	-	-	-	-	-	-	6.22	7.12	-	6.22		
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	6.12	-	-		
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	6.12	-	-		
Follow-up Hdwy	2.218	-	-	-	-	-	-	-	3.318	3.518	-	3.318		
Pot Cap-1 Maneuver	804	-	-	-	-	-	-	-	0	321	62	0	402	-
Stage 1	-	-	-	-	-	-	-	-	0	395	0	-	-	-
Stage 2	-	-	-	-	-	-	-	-	0	0	0	281	0	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	804	-	-	-	-	-	-	-	-	321	39	-	402	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	39	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	387	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	174	-	-	-
Approach	EB	WB	NB	SB										
HCM Control Delay, s	0.2	0	22.6	122.2										
HCM LOS	C	C	F	F										
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	NBLn1	SBLn1	SBLn2				
Capacity (veh/h)	321	804	-	-	-	-	-	39	402	-				
HCM Lane V/C Ratio	0.367	0.021	-	-	-	-	-	0.513	0.022	-				
HCM Control Delay (s)	22.6	9.6	-	-	-	-	-	170.2	14.2	-				
HCM Lane LOS	C	A	-	-	-	-	-	F	B	-				
HCM 95th %tile Q(veh)	1.6	0.1	-	-	-	-	-	1.8	0.1	-				

Lanes, Volumes, Timings Existing
4: Greenbank & Strandherd 05-12-2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Configurations	1	1	1	1	1	1	1	1	1	1	1
Traffic Volume (vph)	180	909	179	160	802	184	221	264	251	331	177
Future Volume (vph)	180	909	179	160	802	184	221	264	251	331	177
Lane Group Flow (vph)	200	1010	189	178	891	204	246	352	279	388	197
Turn Type	pm-pt	NA	Perm	pm+pt	NA	Perm	Prot	Prot	NA	Prot	NA
Protected Phases	7	4	3	8	8	5	2	1	6		
Permitted Phases	4	4	4	3	8	8	5	2	1	6	6
Detector Phase	7	4	4	3	8	8	5	2	1	6	6
Switch Phase											
Minimum Initial (s)	50	100	100	50	100	100	50	100	50	100	100
Minimum Split (s)	11.6	33.5	33.5	11.6	33.5	33.5	11.3	35.5	11.3	35.5	35.5
Total Split (s)	18.0	41.0	41.0	18.0	41.0	41.0	24.0	37.0	24.0	37.0	37.0
Total Split (%)	15.0%	34.2%	34.2%	15.0%	34.2%	34.2%	20.0%	30.8%	20.0%	30.8%	30.8%
Maximum Green (s)	11.4	34.5	34.5	11.4	34.5	34.5	17.7	30.5	17.7	30.5	30.5
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.9	2.8	2.8	2.9	2.8	2.8	2.6	2.8	2.6	2.8	2.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.5	6.5	6.6	6.5	6.5	6.3	6.5	6.3	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	None	C-Max	C-Max
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	20.0	20.0	20.0	20.0	20.0	20.0	22.0	22.0	22.0	22.0	22.0
Pedestrian Calls (#/hr)	1	1	1	0	0	0	2	2	1	1	1
Act Effr Green (s)	45.9	34.6	34.6	45.7	34.5	34.5	14.4	32.8	15.4	33.8	33.8
Actuated G/C Ratio	0.38	0.29	0.29	0.38	0.29	0.29	0.12	0.27	0.13	0.28	0.28
v/c Ratio	0.95	1.08	0.36	0.85	0.96	0.36	0.65	0.40	0.69	0.40	0.36
Control Delay	81.6	94.8	6.4	62.1	63.1	6.6	58.5	35.7	59.3	37.2	6.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	81.6	94.8	6.4	62.1	63.1	6.6	58.5	35.7	59.3	37.2	6.9
LOS	F	F	A	E	E	A	E	D	E	D	A
Approach Delay	80.5			53.9			45.1		37.4		
Approach LOS	F			D			D		D		
Queue Length 50th (m)	32.6	~138.4	0.0	26.7	107.1	0.5	28.5	33.4	32.2	36.5	0.0
Queue Length 95th (m)	#77.7	#178.1	16.7	#64.9	#147.1	17.6	40.5	48.3	45.5	52.5	17.5
Internal Link Dist (m)	596.1			267.5			273.7		216.2		
Turn Bay Length (m)	66.0	95.0	120.0	66.0	72.0	66.0	72.0	85.0	85.0	145.0	145.0
Base Capacity (vph)	210	934	554	210	931	560	463	876	463	912	544
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.95	1.08	0.36	0.85	0.96	0.36	0.53	0.40	0.60	0.40	0.36

Intersection Summary
 Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 7 (6%), Referenced to phase 2:NBT and 6:SBT, Start of Green
 Natural Cycle: 105

Lanes, Volumes, Timings Existing
4: Greenbank & Strandherd 05-12-2020

Control Type: Actuated-Coordinated	Intersection LOS: E
Maximum v/c Ratio: 1.08	ICU Level of Service E
Intersection Signal Delay: 58.3	
Intersection Capacity Utilization 89.2%	
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite.	
Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	



Splits and Phases: 4: Greenbank & Strandherd

HCM 2010 TWSC
7: Borrisokane & Cambrian

Existing
05-12-2020

Intersection	Int Delay, s/veh						
	WBL	WBR	NBT	NBR	SBL	SBT	Int Delay, s/veh
Movement	21	230	29	0	368	71	8.3
Lane Configurations	W		T			F	
Traffic Vol, veh/h	21	230	29	0	368	71	
Future Vol, veh/h	21	230	29	0	368	71	
Conflicting Peds, #/hr	0	0	0	0	0	0	
Sign Control	Stop	Stop	Free	Free	Free	Free	
RT Channelized	-	None	-	None	-	None	
Storage Length	0	-	-	-	-	-	
Veh in Median Storage, #	0	-	0	-	-	0	
Grade, %	0	-	0	-	-	0	
Peak Hour Factor	90	90	90	90	90	90	
Heavy Vehicles, %	2	2	2	2	2	2	
Mvmt Flow	23	256	32	0	388	79	
Major/Minor	Minor1	Major1	Major1	Major2			
Conflicting Flow All	907	32	0	0	32	0	
Stage 1	32	-	-	-	-	-	
Stage 2	875	-	-	-	-	-	
Critical Hdwy	6.42	6.22	-	-	4.12	-	
Critical Hdwy Stg 1	5.42	-	-	-	-	-	
Critical Hdwy Stg 2	5.42	-	-	-	-	-	
Follow-up Hdwy	3,518	3,318	-	-	2,218	-	
Pot Cap-1 Maneuver	306	1042	-	-	1580	-	
Stage 1	991	-	-	-	-	-	
Stage 2	408	-	-	-	-	-	
Platoon blocked, %	-	-	-	-	-	-	
Mov Cap-1 Maneuver	226	1042	-	-	1580	-	
Mov Cap-2 Maneuver	226	-	-	-	-	-	
Stage 1	991	-	-	-	-	-	
Stage 2	301	-	-	-	-	-	
Approach	WB	NB	SB	SB			
HCM Control Delay, s	11.9	0	0	6.7			
HCM LOS	B						
Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT		
Capacity (veh/h)	-	-	800	1580	-		
HCM Lane V/C Ratio	-	-	0.349	0.252	-		
HCM Control Delay (s)	-	-	11.9	8	0		
HCM Lane LOS	-	-	B	A	A		
HCM 95th %tile Q(veh)	-	-	1.6	1	-		

HCM 2010 TWSC
8: Champman Mills

Existing
05-12-2020

Intersection	Int Delay, s/veh						
	WBL	WBR	NBT	NBR	SBL	SBT	Int Delay, s/veh
Movement	0	27	27	0	39	39	3.9
Lane Configurations		T	T		T	T	
Traffic Vol, veh/h	0	27	27	0	39	39	
Future Vol, veh/h	0	27	27	0	39	39	
Conflicting Peds, #/hr	5	5	0	5	5	0	
Sign Control	Stop	Stop	Free	Free	Free	Free	
RT Channelized	-	None	-	None	-	None	
Storage Length	600	0	-	-	300	-	
Veh in Median Storage, #	0	-	0	-	-	0	
Grade, %	0	-	0	-	-	0	
Peak Hour Factor	90	90	90	90	90	90	
Heavy Vehicles, %	2	2	2	2	2	2	
Mvmt Flow	0	30	30	0	43	43	
Major/Minor	Minor1	Major1	Major1	Major2			
Conflicting Flow All	169	40	0	0	35	0	
Stage 1	35	-	-	-	-	-	
Stage 2	134	-	-	-	-	-	
Critical Hdwy	6.42	6.22	-	-	4.12	-	
Critical Hdwy Stg 1	5.42	-	-	-	-	-	
Critical Hdwy Stg 2	5.42	-	-	-	-	-	
Follow-up Hdwy	3,518	3,318	-	-	2,218	-	
Pot Cap-1 Maneuver	821	1031	-	-	1576	-	
Stage 1	987	-	-	-	-	-	
Stage 2	892	-	-	-	-	-	
Platoon blocked, %	-	-	-	-	-	-	
Mov Cap-1 Maneuver	791	1021	-	-	1569	-	
Mov Cap-2 Maneuver	791	-	-	-	-	-	
Stage 1	982	-	-	-	-	-	
Stage 2	863	-	-	-	-	-	
Approach	WB	NB	SB	SB			
HCM Control Delay, s	8.6	0	0	3.7			
HCM LOS	A						
Minor Lane/Major Mvmt	NBT	NBR	WBLn2	SBL	SBT		
Capacity (veh/h)	-	-	1021	1569	-		
HCM Lane V/C Ratio	-	-	0.029	0.028	-		
HCM Control Delay (s)	-	-	8.6	7.4	-		
HCM Lane LOS	-	-	A	A	A		
HCM 95th %tile Q(veh)	-	-	0.1	0.1	-		

Appendix D

Collision Data

DRAFT

Accident Date	Accident Year	Accident Time	Location	Environment Condition	Light	Traffic Control	Traffic Control Condition	Classification Of Accident	Initial Impact Type	Road Surface Condition
2014-03-22	2014	11:54	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD D	03 - Snow	01 - Daylight	10 - No control		03 - P.D. only	07 - SMV other	03 - Loose snow
2015-01-09	2015	7:21	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD D	01 - Clear	03 - Dawn	10 - No control		03 - P.D. only	07 - SMV other	06 - Ice
2015-01-09	2015	7:14	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD D	03 - Snow	03 - Dawn	10 - No control		03 - P.D. only	07 - SMV other	05 - Packed snow
2015-04-03	2015	20:09	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD D	01 - Clear	07 - Dark	10 - No control		02 - Non-fatal injury	07 - SMV other	01 - Dry
2016-09-28	2016	13:17	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD D	01 - Clear	01 - Daylight	10 - No control		02 - Non-fatal injury	07 - SMV other	01 - Dry
2017-02-06	2017	20:11	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD D	03 - Snow	07 - Dark	10 - No control		03 - P.D. only	07 - SMV other	03 - Loose snow
2017-02-10	2017	22:39	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD D	04 - Freezing Rain	07 - Dark	10 - No control		03 - P.D. only	07 - SMV other	06 - Ice
2017-05-23	2017	14:40	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD D	01 - Clear	01 - Daylight	10 - No control		03 - P.D. only	99 - Other	01 - Dry
2017-09-23	2017	21:27	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD D	01 - Clear	07 - Dark	10 - No control		03 - P.D. only	07 - SMV other	01 - Dry
2017-10-07	2017	10:28	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD D	02 - Rain	01 - Daylight	10 - No control		03 - P.D. only	07 - SMV other	02 - Wet
2017-12-06	2017	8:10	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD D	01 - Clear	01 - Daylight	10 - No control		02 - Non-fatal injury	07 - SMV other	01 - Dry
2018-03-07	2018	8:37	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD D	03 - Snow	01 - Daylight	10 - No control		03 - P.D. only	07 - SMV other	03 - Loose snow
2018-05-15	2018	8:26	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD D	01 - Clear	01 - Daylight	10 - No control		02 - Non-fatal injury	07 - SMV other	01 - Dry
2018-08-02	2018	16:36	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD D	01 - Clear	01 - Daylight	10 - No control		03 - P.D. only	07 - SMV other	01 - Dry
2018-08-15	2018	11:11	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD D	01 - Clear	01 - Daylight	10 - No control		03 - P.D. only	07 - SMV other	01 - Dry
2018-08-24	2018	17:17	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD D	01 - Clear	01 - Daylight	10 - No control		02 - Non-fatal injury	07 - SMV other	01 - Dry
2018-09-15	2018	17:30	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD D	01 - Clear	01 - Daylight	10 - No control		03 - P.D. only	07 - SMV other	01 - Dry
2018-10-08	2018	13:45	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD D	02 - Rain	01 - Daylight	10 - No control		03 - P.D. only	07 - SMV other	02 - Wet
2018-12-01	2018	22:45	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD D	01 - Clear	07 - Dark	10 - No control		03 - P.D. only	07 - SMV other	01 - Dry
2018-12-27	2018	12:27	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD D	01 - Clear	01 - Daylight	10 - No control		03 - P.D. only	03 - Rear end	06 - Ice
2014-06-07	2014	12:20	FRASER FIELDS WAY @ STRANDHERD DR	01 - Clear	01 - Daylight	0		03 - P.D. only	02 - Angle	01 - Dry
2014-12-18	2014	20:15	FRASER FIELDS WAY @ STRANDHERD DR	01 - Clear	07 - Dark	0		03 - P.D. only	05 - Turning movement	01 - Dry
2015-02-04	2015	11:28	FRASER FIELDS WAY @ STRANDHERD DR	01 - Clear	01 - Daylight	02 - Stop sign		03 - P.D. only	02 - Angle	04 - Slush
2017-02-18	2017	7:46	FRASER FIELDS WAY @ STRANDHERD DR	01 - Clear	01 - Daylight	02 - Stop sign		03 - P.D. only	02 - Angle	01 - Dry
2018-01-14	2018	14:07	FRASER FIELDS WAY @ STRANDHERD DR	01 - Clear	01 - Daylight	02 - Stop sign		03 - P.D. only	05 - Turning movement	01 - Dry
2018-02-11	2018	9:43	FRASER FIELDS WAY @ STRANDHERD DR	01 - Clear	01 - Daylight	02 - Stop sign		02 - Non-fatal injury	02 - Angle	02 - Wet
2018-03-15	2018	11:45	FRASER FIELDS WAY @ STRANDHERD DR	01 - Clear	01 - Daylight	02 - Stop sign		03 - P.D. only	02 - Angle	01 - Dry
2014-05-25	2014	12:45	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2014-06-11	2014	16:36	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	02 - Rain	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	02 - Wet
2014-06-24	2014	18:43	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	02 - Rain	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	02 - Wet
2014-07-15	2014	9:52	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	02 - Rain	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	02 - Wet
2014-09-21	2014	12:15	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	02 - Rain	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	02 - Wet
2014-11-17	2014	9:40	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	03 - Snow	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	02 - Wet
2014-12-16	2014	13:21	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	02 - Wet
2014-12-16	2014	15:00	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	02 - Rain	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	02 - Wet
2014-12-18	2014	19:06	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	01 - Clear	07 - Dark	01 - Traffic signal		03 - P.D. only	05 - Turning movement	01 - Dry
2015-03-31	2015	19:09	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	01 - Clear	07 - Dark	01 - Traffic signal		02 - Non-fatal injury	03 - Rear end	01 - Dry
2015-05-02	2015	18:09	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2015-05-25	2015	16:50	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	02 - Rain	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	02 - Wet
2015-06-16	2015	6:04	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	02 - Rain	01 - Daylight	01 - Traffic signal		02 - Non-fatal injury	07 - SMV other	02 - Wet
2015-06-28	2015	13:23	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	02 - Rain	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	02 - Wet
2015-08-13	2015	10:00	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	02 - Angle	01 - Dry
2015-08-20	2015	18:20	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	02 - Rain	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	02 - Wet
2015-09-12	2015	14:46	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	02 - Rain	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	02 - Wet
2015-10-20	2015	12:34	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	01 - Clear	01 - Daylight	01 - Traffic signal		02 - Non-fatal injury	02 - Angle	01 - Dry
2015-11-12	2015	11:26	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	02 - Rain	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	02 - Wet
2015-12-02	2015	8:46	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	02 - Rain	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	02 - Wet
2015-12-21	2015	13:23	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	02 - Rain	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	02 - Wet
2016-01-15	2016	12:02	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	02 - Wet
2016-02-06	2016	17:26	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	01 - Clear	05 - Dusk	01 - Traffic signal		03 - P.D. only	05 - Turning movement	01 - Dry
2016-05-08	2016	20:00	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	01 - Clear	01 - Daylight	01 - Traffic signal		02 - Non-fatal injury	03 - Rear end	01 - Dry
2016-08-02	2016	20:57	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	01 - Clear	07 - Dark	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2016-08-04	2016	13:20	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2016-12-02	2016	13:33	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2017-06-12	2017	13:03	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2017-11-25	2017	14:07	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	02 - Rain	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	02 - Wet
2017-12-08	2017	1:22	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	01 - Clear	07 - Dark	01 - Traffic signal		03 - P.D. only	02 - Angle	01 - Dry
2018-04-02	2018	18:22	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	01 - Clear	05 - Dusk	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2018-04-07	2018	17:29	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2018-07-05	2018	11:00	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	05 - Turning movement	01 - Dry
2018-07-12	2018	10:08	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	04 - Sideswipe	01 - Dry

2018-10-11	2018	16:22	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	05 - Turning movement	01 - Dry
2018-10-17	2018	7:45	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	02 - Rain	01 - Daylight	01 - Traffic signal	03 - P.D. only	05 - Turning movement	02 - Wet
2018-10-22	2018	11:58	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	01 - Clear	01 - Daylight	01 - Traffic signal	02 - Non-fatal injury	05 - Turning movement	01 - Dry
2018-12-25	2018	8:03	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	07 - SMV other	01 - Dry
2018-12-30	2018	18:56	STRANDHERD DR @ CEDARVIEW RD/TARTAN DR	01 - Clear	07 - Dark	01 - Traffic signal	03 - P.D. only	03 - Rear end	02 - Wet
2014-01-12	2014	17:31	STRANDHERD DR btwn CEDARVIEW RD & MADRID AVE	01 - Clear	05 - Dusk	10 - No control	02 - Non-fatal injury	05 - Turning movement	01 - Dry
2014-11-16	2014	14:24	STRANDHERD DR btwn CEDARVIEW RD & MADRID AVE	01 - Clear	01 - Daylight	10 - No control	03 - P.D. only	05 - Turning movement	02 - Wet
2015-02-17	2015	16:00	STRANDHERD DR btwn CEDARVIEW RD & MADRID AVE	01 - Clear	01 - Daylight	10 - No control	02 - Non-fatal injury	05 - Turning movement	01 - Dry
2015-07-01	2015	23:12	STRANDHERD DR btwn CEDARVIEW RD & MADRID AVE	01 - Clear	07 - Dark	10 - No control	03 - P.D. only	03 - Rear end	01 - Dry
2015-10-09	2015	12:55	STRANDHERD DR btwn CEDARVIEW RD & MADRID AVE	02 - Rain	01 - Daylight	10 - No control	03 - P.D. only	07 - SMV other	02 - Wet
2015-10-11	2015	19:40	STRANDHERD DR btwn CEDARVIEW RD & MADRID AVE	01 - Clear	07 - Dark	10 - No control	03 - P.D. only	05 - Turning movement	01 - Dry
2016-12-16	2016	15:15	STRANDHERD DR btwn CEDARVIEW RD & MADRID AVE	01 - Clear	01 - Daylight	10 - No control	02 - Non-fatal injury	03 - Rear end	01 - Dry
2016-12-16	2016	21:31	STRANDHERD DR btwn CEDARVIEW RD & MADRID AVE	01 - Clear	07 - Dark	10 - No control	03 - P.D. only	07 - SMV other	01 - Dry
2017-12-31	2017	13:23	STRANDHERD DR btwn CEDARVIEW RD & MADRID AVE	01 - Clear	01 - Daylight	10 - No control	02 - Non-fatal injury	03 - Rear end	02 - Wet
2018-05-29	2018	11:00	STRANDHERD DR btwn CEDARVIEW RD & MADRID AVE	01 - Clear	01 - Daylight	10 - No control	02 - Non-fatal injury	05 - Turning movement	01 - Dry
2018-07-08	2018	11:36	STRANDHERD DR btwn CEDARVIEW RD & MADRID AVE	01 - Clear	01 - Daylight	10 - No control	03 - P.D. only	03 - Rear end	01 - Dry
2018-12-21	2018	16:40	STRANDHERD DR btwn CEDARVIEW RD & MADRID AVE	02 - Rain	05 - Dusk	10 - No control	02 - Non-fatal injury	03 - Rear end	02 - Wet
2014-12-04	2014	16:38	STRANDHERD DR btwn CEDARVIEW RD & MCKENNA CASE	01 - Clear	05 - Dusk	10 - No control	03 - P.D. only	03 - Rear end	01 - Dry
2015-02-08	2015	8:45	STRANDHERD DR btwn CEDARVIEW RD & MCKENNA CASE	03 - Snow	01 - Daylight	10 - No control	02 - Non-fatal injury	01 - Approaching	03 - Loose snow
2016-11-26	2016	14:39	STRANDHERD DR btwn CEDARVIEW RD & MCKENNA CASE	01 - Clear	01 - Daylight	10 - No control	02 - Non-fatal injury	03 - Rear end	01 - Dry
2017-12-22	2017	16:50	STRANDHERD DR btwn CEDARVIEW RD & MCKENNA CASE	01 - Clear	05 - Dusk	10 - No control	03 - P.D. only	04 - Sideswipe	01 - Dry
2018-08-04	2018	14:19	STRANDHERD DR btwn CEDARVIEW RD & MCKENNA CASE	02 - Rain	01 - Daylight	10 - No control	03 - P.D. only	03 - Rear end	02 - Wet

Appendix E

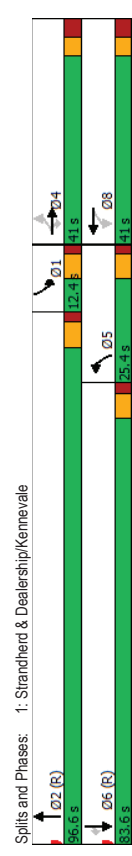
Synchro Intersection Worksheets – 2029 Background Conditions

DRAFT

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	109	28	69	100	168	333	3102	54	1423	471
Future Volume (vph)	109	28	69	100	168	333	3102	54	1423	471
Lane Group Flow (vph)	109	28	69	100	284	333	3188	54	1423	471
Turn Type	Perm	NA	Perm	Perm	NA	Prot	NA	Prot	NA	Perm
Protected Phases	4			8		5	2	1	6	
Permitted Phases	4	4	4	8	8	5	2	1	6	6
Detector Phase										
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)	39.9	39.9	39.9	32.9	11.4	30.4	11.4	39.4	39.4	39.4
Total Split (s)	41.0	41.0	41.0	41.0	41.0	25.4	96.6	12.4	83.6	83.6
Total Split (%)	27.3%	27.3%	27.3%	27.3%	27.3%	16.9%	64.4%	8.5%	55.7%	55.7%
Maximum Green (s)	34.1	34.1	34.1	34.1	19.0	90.2	6.0	77.2	77.2	77.2
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	3.6	3.6	3.6	3.6	3.6	1.8	1.8	1.8	1.8	1.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.9	6.9	6.9	6.9	6.9	6.4	6.4	6.4	6.4	6.4
Lead/Lag						Yes	Yes	Lag	Lead	Lead
Lead-Lag Optimize?						Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	C-Max	None	C-Max	C-Max	C-Max
Walk Time (s)	5.0	5.0	5.0	7.0	7.0	7.0	7.0	5.0	5.0	5.0
Flash Dont Walk (s)	26.0	26.0	26.0	14.0	14.0	14.0	14.0	26.0	26.0	26.0
Pedestrian Calls (#/hr)	10	10	10	10	10	10	10	10	10	10
Act Effr Green (s)	31.3	31.3	31.3	31.3	31.3	19.0	93.0	6.0	80.0	80.0
Actuated G/C Ratio	0.21	0.21	0.21	0.21	0.21	0.13	0.62	0.04	0.53	0.53
v/c Ratio	1.03	0.08	0.23	0.38	0.85	0.84	1.59	0.84	0.82	0.61
Control Delay	152.4	46.6	50.2	54.6	79.5	56.3	287.2	143.6	34.9	29.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	152.4	46.6	50.2	54.6	79.5	56.3	287.2	143.6	34.9	29.2
LOS	F	D	D	D	E	E	F	F	C	C
Approach Delay							265.4		36.6	
Approach LOS							F		D	
Queue Length 50th (m)	31.8	6.5	16.6	24.9	79.0	52.0	~726.0	16.1	185.8	97.1
Queue Length 95th (m)	#70.6	15.2	30.6	42.9	#119.2	m32.7m#340.0	#42.4	218.8	134.9	
Internal Link Dist (m)	172.9			177.4		1040.6		345.0		
Turn Bay Length (m)	70.0	150.0	50.0	130.0	180.0	180.0	180.0	60.0	60.0	60.0
Base Capacity (vph)	115	387	325	286	364	398	1999	64	1728	773
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	0.95	0.07	0.21	0.35	0.78	0.84	1.59	0.84	0.82	0.61

Intersection Summary
 Cycle Length: 150
 Actuated Cycle Length: 150
 Offset: 44 (29%), Referenced to phase 2:NBT and 6:SBT, Start of Green
 Natural Cycle: 125

Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.59	
Intersection Signal Delay: 174.1	Intersection LOS: F
Intersection Capacity Utilization: 144.9%	ICU Level of Service: H
Analysis Period (min): 15	
~ Volume exceeds capacity, queue is theoretically infinite.	
Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	



Splits and Phases: 1: Strandherd & Dealership/Kennevale

2: Borriskane/Tartan & Strandherd

2: Borriskane/Tartan & Strandherd

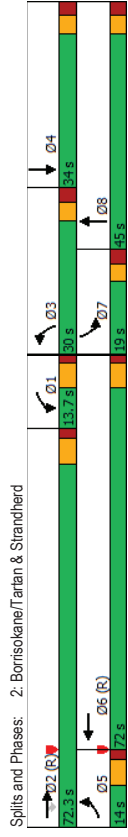
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	137	841	582	68	1944	1199	49	69	23
Future Volume (vph)	137	841	582	68	1944	1199	49	69	23
Lane Group Flow (vph)	137	841	582	68	1996	1199	156	69	315
Turn Type	Prot	NA	Perm	Prot	NA	Prot	NA	Prot	NA
Protected Phases	5	2	2	1	6	3	8	7	4
Permitted Phases	5	2	2	1	6	3	8	7	4
Detector Phase	5	2	2	1	6	3	8	7	4
Switch Phase									
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	5.0	10.0	5.0	10.0
Minimum Split (s)	11.4	56.4	56.4	11.4	56.4	11.0	34.0	11.0	34.0
Total Split (s)	14.0	72.3	72.3	13.7	72.0	30.0	45.0	19.0	34.0
Total Split (%)	9.3%	48.2%	48.2%	9.1%	48.0%	20.0%	30.0%	12.7%	22.7%
Maximum Green (s)	7.6	65.9	65.9	7.3	65.6	24.0	39.0	13.0	28.0
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	3.3	3.3	3.3	3.3
All-Red Time (s)	1.8	1.8	1.8	1.8	1.8	2.7	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	6.4	6.4	6.4	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	None	None	None	None
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	14.0	14.0	14.0	14.0	14.0	21.0	21.0	21.0	21.0
Pedestrian Calls (#/hr)	10	10	10	10	10	10	10	10	10
Act Effr Green (s)	7.6	65.9	65.9	7.3	65.6	24.0	43.7	10.9	28.0
Actuated G/C Ratio	0.05	0.44	0.44	0.05	0.44	0.16	0.29	0.07	0.19
v/c Ratio	1.67	0.59	0.91	0.87	1.41	2.38	0.35	0.59	1.15
Control Delay	370.7	22.2	45.0	104.9	215.9	654.5	46.6	86.9	153.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	370.7	22.2	45.0	104.9	215.9	654.5	46.6	86.9	153.4
LOS	F	C	D	F	F	F	D	F	F
Approach Delay	61.3			212.3			584.5		141.5
Approach LOS	E			F			F		F
Queue Length 50th (m)	~57.7	111.4	182.0	19.5	~411.5	~297.2	37.5	19.9	~108.3
Queue Length 95th (m)	m#78.9	113.4	#237.6	m#24.0	#450.4	#338.2	59.5	36.0	#167.3
Internal Link Dist (m)	1040.6			787.0			275.6		103.1
Turn Bay Length (m)	105.0	110.0	110.0	55.0	100.0	100.0	38.0		
Base Capacity (vph)	82	1423	637	78	1411	503	445	140	274
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	1.67	0.59	0.91	0.87	1.41	2.38	0.35	0.49	1.15

Intersection Summary
 Cycle Length: 150
 Actuated Cycle Length: 150
 Offset: 132 (88%), Referenced to phase 2:EBT and 6:WBT, Start of Green
 Natural Cycle: 125

2: Borriskane/Tartan & Strandherd

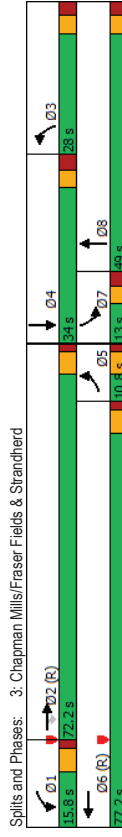
2: Borriskane/Tartan & Strandherd

Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 2.38
 Intersection Signal Delay: 257.3
 Intersection LOS: F
 IOU Level of Service H
 Intersection Capacity Utilization: 143.6%
 Analysis Period (min): 15
 ~ Volume exceeds capacity, queue is theoretically infinite.
 Queue shown is maximum after two cycles.
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.



EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
↖	↗	↘	↖	↗	↘	↖	↗	↘
↖	↗	↘	↖	↗	↘	↖	↗	↘
↖	↗	↘	↖	↗	↘	↖	↗	↘
↖	↗	↘	↖	↗	↘	↖	↗	↘
Prot	NA	Perm	Prot	NA	Prot	NA	Prot	NA
5	2	2	1	6	3	8	7	4
Protected Phases								
Permitted Phases								
Detector Phase								
Switch Phase								
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	5.0	10.0	10.0
Minimum Split (s)	10.8	26.8	26.8	10.8	26.8	11.0	34.0	11.0
Total Split (s)	10.8	72.2	72.2	15.8	77.2	28.0	49.0	13.0
Total Split (%)	7.2%	48.1%	48.1%	10.5%	51.5%	18.7%	32.7%	8.7%
Maximum Green (s)	5.0	66.4	66.4	10.0	71.4	22.0	43.0	7.0
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	3.3	3.3	3.3
All-Red Time (s)	1.6	1.6	1.6	1.6	1.6	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.8	5.8	5.8	5.8	6.0	6.0	6.0	6.0
Lead/Lag	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	None	None	Min
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	5.0	5.0	5.0
Flash Dont Walk (s)	14.0	14.0	14.0	14.0	14.0	21.0	21.0	21.0
Pedestrian Calls (#/hr)	10	10	10	10	10	10	10	10
Act Effr Green (s)	5.0	75.6	75.6	8.6	85.5	28.1	40.1	6.7
Actuated g/C Ratio	0.03	0.50	0.50	0.06	0.57	0.19	0.27	0.04
v/c Ratio	0.07	0.43	0.42	0.47	0.86	0.81	0.19	0.49
Control Delay	46.0	10.2	11.3	105.4	16.4	70.0	44.0	92.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	46.0	10.2	11.3	105.4	16.4	70.0	44.0	92.2
LOS	D	B	B	F	B	E	D	F
Approach Delay	10.7			18.8		66.6		83.0
Approach LOS	B			B		E		F
Queue Length 50th (m)	1.0	22.6	18.2	13.5	34.3	68.1	17.4	10.2
Queue Length 95th (m)	m2.1	42.9	39.2	m15.7	#301.7	#105.5	29.0	22.5
Internal Link Dist (m)	787.0			628.9		349.9		82.1
Turn Bay Length (m)	40.0	145.0	40.0	105.0				40.0
Base Capacity (vph)	54	1633	730	108	1844	589	422	75
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.43	0.42	0.40	0.86	0.81	0.17	0.47
Intersection Summary								
Cycle Length: 150								
Actuated Cycle Length: 150								
Offset: 132 (88%), Referenced to phase 2:EBT and 6:WBT, Start of Green								
Natural Cycle: 125								

Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.86	
Intersection Signal Delay: 25.2	Intersection LOS: C
Intersection Capacity Utilization 77.3%	ICU Level of Service D
Analysis Period (min): 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	

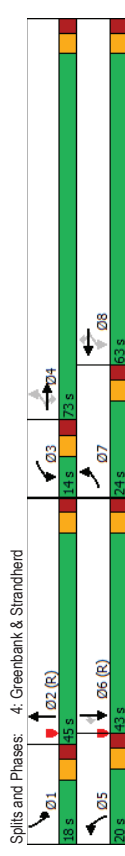


Splits and Phases: 3: Chapman Mills/Fraser Fields & Strandherd

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	186	664	135	107	1070	163	215	521	175	302	291
Future Volume (vph)	186	664	135	107	1070	163	215	521	175	302	291
Lane Group Flow (vph)	186	664	135	107	1070	163	215	660	175	302	291
Turn Type	pm-pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Prot	NA	Perm
Protected Phases	7	4	4	3	8	8	5	2	1	6	6
Permitted Phases	4	4	4	3	8	8	5	2	1	6	6
Detector Phase	7	4	4	3	8	8	5	2	1	6	6
Switch Phase											
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.6	33.5	33.5	11.6	33.5	33.5	11.3	35.5	11.3	35.5	35.5
Total Split (s)	24.0	73.0	73.0	14.0	63.0	63.0	20.0	45.0	18.0	43.0	43.0
Total Split (%)	16.0%	48.7%	48.7%	9.3%	42.0%	42.0%	13.3%	30.0%	12.0%	28.7%	28.7%
Maximum Green (s)	17.4	66.5	66.5	7.4	56.5	56.5	13.7	38.5	11.7	36.5	36.5
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.9	2.8	2.8	2.9	2.8	2.8	2.6	2.8	2.6	2.8	2.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.5	6.5	6.6	6.5	6.5	6.3	6.5	6.3	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag	Lag
Lead-Lag Optimize?											
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	None	C-Max	C-Max
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	10	10	10	10	10	10	10	10	10	10	10
Pedestrian Calls (#/hr)	76.9	63.2	63.2	61.3	54.0	54.0	13.3	42.1	11.4	40.2	40.2
Act Effr Green (s)	0.51	0.42	0.42	0.41	0.36	0.36	0.09	0.28	0.08	0.27	0.27
v/c Ratio	0.81	0.49	0.20	0.36	0.92	0.26	0.77	0.73	0.73	0.35	0.57
Control Delay	81.6	26.0	3.1	23.1	58.5	4.9	83.0	52.8	85.6	46.9	24.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	81.6	26.0	3.1	23.1	58.5	4.9	83.0	52.8	85.6	46.9	24.6
LOS	F	C	A	C	E	A	F	D	F	D	C
Approach Delay	33.4			49.2			60.3			47.3	
Approach LOS	C			D			E			D	
Queue Length 50th (m)	37.8	52.2	0.1	15.2	153.3	0.0	32.6	92.7	26.3	39.2	30.8
Queue Length 95th (m)	#73.5	43.0	2.9	25.4	183.1	13.8	#49.2	114.8	#41.2	53.4	62.4
Internal Link Dist (m)	596.1			267.5			571.3			216.2	
Turn Bay Length (m)	66.0	95.0	120.0	66.0	72.0	66.0	72.0	85.0	85.0	145.0	145.0
Base Capacity (vph)	237	1436	709	301	1220	650	288	893	247	868	509
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.78	0.46	0.19	0.36	0.88	0.25	0.75	0.73	0.71	0.35	0.57

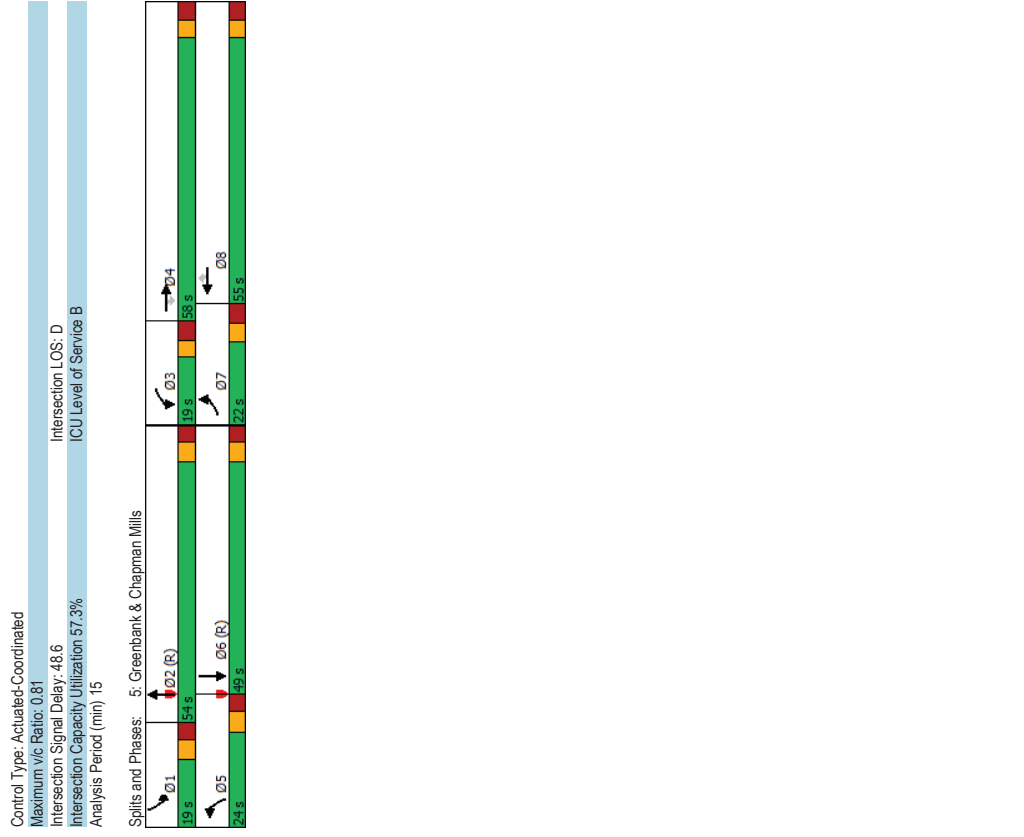
Intersection Summary
 Cycle Length: 150
 Actuated Cycle Length: 150
 Offset: 136 (91%), Referenced to phase 2:NBT and 6:SBT, Start of Green
 Natural Cycle: 105

Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.92
 Intersection Signal Delay: 47.3
 Intersection LOS: D
 Intersection Capacity Utilization 94.3%
 ICU Level of Service F
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations	4	4	4	4	4	4	4	4	4	4
Traffic Volume (vph)	44	293	55	34	242	40	59	267	30	110
Future Volume (vph)	44	293	55	34	242	40	59	267	30	110
Lane Group Flow (vph)	44	293	55	34	242	40	59	332	30	137
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Prot	NA
Protected Phases	7	4	3	8	8	8	5	2	1	6
Permitted Phases	7	4	4	3	8	8	5	2	1	6
Detector Phase	7	4	4	3	8	8	5	2	1	6
Switch Phase	7	4	4	3	8	8	5	2	1	6
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	5.0	10.0
Minimum Split (s)	11.8	43.8	43.8	11.8	43.8	43.8	11.8	43.8	11.8	43.8
Total Split (s)	22.0	58.0	58.0	19.0	55.0	55.0	24.0	54.0	19.0	49.0
Total Split (%)	14.7%	38.7%	38.7%	12.7%	36.7%	36.7%	16.0%	36.0%	12.7%	32.7%
Maximum Green (s)	15.2	51.2	51.2	12.2	48.2	48.2	17.2	47.2	12.2	42.2
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.7	3.7	3.7	3.7
All-Red Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.1	3.1	3.1	3.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?										
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	None	None	None
Walk Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0
Pedestrian Calls (#/hr)	10	10	10	10	10	10	10	10	10	10
Act Effr Green (s)	9.4	31.9	31.9	8.6	31.1	31.1	10.8	81.7	8.3	76.6
Actuated g/C Ratio	0.06	0.21	0.21	0.06	0.21	0.21	0.07	0.54	0.06	0.51
v/c Ratio	0.44	0.81	0.18	0.37	0.69	0.13	0.51	0.19	0.34	0.09
Control Delay	68.0	66.5	41.7	78.3	64.3	46.5	81.1	21.8	74.1	17.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	68.0	66.5	41.7	78.3	64.3	46.5	81.1	21.8	74.1	17.8
LOS	E	D	E	E	D	F	C	E	E	B
Approach Delay	63.2			63.6			30.8			27.9
Approach LOS	E			E			C			C
Queue Length 50th (m)	11.5	88.2	14.5	9.8	66.6	9.7	17.0	28.3	8.7	12.6
Queue Length 95th (m)	23.4	116.7	28.8	21.1	89.4	19.0	31.4	46.5	12.4	25.4
Internal Link Dist (m)	626.4			183.5			478.9			571.3
Turn Bay Length (m)	40.0	60.0	40.0	30.0	60.0	60.0	60.0	60.0	60.0	60.0
Base Capacity (vph)	164	582	494	131	548	465	185	1713	131	1604
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	0.27	0.50	0.11	0.26	0.44	0.09	0.32	0.19	0.23	0.09

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations	4	4	4	4	4	4	4	4	4	4
Traffic Volume (vph)	44	293	55	34	242	40	59	267	30	110
Future Volume (vph)	44	293	55	34	242	40	59	267	30	110
Lane Group Flow (vph)	44	293	55	34	242	40	59	332	30	137
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Prot	NA
Protected Phases	7	4	3	8	8	8	5	2	1	6
Permitted Phases	7	4	4	3	8	8	5	2	1	6
Detector Phase	7	4	4	3	8	8	5	2	1	6
Switch Phase	7	4	4	3	8	8	5	2	1	6
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	5.0	10.0
Minimum Split (s)	11.8	43.8	43.8	11.8	43.8	43.8	11.8	43.8	11.8	43.8
Total Split (s)	22.0	58.0	58.0	19.0	55.0	55.0	24.0	54.0	19.0	49.0
Total Split (%)	14.7%	38.7%	38.7%	12.7%	36.7%	36.7%	16.0%	36.0%	12.7%	32.7%
Maximum Green (s)	15.2	51.2	51.2	12.2	48.2	48.2	17.2	47.2	12.2	42.2
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.7	3.7	3.7	3.7
All-Red Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.1	3.1	3.1	3.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?										
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	None	None	None
Walk Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0
Pedestrian Calls (#/hr)	10	10	10	10	10	10	10	10	10	10
Act Effr Green (s)	9.4	31.9	31.9	8.6	31.1	31.1	10.8	81.7	8.3	76.6
Actuated g/C Ratio	0.06	0.21	0.21	0.06	0.21	0.21	0.07	0.54	0.06	0.51
v/c Ratio	0.44	0.81	0.18	0.37	0.69	0.13	0.51	0.19	0.34	0.09
Control Delay	68.0	66.5	41.7	78.3	64.3	46.5	81.1	21.8	74.1	17.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	68.0	66.5	41.7	78.3	64.3	46.5	81.1	21.8	74.1	17.8
LOS	E	D	E	E	D	F	C	E	E	B
Approach Delay	63.2			63.6			30.8			27.9
Approach LOS	E			E			C			C
Queue Length 50th (m)	11.5	88.2	14.5	9.8	66.6	9.7	17.0	28.3	8.7	12.6
Queue Length 95th (m)	23.4	116.7	28.8	21.1	89.4	19.0	31.4	46.5	12.4	25.4
Internal Link Dist (m)	626.4			183.5			478.9			571.3
Turn Bay Length (m)	40.0	60.0	40.0	30.0	60.0	60.0	60.0	60.0	60.0	60.0
Base Capacity (vph)	164	582	494	131	548	465	185	1713	131	1604
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	0.27	0.50	0.11	0.26	0.44	0.09	0.32	0.19	0.23	0.09

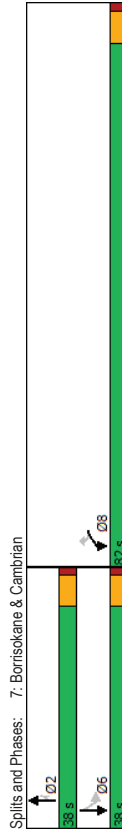


Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Int Delay, s/veh	3.3											
Lane Configurations	29	268	22	30	313	17	47	0	13	57	0	14
Traffic Vol, veh/h	29	268	22	30	313	17	47	0	13	57	0	14
Future Vol, veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Conflicting Peds, #/hr	Free	Free	Free	Free	Free	Free	Free	Free	Free	Free	Free	Free
Sign Control	-	-	-	-	-	-	-	-	-	-	-	-
RT Channelized	400	-	-	400	-	-	-	-	-	-	-	-
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	-	-	-	-	-	-	-	-	-	-	-
Grade, %	-	-	-	-	-	-	-	-	-	-	-	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	29	268	22	30	313	17	47	0	13	57	0	14
Major/Minor	Major1	Major2	Minor1	Minor2	Minor1	Minor2	Minor1	Minor2	Minor1	Minor2	Minor1	Minor2
Conflicting Flow All	330	0	0	290	0	0	726	727	279	726	730	322
Stage 1	-	-	-	-	-	-	337	337	-	382	382	-
Stage 2	-	-	-	-	-	-	389	390	-	344	348	-
Critical Hdwy	4:12	-	-	4:12	-	-	7:12	6:52	6:22	7:12	6:52	6:22
Critical Hdwy Stg 1	-	-	-	-	-	-	6:12	5:52	-	6:12	5:52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6:12	5:52	-	6:12	5:52	-
Follow-up Hdwy	2:18	-	-	2:18	-	-	3:518	4:018	3:318	3:518	4:018	3:318
Pot Cap-1 Maneuver	1229	-	-	1272	-	-	340	351	760	340	349	719
Stage 1	-	-	-	-	-	-	677	641	-	640	613	-
Stage 2	-	-	-	-	-	-	635	608	-	671	634	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1229	-	-	1272	-	-	322	335	760	322	333	719
Mov Cap-2 Maneuver	-	-	-	-	-	-	322	335	-	322	333	-
Stage 1	-	-	-	-	-	-	661	626	-	625	598	-
Stage 2	-	-	-	-	-	-	608	593	-	644	619	-
Approach	EB	WB	NB	WB	EB	SB						
HCM Control Delay, s	0.7	0.7	16.7	16.7	17.4	17.4						
HCM LOS	C	C	C	C	C	C						
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	368	1229	-	-	1272	-	-	361				
HCM Lane V/C Ratio	0.163	0.024	-	-	0.024	-	-	0.197				
HCM Control Delay (s)	16.7	8	-	-	7.9	-	-	17.4				
HCM Lane LOS	C	A	-	-	A	-	-	C				
HCM 95th %ile Q(veh)	0.6	0.1	-	-	0.1	-	-	0.7				

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	105	1135	152	63	499	158
Traffic Volume (vph)	105	1135	152	63	499	158
Future Volume (vph)	105	1135	152	63	499	158
Lane Group Flow (vph)	Prot	Perm	NA	Perm	Perm	NA
Turn Type	8	2	2	2	6	6
Protected Phases	8	8	2	2	6	6
Permitted Phases	8	8	2	2	6	6
Detector Phase	8	8	2	2	6	6
Switch Phase	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Initial (s)	24.8	24.8	23.8	23.8	23.8	23.8
Minimum Split (s)	82.0	82.0	38.0	38.0	38.0	38.0
Total Split (s)	68.3%	68.3%	31.7%	31.7%	31.7%	31.7%
Total Split (%)	76.0	76.0	32.2	32.2	32.2	32.2
Maximum Green (s)	4.6	4.6	4.6	4.6	4.6	4.6
Yellow Time (s)	1.4	1.4	1.2	1.2	1.2	1.2
All-Red Time (s)	0.0	0.0	0.0	0.0	0.0	0.0
Lost Time Adjust (s)	6.0	6.0	5.8	5.8	5.8	5.8
Total Lost Time (s)	6.0	6.0	5.8	5.8	5.8	5.8
Lead/Lag						
Lead-Lag Optimize?	3.0	3.0	3.0	3.0	3.0	3.0
Vehicle Extension (s)	None	None	Min	Min	Min	Min
Recall Mode	7.0	7.0	7.0	7.0	7.0	7.0
Walk Time (s)	11.0	11.0	11.0	11.0	11.0	11.0
Flash Dont Walk (s)	2	2	2	2	2	2
Pedestrian Calls (#/hr)	76.0	76.0	31.1	31.1	31.1	31.1
Ad Effort Green(s)	0.64	0.64	0.26	0.26	0.26	0.26
Actuated G/C Ratio	0.10	1.02	0.34	0.15	0.94	0.35
v/c Ratio	8.9	44.3	38.0	9.1	70.7	38.3
Control Delay	0.0	0.0	0.0	0.0	0.0	0.0
Queue Delay	8.9	44.3	38.0	9.1	70.7	38.3
Total Delay	41.3	29.5	29.5	62.9	62.9	62.9
LOS	A	D	D	A	E	D
Approach Delay	41.3	29.5	29.5	62.9	62.9	62.9
Approach LOS	D	C	C	E	E	E
Queue Length 50th (m)	8.9	~232.0	28.4	0.0	58.1	29.7
Queue Length 95th (m)	15.7	#310.7	46.9	10.5	#89.3	48.5
Internal Link Dist (m)	489.2	241.1	241.1	1276.6	1276.6	1276.6
Turn Bay Length (m)	38.0	30.0	30.0	150.0	150.0	150.0
Base Capacity (vph)	1036	1116	461	438	548	461
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	0.10	1.02	0.33	0.14	0.91	0.34
Intersection Summary						
Cycle Length: 120						
Actuated Cycle Length: 118.9						
Natural Cycle: 100						
Control Type: Actuated-Uncoordinated						

Maximum v/c Ratio: 1.02
 Intersection Signal Delay: 46.9
 Intersection Capacity Utilization 92.5%
 Analysis Period (min) 15
 Intersection LOS: D
 ICU Level of Service F

~ Volume exceeds capacity, queue is theoretically infinite.
 # Queue shown is maximum after two cycles.
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

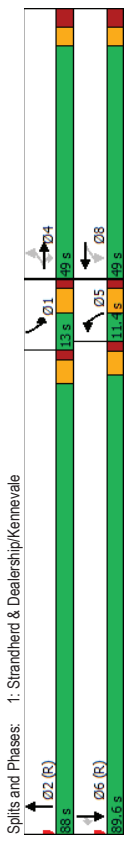


Intersection	WBL	WBR	NBT	NBR	SBL	SBT
Int Delay, s/veh	8.7					
Movement						
Lane Configurations	↔	↔	↔	↔	↔	↔
Traffic Vol, veh/h	30	365	47	0	264	22
Future Vol, veh/h	30	365	47	0	264	22
Conflicting Peds. #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	380	0	-	150	380	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	30	365	47	0	264	22
Minor/Minor	Minor1	Major1	Major2			
Conflicting Flow All	597	47	0	0	47	0
Stage 1	47	-	-	-	-	-
Stage 2	550	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3,518	3,318	-	-	2,218	-
Pot Cap-1 Maneuver	466	1022	-	-	1560	-
Stage 1	975	-	-	-	-	-
Stage 2	578	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	387	1022	-	-	1560	-
Mov Cap-2 Maneuver	387	-	-	-	-	-
Stage 1	975	-	-	-	-	-
Stage 2	480	-	-	-	-	-
Approach	WB	NB	SB			
HCM Control Delay, s	10.8	0	7.2			
HCM LOS	B					
Minor Lane/Major Mvmt	NBT	NBR	WBL	TWBL	N2	SBL
Capacity (veh/h)	-	-	387	1022	1560	-
HCM Lane V/C Ratio	-	-	0.078	0.357	0.169	-
HCM Control Delay (s)	-	-	15.1	10.5	7.8	-
HCM Lane LOS	-	-	C	B	A	-
HCM 95th %tile Q(veh)	-	-	0.3	1.6	0.6	-

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SPR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	429	151	293	128	39	100	2071	93	3142	167
Future Volume (vph)	429	151	293	128	39	100	2071	93	3142	167
Lane Group Flow (vph)	429	151	293	128	139	100	2203	93	3142	167
Turn Type	Perm	NA	Perm	Perm	NA	Prot	NA	Prot	NA	Perm
Protected Phases	4	4	4	8	8	5	2	1	6	6
Permitted Phases	4	4	4	8	8	5	2	1	6	6
Detector Phase										
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)	39.9	39.9	39.9	32.9	32.9	11.4	30.4	11.4	39.4	39.4
Total Split (s)	49.0	49.0	49.0	49.0	49.0	11.4	88.0	13.0	89.6	89.6
Total Split (%)	32.7%	32.7%	32.7%	32.7%	32.7%	7.6%	58.7%	8.7%	59.7%	59.7%
Maximum Green (s)	42.1	42.1	42.1	42.1	42.1	5.0	81.6	6.6	83.2	83.2
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	3.6	3.6	3.6	3.6	3.6	1.8	1.8	1.8	1.8	1.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.9	6.9	6.9	6.9	6.9	6.4	6.4	6.4	6.4	6.4
Lead/Lag						Lead	Lead	Lag	Lead	Lead
Lead-Lag Optimize?						Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	C-Max	None	C-Max	C-Max	C-Max
Walk Time (s)	5.0	5.0	5.0	7.0	7.0	7.0	7.0	5.0	5.0	5.0
Flash Dont Walk (s)	26.0	26.0	26.0	14.0	14.0	14.0	14.0	26.0	26.0	26.0
Pedestrian Calls (#/hr)	10	10	10	10	10	10	10	10	10	10
Act Effr Green (s)	42.1	42.1	42.1	42.1	42.1	5.0	81.6	6.6	83.2	83.2
Actuated G/C Ratio	0.28	0.28	0.28	0.28	0.28	0.03	0.54	0.04	0.55	0.55
v/c Ratio	1.42	0.32	0.73	0.44	0.33	0.96	1.26	1.31	1.75	0.21
Control Delay	244.9	44.8	60.9	49.9	45.3	80.0	138.3	262.1	364.7	17.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	244.9	44.8	60.9	49.9	45.3	80.0	138.3	262.1	364.7	17.7
LOS	F	D	E	D	D	E	F	F	F	B
Approach Delay	148.5			47.5			135.7		344.9	
Approach LOS	F			D			F		F	
Queue Length 50th (m)	~168.7	35.2	78.2	31.0	32.5	16.0	~433.3	~34.9	~718.4	23.9
Queue Length 95th (m)	#233.8	55.0	113.0	51.5	52.0	m13.7m#308.0	#72.0	#748.2	37.2	
Internal Link Dist (m)	172.9			177.4			1040.6		345.0	
Turn Bay Length (m)	70.0	150.0	50.0	130.0	180.0	180.0	180.0	180.0	60.0	60.0
Base Capacity (vph)	303	478	401	293	427	104	1744	71	1797	804
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	1.42	0.32	0.73	0.44	0.33	0.96	1.26	1.31	1.75	0.21

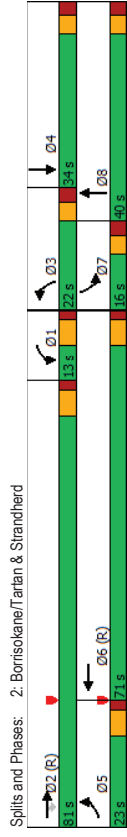
Intersection Summary
 Cycle Length: 150
 Actuated Cycle Length: 150
 Offset: 38 (25%), Referenced to phase 2:NBT and 6:SBT, Start of Green
 Natural Cycle: 125

Control Type: Actuated-Coordinated	Intersection LOS: F
Maximum v/c Ratio: 1.75	ICU Level of Service H
Intersection Signal Delay: 237.9	
Intersection Capacity Utilization: 142.3%	
Analysis Period (min): 15	
~ Volume exceeds capacity, queue is theoretically infinite.	
Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	450	1924	1237	116	1256	815	34	52	49
Future Volume (vph)	450	1924	1237	116	1256	815	34	52	49
Lane Group Flow (vph)	450	1924	1237	116	1321	815	146	92	192
Turn Type	Prot	NA	Perm	Prot	NA	Prot	NA	Prot	NA
Protected Phases	5	2	2	1	6	3	8	7	4
Permitted Phases	5	2	2	1	6	3	8	7	4
Detector Phase	5	2	2	1	6	3	8	7	4
Switch Phase	5	2	2	1	6	3	8	7	4
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	5.0	10.0	5.0	10.0
Minimum Split (s)	11.4	56.4	56.4	11.4	56.4	11.0	34.0	11.0	34.0
Total Split (s)	23.0	81.0	81.0	13.0	71.0	22.0	40.0	16.0	34.0
Total Split (%)	15.3%	54.0%	54.0%	8.7%	47.3%	14.7%	26.7%	10.7%	22.7%
Maximum Green (s)	16.6	74.6	74.6	6.6	64.6	16.0	34.0	10.0	28.0
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	3.3	3.3	3.3	3.3
All-Red Time (s)	1.8	1.8	1.8	1.8	1.8	2.7	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	6.4	6.4	6.4	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lead	Lag	Lag	Lead	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	None	None	None	None
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	14.0	14.0	14.0	14.0	14.0	21.0	21.0	21.0	21.0
Pedestrian Calls (#/hr)	10	10	10	10	10	10	10	10	10
Act Effr Green (s)	21.4	79.4	79.4	6.6	64.6	16.0	32.8	8.9	23.2
Actuated G/C Ratio	0.14	0.53	0.53	0.04	0.43	0.11	0.22	0.06	0.15
v/c Ratio	1.96	1.12	1.61	1.63	0.95	2.43	0.44	0.54	0.82
Control Delay	464.5	71.7	295.1	368.7	52.2	679.6	55.9	88.9	87.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	464.5	71.7	295.1	368.7	52.2	679.6	55.9	88.9	87.2
LOS	F	E	F	F	D	F	E	F	F
Approach Delay	197.2			77.7		584.9		87.6	
Approach LOS	F			E		F		F	
Queue Length 50th (m)	-206.6	-343.2	-522.4	-48.8	154.4	-203.0	38.4	15.0	54.9
Queue Length 95th (m)	m#125.4	m#77.8	m#261.6	m#94.0	#238.6	#242.5	58.7	29.5	80.9
Internal Link Dist (m)	1040.6			787.0		275.6		103.1	
Turn Bay Length (m)	105.0	110.0	110.0	55.0	100.0	100.0	38.0	38.0	38.0
Base Capacity (vph)	230	1714	767	71	1385	335	349	108	282
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	1.96	1.12	1.61	1.63	0.95	2.43	0.42	0.48	0.68

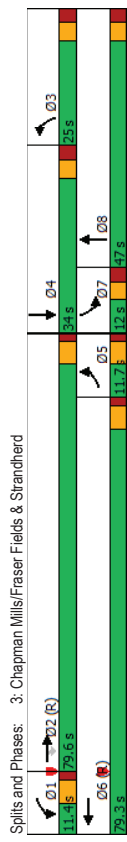
Control Type: Actuated-Coordinated	Intersection LOS: F
Maximum v/c Ratio: 2.43	ICU Level of Service H
Intersection Signal Delay: 225.1	
Intersection Capacity Utilization: 122.4%	
Analysis Period (min): 15	
~ Volume exceeds capacity, queue is theoretically infinite.	
Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	15	1688	531	55	999	438	0	18	0
Future Volume (vph)	15	1688	531	55	999	438	0	18	0
Lane Group Flow (vph)	15	1688	531	55	1053	438	49	18	8
Turn Type	Prot	NA	Perm	Prot	NA	Prot	NA	Prot	NA
Protected Phases	5	2	2	1	6	3	8	7	4
Permitted Phases	5	2	2	1	6	3	8	7	4
Detector Phase	5	2	2	1	6	3	8	7	4
Switch Phase									
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	5.0	10.0	5.0	10.0
Minimum Split (s)	10.8	26.8	26.8	10.8	26.8	11.0	34.0	11.0	34.0
Total Split (s)	11.7	79.6	79.6	11.4	79.3	25.0	47.0	12.0	34.0
Total Split (%)	7.6%	53.1%	53.1%	7.6%	52.9%	16.7%	31.3%	8.0%	22.7%
Maximum Green (s)	5.9	73.8	73.8	5.6	73.5	19.0	41.0	6.0	28.0
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	3.3	3.3	3.3	3.3
All-Red Time (s)	1.6	1.6	1.6	1.6	1.6	2.7	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.8	5.8	5.8	5.8	5.8	6.0	6.0	6.0	6.0
Lead/Lag	Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	None	Min	None	Min
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	14.0	14.0	14.0	14.0	14.0	21.0	21.0	21.0	21.0
Pedestrian Calls (#/hr)	10	10	10	10	10	10	10	10	10
Act Effr Green (s)	5.8	74.2	74.2	8.6	83.9	27.2	42.4	5.9	16.4
Actuated G/C Ratio	0.04	0.49	0.49	0.06	0.56	0.18	0.28	0.04	0.11
v/c Ratio	0.24	1.05	0.74	0.59	0.77	0.12	0.29	0.05	0.05
Control Delay	44.7	41.9	8.4	100.8	6.1	68.2	42.6	81.6	55.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.7	41.9	8.4	100.8	6.1	68.2	42.6	81.6	55.0
LOS	D	D	A	F	A	E	D	F	D
Approach Delay	33.9			10.8		65.6		73.4	
Approach LOS	C			B		E		E	
Queue Length 50th (m)	4.2	~280.6	39.7	14.1	10.3	62.3	11.6	5.2	2.3
Queue Length 95th (m)	m#4.9	m#18.8	m#20.8	m#25.5	m#53.6	#102.2	21.8	13.9	7.0
Internal Link Dist (m)	787.0			628.9		349.9		82.1	
Turn Bay Length (m)	40.0	145.0	40.0	105.0		40.0		40.0	
Base Capacity (vph)	63	1602	717	93	1797	569	423	64	270
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	0.24	1.05	0.74	0.59	0.77	0.12	0.28	0.03	0.03

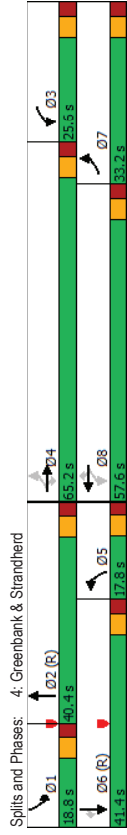
Intersection Summary
 Cycle Length: 150
 Actuated Cycle Length: 150
 Offset: 138 (92%), Referenced to phase 2:EBT and 6:WBT, Start of Green
 Natural Cycle: 125

Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.05
Intersection Signal Delay: 31.6
Intersection LOS: C
Intersection Capacity Utilization: 78.9%
IOU Level of Service D
Analysis Period (min): 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	357	1297	260	259	911	184	219	524	251	666	220
Future Volume (vph)	357	1297	260	259	911	184	219	524	251	666	220
Lane Group Flow (vph)	357	1297	260	259	911	184	219	524	251	666	220
Turn Type	pm-pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2	1		6
Permitted Phases	4	4	4	3	8	8	5	2	1	6	6
Detector Phase	7	4	4	3	8	8	5	2	1	6	6
Switch Phase											
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.6	33.5	33.5	11.6	33.5	33.5	11.3	35.5	11.3	35.5	35.5
Total Split (s)	33.2	65.2	65.2	25.6	57.6	57.6	17.8	40.4	18.8	41.4	41.4
Total Split (%)	22.1%	43.5%	43.5%	17.1%	38.4%	38.4%	11.9%	26.9%	12.5%	27.6%	27.6%
Maximum Green (s)	26.6	58.7	58.7	19.0	51.1	51.1	11.5	33.9	12.5	34.9	34.9
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.9	2.8	2.8	2.9	2.8	2.8	2.6	2.8	2.6	2.8	2.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.5	6.5	6.6	6.5	6.5	6.3	6.5	6.3	6.5	6.5
Lead/Lag	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lag	Lead	Lead	Lead
Lead-Lag Optimize?											
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	None	C-Max	C-Max
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	10	10	10	10	10	10	10	10	10	10	10
Pedestrian Calls (#/hr)	84.2	58.7	58.7	66.2	47.3	47.3	11.5	33.9	12.5	34.9	34.9
Act Effr Green (s)	0.56	0.39	0.39	0.44	0.32	0.32	0.08	0.23	0.08	0.23	0.23
Actuated G/C Ratio	0.87	1.02	0.38	1.04	0.89	0.31	0.91	0.94	0.96	0.88	0.44
v/c Ratio	44.5	39.1	1.4	119.6	60.6	3.5	109.6	79.6	113.1	69.9	8.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Length	44.5	39.1	1.4	119.6	60.6	3.5	109.6	79.6	113.1	69.9	8.4
LOS	D	D	A	F	E	A	F	E	F	E	A
Approach Delay											
Approach LOS											
Queue Length 50th (m)	82.3	~184.3	4.5	~66.2	132.5	0.0	28.1	76.5	38.5	100.3	0.0
Queue Length 95th (m)	m81.2	m143.5	m4.2	#120.9	155.7	10.0	#58.2	#140.4	#65.8	#131.3	21.4
Internal Link Dist (m)	596.1			267.5			571.3				216.2
Turn Bay Length (m)	66.0	95.0	120.0	66.0	72.0	66.0	72.0	85.0	85.0	145.0	145.0
Base Capacity (vph)	411	1268	684	250	1104	635	241	723	262	754	501
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.87	1.02	0.38	1.04	0.83	0.29	0.91	0.94	0.96	0.88	0.44
Intersection Summary											
Cycle Length: 150											
Actuated Cycle Length: 150											
Offset: 30 (20%), Referenced to phase 2:NBT and 6:SBT, Start of Green											
Natural Cycle: 125											

Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.04	
Intersection Signal Delay: 58.2	Intersection LOS: E
Intersection Capacity Utilization: 106.3%	ICU Level of Service G
Analysis Period (min): 15	
~ Volume exceeds capacity, queue is theoretically infinite.	
Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations	3	3	3	3	3	3	3	3	3	3
Traffic Volume (vph)	38	323	74	94	320	40	80	315	50	201
Future Volume (vph)	38	323	74	94	320	40	80	315	50	201
Lane Group Flow (vph)	38	323	74	94	320	40	80	360	50	245
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Prot	NA
Protected Phases	7	4	4	3	8	8	5	2	1	6
Permitted Phases	7	4	4	3	8	8	5	2	1	6
Detector Phase	7	4	4	3	8	8	5	2	1	6
Switch Phase	7	4	4	3	8	8	5	2	1	6
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	5.0	10.0
Minimum Split (s)	11.8	43.8	43.8	11.8	43.8	43.8	11.8	43.8	11.8	43.8
Total Split (s)	18.0	53.0	53.0	26.0	61.0	61.0	23.0	59.0	19.0	48.0
Total Split (%)	12.0%	35.3%	35.3%	17.3%	40.7%	40.7%	15.3%	34.7%	12.7%	32.0%
Maximum Green (s)	11.2	46.2	46.2	19.2	54.2	54.2	16.2	45.2	12.2	41.2
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.7	3.7	3.7
All-Red Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.1	3.1	3.1	3.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?										
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	None	None	C-Max
Walk Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	10	10	10	10	10	10	10	10	10	10
Pedestrian Calls (#/hr)	8.7	33.9	33.9	13.9	41.6	41.6	12.7	67.6	10.0	62.3
Act Effr Green (s)	0.06	0.23	0.23	0.09	0.28	0.28	0.08	0.45	0.07	0.42
Actuated g/C Ratio	0.41	0.84	0.23	0.63	0.68	0.10	0.58	0.25	0.46	0.19
v/c Ratio	79.8	51.4	27.3	82.9	55.5	39.0	82.2	29.8	91.4	12.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Delay	79.8	51.4	27.3	82.9	55.5	39.0	82.2	29.8	91.4	12.2
LOS	E	D	C	F	E	D	F	C	F	B
Approach Delay	49.8			59.7			39.3		25.6	
Approach LOS	D			E			D		C	
Queue Length 50th (m)	10.0	85.8	15.4	27.0	86.1	9.0	23.0	35.2	15.1	9.6
Queue Length 95th (m)	m15.5	m25.2	m21.9	44.6	106.8	16.8	39.4	58.0	m18.5	m19.4
Internal Link Dist (m)	626.4			183.5			478.9		571.3	
Turn Bay Length (m)	40.0	60.0	40.0	30.0	60.0	30.0	60.0	60.0	60.0	60.0
Base Capacity (vph)	121	525	446	207	616	523	178	1432	135	1310
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	0.31	0.62	0.17	0.45	0.52	0.08	0.45	0.25	0.37	0.19

Intersection Summary
 Cycle Length: 150
 Actuated Cycle Length: 150
 Offset: 40 (27%), Referenced to phase 2:NBT and 6:SBT, Start of Green
 Natural Cycle: 115

Control Type: Actuated-Coordinated	Intersection LOS: D
Maximum v/c Ratio: 0.84	IOU Level of Service B
Intersection Signal Delay: 45.3	
Intersection Capacity Utilization 61.0%	
Analysis Period (min) 15	
m Volume for 95th percentile queue is metered by upstream signal.	



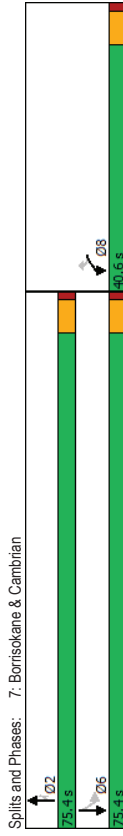
6: Point Prim/Hamsa & Chapman Mills

7: Borriokane & Cambrian

Intersection	3.3											
Int Delay, s/veh												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	W	W	W	W	W	W	W	W	W	W	W	W
Traffic Vol, veh/h	52	399	46	65	324	23	30	0	9	48	0	12
Future Vol, veh/h	52	399	46	65	324	23	30	0	9	48	0	12
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	400	-	-	400	-	-	-	-	-	-	-	-
Veh in Median Storage, #	0	0	0	0	0	0	0	0	0	0	0	0
Grade, %	-	-	-	-	-	-	-	-	-	-	-	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	52	399	46	65	324	23	30	0	9	48	0	12
Major/Minor	Major1	Major2	Minor1	Minor2	Minor1	Minor2	Minor1	Minor2	Minor1	Minor2	Minor1	Minor2
Conflicting Flow All	347	0	0	445	0	0	998	1003	422	997	1015	336
Stage 1	-	-	-	-	-	-	526	526	-	466	466	-
Stage 2	-	-	-	-	-	-	472	477	-	531	549	-
Critical Hdwy	4:12	-	-	4:12	-	-	7:12	6:52	6:22	7:12	6:52	6:22
Critical Hdwy Stg 1	-	-	-	-	-	-	6:12	5:52	-	6:12	5:52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6:12	5:52	-	6:12	5:52	-
Follow-up Hdwy	2:218	-	-	2:218	-	-	3:518	4:018	3:318	3:518	4:018	3:318
Pot Cap-1 Maneuver	1212	-	-	1115	-	-	223	242	632	223	238	706
Stage 1	-	-	-	-	-	-	535	529	-	577	562	-
Stage 2	-	-	-	-	-	-	573	556	-	532	516	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1212	-	-	1115	-	-	203	218	632	203	214	706
Mov Cap-2 Maneuver	-	-	-	-	-	-	203	218	-	203	214	-
Stage 1	-	-	-	-	-	-	512	506	-	552	529	-
Stage 2	-	-	-	-	-	-	530	524	-	502	494	-
Approach	EB	WB	NB	WB	EB	SB	NB	WB	EB	SB	NB	WB
HCM Control Delay, s	0.8	1.3	22.8	1.3	22.8	25.3	22.8	25.3	22.8	25.3	22.8	25.3
HCM LOS	C	C	D	C	C	D	C	C	C	C	C	C
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	NBLn1	EBL	EBT	EBR
Capacity (veh/h)	241	1212	-	-	1115	-	-	237	241	1212	-	-
HCM Lane V/C Ratio	0.162	0.043	-	-	0.058	-	-	0.253	0.162	0.043	-	-
HCM Control Delay (s)	22.8	8.1	-	-	8.4	-	-	25.3	22.8	8.1	-	-
HCM Lane LOS	C	A	-	-	A	-	-	D	C	A	-	-
HCM 95th %ile Q(veh)	0.6	0.1	-	-	0.2	-	-	1	0.6	0.1	-	-

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	80	756	153	83	1162	153
Traffic Volume (vph)	80	756	153	83	1162	153
Future Volume (vph)	80	756	153	83	1162	153
Lane Group Flow (vph)	Prot	Perm	NA	Perm	Perm	NA
Turn Type	8	2	2	2	6	6
Protected Phases	8	8	2	2	6	6
Permitted Phases	8	8	2	2	6	6
Detector Phase	8	8	2	2	6	6
Switch Phase	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Initial (s)	24.8	24.8	23.8	23.8	23.8	23.8
Minimum Split (s)	40.6	40.6	75.4	75.4	75.4	75.4
Total Split (s)	35.0%	35.0%	65.0%	65.0%	65.0%	65.0%
Total Split (%)	34.6	34.6	69.6	69.6	69.6	69.6
Maximum Green (s)	4.6	4.6	4.6	4.6	4.6	4.6
Yellow Time (s)	1.4	1.4	1.2	1.2	1.2	1.2
All-Red Time (s)	0.0	0.0	0.0	0.0	0.0	0.0
Lost Time Adjust (s)	6.0	6.0	5.8	5.8	5.8	5.8
Total Lost Time (s)	6.0	6.0	5.8	5.8	5.8	5.8
Lead/Lag						
Lead-Lag Optimize?	3.0	3.0	3.0	3.0	3.0	3.0
Vehicle Extension (s)	None	None	7.0	7.0	7.0	7.0
Recall Mode	11.0	11.0	11.0	11.0	11.0	11.0
Flash Dont Walk (s)	2	2	2	2	2	2
Pedestrian Calls (#/hr)	15.6	15.6	44.8	44.8	44.8	44.8
Ad Effort Green(s)	0.21	0.21	0.61	0.61	0.61	0.61
Actuated G/C Ratio	0.23	0.84	0.15	0.09	0.87	0.15
v/c Ratio	28.9	12.1	7.3	2.2	21.5	7.3
Control Delay	0.0	0.0	0.0	0.0	0.0	0.0
Queue Delay	28.9	12.1	7.3	2.2	21.5	7.3
Total Delay	0.0	0.0	0.0	0.0	0.0	0.0
LOS	C	B	A	A	C	A
Approach Delay	13.7	5.5	5.5	5.5	19.8	5.8
Approach LOS	B	A	A	A	B	B
Queue Length 50th (m)	8.0	0.0	5.8	0.0	43.9	5.8
Queue Length 95th (m)	25.2	38.4	23.4	5.8	#151.7	23.4
Internal Link Dist (m)	489.2	241.1	241.1	241.1	1276.6	241.1
Turn Bay Length (m)	38.0	30.0	150.7	1291	1930	1507
Base Capacity (vph)	842	1116	1507	1291	1930	1507
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	0.10	0.68	0.10	0.06	0.60	0.10
Intersection Summary						
Cycle Length: 116						
Actuated Cycle Length: 73.4						
Natural Cycle: 80						
Control Type: Actuated-Uncoordinated						

Maximum v/c Ratio: 0.87
 Intersection Signal Delay: 16.3
 Intersection LOS: B
 ICU Level of Service C
 Intersection Capacity Utilization 67.7%
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.



Intersection	WBL	WBR	NBT	NBR	SBL	SBT
Int Delay, s/veh	8.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	17	354	30	0	452	46
Traffic Vol, veh/h	17	354	30	0	452	46
Future Vol, veh/h	0	0	0	0	0	0
Conflicting Peds, #/hr	None					
Sign Control	None					
RT Channelized	None					
Storage Length	380	0	0	150	380	0
Veh in Median Storage, #	0					
Grade, %	0					
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	17	354	30	0	452	46
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	980	30	0	0	30	0
Stage 1	30	-	-	-	-	-
Stage 2	950	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3,518	3,318	-	-	2,218	-
Pot Cap-1 Maneuver	277	1044	-	-	1583	-
Stage 1	993	-	-	-	-	-
Stage 2	376	-	-	-	-	-
Platoon blocked, %	-					
Mov Cap-1 Maneuver	198	1044	-	-	1583	-
Mov Cap-2 Maneuver	198	-	-	-	-	-
Stage 1	993	-	-	-	-	-
Stage 2	268	-	-	-	-	-
Approach	WB	NB	SB			
HCM Control Delay, s	10.9	0	7.4			
HCM LOS	B					
Minor Lane/Major Mvmt	NBT	NBR	WBLn2	SBL	SBT	
Capacity (veh/h)	-	-	198	1044	1583	-
HCM Lane V/C Ratio	-	-	0.086	0.339	0.286	-
HCM Control Delay (s)	-	-	24.9	10.2	8.2	-
HCM Lane LOS	-	-	C	B	A	-
HCM 95th %tile Q(veh)	-	-	0.3	1.5	1.2	-

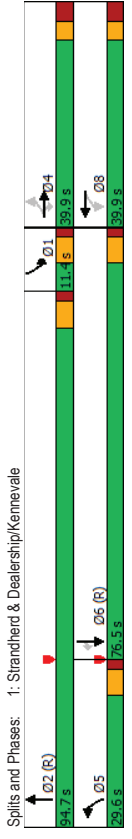
Appendix F

Synchro Intersection Worksheets – 2029 Mitigated Background Conditions

DRAFT

	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations	109	28	69	100	168	333	2406	54	1067	471
Traffic Volume (vph)	109	28	69	100	168	333	2406	54	1067	471
Future Volume (vph)	109	28	69	100	168	333	2492	54	1067	471
Lane Group Flow (vph)	Perm	NA	Perm	Perm	NA	Prot	NA	Prot	NA	Perm
Turn Type	4	4	4	8	8	5	2	1	6	6
Protected Phases	4	4	4	8	8	5	2	1	6	6
Permitted Phases	4	4	4	8	8	5	2	1	6	6
Detector Phase	4	4	4	8	8	5	2	1	6	6
Switch Phase	4	4	4	8	8	5	2	1	6	6
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)	39.9	39.9	39.9	32.9	32.9	11.4	30.4	11.4	39.4	39.4
Total Split (s)	39.9	39.9	39.9	39.9	39.9	29.6	94.7	11.4	76.5	76.5
Total Split (%)	27.3%	27.3%	27.3%	27.3%	27.3%	20.3%	64.9%	7.8%	52.4%	52.4%
Maximum Green (s)	33.0	33.0	33.0	33.0	33.0	23.2	88.3	5.0	70.1	70.1
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	3.6	3.6	3.6	3.6	3.6	1.8	1.8	1.8	1.8	1.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.9	6.9	6.9	6.9	6.9	6.4	6.4	6.4	6.4	6.4
Lead/Lag						Lead	Lag	Lag	Lag	Lag
Lead-Lag Optimize?						Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	C-Max	None	C-Max	C-Max	C-Max
Walk Time (s)	5.0	5.0	5.0	7.0	7.0	7.0	7.0	5.0	5.0	5.0
Flash Dont Walk (s)	26.0	26.0	26.0	14.0	14.0	14.0	14.0	26.0	26.0	26.0
Pedestrian Calls (#/hr)	10	10	10	10	10	10	10	10	10	10
Act Effr Green (s)	30.5	30.5	30.5	30.5	30.5	20.1	90.8	5.0	75.7	75.7
Actuated G/C Ratio	0.21	0.21	0.21	0.21	0.21	0.14	0.62	0.03	0.52	0.52
v/c Ratio	1.02	0.08	0.23	0.38	0.85	0.77	1.24	0.98	0.63	0.63
Control Delay	146.9	45.5	49.0	53.4	78.0	70.7	127.8	184.0	28.5	31.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	146.9	45.5	49.0	53.4	78.0	70.7	127.8	184.0	28.5	31.2
LOS	F	D	D	D	E	E	F	F	C	C
Approach Delay	100.3			71.6			121.1		34.5	
Approach LOS	F			E			F		C	
Queue Length 50th (m)	30.8	6.4	16.2	24.2	77.0	45.4	~475.9	15.7	117.4	97.8
Queue Length 95th (m)	#69.0	14.8	30.0	42.0	#17.8	m35.4	#m#328.9	#44.5	146.2	142.0
Internal Link Dist (m)	172.9			177.4			1040.6		345.0	
Turn Bay Length (m)	70.0	150.0	50.0	130.0	180.0	180.0	180.0	180.0	60.0	60.0
Base Capacity (vph)	116	385	323	284	362	499	2004	55	1681	752
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	0.94	0.07	0.21	0.35	0.78	0.67	1.24	0.98	0.63	0.63

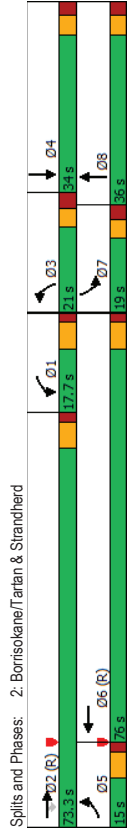
Control Type: Actuated-Coordinated	Intersection LOS: F
Maximum v/c Ratio: 1.24	ICU Level of Service H
Intersection Signal Delay: 88.9	ICU Level of Service H
Intersection Capacity Utilization: 124.6%	
Analysis Period (min): 15	
~ Volume exceeds capacity, queue is theoretically infinite.	
Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	



Intersection Summary
Cycle Length: 146
Actuated Cycle Length: 146
Offset: 82 (56%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 125

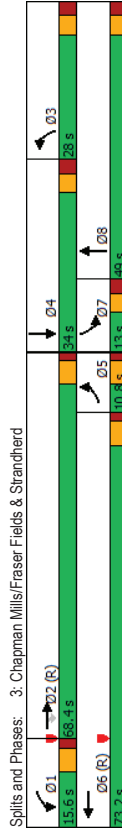
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	137	765	226	59	1823	503	49	69	23
Future Volume (vph)	137	765	226	59	1823	503	49	69	23
Lane Group Flow (vph)	137	765	226	59	1875	503	141	69	315
Turn Type	Prot	NA	Perm	Prot	NA	Prot	NA	Prot	NA
Protected Phases	5	2	2	1	6	3	8	7	4
Permitted Phase	5	2	2	1	6	3	8	7	4
Detector Phase	5	2	2	1	6	3	8	7	4
Switch Phase									
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	5.0	10.0	5.0	10.0
Minimum Split (s)	11.4	56.4	56.4	11.4	56.4	11.0	34.0	11.0	34.0
Total Split (s)	15.0	73.3	73.3	17.7	76.0	21.0	36.0	19.0	34.0
Total Split (%)	10.3%	50.2%	50.2%	12.1%	52.1%	14.4%	24.7%	13.0%	23.3%
Maximum Green (s)	8.6	66.9	66.9	11.3	69.6	15.0	30.0	13.0	28.0
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	3.3	3.3	3.3	3.3
All-Red Time (s)	1.8	1.8	1.8	1.8	1.8	2.7	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	6.4	6.4	6.4	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lead	Lead	Lag	Lead	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	None	None	None	None
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	14.0	14.0	14.0	14.0	14.0	21.0	21.0	21.0	21.0
Pedestrian Calls (#/hr)	10	10	10	10	10	10	10	10	10
Act Effr Green (s)	8.6	70.4	70.4	10.3	69.6	15.0	34.8	10.8	28.0
Actuated G/C Ratio	0.06	0.48	0.48	0.07	0.48	0.10	0.24	0.07	0.19
v/c Ratio	1.44	0.49	0.32	0.52	1.22	1.56	0.39	0.58	1.12
Control Delay	292.2	12.3	11.2	64.4	129.0	306.3	52.5	83.8	142.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	292.2	12.3	11.2	64.4	129.0	306.3	52.5	83.8	142.5
LOS	F	B	B	E	F	F	D	F	F
Approach Delay	46.1			127.0			250.7		132.0
Approach LOS	D			F			F		F
Queue Length 50th (m)	~51.4	35.2	12.8	15.6	~346.6	~104.1	35.1	19.3	~103.1
Queue Length 95th (m)	#95.0	27.7	14.3	m19.5	#382.2	#138.9	57.0	35.2	#161.7
Internal Link Dist (m)	1040.6			787.0			275.6		103.1
Turn Bay Length (m)	105.0		110.0	55.0	100.0			38.0	
Base Capacity (vph)	95	1564	699	125	1538	323	366	144	281
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	1.44	0.49	0.32	0.47	1.22	1.56	0.39	0.48	1.12

Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.56	
Intersection Signal Delay: 124.6	Intersection LOS: F
Intersection Capacity Utilization: 119.1%	ICU Level of Service H
Analysis Period (min): 15	
~ Volume exceeds capacity, queue is theoretically infinite.	
Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	



EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
↖	↗	↘	↖	↗	↘	↖	↗	↘
↖	↗	↘	↖	↗	↘	↖	↗	↘
↖	↗	↘	↖	↗	↘	↖	↗	↘
↖	↗	↘	↖	↗	↘	↖	↗	↘
Prot	NA	Perm	Prot	NA	Prot	NA	Prot	NA
5	2	2	1	6	3	8	7	4
Protected Phases								
Permitted Phases								
Detector Phase								
Switch Phase								
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	5.0	10.0	10.0
Minimum Split (s)	10.8	26.8	26.8	10.8	26.8	11.0	34.0	11.0
Total Split (s)	10.8	68.4	68.4	15.6	73.2	28.0	49.0	13.0
Total Split (%)	7.4%	46.8%	46.8%	10.7%	50.1%	19.2%	33.6%	8.9%
Maximum Green (s)	5.0	62.6	62.6	9.8	67.4	22.0	43.0	7.0
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	3.3	3.3	3.3
All-Red Time (s)	1.6	1.6	1.6	1.6	1.6	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.8	5.8	5.8	5.8	6.0	6.0	6.0	6.0
Lead/Lag	Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	None	None	Min
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	5.0	5.0	5.0
Flash Dont Walk (s)	14.0	14.0	14.0	14.0	14.0	21.0	21.0	21.0
Pedestrian Calls (#/hr)	10	10	10	10	10	10	10	10
Act Effr Green (s)	5.0	72.8	72.8	8.4	82.6	27.0	39.0	6.7
Actuated g/C Ratio	0.03	0.50	0.50	0.06	0.57	0.18	0.27	0.05
v/c Ratio	5.00	12.4	13.7	82.2	30.6	69.6	42.5	88.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Delay	50.0	12.4	13.7	82.2	30.6	69.6	42.5	88.7
LOS	D	B	B	F	C	E	D	F
Approach Delay	13.0					32.0	66.0	79.8
Approach LOS	B					C	E	E
Queue Length 50th (m)	1.2	25.5	24.4	12.0	151.2	66.3	16.9	9.9
Queue Length 95th (m)	m2.4	37.1	36.4	25.0	#264.3	#101.1	28.1	21.8
Internal Link Dist (m)	787.0					628.9	349.9	82.1
Turn Bay Length (m)	40.0	145.0	40.0	105.0				40.0
Base Capacity (vph)	55	1616	723	108	1830	581	429	77
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.38	0.42	0.40	0.80	0.82	0.17	0.45

Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.82
Intersection Signal Delay:	33.1
Intersection LOS:	C
ICU Level of Service D	
Intersection Capacity Utilization:	73.5%
Analysis Period (min):	15
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	



Splits and Phases: 3: Chapman Mills/Fraser Fields & Strandherd

Lanes, Volumes, Timings
4: Greenbank & Strandherd

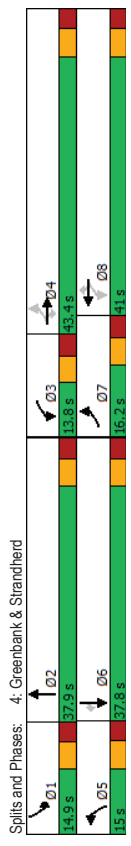
2029 Future Background - GB/Barns
05-26-2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	183	587	126	101	956	163	203	472	175	277	289
Future Volume (vph)	183	587	126	101	956	163	203	472	175	277	289
Lane Group Flow (vph)	183	587	126	101	956	163	203	593	175	277	289
Turn Type	pm-pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Prot	NA	Perm
Protected Phases	7	4	3	8	8	8	5	2	1	6	6
Permitted Phases	4	4	4	3	8	8	5	2	1	6	6
Detector Phase	7	4	4	3	8	8	5	2	1	6	6
Switch Phase											
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.6	33.5	33.5	11.6	33.5	33.5	11.3	35.5	11.3	35.5	35.5
Total Split (s)	16.2	43.4	43.4	13.8	41.0	41.0	15.0	37.9	14.9	37.8	37.8
Total Split (%)	14.7%	39.5%	39.5%	12.5%	37.3%	37.3%	13.6%	34.5%	13.5%	34.4%	34.4%
Maximum Green (s)	9.6	36.9	36.9	7.2	34.5	34.5	8.7	31.4	8.6	31.3	31.3
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.9	2.8	2.8	2.9	2.8	2.8	2.6	2.8	2.6	2.8	2.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.5	6.5	6.6	6.5	6.5	6.3	6.5	6.3	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag	Lag
Lead-Lag Optimize?											
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	Max	None	Max	Max
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	10	10	10	10	10	10	10	10	10	10	10
Pedestrian Calls (#/hr)	46.1	36.6	36.6	41.0	34.0	34.0	8.7	31.5	8.5	31.3	31.3
Act Effr Green (s)	0.42	0.33	0.33	0.37	0.31	0.31	0.08	0.29	0.08	0.29	0.29
Actuated G/C Ratio	0.90	0.54	0.22	0.35	0.95	0.29	0.82	0.64	0.72	0.30	0.54
v/c Ratio	67.7	31.9	2.6	21.1	56.1	5.8	75.0	36.3	66.4	31.8	17.2
Control Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Delay	67.7	31.9	2.6	21.1	56.1	5.8	75.0	36.3	66.4	31.8	17.2
Total Delay	67.7	31.9	2.6	21.1	56.1	5.8	75.0	36.3	66.4	31.8	17.2
LOS	E	C	A	C	E	A	E	D	E	C	B
Approach Delay	35.1										34.3
Approach LOS	D										C
Queue Length 50th (m)	24.4	52.7	0.0	12.0	103.3	0.0	22.2	55.1	18.9	24.1	19.1
Queue Length 95th (m)	#64.6	69.8	6.7	22.0	#42.7	14.2	#40.7	73.8	#33.2	35.4	45.6
Internal Link Dist (m)	596.1			267.5			571.3				216.2
Turn Bay Length (m)	66.0	95.0	120.0	66.0	72.0	66.0	72.0	85.0	85.0	145.0	145.0
Base Capacity (vph)	203	1092	580	293	1020	568	249	920	246	926	533
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.90	0.54	0.21	0.34	0.94	0.29	0.82	0.64	0.71	0.30	0.54
Intersection Summary											
Cycle Length: 110											
Actuated Cycle Length: 109.5											
Natural Cycle: 95											
Control Type: Semi Act-Uncoord											

Lanes, Volumes, Timings
4: Greenbank & Strandherd

2029 Future Background - GB/Barns
06-26-2020

Maximum v/c Ratio: 0.95	Intersection LOS: D
Intersection Signal Delay: 41.1	ICU Level of Service E
Intersection Capacity Utilization 90.5%	
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	



Lanes, Volumes, Timings
5: Greenbank & Chapman Mills

2029 Future Background - GB/Barns
05-26-2020

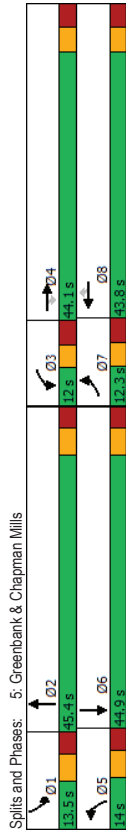
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations	4	4	4	4	4	4	4	4	4	4
Traffic Volume (vph)	44	293	55	33	242	40	59	197	30	70
Future Volume (vph)	44	293	55	33	242	40	59	197	30	70
Lane Group Flow (vph)	44	293	55	33	242	40	59	260	30	97
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Prot	NA
Protected Phases	7	4	3	8	8	5	2	1	6	
Permitted Phase	7	4	4	3	8	8	5	2	1	6
Detector Phase										
Switch Phase										
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	5.0	10.0
Minimum Split (s)	11.8	43.8	43.8	11.8	43.8	43.8	11.8	43.8	11.8	43.8
Total Split (s)	12.3	44.1	44.1	12.0	43.8	43.8	14.0	45.4	13.5	44.9
Total Split (%)	10.7%	38.3%	38.3%	10.4%	38.1%	38.1%	12.2%	39.5%	11.7%	39.0%
Maximum Green (s)	5.5	37.3	37.3	5.2	37.0	37.0	7.2	38.6	6.7	38.1
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.7	3.7	3.7	3.7
All-Red Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.1	3.1	3.1	3.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?										
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	None	None	None
Walk Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0
Pedestrian Calls (#/hr)	10	10	10	10	10	10	10	10	10	10
Act Effr Green (s)	5.7	24.2	24.2	5.4	21.6	21.6	7.1	42.9	6.5	39.8
Actuated G/C Ratio	0.06	0.25	0.25	0.06	0.23	0.23	0.07	0.45	0.07	0.42
v/c Ratio	0.45	0.68	0.15	0.36	0.63	0.12	0.49	0.18	0.27	0.07
Control Delay	64.7	41.3	30.0	60.7	41.5	30.7	62.5	20.7	54.6	22.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	64.7	41.3	30.0	60.7	41.5	30.7	62.5	20.7	54.6	22.6
LOS	E	D	C	E	D	C	E	C	D	C
Approach Delay	42.3			42.1			28.4			30.1
Approach LOS	D			D			C			C
Queue Length 50th (m)	8.3	52.9	8.6	6.2	42.3	6.2	11.0	17.1	5.6	6.1
Queue Length 95th (m)	#26.0	79.6	18.0	#18.7	65.4	14.1	#30.7	32.1	16.1	13.8
Internal Link Dist (m)	626.4			183.5			478.9			571.3
Turn Bay Length (m)	40.0	60.0	40.0	30.0	60.0	30.0	60.0	60.0	60.0	60.0
Base Capacity (vph)	97	696	592	92	691	587	127	1410	118	1300
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	0.45	0.42	0.09	0.36	0.35	0.07	0.46	0.18	0.25	0.07

Intersection Summary
 Cycle Length: 115
 Actuated Cycle Length: 95.1
 Natural Cycle: 115
 Control Type: Semi Act-Uncoord

Lanes, Volumes, Timings
5: Greenbank & Chapman Mills

2029 Future Background - GB/Barns
05-26-2020

Maximum v/c Ratio: 0.68
 Intersection Signal Delay: 37.1
 Intersection LOS: D
 ICU Level of Service B
 Intersection Capacity Utilization 55.6%
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.



Intersection	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR			
Init Delay, s/veh	3.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	29	268	22	30	313	17	47	0	13	57	0	14
Traffic Vol, veh/h	29	268	22	30	313	17	47	0	13	57	0	14
Future Vol, veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Conflicting Peds, #/hr	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Sign Control	-	-	None	-	-	None	-	-	None	-	-	None
RT Channelized	400	-	400	-	-	-	-	-	-	-	-	-
Storage Length	-	0	-	0	-	0	-	0	-	0	-	0
Veh in Median Storage, #	-	0	-	0	-	0	-	0	-	0	-	0
Grade, %	-	0	-	0	-	0	-	0	-	0	-	0
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	29	268	22	30	313	17	47	0	13	57	0	14
Major/Minor	Major1	Major2	Minor1	Minor2	Minor1	Minor2	Minor1	Minor2	Minor1	Minor2	Minor1	Minor2
Conflicting Flow All	330	0	0	290	0	0	726	727	279	726	730	322
Stage 1	-	-	-	-	-	-	337	337	-	382	382	-
Stage 2	-	-	-	-	-	-	389	390	-	344	348	-
Critical Hdwy	4:12	-	-	4:12	-	-	7:12	6:52	6:22	7:12	6:52	6:22
Critical Hdwy Stg 1	-	-	-	-	-	-	6:12	5:52	-	6:12	5:52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6:12	5:52	-	6:12	5:52	-
Follow-up Hdwy	2:18	-	-	2:18	-	-	3:518	4:018	3:318	3:518	4:018	3:318
Pot Cap-1 Maneuver	1229	-	-	1272	-	-	340	351	760	340	349	719
Stage 1	-	-	-	-	-	-	677	641	-	640	613	-
Stage 2	-	-	-	-	-	-	635	608	-	671	634	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1229	-	-	1272	-	-	322	335	760	322	333	719
Mov Cap-2 Maneuver	-	-	-	-	-	-	322	335	-	322	333	-
Stage 1	-	-	-	-	-	-	661	626	-	625	598	-
Stage 2	-	-	-	-	-	-	608	593	-	644	619	-
Approach	EB	WB	NB	WB	NB	SB						
HCM Control Delay, s	0.7	0.7	16.7	16.7	17.4	17.4						
HCM LOS	C	C	C	C	C	C						
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	368	1229	-	-	1272	-	-	361				
HCM Lane V/C Ratio	0.163	0.024	-	-	0.024	-	-	0.197				
HCM Control Delay (s)	16.7	8	-	-	7.9	-	-	17.4				
HCM Lane LOS	C	A	-	-	A	-	-	C				
HCM 95th %ile Q(veh)	0.6	0.1	-	-	0.1	-	-	0.7				

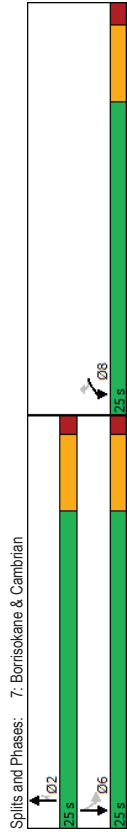
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	188	514	77	97	233	64
Traffic Volume (vph)	188	514	77	97	233	64
Future Volume (vph)	188	514	77	97	233	64
Lane Group Flow (vph)	188	514	77	97	233	64
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8	8	2	2	6	6
Permitted Phases	8	8	2	2	6	6
Detector Phase	8	8	2	2	6	6
Switch Phase	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Initial (s)	24.8	24.8	23.8	23.8	23.8	23.8
Minimum Split (s)	25.0	25.0	25.0	25.0	25.0	25.0
Total Split (s)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Total Split (%)	19.0	19.0	19.2	19.2	19.2	19.2
Maximum Green (s)	4.6	4.6	4.6	4.6	4.6	4.6
Yellow Time (s)	1.4	1.4	1.2	1.2	1.2	1.2
All-Red Time (s)	0.0	0.0	0.0	0.0	0.0	0.0
Lost Time Adjust (s)	6.0	6.0	5.8	5.8	5.8	5.8
Total Lost Time (s)	6.0	6.0	5.8	5.8	5.8	5.8
Lead/Lag						
Lead/Lag Optimize?	3.0	3.0	3.0	3.0	3.0	3.0
Vehicle Extension (s)	None	None	None	None	None	None
Recall Mode	7.0	7.0	7.0	7.0	7.0	7.0
Walk Time (s)	11.0	11.0	11.0	11.0	11.0	11.0
Flash Dont Walk (s)	2	2	2	2	2	2
Pedestrian Calls (#/hr)	11.6	11.6	11.4	11.4	11.4	11.4
Ad Effort Green(s)	0.35	0.33	0.32	0.32	0.32	0.32
Actuated G/C Ratio	11.4	5.2	9.6	3.8	10.5	9.4
v/c Ratio	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay	11.4	5.2	9.6	3.8	10.5	9.4
Queue Delay	11.4	5.2	9.6	3.8	10.5	9.4
Total Delay	B	A	A	A	B	A
LOS	6.9	6.4	6.4	6.4	10.3	10.3
Approach Delay	A	A	A	A	B	B
Approach LOS	7.0	0.0	2.7	0.0	4.3	2.2
Queue Length 50th (m)	21.8	14.3	10.1	6.3	12.5	8.8
Queue Length 95th (m)	489.2	241.1	241.1	241.1	1276.6	1276.6
Internal Link Dist (m)	38.0	30.0	95.5	85.4	1310	955
Turn Bay Length (m)	888	1032	955	854	1310	955
Base Capacity (vph)	0	0	0	0	0	0
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	0.21	0.50	0.08	0.11	0.18	0.07
Intersection Summary						
Cycle Length: 50						
Actuated Cycle Length: 35.2						
Natural Cycle: 50						
Control Type: Actuated-Uncoordinated						

Lanes, Volumes, Timings
7: Borrissokane & Cambrian

2029 Future Background - GB/Barns

05-26-2020

Maximum v/c Ratio: 0.62
Intersection Signal Delay: 7.6
Intersection LOS: A
ICU Level of Service A
Intersection Capacity Utilization 51.8%
Analysis Period (min) 15



HCM 2010 TWSC

8: Access #1 & Chapman Mills

2029 Future Background - GB/Barns

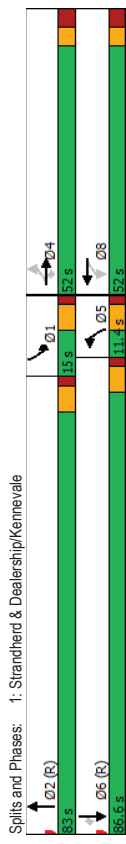
06-26-2020

Intersection	WBL	WBR	NBR	NBL	SBT
In/Delay, s/veh	8.7				
Movement	WBL	WBR	NBR	NBL	SBT
Lane Configurations	↔	↔	↔	↔	↔
Traffic Vol, veh/h	30	365	47	0	264
Future Vol, veh/h	30	365	47	0	264
Conflicting Peds, #/hr	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free
RT Channelized	-	None	-	None	-
Storage Length	380	0	-	150	380
Veh in Median Storage, #	0	-	0	-	0
Grade, %	0	-	0	-	0
Peak Hour Factor	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2
Mvmt Flow	30	365	47	0	264
Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	597	47	0	0	47
Stage 1	47	-	-	-	-
Stage 2	550	-	-	-	-
Critical Hdwy	6.42	6.22	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3,518	3,318	-	2,218	-
Pot Cap-1 Maneuver	466	1022	-	1560	-
Stage 1	975	-	-	-	-
Stage 2	578	-	-	-	-
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	387	1022	-	1560	-
Mov Cap-2 Maneuver	387	-	-	-	-
Stage 1	975	-	-	-	-
Stage 2	480	-	-	-	-
Approach	WB	NB	SB		
HCM Control Delay, s	10.8	0	7.2		
HCM LOS	B				
Minor Lane/Major Mvmt	NBT	NBR	WBL	TWBL	2
Capacity (veh/h)	-	-	387	1022	1560
HCM Lane V/C Ratio	-	-	0.078	0.357	0.169
HCM Control Delay (s)	-	-	15.1	10.5	7.8
HCM Lane LOS	-	-	C	B	A
HCM 95th %tile Q(veh)	-	-	0.3	1.6	0.6

EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
4	4	4	8	8	5	2	1	6	6
4	4	4	8	8	5	2	1	6	6
10.0	10.0	10.0	10.0	10.0	5.0	10.0	5.0	10.0	10.0
39.9	39.9	39.9	32.9	32.9	11.4	30.4	11.4	39.4	39.4
52.0	52.0	52.0	52.0	52.0	11.4	83.0	15.0	86.6	86.6
34.7%	34.7%	34.7%	34.7%	34.7%	7.6%	55.3%	10.0%	57.7%	57.7%
45.1	45.1	45.1	45.1	45.1	5.0	76.6	8.6	80.2	80.2
3.3	3.3	3.3	3.3	3.3	4.6	4.6	4.6	4.6	4.6
3.6	3.6	3.6	3.6	3.6	1.8	1.8	1.8	1.8	1.8
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6.9	6.9	6.9	6.9	6.9	6.4	6.4	6.4	6.4	6.4
3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
None	None	None	None	None	None	None	None	None	None
5.0	5.0	5.0	7.0	7.0	7.0	7.0	5.0	5.0	5.0
10	10	10	10	10	10	10	10	10	10
45.1	45.1	45.1	45.1	45.1	5.0	76.6	8.6	80.2	80.2
0.30	0.30	0.30	0.30	0.30	0.03	0.51	0.06	0.53	0.53
1.31	0.29	0.68	0.40	0.30	0.96	1.04	1.01	1.40	0.22
200.2	42.2	55.5	46.4	42.7	102.5	45.3	164.3	213.4	19.3
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
200.2	42.2	55.5	46.4	42.7	102.5	45.3	164.3	213.4	19.3
F	D	E	D	D	F	D	F	F	B
124.3			44.5		48.4			199.6	
F			D		D			F	
~161.2	34.1	76.0	30.0	31.5	16.0	~286.7	~27.8	~488.8	25.1
#226.3	53.4	109.7	49.9	50.5	m16.2	m251.4	#65.5	#535.6	39.0
172.9			177.4		1040.6			345.0	
70.0	150.0	50.0	130.0		180.0			60.0	
328	512	430	318	457	104	1632	92	1732	775
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
1.31	0.29	0.68	0.40	0.30	0.96	1.04	1.01	1.40	0.22

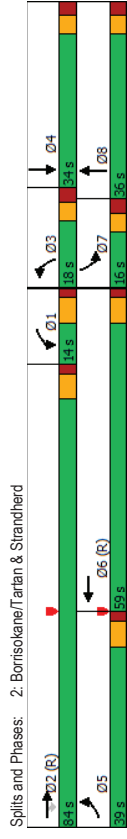
Intersection Summary
 Cycle Length: 150
 Actuated Cycle Length: 150
 Offset: 46 (31%), Referenced to phase 2:NBT and 6:SBT, Start of Green
 Natural Cycle: 125

Control Type: Actuated-Coordinated	Intersection LOS: F
Maximum v/c Ratio: 1.40	ICU Level of Service H
Intersection Signal Delay: 132.1	Intersection Capacity Utilization: 130.8%
Analysis Period (min): 15	Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.	# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.	Volume for 95th percentile queue is metered by upstream signal.



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	450	1775	519	99	1150	315	34	52	49
Future Volume (vph)	450	1775	519	99	1150	315	34	52	49
Lane Group Flow (vph)	450	1775	519	99	1215	315	132	92	192
Turn Type	Prot	NA	Perm	Prot	NA	Prot	NA	Prot	NA
Protected Phases	5	2	2	1	6	3	8	7	4
Permitted Phases	5	2	2	1	6	3	8	7	4
Detector Phase	5	2	2	1	6	3	8	7	4
Switch Phase									
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	5.0	10.0	5.0	10.0
Minimum Split (s)	11.4	56.4	56.4	11.4	56.4	11.0	34.0	11.0	34.0
Total Split (s)	39.0	84.0	84.0	14.0	59.0	18.0	36.0	16.0	34.0
Total Split (%)	26.0%	56.0%	56.0%	9.3%	39.3%	12.0%	24.0%	10.7%	22.7%
Maximum Green (s)	32.6	77.6	77.6	7.6	52.6	12.0	30.0	10.0	28.0
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	3.3	3.3	3.3	3.3
All-Red Time (s)	1.8	1.8	1.8	1.8	1.8	2.7	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	6.4	6.4	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lead	Lead	Lag	Lead	Lead	Lead	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	None	None	None	None
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	14.0	14.0	14.0	14.0	14.0	21.0	21.0	21.0	21.0
Pedestrian Calls (#/hr)	10	10	10	10	10	10	10	10	10
Act Effr Green (s)	37.4	82.4	82.4	7.6	52.6	12.0	28.8	8.9	23.2
Actuated G/C Ratio	0.25	0.55	0.55	0.05	0.35	0.08	0.19	0.06	0.15
v/c Ratio	1.12	1.00	0.65	1.21	1.08	1.25	0.46	0.54	0.82
Control Delay	107.9	19.2	7.7	207.4	88.2	196.2	59.6	88.9	87.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	107.9	19.2	7.7	207.4	88.2	196.2	59.6	88.9	87.2
LOS	F	B	A	F	F	F	E	F	F
Approach Delay	31.6			97.1			155.9		87.6
Approach LOS	C			F			F		F
Queue Length 50th (m)	~152.6	~203.2	29.6	~35.1	~204.5	~59.3	35.5	15.0	54.9
Queue Length 95th (m)	m#104.1	m#80.1	m#27.3	m#65.1	#246.3	#89.7	55.7	29.5	80.9
Internal Link Dist (m)	1040.6			787.0			275.6		103.1
Turn Bay Length (m)	105.0		110.0	55.0	100.0			38.0	
Base Capacity (vph)	403	1779	796	82	1127	251	310	108	282
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	1.12	1.00	0.65	1.21	1.08	1.25	0.43	0.48	0.68

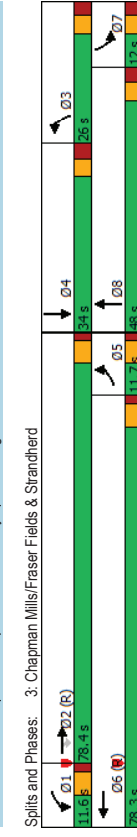
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.25	
Intersection Signal Delay: 64.3	Intersection LOS: E
Intersection Capacity Utilization 104.2%	ICU Level of Service G
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite.	
Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	



Splits and Phases: 2: Borriskane/Tartan & Strandherd

EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
5	2	2	1	6	3	8	7	4
5	2	2	1	6	3	8	7	4
5.0	10.0	10.0	5.0	10.0	5.0	10.0	5.0	10.0
10.8	26.8	26.8	10.8	26.8	11.0	34.0	11.0	34.0
11.7	78.4	78.4	11.6	78.3	26.0	48.0	12.0	34.0
7.8%	52.3%	52.3%	7.7%	52.2%	17.3%	32.0%	8.0%	22.7%
5.9	72.6	5.8	72.5	20.0	42.0	6.0	28.0	
4.2	4.2	4.2	4.2	3.3	3.3	3.3	3.3	
1.6	1.6	1.6	1.6	2.7	2.7	2.7	2.7	
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
5.8	5.8	5.8	5.8	6.0	6.0	6.0	6.0	
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
None	C-Max	C-Max	None	C-Max	None	Min	Min	
7.0	7.0	7.0	7.0	5.0	5.0	5.0	5.0	
14.0	14.0	14.0	14.0	21.0	21.0	21.0	21.0	
10	10	10	10	10	10	10	10	
5.8	75.1	75.1	8.5	84.8	26.4	37.6	12.5	16.4
0.04	0.50	0.50	0.06	0.57	0.18	0.25	0.08	0.11
0.24	0.94	0.73	0.60	0.51	0.79	0.13	0.13	0.05
48.7	18.6	11.4	102.7	5.4	70.4	49.3	61.3	55.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
48.7	18.6	11.4	102.7	5.4	70.4	49.3	61.3	55.0
D	B	B	F	A	E	D	E	D
17.0			10.8		68.3		59.4	
B			B		E		E	
4.2	120.4	44.5	14.1	9.6	62.7	10.4	5.2	2.3
m5.1	m139.6	m47.4	m#25.9	50.5	#98.9	25.0	12.3	7.0
787.0			628.9		349.9		82.1	
40.0	145.0	40.0	105.0		105.0		40.0	
63	1622	725	92	1812	552	425	135	270
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0.24	0.94	0.73	0.60	0.51	0.79	0.12	0.13	0.03

Control Type: Actuated-Coordinated	Intersection LOS: C
Maximum v/c Ratio: 0.94	ICU Level of Service D
Intersection Signal Delay: 22.6	
Intersection Capacity Utilization 77.9%	
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	

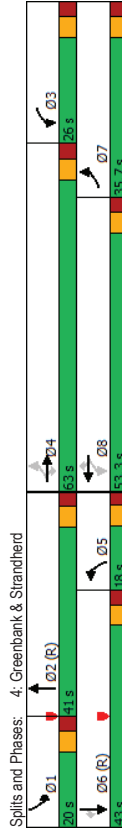


Splits and Phases: 3: Chapman Mills/Fraser Fields & Strandherd

Intersection Summary	
Cycle Length:	150
Actuated Cycle Length:	150
Offset:	142 (95%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle:	125

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	354	1156	245	243	809	184	205	483	251	611	217
Future Volume (vph)	354	1156	245	243	809	184	205	483	251	611	217
Lane Group Flow (vph)	354	1156	245	243	809	184	205	483	251	611	217
Turn Type	pm-pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Prot	NA	Perm
Protected Phases	7	4	3	8	8	5	2	1	6		
Permitted Phases	4	4	4	3	8	8	5	2	1	6	6
Detector Phase	7	4	4	3	8	8	5	2	1	6	6
Switch Phase											
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.6	33.5	33.5	11.6	33.5	33.5	11.3	35.5	11.3	35.5	35.5
Total Split (s)	35.7	63.0	63.0	26.0	63.3	53.3	18.0	41.0	20.0	43.0	43.0
Total Split (%)	23.8%	42.0%	42.0%	17.3%	35.5%	35.5%	12.0%	27.3%	13.3%	28.7%	28.7%
Maximum Green (s)	29.1	56.5	56.5	19.4	46.8	46.8	11.7	34.5	13.7	36.5	36.5
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.9	2.8	2.8	2.9	2.8	2.8	2.6	2.8	2.6	2.8	2.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.5	6.5	6.6	6.5	6.5	6.3	6.5	6.3	6.5	6.5
Lead/Lag	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lag	Lead	Lead	Lead
Lead-Lag Optimize?											
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	None	C-Max	C-Max
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	10	10	10	10	10	10	10	10	10	10	10
Pedestrian Calls (#/hr)	82.0	55.8	55.8	62.3	42.7	42.7	11.7	34.9	13.7	36.9	36.9
Act Effr Green (s)	0.55	0.37	0.37	0.42	0.28	0.28	0.08	0.23	0.09	0.25	0.25
Actuated G/C Ratio	0.80	0.96	0.96	0.94	0.88	0.88	0.33	0.84	0.85	0.77	0.42
v/c Ratio	41.7	32.3	2.0	97.4	62.6	3.9	89.2	58.3	96.0	60.1	8.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.7	32.3	2.0	97.4	62.6	3.9	89.2	58.3	96.0	60.1	8.1
LOS	D	C	A	F	E	A	F	E	F	E	A
Approach Delay	30.0			60.7			65.9				58.0
Approach LOS	C			E			E				E
Queue Length 50th (m)	80.1	147.5	6.0	57.0	118.2	0.0	31.3	92.2	38.1	88.7	0.0
Queue Length 95th (m)	m89.9m#166.6	m41.9	#108.1	139.8	10.5	#50.0	#86.1	#61.9	#110.8	20.7	
Internal Link Dist (m)	596.1			267.5			571.3			216.2	
Turn Bay Length (m)	66.0	95.0	120.0	66.0	72.0	66.0	72.0	85.0	85.0	145.0	
Base Capacity (vph)	443	1220	670	258	1011	599	245	745	287	797	515
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.80	0.95	0.37	0.94	0.80	0.31	0.84	0.85	0.87	0.77	0.42
Intersection Summary											
Cycle Length: 150											
Actuated Cycle Length: 150											
Offset: 34 (23%), Referenced to phase 2:NBT and 6:SBT, Start of Green											
Natural Cycle: 125											

Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.96	
Intersection Signal Delay: 50.0	Intersection LOS: D
Intersection Capacity Utilization 101.2%	ICU Level of Service G
Analysis Period (min): 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	



Splits and Phases: 4: Greenbank & Strandherd

Lanes, Volumes, Timings
5: Greenbank & Chapman Mills

2029 Future Background - GB/Barns
05-26-2020

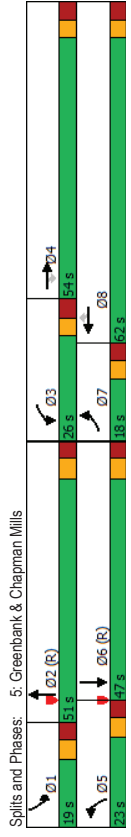
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations	3	3	3	3	3	3	3	3	3	3
Traffic Volume (vph)	38	323	74	92	320	40	80	251	50	113
Future Volume (vph)	38	323	74	92	320	40	80	251	50	113
Lane Group Flow (vph)	38	323	74	92	320	40	80	295	50	157
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Prot	NA
Protected Phases	7	4	4	3	8	8	5	2	1	6
Permitted Phases	7	4	4	3	8	8	5	2	1	6
Detector Phase	7	4	4	3	8	8	5	2	1	6
Switch Phase	7	4	4	3	8	8	5	2	1	6
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	5.0	10.0
Minimum Split (s)	11.8	43.8	43.8	11.8	43.8	43.8	11.8	43.8	11.8	43.8
Total Split (s)	18.0	54.0	54.0	26.0	62.0	62.0	23.0	51.0	19.0	47.0
Total Split (%)	12.0%	36.0%	36.0%	17.3%	41.3%	41.3%	15.3%	34.0%	12.7%	31.3%
Maximum Green (s)	11.2	47.2	47.2	19.2	55.2	55.2	16.2	44.2	12.2	40.2
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.7	3.7	3.7
All-Red Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.1	3.1	3.1	3.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?										
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	None	C-Max
Walk Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	10	10	10	10	10	10	10	10	10	10
Pedestrian Calls (#/hr)	8.7	33.9	33.9	13.8	41.5	41.5	12.7	67.6	10.0	62.4
Act Effr Green (s)	0.06	0.23	0.23	0.09	0.28	0.28	0.08	0.45	0.07	0.42
Actuated G/C Ratio	0.41	0.84	0.84	0.62	0.68	0.68	0.10	0.58	0.21	0.46
v/c Ratio	99.2	55.1	31.4	82.6	55.6	39.0	82.2	29.2	84.7	31.5
Control Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	99.2	55.1	31.4	82.6	55.6	39.0	82.2	29.2	84.7	31.5
LOS	F	E	C	F	E	D	F	C	F	C
Approach Delay	55.0			59.6			40.5		44.4	
Approach LOS	D			E			D		D	
Queue Length 50th (m)	11.0	86.3	14.5	26.4	86.2	9.0	23.0	28.2	14.9	12.1
Queue Length 95th (m)	m16.6	100.0	m16.7	43.6	106.7	16.8	39.4	47.7	m20.6	m19.1
Internal Link Dist (m)	626.4			183.5			478.9		571.3	
Turn Bay Length (m)	40.0	60.0	40.0	30.0	60.0	30.0	60.0	60.0	60.0	60.0
Base Capacity (vph)	121	536	456	207	627	533	178	1429	135	1291
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	0.31	0.60	0.16	0.44	0.51	0.08	0.45	0.21	0.37	0.12

Intersection Summary
 Cycle Length: 150
 Actuated Cycle Length: 150
 Offset: 24 (16%), Referenced to phase 2:NBT and 6:SBT, Start of Green
 Natural Cycle: 115

Lanes, Volumes, Timings
5: Greenbank & Chapman Mills

2029 Future Background - GB/Barns
05-26-2020

Control Type: Actuated-Coordinated	Intersection LOS: D
Maximum v/c Ratio: 0.84	ICU Level of Service B
Intersection Signal Delay: 51.2	
Intersection Capacity Utilization 59.0%	
Analysis Period (min) 15	
m Volume for 95th percentile queue is metered by upstream signal.	



Intersection	3.3											
Int Delay, s/veh												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	h	h	h	h	h	h	h	h	h	h	h	h
Traffic Vol, veh/h	52	399	46	65	324	23	30	0	9	48	0	12
Future Vol, veh/h	52	399	46	65	324	23	30	0	9	48	0	12
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	None	-	None	-	None	-	None	-
Storage Length	400	-	-	400	-	-	-	-	-	-	-	-
Veh in Median Storage, #	0	0	0	0	0	0	0	0	0	0	0	0
Grade, %	-	-	-	-	-	-	-	-	-	-	-	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	52	399	46	65	324	23	30	0	9	48	0	12
Major/Minor	Major1	Major2	Minor1	Minor2	Minor1	Minor2	Minor1	Minor2	Minor1	Minor2	Minor1	Minor2
Conflicting Flow All	347	0	0	445	0	0	998	1003	422	997	1015	336
Stage 1	-	-	-	-	-	-	526	526	-	466	466	-
Stage 2	-	-	-	-	-	-	472	477	-	531	549	-
Critical Hwy	4:12	-	-	4:12	-	-	7:12	6:52	6:22	7:12	6:52	6:22
Critical Hwy Stg 1	-	-	-	-	-	-	6:12	5:52	-	6:12	5:52	-
Critical Hwy Stg 2	-	-	-	-	-	-	6:12	5:52	-	6:12	5:52	-
Follow-up Hwy	2:218	-	-	2:218	-	-	3:518	4:018	3:318	3:518	4:018	3:318
Pot Cap-1 Maneuver	1212	-	-	1115	-	-	223	242	632	223	238	706
Stage 1	-	-	-	-	-	-	535	529	-	577	562	-
Stage 2	-	-	-	-	-	-	573	556	-	532	516	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1212	-	-	1115	-	-	203	218	632	203	214	706
Mov Cap-2 Maneuver	-	-	-	-	-	-	203	218	-	203	214	-
Stage 1	-	-	-	-	-	-	512	506	-	552	529	-
Stage 2	-	-	-	-	-	-	530	524	-	502	494	-
Approach	EB	WB	NB	WB	EB	SB	NB	WB	EB	SB	NB	WB
HCM Control Delay, s	0.8	1.3	22.8	1.3	0.8	25.3	22.8	1.3	0.8	25.3	22.8	1.3
HCM LOS	C	C	D	C	C	D	C	C	C	D	C	C
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	NBLn1	EBL	EBT	EBR
Capacity (veh/h)	241	1212	-	-	1115	-	-	237	241	1212	-	-
HCM Lane V/C Ratio	0.162	0.043	-	-	0.058	-	-	0.253	0.162	0.043	-	-
HCM Control Delay (s)	22.8	8.1	-	-	8.4	-	-	25.3	22.8	8.1	-	-
HCM Lane LOS	C	A	-	-	A	-	-	D	C	A	-	-
HCM 95th %ile Q(veh)	0.6	0.1	-	-	0.2	-	-	1	0.6	0.1	-	-

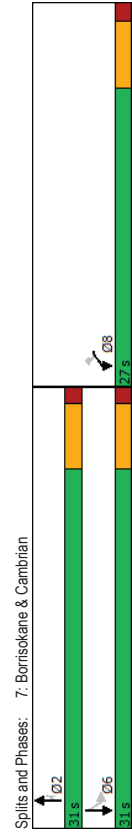
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	h	h	h	h	h	h
Traffic Volume (vph)	132	353	56	169	529	71
Future Volume (vph)	132	353	56	169	529	71
Lane Group Flow (vph)	132	353	56	169	529	71
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8	8	2	2	6	6
Permitted Phases	8	8	2	2	6	6
Detector Phase	8	8	2	2	6	6
Switch Phase	8	8	2	2	6	6
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	24.8	24.8	23.8	23.8	23.8	23.8
Total Split (s)	27.0	27.0	31.0	31.0	31.0	31.0
Total Split (%)	46.6%	46.6%	53.4%	53.4%	53.4%	53.4%
Maximum Green (s)	21.0	21.0	25.2	25.2	25.2	25.2
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	1.4	1.4	1.2	1.2	1.2	1.2
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	5.8	5.8	5.8	5.8
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	Min	Min	Min	Min
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	2	2	2	2	2	2
Ad Effort Green(s)	11.5	11.5	13.8	13.8	13.8	13.8
Actuated G/C Ratio	0.31	0.31	0.37	0.37	0.37	0.37
v/c Ratio	0.27	0.51	0.09	0.26	0.60	0.11
Control Delay	12.4	4.8	8.3	3.2	13.0	8.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.4	4.8	8.3	3.2	13.0	8.5
LOS	B	A	A	A	B	A
Approach Delay	6.9	4.4	4.4	4.4	12.5	12.5
Approach LOS	A	A	A	A	B	B
Queue Length 50th (m)	5.5	0.0	1.9	0.0	11.5	2.5
Queue Length 95th (m)	17.8	13.1	7.8	7.9	28.5	9.3
Internal Link Dist (m)	489.2	241.1	241.1	241.1	1276.6	1276.6
Turn Bay Length (m)	38.0	30.0	150.0	150.0	150.0	150.0
Base Capacity (vph)	938	987	1184	1058	1654	1184
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	0.14	0.36	0.05	0.16	0.32	0.06
Intersection Summary						
Cycle Length: 58						
Actuated Cycle Length: 37.4						
Natural Cycle: 50						
Control Type: Actuated-Uncoordinated						

Lanes, Volumes, Timings
7: Borrisokane & Cambrian

HCM 2010 TWSC
8: Access #1 & Chapman Mills

Maximum v/c Ratio: 0.60
Intersection Signal Delay: 9.0
Intersection Capacity Utilization 41.2%
Analysis Period (min) 15

Intersection In/Delay, s/veh 8.6



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔
Traffic Vol, veh/h	17	354	30	0	452	46
Future Vol, veh/h	17	354	30	0	452	46
Conflicting Peds. #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	380	0	-	150	380	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	17	354	30	0	452	46

Major/Minor	Minor1	Major1	Minor2	Major2
Conflicting Flow All	980	30	0	30
Stage 1	30	-	-	-
Stage 2	950	-	-	-
Critical Hdwy	6.42	6.22	-	4.12
Critical Hdwy Stg 1	5.42	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-
Follow-up Hdwy	3,518	3,318	-	2,218
Pot Cap-1 Maneuver	277	1044	-	1583
Stage 1	993	-	-	-
Stage 2	376	-	-	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	198	1044	-	1583
Mov Cap-2 Maneuver	198	-	-	-
Stage 1	993	-	-	-
Stage 2	268	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.9	0	7.4
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	198	1044	1583	-
HCM Lane V/C Ratio	-	-	0.086	0.339	0.286	-
HCM Control Delay (s)	-	-	24.9	10.2	8.2	-
HCM Lane LOS	-	-	C	B	A	-
HCM 95th %tile Q(veh)	-	-	0.3	1.5	1.2	-

Appendix G

Synchro Intersection Worksheets – 2034 Mitigated Background Conditions

DRAFT

Lanes, Volumes, Timings
1: Strandherd & Dealership/Kennevale

2034 Future Background - GB/Barns
05-26-2020

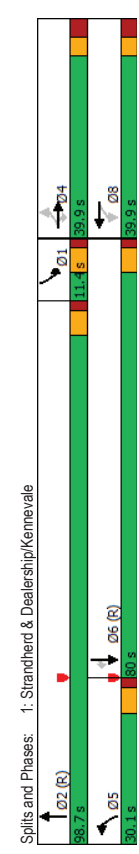
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	109	28	69	100	168	116	333	2514	86	54	1128	471
Traffic Volume (vph)	109	28	69	100	168	116	333	2514	86	54	1128	471
Future Volume (vph)	1621	1706	1450	1621	1602	0	3144	3222	0	1621	3241	1450
Satd. Flow (prot)	0.302			0.739			0.950					0.950
Flt Permitted	515	1706	1431	1259	1602	0	3144	3222	0	1620	3241	1450
Satd. Flow (RTOR)	109	28	69	100	284	0	333	2600	0	54	1128	471
Lane Group Flow (vph)	Perm	NA	Perm	Perm	NA	Prot	NA	Prot	NA	Prot	NA	Perm
Turn Type	4	4	4	8	8	5	2	1	6			6
Protected Phases	4	4	4	8	8	5	2	1	6			6
Permitted Phases	4	4	4	8	8	5	2	1	6			6
Detector Phase	4	4	4	8	8	5	2	1	6			6
Switch Phase	4	4	4	8	8	5	2	1	6			6
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	10.0
Minimum Split (s)	39.9	39.9	39.9	32.9	32.9	11.4	30.4	11.4	39.4	11.4	39.4	39.4
Total Split (s)	39.9	39.9	39.9	39.9	39.9	30.1	98.7	30.1	98.7	11.4	80.0	80.0
Total Split (%)	26.6%	26.6%	26.6%	26.6%	26.6%	20.1%	65.8%	20.1%	65.8%	7.6%	53.3%	53.3%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	4.6	4.6	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	3.6	3.6	3.6	3.6	3.6	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.9	6.9	6.9	6.9	6.9	6.4	6.4	6.4	6.4	6.4	6.4	6.4
Lead/Lag						Lead	Lead	Lag	Lag	Lag	Lag	Lag
Lead-Lag Optimize?						Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	C-Max	None	C-Max	None	C-Max	C-Max
Act Effct Green (s)	31.6	31.6	31.6	31.6	31.6	20.5	93.7	20.5	93.7	5.0	78.2	78.2
Actuated G/C Ratio	0.21	0.21	0.21	0.21	0.21	0.14	0.62	0.14	0.62	0.03	0.52	0.52
v/c Ratio	1.01	0.08	0.23	0.38	0.84	0.77	1.29	0.77	1.29	1.00	0.67	0.62
Control Delay	146.3	47.2	50.7	55.0	78.8	72.7	149.9	72.7	149.9	191.7	29.6	31.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	146.3	47.2	50.7	55.0	78.8	72.7	149.9	72.7	149.9	191.7	29.6	31.1
LOS	F	D	D	D	E	E	F	F	F	F	C	C
Approach Delay							141.1				35.4	
Approach LOS							F				D	
Queue Length 50th (m)	32.0	6.6	16.8	25.1	79.9	47.1	~516.1	16.2	128.5	16.2	128.5	98.6
Queue Length 95th (m)	#71.4	15.4	30.9	43.3	#122.8	m36.0	#44.3	#45.6	158.9	#45.6	158.9	142.2
Internal Link Dist (m)	172.9			177.4		1040.6					345.0	
Turn Bay Length (m)	70.0	150.0	50.0	130.0	180.0						60.0	
Base Capacity (vph)	113	375	314	276	352	496	2013	496	2013	54	1690	756
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.96	0.07	0.22	0.36	0.81	0.67	1.29	0.67	1.29	1.00	0.67	0.62

Intersection Summary
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 76 (51%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 125
Control Type: Actuated-Coordinated

Lanes, Volumes, Timings
1: Strandherd & Dealership/Kennevale

2034 Future Background - GB/Barns
05-26-2020

Maximum v/c Ratio: 1.29	Intersection LOS: F
Intersection Signal Delay: 100.7	ICU Level of Service H
Intersection Capacity Utilization 127.7%	
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite.	
# Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer.	
~ Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	



Lanes, Volumes, Timings
2: Borrissokane/Tartan & Strandherd

2034 Future Background - GB/Barns
05-26-2020

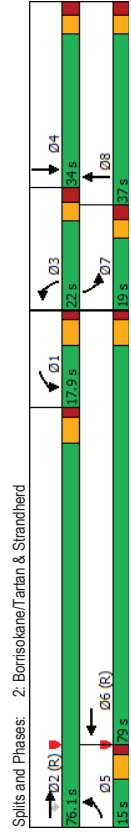
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	137	813	239	59	1892	52	533	49	92	69	23	292
Traffic Volume (vph)	137	813	239	59	1892	52	533	49	92	69	23	292
Future Volume (vph)	1621	3241	1450	1621	3228	0	3144	1539	0	1621	1469	0
Sat'd. Flow (prot)	0.950			0.950			0.950				0.950	
Flt Permitted	1621	3241	1450	1621	3228	0	3144	1539	0	1621	1469	0
Sat'd. Flow (RTOR)	137	813	239	59	1944	0	533	141	0	69	315	0
Lane Group Flow (vph)	Prot	NA	Perm	Prot	NA	Prot	NA	Prot	NA	Prot	NA	
Turn Type	5	2	2	1	6	3	8	7	4			
Protected Phases												
Permitted Phases												
Detector Phase	5	2	2	1	6	3	8	7	4			
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	10.0
Minimum Split (s)	11.4	56.4	56.4	11.4	56.4	11.0	34.0	11.0	34.0	11.0	34.0	34.0
Total Split (s)	15.0	76.1	76.1	17.9	79.0	22.0	37.0	22.0	37.0	19.0	34.0	34.0
Total Split (%)	10.0%	50.7%	50.7%	11.9%	52.7%	14.7%	24.7%	12.7%	22.7%	12.7%	22.7%	22.7%
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	1.8	1.8	1.8	1.8	1.8	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	6.4	6.4	6.4	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lag
Lead/Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	None	C-Max	None	None	None	None	None	None	None
Act Effct Green (s)	8.6	73.3	73.3	10.5	72.6	16.0	35.7	10.9	28.0	10.9	28.0	28.0
Actuated G/C Ratio	0.06	0.49	0.49	0.07	0.48	0.11	0.24	0.07	0.19	0.07	0.19	0.19
v/c Ratio	1.49	0.51	0.34	0.52	1.24	1.59	0.39	0.59	1.15	0.59	1.15	1.15
Control Delay	308.9	12.8	11.2	62.8	138.2	320.2	53.8	86.9	153.4	86.9	153.4	153.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	308.9	12.8	11.2	62.8	138.2	320.2	53.8	86.9	153.4	86.9	153.4	153.4
LOS	F	B	B	E	F	F	D	F	F	F	F	F
Approach Delay	46.6			136.0		264.4		141.5				
Approach LOS	D			F		F		F				
Queue Length 50th (m)	-53.8	57.3	20.4	15.8	-370.0	-114.5	36.1	19.9	-108.3			
Queue Length 95th (m)	m#95.7	47.5	23.1	m 19.6	#409.6	#150.3	58.3	36.0	#167.3			
Internal Link Dist (m)	1040.6			787.0		275.6		103.1				
Turn Bay Length (m)	105.0	110.0	55.0			100.0		38.0				
Base Capacity (vph)	92	1582	708	124	1562	335	366	140	274			
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.49	0.51	0.34	0.48	1.24	1.59	0.39	0.49	1.15			

Intersection Summary
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 144 (96%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 125
Control Type: Actuated-Coordinated

Lanes, Volumes, Timings
2: Borrissokane/Tartan & Strandherd

2034 Future Background - GB/Barns
05-26-2020

Maximum v/c Ratio: 1.59	Intersection LOS: F
Intersection Signal Delay: 131.9	ICU Level of Service H
Intersection Capacity Utilization 122.0%	
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite.	
# Queue shown is maximum after two cycles, queue may be longer.	
# 95th percentile volume exceeds capacity, queue may be longer.	
m Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	



Lanes, Volumes, Timings
3: Chapman Mills/Fraser Fields & Strandherd

2034 Future Background - GB/Barns
05-26-2020

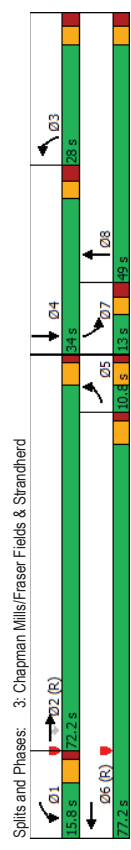
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	4	665	303	43	1518	16	477	0	72	35	0	12
Future Volume (vph)	4	665	303	43	1518	16	477	0	72	35	0	12
Satd. Flow (prot)	1621	3241	1450	1621	3234	0	3144	1450	0	1621	1450	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1621	3241	1450	1621	3234	0	3144	1450	0	1621	1450	0
Lane Group Flow (vph)	4	665	303	43	1534	0	477	72	0	35	12	0
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2									
Detector Phase	5	2	2	1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0		5.0	10.0		5.0	10.0	
Minimum Split (s)	10.8	26.8	26.8	10.8	26.8		11.0	34.0		11.0	34.0	
Total Split (s)	10.8	72.2	72.2	15.8	77.2		28.0	49.0		13.0	34.0	
Total Split (%)	7.2%	48.1%	48.1%	10.5%	51.5%		18.7%	32.7%		8.7%	22.7%	
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2		3.3	3.3		3.3	3.3	
All-Red Time (s)	1.6	1.6	1.6	1.6	1.6		2.7	2.7		2.7	2.7	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.8	5.8	5.8	5.8	5.8		6.0	6.0		6.0	6.0	
Lag/Lead	Lag	Lag	Lag	Lead	Lead		Lag	Lag		Lead	Lead	
Lead/Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	C-Max	C-Max	None	C-Max		None	Mfn		None	Mfn	
Act Effct Green (s)	5.0	75.6	75.6	8.6	85.5		28.1	40.1		6.7	16.4	
Actuated G/C Ratio	0.03	0.50	0.50	0.06	0.57		0.19	0.27		0.04	0.11	
v/c Ratio	0.07	0.41	0.42	0.47	0.83		0.81	0.19		0.49	0.08	
Control Delay	52.0	13.2	14.3	106.2	15.5		70.0	44.0		92.2	56.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	52.0	13.2	14.3	106.2	15.5		70.0	44.0		92.2	56.1	
LOS	D	B	B	F	B		E	D		F	E	
Approach Delay	13.7			18.0			66.6			83.0		
Approach LOS	B			B			E			F		
Queue Length 50th (m)	1.2	26.0	22.6	13.4	33.9		68.1	17.4		10.2	3.4	
Queue Length 95th (m)	m2.5	42.8	42.0	m16.3	#284.1		#105.5	29.0		22.5	9.1	
Internal Link Dist (m)	787.0			628.9			349.9			82.1		
Turn Bay Length (m)	40.0	145.0	40.0	105.0			105.0			40.0		
Base Capacity (vph)	64	1633	730	108	1844		589	422		75	270	
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	0.07	0.41	0.42	0.40	0.83		0.81	0.17		0.47	0.04	

Intersection Summary
 Cycle Length: 150
 Actuated Cycle Length: 150
 Offset: 146 (97%), Referenced to phase 2:EBT and 6:WBT, Start of Green
 Natural Cycle: 125
 Control Type: Actuated-Coordinated

Lanes, Volumes, Timings
3: Chapman Mills/Fraser Fields & Strandherd

2034 Future Background - GB/Barns
05-26-2020

Maximum v/c Ratio: 0.83	Intersection LOS: C
Intersection Signal Delay: 26.1	ICU Level of Service D
Intersection Capacity Utilization 75.7%	
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	



Lanes, Volumes, Timings
4: Greenbank & Strandherd

2034 Future Background - GB/Barns
05-26-2020

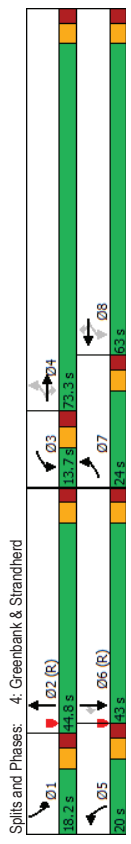
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	183	645	126	101	1021	163	203	494	121	175	292	289
Traffic Volume (vph)	183	645	126	101	1021	163	203	494	121	175	292	289
Future Volume (vph)	1621	3241	1450	1621	3241	1450	3144	3135	0	3144	3241	1450
Satd. Flow (prot)	0.084			0.370			0.950					
Flt Permitted	143	3241	1430	631	3241	1450	3139	3135	0	3137	3241	1430
Satd. Flow (RTOR)	126			167			19					177
Lane Group Flow (vph)	183	645	126	101	1021	163	203	615	0	175	292	289
Turn Type	pm-pt	NA	Perm	pm-pt	NA	Perm	Prot	NA	Prot	NA	Perm	Perm
Protected Phases	7	4	3	8	8	5	2	1	6			6
Permitted Phases	4	4	4	3	8	8	5	2	1	6	6	6
Detector Phase												
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	5.0	10.0	10.0	10.0
Minimum Split (s)	11.6	33.5	33.5	11.6	33.5	33.5	11.3	35.5	11.3	35.5	35.5	35.5
Total Split (s)	24.0	73.3	73.3	13.7	63.0	63.0	20.0	44.8	18.2	43.0	43.0	43.0
Total Split (%)	16.0%	48.9%	48.9%	9.1%	42.0%	42.0%	13.3%	29.9%	12.1%	28.7%	28.7%	28.7%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.9	2.8	2.8	2.9	2.8	2.8	2.6	2.8	2.6	2.8	2.8	2.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.5	6.5	6.6	6.5	6.5	6.3	6.5	6.3	6.5	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag	Lag	Lag
Lead-Lag Optimize?	None	None	None	None	None	None	None	C-Max	None	C-Max	C-Max	C-Max
Recall Mode	75.2	61.8	61.8	59.6	52.6	13.3	43.3	41.9	11.9	41.9	41.9	41.9
Act Effct Green (s)	0.50	0.41	0.41	0.40	0.35	0.35	0.09	0.29	0.08	0.28	0.28	0.28
Actuated G/C Ratio	0.79	0.48	0.19	0.34	0.90	0.26	0.73	0.67	0.70	0.32	0.55	0.55
v/c Ratio	76.4	20.9	1.7	23.3	57.3	5.0	81.5	49.4	82.7	45.6	22.9	22.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	76.4	20.9	1.7	23.3	57.3	5.0	81.5	49.4	82.7	45.6	22.9	22.9
LOS	E	C	A	C	E	A	F	D	F	D	D	C
Approach Delay	29.0			48.0			57.4			45.5		
Approach LOS	C			D			E			D		D
Queue Length 50th (m)	34.0	43.7	0.0	14.7	146.4	0.0	30.4	85.7	25.9	37.5	28.4	28.4
Queue Length 95th (m)	#67.6	38.2	1.6	24.2	171.2	13.8	44.2	106.8	#40.5	51.7	60.0	60.0
Internal Link Dist (m)	596.1			267.5			571.3			216.2		
Turn Bay Length (m)	66.0	95.0	120.0	66.0	72.0	66.0	72.0	85.0	85.0	145.0	145.0	145.0
Base Capacity (vph)	243	1443	706	297	1220	650	292	917	257	904	526	526
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.75	0.45	0.18	0.34	0.84	0.25	0.70	0.67	0.68	0.32	0.55	0.55

Intersection Summary
 Cycle Length: 150
 Actuated Cycle Length: 150
 Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
 Natural Cycle: 105
 Control Type: Actuated-Coordinated

Lanes, Volumes, Timings
4: Greenbank & Strandherd

2034 Future Background - GB/Barns
05-26-2020

Maximum v/c Ratio: 0.90
 Intersection Signal Delay: 44.8
 Intersection LOS: D
 Intersection Capacity Utilization: 92.4%
 ICU Level of Service: F
 Analysis Period (min): 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.



Splits and Phases: 4: Greenbank & Strandherd

Lanes, Volumes, Timings
5: Greenbank & Chapman Mills

2034 Future Background - GB/Barns
05-26-2020

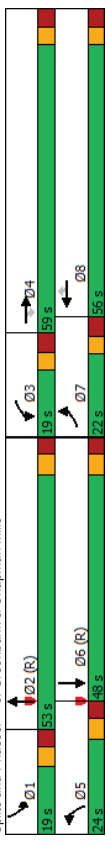
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	4	4	4	4	4	4	4	4	4	4	4
Traffic Volume (vph)	44	293	55	33	242	40	59	196	63	30	72
Future Volume (vph)	44	293	55	33	242	40	59	196	63	30	72
Satd. Flow (prot)	1621	1706	1450	1621	1706	1450	1621	3124	0	1621	3108
Flt Permitted	0.950			0.950			0.950				0.950
Satd. Flow (perm)	1621	1706	1450	1621	1706	1450	1621	3124	0	1621	3108
Lane Group Flow (vph)	44	293	55	33	242	40	59	259	0	30	99
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Prot	NA	NA
Protected Phases	7	4		3	8		5	2		1	6
Permitted Phases			4			8					
Detector Phase	7	4	4	3	8	8	5	2		1	6
Switch Phase											
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0		5.0	10.0
Minimum Split (s)	11.8	43.8	43.8	11.8	43.8	43.8	11.8	43.8		11.8	43.8
Total Split (s)	22.0	59.0	59.0	19.0	56.0	56.0	24.0	53.0		19.0	48.0
Total Split (%)	14.7%	39.3%	39.3%	12.7%	37.3%	37.3%	16.0%	35.3%		12.7%	32.0%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.7	3.7		3.7	3.7
All-Red Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.1	3.1		3.1	3.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8		6.8	6.8
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag	Lag
Recall Mode	None	None	None	None	None	None	None	C-Max		None	C-Max
Act Effct Green (s)	9.4	31.6	31.6	8.5	30.7	30.7	10.8	82.1		8.3	77.0
Actuated G/C Ratio	0.06	0.21	0.21	0.06	0.20	0.20	0.07	0.55		0.06	0.51
v/c Ratio	0.44	0.82	0.18	0.36	0.70	0.14	0.51	0.15		0.34	0.06
Control Delay	63.5	69.9	43.5	78.2	65.3	46.9	81.1	21.3		76.1	17.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay	63.5	69.9	43.5	78.2	65.3	46.9	81.1	21.3		76.1	17.5
LOS	E	E	D	E	E	D	F	C		E	B
Approach Delay		65.5		64.3			32.4			31.1	
Approach LOS		E		E			C			C	
Queue Length 50th (m)	11.4	88.2	15.1	9.5	66.6	9.7	17.0	21.5		9.0	7.8
Queue Length 95th (m)	23.6	116.5	28.7	20.5	89.6	19.0	31.4	36.6		11.9	19.5
Internal Link Dist (m)		626.4		183.5			478.9			571.3	
Turn Bay Length (m)		40.0		60.0			30.0	60.0		60.0	
Base Capacity (vph)		164	593	504	131	559	475	185		1710	131
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		0.27	0.49	0.11	0.25	0.43	0.08	0.32		0.15	0.23

Intersection Summary
 Cycle Length: 150
 Actuated Cycle Length: 150
 Offset: 76 (51%), Referenced to phase 2:NBT and 6:SBR, Start of Green
 Natural Cycle: 115
 Control Type: Actuated-Coordinated

Lanes, Volumes, Timings
5: Greenbank & Chapman Mills

2034 Future Background - GB/Barns
05-26-2020

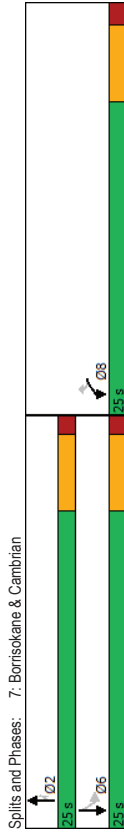
Maximum v/c Ratio: 0.82	Intersection LOS: D
Intersection Signal Delay: 52.2	ICU Level of Service B
Intersection Capacity Utilization 55.6%	
Analysis Period (min) 15	



Intersection	3.3											
Int Delay, s/veh	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	29	268	22	30	313	17	47	0	13	57	0	14
Lane Configurations	29	268	22	30	313	17	47	0	13	57	0	14
Traffic Vol, veh/h	29	268	22	30	313	17	47	0	13	57	0	14
Future Vol, veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Conflicting Peds, #/hr	Free	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop
Sign Control	-	-	None	-	-	-	-	None	-	-	-	None
RT Channelized	400	-	400	-	-	-	-	-	-	-	-	-
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	-	-	-	-	-	-	-	-	-	-	-
Grade, %	-	-	-	-	-	-	-	-	-	-	-	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	29	268	22	30	313	17	47	0	13	57	0	14

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	190	544	86	99	245	69
Traffic Volume (vph)	190	544	86	99	245	69
Future Volume (vph)	1621	1450	1706	1450	3144	1706
Satd. Flow (prot)	0.960				0.701	
Flt Permitted	1621	1450	1706	1450	2320	1706
Satd. Flow (perm)	544				99	
Lane Group Flow (vph)	190	544	86	99	245	69
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2		6	
Permitted Phases	8		2		6	
Detector Phase	8		2		6	
Switch Phase	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Initial (s)	24.8	24.8	23.8	23.8	23.8	23.8
Minimum Split (s)	25.0	25.0	25.0	25.0	25.0	25.0
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	1.4	1.4	1.2	1.2	1.2	1.2
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	5.8	5.8	5.8	5.8
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	Min	Min	Min	Min
Act Effct Green (s)	11.8	11.8	11.4	11.4	11.4	11.4
Actuated G/C Ratio	0.33	0.33	0.32	0.32	0.32	0.32
v/c Ratio	0.35	0.64	0.16	0.19	0.33	0.13
Control Delay	11.3	5.3	9.9	3.9	10.9	9.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.3	5.3	9.9	3.9	10.9	9.7
LOS	B	A	A	A	B	A
Approach Delay	6.9		6.7		10.6	
Approach LOS	A		A		B	
Queue Length 50th (m)	7.1	0.0	3.0	0.0	4.6	2.4
Queue Length 95th (m)	22.0	14.5	11.4	6.6	13.6	9.6
Internal Link Dist (m)	489.2		241.1		1276.6	
Turn Bay Length (m)	38.0			30.0	150.0	
Base Capacity (vph)	895	1044	952	852	1294	952
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	0.21	0.52	0.09	0.12	0.19	0.07
Intersection Summary						
Cycle Length: 50						
Actuated Cycle Length: 35.4						
Natural Cycle: 50						
Control Type: Actuated-Uncoordinated						
Maximum v/c Ratio: 0.64						

Intersection Signal Delay: 7.8
Intersection Capacity Utilization 53.7%
Analysis Period (min) 15
Intersection LOS: A
ICU Level of Service A



Initial Delay, s/veh 8.6

Intersection	WBL	WBR	NBR	NBL	SBT
Movement	30	358	47	0	261
Lane Configurations	30	358	47	0	261
Traffic Vol, veh/h	30	358	47	0	261
Future Vol, veh/h	30	358	47	0	261
Conflicting Peds. #/hr	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free
RT Channelized	- None	- None	- None	- None	- None
Storage Length	380	0	150	380	-
Veh in Median Storage, #	0	0	0	0	0
Grade, %	0	0	0	0	0
Peak Hour Factor	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2
Mvmt Flow	30	358	47	0	261

Major/Minor	Minor1	Major1	Minor2	Major2
Conflicting Flow All	591	47	0	47
Stage 1	47	-	-	-
Stage 2	544	-	-	-
Critical Hdwy	6.42	6.22	-	4.12
Critical Hdwy Stg 1	5.42	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-
Follow-up Hdwy	3,518	3,318	-	2,218
Pot Cap-1 Maneuver	470	1022	-	1560
Stage 1	975	-	-	-
Stage 2	582	-	-	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	392	1022	-	1560
Mov Cap-2 Maneuver	392	-	-	-
Stage 1	975	-	-	-
Stage 2	485	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.7	0	7.2
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR/WBLn1/WBLn2	SBL	SBT
Capacity (veh/h)	-	392	1022	1560
HCM Lane V/C Ratio	-	0.077	0.35	0.167
HCM Control Delay (s)	-	14.9	10.4	7.8
HCM Lane LOS	-	B	B	A
HCM 95th %tile Q(veh)	-	0.2	1.6	0.6

Lanes, Volumes, Timings
1: Strandherd & Dealership/Kennevale

2034 Future Background - GB/Barns
05-26-2020

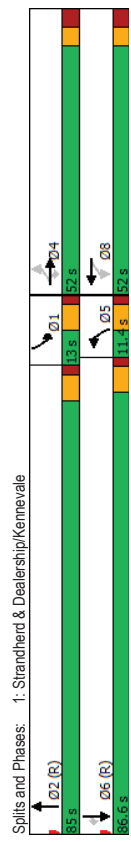
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	429	151	293	128	39	100	100	1646	132	93	2527	167
Future Volume (vph)	429	151	293	128	39	100	100	1646	132	93	2527	167
Satd. Flow (prot)	1621	1706	1450	1621	1522	0	3144	3199	0	1621	3241	1450
Flt Permitted	0.640			0.621			0.950			0.950		
Satd. Flow (perm)	1092	1706	1431	1058	1522	0	3144	3199	0	1620	3241	1450
Satd. Flow (RTOR)												
Lane Group Flow (vph)	429	151	293	128	139	0	100	1778	0	93	2527	167
Turn Type	Perm	NA	Perm	Perm	NA	Prot	NA	Prot	NA	Prot	NA	Perm
Protected Phases	4	4	4	8	8	5	2	1	6			6
Permitted Phases	4	4	4	8	8	5	2	1	6			6
Detector Phase	4	4	4	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	5.0	10.0	10.0
Minimum Split (s)	39.9	39.9	39.9	32.9	32.9	11.4	30.4	11.4	39.4	11.4	39.4	39.4
Total Split (s)	52.0	52.0	52.0	52.0	52.0	11.4	85.0	13.0	86.6	13.0	86.6	86.6
Total Split (%)	34.7%	34.7%	34.7%	34.7%	34.7%	7.6%	56.7%	8.7%	57.7%	8.7%	57.7%	57.7%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	4.6	4.6	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	3.6	3.6	3.6	3.6	3.6	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.9	6.9	6.9	6.9	6.9	6.4	6.4	6.4	6.4	6.4	6.4	6.4
Lead/Lag						Lag	Lead	Lag	Lead	Lag	Lead	
Lead-Lag Optimize?						Yes	Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	None	None	None	None	None	C-Max	None	C-Max	None	C-Max	
Act Effct Green (s)	45.1	45.1	45.1	45.1	45.1	5.0	78.6	6.6	80.2	6.6	80.2	
Actuated G/C Ratio	0.30	0.30	0.30	0.30	0.30	0.03	0.52	0.04	0.53	0.04	0.53	
v/c Ratio	1.31	0.29	0.68	0.40	0.30	0.96	1.06	1.31	1.46	0.22	1.46	
Control Delay	200.2	42.2	55.5	46.4	42.7	100.0	51.7	262.1	239.1	19.3	239.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	200.2	42.2	55.5	46.4	42.7	100.0	51.7	262.1	239.1	19.3	239.1	
LOS	F	D	E	D	D	F	D	F	D	F	F	B
Approach Delay		124.3		44.5		54.2		226.7				
Approach LOS		F		D		D		F				
Queue Length 50th (m)	-161.2	34.1	76.0	30.0	31.5	16.1	-304.0	-34.9	-531.8	25.1	-531.8	25.1
Queue Length 95th (m)	#226.3	53.4	108.7	49.9	50.5	m15.8	m259.2	#72.0	#667.7	39.0	#667.7	39.0
Internal Link Dist (m)		172.9		177.4		1040.6						
Turn Bay Length (m)	70.0	150.0	150.0	50.0	177.4	130.0	1040.6	180.0	1040.6	180.0	1040.6	60.0
Base Capacity (vph)	328	512	430	318	457	104	1676	71	1732	775	1732	775
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.31	0.29	0.68	0.40	0.30	0.96	1.06	1.31	1.46	0.22	1.46	0.22

Intersection Summary
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 48 (32%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 125
Control Type: Actuated-Coordinated

Lanes, Volumes, Timings
1: Strandherd & Dealership/Kennevale

2034 Future Background - GB/Barns
05-26-2020

Maximum v/c Ratio: 1.46	Intersection LOS: F
Intersection Signal Delay: 147.1	ICU Level of Service H
Intersection Capacity Utilization: 132.2%	
Analysis Period (min): 15	
~ Volume exceeds capacity, queue is theoretically infinite.	
# Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer.	
~ Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	



Lanes, Volumes, Timings
2: Borrissokane/Tartan & Strandherd

2034 Future Background - GB/Barns
05-26-2020

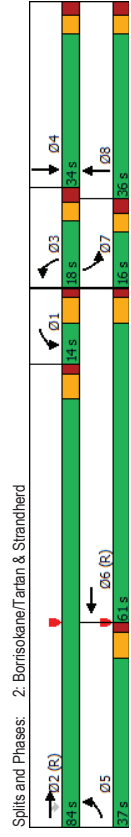
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	450	1852	551	99	1206	65	331	34	98	52	49	143
Future Volume (vph)	450	1852	551	99	1206	65	331	34	98	52	49	143
Satd. Flow (prot)	1621	3241	1450	1621	3215	0	3144	1517	0	1621	1515	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1621	3241	1450	1621	3215	0	3144	1517	0	1621	1515	0
Satd. Flow (RTOR)												
Lane Group Flow (vph)	450	1852	551	99	1271	0	331	132	0	52	192	0
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2	1	6	3	8	7	4				
Permitted Phases			2									
Detector Phase	5	2	2	1	6	3	8	7	4			
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0
Minimum Split (s)	11.4	56.4	56.4	11.4	56.4	11.0	34.0	11.0	34.0	11.0	34.0	11.0
Total Split (s)	37.0	84.0	84.0	14.0	61.0	18.0	36.0	16.0	34.0	16.0	34.0	16.0
Total Split (%)	24.7%	56.0%	56.0%	9.3%	40.7%	12.0%	24.0%	10.7%	22.7%	10.7%	22.7%	10.7%
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	1.8	1.8	1.8	1.8	1.8	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	6.4	6.4	6.4	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead
Lead/Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	None	C-Max	None	None	None	None	None	None	None
Act Effct Green (s)	35.4	82.4	82.4	7.6	54.6	12.0	28.8	8.9	23.2	8.9	23.2	8.9
Actuated G/C Ratio	0.24	0.55	0.55	0.05	0.36	0.08	0.19	0.06	0.15	0.06	0.15	0.06
v/c Ratio	1.18	1.04	0.69	1.21	1.09	1.32	0.46	0.54	0.82	0.54	0.82	0.54
Control Delay	134.5	34.2	7.9	207.3	90.9	219.1	59.6	88.9	87.2	88.9	87.2	88.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	134.5	34.2	7.9	207.3	90.9	219.1	59.6	88.9	87.2	88.9	87.2	88.9
LOS	F	C	A	F	F	F	E	F	F	F	F	F
Approach Delay	45.0			99.3		173.6				87.6		
Approach LOS	D			F		F				F		
Queue Length 50th (m)	-159.5	-309.3	31.9	-35.0	-215.6	-64.3	36.5	15.0	54.9	15.0	54.9	15.0
Queue Length 95th (m)	m#107.8	m#93.0	m#27.5	m#66.0	#257.8	#95.4	55.7	29.5	80.9	29.5	80.9	29.5
Internal Link Dist (m)	1040.6			787.0		275.6				103.1		
Turn Bay Length (m)	105.0			110.0	55.0	100.0				38.0		
Base Capacity (vph)	382	1779	796	82	1170	251	310	108	282	108	282	108
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.18	1.04	0.69	1.21	1.09	1.32	0.43	0.48	0.68	0.48	0.68	0.48

Intersection Summary
 Cycle Length: 150
 Actuated Cycle Length: 150
 Offset: 136 (91%), Referenced to phase 2:EBT and 6:WBT, Start of Green
 Natural Cycle: 125
 Control Type: Actuated-Coordinated

Lanes, Volumes, Timings
2: Borrissokane/Tartan & Strandherd

2034 Future Background - GB/Barns
05-26-2020

Maximum v/c Ratio: 1.32	Intersection LOS: E
Intersection Signal Delay: 74.3	ICU Level of Service G
Intersection Capacity Utilization 106.3%	
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite.	
# Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer.	
~ Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	



Splits and Phases: 2: Borrissokane/Tartan & Strandherd

Lanes, Volumes, Timings
3: Chapman Mills/Fraser Fields & Strandherd

2034 Future Background - GB/Barns
05-26-2020

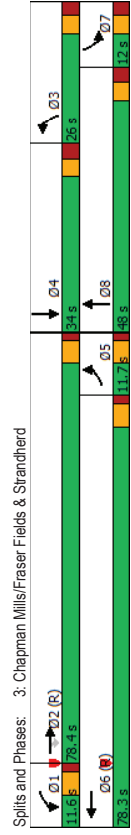
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	15	1595	531	55	939	54	438	0	49	18	0	8
Future Volume (vph)	15	1595	531	55	939	54	438	0	49	18	0	8
Satd. Flow (prot)	1621	3241	1450	1621	3212	0	3144	1450	0	1621	1450	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1621	3241	1450	1621	3212	0	3144	1450	0	1621	1450	0
Lane Group Flow (vph)	15	1595	531	55	939	0	438	49	0	18	8	0
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2	1	6	3	8	7	4				
Permitted Phases			2									
Detector Phase	5	2	2	1	6	3	8	8	7	4		
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	5.0	10.0	5.0	10.0	5.0	10.0	5.0
Minimum Split (s)	10.8	26.8	26.8	10.8	26.8	11.0	34.0	11.0	34.0	11.0	34.0	11.0
Total Split (s)	11.7	78.4	78.4	11.6	78.3	26.0	48.0	26.0	48.0	12.0	34.0	12.0
Total Split (%)	7.8%	52.3%	52.3%	7.7%	52.2%	17.3%	32.0%	17.3%	32.0%	8.0%	22.7%	8.0%
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	1.6	1.6	1.6	1.6	1.6	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.8	5.8	5.8	5.8	5.8	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lag/Lead	Lag	Lag	Lag	Lead	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	None	C-Max	None	C-Max	None	C-Max	None	C-Max	None
Act Effct Green (s)	5.8	75.1	75.1	8.5	84.8	26.4	37.6	26.4	37.6	12.5	16.4	12.5
Actuated G/C Ratio	0.04	0.50	0.50	0.06	0.57	0.18	0.25	0.18	0.25	0.08	0.11	0.08
v/c Ratio	0.24	0.98	0.73	0.60	0.55	0.79	0.13	0.79	0.13	0.13	0.05	0.13
Control Delay	47.7	23.3	10.5	102.3	5.3	70.4	49.3	70.4	49.3	61.3	55.0	61.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	47.7	23.3	10.5	102.3	5.3	70.4	49.3	70.4	49.3	61.3	55.0	61.3
LOS	D	C	B	F	A	E	D	E	D	E	D	D
Approach Delay		20.3		10.4		68.3		68.3		59.4		59.4
Approach LOS		C		B		E		E		E		E
Queue Length 50th (m)	4.2	147.0	42.9	14.2	9.7	62.7	10.4	62.7	10.4	5.2	2.3	5.2
Queue Length 95th (m)	m#4.9	m#141.0	m#40.2	m#24.7	m#50.4	#98.9	25.0	#98.9	25.0	12.3	7.0	12.3
Internal Link Dist (m)		787.0		628.9		349.9		349.9		82.1		82.1
Turn Bay Length (m)	40.0	145.0	40.0	105.0		40.0		40.0		40.0		40.0
Base Capacity (vph)	63	1622	725	92	1814	552	425	552	425	135	270	135
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.24	0.98	0.73	0.60	0.55	0.79	0.12	0.79	0.12	0.13	0.03	0.13

Intersection Summary
 Cycle Length: 150
 Actuated Cycle Length: 150
 Offset: 144 (96%), Referenced to phase 2:EBT and 6:WBT, Start of Green
 Natural Cycle: 125
 Control Type: Actuated-Coordinated

Lanes, Volumes, Timings
3: Chapman Mills/Fraser Fields & Strandherd

2034 Future Background - GB/Barns
05-26-2020

Maximum v/c Ratio: 0.98
 Intersection Signal Delay: 24.1
 Intersection LOS: C
 ICU Level of Service D
 Intersection Capacity Utilization 77.9%
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.



Lanes, Volumes, Timings
4: Greenbank & Strandherd

2034 Future Background - GB/Barns
05-26-2020

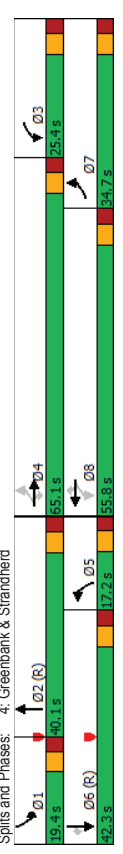
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	354	1239	245	243	882	184	205	507	147	251	641	217
Future Volume (vph)	354	1239	245	243	882	184	205	507	147	251	641	217
Satd. Flow (prot)	1621	3241	1450	1621	3241	1450	3144	3120	0	3144	3241	1450
Flt Permitted	0.139			0.087			0.950					
Satd. Flow (perm)	237	3241	1430	148	3241	1450	3141	3120	0	3137	3241	1430
Satd. Flow (RTOR)		202			214			23				217
Lane Group Flow (vph)	354	1239	245	243	882	184	205	654	0	251	641	217
Turn Type	pm-pt	NA	Perm	pm-pt	NA	Perm	Prot	NA	Prot	NA	Perm	Perm
Protected Phases	7	4		3	8		5	2		1		6
Permitted Phases	4	4	4	3	8	8	5	2	1	6	6	6
Detector Phase												
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	5.0	10.0	10.0	10.0
Minimum Split (s)	11.6	33.5	33.5	11.6	33.5	33.5	11.3	35.5	11.3	35.5	35.5	35.5
Total Split (s)	34.7	65.1	65.1	25.4	55.8	55.8	17.2	40.1	19.4	42.3	42.3	42.3
Total Split (%)	23.1%	43.4%	43.4%	16.9%	37.2%	37.2%	11.5%	26.7%	12.9%	28.2%	28.2%	28.2%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.9	2.8	2.8	2.9	2.8	2.8	2.8	2.8	2.6	2.8	2.8	2.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.5	6.5	6.6	6.5	6.5	6.3	6.5	6.3	6.5	6.5	6.5
Lead/Lag	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max	None	C-Max	C-Max	C-Max
Act Effct Green (s)	83.9	58.6	58.6	64.5	45.8	45.8	10.9	33.6	13.1	35.8	35.8	35.8
Actuated G/C Ratio	0.56	0.39	0.39	0.43	0.31	0.31	0.07	0.22	0.09	0.24	0.24	0.24
v/c Ratio	0.83	0.98	0.98	0.98	0.89	0.89	0.31	0.90	0.91	0.92	0.83	0.43
Control Delay	44.5	31.8	31.8	1.6	107.0	61.7	3.7	100.4	66.5	103.5	64.5	8.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.5	31.8	31.8	1.6	107.0	61.7	3.7	100.4	66.5	103.5	64.5	8.2
LOS	D	C	A	F	E	A	F	E	F	E	F	A
Approach Delay		30.2		62.0			74.6			62.3		
Approach LOS		C		E			E			E		E
Queue Length 50th (m)	82.9	147.1	5.2	57.5	128.4	0.0	31.5	97.5	38.3	94.7	0.0	0.0
Queue Length 95th (m)	m88.1	m93.7	m4.1	m110.9	152.2	10.2	m82.7	m124.5	m63.9	m118.0	m20.9	m20.9
Internal Link Dist (m)		596.1		267.5			571.3			216.2		
Turn Bay Length (m)	66.0	95.0	120.0	66.0	72.0	66.0	72.0	66.0	85.0	72.0	66.0	145.0
Base Capacity (vph)	424	1266	681	248	1065	620	228	716	274	773	506	0
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.83	0.98	0.98	0.36	0.98	0.83	0.30	0.90	0.91	0.92	0.83	0.43

Intersection Summary
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 36 (24%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 125
Control Type: Actuated-Coordinated

Lanes, Volumes, Timings
4: Greenbank & Strandherd

2034 Future Background - GB/Barns
05-26-2020

Maximum v/c Ratio: 0.98	Intersection LOS: D
Intersection Signal Delay: 52.8	ICU Level of Service G
Intersection Capacity Utilization 103.7%	
Analysis Period (min): 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	



Lanes, Volumes, Timings
5: Greenbank & Chapman Mills

2034 Future Background - GB/Barns
05-26-2020

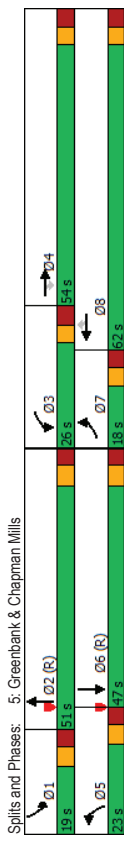
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR	SBR
Lane Configurations	38	323	74	92	320	40	80	262	44	50	105	44
Traffic Volume (vph)	38	323	74	92	320	40	80	262	44	50	105	44
Future Volume (vph)	1621	1706	1450	1621	1706	1450	1621	1706	1450	1621	1706	1450
Satd. Flow (prot)	0.950			0.950			0.950			0.950		
Flt Permitted												
Satd. Flow (perm)	1621	1706	1450	1621	1706	1450	1621	1706	1450	1621	1706	1450
Lane Group Flow (vph)	38	323	74	92	320	40	80	306	0	50	149	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Prot	NA	Prot	NA
Protected Phases	7	4		3	8		5	2		1		6
Permitted Phases							8					
Detector Phase	7	4	4	3	8	8	5	2		1		6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0		5.0	10.0	
Minimum Split (s)	11.8	43.8	43.8	11.8	43.8	43.8	11.8	43.8		11.8	43.8	
Total Split (s)	18.0	54.0	54.0	26.0	62.0	62.0	23.0	51.0		19.0	47.0	
Total Split (%)	12.0%	36.0%	36.0%	17.3%	41.3%	41.3%	15.3%	34.0%		12.7%	31.3%	
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.7	3.7		3.7	3.7	
All-Red Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.1	3.1		3.1	3.1	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8		6.8	6.8	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max		None	C-Max	
Act Effct Green (s)	8.7	33.9	33.9	13.8	41.5	41.5	12.7	67.6		10.0	62.4	
Actuated G/C Ratio	0.06	0.23	0.23	0.09	0.28	0.28	0.08	0.45		0.07	0.42	
v/c Ratio	0.41	0.84	0.23	0.62	0.68	0.10	0.58	0.21		0.46	0.12	
Control Delay	100.9	56.6	32.9	82.6	55.6	39.0	82.2	29.3		82.6	36.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	100.9	56.6	32.9	82.6	55.6	39.0	82.2	29.3		82.6	36.4	
LOS	F	E	C	F	E	D	F	C		F	D	
Approach Delay		56.4			59.6			40.3			48.0	
Approach LOS		E			E			D			D	
Queue Length 50th (m)	11.2	86.3	14.4	26.4	86.2	9.0	23.0	29.3		15.0	12.7	
Queue Length 95th (m)	m16.9	99.5	m17.0	43.6	106.7	16.8	39.4	49.3		m19.6	m18.6	
Internal Link Dist (m)		626.4			183.5			478.9			571.3	
Turn Bay Length (m)		40.0			60.0			60.0			60.0	
Base Capacity (vph)		121	536	456	207	627	533	178	1429	135	1288	
Starvation Cap Reductn		0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn		0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn		0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio		0.31	0.60	0.16	0.44	0.51	0.08	0.45	0.21	0.37	0.12	

Intersection Summary	
Cycle Length:	150
Actuated Cycle Length:	150
Offset:	24 (16%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle:	115
Control Type:	Actuated-Coordinated

Lanes, Volumes, Timings
5: Greenbank & Chapman Mills

2034 Future Background - GB/Barns
05-26-2020

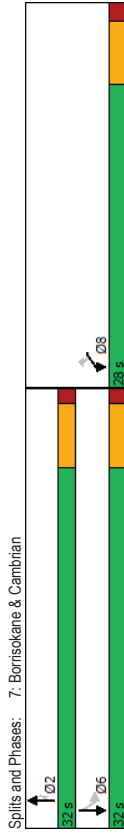
Maximum v/c Ratio:	0.84
Intersection Signal Delay:	52.0
ICU Level of Service B	
Intersection Capacity Utilization:	59.3%
Analysis Period (min):	15
m	Volume for 95th percentile queue is metered by upstream signal.



Intersection	3.3											
Int Delay, s/veh	3.3											
Initial Delay, s/veh	3.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	W	T	T	W	T	T	W	T	T	W	T	T
Traffic Vol, veh/h	52	399	46	65	324	23	30	0	9	48	0	12
Future Vol, veh/h	52	399	46	65	324	23	30	0	9	48	0	12
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	None	-	-	None	-	-	None	-
Storage Length	400	-	-	400	-	-	-	-	-	-	-	-
Veh in Median Storage, #	0	0	0	0	0	0	0	0	0	0	0	0
Grade, %	-	-	-	-	-	-	-	-	-	-	-	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	52	399	46	65	324	23	30	0	9	48	0	12
Major/Minor	Major1	Major2	Minor1	Minor2	Minor1	Minor2	Minor1	Minor2	Minor1	Minor2	Minor1	Minor2
Conflicting Flow All	347	0	0	445	0	0	998	1003	422	997	1015	336
Stage 1	-	-	-	-	-	-	526	526	-	466	466	-
Stage 2	-	-	-	-	-	-	472	477	-	531	549	-
Critical Hdwy	4:12	-	-	4:12	-	-	7:12	6:52	6:22	7:12	6:52	6:22
Critical Hdwy Stg 1	-	-	-	-	-	-	6:12	5:52	-	6:12	5:52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6:12	5:52	-	6:12	5:52	-
Follow-up Hdwy	2:218	-	-	2:218	-	-	3:518	4:018	3:318	3:518	4:018	3:318
Pot Cap-1 Maneuver	1212	-	-	1115	-	-	223	242	632	223	238	706
Stage 1	-	-	-	-	-	-	535	529	-	577	562	-
Stage 2	-	-	-	-	-	-	573	556	-	532	516	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1212	-	-	1115	-	-	203	218	632	203	214	706
Mov Cap-2 Maneuver	-	-	-	-	-	-	203	218	-	203	214	-
Stage 1	-	-	-	-	-	-	512	506	-	552	529	-
Stage 2	-	-	-	-	-	-	530	524	-	502	494	-
Approach	EB	WB	NB	WB	NB	SB	WB	NB	SB	WB	NB	SB
HCM Control Delay, s	0.8	1.3	22.8	22.8	25.3	25.3	22.8	25.3	25.3	22.8	25.3	25.3
HCM LOS	C	C	D	D	D	D	C	D	D	C	D	D
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBT	SBR	SBLn1	SBT
Capacity (veh/h)	241	1212	-	-	1115	-	-	237	-	-	237	-
HCM Lane V/C Ratio	0.162	0.043	-	-	0.058	-	-	0.253	-	-	0.253	-
HCM Control Delay (s)	22.8	8.1	-	-	8.4	-	-	25.3	-	-	25.3	-
HCM Lane LOS	C	A	-	-	A	-	-	D	-	-	D	-
HCM 95th %ile Q(veh)	0.6	0.1	-	-	0.2	-	-	1	-	-	1	-

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W	T	T	T	W	T
Traffic Volume (vph)	134	374	59	169	561	77
Future Volume (vph)	134	374	59	169	561	77
Satd. Flow (prot)	1621	1450	1706	1450	3144	1706
Flt Permitted	0.950				0.719	
Satd. Flow (perm)	1621	1450	1706	1450	2379	1706
Satd. Flow (RTOR)	374			169		
Lane Group Flow (vph)	134	374	59	169	561	77
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2		6	
Permitted Phases	8		2		6	
Detector Phase	8		2		6	
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Spilt (s)	24.8	24.8	23.8	23.8	23.8	23.8
Total Spilt (s)	28.0	28.0	32.0	32.0	32.0	32.0
Total Spilt (%)	46.7%	46.7%	53.3%	53.3%	53.3%	53.3%
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	1.4	1.4	1.2	1.2	1.2	1.2
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	5.8	5.8	5.8	5.8
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	Min	Min	Min	Min
Act Effct Green (s)	11.5	11.5	14.3	14.3	14.3	14.3
Actuated g/C Ratio	0.30	0.30	0.38	0.38	0.38	0.38
v/c Ratio	0.27	0.54	0.09	0.26	0.63	0.12
Control Delay	12.9	5.1	8.2	3.1	13.3	8.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.9	5.1	8.2	3.1	13.3	8.4
LOS	B	A	A	A	B	A
Approach Delay	7.1		4.4		12.7	
Approach LOS	A		A		B	
Queue Length 50th (m)	5.7	0.0	2.0	0.0	12.5	2.7
Queue Length 95th (m)	18.7	13.7	8.0	7.8	30.5	9.8
Internal Link Dist (m)	489.2		241.1		1276.6	
Turn Bay Length (m)	38.0				30.0	150.0
Base Capacity (vph)	969	1017	1215	1081	1695	1215
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	0.14	0.37	0.05	0.16	0.33	0.06
Intersection Summary						
Cycle Length: 60						
Actuated Cycle Length: 38						
Natural Cycle: 50						
Control Type: Actuated-Uncoordinated						
Maximum v/c Ratio: 0.63						

Intersection Signal Delay: 9.3
 Intersection Capacity Utilization: 42.6%
 Analysis Period (min): 15
 Intersection LOS: A
 ICU Level of Service: A



Intersection	WBL	WBR	NBT	NBR	SBL	SBT
Int Delay, s/veh	8.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔
Traffic Vol, veh/h	17	349	30	0	445	46
Future Vol, veh/h	17	349	30	0	445	46
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	380	0	-	150	380	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	17	349	30	0	445	46
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	966	30	0	0	30	0
Stage 1	30	-	-	-	-	-
Stage 2	936	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3,518	3,318	-	-	2,218	-
Pot Cap-1 Maneuver	282	1044	-	-	1583	-
Stage 1	993	-	-	-	-	-
Stage 2	382	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	203	1044	-	-	1583	-
Mov Cap-2 Maneuver	203	-	-	-	-	-
Stage 1	993	-	-	-	-	-
Stage 2	275	-	-	-	-	-
Approach	WB	NB	SB			
HCM Control Delay, s	10.9	0	7.4			
HCM LOS	B					
Minor Lane/Major Mvmt	NBT	NBR	WBL	NBL	WBL	WBL
Capacity (veh/h)	-	203	1044	1583	-	-
HCM Lane V/C Ratio	-	0.084	0.334	0.281	-	-
HCM Control Delay (s)	-	24.3	10.2	8.2	-	-
HCM Lane LOS	-	C	B	A	-	-
HCM 95th %tile Q(veh)	-	0.3	1.5	1.2	-	-

Appendix H

MMLOS Analysis

DRAFT

Consultant
Scenario
Comments

CGH Transportation
Existing/Future

Project
Date

Conservancy East
22-May-20

INTERSECTIONS													
	Crossing Side	Strandherd-Kennevale (Existing)				Strandherd-Kennevale (Future)				Strandherd-Borrisokane (Existing)			
		NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Pedestrian	Lanes	4	5	3	5	7	7	3	5	4	3	3	4
	Median	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	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	No Median - 2.4 m
	Conflicting Left Turns	Permissive	Permissive	Permissive	Permissive	Protected	Protected	Protected	Protected	Permissive	Permissive	Permissive	Permissive
	Conflicting Right Turns	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control
	Right Turns on Red (RTOR) ?	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed
	Ped Signal Leading Interval?	No	No	No	No	No	No	No	No	No	No	No	No
	Right Turn Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel
	Corner Radius	10-15m	10-15m	5-10m	15-25m	10-15m	10-15m	15-25m	15-25m	10-15m	10-15m	5-10m	15-25m
	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	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings
	PETSI Score	53	37	71	35	18	12	76	43	53	70	71	51
	Ped. Exposure to Traffic LoS	D	E	C	E	F	F	B	E	D	C	C	D
	Cycle Length												
	Effective Walk Time												
	Average Pedestrian Delay												
Pedestrian Delay LoS	-	-	-	-	-	-	-	-	-	-	-	-	
Level of Service	D	E	C	E	F	F	B	E	D	C	C	D	
	E				F				D				
Approach From	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	
Bicycle	Bicycle Lane Arrangement on Approach	Pocket Bike Lane	Pocket Bike Lane	Mixed Traffic	Mixed Traffic	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic
	Right Turn Lane Configuration	≤ 50 m Introduced right turn lane	> 50 m Introduced right turn lane	≤ 50 m	≤ 50 m	Not Applicable	Not Applicable	≤ 50 m	≤ 50 m	≤ 50 m	≤ 50 m	≤ 50 m	> 50 m
	Right Turning Speed	≤ 25 km/h	≤ 25 km/h	≤ 25 km/h	≤ 25 km/h	Not Applicable	Not Applicable	≤ 25 km/h	≤ 25 km/h	≤ 25 km/h	≤ 25 km/h	≤ 25 km/h	>25 km/h
	Cyclist relative to RT motorists	B	D	D	D	Not Applicable	Not Applicable	D	D	D	D	D	F
	Separated or Mixed Traffic	Separated	Separated	Mixed Traffic	Mixed Traffic	Separated	Separated	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic
	Left Turn Approach	1 lane crossed	1 lane crossed	No lane crossed	One lane crossed	2-stage, LT box	2-stage, LT box	No lane crossed	One lane crossed	One lane crossed	One lane crossed	One lane crossed	≥ 2 lanes crossed
	Operating Speed	≥ 60 km/h	≥ 60 km/h	> 40 to ≤ 50 km/h	> 50 to < 60 km/h	≥ 60 km/h	≥ 60 km/h	> 40 to ≤ 50 km/h	> 50 to < 60 km/h	> 50 to < 60 km/h	> 40 to ≤ 50 km/h	≥ 60 km/h	≥ 60 km/h
	Left Turning Cyclist	E	E	B	E	A	A	B	E	E	D	F	F
Level of Service	E	E	D	E	A	A	D	E	E	D	F	F	
	E				E				F				
Transit	Average Signal Delay	> 40 sec	> 40 sec	≤ 30 sec	> 40 sec	> 40 sec	> 40 sec	> 40 sec	> 40 sec	≤ 40 sec	≤ 20 sec	≤ 40 sec	≤ 40 sec
	Level of Service	F	F	D	F	F	F	F	F	E	C	E	E
	F				F				E				
Truck	Effective Corner Radius	10 - 15 m	< 10 m	10 - 15 m	> 15 m	10 - 15 m	10 - 15 m	> 15 m	> 15 m	10 - 15 m	10 - 15 m	< 10 m	> 15 m
	Number of Receiving Lanes on Departure from Intersection	1	≥ 2	≥ 2	1	1	≥ 2	≥ 2	≥ 2	1	1	1	1
	Level of Service	E	D	B	C	E	B	A	A	E	E	F	C
	E				E				F				
Auto	Volume to Capacity Ratio	0.91 - 1.00				> 1.00				0.91 - 1.00			
	Level of Service	E				F				E			

Strandherd-Borrisokane (Future)				Strandherd-Chapman Mills (Future)				Strandherd-Greenbank (Existing & Future)				Chapman Mills-Greenbank (Future)			
NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
3	4	5	6	3	4	5	6	7	7	6	7	5	5	7	7
Median > 2.4 m	No Median - 2.4 m	No Median - 2.4 m	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	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	Median > 2.4 m	Median > 2.4 m
Protected	Protected	Protected	Protected	Protected	Protected	Protected	Protected	Protected/Permissive	Protected/Permissive	Protected	Protected	Protected	Protected	Protected	Protected
Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control
RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed
No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	Smart Channel	No Channel	Conv'tl without Receiving Lane	Conv'tl without Receiving Lane	No Channel	No Channel	No Channel	No Channel
5-10m	5-10m	10-15m	10-15m	5-10m	5-10m	10-15m	10-15m	>25m	>25m	15-25m	>25m	5-10m	10-15m	5-10m	5-10m
Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings
79	62	45	28	79	62	45	28	7	1	30	13	46	45	19	19
B	C	D	F	B	C	D	F	F	F	E	F	D	D	F	F
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B	C	D	F	B	C	D	F	F	F	E	F	D	D	F	F
F				F				F				F			
NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Separated	Separated	Separated	Separated	Separated	Separated	Separated	Separated	Separated	Separated	Separated	Separated	Separated	Separated	Separated	Separated
2-stage, LT box	2-stage, LT box	2-stage, LT box	2-stage, LT box	No lane crossed	2-stage, LT box	2-stage, LT box	2-stage, LT box	≥ 2 lanes crossed	≥ 2 lanes crossed	≥ 2 lanes crossed	≥ 2 lanes crossed	2-stage, LT box	2-stage, LT box	2-stage, LT box	2-stage, LT box
> 40 to ≤ 50 km/h	> 50 to < 60 km/h	≥ 60 km/h	≥ 60 km/h	> 40 to ≤ 50 km/h	> 50 to < 60 km/h	≥ 60 km/h	≥ 60 km/h	≥ 60 km/h	≥ 60 km/h	≥ 60 km/h	≥ 60 km/h	≥ 60 km/h	≥ 60 km/h	> 40 to ≤ 50 km/h	> 40 to ≤ 50 km/h
A	A	A	A	B	A	A	A	F	F	F	F	A	A	A	A
A	A	A	A	B	A	A	A	F	F	F	F	A	A	A	A
A				B				F				A			
> 40 sec	> 40 sec	> 40 sec	> 40 sec	> 40 sec	> 40 sec	≤ 20 sec	≤ 20 sec	≤ 40 sec	> 40 sec	> 40 sec	> 40 sec	> 40 sec	> 40 sec	≤ 40 sec	≤ 40 sec
F	F	F	F	F	F	C	C	E	F	F	F	F	F	E	E
F				F				F				F			
< 10 m	< 10 m	< 10 m	10 - 15 m	< 10 m	< 10 m	10 - 15 m	10 - 15 m	> 15 m	> 15 m	> 15 m	> 15 m	< 10 m	10 - 15 m	< 10 m	< 10 m
≥ 2	≥ 2	1	1	≥ 2	≥ 2	1	1	≥ 2	≥ 2	≥ 2	≥ 2	1	1	≥ 2	≥ 2
D	D	F	E	D	D	E	E	A	A	A	A	F	E	D	D
F				E				A				F			
> 1.00				0.81 - 0.90				0.91 - 1.00				0.0 - 0.60			
F				D				E				A			

Chapman Mills-Hamsa (Future)				Chapman Mills-Chapman Mills (Future)				Cambrian-Borrisokane (Future)				Access #2-Borrisokane (Future)			
NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
0 - 2	0 - 2	6	6	0 - 2	0 - 2	6	0 - 2	4	3	3		4	4	3	3
No Median - 2.4 m	No Median - 2.4 m	Median > 2.4 m	Median > 2.4 m	No Median - 2.4 m	No Median - 2.4 m	Median > 2.4 m	No Median - 2.4 m	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
Protected	Protected	Protected	Protected	No left turn / Prohib.	Protected	Permissive	No left turn / Prohib.	No left turn / Prohib.	Permissive	Protected		Permissive	Permissive	Protected	Protected
Permissive or yield control	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	No right turn	Permissive or yield control		Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control
RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR prohibited	RTOR allowed	RTOR allowed	RTOR prohibited	RTOR prohibited	RTOR allowed	RTOR allowed		RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed
No	No	No	No	No	No	No	No	No	No	No		No	No	No	No
No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Right Turn	No Channel	No Channel		No Channel	No Channel	No Channel	No Channel
5-10m	5-10m	5-10m	5-10m	5-10m	5-10m	5-10m	5-10m	No Right Turn	10-15m	10-15m		10-15m	10-15m	10-15m	10-15m
Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings		Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings
94	94	34	34	97	99	26	102	74	75	78		53	53	78	78
A	A	E	E	A	A	F	A	C	B	B	-	D	D	B	B
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A	A	E	E	A	A	F	A	C	B	B	-	D	D	B	B
E				F				C				D			
NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Mixed Traffic	Mixed Traffic	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP		Pocket Bike Lane	Curb Bike Lane, Cycletrack or MUP		Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP
≤ 50 m	≤ 50 m								≤ 50 m Introduced right turn lane						
≤ 25 km/h	≤ 25 km/h								≤ 25 km/h						
D	D	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	-	B	Not Applicable	-	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Mixed Traffic	Mixed Traffic	Separated	Separated	Separated	Separated	Separated	Separated	-	Separated	Separated	-	Separated	Separated	Separated	Separated
No lane crossed	No lane crossed	2-stage, LT box	2-stage, LT box	2-stage, LT box	2-stage, LT box	2-stage, LT box	2-stage, LT box	≥ 2 lanes crossed		1 lane crossed		2-stage, LT box	2-stage, LT box	2-stage, LT box	2-stage, LT box
≤ 40 km/h	≤ 40 km/h			> 40 to ≤ 50 km/h	> 40 to ≤ 50 km/h	> 50 to < 60 km/h	> 50 to < 60 km/h	≥ 60 km/h		≥ 60 km/h		> 50 to < 60 km/h	> 50 to < 60 km/h	> 40 to ≤ 50 km/h	> 40 to ≤ 50 km/h
B	B	-	-	A	A	A	A	F	-	E	-	A	A	A	A
D	D	-	-	A	A	A	A	-	-	E	-	A	A	A	A
D				A				E				A			
≤ 30 sec	≤ 30 sec	≤ 20 sec	≤ 20 sec	≤ 30 sec	≤ 20 sec	≤ 40 sec	≤ 40 sec	≤ 10 sec	≤ 10 sec	≤ 20 sec		≤ 20 sec	≤ 20 sec	≤ 10 sec	≤ 40 sec
D	D	C	C	D	C	E	E	B	B	C	-	C	C	B	E
D				E				C				E			
< 10 m	< 10 m	< 10 m	< 10 m		< 10 m	< 10 m			10 - 15 m	10 - 15 m		10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m
1	1	1	1		1	1			≥ 2	1		1	1	1	1
F	F	F	F	-	F	F	-	-	B	E	-	E	E	E	E
F				F				E				E			
0.0 - 0.60				0.61 - 0.70				0.0 - 0.60				0.61 - 0.70			
A				B				A				B			

Access #3-Borrisokane (Future)			
NORTH	SOUTH	EAST	WEST
4	3	0 - 2	3
No Median - 2.4 m	No Median - 2.4 m	Median > 2.4 m	No Median - 2.4 m
Permissive	Permissive	No left turn / Prohib.	Permissive
No right turn	Permissive or yield control	No right turn	Permissive or yield control
RTOR allowed	RTOR prohibited	RTOR prohibited	RTOR allowed
No	No	No	No
No Right Turn	No Channel	No Right Turn	No Channel
10-15m	10-15m	10-15m	10-15m
Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings
62	73	105	70
C	C	A	C
C			
C	C	A	C
C			
NORTH	SOUTH	EAST	WEST
Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP
Not Applicable	Not Applicable	Not Applicable	Not Applicable
Separated	Separated	Separated	Separated
2-stage, LT box	2-stage, LT box	2-stage, LT box	2-stage, LT box
> 50 to < 60 km/h	> 50 to < 60 km/h	> 40 to ≤ 50 km/h	> 40 to ≤ 50 km/h
A	A	A	A
A	A	A	A
A			
≤ 10 sec	≤ 10 sec	> 40 sec	> 40 sec
B	B	F	F
F			
10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m
1	1	1	1
E	E	E	E
E			
0.61 - 0.70			
B			

Multi-Modal Level of Service - Segments Form

Consultant
Scenario
Comments

CGH Transportation
Existing/Future

Project
Date

Conservancy East
22-May-20

SEGMENTS		Street A	Borrisokane (Existing)	Borrisokane (Future)	Section
			1	2	3
Pedestrian	Sidewalk Width	C	no sidewalk	≥ 2 m	
	Boulevard Width		n/a	> 2 m	
	Avg Daily Curb Lane Traffic Volume		> 3000	> 3000	
	Operating Speed		> 60 km/h	> 50 to 60 km/h	
	On-Street Parking		no	no	
	Exposure to Traffic PLoS		F	C	-
	Effective Sidewalk Width			2.0 m	
	Pedestrian Volume			250 ped/hr	
Crowding PLoS	-	B	-		
Level of Service	-	C	-		
Bicycle	Type of Cycling Facility	C	Mixed Traffic	Curbside Bike Lane	
	Number of Travel Lanes		2-3 lanes total	≤ 1 each direction	
	Operating Speed		≥ 60 km/h	>50 to 70 km/h	
	# of Lanes & Operating Speed LoS		F	C	-
	Bike Lane (+ Parking Lane) Width			≥1.5 to <1.8 m	
	Bike Lane Width LoS		-	B	-
	Bike Lane Blockages			Rare	
	Blockage LoS		-	A	-
	Median Refuge Width (no median = < 1.8 m)			< 1.8 m refuge	
	No. of Lanes at Unsignalized Crossing			≤ 3 lanes	
	Sidestreet Operating Speed			>40 to 50 km/h	
	Unsignalized Crossing - Lowest LoS		-	A	-
Level of Service	-	C	-		
Transit	Facility Type	D	Mixed Traffic	Mixed Traffic	
	Friction or Ratio Transit:Posted Speed		Vt/Vp ≥ 0.8	Vt/Vp ≥ 0.8	
	Level of Service		D	D	-
Truck	Truck Lane Width	B	> 3.7 m	> 3.7 m	
	Travel Lanes per Direction		1	1	
	Level of Service		B	B	-
Auto	Level of Service	Not Applicable			

Appendix I

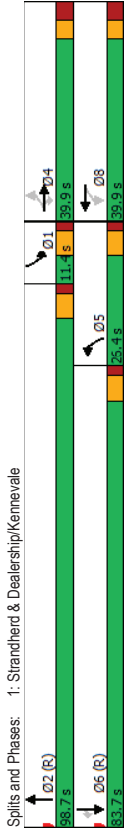
Synchro Intersection Worksheets – 2029 Future Total Conditions

DRAFT

EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
109	28	69	100	168	333	2699	54	1206	471
109	28	69	100	168	333	2699	54	1206	471
109	28	69	100	168	333	2785	54	1206	471
Perm	NA	Perm	NA	Prot	NA	Prot	NA	Perim	
4	4	4	8	8	5	2	1	6	6
4	4	4	8	8	5	2	1	6	6
100	100	100	100	100	50	100	50	100	100
39.9	39.9	39.9	32.9	11.4	30.4	11.4	39.4	39.4	
39.9	39.9	39.9	39.9	26.4	98.7	11.4	83.7	83.7	
26.6%	26.6%	26.6%	26.6%	17.6%	65.8%	7.6%	55.8%	55.8%	
33.0	33.0	33.0	33.0	20.0	92.3	5.0	77.3	77.3	
3.3	3.3	3.3	3.3	4.6	4.6	4.6	4.6	4.6	
3.6	3.6	3.6	3.6	1.8	1.8	1.8	1.8	1.8	
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
6.9	6.9	6.9	6.9	6.4	6.4	6.4	6.4	6.4	
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
None	None	None	None	None	C-Max	None	C-Max	C-Max	
5.0	5.0	5.0	7.0	7.0	7.0	5.0	5.0	5.0	
26.0	26.0	26.0	14.0	14.0	14.0	26.0	26.0	26.0	
10	10	10	10	10	10	10	10	10	
31.6	31.6	31.6	31.6	20.0	93.7	5.0	78.7	78.7	
0.21	0.21	0.21	0.21	0.13	0.62	0.03	0.52	0.52	
1.01	0.08	0.23	0.38	0.84	0.79	1.38	1.00	0.71	0.62
146.3	47.2	50.7	55.0	78.8	54.7	191.9	191.7	30.2	30.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
146.3	47.2	50.7	55.0	78.8	54.7	191.9	191.7	30.2	30.0
F	D	D	D	E	D	F	F	C	C
100.8			72.6		177.3		35.2		
F			E		F		D		
32.0	6.6	16.8	25.1	79.9	51.8	-586.8	16.2	140.5	96.9
#71.4	15.4	30.9	43.3	#122.8	m39.5m#354.2	#45.6	166.6	134.8	
172.9			177.4		1040.6		345.0		
70.0	150.0	50.0		130.0		180.0		60.0	
113	375	314	276	352	419	2013	54	1701	761
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0.96	0.07	0.22	0.36	0.81	0.79	1.38	1.00	0.71	0.62

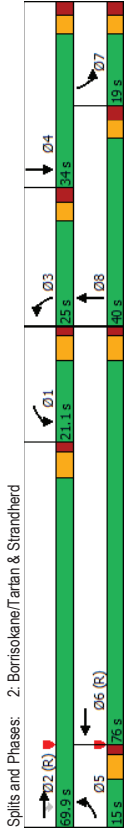
Intersection Summary
 Cycle Length: 150
 Actuated Cycle Length: 150
 Offset: 32 (21%), Referenced to phase 2:NBT and 6:SBT, Start of Green
 Natural Cycle: 125

Control Type: Actuated-Coordinated	Intersection LOS: F
Maximum v/c Ratio: 1.38	ICU Level of Service H
Intersection Signal Delay: 121.8	
Intersection Capacity Utilization: 133.1%	
Analysis Period (min): 15	
Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	
Volume for 95th percentile queue is metered by upstream signal.	



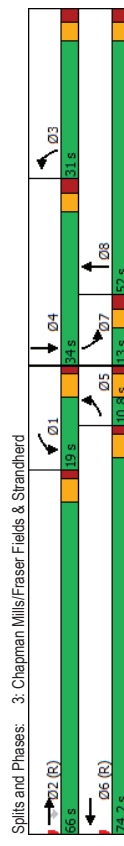
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	137	789	341	83	1874	745	49	69	23
Future Volume (vph)	137	789	341	83	1874	745	49	69	23
Lane Group Flow (vph)	137	789	341	83	1926	745	192	69	315
Turn Type	Prot	NA	Perm	Prot	NA	Prot	NA	Prot	NA
Protected Phases	5	2	2	1	6	3	8	7	4
Permitted Phases	5	2	2	1	6	3	8	7	4
Detector Phase	5	2	2	1	6	3	8	7	4
Switch Phase									
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	5.0	10.0	5.0	10.0
Minimum Split (s)	11.4	56.4	56.4	11.4	56.4	11.0	34.0	11.0	34.0
Total Split (s)	15.0	69.9	69.9	21.1	76.0	25.0	40.0	19.0	34.0
Total Split (%)	10.0%	46.6%	46.6%	14.1%	50.7%	16.7%	26.7%	12.7%	22.7%
Maximum Green (s)	8.6	63.5	63.5	14.7	69.6	19.0	34.0	13.0	28.0
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	3.3	3.3	3.3	3.3
All-Red Time (s)	1.8	1.8	1.8	1.8	1.8	2.7	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	6.4	6.4	6.4	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lead	Lead	Lag	Lead	Lead	Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	None	None	None	None
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	14.0	14.0	14.0	14.0	14.0	21.0	21.0	21.0	21.0
Pedestrian Calls (#/hr)	10	10	10	10	10	10	10	10	10
Act Effr Green (s)	8.6	63.5	63.5	14.7	69.6	19.0	31.7	17.9	28.0
Actuated G/C Ratio	0.06	0.42	0.42	0.10	0.46	0.13	0.21	0.12	0.19
v/c Ratio	1.49	0.58	0.56	0.53	1.29	1.87	0.60	0.36	1.15
Control Delay	295.0	31.1	32.3	66.2	161.2	430.8	51.2	66.1	153.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	295.0	31.1	32.3	66.2	161.2	430.8	51.2	66.1	153.4
LOS	F	C	C	E	F	F	D	E	F
Approach Delay	60.0			157.3			353.0		137.7
Approach LOS	E			F			F		F
Queue Length 50th (m)	~53.9	116.7	95.0	22.1	~374.3	~173.1	55.8	18.2	~108.3
Queue Length 95th (m)	m#89.2	141.3	132.9	m#27.4	#414.2	#209.8	71.8	35.6	#167.3
Internal Link Dist (m)	1040.6			787.0			275.6		103.1
Turn Bay Length (m)	105.0			110.0	55.0	100.0		38.0	
Base Capacity (vph)	92	1372	613	158	1497	398	381	206	274
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	1.49	0.58	0.56	0.53	1.29	1.87	0.50	0.33	1.15

Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.87	
Intersection Signal Delay: 168.7	Intersection LOS: F
Intersection Capacity Utilization: 127.9%	IOU Level of Service H
Analysis Period (min): 15	
~ Volume exceeds capacity, queue is theoretically infinite.	
Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	4	670	327	67	1468	528	0	35	0
Future Volume (vph)	4	670	327	67	1468	528	0	35	0
Lane Group Flow (vph)	4	670	327	67	1484	528	123	35	12
Turn Type	Prot	NA	Perm	Prot	NA	Prot	NA	Prot	NA
Protected Phases	5	2	2	1	6	3	8	7	4
Permitted Phases	2								
Detector Phase	5	2	2	1	6	3	8	7	4
Switch Phase	3								
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	5.0	10.0	5.0	10.0
Minimum Split (s)	10.8	26.8	26.8	10.8	26.8	11.0	34.0	11.0	34.0
Total Split (s)	10.8	66.0	66.0	19.0	74.2	31.0	52.0	13.0	34.0
Total Split (%)	7.2%	44.0%	44.0%	12.7%	49.5%	20.7%	34.7%	8.7%	22.7%
Maximum Green (s)	5.0	60.2	60.2	13.2	68.4	25.0	46.0	7.0	28.0
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	3.3	3.3	3.3	3.3
All-Red Time (s)	1.6	1.6	1.6	1.6	1.6	2.7	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.8	5.8	5.8	5.8	5.8	6.0	6.0	6.0	6.0
Lead/Lag	Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	None	Min	None	Min
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	14.0	14.0	14.0	14.0	14.0	21.0	21.0	21.0	21.0
Pedestrian Calls (#/hr)	10	10	10	10	10	10	10	10	10
Act Effr Green (s)	5.0	71.6	71.6	10.9	83.6	30.1	41.7	7.1	16.4
Actuated G/C Ratio	0.03	0.48	0.48	0.07	0.56	0.20	0.28	0.05	0.11
v/c Ratio	0.07	0.43	0.47	0.57	0.82	0.84	0.31	0.46	0.08
Control Delay	46.0	8.6	10.3	64.3	15.3	47.1	26.7	89.0	56.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	46.0	8.6	10.3	64.3	15.3	47.1	26.7	89.0	56.1
LOS	D	A	B	E	B	D	C	F	E
Approach Delay	9.3	17.4	17.4	17.4	17.4	43.3	43.3	80.6	80.6
Approach LOS	A	B	B	B	B	D	D	F	F
Queue Length 50th (m)	1.3	19.2	17.9	20.2	28.3	52.4	16.6	10.1	3.4
Queue Length 95th (m)	m2.2	36.7	40.1	m27.3	#277.5	#110.8	33.7	22.5	9.1
Internal Link Dist (m)	787.0	628.9	628.9	628.9	628.9	349.9	349.9	82.1	82.1
Turn Bay Length (m)	40.0	145.0	40.0	40.0	105.0	105.0	40.0	40.0	40.0
Base Capacity (vph)	54	1546	691	142	1801	630	446	79	270
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	0.07	0.43	0.47	0.47	0.82	0.84	0.28	0.44	0.04

Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.84
Intersection Signal Delay: 21.0
Intersection LOS: C
IOU Level of Service F
Intersection Capacity Utilization 91.4%
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Splits and Phases: 3: Chapman Mills/Fraser Fields & Strandherd

Phase	Split (s)	Split (%)
Ø2 (R)	56.5	7.2%
Ø6 (R)	74.2	44.0%
Ø1	19.5	12.7%
Ø4	34.5	49.5%
Ø7	52.5	20.7%
Ø5	10.8	34.7%
Ø3	31.5	8.7%
Ø8	52.5	22.7%

Lanes, Volumes, Timings
4: Greenbank & Strandherd

2029 Future Total
05-26-2020

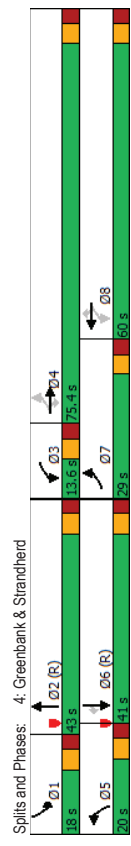
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	234	638	126	101	980	163	203	472	175	277	313
Future Volume (vph)	234	638	126	101	980	163	203	472	175	277	313
Lane Group Flow (vph)	234	638	126	101	980	163	203	593	175	277	313
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Prot	NA	Perm
Protected Phases	7	4	3	8	8	5	2	1	6	6	6
Permitted Phases	4	4	4	3	8	8	5	2	1	6	6
Detector Phase	7	4	4	3	8	8	5	2	1	6	6
Switch Phase											
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.6	33.5	33.5	11.6	33.5	33.5	11.3	35.5	11.3	35.5	35.5
Total Split (s)	29.0	75.4	75.4	13.6	60.0	60.0	20.0	43.0	18.0	41.0	41.0
Total Split (%)	19.3%	50.3%	50.3%	9.1%	40.0%	40.0%	13.3%	28.7%	12.0%	27.3%	27.3%
Maximum Green (s)	22.4	68.9	68.9	7.0	53.5	53.5	13.7	36.5	11.7	34.5	34.5
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.9	2.8	2.8	2.9	2.8	2.8	2.6	2.8	2.6	2.8	2.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.5	6.5	6.6	6.5	6.5	6.3	6.5	6.3	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag	Lag
Lead-Lag Optimize?											
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	None	C-Max	C-Max
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	10	10	10	10	10	10	10	10	10	10	10
Pedestrian Calls (#/hr)	77.6	64.1	64.1	57.1	50.2	50.2	13.3	41.2	11.8	39.7	39.7
Act Effr Green (s)	0.52	0.43	0.43	0.38	0.33	0.33	0.09	0.27	0.08	0.26	0.26
Actuated G/C Ratio	0.83	0.46	0.18	0.33	0.90	0.27	0.73	0.68	0.71	0.32	0.57
v/c Ratio	77.6	15.4	1.1	22.7	59.7	5.3	81.0	53.8	83.5	47.3	17.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Delay	77.6	15.4	1.1	22.7	59.7	5.3	81.0	53.8	83.5	47.3	17.3
LOS	E	B	A	C	E	A	F	D	F	D	B
Approach Delay	28.2	49.6	60.8	43.3	43.3	43.3	43.3	43.3	43.3	43.3	43.3
Approach LOS	C	D	E	D	D	D	D	D	D	D	D
Queue Length 50th (m)	46.9	43.8	0.2	14.2	141.8	0.0	29.3	87.4	26.0	36.2	18.0
Queue Length 95th (m)	#84.2	31.7	1.1	23.4	167.2	14.3	42.4	108.5	#41.2	50.1	50.8
Internal Link Dist (m)	596.1	267.5	267.5	571.3	571.3	571.3	571.3	571.3	571.3	571.3	571.3
Turn Bay Length (m)	66.0	95.0	120.0	66.0	72.0	66.0	72.0	85.0	85.0	145.0	145.0
Base Capacity (vph)	296	1488	724	309	1155	624	292	874	254	856	553
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.79	0.43	0.17	0.33	0.85	0.26	0.70	0.68	0.69	0.32	0.57

Intersection Summary
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 142 (95%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 105

Lanes, Volumes, Timings
4: Greenbank & Strandherd

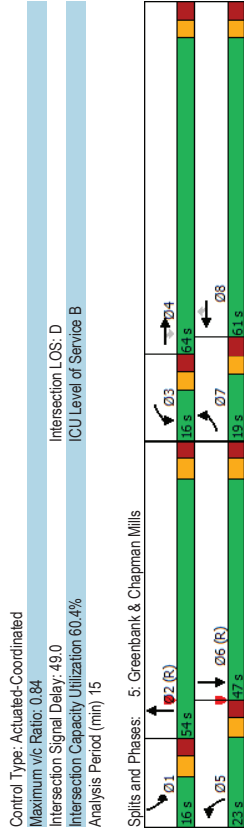
2029 Future Total
05-26-2020

Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.90
Intersection Signal Delay: 45.0
Intersection LOS: D
Intersection Capacity Utilization 94.1%
IOU Level of Service F
Analysis Period (min): 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



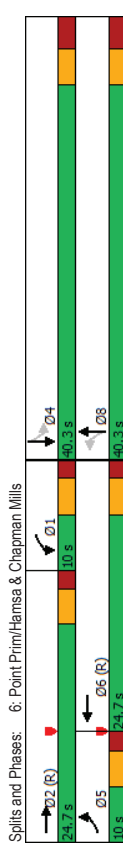
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations	4	4	4	4	4	4	4	4	4	4
Traffic Volume (vph)	44	380	55	33	288	53	65	197	30	70
Future Volume (vph)	44	380	55	33	288	53	65	197	30	70
Lane Group Flow (vph)	44	380	55	33	288	53	65	260	30	97
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Prot	NA
Protected Phases	7	4	3	8	8	5	2	1	6	6
Permitted Phases	7	4	4	3	8	8	5	2	1	6
Detector Phase	7	4	4	3	8	8	5	2	1	6
Switch Phase	7	4	4	3	8	8	5	2	1	6
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	5.0	10.0
Minimum Split (s)	11.8	43.8	43.8	11.8	43.8	43.8	11.8	43.8	11.8	43.8
Total Split (s)	19.0	64.0	64.0	16.0	61.0	61.0	23.0	54.0	16.0	47.0
Total Split (%)	12.7%	42.7%	42.7%	10.7%	40.7%	40.7%	15.3%	36.0%	10.7%	31.3%
Maximum Green (s)	12.2	57.2	57.2	9.2	54.2	54.2	16.2	47.2	9.2	40.2
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.7	3.7	3.7	3.7
All-Red Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.1	3.1	3.1	3.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?										
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	None	None	None
Walk Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0
Pedestrian Calls (#/hr)	10	10	10	10	10	10	10	10	10	10
Act Effr Green (s)	9.2	39.6	39.6	7.9	38.3	38.3	11.4	74.7	8.3	69.1
Actuated G/C Ratio	0.06	0.26	0.26	0.05	0.26	0.26	0.08	0.50	0.06	0.46
v/c Ratio	0.44	0.84	0.14	0.39	0.66	0.14	0.53	0.17	0.34	0.07
Control Delay	82.8	54.4	26.0	81.5	56.9	41.7	81.5	25.4	108.3	17.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	82.8	54.4	26.0	81.5	56.9	41.7	81.5	25.4	108.3	17.5
LOS	F	D	C	F	E	D	F	C	F	B
Approach Delay	54.0			57.0			36.6		39.0	
Approach LOS	D			E			D		D	
Queue Length 50th (m)	10.5	109.1	12.3	9.5	75.9	12.1	18.7	24.1	9.4	4.1
Queue Length 95th (m)	26.8	146.3	20.2	20.9	99.6	21.9	33.6	39.8	21.0	16.4
Internal Link Dist (m)	626.4			183.5			478.9		571.3	
Turn Bay Length (m)	40.0	60.0	40.0	30.0	60.0	30.0	60.0	60.0	60.0	60.0
Base Capacity (vph)	131	650	552	99	616	523	175	1556	104	1430
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	0.34	0.58	0.10	0.33	0.47	0.10	0.37	0.17	0.29	0.07

Intersection Summary
 Cycle Length: 150
 Actuated Cycle Length: 150
 Offset: 46 (31%), Referenced to phase 2:NBT and 6:SBT, Start of Green
 Natural Cycle: 115



EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
→	→	←	←	←	←	←	←
EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
5	2	1	6	8	8	4	4
Protected Phases							
Detector Phase							
Switch Phase							
Minimum Initial (s)	5.0	10.0	5.0	10.0	10.0	10.0	10.0
Minimum Split (s)	10.0	23.0	10.0	23.0	40.3	40.3	40.3
Total Split (s)	29	367	30	365	47	0	57
Total Split (%)	10.0	24.7	10.0	24.7	40.3	40.3	40.3
Maximum Green (s)	5.0	19.7	5.0	19.7	34.0	34.0	34.0
Maximum Yellow (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	1.7	1.7	1.7	1.7	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	6.3	6.3	6.3
Lead/Lag	Lead	Lead	Lag	Lag			
Lead-Lag Optimize?	Yes	Yes	Yes	Yes			
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Min	None	C-Min	None	None	None
Flash Dont Walk (s)	11.0	11.0	11.0	29.0	29.0	29.0	29.0
Pedestrian Calls (#/hr)	10	10	10	10	10	10	10
Act Effr Green (s)	6.1	48.9	5.6	48.4	15.0	15.0	15.0
Actuated g/C Ratio	0.08	0.65	0.07	0.65	0.20	0.20	0.20
v/c Ratio	0.22	0.35	0.25	0.35	0.25	0.25	0.29
Control Delay	40.7	15.0	30.4	11.7	24.8	25.8	25.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	40.7	15.0	30.4	11.7	24.8	25.8	25.8
LOS	D	B	C	B	C	C	C
Approach Delay	16.8	13.1	13.1	24.8	25.8	25.8	25.8
Approach LOS	B	B	B	C	C	C	C
Queue Length 50th (m)	7.7	3.5	3.2	21.4	7.8	9.3	9.3
Queue Length 95th (m)	m8.3	#162.7	m10.5	#92.8	10.9	12.5	12.5
Internal Link Dist (m)	462.9		626.4	112.1		80.0	
Turn Bay Length (m)	40.0	40.0					
Base Capacity (vph)	132	1103	121	1093	544	547	547
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.22	0.35	0.25	0.35	0.11	0.13	0.13
Intersection Summary							
Cycle Length: 75							
Actuated Cycle Length: 75							
Offset: 68 (91%), Referenced to phase 2,EBT and 6,WBT, Start of Green							
Natural Cycle: 75							

Control Type: Actuated-Coordinated	Intersection LOS: B
Maximum v/c Ratio: 0.35	ICU Level of Service A
Intersection Signal Delay: 16.3	
Intersection Capacity Utilization 44.1%	
Analysis Period (min): 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	188	516	87	97	238	84
Future Volume (vph)	188	516	87	97	238	84
Lane Group Flow (vph)	188	516	87	97	238	84
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8	8	2	2	6	6
Permitted Phases	8	8	2	2	6	6
Detector Phase						
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	24.8	24.8	23.8	23.8	23.8	23.8
Total Split (s)	45.0	45.0	30.0	30.0	30.0	30.0
Total Split (%)	60.0%	60.0%	40.0%	40.0%	40.0%	40.0%
Maximum Green (s)	39.0	39.0	24.2	24.2	24.2	24.2
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	1.4	1.4	1.2	1.2	1.2	1.2
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	5.8	5.8	5.8	5.8
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	C-Min	C-Min	C-Min	C-Min
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	2	2	2	2	2	2
Act Effr Green (s)	15.3	15.3	47.9	47.9	47.9	47.9
Actuated G/C Ratio	0.20	0.20	0.64	0.64	0.64	0.64
v/c Ratio	0.57	0.73	0.08	0.10	0.16	0.08
Control Delay	32.8	9.2	6.8	2.2	4.0	4.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.8	9.2	6.8	2.2	4.0	4.1
LOS	C	A	A	A	A	A
Approach Delay	15.5	4.4				4.1
Approach LOS	B	A				A
Queue Length 50th (m)	24.3	0.0	3.8	0.0	4.0	2.7
Queue Length 95th (m)	36.9	21.4	11.6	5.8	7.9	6.5
Internal Link Dist (m)	489.2		241.1			1276.6
Turn Bay Length (m)	38.0		30.0		150.0	
Base Capacity (vph)	842	1001	1090	961	1482	1090
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	0.22	0.52	0.08	0.10	0.16	0.08
Intersection Summary						
Cycle Length: 75						
Actuated Cycle Length: 75						
Offset: 10 (13%), Referenced to phase 2:NBT and 6:SBTL, Start of Green						
Natural Cycle: 50						

Lanes, Volumes, Timings
7: Borrissokane & Cambrian

2029 Future Total
05-26-2020

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.73

Intersection LOS: B

IOU Level of Service A

Intersection Signal Delay: 10.8

Intersection Capacity Utilization 51.9%

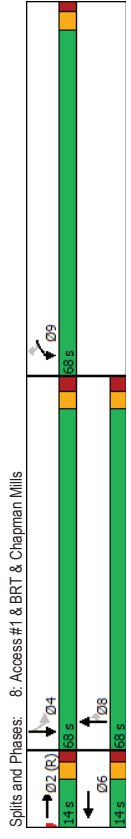
Analysis Period (min) 15

Splits and Phases: 7: Borrissokane & Cambrian

Lane Group	EBT	WBL	WBT	NBT	NBR	SBL	SBT
Lane Configurations	→	←	←	←	←	←	←
Traffic Volume (vph)	5	72	10	365	149	94	264
Future Volume (vph)	5	72	10	365	149	94	264
Lane Group Flow (vph)	5	72	10	365	149	94	264
Turn Type	NA	Prot	NA	custom	NA	Perm	NA
Protected Phases	2	9	6	8	8	4	4
Permitted Phases							
Detector Phase	2	9	6	9	8	4	4
Switch Phase							
Minimum Initial (s)	5.0	10.0	5.0	10.0	10.0	10.0	10.0
Minimum Split (s)	10.4	26.4	10.4	26.4	40.2	40.2	40.2
Total Split (s)	14.0	68.0	14.0	68.0	68.0	68.0	68.0
Total Split (%)	9.3%	45.3%	9.3%	45.3%	45.3%	45.3%	45.3%
Maximum Green (s)	8.6	62.6	8.6	62.6	61.8	61.8	61.8
All-Red Time (s)	2.1	2.1	2.1	2.1	2.9	2.9	2.9
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.4	5.4	5.4	6.2	6.2	6.2	6.2
Lead/Lag							
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	Min	Min	Min	Min	Min	Min
Walk Time (s)	7.0	7.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	14.0	14.0	29.0	29.0	29.0	29.0	29.0
Pedestrian Calls (#/hr)	45.9	44.4	45.9	44.4	42.6	42.6	42.6
Act Effr Green (s)	0.31	0.30	0.31	0.30	0.28	0.28	0.28
Actuated G/C Ratio	0.01	0.15	0.02	0.85	0.31	0.23	0.90
Control Delay	50.2	25.3	60.7	53.5	41.7	39.8	57.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	50.2	25.3	60.7	53.5	41.7	39.8	57.8
LOS	D	C	E	D	D	D	E
Approach Delay	50.2	49.2		41.0			50.1
Approach LOS	D	D		D			D
Queue Length 50th (m)	1.0	14.7	2.7	110.1	34.4	21.2	33.2
Queue Length 95th (m)	5.5	21.1	m8.7	80.7	46.6	31.7	77.0
Internal Link Dist (m)	50.9	462.9		117.7			349.9
Turn Bay Length (m)	38.0			60.0			15.0
Base Capacity (vph)	522	676	522	605	702	597	427
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.11	0.02	0.60	0.21	0.16	0.62

Intersection Summary	
Cycle Length:	150
Actuated Cycle Length:	150
Offset:	148 (99%), Referenced to phase 2:EBT, Start of Green
Natural Cycle:	80

Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.90
Intersection Signal Delay:	47.5
Intersection LOS:	D
IOU Level of Service A	
Intersection Capacity Utilization:	49.5%
Analysis Period (min):	15
m	Volume for 95th percentile queue is metered by upstream signal.

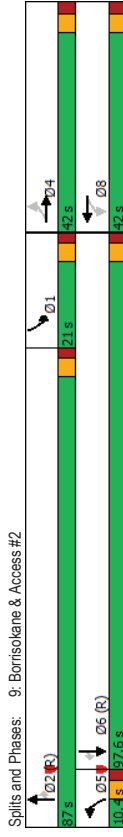


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	128	0	13	0	6	622	6	78	265	61
Traffic Volume (vph)	128	0	13	0	6	622	6	78	265	61
Future Volume (vph)	128	13	13	153	6	622	6	78	265	61
Lane Group Flow (vph)	Perm	NA	Perm	NA	Prot	NA	Perm	Prot	NA	Perm
Turn Type	4	8	8	5	2	2	1	6		
Protected Phases	4	8	8	5	2	2	1	6		
Permitted Phases	4	4	8	8	5	2	2	1	6	6
Detector Phase	4	4	8	8	5	2	2	1	6	6
Switch Phase										
Minimum Initial (s)	10.0	10.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	28.8	28.8	28.8	10.3	24.3	24.3	10.3	24.3	24.3	24.3
Total Split (s)	42.0	42.0	42.0	10.4	87.0	87.0	21.0	97.6	97.6	97.6
Total Split (%)	28.0%	28.0%	28.0%	6.9%	58.0%	58.0%	14.0%	65.1%	65.1%	65.1%
Maximum Green (s)	36.2	36.2	36.2	3.3	3.3	3.3	3.3	3.3	3.3	3.3
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.5	2.5	2.5	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.8	5.8	5.8	5.3	5.3	5.3	5.3	5.3	5.3	5.3
Lead/Lag					Lead	Lead	Lead	Lag	Lag	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max	C-Max
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	16.0	16.0	16.0	16.0	12.0	12.0	12.0	12.0	12.0	12.0
Pedestrian Calls (#/hr)	10	10	10	10	10	10	10	10	10	10
Act Effr Green (s)	24.9	24.9	24.9	24.9	5.9	93.0	93.0	15.7	111.8	111.8
Actuators g/C Ratio	0.17	0.17	0.17	0.17	0.04	0.62	0.62	0.10	0.75	0.75
v/c Ratio	0.90	0.02	0.06	0.27	0.10	0.59	0.01	0.46	0.21	0.06
Control Delay	112.1	0.1	48.8	1.2	74.8	20.8	0.0	53.2	0.7	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	112.1	0.1	48.8	1.2	74.8	20.8	0.0	53.2	0.7	0.1
LOS	F	A	D	A	E	C	A	D	A	A
Approach Delay	101.7		4.9		21.1			10.8		
Approach LOS	F		A		C			B		
Queue Length 50th (m)	37.3	0.0	3.3	0.0	1.8	104.3	0.0	19.9	1.2	0.0
Queue Length 95th (m)	57.7	0.0	8.9	0.0	m3.8	161.0	m0.0	35.0	2.1	0.1
Internal Link Dist (m)	145.0		184.4		1276.6			273.4		
Turn Bay Length (m)	38.0	36.0	36.0	38.0	38.0	30.0	38.0	30.0	30.0	30.0
Base Capacity (vph)	208	846	308	645	63	1057	921	169	1271	1096
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	0.62	0.02	0.04	0.24	0.10	0.59	0.01	0.46	0.21	0.06

Intersection Summary

Cycle Length: 150
Actuated Cycle Length: 150
Offset: 146 (97%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 80

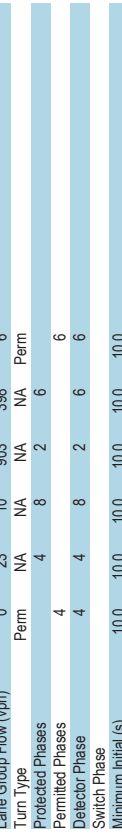
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.90
Intersection Signal Delay: 24.4
Intersection LOS: C
ICU Level of Service D
Intersection Capacity Utilization 76.0%
Analysis Period (min): 15
m. Volume for 95th percentile queue is metered by upstream signal.



	EBL	EBT	WBT	NBT	SBT	SBR
Lane Configurations	4	4	8	2	6	6
Traffic Volume (vph)	13	5	10	903	398	6
Future Volume (vph)	13	5	10	903	398	6
Lane Group Flow (vph)	0	23	10	903	398	6
Turn Type	Perm	NA	NA	NA	NA	Perm
Protected Phases	4	4	8	2	6	6
Permitted Phases	4	4	8	2	6	6
Detector Phase	4	4	8	2	6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	28.3	28.3	28.3	23.8	23.8	23.8
Total Split (s)	28.3	28.3	28.3	121.7	121.7	121.7
Total Split (%)	18.9%	18.9%	18.9%	81.1%	81.1%	81.1%
Maximum Green (s)	23.0	23.0	23.0	116.1	116.1	116.1
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.0	2.0	2.0	2.3	2.3	2.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.3	5.3	5.3	5.6	5.6	5.6
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	C-Max	C-Max	C-Max
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	16.0	16.0	16.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	10	10	10	10	10	10
Act Effr Green (s)	15.2	15.2	132.3	132.3	132.3	132.3
Actuated g/C Ratio	0.16	0.16	0.06	0.60	0.26	0.00
v/c Ratio	50.8	57.4	3.0	0.7	0.0	0.0
Control Delay	0.0	0.0	0.0	0.0	0.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	50.8	57.4	3.0	0.7	0.0	0.0
LOS	D	E	A	A	A	A
Approach Delay	50.8	57.4	3.0	0.7		
Approach LOS	D	E	A	A	A	A
Queue Length 50th (m)	5.1	2.8	9.7	1.1	0.0	0.0
Queue Length 95th (m)	13.4	8.2	27.1	m5.4	m0.0	m0.0
Internal Link Dist (m)	113.8	104.5	273.4	275.6		
Turn Bay Length (m)					30.0	
Base Capacity (vph)	216	261	1504	1504	1280	
Starvation Cap Reductn	0	0	14	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.11	0.04	0.61	0.26	0.00	

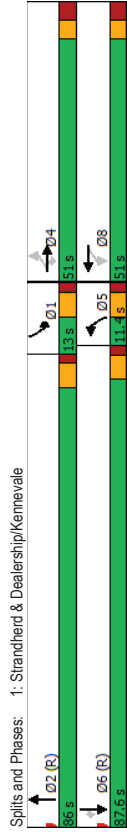
Intersection Summary
 Cycle Length: 150
 Actuated Cycle Length: 150
 Offset: 124 (83%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
 Natural Cycle: 80

Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.60
 Intersection Signal Delay: 3.5
 Intersection LOS: A
 IOU Level of Service C
 Intersection Capacity Utilization 67.6%
 Analysis Period (min) 15
 m Volume for 95th percentile queue is metered by upstream signal.



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	429	151	233	128	39	100	1780	93	2708	167
Future Volume (vph)	429	151	233	128	39	100	1780	93	2708	167
Lane Group Flow (vph)	429	151	233	128	139	100	1912	93	2708	167
Turn Type	Perm	NA	Perm	Perm	NA	Prot	NA	Prot	NA	Perm
Protected Phases	4	4	4	8	8	5	2	1	6	6
Permitted Phase	4	4	4	8	8	5	2	1	6	6
Detector Phase										
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)	39.9	39.9	39.9	32.9	32.9	11.4	30.4	11.4	39.4	39.4
Total Split (s)	51.0	51.0	51.0	51.0	51.0	11.4	86.0	13.0	87.6	87.6
Total Split (%)	34.0%	34.0%	34.0%	34.0%	34.0%	7.6%	57.3%	8.7%	58.4%	58.4%
Maximum Green (s)	44.1	44.1	44.1	44.1	44.1	5.0	79.6	6.6	81.2	81.2
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	3.6	3.6	3.6	3.6	3.6	1.8	1.8	1.8	1.8	1.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lost Time (s)	6.9	6.9	6.9	6.9	6.9	6.4	6.4	6.4	6.4	6.4
Lead/Lag						Lag	Lead	Lag	Lead	
Lead-Lag Optimize?						Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	C-Max	None	C-Max	C-Max	C-Max
Walk Time (s)	5.0	5.0	5.0	7.0	7.0	7.0	7.0	5.0	5.0	5.0
Flash Dont Walk (s)	26.0	26.0	26.0	14.0	14.0	14.0	14.0	26.0	26.0	26.0
Pedestrian Calls (#/hr)	10	10	10	10	10	10	10	10	10	10
Act Effr Green (s)	44.1	44.1	44.1	44.1	44.1	5.0	79.6	6.6	81.2	81.2
Actuated G/C Ratio	0.29	0.29	0.29	0.29	0.29	0.03	0.53	0.04	0.54	0.54
v/c Ratio	1.34	0.30	0.70	0.41	0.31	0.96	1.13	1.31	1.54	0.21
Control Delay	213.6	43.1	57.2	47.5	43.5	93.9	78.6	262.1	275.7	18.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	213.6	43.1	57.2	47.5	43.5	93.9	78.6	262.1	275.7	18.7
LOS	F	D	E	D	D	F	E	F	F	B
Approach Delay										
Approach LOS										
Queue Length 50th (m)	~163.6	34.5	76.7	30.3	31.8	15.6	~343.5	~34.9	~586.3	24.7
Queue Length 95th (m)	#228.7	53.9	110.8	50.4	51.0	m15.5m#3017	#72.0	#620.3	#38.4	38.4
Internal Link Dist (m)						177.4	1040.6		345.0	
Turn Bay Length (m)	70.0	150.0	50.0	130.0	130.0	180.0	180.0	60.0	60.0	60.0
Base Capacity (vph)	320	501	420	310	447	104	1699	71	1754	784
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	1.34	0.30	0.70	0.41	0.31	0.96	1.13	1.31	1.54	0.21

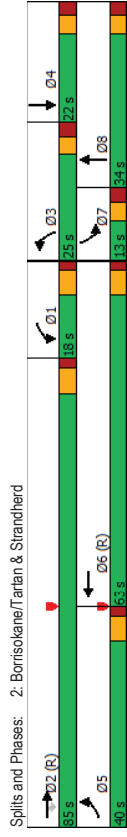
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.54	
Intersection Signal Delay: 173.4	Intersection LOS: F
Intersection Capacity Utilization: 132.2%	ICU Level of Service H
Analysis Period (min): 15	
~ Volume exceeds capacity, queue is theoretically infinite.	
Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	



Intersection Summary
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 28 (19%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 125

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	450	1824	754	148	1186	488	34	52	49
Future Volume (vph)	450	1824	754	148	1186	488	34	52	49
Lane Group Flow (vph)	450	1824	754	148	1251	488	168	92	192
Turn Type	Prot	NA	Perm	Prot	NA	Prot	NA	Prot	NA
Protected Phases	5	2	2	1	6	3	8	7	4
Permitted Phases	5	2	2	1	6	3	8	7	4
Detector Phase	5	2	2	1	6	3	8	7	4
Switch Phase									
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	5.0	10.0	5.0	10.0
Minimum Split (s)	11.4	56.4	56.4	11.4	56.4	11.0	34.0	11.0	16.0
Total Split (s)	40.0	85.0	85.0	18.0	63.0	25.0	34.0	13.0	22.0
Total Split (%)	26.7%	56.7%	56.7%	12.0%	42.0%	16.7%	22.7%	8.7%	14.7%
Maximum Green (s)	33.6	78.6	78.6	11.6	56.6	19.0	28.0	7.0	16.0
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	3.3	3.3	3.3	3.3
All-Red Time (s)	1.8	1.8	1.8	1.8	1.8	2.7	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	6.4	6.4	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	None	None	None	None
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	14.0	14.0	14.0	14.0	14.0	21.0	21.0	21.0	21.0
Pedestrian Calls (#/hr)	10	10	10	10	10	10	10	10	10
Act Effr Green (s)	33.6	78.6	78.6	11.6	56.6	19.0	30.6	6.9	16.0
Actuated g/C Ratio	0.22	0.52	0.52	0.08	0.38	0.13	0.20	0.05	0.11
v/c Ratio	1.24	1.07	0.99	1.18	1.03	1.23	0.55	0.70	1.19
Control Delay	159.2	49.2	22.1	174.6	64.0	169.9	62.2	113.0	186.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	159.2	49.2	22.1	174.6	64.0	169.9	62.2	113.0	186.6
LOS	F	D	C	F	E	F	E	F	F
Approach Delay	58.8			75.7		142.3		170.9	
Approach LOS	E			E		F		F	
Queue Length 50th (m)	~162.0	~308.5	138.9	~51.3	~202.5	~92.5	47.6	15.4	~67.7
Queue Length 95th (m)	m#7.2	m#66.6	m#41.4	m#78.0	m#220.6	#128.2	72.4	#37.2	#117.6
Internal Link Dist (m)	1040.6			787.0		275.6		103.1	
Turn Bay Length (m)	105.0	110.0	55.0	100.0	100.0	38.0			
Base Capacity (vph)	363	1698	759	125	1213	398	306	75	161
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	1.24	1.07	0.99	1.18	1.03	1.23	0.55	0.69	1.19

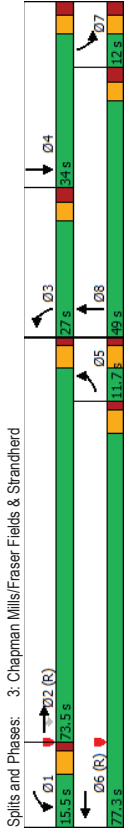
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.24	
Intersection Signal Delay: 78.7	Intersection LOS: E
Intersection Capacity Utilization 110.5%	ICU Level of Service H
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite.	
Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	



Intersection Summary	
Cycle Length:	150
Actuated Cycle Length:	150
Offset:	118 (79%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle:	125

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	15	1561	580	104	925	474	0	18	0
Future Volume (vph)	15	1561	580	104	925	474	0	18	0
Lane Group Flow (vph)	15	1561	580	104	925	474	85	18	8
Turn Type	Prot	NA	Perm	Prot	NA	Prot	NA	Prot	NA
Protected Phases	5	2	2	1	6	3	8	7	4
Permitted Phases	5	2	2	1	6	3	8	7	4
Detector Phase	5	2	2	1	6	3	8	7	4
Switch Phase	5	2	2	1	6	3	8	7	4
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	5.0	10.0	5.0	10.0
Minimum Split (s)	10.8	26.8	26.8	10.8	26.8	11.0	34.0	11.0	34.0
Total Split (s)	11.7	73.5	73.5	15.5	77.3	27.0	49.0	12.0	34.0
Total Split (%)	7.8%	49.0%	49.0%	10.3%	51.5%	18.0%	32.7%	8.0%	22.7%
Maximum Green (s)	5.9	67.7	67.7	9.7	71.5	21.0	43.0	6.0	28.0
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	3.3	3.3	3.3	3.3
All-Red Time (s)	1.6	1.6	1.6	1.6	1.6	2.7	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.8	5.8	5.8	5.8	5.8	6.0	6.0	6.0	6.0
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	None	None	None	Min
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	14.0	14.0	14.0	14.0	14.0	21.0	21.0	21.0	21.0
Pedestrian Calls (#/hr)	10	10	10	10	10	10	10	10	10
Act Effr Green (s)	5.8	74.5	74.5	14.5	90.1	21.0	32.6	12.1	16.4
Actuated G/C Ratio	0.04	0.50	0.50	0.10	0.60	0.14	0.22	0.08	0.11
v/c Ratio	0.24	0.97	0.81	0.66	0.51	1.08	0.27	0.14	0.05
Control Delay	47.5	20.4	13.7	87.0	11.5	130.6	69.4	62.1	55.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	47.5	20.4	13.7	87.0	11.5	130.6	69.4	62.1	55.0
LOS	D	C	B	F	B	F	E	E	D
Approach Delay	18.8	18.8	18.8	18.8	18.8	121.3	59.9	59.9	59.9
Approach LOS	B	B	B	B	B	F	F	F	E
Queue Length 50th (m)	4.1	82.8	33.4	28.3	36.2	-81.4	24.4	5.2	2.3
Queue Length 95th (m)	mm4.9mm#207.8	mm88.8	mm#43.2	177.3	#117.0	m35.5	12.4	7.0	7.0
Internal Link Dist (m)	787.0	787.0	787.0	628.9	628.9	349.9	349.9	82.1	82.1
Turn Bay Length (m)	40.0	145.0	40.0	105.0	105.0	105.0	40.0	40.0	40.0
Base Capacity (vph)	63	1608	719	157	1929	440	415	131	270
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	0.24	0.97	0.81	0.66	0.51	1.08	0.20	0.14	0.03
Intersection Summary									
Cycle Length: 150									
Actuated Cycle Length: 150									
Offset: 130 (87%), Referenced to phase 2:EBT and 6:WBT, Start of Green									
Natural Cycle: 125									

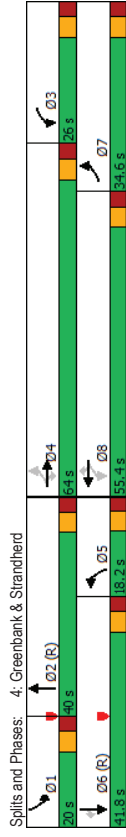
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.08
Intersection Signal Delay: 34.1
Intersection LOS: C
IOU Level of Service E
Intersection Capacity Utilization 87.2%
Analysis Period (min) 15
Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	390	1192	245	243	858	184	205	483	251	611	266
Future Volume (vph)	390	1192	245	243	858	184	205	483	251	611	266
Lane Group Flow (vph)	390	1192	245	243	858	184	205	630	251	611	266
Turn Type	pm-pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Prot	NA	Perm
Protected Phases	7	4	3	8	8	5	2	1	6		
Permitted Phases	4	4	4	3	8	8	5	2	1	6	6
Detector Phase	7	4	4	3	8	8	5	2	1	6	6
Switch Phase											
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.6	33.5	33.5	11.6	33.5	33.5	11.3	35.5	11.3	35.5	35.5
Total Split (s)	34.6	64.0	64.0	26.0	55.4	55.4	18.2	40.0	20.0	41.8	41.8
Total Split (%)	23.1%	42.7%	42.7%	17.3%	36.9%	36.9%	12.1%	26.7%	13.3%	27.9%	27.9%
Maximum Green (s)	28.0	57.5	57.5	19.4	48.9	48.9	11.9	33.5	13.7	35.3	35.3
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.9	2.8	2.8	2.9	2.8	2.8	2.6	2.8	2.6	2.8	2.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.5	6.5	6.6	6.5	6.5	6.3	6.5	6.3	6.5	6.5
Lead/Lag	Lag	Lead	Lag	Lead	Lead	Lag	Lag	Lag	Lead	Lead	Lead
Lead-Lag Optimize?											
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	None	C-Max	C-Max
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	10	10	10	10	10	10	10	10	10	10	10
Pedestrian Calls (#/hr)	83.2	57.0	57.0	64.3	44.8	44.8	11.9	33.7	13.7	35.5	35.5
Act Effr Green (s)	0.55	0.38	0.38	0.43	0.30	0.30	0.08	0.22	0.09	0.24	0.24
Actuated G/C Ratio	0.91	0.97	0.36	0.95	0.89	0.32	0.82	0.88	0.87	0.80	0.49
v/c Ratio	43.8	43.6	5.2	98.0	61.8	3.7	90.0	64.9	96.0	62.8	8.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Delay	43.8	43.6	5.2	98.0	61.8	3.7	90.0	64.9	96.0	62.8	8.3
LOS	D	D	A	F	E	A	F	E	F	E	A
Approach Delay											
Approach LOS											
Queue Length 50th (m)	89.7	145.6	5.2	57.1	125.1	0.0	31.4	90.5	38.1	89.7	0.0
Queue Length 95th (m)	m#107.6	m136.0	m11.2	#108.3	147.5	10.3	#51.8	#123.7	#61.9	112.1	23.1
Internal Link Dist (m)	596.1			267.5			571.3				216.2
Turn Bay Length (m)	66.0	95.0	120.0	66.0	72.0	66.0	72.0	85.0	85.0	145.0	145.0
Base Capacity (vph)	428	1242	676	257	1056	616	249	720	287	767	541
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.91	0.96	0.36	0.95	0.81	0.30	0.82	0.88	0.87	0.80	0.49

Intersection Summary
 Cycle Length: 150
 Actuated Cycle Length: 150
 Offset: 2 (1%), Referenced to phase 2:NBT and 6:SBT, Start of Green
 Natural Cycle: 125

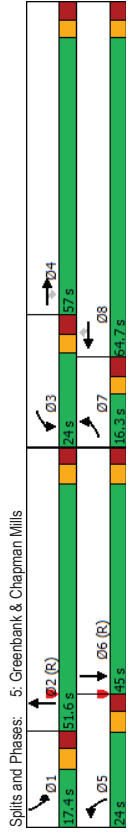
Control Type: Actuated-Coordinated	Intersection LOS: D
Maximum v/c Ratio: 0.97	ICU Level of Service G
Intersection Signal Delay: 53.5	
Intersection Capacity Utilization: 102.3%	
Analysis Period (min): 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	



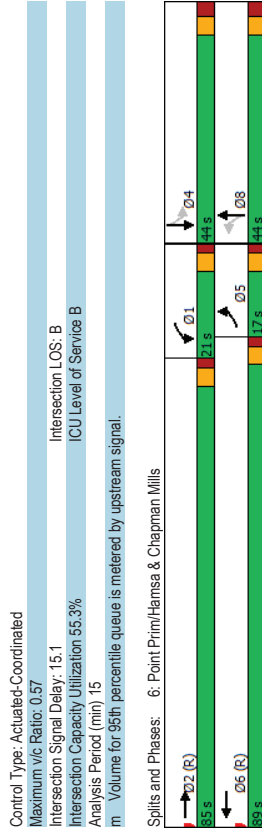
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations	38	388	74	92	404	49	92	251	50	113
Traffic Volume (vph)	38	388	74	92	404	49	92	251	50	113
Future Volume (vph)	38	388	74	92	404	49	92	295	50	157
Lane Group Flow (vph)	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Prot	NA
Turn Type	7	4	3	3	8	8	5	2	1	6
Protected Phases	4									
Permitted Phases	7	4	4	3	8	8	5	2	1	6
Detector Phase										
Switch Phase										
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	5.0	10.0
Minimum Split (s)	11.8	43.8	43.8	11.8	43.8	43.8	11.8	43.8	11.8	43.8
Total Split (s)	16.3	57.0	57.0	24.0	64.7	64.7	24.0	51.6	17.4	45.0
Total Split (%)	10.9%	38.0%	38.0%	16.0%	43.1%	43.1%	16.0%	34.4%	11.6%	30.0%
Maximum Green (s)	9.5	50.2	50.2	17.2	57.9	57.9	17.2	44.8	10.6	38.2
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.7	3.7	3.7
All-Red Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.1	3.1	3.1	3.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?										
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	None	None	None
Walk Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	10	10	10	10	10	10	10	10	10	10
Pedestrian Calls (#/hr)	8.2	39.6	39.6	13.4	47.3	47.3	13.5	62.9	9.4	56.3
Act Effr Green (s)	0.05	0.26	0.26	0.09	0.32	0.32	0.09	0.42	0.06	0.38
Actuated g/C Ratio	0.43	0.86	0.19	0.64	0.75	0.11	0.63	0.22	0.50	0.13
v/c Ratio	62.1	65.3	37.9	85.0	55.1	35.1	84.3	32.1	51.0	41.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Delay	62.1	65.3	37.9	85.0	55.1	35.1	84.3	32.1	51.0	41.1
LOS	E	E	D	F	E	D	F	C	D	D
Approach Delay	61.0			58.3			44.5		43.5	
Approach LOS	E			E			D		D	
Queue Length 50th (m)	10.0	111.1	21.0	26.4	109.5	10.5	26.4	30.3	13.5	22.0
Queue Length 95th (m)	m18.5	147.2	36.5	44.3	130.9	18.3	44.1	48.3	m21.0	m28.8
Internal Link Dist (m)	626.4			183.5			478.9		571.3	
Turn Bay Length (m)	40.0	60.0	40.0	30.0	60.0	60.0	30.0	60.0	60.0	60.0
Base Capacity (vph)	102	570	485	185	658	559	186	1329	117	1164
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	0.37	0.68	0.15	0.50	0.61	0.09	0.49	0.22	0.43	0.13

Intersection Summary
 Cycle Length: 150
 Actuated Cycle Length: 150
 Offset: 78 (52%), Referenced to phase 2:NBT and 6:SBT, Start of Green
 Natural Cycle: 115

Control Type: Actuated-Coordinated	Intersection LOS: D
Maximum v/c Ratio: 0.86	IOU Level of Service B
Intersection Signal Delay: 54.0	
Intersection Capacity Utilization 63.3%	
Analysis Period (min) 15	
m Volume for 95th percentile queue is metered by upstream signal.	



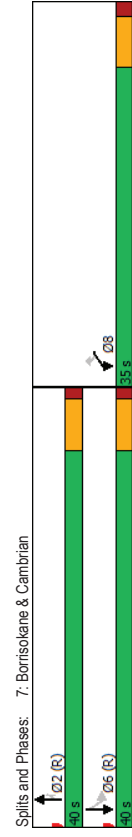
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	5	2	1	6	8	8	4	4
Traffic Volume (vph)	52	473	65	420	30	0	48	0
Future Volume (vph)	52	473	65	420	30	0	48	0
Lane Group Flow (vph)	52	519	65	443	0	39	0	60
Turn Type	Prot	NA	Prot	NA	Perm	NA	Perm	NA
Protected Phases	5	2	1	6	8	8	4	4
Permitted Phases	5	2	1	6	8	8	4	4
Detector Phase	5	2	1	6	8	8	4	4
Switch Phase	5	2	1	6	8	8	4	4
Minimum Initial (s)	5.0	10.0	5.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	10.0	23.0	10.0	23.0	42.3	42.3	42.3	42.3
Total Split (s)	17.0	85.0	21.0	89.0	44.0	44.0	44.0	44.0
Total Split (%)	11.3%	56.7%	14.0%	59.3%	29.3%	29.3%	29.3%	29.3%
Maximum Green (s)	12.0	80.0	16.0	84.0	37.7	37.7	37.7	37.7
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	1.7	1.7	1.7	1.7	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	6.3	6.3	6.3	6.3
Lag/Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	None	C-Max	Max	Max	Max	Max
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	29.0	29.0	29.0	29.0	29.0
Pedestrian Calls (#/hr)	10	10	10	10	10	10	10	10
Act Effr Green (s)	9.7	80.8	13.0	84.0	42.2	42.2	42.2	42.2
Actuated G/C Ratio	0.06	0.54	0.09	0.56	0.28	0.28	0.28	0.28
v/c Ratio	0.50	0.57	0.46	0.47	0.11	0.11	0.17	0.17
Control Delay	65.0	3.8	72.6	7.4	43.9	44.7	44.7	44.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	65.0	3.8	72.6	7.4	43.9	44.7	44.7	44.7
LOS	E	A	E	A	D	D	D	D
Approach Delay	9.3	15.8	15.8	43.9	44.7	44.7	44.7	44.7
Approach LOS	A	B	B	D	D	D	D	D
Queue Length 50th (m)	16.2	6.3	20.3	7.4	8.8	8.8	13.7	13.7
Queue Length 95th (m)	m21.8	m9.2	m32.9	55.0	18.9	18.9	28.6	28.6
Internal Link Dist (m)	462.9	462.9	462.9	626.4	112.1	112.1	80.0	80.0
Turn Bay Length (m)	40.0	40.0	40.0	40.0	369	369	360	360
Base Capacity (vph)	129	907	172	947	0	0	0	0
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.40	0.57	0.38	0.47	0.11	0.11	0.17	0.17



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	132	358	76	169	533	86
Future Volume (vph)	132	358	76	169	533	86
Lane Group Flow (vph)	132	358	76	169	533	86
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2		2	6
Permitted Phases	8	8	2	2	6	6
Detector Phase						
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	24.8	24.8	23.8	23.8	23.8	23.8
Total Split (s)	35.0	35.0	40.0	40.0	40.0	40.0
Total Split (%)	46.7%	46.7%	53.3%	53.3%	53.3%	53.3%
Maximum Green (s)	29.0	29.0	34.2	34.2	34.2	34.2
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	1.4	1.4	1.2	1.2	1.2	1.2
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	5.8	5.8	5.8	5.8
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	C-Min	C-Min	C-Min	C-Min
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	2	2	2	2	2	2
Act Effr Green (s)	12.6	12.6	50.6	50.6	50.6	50.6
Actuated g/C Ratio	0.17	0.17	0.67	0.67	0.67	0.67
v/c Ratio	0.49	0.66	0.07	0.16	0.34	0.07
Control Delay	33.8	9.7	5.1	1.5	1.4	0.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.8	9.7	5.1	1.5	1.4	0.6
LOS	C	A	A	A	A	A
Approach Delay	16.2	2.6				1.3
Approach LOS	B	A				A
Queue Length 50th (m)	17.3	0.0	2.9	0.0	0.7	0.2
Queue Length 95th (m)	29.5	19.4	8.6	6.3	0.4	0.2
Internal Link Dist (m)	489.2		241.1			1276.6
Turn Bay Length (m)	38.0		30.0		150.0	
Base Capacity (vph)	626	780	1152	1033	1581	1152
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	0.21	0.46	0.07	0.16	0.34	0.07

Intersection Summary	
Cycle Length: 75	
Actuated Cycle Length: 75	
Offset: 64 (85%), Referenced to phase 2:NBT and 6:SBTL, Start of Green	
Natural Cycle: 50	

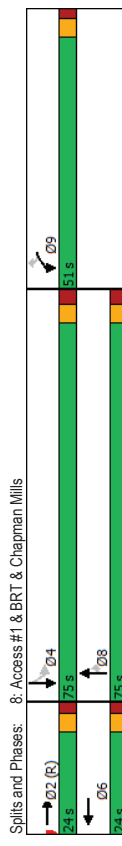
Lanes, Volumes, Timings 7: Borrissokane & Cambrian	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.66	
Intersection Signal Delay: 6.9	Intersection LOS: A
Intersection Capacity Utilization 41.6%	IOU Level of Service A
Analysis Period (min): 15	



Lane Group	EBT	WBL	WBT	NBT	NBR	SBL	SBT
Lane Configurations	←	←	←	←	←	←	←
Traffic Volume (vph)	5	103	10	354	103	69	452
Future Volume (vph)	5	103	10	354	103	69	452
Lane Group Flow (vph)	5	103	10	354	103	69	452
Turn Type	NA	Prot	NA	custom	NA	Perm	NA
Protected Phases	2	9	6	8	8	4	4
Permitted Phases	2	9	6	9	8	4	4
Detector Phase	2	9	6	9	8	4	4
Switch Phase							
Minimum Initial (s)	5.0	10.0	5.0	10.0	10.0	10.0	10.0
Minimum Split (s)	22.4	26.4	22.4	26.4	42.2	42.2	42.2
Total Split (s)	24.0	51.0	24.0	51.0	75.0	75.0	75.0
Total Split (%)	16.0%	34.0%	16.0%	34.0%	50.0%	50.0%	50.0%
Maximum Green (s)	18.6	45.6	18.6	45.6	68.8	68.8	68.8
All-Red Time (s)	2.1	2.1	2.1	2.1	2.9	2.9	2.9
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.4	5.4	5.4	6.2	6.2	6.2	6.2
Lead/Lag							
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	None	None	Max	Max	Max	Max
Walk Time (s)	7.0	7.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	14.0	14.0	29.0	29.0	29.0	29.0	29.0
Pedestrian Calls (#/hr)	10	10	10	10	10	10	10
Act Effr Green (s)	23.7	40.5	23.7	40.5	68.8	68.8	68.8
Actuated G/C Ratio	0.16	0.27	0.16	0.27	0.46	0.46	0.46
v/c Ratio	0.02	0.24	0.04	0.91	0.13	0.10	0.84
Control Delay	57.8	22.4	62.7	58.1	24.0	23.7	35.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	57.8	22.4	62.7	58.1	24.0	23.7	35.3
LOS	E	C	E	C	C	D	B
Approach Delay	57.8	50.3	23.9	29.4	29.4	29.4	29.4
Approach LOS	E	D	C	C	C	C	C
Queue Length 50th (m)	1.3	24.2	3.1	103.9	17.2	11.4	141.3
Queue Length 95th (m)	5.6	37.9	m6.7	#145.4	29.0	20.9	#182.4
Internal Link Dist (m)	67.7	462.9	462.9	117.7	349.9	349.9	349.9
Turn Bay Length (m)	38.0	60.0	60.0	15.0	15.0	38.0	38.0
Base Capacity (vph)	269	492	269	440	782	665	539
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.21	0.04	0.80	0.13	0.10	0.84

Intersection Summary	
Cycle Length:	150
Actuated Cycle Length:	150
Offset:	140 (93%), Referenced to phase 2:EBT, Start of Green
Natural Cycle:	95

Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.91
Intersection Signal Delay:	36.6
Intersection LOS:	D
ICU Level of Service B	
Intersection Capacity Utilization:	55.5%
Analysis Period (min):	15
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	

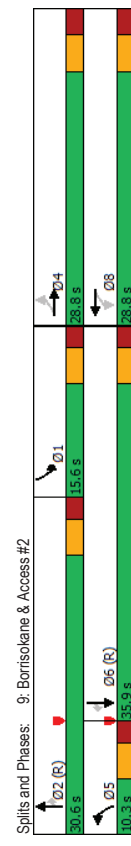


Splits and Phases: 8: Access #1 & BRT & Chapman Mills

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	91	0	9	0	12	386	12	153	621	124
Traffic Volume (vph)	91	0	9	0	12	386	12	153	621	124
Future Volume (vph)	91	0	9	0	12	386	12	153	621	124
Lane Group Flow (vph)	91	0	9	109	12	386	12	153	621	124
Turn Type	Perm	NA	Perm	NA	Prot	NA	Perm	NA	NA	Perm
Protected Phases	4	8	8	5	2	2	1	6		
Permitted Phase	4	4	8	8	5	2	2	1	6	6
Detector Phase										
Switch Phase										
Minimum Initial (s)	10.0	10.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	28.8	28.8	28.8	28.8	10.3	24.3	24.3	10.3	24.3	24.3
Total Split (s)	28.8	28.8	28.8	28.8	10.3	30.6	30.6	15.6	35.9	35.9
Total Split (%)	38.4%	38.4%	38.4%	38.4%	13.7%	40.8%	40.8%	20.8%	47.9%	47.9%
Maximum Green (s)	23.0	23.0	23.0	23.0	5.0	25.3	25.3	10.3	30.6	30.6
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.5	2.5	2.5	2.5	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lost Time (s)	5.8	5.8	5.8	5.8	5.3	5.3	5.3	5.3	5.3	5.3
Total Lost Time (s)										
Lead/Lag										
Lead-Lag Optimize?										
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	10	10	10	10	10	10	10	10	10	10
Pedestrian Calls (#/hr)	13.5	13.5	13.5	13.5	5.7	38.0	38.0	10.3	52.6	52.6
Act Effr Green (s)	0.18	0.18	0.18	0.18	0.08	0.51	0.51	0.14	0.70	0.70
Actuated g/C Ratio	0.43	0.02	0.04	0.16	0.10	0.45	0.02	0.69	0.52	0.12
v/c Ratio	32.4	0.1	22.3	0.5	33.8	16.1	0.0	45.3	11.5	3.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.4	0.1	22.3	0.5	33.8	16.1	0.0	45.3	11.5	3.0
LOS	C	A	C	A	C	B	A	D	B	A
Approach Delay	29.4		2.1		16.2			16.1		
Approach LOS	C		A		B			B		
Queue Length 50th (m)	11.9	0.0	1.1	0.0	1.5	29.1	0.0	22.7	61.9	2.5
Queue Length 95th (m)	20.4	0.0	3.9	0.0	m#4.2	78.1	m#0.0	#35.6	#127.0	10.7
Internal Link Dist (m)	154.2		129.4		1276.6			273.4		
Turn Bay Length (m)	38.0	38.0	38.0	38.0	38.0	38.0	38.0	38.0	38.0	38.0
Base Capacity (vph)	359	654	383	814	123	864	792	222	1196	1051
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	0.25	0.01	0.02	0.13	0.10	0.45	0.02	0.69	0.52	0.12

Intersection Summary
 Cycle Length: 75
 Actuated Cycle Length: 75
 Offset: 62 (83%), Referenced to phase 2:NBT and 6:SBT, Start of Green
 Natural Cycle: 75

Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.69	
Intersection Signal Delay: 15.9	Intersection LOS: B
Intersection Capacity Utilization 64.3%	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.	
m Volume for 95th percentile queue is metered by upstream signal.	

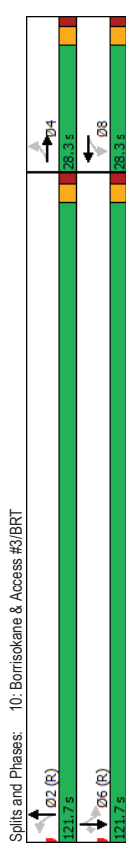


Splits and Phases: 9: Borrissokane & Access #2

	EBL	EBT	WBT	NBT	SBT	SBR
Lane Configurations	4	4	8	2	6	6
Traffic Volume (vph)	9	5	10	586	893	12
Future Volume (vph)	9	5	10	586	893	12
Lane Group Flow (vph)	Perm	NA	NA	NA	NA	Perm
Turn Type	4	8	2	2	6	6
Protected Phases	4	8	2	2	6	6
Detector Phase	4	8	2	2	6	6
Switch Phase	4	8	2	2	6	6
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	28.3	28.3	28.3	23.6	23.6	23.6
Total Split (s)	28.3	28.3	28.3	121.7	121.7	121.7
Total Split (%)	18.9%	18.9%	18.9%	81.1%	81.1%	81.1%
Maximum Green (s)	23.0	23.0	23.0	116.1	116.1	116.1
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.0	2.0	2.0	2.3	2.3	2.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.3	5.3	5.6	5.6	5.6	5.6
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	C-Max	C-Max	C-Max
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	16.0	16.0	16.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	10	10	10	10	10	10
Act Effr Green (s)	15.2	15.2	132.3	132.3	132.3	132.3
Actuated g/C Ratio	0.10	0.10	0.88	0.88	0.88	0.88
v/c Ratio	47.9	57.4	5.5	0.3	0.0	0.0
Control Delay	0.0	0.0	0.0	0.4	0.0	0.0
Queue Delay	47.9	57.4	5.5	0.7	0.0	0.0
Total Delay	47.9	57.4	5.5	0.7	0.0	0.0
LOS	D	E	A	A	A	A
Approach Delay	47.9	57.4	5.5	0.7		
Approach LOS	D	E	A	A	A	A
Queue Length 50th (m)	3.9	2.8	53.4	1.2	0.0	0.0
Queue Length 95th (m)	11.4	8.2	95.6	m0.7	m0.0	m0.0
Internal Link Dist (m)	209.1	212.9	273.4	275.6		
Turn Bay Length (m)					30.0	
Base Capacity (vph)	223	261	1504	1504	1280	1280
Starvation Cap Reductn	0	0	0	202	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.04	0.39	0.69	0.01	0.01

Intersection Summary	
Cycle Length:	150
Actuated Cycle Length:	150
Offset:	84 (56%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle:	80

Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.59
Intersection Signal Delay:	3.5
Intersection LOS:	A
IOU Level of Service C	
Intersection Capacity Utilization:	67.0%
Analysis Period (min):	15
m. Volume for 95th percentile queue is metered by upstream signal.	



Appendix J

Synchro Intersection Worksheets – 2034 Future Total Conditions

DRAFT

Lanes, Volumes, Timings
1: Strandherd & Dealership/Kennevale

2034 Future Total
05-26-2020

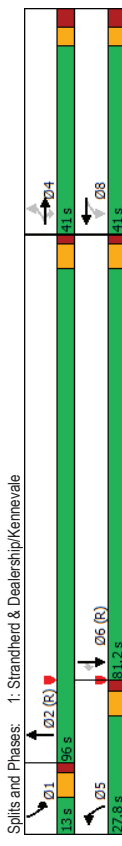
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	109	28	69	100	168	116	333	2807	86	54	1267	471
Traffic Volume (vph)	109	28	69	100	168	116	333	2807	86	54	1267	471
Future Volume (vph)	1621	1706	1450	1621	1602	0	3144	3226	0	1621	3241	1450
Satd. Flow (prot)	0.299			0.739			0.950			0.950		
FI Permitted	510	1706	1431	1259	1602	0	3144	3226	0	1620	3241	1450
Satd. Flow (RTOR)												
Lane Group Flow (vph)	109	28	69	100	284	0	333	2893	0	54	1267	471
Turn Type	Perm	NA	Perm	Perm	NA	Prot	NA	Prot	NA	Prot	NA	Perm
Protected Phases	4	4	4	8	8	5	2			1	6	
Permitted Phases	4	4	4	8	8	5	2			1	6	
Detector Phase	4	4	4	8	8	5	2			1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	10.0
Minimum Split (s)	39.9	39.9	39.9	32.9	32.9	11.4	30.4		11.4	39.4	39.4	
Total Split (s)	41.0	41.0	41.0	41.0	41.0	27.8	96.0		13.0	81.2	81.2	
Total Split (%)	27.3%	27.3%	27.3%	27.3%	27.3%	18.5%	64.0%		8.7%	54.1%	54.1%	
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	4.6	4.6		4.6	4.6	4.6	
All-Red Time (s)	3.6	3.6	3.6	3.6	3.6	1.8	1.8		1.8	1.8	1.8	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	
Total Lost Time (s)	6.9	6.9	6.9	6.9	6.9	6.4	6.4		6.4	6.4	6.4	
Lead/Lag						Lead	Lag		Lead	Lag		
Lead-Lag Optimize?						Yes	Yes		Yes	Yes		
Recall Mode	None	None	None	None	None	C-Max	C-Max		None	C-Max	C-Max	
Act Effct Green (s)	31.3	31.3	31.3	31.3	31.3	19.7	91.8		7.2	79.3	79.3	
Actuated G/C Ratio	0.21	0.21	0.21	0.21	0.21	0.13	0.61		0.05	0.53	0.53	
v/c Ratio	1.03	0.08	0.23	0.38	0.85	0.81	1.47		0.70	0.74	0.61	
Control Delay	152.4	46.6	50.2	54.6	79.5	77.9	229.4		111.1	31.7	30.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	
Total Delay	152.4	46.6	50.2	54.6	79.5	77.9	229.4		111.1	31.7	30.3	
LOS	F	D	D	D	E	E	F		F	C	C	
Approach Delay						73.0	213.8			33.7		
Approach LOS						F	F			C		
Queue Length 50th (m)	31.8	6.5	16.6	24.9	79.0	47.2	-634.4		16.0	157.0	100.0	
Queue Length 95th (m)	#/0.6	15.2	30.6	42.9	#/19.2	m33.5	#/371.4		#40.4	186.9	139.7	
Internal Link Dist (m)	70.0	172.9		177.4		1040.6				345.0		
Turn Bay Length (m)	70.0	150.0	50.0	50.0	50.0	130.0			180.0		60.0	
Base Capacity (vph)	115	387	325	286	364	448	1973		77	1713	766	
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	0.95	0.07	0.21	0.35	0.78	0.74	1.47		0.70	0.74	0.61	

Intersection Summary
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 52 (35%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 125
Control Type: Actuated-Coordinated

Lanes, Volumes, Timings
1: Strandherd & Dealership/Kennevale

2034 Future Total
05-26-2020

Maximum v/c Ratio: 1.47	Intersection LOS: F
Intersection Signal Delay: 142.6	ICU Level of Service H
Intersection Capacity Utilization 136.3%	
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite.	
# Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer.	
~ Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	



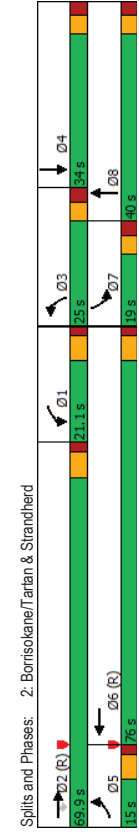
Lanes, Volumes, Timings 2034 Future Total 05-26-2020

Lanes, Volumes, Timings 2034 Future Total 05-26-2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	137	837	354	83	1943	52	775	49	143	69	23	292
Traffic Volume (vph)	137	837	354	83	1943	52	775	49	143	69	23	292
Future Volume (vph)	1621	3241	1450	1621	3228	0	3144	1515	0	1621	1469	0
Satd. Flow (prot)	0.950			0.950			0.950			0.950		
Flt Permitted	1621	3241	1450	1621	3228	0	3144	1515	0	1621	1469	0
Satd. Flow (perm)	137	837	354	83	1995	0	775	192	0	69	315	0
Lane Group Flow (vph)	Prot	NA	Perm	Prot	NA	Prot	NA	Prot	NA	Prot	NA	
Turn Type	5	2	2	1	6	3	8	7	4			
Protected Phases												
Permitted Phases	5	2	2	1	6	3	8	7	4			
Detector Phase												
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	5.0	10.0	5.0	10.0	5.0	10.0	
Minimum Split (s)	11.4	56.4	56.4	11.4	56.4	11.0	34.0	11.0	34.0	11.0	34.0	
Total Split (s)	15.0	69.9	69.9	21.1	76.0	25.0	40.0	19.0	34.0	12.7%	22.7%	
Total Split (%)	10.0%	46.6%	46.6%	14.1%	50.7%	16.7%	26.7%	12.7%	22.7%			
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	3.3	3.3	3.3	3.3			
All-Red Time (s)	1.8	1.8	1.8	1.8	1.8	2.7	2.7	2.7	2.7			
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
Total Lost Time (s)	6.4	6.4	6.4	6.4	6.4	6.0	6.0	6.0	6.0			
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lead	Lag	Lead	Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	C-Max	C-Max	None	C-Max	None	None	None	None	None	None	
Act Effct Green (s)	8.6	63.5	63.5	14.7	69.6	19.0	38.7	10.9	28.0			
Actuated G/C Ratio	0.06	0.42	0.42	0.10	0.46	0.13	0.26	0.07	0.19			
v/c Ratio	1.49	0.61	0.58	0.53	1.33	1.95	0.49	0.59	1.15			
Control Delay	302.9	20.1	20.7	64.1	181.2	464.2	46.9	86.9	153.4			
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
Total Delay	302.9	20.1	20.7	64.1	181.2	464.2	46.9	86.9	153.4			
LOS	F	C	C	E	F	F	D	F	F			
Approach Delay		49.4		176.5		381.4		141.5				
Approach LOS		D		F		F		F				
Queue Length 50th (m)	-54.1	86.2	64.6	22.1	-306.8	-182.7	52.0	19.9	-108.3			
Queue Length 95th (m)	m#85.0	86.7	84.0	m#26.4	#436.6	#219.5	75.1	36.0	#167.3			
Internal Link Dist (m)		1040.6		787.0		275.6		103.1				
Turn Bay Length (m)		105.0		110.0		55.0		100.0				
Base Capacity (vph)		92	1372	613	158	1497	398	390	140	274		
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	1.49	0.61	0.58	0.53	1.33	1.95	0.49	0.49	1.15			

Intersection Summary
 Cycle Length: 150
 Actuated Cycle Length: 150
 Offset: 130 (87%), Referenced to phase 2:EBT and 6:WBT, Start of Green
 Natural Cycle: 125
 Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.95
 Intersection Signal Delay: 179.8
 Intersection LOS: F
 ICU Level of Service H
 Intersection Capacity Utilization 130.8%
 Analysis Period (min) 15
 ~ Volume exceeds capacity, queue is theoretically infinite.
 # Queue shown is maximum after two cycles, queue may be longer.
 # 95th percentile volume exceeds capacity, queue may be longer.
 ~ Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.



Lanes, Volumes, Timings
3: Chapman Mills/Fraser Fields & Strandherd

2034 Future Total
05-26-2020

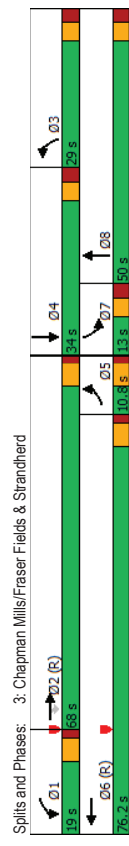
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	4	716	327	67	1542	16	528	0	123	35	0	12
Traffic Volume (vph)	4	716	327	67	1542	16	528	0	123	35	0	12
Future Volume (vph)	1621	3241	1450	1621	3234	0	3144	1450	0	1621	1450	0
Satd. Flow (prot)	0.950			0.950			0.950					0.950
Flt Permitted	1621	3241	1450	1621	3234	0	3144	1450	0	1621	1450	0
Satd. Flow (perm)	4	716	327	67	1558	0	528	123	0	35	12	0
Lane Group Flow (vph)	Prot	NA	Perm	Prot	NA	Prot	NA	Prot	NA	Prot	NA	
Turn Type	5	2	1	6	3	8	7	4				
Permitted Phases	2											
Detector Phase	5	2	2	1	6	3	8	8	7	4		
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	5.0	10.0	5.0	10.0	5.0	10.0	5.0
Minimum Split (s)	10.8	26.8	26.8	10.8	26.8	11.0	34.0	11.0	34.0	11.0	34.0	11.0
Total Split (s)	10.8	68.0	68.0	19.0	76.2	29.0	50.0	29.0	50.0	13.0	34.0	13.0
Total Split (%)	7.2%	45.3%	45.3%	12.7%	50.8%	19.3%	33.3%	19.3%	33.3%	8.7%	22.7%	8.7%
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	1.6	1.6	1.6	1.6	1.6	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.8	5.8	5.8	5.8	5.8	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lag/Lag	Lag	Lag	Lag	Lag	Lead	Lag	Lag	Lag	Lead	Lead	Lead	Lead
Lead/Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	None	C-Max	None	Mfn	None	Mfn	None	Mfn	None
Act Effct Green (s)	5.0	70.0	70.0	10.9	82.0	31.7	43.7	31.7	43.7	6.7	16.4	6.7
Actuated G/C Ratio	0.03	0.47	0.47	0.07	0.55	0.21	0.29	0.21	0.29	0.04	0.11	0.04
v/c Ratio	0.07	0.47	0.48	0.57	0.88	0.80	0.29	0.49	0.29	0.49	0.08	0.49
Control Delay	44.5	9.8	11.1	96.9	19.1	47.7	29.8	47.7	29.8	92.2	56.1	92.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.5	9.8	11.1	96.9	19.1	47.7	29.8	47.7	29.8	92.2	56.1	92.2
LOS	D	A	B	F	B	D	C	D	C	F	E	E
Approach Delay	10.3			22.3		44.3		83.0				
Approach LOS	B			C		D		F				
Queue Length 50th (m)	1.1	28.2	24.6	18.4	198.7	49.5	16.4	10.2	16.4	10.2	3.4	3.4
Queue Length 95th (m)	m2.0	34.0	33.1	m22.9	#295.5	#117.4	37.3	22.5	37.3	22.5	9.1	9.1
Internal Link Dist (m)	787.0			628.9		349.9		82.1				
Turn Bay Length (m)	40.0			145.0	40.0	105.0		40.0				
Base Capacity (vph)	64	1512	676	142	1767	663	446	663	446	75	270	75
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.47	0.48	0.47	0.88	0.80	0.28	0.47	0.28	0.47	0.04	0.47

Intersection Summary	
Cycle Length:	150
Actuated Cycle Length:	150
Offset:	144 (96%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle:	125
Control Type:	Actuated-Coordinated

Lanes, Volumes, Timings
3: Chapman Mills/Fraser Fields & Strandherd

2034 Future Total
05-26-2020

Maximum v/c Ratio:	0.88
Intersection Signal Delay:	23.7
Intersection LOS:	C
ICU Level of Service:	F
Analysis Period (min):	15
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	



Lanes, Volumes, Timings
4: Greenbank & Strandherd

2034 Future Total
05-26-2020

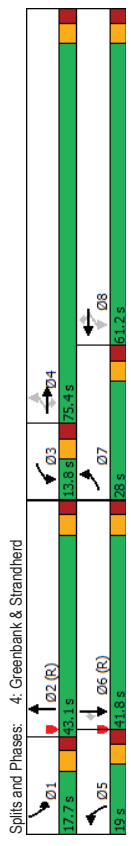
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	234	696	126	101	1045	163	203	494	121	175	292	313
Future Volume (vph)	234	696	126	101	1045	163	203	494	121	175	292	313
Satd. Flow (prot)	1621	3241	1450	1621	3241	1450	3144	3135	0	3144	3241	1450
Flt/Permitted	0.075			0.374			0.950					
Satd. Flow (perm)	128	3241	1430	638	3241	1450	3139	3135	0	3137	3241	1430
Satd. Flow (RTOR)	126			167			167	19				221
Lane Group Flow (vph)	234	696	126	101	1045	163	203	615	0	175	292	313
Turn Type	pm-pt	NA	Perm	pm-pt	NA	Perm	Prot	NA	Prot	NA	Perm	Perm
Permitted Phases	7	4	4	3	8	8	5	2	1	6	6	6
Detector Phase	7	4	4	3	8	8	5	2	1	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	5.0	10.0	10.0	10.0
Minimum Split (s)	11.6	33.5	33.5	11.6	33.5	33.5	11.3	35.5	11.3	35.5	35.5	35.5
Total Split (s)	28.0	75.4	75.4	13.8	61.2	61.2	19.0	43.1	17.7	41.8	41.8	41.8
Total Split (%)	18.7%	50.3%	50.3%	9.2%	40.8%	40.8%	12.7%	28.7%	11.8%	27.9%	27.9%	27.9%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.9	2.8	2.8	2.9	2.8	2.8	2.6	2.8	2.6	2.8	2.8	2.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.5	6.5	6.6	6.5	6.5	6.3	6.5	6.3	6.5	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag	Lag	Lag
Recall Mode	None	None	None	None	None	None	None	C-Max	None	C-Max	C-Max	C-Max
Act Effct Green (s)	79.5	65.8	65.8	59.6	52.5	52.5	12.5	39.8	11.3	38.6	38.6	38.6
Actuated G/C Ratio	0.53	0.44	0.44	0.40	0.35	0.35	0.08	0.27	0.08	0.26	0.26	0.26
v/c Ratio	0.86	0.49	0.18	0.34	0.92	0.27	0.77	0.73	0.74	0.35	0.59	0.59
Control Delay	88.4	20.5	2.2	22.0	60.2	5.2	87.9	54.0	86.7	48.0	20.0	20.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	88.4	20.5	2.2	22.0	60.2	5.2	87.9	54.0	86.7	48.0	20.0	20.0
LOS	F	C	A	C	E	A	F	D	F	D	D	C
Approach Delay	33.3			50.4			62.5			45.5		
Approach LOS	C			D			E			D		
Queue Length 50th (m)	57.2	34.4	0.0	13.8	151.1	0.0	30.9	91.4	26.3	38.2	23.1	23.1
Queue Length 95th (m)	#95.3	51.5	3.8	23.4	180.4	14.1	#48.6	112.8	#42.2	52.3	56.1	56.1
Internal Link Dist (m)	596.1			267.5			571.3			216.2		
Turn Bay Length (m)	66.0	95.0	120.0	66.0	72.0	66.0	72.0	85.0	85.0	145.0	145.0	145.0
Base Capacity (vph)	280	1488	724	300	1181	634	269	846	242	833	531	531
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.84	0.47	0.17	0.34	0.88	0.26	0.75	0.73	0.72	0.35	0.59	0.59

Intersection Summary	
Cycle Length:	150
Actuated Cycle Length:	150
Offset:	136 (91%), Referenced to phase 2:NBT and 6:SBT. Start of Green
Natural Cycle:	115
Control Type:	Actuated-Coordinated

Lanes, Volumes, Timings
4: Greenbank & Strandherd

2034 Future Total
05-26-2020

Maximum v/c Ratio:	0.92	Intersection LOS:	D
Intersection Signal Delay:	47.4	ICU Level of Service:	F
Intersection Capacity Utilization:	96.0%		
Analysis Period (min):	15		
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			



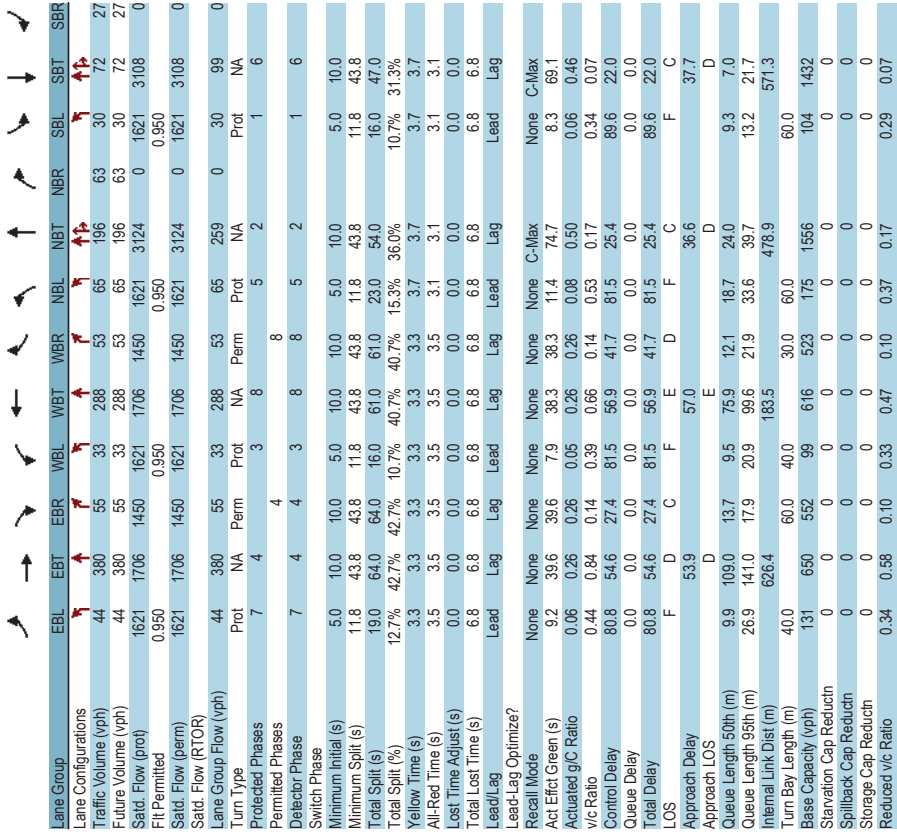
Lanes, Volumes, Timings
5: Greenbank & Chapman Mills

Lanes, Volumes, Timings
5: Greenbank & Chapman Mills

2034 Future Total
05-26-2020

2034 Future Total
05-26-2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	44	380	55	33	288	53	65	196	63	30	72	27
Traffic Volume (vph)	44	380	55	33	288	53	65	196	63	30	72	27
Future Volume (vph)	1621	1706	1450	1621	1706	1450	1621	3124	0	1621	3108	0
Sat'd. Flow (prot)	0.950			0.950			0.950					
Flt Permitted	1621	1706	1450	1621	1706	1450	1621	3124	0	1621	3108	0
Sat'd. Flow (RTOR)												
Lane Group Flow (vph)	44	380	55	33	288	53	65	259	0	30	99	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Prot	NA		
Protected Phases	7	4		3	8		5	2		1		6
Permitted Phases			4			8						
Detector Phase	7	4	4	3	8	8	5	2		1		6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0		5.0	10.0	
Minimum Split (s)	11.8	43.8	43.8	11.8	43.8	43.8	11.8	43.8		11.8	43.8	
Total Split (s)	19.0	64.0	64.0	16.0	61.0	61.0	23.0	54.0		16.0	47.0	
Total Split (%)	12.7%	42.7%	42.7%	10.7%	40.7%	40.7%	15.3%	36.0%		10.7%	31.3%	
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.7	3.7		3.7	3.7	
All-Red Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.1	3.1		3.1	3.1	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8		6.8	6.8	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Recall Mode	None	None	None	None	None	None	None	C-Max		None	C-Max	
Act Effct Green (s)	9.2	39.6	39.6	7.9	38.3	38.3	11.4	74.7		8.3	69.1	
Actuated G/C Ratio	0.06	0.26	0.26	0.05	0.26	0.26	0.08	0.50		0.06	0.46	
v/c Ratio	0.44	0.84	0.14	0.39	0.66	0.14	0.53	0.17		0.34	0.07	
Control Delay	80.8	54.6	27.4	81.5	56.9	41.7	81.5	25.4		89.6	22.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	80.8	54.6	27.4	81.5	56.9	41.7	81.5	25.4		89.6	22.0	
LOS	F	D	C	F	E	D	F	C		F	C	
Approach Delay												
Approach LOS												
Queue Length 50th (m)	9.9	109.0	13.7	9.5	75.9	12.1	18.7	24.0		9.3	7.0	
Queue Length 95th (m)	26.9	141.0	17.9	20.9	99.6	21.9	33.6	39.7		13.2	21.7	
Internal Link Dist (m)		626.4			183.5			478.9			571.3	
Turn Bay Length (m)		40.0			60.0			60.0			60.0	
Base Capacity (vph)	131	650	552	99	616	523	175	1556		104	1432	
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	0.34	0.58	0.10	0.33	0.47	0.10	0.37	0.17		0.29	0.07	



Maximum v/c Ratio: 0.84
Intersection LOS: D
ICU Level of Service B
Intersection Signal Delay: 48.9
Intersection Capacity Utilization 60.4%
Analysis Period (min) 15

Splits and Phases: 5: Greenbank & Chapman Mills

Lanes, Volumes, Timings
6: Point Prim/Hamsa & Chapman Mills

2034 Future Total
05-26-2020

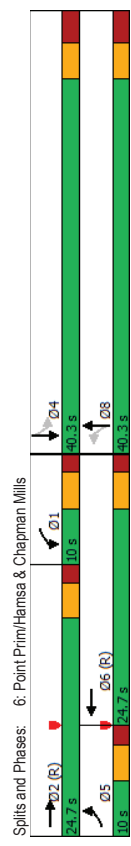
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	29	367	22	30	365	17	47	0	13	57	0	14
Future Volume (vph)	29	367	22	30	365	17	47	0	13	57	0	14
Satd. Flow (prot)	1621	1692	0	1621	1694	0	0	1593	0	0	1695	0
Flt Permitted	0.950			0.950			0.725				0.728	
Satd. Flow (perm)	1621	1692	0	1621	1694	0	0	1201	0	0	1208	0
Lane Group Flow (vph)	29	389	0	30	382	0	0	60	0	0	71	0
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6		8			4		
Permitted Phases							8			4		
Detector Phase	5	2		1	6		8			4		
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		10.0			10.0		
Minimum Split (s)	10.0	23.0		10.0	23.0		40.3			40.3		
Total Split (s)	10.0	24.7		10.0	24.7		40.3			40.3		
Total Split (%)	13.3%	32.9%		13.3%	32.9%		53.7%			53.7%		
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3			3.3		
All-Red Time (s)	1.7	1.7		1.7	1.7		3.0			3.0		
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0			0.0		
Total Lost Time (s)	5.0	5.0		5.0	5.0		6.3			6.3		
Lead/Lag	Lead	Lead		Lag	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes			Yes		
Recall Mode	None	C-Min		None	C-Min		None			None		
Act Effct Green (s)	6.1	48.9		5.6	48.4		15.0			15.0		
Actuated G/C Ratio	0.08	0.65		0.07	0.65		0.20			0.20		
v/c Ratio	0.22	0.35		0.25	0.35		0.25			0.29		
Control Delay	35.1	18.1		28.3	10.2		24.8			25.8		
Queue Delay	0.0	0.0		0.0	0.0		0.0			0.0		
Total Delay	35.1	18.1		28.3	10.2		24.8			25.8		
LOS	D	B		C	B		C			C		
Approach Delay		19.3			11.5		24.8			25.8		
Approach LOS		B			B		C			C		
Queue Length 50th (m)	5.1	50.2		3.6	11.3		7.8			9.3		
Queue Length 95th (m)	m10.7	#160.5		m9.3	#84.1		10.9			12.5		
Internal Link Dist (m)		462.9			626.4		112.1			80.0		
Turn Bay Length (m)		40.0			40.0							
Base Capacity (vph)	132	1103		121	1093		544			547		
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	0.22	0.35		0.25	0.35		0.11			0.13		

Intersection Summary	
Cycle Length: 75	
Actuated Cycle Length: 75	
Offset: 2 (3%), Referenced to phase 2:EBT and 6:WBT, Start of Green	
Natural Cycle: 75	
Control Type: Actuated-Coordinated	

Lanes, Volumes, Timings
6: Point Prim/Hamsa & Chapman Mills

2034 Future Total
05-26-2020

Maximum v/c Ratio: 0.35	Intersection LOS: B
Intersection Signal Delay: 16.8	ICU Level of Service A
Intersection Capacity Utilization 44.1%	
Analysis Period (min): 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	



Lanes, Volumes, Timings
7: Borrissokane & Cambrian

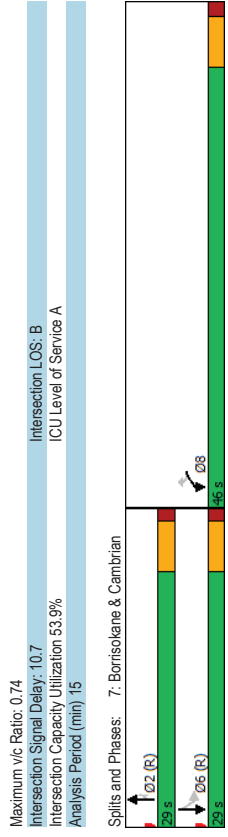
Lanes, Volumes, Timings
7: Borrissokane & Cambrian

2034 Future Total
05-26-2020

2034 Future Total
05-26-2020

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	190	546	96	99	250	89
Traffic Volume (vph)	190	546	96	99	250	89
Future Volume (vph)	1621	1450	1706	1450	3144	1706
Satd. Flow (prot)	0.950			0.695		
Flt Permitted	1621	1450	1706	1450	2300	1706
Satd. Flow (perm)	546		99			
Lane Group Flow (vph)	190	546	96	99	250	89
Prot	Perm	NA	Perm	Perm	NA	NA
Turn Type	8	2	2	2	6	6
Protected Phases	8	8	2	2	6	6
Detector Phase	8	8	2	2	6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	24.8	24.8	23.8	23.8	23.8	23.8
Total Split (s)	46.0	46.0	29.0	29.0	29.0	29.0
Total Split (%)	61.3%	61.3%	38.7%	38.7%	38.7%	38.7%
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	1.4	1.4	1.2	1.2	1.2	1.2
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	5.8	5.8	5.8	5.8
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	C-Min	C-Min	C-Min	C-Min
Act Effct Green (s)	15.6	15.6	47.6	47.6	47.6	47.6
Actuated G/C Ratio	0.21	0.21	0.63	0.63	0.63	0.63
v/c Ratio	0.56	0.74	0.09	0.10	0.17	0.08
Control Delay	32.1	32.1	7.1	2.3	4.8	4.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.1	32.1	7.1	2.3	4.8	4.8
LOS	C	A	A	A	A	A
Approach Delay	15.1		4.7		4.8	
Approach LOS	B		A		A	
Queue Length 50th (m)	24.5	0.0	4.3	0.0	5.3	3.5
Queue Length 95th (m)	36.1	21.0	13.2	6.2	11.2	9.0
Internal Link Dist (m)	489.2		241.1		1276.6	
Turn Bay Length (m)	38.0		30.0		150.0	
Base Capacity (vph)	864	1028	1082	956	1459	1082
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	0.22	0.53	0.09	0.10	0.17	0.08

Intersection Summary	
Cycle Length: 75	
Actuated Cycle Length: 75	
Offset: 10 (13%), Referenced to phase 2:NBT and 6:SBTL - Start of Green	
Natural Cycle: 50	
Control Type: Actuated-Coordinated	



Lanes, Volumes, Timings
8: Access #1 & BRT & Chapman Mills

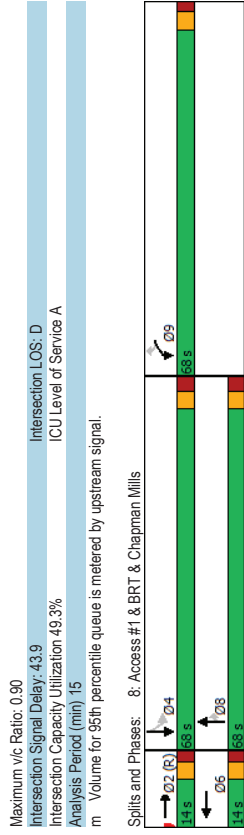
2034 Future Total
05-26-2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	5	0	72	10	358	0	149	94	261	70	0
Future Volume (vph)	0	5	0	72	10	358	0	149	94	261	70	0
Satd. Flow (prot)	0	1706	0	1621	1706	1450	0	1706	1450	1621	1706	0
Flt Permitted				0.950						0.607		
Satd. Flow (perm)	0	1706	0	1621	1706	1450	0	1706	1450	1035	1706	0
Satd. Flow (RTOR)												
Lane Group Flow (vph)	0	5	0	72	10	358	0	149	94	261	70	0
Turn Type	NA	NA	NA	Prot	NA	custom	NA	Perm	Perm	NA	NA	NA
Protected Phases	2	9	6	9	6	9	8	8	8	4	4	4
Permitted Phases	2	9	6	9	6	9	8	8	8	4	4	4
Detector Phase												
Switch Phase												
Minimum Initial (s)	5.0	10.0	5.0	10.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	10.4	26.4	10.4	26.4	10.4	26.4	40.2	40.2	40.2	40.2	40.2	40.2
Total Split (s)	14.0	68.0	14.0	68.0	14.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0
Total Split (%)	9.3%	45.3%	9.3%	45.3%	9.3%	45.3%	45.3%	45.3%	45.3%	45.3%	45.3%	45.3%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.1	2.1	2.1	2.1	2.1	2.1	2.9	2.9	2.9	2.9	2.9	2.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.4	5.4	5.4	5.4	5.4	5.4	6.2	6.2	6.2	6.2	6.2	6.2
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	None	Min	Min	Min	Min	Min	Min	Min	Min	Min	Min
Act Effct Green (s)	47.0	43.8	47.0	43.8	47.0	43.8	42.2	42.2	42.2	42.2	42.2	42.2
Actuated G/C Ratio	0.31	0.29	0.31	0.29	0.31	0.29	0.28	0.28	0.28	0.28	0.28	0.28
v/c Ratio	0.01	0.15	0.02	0.85	0.31	0.23	0.31	0.23	0.31	0.23	0.31	0.15
Control Delay	49.4	23.6	54.6	51.1	42.0	40.1	49.9	13.2	49.9	13.2	49.9	13.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	49.4	23.6	54.6	51.1	42.0	40.1	49.9	13.2	49.9	13.2	49.9	13.2
LOS	D	C	D	D	D	D	D	D	D	D	D	B
Approach Delay	49.4	46.7	49.4	46.7	49.4	46.7	41.3	41.3	41.3	41.3	41.3	42.1
Approach LOS	D	D	D	D	D	D	D	D	D	D	D	D
Queue Length 50th (m)	1.0	15.7	2.7	105.9	34.5	21.3	38.7	9.0	38.7	9.0	38.7	9.0
Queue Length 95th (m)	5.5	23.4	m6.5	89.7	46.8	31.9	67.5	8.1	67.5	8.1	67.5	8.1
Internal Link Dist (m)	50.9	462.9	462.9	117.7	117.7	117.7	150.0	38.0	150.0	38.0	349.9	349.9
Turn Bay Length (m)	534	676	534	605	605	605	702	597	426	426	702	702
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.11	0.02	0.59	0.21	0.16	0.61	0.10	0.61	0.10	0.61	0.10

Intersection Summary	
Cycle Length:	150
Actuated Cycle Length:	150
Offset:	148 (99%), Referenced to phase 2:EBT, Start of Green
Natural Cycle:	80
Control Type:	Actuated-Coordinated

Lanes, Volumes, Timings
8: Access #1 & BRT & Chapman Mills

2034 Future Total
05-26-2020



Lanes, Volumes, Timings
9: Borrissokane & Access #2

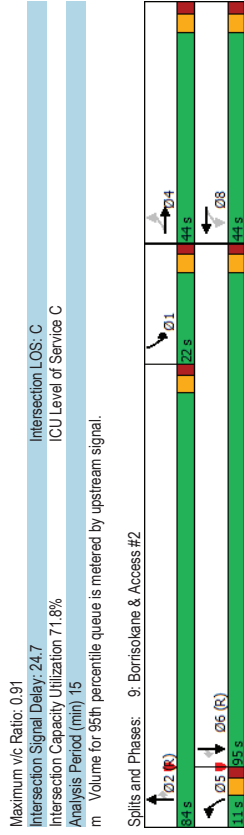
2034 Future Total
05-26-2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	128	0	13	13	0	153	6	548	6	78	232	61
Traffic Volume (vph)	128	0	13	13	0	153	6	548	6	78	232	61
Future Volume (vph)	1621	1450	0	1621	1450	0	1621	1706	1450	1621	1706	1450
Sat'd. Flow (prot)	0.504			0.749			0.950					0.950
Flt Permitted	860	1450	0	1278	1450	0	1621	1706	1450	1621	1706	1450
Sat'd. Flow (perm)	692			431			59					61
Lane Group Flow (vph)	128	13	0	13	153	0	6	548	6	78	232	61
Turn Type	Perm	NA	Perm	NA	Prot	NA	Prot	NA	Perm	Prot	NA	Perm
Permitted Phases	4	4	8	8	8	5	2	2	2	1	6	6
Detector Phase	4	4	8	8	8	5	2	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	5.0	10.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	28.8	28.8	28.8	28.8	28.8	10.3	24.3	24.3	24.3	10.3	24.3	24.3
Total Split (s)	44.0	44.0	44.0	44.0	44.0	11.0	84.0	84.0	84.0	22.0	95.0	95.0
Total Split (%)	29.3%	29.3%	29.3%	29.3%	29.3%	7.3%	56.0%	56.0%	56.0%	14.7%	63.3%	63.3%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.5	2.5	2.5	2.5	2.5	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.8	5.8	5.8	5.8	5.8	5.3	5.3	5.3	5.3	5.3	5.3	5.3
Lead/Lag						Lead	Lead	Lead	Lead	Lag	Lag	Lag
Lead-Lag Optimize?						Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	C-Max	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	24.7	24.7	24.7	24.7	24.7	6.2	92.2	92.2	92.2	16.7	111.7	111.7
Actuated G/C Ratio	0.16	0.16	0.16	0.16	0.16	0.04	0.61	0.61	0.61	0.11	0.74	0.74
v/c Ratio	0.91	0.02	0.06	0.26	0.09	0.09	0.52	0.01	0.43	0.18	0.06	0.06
Control Delay	115.0	0.0	49.0	1.0	73.8	19.1	0.0	50.5	0.6	0.1	0.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	115.0	0.0	49.0	1.0	73.8	19.1	0.0	50.5	0.6	0.1	0.0	0.1
LOS	F	A	D	A	E	B	A	D	A	D	A	A
Approach Delay	104.4			4.8			19.5				11.0	
Approach LOS	F			A			B				B	
Queue Length 50th (m)	37.4	0.0	3.3	0.0	1.8	87.4	0.0	20.0	1.0	20.0	1.0	0.0
Queue Length 95th (m)	57.9	0.0	8.9	0.0	m3.6	138.6	m0.0	35.3	1.5	35.3	1.5	0.0
Internal Link Dist (m)	145.0			184.4			1276.6			273.4		
Turn Bay Length (m)	38.0			38.0			38.0		30.0	38.0		30.0
Base Capacity (vph)	219	885	325	690	67	1048	914	180	1269	1095		
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.68	0.01	0.04	0.22	0.09	0.52	0.01	0.43	0.18	0.06		

Intersection Summary	
Cycle Length:	150
Actuated Cycle Length:	150
Offset:	2 (1%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle:	75
Control Type:	Actuated-Coordinated

Lanes, Volumes, Timings
9: Borrissokane & Access #2

2034 Future Total
05-26-2020



Maximum v/c Ratio:	0.91
Intersection Signal Delay:	24.7
Intersection Capacity Utilization:	71.8%
Analysis Period (min):	15
Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases:	9: Borrissokane & Access #2
D1	53.7 s
D2	11.8 s
D3	195 s
D4	22.5 s
D5	11.8 s
D6	195 s
D7	22.5 s
D8	11.8 s

Intersection LOS:	C
ICU Level of Service:	C

Lanes, Volumes, Timings
10: Borrisokane & Access #3/BRT

2034 Future Total
05-26-2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	4	4	4	4	4	4	2	2	2	6	6	6
Traffic Volume (vph)	13	5	5	0	10	0	0	829	0	0	365	6
Future Volume (vph)	13	5	5	0	10	0	0	829	0	0	365	6
Satd. Flow (prot)	0	1612	0	0	1706	0	1706	1706	0	1706	1706	1450
Flt Permitted	0	0.835	0	0	0	0	1706	1706	0	1706	1706	1450
Satd. Flow (perm)	0	1383	0	0	1706	0	1706	1706	0	1706	1706	1450
Satd. Flow (RTOR)	5											17
Lane Group Flow (vph)	0	23	0	0	10	0	0	829	0	0	365	6
Turn Type	Perm	NA	NA	NA	Perm	NA	Perm	NA	Perm	NA	Perm	6
Protected Phases	4	4	4	8	8	8	2	2	2	6	6	6
Permitted Phases	4	4	4	8	8	8	2	2	2	6	6	6
Detector Phase	4	4	4	8	8	8	2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	28.3	28.3	28.3	28.3	28.3	28.3	23.8	23.8	23.8	23.8	23.8	23.8
Total Split (s)	29.0	29.0	29.0	29.0	29.0	29.0	121.0	121.0	121.0	121.0	121.0	121.0
Total Split (%)	19.3%	19.3%	19.3%	19.3%	19.3%	19.3%	80.7%	80.7%	80.7%	80.7%	80.7%	80.7%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.3	2.3	2.3	2.3	2.3	2.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.3	5.3	5.3	5.3	5.3	5.3	5.6	5.6	5.6	5.6	5.6	5.6

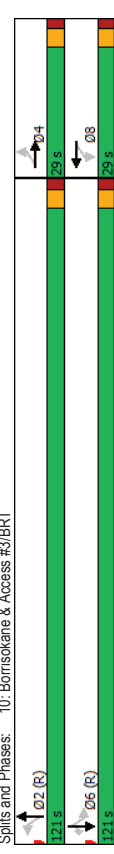
Lead/Lag Optimize?	None	None	None	C-Max	C-Max	C-Max	C-Max	C-Max
Recall Mode	None	None	None	152	152	132.3	132.3	132.3
Act Effct Green (s)	0.10	0.10	0.10	0.88	0.88	0.88	0.88	0.88
v/c Ratio	0.16	0.06	0.06	0.55	0.24	0.00	0.00	0.00
Control Delay	50.8	57.4	57.4	2.6	2.6	0.6	0.6	0.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	50.8	57.4	57.4	2.6	2.6	0.6	0.6	0.6
LOS	D	E	E	A	A	A	A	A
Approach Delay	50.8	57.4	57.4	2.6	2.6	0.6	0.6	0.6
Approach LOS	D	E	E	A	A	A	A	A
Queue Length 50th (m)	5.1	2.8	2.8	7.5	0.8	0.8	0.8	0.8
Queue Length 95th (m)	13.4	8.2	8.2	22.1	m4.6	m0.0	m0.0	m0.0
Internal Link Dist (m)	113.8	104.5	104.5	273.4	275.6	275.6	275.6	275.6
Turn Bay Length (m)								
Base Capacity (vph)	222	269	269	1504	1504	1504	1280	1280
Starvation Cap Reductn	0	0	0	3	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.04	0.04	0.55	0.24	0.24	0.24	0.24

Intersection Summary
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 126 (84%), Referenced to phase 2:NBL and 6:SBTL, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated

Lanes, Volumes, Timings
10: Borrisokane & Access #3/BRT

2034 Future Total
05-26-2020

Maximum v/c Ratio: 0.55
Intersection Signal Delay: 3.3
Intersection LOS: A
Intersection Capacity Utilization: 63.5%
ICU Level of Service: B
Analysis Period (min): 15
m Volume for 95th percentile queue is metered by upstream signal.



Lanes, Volumes, Timings
1: Strandherd & Dealership/Kennevale

2034 Future Total
05-26-2020

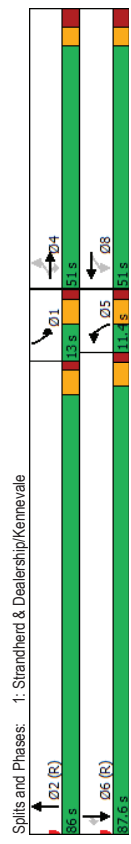
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	429	151	293	128	39	100	100	1855	132	93	2811	167
Future Volume (vph)	429	151	293	128	39	100	100	1855	132	93	2811	167
Satd. Flow (prot)	1621	1706	1450	1621	1522	0	3144	3203	0	1621	3241	1450
Flt Permitted	0.639		0.619			0.950				0.950		
Satd. Flow (perm)	1090	1706	1431	1055	1522	0	3144	3203	0	1620	3241	1450
Satd. Flow (RTOR)												
Lane Group Flow (vph)	429	151	293	128	139	0	100	1987	0	93	2811	167
Turn Type	Perm	NA	Perm	Perm	NA	Prot	NA	Prot	NA	Prot	NA	Perm
Protected Phases	4	4	4	8	8	5	2	1	6			
Permitted Phases	4	4	4	8	8	5	2	1	6			
Detector Phase	4	4	4	8	8	5	2	1	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	10.0	10.0
Minimum Split (s)	39.9	39.9	39.9	32.9	32.9	11.4	30.4	11.4	39.4	39.4	39.4	39.4
Total Split (s)	51.0	51.0	51.0	51.0	51.0	11.4	86.0	13.0	87.6	87.6	87.6	87.6
Total Split (%)	34.0%	34.0%	34.0%	34.0%	34.0%	7.6%	57.3%	8.7%	58.4%	58.4%	58.4%	58.4%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	4.6	4.6	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	3.6	3.6	3.6	3.6	3.6	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.9	6.9	6.9	6.9	6.9	6.4	6.4	6.4	6.4	6.4	6.4	6.4
Lead/Lag						Lag	Lead	Lag	Lead	Lag	Lead	
Lead-Lag Optimize?						Yes	Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	None	None	None	None	None	C-Max	None	C-Max	C-Max	C-Max	
Act Effct Green (s)	44.1	44.1	44.1	44.1	44.1	5.0	79.6	6.6	81.2	81.2	81.2	
Actuated G/C Ratio	0.29	0.29	0.29	0.29	0.29	0.03	0.53	0.04	0.54	0.54	0.54	
v/c Ratio	1.34	0.30	0.70	0.41	0.31	0.96	1.17	1.31	1.60	0.21	0.21	
Control Delay	213.6	43.1	57.2	47.5	43.5	77.6	97.1	262.1	301.3	18.7	18.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	213.6	43.1	57.2	47.5	43.5	77.6	97.1	262.1	301.3	18.7	18.7	
LOS	F	D	E	D	D	E	F	F	F	F	F	B
Approach Delay	131.6			45.4			96.2		284.8			
Approach LOS	F			D			F		F			
Queue Length 50th (m)	~163.6	34.5	76.7	30.3	31.8	15.5	~368.8		~34.9	~619.3	24.7	
Queue Length 95th (m)	#228.7	53.9	110.8	50.4	51.0	m14.8	#6307.5		#72.0	#652.3	38.4	
Internal Link Dist (m)	172.9			177.4			1040.6			345.0		
Turn Bay Length (m)	70.0	150.0	50.0	177.4		130.0			180.0		60.0	
Base Capacity (vph)	320	501	420	310	447	104	1699		71	1754	784	
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	1.34	0.30	0.70	0.41	0.31	0.96	1.17		1.31	1.60	0.21	

Intersection Summary
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 30 (20%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 125
Control Type: Actuated-Coordinated

Lanes, Volumes, Timings
1: Strandherd & Dealership/Kennevale

2034 Future Total
05-26-2020

Maximum v/c Ratio: 1.60	Intersection LOS: F
Intersection Signal Delay: 190.9	ICU Level of Service H
Intersection Capacity Utilization 132.5%	
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite.	
# Queue shown is maximum after two cycles, queue may be longer.	
# 95th percentile volume exceeds capacity, queue may be longer.	
m Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	



Lanes, Volumes, Timings
2: Borrissokane/Tartan & Strandherd

2034 Future Total
05-26-2020

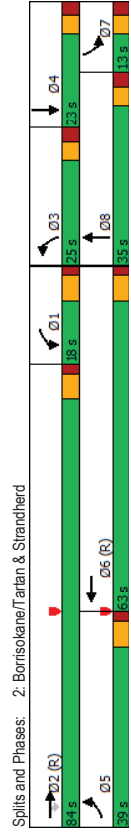
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	450	1901	786	148	1242	65	504	34	134	52	49	143
Future Volume (vph)	450	1901	786	148	1242	65	504	34	134	52	49	143
Sat'd. Flow (prot)	1621	3241	1450	1621	3218	0	3144	1501	0	1621	1515	0
Flt Permitted	0.950			0.950			0.950					0.950
Sat'd. Flow (perm)	1621	3241	1450	1621	3218	0	3144	1501	0	1621	1515	0
Sat'd. Flow (RTOR)												
Lane Group Flow (vph)	450	1901	786	148	1307	0	504	168	0	52	192	0
Turn Type	Prot	NA	Perm	Prot	NA	Prot	NA	Prot	NA	Prot	NA	Prot
Protected Phases	5	2	1	6	3	8	7	4				
Permitted Phases			2									
Detector Phase	5	2	2	1	6	3	8	7	4			
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0
Minimum Split (s)	11.4	56.4	56.4	11.4	56.4	11.0	34.0	11.0	34.0	11.0	16.0	16.0
Total Split (s)	39.0	84.0	84.0	18.0	63.0	25.0	35.0	13.0	23.0	8.7%	15.3%	15.3%
Total Split (%)	26.0%	56.0%	56.0%	12.0%	42.0%	16.7%	23.3%	8.7%	15.3%	8.7%	15.3%	15.3%
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	1.8	1.8	1.8	1.8	1.8	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	6.4	6.4	6.4	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lead	Lead	Lag	Lag	Lag	Lag	Lag
Lead/Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	None	C-Max	None	None	None	None	None	None	None
Act Effct Green (s)	32.6	77.6	77.6	11.6	56.6	19.0	27.6	11.0	17.0	0.0	0.0	0.0
Actuated G/C Ratio	0.22	0.52	0.52	0.08	0.38	0.13	0.18	0.07	0.11	0.07	0.11	0.11
v/c Ratio	1.28	1.13	1.05	1.18	1.08	1.27	0.61	0.44	1.12	0.44	1.12	1.12
Control Delay	175.3	76.9	40.4	174.5	81.1	183.8	61.2	78.0	163.3	78.0	163.3	163.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	175.3	76.9	40.4	174.5	81.1	183.8	61.2	78.0	163.3	78.0	163.3	163.3
LOS	F	E	D	F	F	F	E	E	F	E	F	F
Approach Delay	81.9	90.6	153.1									
Approach LOS	F	F	F									
Queue Length 50th (m)	-165.5	-336.7	-246.8	-51.4	-220.6	-96.5	49.1	14.6	-64.6			
Queue Length 95th (m)	m#84.9	m#62.6	m#45.3	m#76.8	m#226.9	#130.0	73.0	#37.2	#14.5			
Internal Link Dist (m)	1040.6			787.0		275.6						
Turn Bay Length (m)	105.0	110.0	55.0	100.0		38.0						
Base Capacity (vph)	352	1676	750	125	1214	398	316	119	171			
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	1.28	1.13	1.05	1.18	1.08	1.27	0.53	0.44	1.12			

Intersection Summary
 Cycle Length: 150
 Actuated Cycle Length: 150
 Offset: 120 (80%), Referenced to phase 2:EBT and 6:WBT, Start of Green
 Natural Cycle: 125
 Control Type: Actuated-Coordinated

Lanes, Volumes, Timings
2: Borrissokane/Tartan & Strandherd

2034 Future Total
05-26-2020

Maximum v/c Ratio: 1.28	Intersection LOS: F
Intersection Signal Delay: 95.7	ICU Level of Service H
Intersection Capacity Utilization 112.5%	
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite.	
# Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer.	
~ Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	



Lanes, Volumes, Timings
3: Chapman Mills/Fraser Fields & Strandherd

2034 Future Total
05-26-2020

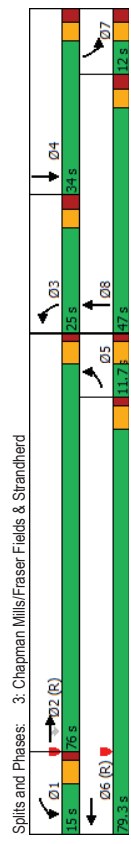
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	15	1631	580	104	988	54	474	0	85	18	0	8
Future Volume (vph)	15	1631	580	104	988	54	474	0	85	18	0	8
Satd. Flow (prot)	1621	3241	1450	1621	3212	0	3144	1450	0	1621	1450	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1621	3241	1450	1621	3212	0	3144	1450	0	1621	1450	0
Satd. Flow (RTOR)												
Lane Group Flow (vph)	15	1631	580	104	1042	0	474	85	0	18	8	0
Turn Type	Prot	NA	Perm	Prot	NA	Prot	NA	Prot	NA	Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2									
Detector Phase	5	2	2	1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0		5.0	10.0		5.0	10.0	
Minimum Split (s)	10.8	26.8	26.8	10.8	26.8		11.0	34.0		11.0	34.0	
Total Split (s)	11.7	76.0	76.0	15.0	79.3		25.0	47.0		12.0	34.0	
Total Split (%)	7.8%	50.7%	50.7%	10.0%	52.9%		16.7%	31.3%		8.0%	22.7%	
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2		3.3	3.3		3.3	3.3	
All-Red Time (s)	1.6	1.6	1.6	1.6	1.6		2.7	2.7		2.7	2.7	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.8	5.8	5.8	5.8	5.8		6.0	6.0		6.0	6.0	
Lead/Lag	Lag	Lag	Lag	Lead	Lead		Lead	Lead		Lag	Lag	
Lead/Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	C-Max	C-Max	None	C-Max		None	Min		None	Min	
Act Effct Green (s)	5.8	76.1	76.1	14.9	92.1		19.0	31.4		11.3	16.4	
Actuated G/C Ratio	0.04	0.51	0.51	0.10	0.61		0.13	0.21		0.08	0.11	
v/c Ratio	0.24	0.99	0.79	0.65	0.53		1.19	0.28		0.15	0.05	
Control Delay	43.8	16.9	9.3	90.5	9.2		168.0	71.2		63.8	55.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	43.8	16.9	9.3	90.5	9.2		168.0	71.2		63.8	55.0	
LOS	D	B	A	F	A		F	E		E	D	
Approach Delay		15.1		16.6			153.2			61.1		
Approach LOS		B		B			F			E		
Queue Length 50th (m)	4.2	48.3	20.8	28.0	9.4		-88.1	24.3		5.2	2.3	
Queue Length 95th (m)	m#4.6	m#148.9	m#60.4	m#41.9	m#159.8		#123.7	m#35.7		12.6	7.0	
Internal Link Dist (m)		787.0		628.9			349.9			82.1		
Turn Bay Length (m)		40.0		145.0			105.0			40.0		
Base Capacity (vph)	63	1644	735	161	1972		398	396		123	270	
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	0.24	0.99	0.79	0.65	0.53		1.19	0.21		0.15	0.03	

Intersection Summary
 Cycle Length: 150
 Actuated Cycle Length: 150
 Offset: 130 (87%), Referenced to phase 2:EBT and 6:WBT, Start of Green
 Natural Cycle: 125
 Control Type: Actuated-Coordinated

Lanes, Volumes, Timings
3: Chapman Mills/Fraser Fields & Strandherd

2034 Future Total
05-26-2020

Maximum v/c Ratio: 1.19	Intersection LOS: D
Intersection Signal Delay: 35.3	ICU Level of Service E
Intersection Capacity Utilization 89.3%	
Analysis Period (min): 15	
~ Volume exceeds capacity, queue is theoretically infinite.	
Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	



Lanes, Volumes, Timings
4: Greenbank & Strandherd

2034 Future Total
05-26-2020

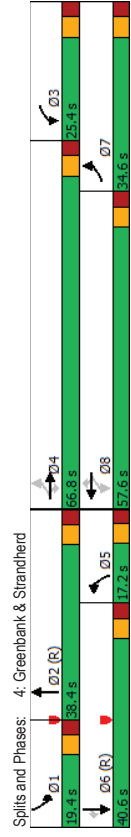
EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
390	1275	245	243	931	184	205	507	147	251	641	266
390	1275	245	243	931	184	205	507	147	251	641	266
1621	3241	1450	1621	3241	1450	3144	3120	0	3144	3241	1450
FIT Permitted											
0.128											
Said. Flow (perm)											
218											
Said. Flow (RTOR)											
200											
Lane Group Flow (vph)											
390											
Turn Type											
pm-pt NA Perm pm-pt NA Perm											
Protected Phases											
7 4 4 8 3 8 8 5 2 1 6											
Permitted Phases											
4 4 4 3 8 8 5 2 1 6											
Detector Phase											
7 4 4 3 8 8 5 2 1 6											
Switch Phase											
Minimum Initial (s)											
5.0											
Minimum Split (s)											
11.6											
Total Split (s)											
34.6											
Total Split (%)											
23.1%											
Yellow Time (s)											
3.7											
All-Red Time (s)											
2.9											
Lost Time Adjust (s)											
0.0											
Total Lost Time (s)											
6.6											
Lead/Lag											
Lag Lead Lag Lead Lag Lead Lag Lead Lag Lead Lag Lead											
Recall Mode											
None None None None None C-Max C-Max C-Max C-Max C-Max											
Act Effct Green (s)											
85.6											
Actuated G/C Ratio											
0.57											
v/c Ratio											
0.94											
Control Delay											
48.4											
Queue Delay											
0.0											
Total Delay											
48.4											
LOS											
D D A F E A F E A F E A											
Approach Delay											
37.1											
Approach LOS											
D E E F E											
Queue Length 50th (m)											
92.6											
Queue Length 95th (m)											
106.2											
Internal Link Dist (m)											
596.1											
Turn Bay Length (m)											
66.0											
Base Capacity (vph)											
416											
Starvation Cap Reductn											
0											
Spillback Cap Reductn											
0											
Storage Cap Reductn											
0											
Reduced v/c Ratio											
0.94											

Intersection Summary
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 8 (6%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 125
Control Type: Actuated-Coordinated

Lanes, Volumes, Timings
4: Greenbank & Strandherd

2034 Future Total
05-26-2020

Maximum v/c Ratio: 0.98
Intersection Signal Delay: 57.0
Intersection LOS: E
Intersection Capacity Utilization: 104.7%
ICU Level of Service G
Analysis Period (min): 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Lanes, Volumes, Timings
5: Greenbank & Chapman Mills

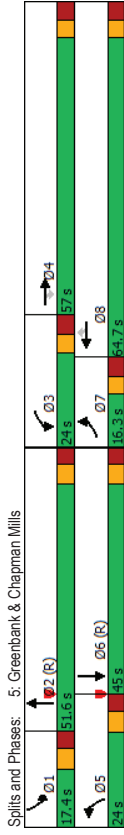
Lanes, Volumes, Timings
5: Greenbank & Chapman Mills

2034 Future Total
05-26-2020

2034 Future Total
05-26-2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	38	388	74	92	404	49	92	262	44	50	105
Traffic Volume (vph)	38	388	74	92	404	49	92	262	44	50	105
Future Volume (vph)	1621	1706	1450	1621	1706	1450	1621	3170	0	1621	3099
Satd. Flow (prot)	0.950			0.950			0.950			0.950	
Flt Permitted	1621	1706	1450	1621	1706	1450	1621	3170	0	1621	3099
Satd. Flow (perm)	38	388	74	92	404	49	92	306	0	50	149
Satd. Flow (RTOR)	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Prot	NA	
Lane Group Flow (vph)	7	4	3	8	8	5	2	1	6		
Protected Phases	7	4	4	3	8	8	5	2	1	6	
Permitted Phases	7	4	4	3	8	8	5	2	1	6	
Detector Phase	7	4	4	3	8	8	5	2	1	6	
Switch Phase	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	5.0	10.0	
Minimum Initial (s)	11.8	43.8	43.8	11.8	43.8	43.8	11.8	43.8	11.8	43.8	
Minimum Split (s)	16.3	57.0	57.0	24.0	64.7	64.7	24.0	51.6	17.4	45.0	
Total Split (%)	10.9%	38.0%	38.0%	16.0%	43.1%	43.1%	16.0%	34.4%	11.6%	30.0%	
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.7	3.7	3.7	
All-Red Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.1	3.1	3.1	3.1	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag	
Lead-Lag Optimize?	None	None	None	None	None	None	None	C-Max	None	C-Max	
Recall Mode	8.2	39.6	39.6	13.4	47.3	47.3	13.5	62.9	9.4	56.3	
Act Effct Green (s)	0.05	0.26	0.26	0.09	0.32	0.32	0.09	0.42	0.06	0.38	
Actuated G/C Ratio	0.43	0.86	0.19	0.64	0.75	0.11	0.63	0.23	0.50	0.13	
v/c Ratio	62.1	65.6	38.3	85.0	55.1	35.1	84.3	32.2	49.5	37.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	62.1	65.6	38.3	85.0	55.1	35.1	84.3	32.2	49.5	37.0	
LOS	E	E	D	F	E	D	F	C	D	D	
Approach Delay	61.3			58.3			44.3		40.2		
Approach LOS	E			E			D		D		
Queue Length 50th (m)	10.1	111.2	21.0	26.4	109.5	10.5	26.4	31.5	11.8	21.3	
Queue Length 95th (m)	m18.5	146.8	36.5	44.3	130.9	18.3	44.1	50.0	m18.3	m26.0	
Internal Link Dist (m)	626.4			183.5			478.9		571.3		
Turn Bay Length (m)	40.0	60.0	40.0	30.0	60.0	60.0	60.0	60.0	60.0	60.0	
Base Capacity (vph)	102	570	485	185	658	559	186	1329	117	1162	
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	0.37	0.68	0.15	0.50	0.61	0.09	0.49	0.23	0.43	0.13	

Maximum v/c Ratio: 0.86
Intersection Signal Delay: 53.6
Intersection LOS: D
Intersection Capacity Utilization: 63.3%
ICU Level of Service B
Analysis Period (min): 15
Volume for 95th percentile queue is metered by upstream signal.



Lanes, Volumes, Timings
6: Point Prim/Hamsa & Chapman Mills

2034 Future Total
05-26-2020

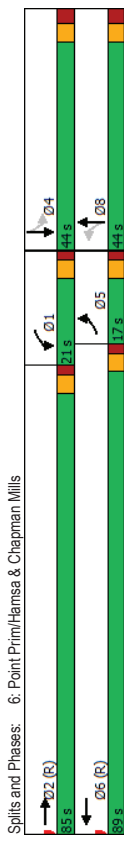
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	5	2	1	6	6	6	8	8	8	4	4
Traffic Volume (vph)	52	473	46	65	420	23	30	30	0	9	48
Future Volume (vph)	52	473	46	65	420	23	30	30	0	9	48
Satd. Flow (prot)	1621	1684	0	1621	1692	0	0	1592	0	0	1697
Flt Permitted	0.950			0.950			0.795				0.772
Satd. Flow (perm)	1621	1684	0	1621	1692	0	0	1314	0	0	1281
Lane Group Flow (vph)	52	519	0	65	443	0	0	39	0	0	60
Turn Type	Prot	NA	Prot	NA	Perm	NA	Perm	NA	Perm	NA	NA
Protected Phases	5	2	1	6	6	6	8	8	4	4	4
Permitted Phases	5	2	1	6	6	6	8	8	4	4	4
Detector Phase	5	2	1	6	6	6	8	8	4	4	4
Switch Phase	5	2	1	6	6	6	8	8	4	4	4
Minimum Initial (s)	5.0	10.0	None	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	10.0	23.0	10.0	23.0	42.3	42.3	42.3	42.3	42.3	42.3	42.3
Total Split (s)	17.0	85.0	21.0	89.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0
Total Split (%)	11.3%	56.7%	14.0%	59.3%	29.3%	29.3%	29.3%	29.3%	29.3%	29.3%	29.3%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	1.7	1.7	1.7	1.7	1.7	1.7	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	6.3	6.3	6.3	6.3	6.3
Lead/Lag	Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	None	C-Max	None	C-Max	Max	Max	Max	Max	Max
Act Effct Green (s)	9.7	80.8	13.0	84.0	0.09	0.56	0.28	0.28	0.28	0.28	0.28
Actuated G/C Ratio	0.06	0.54	0.09	0.56	0.46	0.47	0.11	0.11	0.11	0.11	0.11
v/c Ratio	0.50	0.57	0.46	0.47	0.46	0.47	0.11	0.11	0.11	0.11	0.11
Control Delay	65.5	4.0	72.6	7.4	43.9	44.7	43.9	44.7	44.7	44.7	44.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	65.5	4.0	72.6	7.4	43.9	44.7	43.9	44.7	44.7	44.7	44.7
LOS	E	A	E	A	E	A	D	D	D	D	D
Approach Delay	9.6	15.8	15.8	43.9	43.9	44.7	44.7	44.7	44.7	44.7	44.7
Approach LOS	A	B	B	D	D	D	D	D	D	D	D
Queue Length 50th (m)	16.0	7.3	20.3	8.4	8.8	8.8	13.7	13.7	13.7	13.7	13.7
Queue Length 95th (m)	m22.1	m10.3	m32.9	m55.0	16.9	16.9	26.6	26.6	26.6	26.6	26.6
Internal Link Dist (m)	462.9		626.4		112.1	112.1	80.0	80.0	80.0	80.0	80.0
Turn Bay Length (m)	40.0		40.0		369	369	360	360	360	360	360
Base Capacity (vph)	129	907	172	947	0	0	0	0	0	0	0
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.40	0.57	0.38	0.47	0.11	0.11	0.17	0.17	0.17	0.17	0.17

Intersection Summary
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 24 (16%), Referenced to phase 2EBT and 6WBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Lanes, Volumes, Timings
6: Point Prim/Hamsa & Chapman Mills

2034 Future Total
05-26-2020

Maximum v/c Ratio: 0.57
Intersection Signal Delay: 15.2
Intersection LOS: B
ICU Level of Service B
Intersection Capacity Utilization 55.3%
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.



Lanes, Volumes, Timings
7: Borrissokane & Cambrian

Lanes, Volumes, Timings
7: Borrissokane & Cambrian

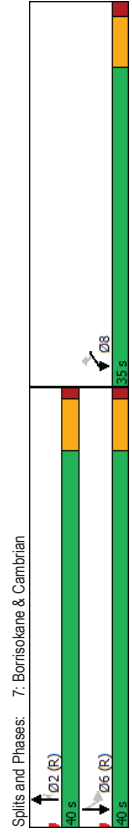
2034 Future Total
05-26-2020

2034 Future Total
05-26-2020

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	134	379	79	169	565	92
Future Volume (vph)	134	379	79	169	565	92
Satd. Flow (prot)	1621	1450	1706	1450	3144	1706
Flt Permitted	0.950				0.706	
Satd. Flow (perm)	1621	1450	1706	1450	2336	1706
Satd. Flow (RTOR)	379	169				
Lane Group Flow (vph)	134	379	79	169	565	92
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Permitted Phases	8	2	2	2	6	6
Detector Phase	8	8	2	2	6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	24.8	24.8	23.8	23.8	23.8	23.8
Total Split (s)	35.0	35.0	40.0	40.0	40.0	40.0
Total Split (%)	46.7%	46.7%	53.3%	53.3%	53.3%	53.3%
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	1.4	1.4	1.2	1.2	1.2	1.2
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	5.8	5.8	5.8	5.8
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	C-Min	C-Min	C-Min	C-Min
Act Effct Green (s)	12.6	12.6	50.6	50.6	50.6	50.6
Actuated G/C Ratio	0.17	0.17	0.67	0.67	0.67	0.67
v/c Ratio	0.49	0.68	0.07	0.16	0.36	0.08
Control Delay	33.9	9.9	5.2	1.5	2.5	1.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.9	9.9	5.2	1.5	2.5	1.4
LOS	C	A	A	A	A	A
Approach Delay	16.2	2.6	2.6	2.4		
Approach LOS	B	A	A	A		
Queue Length 50th (m)	17.5	0.0	3.0	0.0	3.3	1.0
Queue Length 95th (m)	29.8	20.0	8.9	6.3	3.0	1.3
Internal Link Dist (m)	489.2		241.1		1276.6	
Turn Bay Length (m)	38.0		30.0	150.0		
Base Capacity (vph)	626	793	1151	1033	1576	1151
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	0.21	0.48	0.07	0.16	0.36	0.08

Intersection Summary	
Cycle Length: 75	
Actuated Cycle Length: 75	
Offset: 72 (96%), Referenced to phase 2:NBT and 6:SBTL - Start of Green	
Natural Cycle: 50	
Control Type: Actuated-Coordinated	

Maximum v/c Ratio: 0.68
Intersection Signal Delay: 7.4
Intersection Capacity Utilization: 42.9%
Analysis Period (min): 15



Lanes, Volumes, Timings
8: Access #1 & BRT & Chapman Mills

Lanes, Volumes, Timings
8: Access #1 & BRT & Chapman Mills

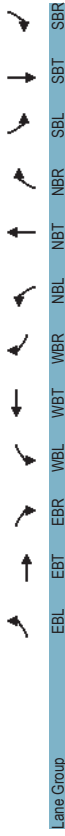
2034 Future Total
05-26-2020

2034 Future Total
05-26-2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	5	0	103	10	349	0	103	69	445	145	0
Future Volume (vph)	0	5	0	103	10	349	0	103	69	445	145	0
Satd. Flow (prot)	0	1706	0	1621	1706	1450	0	1706	1450	1621	1706	0
Flt Permitted				0.950						0.690		
Satd. Flow (perm)	0	1706	0	1621	1706	1450	0	1706	1450	1177	1706	0
Satd. Flow (RTOR)												
Lane Group Flow (vph)	0	5	0	103	10	349	0	103	69	445	145	0
Turn Type	NA	NA	Prot	NA	custom	NA	Perm	NA	Perm	NA	NA	NA
Protected Phases	2	9	6	8				8		4		
Permitted Phases				9				8		4		
Detector Phase	2	9	6	9				8		4		
Switch Phase												
Minimum Initial (s)	5.0	10.0	5.0	10.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	22.4	26.4	22.4	26.4	26.4	42.2	42.2	42.2	42.2	42.2	42.2	42.2
Total Split (s)	24.0	51.0	24.0	51.0	24.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0
Total Split (%)	16.0%	34.0%	16.0%	34.0%	16.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.1	2.1	2.1	2.1	2.1	2.9	2.9	2.9	2.9	2.9	2.9	2.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.4	5.4	5.4	5.4	5.4	6.2	6.2	6.2	6.2	6.2	6.2	6.2
Lead/Lag Optimize?												
Recall Mode	C-Max	None	None	None	None	None	None	None	None	None	None	None
Act Effct Green (s)	24.1	40.1	24.1	40.1	24.1	68.8	68.8	68.8	68.8	68.8	68.8	68.8
Actuated G/C Ratio	0.16	0.27	0.16	0.27	0.16	0.46	0.46	0.46	0.46	0.46	0.46	0.46
v/c Ratio	0.02	0.24	0.04	0.90	0.10	0.13	0.10	0.83	0.19	0.83	0.19	0.19
Control Delay	57.6	22.3	62.0	57.1	24.0	23.7	32.9	32.9	10.6	32.9	10.6	10.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	57.6	22.3	62.0	57.1	24.0	23.7	32.9	32.9	10.6	32.9	10.6	10.6
LOS	E	C	E	E	E	C	C	C	C	C	C	B
Approach Delay	57.6	49.5		49.5		23.9		23.9		27.4		27.4
Approach LOS	E	D		D		C		C		C		C
Queue Length 50th (m)	1.3	24.3	3.2	102.8	17.2	11.4	132.4	22.2		132.4	22.2	22.2
Queue Length 95th (m)	5.6	37.8	m6.9	#141.9	29.0	20.9	#177.8	m21.2		#177.8	m21.2	m21.2
Internal Link Dist (m)	67.7			462.9		117.7		117.7		349.9		349.9
Turn Bay Length (m)		38.0		60.0		15.0	38.0			38.0		38.0
Base Capacity (vph)	273	492	273	440	782	665	539	782		539		782
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.21	0.04	0.79	0.13	0.10	0.83	0.19		0.83	0.19	0.19

Intersection Summary												
Cycle Length:	150											
Actuated Cycle Length:	150											
Offset:	140 (93%), Referenced to phase 2:EBT, Start of Green											
Natural Cycle:	95											
Control Type:	Actuated-Coordinated											

Splits and Phases: 8: Access #1 & BRT & Chapman Mills												
Maximum v/c Ratio:	0.90											
Intersection Signal Delay:	35.3											
Intersection LOS:	D											
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.												
m Volume for 95th percentile queue is metered by upstream signal.												
Phase	24 s	75 s	75 s	24 s	75 s	75 s	24 s	75 s	75 s	24 s	75 s	75 s
Phase	Ø2 (R)	Ø4	Ø8	Ø6	Ø8	Ø8	Ø2 (R)	Ø4	Ø8	Ø6	Ø8	Ø8
Phase	Ø9	Ø9	Ø9	Ø9	Ø9	Ø9	Ø9	Ø9	Ø9	Ø9	Ø9	Ø9



Lanes, Volumes, Timings
9: Borrissokane & Access #2

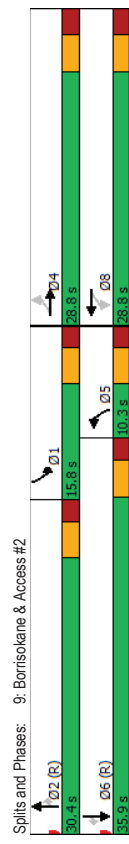
Lanes, Volumes, Timings
9: Borrissokane & Access #2

2034 Future Total
05-26-2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	9	0	9	9	0	109	12	340	12	163	645	124
Traffic Volume (vph)	91	0	9	9	0	109	12	340	12	163	645	124
Future Volume (vph)	91	0	9	9	0	109	12	340	12	163	645	124
Satd. Flow (prot)	1621	1450	0	1621	1450	0	1621	1706	1450	1621	1706	1450
Flt Permitted	0.687			0.752			0.950					
Satd. Flow (perm)	1172	1450	0	1283	1450	0	1621	1706	1450	1621	1706	1450
Satd. Flow (RTOR)	338			428			195					118
Lane Group Flow (vph)	91	9	0	9	109	0	12	340	12	163	645	124
Turn Type	Perm	NA	Perm	NA	Perm	NA	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	4	4		8	8		5	2	2	1	6	6
Permitted Phases	4	4		8	8		5	2	2	1	6	6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	13.5	13.5	13.5	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	28.8	28.8	28.8	28.8	28.8	28.8	10.3	24.3	24.3	10.3	24.3	24.3
Total Split (s)	28.8	28.8	28.8	28.8	28.8	28.8	10.3	30.4	30.4	15.8	35.9	35.9
Total Split (%)	38.4%	38.4%	38.4%	38.4%	38.4%	38.4%	13.7%	40.5%	40.5%	21.1%	47.9%	47.9%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.5	2.5	2.5	2.5	2.5	2.5	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.8	5.8	5.8	5.8	5.8	5.8	5.3	5.3	5.3	5.3	5.3	5.3
Lead/Lag							Lag	Lead	Lag	Lead	Lag	Lead
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	13.5	13.5	13.5	13.5	13.5	13.5	5.0	38.3	38.3	10.0	52.6	52.6
Actuated G/C Ratio	0.18	0.18	0.18	0.18	0.18	0.18	0.07	0.51	0.51	0.13	0.70	0.70
v/c Ratio	0.43	0.02	0.04	0.18	0.11	0.39	0.01	0.71	0.71	0.46	0.12	0.12
Control Delay	32.4	0.1	22.3	0.6	38.0	15.4	0.0	51.5	9.8	3.1	0.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.4	0.1	22.3	0.6	38.0	15.4	0.0	51.5	9.8	3.1	0.0	0.0
LOS	C	A	C	A	D	B	A	D	A	D	A	A
Approach Delay	29.4		2.3					15.6			16.5	
Approach LOS	C		A				B				B	
Queue Length 50th (m)	11.9	0.0	1.1	0.0	1.6	24.9	0.0	24.1	0.0	41.5	2.6	2.6
Queue Length 95th (m)	20.4	0.0	3.9	0.0	m4-1	68.3	m0.0	40.0	103.4	12.0	12.0	12.0
Internal Link Dist (m)	154.2		129.4			1276.6				273.4		
Turn Bay Length (m)	38.0		38.0		38.0	38.0	30.0	38.0	38.0	30.0	38.0	38.0
Base Capacity (vph)	359	679	393	741	108	871	836	226	1196	1051	0	0
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.25	0.01	0.02	0.15	0.11	0.39	0.01	0.68	0.46	0.12	0.12	0.12

Intersection Summary	
Cycle Length: 75	
Actuated Cycle Length: 75	
Offset: 62 (83%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Natural Cycle: 70	
Control Type: Actuated-Coordinated	

Maximum v/c Ratio: 0.71
Intersection Signal Delay: 16.0
Intersection LOS: B
Intersection Capacity Utilization 60.1%
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.
m Volume for 95th percentile queue is metered by upstream signal.



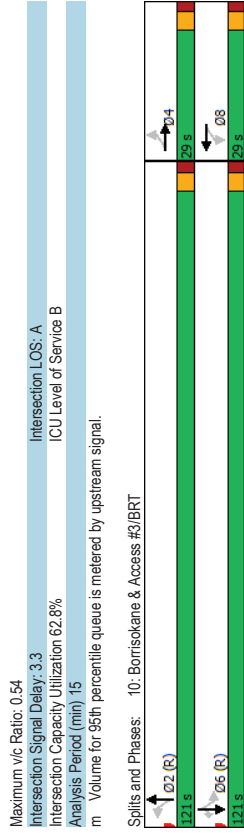
Lanes, Volumes, Timings
10: Borrisokane & Access #3/BRT

Lanes, Volumes, Timings
10: Borrisokane & Access #3/BRT

2034 Future Total
05-26-2020

2034 Future Total
05-26-2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	9	5	5	0	10	0	0	540	0	0	817	12
Traffic Volume (vph)	9	5	5	0	10	0	0	540	0	0	817	12
Future Volume (vph)	9	5	5	0	10	0	0	540	0	0	817	12
Satd. Flow (prot)	0	1607	0	0	1706	0	1706	1706	0	1706	1706	1450
Flt Permitted	0.868											
Satd. Flow (perm)	0	1427	0	0	1706	0	1706	1706	0	1706	1706	1450
Satd. Flow (RTOR)	5											17
Lane Group Flow (vph)	0	19	0	0	10	0	0	540	0	0	817	12
Turn Type	Perm	NA	NA	NA	Perm	NA	Perm	NA	Perm	NA	Perm	Perm
Permitted Phases	4	4		8	8	2	2	2	6	6	6	6
Detector Phase	4	4		8	8	2	2	2	6	6	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	28.3	28.3	28.3	28.3	28.3	23.6	23.6	23.6	23.6	23.6	23.6	23.6
Total Split (s)	29.0	29.0	29.0	29.0	29.0	121.0	121.0	121.0	121.0	121.0	121.0	121.0
Total Split (%)	19.3%	19.3%	19.3%	19.3%	19.3%	80.7%	80.7%	80.7%	80.7%	80.7%	80.7%	80.7%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.3	2.3	2.3	2.3	2.3	2.3	2.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.3	5.3	5.3	5.3	5.3	5.6	5.6	5.6	5.6	5.6	5.6	5.6
Lead/Lag Optimize?												
Recall Mode	None	None	None	None	None	C-Max	C-Max	C-Max	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)	15.2	15.2	15.2	15.2	15.2	132.3	132.3	132.3	132.3	132.3	132.3	132.3
Actuated G/C Ratio	0.10	0.10	0.10	0.10	0.10	0.88	0.88	0.88	0.88	0.88	0.88	0.88
v/c Ratio	0.13	0.13	0.13	0.06	0.06	0.36	0.36	0.36	0.36	0.36	0.36	0.36
Control Delay	47.9	47.9	47.9	57.4	57.4	5.1	5.1	5.1	5.1	5.1	5.1	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	47.9	47.9	47.9	57.4	57.4	5.1	5.1	5.1	5.1	5.1	5.1	5.1
LOS	D	D	D	E	E	A	A	A	A	A	A	A
Approach Delay	47.9	47.9	47.9	57.4	57.4	5.1	5.1	5.1	5.1	5.1	5.1	5.1
Approach LOS	D	D	D	E	E	A	A	A	A	A	A	A
Queue Length 50th (m)	3.9	3.9	3.9	2.8	2.8	56.7	56.7	56.7	56.7	56.7	56.7	56.7
Queue Length 95th (m)	11.4	11.4	11.4	8.2	8.2	96.2	96.2	96.2	96.2	96.2	96.2	96.2
Internal Link Dist (m)	209.1	209.1	209.1	212.9	212.9	273.4	273.4	273.4	273.4	273.4	273.4	273.4
Turn Bay Length (m)												
Base Capacity (vph)	229	229	229	269	269	1504	1504	1504	1504	1504	1504	1280
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.08	0.08	0.08	0.04	0.04	0.36	0.36	0.36	0.36	0.36	0.36	0.36



Appendix K

TDM Checklist for Subdivisions

DRAFT

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

Legend

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

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

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

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

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

TDM measures: Residential developments		Check if proposed & add descriptions
6. TDM MARKETING & COMMUNICATIONS		
6.1 Multimodal travel information		
BASIC ★	6.1.1 Provide a multimodal travel option information package to new residents	<input checked="" type="checkbox"/>
6.2 Personalized trip planning		
BETTER ★	6.2.1 Offer personalized trip planning to new residents	<input type="checkbox"/>